FISHGUARD REPLACEMENT LINKSPAN

ENVIRONMENTAL STATEMENT

VOLUME 1 MAIN TEXT

794-NI-POR-08886R
F01
Fishguard
Replacement Linkspan
May 2025

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 Statement
Volume I Main Text

Chapter 1 Introduction

794-NI-POR-00886R
May 2025

Document status

Version	Purpose of document	Authored by	Reviewed by	Approved by	Review date
D01	EIA Report	Various	MP	GN	May 2025

Approval for issue

Gavin Nichol	1 May 2025

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Prepared by:

RPS

Prepared for:

Stena Line Ports Ltd

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 licence 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, RPS	BLE (Hons) MRTPI
2	Project Description	Gavin Nicholl, RPS	BLE (Hons) MRTPI
3	Project Need & Alternatives	Michelle Price, RPS	BLE (Hons) MRTPI
4	EIA Process and Methodology	Michelle Price, RPS	BLE (Hons) MRTPI
5	Scoping and Consultation	Michelle Price, RPS	BLE (Hons) MRTPI
6	Policy & Legislation	Michelle Price, RPS	BLE (Hons) MRTPI
7	Human Health	Rygnan Pyper, RPS	MA PGDip CEnv MIEMA PFPH
8	Marine Biodiversity	Ellie Cooper, RPS	BSc Hons, MSc
9	Terrestrial Ecology & Ornithology	Tim Oliver, RPS	BSc, MSc
10	Coastal Processes	Kristopher Calder, RPS	BSc (HONS) MSc C.Sci MCIWEM C.WEM AMICE
11	Water Resources & WFD	Mark Magee, RPS	BA, MSc, CSci, CEnv, CWEM, MCIWEM
12	Flood Risk	Diane MacGinnis, RPS	BEng, MSc
13	Noise & Vibration	Catriona Cooper, RPS	BSc, MSc, MIOA
14	Underwater Acoustics	Rasmus Pederson, RPS	BSc. MSc, PhD
15	Air Quality	Stephen McAfee, RPS	BSc, MSc, AIEMA, MIAQM, IES
16	Archaeology, Architectural & Cultural Heritage	Nick Cooke, RPS	BA (Hons), PhD, MCIfA, FSA
17	Soils, Geology & Geohydrology	Joseph McGrath, RPS	MCIWEM C.WEM C.Sci
18	Land Use & Material Assets	Michelle Price, RPS	BLE (Hons) MRTPI
19	Transport	Conor O'Hara, RPS	MSc, BSc, CMILT, MCIHT
20	Seascape, Landscape & Visual	Stuart Anderson, RPS	BSc, Dip LandMan, Dip For, CMLI
21	Waste	Peter Braithwaite, RPS	BSc, MSc
22	Climate	Stephen McAfee, RPS	BSc, MSc, AIEMA, MIAQM, IES

23	Risk of Major Accidents & Disasters	Michelle Price, RPS	BLE (Hons) MRTPI
24	Shipping & Navigation	Client (Stena Line)	
25	Interactions	Sarah Little, RPS	BSc (Hons), MA

Table 1 List of Chapters

FISHGUARD LINKSPAN REPLACEMENT

Environmental Statement
Volume I Main Text

Chapter 2 Project Description

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May 2025

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 36 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 on the Figure 2-1 Site Location as shown below and appended to this report.

Figure 2-1 Site Location

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 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 2-2 below.

Figure 2-2 Existing Jack Up Barge, Linkspan Bridge, Towers and Concrete Buffer Dolphin

To safeguard the port and provide a safe, long-term solution, Stena Line wish to replace the existing temporary arrangement with a floating linkspan pontoon. Stena already own the proposed linkspan pontoon, which is in service at Mostyn, north Wales. Figure 2-3, below, shows the linkspan pontoon at Mostyn.

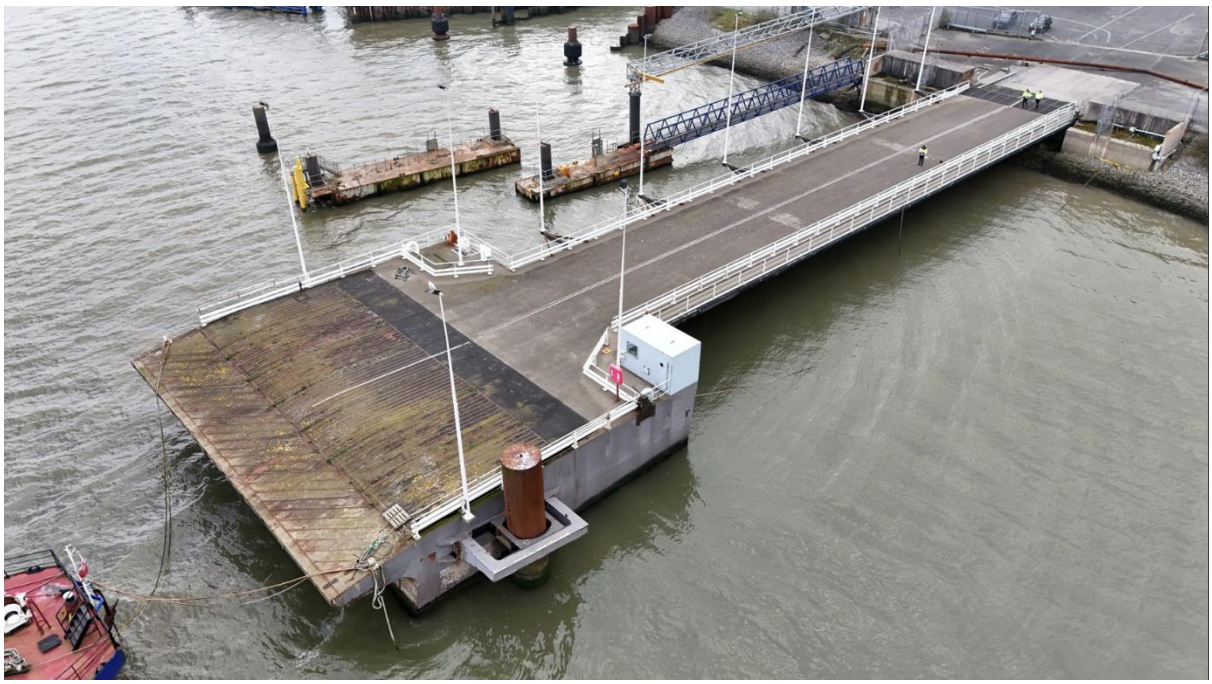

Figure 2-3 New floating linkspan pontoon in service in Mostyn, north Wales

Civil engineering works are required to accommodate the proposed floating linkspan pontoon. These works include demolition, dredging, piling, land reclamation, and rock armour revetment construction.

Landside works will be required to adjust traffic and pedestrian routes.

Capital dredging will be carried out to the area to the south of the berth and beneath the existing linkspan to create sufficient water depth for the pontoon linkspan to float at all stages of the tide. Soft bed material within the footprint of the reclaimed area will be dredged to allow the revetment to bear on to competent strata below. Capital dredging in the approach channel and north section of the berth is also included within the scope of the project.

It is proposed that all dredged arisings will be disposed of to sea at a licenced sea disposal site near Milford Haven (LU169).

To construct the civil engineering infrastructure and install the new linkspan pontoon will involve a shutdown of the ferry terminal. It is expected that this shutdown will last approximately 3 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:

- Demolition of
    - Disused RNLI slipway structure
    - Buffer Dolphin
    - Suspended deck structure
    - 3 No. small disused kiosks
- Removal of
    - Linkspan bridge, equipment and cabin
    - Jack up barge
- Dredging with disposal at sea
- Reclamation
- Scour protection to the berth and dredged slope to the rear of the berth.
- Piled Reinforced Concrete Bankseat
- Tubular Steel Guide Pile
- Floating pontoon linkspan installation
- Terminal reconfiguration
- Temporary Works

The schematic diagram shown in Figure 2-4 below identifies the main components of the Proposed Development which will constitute the replacement linkspan.

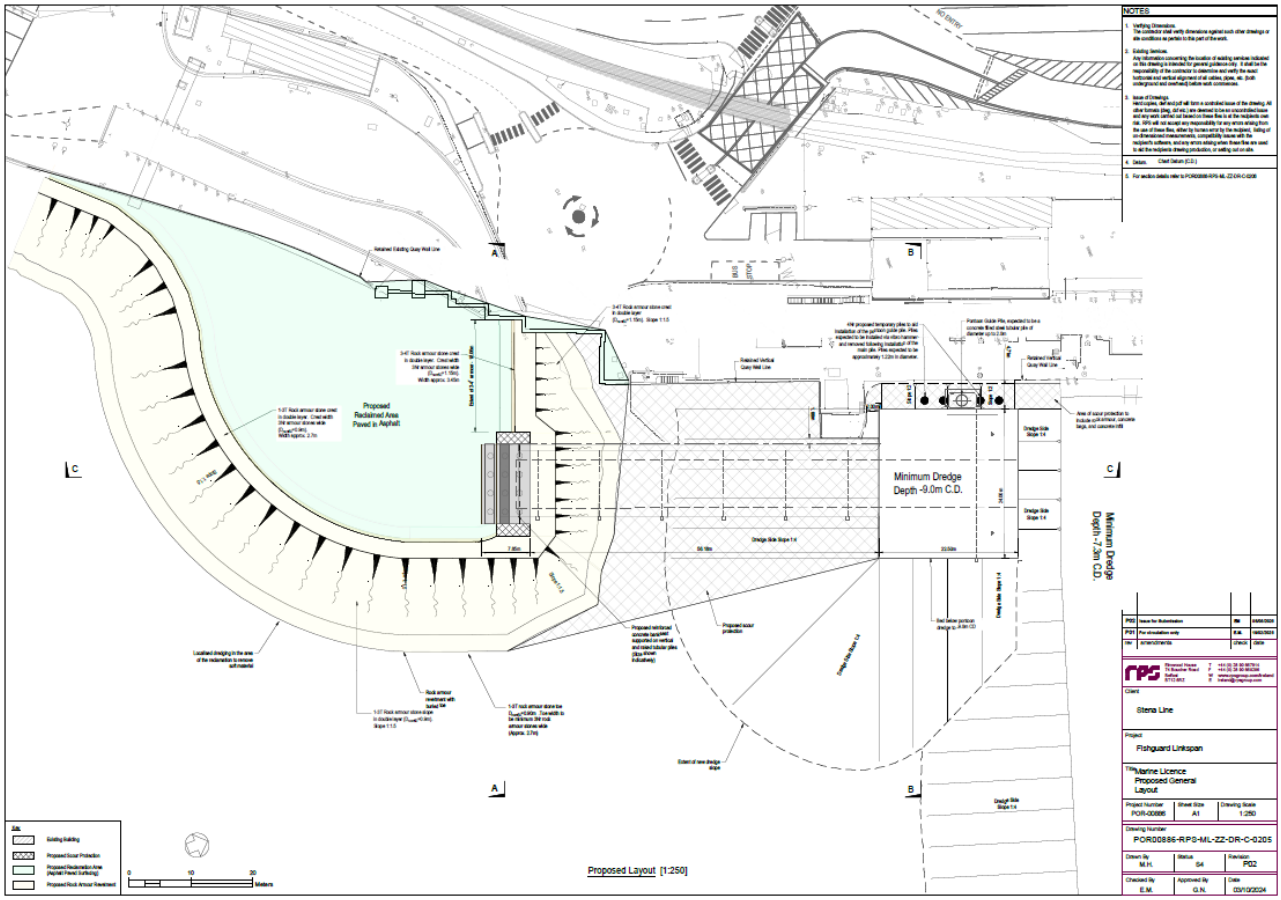

Figure 2-4 Layout showing proposed reclamation works and linkspan and dredging at berth

2.3.1 Reclamation

Construction of the new reclamation area will be undertaken against the shoreline in the vicinity of the old RNLI slipway. The extent of the reclamation is shown in Figure 2-4 Layout showing proposed reclamation works and linkspan and dredging at berth.

This area will be formed with imported crushed rock fill material protected by a rock armour revetment. Crushed rock will range from be in the 0-500mm in size whilst rock armour will range in size from 0.5 tonnes up to 6 tonnes. The footprint of the entire reclaimed area including the rock armour revetment is approximately 5500m^2 to include 2,150 m^2 of asphalt paving. The volume of primary rock armour (1-6t) required has been estimated at 5600m^3.

The crushed rock and rock armour to form the revetment will either be delivered by road and end tipped off the side of the sea wall or by split hopper barge vessel and dumped within the reclamation area. The crushed rock will be levelled and shaped within the reclamation footprint using plant such as excavators and jack up barges. Excavators shaping the reclamation area will be located on the reclamation area whilst excavators placing the rock armour may be located on jack up barges immediately adjacent to the reclamation area.

The rock armour revetment will have a toe detail which will tie into the scour protection proposed to the dredged slope behind the berth.

This area will be surfaced with an asphalt road surface (surfaced area approximately 1800sqm) which will connect to the existing road and pedestrian footpath network within the terminal. There is currently a storm

water outfall at the location of the proposed revetment. The storm sewer will be extended through the reclaimed area with a new headwall being constructed in the revetment.

2.3.2 Demolition/Removal of Structures

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. These are presented in Figure 2-5 Extents of Demolition/Removal from site , below. Note the car ramp structure is to be demolished and removed in advance of the rest of the works.

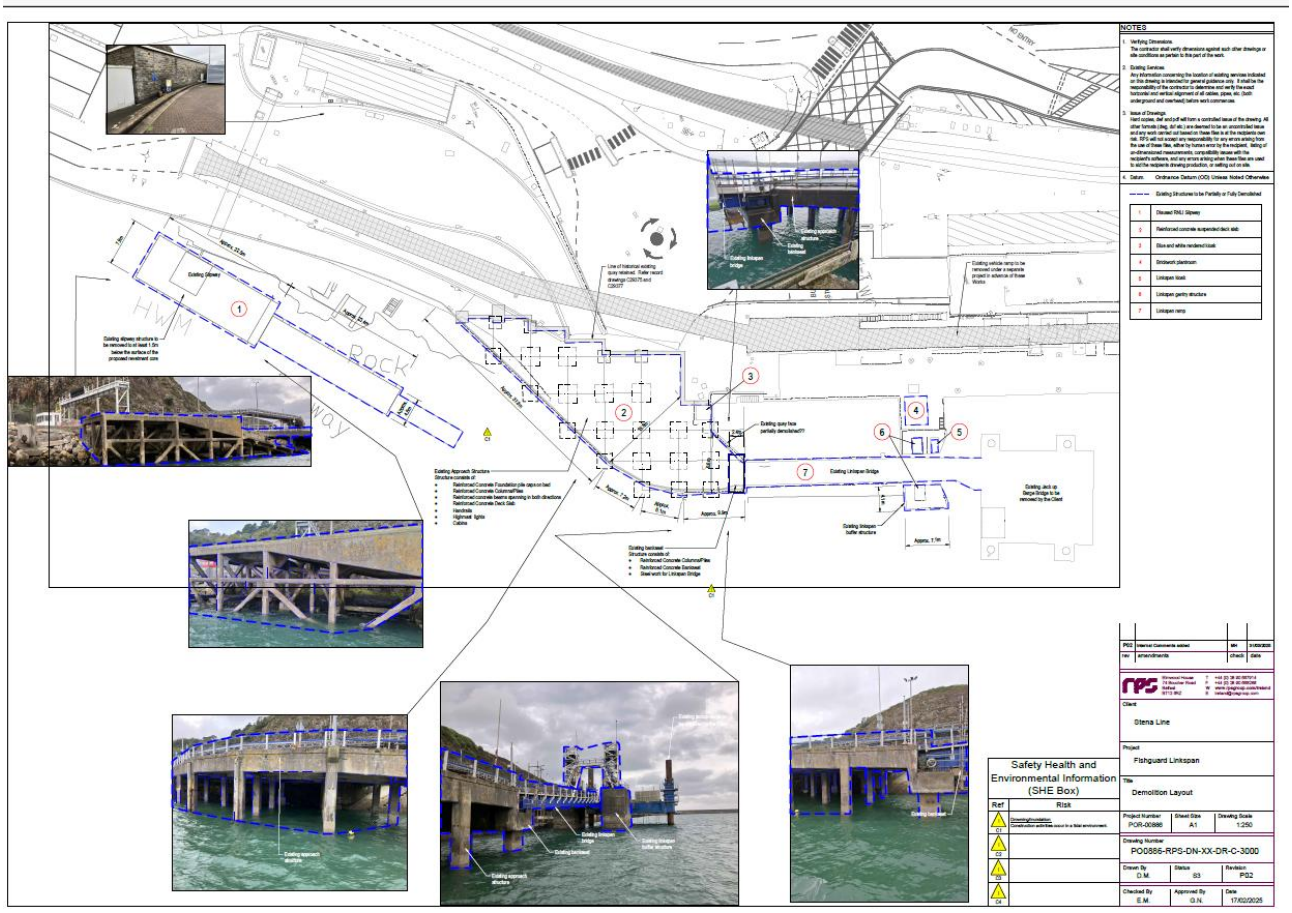

Figure 2-5 Extents of Demolition/Removal from site

Two phases of demolition will be required. The structures to be demolished or removed in each phase are as follows;

1. Construction Phase with berth operational
   The existing disused RNLI slipway, presented in Figure 2-6 Disused RNLI Slipway Structure below will be removed using land-based excavators equipped with rock breakers and hydraulic grabs. The area of the RNLI slipway is within the area of reclamation. The shoreline in this area around the slipway consists of concrete or block retaining walls, rock rubble revetment or exposed bedrock. The volume of material to be removed will be approximately 350m^3

Figure 2-6 Disused RNLI Slipway Structure

2. Construction Phase with closed berth
   The existing jack-up barge will be floated away and the steel linkspan bridge and gantry removed. The following structures will be demolished;
   - 3 No. small masonry kiosk buildings adjacent to the structures
   - Existing linkspan bridge and steel linkspan towers
   - Suspended reinforced concrete deck structure (Figure 2-7 Suspended reinforced concrete deck structure). This suspended deck is not a piled structure; the columns are placed directly on to bedrock exposed on the shoreline.
   - Concrete ‘buffer dolphin’ structure. (See Figure 2-8 South Buffer Dolphin and Linkspan Tower and Bridge)
   - Jack up barge will be floated away
   - The total volume of material to be removed is approximately 2200m^3

Figure 2-7 Suspended reinforced concrete deck structure

Figure 2-8 South Buffer Dolphin and Linkspan Tower and Bridge

The RNLI Slipway, suspended slab and buffer dolphin structures are all reinforced concrete marine structures. The demolition arisings from these structures may be temporarily placed on the seabed in the immediate vicinity of the respective structure before being removed prior to the construction of the reclaimed area.

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. All initial dredging undertaken as part of these works will be capital dredging. The Client is also applying for a licence to subsequently maintenance dredge the harbour over the next 5 years under a separate application.

The proposed areas to be dredged have been named A-H and are presented in Figure 2-9 Dredge Areas The harbour will be dredged to depths ranging between -7.3mCD and -6.8mCD in the berth and channel and -5.5mCD to the north of the harbour.

It is anticipated that the dredging will be a 24/7 operation over a 12-week period which may be broken into phases. The dredge material is expected to be silty sands and gravels. The dredge material is unsuitable for reclamation fill due to the potential settlement issues from the fine silt material present and the time and space required to dry out material.

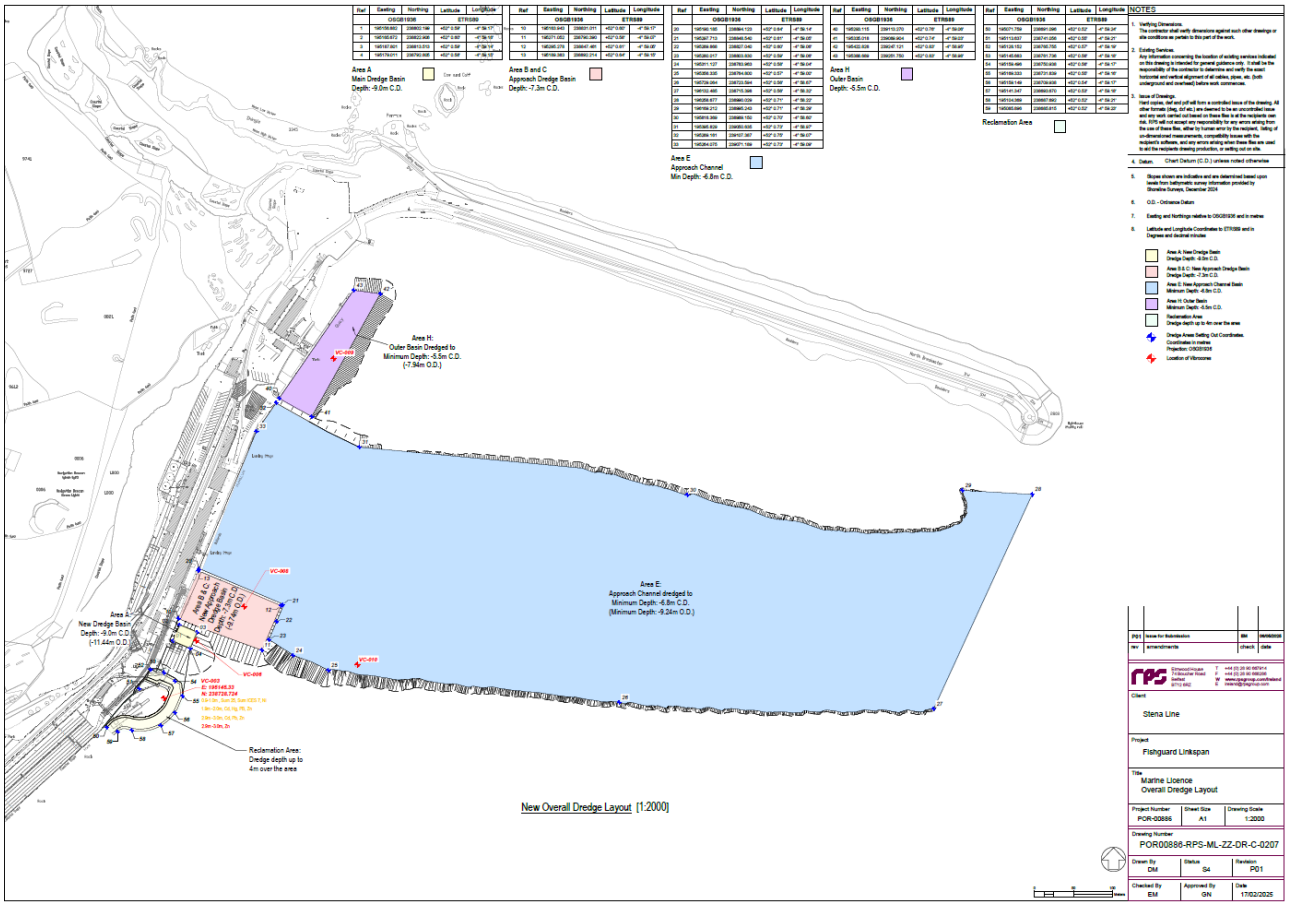

Figure 2-9 Dredge Areas

In total 78,000m^3 of capital dredging is expected. The bed material in and around the area of the new linkspan will be dredged using a backhoe excavator mounted on a pontoon. The dredging in the approach channel and the north section of the berth will be undertaken using a Trailer Suction Hopper Dredger (TSHD) or backhoe. Approximate dredge volumes & dredge methods for each area are summarised in Table 2-1.

Table 2-1 Dredge Quantities

Area	Rounded totals to include the contingency up to 78000 m^3	Method
A	**10,200**	Backhoe
B	**9,200**	Backhoe
C		
E	**40,000**	TSHD or Backhoe
H	**11,200**	TSHD or Backhoe
Reclamation area	**7,400**	Backhoe
Total	**78,000**	

Subject to geotechnical testing finding the material to be suitable, it is proposed that all dredged material will be disposed of to sea under licence from NRW at a licenced sea disposal site near Milford Haven (LU169).

2.3.4 Bankseat

A reinforced concrete bankseat structure will be constructed at the northern edge of the reclamation to support the linkspan pontoon. This structure is expected to be a piled bank seat, with steel tubular piles filled with concrete. The piles will be raked or vertical piles installed using vibro, impact driving and rotary boring techniques. These piles are proposed to be steel tubes approximately 0.914m in diameter.

2.3.5 Guide Pile

The guide pile to restrain the floating linkspan will be a steel tube, approximately 2m in diameter, filled with reinforced concrete. This single guide pile 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 four 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 four temporary support piles will be removed once the guide pile has been installed.

2.3.6 Scour Protection

Discrete scour protection will be installed along sections of the existing quay wall where issues are regularly experienced with ship bow thrusters creating scour holes in front of the quay wall. This discrete scour protection will involve insitu poured concrete fill to be placed behind stacked concrete bags and surrounding rock armour.

Scour protection will also be provided to the northern edge of the existing buffer dolphin on the seabed. This scour protection consists of stacked concrete bags with insitu fill behind, between the bags and the toe of the wall. Rock armour will be placed around the bags on the slope of the dredged pocket. Scour protection will also be placed between the south side of the existing dolphin buffer and the toe of the revetment. It is proposed to consist of rock armour or a concrete gabion mattress, approximately 500mm thick.

The gabion mattresses/additional rock armour will also address the issue of secondary scour pits forming in front of the rock armour revetment.

2.3.7 Terminal Reconfiguration

On the landside, changes will be made to the movement of vehicles passenger access and footways to integrate the new reclaimed area to the existing road network to connect the linkspan to the internal terminal road network. No works are planned for the railway station or rail line.

The pontoon will be equipped with electricity, with 10 LED streetlights long its length. The lighting will be designed to prevent glare to receptors and illumination of night sky. A new high mast lighting column will be installed within the footprint of the new reclaimed area.

Drainage provision including drainage channels, gulleys, pipework, manholes, interceptor (where required) and an extension of the existing outfall through the reclamation area will be established. Ducting will be installed to connect power and communication cables to the linkspan pontoon.

International Ship and Port Security Fencing (ISPS) and vehicle barriers will be provided around the boundary of the proposed reclamation area at the waterside.

2.3.8 Linkspan Installation

The proposed linkspan will be transported to the site via floating plant. The linkspan will be floated or lifted into position using floating plant and crawler cranes working from the land.

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 2-10 Potential Site Compound Locations. 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 could be utilised.

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

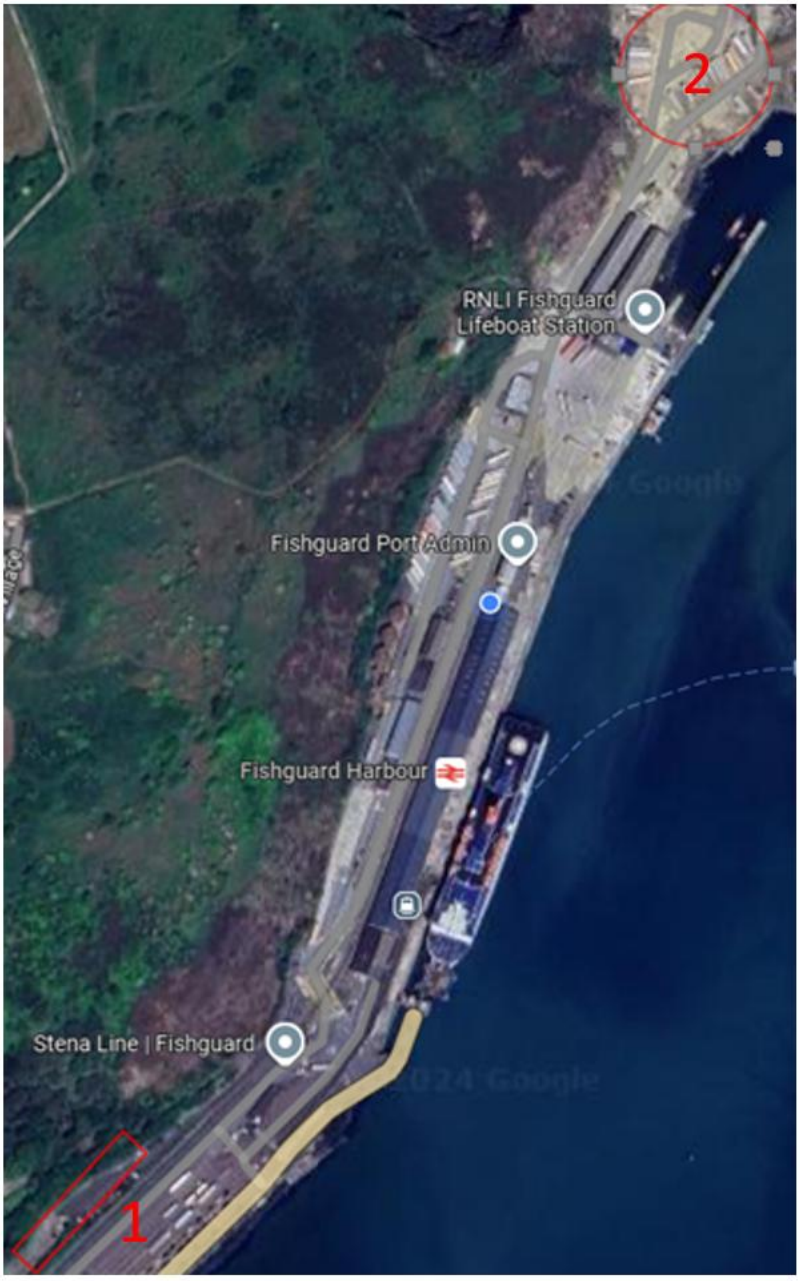

Figure 2-10 Potential Site Compound Locations

2.5 Site Access

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

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 port during the construction period.

The town itself should not be majorly affected by construction traffic; however, shipping and fishing vessels may be interrupted during the construction works.

2.6 Construction Period/Contractors Methodology

McLaughlin and Harvey, the appointed contractor specialising in construction and civil engineering have developed an outline programme.

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

2.6.1 Working Hours

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

Due to the 3-month shutdown to the ferry service, it is expected that work during the construction stage will be 24hrs/day 7 days per week.

2.6.2 Construction Sequence

- Overall Construction – Approximately 9 months
- Shutdown Period – Approximately 3 months

2.6.3 Enabling Works

- Demolition of Car Ramp
- Linkspan Refurbishment Work

2.6.4 Outline Method of Works

- Demolition of RNLI slipway
- Dredging in the wider harbour and outside the area of the jack up barge
- Reclamation and revetment construction and paving works
- Road furniture and fencing
- Bankseat piling and concrete works
- Pavement construction and tie in to existing
- Guide Pile installation (including installation and removal of temporary piles)

2.6.5 Construction Sequence - Shutdown Period

- Demolition of Buffer Dolphin
- Demolition of Suspended Slab
- Installation of Linkspan
- Remove hydraulic Linkspan and Jackup Barge
- Dredge beneath of Jackup Barge
- Drainage and connection to the existing network
- Completion of the pavement works to reclaimed area and rock armour

- Scour protection

2.6.6 Dredging Works Method

Dredging will be undertaken within the footprint of the proposed reclaimed area and pontoon using a combination of dredging techniques, including Trailor Suction Hopper Dredger (TSHDs) and Backhoe Dredger over 2 phases. Dredged materials will be transported via split hopper barge to licenced disposal site Milford Haven LU169. To maximise the use of the dredging equipment on site, 24/7 dredging/transferring to the licenced site is proposed.

2.6.7 Removal of RNLI Slipway

During the reclamation works, the existing RNLI slipway will be demolished using tracked and 90t long reach excavators equipped with rock breakers and hydraulic grabs. Demolition arisings will be removed via dump truck from the site and transported to an approved offsite disposal facility.

2.6.8 Reclamation Works

Works to create a new area of area in front of the existing quay wall will involve transportation of infill material by tipper lorry, where it will be end tipped from the existing quay wall. The material will be placed and levelled within the reclamation footprint using plant such as excavators and dozers where it will be dynamically compacted by compaction roller. The rock armour revetment will be installed either during the installation of the core material so that it is protected from tidal/weather events or as soon as possible following.

Existing traffic management and barriers will be retained, and if necessary to be removed, will be replaced with temporary ones that can be installed/removed as required for traffic flow.

2.6.9 Bankseat Construction Method

A piled bankseat will be constructed for the floating linkspan. Piling activities will include a combination of vibro/impact driving and rotary boring technique to include a rotary piling rig and crawler crane vibro/impact hammer.

2.6.10 Guide Pile Installation

A guide pile is required for the floating linkspan. A temporary piling rig will be used to facilitate the installation of guide piles for the linkspan. This will require vibro/impact driving of temporary piles into position using a crawler crane operating from the quay edge. The guide pile will then be installed using a combination of vibro/impact driving and rotary boring techniques. A temporary steel piling platform will be installed supported on temporary piles to increase the working area of the crawler crane. Upon completion of the guide pile installation, the temporary works will be removed.

2.6.11 Demolition Works

Demolition of the buffer dolphin and suspended slab will be undertaken to accommodate the proposed linkspan. This will be carried out from floating plant (Jack up Barge/Spud Leg Barge/Sheer leg crane barge) using a combination of wire saws, underwater drilling/coring, expansive compounds cardox, and excavators equipped with rock breakers. Demolition arising will be recovered during the dredging campaign.

2.6.12 Linkspan Installation

The proposed linkspan will be transported to the site via floating plant (barges/crane barge) and then lifted onto the bankseat using floating plant and 500t mobile crawler cranes from the quay edge.

2.6.13 Ancillary works

On completion of the linkspan, the Stena line ferry operations will recommence and the contractor will undertake remaining ancillary works (road furniture and fencing) works around the sailings.

2.7 Proposed Development v Marine Licence ref. CRML1806 (not enacted)

Marine Licence ref. CRML1806	**Proposed Development**
Installation of replacement single tier linkspan	Installation of a replacement linkspan pontoon
Removal of existing jack up structure and existing linkspan ramp	Removal of existing jack up and existing linkspan bridge
Demolition of existing concrete bank seat, dolphins and open piled deck	Demolition of suspended deck structure, buffer dolphin, disused RNLI slipway structure, steel car ramp structure, and 3 x small disused kiosks
Dolphin construction and piling (if required)	N/A
Dredging below the new area of reclamation (approx. 10,000m3) to maximum depth of 7m	Dredging below the new area of reclamation and within approach channel (approx. 78,000m3) to maximum depth of 9m. Disposal to offshore disposal site Milford Haven LU169.
Revetment construction and reclamation behind bankseat. 17,000m3 of infill creating 1,200m3 paved area. Rock armour revetment to the seaward edge of the reclaimed area.	Revetment construction and reclamation area of approximately 5,500sqm to include 2,150sqm of paved area. Volume of rock armour estimated 5,600sqm.
Bankseat construction and piling	Bankseat construction and piling to include guide pile and 4 temporary piles
	Scour Protection of rock/grout filled bags or gabion mattresses to quay wall Scour Protection to southern face of the dredged pocket and northern face of the dredged slope behind the linkspan pontoon of rock filled gabion mattresses or rock armour
Pavement construction and white lining of 1,200m2 of surfacing, including transition slabs connecting new access to the existing road	Integration of reclamation area to connect to existing road and pedestrian networks
Construction of steel walkways between dolphins	N/A
Associated service connections and security (service ducts, lighting, fencing)	10 LED streetlights, drainage provision and extension of existing outfall, service ducts, International Ship and Port Security Fencing (ISPS) and vehicle barriers

FISHGUARD LINKSPAN REPLACEMENT

Environmental Statement
Volume I Main Text

Chapter 3 Project Need and Alternatives

794-NI-POR-00886R
May 2025

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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.

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; and for the footprint of the revetment to be placed onto competent strata; and dredging of the approach channel, the design has evolved to include the necessary dredging of approximately 78,000m3.

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.

FISHGUARD LINKSPAN REPLACEMENT

Environmental Statement
Volume I Main Text

Chapter 4 EIA Process and Methodology

794-NI-POR-00886R
May 2025

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.

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

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.

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.

FISHGUARD LINKSPAN REPLACEMENT

Environmental Statement
Volume I Main Text

Chapter 5 Scoping & Consultation

794-NI-POR-00886R
May 2025

5 SCOPING & CONSULTATION

5.1.1 Screening, Scoping and Consultation

5.1.1.1 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. Clarifications were sought from NRW regarding the sample locations, sample plan and analysis and timescales for the associated band 1 licence. RPS clarified the timescales for submission of the Band 1 and Band 3 screening/scoping and EIA/Marine 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.

5.1.1.2 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.

5.1.1.3 Scoping Responses

In preparation of the 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. A list of the consultees whom responded to the scoping request are set out in 5.1.1.7List of Consultees; and issues raised and project team responses are set out in 5.1.1.6Table 1 Consultee Responses and Consideration.

Copies of correspondence between RPS and NRW, is included in Volume II, Appendix 5.1.

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.

5.1.1.4 Engagement with NRW Advisory Team

Further meetings were undertaken between NRW and the project team following the scoping opinion.

A meeting with NRW Advisory team and the project team was undertaken on the 28th February 2025. Key elements discussed included; the disposal of dredge materials and the procedures for new dredge materials and potential in combination effects; the calibration/validation of data within the Harbour and disposal site; records of blue mussels and necessary for subtidal survey; and the necessity of an intertidal survey.

A 2nd meeting was undertaken on the 5th March 2025 with James Highfield, NRW Advisory lead for Benthic ecology and the project team to discuss the plans for sampling and possibility of blue Mussels within the Harbour. At this meeting it was confirmed that the record of Blue Mussels from 2014 suggested that the age and size of mussel from that record would not warrant a survey to be undertaken. It was also confirmed that another grab sample was undertaken for Macrofauna at each of the sample locations and that these are tested at an accredited laboratory.

A 3rd Meeting was undertaken on the 18th March 2025 with Heads of Development Planning and Marine, NRW; Rhian Jardine and Emmer Litt as point of contacts for the project. It was confirmed that

the requirement for modelling at Fishguard Harbour was dependent on any sensitive habitats present within the vicinity of the proposed project and that no modelling of the disposal site was required as this was considered disproportionate to the scale of the disposal at LU169. It was however advised that engagement was undertaken with Milford Haven Port Authority (MHPA).

5.1.1.5 Engagement with Milford Haven

RPS Project Team met with Martin Maloney, The Port Hydrographer from The Bates Partnership Dredging, Harbour and Offshore Consultancy on behalf of Milford Haven Port Authority on 1st April 2024. The Bates Partnership consultancy carry out the development and supervision of dredging and survey requirements of Milford Haven Port Authority and others wishing to dispose at the licensed sites LU168 and LU169.

Mr Maloney advised that LU169 is licensed to accept 154,000m3 and up to 250,000m3 with permission by NRW over a 12-month period providing an allowance of 96,000 m3 for third parties to use the disposal site.

It was confirmed that there are no commitments for 2026, but that planned dredging in 2025 may spill into 2026. It was also advised that Milford Haven Port Authority undertake annual surveys in August/September to assess need for any dredging to be undertaken. The Proposed Development seeks to disposed 78,000M3 of sandy silt in 2026 which is well below the licensed capacity per annum.

5.1.1.6 Table 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
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	Inclusion within EIA: -	Chapter 23 outlines the risks of major accidents and disasters

31 January 2025 NRW PS Scoping Opinion	Description of significant adverse effects from 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 NRW PS Scoping Opinion	Further information on dredging methodology, location and duration	Chapter 2 Project Description sets out the dredging methodology, location and duration
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	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

	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.	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 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.

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

		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 associated direct ground-truthing. NRW(A) also note that there are discrepancies between the habitats maps shown in Figures 4.2 (EUSeaMap)	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

	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	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	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

16 January 2025NRW(A) Comments	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.	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 (see section **Error! Reference source not found.**). Appropriate mitigation measures for fish and shellfish receptors have been discussed in section **Error! Reference source not found.** and within the assessment itself in section **Error! Reference source not found.**
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 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 of Chapter 8 marine Ecology).
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	Common dolphin has been scoped into the assessment (see section 8.8.3.2.3 of Chapter 8 Marine Ecology).

	the Environment (Wales) Act 2016, should be also considered for assessment.	
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: 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.
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	Suggestion of creating habitat for Black guillemots	Measures for Black Guillemots are provided within Chapter 9, section 9.11.3

NRW PS Scoping Opinion		
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 NRW PS Scoping Opinion	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.
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	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

NRW PS Scoping Opinion		
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 NRW PS Scoping Opinion	Navigation Safety Plan and Vessel Management Plan	Stena Lines existing Navigational Safety and Vessel Management of Fishguard Harbour will apply.
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

5.1.1.7 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

5.1.1.8 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 Statement
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Chapter 6 Policy and Legislation

794-NI-POR-00886R
May 2025

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

The National Policy Statement for Ports was published in 2012 to provide a framework for planning decisions in relation to ports infrastructure development. In 2023 it was announced that the statement would be reviewed under the provisions of the Planning Act 2008. The policy for ports; encourages sustainable port development; enables judgements on developments on basis of commercial factors; and ensures proposed developments satisfy the relevant legal, environmental and social constraints and objectives. The Proposed Development supports and in compliance with this 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 second deposition consultation taking place in Autumn 2024, no submission has been made to the Welsh Government 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 Pembrokeshire National Park Plan 2020

The Pembrokeshire National Pak Management Plan 2020 – 2024 was adopted in 2020. The Proposed Development does not lie within the Parks jurisdiction however the Park is in close proximity.

Policy L1 seeks to conserve and enhance National Park landscapes and seascapes through managing major development and reducing visibility of existing infrastructure. Chapter 20 Landscape and Seascapes of the EIA considers the Proposed Development within this context. Policy L2 seeks to protect and enhance dark skies promoting good practice in regard to lighting. The Proposed Development has considered lighting and mitigation, and a lighting assessment and design accompanies this submission in Appendix 18.B.

Policy W1 seeks to provide and promote sustainable outdoor recreation opportunities for all through removing barriers to recreation, improving water quality at designated bathing waters, promoting a range of activities and managing recreational disturbance to species such as cliff nesting birds and marine mammals. Chapter 18 Land Use and Material Assets considers impact on recreational sea users.

Policy E1 seeks to protect and improve biodiversity quality, extent and connectivity at scale such as managing lighting for vulnerable species and managing invasive non-native species. A biosecurity management plan accompanies this EIA document.

Policy H1 seeks to conserve and enhance landscapes of particular historic interest, conservation areas, scheduled monuments, listed buildings and their settings. Chapter 16 assesses the impacts upon archaeology, architectural and cultural heritage.

Policy N1 Seeks the adaptation to climate change and Policy N4 seeks to protect air quality. Chapter 15 sets out the assessment of the Proposed Development in terms of Air Quality.

Policy N2 seeks to conserve and enhance water quality and restore water levels and natural flow regimes. This EIA sets out Chapter 11 Water Quality and Chapter 12 Flood Assessment and as set in the context of the Water Framework Directive.

6.2.11.3 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.

6.3 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 have 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 Statement
Volume I Main Text

Chapter 7 Population and Human Health

794-NI-POR-00886R
May 2025

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 human health and population and the vulnerability of the Proposed Development to bio-physical, social, behavioural, economic and institutional determinants of health and population. This chapter considers the potentially significant effects on population health (i.e. the implications for public 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: Transport

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 Proposed Development on human health and population. In particular, this ES chapter:

- Presents the existing environmental baseline established from desk studies, relevant datasets and consultation (section 7.8);
- 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 (sections 7.9.1 and 7.9.2) 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 and/or measures (see section 7.10) to prevent, minimise, reduce or offset the likely significant environmental effects identified in the assessment (sections 7.9.1 and 7.9.2).

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.

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

The 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
	"Development will be permitted where the following criteria are met: […..]

GN.1 General Development Policy	*7. It would not cause or result in unacceptable harm to health and safety"* 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.

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 Project 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. 7.9]

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. 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	Office for National Statistics (ONS)	2022
Population and household Estimates		
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 as follows:

- 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; WHO, 2021, 2018, 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 7-8. 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 sensitivity in this chapter are outlined in Table 7-6 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 following general characterisations of how the 'general population' may differ from 'vulnerable group populations' were considered when scoring sensitivity. These statements are not duplicated in each assessment and apply (as relevant) to the issues discussed for both construction and operation.

- In terms of life stage, 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. By contrast, 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.
- The general population can be characterised as experiencing low deprivation. However, the professional judgment is that the vulnerable group population experiences high deprivation (including where this is due to pockets of higher deprivation within low deprivation areas).

- The general population can be characterised as broadly comprised of people with good health status. Vulnerable groups, however, tend to include those parts of the population reporting bad or very bad health status.
- The general population tends to include a large majority of people who characterise their day-to-day activities as not limited. The vulnerable group population tends to represent those who rate their day-to-day activities as limited a little or limited a lot.
- Based on a professional judgement the general population's resilience (capacity to adapt to change) can be characterised as high whilst the vulnerable group population can be characterised as having limited resilience.
- Regarding the usage of affected infrastructure or facilities, the professional judgement is that the general population are more likely to have many alternatives to resources shared with the Project. For the vulnerable group population, the professional judgement is that they are more likely to have a reliance on shared resources.
- The general population includes the proportion of the community whose outlook on the Project includes support and ambivalence. The vulnerable group population includes the proportion of the community who are uncertain or concerned about the Project.

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 upon expert 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 Infrastructure Planning (Environmental Impact Assessment) Regulations 2017.

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

Sensitivity of receptor	Magnitude of impact			
	Negligible	Low	Medium	High
Very Low	Negligible	Negligible	Negligible or Minor	Minor
Low	Negligible	Minor	Minor	Minor or Moderate
Medium	Negligible or Minor	Minor	Moderate	Moderate or Major
High	Minor or Negligible	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.

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.

7.8 Baseline Environment

7.8.1 General Health

Table 7-9: Human health baseline data

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
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 (µg/m³)	n/a	n/a	4.2	6.9

Health life expectancy at birth, i.e. the average number of years a person can be expected to live in full health in Pembrokeshire is similar 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).

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

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. 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%.

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%).

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 Vulnerable groups including social disadvantage equality considerations.

Relevant protected characteristics are listed in Table 7-10 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 7-10 have been reviewed and are not considered to have relevant links to health outcomes that may be influenced by this Proposed Development.

Table 7-10: Relevant 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	0.7
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 fewer young people and working age people and more older people 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 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% which is slightly lower than the national average of 78.4% and Goodwick has a proportion of 78.3% of people with no disability or limiting condition which is similar to the national average.

Considering **language proficiency**, relevant to communicating findings and mitigations, Fishguard northeast has a proportion of 0.2% and Goodwick, 0.5% of the population who 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%.

7.8.3 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.

7.9 Impact Assessment

7.9.1 Assessment of Construction Effects

7.9.1.1 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 and Chapter 19: Transport of the ES, which sets 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, old age, low income, poor health, social disadvantage or access and geographical factors

7.9.1.1.1 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 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, both 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 affect physical activity. Vulnerability is linked to mode of travel, including pedestrians and cyclists being more sensitive to road safety changes. It also relates to age (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.

7.9.1.1.2 Magnitude of change

As stated in Chapter 2: Project Description, the construction programme is anticipated to be over a 9 month period. While port operations will continue for the majority of this time, there will be a 3 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: Transport 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 work 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. The magnitude is therefore considered to be **low**.

7.9.1.1.3 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, at most, be 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.

7.9.1.2 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 (children and young people).
  - Old age vulnerability (older people).
  - Poor health vulnerability (people with existing poor respiratory or cardiovascular health).
  - Access and geographical vulnerability (people for whom close proximity to Proposed Development change increases sensitivity).

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. The health assessment focus is on effects at the site-specific level.

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 14: 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, p. 201). 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.

7.9.1.2.1 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 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.

7.9.1.2.2 Magnitude of change

As stated in Chapter 14: 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 these phases, to further minimise construction dust impacts. These are detailed in Chapter 14: Air Quality (Section 14.10.1). Following mitigation, the air quality assessment predicts the risk of dust impacts to be at a level that is not significant.

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 *occasiona*l 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 dusts 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.

7.9.1.2.3 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.

7.9.1.3 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 including aviation 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).

- Old age vulnerability (older people including for elderly nursing homes).
- Poor health vulnerability (people with existing poor physical or mental health).
- 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 changes increases sensitivity).

The assessment covers these populations within two groups. The general population for the geographic area, notably Fishguard and Goodwick village residents, and the vulnerable sub-population for this area. The latter is a comprised of the vulnerabilities listed above. The differentiation of these two groups allows a discussion of any potentially significant health inequalities and the targeting of any mitigation.

7.9.1.3.1 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 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, both 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.

7.9.1.3.2 Magnitude of change

As stated in Chapter 2: Project Description, the duration of construction works is estimated to be 9 months. 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. However, when considering a worst-case scenario, Chapter 13: Noise and Vibration identifies the potential for construction noise to exceed limits (both daytime and night time) at a small number of individual receptors that are located closest to the construction activities, with the receptors most likely to be impacted being residential. These changes will be mitigated as set out in Chapter 13: Noise and Vibration, which includes the use of silencers for mechanical plant and equipment. Residents will also be informed of the timing and duration of activities that may produce high noise. The residual effects reported in Chapter 13: Noise and Vibration are not anticipated to result in significant impacts. As stated in Chapter 13: Noise and Vibration, with construction mitigation in place as proposed through the OCEMP, the noise impacts of construction activities are predicted to be reduced to temporary minor adverse.

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.

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 the 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.

7.9.1.3.3 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.

7.9.1.4 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.

This section has been informed by Chapter 11: Water Resources and WFD, which set 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),
  - old age (including the elderly),
  - social disadvantage or access and geographical factors (for example, people for whom alternative opportunities may be limited).

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 – feeling positive, 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).

7.9.1.4.1 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. 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 increases risks from a given toxin exposure. Increase sensitivity to exposure may also apply to older people and those with existing poor health (e.g. long-term illness).

7.9.1.4.2 Magnitude of Impact

Chapter 11: Water Resources and WFD 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 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 SSC 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.

7.9.1.4.3 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.

7.9.2 Assessment of Operational Effects

7.9.2.1 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: Transport 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 7.9.1.1.

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)
  - Old age vulnerability (older people)
  - Poor health vulnerability (people with a disability)
  - Access and geographical vulnerability (people who experience existing access barriers or who rely on the affected routes).

7.9.2.1.1 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 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, both 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 those with disabilities such as mobility issues, who will benefit from the proposed improvements to passenger access and footways.

7.9.2.1.2 Magnitude of change

Chapter 19: Transport of the ES reports 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.

7.9.2.1.3 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 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 and population assessment for the operational phase.

7.10.3 Future Monitoring

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

7.11 Assessment of Residual Effects

The residual effects of the Proposed Scheme 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 health study area.

7.12.1 In-combination effects

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 7-11 below.

Table 7-11: Summary of likely significant in-combination effects on health for individual effects occurring across the construction and operational and maintenance 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.

7.12.2 Effects interactions

The population health effects identified and assessed in this chapter have the potential to interact with each other. The areas of potential interaction between effects for a given geographic population are presented in Table 7-12. Vulnerable group effects are expected across all geographic populations, so are not listed separately.

Table 7-12: Interaction between health determinants by geographic populations.

	Site specific	Local	Regional	National	Inter-national
Transport	✓	✓			
Noise and vibration	✓				
Air Quality	✓				
Water Quality	✓				

Key:	Positive (green)	Positive as an influence of site-specific effects on the wider local area (light green)	Negative (blue)	Positive and negative (orange)

A summary of receptor led effects i.e. an assessment of the potential for effects to interact, spatially and temporally, to create inter-related effects on a receptor. As an example, all effects on human health, such as changes in noise and air quality, may interact to produce a different, or greater effect on a given population than when the effects are considered in isolation. Receptor-led effects may be short term, temporary or transient effects, or incorporate longer term effects.

Table 7-13: Summary of likely significant inter-related effects on health from multiple effects interacting across all phases (receptor-led effects).

Description of impact	Phase		Likely significant inter-related effects	Significance
	C	O		
Potential annoyance due to increase in noise pollution and air pollution in the site-specific study area.	✓	✓	Construction noise and dust would be properly mitigated as detailed in the OCEMP, Chapter 13: Noise and Vibration and Chapter 14: Air Quality. Impacts would be reduced to a level that is not significant. These would also be temporary. This limits the potential for effects, even in combination to be significant public health effects.	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 note 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 describe 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."* 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 7-14.

Table 7-14: Summary of impacts

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
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	Minor adverse	None
Noise and vibration	✓	×	None	C: Low	C: High	C: Minor adverse	None	Minor adverse	None
Water quality	✓	×	None	C: Low	C: High	C: Minor adverse	None	Minor adverse	None

7.15 References

Berglund, B., Lindval, T., Schwela, D.H., Organization, W.H., 1999. Guidelines for community noise. WHO Occupational and Environmental Health Team, Geneva.

Cave, B., Claßen, T., Fischer-Bonde, B., Humboldt-Dachroeden, S., Martin-Olmedo, P., Mekel, O., Pyper, R., Silva, F., Viliani, F., Xiao, Y., 2020. Human health: Ensuring a high level of protection A reference paper on addressing Human Health in Environmental Impact Assessment As per EU Directive 2011/92/EU amended by 2014/52/EU.

Cave, B., Pyper, R., Fischer-Bonde, B., Humboldt-Dachroeden, S., Martin-Olmedo, P., 2021. Lessons from an International Initiative to Set and Share Good Practice on Human Health in Environmental Impact Assessment. Int J Env. Res Public Health 18. https://doi.org/10.3390/ijerph18041392

Cesaroni, G., Forastiere, F., Stafoggia, M., Andersen, Z.J., Badaloni, C., Beelen, R., Caracciolo, B., de Faire, U., Erbel, R., Eriksen, K.T., Fratiglioni, L., Galassi, C., Hampel, R., Heier, M., Hennig, F., Hilding, A., Hoffmann, B., Houthuijs, D., Jöckel, K.-H., Korek, M., Lanki, T., Leander, K., Magnusson, P.K.E., Migliore, E., Ostenson, C.-G., Overvad, K., Pedersen, N.L., J, J.P., Penell, J., Pershagen, G., Pyko, A., Raaschou-Nielsen, O., Ranzi, A., Ricceri, F., Sacerdote, C., Salomaa, V., Swart, W., Turunen, A.W., Vineis, P., Weinmayr, G., Wolf, K., de Hoogh, K., Hoek, G., Brunekreef, B., Peters, A., 2014. Long term exposure to ambient air pollution and incidence of acute coronary events: prospective cohort study and meta-analysis in 11 European cohorts from the ESCAPE Project. BMJ 348, f7412. https://doi.org/10.1136/bmj.f7412

Guski, R., 1999. Personal and social variables as co-determinants of noise annoyance. Noise Health 1, 45–56.

Guski, R., Schreckenberg, D., Schuemer, R., 2017. WHO Environmental Noise Guidelines for the European Region: A Systematic Review on Environmental Noise and Annoyance. Int J Env. Res Public Health 14. https://doi.org/10.3390/ijerph14121539

Koreivienė, J., Anne, O., Kasperovičienė, J., Burškytė, V., 2014. Cyanotoxin management and human health risk mitigation in recreational waters. Env. Monit Assess 186, 4443–4459. https://doi.org/10.1007/s10661-014-3710-0

Meo, S., Suraya, F., 2015. Effect of environmental air pollution on cardiovascular diseases. Eur Rev Med Pharmacol Sci 19, 4890–4897.

Münzel, T., Herzog, J., Schmidt, F.P., Sørensen, M., 2017. Environmental stressors and cardiovascular disease: the evidence is growing. Eur Heart J 38, 2297–2299. https://doi.org/10.1093/eurheartj/ehx306

Münzel, T., Schmidt, F.P., Steven, S., Herzog, J., Daiber, A., Sørensen, M., 2018a. Environmental Noise and the Cardiovascular System. J. Am. Coll. Cardiol. 71, 688–697. https://doi.org/10.1016/j.jacc.2017.12.015

Münzel, T., Sørensen, M., Schmidt, F., Schmidt, E., Steven, S., Kröller-Schön, S., Daiber, A., 2018b. The Adverse Effects of Environmental Noise Exposure on Oxidative Stress and Cardiovascular Risk. Antioxid Redox Signal 28, 873–908. https://doi.org/10.1089/ars.2017.7118

Papadopoulou, L., Phillips, P., Twigger-Ross, C., Krisht, S., 2018. The value of bathing waters and the influence of bathing water quality: Literature Review.

Pyper, R., Cave, B., Purdy, J., McAvoy, H., 2021. Institute of Public Health (IPH) guidance: Standalone Health Impact Assessment and health in environmental assessment. Institute of Public Health.

Pyper, R., Lamming, M., Beard, C., Buroni, A., Douglas, M., Turton, P., Hardy, K., Netherton, A., McClenaghan, R., Barratt, T., Bhatt, A., Cave, B., Gibson, G., 2022a. IEMA Guide: Effective Scoping of Human Health in Environmental Impact Assessment. England: Institute of Environmental Management and Assessment.

Pyper, R., Waples, H., Barratt, T., Hardy, K., Turton, P., Netherton, A., McDonald, J., Buroni, A., Bhatt, A., 2022b. IEMA Guide: Determining Significance for Human Health in Environmental Impact Assessment. Institute of Environmental Management and Assessment.

Syed, S., Gerber, B., Sharp, L., 2013. Traveling towards disease: transportation barriers to health care access. J Community Health 38, 976–993.

Welsh Government, 2024. Planning Policy Wales.

Welsh Government, 2021. Future Wales The National Plan 2040. Welsh Government.

WHIASU, 2017. Quality Assurance Review Framework for Health Impact Assessment.

WHO, 2022. Mental health: strengthening our response. Retrieved Sept. 2022.

WHO, 2021. New WHO global air quality guidelines: more pressure on nations to reduce air pollution levels. Lancet Planet. Health 5, e760–e761.

WHO, 2018. Environmental Noise Guidelines for the European Region. World Health Organization Regional Office for Europe, Copenhagen.

WHO, 2013. Review of evidence on health aspects of air pollution – REVIHAAP Project Technical Report. World Health Organ.

WHO, 2009. Night Noise Guidelines for Europe.

World Health Organization, 2022. World mental health report: transforming mental health for all. World Health Organization, Geneva.

World Health Organization, 2004. The precautionary principle: protecting public health, the environment and the future of our children.

World Health Organization, 1948. The Preamble of the Constitution of the World Health Organization. Bulletin of the World Health Organization, New York.

FISHGUARD LINKSPAN REPLACEMENT

Environmental Statement
Volume I Main Text

Chapter 8 Marine Biodiversity

794-NI-POR-00886R
May 2025

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 Acoustics.

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 Proposed Development 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.
- Highlights any necessary mitigation and monitoring (section 8.10) to prevent, minimise, reduce or offset the likely significant environmental effects identified in the assessment.

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 Planning Boundary (i.e. Fishguard Harbour), 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 Planning Boundary, wherein all construction and operation activities will take place (Figure 8-1).

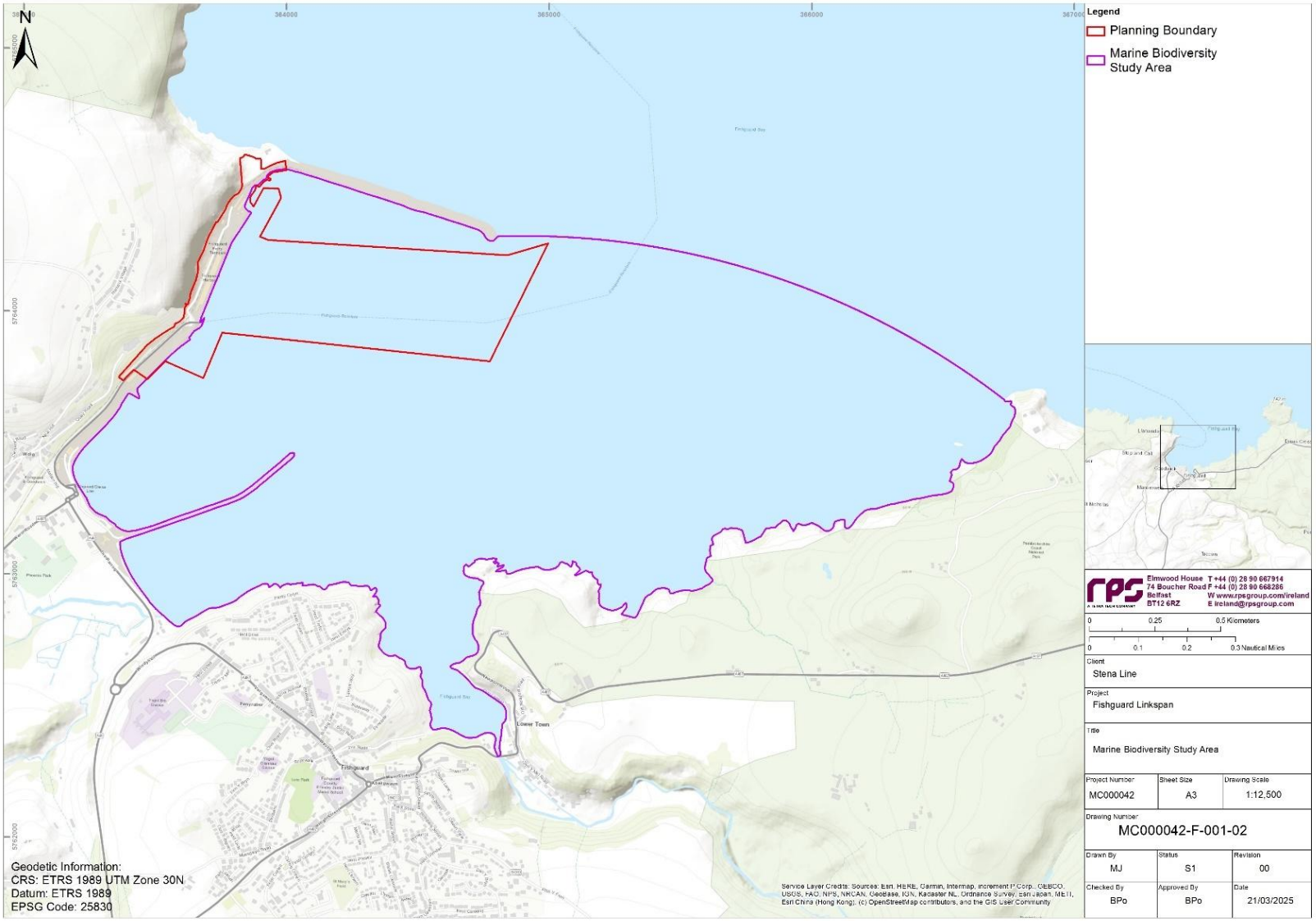

Figure 8-1: Marine Biodiversity Study Area

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 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: • 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.	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.

8.4.2 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 Volume IV: Report to Inform Appropriate Assessment (RIAA).

Key Provision/Objective	Where Considered in this Chapter
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 IV RIAA.
Living within Environmental Limits: Support the achievement and maintenance of Good	This chapter provides an assessment of the Proposed Development alone and cumulatively with

Key Provision/Objective	Where Considered in this Chapter
Environmental Status (GES) and Good Ecological Status (GeS).	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 IV RIAA.
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 Line 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 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.
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.	

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) 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 this Chapter 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, 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

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
			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 Line 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 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	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.

[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
		in line with the guidelines of the North East Atlantic Marine Biological Analytical Quality Control (NMBAQC) scheme.	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 8A 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 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.	

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	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).
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
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.	

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
			provided here is standard practice across EIAs from a range of sectors and aligns with the proportionate EIA approach.
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). 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).
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	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

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
		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	discussed in section 8.10 and within the assessment itself in section 8.9.2.2.3.
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	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
		that North Anglesey Marine SAC is scoped in for harbour porpoise.	
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 8-29). 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

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
			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
Benthic Subtidal and Intertidal Ecology	
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)
Fish and Shellfish Ecology	
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)

Title	Source
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)
Marine Mammals	
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)
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)
The Identification of Discrete and Persistent Areas of Relatively High Harbour Porpoise Density in the Wider UK Marine Area	Heinänen and Skov (2015)
Analysis of Long-Term Effort-Related Land-Based Observations to Identify whether Coastal Areas of Harbour Porpoise and Bottlenose Dolphin have Persistent High Occurrence and Abundance	Evans *et al.* (2015)
Bottlenose Dolphin and Harbour Porpoise Monitoring in Cardigan Bay and Pen Llŷn a'r Sarnau 2011 – 2013	Feingold and Evans (2014)
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, and the benthic validation survey results are reported in full in Appendix IV. The intertidal survey results will be submitted as an addendum when available.

These desktop data sources include the results of site-specific surveys undertaken within Fishguard Harbour for similar works at both the Stena Line 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 (EclA) 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).

Magnitude of impact	Definition
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

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

8.7.2 Underwater Noise Assessment Methodology

There are a number of activities associated with the Proposed Development that ae likely to generate underwater noise (see Table 7-8). 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 Acoustics).
- 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 Acoustics).

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 Acoustics for further information).

As detailed in Chapter 2: Project Description, a reinforced concrete bank seat structure will be constructed at the northern edge of the reclamation area to support the linkspan pontoon. This structure is expected to be a piled bank seat, with steel tubular piles filled with concrete. The piles will be raked or vertical piles installed using vibro piling, impact driving and rotary boring techniques. These piles are proposed to be steel tubes approximately 0.914 m in diameter. In addition, a guide pile will be installed to restrain the floating linkspan structure. The guide pile will be a steel tube, approximately 2 m in diameter, filled with reinforced concrete. This single guide pile will be socketed into bedrock beneath the bed material using a combination of vibro piling and rotary boring techniques. The installation of the guide pile will require four 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 piling and/or impact driving techniques. The four temporary support piles will be removed once the guide pile has been installed.

The source levels used in the underwater noise modelling (see Chapter 14: Underwater Acoustics) are based on the following metrics: Sound Pressure Level (SPL) equal to SPL_{RMS} 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**Error! Reference source not found.**.

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

Activitiy	Source Level	Comments	Impulsive or Non-impulsive
Dredging	174 dB SPL	Based on a 90 m generic Trailing Suction Hopper Dredger (TSHD) vessel.	Non-impulsive
Demolition, Rock Breaking, Pecking during dredging	194 dB SPL	Based on Standard Penetration Testing (SPT), 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 pile	194 dB SPL	Assuming pile diameter of 2 m.	Non-impulsive
Coring, main pontoon pile	163 dB SPL	Assuming pile diameter of 2 m.	Non-impulsive
Impact piling, support pile	209 dB SEL (245 dB L_P)	Assuming a blow rate of 0.6 Hz, pile diameter of 1.22 m, 110 kJ hammer. Maximum daily duration of two 30 minute intervals (a total of 60 minutes daily with a total of four occurences over two to four days).	Impulsive to 900 m range then non-impulsive
Vibro piling, support pile	194 dB SPL	Assuming pile diameter of 1.22 m.	Non-impulsive
Impact piling, Bank seat piles	194 dB SPL in water	Assuming pile diameter of 1.22 m.	Non-impulsive (due to land-

Activitiy	Source Level	Comments	Impulsive or Non-impulsive
(piles installed in made ground)	*Based on 209 dB SEL (245 dB L_P)*		water interface effects)
Coring, Bank seat pile	159 dB SPL	Assuming pile diameter of 1.22 m.	Non-Impulsive

The reduction of noise between the source and the receiver was modelled using the Weston model (Appendix 14.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 Chapter 14. Underwater acoustics. Appendix 14 A) 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. The results of the intertidal survey will be submitted as an addendum when available. 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)).

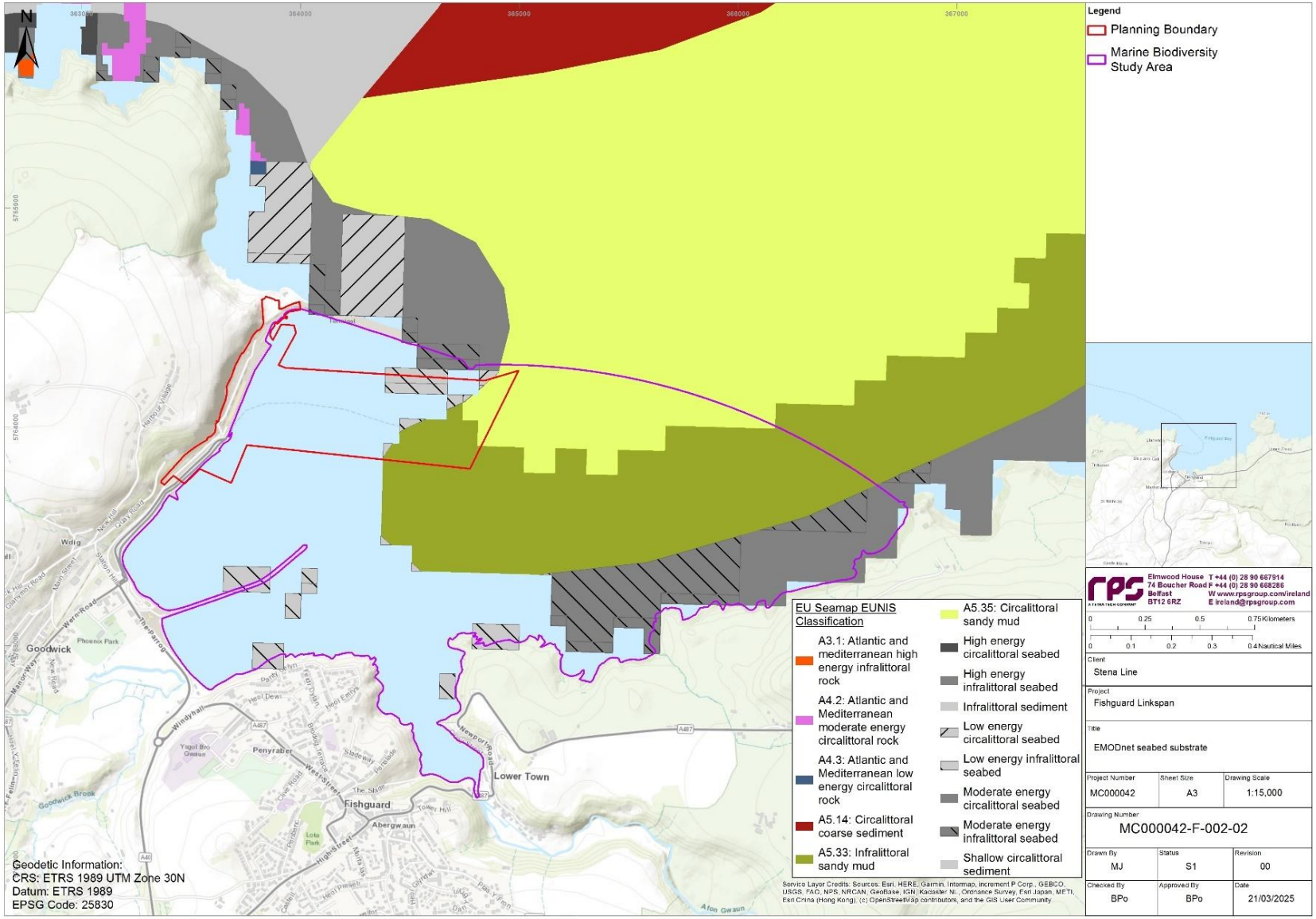

Figure 8-2: EUSeaMap Habitat Classifications in the vicinity of the Marine Biodiversity Study Area (EMODnet, 2025)

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 Planning 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 Planning Boundary in 2017 for a replacement linkspan at the Stena Line 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 Planning 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 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, 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).

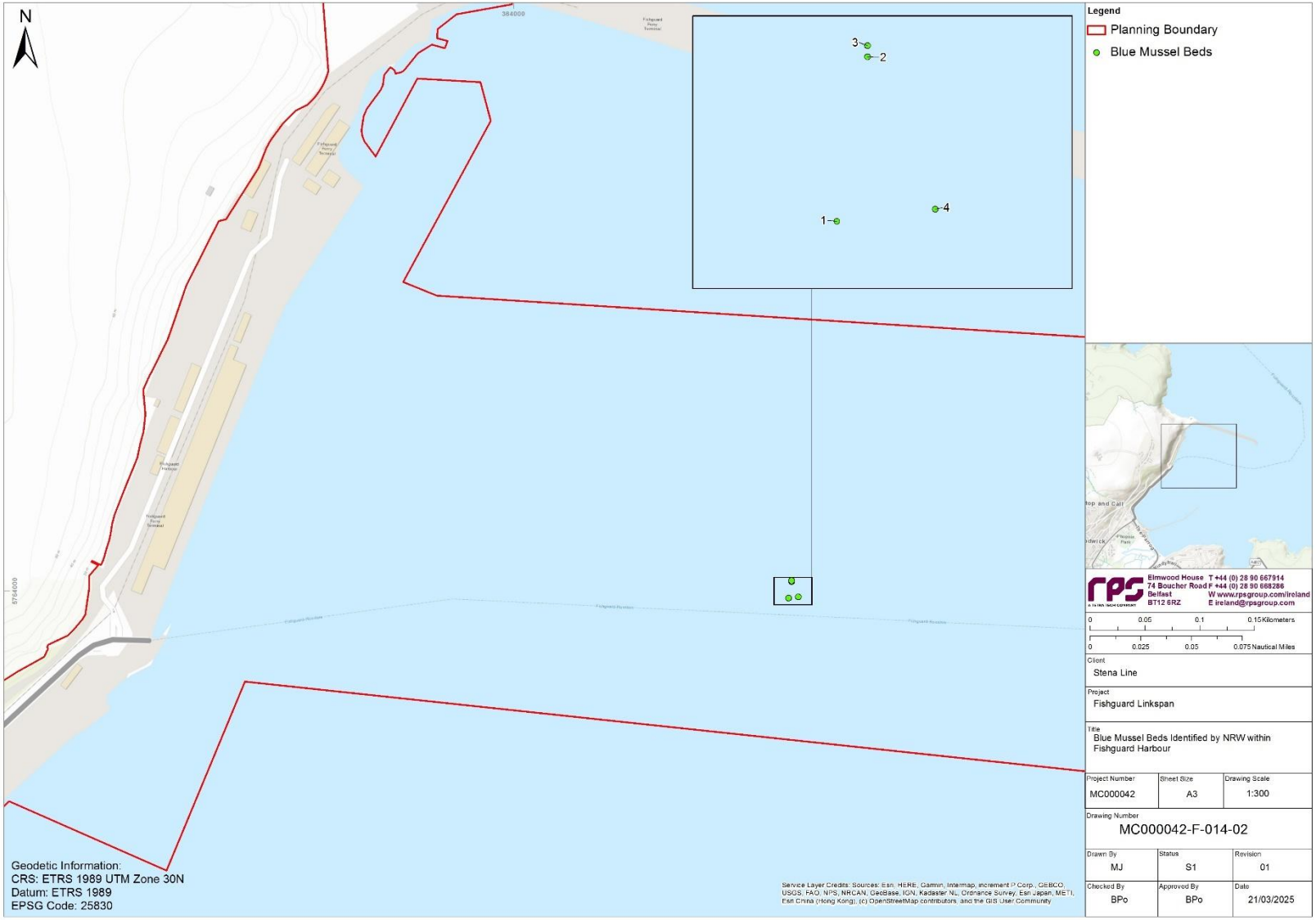

Figure 8-3: Location of Blue Mussel Beds (Later Confirmed to be juvenile Blue Mussels not Beds) Recorded within the Planning Boundary (NRW, 2025b)

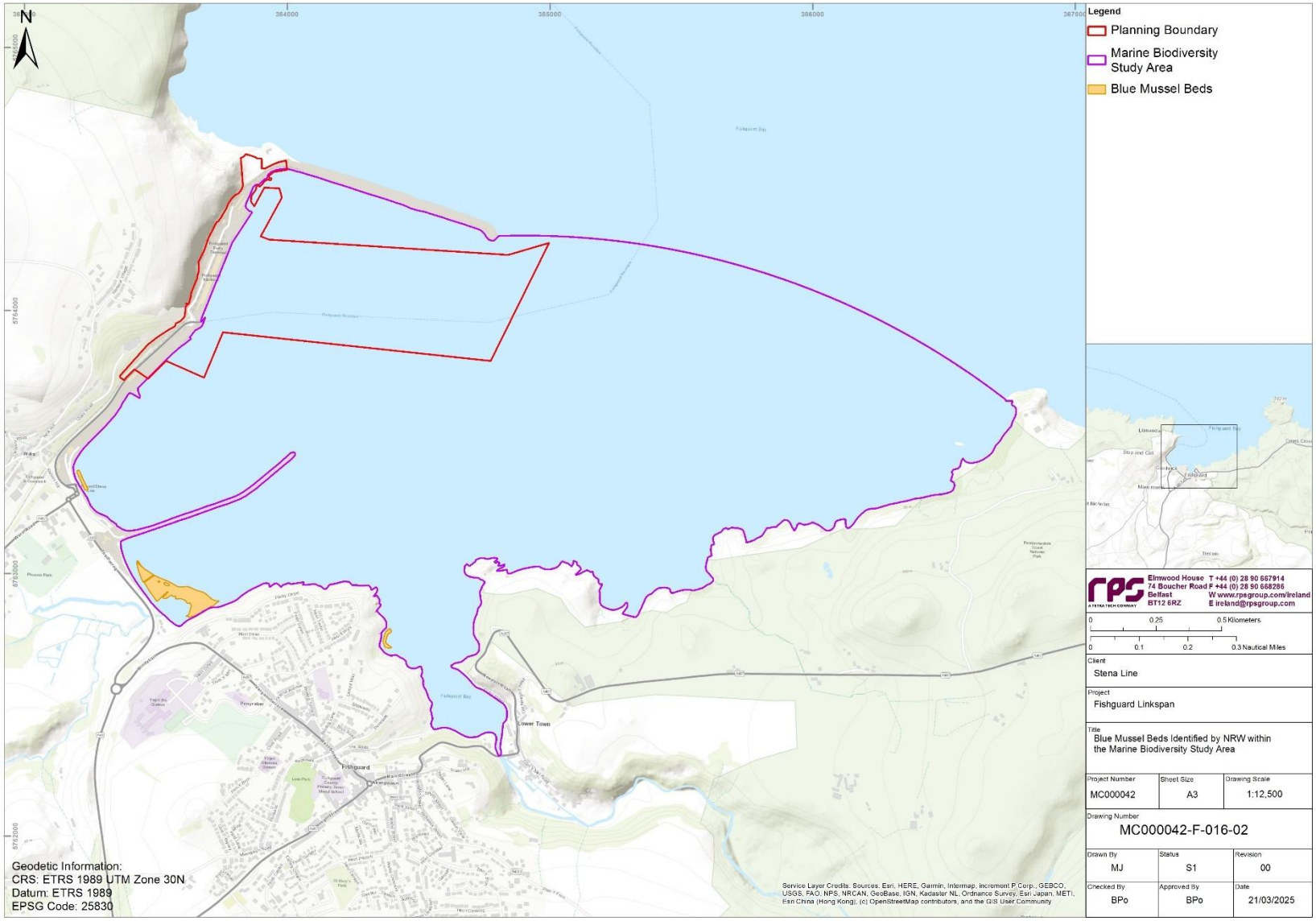

Figure 8-4: Location of Intertidal Blue Mussel Beds within the Marine Biodiversity Study Area (NRW, 2025c)

Figure 8-5: Grab Sample Locations and the Results of Site-specific Surveys conducted in 2017 for similar works at the Stena Line Fishguard 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).

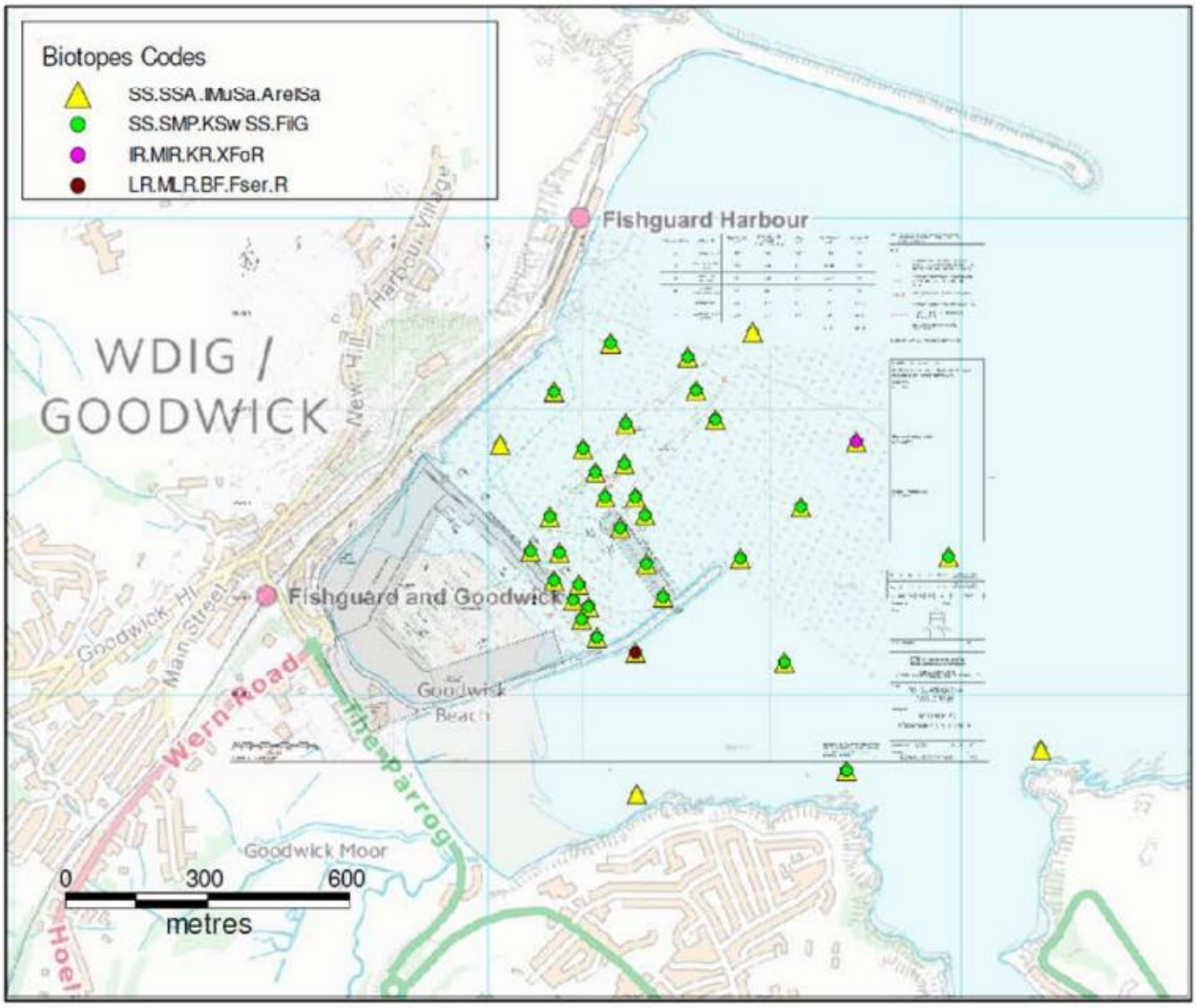

Figure 8-6: Subtidal Biotopes Recorded in a DDV Survey of Fishguard Harbour (Aquatic Environments (2015) cited in RPS (2018))

In addition, grab sample data provided by NRW (*pers. comm*.)[2] included grab sampling from two sites within the study area in 2022 (one of which was within the Planning Boundary). The PSA results of the grab samples within the Planning 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 Planning Boundary were as follows (NRW, *pers. comm*.):

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

- 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 Planning 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 Planning 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 Planning Boundary in 2017 for a replacement linkspan at the Stena Line 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 Planning 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 Planning Boundary is 0.49 km^2/490,000 m^2, therefore this footprint of 'Intertidal under boulder communities' is small in relation, up to 0.02% of the total Planning Boundary Area.

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.

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 Planning 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 Planning Boundary, data were available from surveys undertaken in 2001 and 2003. The following intertidal biotopes (JNCC 2022 Classification) were recorded within the Planning 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 14.9 km from the Planning 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 Planning 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 Planning 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 8.A) classified the inshore area within the Planning 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 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 Planning 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 Planning 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 Line 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[3], 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.

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 Line 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 Planning Boundary are presented in Table 8-10 and in Figure 8-7 to Figure 8-9.

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

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
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 Planning Boundary. All other grounds for the other species overlap with the Planning Boundary.

The spawning periods of species with spawning grounds overlapping with the Planning 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

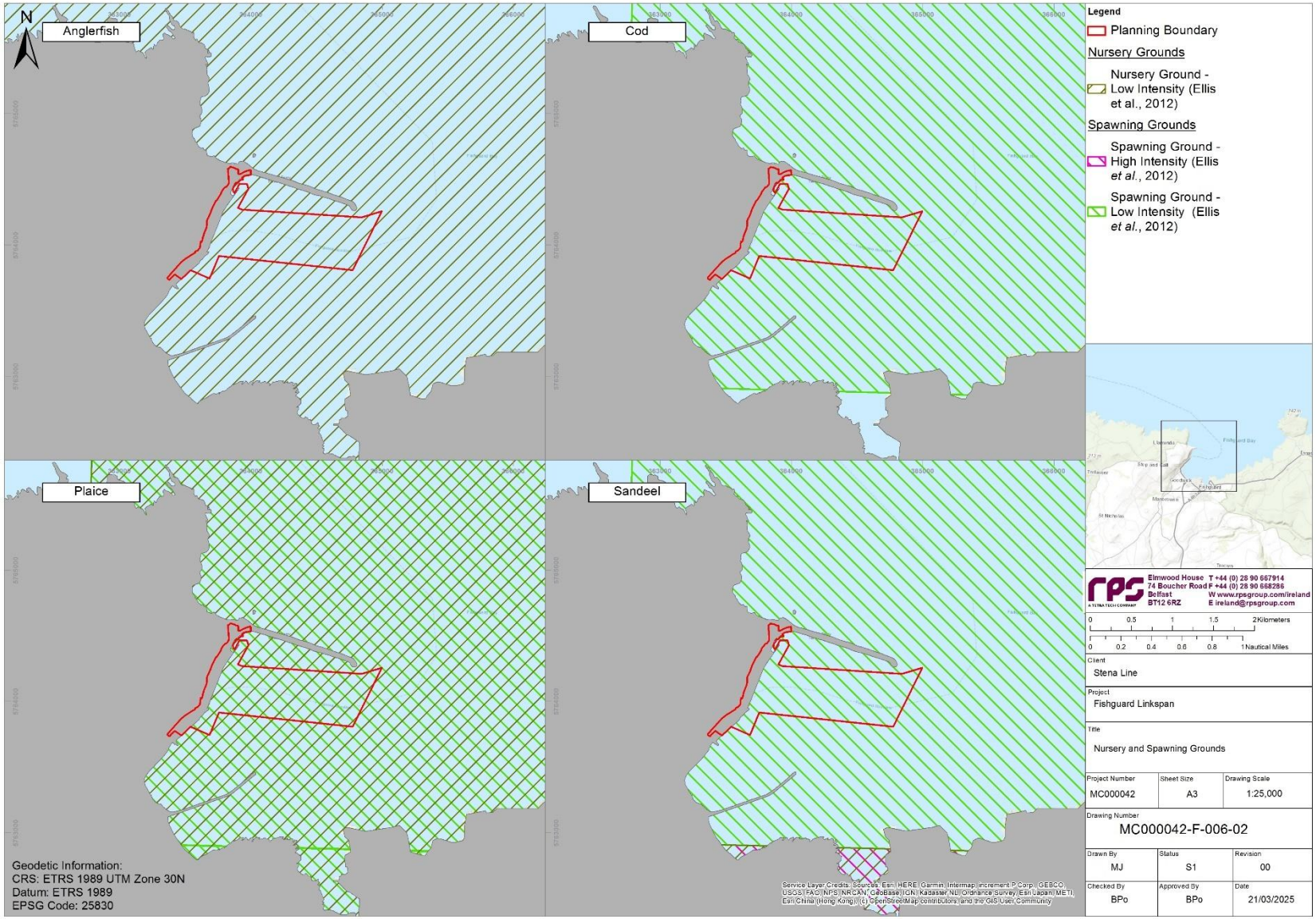

Figure 8-7: Spawning and Nursery Grounds of Anglerfish, Cod, Plaice, and Sandeel (Ellis *et al.*, 2012)

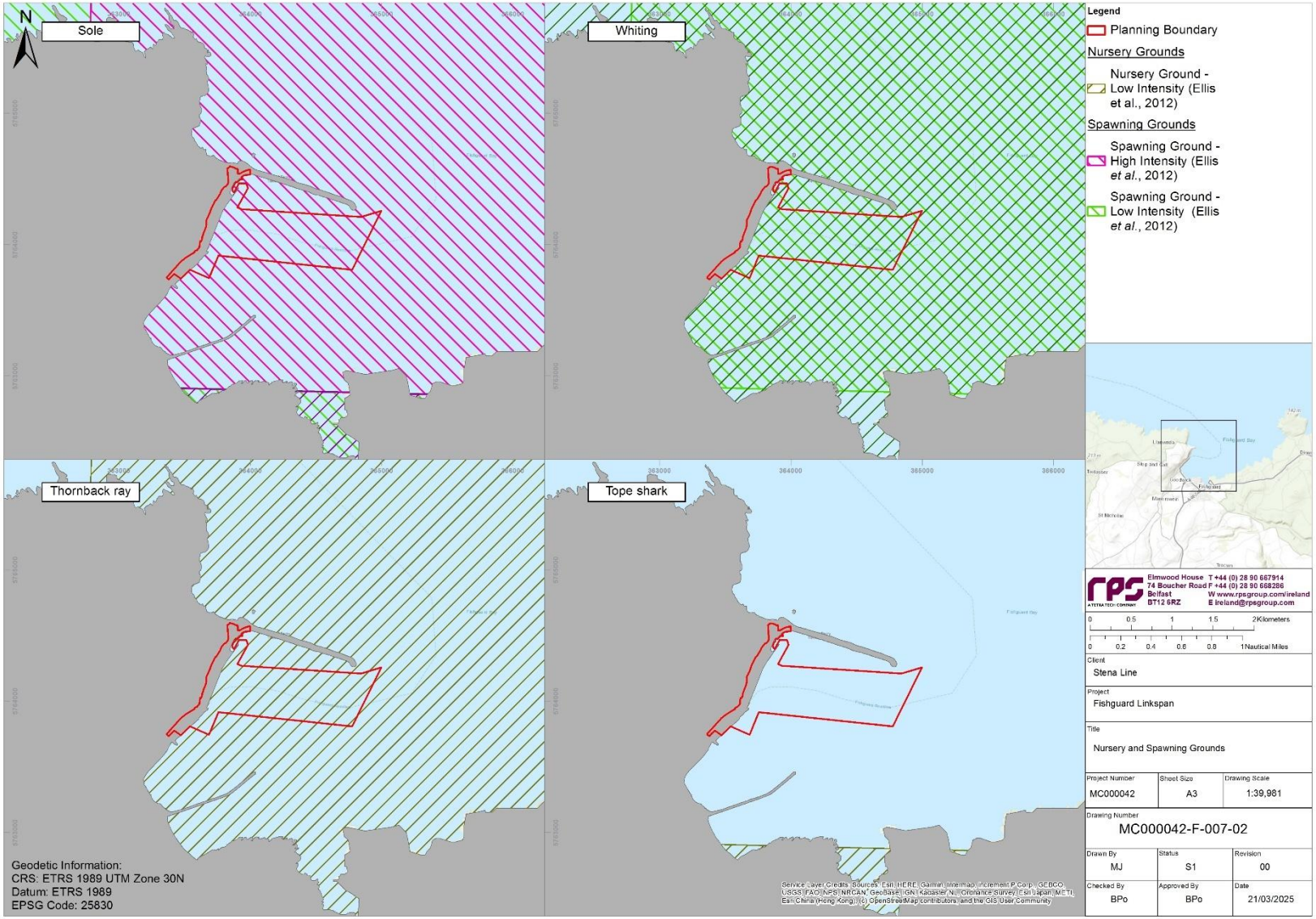

Figure 8-8: Spawning and Nursery Grounds of Sole, Whiting, Thornback Ray, and Tope Shark (Ellis *et al.*, 2012)

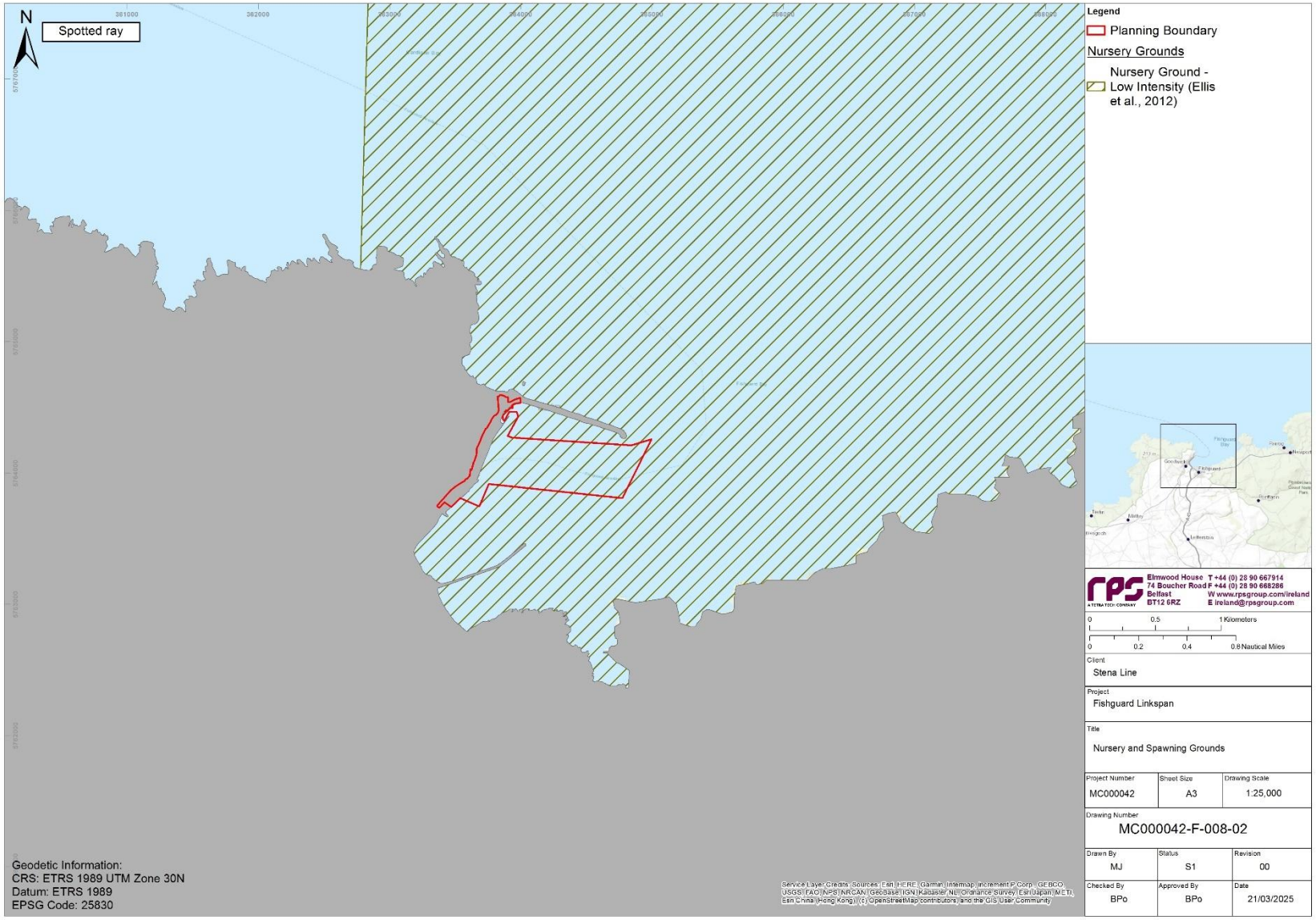

Figure 8-9: Nursery Grounds of Spotted Ray (Ellis *et al.*, 2012)

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 Planning 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 Planning 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 Planning Boundary (km)	Relevant Qualifying Feature
Cardigan Bay/Bae Ceredigion SAC	14.9	Sea lamprey River lamprey
Pembrokeshire Marine/Sir Benfro Forol SAC	21.5	Sea lamprey River lamprey Allis shad Twaite shad
River Teifi/Afon Teifi SAC	22.8	Brook lamprey River lamprey Atlantic salmon Sea lamprey
Cleddau Rivers/Afonydd Cleddau SAC	93.6	Brook lamprey River lamprey Sea lamprey
Carmarthen Bay and Estuaries/Bae Caerfyrddin ac Aberoedd SAC	95.2	River lamprey Sea lamprey Allis shad Twaite shad

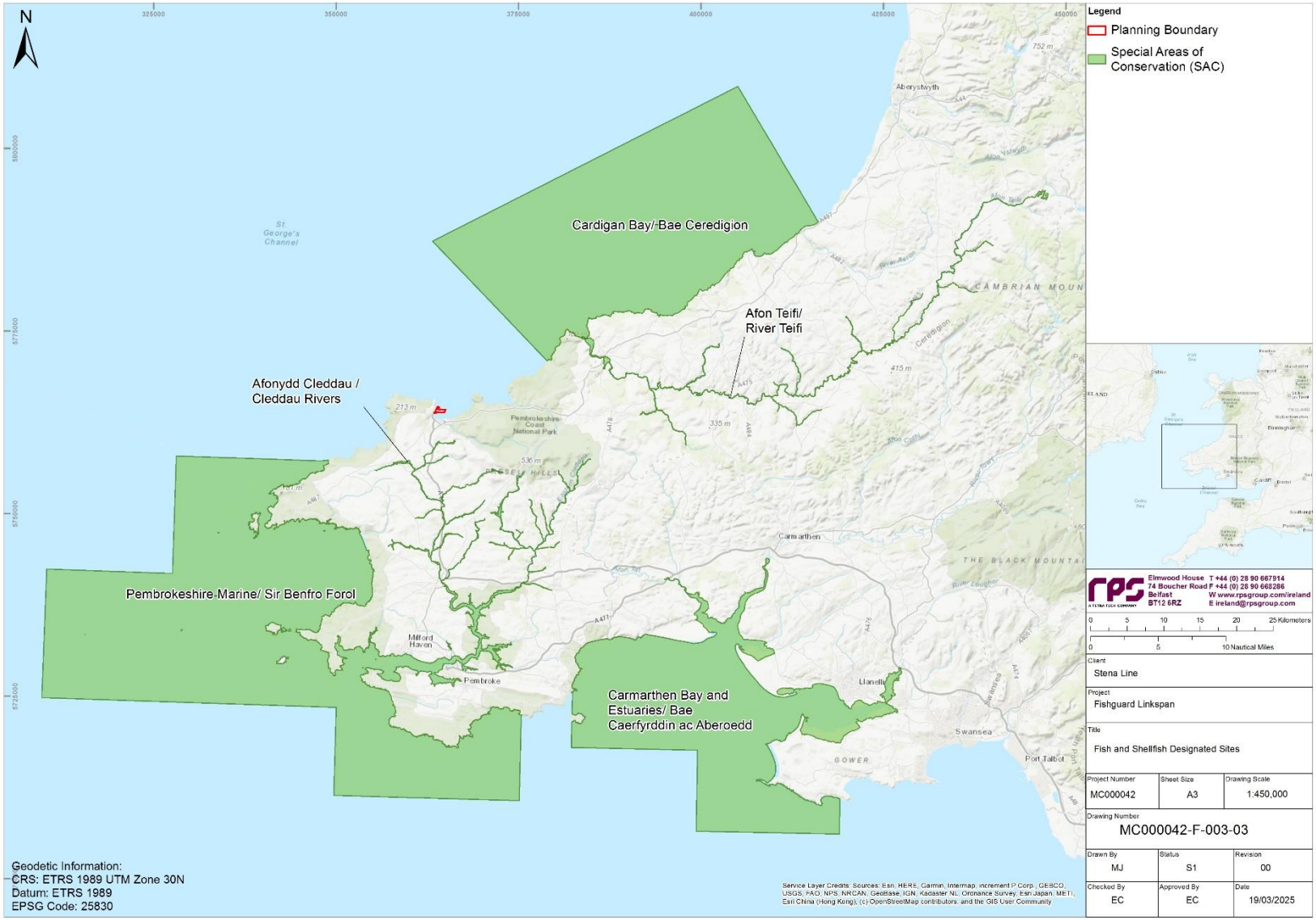

Figure 8-10: Designated Sites with Fish and Shellfish Qualifying Features in the Surrounding Region

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 Planning 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 Planning 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 Planning Boundary; and • Priority Species under the Environment (Wales) Act 2016; and • UK BAP Priority Species.
Sandeel	National	• Low intensity spawning grounds overlapping with the Planning 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 Planning Boundary; • Priority Species under the Environment (Wales) Act 2016; and • UK BAP Priority Species.

IEF	Value	Justification
Whiting	National	• Low intensity spawning and nursery grounds overlapping with the Planning 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; • Priority Species under the Environment (Wales) Act 2016; and • Low intensity nursery grounds overlapping with the Planning 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 Planning 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 Planning 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 Planning 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;

IEF	Value	Justification
		• 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; • Annex II species that are designated features of a several SACs in Pembrokeshire, the closest being 14.9 km from the Planning 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 21.5 km from the Planning Boundary; • Protected under the Salmon Act 1986 and Salmon and Freshwater Fisheries Act 1975;

IEF	Value	Justification
		• 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 Line 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 Planning 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).

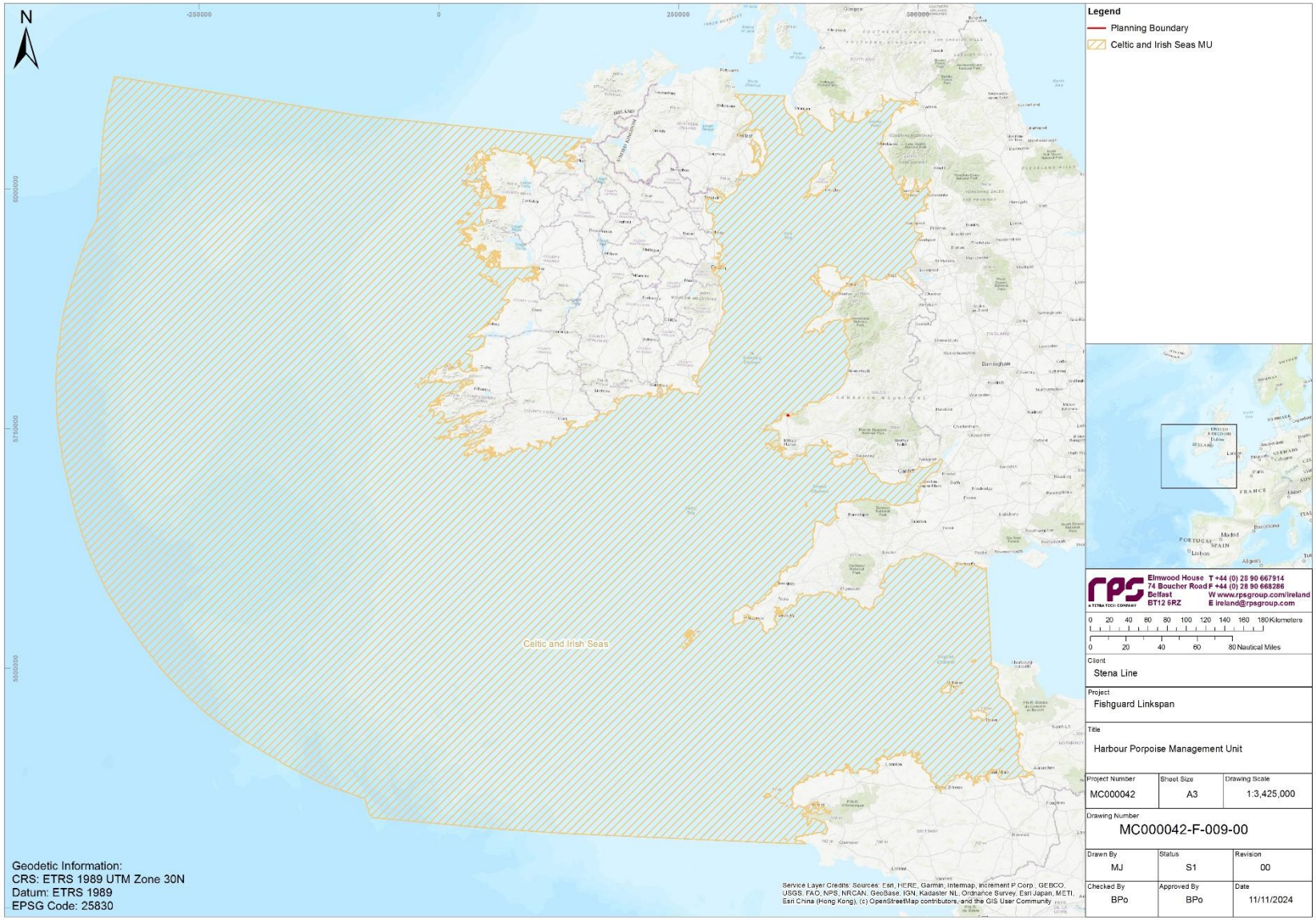

Figure 8-11: Celtic and Irish Seas MU for Harbour Porpoise in relation to the Planning Boundary

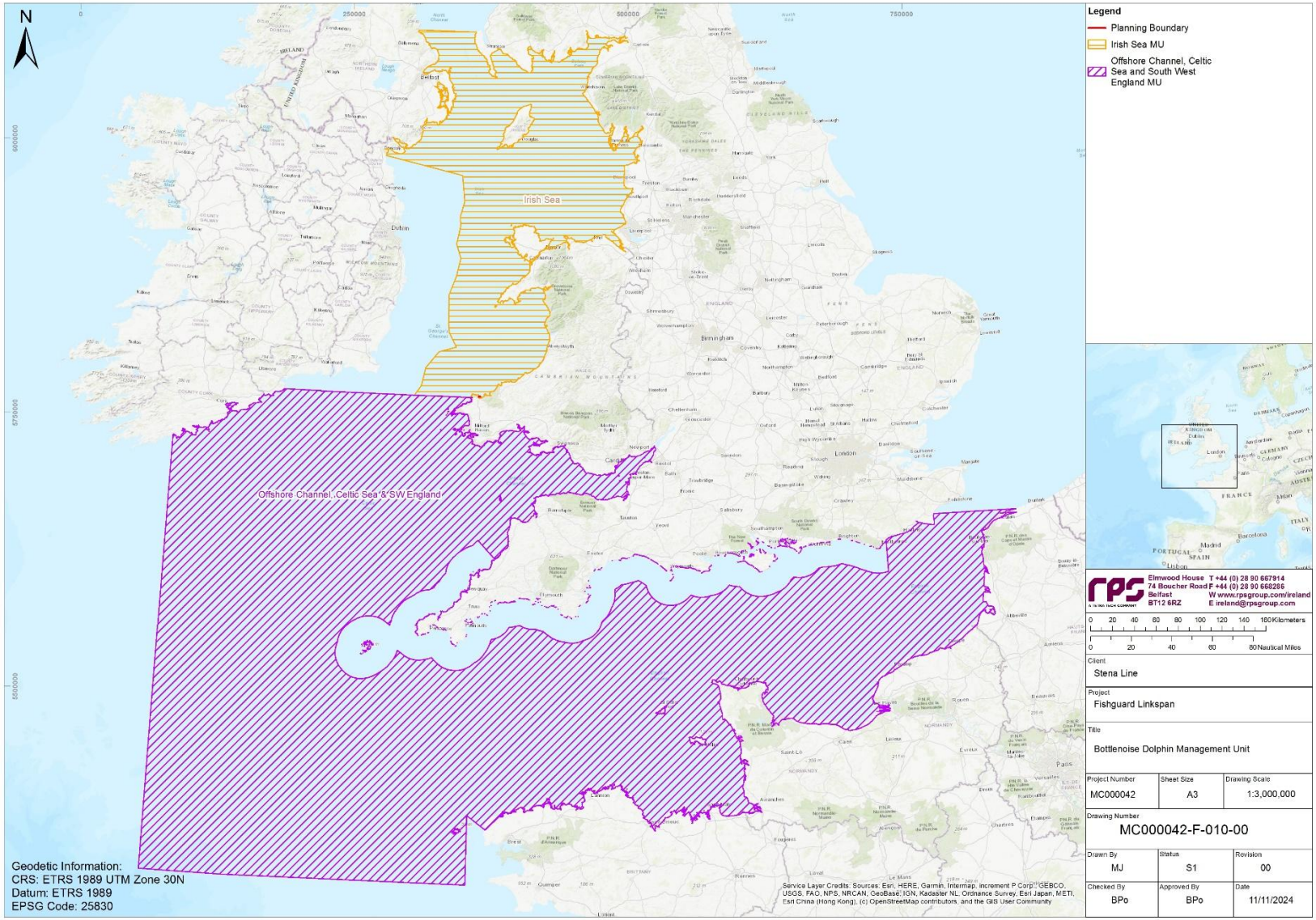

Figure 8-12: Bottlenose Dolphin MUs in relation to the Planning Boundary

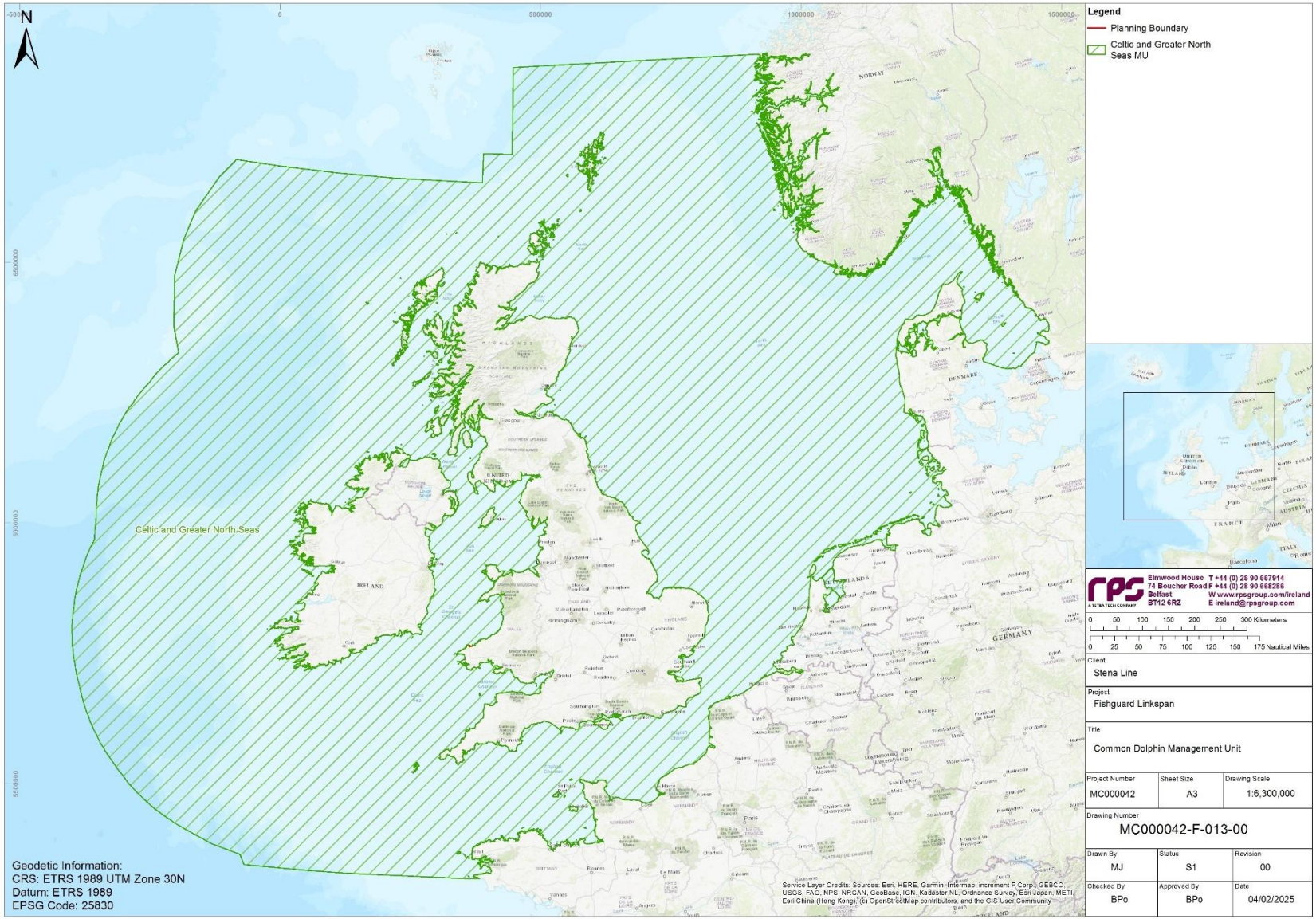

Figure 8-13: Celtic and Greater North Seas MU for Common Dolphin in relation to the Planning Boundary

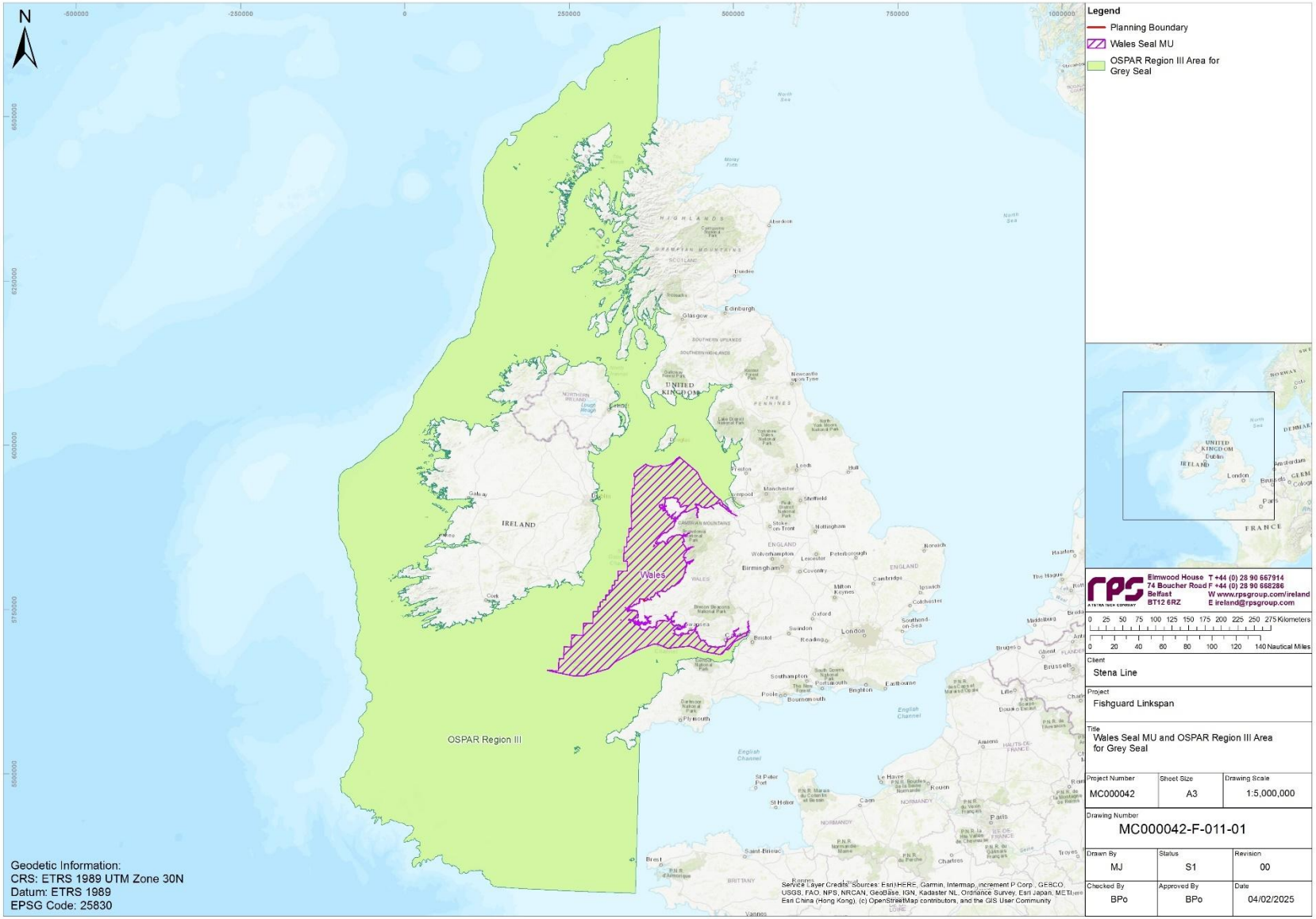

Figure 8-14: Wales Seal MU and OSPAR Region III in relation to the Planning Boundary

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[4]. 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)).

[4] Council Directive 94/43/EEC

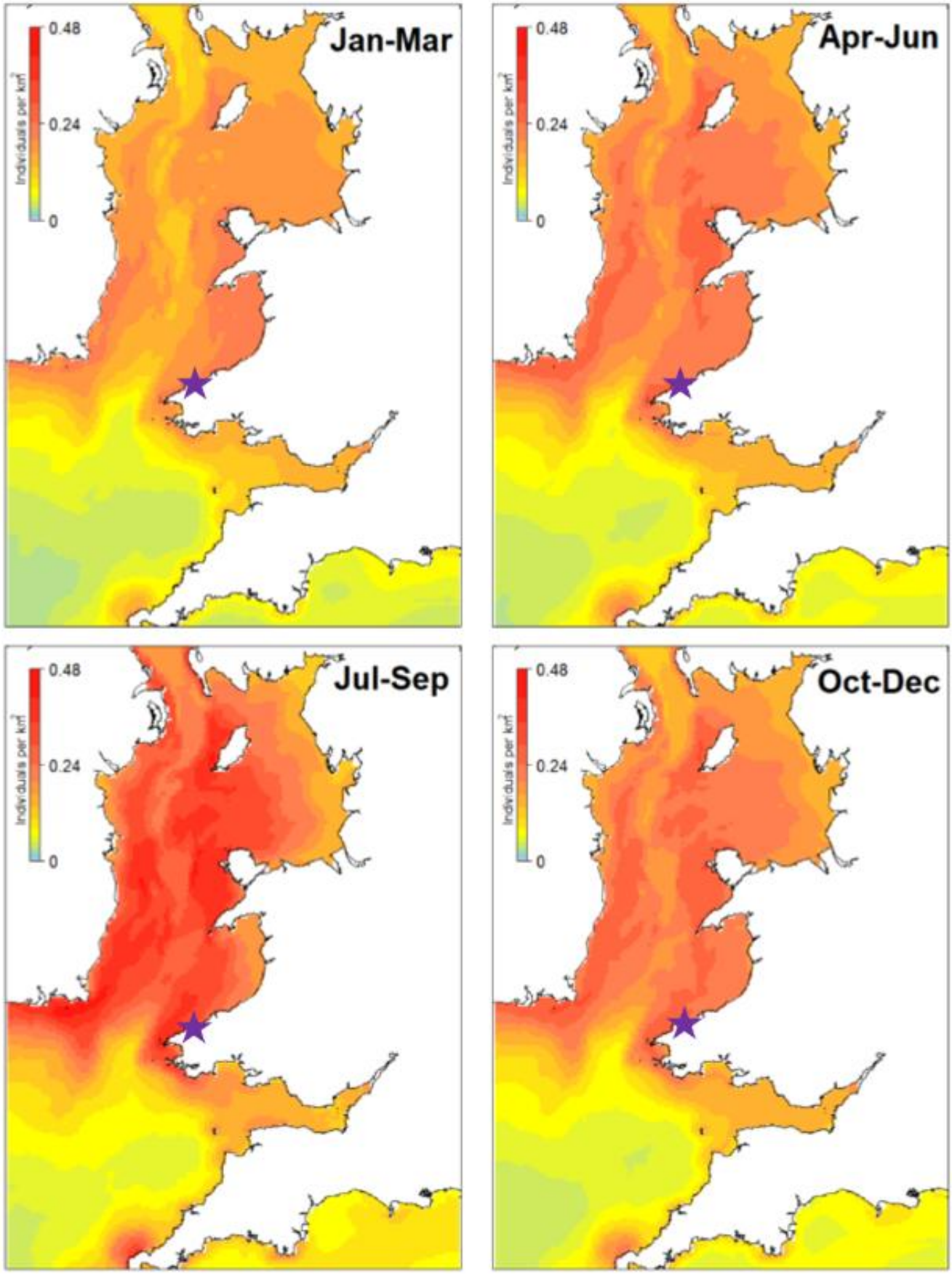

Figure 8-15: Modelled Densities of Harbour Porpoise per quarter (measured as the mean density per cell across months within each season) (Evans and Waggitt, 2023) (location of Fishguard Harbour Denoted with a star)

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 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 14.9 km from the Planning 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)).

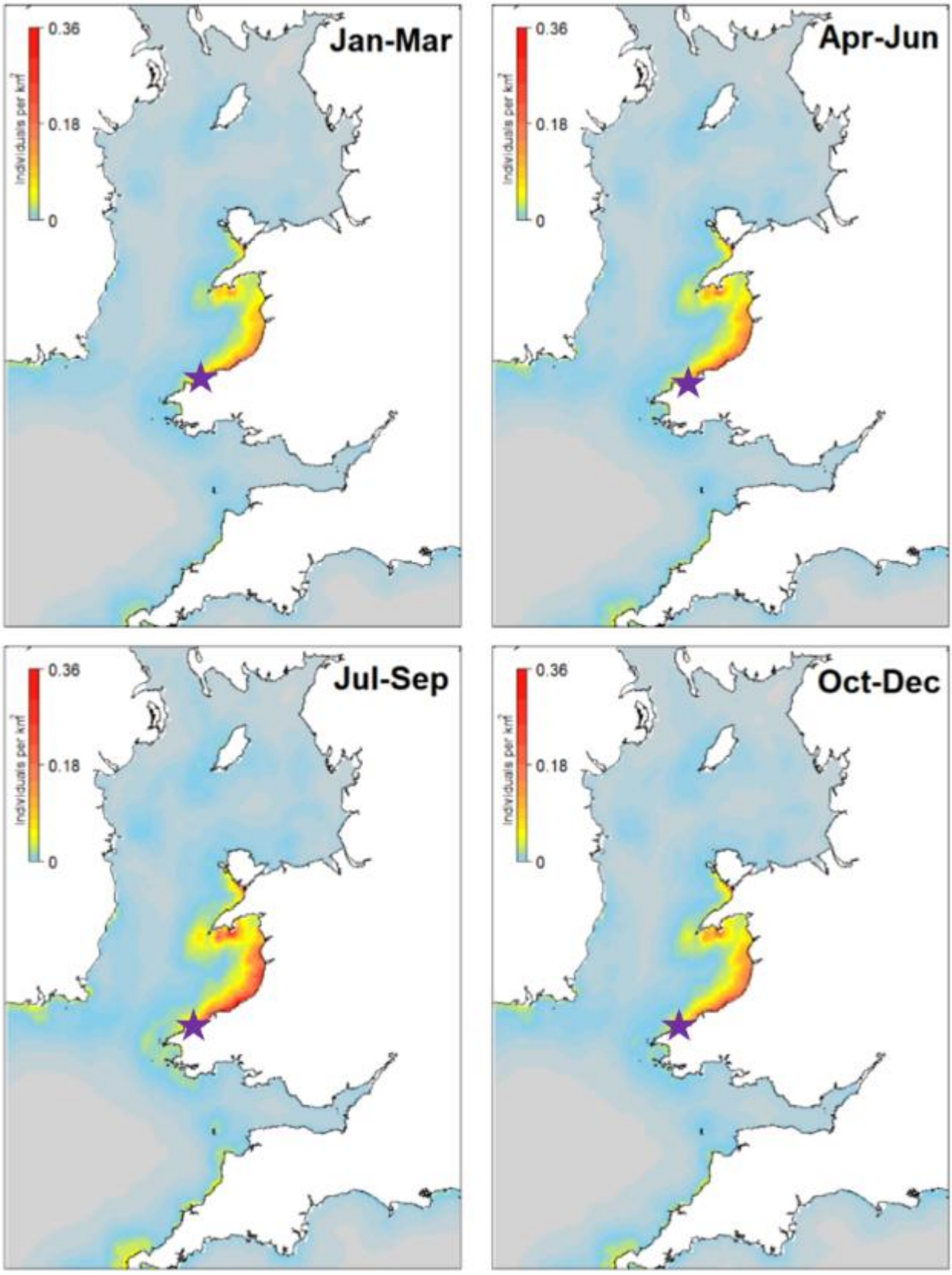

Figure 8-16: Modelled Densities of Bottlenose Dolphin per quarter (measured as the mean density per cell across months within each season) (Evans and Waggitt, 2023) (location of Fishguard Harbour Denoted with a star)

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[5]. 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)).

[5] Council Directive 94/43/EEC

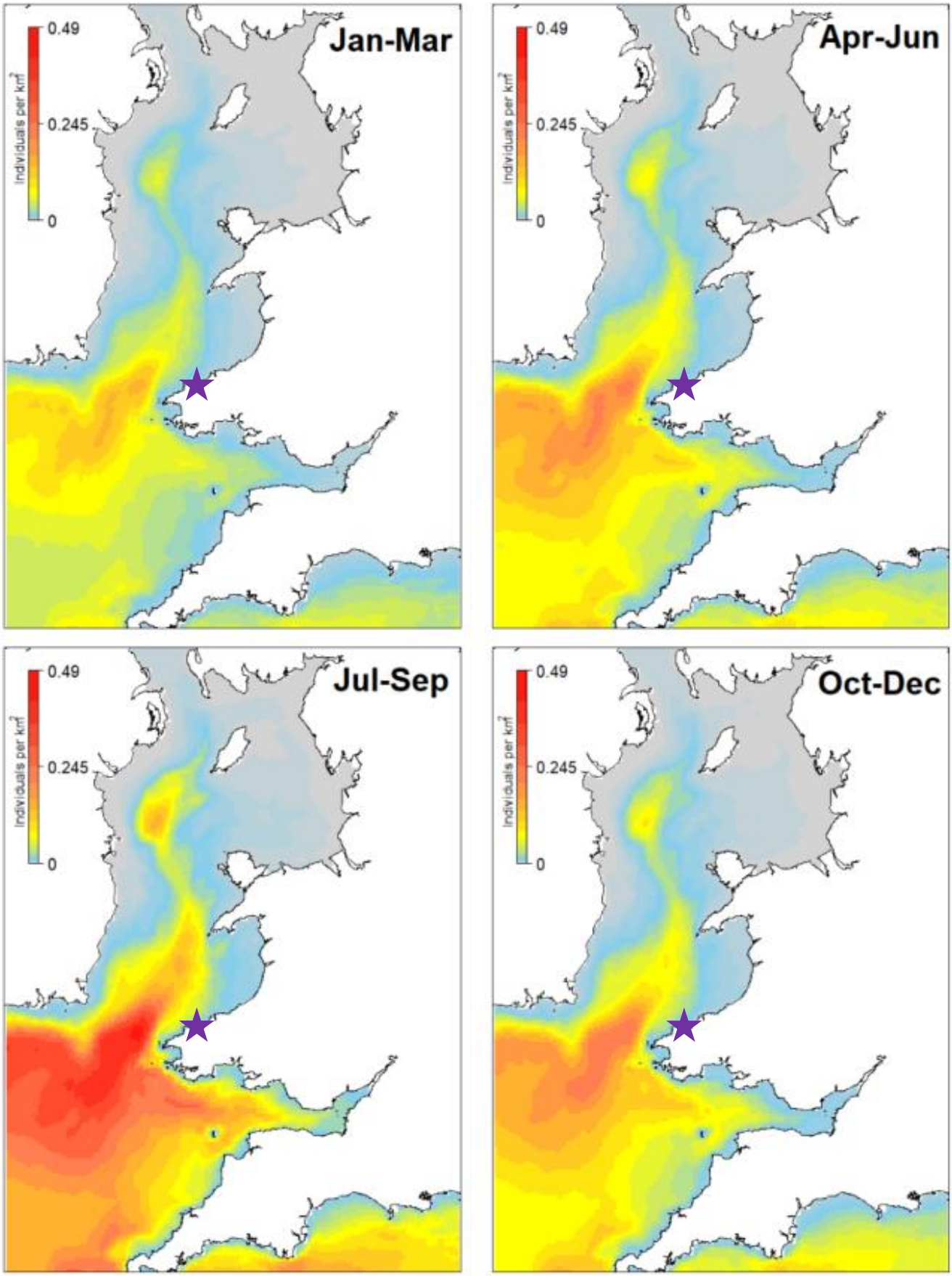

Figure 8-17: Modelled Densities of Common Dolphin per quarter (measured as the mean density per cell across months within each season) (Evans and Waggitt, 2023) (location of Fishguard Harbour Denoted with a star)

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 Planning Boundary (14.9 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.

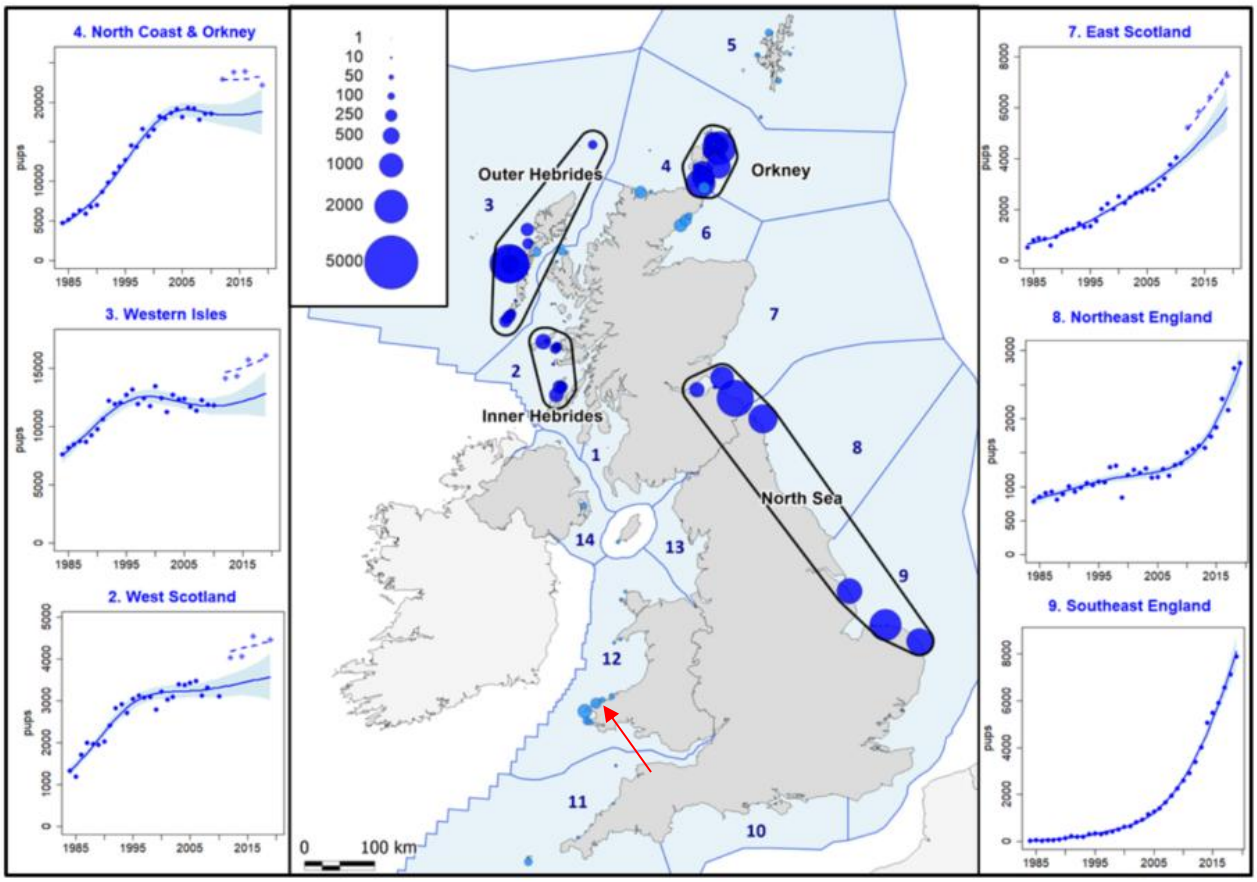

Figure 8-18: Distributions and Estimated Pup Production of the main Grey Seal Breeding Colonies in the UK (Light Blue Circles Indicate Sporadically Monitored Areas, while Dark Blue Indicate Regularly Monitored, Approximate Location of Fishguard Harbour Marked with a Red Arrow) (SCOS, 2023)

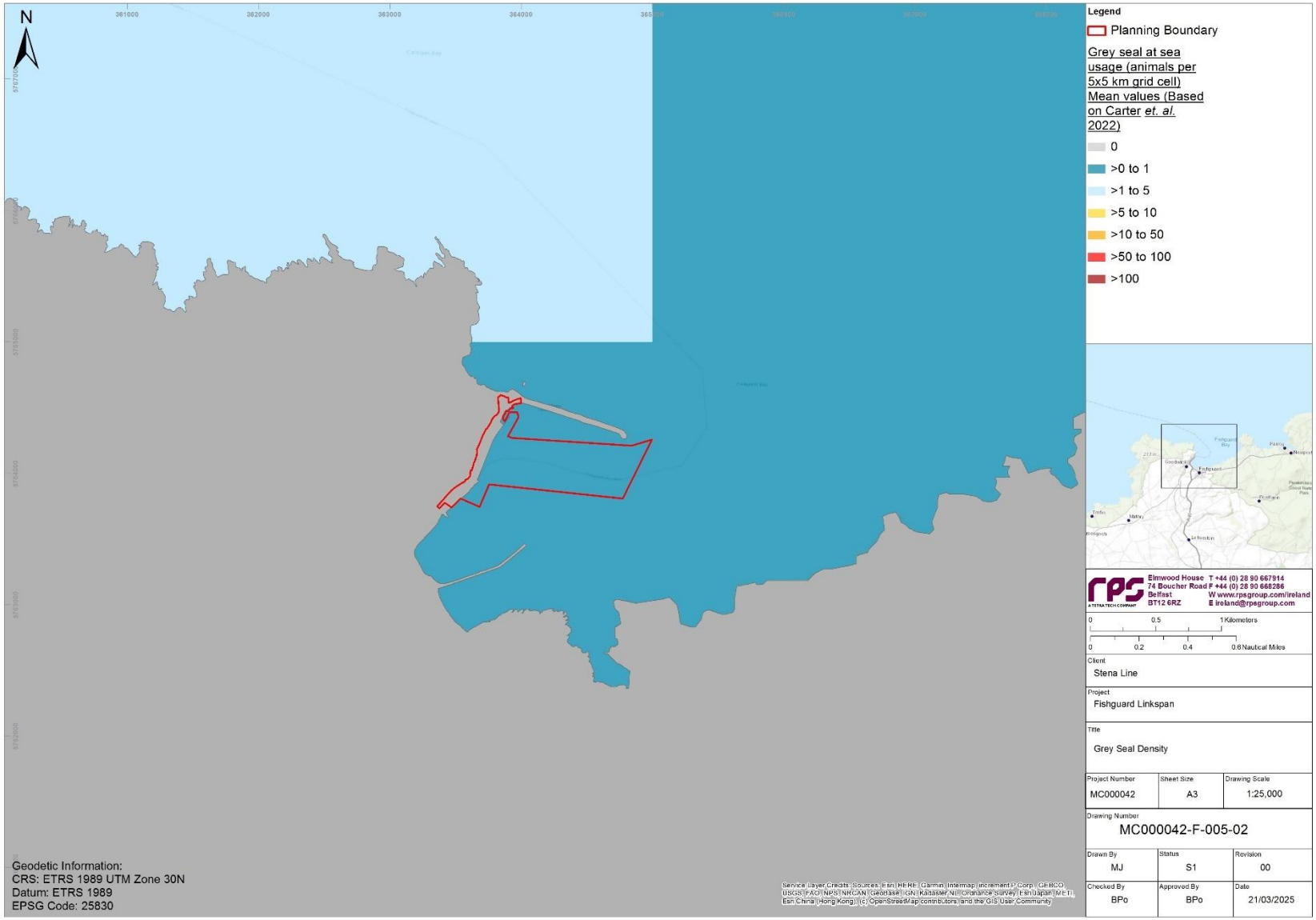

Figure 8-19: Grey Seal Density at Sea in the Vicinity of the Planning Boundary (Carter *et al.*, 2022)

8.8.3.3 Designated Sites

The Planning 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 Planning Boundary (km)	Relevant Qualifying Feature
West Wales Marine/Gorllewin Cymru Forol SAC	Overlaps	Harbour porpoise
Cardigan Bay/Bae Ceredigion SAC	14.9	Bottlenose dolphin Grey seal
Pembrokeshire Marine/Sir Benfro Forol SAC	21.5	Grey seal
Lleyn Peninsula and the Sarnau/Pen Llyn a`r Sarnau SAC	66.5	Bottlenose dolphin Grey seal
Bristol Channel Approaches/Dynesfeydd Môr Hafren SAC	85.3	Harbour porpoise
North Anglesey Marine/Gogledd Môn Forol SAC	135.0	Harbour porpoise

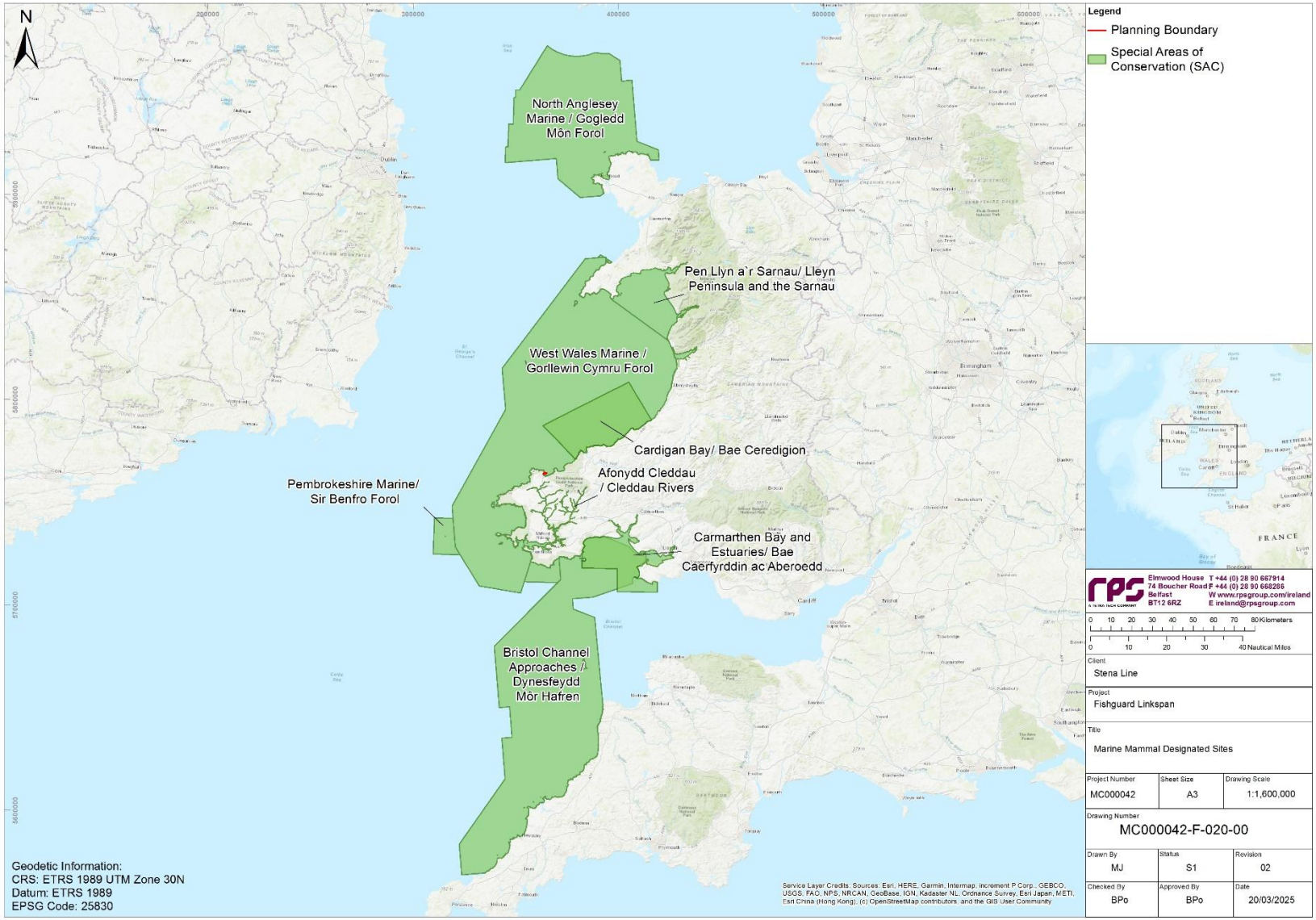

Figure 8-20: Designated Sites with Marine Mammal Qualifying Features in the Surrounding Region

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 Planning 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 14.9 km from the Planning 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 14.9 km from the Planning 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 capital dredging within the construction phase. As per Chapter 2: Project Description, up to 17,500 m^2 of temporary habitat loss and disturbance may occur due to the dredging of up to 78,000 m^3 of sediment. Dredging involves physical removal of seabed sediments, causing a short term modification to the existing habitat. It is anticipated that dredging will occur over a 12 week period, which may be broken into phases. The dredged material will be deposited in a licenced disposal site near Milford Haven (LU169), beyond the remit and footprint of Fishguard Harbour.

In addition, temporary habitat loss may occur due to the use of jack up barges. However, as the existing jack up barge will be used (with legs of a diameter of 1.22 m and area of 1.17 m^2 each), there is no additional

footprint of temporary habitat disturbance associated with jack up usage. Therefore, the MDS for this impact is up to 17,500 m^2 of temporary habitat loss and disturbance due to dredging of up to 78,000 m^3 of sediment. This is low in the context of the Planning Boundary (0.49 km^2 / 490,000 m^2) and the Marine Biodiversity Study Area (3.97 km^2 / 3,970,000 m^2). The footprint of temporary habitat loss and disturbance due to dredging therefore represents only up to 3.57% of the Planning Boundary and up to 0.44% 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).

However, other species such as the brittlestar *A. filiformis* 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 Planning Boundary (approximately 90 m^2). However, the footprint of this habitat was small in relation to the Planning Boundary (490,000 m^2), at up to 0.02% of the total Planning 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 rock placement as part of the construction of the new reclamation area. This will be undertaken against the shoreline in the vicinity of the old RNLI slipway (see Chapter 2: Project Description). This area will be formed with imported crushed rock fill material protected by a rock armour revetment. Crushed rock will be in the 0 mm to 500 mm size range. Rock armour will range in weight from 0.5 tonnes up to 6 tonnes. The footprint of the entire reclaimed area including the rock armour revetment is approximately 5,500m^2, which represents the MDS for this impact. This is low in the context of the Planning Boundary (0.49 km^2 / 490,000 m^2) and the Marine Biodiversity Study Area (3.97 km^2 / 3,970,000 m^2). The footprint of long term habitat loss and disturbance therefore represents only up to 1.12% of the Planning Boundary and up to 0.13% 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 Planning 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 78,000 m^3 of sediment may be dredged during the construction phase over a range of areas (see Chapter 10: Coastal Processes for locations of these areas) within the Planning Boundary (Table 8-17). It is anticipated that dredging will occur over a 12-week period, which may be broken into phases. The dredged material will be deposited in a licenced disposal site near Milford Haven (LU169), beyond the remit and footprint of Fishguard Harbour. A 5% spill rate has been assumed for both dredging methods (backhoe and TSHD).

Table 8-17: Summary of Dredging Parameters by Area

Area	Volume m^3 (rounded)	Rounded totals to include the contingency up to 78,000 m^3	Method	Dredge operation duration
A	7,000	10,200	Backhoe	5.5 days
B	6,200	9,200	Backhoe	4.6 days
C				
E	19,500	40,000	TSHD	7 days
H	5,700	11,200	TSHD	2 days
Reclamation Area	5,000	7,400	TSHD	2.8 days
Total	**43,400**	**78,000**		**12 weeks**

To characterise the sediment plumes generated as a result of the dredging activities, a coupled hydrodynamic and mud transport model was run for each dredging operation over a range of spring tides. The results of this have been summarised in Table 8-18 to help quantify the magnitude of impact (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.

Table 8-18: Summary of Coastal Processes Modelling Undertaken for Dredging at the Different Areas

Dredge Area	Maximum SSCs	Average SSCs	Sediment Dispersion	Sediment Deposition
A	2,165 mg/L during all tidal phase, dropping quickly to 200 mg/L beyond	Did not exceed 280 mg/L within the immediate vicinity of works, quickly	300 m to the southwest of the dredge path	Resultant deposition within the dredge footprint did not exceed 24 cm. In reality, dredging would proceed until the specified design depth is reached and

Dredge Area	Maximum SSCs	Average SSCs	Sediment Dispersion	Sediment Deposition
	the immediate vicinity.	dropping below background concentrations of 5 mg/L within 300 m.		any material deposited within the dredge area would be removed by the dredger until the specification is met. Within the vicinity of the dredging operation, the total deposition of sediment is typically less than 4 cm, with deposition beyond 100 m reducing to less than 0.5 cm.
B C	1,415 mg/L during all tidal phases, dropping quickly to below 120 mg/L beyond the immediate vicinity.	Did not exceed 125 mg/L within the immediate vicinity of the works, quickly dropping below background concentrations of 5 mg/L within 350 m.	300 m to the southwest of the dredge path	Resultant deposition within the dredge footprint did not exceed 9.6 cm. Within the vicinity of the dredging operation, the total deposition of sediment is typically less than 2.4 cm, with deposition beyond 50 reducing to less than 0.8 cm.
E	610 mg/L during low water, dropping quickly to below 30 mg/L beyond the immediate vicinity.	Did not exceed 35 mg/L within the immediate vicinity of works, quickly dropping below background concentrations of 5 mg/L within 70 m.	650 m to the north and east of the dredge path	Resultant deposition within the dredge footprint did not exceed 2 cm. Within the vicinity of the dredging operation, the total deposition of sediment is typically less than 0.45 cm, with deposition beyond 50 m reducing to less than 0.15 cm.
H	2,350 mg/L during low water, dropping to quickly to less than 170 mg/L within 50 m.	Did not exceed 175 mg/L within the immediate vicinity of the works, quickly dropping to below background concentrations of 5 mg/L within 100 m.	100 m to the north of the dredge path	Resultant deposition within the dredge footprint did not exceed 6 cm. Within the vicinity of the dredging operation, the total deposition of sediment is typically less than 4 cm, with deposition beyond 50 m reducing to less than 0.5 cm.
Reclamation Area	1,450 mg/L during low water, dropping to less than 110 mg/L within 50 m.	Did not exceed 125 mg/L in the immediate vicinity of the works, quickly dropping below background concentrations of 5 mg/L within 200 m to the southwest and 100 m to the east.	200 m to the southwest of the dredge path	Resultant deposition within the dredge footprint did not exceed 1.4 cm, with less than 1.1 cm within the Reclamation Area.

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 Planning 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 78,000 m^3 of sediment may be dredged during the construction phase. It is anticipated that dredging will occur over a 12-week period, which may be broken into phases. The dredged material will be deposited in a licenced disposal site near Milford Haven (LU169), beyond the remit and footprint of Fishguard Harbour.

Chemical sediment analysis was undertaken on samples collected during the 2017 site-specific baseline surveys for replacement linkspan works at the Stena Line terminal (ABPmer, 2018) (see Figure 8-5 for the sample locations), which are within the Planning 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 Planning 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:

- Up to two tug boats;
- A split hopper barge;
- A floating barge;
- A multicat vessel;
- A TSHD; and
- A backhoe dredger (from the existing pontoon).

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 linkspan will be on site for up to five days. In addition, the construction works will include a three month shutdown of the existing ferry service to the Stena Line 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.

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 5,500 m^2 of rock armour 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 three month shutdown of the 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 Planning 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; 0.02% of the Planning Boundary), 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 five impacts scoped in for the operational 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 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 operational phase are detailed in Table 8-19.

Table 8-19: 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.

8.9.1.3.1 Temporary Habitat Loss and/or Disturbance

8.9.1.3.1.1 Magnitude of Impact

This impact was proposed to be scoped in for the operational phase in the Scoping Report due to the potential for temporary habitat loss and disturbance due to maintenance dredging within the operational phase. However, this maintenance dredging will be assessed as part of a separate Marine Licence, and therefore does not represent the MDS during the operational phase of the Proposed Development in this assessment. Therefore, this impact is not considered further for the operational phase.

8.9.1.3.2 Long Term Habitat Loss and/or Disturbance

8.9.1.3.2.1 Magnitude of Impact

The infrastructure installed within the construction phase and persisting throughout the operational phase of the Proposed Development represents up to 5,500 m^2 of long term habitat loss and disturbance (see section 8.9.1.2.2). This represents only up to 1.12% of the Planning Boundary and up to 0.13% 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.

8.9.1.3.2.2 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.

8.9.1.3.2.3 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 Planning 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.

8.9.1.3.3 Increased SSCs and Associated Deposition

8.9.1.3.3.1 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 maintenance dredging within the operational phase. However, this maintenance dredging will be assessed as part of a separate Marine Licence, and therefore does not represent the MDS during the operational phase of the Proposed Development in this assessment. Therefore, this impact is not considered further for the operational phase.

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

8.9.1.3.4.1 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, this maintenance dredging will be assessed as part of a separate Marine Licence, and therefore does not represent the MDS during the operational phase of the Proposed Development in this assessment. Therefore, this impact is not considered further for the operational phase.

8.9.1.3.5 Increased Risk of Introduction and Spread of INNS

8.9.1.3.5.1 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. Although there will be maintenance dredging within the operational phase, which represents additional vessels within the Planning Boundary, this maintenance dredging will be assessed and considered under a different Marine Licence Application, and is therefore not discussed further here.

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.

8.9.1.3.5.2 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.

8.9.1.3.5.3 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; 0.02% of the Planning Boundary), 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 8-20.

Table 8-20: 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 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

Impact	Justification for Scoping Out
	embedded mitigation of an INNS Management Plan 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 (Table 8-18) 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 Acoustics 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**Error! Reference source not found.**, 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 four 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 four 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 L_P (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 8-21 and Table 8-22 for impulsive noise (L_p) and non-impulsive noise (SEL) respectively. The L_p 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 13: Underwater Acoustics 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 8-21: 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	210[1]	(*Near*) Moderate*	-	-
	L_P	207[1]	(*Mid*) Low* (*Far*) Low*	-	-

[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 8-22: 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 13: Underwater Acoustics.

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 8-23). 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 8-23: Threshold Exceedance Ranges for Dredging for All Fish Hearing Groups

Condition		Range (m) (all fish hearing groups)
	90th percentile range [m]	1,100

Condition		Range (m) (all fish hearing groups)
Behavioural disturbance range	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

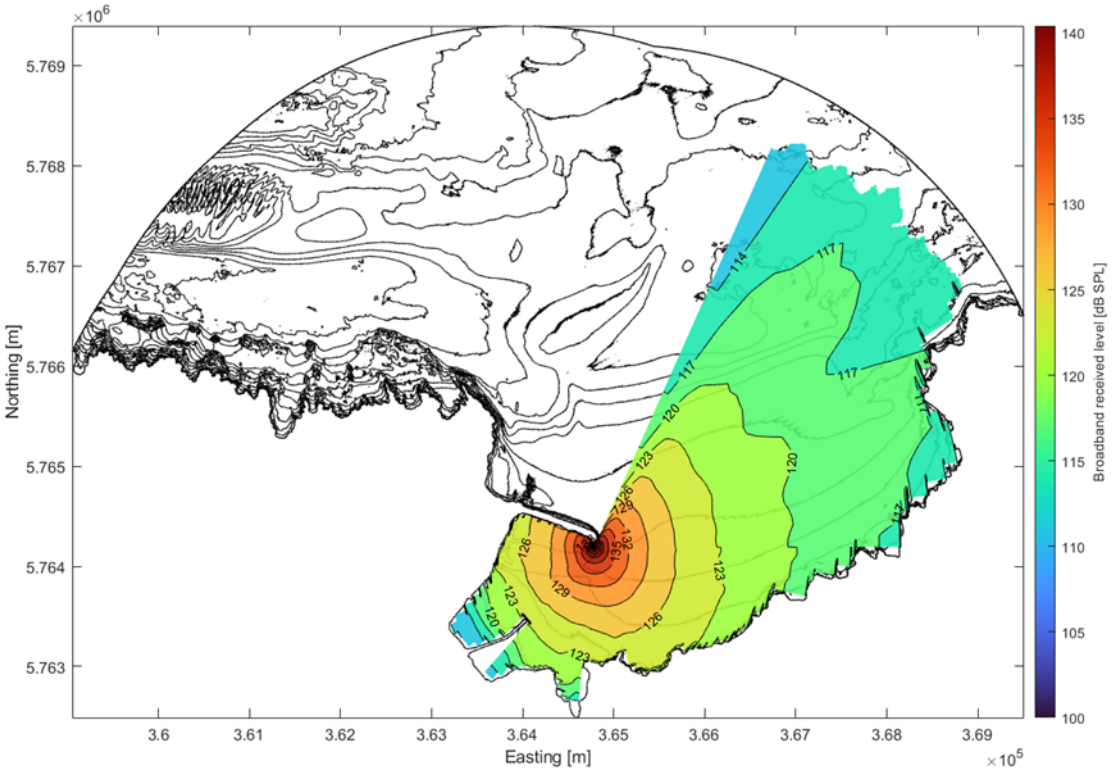

Figure 8-21: Map of Unweighted Levels (SPL) from Dredging near the end of the Breakwater. UTM 30N.

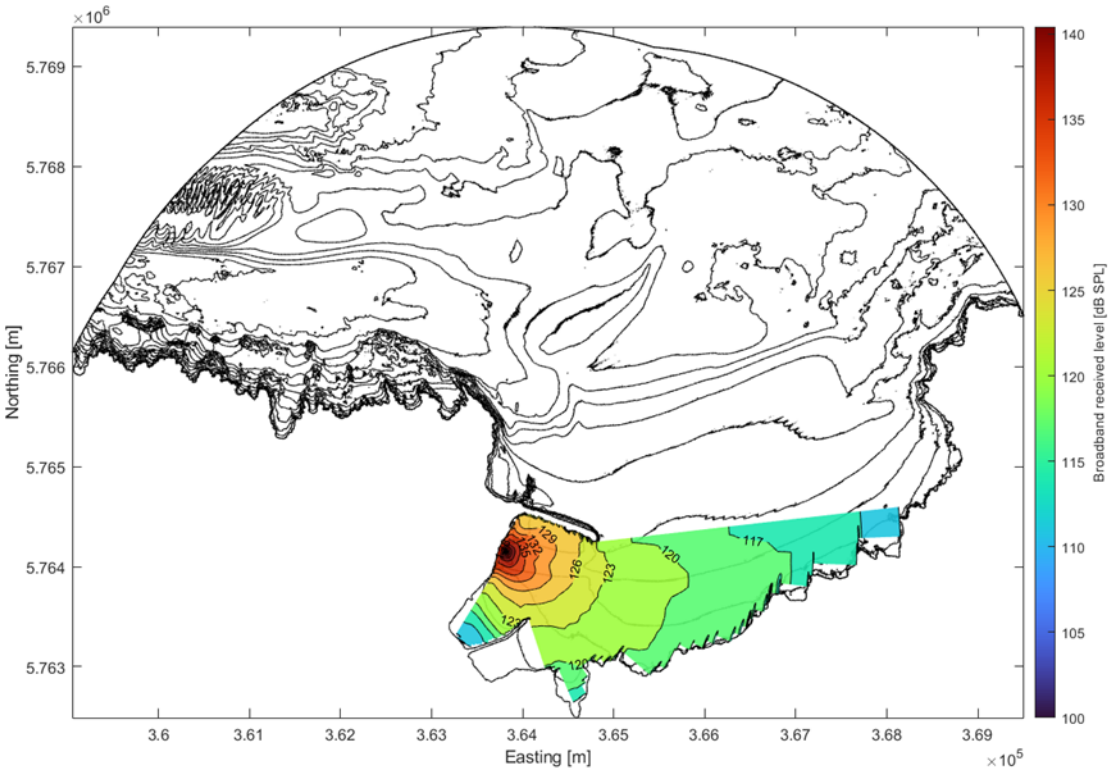

Figure 8-22: Map of Unweighted Levels (SPL) from Dredging near the Quay and Linkspan. UTM 30N.

Impact Piling

The results of the noise modelling indicated that impact piling of the four 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 8-24). 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 8-24).

Ranges for behavioural disturbance were modelled out to 4,900 m (Table 8-24), 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 8-24). 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 8-24: 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

Condition		Range (m) (all fish hearing groups)
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

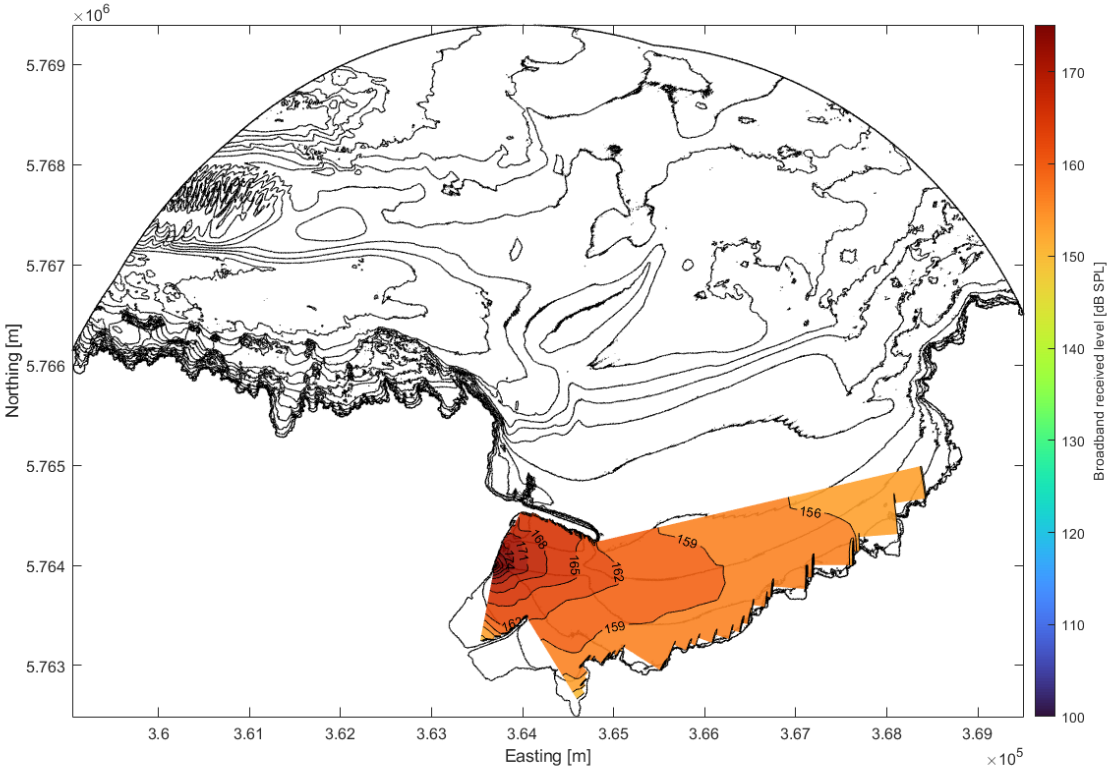

Figure 8-23: Map of Unweighted SPL from Impact Piling of the Support Piles. UTM 30N

Bank Seat Piling and Demolition Activities

The bank seat 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 fish, with ranges of <10 m modelled (Table 8-25). The TTS threshold may be exceeded up to 40 m from the source (Table 8-25). 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 8-25: Threshold Exceedance Ranges for Bank Seat Piling and Demolition Activities

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

Condition		Range (m) (all fish hearing groups
	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 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 Acoustics 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 8-26). The TTS threshold may be exceeded up to 30 m from the source (Table 8-26). 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 8-26: 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

Finally, coring/rotary drilling of the main pontoon pile and bank seat piles has little to no risk of exceeding the auditory injury or TTS thresholds of fish (Table 8-27). Behavioural disturbance ranges were the lowest of all scenarios modelled for pile installation, at up to 250 m from the source (Table 8-27).

Table 8-27: Threshold Exceedance Ranges for Coring/Rotary Drilling of the Main Ponton and Bank Seat 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

Condition		Range (m) (all fish hearing groups
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

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 Acoustics, baseline noise in Fishguard Harbour is dominated by the 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 Line 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 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 8-24). 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 up to four 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 8-28.

Table 8-28: 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 8-20.
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 maintenance dredging within the operational phase. However, this maintenance dredging will be assessed as part of a separate Marine Licence, and therefore does not represent the MDS during the operational phase of the Proposed Development in this assessment. 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, this maintenance dredging will be assessed as part of a separate Marine Licence, and therefore does not represent the MDS during the operational phase of the Proposed Development in this assessment. 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 8-29.

Table 8-29: Impacts Scoped Out of the Assessment for Marine Mammals in the Construction Phase

Impact	Justification for Scoping Out
Temporary habitat loss and/or disturbance Long term 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.
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.
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 8-20.
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 Acoustics 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 Acoustics). 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 four 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 four 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 8-30. 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 8-30: 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 8-31. 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 Acoustics for further information).

Table 8-31: 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 L_P* (NMFS level B-harassment)
VHF cetaceans (harbour porpoise)	95	
PCW (grey seal)	108	

* 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 8-32). 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 8-32: 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 four 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 SPLp (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 8-33). 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 8-33).

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 8-33). 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 8-33: 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 and Demolition Activities

The bank seat 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 8-34). 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 8-34). 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 8-34: Threshold Exceedance Ranges for Bank Seat Piling and Demolition Activities

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

Condition		HF Cetaceans	VHF Cetaceans	PCW
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 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 Acoustics 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 8-35). 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 8-35). However, for the VHF hearing group, the TTS threshold may be exceeded up to 270 m from the source (Table 8-35). 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 8-35: 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 receiver, no soft start	90th percentile range [m]	<10	190	20
	Maximal range [m]	<10	270	30
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

Finally, coring/rotary drilling of the main pontoon pile and bank seat piles 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 8-36). 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 8-36).

Table 8-36: Threshold Exceedance Ranges for Coring/Rotary Drilling of the Main Ponton and Bank Seat 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

Condition		HF Cetaceans	VHF Cetaceans	PCW
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 8-33).

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 four 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 up to four 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 up to four 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 8-37.

Table 8-37: 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 8-29.
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 Acoustics, 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 Acoustics, 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 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.
- 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

8.12.1 Cumulative Effects Assessment

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).

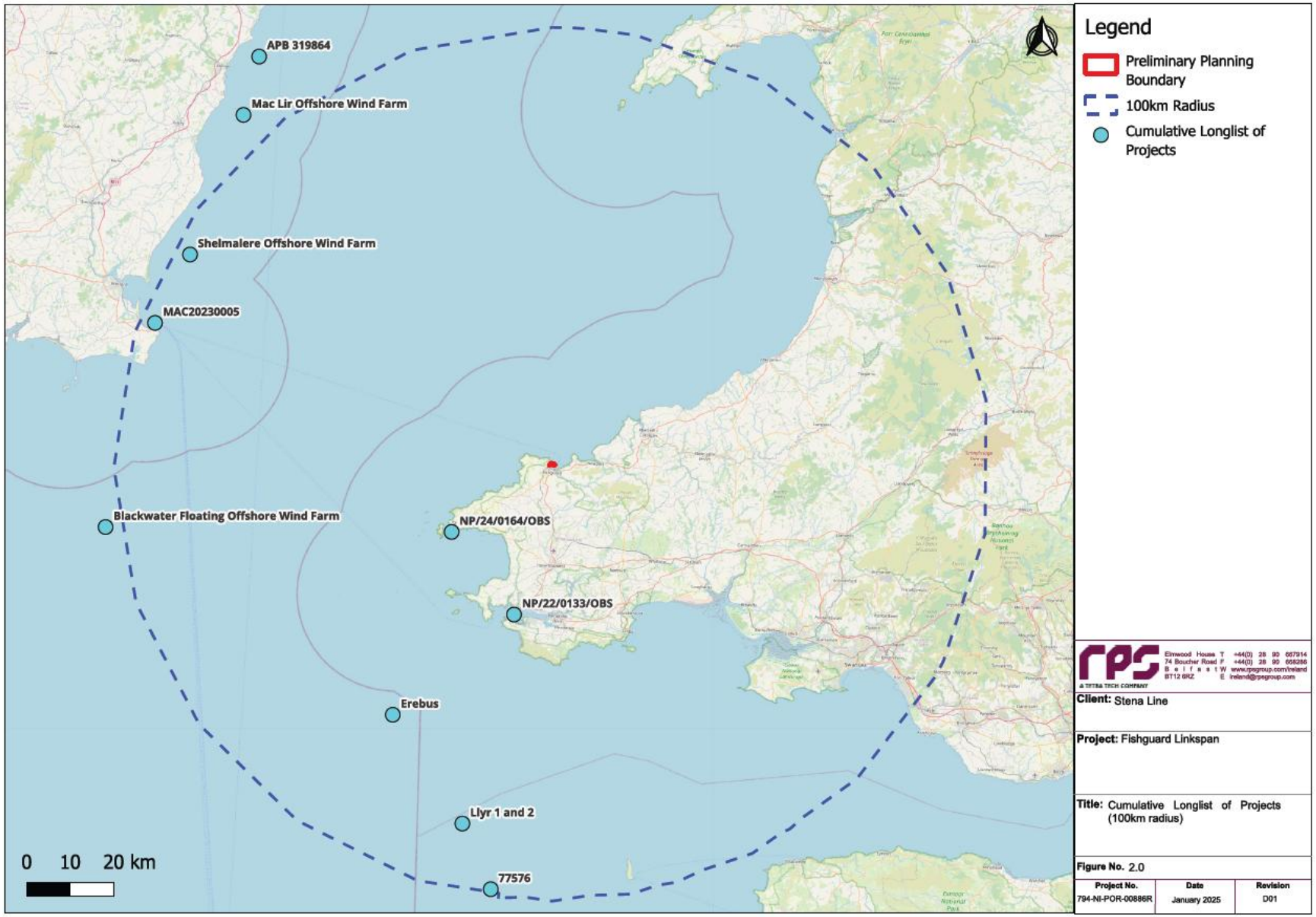

Figure 8-24: CEA Long List of Plans and Projects within 100 km of the Planning Boundary

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 Planning 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 Acoustics 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.

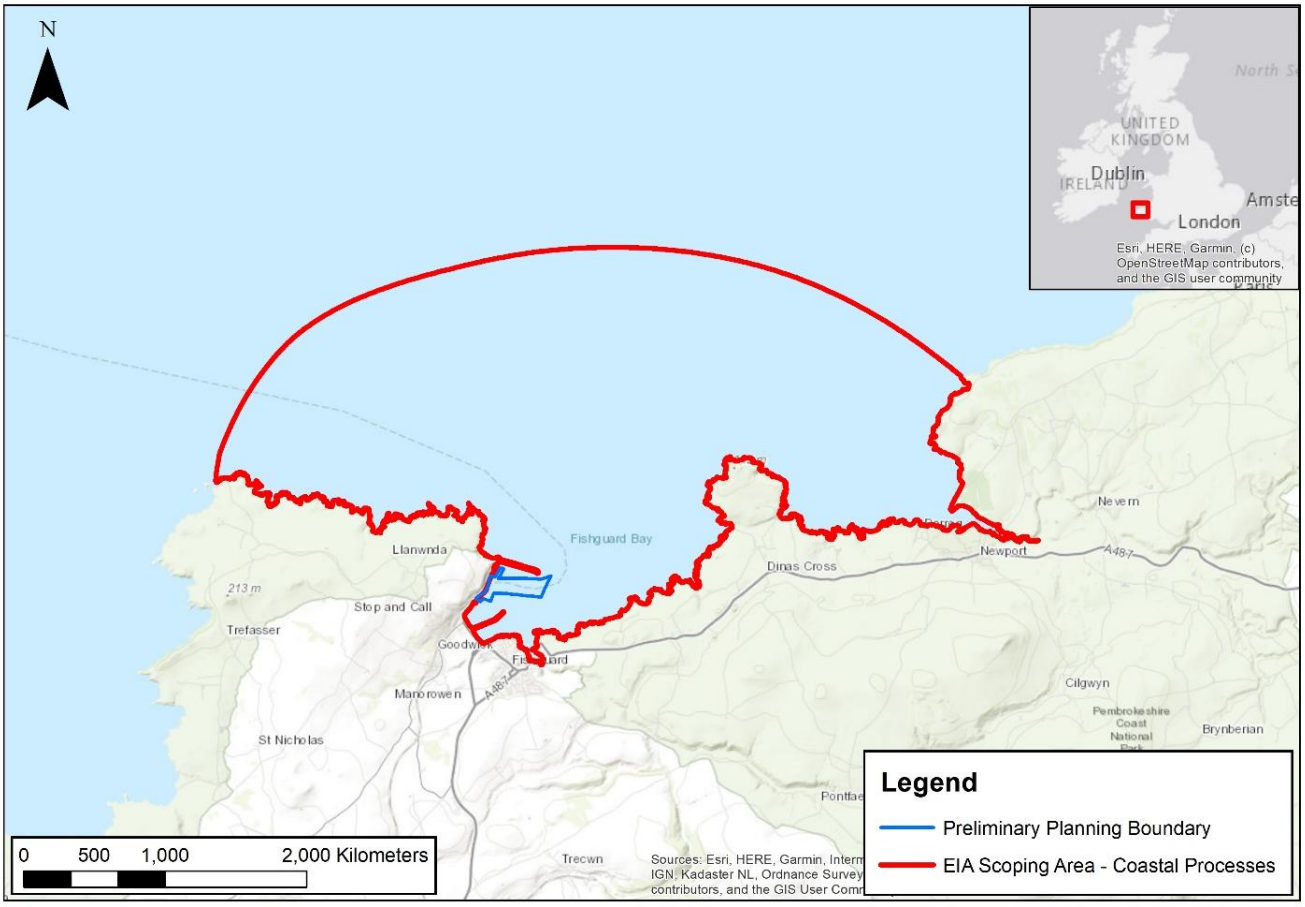

Figure 8-25: Coastal Processes Study Area used to Screen Out Plans and Projects for Benthic Subtidal and Intertidal Ecology and Fish and Shellfish Ecology

- Marine mammals:
  - Behavioural disturbance associated with piling was modelled out to 5.6 km for marine mammals (Chapter 14: Underwater Acoustics 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.

8.12.2 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 Acoustics, 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 8-38.

Table 8-38: Impact Assessment Summary Table

Description of impact	Phase		Measures included in the Project	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional measures	Residual effect	Proposed monitoring
	C	O							
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 Management Plan	Low	Benthic subtidal community IEF: low Benthic intertidal IEFs: high	All IEFs: Minor adverse	None required	None	None
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	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
					Behavioural disturbance: low				
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

8.15 References

Aarts, G., Brasseur, S. and Kirkwood, R. (2018). *Behavioural response of grey seals to pile driving.* Wageningen, Wageningen Marine Research (University & Research centre) pp.54.

ABPmer. (2018). *Fishguard Ferry Port Marine Ecology Surveys, Baseline surveys for the proposed linkspan works, ABPmer. Report No. R.2841. A report produced by ABPmer for RPS, January 2018.* pp.29.

Baines, M. E. and Evans, P. G. H. (2012). *Atlas of the Marine Mammals of Wales.* CCW Monitoring Report No. 68. 68. pp.129.

Bash, J., Berman, C. H. and Bolton, S. (2001). *Effects of turbidity and suspended solids on salmonids.* Center for Streamside Studies University of Washington pp.74.

Berg, L. (1979). *Effects of short term exposure to suspended sediment on the behaviour of juvenile coho salmon Oncorhynchus kisutch.* University of British Columbia.

Berg, L. and Northcote, T. (1985). *Changes in territorial, gill-flaring, and feeding behavior in juvenile coho salmon (Oncorhynchus kisutch) following short-term pulses of suspended sediment*. Canadian Journal of Fisheries and Aquatic Sciences, 42 (8), pp.1410-1417.

Berli, B. I., Gilbert, M. J. H., Ralph, A. L., Tierney, K. B. and Burkhardt-Holm, P. (2014). *Acute exposure to a common suspended sediment affects the swimming performance and physiology of juvenile salmonids*. Comparative Biochemistry and Physiology Part A: Molecular & Integrative Physiology, 176, pp.1-10. DOI:10.1016/j.cbpa.2014.03.013.

BGS. (2025). *British Geological Society GeoIndex Offshore* [Online]. Available at: https://mapapps2.bgs.ac.uk/geoindex_offshore/home.html?_ga=2.187977000.1286835908.1739799800-1274061494.1739799799. Accessed on: February 2025.

Bisson, P. A. and Bilby, R. E. (1982). *Avoidance of suspended sediment by juvenile coho salmon*. North American Journal of Fisheries Management, 2 (4), pp.371-374.

Bolam, S., Rees, H., Somerfield, P., Smith, R., Clarke, K., Warwick, R., Atkins, M. and Garnacho, E. (2006a). *Ecological consequences of dredged material disposal in the marine environment: a holistic assessment of activities around the England and Wales coastline*. Marine Pollution Bulletin, 52 (4), pp.415-426.

Bolam, S., Whomersley, P. and Schratzberger, M. (2004). *Macrofaunal recolonization on intertidal mudflats: effect of sediment organic and sand content*. Journal of Experimental Marine Biology and Ecology, 306 (2), pp.157-180.

Bolam, S. G. and Rees, H. L. (2003). *Minimizing impacts of maintenance dredged material disposal in the coastal environment: a habitat approach*. Environmental management, 32, pp.171-188.

Bolam, S. G., Schratzberger, M. and Whomersley, P. (2006b). *Macro-and meiofaunal recolonisation of dredged material used for habitat enhancement: temporal patterns in community development*. Marine Pollution Bulletin, 52 (12), pp.1746-1755.

Boubée, J. A., Dean, T. L., West, D. W. and Barrier, R. F. (1997). *Avoidance of suspended sediment by the juvenile migratory stage of six New Zealand native fish species*. New Zealand journal of marine and freshwater research, 31 (1), pp.61-69.

BRIG. (2016). *Intertidal Underboulder Communities.* UK Biodiversity Action Plan Priority Habitat Descriptions. JNCC. Peterborough, England

Budd, G. C. (2007). *Abra alba White furrow shell.* Marine Life Information Network: Biology and Sensitivity Key Information Reviews. Marine Biological Association of the United Kingdom. Plymouth, UK

Campanella, F. and van der Kooij, J. (2021). *Spawning and nursery grounds of forage fish in Welsh and surrounding waters Distribution of adult and juvenile forage fish species during autumn and winter.* Cefas. Cefas Project Report for RSPB. pp.65.

Carter, M. I. D., Boehme, L., Cronin, M. A., Duck, C. D., Grecian, W. J., Hastie, G. D., Jessopp, M., Matthiopoulos, J., McConnell, B. J., Miller, D. L., Morris, C. D., Moss, S. E. W., Thompson, D., Thompson, P. M. and Russell, D. J. F. (2022). *Sympatric Seals, Satellite Tracking and Protected Areas: Habitat-Based*

Distribution Estimates for Conservation and Management. Frontiers in Marine Science, 9, pp.18. DOI:10.3389/fmars.2022.875869.

Catalano, B., Moltedo, G., Martuccio, G., Gastaldi, L., Virno-Lamberti, C., Lauria, A. and Ausili, A. (2012). *Can Hediste diversicolor (Nereidae, Polychaete) be considered a good candidate in evaluating PAH contamination? A multimarker approach*. Chemosphere, 86 (9), pp.875-882.

Chapman, M. G. (2012). *Restoring intertidal boulder-fields as habitat for "Specialist" and "Generalist" animals*. Restoration Ecology, 20 (2), pp.277-285.

Chiasson, A. G. (1993). *The effects of suspended sediment on rainbow smelt (Osmerus mordax): a laboratory investigation*. Canadian Journal of Zoology, 71 (12), pp.2419-2424.

Christian, J. R., Mathieu, A., Thomson, D. H., White, D. and Buchanan, R. A. (2003). *Effect of Seismic Energy on Snow Crab (Chionoecetes opilio).* Prepared for National Energy Board,File No. CAL-1-00364. Calgary, Canada pp.50.

CIEEM. (2022). *Guidelines for ecological impact assessment in the UK and Ireland. Terrestrial, freshwater, coastal and marine.* CIEEM. Version 1.2 - Updated April 2022. pp.44.

Collin, S. P. and Hart, N. S. (2015). *Vision and photoentrainment in fishes: The effects of natural and anthropogenic perturbation*. Integrative Zoology, 10 (1), pp.15-28. DOI:10.1111/1749-4877.12093.

Costa, D. P. (2012). *A bioenergetics approach to developing a population consequences of acoustic disturbance model*. *The effects of noise on aquatic life.* Springer.

Coull, K., Johnstone, R. and Rogers, S. (1998). *Fisheries sensitivity maps in British waters.* Published and distributed by UKOOA Ltd pp.63.

Dauvin, J.-C. (2008). *Effects of heavy metal contamination on the macrobenthic fauna in estuaries: the case of the Seine estuary*. Marine Pollution Bulletin, 57 (1-5), pp.160-169.

De-Bastos, E. S. R., Marshall, C. E. and Watson, A. (2023). *Kurtiella bidentata and Thyasira spp. in circalittoral muddy mixed sediment.* Marine Life Information Network: Biology and Sensitivity Key Information Reviews. Marine Biological Association of the United Kingdom. Plymouth, UK

Deecke, V. B., Slater, P. J. and Ford, J. K. (2002). *Selective habituation shapes acoustic predator recognition in harbour seals*. Nature, 420 (6912), pp.171-173.

Edmonds, N. J., Firmin, C. J., Goldsmith, D., Faulkner, R. C. and Wood, D. T. (2016). *A review of crustacean sensitivity to high amplitude underwater noise: Data needs for effective risk assessment in relation to UK commercial species*. Marine Pollution Bulletin, 108 (1), pp.5-11. DOI:https://doi.org/10.1016/j.marpolbul.2016.05.006.

Ellis, J., Milligan, S., Readdy, L., Taylor, N. and Brown, M. (2012). *Spawning and nursery grounds of selected fish species in UK waters, Centre for Environment Fisheries and Aquaculture Science (CEFAS).* CEFAS Science Series Technical Report pp.56.

Ellison, W. T., Southall, B. L., Clark, C. W. and Frankel, A. S. (2012). *A new context-based approach to assess marine mammal behavioral responses to anthropogenic sounds*. Conserv Biol, 26 (1), pp.21-8. DOI:10.1111/j.1523-1739.2011.01803.x.

EMODnet. (2025). *Biogenic Substrate in Europe* [Online]. Available at: https://emodnet.ec.europa.eu/geonetwork/srv/eng/catalog.search#/metadata/2328d839-8024-47f3-aca6-32d788afe3dd. Accessed on: January 2025.

Engell-Sørensen, K. and Skyt, P. H. (2001). *Evaluation of the effect of sediment spill from offshore wind farm construction on marine fish.* Report to SEAS, Denmark pp.18.

Erbe, C., Dunlop, R. and Dolman, S. (2018). *Effects of Noise on Marine Mammals*. *Springer Handbook of Auditory Research.*

Evans, P. G. H., Pierce, G. J., Veneruso, G., Weir, C. R., Gibas, D., Anderwald, P. and Begoña Santos, M. (2015). *Analysis of long-term effort-related land-based observations to identify whether coastal areas of harbour porpoise and bottlenose dolphin have persistent high occurrence and abundance (revised June 2015).* JNCC Report No. 543. Peterborough, UK

Evans, P. G. H. and Waggitt, J. J. (2023). *Modelled Distribution and Abundance of Cetaceans and Seabirds in Wales and Surrounding Waters.* NRW Evidence Report, Report No: 646. Natural Resources Wales. Bangor. 646. pp.354.

Feingold, D. and Evans, P. G. H. (2014). *Bottlenose Dolphin and Harbour Porpoise Monitoring in Cardigan Bay and Pen Llŷn a'r Sarnau Special Areas of Conservation 2011 - 2013.* NRW Evidence Report Series. Natural Resource Wales. Bangor pp.120.

Fernandez-Betelu, O., Graham, I. M., Brookes, K. L., Cheney, B. J., Barton, T. R. and Thompson, P. M. (2021). *Far-field effects of impulsive noise on coastal bottlenose dolphins*. Frontiers in Marine Science, 8**,** pp.664230.

Fernandez-Betelu, O., Graham, I. M., Cornulier, T. and Thompson, P. M. (2019). *Fine scale spatial variability in the influence of environmental cycles on the occurrence of dolphins at coastal sites*. Scientific Reports, 9 (1)**,** pp.1-12.

Finneran, J. J. and Schlundt, C. E. (2013). *Effects of fatiguing tone frequency on temporary threshold shift in bottlenose dolphins (Tursiops truncatus)*. The Journal of the Acoustical Society of America, 133 (3)**,** pp.1819-1826.

Gardner, G. R., Pruell, R. J. and Malcolm, A. R. (1992). *Chemical induction of tumors in oysters by a mixture of aromatic and chlorinated hydrocarbons, amines and metals*. Marine Environmental Research, 34 (1-4)**,** pp.59-63.

Genov, T., Centrih, T., Kotnjek, P. and Hace, A. (2019). *Behavioural and temporal partitioning of dolphin social groups in the northern Adriatic Sea*. Marine Biology, 166 (1)**,** pp.14. DOI:10.1007/s00227-018-3450-8.

Gilles, A., Authier, M., Ramirez-Martinez, N. C., Araújo, H., Blanchard, A., Carlström, J., Eira, C., Dorémus, G., Fernández-Maldonado, C., Geelhoed, S. C. V., Kyhn, L., Laran, S., Nachtsheim, D., Panigada, S., Pigeault, R., Sequeira, M., Sveegaard, S., Taylor, N. L., Owen, K., Saavedra, C., Vázquez-Bonales, J. A., Unger, B. and Hammond, P. S. (2023). *Estimates of cetacean abundance in European Atlantic waters in summer 2022 from the SCANS-IV aerial and shipboard surveys.* Final report published 29 September 2023 pp.64.

Graham, I. M., Pirotta, E., Merchant, N. D., Farcas, A., Barton, T. R., Cheney, B., Hastie, G. D. and Thompson, P. M. (2017). *Responses of bottlenose dolphins and harbor porpoises to impact and vibration piling noise during harbor construction*. Ecosphere, 8 (5)**,** pp.e01793. DOI:10.1002/ecs2.1793.

Grant, R., Wieskotten, S., Wengst, N., Prescott, T. and Dehnhardt, G. (2013). *Vibrissal touch sensing in the harbor seal (Phoca vitulina): how do seals judge size?* Journal of Comparative Physiology A, 199**,** pp.521-533.

Hammond, P. S., C. Lacey, A. Gilles, S. Viquerat, P. Börjesson, H. Herr, K. Macleod, V. Ridoux, M. Santos, M. Scheidat, J. Teilmann, J. Vingada and N. Øien. (2021). *Estimates of cetacean abundance in European Atlantic waters in summer 2016 from the SCANS-III aerial and shipboard surveys. Revised June 2021.* pp.42.

Hammond, P. S., Macleod, K., Berggren, P., Borchers, D. L., Burt, L., Cañadas, A., Desportes, G., Donovan, G. P., Gilles, A., Gillespie, D., Gordon, J., Hiby, L., Kuklik, I., Leaper, R., Lehnert, K., Leopold, M., Lovell, P., Øien, N., Paxton, C. G. M., Ridoux, V., Rogan, E., Samarra, F., Scheidat, M., Sequeira, M., Siebert, U., Skov, H., Swift, R., Tasker, M. L., Teilmann, J., Van Canneyt, O. and Vázquez, J. A. (2013). *Cetacean abundance and distribution in European Atlantic shelf waters to inform conservation and management*. Biological Conservation, 164**,** pp.107-122. DOI:https://doi.org/10.1016/j.biocon.2013.04.010.

Hammond, P. S., Northridge, S. P., Thompson, D., Gordon, J. C. D., Hall, A. J., Aarts, G. and Matthiopoulos, J. (2005). *Background information on marine mammals for Strategic Environmental Assessment 6.* Sea Mammal Research Unit

Hannam, M. L., Bamber, S. D., Galloway, T. S., Moody, A. J. and Jones, M. B. (2010). *Effects of the model PAH phenanthrene on immune function and oxidative stress in the haemolymph of the temperate scallop Pecten maximus*. Chemosphere, 78 (7)**,** pp.779-784.

Hastie, G. D., Lepper, P., McKnight, J. C., Milne, R., Russell, D. J. and Thompson, D. (2021). *Acoustic risk balancing by marine mammals: anthropogenic noise can influence the foraging decisions by seals*. Journal of Applied Ecology, 58 (9)**,** pp.1854-1863.

Hastie, G. D., Russell, D. J., Benjamins, S., Moss, S., Wilson, B. and Thompson, D. (2016). *Dynamic habitat corridors for marine predators; intensive use of a coastal channel by harbour seals is modulated by tidal currents*. Behavioral Ecology and Sociobiology, 70 (12), pp.2161-2174. DOI:10.1007/s00265-016-2219-7.

Hastie, G. D., Russell, D. J. F., McConnell, B., Moss, S., Thompson, D., Janik, V. M. and Punt, A. (2015). *Sound exposure in harbour seals during the installation of an offshore wind farm: predictions of auditory damage*. Journal of Applied Ecology, 52 (3), pp.631-640. DOI:10.1111/1365-2664.12403.

Hastings, M. C. (2002). *Clarification of the Meaning of Sound Pressure Levels & the Known Effects of Sound on Fish.* White Paper.

Heinänen, S. and Skov, H. (2015). *The identification of discrete and persistent areas of relatively high harbour porpoise density in the wider UK marine area.* JNCC Report No: 544. Peterborough, UK pp.115.

Hill, J. M. and Wilson, E. (2008). *Amphiura filiformis A brittlestar.* Marine Life Information Network: Biology and Sensitivity Key Information Reviews. Marine Biological Association of the United Kingdom. Plymouth, UK

Hrycik, A. R., Almeida, L. Z. and Höök, T. O. (2017). *Sub‐lethal effects on fish provide insight into a biologically‐relevant threshold of hypoxia*. Oikos, 126 (3), pp.307-317.

IAMMWG. (2022). *Updated abundance estimates for cetacean Management Units in UK waters.* JNCC Report No. 680 (Revised March 2022). Joint Nature Conservation Committee. Peterborough. 0963-8091. pp.22.

IAMMWG. (2023). *Review of Management Unit boundaries for cetaceans in UK waters.* JNCC Report No. 734. Joint Nature Conservation Committee. Peterborough, UK pp.23.

JNCC. (2010). *Statutory nature conservation agency protocol for minimising the risk of injury to marine mammals from piling noise.* Joint Nature Conservation Committee. Aberdeen, Scotland pp.13.

JNCC. (2020a). *Consultation Report: Harbour porpoise SACs noise guidance.* JNCC Report No. 652. Peterborough, UK pp.90.

JNCC. (2020b). *Guidance on noise management in harbour porpoise SACs* [Online]. Available at: https://hub.jncc.gov.uk/assets/2e60a9a0-4366-4971-9327-2bc409e09784. Accessed on: July 2024.

Jones, E. L., McConnell, B. J., Smout, S., Hammond, P. S., Duck, C. D., Morris, C. D., Thompson, D., Russell, D. J. F., Vincent, C., Cronin, M., Sharples, R. J. and Matthiopoulos, J. (2015). *Patterns of space use in sympatric marine colonial predators reveal scales of spatial partitioning*. Marine Ecology Progress Series, 534, pp.235-249. DOI:10.3354/meps11370.

Kastelein, R., Hoek, L., Jennings, N., Kester, R. and Huisman, R. (2019). *Reduction in Body Mass and Blubber Thickness of Harbor Porpoises (Phocoena phocoena) Due to Near-Fasting for 24 Hours in Four Seasons*. Aquatic Mammals, 45, pp.37-47. DOI:10.1578/AM.45.1.2019.37.

Kastelein, R. A., Hardeman, J. and Boer, H. (1997). *Food consumption and body weight of harbour porpoises (Phocoena phocoena)*. *In:* Read, A. J., Wiepkema, P. R. and Nachtigall, P. E. (eds.) *The Biology of the Harbour Porpoise.* The Netherlands: De Spil Publishers.

Kastelein, R. A., Helder-Hoek, L., Kommeren, A., Covi, J. and Gransier, R. (2018). *Effect of pile-driving sounds on harbor seal (Phoca vitulina) hearing*. The Journal of the Acoustical Society of America, 143 (6), pp.3583. DOI:10.1121/1.5040493.

Kastelein, R. A., Helder-Hoek, L. and Van De Voorde, S. (2017). *Hearing thresholds of a male and a female harbor porpoise (Phocoena phocoena)*. The Journal of the Acoustical Society of America, 142 (2), pp.1006-1010. DOI:10.1121/1.4997907.

Kastelein, R. A., van Heerden, D., Gransier, R. and Hoek, L. (2013). *Behavioral responses of a harbor porpoise (Phocoena phocoena) to playbacks of broadband pile driving sounds*. Marine Environmental Research, 92, pp.206-14. DOI:10.1016/j.marenvres.2013.09.020.

Lohrengel, K., Evans, P. G. H., Lindenbaum, C. P., Morris, C. W. and Stringell, T. B. (2018). *Bottlenose Dolphin Monitoring in Cardigan Bay 2014 - 2016.* Natural Resources Wales. Bangor. NRW Evidence Report No: 191.

Long, E. R., Macdonald, D. D., Smith, S. L. and Calder, F. D. (1995). *Incidence of adverse biological effects within ranges of chemical concentrations in marine and estuarine sediments*. Environmental Management, 19, pp.81-97.

MacDonald, D. D. and Ingersoll, C. G. (2010). *Tools for assessing contaminated sediments in freshwater, estuarine, and marine ecosystems*. Sedimentology of aqueous systems, pp.171-199.

Marine Conservation Society. (2020). *UK Basking Shark sightings from 1987 to 2016*. NBN Atlas.

Marine Ecological Surveys Limited. (2008). *Marine Macrofauna Genus Trait Handbook.* Bath, UK, Marine Ecological Surveys Limited.

Marriott, S., Cowan, E., Cohen, J. and Hallock, R. M. (2013). *Somatosensation, echolocation, and underwater sniffing: adaptations allow mammals without traditional olfactory capabilities to forage for food underwater*. Zoological science, 30 (2), pp.69-75.

Marshall, C. E. and Wilson, E. (2008). *Pecten maximus Great scallop.* Marine Life Information Network: Biology and Sensitivity Key Information Reviews. Marine Biological Association of the United Kingdom. Plymouth, UK pp.17.

Mellish, J., Iverson, S. and Don Bowen, W. (1999). *Variation in Milk Production and Lactation Performance in Grey Seals and Consequences for Pup Growth and Weaning Characteristics*. Physiological and Biochemical Zoology, 72 (6), pp.677-690. DOI:10.1086/316708.

MMO. (2023). *UK sea fisheries annual statistics report 2022*. Office of National Statistics.

MMO. (2024). *UK sea fisheries annual statistics report 2023*. Office of National Statistics.

Nacci, D. and Jackim, E. (1989). *Using the DNA alkaline unwinding assay to detect DNA damage in laboratory and environmentally exposed cells and tissues*. Marine environmental research, 28 (1-4), pp.333-337.

Neal, K. J. and Pizzolla, P. F. (2008). *Carcinus maenas Common shore crab.* Marine Life Information Network: Biology and Sensitivity Key Information Reviews. Marine Biological Association of the United Kingdom. Plymouth, UK pp.20.

Neal, K. J. and Wilson, E. (2008). *Cancer pagurus Edible crab.* Marine Life Information Network: Biology and Sensitivity Key Information Reviews. Marine Biological Association of the United Kingdom. Plymouth, UK

Nedwell, J., Turnpenny, A., Lovell, J., Parvin, S., Workman, R., Spinks, J. and Howell, D. (2007). *A validation of the dBht as a measure of the behavioural and auditory effects of underwater noise.* Subacoustech Report Reference: 534R1231. Department for Business, Enterprise and Regulatory Reform

Newcombe, C. P. and Jensen, J. O. T. (1996). *Channel Suspended Sediment and Fisheries: A Synthesis for Quantitative Assessment of Risk and Impact*. North American Journal of Fisheries Management, 16 (4), pp.693-727.

Newcombe, C. P. and Macdonald, D. D. (1991). *Effects of Suspended Sediments on Aquatic Ecosystems*. North American Journal of Fisheries Management, 11 (1), pp.72-82.

Newell, R., Seiderer, L. and Hitchcock, D. (1998). *The impact of dredging works in coastal waters: a review of the sensitivity to disturbance and subsequent recovery of biological resources on the sea bed*. Oceanography and Marine Biology: an annual review, 36 (1), pp.127-178.

NMFS. (2024). *Update to: Technical Guidance for Assessing the Effects of of Anthropogenic Sound on Marine Mammal Hearing (v3): Underwater and In-Air Criteria for Onset of Auditory Injury and Temporary Threshold Shifts.* NOAA. US Department of Commer. NMFS-OPR-71. pp.182.

NRW. (2023a). *NRW's Position on assessing behavioural disturbance of harbour porpoise (Phocoena phocoena) from underwater noise. Position statement.* NRW. Version 1.0.

NRW. (2023b). *NRW's Position on Assessing the effects of Hearing Injury from Underwater Noise on Marine Mammals*. Natural Resources Wales.

NRW. (2024). *NRW Marine Fish Surveys* [Online]. Available at: https://datamap.gov.wales/layergroups/geonode:nrw_marine_fish_surveys. Accessed on: October 2024.

NRW. (2025a). *Marine ecology datasets for marine developments* [Online]. Available at: https://naturalresources.wales/guidance-and-advice/business-sectors/marine/marine-ecology-datasets-for-marine-developments/?lang=en. Accessed on: January 2025.

NRW. (2025b). *NRW Data Map Wales: Environment (Wales) Act Section 7 and OSPAR: Marine Habitats - Section 7 OSPAR Blue Mussel Beds Points* [Online]. NRW. Available at: https://datamap.gov.wales/maps/new?layer=inspire-nrw:NRW_NERC_OSPAR_BLUE_MUSSEL_POINT#/. Accessed on: February 2025.

NRW. (2025c). *NRW Data Map Wales: Environment (Wales) Act Section 7 and OSPAR: Marine Habitats - Section 7 OSPAR Blue Mussel Beds Polygon* [Online]. NRW. Available at: https://datamap.gov.wales/maps/new?layer=inspire-nrw:NRW_NERC_OSPAR_BLUE_MUSSEL#/. Accessed on: February 2025.

NRW. (2025d). *NRW Data Map Wales: Intertidal Phase 1 Habitat Survey Results Portal* [Online]. Available at: https://datamap.gov.wales/maps/new?layergroup=geonode:nrw_intertidal_phase_1_habitat_survey#/. Accessed on: January 2025.

Parry, G. D. and Gason, A. (2006). *The effect of seismic surveys on catch rates of rock lobsters in western Victoria, Australia*. Fisheries Research, 79 (3), pp.272-284.

Pearce, F., Peeler, E. and Stebbing, P. (2012). *Modelling the risk of the introduction and spread of non-indigenous species in the UK and Ireland.* Cefas pp.70.

Pearson, W. H., Skalski, J. R., Sulkin, S. D. and Malme, C. I. (1994). *Effects of seismic energy releases on the survival and development of zoeal larvae of dungeness crab (Cancer magister)*. Marine Environmental Research, 38 (2), pp.93-113.

Pierpoint, C. (2008). *Harbour porpoise (Phocoena phocoena) foraging strategy at a high energy, near-shore site in south-west Wales, UK*. Journal of the Marine Biological Association of the United Kingdom, 88 (6), pp.1167-1173. DOI:10.1017/s0025315408000507.

Popper, A., Hawkins, A., Fay, R., Mann, D., Bartol, S., Carlson, T., Coombs, S., Ellison, W., Gentry, R., Halvorsen, M., Løkkeborg, S., Rogers, P., Southall, B., Zeddies, D. and Tavolga, W. (2014). *Sound Exposure Guidelines for Fishes and Sea Turtles: A Technical Report prepared by ANSI-Accredited Standards Committee S3/SC1 and registered with ANSI.* New York, Springer.

Popper, A. N., Salmon, M. and Horch, K. W. (2001). *Acoustic detection and communication by decapod crustaceans*. Journal of Comparative Physiology A, 187, pp.83-89.

Rayment, W. J. (2007). *Aphelochaeta marioni A bristleworm.* Marine Life Information Network: Biology and Sensitivity Key Information Reviews. Marine Biological Association of the United Kingdom. Plymouth, UK

Reichmuth, C., Sills, J. M., Mulsow, J. and Ghoul, A. (2019). *Long-term evidence of noise-induced permanent threshold shift in a harbor seal (Phoca vitulina)*. The Journal of the Acoustical Society of America, 146 (4), pp.2552-2561. DOI:10.1121/1.5129379.

Richardson, W. J., Malme, C. I., Green, J. C. R. and Thomson, D. H. (1995). *Marine mammals and noise.* San Diego, California, USA, Vol 1. Academic Press.

Robertson, M. J., Scruton, D. A. and Clarke, K. D. (2007). *Seasonal effects of suspended sediment on the behavior of juvenile Atlantic salmon*. Transactions of the American Fisheries Society, 136 (3), pp.822-828.

Robertson, M. J., Scruton, D. A., Gregory, R. S. and Clarke, K. D. (2006). *Effect of suspended sediment on freshwater fish and fish habitat.* Canadian Technical Report of Fisheries Sciences 2644. Fisheries and Oceans Canada pp.37.

Rogan, E., Breen, P., Mackey, M., Cañadas, A., Scheidat, M., Geelhoed, S. and Jessopp, M. (2018). *Aerial Surveys of Cetaceans and Seabirds in Irish waters: Occurrence, distribution and abundance in 2015-2017.*

Rojano-Doñate, L., McDonald, B. I., Wisniewska, D. M., Johnson, M., Teilmann, J., Wahlberg, M., Højer-Kristensen, J. and Madsen, P. T. (2018). *High field metabolic rates of wild harbour porpoises*. Journal of Experimental Biology, 221 (Pt 23), pp.12. DOI:10.1242/jeb.185827.

RPS. (2018). *Chapter 7.0: Marine Biodiversity.* Fishguard Port Replacement Linkspan Environmental Impact Assessment. Stena Line pp.62.

Russell, D. J., Hastie, G. D., Thompson, D., Janik, V. M., Hammond, P. S., Scott-Hayward, L. A., Matthiopoulos, J., Jones, E. L. and McConnell, B. J. (2016). *Avoidance of wind farms by harbour seals is limited to pile driving activities*. Journal of Applied Ecology, 53 (6), pp.1642-1652.

Sabatini, M. and Ballerstedt, S. (2008). *Varicorbula gibba Basket shell.* Marine Life Information Network: Biology and Sensitivity Key Information Reviews. Marine Biological Association of the United Kingdom. Plymouth, UK

Schulte-Pelkum, N., Wieskotten, S., Hanke, W., Dehnhardt, G. and Mauck, B. (2007). *Tracking of biogenic hydrodynamic trails in harbour seals (Phoca vitulina)*. Journal of Experimental Biology, 210 (5), pp.781-787. DOI:10.1242/jeb.02708.

SCOS. (2023). *Scientific Advice on Matters Related to the Management of Seal Populations: 2022.* Natural Environment Research Council, Special Committee on Seals pp.206.

Sinclair, R. R., Kazer, S., Ryder, M., New, P. and Verfuss, U. K. (2023). *Review and recommendations on assessment of noise disturbance for marine mammals.* Natural Resources Wales

Southall, B. L., Bowles, A. E., Ellison, W. T., Finneran, J. J., Gentry, R. L., Greene Jr, C. R., Kastak, D., Ketten, D. R., Miller, J. H., Nachtigall, P. E. and Richardson, W. J. (2007). *Marine mammal noise-exposure criteria: initial scientific recommendations*. Aquatic Mammals, 33 (4), pp.414-521.

Southall, B. L., Finneran, J. J., Reichmuth, C., Nachtigall, P. E., Ketten, D. R., Bowles, A. E., Ellison, W. T., Nowacek, D. P. and Tyack, P. L. (2019). *Marine Mammal Noise Exposure Criteria: Updated Scientific Recommendations for Residual Hearing Effects*. Aquatic Mammals, 45 (2), pp.125-232. DOI:10.1578/am.45.2.2019.125.

Southall, B. L., Nowacek, D. P., Bowles, A. E., Senigaglia, V., Bejder, L. and Tyack, P. L. (2021). *Marine mammal noise exposure criteria: assessing the severity of marine mammal behavioral responses to human noise*. Aquatic Mammals, 47 (5), pp.421-464.

Sparling, C. E., Speakman, J. R. and Fedak, M. A. (2006). *Seasonal variation in the metabolic rate and body composition of female grey seals: fat conservation prior to high-cost reproduction in a capital breeder?* Journal of Comparative Physiology B, 176, pp.505-512.

Speiser, D. I. and Johnsen, S. (2008). *Scallops visually respond to the size and speed of virtual particles*. Journal of Experimental Biology, 211 (13), pp.2066-2070.

Taeubert, J.-E. and Geist, J. (2017). *The relationship between the freshwater pearl mussel (Margaritifera margaritifera) and its hosts*. Biology Bulletin, 44 (1), pp.67-73. DOI:10.1134/s1062359017010149.

Taylor, N., Authier, M., Banga, R., Genu, M., Macleod, K. and Gilles, A. (2022). *Marine Mammal By-catch.* OSPAR, 2023: The 2023 Quality Status Report for the Northeast Atlantic. OSPAR Commission. London, UK

Tillin, H. M., Houghton, A. J., Saunders, J. E., Drabble, R. and Hull, S. C. (2011). *Direct and Indirect Impacts of Aggregate Dredging.* MALSF. Science Monography Series: No.1. ABPmer. Southampton, UK pp.46.

Tillin, H. M., Kessel, C., Sewell, J., Wood, C. A. and Bishop, J. D. D. (2020). *Assessing the impact of key Marine Invasive Non-Native Species on Welsh MPA habitat features, fisheries and aquaculture. NRW Evidence Report. Report No: 454.* Natural Resources Wales. Bangor, Wales pp.260.

Tougaard, J. (2021). *Thresholds for behavioural responses to noise in marine mammals. Background note to revision of guidelines from the Danish Energy Agency.* DCE – Danish Centre for Environment and Energy. 225. pp.31.

Tyler-Walters, H. (2008). *Arenicola marina Blow lug.* Marine Life Information Network: Biology and Sensitivity Key Information Reviews. Marine Biological Association of the United Kingdom. Plymouth, UK

Tyler-Walters, H., Tillin, H. M., d'Avack, E. A. S., Perry, F. and Stamp, T. (2023). *Marine Evidencebased Sensitivity Assessment (MarESA) – Guidance Manual. Marine Life Information Network (MarLIN).* Marine Biological Association of the UK. Plymouth, UK pp.170.

UK Government. (2011). *Marine Policy Statement.* HM Government, Northern Ireland, Executive Scottish Government, and Welsh Assembly Government. London: The Stationery Office pp.51.

Wang, Z., Pu, D., Zheng, J., Li, P., Lü, H., Wei, X., Li, M., Li, D. and Gao, L. (2023). *Hypoxia-induced physiological responses in fish: From organism to tissue to molecular levels*. Ecotoxicology and Environmental Safety, 267**,** pp.115609. DOI:https://doi.org/10.1016/j.ecoenv.2023.115609.

Welsh Government. (2016). *Environment (Wales) Act 2016 – Section 7 Biodiversity Partnership Priority Habitats.* Welsh Government

Welsh Government. (2019). *Welsh National Marine Plan.* Welsh Government pp.180.

Wenger, A. S., Harvey, E., Wilson, S., Rawson, C., Newman, S. J., Clarke, D., Saunders, B. J., Browne, N., Travers, M. J., McIlwain, J. L., Erftemeijer, P. L. A., Hobbs, J.-P. A., McLean, D., Depczynski, M. and Evans, R. D. (2017). *A critical analysis of the direct effects of dredging on fish*. Fish and Fisheries, 18 (5)**,** pp.967-985. DOI:10.1111/faf.12218.

Westerberg, H., Rännbäek, P. and Frimansson, H. (1996). *Effects of Suspended Sediments on Cod Egg and Larvae and on the Behaviour of Adult Herring and Cod*. *ICES Council Meeting Papers. ICES Council Meeting of the International Council for the Exploration of the Sea.* Reykjavik, Iceland.

Wilber, D. H. and Clarke, D. G. (2001). *Biological effects of suspended sediments: a review of suspended sediment impacts on fish and shellfish with relation to dredging activities in estuaries*. North American Journal of Fisheries Management, 21 (4)**,** pp.855-875.

Wisniewska, D. M., Johnson, M., Teilmann, J., Rojano-Donate, L., Shearer, J., Sveegaard, S., Miller, L. A., Siebert, U. and Madsen, P. T. (2016). *Ultra-High Foraging Rates of Harbor Porpoises Make Them Vulnerable to Anthropogenic Disturbance*. Current Biology, 26 (11)**,** pp.1441-6. DOI:10.1016/j.cub.2016.03.069.

Worcester, T. (2006). *Effects of Seismic Energy on Fish; A Literature Review.* Department of Fisheries and Oceans, Bedford Institute of Oceanography. Dartmouth, Canada pp.72.

WSDOT. (2020). *Biological Assessment Preparation Manual. Chapter 7 Construction Noise Impact Assessment.* Washington State Department of Transport. Chapter Updated August 2020. pp.95.

Wyn, G. and Brazier, P. (2001). *Procedural Guideline No. 3-1 - In situ intertidal biotope recording*. *In:* Davies, J., Baxter, J., Bradley, M., Connor, D., Khan, J., Murray, E., Sanderson, W., Turnbull, C. and Vincent, M. (eds.) *Marine Monitoring Handbook.* Peterborough: JNCC.

Wyn, G., Brazier, P., Birch, K., Bunker, A., Cooke, A., Jones, M., Lough, N., McMath, A. and Roberts, S. (2006). *Handbook for Marine Intertidal Phase 1 Biotope Mapping Survey.* Bangor, Countryside Council for Wales.

Yang, Z., Chen, D. and Xiao, B. (2019). *Impact assessment of dredging on fish eggs and larvae: A case study in Caotan, South China*. *IOP Conference Series: Earth and Environmental Science.* IOP Publishing.

FISHGUARD LINKSPAN REPLACEMENT

Environmental Statement
Volume I Main Text

Chapter 9 Terrestrial Ecology and Ornithology

794-NI-POR-00886R
May 2025

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

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 and phases, where necessary, and
- Predict residual impacts.

The information presented in this document is based upon ecological surveys and assessments of the Site between 2021 and 2024. It has been prepared as per Chartered Institute of Ecology and Environmental Management’s Guidelines for Ecological Impact Assessment (CIEEM, 2018).

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

- Chapter 2: Project Description

Other aspects relevant to terrestrial ecology and/or ornithology are addressed in the specific chapters of the ES, namely:

- Chapter 11 Water Resources & WFD
- Chapter 13 Noise & Vibration
- Chapter 20 Seascape, Landscape & Visual

The marine environment in the harbour, potential effects from the development and mitigation measures in relation to these 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. This ES chapter:

- Presents information obtained from the scoping response (section 9.5);
- Presents the baseline conditions derived from the habitat survey, external building inspections and protected species scoping assessment (Appendix 9.A) with summaries in section (9.9);
- Identifies the limitations of the baseline information (9.9);
- Outlines embedded mitigation adopted as part 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.
- Presents the assessment of residual effects, both adverse and beneficial (9.12) measures that will be implemented as part of the development to deliver a Net benefit for Biodiversity
- Presents an assessment of potential cumulative impacts is provided in section (9.13).

9.3 Study Area

The Terrestrial Ecology Study Areas comprise a number of different distance buffers per ecological receptor. The Study Areas extend from the 'Survey Area', which has been defined based on the extent of Application 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
- 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), (CIEEM, 2020) 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 Summary of national planning policies 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 development is 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 development does not provide opportunities to create new terrestrial habitat within the operational harbour. Maintain and enhancement ecosystem resilience is addressed through the design of the temporary compounds which would lie adjacent to these 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. Where seasonally constrained surveys have not yet been carried, precautionary assumptions have been made. Species avoidance, protection and mitigation is presented in section 9.10. 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.
Section 5 – Development Affecting Designated Sites and Habitats	No impacts on terrestrial ecology nature conservation designated sites are anticipated and have been scoped out of the assessment.
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 classified as important ecological receptors in the context of the Proposed Development. The ES chapter includes assessment of the potential for the species to be directly or indirectly affected during construction and/or operation. Potential impacts on these species would be controlled through embedded mitigation (section 9.11). Black guillemot is classified as BoCCW Green as a species that is very rare in Pembrokeshire has been considered a priority species in this assessment. Where practicably possible direct impacts would be avoided but where unavoidable they will be fully compensated (section 9.10). Indirect impacts during construction would be controlled through embedded mitigation (section 9.10). Where practicably possible direct impact to priority species have been reduced following embedded design measures. Mitigation to further reduce direct and indirect impacts to both priority habitats and species are referred to in section 9.12 of this chapter.

The Proposed Development site is located within Pembrokeshire County Council. The local planning policy document relevant to the assessment of Terrestrial Ecology for the Proposed Development is:

- **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

policies provides a summary of the provisions contained within the local plan 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 proposal 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 have included avoiding tree loss. Protection of species is integrated into the proposed development. Enhancement for target species is provided as additional mitigation
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 to the harbour. Targeted enhancement, appropriate for the nature and context of the harbour, is integrated into the development proposal
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.	Maintenance of potential bat roosts and potential flight lines through the site has been incorporated into the development proposals • Avoidance of harm to otter • Protection buildings with potential to have features used by roosting bats • Avoidance effects on habitats adjacent to temporary construction areas • Sensitive lighting design – aligned to safe operational requirements
Supplementary Planning Guidance – Biodiversity	
The Biodiversity SPG reiterates the legislative and policy background to 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, • 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	Protected species scoping assessment has been completed. 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 development proposals – lighting controls, stand offs from off-site habitats.

9.5 Consultation

Table 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
	NRW	Scoping out of impacts on non-marine designated nature conservation sites	Agreed that scoping out of potential effects on designated sites was acceptable
	NRW	Otters	The response welcomes the commitment to otter survey. Scoping assessment is presented in based on habitat features. Precautionary mitigation for indirect effects during construction form part of the embedded mitigation (section 9.10).
	NRW	Bats roosts	Welcome the commitment to undertaking bat survey. Preliminary assessment of the structure buildings is presented in Appendix 9.A. Potential impacts on buildings has been avoided.
	NRW	Black guillemot	Response welcomes the commitment to undertake surveys in spring/summer 2025 Conservation measures for the small black guillemot population at Fishguard harbour should consider the provision of nest boxes for this species.

9.6 Methodology to inform the baseline

9.6.1 Desktop study

Information on designations, species records within the 2km of 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 9.4 Summary of key desktop information

	Source
International and National Designated sites, Wildlife Trust Reserves	MAGIC, WWBIC

Ancient woodland, Important Plant Areas, B-lines, NRW Priority Areas	WWBIC
Priority species; species of conservation concern, locally important species	WWBIC
Broad scale habitat mapping	WWBIC
Wetland Bird Survey Data Monthly counts between September and March from 2018/2019 to 2022/2023	BTO

9.6.2 Surveys

In order to inform the ES, a habitat survey was undertaken to define the baseline features in the landside part of the proposed development and adjoining habitats is outlined in Table 9.5 Summary of site-specific data.

Table 9.5 Summary of site-specific data

Title	Extent of survey	Overview of survey	Survey contractor	Date
Habitat survey	Landside and adjoining terrestrial habitat	Assessment of terrestrial habitats within and directly adjoining the application site boundary	RPS	25/01/25
Preliminary Bat Roost Assessment	Buildings (Landside)	External inspection of the structure of buildings within the application site	RPS	25/01/25
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

9.7 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 the specific guidance defined in the Guidelines for Ecological Impact Assessment - Third Edition' GLVIA3 (Chartered Institute of Ecology and Environmental Management, 2024).

Ecological receptors identified in the baseline surveys have been evaluated following these guidelines. Ecological receptors identified as important were subject to detailed assessment and are termed Important Ecological Features (IEFs). Receptors considered common, widespread and/or unthreatened by the Proposed Development were scoped out of any further evaluation within this chapter.

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 (SSS) 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 are derived from their condition and extent. Only where extents of such habitats form an appreciable part of the Welsh resource, would however be considered of 'National Importance'. The same approach to evaluation applies to protected or priority species. Small populations of priority species that are widespread in the would be of lesser importance than large populations or 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; and
- 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. This includes

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.

Features that are sufficiently widespread, threatened and resilient to project impacts and will remain viable and sustainable' and it is unnecessary to 'carry out detailed assessment of these ecological features. This would include common and widespread species and habitats that have conservation interest 'site or negligible' importance which have been scoped out of the assessment as they cannot experience significant effects under the definitions of the EIA.

Table 9.6 Definition of Geographic Importance

Value	Definition
International (Europe)	>1% of the European community species population/area of habitat extent. Internationally designated sites such as a 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 National Nature Reserve (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) 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) priorities, 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

Receptor Importance and Sensitivity

The criteria for defining sensitivity in this chapter of the ES are outlined in receptor below. Sensitivity criteria is usually associated with geographical importance as part of EIAs, as an example Special Areas of Conservation which are internationally importance 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.

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

Table 9.7 Definition of terms relating to the geographic importance (sensitivity) of the receptor

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 Those affected are able to adapt easily and maintain pre-impact status.

Magnitude of Effect

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 have also been taken into account 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, the impact is classed as irreversible.

Table 9.8 Duration of Effect

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.

The four levels of magnitude are used in this assessment; these are generally considered to be adverse unless stated otherwise. 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 8.9 Definition of terms 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).

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 presented in Table 9.10 Matrix used for the assessment of the significance of the effect 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 calculated assessment 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 concluded to be 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 described 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 enter this category. Effects upon human receptors may also be attributed this level of significance.
- **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

Observations were made on bird activity around the quay periodic scanning over a number of hours to assess species presence and activity as a snapshot. 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 BTO data collected over 5 years 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 data coupled with a 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. Only a small extent of rock armour falls within the application site and the quay wall lacks 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 the application site.

No information available on feeding, loafing, roosting activity of black guillemot within the harbour.

9.9 Baseline Environment

Desk study

Desk-based assessments have been undertaken to support data collection for the Proposed Development to include requests for past biodiversity records, made to West Wales Biodiversity Information Centre (WWBIC).

A search for records of designated sites and protected and notable species was requested within a 2 km search area of a previous iteration of the Proposed Development's Application Boundary.

The request included Ancient Woodland, Priority Habitats and Species, internationally and nationally protected species, species protected by planning policy and species of local conservation interest. The request made in January 2025 and included a request for bat records within 5km of the application site.

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 on protected and notable species are presented in Appendix 9.A – Preliminary Ecological Baseline. Details are provided on the Statutory nature conservation designated sites and their approximate distance from the boundary of the application site boundary.

Designated Sites

Part of the application site lies within West Wales Marine SAC with harbour porpoise *Phocoena phocoena* the primary qualifying feature. Potential impacts on this qualifying feature is addressed in the Marine section of the scoping report.

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 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. There are no Non-Statutory Designated Sites within 2km.

Designated sites (terrestrial ecology) are not considered further in the impact assessment.

Field Survey

The 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 audit 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)

Habitats

The landside area is predominately comprised of infrastructure and roads associated with the ferry terminal and Pembroke Harbour train station alongside areas of hard standing, currently used for storage and movement of vehicles.

Pembroke Harbour train station buildings and railway line are located in the central section of the application 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 the majority of its length, historically used for the movement of livestock being transported by boat.

To the north of the ferry terminal the structure of quay wall changes with a different block constriction and a slightly angled face with mooring for smaller boats. This section of the harbour wall forms eastern side of a smaller quay with 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.

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.

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. Rock armour revetment also forms the edge of the harbour along the northern and eastern breakwaters.

The northern section of the application site is a broadly circular flat area of unsealed hardstanding approximately 800m^2 in extent. This area is adjoined by coastal heath / scrub and the rock outcrop extends around the northern side creating separation between the hardstanding and the foreshore to the north.

Areas of vegetation with the application are limited to a narrow linear strip of butterfly bush *Buddleija 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 southwestern 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.

A range of buildings located within the application site. Descriptions and photographs of these are presented in Appendix 9.A. The largest building complex is the railway station which is c240m long with a continuous corrugated metal canopy. There are a number of single and double storey building sections below the canopy.

The two-storey port office building lies directly to the north of the railway station. A single storey stone block building with flat roof and ‘portacabin style’ building lie to the south of the railway station. Two large warehouse buildings adjoin the dock in the northern part of the application. A modern RNLI building, and a single storey building lie adjacent to the large warehouse buildings. A further fourth building is located on the western side of the railway line opposite the railway station.

No stands of non-native invasive plant species listed under Schedule 9 of the Wildlife and Countryside Act 1981 were recorded within the application site.

None of the areas of vegetation within the application 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

Broadleaved woodland adjoins the south-western boundary of the application 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. A number of 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.

The western site boundary as a whole adjoins 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% on 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; sandflat/mud flat with some exposed rocks. Intertidal habitats are considered in the marine ecology ES chapter.

A small operational water treatment works adjoins the northern boundary of the application site located between the northern area of hardstanding, northern breakwater and rocky shore.

The priority habitats adjoining the application boundary have local importance for biodiversity (low sensitivity).

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 hunting primarily at night and typically use holts and to lay up during the daytime. These features are generally located in dense cover in undisturbed locations. Searches were made for potential daytime refuges that could be used 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 application boundary 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 artificial lighting. Given this context this habitat would be very unlikely to be used as a resting place by otters during daytime hours.

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 structure creates a localised more enclosed space but lies directly although beneath 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.

The rock armour stone revetment around the harbour creates small cavities between the stones of suboptimal value as resting places for otter. The sections of rock armour located within and adjacent to the application site are localised and situated close to the ferry terminal operations and vehicle movements. Outside the application site to the south the section of rock armour revetment, the foreshore is exposed at low tide and is subject to public access including dog walkers.

All the quayside and harbour margin habitat within and adjoining the application site were assessed has having a very low potential of use by otter.

In the wider area the records of otter provided by WWBIC from Goodwick Brook and its tributaries to the south-west of the Fishguard and Afon Gwaun, a river flowing into Fishguard Bay to the east of the harbour.

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 (Keen 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.

In the context of the application site the landside habitats within and adjacent to the Proposed Development boundary and the quay wall are considered to have negligible importance for otter but the open water harbour forms part of the extensive foraging territory used by the local otter population. Consequently, the application site is classified as having up to local importance for otter (low sensitivity).

Bats

The desk study confirmed records of seven species of bats within 2km of the Application 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.*

Roosts

The closest records of bat roosts are in buildings within the Fishguard Bay Hotel complex, located c50m to the south-west of the application site boundary. The hotel is bounded by woodland which extends up to the application site boundary. It is assumed that all the bat species that have been recorded in the past will have roosts within 2km of the application site, although greater horseshoe bats will commute further than 2km from a roost site to feed.

The buildings within the application site boundary comprise the Fishguard Harbour railway station and 11 further buildings associated with the ferry terminal and harbour. From the external assessments the two warehouse buildings (B9 and B10) were classified as having potential high value for roosting bats due to their size and age. External inspections of the other buildings within the application site recorded very few cavity features and were classified as having up to low roost potential.

The railway station and ferry terminal are subject to artificial lighting as operational areas that are used 24 hours a day. The buildings are located within a built development with no vegetation providing flight line connections within the harbour. This sub-optimal context significantly reduces the likelihood of the buildings associated with the railway and ferry terminal being used by roosting bats.

All the buildings within the application site are to be retained and remain unaffected by development.

Several of trees in the broadleaved woodland, adjoining the south-western boundary, were noted as having cavity features, knot holes. 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 application site had negligible potential value for roosting bats.

Activity

A proportion of the bat species that have been recorded with 2km are expected to commute through, and potentially forage, within the application 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.

Bats select sheltered still conditions and the east-facing rock face will create a significant degree of sheltered from the prevailing south-westerly winds increasing the likelihood of very regular bat activity on the western boundary of the Application Site.

Light columns at the base the cliff will create an element of light spill onto vegetation behind the lights, but the rock face will remain a dark corridor and the western boundary is considered to be a frequently used linear flightline.

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, especially pipistrelle species that are less sensitive to artificial light. Activity levels would be expected to vary as a result of relative prey abundance and weather conditions.

The harbour including the railway station and ferry terminal will be subject to high light levels. These types of conditions are generally associated with a small number of less light sensitive species and the levels of bat activity are predicted to be low. All light sensitive species would be likely to avoid the developed areas subject to artificial lighting.

Overall

The application site is classified as having the potential to have importance in up to a local context for bat populations (Low sensitivity).

Birds

Black guillemot

The black guillemot *Cepphus grylle* 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 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/). 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 was 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. Black guillemot typically breeds in holes in walls of the harbour. Activity was noted around a timber stanchion in a section of the quay wall alongside the railway station. The ferry lies alongside this part of the quay wall when docked, reducing 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 individuals and not a breeding pair.

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 bird 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. A very small number of species were recorded. Five pairs of feral pigeon *Columba livia domestica* nesting under the quay wall within or adjacent to the linkspan. Four house martin *Delichon urbicum* 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 application site include house sparrow and starling; both BoCCW red list as well as green list species including pied wagtail and robin. The status of the site and nature of the built structures has not a significantly changed over the last 8 years. The breeding bird assemblage in the application site (encompassing a much larger part of the harbour) is expected to have 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 for this compartment, obtained from the BTO, provides information on the assemblage of bird species that use the harbour and the immediate vicinity.

The application site overlaps with approximately 20% of the BTO survey compartment, comprising open water the quayside and small areas of stone revetement. Areas of intertidal habitat lie within the wider BTO compartment 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 for these species from this period are provided below and the mean of the peak counts

- Black headed gull with a peak monthly count of 400 and a 5 year mean of 220.
- Herring gull with a peak count of 170 and a 5 year mean of 123
- Lesser black backed gull with a peak count of 40 and a 5 year mean of 12
- Mallard with a peak count of 30 and a 5 year mean of 21
- Oystercatcher with a peak count of 55 and a 5 year mean of 34
- Turnstone with a peak count of 22 and a 5 year mean of 17
- Curlew with a peak count of 13 and a 5 year mean of 7
- Dunlin with a peak count of 50 and a 5 year mean 14
- Cormorant with a peak count of 23 and a 5 year mean 13
- Shag 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 medium average numbers present in the survey compartment will be significantly lower than mean average for each of the species.

Great crested grebe, little grebe, and heron are also regularly occurring species. Other wader species that were regularly recorded in small numbers included redshank, and ringed plover and purple sandpiper have occasional been recorded in small flocks. There are also records of individual or small numbers of long tailed duck, diver species, and common scoter which move close to the coast from further offshore during poor weather.

The area will also be a resource for passage birds with the wader species moving between wintering and breeding areas in both spring and autumn. In September 2019 a flock of 23 sandwich tern, representing 10% of national breeding population, were recorded in the harbour for a brief period on migration.

During a scoping assessment of the section of the harbour within the application 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 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.

Considering that the WeBS data includes records of species from the wider harbour and adjoining habitats, the application site is considered to have up to local importance for wintering and passage species.

Important Ecological Features

Table 9.11 Important Ecological Features 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 as a result of Proposed Development impacts. This is based on professional judgement and has been assessed based on its limited geographical importance (i.e. of site importance or below) or likely to be absent from the application boundary.

Table 9.11 Important Ecological Features

Receptor	Description	Value	Sensitivity

Otter	A European Protected Species, listed on Section 7 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
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	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

Bat Roosts

Potential impacts on roosting bats has been scoped out of the assessment at this stage.

The presence of bat roosts in other buildings within the application site has not been discounted. All these buildings will be retained with no proposed changes to their current use or immediate context. Additional artificial lighting will be required along the new quay wall and at the replacement linkspan. Lighting across the harbour and along the western wooded boundary will remain unchanged.

The main temporary compound will be located in the northern part of the application site adjacent to coastal heath growing on a rocky slope. There will be no construction lighting in the secondary temporary compound on the south-western boundary of the application site and the context of trees with potential roost features (PRFs) on the edge of the broadleaved woodland will remain changed.

There is no potential for bats roosts in the Fishguard Bay Hotel building complex or connected flightlines to be impacted by the Proposed Development. Consequently, bat roosts are not considered further in this ES chapter.

9.10 Development Design, Mitigation and Enhancement Measures Adopted as Part of the Proposed Development

Stena Line propose to replace their existing temporary linkspan and jack up barge and provide a replacement pontoon to allow berthing of the ferry at Fishguard in the long term.

Civils works will be required to enable access and utilisation of the replacement pontoon for the ferry traffic, to include

- Dredging of the berth, navigation channel and beneath the location of the floating pontoon
- Construction of a new reclamation area to be retained using a rock armour revetment
- Construction of reinforced concrete bank seat structure using rotary installed steel tubular piles (filled with concrete) at the edge of the reclaimed land to support the floating pontoon
- Removal of the existing temporary jack-up barge
- Demolition of one of the existing ‘buffer dolphin’ tower structures
- Demolition of the disused (derelict) RNLI jetty
- 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 in the northern part of the application site. 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 application site.

Temporary lighting requirements are anticipated in the main temporary compound.

The landside developments will comprise adjustment to the traffic and pedestrian routes to service the new floating pontoon. Permanent terrestrial habitat loss will be restricted to the existing sections quay wall.

Land reclamation will comprise construction into the open water dock as detailed in Chapter 2 Project Description. New permanent lighting columns will be installed on the quayside.

It is anticipated that all elements of the construction phase will be completed over a 9-month period.

The proposed dredging would be at the berth, navigation channel and beneath the location of the floating pontoon in proximity to the quay wall on the western side of the harbour. Dredging is anticipated to be for 4hrs per day based on two daily cycles involving 2 hour periods of active dredging. Assuming 24 hr working due to tidal cycles over a 12 week period.

The new reclamation area would be constructed alongside the existing quay wall on the boundary of the harbour and would be retained using a new section of rock armour revetment.

On the quayside the construction of reinforced concrete bank seat structure will require piling using rotary installed steel tubular piles (filled with concrete) at the edge of the reclaimed land to support the floating pontoon. Temporary piles will be installed on the quayside to enable to the installation of permanent piles.

Demolition activities involve the removal of one of the existing 'buffer dolphin' tower structures, the suspended concrete deck, and the derelict former RNLI slipway and supports. Sections of the open walkway within the quay wall to be filled with concrete in discrete locations.

The northern temporary construction compound is located on an extensive area of unsealed ground with a crushed stone surface in the northern part of the application site currently used for overflow parking for trailers and machinery. A southern temporary construction compound area is allocated on the long stay car park in the south-western section of the application 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 is expected to be required in all the working areas and construction compounds.

The new pontoon will be equipped with electricity, with 10 LED streetlights long its length. The lighting specifications would be selected to designed to prevent glare to receptors and illumination of night sky. The landside developments will comprise adjustment to the traffic and pedestrian routes to service the new floating pontoon.

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 separately considered during this chapter of the ES. 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 demolition and construction activities will be centred.

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. These could arise during the following activities.

- demolition of linkspan tower, suspended deck structure and concrete supports in open water and disused RNLI slipway while below water concreate supports.
- Piling activities creating elevated underwater noise.
- Dredging activities on the western side of the open water harbour
- Land reclamation, construction of reinforced concrete bankseat to support the linkspan pontoon and installation of rock armour revetement

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 majority of these activities will be undertaken in the first six months of the construction period.

For land reclamation and many aspects of demolition the works would be from the landside using long reach machinery. Levels of noise below the water level across the majority harbour are expected to be limited.

Piling activity will be primarily on the quay edge where it is required for the construction of the reinforced concrete bankseat, with temporary piles to be installed from vibro/impact piling and the permanent pile installed by rotary boring. Elevated underwater noise levels are anticipated in open water in proximity to the quay.

Dredging will be undertaken in selected locations on the western side of the harbour. The dredging during construction will result in the localised disturbance of the sea bed affecting an area of 6500m2 and locally extending up to c200m from the quayside. The area of disturbance represents c6% of the extent of open water at high tide as defined by the northern and eastern breakwaters.

For all the construction activities the potential disturbance effects on otter behaviour would be short term and generally related to under water noise and disturbance.

The section of quayside within the application 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 assessment it is assumed that foraging otters avoid the using the majority of the harbour during the periods of when activities are generating elevated levels of underwater noise. The potential extent of displacement would be task specific and largely defined by zone of elevated noise. 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. Daytime construction activities would be expected to have a lower effect with otter less likely to be active hunting within the harbour. The local otter population will have an extensive territory with multiple foraging areas although it is recognised that the harbour has the potential to be a frequently used resource and of importance to the otter population.

In addition, individual otters could be present in or adjacent to the working areas when activities start. 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.

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.

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.

No aspect of the construction of the Proposed Scheme does not create any physical barriers to the movement of otters through the territory.

Therefore, 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.

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.

Bats

Buidling (B7) has negligible value for bats. The potential for bat roosts to be present in other buildings within the application site cannot be discounted. None of these buildings will be modified or changed under the Proposed Development and their current value for roosting bats and potential use would remain unchanged for the duration of the 12 month construction period.

No features likely to be frequently used by foraging bats will be lost. Based on the developed nature of the application site, the level of bat activity at the quayside is predicted to be predominantly low, but it is acknowledged that activity levels do not remain constant. Short periods of higher levels of bat activity within the application site are possible with activity levels reflecting periods of higher prey abundance.

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.

In the absence of controls, artificial lighting installed close to the habitats adjoining the western boundary could have a localised effect on the behaviour of light sensitive bat species in the immediate vicinity of the temporary compounds. Minor changes to the behaviour of light sensitive species are possible during construction outside the core daytime working hours.

The context 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.

There will be no additional artificial lighting beyond on the new pontoon on the quay edge.

The magnitude of potential construction related impacts are 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.

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 auditory 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 level noise 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.

In general terms, it is anticipated that over the 12-month construction period, the western part of the harbour would be frequently subject to moderate level disturbance with variation in noise level with intermittent periods of high-level disturbance events anticipated at least at the quayside.

The birds will also be habituated to existing operations in the harbour and quayside. Consequently, low level disturbance would not be expected to result in any changes in behaviour or the use of the harbour by wintering bird species.

During moderate disturbance noise generating construction activities behavioural change and temporary displacement would be expected in the western part of the harbour adjoining the quay.

During periods of high noise disturbance behavioural changes and temporary displacement of wintering birds are likely.

Most, if not all, bird species would be expected to disperse away from the quay during impact piling and other 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 which were observed in the harbour adjoining the quayside during the period when the ferry was docked. Visual disturbance would be minimal effect on gull activity. Minimal bird activity was observed around the rock armour revetment, and concrete supports of the RNLI slipway and suspended concrete decking, limited to an individual heron during the walkover assessment. The level of wintering bird activity in the areas located adjacent to construction activities are expected to be limited to a relatively small number of species.

An assemblage of wader species has been recorded utilising intertidal habitats in the BTO survey compartment. Wader species would be expected to be more susceptible to noise disturbance than gulls.

A few wader species were observed during the walkover survey (oystercatcher and curlew), flying towards and away from the coastline to the north of the application site.

The closest intertidal habitat to the application site is the southern foreshore of the harbour with exposed habitat located within 200m of the demolition / construction activities during the low tide period. The existing level of wader activity in this intertidal area will be 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. Wader species will generally be associated with intertidal sand/mud and may roost around the rock armour revetment in locations that are undisturbed by walkers.

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/demolition and 850m from the northern construction compound.

Construction activities should not result in an increase in human activity in locations where waders roost or loaf and given the distance, noise generating activities during construction are not expected to result in changes in its use by birds.

Intertidal habitat, that is less accessible to the public, lies to the south-east of the east breakwater providing alternative and potentially more optimal foraging habitat. Some noise related displacement of birds into habitats beyond the east breakwater is anticipated, especially at low tide.

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.

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.

The black guillemot often uses 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 or where smaller boats are moored at the northern end of the quay.

The rock armour is considered to be sub-optimal habitat for black guillemot with the cavities between the rocks would be accessible to predators.

New rock armour material will be placed in front of an existing c130m long section of rock armour revetment and will extend in front of the southern end of quay wall. No features with the potential to be used by a nesting pair should be lost.

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 utilise parts of the harbour further from the zones of construction and demolition.

In recent years black guillemot has been recorded in Fishguard Harbour between February and August. The nine-month construction period would overlap with only part of the period. The closest records of this species in winter are from North Wales.

The timing of the start of construction could also have an influence on behavioural change.

Initiation of construction and demolition over winter would create a changed context in the harbour when the birds return in late winter. Dispersal of the pair from the harbour due to the noise construction associated with construction is not predicted. The small quay, north-western corner of the harbour and northern breakwater provide sheltered conditions over 300m from the closest areas of construction and demolition. Although dredging will be closer to these locations the noise levels will be lower and are not predicted to affected black guillemot behaviour.

A construction start in summer would create noise disturbance during the middle of the period when birds would be in the harbour. The dispersal of unpaired/non breeding birds from the harbour to their wintering site earlier in the year is unlikely but possible.

The magnitude of the effect on black guillemot is predicted to be low, with no impact on the use of the sections of the harbour further from the noise generating activities. 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. The 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, 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.

Mitigation

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). Precautionary Working Methods to prevent accidental damage to habitats.

Environmental best practice will such as pollution prevention, dust minimisation, precautionary working methods to prevent the potential for injury and/mortality to protected and/notable species, sensitive management, and materials.

Specific measures will be employed where the working areas adjoin sensitive habitat

- Potential damage to nests in the quay wall (including feral pigeon) would also be set out in a CEMP.
- Pre-demolition checks for otter resting places in the harbourside working area
- 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
- 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
- Protection of adjoining priority habitats during the decommissioning of temporary construction compounds

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 mitigations would be applied including the use of Noise Reduced equipment and ensuring that plant is not left idling when not in active use. Additional assessment of soft start is demonstrated within Chapter 14 Underwater Acoustics.

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.

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 next 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.

9.11.4 Operational Phase Mitigation Measures

Operational Environmental Management Plan would be prepared covering general environmental protections and good working practices to help safeguard the harbour environment.

Additional mitigation measures

Consistent with the Environment (Wates) 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.

Given the nature and use of the harbour there is no potential for the creation of new areas of priority habitat or higher value habitat within the landholding. Consequently, net benefit would be delivered through targeted enhancements for species.

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 nest 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) would be installed within the landholding. The bat boxes would be installed on trees in locations that are not subject to artificial light spill, and which are located in proximity to the western boundary flight line. Bird boxes would be installed on buildings, targeting species that have been subject to historic population declines including swift, and house sparrow.

9.11.5 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.

9.12 Assessment of Residual Effects

This section sets out the predicted residual effects on IEF following the identification of secondary / additional mitigation.

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 (Chapter 14 Underwater Acoustics). 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.

Bats

With the implementation of sensitive construction lighting around the northern temporary construction compound and ensuring there is no temporary lighting on the boundary of the southern temporary construction compound potential adverse effects on the bat flightline 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. 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. There would be no degradation in the value of the application site for foraging bats. The residual effect on bat populations is classified as up to minor beneficial.

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.

Black guillemot

Black guillemot appear 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 and summer would remain as up to minor adverse.

The installation of nest boxes in selected locations on the walls of the harbour in locations set back from the working areas would not reduce the effects on construction on this species (primarily noise and visual disturbance to a lesser extent) but could provide a refuge if installed at the start of the construction period. A residual minor adverse effect would not be significant.

During operation the maintenance of functional nest boxes has the potential to re-establish nesting within the harbour and has the potential to become a small breeding population within the application site. The residual effect should be minor beneficial and would have the potential to be moderate beneficial.

9.13 Cumulative Effects

The projects considered in the cumulative assessment extent up to 100km from Fishguard Harbour with 10 projects considered, 7 of which were offshore developments, and one 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.

9.13.1 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.

Otter populations will be present in coastal habitats around St Brides or 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.

9.14 Limitations of the Assessment

The application is primarily built development and bare ground with vegetation limited to small patches of native scrub and very localised areas of sparse ruderal vegetation. A small part of the coastal grassland overlaps the northern boundary. The recorded dense sward of red fescue with scattered populations of coastal herb species is considered to sufficiently reflect the habitat type and allow assessment of value (site value) and scoped out of the ES chapter.

Most of the buildings in the application site are not located near proposed construction activities with no potential for features to be loss of negatively impacted by the development. The preliminary assessment of building structure and the precautionary assessment of overall bat roost potential is considered to be appropriate for buildings that will remain unaffected. The building subject to demolition was inspected in greater detail and its potential value for roosting bats was defined with certainty.

It is concluded that there were no significant limitations that would have affected the robustness of the assessment for EIA purposes.

9.15 Summary of Effects and Conclusion

Table 9.12 Summary of Effects provides a summary of the effects based on the Proposed Development detailed in Chapter 2 of the ES and conclusions of significance.

This table provides a summary of the effects for each import ant 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 comprising 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 part of the harbour bounded by breakwaters to the north and east. A near vertical vegetation rock face, broadleaved woodland and coastal heathland adjoin the application site to the west. The majority of the section of quayside within the application site is a near vertical engineered block and concrete wall. 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, bat populations (multiple species) and black guillemot.

Ecological features that have been scoped out with no potential for impacts to arise from development include 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 application site and immediate surroundings.

Otter

Following a precautionary approach the residual effect 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.

Bats

There would be a negligible residual effect on bat populations (roosting and foraging) during construction and operation. None of the other existing buildings within the harbour will be modified or changed under the Proposed Development. The potential to be used by roosting bats would remain unchanged during construction and once operational. 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 the units beyond those being installed on the quayside.

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 for periods of the works.

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 and even a moderate beneficial is possible.

Table 9.12 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
Effects on otter population – resting, foraging, breeding	C	Soft Start piling Use of noise reduced equipment	Low	Low	Minor adverse	None	Minor adverse	None
	O	None	Negligible	Low	None	None	None	None
Effects on wintering and passage bird assemblage	C	Soft Start piling Use of noise reduced 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 (Negligible)	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	Negligible	Low	Negligible	Avoidance high level noise adjacent to buildings with PRFs Controls on temporary construction lighting	Negligible	None
	O	No increase in landside artificial lighting	Negligible	Low	None	Bat box provision	Minor beneficial	None

9.16 References

British Standard (2013) BS 42020:2023 Biodiversity: Code of Practice for Planning and Development.

Chanin P (2003). Ecology of the European Otter. Conserving Natura 2000. Rivers Ecology Series No. 10. English Nature

Collins, J (ed) (2023) Bat Surveys for Professional Ecologists: Good Practice Guidelines (4th Edition), The Bat Conservation Trust, London

Cutts, N., Phelps, A., Spencer, J., & Hemmingway, K. (2013). Waterbird disturbance mitigation toolkit. Tide toolbox, Interreg IVB North Sea Region Programme.

CIEEM (2017) Guidelines for Preliminary Ecological Appraisal, 2nd edition. Chartered Institute of Ecology and Environmental Management, Winchester

CIEEM (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine version 1.2. Chartered Institute of Ecology and Environmental Management, Winchester

CIEEM. (2019). Advice Note on the Lifespan of Ecological Reports and Surveys. CIEEM. (2020). Guidelines for Accessing, Using and Sharing Biodiversity Data in the UK. 2nd Edition. Chartered Institute of Ecology and Environmental Management. Winchester, UK

Greenwood (2010) Black guillemots at Bangor Co. Down: a 25 year study. British Wildlife 21 (3): 153-158

Greenwood J (2015) Breeding Sites and Breeding Success in 2014 of Black Guillemots at Bangor Marina, Co. Down. Northern Ireland Seabird Report 2014: 42 – 45 British Trust for Ornithology

Institute of Lighting Professionals. (2021). Guidance Note 01/21. The Reduction of Obtrusive Light.

JNCC. (2016). Handbook for Phase 1 Habitat Survey – a technique for environmental audit. Peterborough.

Johnstone, I.G., Hughes, J., Balmer, D.E., Brenchley, A., Facey, R.J., Lindley, P.J., Noble, D.G. and Taylor, R.C. Online First. Birds of Conservation Concern Wales 4: the population status of birds in Wales. Milvus: The Journal of the Welsh Ornithological Society

Leonard et al, (2015) Nest Boxes for Guillemots; Northern Ireland Seabird Report 2014: 40–41 British Trust for Ornithology

Kean E. F. and Chadwick E. A. (2021). Otter Survey of Wales 2015-2018. NRW Report No: 519, NRW

RPS (2018) Environmental Statement Replacement Linkspan Fishguard Port Chapter 8 Terrestrial Biodiversity

Reason, P.F. and Wray, S. (2023). UK Bat Mitigation Guidelines: a guide to impact assessment, mitigation and compensation for developments affecting bats. Version 1.1. Chartered Institute of Ecology and Environmental Management, Ampfield.

Welsh Government (2009) Technical Advice Note 5: Nature Conservation and Planning. Available at: http://wales.gov.uk/topics/planning/policy/tans/tan5/?lang=en

Welsh Government (2024) Planning Policy Wales Edition 12. Available at: gov.wales/sites/default/files/publications/2024-07/planning-policy-wales-edition-12.pdf

Welsh Ornithological Society (2024) Welsh Bird Report 2023 Milvus The Journal of the Welsh Ornithological Society Volume 3 Issue 3:

FISHGUARD LINKSPAN REPLACEMENT

Environmental Statement
Volume I Main Text

Chapter 10 Coastal Processes

794-NI-POR-00886R
May 2025

rpsgroup.com

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. This chapter considers the potential impacts to Coastal Processes arising 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;
- 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 10.7).
- 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 10.12.
- Highlights any necessary monitoring (section 10.10.3) and/or measures (see section 10.10.1) 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 0.

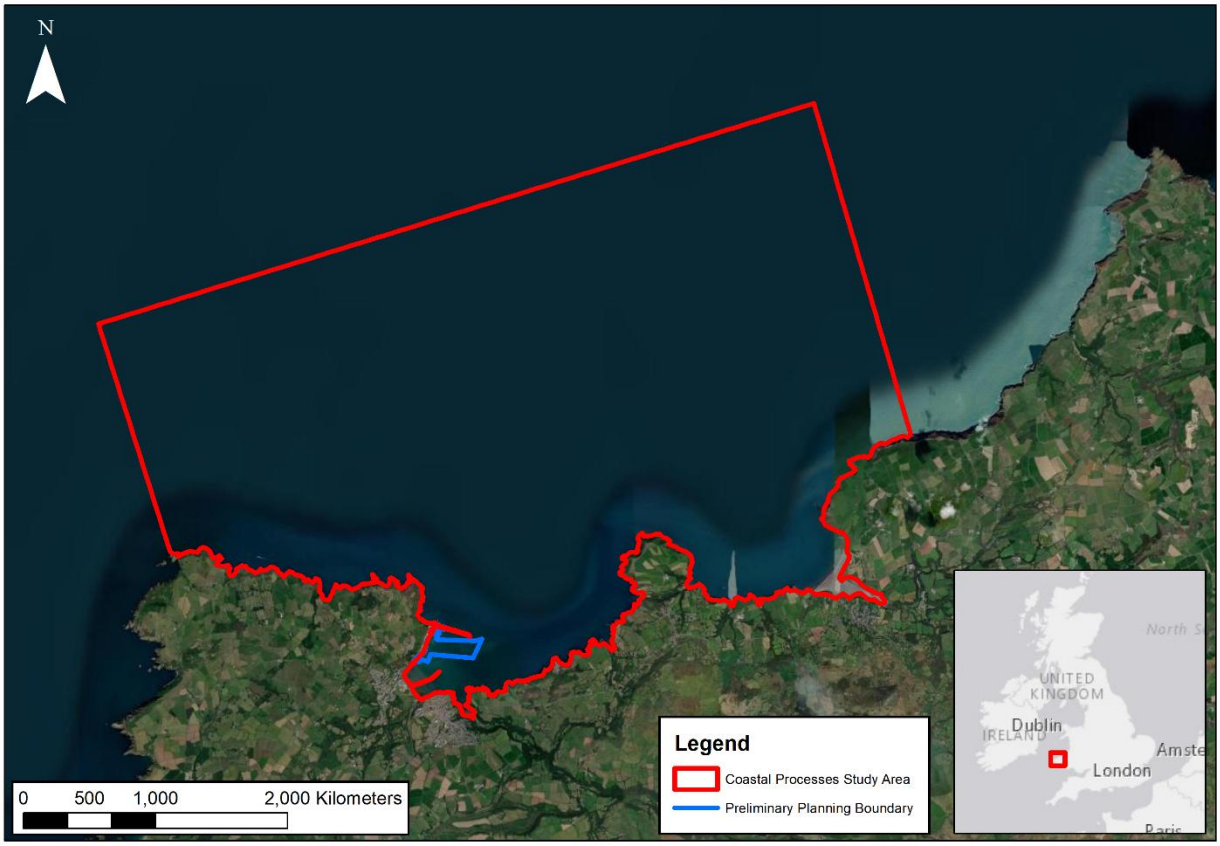

Figure 10-1: Coastal Processes Study Area

10.3.1 EU Legislation and Policy

10.3.1.1 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).

10.3.2 National Legislation and Policy

10.3.2.1 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 Marine Works (Environmental Impact Assessment) Regulations 2007 (as amended) set out the requirements for EIA.

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 10.6.

10.3.2.2 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.

10.3.2.3 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.

10.3.2.4 UK Marine Policy Statement

The UK-wide Marine Policy Statement (MPS) was published in March 2011, under the Marine and Coastal Access Act 2009, 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 developments 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.

10.3.2.5 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					

10.4 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, six responses were received from 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 10.6 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 10.3.2.5 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 for sediment transport estimates, will require the seabed sediment characteristics (size, distribution, type etc) representative of the study area	Correspondence with NRW highlighted that ADCP deployement 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 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 10.9.2 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 10.7. 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 dredging operations and related modelling scenarios are presented in Section 10.9.2. The worst case scenario for sediment remining suspended is described in Section 10.9.2.3, concluding 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.	
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.	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.
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 in front of the rock armour revetment is considered within the Assessment of Operational Effects shown in Section 10.9.3.1.
NRW advises that consideration needs to be given to the potential for increased erosion at the end of the revetment and the potential for seabed lowering in front of the revetment caused by partial wave reflection.	The potential for lowering of the seabed in front of the rock armour revetment as a result of partial wave reflection, will be mitigated by the inclusion of rock filled gabion mattresses. This scour protection will extend below the revetment, stabilising the bed and dissipating wave energy as discussed in Section 10.9.3.2.

10.5 Methodology to Inform the Baseline

10.5.1 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 (BGS, 2025)	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
Hydrography of the Irish Sea, SEA6 Technical Report	UK Government	2005

10.5.2 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 10-2, the Coastal Processes Study Area is situated in the direct vicinity of two designated marine areas, defined in **Table 10-4: Relevant designated marine area within or near the Coastal Processes Study Area.** 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)

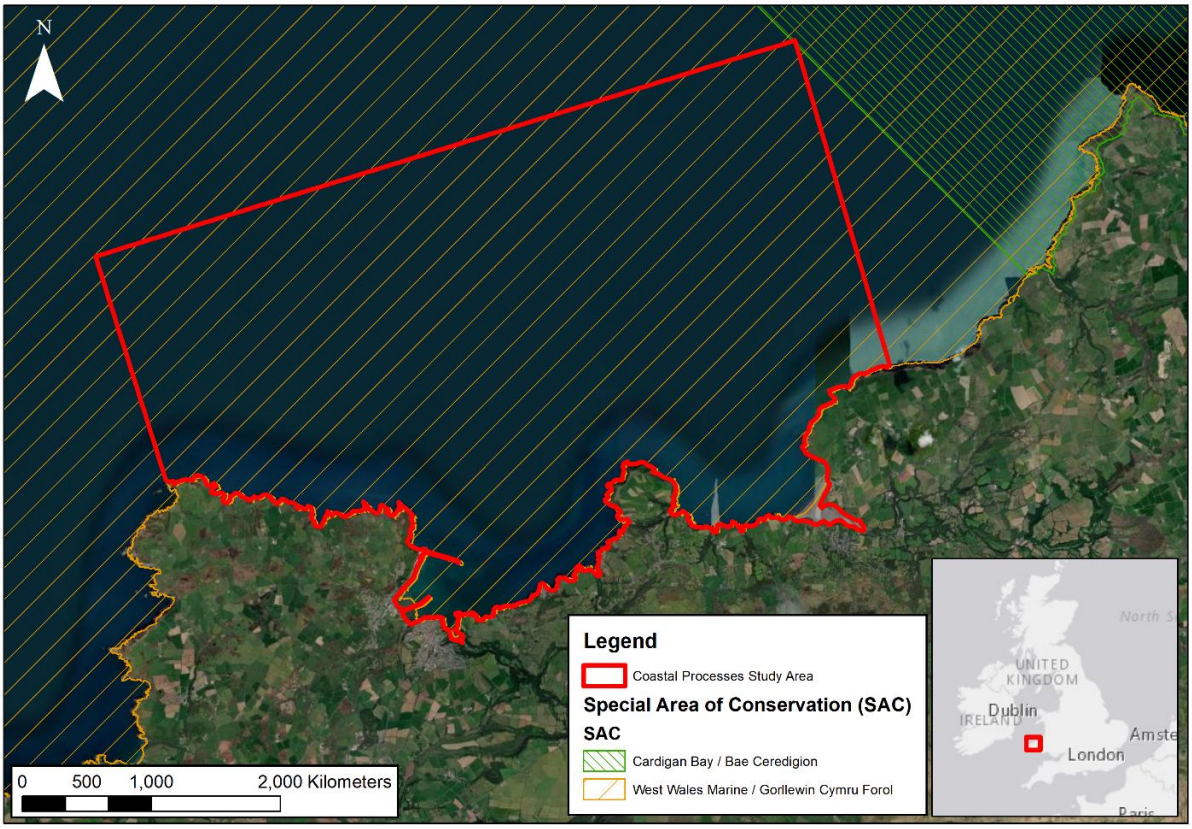

Figure 10-2: Relevant designated marine areas within or near the Coastal Processes Study Area

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

10.5.3 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 data

Title	Extent ofOverview of survey 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	(FUGRO, 2015)

10.5.4 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.

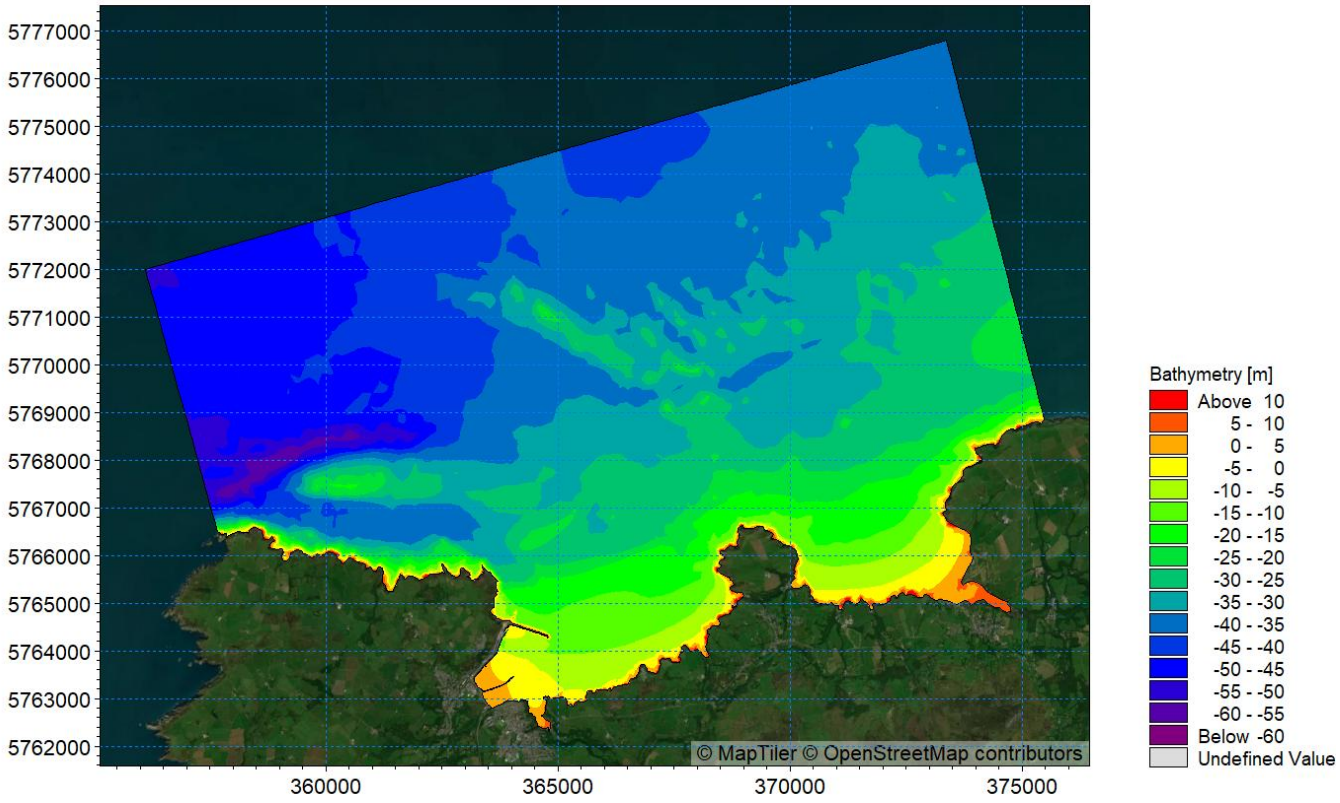

Figure 10-3: Coastal Processes model domain

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.

10.6 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

10.6.1 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.

Table 10-7: Definition of terms relating to the magnitude of an impact.

Magnitude of impact	Definition
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 Table 10-8.

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.

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

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.

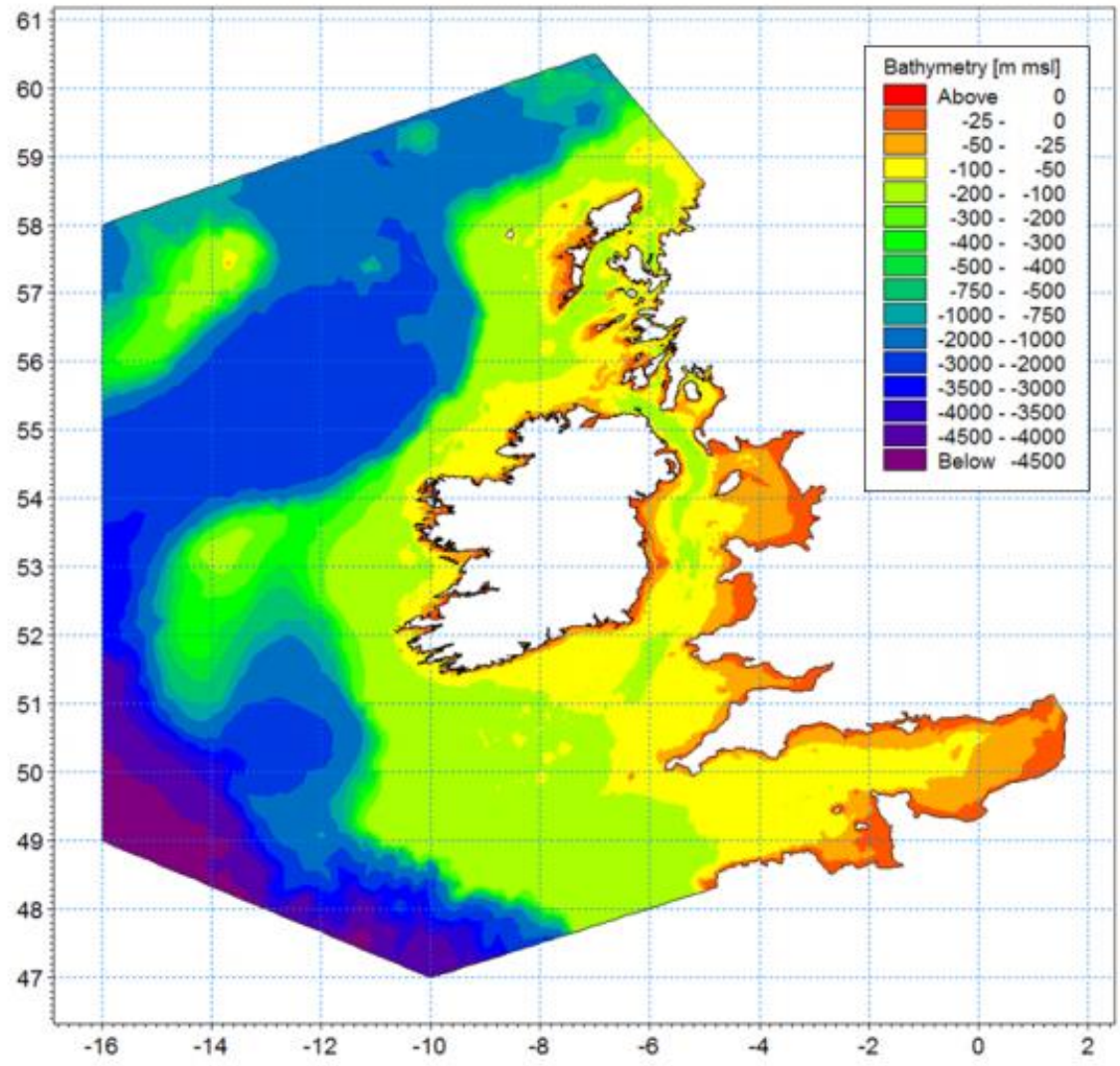

Figure 10-4: Extent and bathymetry of Irish Seas tidal and storm surge model

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.

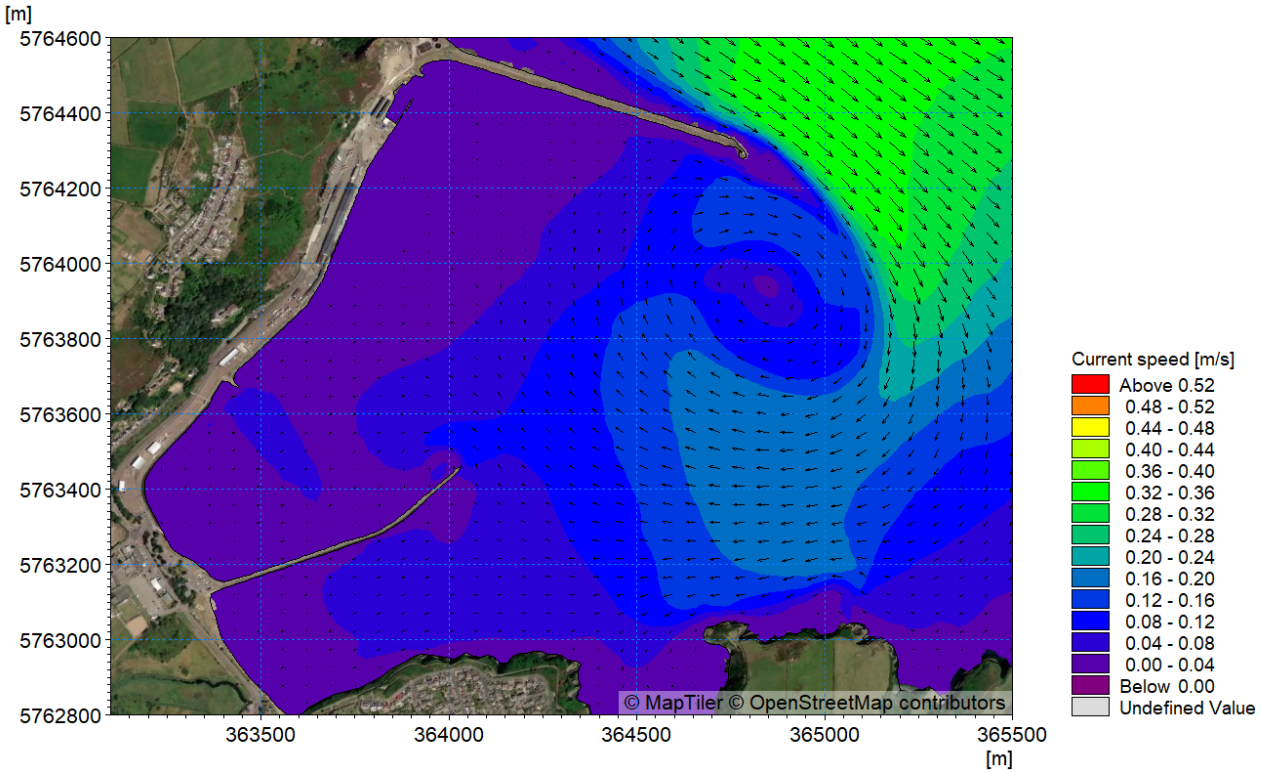

Figure 10-5: Tidal flow patterns – spring tide flood.

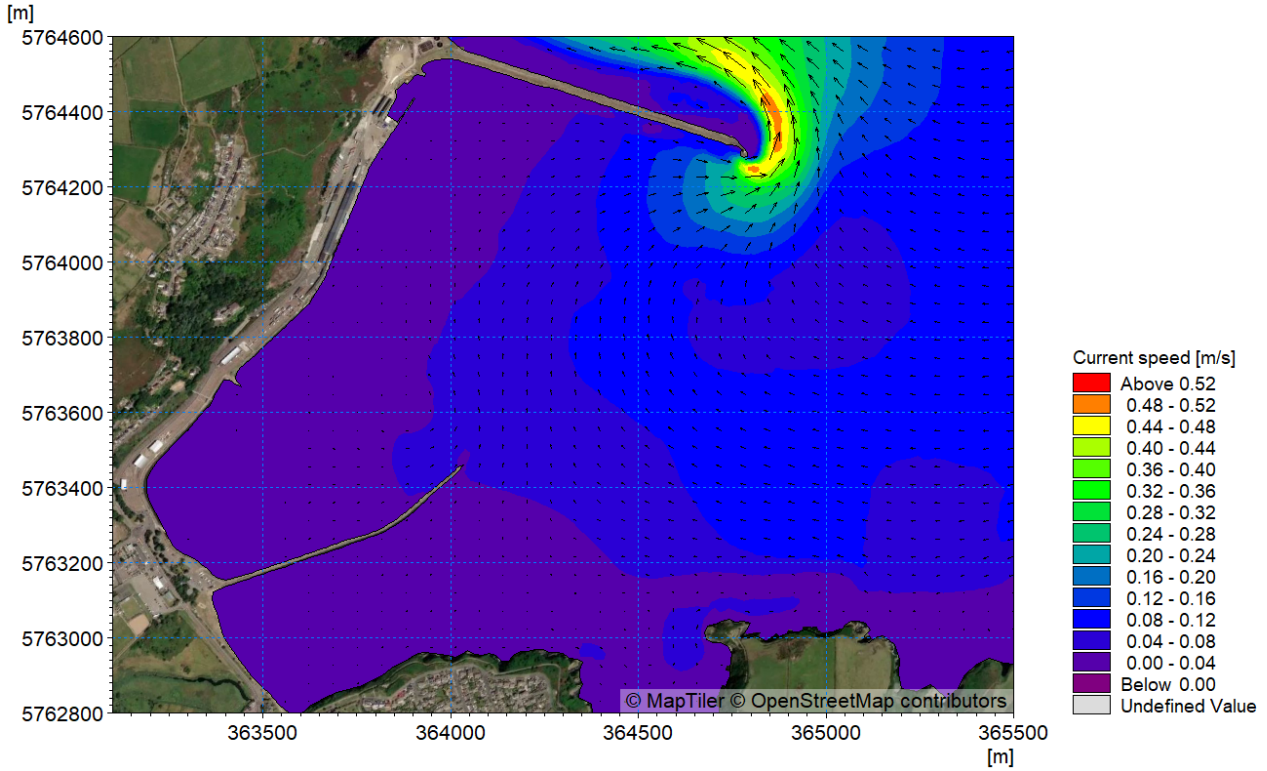

Figure 10-6: Tidal flow patterns – spring high water.

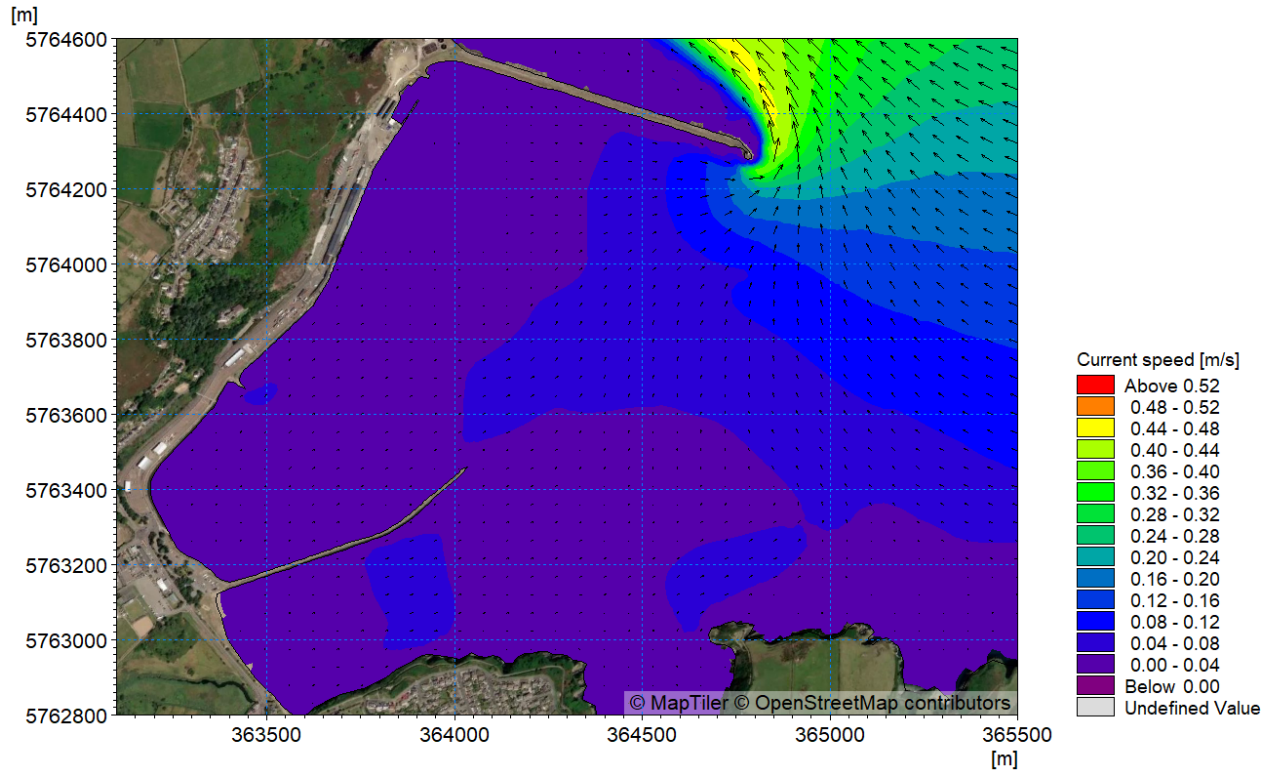

Figure 10-7: Tidal flow patterns – spring tide ebb.

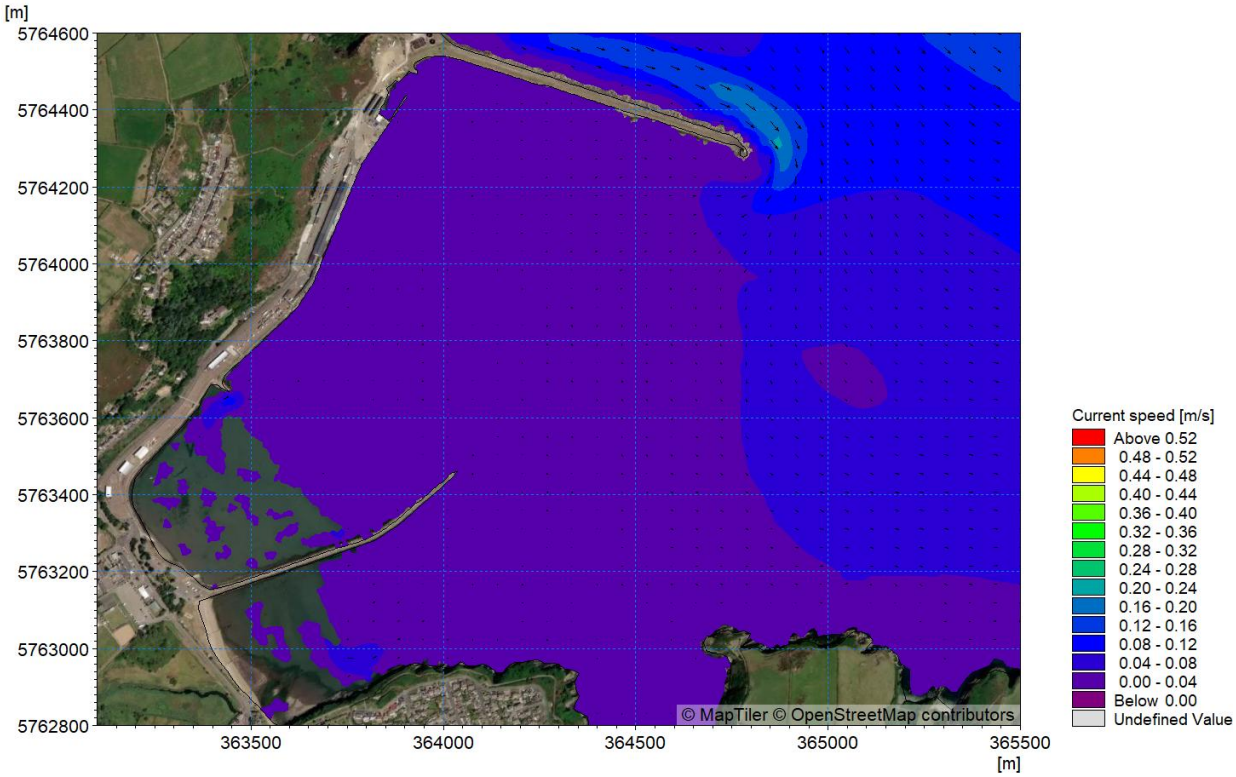

Figure 10-8: Tidal flow patterns – spring tide low water.

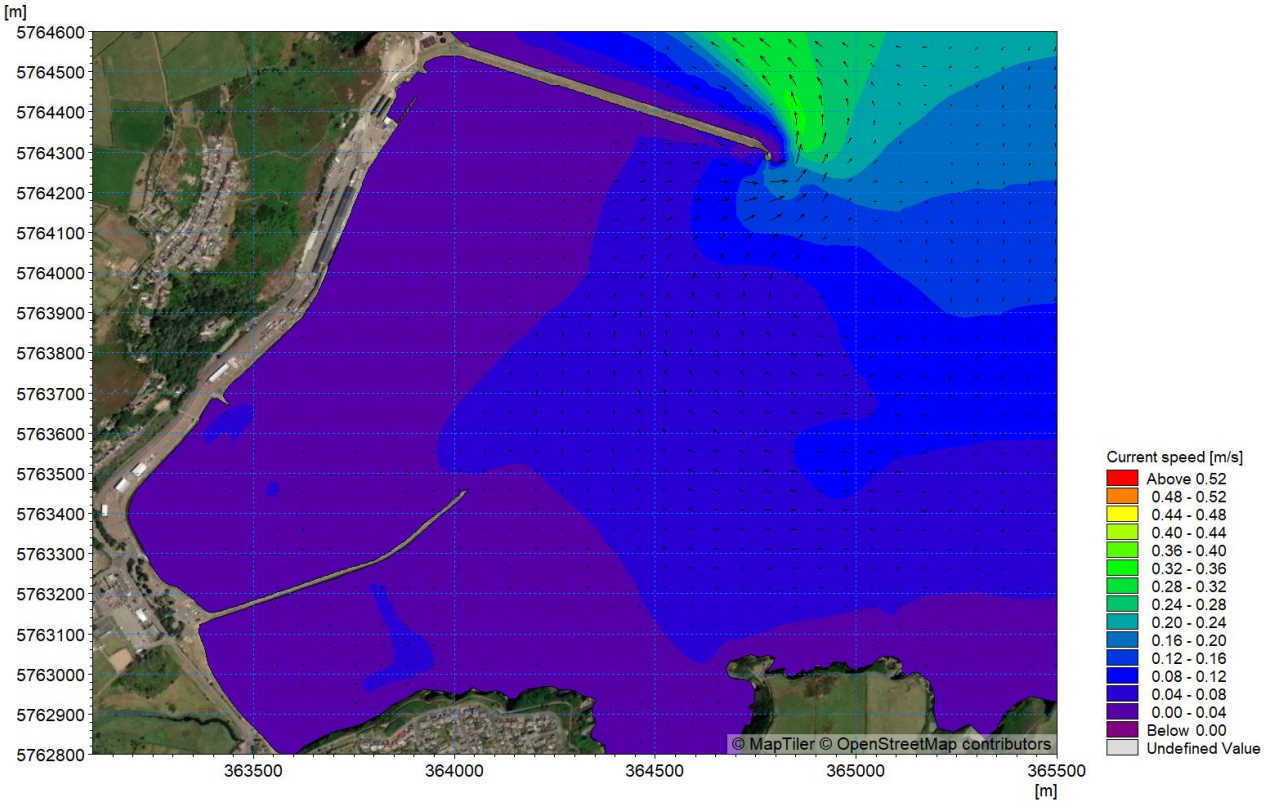

Figure 10-9: Tidal flow patterns – spring tide residual.

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 port structures and adjoining coastline can also be seen in the diagram.

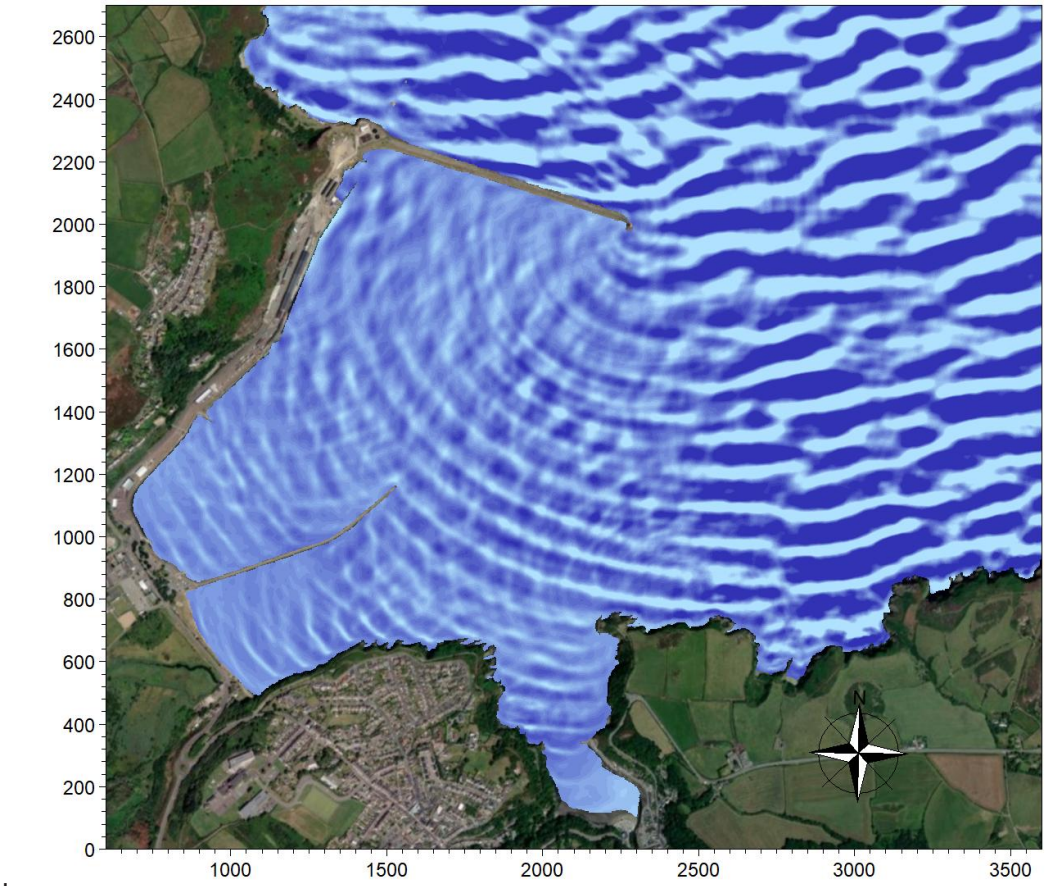

Figure 10-10: Wave disturbance patterns – 1 in 100 year return period storm from 345º.

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 0.9 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 120º 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.

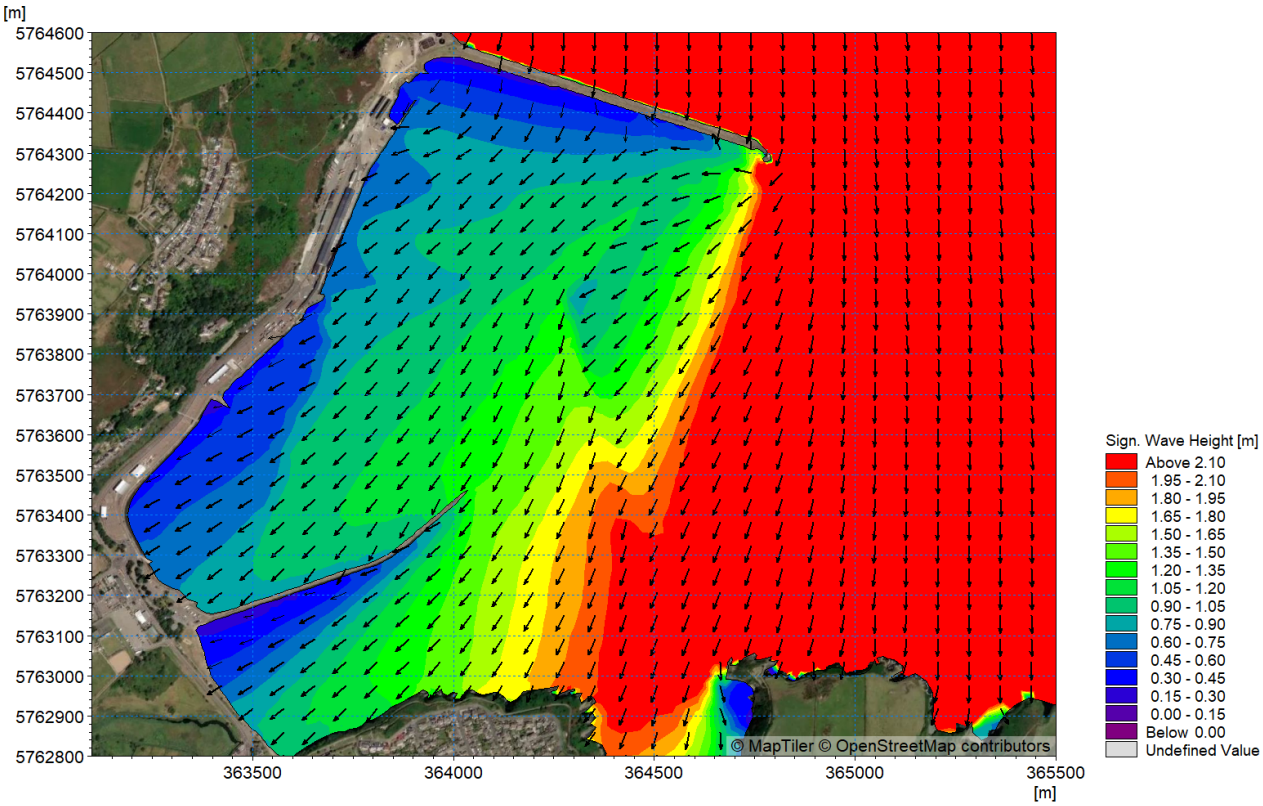

Figure 10-11: Significant wave heights and mean wave direction 1 in 100 year return period storm from 345º N

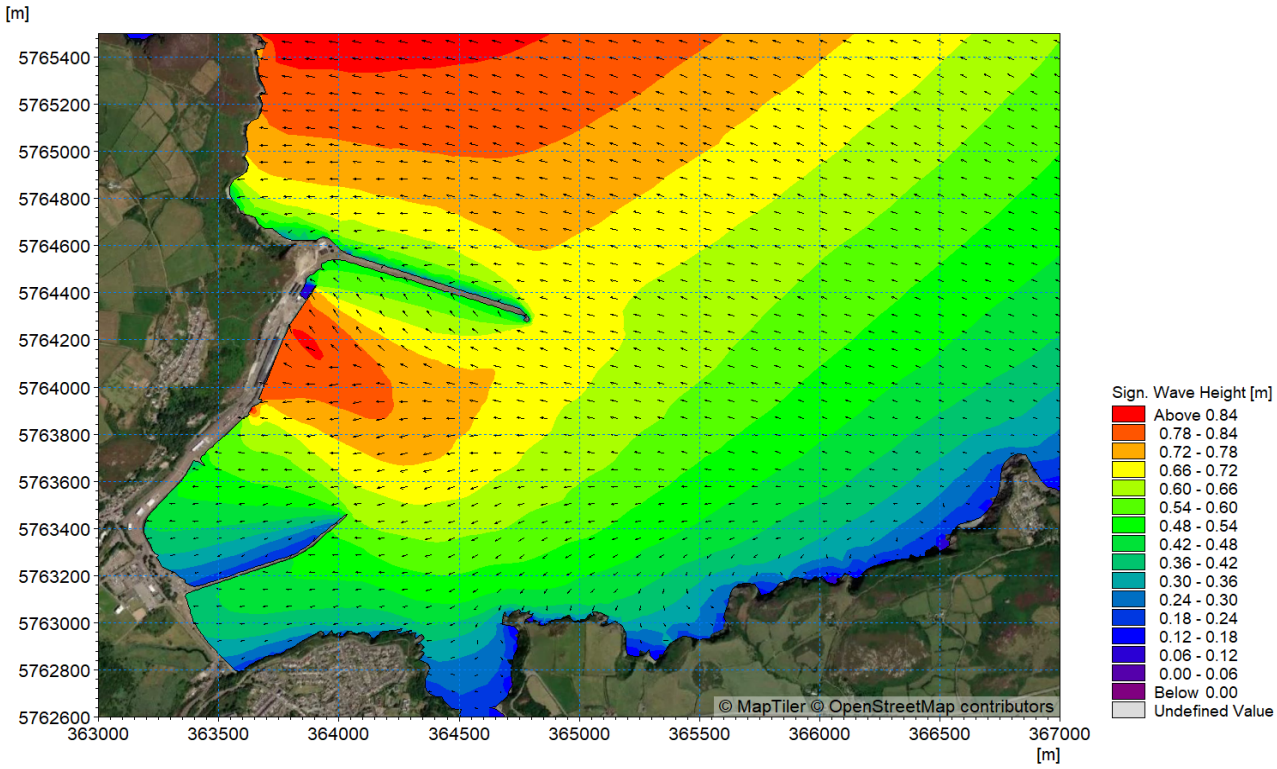

Figure 10-12: Significant wave heights and mean wave direction 1 in 100 year return period storm from 120º N

10.8.3 Sediment Transport

As presented in 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.

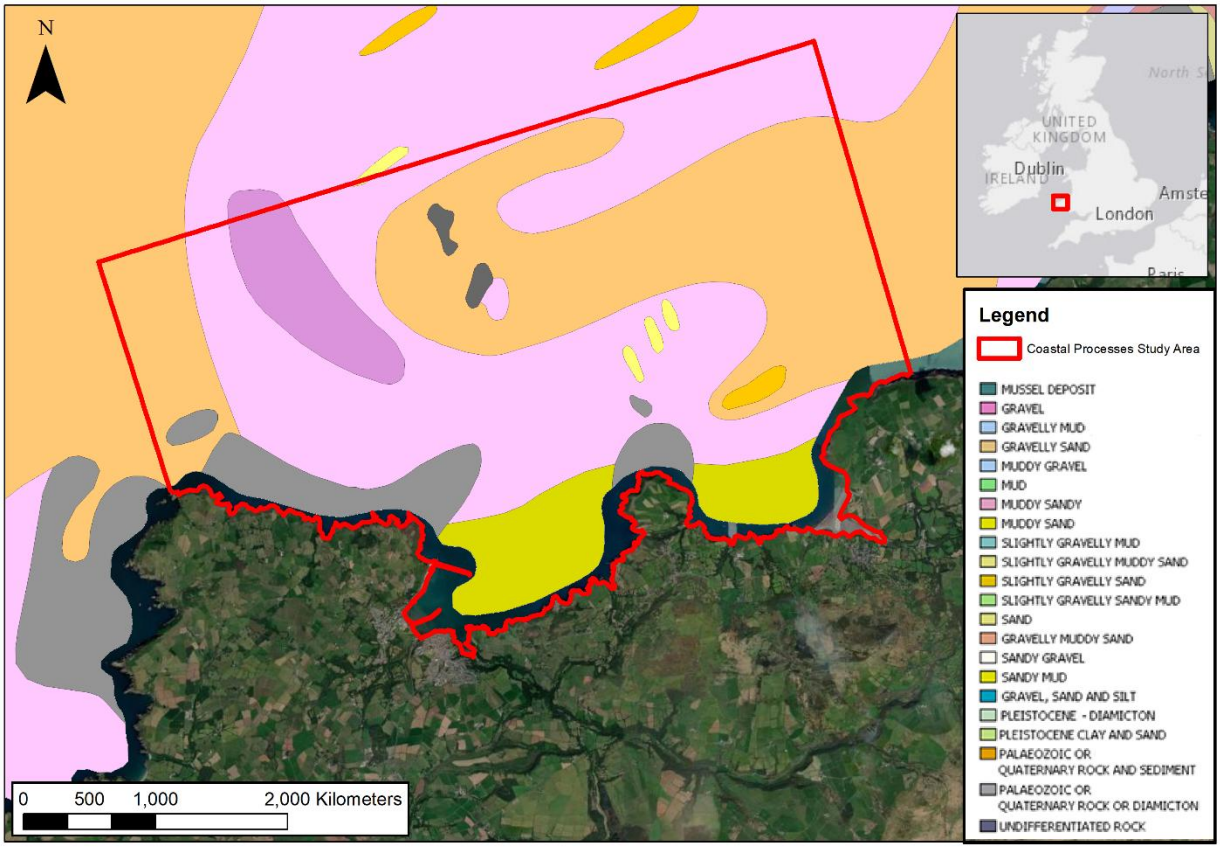

Figure 10-13: Marine sediments along the Offshore Cable Corridor (Contains British Geological Survey materials @UKRI 2024)

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 preliminary planning boundary indicated in the vicinity of offshore works, local sediments will be comprised predominantly of sand mixed with fine silts and clays, or silty/clayey sands.

The detailed vibrocore information included within the ground investigation report prepared as part of the InSitu survey, was used to describe parameters of mobilised sediment due to construction activities, as further discussed in 10.9.2.

Furthermore historic site-specific sediment survey in the form of a 2015 ground investigation survey undertaken by FUGRO (FUGRO, 2015), which utilised borehole and grab sampling with subsequent lab analysis, was considered within the assessment, with findings largely agreeing with the more recent InSitu survey.

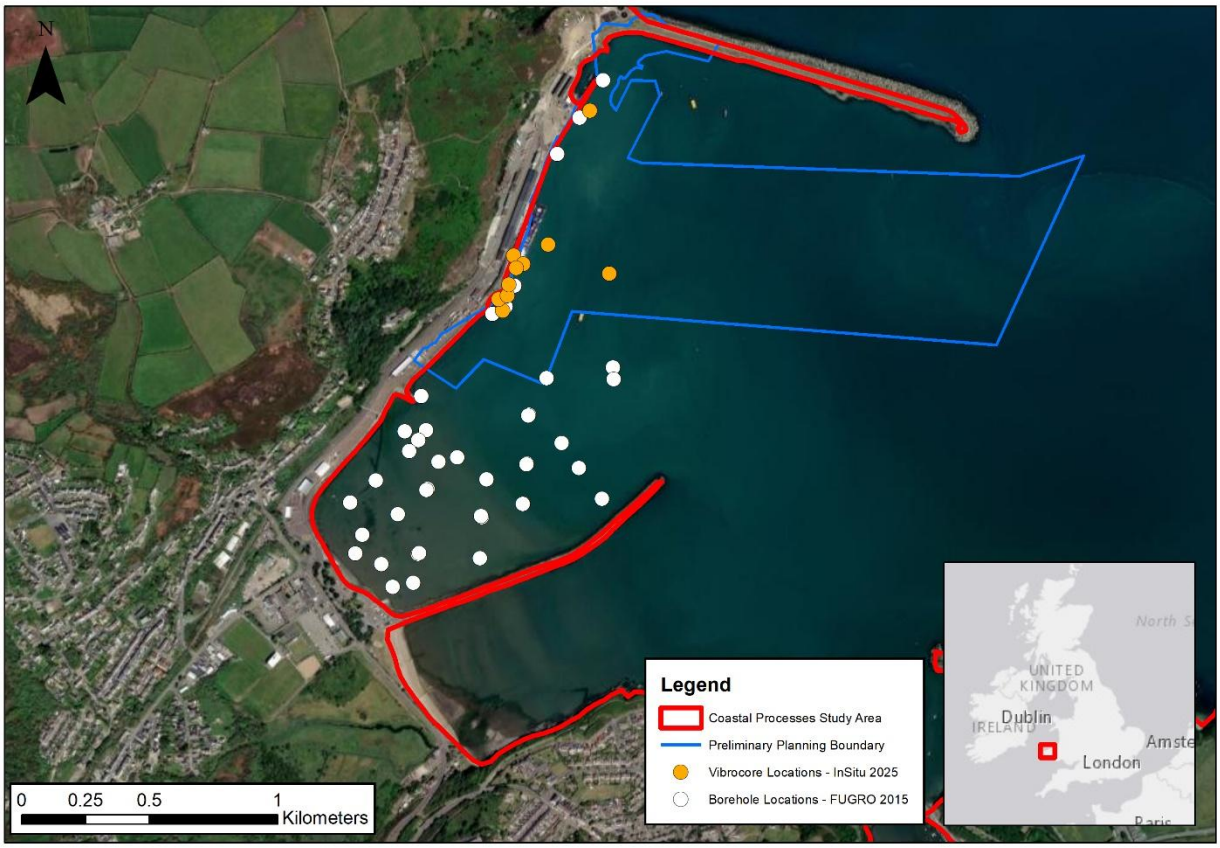

Figure 10-14: Vibrocore and borehole locations analysed within the InSitu and FUGRO site investigation surveys, respectively.

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 the various capital dredging operations.

A total volume of *c.* 78,000 m^3 is anticipated to be excavated across areas A, B, C, E and H using either a Trailer Suction Hopper Dredger (TSHD) or Backhoe Dredger as summarised in Table 10-10 below. As described in Chapter 2, it is envisaged that dredged material will be transported and disposed of at the licensed Milford Haven I. This has not been modelled given that it was the view of NRW that this *"…would be disproportionate to the scale of the disposal at LU169*". It should be noted that the developer will engage with Milford Haven Port Authority (MHPA) who currently hold a licence for disposal at LU169 to ensure disposal occurs in line with existing conditions and that disposal operations do not overlap.

As summarised in Table 10-10 it is anticipated that all dredging operations will be undertaken within a period of 12 weeks.

Table 10-10: Summary of dredge volumes by area

Area	Volume m3 (rounded from drawing)	Rounded totals to include the contingency up to 78,000 m3	Method	Dredge operation duration (days)
A	7,000	10,200	Backhoe	5.5 days
B	6,200	9,200	Backhoe	4.6 days
C				
E	19,500	40,000	TSHD	7 days
H	5,700	11,200	TSHD	2 days
Reclamation Area	5,000	7,400	TSHD	2.8 days
Total	43,400	78,000		12 week dredging window

Based on information supplied by the dredging contractor, it is envisaged that the TSHD would remove *c.* 3,000 m^3 per two-hour period whilst the backhoe would have a lower production rate of 2,000 m^3 per 12-hour period. In each instance, the sail time from Fishguard to the licensed offshore disposal site is *c.* 5 hrs (i.e., *c.* 10 hrs for a return trip). These parameters were used to characterise each dredging technique within the numerical modelling, as summarised in Table 10-11.

Table 10-11: Dredging techniques to be utilised within the construction phase

	TSHD	Backhoe	Unit
Dredge rate	1,500	166.6	m3/hr
1 Cycle to "full hopper"			
Active Dredge period	2	12	hrs
Sail	10	10	hrs
Dredge volume per cycle	3,000.0	1,999.2	m3
Dredge volume per day	6,000.0	2,180.9	m3
Spill rate	5%	5%	

To characterise the sediment plumes generated as a result of the dredging activities, a coupled hydrodynamic and mud transport model was used to simulate each dredging operation over a range of spring tides in order to analyse the greatest possible dispersion. The composition of the seabed and thus the material lost to the water column as a result of dredging overspill was defined for each area based on site investigation data reported by InSitu.

10.9.2.1 Area A

The seabed characteristics for Area A as established through site-specific survey, are summarised in Table 10-12, modelled dredging parameters are described in Table 10-13. The dredge path along which the sediment material was introduced as a source term is illustrated in Figure 10-15.

Table 10-12: Summarised seabed charecteristics – Area A

Top of Stratum (mCD)	Thickness (m)	Description
-4.91	0.68	(Very soft) Dark brownish grey slightly clayey sandy **SILT**
-5.59	1.88	(Very soft to soft) Dark greyish brown slightly sandy silty **Clay**
-7.47	0.34	(Very soft) Dark grey slightly sandy slightly gravelly silty **CLAY**
-7.81	0.43	(Soft) Dark brownish grey slightly gravelly sandy silty **CLAY**
-8.24	0.23	Dark grey silty gravelly fine to coarse **SAND**
-8.47	0.69	Greyish brown slightly silty slightly gravelly fine to medium **SAND**
-9.16	0.24	Dark brownish grey silty fine to medium **SAND**

Table 10-13: Dredge simulation input parameters – Area A

Parameter	Value
Dredging Technique	Backhoe
Target Dredge Volume	10,200 m^3
Dredge Rate	166.6 m^3/hr
Fines Content	73%
Overspill	5%
Active Dredging	12 hrs per cycle
Sail Time (Return Trip)	10 hours per cycle
Total Cycle Time	22 hours
Cycles	6
Length of Operation	c. 5.5 days

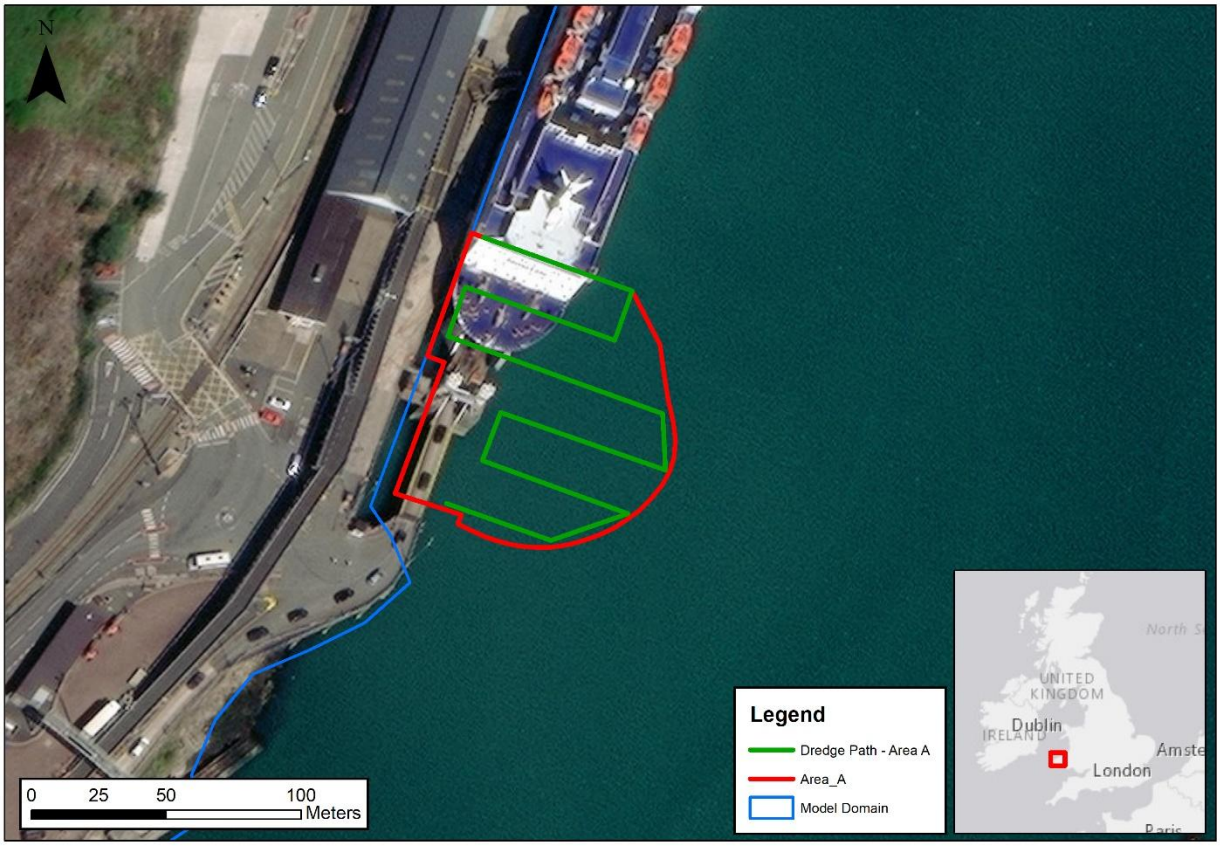

Figure 10-15: Dredge Path – Area A

The dispersion of fine material during the dredging of Area A is illustrated by a series of plume envelope diagrams in Figure 10-16 - Figure 10-19 that show total suspended sediment concentrations (SSCs) within the water column during typical spring mid-flood, high water, mid-ebb and low water conditions respectively.

As demonstrated by these figures, SSCs can reach up to *c.* 2,165 mg/L within the immediate vicinity of the dredging source term during all phases of the tide. However, beyond the immediate vicinity of the dredging source term, SSCs quickly drop to below *c.* 200 mg/L.

As can be seen from all stages of the spring tidal cycle, 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 high tide wherein the sediment plume can extend *c*. 300 m to the southwest before being fully dispersed to below background levels. As demonstrated by Figure 10-16 - Figure 10-19, the SSC of these plumes is typically less than 200 mg/L.

As can be seen from Figure 10-19, the resultant SSC plume is highly localised during low water conditions due to the minimal current speeds and dispersion.

Overall sediment dispersion during the dredging operations for Area A is highly localised and generally confined to within a small area of Fishguard Harbour, with average SSCs limited to *c*. 280 mg/l within the immediate vicinity of works and quickly reducing to below background concentrations of 5 mg/L within *c*. 300 m.

Sediment deposition as a result of the backhoe dredge operations within Area A, is presented in Figure 10-21. As can be seen, the resultant deposition within the footprint of the dredge operations does not exceed 24 cm. In reality, 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. Within the vicinity of the dredging operation, the total deposition of sediment is typically less than 4 cm, with deposition beyond 100 m reducing to < 0.5 cm.

In summary, the modelling of the dredging operations at Area A found that:

- Sediment dispersion during the dredging operations for Area A is highly localised and generally confined to within a small area of Fishguard Harbour.
- The highest suspended sediment concentrations of *c*. 2,165 mg/L occurred directly at the active dredging source term and quickly reduced to 200 mg/L within 50 metres.
- Average SSCs did not generally exceed *c.* 280 mg/l within the immediate vicinity of works and quickly reduced to below background concentrations of 5 mg/L within *c*. 300 m.
- The resultant deposition within the footprint of the dredge operations did not exceed 24 cm. Within the vicinity of the dredging operation, the total deposition of sediment is typically less than 4 cm, with deposition beyond 100m reducing to < 0.5 cm.

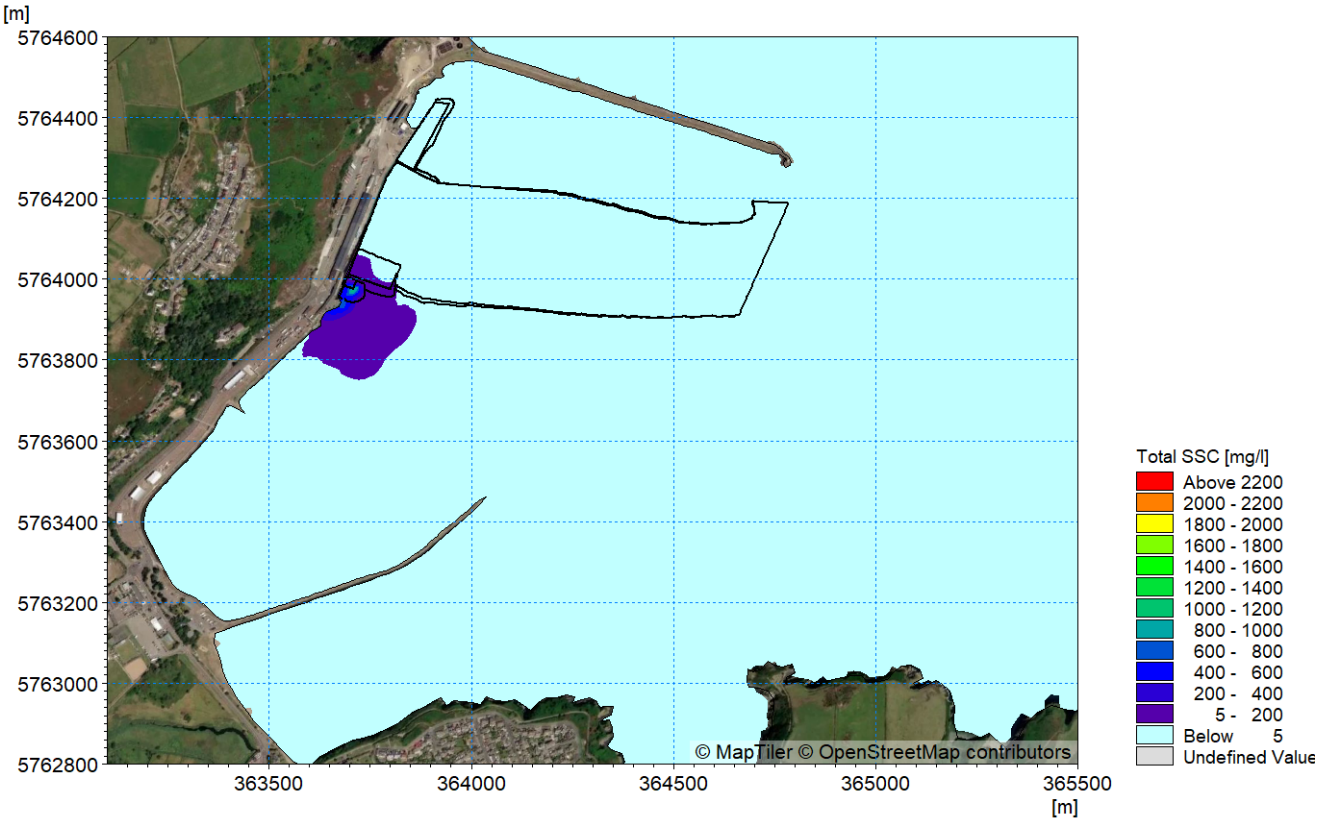

Figure 10-16: Suspended sediment concentration plume during typical mid-flood conditions.

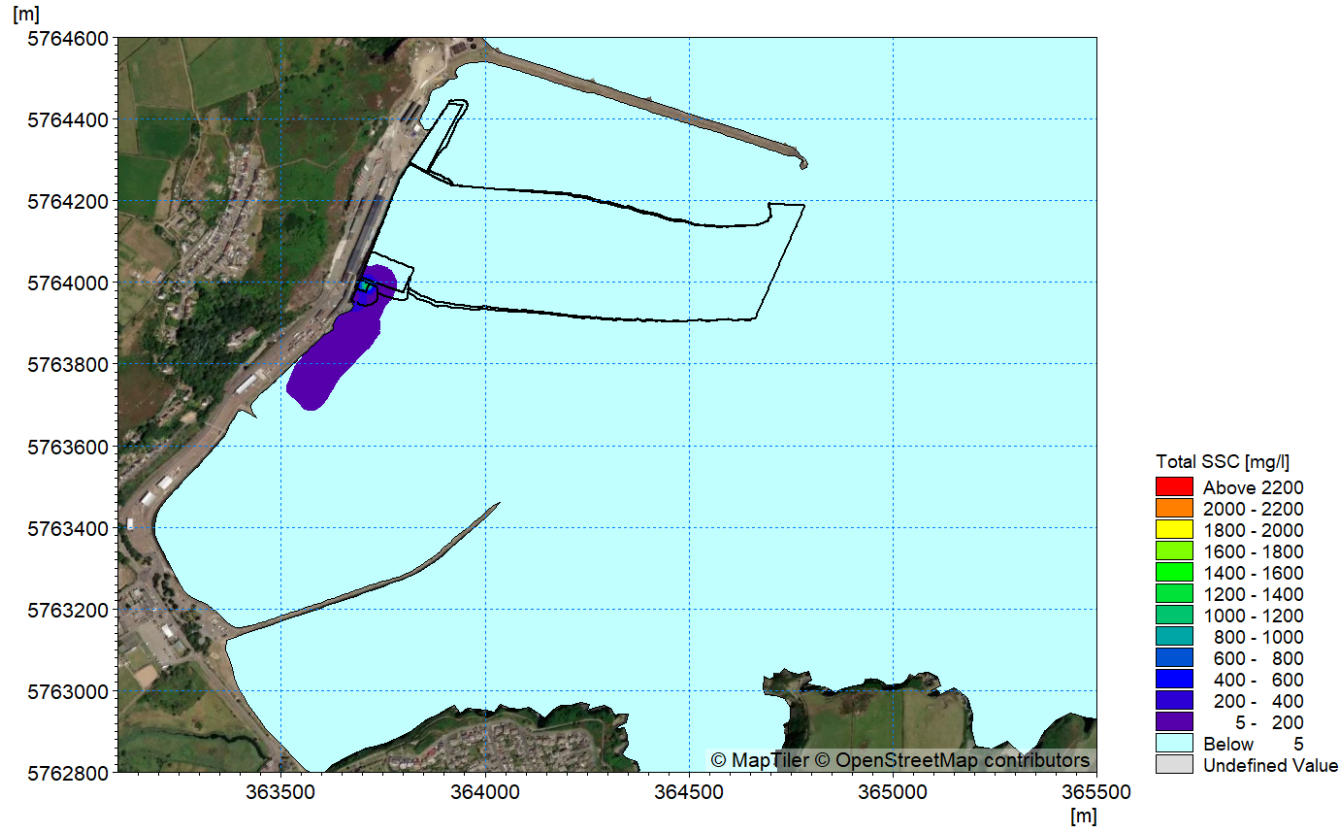

Figure 10-17: Suspended sediment concentration plume during typical high tide conditions.

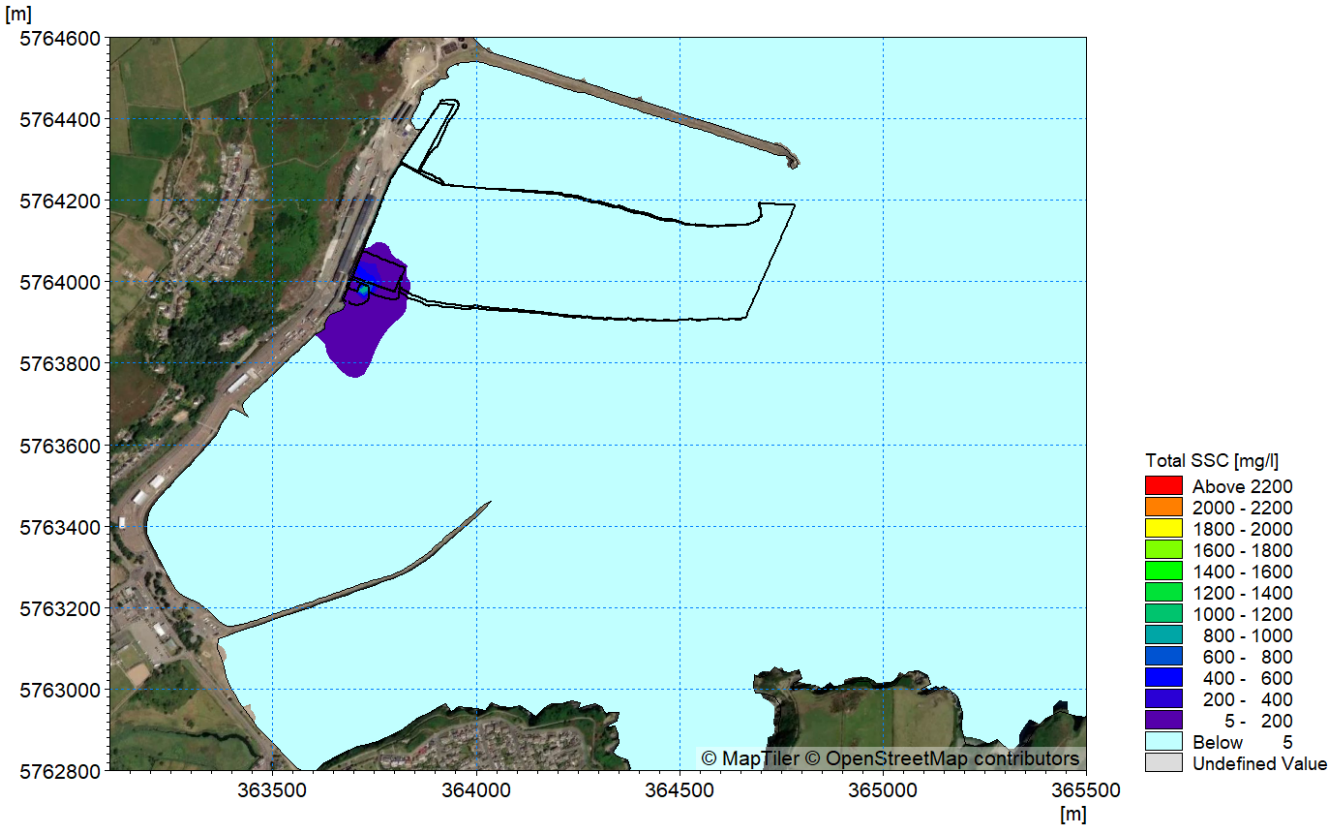

Figure 10-18: Suspended sediment concentration plume during typical mid-ebb conditions.

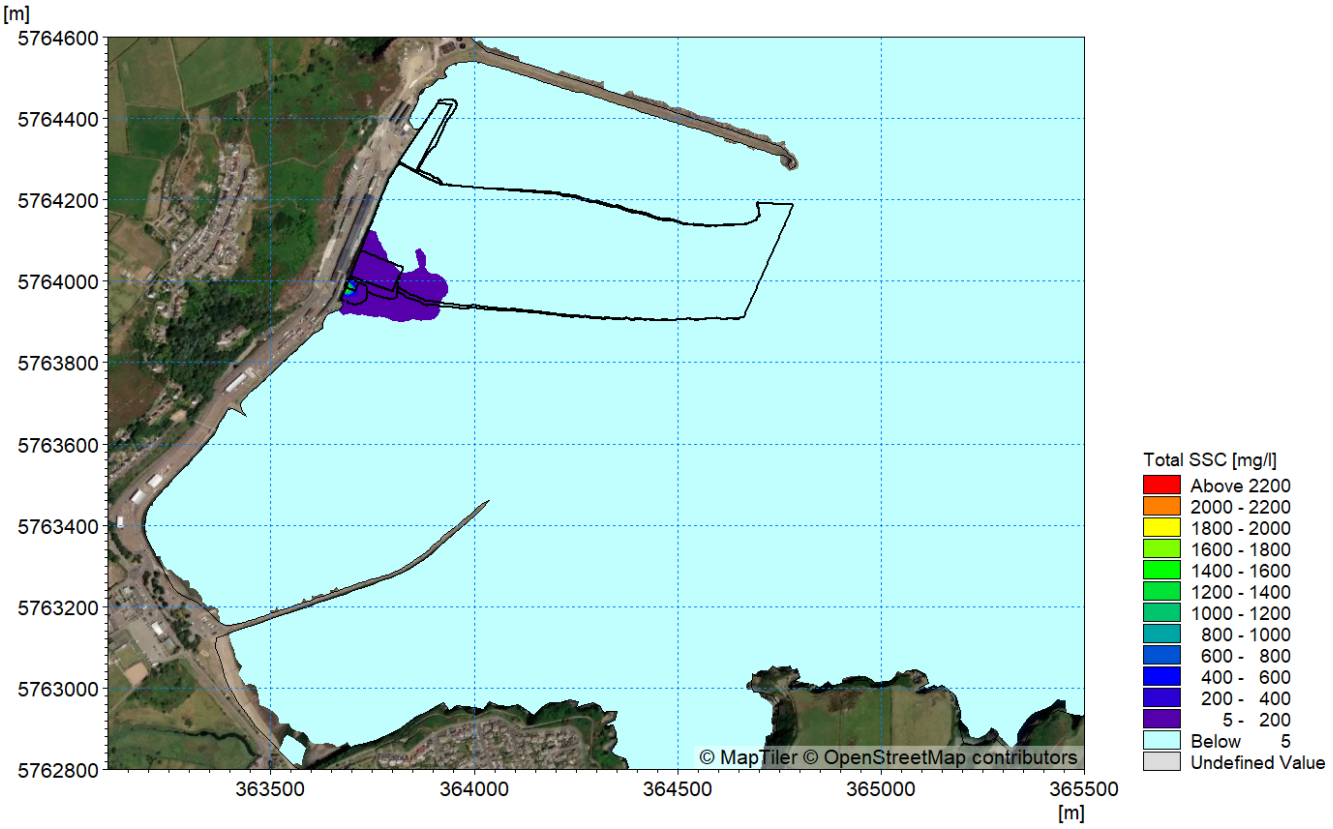

Figure 10-19: Suspended sediment concentration plume during typical low tide conditions.

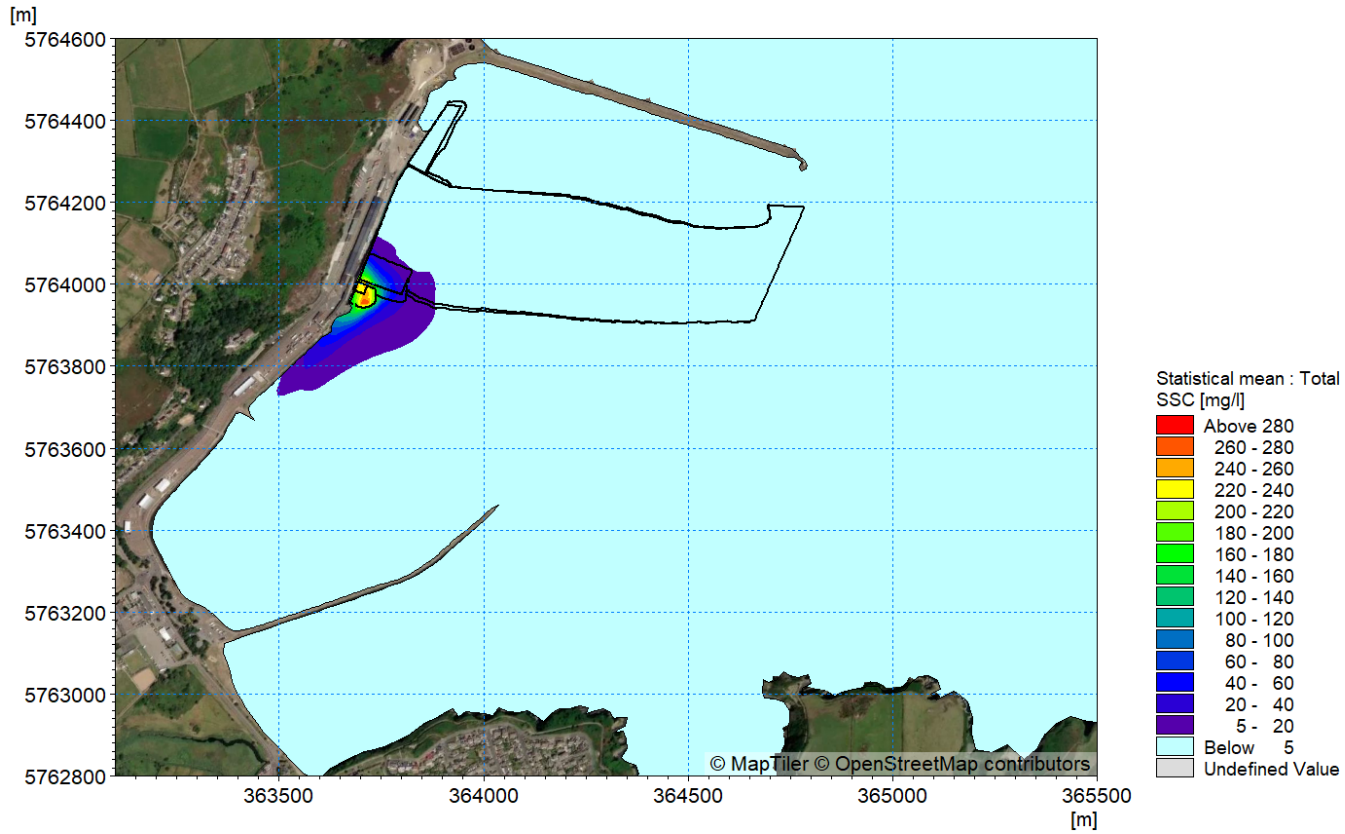

Figure 10-20: Average suspended sediment concentration plume over the course of the dredging operation in Area A.

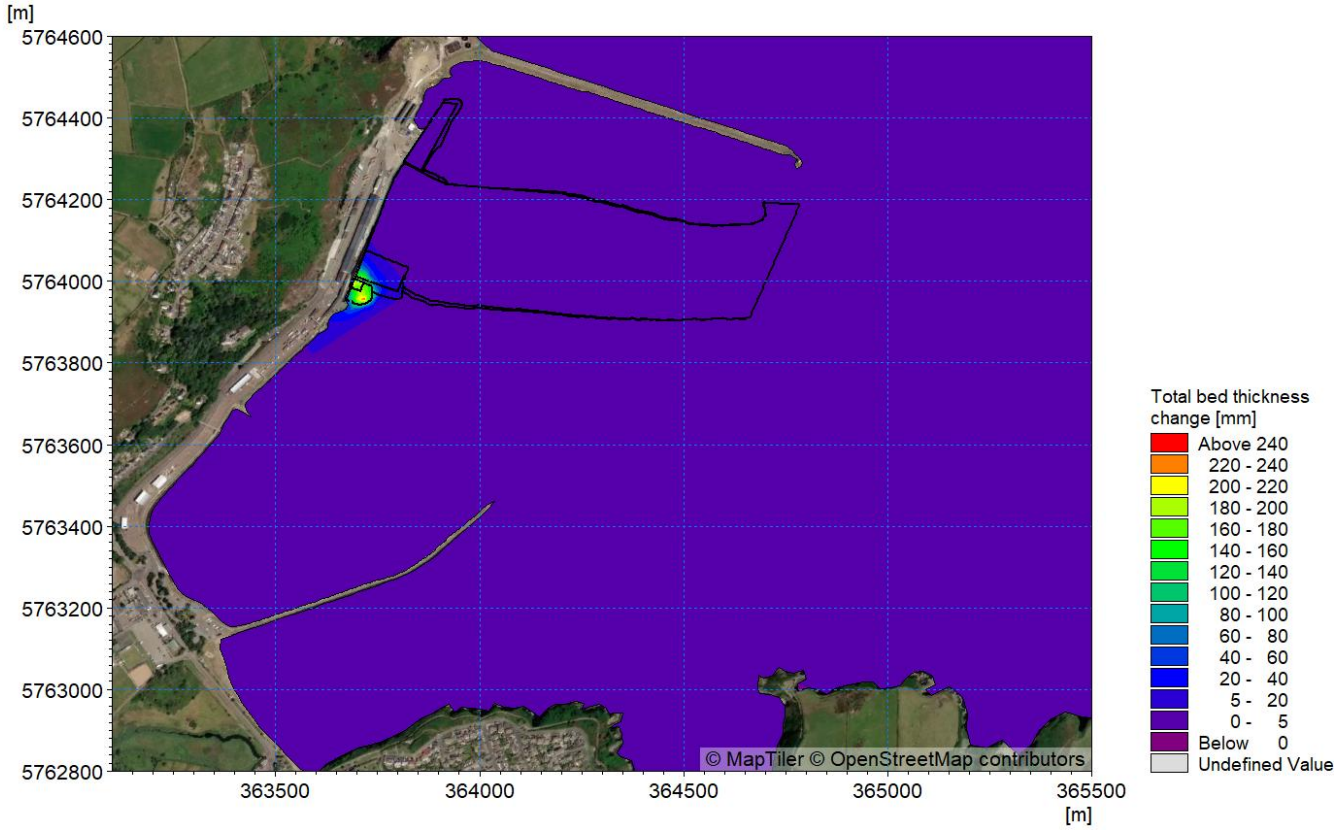

Figure 10-21: Total Deposition of sediment upon completion of the dredge works in Area A.

10.9.2.2 Area B&C

The seabed characteristics for Area B&C as established through site-specific survey are summarised in Table 10-14 modelled dredging parameters are described in Table 10-15. The dredge path along which the sediment material was introduced as a source term is illustrated in Figure 10-22.

Table 10-14: Summarised seabed charecteristics up to design depth – Area B&C

Top of Stratum (mCD)	Thickness (m)	Description
-6.42	1.18	Very soft dark grey slightly gravelly sandy silty **CLAY**

Table 10-15: Dredge simulation input parameters – Area B&C

Parameter	Value
Dredging Technique	Backhoe
Target Dredge Volume	9,200 m^3
Dredge Rate (hour/day)	166.6 m^3/hr
Fines Content	65%
Overspill	5%
Active Dredging	12 hrs per cycle
Sail Time (Return Trip)	10 hours per cycle
Total Cycle Time	22 hours
Cycles	5
Duration of Dredging Operation	c. 5 days

Figure 10-22: Dredge Path – Areas B&C

The plume envelope drawings for Area B&C are illustrated in Figure 10-23 - Figure 10-26, showing total SSCs within the water column during typical spring mid-flood, high water, mid-ebb and low water conditions, respectively.

As demonstrated by these figures, SSCs can reach up to *c.* 1,415 mg/L within the immediate vicinity of the dredging source term during all phases of the tide. However, beyond the immediate vicinity of the dredging source term, SSCs quickly drop to below *c.* 120 mg/L.

The greatest dispersion of SSCs during the dredging of Area B&C produced a sediment plume which again extended for c. 300 m to the southwest before being fully dispersed to below background levels (i.e., 5 mg/L). As demonstrated in Figure 10-23 - Figure 10-26, the SSC of these plumes is typically less than 120 mg/L.

As can be seen from Figure 10-26, the resultant SSC plume is highly localised during low water conditions due to the minimal current speeds and dispersion.

Overall sediment dispersion during the dredging operations for Area B&C is highly localised and generally confined to within a small area of Fishguard Harbour. Average SSCs are limited to *c*. 125 mg/l within the immediate vicinity of works and quickly reduce to below background concentrations of 5 mg/L within *c*. 100 m to the east and *c*. 300 to the southwest of the dredge source term.

Sediment deposition as a result of the backhoe dredge operations within Area B&C is presented in Figure 10-28. As can be seen, the resultant deposition within the footprint of the dredge operations does not exceed 9.6 cm. Within the vicinity of the dredging operation, the total deposition of sediment is typically less than 2.4 cm, with deposition beyond 50 m reducing to < 0.8 cm.

In summary, the modelling of dredging operations at Area B&C found that:

- Sediment dispersion during the dredging operations for Area B&C is highly localised and confined to within a small area of Fishguard Harbour.
- The highest suspended sediment concentrations of *c*. 1,415 mg/L occurred directly at the active dredging source term and quickly reduced to 120 mg/L within 50 metres.
- Average SSCs did not generally exceed *c.* 125 mg/l within the immediate vicinity of works and quickly reduced to below background concentrations of 5 mg/L within *c*. 300 m.
- The resultant deposition within the footprint of the dredge operations did not exceed 9.6 cm. Within the vicinity of the dredging operation, the total deposition of sediment is typically less than 2.4 cm, with deposition beyond 50m reducing to < 0.8 cm.

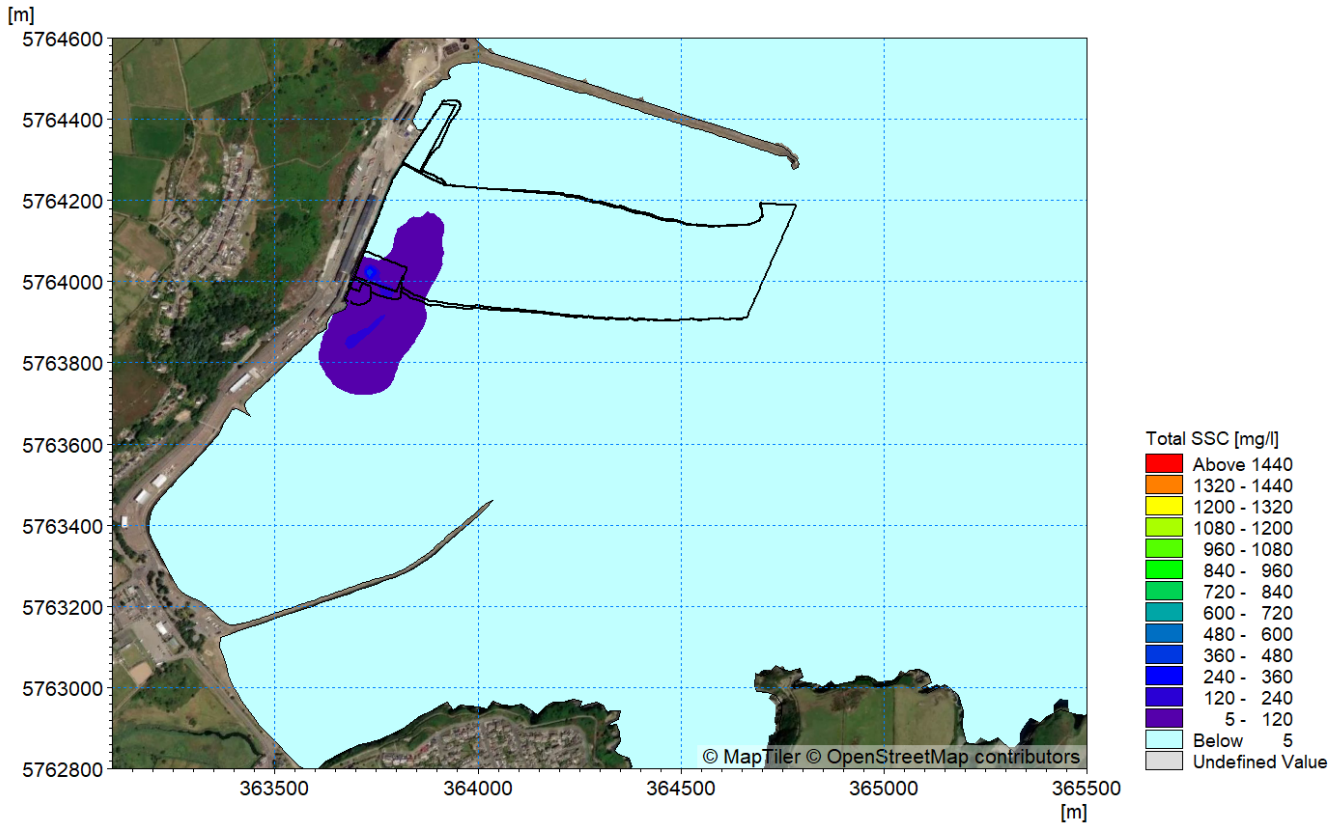

Figure 10-23: Suspended sediment concentration plume during typical mid-flood conditions.

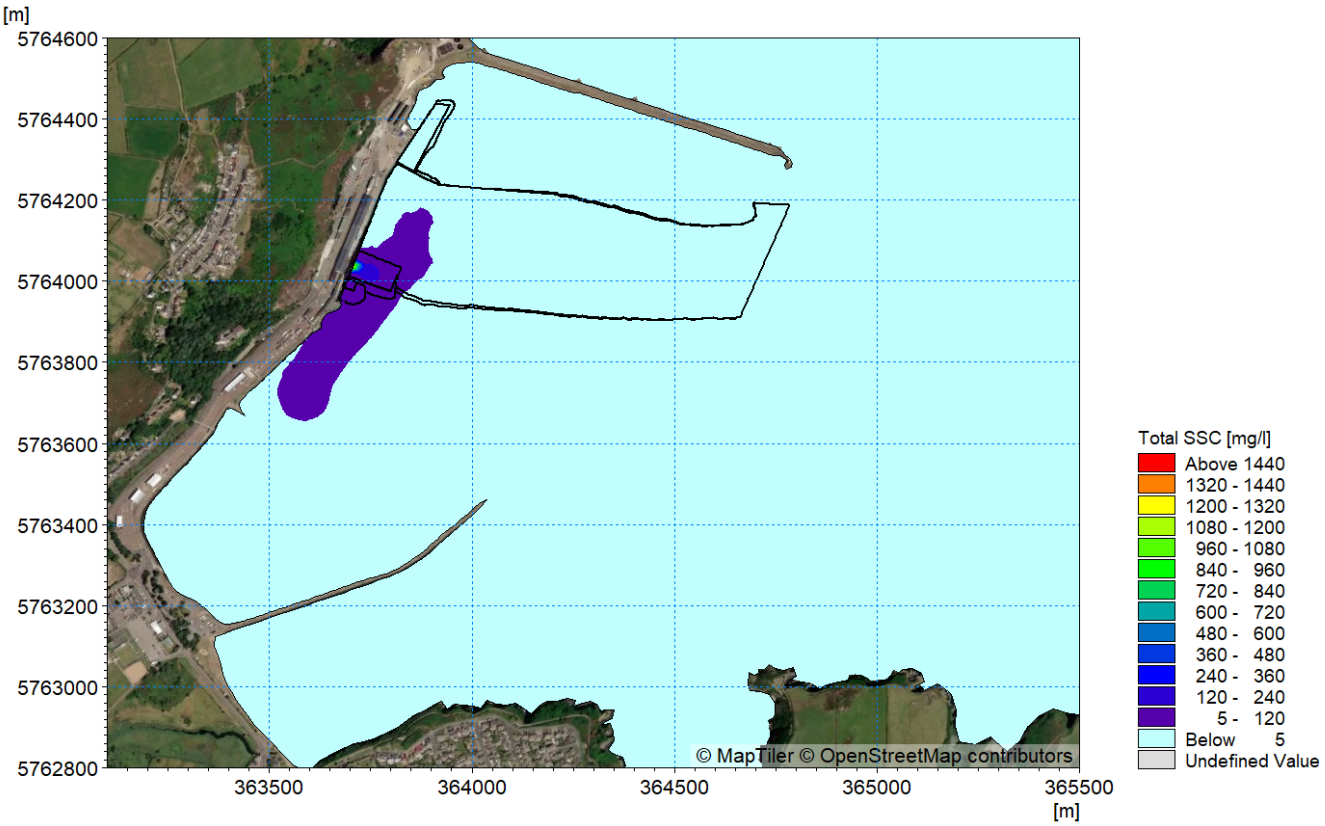

Figure 10-24: Suspended sediment concentration plume during typical high tide conditions.

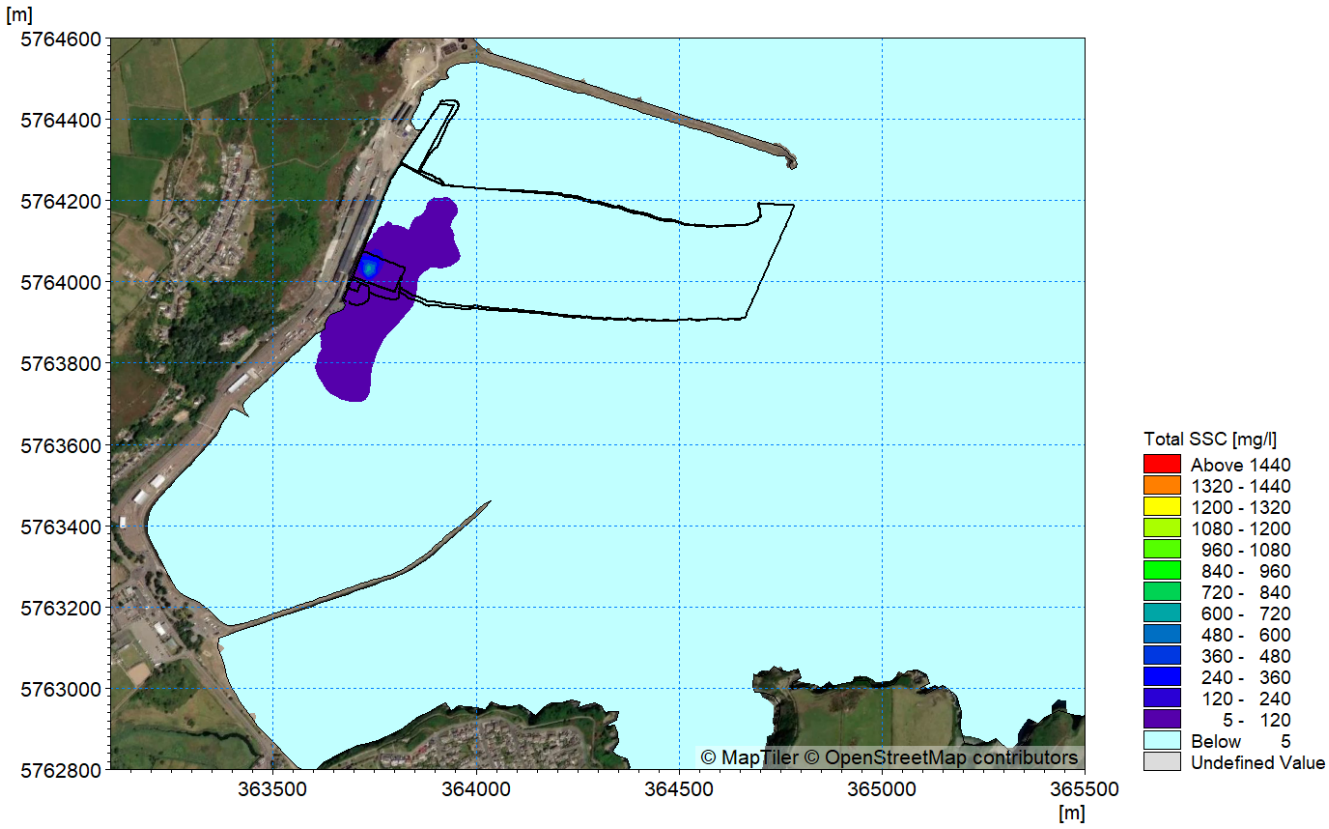

Figure 10-25: Suspended sediment concentration plume during typical mid-ebb tide conditions.

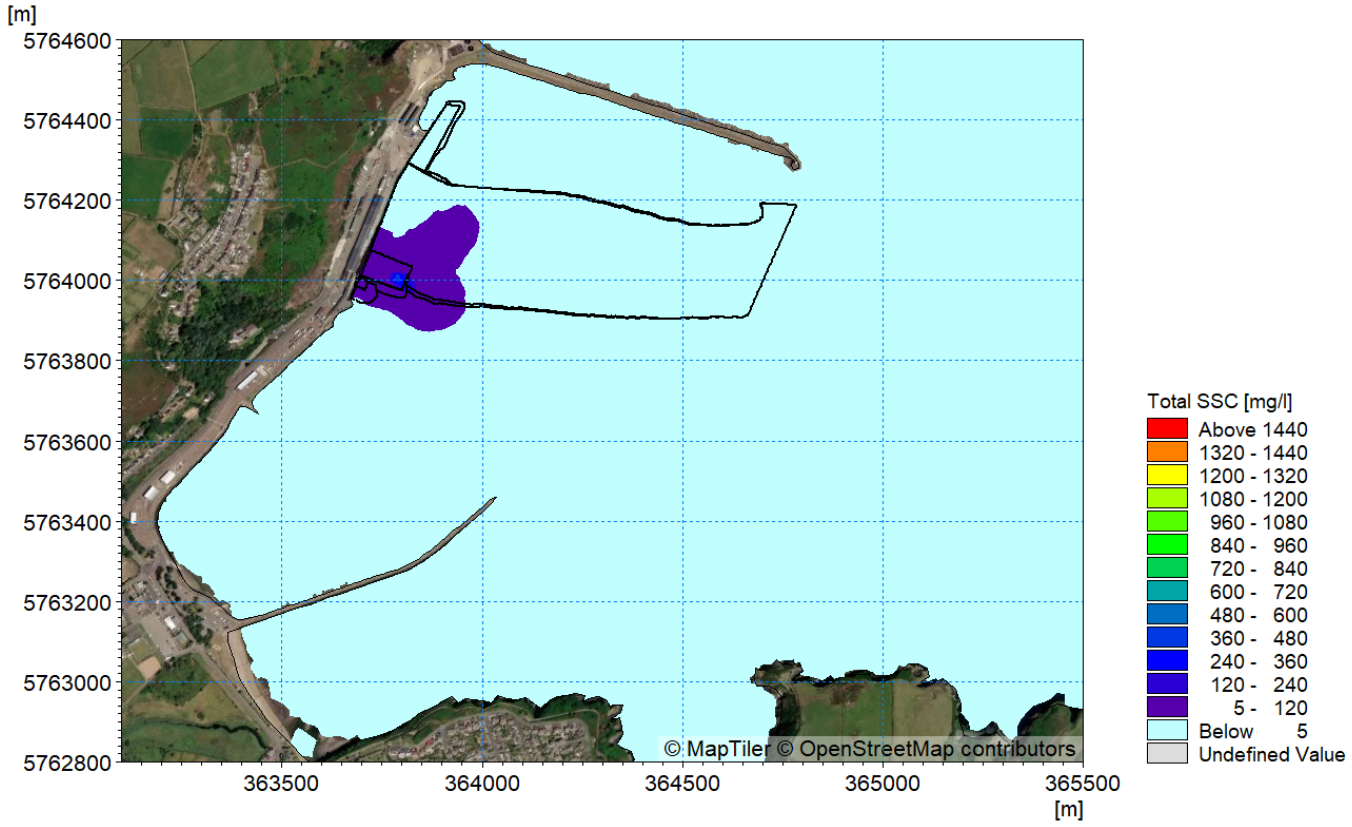

Figure 10-26: Suspended sediment concentration plume during typical low water conditions.

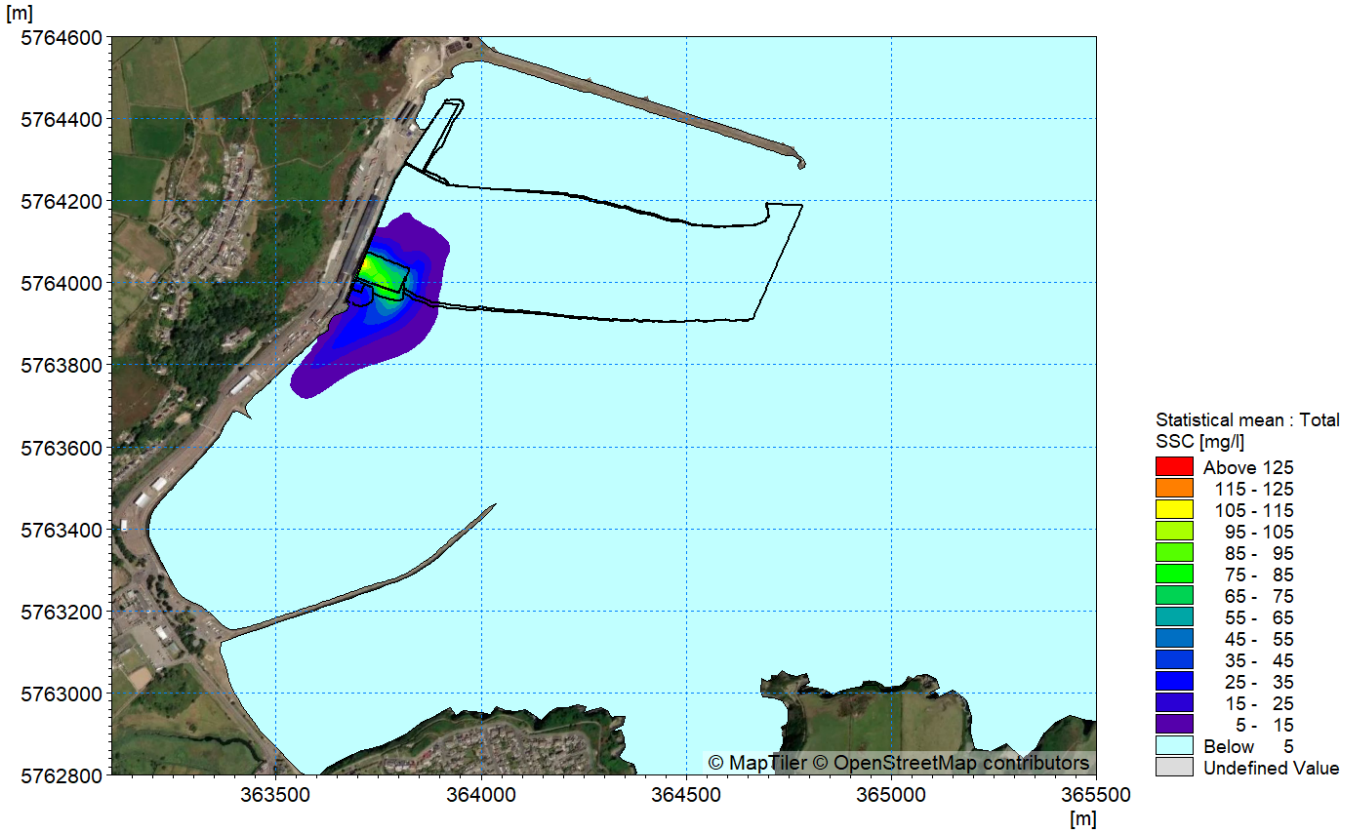

Figure 10-27: Average suspended sediment concentration plume over the course of the dredging operation in Areas B&C.

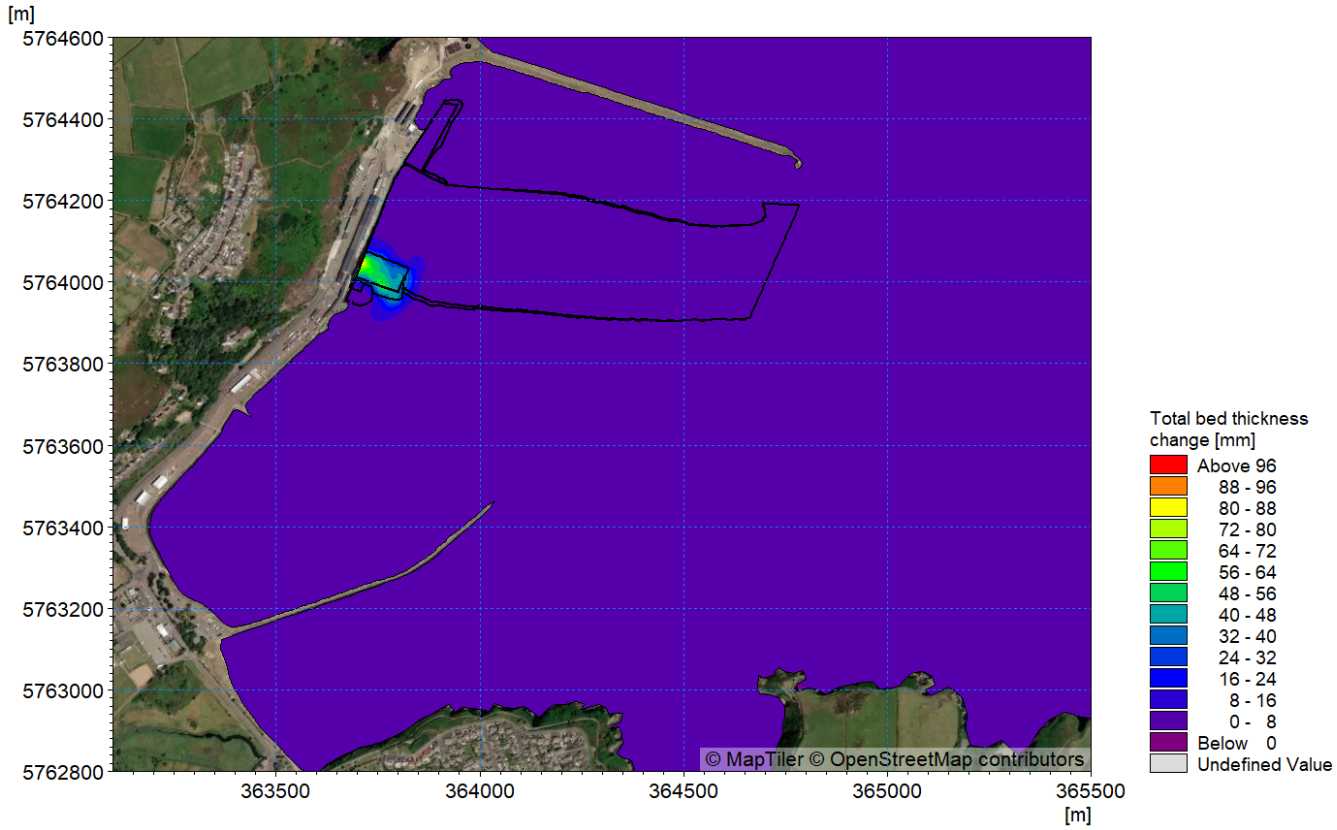

Figure 10-28: Total deposition of sediment upon completion of the dredge works in Areas B&C.

10.9.2.3 Area E

The seabed characteristics for Area E as established through site-specific survey, are summarised in Table 10-16, modelled dredging parameters are described in Table 10-17. The dredge path along which the sediment material was introduced as a source term is illustrated in Figure 10-29.

Table 10-16: Summarised seabed charecteristics – Area E

Top of Stratum (mCD)	Thickness (m)	Description
-5.64	1.46	(Very soft to soft) Dark grey slightly sandy **CLAY**

Table 10-17: Dredge simulation input parameters – Area E

Parameter	Value
Dredging Technique	TSHD
Target Dredge Volume	40,000 m^3
Dredge Rate	1,500m^3/hr
Fines Content	100%
Overspill	5%
Active Dredging	2 hrs per cycle
Sail Time (Return Trip)	10 hours per cycle
Total Cycle Time	12 hours
Cycles	14
Duration of Dredging Operation	c. 7 days

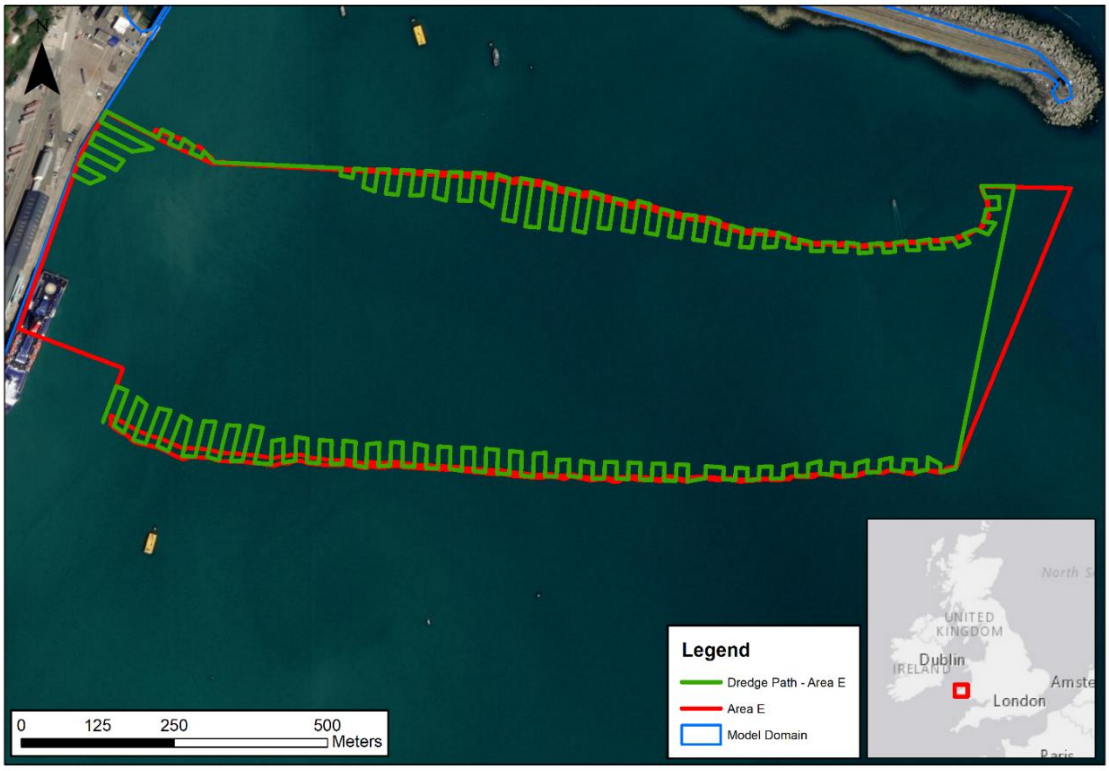

Figure 10-29: Dredge Path – Area E

The plume envelope drawings for Area E are illustrated in Figure 10-30 - Figure 10-33, showing total SSCs within the water column during typical spring mid-flood, high water, mid-ebb and low water conditions, respectively.

As demonstrated by these figures, SSCs can reach up to *c.* 610 mg/L during low water conditions, within the immediate vicinity of the dredging source term, however, beyond the immediate vicinity of the dredging source term, SSCs quickly drop to below *c.* 30 mg/L. The influence of the tidal eddy which forms at the harbour entrance to the southeast of the northern breakwater can be seen in Figure 10-31, wherein suspended sediments are first carried northeast before being caught in the eddy which curls in a clockwise.

This eddy is also clearly observed when considering suspended sediments sometime after active release. For example, Figure 10-34 shows suspended sediments one hour after a mid-flood release, and clearly identifies how the eddy traps suspended sediment. Sediment released at the eastern extent shown in Figure 10-30 - Figure 10-34 can remain suspended for up to four hours after dredging operations depending on the tidal phase.

Overall, sediment dispersion during the dredging operations for Area E has the greatest spatial scale with the greatest potential for dispersion outside of Fishguard Harbour occurring at the easternmost section of the dredging operation, reaching a maximum plume at high tide and mid-ebb. As illustrated in Figure 10-35, average SSCs across the operation are limited to 35 mg/L, a significantly reduced value compared to Areas A,B and C, accounting for both the spread-out nature of the dredge operation and the greater water depths in which they occur.

Sediment deposition as a result of the TSHD dredge operations within Area E is presented in Figure 10-36. As can be seen, the resultant deposition within the footprint of the dredge operations does not exceed 4.2 cm. Within the vicinity of the dredging operation, the total deposition of sediment is typically less than 1.5 cm, with deposition beyond 50 m reducing to < 0.15 cm.

In summary, the modelling of dredging operations at Area E found that:

- Sediment dispersion during the dredging operations for Area E extends up to c. 650 m to the east and north of the dredge path under high tide and mid-ebb water level conditions respectively. However, the SSC of these plumes do not exceed < 75 mg/L and generally occurs at concentrations of < 30 mg/L.
- The highest suspended sediment concentrations of *c*. 610 mg/L occurred at low water, directly at the active dredging source term. The influence of the tidal eddy is pronounced in the dispersion of the sediment plume.
- Average SSCs did not generally exceed *c.* 35 mg/L within the immediate vicinity of works and quickly reduce to below background concentrations of 5 mg/L within *c*. 70 m.
- The resultant deposition within the footprint of the dredge operations do not exceed 2 cm. Within the vicinity of the dredging operation, the total deposition of sediment is typically less than 0.45 cm, with deposition beyond 50m reducing to < 0.15 cm.

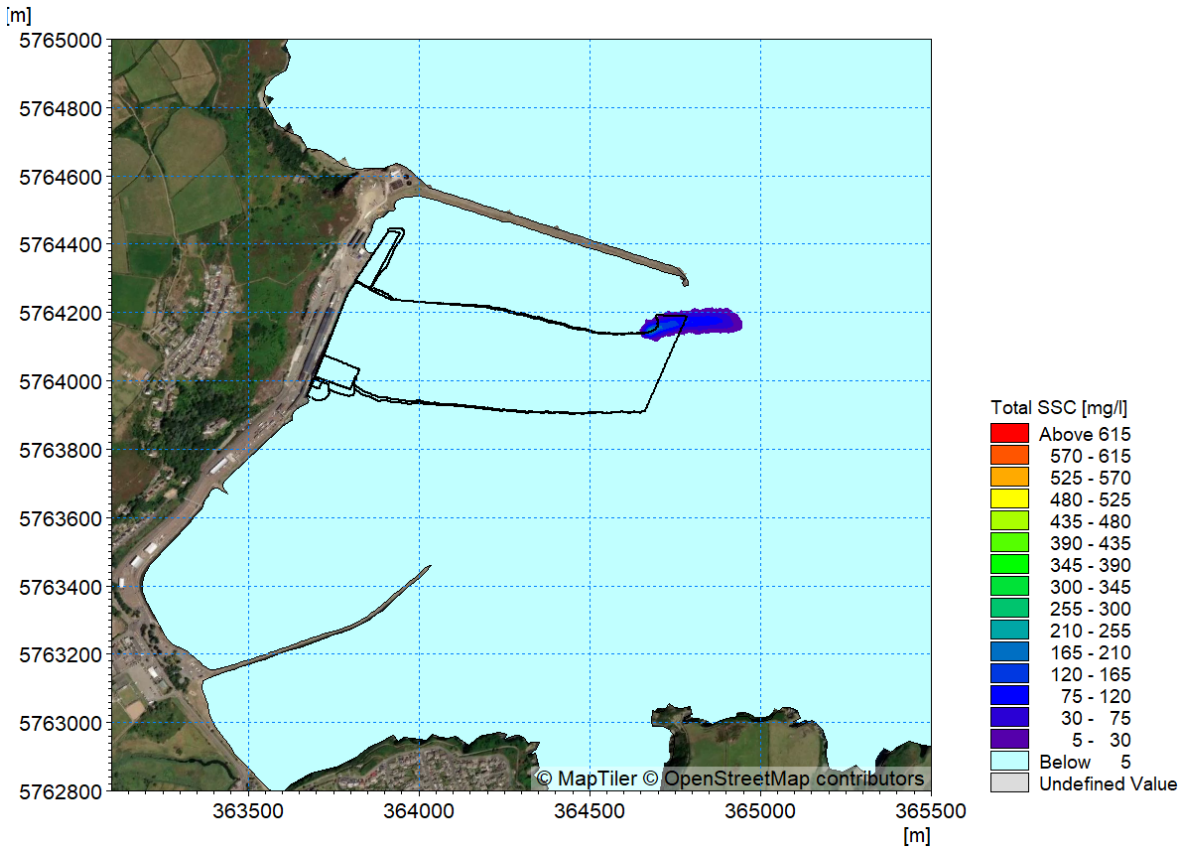

Figure 10-30: Suspended sediment concentration plume during typical mid-flood conditions.

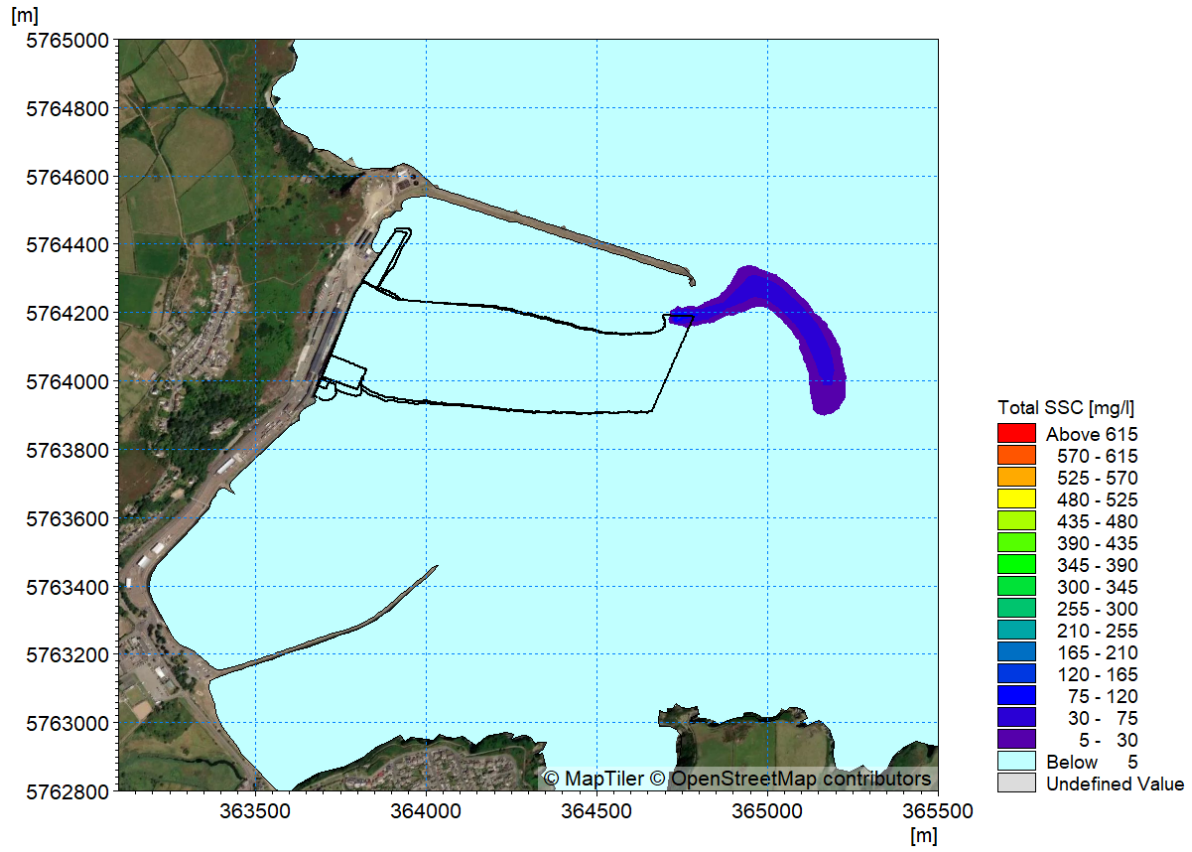

Figure 10-31: Suspended sediment concentration plume during typical high tide conditions.

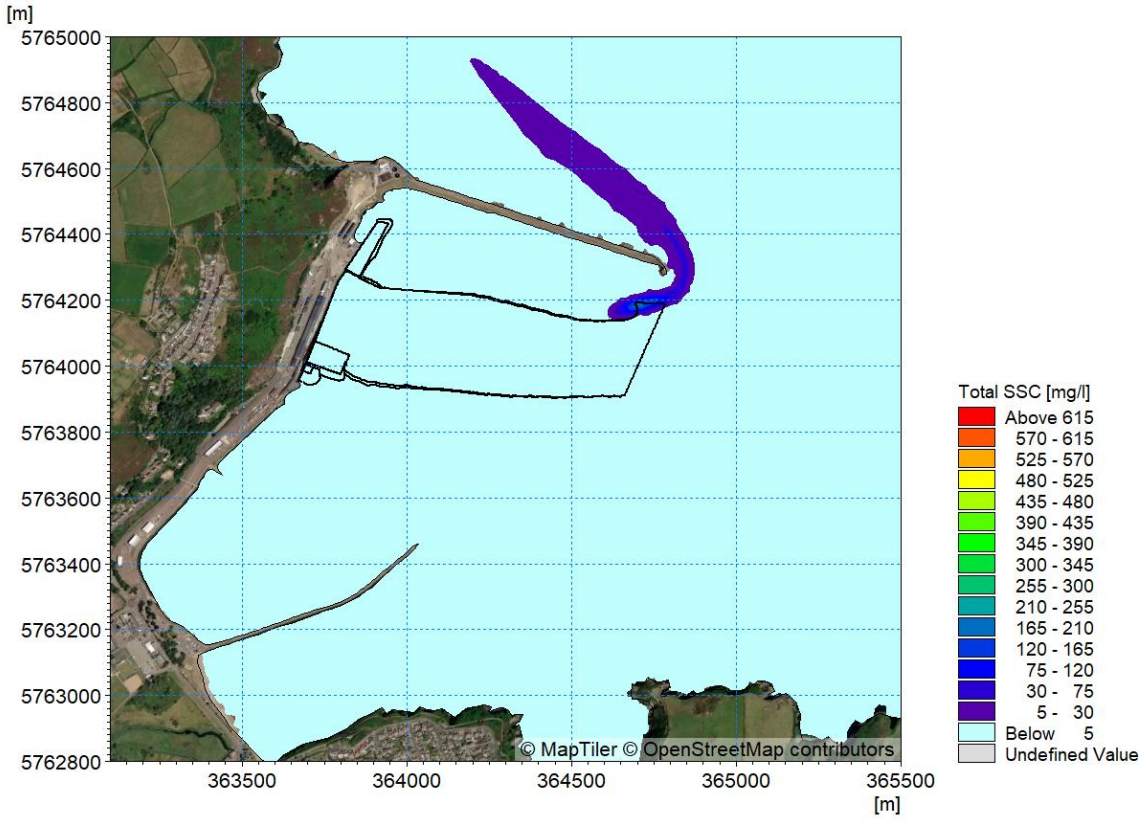

Figure 10-32: Suspended sediment concentration plume during typical mid-ebb tide conditions.

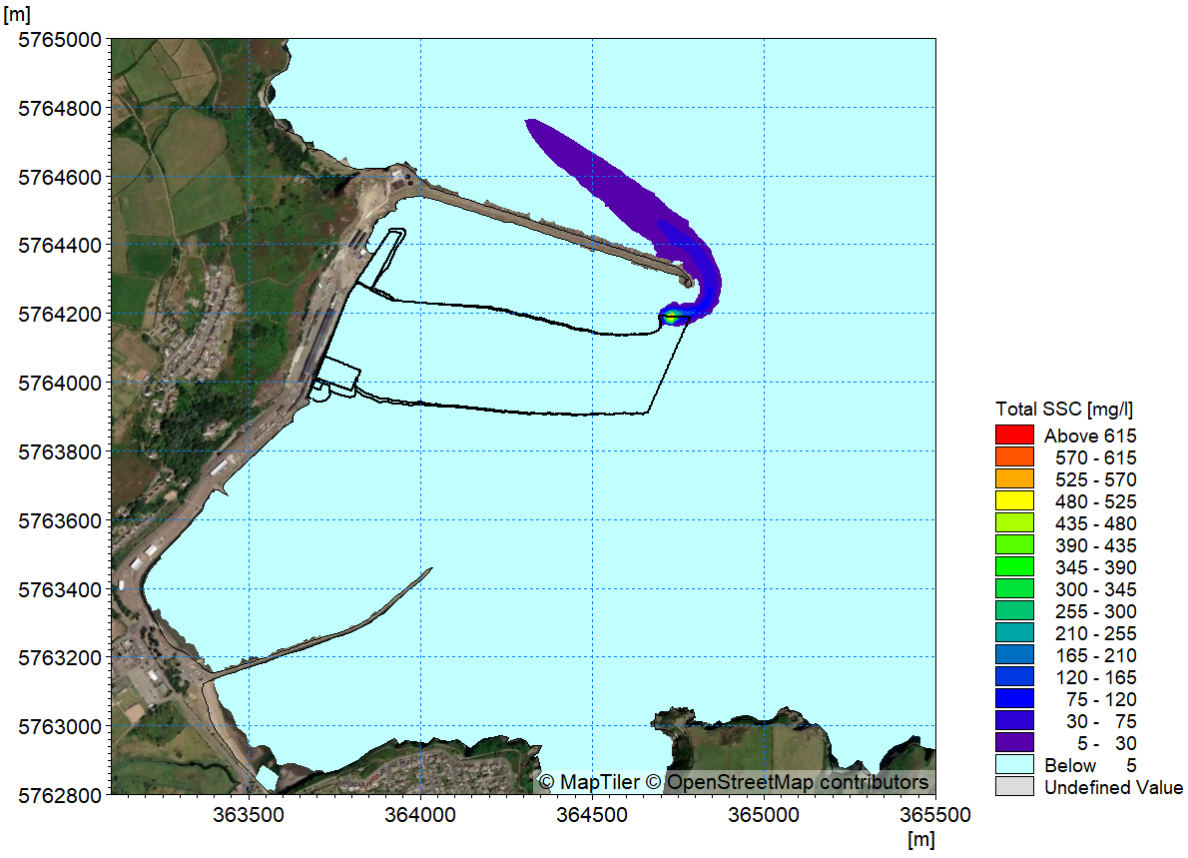

Figure 10-33: Suspended sediment concentration plume during typical low water conditions.

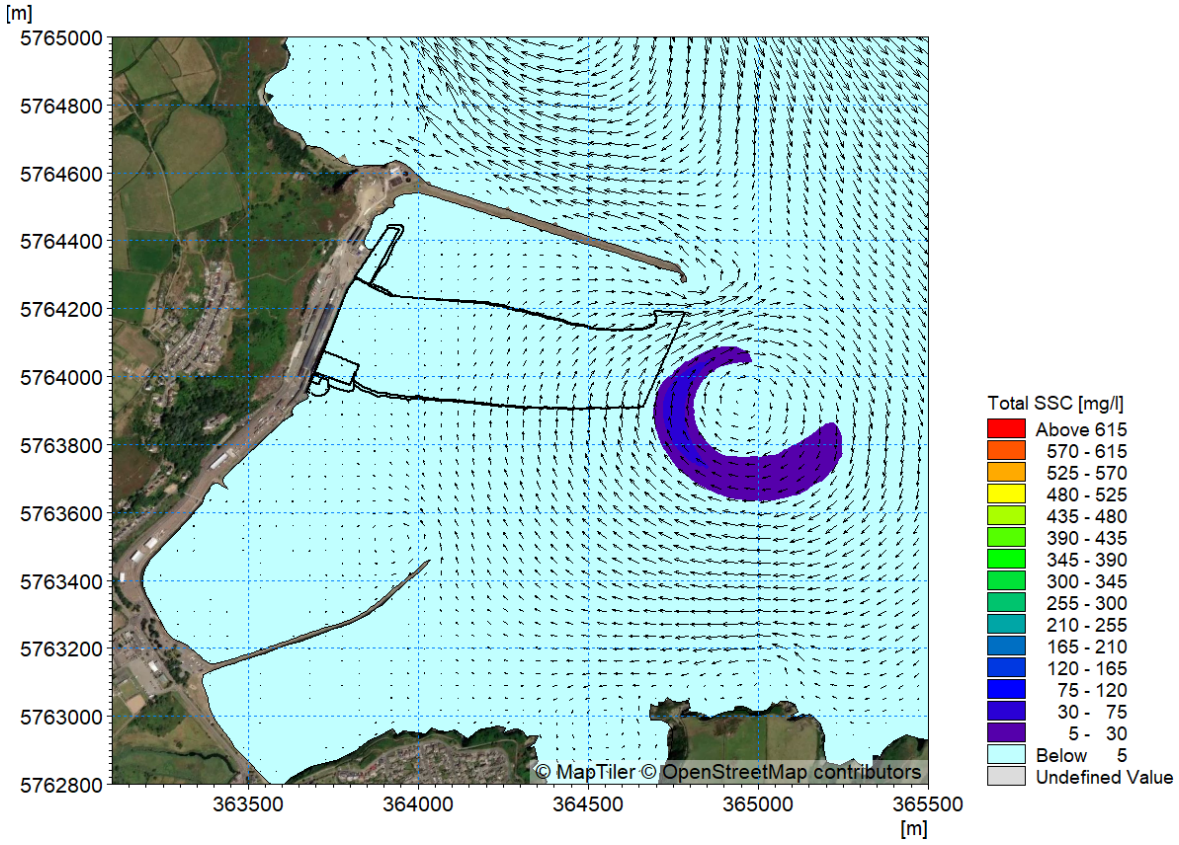

Figure 10-34: Suspended sediment concentration plume one hour post cessation of release at mid flood

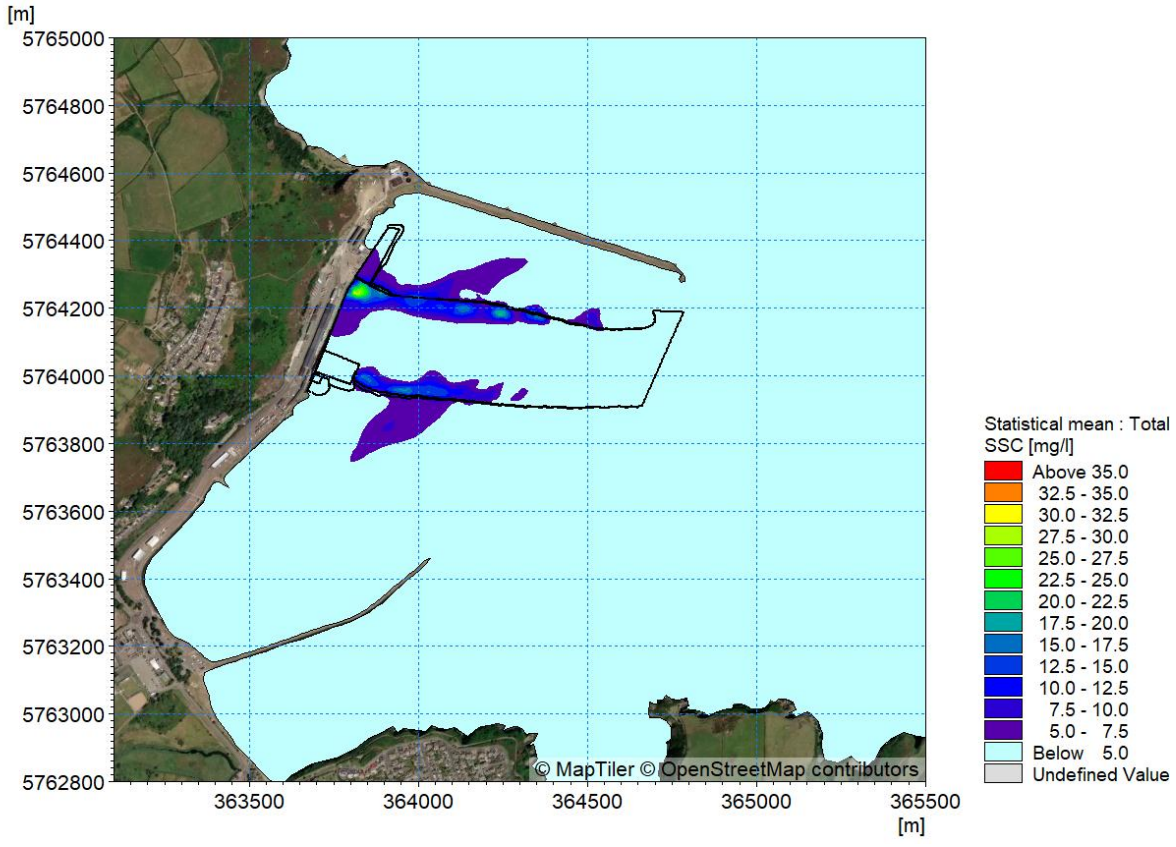

Figure 10-35: Average suspended sediment concentration plume over the course of the dredging operation in Area E.

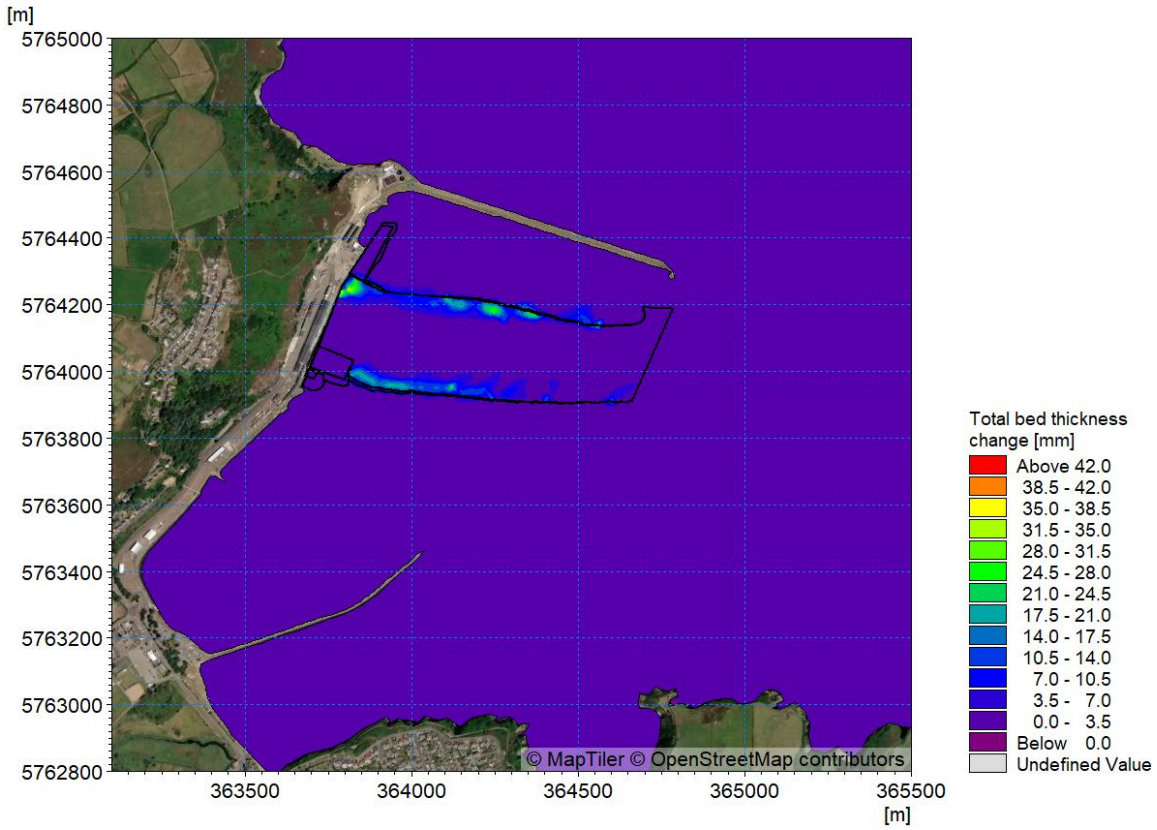

Figure 10-36: Total deposition of sediment upon completion of the dredge works in Area E.

10.9.2.4 Area H

The seabed characteristics for Area A established through site-specific survey, are summarised in Table 10-18, modelled dredging parameters are described in Table 10-19Table 10-19. The dredge path along which the sediment material was introduced as a source term is illustrated in Figure 10-37.

Table 10-18: Summarised seabed charecteristics – Area H

Top of Stratum (mCD)	Thickness (m)	Description
-5.05	0.75	(Very soft) Dark brownish grey brown slightly sandy silty **CLAY**

Table 10-19: Dredge simulation input parameters – Area H

Parameter	Value
Dredging Technique	TSHD
Target Dredge Volume	11,200 m^3
Dredge Rate (hour/day)	1,500m^3/hr
Fines Content	100%
Overspill	5%
Active Dredging	2 hrs per cycle
Sail Time (Return Trip)	10 hours per cycle
Total Cycle Time	12 hours
Cycles	4
Duration of Dredging Operation	c. 2 days

Figure 10-37: Dredge Path – Area H

The plume envelope drawings for Area H are illustrated in Figure 10-38 - Figure 10-41, showing total SSCs within the water column during typical spring mid-flood, high water, mid-ebb and low water conditions, respectively.

As demonstrated by these figures, SSCs can reach up to *c.* 2,350 mg/L during low water conditions, within the immediate vicinity of the dredging source term, however, beyond the immediate vicinity of the dredging source term, SSCs quickly drop to below *c.* 170 mg/L.

Under all stages of the tidal cycle, the SSC plume is contained within the north western extent of Fishguard Harbour by the northern breakwater. Dispersion potential to the south of Area H is negligible due to the relatively slack tidal conditions in this area. As demonstrated in Figure 10-38 - Figure 10-41, the SSC of these plumes is typically less than 170 mg/L.

Overall sediment dispersion during the dredging operations for Area H is highly localised and confined to a small area of Fishguard Harbour, with average SSCs limited to *c*. 175 mg/L within the immediate vicinity of works and quickly reducing to below background concentrations of 5 mg/L with distance from the source of disturbance, within as short a distance as *c*. 100 m to the north where it is contained by the breakwater and a maximum of *c*. 100 to the east.

Sediment deposition as a result of the TSHD dredge operations within Area H is presented in Figure 10-43. As can be seen, the resultant deposition within the footprint of the dredge operations does not exceed 6 cm. Within the vicinity of the dredging operation, the total deposition of sediment is typically less than 4 cm, with deposition beyond 50 m reducing to < 0.5 cm.

In summary, the modelling of dredging operations at Area H found that:

- Sediment dispersion during the dredging operations for Area E extends as far as c. 100 m to the north of the dredge path under all tidal phases, however, it does so at concentrations limited to < 170 mg/L and generally at concentrations of < 50 mg/L.
- The highest suspended sediment concentrations of *c*. 2,350 mg/L occurred at low water, directly at the active dredging source term and quickly reduced to < 170 mg/L within 50 metres.
- Average SSCs did not generally exceed *c.* 175 mg/l within the immediate vicinity of works and quickly reduced to below background concentrations of 5 mg/L within *c*. 100 to the north and east.
- The resultant deposition within the footprint of the dredge operations did not exceed 6 cm. Within the vicinity of the dredging operation, the total deposition of sediment is typically less than 4 cm within Area H, and with deposition beyond 50m reducing to < 0.5 cm.

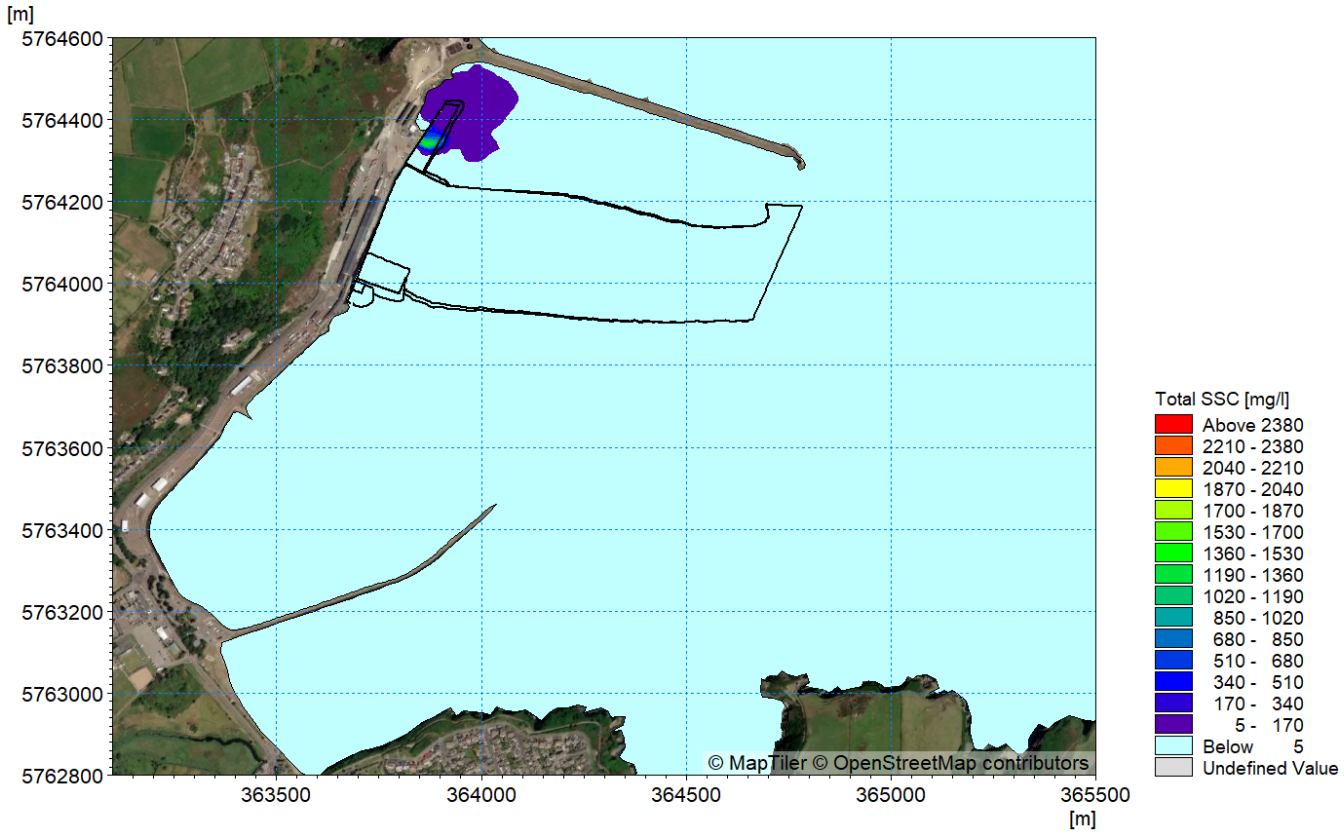

Figure 10-38: Suspended sediment concentration plume during typical mid-flood conditions.

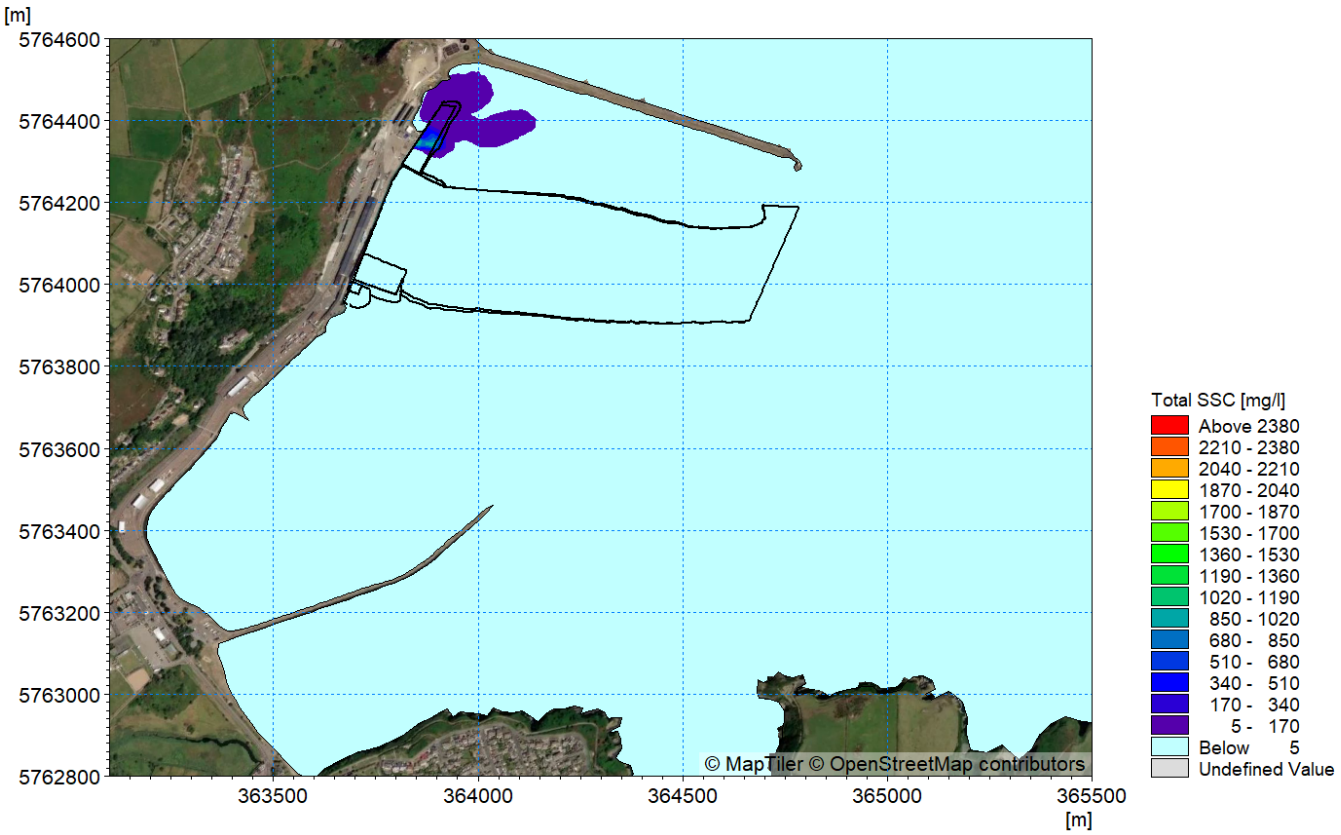

Figure 10-39: Suspended sediment concentration plume during typical high tide conditions.

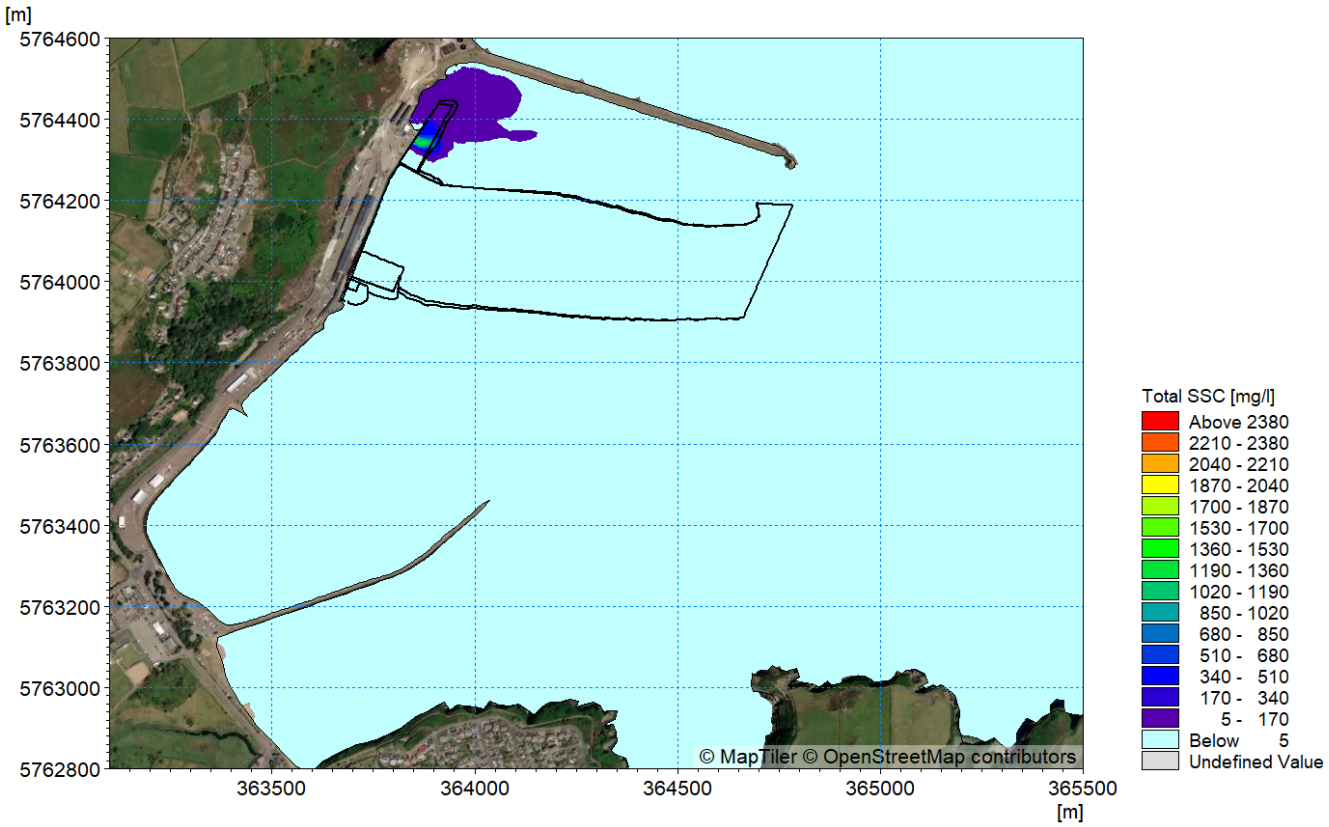

Figure 10-40: Suspended sediment concentration plume during typical mid-ebb tide conditions.

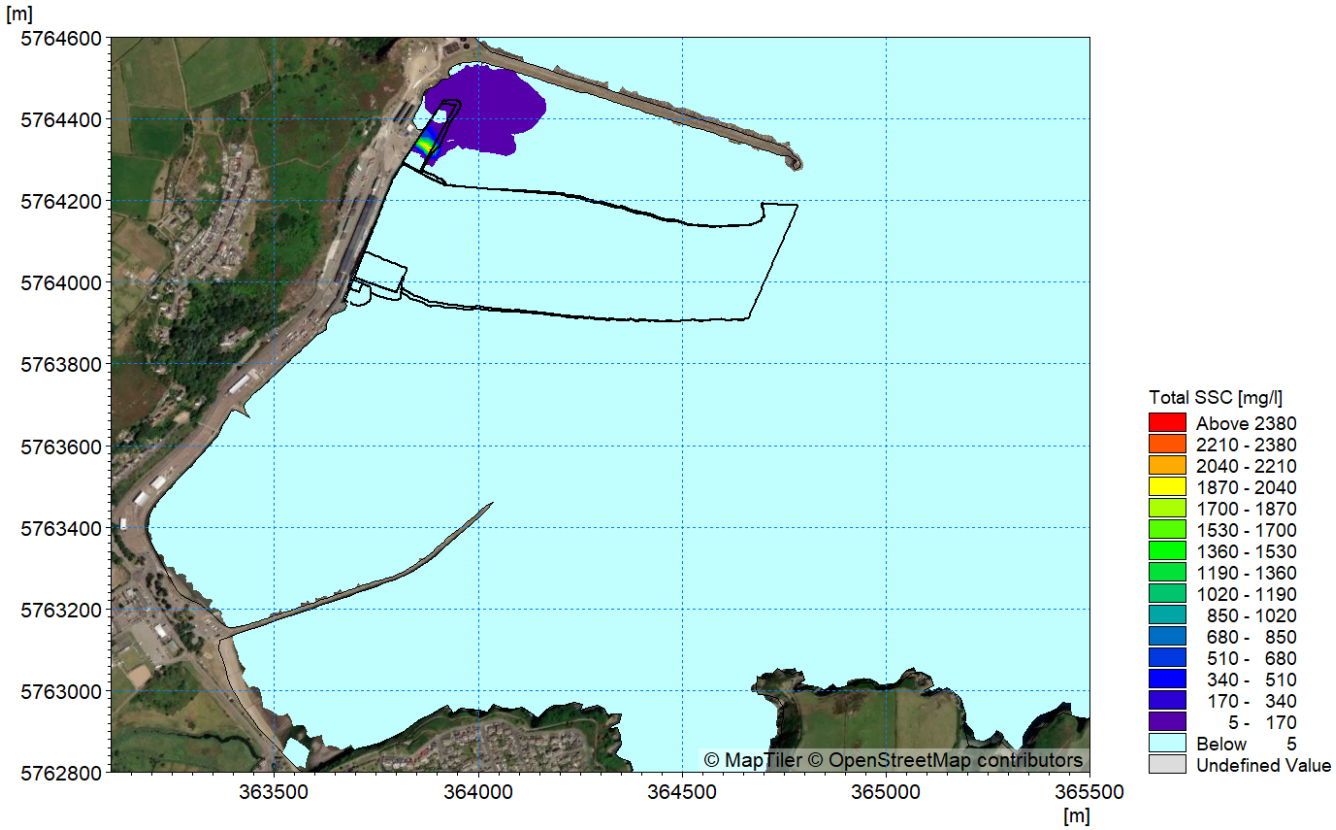

Figure 10-41: Suspended sediment concentration plume during typical low water conditions.

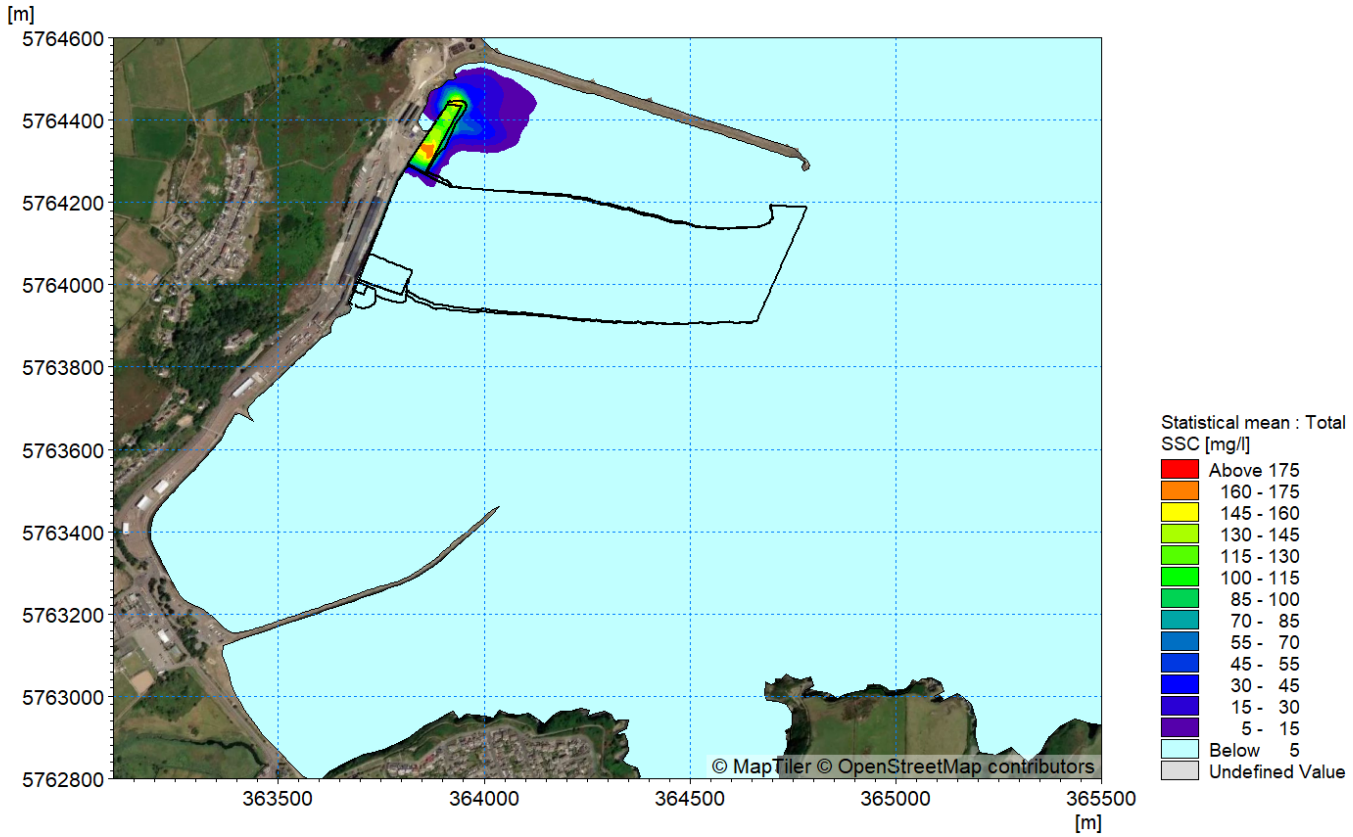

Figure 10-42: Average suspended sediment concentration plume over the course of the dredging operation.

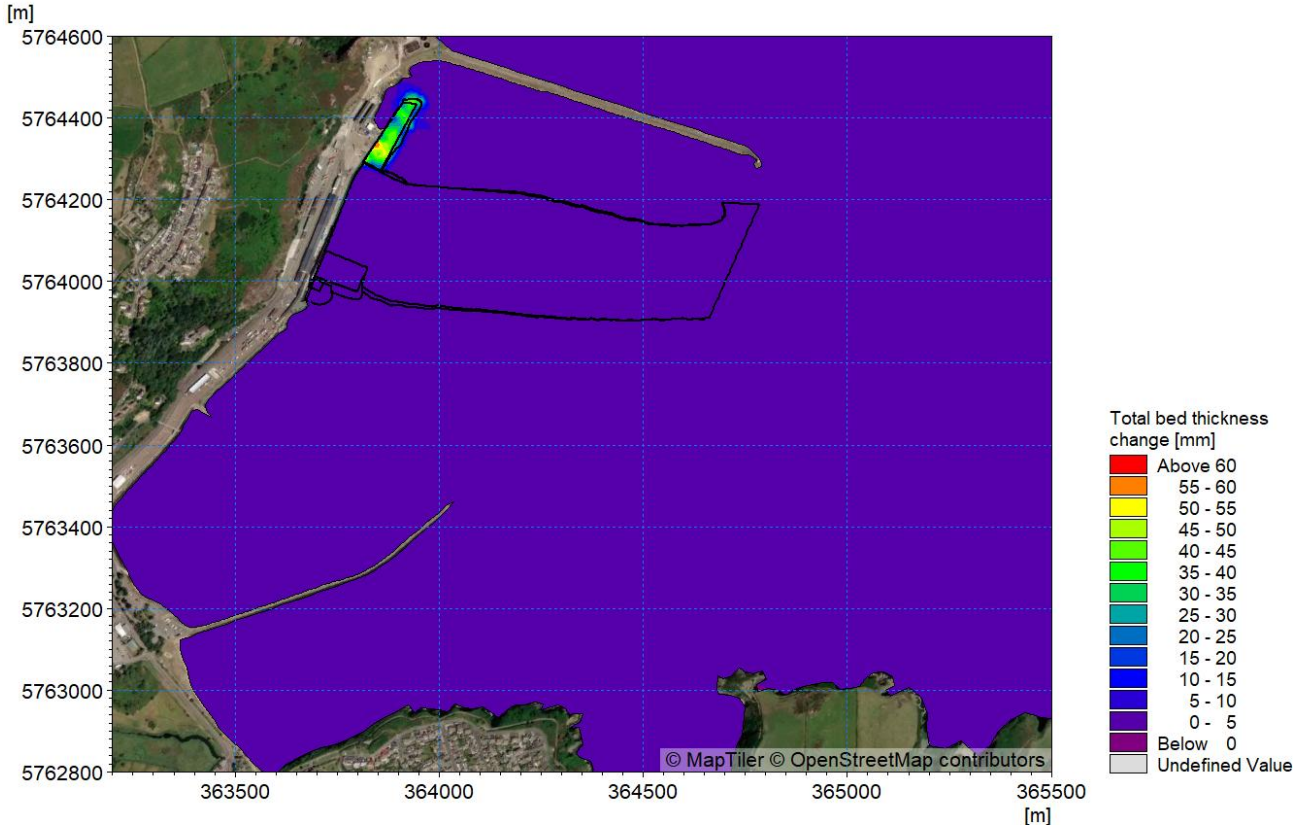

Figure 10-43: Total deposition of sediment upon completion of the dredge works.

10.9.2.5 Reclamation Area

The seabed characteristics for the Reclamation Area were established through site-specific survey are summarised in Table 10-20, modelled dredging parameters are described in Table 10-21. The dredge path along which the sediment material was introduced as a source term is illustrated in Figure 10-44.

Table 10-20: Summarised seabed charecteristics – Reclamation Area

Top of Stratum (mCD)	Thickness (m)	Description
-0.65	0.35	Dark brownish grey slightly clayey silty fine to medium **SAND**
-1.00	0.54	Dark grey clayey very silty fine **SAND**
-1.54	1.76	Dark grey and brownish grey slightly clayey very silty fine **SAND**

Table 10-21: Dredge simulation input parameters – Reclamation Area

Parameter	Value
Dredging Technique	Backhoe
Target Dredge Volume	7,400 m^3
Dredge Rate	166.6m^3/hr
Fines Content	32%
Overspill	5%
Active Dredging	12 hrs per cycle
Sail Time (Return Trip)	10 hours per cycle
Total Cycle Time	22 hours
Cycles	3
Duration of Dredging Operation	c. 2.8 days

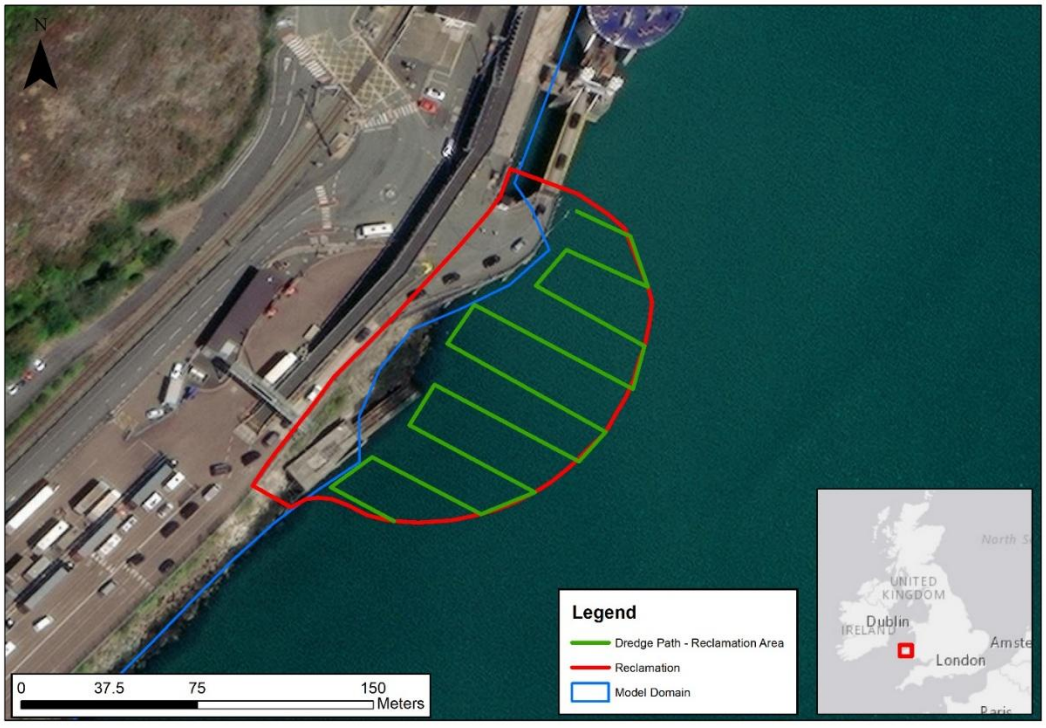

Figure 10-44: Dredge Path – Reclamation Area

The plume envelope drawings for the Reclamation Area are illustrated in Figure 10-45 - Figure 10-48, showing total SSCs within the water column during typical spring mid-flood, high water, mid-ebb and low water conditions, respectively.

As demonstrated by these figures, SSCs can reach up to *c.* 1,500 mg/L during low water conditions, within the immediate vicinity of the dredging source term, however, beyond the immediate vicinity of the dredging source term, SSCs quickly drop to below *c.* 110 mg/L within 50 m of the dredge site.

The greatest dispersion of SSCs during the dredging of the Reclamation Area produced a sediment plume which extended up to *c*. 200 m to the southwest before being fully dispersed to below background levels (i.e., 5 mg/L).

Overall sediment dispersion during the dredging operations for the Reclamation Area is highly localised and confined to a small area of Fishguard Harbour, with average SSCs limited to *c*. 125 mg/L within the immediate vicinity of works and quickly reducing to below background concentrations of 5 mg/L within *c*. 100 m to the east and *c*. 200 m to the southwest.

Sediment deposition as a result of the backhoe dredge operations within the Reclamation Area is presented in Figure 10-50. As can be seen, the resultant deposition within the footprint of the dredge operations does not exceed 1.5 cm. Within the vicinity of the dredging operation, the total deposition of sediment is typically less than 1.1 cm. Deposition up to 1 mm can occur as far south as Goodwick Jetty.

In summary, the modelling of dredging operations at the Reclamation Area found that:

- Sediment dispersion during the dredging operations for the Reclamation Area extends as far as c. 200 m to the southwest of the dredge path, however, it does so at concentrations limited to < 100 mg/L and generally at concentrations of < 25 mg/L.
- The highest suspended sediment concentrations of *c*. 1450 mg/L occurred at low water, directly at the active dredging source term and quickly reduced to background concentrations with distance from the operation.
- Average SSCs did not generally exceed *c.* 125 mg/l within the immediate vicinity of works and quickly reduced to below background concentrations of 5 mg/L within *c*. 200 m to the southwest and 100 m to the east.
- The resultant deposition within the footprint of the dredge operations did not exceed 1.5 cm. Within the vicinity of the dredging operation, the total deposition of sediment is typically less than *c*. 1.1 cm within the Reclamation Area.

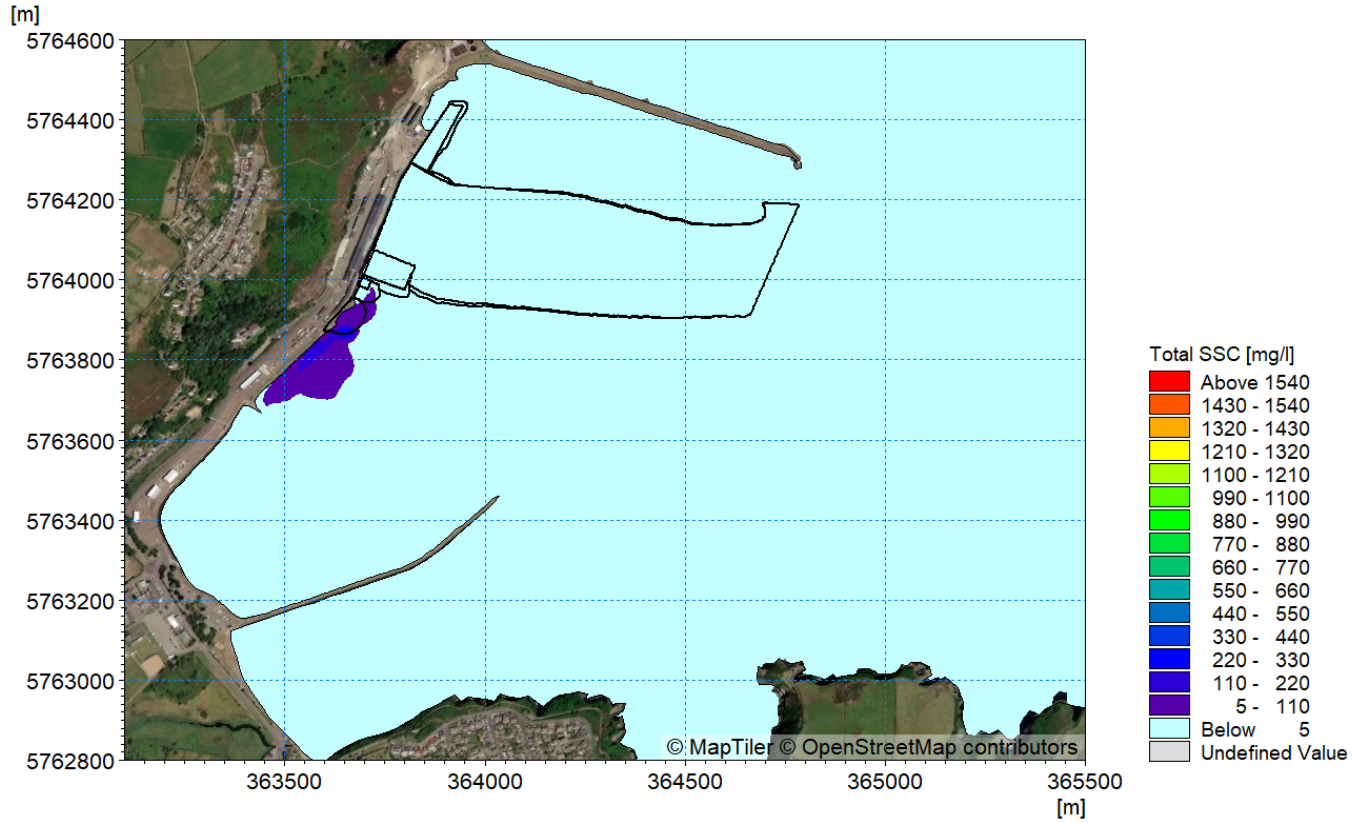

Figure 10-45: Suspended sediment concentration plume during typical mid-flood conditions.

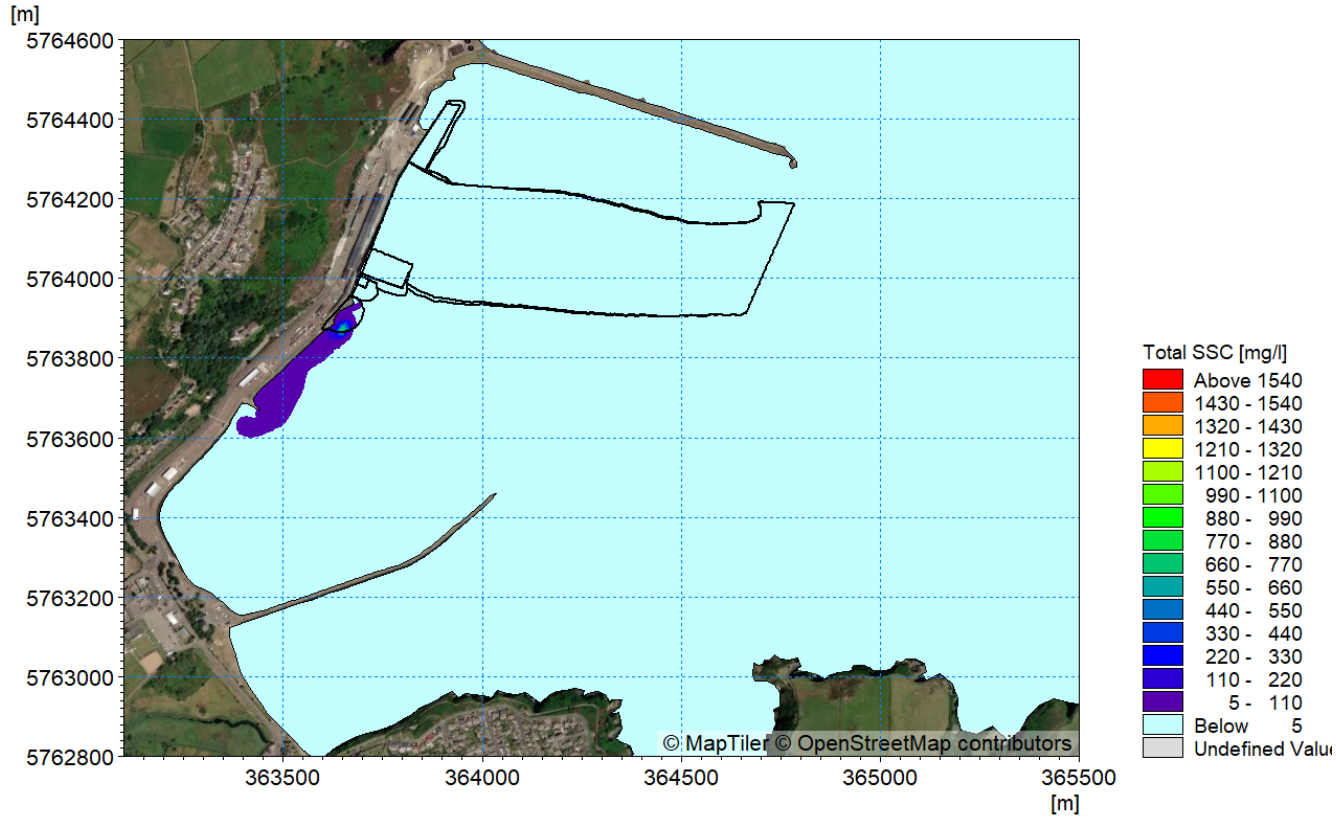

Figure 10-46: Suspended sediment concentration plume during typical high tide conditions.

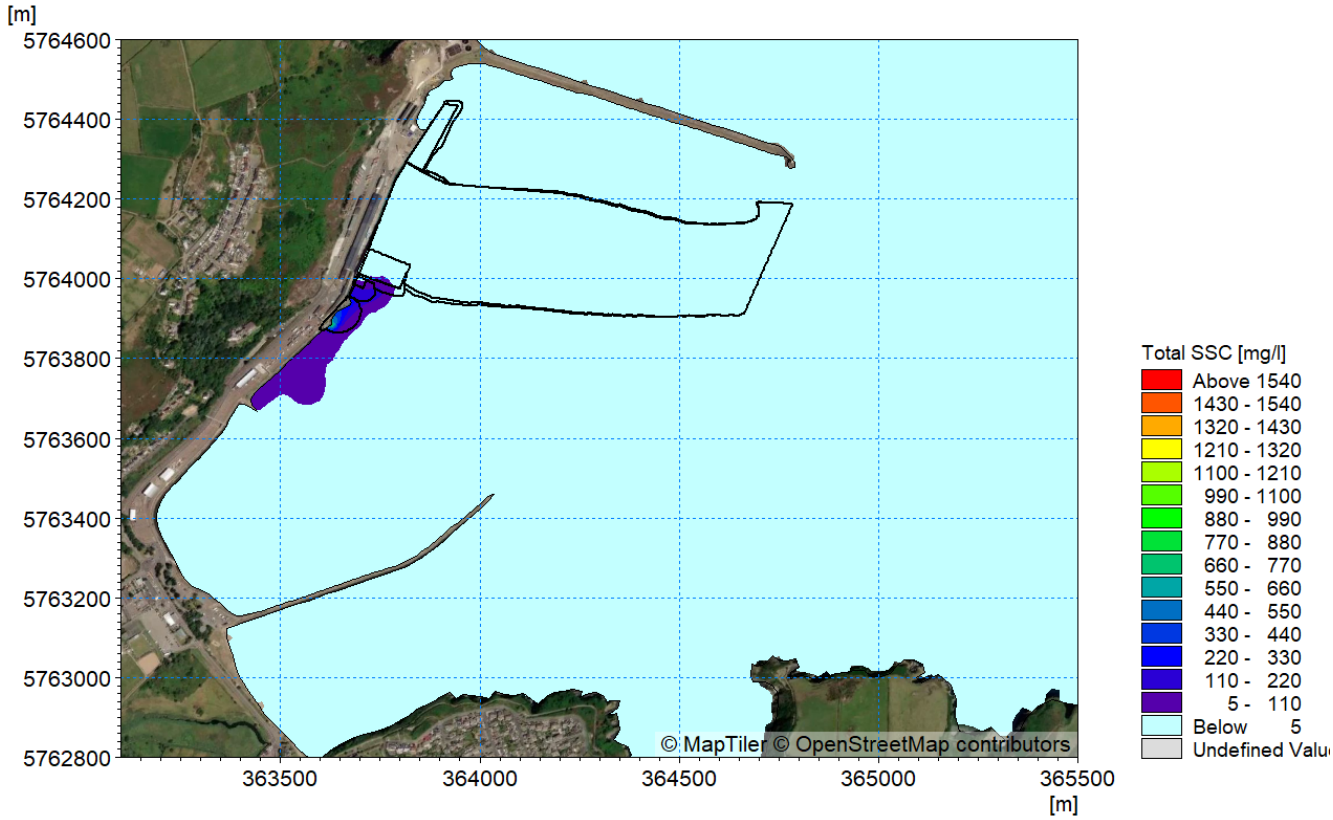

Figure 10-47: Suspended sediment concentration plume during typical mid-ebb tide conditions.

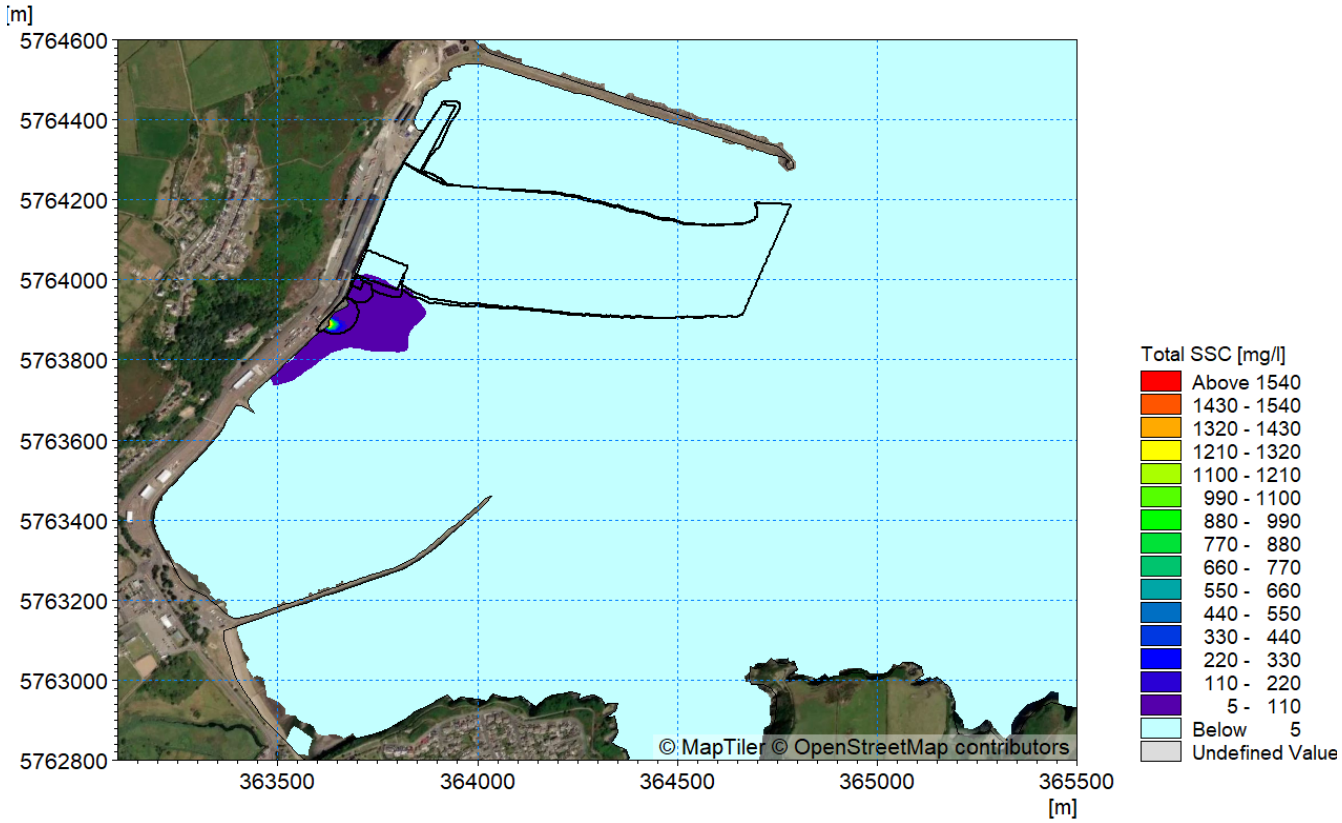

Figure 10-48: Suspended sediment concentration plume during typical low water conditions.

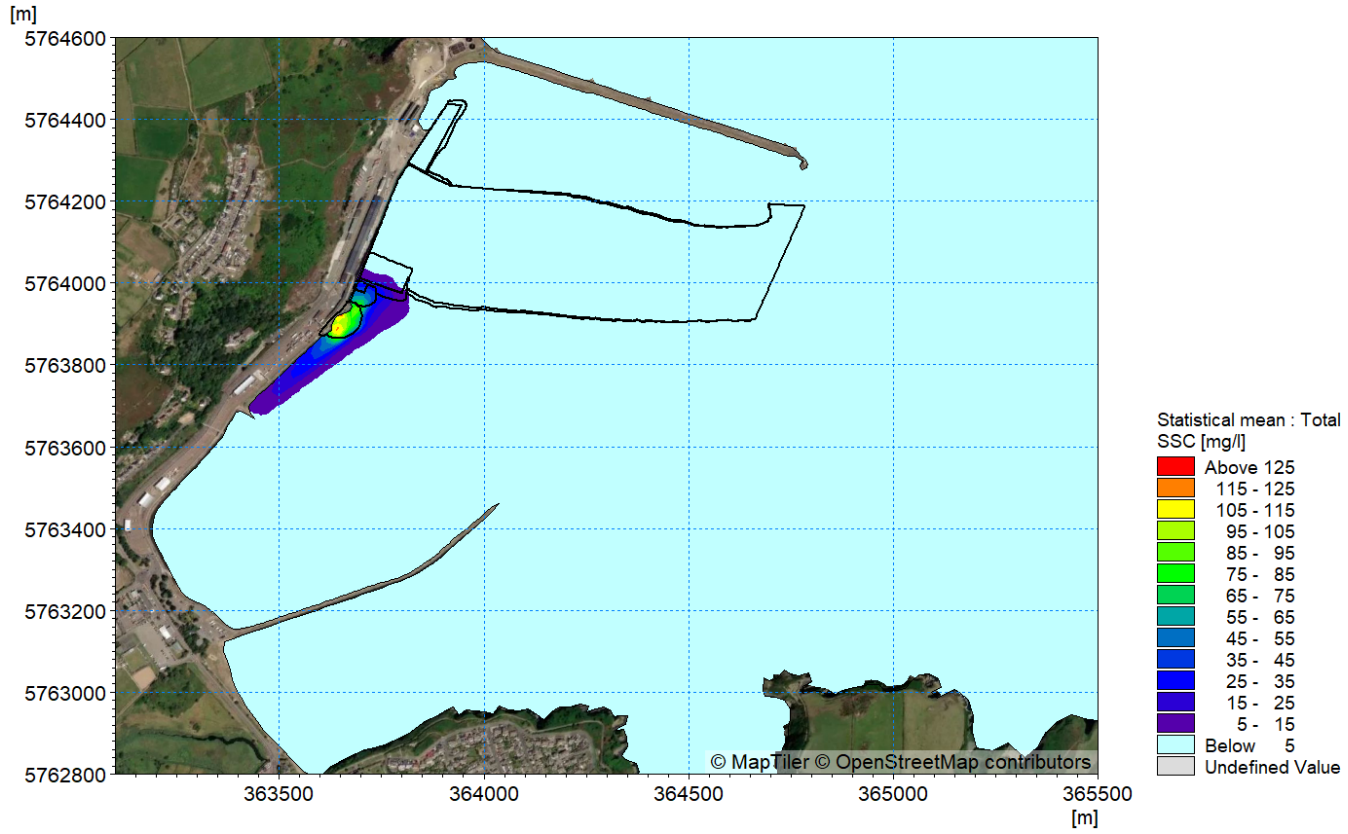

Figure 10-49: Average suspended sediment concentration plume over the course of the dredging operation.

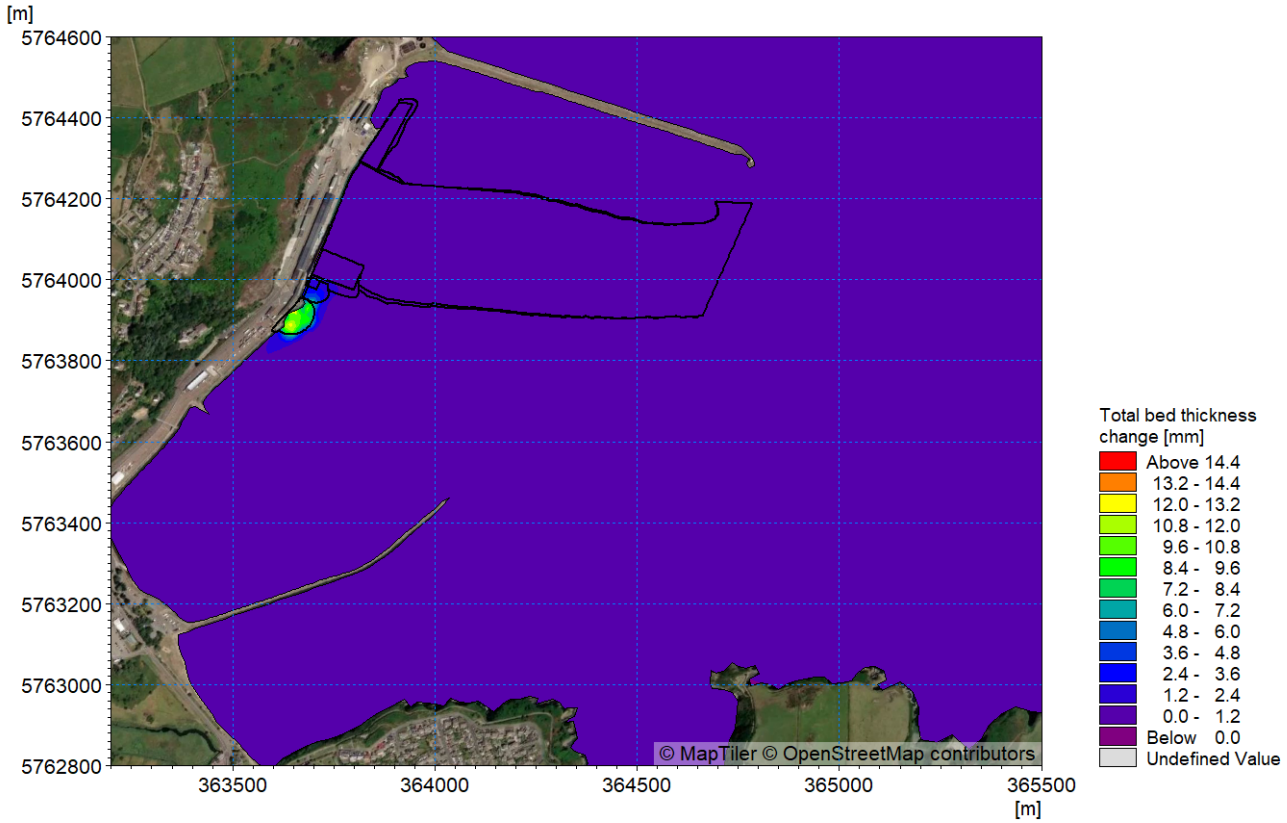

Figure 10-50: Total deposition of sediment upon completion of the dredge works.

10.9.2.6 Significance of Effect

A summary of the results for the dredging simulations modelled for the construction phase is presented in Table 10-22. As described in Sections 10.9.2.1 - 10.9.2.5, the modelling of all capital dredging operations demonstrates that there is both a limited temporal and spatial increase in suspended sediments with reference to background sediment concentrations, and a negligible resultant deposition following the cessation of dredging activities. Thus, the magnitude of change as a result of construction activities can be considered **negligible.**

Likewise, given that all sediment will remain within the direct vicinity of Fishguard Harbour and its entrance, all deposition can be considered local sediment and therefore no different to deposition via natural coastal processes within the local marine environment. It is thus of very low importance, of local scale, highly recoverable, and so the receptor can be considered to be of **negligible** sensitivity. Therefore, the resulting effect has been assessed as short-term **negligible** and **not significant**.

Table 10-22: Summary of modelled dredging scenarios

Area	Extent of dispersion	Peak SSC	Average SSCs	Deposition beyond dredge footprint	Peak deposition
A	300 m	2,165 mg/L	280 mg/L reducing to below background within 300 m	<0.50 cm beyond 100 m	2.4 cm
B	300 m	1,415 mg/L	125 mg/L reducing to below background within 300 m	<0.8 cm beyond 50 m	9.6 cm
C					
E	650 m	610 mg/L	35 mg/L reducing ti below background within 70 m	0.15 cm beyond 50 m	2 cm
H	100	2,350 mg/L	175 mg/L reducing to below background within 100m	<0.50 cm beyond 50 m	6 cm
Reclamation Area	300 m	1,450 mg/L	150 mg/L reducing to below background within 200 m	<0.12 cm beyond 50 m	1.5 cm

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 0 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 10-51 to Figure 10-54 illustrate tidal current velocities and directions 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 10-51 to Figure 10-54, that changes to the tidal regime are both highly 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 in the form of rock-filled gabion mattresses which will extend below the rock armour revetment. These measures will maintain the structural integrity of the structure and mitigate the risk of undermining.

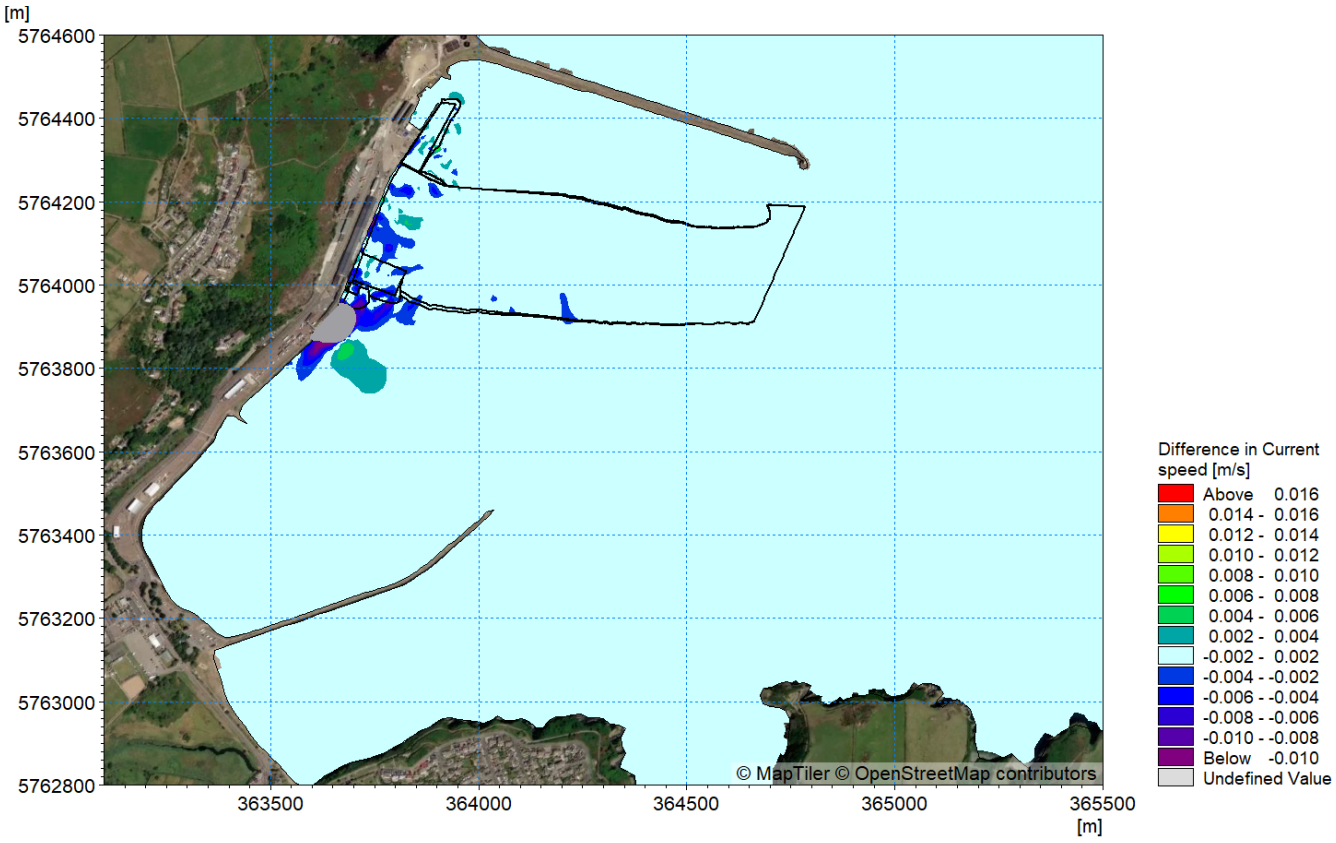

Figure 10-51: Difference in current speed – operational minus baseline – mid flood

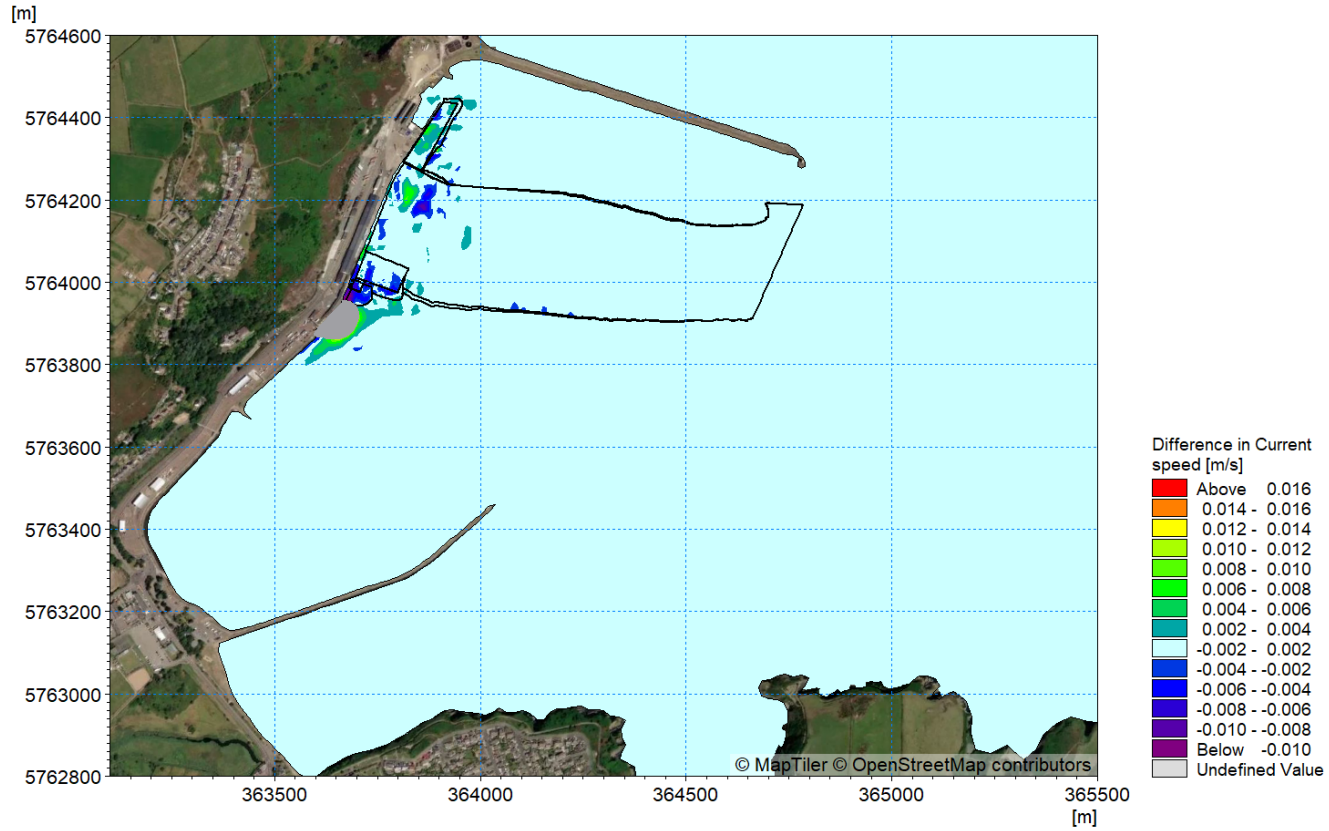

Figure 10-52: Difference in current speed – operational minus baseline – high water

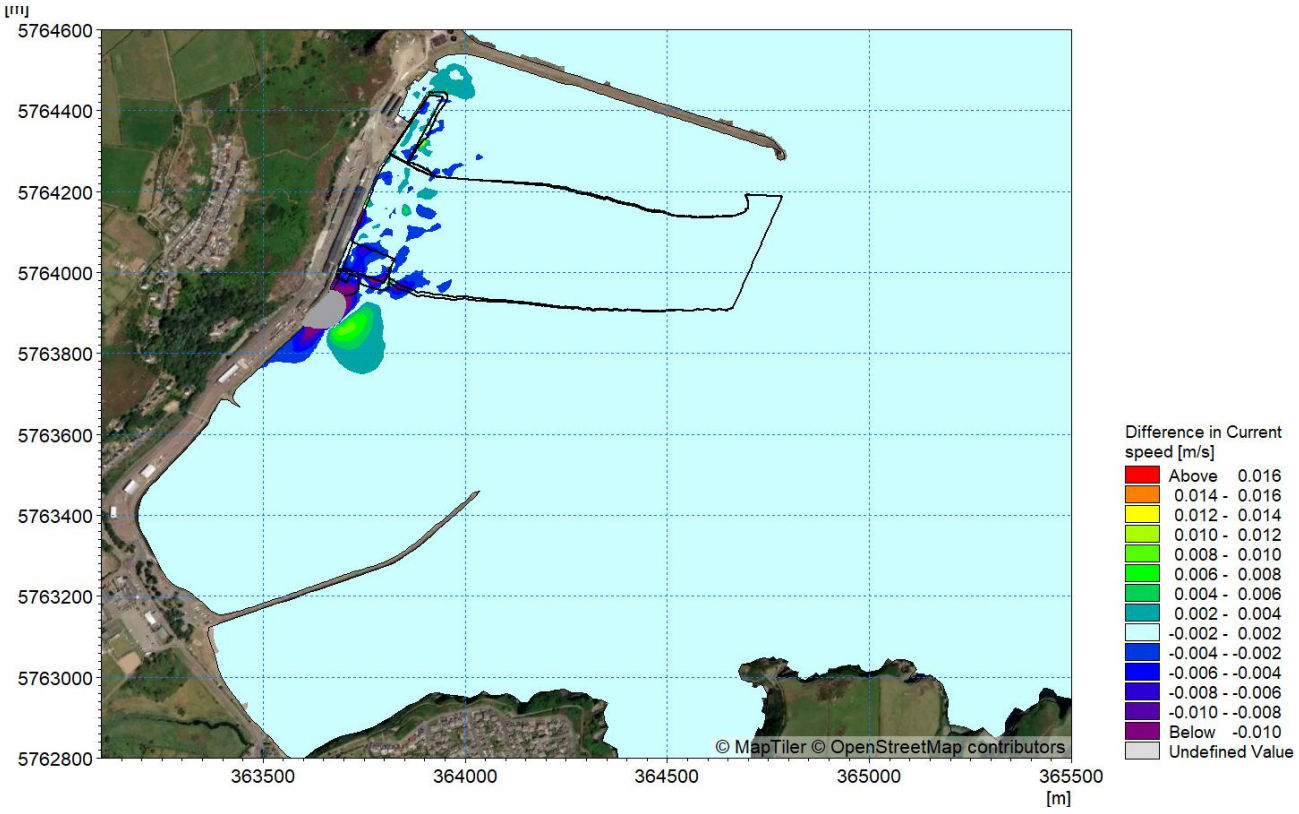

Figure 10-53: Difference in current speed – operational minus baseline – mid ebb

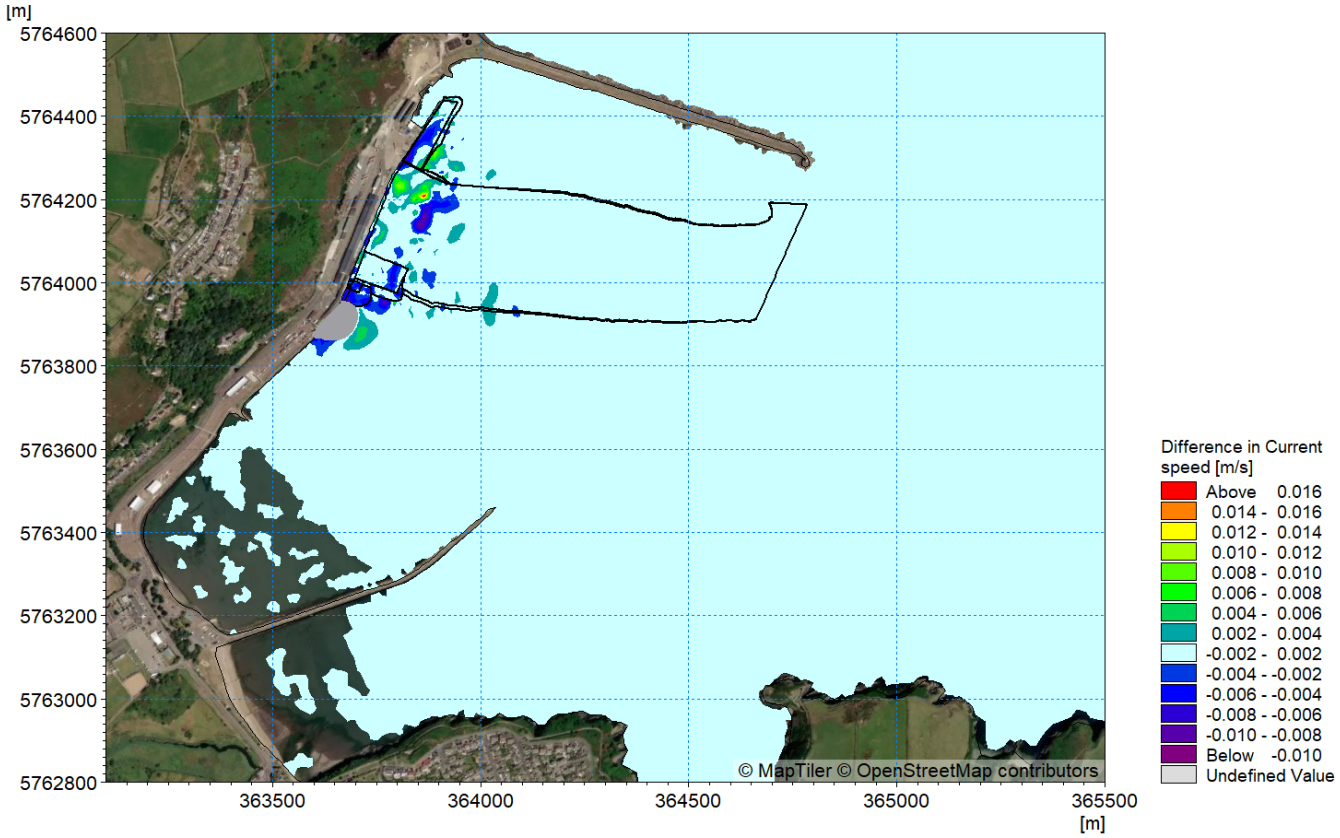

Figure 10-54: Difference in current speed – operational minus baseline – low water

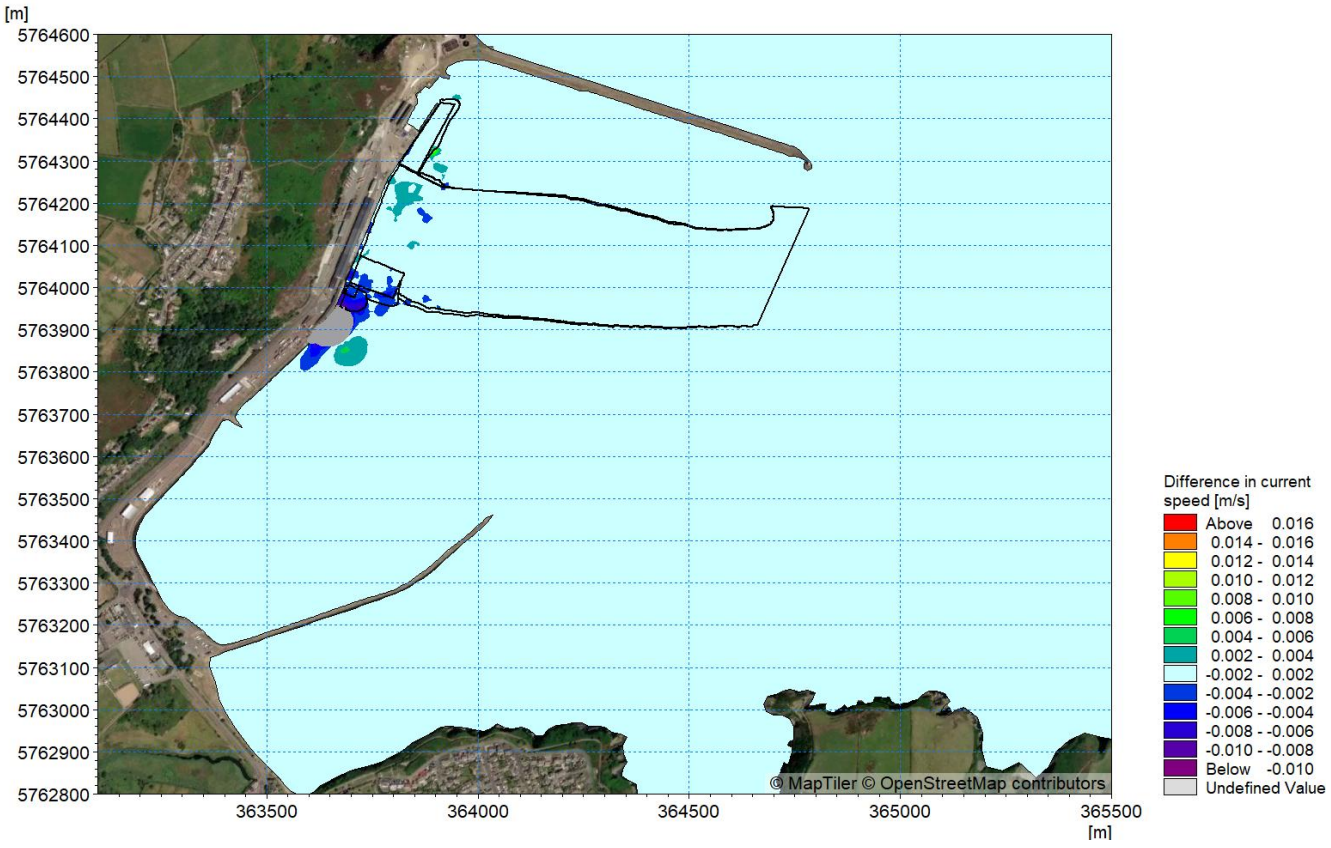

Figure 10-55: Difference in current speed – operational minus baseline – Residual

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. The proposed replacement of the open piled approach ramp with a rockfill reclamation area, complete with wave absorbing revetments, will marginally improve the wave reflections in the immediate area around the linkspan.

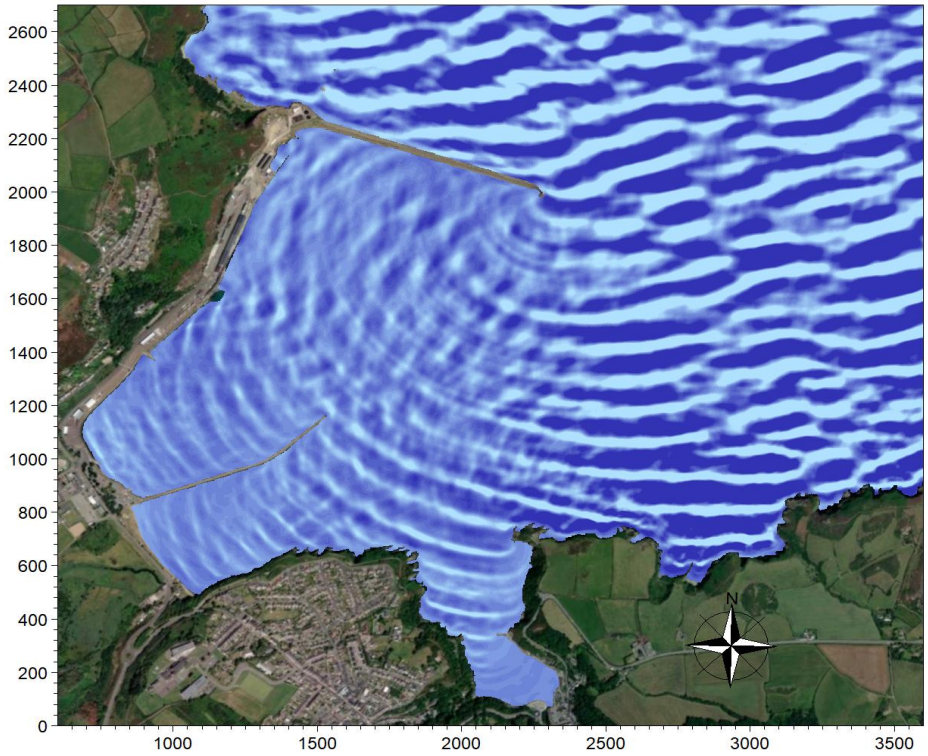

Figure 10-56: Wave disturbance patterns – 1 in 100 year return period storm from 345º N – post construction.

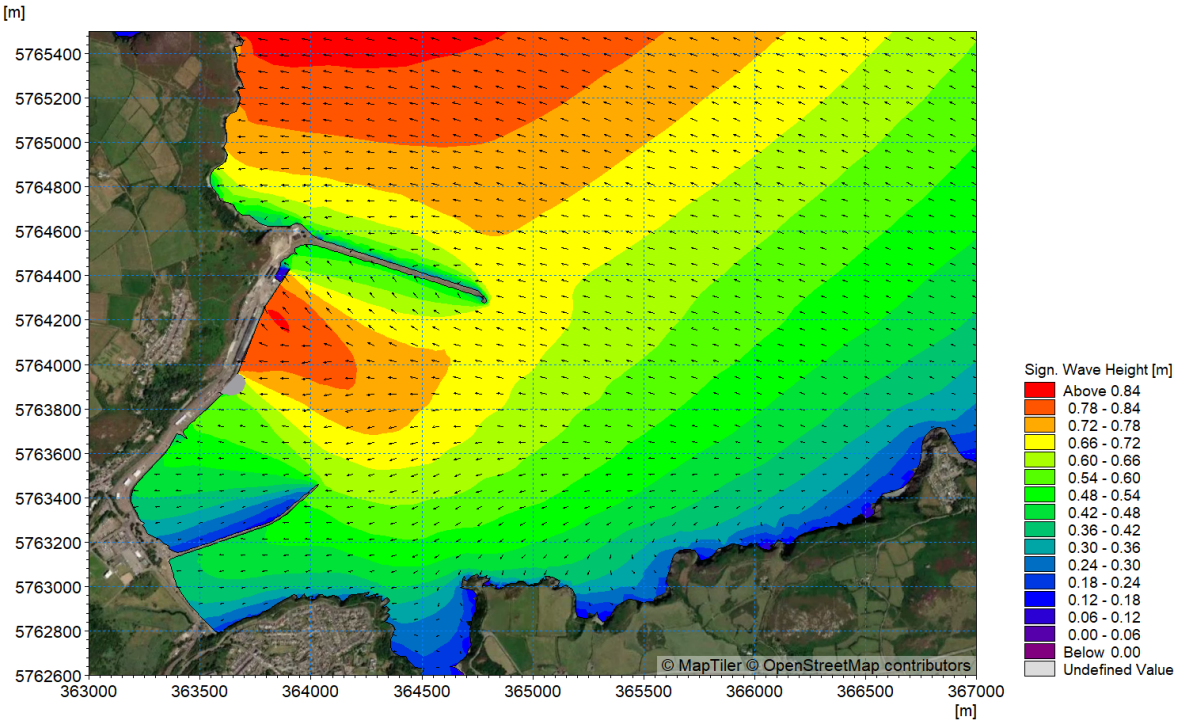

Figure 10-57: Significant wave heights and mean wave direction 1 in 100 year return period storm from 120º N - post construction

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 10-23 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.

Through correspondence with the NRW it was determined that no detailed modelling works/assessment was required to assess dumping of dredged material within the Milford Haven disposal site, given the disproportionality of such works with respect to the scale of disposal (Natural Resources Wales, 2024). This was supported by the shared nature of sediment within Fishguard Harbour and the disposal site, as identified through site investigation. Nevertheless, the developer of this scheme will engage with Milford Haven Port Authority (MHPA) who currently hold a licence for disposal at LU169 to ensure disposal occurs in line with existing conditions and that disposal operations do not overlap.

Table 10-23: Summary of environmental effects, mitigation and monitoring.

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
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

11 REFERENCES

BGS Geoindex Offshore [Online] // British Geological Survey. - 2025. - 2025. - https://mapapps2.bgs.ac.uk/geoindex_offshore/home.html?_ga=2.176133794.1030761242.1744188038-2015070263.1744188038.

Cefas Suspended Sediment Climatologies around the UK [Report]. - 2016.

EMODnet EMODnet Geology [Online] // European Comission. - 2025. - February 2025. - https://emodnet.ec.europa.eu/en/geology.

FUGRO Report on Ground Investigation without Geotechnical Evaluation [Report]. - 2015.

HM Government UK Marine Policy Statement [Report]. - 2011.

In Situ Site Investigation Limited POR-00886 Geotechnical Site Investigation for the Fishguard Linkspan Project [Report]. - 2025.

JNCC MPA Mapper [Online] // JNCC. - 2025. - 2025. - https://jncc.gov.uk/mpa-mapper/.

Mellet C [et al.] Geology of the seabed and shallow subsurface: The Irish Sea. British Geological Survey Comissioned Report CR/15/057 52pp [Report]. - 2015.

Natural Resources Wales Disposal of dredge material from Milford Haven Berths and Channels to LU168 and LU169 Marine Licence number: DML2166v1 [Report]. - 2024.

RPS Fishguard Linkspan Replacement EIA Scoping Report [Report]. - 2024.

UKHO [Online] // Admiralty. - 2025. - 2025. - https://www.admiralty.co.uk/.

Welsh Government Welsh National Marine Plan [Report]. - 2019.

West of Wales Coastal Group Main Document [Online] // West of Wales Coastal Group. - 2011. - 2025. - https://www.grwparfordirolgorllewincymru.cymru/page/smp2/main-document.