MWP

ENVIRONMENTAL IMPACT ASSESSMENT REPORT (EIAR)

Ros an Mhíl Deep Water Quay

Chapter 8: Marine

Department of Agriculture, Food and the Marine

November 2025

Contents

Tables

Figures

Appendices

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8. Marine

8.1 Introduction

This chapter considers the potential effects on the existing marine environment arising from the proposed development. A full description of the proposed development and the associated project elements are provided in Chapter 2 Project Description of this EIAR. The nature and probability of effects on the existing marine environment arising from both the works completed to date and works to be completed have been assessed. The assessment comprises:

- A review of the existing receiving environment for works to be completed in 2025;
- Prediction and characterisation of likely effects;
- Evaluation of significance of effects;
- Review of mitigation measures for completed works; and
- Consideration of mitigation measures for works to be completed, where appropriate.

8.2 Methodology

8.2.1 Legislation and Best Practice Guidelines

The following section sets out the legislative context of the assessment in relation to marine ecology, and the relevant guidelines with further legislation used to inform the preparation and assessment of impacts from the proposed development on marine ecology.

The assessment of likely significant effects upon marine ecology has been made with specific reference to the following identified relevant guidance:

- Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters (Department of Arts, Heritage and the Gaeltacht (DAHG), 2014).
- Guidelines on the information to be contained in Environmental Impact Assessment Reports (Environmental Protection Agency (EPA), 2022).
- Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine version 1.3. (Chartered Institute of Ecology and Environmental Management (CIEEM), 2018).
- Guidelines for the assessment of dredge material for disposal in Irish water (Cronin, *et al*., 2006).
- Marine Evidence-based Sensitivity Assessment (MarESA) – Guidance Manual. Marine Life Information Network (MarLIN). (Tyler-Walters, *et al.*, 2018).
- Marine Mammal Noise Exposure Criteria: Updated Scientific Recommendations for Residual Hearing Effects (Southall, *et al*., 2019).
- Sound Exposure Guidelines for Fishes and Sea Turtles: A Technical Report prepared by American National Standards Institute (ANSI) Accredited Standards Committee S3/SC1 and registered with ANSI (Popper *et al*., 2014).

This chapter has been prepared in the context of the following European, National and Regional Plans and Policies;

- EU Marine Strategy Framework Directive - Directive 2008/56/EC of the European Parliament and of the Council of 17th June 2008 establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive).
- EU Water Framework Directive - Directive 2000/60/EC of the European Parliament and of the Council of 23rd October 2000 establishing a framework for Community action in the field of water policy.
- EU Habitats Directive - Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora.
- EU Birds Directive - Directive 2009/147/EC of the European Parliament and of the Council of 30th November 2009 on the conservation of wild birds.
- Wildlife Acts 1976 – 2023.
- National Marine Planning Framework – Project Ireland 2040.
- National Development Plan 2018-2027.
- National Biodiversity Action Plan 2023 – 2030.
- Galway County Development Plan 2022-2028.
- Galway County Heritage and Biodiversity Plan 2024 – 2030.

Marine Strategy Framework Directive (MSFD) (2008/56/EC)

The Marine Strategy Framework Directive (MSFD) (2008/56/EC) requires Member States to reach good environmental status (GES) in the marine environment by the year 2020 at the latest, by applying an ecosystem-based approach to the management of human activities, while enabling the sustainable use of the marine environment for present and future generations.

At the core of the MSFD is the determination, achievement, and maintenance of Good Environmental Status (GES) according to 11 qualitative condition descriptors which describe the state of the marine environment and anthropogenic pressure on the marine environment. Annex I the Directive sets out these eleven qualitative descriptors which describe what the environment will look like when GES has been achieved.

- **Descriptor 1:** Biodiversity is maintained.
- **Descriptor 2:** Non-indigenous species do not adversely alter ecosystems.
- **Descriptor 3:** Populations of commercial fish and shellfish species are healthy.
- **Descriptor 4:** Food webs ensure long-term abundance and reproduction of species.
- **Descriptor 5:** Eutrophication is reduced.
- **Descriptor 6:** Sea floor integrity ensures the proper functioning of ecosystems.
- **Descriptor 7:** Permanent alteration of hydrographical conditions does not adversely affect ecosystems.
- **Descriptor 8:** Concentrations of contaminants give no pollution effects.
- **Descriptor 9:** Contaminants in seafood are at safe levels.
- **Descriptor 10:** Marine litter does not cause harm.
- **Descriptor 11:** Introduction of energy (including underwater noise) does not adversely affect the ecosystem.

Water Framework Directive (WFD) (2000/60/EC)

The Water Framework Directive (WFD) (2000/60/EC) establishes an integrated and coordinated framework for the sustainable management of water. Under the WFD, the island of Ireland has been divided into a number of River Basin Districts (RBD) in order to facilitate the effective implementation of the WFD objectives. The proposed development site is located within the Irish River Basin District (IRBD) in Hydrometric Area No. 31.

The strategies and objectives of the WFD in Ireland have influenced a range of national legislation and regulations, since its inception in the year 2000.

The WFD (1st Cycle) was transposed into national legislation in 2003, with the aims to:

- Prevent deterioration of status for surface and groundwaters and the protection, enhancement and restoration of all water bodies,
- Achieve good ecological status and good chemical status for surface waters and good chemical and good quantitative status for groundwaters,
- Progressively reduce pollution of priority substances and phase-out of priority hazardous substances in surface waters and prevention and limitation of input of pollutants in groundwaters,
- Reverse any significant upward trend of pollutants in groundwaters; and
- Achieve standards and objectives set for protected areas in Community legislation.

The objective for each surface water and groundwater body is to prevent deterioration, maintain high and good status waters, restore waters to at least good status where necessary, and ensure that the requirements of associated protected areas are met, tying in with the goal of Good Environmental Status under the Marine Strategy Framework Directive.

Birds Directive (2009/147/EC) and Habitats Directive (92/43/EEC)

The Birds Directive (2009/147/EC) seeks to conserve all wild birds in the EU by setting out rules for their protection, management and control. The Directive covers birds, their eggs, nests and habitats. Member states must take action to maintain or restore the populations of endangered species to a level, which is in line with ecological, scientific and cultural requirements, while taking into account economic and recreational needs. The Birds Directive requires Member States to create special protected areas (SPAs) for the protection of threatened species and migratory birds, with conditions favourable to their survival, situated in the birds' natural area of distribution.

The Habitats Directive (92/43/EEC) The Habitats Directive contributes to ensuring biodiversity in the European Union by conserving natural habitats and wild fauna and flora species. Annex I and Annex II of the Habitats Directive list the types of habitats (Annex I) and species of flora and fauna (Annex II) require the designation of special areas of conservation (SACs). Under Annex IV of the Directive, Member States must establish a system of strict protection for listed species.

The Habitats Directive also sets up the 'Natura 2000' network, the largest ecological network in the world. Natura 2000 comprises special areas of conservation (SACs) designated by EU countries under this directive and special protection areas (SPAs) classified under the Birds Directive.

Wildlife Acts (1976 – 2023)

The Wildlife Act, 1976, is the principal national legislation providing for the protection of wildlife and the control of some activities that may adversely affect wildlife. The aims of the Wildlife Act, 1976, are to provide for the protection and conservation of wild fauna and flora, and to conserve a representative sample of important ecosystems.

The Wildlife (Amendment) Act 2010 broadened the scope of the Wildlife Acts to include aquatic species excluded from the 1976 Act, provided a mechanism to give statutory protection to natural heritage areas (NHAs), strengthened protection for SACs, and gave statutory underpinning to Ireland's commitments under the UN Convention on Biological Diversity (CBD).

The Wildlife (Amendment) Act 2023 put the National Biodiversity Action Plan on a statutory footing and to place a biodiversity duty on public bodies.

Currently all bird species, 23 other animal species or groups of species and 157 species of flora are afforded protected status under the Wildlife Acts.

Convention on Biological Diversity (CBD)

The Convention on Biological Diversity (CBD) sets out commitments for maintaining the world's ecosystems in parallel with economic development. The Convention establishes three main goals: the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of the benefits from the use of genetic resources. Ireland is a signatory to the CBD and as such undertook to promote the conservation and sustainable use of biological diversity.

Bonn Convention

The Convention on the Conservation of Migratory Species of Wild Animals (also known as CMS or The Bonn Convention) aims to conserve terrestrial, marine and avian migratory species throughout their range. It is an intergovernmental treaty, concluded under the aegis of the United Nations Environment Programme, concerned with the conservation of wildlife and habitats on a global scale. The main pieces of legislation to ensure that the provisions of the Bonn convention are applied include the Birds Directive and the Habitats Directive.

Bern Convention

The European Community is a contracting party to the Convention on the conservation of European wildlife and natural habitats (known as the Bern Convention). The aim of the Bern Convention is to ensure the conservation of European wildlife and natural habitats by means of cooperation between member States. The Bern Convention co-ordinates the action of European States in adopting common standards and policies for the sustainable use of biological diversity, thus contributing to the improvement of the quality of life of Europeans and the promotion of sustainable development.

OSPAR Convention

The 1992 OSPAR Convention is the current instrument guiding international cooperation on the protection of the marine environment of the North-East Atlantic. It combined and up-dated the 1972 Oslo Convention on dumping waste at sea and the 1974 Paris Convention on land-based sources of marine pollution. With the adoption of Annex V in 1998, the convention embraced a more holistic responsibility for environmental protection in the region, including its biodiversity.

The OSPAR Commission identifies species and habitats in need of protection and has developed the OSPAR List of Threatened and/or Declining Species and Habitats.

8.2.2 Definition of Study Area

Following a desktop review and field survey, the study area was defined as the full extent of Cashla Bay from Cashla Point to Clynagh Bay encompassed by the 2km National Grids; L92F, L92K, L92L-N, and L92Q-T, and surrounding coastal waters encompassed by the 10km National Grid L91. This broad area of study was identified in recognition of the fact that marine species can be highly mobile. The study area also encompasses all known seal haul-out sites in the bay. The zone of impact of certain pressures can be extensive, for example, suspended sediments can be transported over extended distances due to tidal action, while underwater noise from construction projects can be above ambient noise levels several kilometres from the noise source.

The baseline environment prior to January 2023 was assessed following a comprehensive desk-based assessment and field survey program.

The proposed development does not take place in any Natura 2000 site; however, several SACs and SPAs have been identified within 15km of the development, which could potentially be affected by the proposed development, these are presented in **Table 8-1** below. In recognition of the highly mobile nature of marine mammals, a further six SACs with marine mammals as Qualifying Interests (QIs) have been within 50km of the development, which could potentially be affected by the proposed development, these are presented in **Table 8-2** below.

Table 8-1: Designated Sites within 15km of the Proposed Development

Site Name	Site Code	Distance to Project Area (km)	Qualifying Interests (* denotes a priority habitat)
Connemara Bog Complex SAC	2034	2.22	**Habitats** Coastal lagoons* Reefs Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*) Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or *Isoeto-Nanojuncetea* Natural dystrophic lakes and ponds Water courses of plain to montane levels with the *Ranunculion fluitantis* and Callitricho-Batrachion vegetation Northern Atlantic wet heaths with *Erica tetralix* European dry heaths Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) Blanket bogs (* if active bog) Transition mires and quaking bogs Depressions on peat substrates of the Rhynchosporion Alkaline fens Old sessile oak woods with Ilex and Blechnum in the British Isles **Species** Marsh Fritillary (*Euphydryas aurinia*) Salmon (*Salmo salar*) Otter (*Lutra lutra*) Slender Naiad (*Najas flexilis*)
Kilkieran Bay and Islands SAC	2111	2.58	**Habitats** Mudflats and sandflats not covered by seawater at low tide Coastal lagoons* Large shallow inlets and bays Reefs Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) Mediterranean salt meadows (*Juncetalia maritimi*) Machairs (* in Ireland) Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or *Isoeto-Nanojuncetea* Lowland hay meadows (*Alopecurus pratensis, Sanguisorba*

Site Name	Site Code	Distance to Project Area (km)	Qualifying Interests (* denotes a priority habitat)
			officinalis) **Species** Harbour Porpoise (*Phocoena phocoena*) Otter (*Lutra lutra*) Harbour Seal (*Phoca vitulina*) Slender Naiad *(Najas flexilis*)
Inishmore Island SAC	213	12.90	**Habitats** Coastal lagoons* Reefs Perennial vegetation of stony banks Vegetated sea cliffs of the Atlantic and Baltic coasts Embryonic shifting dunes Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) Fixed coastal dunes with herbaceous vegetation (grey dunes)* Dunes with Salix repens ssp. argentea (*Salicion arenariae*) Humid dune slacks Machairs (* in Ireland) European dry heaths Alpine and Boreal heaths Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites) Lowland hay meadows (*Alopecurus pratensis, Sanguisorba officinalis*) Limestone pavements* Submerged or partially submerged sea caves **Species** Narrow-mouthed Whorl Snail (*Vertigo angustior*) Harbour Porpoise (*Phocoena phocoena*)
Connemara Bog Complex SPA	4181	5.87	**Birds** Cormorant (*Phalacrocorax carbo*) Merlin (*Falco columbarius*) Golden Plover (*Pluvialis apricaria*) Common Gull (*Larus canus*)
Slyne Head to Ardmore Point Islands SPA	4159	14.32	**Birds** Barnacle Goose (*Branta leucopsis*) Sandwich Tern (*Sterna sandvicensis*) Arctic Tern (*Sterna paradisaea*) Little Tern (*Sterna albifrons*)

Table 8-2: Designated Sites within 50km of the Proposed Development

Site Name	Site Code	Distance to Project Area (km)	Qualifying Interests
Kilkieran Bay and Islands SAC	2111	2.60	Harbour Porpoise (*Phocoena phocoena*) Harbour Seal (*Phoca vitulina*)
Inishmore Island SAC	213	12.90	Harbour Porpoise (*Phocoena phocoena*)
Galway Bay Complex SAC	268	27.62	Harbour Seal (*Phoca vitulina*)
Slyne Head Peninsula SAC	2047	37.09	Common Bottlenose Dolphin (Tursiops truncatus)
West Connacht Coast SAC	2998	42.85	Common Bottlenose Dolphin (*Tursiops truncatus*) Harbour Porpoise (*Phocoena phocoena*)
Slyne Head Islands SAC	328	42.90	Common Bottlenose Dolphin (*Tursiops truncatus*) Grey Seal (*Halichoerus grypus*)

8.2.3 Desktop Study

A comprehensive desk-based assessment of the receiving environment was conducted by Emerald Marine Environmental Consultancy. The desktop assessment was sourced from published references, datasets, and resources. A selection of key resources is provided below:

- Ireland's Marine Atlas;
- ICES Database on Trawl Surveys (DATRAS);
- Inland Fisheries Ireland, National Shore Marks;
- Irish Whale & Dolphin Group, Casual Cetacean Sightings Database;
- Irish Whale & Dolphin Group, IWDG Chondrichthyan Database;
- National Biodiversity Data Centre;
- National Parks and Wildlife Service, Seal Database;
- National Parks and Wildlife Service, Ireland Red List No. 5: Amphibians, Reptiles & Freshwater Fish; and
- Aquafact, 2025. Ros an Mhíl Harbour Benthic Survey 2025 (see **Appendix 8A**).

8.2.4 Field Surveys

Aquafact completed macrofaunal and sediment analysis surveys at Ros an Mhíl Harbour in June 2025 using the same methodology as used in 2016 and 2017 (see **Appendix 8A,** Aquafact Marine Survey Report 2025).

The primary objective of the survey was to characterise the benthic environment in terms of biological community structure and sediment composition. To achieve this, a series of grab samples were collected and subjected to macrofaunal analysis, granulometry, and measurement of metal concentrations and radioactivity concentrations of sediments that could be impacted by the development. The impacts of the proposed development activities on the receiving environment were assessed.

8.2.4.1 Drop Down Video Survey

A drop-down video (DDV) survey was conducted to assess the suitability of the subtidal substrate for a benthic faunal and sediment contaminants survey. The video survey was carried out on the 30th of June 2025 from the RPS Marine Vessel, *MV Madelen*, the methodology used was consistent with methods used during the 2017 drop-down video survey. A number of grab stations were moved as a result of the drop-down video survey due to unsuitable substrate or inaccessibility due to tidal conditions on the day.

The locations of drop-down survey stations are presented in **Table 8-3** and **Figure 8-1** below.

Table 8-3: Drop-down Video Stations

Station	Latitude	Longitude	Station	Latitude	Longitude
DDV01	53.2636689	-9.5724329	DDV11	53.25929423	-9.5732733
DDV02	53.2617512	-9.57207544	DDV12	53.2617625	-9.5702923
DDV03	53.26607618	-9.57430018	DDV13	53.2643502	-9.5702387
DDV04	53.2667385	-9.5755104	DDV14	53.264012	-9.5715212
DDV05	53.26688722	-9.57606656	DDV15	53.26726234	-9.56880039
DDV06	53.26856217	-9.577064992	DDV16	53.26711892	-9.56685232
DDV07	53.267833	-9.5755278	DDV17	53.26619052	-9.56993918
DDV08	53.26588575	-9.57135968	DDV18	53.26710767	-9.57152269
DDV09	53.26289786	-9.57011979	DDV19	53.26347022	-9.569893113
DDV10	53.2615046	-9.5726143	DDV20	53.26354062	-9.57162206

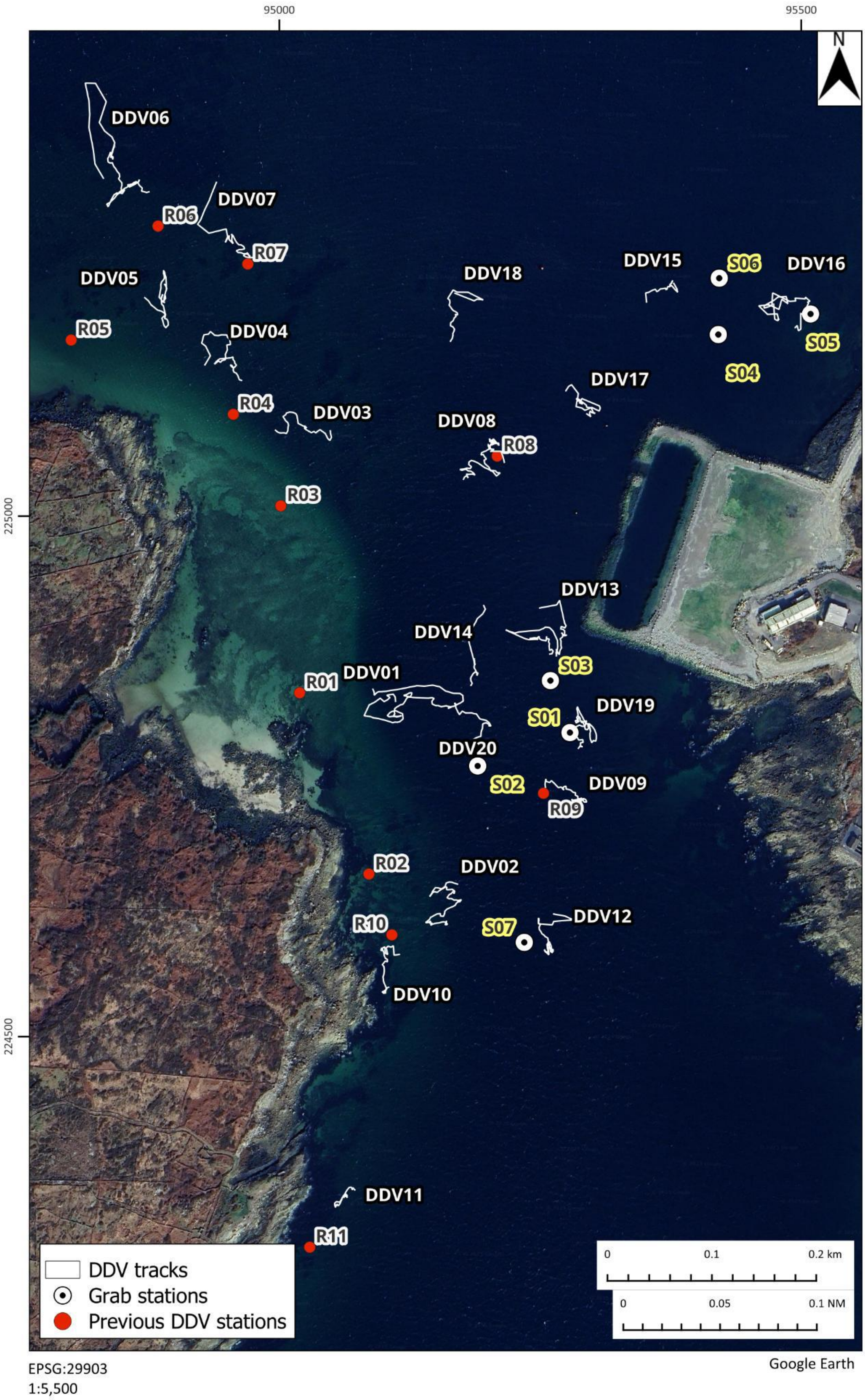

Figure 8-1: Location of Drop-down Video Tracks Conducted During the Survey

8.2.4.2 Benthic Grab Survey

In order to carry out the subtidal benthic assessment of the development area, Aquafact sampled a total of 7 No. stations. Sampling took place on the 30th June 2025 from RPS Marine Vessel, *MV Madelen* (see Appendix 8A, Aquafact Marine Survey Report 2025). The potential grab stations were confirmed and assessed for suitability for grab sampling during the drop-down video surveys on the same day, in accordance with Aquafact's standard operating procedure (SOP) for benthic sampling using drop-down video survey. The detection of unsuitable habitat for grab sampling and presence of reclaimed land from previous works necessitated the relocation of grab stations relative to the locations previously sampled. The final location of the stations sampled in 2025 are presented in Table 8-4 below. Figure 8-2 below shows the relative position of grab stations sampled in 2025 and 2016.

Table 8-4: Subtidal Grab Station Locations and Type of Sediment Analysis Conducted

Station	Latitude	Longitude	Type of Sediment Analysis
Station 1	53.26338833	-9.57012	Fauna, Sed. Chem. & Radiology
Station 2	53.26308333	-9.571433333	Fauna, Sed. Chem. & Radiology
Station 3	53.26383333	-9.570416667	Fauna & Sed. Chem.
Station 4	53.26685	-9.568116667	Fauna & Sed. Chem.
Station 5	53.267045	-9.5668	Fauna & Sed. Chem.
Station 6	53.26733667	-9.568121667	Fauna & Sed. Chem.
Station 7	53.26157	-9.570708333	Fauna & Sed. Chem.

AII samples were taken using a 0.1m2 weighted Day grab sampler operated by winch from the vessel MV Madelen. At each station, three grab samples were collected, one for sediment Particle Size Analysis (PSA) and organic carbon, and two for faunal analysis.

Coordinate Reference System: EPSG:3857
Map Scale: 1:10,000

Figure 8-2: Map showing DDV Stations (2025), Previous Grab Stations (2016) and new Grab Stations (2025)

8.2.4.2.1 Benthic Fauna Analysis

Aquafact followed standard in-house SOPs for faunal sampling and analysis, ensuring comparability of results with the survey previously undertaken at the site. Additionally, Aquafact follows the Northeast Atlantic Marine Biological Analytical Quality Control (NMBAQC) standard for benthic sampling and analysis (Worsfold et al., 2010).

Uni- and multi-variate statistical analysis of the faunal data was undertaken using PRIMER v.6 (Plymouth Routines in Ecological Research). Epifaunal and colonial fauna was removed from the dataset prior to analysis.

8.2.4.2.2 Particle Size Analysis

Particle size distribution was carried out by the accredited laboratory SOCOTECH UK Ltd. using traditional granulometric techniques. Sediment was classified into size classes by sediment particle size range (see **Table 8-4** above) using sieves, which corresponded to the range of particle sizes.

8.2.4.2.3 Organic Carbon

All samples were tested for total organic carbon using the Loss on Ignition method. All testing was carried out by SOCOTECH UK Ltd. following standard methodology.

8.3 Baseline Characterisation

The baseline characterisation was reassessed in June 2025. A comprehensive desk-based assessment and field survey program was undertaken to supplement data previously gathered for the characterisation of the environment prior to January 2023.

8.3.1 Benthic Communities

The littoral zone within this study area comprises of boulders and is relatively sheltered to wave action. The upper shore consists of a narrow band of *Pelvetia canaliculata* with the spiral wrack *Fucus spiralis* below it. In parts, barren rock or yellow and grey lichens dominate the upper shore. The mid-shore is dominated by dense knotted wrack *Ascophyllum nodosum*, which supports the epiphytic algae *Vertebrata lanosa*. The green algae *Cladophora rupestris* is present on the rocks below the *A. nodosum* zone. Within the *A. nodosum* zone, raised areas of bedrock are colonised by barnacles and limpets. A narrow band of the serrated wrack *Fucus serratus* is present below the A. nodosum zone and below that kelp *Laminaria digitata* is present in the sublittoral fringe.

Beyond the *L. digitata* zone, a band of sheltered infralittoral rock (SIR) is present which is dominated by sugar kelp *L. saccharina*. The main channel is predominantly coarse gravel and sand with decaying red and green seaweeds with tunicates on them and anemones buried in the sand and the starfish *Asterias rubens* on the substrata. The pinnate sea pen *Virgularia mirabilis* was also recorded from the area. There is also a patch of circalittoral muds in the centre of the channel.

The western margin of the channel is mainly dominated by a mixed substratum with *L. saccharina* and mixed filamentous algae (SS.SMp.KSwSS.SlatR). There are also patches of sandy gravel dominated by seagrass *Zostera marina* along this western margin (SS.SMp.SSgr.Zmar). The Zostera beds in the southern part of the western margin are extensive whereas the beds in the northern part are quite sparse.

Aquafact re-surveyed the study area in June 2025 to reconfirm the habitats and communities present and the results of this survey are presented in the following sections.

8.3.1.1 Benthic Fauna

Taxonomic identification of benthic fauna across all seven subtidal grab stations surveyed in the vicinity of the Ros an Mhíl Harbour yielded a total count of 255 taxa comprising 6,052 individuals ascribed to nine phyla. Of the 225 taxa identified, 155 were identified to species level. The remaining 70 taxa could not be identified to species level due to life stage (juveniles) or damage.

Of the 255 taxa recorded (225 infaunal taxa infauna and 33 epifaunal or colonial taxa), 1 was a foraminiferan, 2 were poriferans (sponges), 3 were cnidarians (anemones, soft-corals), 3 were nemertean (ribbon worm), 1 was a nematode (round worm), 112 were annelids (segmented worms), 63 were arthropods (crabs, shrimps, insects *etc*.), 52 were molluscs (mussels, cockles, snails *etc.*), 7 were echinoderms (brittle stars, sea urchins *etc.*), 3 were ascidians (sea squirts), 7 were bryozoans (moss animals), and 1 was a phoronid (horse shoe worm).

Univariate statistical analyses were carried out on the station-by-station faunal data to assess species richness, evenness and diversity at each of the seven stations sampled.

The same dataset was used to for the multivariate analyses which revealed three statistically significant groupings between the seven stations. A clear divide (66.39% dissimilarity) was observed between Groups A & B which had a gravelly muddy sand substrate and Group C which had a higher silt content.

Group A (Station 2) and Group B (Stations 1, 3 and 7) can be classified as exhibiting many of the characteristics of the JNCC biotope 'SS.SCS.CCS.MedLumVen *Mediomastus fragilis*, *Lumbrineris* spp. and venerid bivalves in circalittoral coarse sand or gravel' (EUNIS code MC3212) (Tillin & Watson, 2024).

Group C (Stations 4, 5 and 6) can be classified as exhibiting many of the characteristics of the JNCC biotope 'SS.SMu.ISaMu.MelMagThy *Melinna palmata* with *Magelona* spp. and *Thyasira* spp. in infralittoral sandy mud' (EUNIS code MB6244) (De-Bastos & Watson, 2023).

The different biotopes identified from the faunal grabs within the vicinity of Ros an Mhíl Harbour are shown in **Figure 8-3**.

The Drop-down video (DDV) survey identified areas suitable for grab survey (for fauna and sediment contaminants) as well as identifying locations of potential reef habitat. Two main broadscale habitats, 'SS.SMx.CMx - Circalittoral mixed sediment' and 'SS.SMp - Sublittoral macrophyte-dominated communities on sediments', were identified from the DDV survey. Two main biotopes were also identified from the DDV survey, these were characterised as JNCC biotopes 'SS.SMp.SSgr.Zmar - *Zostera marina/angustifolia* beds on lower shore or infralittoral clean or muddy sand' (EUNIS: MB5223) (d'Avack, *et al.*, 2024) and 'SS.SMx.CMx.FluHyd - *Flustra foliacea* and *Hydrallmania falcata* on tide-swept circalittoral mixed sediment' (EUNIS code MC4214) (Readman & Watson, 2024). No reef system was identified during the survey**. Figure 8-4** and **Figure 8-5** below show the habitats and biotopes identified during the DDV survey.

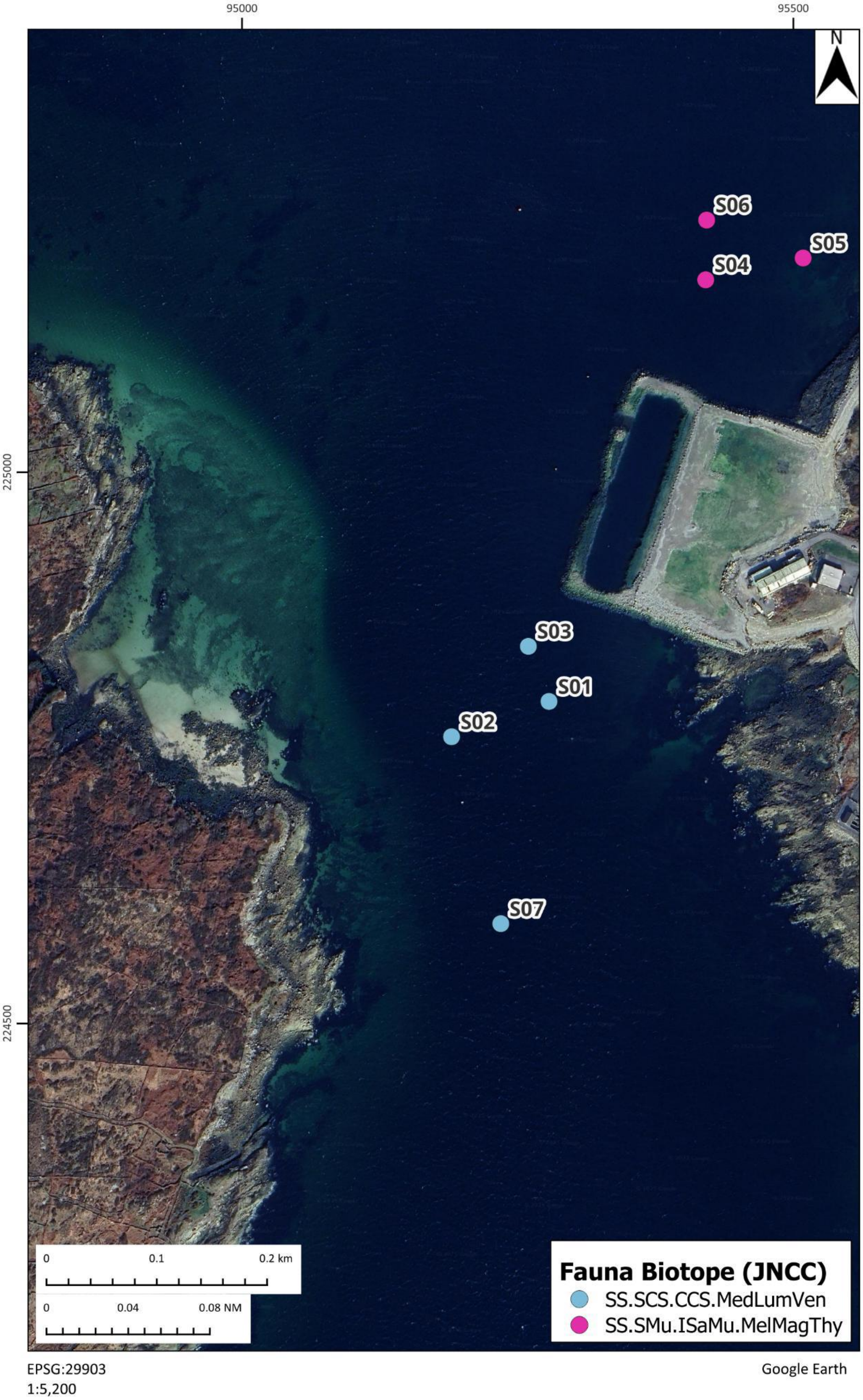

Figure 8-3: Biotopes Classification Based on Infauna Species Identified at Sample Locations

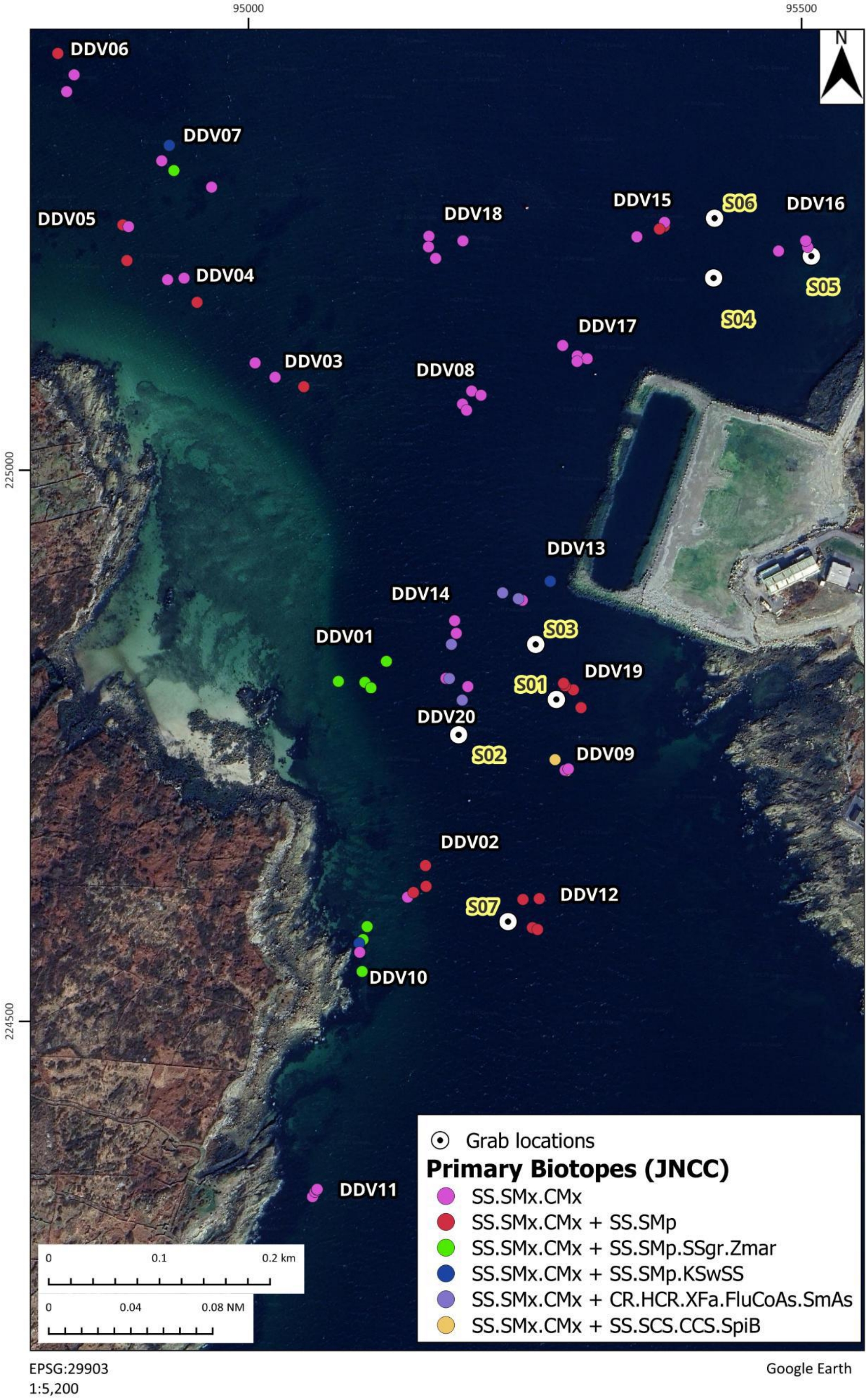

Figure 8-4: Identification of Biotopes Based on Drop-Down Video Survey

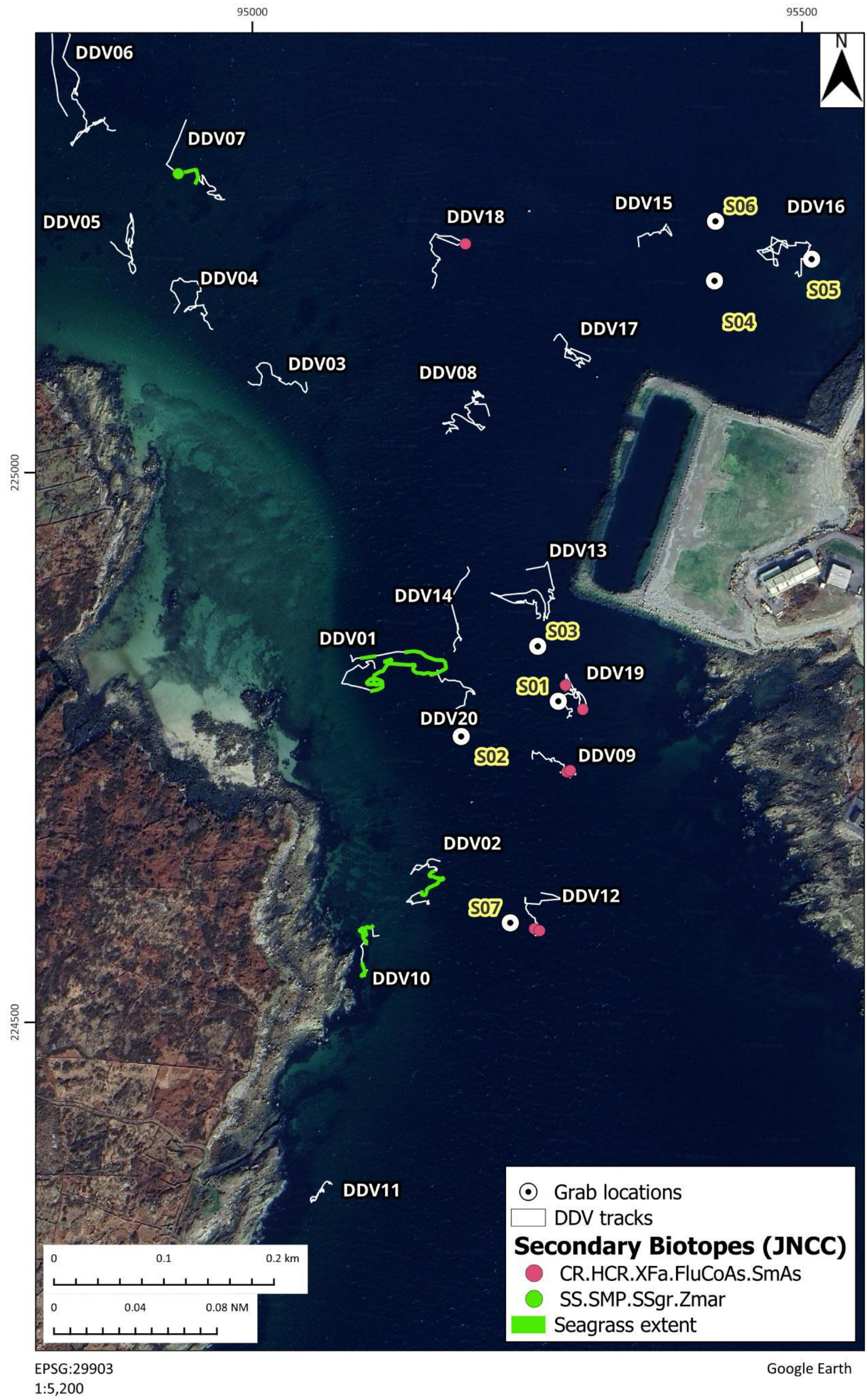

Figure 8-5: Identification of Secondary Biotopes Identified by Drop-Down Video Survey

8.3.2 Sediment Characteristics

Granulometry results for the sediment composition in percentages for gravel (>2 mm), sand (63-2000 µm), and silt (<63 µm) are shown in **Table 8-5**. Gravel percentage composition ranged from 5.50 % (Station 6) to 21.71 % (Station 3). Sand percentage composition ranged from 27.49 % (Station 6) to 69.70 % (Station 3). Silt percentage composition ranged from 8.59 % (Station 3) to 67.0 % (Station 6). Sediment particles varied between gravelly muddy sand to gravelly mud (see **Table 8-5**).

Table 8-5: Sediment Characteristics and Folk (1954) Classification of Each Station

Stations	% Gravel (>2 mm)	% Sand (63-2000 µm)	% Mud (<63 µm)	Folk (1954)
Station 1	10.22%	63.44%	26.33%	Gravelly Muddy Sand
Station 2	12.25%	69.18%	18.56%	Gravelly Muddy Sand
Station 3	21.71%	69.70%	8.59%	Gravelly Muddy Sand
Station 4	11.65%	31.76%	56.59%	Gravelly Mud
Station 5	7.57%	59.94%	32.49%	Gravelly Muddy Sand
Station 6	5.50%	27.49%	67.00%	Gravelly Mud
Station 7	12.36%	65.82%	21.82%	Gravelly Muddy Sand

8.3.3 Sediment Physio-chemistry

The results of physio-chemical analysis of the parameters; moisture content, sediment density, total organic carbon and carbonate, are presented in **Table 8-6** below.

Table 8-6: Physio-chemical Results of Each Station

Station	Total Moisture @120°C (%)	Total Solids	Gravel (>2mm) (%)	Sand (63-2000 µm) (%)	Silt (<63 µm) (%)	Particle Density mg/m3	TOC (%m/m)	Carbonate Equivalent (% CO3) (%m/m)
Station 1	47.2	52.8	10.22	63.44	26.33	2.69	1.46	40.0
Station 2	42.3	57.7	12.25	69.18	18.56	2.68	1.50	41.5
Station 3	45.2	54.8	21.71	69.70	8.59	2.75	1.08	41.0
Station 4	53.1	46.9	11.65	31.76	56.59	2.57	2.76	32.3
Station 5	44.7	55.3	7.57	59.94	32.49	2.67	2.14	31.8

Station	Total Moisture @120°C (%)	Total Solids	Gravel (>2mm) (%)	Sand (63-2000 µm) (%)	Silt (<63 µm) (%)	Particle Density mg/m3	TOC (%m/m)	Carbonate Equivalent (% CO3) (%m/m)
Station 6	68.6	31.4	5.50	27.49	67.00	2.54	4.47	22.3
Station 7	39.7	60.3	12.36	65.82	21.82	2.68	1.36	42.0

All sediments tested for contaminants were below the lower and upper-level guidance values outlined in Cronin *et al*. (2006). The following tables present the guidance values and results of measured levels of trace metals (**Table 8-7**), organochlorides and polychlorinated biphenyls (PCBs) (**Table 8-8**), total extractable hydrocarbon (**Table 8-9**), tributylin (TBT) and dibutylin (DBT) (**Table 8-10**), and polycyclic aromatic hydrocarbons (**Table 8-11**).

Table 8-7: Trace Metals Results and Guidance Values (Cronin, et al., 2006; 2019)

Determinant mg/kg	Lower Level	Upper Level	St. 1	St. 2	St. 3	St. 4	St. 5	St. 6	St. 7
Al	N/A	N/A	15900	12500	16700	19300	19800	28500	14600
Cd	0.7	4.2	0.14	0.08	0.08	0.35	0.33	0.35	0.08
Hg	0.2	0.7	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
As	20	70	8.4	9.1	17.9	9.8	12.1	13.5	9.6
Cr	120	370	15.4	13.8	21.7	24.3	28.2	39.2	13.2
Cu	40	110	7.1	3.3	2.5	7.7	8.1	12.2	3.4
Pb	60	218	18.3	11.3	30.4	15.8	19.2	25.6	10.4
Ni	40	60	7.3	5.9	4.1	12.4	13.5	18.2	5.3
Zn	160	410	29.6	23.2	28.1	52.9	48.4	59.1	21.8

Table 8-8: Organochlorides and PCBs Results and Guidance Values (Cronin, et al., 2006)

Determinant µg/kg	Lower Level	Upper Level	St. 1	St. 2	St. 3	St. 4	St. 5	St. 6	St. 7
AHCH	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BHCH	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
GHCH	0.3	1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
DIELDRIN	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

Determinant µg/kg	Lower Level	Upper Level	St. 1	St. 2	St. 3	St. 4	St. 5	St. 6	St. 7
HCB	0.3	1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
DDE	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
DDT	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
DDD	N/A	N/A	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
PCB28	1	180	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
PCB52	1	180	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
PCB101	1	180	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
PCB118	1	180	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
PCB138	1	180	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
PCB153	1	180	<0.08	<0.08	<0.08	<0.08	<0.08	0.09	<0.08
PCB180	1	180	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08

Table 8-9: Total Extractable Hydrocarbon Results and Guidance Values (Cronin, et al., 2006)

Determinant g/kg	Lower Level	Upper Level	St. 1	St. 2	St. 3	St. 4	St. 5	St. 6	St. 7
TEH	1.0	N/A	0.0463	0.0135	0.0231	0.0626	0.0594	0.178	0.0368

Table 8-10: TBT and DBT Results and Guidance Values (Cronin, et al., 2006)

Determinant mg/kg	Lower Level	Upper Level	St. 1	St. 2	St. 3	St. 4	St. 5	St. 6	St. 7
DBT	N/A	N/A	<5	<5	<5	<5	<5	<5	<5
TBT	N/A	N/A	<5	<5	<5	<5	<5	<5	<5

Table 8-11: Polycyclic Aromatic Hydrocarbons Results and Guidance Values (Cronin, et al., 2006)

Determinant µg/kg	Lower Level	Upper Level	St. 1	St. 2	St. 3	St. 4	St. 5	St. 6	St. 7
Acenaphthene	N/A	N/A	<5	<5	<5	<5	<5	<5	<5

Determinant µg/kg	Lower Level	Upper Level	St. 1	St. 2	St. 3	St. 4	St. 5	St. 6	St. 7
Acenaphthylene	N/A	N/A	<5	<5	<5	<5	<5	<5	<5
Anthracene	N/A	N/A	<5	<5	<5	<5	<5	<5	<5
Benzo (a) anthracene	N/A	N/A	25.8	<5	<5	<5	<5	<5	<5
Benzo (a) pyrene	N/A	N/A	18.2	<5	<5	<5	<5	<5	<5
Benzo (b) fluoranthene	N/A	N/A	15.7	<5	<5	11.1	<5	<5	<5
Benzo (ghi) perylene	N/A	N/A	<5	<5	<5	<5	<5	<5	<5
Benzo (k) fluoranthene ug kg-1	N/A	N/A	19.2	<5	<5	<5	<5	20.3	<5
Chrysene	N/A	N/A	25.8	<5	<5	<5	<5	16.5	<5
Dibenz (a,h) anthracene	N/A	N/A	<5	<5	<5	<5	<5	<5	<5
Fluorene	N/A	N/A	<5	<5	<5	<5	<5	<5	<5
Fluoranthene	N/A	N/A	38.8	<5	<5	17.0	<5	29.4	<5
Indeno (1,2,3–cd) pyrene	N/A	N/A	9.47	<5	<5	<5	<5	<5	<5
Naphthalene	N/A	N/A	<5	<5	<5	11.8	<5	<5	<5
Phenanthrene	N/A	N/A	<5	<5	<5	14.0	<5	<5	<5
Pyrene	N/A	N/A	35.1	<5	<5	14.2	<5	23.3	<5
Σ 16 PAHs	4000	N/A	< 228.07	< 80	< 80	< 123.1	< 80	< 149.5	< 80

8.3.4 Sediment Radiological Analysis

The samples were prepared by placing an aliquot in a well-defined counting geometry and then measured on a high-resolution gamma spectrometer. Appropriate density corrections were applied to the resultant spectra to take account of the differences in sample density. Dry to wet weight ratio was determined for the sample. Results are quoted on a dry weight basis. The results indicated that dumping of these materials at sea will not result in a radiological hazard and are presented in **Table 8-12**.

Table 8-12: Radiological Analysis Results 2025 Results. Nd indicates not detected.

Stations	K-40	I-131	Cs-134	Cs-137	Ra-226	Ra-228	Am-241	Pb-210	U-235	U-238
1	183 ± 3	Nd	Nd	0.38 ± 0.01	5.6 ± 0.1	5.4 ± 0.1	0.41 ± 0.04	27.0 ± 2.1	0.49 ± 0.02	17.1 ± 0.6
2	249 ± 3	Nd	Nd	1.19 ± 0.02	9.5 ± 0.2	9.5 ± 0.2	<0.25	70.5 ± 3.0	0.79 ± 0.03	24.4 ± 0.8

8.3.5 Marine Mammals and Marine Megafauna

Irish waters represent one of the most important marine habitats for cetaceans in Europe (Berrow, 2001) and are utilized by a wide range of marine mammal species. At present, there are twenty-six species of cetaceans known to occur in Ireland (Whooley, 2016), along with two species of seals (NPWS, 2013).

Marine mammals in Ireland are protected under the EU Habitats Directive (92/43/EEC). All cetaceans are listed under Annex IV of the Habitats Directive as species requiring strict protection in their natural range (Article 12, EC Council Directive 92/43/EEC). The harbour porpoise *Phocoena phocoena* and the bottlenose dolphin *Tursiops truncatus*, together with both seal species occurring in Irish waters, the grey seal *Halichoerus grypus* and the harbour seal *Phoca vitulina*, are listed in Annex II and further protected under Article 3 of the Directive, as species whose conservation requires the designation of Special Areas of Conservation (SACs).

Harbour seals haul out to moult each year from late July to September and are known to haul out at several locations in Cashla Bay (Cronin et al., 2004), these haul out locations are presented in **Figure 8-10**. A robust baseline population assessment was conducted in 2003, numbers at haul out sites in Cashla Bay ranged from 1 to 12 individuals (Cronin et al., 2004). Subsequent monitoring surveys recorded maximum counts in inner Cashla Bay of 108, 77 and 77 in 2009, 2010 and 2011 respectively (NPWS, 2012), while counts of 74 and 72 were recorded in inner Cashla Bay in 2012 and 2013 respectively (NPWS, 2025). Harbour seal is a qualifying interest of the Kilkieran Bay & Islands SAC and Galway Bay Complex SAC.

Grey seals are recorded within Cashla Bay; however, this species prefers remote rocky skerries and uninhabited islands as haul out and breeding sites (O'Cadhla, *et al*., 2005). Grey seal is a qualifying interest of the Slyne Head Island SAC. There are no known grey seal haul out or breeding sites in Cashla Bay (O'Cadhla et al., 2005; O'Cadhla & Strong, 2007), however, individuals are known to frequent the area to forage within the active fishing port of Ros an Mhíl.

A number of cetaceans have the potential to occur in the vicinity of the proposed development. A search of the IWDG casual cetacean sightings database (IWDG, 2025a), accessed through the National Biodiversity Centre portal revealed that five species of cetacean were recorded in Cashla Bay and adjacent waters in Galway Bay, species recorded were bottlenose dolphin, common dolphin *Delphinus delphis*, harbour porpoise, minke whale *Balaenoptera acutorostrata* and humpback whale *Megaptera novaeangliae*. Of these species, only bottlenose dolphins were recorded in inner Cashla Bay (record count n=2), while bottlenose dolphin (record count n=5) and minke whale (record count n=1) were recorded in at Cashla Point. The remaining records were noted in adjacent waters of Galway Bay within 10km grid reference L91. A summary of these records is presented in **Table 8-13** below.

Table 8-13: Summary of Cetacean Records in Cashla Bay, Cashla Point and Adjacent Waters of Galway Bay, All Numbers Refer to Number of Records rather than Number of Individual Animals (IWDG, 2025a)

Species name	Inner Cashla bay[1]	Cashla Point[2]	Adjacent waters of Galway Bay[3]
Bottlenose dolphin (Tursiops truncatus)	2	5	4
Common dolphin (Delphinus delphis)	0	0	22
Harbour porpoise (Phocoena phocoena)	0	0	10
Humpback whale (Megaptera novaeangliae)	0	0	2
Minke whale (Balaenoptera acutorostrata)	0	1	16

[1] Defined as areas covered by the national 2km grid references; L92L, L92M, L92N L92R, L92S and L92T.
[2] Defined as areas covered by the national 2km grid references; L92F, L92K and L92Q.
[3] Defined as areas covered by the national 10km grid reference L91F.

Harbour porpoise is a qualifying interest of the Kilkieran Bay & Islands SAC, Inishmore Island SAC, Galway Bay Complex SAC, and West Connacht Coast SAC. Berrow et al. (2008) showed an overall density of porpoises of 0.73 per km² with an abundance of 402 ± 84 in outer Galway Bay. Subsequent boat-based harbour porpoise surveys conducted on behalf of NPWS have focused on SACs on the east and southwest coasts. Using aerial survey techniques, Rogan et al. (2022) estimated a summer abundance of 623.8 individuals (95% CI 258.4 – 1506.1) and winter abundance of 4422.1 individuals (95% CI 1796.9 – 10882.8) in strata seven, an inshore stratum encompassing west Galway, Clare, and west Kerry.

Bottlenose dolphin is a qualifying interest of Slyne Head Island SAC, Slyne Head Peninsula SAC, West Connacht Coast SAC, and Lower River Shannon SAC. Three distinct populations of bottlenose dolphin are recognised in Ireland: resident in Shannon estuary, coastal and offshore. The coastal population are wide ranging, and their populations are not contained within the limits of SACs, similarly the resident Shannon estuary population are frequently recorded outside of the estuary. Rogan et al. (2022) estimated a summer abundance of 18,704 individuals (95% CI 5,425 – 64,484) and winter abundance of 2,762 individuals (95% CI 498 – 15,317) in strata seven.

While minke whale and humpback whale have been recorded in outer Cashla Bay, it is considered unlikely that these species or any other mysticete would occur in the inner bay. Other delphinid species occurring in outer Galway Bay include Atlantic white-sided dolphin *Lagenorhynchus acutus*, killer whale *Orcinus orca*, Risso's dolphin *Grampus griseus* and white-beaked dolphin *Lagenorhynchus albirostris*, however these species are infrequently recorded and also unlikely to occur within Cashla Bay.

Otter Lutra lutra, an Annex II species, which is a qualifying interest of the Kilkieran Bay and Islands SAC and the Connemara Bog Complex SAC, occurs within Cashla Bay (NBDC, 2025) and may forage in the vicinity of the proposed deep water quay

Basking shark *Cetorhinus maximus* occur around all Irish coasts with greatest numbers occurring on our Atlantic seaboard. A number of records are noted in outer Galway Bay, while a single basking shark was also recorded in in Cashla Bay in 2012, grid reference L961233 (IWDG, 2025b). Basking sharks are protected under the Irish Wildlife Act 1976 and listed on the OSPAR list of threatened and/or declining species and habitats (OSPAR Agreement 2008-06).

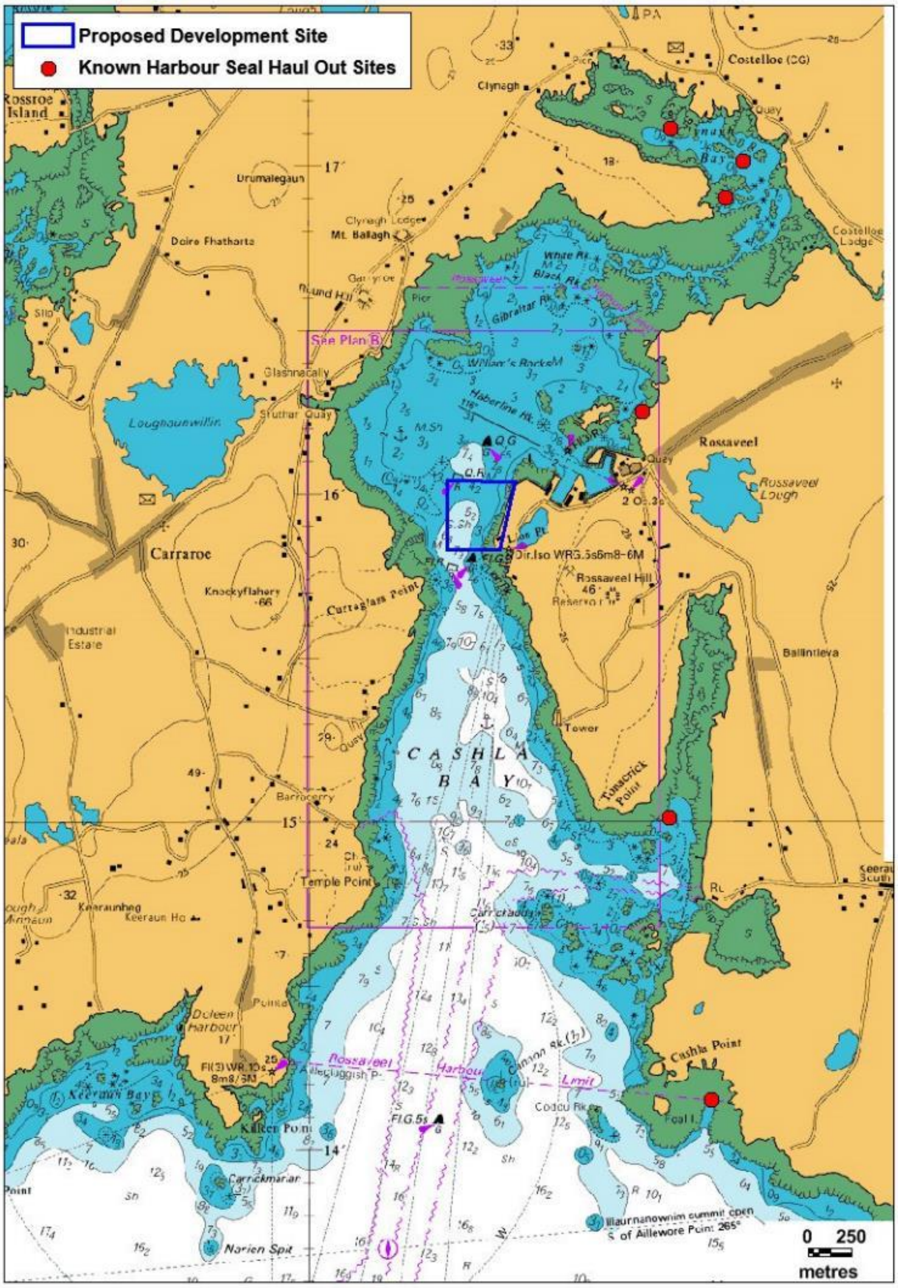

Figure 8-6: Known Harbour Seal Haul Out Sites

Five species of marine turtle are recorded in Irish waters, of these, three species; leatherback turtle *Dermochelys coriacea*, loggerhead turtle *Caretta caretta* and Kemp's ridleys turtle *Lepidochelys Kempii* are recorded in Galway Bay, with a single dead stranded leatherback turtle also recorded in inner Cashla Bay. All five species of marine turtle are Annex IV species, while leatherback turtle and loggerhead turtle are also listed on the OSPAR list of threatened and/or declining species and habitats (OSPAR Agreement 2008-06).

8.3.6 Fish and Shellfish

8.3.6.1 Anadromous and Catadromous Species

The Cashla system is a good example of western acidic spate river which supports both Atlantic salmon *Salmo salar* and sea trout *Salmo trutta* (McGinnity, 2003). The Atlantic salmon is listed under Annex II of the E.U. Habitats Directive and is a qualifying interest of the Connemara Bog Complex SAC, while sea trout stocks have collapsed in Ireland and are subject to controls under the national salmon and sea trout fisheries management regulations and a bye-law prohibiting the retention of rod caught sea trout from Galway Bay to Achill Head (King, *et al.,* 2011). salmon and sea trout will pass through the development area when migrating to and from the Cashla River.

Juvenile salmon spend two years in freshwater before migrating to the sea as smolts in April or May (Borland, *et al.*, 2025). From January to May, spring (multi-sea winter, MSW) salmon return to Irish rivers, from June to October summer salmon (1SW or 'grilse') are present (King, 2011). Grilse generally make up the majority of the spawning stock, with spring salmon contributing a smaller proportion. The spawning stock in the Cashla river varied between circa 500-1000 individuals from 2019-2023 and is currently assessed as above the advised Conservation Limits for the river (TEGOS, 2025).

Juvenile sea trout spend four years in freshwater before migrating to the sea as smolts between March and May. Some sea trout may return later the same year or can spend a number of years at sea as adults. The majority of adult sea trout return from June to August.

IFI (2024b) fish counter data for the year 2023 reported; 69 spring salmon, 389 grilse, 68 late summer salmon, and 827 sea trout in the Cashla river.

European eel *Anguilla anguilla* are reported from numerous sites in Connemara and potentially occur within the Cashla catchment also. European eel is listed on the OSPAR list of threatened and/or declining species and habitats (OSPAR Agreement 2008-06) and listed as critically endangered on the IUCN Red List. Adult European eels leave Irish rivers between September and January with juvenile 'glass eel' returning from January to March.

8.3.6.2 Marine Species

A search of IGFS survey data for the closest survey station (Station no. 58) in the North Sound revealed a fish assemblage typical of Irish Atlantic shelf waters (DATRAS, 2025). Species most frequently recorded in terms of catch per unit effort (CPUE) included the commercially exploited demersal gadoids; haddock Melanogrammus aeglefinus, hake Merluccius merluccius and whiting Merlangius merlangus non-commercial demersal species recorded included poor cod Trisopterus minutus, Norway pout Trisopterus esmarkii, grey gurnard Eutrigla gurnardus, common dragonette Callionymus lyra and spotted dragonette Callionymus maculatus. The most abundant flatfish recorded are witch Glyptocephalus cynoglossus, long rough dab Hippoglossoides platessoides and thickback sole Microchirus variegatus, while cephalopods such as Alloteuthis subulata, Loligo forbesii and Todaropsis eblanae are also abundant. Pelagic species occurring in the greatest abundance are blue whiting Micromesistius poutassou, horse mackerel Trachurus trachurus and sprat Sprattus sprattus. Many of these species are likely to occur in Cashla Bay also, however, larger demersal and pelagic species may be entirely absent or replaced by the young of the species. While offshore species are replaced by inshore species such as wrasse species *Labridae,* blennies *blenniidae*, gobies *gobiidae* and similar typical inshore species.

Elasmobranchs such as the common skate *Dipturus batis*, flapper skate *Dipturus intermedius*, spotted ray *Raja montagui*, spurdog *Squalus acanthias* and lesser spotted dogfish *Scyliorhinus canicula* were recorded at the closest IGFS station, and these species could potentially occur with Cashla Bay also. The common skate complex (which includes both the common skate and flapper skate) is listed on the OSPAR list of threatened and/or declining species and habitats and is considered to be 'critically endangered' globally on the IUCN Red List (Clarke, *et al.,* 2016).

Cashla Bay is a nursery ground for a number of commercially important fish species, including Atlantic cod *Gadus morhua,* Atlantic herring *Clupae harengus*, Atlantic mackerel *Scomber scombrus*, horse mackerel, white-bellied monkfish *Lophius piscatorius* and whiting (ICES, 2009). Ellis *et al.* (2012) predicted nursery grounds of hake, ling *Molva molva*, spurdog and common skate complex occurring in Cashla Bay also. Historical herring spawning grounds are located at Cashla point and Keeran Bay with spawning traditionally occurring in October – November (O'Sullivan *et al.* 2013).

Common shellfish species occurring within Cashla Bay include the commercial species European lobster *Hommarus gammarus,* brown crab *Cancer pagurus* and common shrimp *Palaemon serratus* and various non-commercial species.

8.3.6.3 Commercial and Recreational Fisheries

A number of commercially important shellfish species also occur within the bay. Ros an Mhíl is an active fishing port with an active inshore fishing fleet, larger inshore vessels (>10m) from Ros an Mhíl generally fish along the north shore of Galway Bay and out to the Aran Islands, however a number of smaller inshore vessels (<10m) operate within Cashla Bay. These vessels may target European lobster and brown crab throughout the year with creels or shrimp with shrimp pots from September to December. A set net fishery targeting bait, crayfish *Palinurus elephans* or pollack *Pollachius pollachius* (pending availability of quota) may also occur in outer Cashla Bay and Galway Bay. Line fishing for Mackerel or Pollack can also occur depending on availability of quota. A mixed demersal fishery and seasonal pelagic mid-water trawl fishery are also noted in the North Sound and north shore of Galway Bay.

Two recreational shore mark locations are reported within Cashla Bay: at Ros an Mhíl harbour and Carraroe. Reported species include cod, pollack, dogfish species, thornback ray *Raja clavata*, black pollack *Pollachius virens*, mackerel, wrasse species, Whiting, European conger eel *Conger conger*, mullet *Chelon spp.* and European flounder *Platichthys flesus* (IFI, 2024a).

8.3.7 Important Ecological Features

The importance of ecological features is dependent upon their biodiversity, social, and economic value within a geographic framework of appropriate reference (CIEEM, 2018). Following baselines characterisation, nine important ecological features (IEFs) were identified. The identified IEFs are presented in Table 8-14 below.

Table 8-14: Important Ecological Features

Ecological Feature	Protected status	Importance
Harbour seal	Annex II & V, Wildlife Act	International, National
Grey seal	Annex II & V, Wildlife Act	International, National
Harbor porpoise & bottlenose dolphin	Annex II & IV, OSPAR, Wildlife Act	International, National
Other marine megafauna, including cetaceans, basking shark, marine turtles, otter	Annex IV, Wildlife Act	International, National

Ecological Feature	Protected status	Importance
Anadromous and catadromous species; salmon, sea trout, European eel	Annex II & V, OSPAR, IUCN	International, National
Zostera beds	Annex I, OSPAR	International, National
Benthic subtidal and intertidal habitats & associated communities		Local
Demersal fish, cephalopod and elasmobranch assemblage which form an important component of marine food webs, including commercial and non-commercial species, and species with nursery grounds occurring in the area.		Local
Pelagic fish, cephalopod and elasmobranch assemblage which form an important component of marine food webs, including commercial and non-commercial species, and species with nursery grounds occurring in the area, and herring which has spawning grounds at Cashla Point		Local

8.4 Description of Likely Effects

The sensitivity of receptors (species and habitats) identified in the baseline characterisation to pressures arising as a result of the development was assessed. Sensitivity is determined by the capacity of the feature to remain unchanged under the influence of the pressure (termed resistance) and, if changed, the amount of time needed for a full recovery once the activity has stopped (termed resilience) (MPAAG, 2024). The sensitivities assigned to receptors were arrived at by reference to available sensitivity assessments such as the Marine Evidence-based Sensitivity Assessment (MarESA) (Tyler-Waters *et al.* 2003), Feature Activity Sensitivity Tool (FeAST) (FeAST Working Group, 2023), and sensitivity analysis of the Celtic Sea and Irish Sea conducted by the Marine Protected Area Advisory Group (MPAAG). Sensitivities were assigned to one of four categories which are defined in **Table 8-15** below.

Table 8-15: Sensitivity of Receptors

Receptor Sensitivity	Description
High	Habitats or species with a resistance of ‘None’ or ‘Low’ and resilience of ‘Very Low’ (i.e. negligible or prolonged recovery of over 25 years or not at all) Habitats or species with a resistance of ‘None’ or ‘Low’ and resilience of ‘Low' (i.e. recovery within 10 to 25 years)
Medium	Habitats or species with a resistance of ‘None’ and resilience of ‘Medium'(i.e. recovery in 2 to 10 years) or 'High' (i.e. recovery within 2 years) Habitats or species with a resistance of ‘Low’ and resilience of ‘Medium' (i.e. recovery in 2 to 10 years)

Receptor Sensitivity	Description
	Habitats or species with a resistance of 'Medium' and resilience of 'Very Low' (i.e. recovery over 25 years or not at all), 'Low'(i.e. recovery within 10 to 25 years) or 'Medium' (i.e. recovery in 2 to 10 years)
Low	Habitats or species with a resistance of 'Low' and resilience of 'High' (i.e. recovery within 2 years) Habitats or species with a resistance of 'Medium' and resilience of 'High' (i.e. recovery within 2 years) Habitats or species with a resistance of 'High' and resilience of 'Very Low' (i.e. recovery over 25 years or not at all), 'Low'(i.e. recovery within 10 to 25 years) or 'Medium' (i.e. recovery in 2 to 10 years)
Negligible	Habitats or species with a resistance of 'High' and resilience of 'High' (i.e. recovery within 2 years)

Pressures are defined as 'the mechanism by which a human activity or natural event affects the ecosystem' (Robinson, *et al.*, 2008). The pressures used are based on the pressure definitions developed by the OSPAR Intercessional Correspondence Group on Cumulative Effects (ICG-C) – Amended 25th March 2011 (OSPAR, 2011) using benchmarks as defined in MarESA (Tyler-Waters *et al.* 2003).

The magnitude of impact was assessed based on; the scale of the impact, spatial extent, duration, frequency, and consequences (see Table **8-16**).

Table 8-16: Magnitude of the Impact

Magnitude	Definition
High	**Extent:** Impact across the near-field and far-field areas beyond the study area. **Duration:** The impact is anticipated to be permanent (i.e., over 60 years). **Frequency:** The impact will occur constantly throughout the relevant project phase. **Consequences:** Permanent changes to key characteristics or features of the particular environmental aspect's character or distinctiveness.
Medium	**Extent:** The greatest extent of the impact is restricted to the near-field and far-field (i.e., the defined study area). **Duration:** The impact is anticipated to medium-term (i.e., seven to 15 years) to long-term (15 to 60 years). **Frequency:** The impact will occur constantly throughout a relevant project phase. **Consequences:** Noticeable change to key characteristics or features of the particular environmental aspect's character or distinctiveness.

Magnitude	Definition
Low	**Extent:** The greatest extent of the impact is restricted to the near-field and adjacent far-field areas. **Duration:** The impact is anticipated to be temporary (i.e., lasting less than one year) to short-term (i.e., one to seven years). **Frequency:** The impact will occur frequently throughout a relevant project phase. **Consequences:** Barely discernible to noticeable change to key characteristics or features of the particular environmental aspect's character or distinctiveness.
Negligible	**Extent:** The greatest extent of the impact is restricted to the near-field and immediately adjacent far-field areas. **Duration:** The impact is anticipated to be momentary (seconds to minutes) to brief (lasting less than one day). **Frequency:** The impact will occur once or infrequently throughout a relevant project phase. **Consequences:** No discernible to barely discernible change to key characteristics or features of the particular environmental aspect's character or distinctiveness

The significance of likely effects was assessed by combining the magnitude of impact with the sensitivity of the receptor as per EPA 2022 Guidelines. The description of the likely significant effects follows Table 3.4 of the EPA 2022 guidance. In general, "significant", "very significant" and "profound" effects are interpreted as "likely significant effects" in EIA terms. "Moderate" effects may or may not be considered "likely significant effects" in EIA terms, this is determined as appropriate on each particular assessment. The assessment methodology for determining the significance of likely significant effects is described in **Table 8-17**.

Table 8-17: Magnitude of the Impact

			Sensitivity of Receptor			
			High	Medium	Low	Negligible
Magnitude of Impact	Positive	High	Profound or very significant	Significant	Moderate	Imperceptible
		Medium	Significant	Moderate	Slight	Imperceptible
		Low	Moderate	Slight	Slight	Imperceptible
		Negligible	Not significant	Not significant	Not significant	Imperceptible
	Negative	Negligible	Not significant	Not significant	Not significant	Imperceptible

		Sensitivity of Receptor			
		High	Medium	Low	Negligible
	Low	Moderate	Slight	Slight	Imperceptible
	Medium	Significant	Moderate	Slight	Imperceptible
	High	Profound or very significant	Significant	Moderate	Imperceptible

8.4.1 Construction Phase Effects for Works to be Completed

Relevant pressures were identified based on the OSPAR (2011) pressure definitions; these were aggregated into the following pressures for the purpose of this assessment.

- Habitat disturbance or structure change;
- Suspended sediments, smothering and siltation rate changes;
- Underwater noise; and
- Death or injury by collision.

The likely significant effect on receptors was assessed for each of the above listed pressures where a realistic impact pathway exists, not all pressures are relevant for each identified receptor.

8.4.1.1 Habitat Disturbance or Structure Change

Habitat structure change relates to the physical removal of a portion of the sediment as a result of dredging where a residual layer of sediment similar to the pre-dredge structure is retained (Tyler-Walters et al., 2023). Excavation by dredging and rock blasting of the approach channel including circa 1,000m^3 of rock in isolated locations on each side of the channel is required to provide for a fully dredged approach channel of -7m Chart Datum. These works will result in habitat disturbance due to the abrasion, penetration and removal of substrate and compaction of substrate from mechanical action of dredgers, from placement of spuds or as consequence of rock blasting.

The presence of infrastructure would also have resulted in habitat loss and disturbance, however, as this is a permanent impact it is assessed as an operational phase impact.

8.4.1.1.1 Sensitivity of IEFs

Dredging works are proposed in areas of infralittoral mixed sediments and circalittoral muds of the approach channel. The proposed dredging will result in the temporary change to the habitat where a residual layer of sediment similar to the pre-dredge structure is retained (Tyler-Walters et al., 2023), allowing for recolonisation to occur.

The sensitivity of identified benthic biotopes to habitat disturbance or structural change are presented in Table 8-18 below. Habitat disturbance is assessed as two separate pressures: abrasion of the surface of the substratum and penetration of substratum subsurface.

Table 8-18: Sensitivity of Biotopes to Habitat Disturbance or Structural Change

Biotope	Habitat Structure Change	Abrasion/Disturbance of the Surface of the Substratum	Penetration or Disturbance of the Substratum Subsurface
SS.SCS.CCS.MedLumVen *Mediomastus fragilis*, *Lumbrineris* spp. and venerid bivalves in circalittoral coarse sand or gravel	Medium	Low	Low
SS.SMu.ISaMu.MelMagThy *Melinna palmata* with *Magelona* spp. and *Thyasira* spp. in infralittoral sandy mud	Medium	Low	Low
SS.SCS.CCS.SpiB *Spirobranchus triqueter* with barnacles and bryozoan crusts on unstable circalittoral cobbles and pebbles	Medium	Low	Low
CR.HCR.XFa.FluCoAs.SmAs - *Flustra foliacea*, small solitary & colonial ascidians on tide swept circalittoral bedrock or boulders	Not relevant	Low	Not relevant
SS.SMx.CMx.FluHyd - *Flustra foliacea* and *Hydrallmania falcata* on tide-swept circalittoral mixed sediment	Medium	Medium	Medium
SS.SMp.SSgr.Zmar - *Zostera marina/angustifolia* beds on lower shore or infralittoral clean or muddy sand.	High	Medium	High

The impacts of remaining dredging activities (removal of seabed substratum) may have an impact on the characterising species of the biotope SS.SCS.CCS.MedLumVen. Extraction of the sediment will remove the characterising and associated species present and therefore resistance is assessed as 'None'. Resilience is assessed as 'Medium' as some species may require longer than two years to re-establish and sediments may need to recover (where exposed layers are different). The sensitivity of the biotope SS.SCS.CCS.MedLumVen to habitat structure change is therefore assessed as 'Medium' (Tillin & Watson, 2024).

The biological assemblage present in the biotope SS.SCS.CCS.MedLumVen is characterized by species that are relatively tolerant of penetration and disturbance of the sediments, therefore resistance is assessed as 'Medium' as some species will be displaced and may be predated or injured and killed. Resilience is assessed as 'High' as most species will recover rapidly and the biotope is likely to still be classified as SS.SCS.ICS.MedLumVen following disturbance. Biotope sensitivity to habitat disturbance is therefore assessed as 'Low' (Tillin & Watson, 2024).

The remaining dredging works will likely extract at least 30 cm of sediment from the seafloor and will remove the characterizing species of the biotope SS.SMu.ISaMu.MelMagThys. Resistance is assessed as 'None', resilience is therefore judged as 'Medium', based on the recruitment dispersal limitation of the characterizing fauna (De-Bastos & Watson, 2023). The sensitivity of this biotope to habitat structure change has been assessed as 'Medium' (De-Bastos & Watson, 2023).

The characterizing species of the biotopes SS.SMu.ISaMu.MelMagThys are likely to be damaged or removed by abrasion or penetration. Resistance is therefore considered 'Low'. Resilience of the biotopes is likely to be 'High', therefore, the biotopes sensitivity to habitat disturbance is likely to be 'Low' (De-Bastos & Watson, 2023).

The characterising species of the biotope SS.SCS.CCS.SpiB are epifaunal in nature, occurring on cobbles and pebbles. The removal of the substratum would remove the habitat, and the characterising species attached. Resistance is assessed as 'None' within the extraction footprint, and resilience is assessed as 'High' if habitat is restored. Sensitivity to habitat structure change is therefore assessed as 'Medium'. If all habitat is removed and restoration does not occur, recovery will be prolonged, and sensitivity will be higher (Tyler-Walters, *et al.*, 2024). Evidence for the effects of habitat disturbance in the form of abrasion or penetration on the biotope SS.SCS.CCS.SpiB, suggest that resistance, to a single disturbance event is 'Low' and resilience is 'High', so sensitivity is assessed as 'Low' (Tyler-Walters, *et al.*, 2024).

The species characterizing the biotope CR.HCR.XFa.FluCoAs.SmAs are epifauna or epifloral occurring on rock and would be sensitive to the removal of the habitat from remaining dredging in the development area. As the extraction of approximately 1000 m^3 of rock substratum is planned as part of widening the main approach channel for the development, this impact is considered likely, though recovery is also likely. Whilst disturbance would damage the sessile *Flustra foliacea*, the flexibility and ability to regenerate damaged fronds (as long as the holdfast is undamaged) would result in a significant proportion of the colonies to survive disturbance. Therefore, resistance to habitat disturbance is assessed as 'Medium', resilience is 'High' and sensitivity as 'Low' (Readman, *et al.*, 2023).

The species characterizing the biotope SS.SMx.CMx.FluHyd are epifaunal or epiflora, occurring mostly on cobbles and pebbles. The extraction of the substratum through remaining dredging activity for the development will likely cause the removal of the habitat (boulders, cobbles and pebbles) and the attached characterizing epifauna. The resistance of this biotope is assessed as 'None' (within the extraction footprint), resilience is assessed as 'Medium' if habitat is restored and if the underlying substrate remains the same and sensitivity to habitat structure change is, therefore, assessed as 'Medium'. Recovery will likely be prolonged with a higher sensitivity if the entire habitat is completely removed and restoration (artificial or natural) to the previous state does not occur (Readman & Watson, 2024).

Given the sessile, erect nature of the hydroids and bryozoans characterizing the biotope SS.SMx.CMx.FluHyd, damage and mortality following a physical disturbance effect are likely to be significant. However, abrasion from scouring by sand, mobile cobbles and pebbles is an important structuring factor in this biotope and the persistence of the assemblage may depend on rapid recovery together with scour resistance. Therefore, resistance to habitat disturbance is assessed as 'Low', resilience as 'Medium', and sensitivity is assessed as 'Medium' (Readman & Watson, 2024).

Typically, the extraction of sediments to 30 cm (the benchmark) within the pressure footprint of dredging will cause the complete removal of seagrass beds from the biotope SS.SMp.SSgr.Zmar. The resistance of this biotope to habitat structure change is assessed as 'None', resilience is considered 'Very Low' resulting in a sensitivity score of 'High' (d'Avack, *et al.*, 2024). Similarly, the biotope SS.SMp.SSgr.Zmar has limited resistance to habitat disturbance in the form of abrasion and penetration, sensitivity to these pressures is 'Medium' to 'High' depending on the nature and extent of the pressure. Given that this biotope falls outside of the immediate footprint of the remaining dredging zone, it is unlikely that seagrass beds will be impacted in this way. Therefore, for the purpose of this assessment, this pressure is not considered relevant to the biotope SS.SMp.SSgr.Zmar (d'Avack, *et al.*, 2024).

Benthic fish and invertebrate species occurring within this area are assessed collectively as 'Medium' sensitivity. These species are closely associated with benthic habitats, and some species or life stages have limited mobility and may be unable to avoid this impact, however, recovery of species is expected within in 2 years.

Demersal fish, cephalopod and elasmobranch species occurring within this area are assessed collectively as 'Medium' sensitivity. The adults of these species are highly mobile and unlikely to be directly affected by this pressure; however, the juveniles or eggs of certain species present in the area may have reduced ability to relocate. Recovery is anticipated to be rapid (within 2 years).

8.4.1.1.2 Magnitude of Impact

Dredging will result in the temporary change of the structure of the benthic habitat. Marine invertebrates quickly re-colonise the seabed after a disturbance such as burial under sediment deposition and it is anticipated that the same species that were previously recorded will be re-establishing themselves within two or more years after remaining dredging activities for the development. The extent of the impact is equal to the total dredge area of *c.* 45,010.11m^2, which is low in comparison to the total area of available benthic habitats in Cashla Bay and low in the context of the wider Galway Bay area supporting similar biotopes. The duration of this pressure is short; recolonisation of the habitat by epifauna and infauna is expected to occur in the short term, 1-7 years. The magnitude of impact from habitat structure change is therefore assessed as 'Low' for all benthic habitats and species, demersal fish, cephalopod and elasmobranch species.

8.4.1.1.3 Likely Significant Effect

For the purpose of this assessment, the likely significant effect of habitat structure change, abrasion of the surface of the substratum, and penetration of the substratum subsurface have been collectively assessed as a single pressure; 'habitat disturbance or structure change'. The overall sensitivity of receptors to this pressure was determined as the highest sensitivity score assigned for any single pressure.

The biotope SS.SCS.CCS.MedLumVen was assessed as having 'Medium' sensitivity to habitat disturbance or structure change, the magnitude of the impact was assessed as 'Low'. Therefore, the likely significant effect of habitat structure change on circalittoral mud community is assessed as 'Slight negative'.

The biotope SS.SMu.ISaMu.MelMagThys was assessed as having 'Medium' sensitivity to habitat disturbance or structure change, the magnitude of the impact was assessed as 'Low'. Therefore, the likely significant effect of habitat structure change on circalittoral mud community is assessed as 'Slight negative'.

The biotope SS.SCS.CCS.SpiB was assessed as having 'Medium' sensitivity to habitat disturbance or structure change, the magnitude of the impact was assessed as 'Low'. Therefore, the likely significant effect of habitat structure change on circalittoral mud community is assessed as 'Slight negative'.

The biotope CR.HCR.XFa.FluCoAs.SmAs was assessed as having 'Low' sensitivity to habitat disturbance or structure change, the magnitude of the impact was assessed as 'Low'. Therefore, the likely significant effect of habitat structure change on circalittoral mud community is assessed as 'Slight negative'.

The biotope SS.SMx.CMx.FluHyd was assessed as having 'Medium' sensitivity to habitat disturbance or structure change, the magnitude of the impact was assessed as 'Low'. Therefore, the likely significant effect of habitat structure change on circalittoral mud community is assessed as 'Slight negative'.

The benthic fish and invertebrate species assemblage is assessed as having 'Medium' sensitivity to habitat structure change, the magnitude of the impact was assessed as 'Low'. Therefore, the likely significant effect of habitat structure change on circalittoral mud community is assessed as 'Slight negative'.

The demersal species assemblage is assessed as having 'Medium' sensitivity to habitat structure change, the magnitude of the impact was assessed as 'Low'. Therefore, the likely significant effect of habitat structure change on circalittoral mud community is assessed as 'Slight negative'.

The rating of pre-mitigation likely significant effect of habitat disturbance or structure change from construction phase dredging and blasting for all relevant receptors is presented in **Table 8-19** below.

Table 8-19: Rating of Pre-mitigation LSE of Habitat Disturbance or Structure Change from Construction Phase Dredging and Blasting

Ecological Feature Affected	Quality of Effect	Sensitivity	Duration	Magnitude	Significance
SS.SCS.CCS.MedLumVen	Negative	Medium	Short-term	Low	Slight
SS.SMu.ISaMu.MelMagThys	Negative	Medium	Short-term	Low	Slight
SS.SCS.CCS.SpiB	Negative	Medium	Short-term	Low	Slight
CR.HCR.XFa.FluCoAs.SmAs	Negative	Low	Short-term	Low	Slight
SS.SMx.CMx.FluHyd	Negative	Medium	Short-term	Low	Slight
Benthic fish and invertebrate species	Negative	Medium	Short-term	Low	Slight
Demersal fish, cephalopod and elasmobranch species	Negative	Medium	Short-term	Low	Slight

8.4.1.2 Suspended Sediments, Smothering and Siltation Rate Changes

Excavation by dredging and rock blasting of the approach channel including circa 1,000m^3 of rock in isolated locations on each side of the channel is required to provide for a fully dredged approach channel of -7m Chart Datum. These activities will cause the resuspension of fine sediment and hence changes in suspended sediments and siltation rates in the surrounding environment. Blasting operations also have the potential to cause resuspension of fine material and increases in suspended sediments.

Turbidity monitoring undertaken during works at Ros an Mhíl to date reported a number of peaks in turbidity which were attributed to blasting operations, dredging works of the blasted rock, placement of fill material for reclamation, and installation of quay wall foundations. The proposed dredging of the approach channel will entail the removal of infralittoral mixed sediments and circalittoral mud. Dredging of these sediments will cause a greater suspension of sediment than recorded during dredging works of the blasted rock owing to the higher proportion of finer sediments present.

8.4.1.2.1 Sensitivity of IEFs

The main environmental effects of increased turbidity levels as a result of increase in suspended solids are a reduction in penetration of light into the water column, suspended-sediment impacts on filter-feeding organisms and increased deposition of particulates in low-energy environments. The pressure benchmark for changes in suspended sediments is “a change in one rank on the Water Framework Directive scale for one year”. The pressure benchmark for ‘light’ smothering and siltation rate change is “light deposition of up to 5 cm of fine material added to the habitat in a single, discrete event” and ‘heavy’ smothering and siltation rate change is “heavy deposition of up to 30 cm of fine material added to the habitat in a single discrete event” (Tyler-Walters et al., 2023). The sensitivities of biotopes to suspended sediments, smothering and siltation rate changes are presented in **Table 8-20** below.

Table 8-20: Sensitivity of Biotopes to Suspended Sediments, Smothering and Siltation Rate Changes

Biotope	Changes in Suspended Solids	Smothering & Siltation Rate Changes (Light: <5cm)	Smothering & Siltation Rate Changes (Heavy: <30cm)
SS.SCS.CCS.MedLumVen *Mediomastus fragilis*, *Lumbrineris* spp. and venerid bivalves in circalittoral coarse sand or gravel	Low	Low	Medium
SS.SMu.ISaMu.MelMagThy *Melinna palmata* with *Magelona* spp. and *Thyasira* spp. in infralittoral sandy mud	Low	Not sensitive	Low
SS.SCS.CCS.SpiB *Spirobranchus triqueter* with barnacles and bryozoan crusts on unstable circalittoral cobbles and pebbles	Not sensitive	Not sensitive	Low
CR.HCR.XFa.FluCoAs.SmAs - *Flustra foliacea*, small solitary & colonial ascidians on tide swept circalittoral bedrock or boulders	Not sensitive	Low	Medium
SS.SMx.CMx.FluHyd - *Flustra foliacea* and *Hydrallmania falcata* on tide-swept circalittoral mixed sediment	Not sensitive	Not sensitive	Low
SS.SMp.SSgr.Zmar - *Zostera marina/angustifolia* beds on lower shore or infralittoral clean or muddy sand.	High	Medium	High

The biotope SS.SCS.CCS.MedLumVen is considered to have 'Medium' sensitivity to 'heavy' deposition of fine material added to the seabed in a single discrete event (Tillin & Watson, 2024). However, for 'light' deposition, this biotope is considered to have 'Low' sensitivity at the benchmark threshold (Tillin & Watson, 2024).

The biotope SS.SCS.CCS.MedLumVen is assessed as 'Medium' resistance to changes in suspended sediments as there may be some shift in the structure of the biological assemblage although the biotope is likely to still be characterized as SS.CCS.MedLumVen. Resilience is assessed as 'High' (following restoration of typical conditions) and sensitivity is assessed as 'Low' (Tillin & Watson, 2024).

The biotope SS.SMu.ISaMu.MelMagThy is likely to resist 'light' smothering at the benchmark level. The majority of the associated fauna are burrowing infauna making them adaptive to light sediment deposition conditions. Their resistance 'light' deposition is therefore assessed as 'High', and resilience 'High' with their overall sensitivity assessed as 'Not Sensitive' at benchmark level (De-Bastos & Watson, 2023). Under 'heavy' deposition conditions, bivalves and polychaetes have been reported to migrate through depositions of sediment greater that the benchmark level (De-Bastos & Watson, 2023). Some mortality of the characterizing species is likely to occur depending on the type of substrate and thickness of substrate being deposited. Resistance to 'heavy' deposition is therefore assessed as 'Low' (25-75% loss) and resilience as 'High' and the biotopes are considered to have 'Low' sensitivity to a 'heavy' deposition of up to 30 cm of fine material in a single discrete event (De-Bastos & Watson, 2023).

Changes to suspended sediments can alter the infauna of a deposit feeding community which is essentially food limited. This may lead to a shift in community structure with increased abundance of deposit feeders and a lower proportion of suspension feeders (as feeding is inhibited where suspended particulates are high and the sediment is destabilised by the activities of deposit feeders). The characterizing species of the biotope

SS.SMu.ISaMu.MelMagThy are likely to resist a change in one rank on the WFD (Water Framework Directive) scale e.g. from clear to intermediate. But some species, such as *Melinna palmata, Thyasira* spp. and *Abra* spp., would be adversely impacted where a change from intermediate to medium (100-300 mg/l) turbidity occurred. Resistance is therefore assessed as 'Low'. Resilience is likely to be 'High', so the biotopes are considered to have 'Low' sensitivity to a change in suspended solids at the pressure benchmark level (De-Bastos & Watson, 2023).

The characterizing species within SS.SCS.CCS.SpiB are considered to have high resistance to 'light' siltation and smothering. Sensitivity to 'light' siltation is assessed as 'Not sensitive' based on the consideration that sediments are fairly quickly removed from the biotope subject to water movements and that the scour tolerance of the characterizing species and encrusting corallines would reduce mortalities. However, if sediment deposit remained in place due to lack of water flow or intensity of sedimentation is high, then resistance would be assessed as lower and higher sensitivity. Heavier sediment deposition will likely cause complete burial and loss of characterising species, however the impact may be reduced if sediment is removed rapidly. Therefore, resistance to 'heavy' deposition is assessed as 'Medium'. Larval recolonization by *Spirobranchus triqueter* may occur and therefore resilience is assessed as 'High' based on re-growth of the biotope and sensitivity is therefore assessed as 'Low' (Tyler-Walters, *et al.*, 2024).

The biotope SS.SCS.CCS.SpiB occurs in scoured habitats where it is likely exposed to intermittent episodes of high-levels of suspended solids as local sediments are re-mobilised and transported. The biotope resistance is assessed as 'High' to an increase or decrease in suspended solids and resilience is categorised as 'High'. The biotope is considered to be 'Not sensitive' to changes in suspended solids (Tyler-Walters, *et al.*, 2024).

For the characterising infauna of the biotope CR.HCR.XFa.FluCoAs.SmAs, a deposit of 5 cm of fine sediment could cause smothering and damage of small fauna while larger fauna such as *Flustra foliacea* is likely to show more resistance. Deposited sediment would likely be dispersed quickly given the high energy area where the biotope occurs. Therefore, the biotope is considered to have 'Medium' resistance, 'High' resilience and 'Low' sensitivity to 'light' deposition (Readman, *et al.*, 2023). 'Heavy' silt deposition (30 cm of fine sediment) would likely smother and damage the majority of the faunal community. In the high energy environment that the biotope occurs, deposited sediment would probably be removed fairly quickly. Resistance under 'heavy' siltation conditions is therefore assessed as 'Low', resilience as 'Medium' and sensitivity as 'Medium' (Readman, *et al.*, 2023).

Sediment scour within CR.HCR.XFa.FluCoAs biotope is an important factor in the dominance of the scour tolerant *Flustra foliacea*. Whilst an increase is unlikely to have an effect, a reduction in suspended sediment could reduce scour and allow other species to colonize the biotope. On return to the original sediment levels, it is probable that *Flustra foliacea* would again dominate the biotope. Resistance to changes in suspended solids is assessed as 'High', resilience as 'High' and the biotope is 'Not Sensitive' at the benchmark level (Readman, *et al.*, 2023).

'Light' siltation may bury some of the characterising species within the biotope SS.SMx.CMx.FluHyd at the benchmark level. This biotope occur in areas of moderate water movement and sediment is likely to be removed fairly rapidly. The biotope typically experiences occasional sand deposition and therefore, resistance to 'light' deposition is assessed as 'High', resilience as 'High' and the biotope is assessed as 'Not sensitive' at the benchmark level. Under 'heavy' silt deposition, most characterizing species except for those on large boulders and would be lost. Resistance to 'heavy' deposition is, therefore, assessed as 'Medium', resilience as 'High' and sensitivity as 'Low' (Readman & Watson, 2024).

An increase in suspended sediment may have a deleterious effect on the suspension feeding community within the biotope SS.SMx.CMx.FluHyd. It is likely to clog their feeding apparatus to some degree, resulting a reduction in feeding efficiency. Whilst an increase in suspended sediment may result in extra energetic expenditure in cleaning, it is unlikely to increase mortality. Therefore, resistance to changes in suspended sediments has been assessed as 'High', resilience as 'High' and the biotope is 'Not Sensitive' at the benchmark level (Readman & Watson, 2024).

The biotope SS.SMp.SSgr.Zmar, containing the characterising seagrass *Zostera marina,* can be significantly impacted by siltation both light and heavy deposition depending on the depths of burial and sediment type (d'Avack, *et al.*, 2024). Several studies have investigated the impact of smothering on *Zostera* beds, with most studies indicating that some degree of mortality and biomass loss will occur at burial depths of 5cm. Munke *et al.* (2015) noted that the effect of burial depended on the actual leaf length rather than species size. In their experimental field study in Kiel Bight, Munke *et al.* (2015) found negative effects on shoot mortality, delayed growth and flowering and reduced carbohydrate storage even after burial under the sand at 5 cm (ca 10% of plant height). The effects were significant enough to affect the next year's growth. Burial by greater than 5 cm resulted in shoot mortality but burial by 5 cm reduced maximum biomass, leaf length, starch storage and flowering capacity.

The biotope is assessed as having low resistance to 'light' deposition; however, some plants may survive, and rhizome reestablishment may occur, resilience is therefore assessed as 'Medium' at the pressure benchmark. In addition, seagrass beds occur in low energy environments, suggesting that silt deposition may not be quickly flushed away. Therefore, sensitivity of this biotope is considered as 'Medium' to siltation at the pressure benchmark (d'Avack, *et al.*, 2024). 'Heavy' siltation is likely to cause significant damage to such biotopes with all individuals highly likely not to survive. Resistance to 'heavy' sedimentation at the pressure benchmark (30 cm of added material) is therefore assessed as 'None', with resilience as 'Low' to 'Very Low'. Sensitivity of this biotope is therefore assessed as 'High' (d'Avack, *et al.*, 2024).

Water clarity is a vital component for seagrass beds as it determines the depth-penetration of photosynthetically active radiation of sunlight. Seagrasses have light requirements an order of magnitude higher than other marine macrophytes making water clarity a primary factor in determining the maximum depth at which seagrasses can occur. Increases in turbidity over a prolonged period of time are therefore highly likely to impact seagrass species. The growth of both *Zostera marina* and its associated epiphytes are reduced by increased shading due to turbidity and intensive shading inhibits flowering in *Zostera marina* plants. Thus, turbidity is an important factor controlling production and ultimately survival and recruitment of seagrasses. Seagrass populations are likely to survive short-term increases in turbidity, however, a prolonged increase in light attenuation, especially at the lower depths of its distribution, will probably result in loss or damage of the population. Therefore, resistance to changes in suspended sediments is assessed as 'Low'. A loss of seagrass beds will promote the re-suspension of sediments, making recovery unlikely as seagrass beds are required to initially stabilise the sediment and reduce turbidity levels. A high turbidity state appears to be a highly resilient alternative stable state; hence return to the seagrass biotope is unlikely resulting in 'Low' resilience. *Zostera marina* is considered intolerant of any activity that changes the sediment regime where the change is greater than expected due to natural events, and sensitivity is assessed as 'High' (d'Avack, *et al.*, 2024).

While marine mammals are not directly dependent on water clarity for navigation or communication, elevated turbidity can influence them indirectly through effects on their prey base (e.g., fish, cephalopods), reducing foraging efficiency. Remaining dredging activity will result in episodic turbidity spikes within Cashla Bay. These impacts are of particular relevance during periods of high marine mammal activity such as the harbour seal moulting season (August–September), when animals may spend extended periods in nearshore waters. The sensitivity of harbour seal to changes in suspended sediments is therefore assessed as 'Medium', while the sensitivity of all other marine mammals is assessed as 'Low'.

Many fish and shellfish species are sensitive to increased levels of suspended sediments, this can include direct mortality, behavioural changes and impacts to foraging ability (Wenger, *et al.,* 2017), the impacts are species and life stage specific. Adult individuals of these species would be able to relocate; however, eggs, larvae and juveniles may be greater affected. However, considering the relatively small scale and short duration of this pressure, sensitivity to changes in suspended sediments is assessed as 'Low' for all fish and shellfish species.

8.4.1.2.2 Magnitude of Impact

Dredging of the approach channel will result in the temporary resuspension of fine particular matter within the vicinity of the activity. The sediment composition in the area was characterised as gravelly sand and gravelly muddy sand, with medium, coarse and very coarse sands constituting the largest proportion of sampled sediment (Aquafact, 2025). Larger material will drop out of suspension rapidly, while finer material will be dispersed over a broader area. The extent to which turbidity will be affected will be a function of particle size and flow velocity (Earle, 2014), the maximum extent of the impact is anticipated to be equivalent to one tidal excursion. The scale of this pressure is low since the non-rock portion of the removed sediment is expected to be circa 2,000m^3, the majority of which will be retained in the dredge bucket. Considering the relatively small quantities of material being removed, short duration of the pressure, and since the dispersion of suspended sediment is limited by tidal flow and direction, the magnitude of impact to benthic communities as a result of changes in suspended sediments and siltation rates is assessed as 'Low'.

Suspended sediments, smothering and siltation rate changes are unlikely to affect the *Zostera* beds, which are located on the shallow western shore of Cashla Bay, as the current flows in and out in a north to south direction, and therefore sediment suspension is likely to be carried and deposited south of the development in Cashla Bay. The magnitude of impact is therefore assessed as 'Negligible'.

Considering the relatively small quantities of material being removed and short duration of the impact, the magnitude of impact to all other IEFs as a result of changes in suspended sediments and siltation rates is assessed as 'Low'.

8.4.1.2.3 Likely Significant Effect

For the purpose of this assessment, the likely significant effect of changes in suspended solids, 'light' smothering and siltation rate changes, and 'heavy' smothering and siltation rate changes have been collectively assessed under the heading; 'suspended sediments, smothering and siltation rate change'.

The biotope SS.SCS.CCS.MedLumVen was assessed as having 'Low' sensitivity to changes in suspended sediments or 'light' deposition, and was assessed as having 'Medium' sensitivity to 'heavy' deposition, the magnitude of the impact was assessed as 'Low'. Therefore, the likely significant effect of habitat structure change on circalittoral mud community is assessed as 'Slight negative'.

The biotope SS.SMu.ISaMu.MelMagThy was assessed as having 'Low' sensitivity to suspended sediments, smothering and siltation rate change, the magnitude of the impact was assessed as 'Low'. Therefore, the likely significant effect of suspended sediments, smothering and siltation rate change is assessed as 'Slight negative'.

The biotope SS.SCS.CCS.SpiB is not sensitive to changes in suspended sediments or 'light' deposition, and was assessed as having 'Low' sensitivity to 'heavy' deposition. Since the spatial extent of 'heavy' deposition is restricted to the immediate vicinity of dredge operations, the magnitude of the impact was assessed as 'Negligible'. Therefore, the likely significant effect of suspended sediments, smothering and siltation rate change is assessed as 'Not significant'.

The biotope CR.HCR.XFa.FluCoAs.SmAs is not sensitive to changes in suspended sediments and was assessed as having 'Low' to 'Medium' sensitivity to smothering. The magnitude of the impact was assessed as 'Low', therefore, the likely significant effect of suspended sediments, smothering and siltation rate change is assessed as 'Slight negative'.

The biotope SS.SMx.CMx.FluHyd is not sensitive to changes in suspended sediments or 'light' deposition and was assessed as having 'Low' sensitivity to 'heavy' deposition. Since the spatial extent of 'heavy' deposition is restricted to the immediate vicinity of dredge operations, the magnitude of the impact was assessed as 'Negligible'.

Therefore, the likely significant effect of suspended sediments, smothering and siltation rate change is assessed as 'Not significant'.

The biotope SS.SMp.SSgr.Zmar was assessed as having 'High' sensitivity to changes in suspended sediments, 'Medium' sensitivity to 'light' deposition, and 'High' sensitivity to 'heavy' deposition, the magnitude of the impact was assessed as 'Negligible'. Therefore, the likely significant effect of habitat structure change on circalittoral mud community is assessed as 'Not significant'.

Harbour seal was assessed as having a sensitivity of 'Medium' to changes in suspended sediments, the magnitude of the impact was assessed as 'Low'. Therefore, the likely significant effect of changes in suspended sediments on fish and shellfish is assessed as 'Slight negative'. All other marine mammals are assessed as having a sensitivity of 'Low' to changes in suspended sediments, the magnitude of the impact was assessed as 'Low'. Therefore, the likely significant effect of changes in suspended sediments on fish and shellfish is assessed as 'Slight negative'.

All fish and shellfish species are assessed as having a sensitivity of 'Low' to changes in suspended sediments, the magnitude of the impact was assessed as 'Low'. Therefore, the likely significant effect of changes in suspended sediments on fish and shellfish is assessed as 'Slight negative'.

The rating of pre-mitigation likely significant effect of suspended sediments, smothering and siltation rate changes from construction phase dredging and blasting for all relevant receptors is presented in Table 8-21 below.

Table 8-21: Rating of Pre-mitigation LSE of Suspended Sediments, Smothering and Siltation Rate Changes from Construction Phase Dredging and Blasting

Ecological Feature Affected	Quality of Effect	Sensitivity	Duration	Magnitude	Significance
SS.SCS.CCS.MedLumVen	Negative	Low to Medium	Temporary to Short-term	Low	Slight
SS.SMu.ISaMu.MelMagThy	Negative	Low	Temporary to Short-term	Low	Slight
SS.SCS.CCS.SpiB	Negative	Low	Temporary to Short-term	Negligible	Not significant
CR.HCR.XFa.FluCoAs.SmAs	Negative	Low to Medium	Temporary to Short-term	Low	Slight
SS.SMx.CMx.FluHyd	Negative	Low	Temporary to Short-term	Negligible	Not significant
SS.SMp.SSgr.Zmar	Negative	Medium to High	Temporary to Short-term	Negligible	Not significant
Harbour seal	Negative	Medium	Temporary to Short-term	Low	Slight
Other marine mammals	Negative	Low	Temporary to Short-term	Low	Slight
Anadromous species	Negative	Low	Temporary to Short-term	Low	Slight

Ecological Feature Affected	Quality of Effect	Sensitivity	Duration	Magnitude	Significance
Marine fish and shellfish	Negative	Low	Temporary to Short-term	Negligible	Not significant

8.4.1.3 Underwater Noise

The addition of anthropogenic underwater noise to the marine environment is recognised as a significant pressure on variety of marine species, particularly marine mammals and fish capable of detecting sound pressure. All marine mammals fishes, and marine turtles can detect sound, however, sensitivity to sound varies greatly between species. Marine mammals are generally grouped into broad hearing groups based on frequency-specific sensitivity (Southall, *et al.*, 2019), while fish are grouped into hearing groups based on the presence of anatomical structures involved in hearing (Popper, *et al.*, 2014). Data on hearing in marine turtles is limited, however, turtles are generally understood to have hearing capabilities more similar to that of fish than marine mammals (Popper, *et al.*, 2014).

Underwater noise can impact marine species in a number of ways, including death or mortal injury, recoverable injury, permanent or temporary hearing threshold shift, behavioural impacts or masking of vocalisations. For the purpose of this assessment, the impacts of construction or operational activities are assessed based on their potential to cause; (a) injury or (b) disturbance, to an identified hearing group.

In marine mammals, an injury is defined as; mortality, mortal injury or injury to the hearing structures resulting in auditory threshold shift. Recoverable injury to these hearing structures is referred to as temporary hearing threshold shift (TTS), if recovery does not occur over a relatively long interval the injury is termed a permanent threshold shift (PTS) (Southall, et al., 2007). A disturbance is defined as a behavioural impact including; the masking of vocalisations, disturbance of normal activities and avoidance of impacted areas.

In fish, an injury is defined as; mortality, mortal injury or recoverable injury, while a disturbance is defined as; TTS, behavioural impact or masking of vocalisations. Note, in contrast to marine mammals, TTS is considered a disturbance in fish as the sensory hairs cells of the inner ear of fish are regularly replaced, thereby mitigating damage to these structures (Popper, *et al.*, 2014).

Multiple activities necessary for the completion of the proposed development have the potential to input significant anthropogenic underwater noise to the receiving environment. These activities are;

- Dredging;
- Drilling; and
- Blasting.

Other activities such as installation of pre-cast concrete foundation beams, installation of pre-cast concrete caissons, backfill of pre-cast concrete caissons and other land-based construction activities are not considered to produce sound levels sufficient to have significant impact on any identified IEFs.

8.4.1.3.1 Marine Mammals

All cetaceans and pinnipeds rely on sounds for a variety of biological and social activities and are sensitive to anthropogenic underwater noise. Marine mammals use sound to locate prey, maintain social interactions, navigate, avoid predators and communicate over large distances. Marine mammals are generally separated into broad hearing groups in recognition of differences in frequency-specific hearing sensitivities between species.

Table 8-22 below presents relevant marine mammal hearing groups and species potentially occurring in Cashla Bay based on hearing groups proposed by Southall, et al., (2019).

Table 8-22: Proposed Marine Mammal Hearing Groups from Southall, et al., 2019

Marine Mammal Hearing Group	Auditory Weighting Function	Genera (or Species) Included
Low-frequency cetaceans	LF	Minke whale, humpback whale
High-frequency cetaceans	HF	Bottlenose dolphin, common dolphin, orca, white-sided dolphin, white-beaked dolphin, Risso's dolphin
Very high- frequency cetaceans	VHF	Harbour porpoise
Phocid carnivores in water/ Phocid carnivores in air	PCW/ PCA	Harbour seal, grey seal
Other marine carnivores in water/ Other marine carnivores in air	OCW/ OCA	Otter

Southhall, *et al.*, (2019) generated modified noise exposure criteria for TTS and PTS onset. TTS-onset for impulsive noise was estimated using frequency weighted exposure levels. Southhall, *et al.*, (2019) proposed dual metric criteria for impulsive noise (frequency-weighted sound exposure level (SEL) and unweighted peak sound pressure level (SPL)), while only weighted SEL are presented for non-impulsive noise. **Table 8-23** below shows TTS- and PTS-onset thresholds in weighted SEL for marine mammals exposed to non-impulsive noise. **Table 8-24** below shows TTS- and PTS- onset thresholds in weighted SEL and peak SPL for marine mammals exposed to impulsive noise. PTS-onset threshold is the metric used to indicate injury in a marine mammal, while TTS-onset can be used as a proxy for behavioural impacts (Southall, *et al.*, 2007).

Table 8-23: TTS- and PTS-onset Thresholds for Marine Mammals Exposed to Non-impulsive Noise: SEL Thresholds in dB re 1 µPa2s underwater and dB re (20 µPa)2s in air (groups PCA and OCA only) from Southall, *et al.*, 2019

Marine Mammal Hearing Group	TTS onset: SEL (weighted)	PTS onset: SEL (weighted)
LF	179	199
HF	178	198
VHF	153	173
PCW	181	201
OCW	199	219
PCA	134	154

Marine Mammal Hearing Group	TTS onset: SEL (weighted)	PTS onset: SEL (weighted)
OCA	157	177

Table 8-24: TTS- and PTS-onset Thresholds for Marine Mammals Exposed to Impulsive Noise: SEL Thresholds in dB re 1 µPa2s underwater and dB re (20 µPa)2s in Air (groups PCA and OCA only); and Peak SPL Thresholds in dB re 1 µPa underwater and dB re 20 µPa in air (groups PCA and OCA only) from Southall, *et al*., 2019

Marine Mammal Hearing Group	TTS onset: SEL (weighted)	TTS onset: Peak SPL (unweighted)	PTS onset: SEL (weighted)	PTS onset: Peak SPL (unweighted)
LF	168	213	183	219
HF	170	224	185	230
VHF	140	196	155	202
PCW	170	212	185	218
OCW	188	226	203	232
PCA	123	138	138	144
OCA	146	161	161	167

8.4.1.3.2 Fish and Marine Turtles

Sound plays a vital role in the life of fish which also may use sounds for important biological functions such as communication, predator avoidance and environmental ques such as the location of a reef. Hearing sensitivity in fish varies between species; all fish detect the particle motion component of the sound field through the response of the otolithic organ, while some fish have gas filled structures near the ear and/or extensions of the swim bladder providing sensitivity to sound pressure (Popper, *et al.*, 2014). Popper, *et al.*, (2014) categorised the hearing of fish based on the presence of a swim bladder and its use in hearing and sound production:

- Group 1: Fishes with no swim bladder or other gas chamber (e.g. flatfish and elasmobranchs);
- Group 2: Fishes with swim bladders in which hearing does not involve the swim bladder or other gas volume (e.g., Atlantic salmon, sea trout);
- Group 3: Fishes in which hearing involves a swim bladder or other gas volume (e.g., European eel, Atlantic cod, herring and relatives);
- Sea turtles; and
- Eggs and larvae.

Table 8-25 below provides sound exposure guidelines for fish, sea turtles and eggs and larvae exposed to noise from underwater explosions from Popper, *et al.*, (2014). Guidelines are not provided for masking since the animals are not exposed to more than a few explosive events, and masking would not last beyond the period of exposure. Relative risk was defined as high, moderate or low, and is given for animals at three distances from the source defined in relative terms as near (N), intermediate (I), and far (F). Specific distances were not ascribed to effects however “near” might be considered to be in the tens of meters from the source, “intermediate” in the hundreds of meters, and “far” in the thousands of meters (Popper, *et al.*, (2014)).

Table 8-25: Sound Exposure Guidelines for Explosions from Popper, et al., (2014)

Type of Animal	Mortality and Potential Mortal Injury	Recoverable Injury	TTS	Masking	Behaviour
Group 1 (e.g. flatfish and elasmobranchs)	229 - 234 dB peak	(N) High (I) Low (F) Low	(N) High (I) Moderate (L) Low	NA	(N) High (I) Moderate (F) Low
Group 2 (e.g. salmon and sea trout)	229 - 234 dB peak	(N) High (I) High (F) Low	(N) High (I) Moderate (F) Low	NA	(N) High (I) High (F) Low
Group 3 (e.g. cod, herring and relatives)	229 - 234 dB peak	(N) High (I) High (F) Low	(N) High (I) High (F) Low	NA	(N) High (I) High (F) Low
Sea turtles	229 - 234 dB peak	(N) High (I) High (F) Low	(N) High (I) High (F) Low	NA	(N) High (I) High (F) Low
Eggs and larvae	>13 mm s^{-1} peak velocity	(N) High (I) Low (F) Low	(N) High (I) Low (F) Low	NA	(N) High (I) Low (F) Low

Notes: peak and rms sound pressure levels dB re 1 µPa. All criteria are presented as sound pressure. Relative risk (high, moderate, low) is given for animals at three distances from the source defined in relative terms as near (N), intermediate (I), and far (F).

Table 8-26 below provides sound exposure guidelines for fish, sea turtles and eggs and larvae exposed to non-impulsive noise such dredging, drilling or shipping. Relative risk was defined as high, moderate or low, and is given for animals at three distances from the source defined in relative terms as near (N), intermediate (I), and far (F). Specific distances were not ascribed to effects however "near" might be considered to be in the tens of meters from the source, "intermediate" in the hundreds of meters, and "far" in the thousands of meters (Popper *et al.*, (2014).

Table 8-26: Sound Exposure Guidelines for Shipping and Continuous Sounds from Popper et al., (2014)

Type of Animal	Mortality and Potential Mortal Injury	Recoverable Injury	TTS	Masking	Behaviour
Group 1 (e.g. flatfish and elasmobranchs)	(N) Low (I) Low (F) Low	(N) Low (I) Low (F) Low	(N) Moderate (I) Low (F) Low	(N) High (I) High (F) Moderate	(N) Moderate (I) Moderate (F) Low
Group 2 (e.g. salmon and sea trout)	(N) Low (I) Low (F) Low	(N) Low (I) Low (F) Low	(N) Moderate (I) Low (F) Low	(N) High (I) High (F) Moderate	(N) Moderate (I) Moderate (F) Low
Group 3 (e.g. cod, herring and relatives)	(N) Low (I) Low (F) Low	170 dB rms for 48 h	158 dB rms for 12 h	(N) High (I) High (F) High	(N) High (I) Moderate (F) Low
Sea turtles	(N) Low (I) Low (F) Low	(N) Low (I) Low (F) Low	(N) Moderate (I) Low (F) Low	(N) High (I) High (F) Moderate	(N) High (I) Moderate (F) Low
Eggs and larvae	(N) Low (I) Low (F) Low	(N) Low (I) Low (F) Low	(N) Low (I) Low (F) Low	(N) High (I) Moderate (F) Low	(N) Moderate (I) Moderate (F) Low

Notes: rms sound pressure levels dB re 1 µPa peak and sound exposure levels; SEL dB re 1 µPa2·s. All criteria are presented as sound pressure. Relative risk (high, moderate, low) is given for animals at three distances from the source defined in relative terms as near (N), intermediate (I), and far (F).

8.4.1.3.3 Marine Invertebrates

Many marine invertebrates are also sensitive to sound, however, hearing in these species is achieved through sensitivity to particle motion component of the sound field. Studies of hearing in marine invertebrates are limited, our understanding of the impact of anthropogenic sound on marine invertebrates is also currently limited (Hawkins, 2014). Currently there are no sound exposure guidelines for injury or behavioural impacts to marine invertebrates. As such, it is not possible to assess sensitivity of these species to underwater noise, they are therefore assessed collectively with Group 1 fish for the purpose of this assessment.

8.4.1.3.4 Dredging

Dredging will be required in the channel and turning circle in order to ensure a maximum level of minus 7mcd is achieved within the turning area/channel. It is expected that most of the material to be dredged in the channel will be sand, gravels and silts. Some dredging has already been conducted in the channel during the previous phase of works. This was for the creation of the berthing pocket on the seaward side of the proposed quay wall.

Dredging activities are omni-directional, low frequency, continuous sound sources. Dredging generally produces continuous broadband frequencies concentrated at or below 1kHz. Noise produced during dredging varies depending on the type of dredger used, operational phase and the characteristics of the dredged material (MTE, 2020). Sound pressure levels (SPL) from dredging can range from 160 to more that 180dB re 1 µPa at 1m (Thomsen, *et al.*, 2009). Sound pressure reported from backhoe dredgers has been reported from the Shetland islands of 163dB re 1 µPa at 1m SPL (Nedwell, *et al*., 2008), while Reine, *et al.* (2012) reported SPL of 179db re 1 µPa at 1m with maximum energy recorded between 20-300Hz. Ripping of fractured rock could be anticipated to produce sound levels similar to the operation of cutting suction dredger of 179db re 1 µPa/ √Hz at 1m (MTE, 2020).

8.4.1.3.4.1 Sensitivity of IEFs

8.4.1.3.4.1.1 Injury Resulting from Underwater Noise Produced by Dredging Activities

Anticipated peak frequencies during dredging operations at Ros an Mhíl are expected to be <1kHz. Low frequency cetaceans, such as minke whales and humpback whales, are most sensitive to noise at these frequencies, and the anticipated noise levels of up to 180dB re 1 µPa at 1m have the potential to cause injury to animals at very close distance from the sound source (<50m). It is considered unlikely that a minke whale or humpback whale would occur in the inshore waters of Cashla Bay and extremely unlikely to occur in such close proximity to active dredging operations for an injury to occur. Minke whale and humpback whale are therefore assessed as having 'Negligible' sensitivity to injury as a result of underwater noise produced by dredging operations.

The anticipated peak frequencies of dredging operations at <1kHz are below the peak sensitivity of high frequency cetaceans such as common dolphin and bottlenose dolphin, very high frequency cetaceans such as harbour porpoise and both seal species. Additionally, the expected noise levels of up to 180dB re 1 µPa at 1m are unlikely to cause injury to species in these functional hearing groups. The sensitivity of these animals to injury due to underwater noise originating from dredging operations is therefore assessed as 'Negligible'.

The anticipated peak frequencies of dredging operations at <1kHz coincide with the peak sensitivity of many fish species. Noise from continuous sources such as dredging present a low risk of mortality, mortal injury or recoverable to fish in functional hearing Groups 1 & 2, and marine turtles (Popper, *et al.*, 2014). The sensitivity of these species to injury as a result of underwater noise produced by dredging operations is therefore assessed as 'Negligible'. The risk of mortality or mortal injury is also low for hearing Group 3 fish species, however, they could potentially suffer recoverable injury following exposure to SPL of 170dB re 1 µPa at 1m for 48hrs. The sensitivity of these species to injury as a result of underwater noise produced by dredging operations is therefore assessed as 'Low'.

8.4.1.3.4.1.2 Disturbance Resulting from Underwater Noise Produced by Dredging Activities

Low frequency noise from dredging may be above ambient noise levels at some distance from the site of operations, potentially causing disturbance of low frequency cetaceans, however, given the paucity of minke whale and humpback whale in the area, sensitivity to disturbance as a result of underwater noise produced by dredging operations is assessed as 'Negligible'.

The anticipated noise levels of the low frequency noise from dredging operations may be above ambient levels at extended distance from the sound source and therefore have the potential to cause disturbance to other functional hearing groups of marine mammals which occurring in the area. The sensitivity of these species to disturbance as a result of underwater noise produced by dredging operations is therefore assessed as 'Low'.

Cashla Bay is identified as a nursery ground for a number of hearing Group 1 fish including mackerel, horse mackerel, white-bellied monkfish, spurdog and common skate complex. Salmon and sea trout (Group 2) also migrate through the bay annually. Projected noise levels pose a moderate risk of TTS in the near field, a moderate risk of behavioural impact in the intermediate field, and a high risk of masking in the intermediate field for hearing Group 1 & 2 fish and marine turtles. Group 3 fish, such as European eel, herring or cod, could potentially suffer TTS following exposure to SPL of 158dB re 1 µPa at 1m for 12hrs. Masking is likely to occur over far-field distances while behavioural impacts may occur in the intermediate field. Cashla Bay is identified as a nursery ground for a number of Group 3 fish including cod, herring, whiting, ling and hake; and herring spawning grounds are reported at Cashla Point. European eel may also migrate through the bay annually.

The expected noise output from dredging at Ros an Mhíl is estimated at up to a maximum of 180dB re 1 µPa at 1m, this is a conservative estimate based on reported outputs from similar projects and does not account for the use of a protective berm. The extent of the impact of disturbance from dredging would be largely limited to within a few hundred meters of the sound source, the species affected are mobile and capable of avoiding the area, nursery grounds identified in the area are widespread and common and rapid recovery is expected following cessation of operations. The sensitivity of all fish and marine turtles to disturbance as a result of underwater noise produced by dredging operations is therefore assessed as 'Low'.

8.4.1.3.4.2 Magnitude of Impact

The duration of the impact is short, and the scale of the impact is considered low given the relatively small quantities of material dredged. The protective berm constructed around the site would have provided a degree of sound abatement, reducing the input of sound to the wider Cashla Bay to some extent. However, noise levels may be above ambient sound levels at extended distance from the sound source and could cause disturbance or masking of biologically significant communication.

Noise levels during dredging can theoretically result in injury to LF cetaceans but only within close range of the source. Rogan, *et al.* (2018) calculated the summer density of minke whale in western coastal waters at 0.102 animals/km^2. The total area of suitable habitat available in Cashla Bay is approximately 5.78km^2, which excludes intertidal and shallow subtidal waters. The potential abundance of minke whale in Cashla Bay is therefore estimated at 0.59 individuals. No humpback whales were recorded during surveys conducted by Rogan, *et al.*, therefore abundance of humpback whale in the area is assumed to be less than that of minke whale. Considering the low abundance of LF cetaceans in the area, the magnitude of impact of injury or disturbance due to noise resulting from dredging activities is assessed as 'Negligible'.

For all other functional hearing groups of marine mammals, anticipated sound levels are not sufficiently high to cause injury to any of these species at distances of more than 10-20meters from the source, the magnitude of impact from injury from noise due to dredging is considered to be 'Negligible' for these species. There is a potential for disturbance to these species as a result of noise from dredging, however, since impacts will be restricted to the near-field and adjacent far-field, the duration is short-term, and rapid recovery is expected once operations cease; the magnitude of impact is assessed as 'Low'.

Continuous sound sources such as dredging do not pose a significant risk of injury to fish and marine turtles, the magnitude of impact is thus assessed as 'Negligible'. Noise from continuous sources such as dredging has the potential to result in disturbance to fish and marine turtles, however, since impacts will be restricted to the near-field and adjacent far-field, the duration is short-term, and rapid recovery is expected once operations cease; the magnitude of impact is assessed as 'Low'.

8.4.1.3.4.3 Likely Significant Effect

8.4.1.3.4.3.1 Injury Resulting from Underwater Noise Produced by Dredging Activities

LF cetaceans have been assessed as having 'Negligible' sensitivity to injury resulting from underwater noise produced by dredging activities, and the magnitude of impact has also been assessed as 'Negligible'. The likely significant effect of injury resulting from underwater noise produced by dredging activities is therefore 'Imperceptible'.

All other functional hearing groups of marine mammals are assessed as having 'Negligible' sensitivity to injury due to underwater noise arising from dredging operations, the magnitude of impact has also been assessed as 'Negligible'. The likely significant effect of injury resulting from underwater noise produced by dredging activities is therefore 'Imperceptible'.

Group 1 & 2 fish, and marine turtles have been assessed as having 'Negligible' sensitivity to injury as a result of noise from dredging, while Group 3 have been assessed 'Low' sensitivity. The magnitude of impact has been assessed as 'Negligible' for all functional hearing groups. The likely significant effect of injury due to noise from dredging is therefore 'Not significant' for Group 3 fish, and 'Imperceptible' for all other functional hearing groups and marine turtles.

The rating of pre-mitigation likely significant effect of injury due to underwater noise from construction phase dredging for all relevant receptors is presented in Table 8-27 below.

Table 8-27: Rating of Pre-mitigation LSE of Injury due to Underwater Noise from Construction Phase Dredging

Ecological Feature Affected	Quality of Effect	Sensitivity	Duration	Magnitude	Significance
Low Frequency cetaceans (minke or humpback whales)	Negative	Negligible	Short-term	Negligible	Imperceptible
High Frequency cetaceans (common or bottlenose dolphin)	Negative	Negligible	Short-term	Negligible	Imperceptible
Very High frequency cetaceans (harbour porpoise)	Negative	Negligible	Short-term	Negligible	Imperceptible
Harbour seal	Negative	Negligible	Short-term	Negligible	Imperceptible
Grey seal	Negative	Negligible	Short-term	Negligible	Imperceptible
Group 1 & 2 fish, and marine turtles	Negative	Negligible	Short-term	Negligible	Imperceptible
Group 3 fish	Negative	Low	Short-term	Negligible	Not significant

8.4.1.3.4.3.2 Disturbance Resulting from Underwater Noise Produced by Dredging Activities

LF cetaceans have been assessed as having 'Negligible' sensitivity to disturbance resulting from underwater noise produced by dredging activities, and the magnitude of impact has also been assessed as 'Negligible'. The likely significant effect of disturbance resulting from underwater noise produced by dredging activities is therefore 'Imperceptible'.

All other functional hearing groups of marine mammals are assessed as having 'Low' sensitivity to disturbance due to underwater noise arising from dredging operations, the magnitude of impact has also been assessed as 'Low'. The likely significant effect of disturbance resulting from underwater noise produced by dredging activities is therefore 'Slight negative'.

All functional hearing groups of fish and marine turtles have been assessed as having 'Low' sensitivity to disturbance as a result of noise from dredging, and the magnitude of impact has been assessed as 'Low'. The likely significant effect of disturbance due to noise from dredging is therefore 'Not significant'.

The rating of pre-mitigation likely significant effect of disturbance due to underwater noise from construction phase dredging for all relevant receptors is presented in Table 8-28 below.

Table 8-28: Rating of Pre-mitigation LSE of Disturbance due to Underwater Noise from Construction Phase Dredging

Ecological Feature Affected	Quality of Effect	Sensitivity	Duration	Magnitude	Significance
Low Frequency cetaceans (minke or humpback whales)	Negative	Negligible	Short-term	Negligible	Imperceptible
High Frequency cetaceans (common or bottlenose dolphin)	Negative	Low	Short-term	Low	Not significant
Very High frequency cetaceans (harbour porpoise)	Negative	Low	Short-term	Low	Not significant
Harbour seal	Negative	Low	Short-term	Low	Not significant
Grey seal	Negative	Low	Short-term	Low	Not significant
Fish and marine turtles	Negative	Low	Short-term	Low	Not significant

8.4.1.3.5 __Drilling__

Further blasting will be required in the channel and turning circle in order to ensure a maximum level of minus 7mcd is achieved within the turning area/channel. This blasting will most likely require no more than four boreholes in total.

Drilling is considered a low frequency, continuous sound source. Drilling generally produces continuous broadband frequencies concentrated at or below 1kHz. Noise generated during drilling varies significantly depending on the type of platform used, with floating platforms and ships generating more noise than fixed or jack-up rigs (MTE, 2020). Studies of the impact of coastal drilling operations are limited, most available research relates to deep-sea drilling in the oil and gas industry (Nedwell and Howell, 2004). Erbe and McPherson (2017) reported source levels of 142–145 dB re 1 µPa rms @ 1 m (30–2000 Hz) from drilling operations from a jack-up barge during geotechnical site investigation survey. Todd, *et al.*, (2020) reported 120dB re 1 µPa @ 41 m during geotechnical drilling operations from a jack-up barge, while Huang, *et al.*, (2023) reported 155.9 dB re 1 µPa rms @ 1 m when conducting drilling operations from an anchored vessel. The higher sound levels reported by Huang, *et al*., are likely in part due to the differing platforms used, with the jack-up rigs generating less sound than the anchored vessel. Drilling operations from a range of natural or man-made drilling platforms have recorded received levels of 119-125dB re 1 µPa at distances of 115-259m (Nedwell and Howell, 2004).

The transmission of noise to the marine environment is highly dependent on the platform type. Since drilling was carried out using drilling rigs operating on top of the temporary blasting platforms some reduction in noise input to the underwater environment would be expected relative to drilling operations from floating or jack-up platforms.

8.4.1.3.5.1 Sensitivity of IEFs

8.4.1.3.5.1.1 Injury Resulting from Underwater Noise Produced by Drilling Operations

Anticipated peak frequencies during drilling operations at Ros an Mhíl are expected to be <1kHz. Low frequency cetaceans, such as minke whales and humpback whales, are most sensitive to noise at these frequencies. Noise levels have been conservatively estimated at up to 160dB re 1 µPa at 1m, such levels have the potential to cause injury to animals at very close distance from the sound source (<10m).

It is considered unlikely that a minke whale or humpback whale would occur in the inshore waters of Cashla Bay and extremely unlikely to occur in such close proximity to active drilling operations for an injury to occur. Minke whale and humpback whale are therefore assessed as having 'Negligible' sensitivity to injury resulting from underwater noise produced by drilling operations.

The anticipated peak frequencies of drilling operations at <1kHz are below the peak sensitivity of high frequency cetaceans such as common dolphin and bottlenose dolphin, very high frequency cetaceans such as harbour porpoise and both seal species. Additionally, the expected noise levels of up to 160dB re 1 µPa at 1m are not sufficient to cause injury to species in these functional hearing groups. The sensitivity of these species to injury resulting from underwater noise produced by drilling operations is therefore assessed as 'Negligible'.

The anticipated peak frequencies of drilling operations at <1kHz coincide with the peak sensitivity of many fish species. Noise from continuous sources such as drilling present a low risk of mortality, mortal injury or recoverable to fish in functional hearing Groups 1 & 2, and marine turtles (Popper, *et al.*, 2014). The sensitivity of these species to injury as a result of underwater noise produced by drilling operations is therefore assessed as 'Negligible'. The risk of mortality or mortal injury is also low for hearing Group 3 fish species, however, they could potentially suffer recoverable injury following exposure to SPL of 170dB re 1 µPa at 1m for 48hrs. The sensitivity of these species to injury as a result of underwater noise produced by drilling operations is therefore assessed as 'Low'.

8.4.1.3.5.1.2 Disturbance Resulting from Underwater Noise Produced by Drilling Activities

Low frequency noise from drilling may be above ambient noise levels at some distance from the site of operations, potentially causing disturbance of low frequency cetaceans, however, given the paucity of minke whale and humpback whale in the area, sensitivity to disturbance as a result of underwater noise produced by drilling operations is assessed as 'Negligible'.

The anticipated noise levels of the low frequency noise from drilling operations may be above ambient levels at extended distance from the sound source and therefore have the potential to cause disturbance other functional hearing groups of marine mammals occurring in the area. The sensitivity of these species to disturbance as a result of underwater noise produced by drilling operations is therefore assessed as 'Low'.

Cashla Bay is identified as a nursery ground for a number of hearing Group 1 fish including mackerel, horse mackerel, white-bellied monkfish, spurdog and common skate complex. Salmon and sea trout (Group 2) also migrate through the bay annually. Projected noise levels pose a moderate risk of TTS in the near field, a moderate risk of behavioural impact in the intermediate field, and a high risk of masking in the intermediate field for hearing Group 1 & 2 fish and marine turtles. Group 3 fish, such as European eel, herring or cod, could potentially suffer TTS following exposure to SPL of 158dB re 1 µPa at 1m for 12hrs. Masking is likely to occur over far-field distances while behavioural impacts may occur in the intermediate field. Cashla Bay is identified as a nursery ground for a number of Group 3 fish including cod, herring, whiting, ling and hake; and herring spawning grounds are reported at Cashla Point. European eel may also migrate through the bay annually.

The expected noise output from drilling at Ros an Mhíl is estimated at up to a maximum of 180dB re 1 µPa at 1m, this is a conservative estimate based on reported outputs from similar projects and does not account for the use of a protective berm. The extent of the impact of disturbance from drilling would be largely limited to within a few hundred meters of the sound source, the species affected are mobile and capable of avoiding the area, nursery grounds identified in the area are widespread and common and rapid recovery is expected following cessation of operations. The sensitivity of all fish and marine turtles to disturbance as a result of underwater noise produced by drilling operations is therefore assessed as 'Low'.

8.4.1.3.5.2 Magnitude of Impact

The timing of operations is intermittent, the duration of the impact is brief, and the scale of the impact is considered low given the maximum number of up to 4 boreholes proposed. However, noise levels may be above ambient sound levels at extended distance from the sound source and could cause disturbance or masking of biologically significant communication.

Noise levels during dredging can theoretically result in injury to LF cetaceans but only within close range of the source. Rogan, *et al.* (2018) calculated the summer density of minke whale in western coastal waters at 0.102 animals/km^2. The total area of suitable habitat available in Cashla Bay is approximately 5.78km^2, which excludes intertidal and shallow subtidal waters. The potential abundance of minke whale in Cashla Bay is therefore estimated at 0.59 individuals. No humpback whales were recorded during surveys conducted by Rogan, *et al.*, therefore abundance of humpback whale in the area is assumed to be less than that of minke whale. No baleen whale sightings were reported by the MMOs on site during previous works at the site. Considering the low abundance of LF cetaceans in the area, the magnitude of impact of injury or disturbance due to noise resulting from drilling activities is assessed as 'Negligible'.

For all other functional hearing groups of marine mammals, anticipated sound levels are not sufficiently high to cause injury to any of these species, the magnitude of impact from injury from noise due to drilling is considered to be 'Negligible' for these species. There is a potential for disturbance to these species as a result of noise from drilling, however, considering the limited scale of drilling operations, the magnitude of this impact is assessed as 'Negligible'.

Continuous sound sources such as drilling do not pose a significant risk of injury to fish and marine turtles, the magnitude of impact is thus assessed as 'Negligible'. Noise from continuous sources such as drilling has the potential to result in disturbance to fish and marine turtles, however impacts will be restricted to the near-field and adjacent far-field, the duration is brief and infrequent, and rapid recovery is expected once operations ceased, the magnitude of impact is assessed as 'Negligible'.

8.4.1.3.5.3 Likely Significant Effect

8.4.1.3.5.3.1 Injury Resulting from Underwater Noise Produced by Drilling Operations

LF cetaceans have been assessed as having 'Negligible' sensitivity to injury from noise due to drilling, and the magnitude of impact from injury from noise due to drilling has also been assessed as 'Negligible'. The likely significant effect of injury due to noise from drilling is therefore 'Imperceptible'.

All other functional hearing groups of marine mammals are assessed as having 'Negligible' sensitivity to injury due to underwater noise arising from drilling operations, the magnitude of impact has also been assessed as 'Negligible'. The likely significant effect of injury due to noise from drilling is therefore 'Imperceptible'.

Group 1 & 2 fish, and marine turtles have been assessed as having 'Negligible' sensitivity to injury as a result of noise from drilling, while Group 3 have been assessed 'Low' sensitivity. The magnitude of impact has been assessed as 'Negligible' for all functional hearing groups. The likely significant effect of injury due to noise from dredging is therefore 'Not significant' for Group 3 fish, and 'Imperceptible' for all other functional hearing groups and marine turtles.

The rating of pre-mitigation likely significant effect of injury due to underwater noise from construction phase drilling for all relevant receptors is presented in Table 8-29 below.

Table 8-29: Rating of Pre-mitigation LSE of Injury due to Underwater Noise from Construction Phase Drilling

Ecological Feature Affected	Quality of Effect	Sensitivity	Duration	Magnitude	Significance
Low Frequency cetaceans (minke or humpback whale)	Negative	Negligible	Brief & infrequent	Negligible	Imperceptible
High Frequency cetaceans (common or bottlenose dolphin)	Negative	Negligible	Brief & infrequent	Negligible	Imperceptible
Very High frequency cetaceans (harbour porpoise)	Negative	Negligible	Brief & infrequent	Negligible	Imperceptible
Harbour seal	Negative	Negligible	Brief & infrequent	Negligible	Imperceptible
Grey seal	Negative	Negligible	Brief & infrequent	Negligible	Imperceptible
Group 1 & 2 fish, and marine turtles	Negative	Negligible	Brief & infrequent	Negligible	Imperceptible
Group 3 fish	Negative	Low	Brief & infrequent	Negligible	Not significant

8.4.1.3.5.3.2 Disturbance Resulting from Underwater Noise Produced by Drilling Operations

LF cetaceans have been assessed as having 'Negligible' sensitivity to disturbance from noise due to drilling, and the magnitude of impact from disturbance from noise due to drilling has also been assessed as 'Negligible'. The likely significant effect of disturbance due to noise from drilling is therefore 'Imperceptible'.

All other functional hearing groups of marine mammals are assessed as having 'Low' sensitivity to disturbance due to underwater noise arising from drilling operations, the magnitude of impact has also been assessed as 'Negligible'. The likely significant effect of disturbance due to noise from drilling is therefore 'Not significant'.

All functional hearing groups of fish and marine turtles have been assessed as having 'Low' sensitivity to disturbance as a result of noise from drilling, and the magnitude of impact has been assessed as 'Negligible'. The likely significant effect of disturbance due to noise from drilling is therefore 'Not significant'.

The rating of pre-mitigation likely significant effect of disturbance due to underwater noise from construction phase drilling for all relevant receptors is presented in Table 8-30 below.

Table 8-30: Rating of Pre-mitigation LSE of Disturbance due to Underwater Noise from Construction Phase Drilling

Ecological Feature Affected	Quality of Effect	Sensitivity	Duration	Magnitude	Significance
Low Frequency cetaceans (minke or humpback whale)	Negative	Negligible	Brief & infrequent	Negligible	Imperceptible
High Frequency cetaceans (common or bottlenose dolphin)	Negative	Low	Brief & infrequent	Negligible	Not significant
Very High frequency cetaceans (harbour porpoise)	Negative	Low	Brief & infrequent	Negligible	Not significant
Harbour seal	Negative	Low	Brief & infrequent	Negligible	Not significant
Grey seal	Negative	Low	Brief & infrequent	Negligible	Not significant
Fish and marine turtles	Negative	Low	Brief & infrequent	Negligible	Not significant

8.4.1.3.6 Blasting

Blasting produces broad spectrum impulsive sound at very high levels which can have significant impact on the marine environment. Sound produced is low frequency (2Hz – 1kHz) with peak frequency generally below 500Hz. Explosive charges of less than 1 kg TNT equivalent can generate emission levels (Lp,pk) above 260dB re 1 µPa @ 1 m, while explosive charges of several thousand kg of TNT equivalent may generate levels in excess of 300dB re 1 µPa @ 1 m (MTE, 2020). Near the source, the pressure rise-time for some explosives, such as TNT, is nearly instantaneous, followed by exponential decay (Popper, *et al.*, 2014).

Further blasting will be required in the channel and turning circle in order to ensure a maximum level of minus 7mcd is achieved within the turning area/channel. It is most likely to require no more than four boreholes in total. Blast holes will be taken to a depth at least 2m lower than the desired dredge level to ensure that fragmentation is achieved across the whole of the surface area to be blasted.

The transmission of noise to the marine environment is highly dependent on the blast type. As blasting will be carried out by placing charges in pre-drilled holes at depths of 2m below final dredge depth, significant reduction in noise input to the underwater environment would be expected relative to surface laid charges. However, noise levels may be above ambient sound levels at extended distance from the sound source (up to several kilometres) and could cause injury, disturbance or masking of biologically significant communication. Sound levels of over 260dB re 1 µPa @ 1 m could be expected. Such sound levels have potential to cause serious injury to a number of species identified as IEFs.

8.4.1.3.6.1 Sensitivity of IEFs

8.4.1.3.6.1.1 Injury Resulting from Underwater Noise Produced by Blasting Operations

Estimating potential distance at which injury can occur as a result of blasting is challenging and will be affected by factors such as charge size, number of charges, burial depth, type of rock and bathymetry. There is limited published information available to allow an accurate estimate of peak levels underwater following detonations from confined explosions. A study by Nedwell and Thandavamoorthy (1992) determined that the peak pressure from detonations in bore holes could be as low as 6% of that generated in equivalent, open water conditions. During the Miami harbour deepening project, Hempen *et al.,* (2007) showed levels of blast pressure in water following borehole detonations, falling to 19% to 41% of that recorded in open water.

Proposed blasting will be undertaken by placing charges in pre-drilled holes at depths of 2m below final dredge depth. It is estimated that sound levels could be sufficient to cause PTS in marine mammals at ranges in the order of hundreds of meters, and possibly up to one kilometre. Due to the uncertainty over the range at which an impact might occur, a precautionary approach has been taken, and all marine mammals have been assessed as potentially experiencing PTS at up to 1km from the source. The total area potentially impacted in Cashla Bay would therefore equal approximately 1.5km^2.

As anticipated peak frequencies from blasting are in the range of 2Hz – 1kHz, LF cetaceans are the most susceptible to impacts of injury from noise from blasting and predicted potential sound pressure levels of >260dB re 1 µPa @ 1 m have the potential to cause injury to LF cetaceans. LF cetaceans are therefore assessed as having 'Medium' sensitivity to injury as a result of underwater noise produced by blasting.

The primary acoustic energy from blasting is below the region of greatest sensitivity for porpoise, dolphins and seals (Southall et al. 2019). If PTS were to occur within this low frequency range, it would be unlikely to result in any significant effect to survival rates of, or population level effects in, porpoise, dolphins, and seals. Therefore, porpoise, dolphins, and grey seals have been assessed as having a 'Low' sensitivity to injury resulting from noise from blasting. A precautionary approach has been taken in assessment of sensitivity of harbour seal due to the importance of Cashla Bay to the species, harbour seals are therefore assessed as having 'Medium' sensitivity to injury as a result of underwater noise produced by blasting.

The predicted peak frequencies of blasting at <1kHz coincide with the peak sensitivity of many fish species. Noise from impulsive sources such as blasting present a potential risk of mortality or potential mortal injury for all functional hearing groups of fish and marine turtles at received peak SPL of 229 - 234dB re 1 µPa at 1m (Popper, *et al.*, 2014). Due to the uncertainty over the range at which an impact might occur, a precautionary approach has been taken, and all fish and marine turtles have been assessed as being at risk of injury at up to several hundred meters from the source.

The Cashla River is an important spawning and nursery ground for salmon and sea trout, IFI (2024b) fish counter data for the year 2023 reported; 69 spring salmon, 389 grilse, and 68 late summer salmon. The spawning stock of salmon in the Cashla system in 2024 was 578 individuals, the majority of these were grilse (TEGOS, 2024). The Conservation Limit for the system was 419 in 2024 with a forecasted surplus of 126 for 2025 (TEGOS, 2025), and the fishery was open for harvest. A total of 827 sea trout were recorded in the Cashla river in 2023 (IFI, 2024b). The sea trout fishery is currently catch and release only due to concerns over the national sea trout stock. Atlantic salmon is listed under Annex II of the E.U. Habitats Directive and is a qualifying interest of the Connemara Bog Complex SAC, while sea trout stocks have collapsed in Ireland and are subject to controls under the national salmon and sea trout fisheries management regulations and a bye-law prohibiting the retention of rod caught sea trout from Galway Bay to Achill Head (King, *et al.,* 2011).

Salmon populations are declining across their natural range and marine survival is a key concern. Marine survival of Irish salmon has declined dramatically since the 1970s, salmon smolt survival during the coastal component of their marine migration can have an impact on subsequent marine survival of salmon (TEGOS, 2025), estuaries and the lower stretches or rivers have been identified as high mortality locations for migrating smolts due to predation and other pressures (Flavio, *et al.*, 2019). The post-smolt and at-sea movements of both species are poorly understood and the focus of much research. The sensitivity of these species to mortality or potential mortal injury due to underwater noise arising from blasting operations is therefore assessed as 'Medium'.

Cashla Bay is identified as a nursery ground for a number of Group 1 fish including mackerel, horse mackerel, white-bellied monkfish, spurdog and the common skate complex. Cashla Bay is also a nursery ground for a number of Group 3 fish including cod, herring, whiting, ling and hake; and herring spawning grounds are reported at Cashla Point. European eel (Group 3) may also migrate through the bay annually. Although the above listed species are at risk of mortality or potential mortal injury at up to several hundred meters, the impact would occur at the individual level, and it is considered unlikely that a population level impact would occur. The nursery grounds identified in the area are widespread and common, and rapid recovery is expected following cessation of operations. The sensitivity of these species to injury as a result of underwater noise produced by blasting is therefore assessed as 'Low'.

8.4.1.3.6.1.2 Disturbance Resulting from Underwater Noise Produced by Blasting Operations

There is limited published guidance on assessment of disturbance or behavioural impacts from blasting. A precautionary approach has therefore been taken and all individuals of a species within the bounds of Cashla Bay are assumed to be potentially disturbed. Blasting will occur as a series of discrete events of momentary duration, noise from such events can cause a startle response but is not considered to be of sufficient duration to cause significant disturbance in marine mammals, fish or marine turtles. Any behavioural effects will be temporary and unlikely to alter survival or reproductive rates at the population level. The sensitivity to disturbance as a result of underwater noise produced by blasting is therefore assessed as 'Low' for all IEFs.

8.4.1.3.6.2 Magnitude of Impact

The duration of the impact of noise from blasting is momentary and occasional since blasting occurs as a series of discrete events separated by a number of days, the total number of proposed blasts will range from 4-10. The maximum area in Cashla Bay where marine mammals could be potentially impacted by PTS has been estimated at approximately 1.5km^2.

Rogan, *et al.* (2018) calculated the summer density of minke whale in western coastal waters at 0.102 animals/km^2. The total area of suitable habitat available in Cashla Bay is approximately 5.78km^2. The potential abundance of minke whale in Cashla Bay is therefore estimated at 0.59 individuals and 0.15 within the potentially impacted area. No humpback whales were recorded during surveys conducted by Rogan, *et al.*, therefore abundance of humpback whale in the area is assumed to be less than that of minke whale. No baleen whales were recorded by the MMOs on site during operations to date. The abundance of LF cetaceans is extremely low in the receiving environment therefore the likelihood of exposure to this impact should be considered very low also. The magnitude of the impact of injury as a result of underwater noise produced by blasting is therefore assessed as 'Negligible'.

Rogan, *er al.* (2018) calculated the winter density of common dolphin (including dolphins recorded as common/striped dolphin) in western coastal waters a 0.812 animals/km^2, while the summer density of bottlenose dolphin in western coastal waters a 1.084 animals/km^2. The total area of potential habitat in Cashla Bay is 5.78km^2, therefore the abundance of common dolphin in Cashla Bay is calculated as 4.69 individuals, and the abundance of bottlenose dolphin is calculated as 6.27 individuals. The number of common dolphins potentially present within the impacted area is 1.22, while the number of bottlenose dolphin potentially present is 1.63. The abundance of HF cetaceans is relatively low in the receiving environment therefore the likelihood of exposure to this impact should be considered relatively low also. The magnitude of the impact of injury as a result of underwater noise produced by blasting is therefore assessed as 'Low'.

Rogan, *er al.* (2018) calculated the winter density of harbour porpoise in western coastal waters a 0.262 animals/km^2, which would result in a calculated density of 1.51 individuals within Cashla Bay and 0.39 individuals within the potentially impacted area. Since the abundance of harbour porpoise is very low in the receiving environment therefore the likelihood of exposure to this impact should be considered very low also. The magnitude of the impact of injury as a result of underwater noise produced by blasting is therefore assessed as 'Negligible'.

The median number of harbour seal reported at haul sites in Cashla Bay is 77 (NPWS, 2012; 2025). While harbour seals congregate in significant numbers at haul out site during the annual moulting season, outside of this season harbour seal will disperse across the surrounding waters up to 20km from haul out sites (Cronin, *et al*., 2008). Carter *et al*., (2020) modelled the at-sea distribution of harbour seal around British and Irish coasts and determined an at sea relative abundance of 0.1% of the joint UK and Ireland population within a 5km-by-5km grid in inner Cashla Bay. Using scalars provided by Carter *et al.,* (2020) an at-sea absolute abundance of 40 individuals was calculated for inner Cashla Bay with a further 24 individuals predicted at Cashla Point. The median number of harbour seal of 77 reported at haul-out sites in Cashla Bay and the predicted at-sea abundance of harbour seal in Cashla Bay of 64, are both significant in terms of the national population (i.e. >1%). However, underwater noise will only affect that at-sea portion of the local population within the zone of impact of the noise.

The at-sea abundance of harbour seal in inner Cashla bay was calculated as 40 individuals based on the 25km^2 grids modelled by Carter *et al.*, (2020) which equals a density of 1.6/km^2. The number of harbour seal occurring within the 1.5km^2 potentially affected by PTS as a result of blasting is approximately 2.4 individual. Considering the importance of Cashla Bay for harbour seal and the potential for permanent injury, the magnitude of the impact of injury as a result of underwater noise produced by blasting is therefore assessed as 'Medium'.

The predicted abundance of grey seal in Cashla Bay based on modelling by Carter *et al.*, (2022) is <1 animal, however grey seals were recorded in Cashla Bay on a number of occasions by MMOs on site, the magnitude of the impact of injury as a result of underwater noise produced by blasting is therefore assessed as 'Low'.

Blasting presents a potential risk of injury for all functional hearing groups of fish and marine turtles. The duration of the noise impact from basting and the resultant increase in underwater noise is momentary and occasional as blasting will occur as a series of discrete events separated by a number of days, the total number of blasts will be low (4-10). The maximum distance at which fish and marine turtles could experience a potential risk of injury has been estimated at less than several hundred meters.

Salmon and sea trout both migrate through Cashla Bay annually, smolts will transit through the bay in the spring, with adults returning throughout the summer. Smolts of both species migrate in shoals, and the number of fish migrating can vary throughout the smolt run. This shoaling behaviour is likely a predator avoidance response, however it can leave the migrating fish vulnerable to impact from man-made pressures. Due to the presence of sensitive life stages of both salmon and sea trout, and the vulnerability of these local populations, and in consideration of the temporary and infrequent nature of the impact, the magnitude of impact injury as a result of underwater noise produced by blasting is therefore assessed as 'Medium' for both salmon and sea trout.

Cashla Bay is identified as a nursery ground for a number of commercial fish species (ICES, 2009), adults of these species are subject to directed fisheries which are managed using a variety of tools including total allowable catch (TAC) restrictions. The common skate complex is also reported as having spawning grounds in Cashla Bay, however spawning intensity is predicted to be low (Ellis, *et al.*, 2012). All of the identified species' nursery grounds are widespread in Irish waters, including the Galway coast. Any potential effect would not impact the survival of receptors to the extent that could alter the population trajectory. Considering this, and the limited extent and duration of the impact, the magnitude of impact of injury as a result of underwater noise produced by blasting is therefore assessed as 'Low' for all other fish IEFs.

Blasting will occur as a series of discrete events of momentary duration, noise from such events can cause a startle response but is not considered to be of sufficient duration to cause significant disturbance in marine mammals, fish or marine turtles. Any behavioural effects would be temporary and unlikely to alter survival or reproductive rates at the population level. For marine mammals, the number of potentially affected individuals was precautionarily assumed to be up to equivalent to the species at-sea abundance determined for Cashla Bay above. The total number of potentially affected individuals for each species is low (<1%) relative to national populations or management units. The abundance of all fish and marine turtles receptors was also assessed to be below nationally significant number. The magnitude of impact from disturbance is therefore assessed as 'Low' for all receptors, with the exception of LF cetaceans which are assessed as 'Negligible' in light of the very low abundance (<1 no.) in the area.

8.4.1.3.6.3 Likely Significant Effect

8.4.1.3.6.3.1 Injury Resulting from Underwater Noise Produced by Blasting Operations

LF cetaceans have been assessed as having 'Medium' sensitivity to injury due to underwater noise arising from blasting, and the magnitude of impact has been assessed as 'Negligible'. The likely significant effect of injury due to underwater noise arising from blasting is therefore 'Not significant'.

HF cetaceans and grey seal have been assessed as having 'Low' sensitivity to injury due to underwater noise arising from blasting, and the magnitude of impact has been assessed as 'Low'. The likely significant effect of injury due to underwater noise arising from blasting is therefore 'Slight negative'.

Harbour porpoise has been assessed as having 'Low' sensitivity to injury due to underwater noise arising from blasting, and the magnitude of impact has been assessed as 'Negligible'. The likely significant effect of injury due to underwater noise arising from blasting is therefore 'Not significant'.

Harbour seal have been assessed as having 'Medium' sensitivity to injury due to underwater noise arising from blasting, and the magnitude of impact has been assessed as 'Medium'. The likely significant effect of injury due to underwater noise arising from blasting is therefore 'Moderate negative'.

The sensitivity of salmon and sea trout to injury due to underwater noise arising from blasting operations is assessed as 'Medium', and the magnitude of impact is assessed as 'Medium'. The likely significant effect of injury due to underwater noise arising from blasting is therefore 'Moderate negative'.

The sensitivity of all other fish IEFs to injury due to underwater noise arising from blasting operations is assessed as 'Medium', and the magnitude of impact is assessed as 'Low'. The likely significant effect of injury due to underwater noise arising from blasting is therefore 'Not significant'.

The rating of pre-mitigation likely significant effect of injury due to underwater noise from construction phase blasting for all relevant receptors is presented in Table 8-31 below.

Table 8-31: Rating of Pre-mitigation LSE of Injury due to Underwater Noise from Construction Phase Blasting

Ecological Feature Affected	Quality of Effect	Sensitivity	Duration	Magnitude	Significance
Low Frequency cetaceans (minke or humpback whales)	Negative	Medium	Momentary & occasional	Negligible	Not significant
High Frequency cetaceans (common or bottlenose dolphin)	Negative	Low	Momentary & occasional	Low	Slight
Very High frequency cetaceans (harbour porpoise)	Negative	Low	Momentary & occasional	Negligible	Not significant
Harbour seal	Negative	Medium	Momentary & occasional	Medium	Moderate
Grey seal	Negative	Low	Momentary & occasional	Low	Slight
Atlantic salmon & sea trout	Negative	Medium	Momentary & occasional	Medium	Moderate
All other fish & marine turtles	Negative	Low	Momentary & occasional	Low	Not significant

8.4.1.3.6.3.2 Disturbance Resulting from Underwater Noise Produced by Blasting Operations

LF cetaceans are assessed as having 'Low' sensitivity to disturbance due to underwater noise arising from blasting operations, the magnitude of impact from disturbance from noise due to blasting has assessed as 'Negligible'. The likely significant effect of disturbance due to underwater noise arising from blasting is therefore 'Not significant'.

All other functional hearing groups of marine mammals are assessed as having 'Low' sensitivity to disturbance due to underwater noise arising from blasting operations, the magnitude of impact from disturbance from noise due to blasting has also been assessed as 'Low'. The likely significant effect of disturbance due to underwater noise arising from blasting is therefore 'Slight negative'.

All functional hearing groups of fish and marine turtles are assessed as having 'Low' sensitivity to disturbance due to underwater noise arising from blasting operations, the magnitude of impact has also been assessed as 'Low'. The likely significant effect of disturbance due to underwater noise arising from blasting is therefore 'Slight negative'.

The rating of pre-mitigation likely significant effect of disturbance due to underwater noise from construction phase blasting for all relevant receptors is presented in Table 8-32 below.

Table 8-32: Rating of Pre-mitigation LSE of Disturbance due to Underwater Noise from Construction Phase Blasting

Ecological Feature Affected	Quality of Effect	Sensitivity	Duration	Magnitude	Significance
Low Frequency cetaceans (minke or humpback whale)	Negative	Low	Momentary & occasional	Negligible	Not significant
All other marine mammals	Negative	Low	Momentary & occasional	Low	Slight
All fish and marine turtles	Negative	Low	Momentary & occasional	Low	Slight

8.4.1.4 Death or Injury by Collision

Vessel collision presents a particular risk to species which spend significant time at the surface either to breath (e.g. marine mammals, and marine turtle) or while feeding (e.g. basking sharks). Vessel collisions have been documented in a wide range of marine megafauna, including; basking shark (Chapple, *et al.* 2024), marine turtles (Hazel & Gyuris, 2006), pinnipeds and cetaceans (Olson, *et al.*, 2021; Laist, *et al.*, 2001) and can have adverse effects on the health or survival of individuals (Moore, *et al.*, 2013), and pose a threat to critically endangered populations (Blondin, *et al.*, 2025).

Key factors affecting collision risk include; vessel traffic, vessel speed, size and movement patterns (Blondin, *et al.*, 2025) and can vary between species. For instance, large vessels (>80m) travelling at speeds over 14 knots have been identified as particular threats to larger whales (Laist, *et al.*, 2001; Blondin, *et al.*, 2025), while small cetaceans, delphinids and pinnipeds may be at greater risk from fast moving recreational vessels (van Waerebeek *et al.* 2007; Olson, *et al.*, 2021). The severity and type of injury resulting from a vessel collision is dependent on a number of factors such as; vessel speed, vessel size, angle of impact and anatomical site of contact (Moore, *et al.*, 2013).

Ros an Mhíl Harbour is an active port with a significant level of daily vessel movements arising from fishing vessels and passenger ferries, especially in summer months. The use of a small number of vessels and barges during construction works will not add significantly to current vessel traffic. Furthermore, the type of vessels used during construction works are typically very slow moving and will not pose a collision risk to marine fauna.

The sensitivity of all IEFs to collision risk due to increased vessel traffic due to construction vessels is assessed as 'Negligible'. The spatial extent of this pressure is limited to the immediate vicinity of individual construction vessels as they manoeuvre within the harbour, and the duration of this pressure is short term; therefore, magnitude of impact is assessed as 'Negligible'.

The likely significant effect of death or injury by collision is assessed as 'Imperceptible' for all marine mammals, marine turtles and basking shark (see Table 8-33).

The rating of pre-mitigation likely significant effect of death or injury by collision during construction phase for all relevant receptors is presented in Table 8-33 below.

Table 8-33: Rating of Pre-mitigation LSE of Death or Injury by Collision During Construction Phase

Ecological Feature Affected	Quality of Effect	Sensitivity	Duration	Magnitude	Significance
Marine mammals	Negative	Negligible	Short-term	Negligible	Imperceptible
Basking shark and marine turtles	Negative	Negligible	Short-term	Negligible	Imperceptible

8.4.2 Operational Phase Effects

During the operational phase the presence of infrastructure and increased vessel activity have the potential to impact on the marine ecology. Relevant pressures were identified based on the OSPAR (2011) pressure definitions; these were aggregated into the following pressures for the purpose of this assessment.

- Permanent loss of habitat or change of habitat type due to presence of infrastructure;
- Death or injury by collision.

The likely significant effect on receptors was assessed for each of the above listed pressures where a realistic impact pathway exists, not all pressures are relevant for each identified receptor.

8.4.2.1 Permanent Loss of Habitat or Change of Habitat Type Due to Presence of Infrastructure

Permanent habitat loss or change is considered an operational phase impact as it will result in the permanent loss of marine habitat to land habitat in the case of the quay wall construction and reclamation works, or a permanent change in habitat type in the case of the construction of revetments.

The development involves the reclamation of 2.4 hectares achieved with the import of rock fill material to increase the existing ground level to the high-water level and to fill the marine area behind the proposed quay wall (east side) to create a construction surface. The current level of the site is +5mCD, this will be increased to +7mCD with the addition of further infill material. Preparatory dredging and cleaning of the quay wall trench will also be undertaken prior to placement of caissons to form the quay wall and completion of working surface. The resulting pressure following completion of these combined works will constitute a permanent loss of marine habitat to land habitat.

A total of 150m of rock armour will be placed for revetments on the north and south side of the reclaimed area behind the quay wall, 75m of revetment was constructed between 11th July 2023 and 20th May 2024, with a further 75m yet to be constructed. The completion of the revetments will result in a permanent change from one marine habitat to another and therefore constitutes a permanent physical loss of habitat but has an equal creation of an alternate habitat type (Tyler-Walters et al., 2023), where colonisation by certain species will occur.

8.4.2.1.1 Sensitivity of IEFs

The reclaimed area, quay wall and revetments will overlie the intertidal fucoid communities identified as well as a portion of sublittoral *L. digitata* habitat. All marine benthic habitats and species have a sensitivity of 'High' to permanent physical loss of habitat, their resistance to this pressure is 'None' and resilience is 'Very low' as there is no possibility of recovery of the lost habitat. Benthic fish and shellfish occurring in these habitats are similarly assessed as having 'High' sensitivity to this pressure.

Atlantic salmon, sea trout and European eel are highly sensitive to physical loss of habitat crucial to key life stages (MPAAG, 2024). Estuarine habitats are crucial to these species as they must migrate through these at key life stages, therefore sensitivity of these species to this pressure is 'High'.

Demersal fish, cephalopod and elasmobranch species occurring within this area are assessed collectively as 'Medium' sensitivity. The adults of these species are mobile and unlikely to be directly affected by this pressure; however, juveniles or eggs present in the area may have reduced ability to relocate. Although the loss of benthic habitat resulting from the development may have reduced the availability of spawning or nursery habitats, similar suitable habitats are widespread in Cashla Bay and the wider Galway Bay.

Adult pelagic fish, cephalopods, and elasmobranch species are also highly mobile, and not associated with littoral and shallow sublittoral habitats and are therefore unlikely to be directly affected by this pressure. Juvenile sprat, herring or horse mackerel present in the area may use the *Laminaria* or fucoid habitats for shelter, however, the juveniles of these species are also highly mobile and therefore able to avoid the area and relocate to other suitable locations within the bay. These species are collectively assessed as having 'Low' sensitivity to this impact.

8.4.2.1.2 Magnitude of Impact

The construction of the deep water quay and associated land reclamation will result in the permanent change from one marine habitat to another. However, the extent of the impact is limited to the footprint of construction works. The total area of seabed reclaimed is *c.* 24,000m^2, which is low in comparison to the total area of available habitats in Cashla Bay and the wider Galway Bay supporting similar biotopes.

The loss of marine benthic habitat is a permanent loss with no potential for recovery; however, the extent of this impact is limited to the footprint on the development. The magnitude of impact from the physical loss of marine habitat on benthic habitats and species is assessed as 'Negligible' as the affected benthic habitats are widespread, and there are no benthic species or habitats of national or international significance dependent on the area.

The magnitude of impact from the physical loss of marine habitat on salmon, sea trout and European eel is assessed as 'Low' since these species are mobile, and the extent of the habitat lost is low relative to available habitat in the bay.

The magnitude of impact from the physical loss of marine habitat on the demersal and pelagic species assemblage is assessed as 'Negligible' since these species are mobile, the extent of the pressure is low, and there is considerable area of suitable alternate habitat available in Cashla Bay.

8.4.2.1.3 Likely Significant Effect

Marine benthic habitats and species are assessed as having 'High' sensitivity to permanent loss of marine habitat to land habitat, the magnitude of the impact was assessed as 'Negligible'. Therefore, the likely significant effect of permanent loss of marine habitat to land habitat on benthic habitats and species is assessed as 'Not significant'.

Atlantic salmon, sea trout and European eel are assessed as having 'High' sensitivity to permanent loss of marine habitat to land habitat, the magnitude of the impact was assessed as 'Negligible'. Therefore, the likely significant effect of permanent loss of marine habitat to land habitat on benthic habitats and species is assessed as 'Not significant'.

The demersal species assemblage is assessed as having 'Medium' sensitivity to permanent loss of marine habitat to land habitat, the magnitude of the impact was assessed as 'Negligible'. Therefore, the likely significant effect of permanent loss of marine habitat to land habitat on demersal species is assessed as 'Not significant'.

The pelagic species assemblage is assessed as having 'Medium' sensitivity to permanent loss of marine habitat to land habitat, the magnitude of the impact was assessed as 'Negligible'. Therefore, the likely significant effect of permanent loss of marine habitat to land habitat on demersal species is assessed as 'Not significant'.

The rating of pre-mitigation likely significant effect of permanent habitat loss or change of habitat type due to presence of infrastructure for all relevant receptors is presented in **Table 8-34** below.

Table 8-34: Rating of Pre-mitigation Permanent Habitat Loss or Change of Habitat Type due to Presence of Infrastructure

Ecological Feature Affected	Quality of Effect	Sensitivity	Duration	Magnitude	Significance
Marine benthic habitats and species	Negative	High	Permanent	Negligible	Not Significant
Anadromous species	Negative	High	Permanent	Negligible	Not Significant
Demersal fish, cephalopod and elasmobranch species	Negative	Medium	Permanent	Negligible	Not Significant
Pelagic fish, cephalopod and elasmobranch species	Negative	Medium	Permanent	Negligible	Not Significant

8.4.2.2 Death or Injury by Collision

Vessel collision presents a particular risk to species which spend significant time at the surface either to breath (e.g. marine mammals, and marine turtle) or while feeding (e.g. basking sharks). Vessel collisions have been documented in a wide range of marine megafauna, including; basking shark (Chapple, *et al.* 2024), marine turtles (Hazel & Gyuris, 2006), pinnipeds and cetaceans (Olson, *et al.*, 2021; Laist, *et al.*, 2001) and can have adverse effects on the health or survival of individuals (Moore, *et al.*, 2013), and pose a threat to critically endangered populations (Blondin, *et al.*, 2025).

Key factors affecting collision risk include; vessel traffic, vessel speed, size and movement patterns (Blondin, *et al.*, 2025), and can vary between species. For instance, large vessels (>80m) travelling at speeds over 14 knots have been identified as particular threats to larger whales (Laist, *et al.*, 2001; Blondin, *et al.*, 2025), while small cetaceans, delphinids and pinnipeds may be at greater risk from fast moving recreational vessels (van Waerebeek *et al.* 2007; Olson, *et al.*, 2021). The severity and type of injury resulting from a vessel collision is dependent on a number of factors such as; vessel speed, vessel size, angle of impact and anatomical site of contact (Moore, *et al.*, 2013).

The development of the deep water quay will form an extension to the existing Ros an Mhíl Harbour providing an opportunity for increased landings of fish by both the demersal and pelagic fishing fleets, particularly larger vessels of >30m Length Overall (LOA). Landings of both demersal and pelagic species are predicted to grow by +10% by 2030 and by a further +3.5% by 2039.

Ros an Mhíl Harbour is an active port with a significant level of daily vessel movements arising from fishing vessels and passenger ferries, especially in summer months. While the extension of Ros an Mhíl Harbour will likely result in increased vessel traffic, it is considered unlikely that this increased vessel traffic will result in increased collision risk since the increased traffic will be in the form of large fishing vessels travelling at low speeds within the harbour. Slower moving vessels on a predictable course provide greater opportunity for both the vessel and marine fauna to avoid collision.

The sensitivity of all IEFs to collision risk due to increased vessel traffic at the predicted levels is assessed as 'Negligible'. The spatial extent of the impact risk is limited to the immediate vicinity of individual vessels as they transiting to/from, or manoeuvre within, the harbour, and the duration of this pressure is long term but intermittent; therefore magnitude of impact is assessed as 'Low'.

The likely significant effect of death or injury by collision is assessed as 'Imperceptible' for all marine mammals, marine turtles and basking shark (see **Table 8-35**).

Table 8-35: Rating of Pre-Mitigation Death or Injury by Collision during Operational Phase

Ecological Feature Affected	Quality of Effect	Sensitivity	Duration	Magnitude	Significance
Marine mammals	Negative	Negligible	Permanent & intermittent	Low	Not Significant
Basking shark and marine turtles	Negative	Negligible	Permanent & intermittent	Low	Not Significant

8.5 Mitigation Measures

8.5.1 Construction Phase Mitigation

8.5.1.1 Pollution Control

There is potential for accidental spills or leaks of fuels, oils, or hydraulic fluids from construction equipment operating near or on the water. Such events, though unlikely if managed properly, could cause localised contamination and acute toxicity to marine organisms.

To mitigate these risks, best-practice construction environmental management must be maintained. Key measures include bunded fuel storage, spill kits, and regular equipment checks to prevent hydrocarbon leaks and timing in-water works outside biologically sensitive periods, where possible. With these controls in place, the residual impact to marine ecology is predicted to be low, temporary, and localised.

8.5.1.2 Marine Mammal Mitigation

Assessment of the unmitigated impact of injury or disturbance caused by underwater noise from drilling and dredging concluded no likely significant effect to any functional hearing group of marine mammals. This assessment was based on the low abundance of low frequency cetaceans in the area, extremely small distances within which an injury could potentially occur, and the rapid attenuation of sound in coastal waters.

The unmitigated likely significant effect of injury due to underwater noise arising from blasting was evaluated as 'Moderate' for harbour seal. The significance of impact was assessed as 'Slight negative' for HF cetaceans and grey seal, and 'Not significant' for LF cetaceans and harbour porpoise.

In accordance with the 'Guidance to Manage the Risk to Marine Mammals from Man-made Sounds Sources in Irish Waters' (NPWS, 2014), marine mammal mitigation should be applied for all dredging, drilling and blasting operations. In light of the low potential for significant effect due to dredging and drilling, the requirement for delaying operations following detection of a marine mammal in the mitigation zone during a pre-watch has been revised.

8.5.1.2.1 Dredging

- A dedicated MMO shall be on site during all dredging operations, including within the protective berm, and for all operations where an excavator bucket is expected to make contact with the seabed or material on the seabed. For all such activities, the following mitigation measures should be implemented;
- A clear line of communication between the MMO and operators will be established;
- All mitigation measures shall be implemented for all species of cetacean, seal, marine turtle, otter and basking shark;
- A 30-minute pre-watch prior to operations shall be undertaken;
- A WMO sea state four or less, 1km or more of visibility beyond the limits of the mitigation zone, and daylight, is required for the MMO to conduct a pre-watch;
- A mitigation zone of 500m radius from the sound source shall be implemented;
- Following the detection of a marine mammal within the mitigation zone during the pre-watch, a delay in commencement of operations shall be adhered to until the animal is visibly observed to have left the mitigation zone, or at least 15 minutes has elapsed since the animal was last detected in the mitigation zone;
- During any breaks in sound of >30 minutes, a full 30-minute pre-watch shall be conducted prior to recommencement of operations.

8.5.1.2.2 Drilling

- A dedicated MMO shall be on site during all drilling operations;
- A clear line of communication between the MMO and operators will be established;
- All mitigation measures shall be implemented for all species of cetacean, seal, marine turtle, otter and basking shark;
- A 30-minute pre-watch prior to operations shall be undertaken;
- A WMO sea state four or less, 1km or more of visibility beyond the limits of the mitigation zone, and daylight, is required for the MMO to conduct a pre-watch;
- A mitigation zone of 500m radius from the sound source shall be implemented;
- Following the detection of a marine mammal within the mitigation zone during the pre-watch, a delay in commencement of operations shall be adhered to until the animal is visibly observed to have left the mitigation zone, or at least 15 minutes has elapsed since the animal was last detected in the mitigation zone;
- During any breaks in sound of >30 minutes, a full 30-minute pre-watch shall be conducted prior to recommencement of operations.

8.5.1.2.3 Blasting

- A dedicated MMO shall be on site during all blasting operations;

- A clear line of communication between the MMO and operators will be established;
- All mitigation measures shall be implemented for all species of cetacean, seal, marine turtle, otter and basking shark;
- A WMO sea state four or less, 1km or more of visibility beyond the limits of the mitigation zone, and daylight, is required for the MMO to conduct a pre-watch;
- A 30-minute pre-watch prior to operations shall be undertaken. The MMO shall maintain constant surveillance of the mitigation zone from a suitable platform;
- A mitigation zone of 1,000m radius from the sound source shall be implemented;
- Following the detection of a marine mammal within the mitigation zone during the pre-watch, a delay in commencement of operations shall be adhered to until at least 30 minutes elapsed since the animal was last detected in the mitigation zone;
- The time between the end of pre-watch and operations commencing shall be minimised. The MMO shall maintain constant surveillance of the mitigation zone from a suitable platform up until the blast takes place;
- A 30 minute post-blast watch of the mitigation zone shall be undertaken.

8.5.1.3 Atlantic Salmon and Sea Trout

The unmitigated impact on salmon and sea trout caused by injury resulting from blasting noise was assessed as 'Moderate' in recognition of the presence of vulnerable life stages present in the area, and the sensitivity of the local populations.

To mitigate potential impacts to these species operational restrictions shall be implemented to restrict operations during sensitive periods.

- No blasting shall be conducted between 1st April and 31st May, inclusive, as this is the time of year when smolts of both species will be transiting through Cashla Bay.
- No blasting shall be conducted between 1st June and 31st August, inclusive, as this is the peak migration of returning adults of both species through Cashla Bay.

8.5.1.4 Invasive Alien Species

The remaining construction works of the deep water quay at Ros an Mhíl present potential pathways for the introduction and spread of invasive alien species (IAS) in the marine environment. Marine infrastructure developments often act as vectors for IAS through increased vessel traffic, ballast water discharge, and the attachment of non-native organisms to construction materials, equipment, and vessel hulls (Minchin and Nunn, 2013). Quay structures, pontoons, and submerged surfaces can also serve as new hard substrates for colonisation by opportunistic non-native fouling organisms, which may subsequently spread to surrounding natural habitats.

Species of concern in Irish coastal waters include *Didemnum vexillum* (carpet sea squirt), *Crepidula fornicata* (slipper limpet), and *Undaria pinnatifida* (wakame), all of which can outcompete native flora and fauna, alter benthic community structure, and impact commercial aquaculture and fisheries (BIM, 2023). The risk is heightened when construction involves equipment or materials transported from other regions, particularly from areas where IAS are already established.

To minimise the introduction and spread of IAS, a suite of biosecurity measures should be implemented during the construction phase. These include cleaning and inspection of all marine plant, vessels, and construction equipment before deployment on site, sourcing materials such as rock fill from terrestrial, non-marine locations and avoiding material with prior aquatic exposure, ensuring that ballast water management practices comply with IMO Ballast Water Management Convention standards, regular monitoring of new structures for colonisation by non-native species, Development of a Biosecurity Risk Assessment and, if needed, a Rapid Response Plan for any detected IAS.

With proper controls, the likelihood of IAS establishment due to the development is considered low, though continued vigilance during the remainder of the construction phase remains important.

8.5.2 Operational Phase Mitigation

8.5.2.1 Pollution Control

Surface water runoff during the operational phase has the potential to carry pollutants into Cashla Bay. These pollutants can include fuels and oils from vehicles, sediment run off, heavy metals and chemicals from activity on the deep water quay. To minimize this risk the deep water quay has been designed to integrate an appropriate drainage network with interceptors to manage drainage and prevent contamination of the water in Cashla Bay.

The remaining operational mitigation measures required involve the following:

- The installed surface water drainage system and interceptors will be monitored for blockages and integrity and maintained to ensure their ongoing optimal effectiveness;
- No waste will be disposed of at sea;
- Hazardous wastes will be stored in sealed, labelled drums in locked chemical cabinets;
- Spills on deck will be contained and controlled using absorbing materials;
- Vessels without sewage treatment systems will have suitable holding tanks and will bring waste onshore for treatment in the sewage system operated by Údarás na Gaeltachta;
- All chemicals used on-board should be handled in compliance with COSHH instructions on handling hazardous materials;
- Chemicals will be stored appropriately in suitably bunded areas and with material safety data sheets; and;
- All waste discharges will be monitored and recorded as per vessel procedures.

8.5.2.2 Invasive Alien Species

The operational phases of the deep water quay at Ros an Mhíl presents a potential pathways for the introduction and spread of invasive alien species (IAS) in the marine environment. Marine infrastructure developments often act as vectors for IAS through increased vessel traffic, ballast water discharge, and the attachment of non-native organisms to construction materials, equipment, and vessel hulls (Minchin and Nunn, 2013). Quay structures, pontoons, and submerged surfaces can also serve as new hard substrates for colonisation by opportunistic non-native fouling organisms, which may subsequently spread to surrounding natural habitats.

Species of concern in Irish coastal waters include *Didemnum vexillum* (carpet sea squirt), *Crepidula fornicata* (slipper limpet), and *Undaria pinnatifida* (wakame), all of which can outcompete native flora and fauna, alter benthic community structure, and impact commercial aquaculture and fisheries (BIM, 2023). The risk is heightened when construction involves equipment or materials transported from other regions, particularly from areas where IAS are already established. Furthermore, increased post-construction vessel traffic, particularly from non-local operators, may elevate the risk of IAS arrival and establishment via biofouling or ballast water.

To minimise the introduction and spread of IAS, a suite of biosecurity measures should be implemented during the operational phases. These include cleaning and inspection of all marine plant, equipment, and vessels, before deployment on site, sourcing raw materials from terrestrial, non-marine locations and avoiding material with prior aquatic exposure, ensuring that ballast water management practices comply with IMO Ballast Water Management Convention standards, regular monitoring of new structures for colonisation by non-native species, especially during the initial years of operation, development of a Biosecurity Risk Assessment and, if needed, a Rapid Response Plan for any detected IAS.

With proper controls, the likelihood of IAS establishment due to the development is considered low, though continued vigilance during the operational phase remains important, particularly given the quay's role in facilitating marine access and transport.

8.6 Residual Effects

The post-mitigation residual effects of construction and operation phases are assessed below. Residual effects on marine mammals, Atlantic salmon and sea trout are discussed in detail in the below sections. A summary of the post-mitigation residual effects on all other IEFs during the construction and operation phases are presented below in Table 8-36 and Table 8-37, respectively.

8.6.1 Marine Mammal

The assessment of the unmitigated impact of injury caused by underwater noise from drilling and dredging concluded no likely significant effect to any functional hearing group of marine mammals. The likely significance of injury from both drilling and dredging was assessed as 'Imperceptible' for all marine mammals. This assessment was based on the low abundance of low frequency cetaceans in the area, extremely small distances within which an injury could potentially occur, and the rapid attenuation of sound in coastal waters.

The assessment of the unmitigated impact of disturbance caused by underwater noise from drilling and dredging concluded no likely significant effect to any functional hearing group of marine mammals. The likely significance of disturbance from both drilling and dredging was assessed as 'Imperceptible' for low frequency marine mammals and 'Not significant' for all other marine mammals.

The mitigation measures proposed will not further mitigate impacts of disturbance or injury to any marine mammal IEF. Residual impacts of both injury or disturbance are therefore unchanged, remaining 'Imperceptible' for all marine mammals, however, the proposed mitigation measures would reduce the likelihood of an effect occurring.

The unmitigated likely significant effect of injury or disturbance due to underwater noise arising from blasting was evaluated as 'Moderate' for harbour seal. The significance of impact was assessed as 'Slight negative' for HF cetaceans and grey seal, and 'Not significant' for LF cetaceans and harbour porpoise. The mitigation measures proposed for blasting operations will reduce the magnitude of impact for all marine mammals IEFs by ensuring there are no marine mammals in the zone of impact prior to a blast taking place. The post-mitigation magnitude of impact is assessed as 'Negligible' for all marine mammal IEFs, therefore, the residual likely significance effect is assessed as 'Not significant' for all marine mammal IEFs.

8.6.2 Atlantic Salmon and Sea Trout

The unmitigated impact on salmon and sea trout caused by injury resulting from blasting noise was assessed as 'Moderate' in recognition of the presence of vulnerable life stages present in the area, and the sensitivity of the local populations. To mitigate potential impacts to these species operational restrictions are proposed to restrict operations during sensitive periods. By avoiding the smolt migration in April to May, and the grilse migration from June - August the magnitude of impact on the population will be reduced to 'Negligible'. As the post-mitigation magnitude of impact is reduced to 'Negligible' and the sensitivity of both species was assessed as 'Medium', the residual likely significant effect of the impact is assessed as 'Not significant'.

Table 8-36: Summary of the Post-mitigation Residual Effects on all IEFs Arising during the Construction Phase

Impact/Activity/Receptor	Quality of Effect	Pre-mitigation Significance Rating	Mitigation Measures	Post-mitigation/ Residual Significance Rating
Habitat Disturbance or Structure Change				
Benthic habitats	Negative	Slight	None	Slight
Benthic fish and invertebrate species	Negative	Slight	None	Slight
Demersal fish, cephalopod and elasmobranch species	Negative	Slight	None	Slight
Suspended Sediments, Smothering and Siltation Rate Changes				
Benthic habitats	Negative	Not significant to slight	Best-practice construction environmental management maintained, including phased dredging to minimise the spatial and temporal extent of sediment disturbance, real-time turbidity monitoring with defined trigger levels and stop-work thresholds	Not significant to slight
Harbour seal	Negative	Not significant	None	Not significant
Other marine mammals	Negative	Not significant	None	Not significant

MWP

Impact/Activity/Receptor	Quality of Effect	Pre-mitigation Significance Rating	Mitigation Measures	Post-mitigation/ Residual Significance Rating
Fish and shellfish	Negative	Not significant	Best-practice construction environmental management maintained, including phased dredging to minimise the spatial and temporal extent of sediment disturbance, real-time turbidity monitoring with defined trigger levels and stop-work thresholds	Not significant
Injury due to Underwater Noise from Construction Phase Dredging or Drilling				
All functional hearing groups of marine mammals	Negative	Imperceptible	MMO monitoring; 30-minute pre-watch, 500m mitigation zone, delay following detection in mitigation zone for 15mins or until animal is observed leaving mitigation zone	Imperceptible
Group 1 & 2 fish, and marine turtles	Negative	Imperceptible	No mitigation measures proposed for fish. MMO mitigation measures as above should be applied to basking shark and marine turtles	Imperceptible
Group 3 fish	Negative	Not significant	None	Not significant
Disturbance due to Underwater Noise from Construction Phase Dredging or Drilling				
Low Frequency cetaceans (minke or humpback whales)	Negative	Imperceptible	MMO monitoring; 30-minute pre-watch, 500m mitigation zone, delay following detection in mitigation zone for 15mins or until animal is observed leaving mitigation zone	Imperceptible

Impact/Activity/Receptor	Quality of Effect	Pre-mitigation Significance Rating	Mitigation Measures	Post-mitigation/ Residual Significance Rating
All other functional hearing groups of marine mammals	Negative	Not significant	MMO monitoring; 30-minute pre-watch, 500m mitigation zone, delay following detection in mitigation zone for 15mins or until animal is observed leaving mitigation zone	Not significant
Fish, and marine turtles	Negative	Not significant	No mitigation measures proposed for fish. MMO mitigation measures as above should be applied to basking shark and marine turtles	Not significant
Injury due to underwater Noise from Construction Phase Blasting				
Low Frequency cetaceans (minke or humpback whales)	Negative	Not Significant	MMO monitoring; 30-minute pre-watch, 1000m mitigation zone, 30 min delay following detection in mitigation zone	Not Significant
High Frequency cetaceans (common or bottlenose dolphin)	Negative	Slight	MMO monitoring; 30-minute pre-watch, 1000m mitigation zone, 30 min delay following detection in mitigation zone	Not Significant
Very High frequency cetaceans (harbour porpoise)	Negative	Not Significant	MMO monitoring; 30-minute pre-watch, 1000m mitigation zone, 30 min delay following detection in mitigation zone	Not Significant
Harbour seal	Negative	Moderate	MMO monitoring; 30-minute pre-watch, 1000m mitigation zone, 30 min delay following detection in mitigation zone	Not Significant
Grey seal	Negative	Slight	MMO monitoring; 30-minute pre-watch, 1000m mitigation zone, 30 min delay following detection in mitigation zone	Not Significant

Impact/Activity/Receptor	Quality of Effect	Pre-mitigation Significance Rating	Mitigation Measures	Post-mitigation/ Residual Significance Rating
Atlantic salmon and sea trout	Negative	Moderate	No blasting shall take place between 1st April and 31st August to avoid migrating fish	Not Significant
All other fish & marine turtles	Negative	Not Significant	No mitigation measures proposed for fish. MMO mitigation measures as above should be applied to basking shark and marine turtles	Not Significant
Disturbance due to Underwater Noise from Construction Phase Blasting				
Low Frequency cetaceans (minke or humpback whales)	Negative	Not Significant	MMO monitoring; 30-minute pre-watch, 1000m mitigation zone, 30 min delay following detection in mitigation zone	Not Significant
All other functional hearing groups of marine mammals	Negative	Slight	MMO monitoring; 30-minute pre-watch, 1000m mitigation zone, 30 min delay following detection in mitigation zone	Not Significant
Atlantic salmon and sea trout	Negative	Slight	No blasting shall take place between 1st April and 31st August to avoid migrating fish	Not Significant
All other fish & marine turtles	Negative	Slight	No mitigation measures proposed for fish. MMO mitigation measures as above should be applied to basking shark and marine turtles	Slight
Death of Injury by Collision				
Marine mammals	Negative	Imperceptible	None	Imperceptible
Basking shark and marine turtles	Negative	Imperceptible	None	Imperceptible
Pollution Control	Negative	Slight	Best-practice construction environmental management maintained, including bunded	Not Significant

Impact/Activity/Receptor	Quality of Effect	Pre-mitigation Significance Rating	Mitigation Measures	Post-mitigation/ Residual Significance Rating
			fuel storage, spill kits, regular equipment checks to prevent hydrocarbon leaks	
Invasive Alien species	Negative	Slight	Biosecurity measures implemented, including cleaning and inspection of all marine plant, vessels, and construction equipment before deployment on site, sourcing rock fill from terrestrial, non-marine locations and avoiding material with prior aquatic exposure, ensuring that ballast water management practices comply with IMO Ballast Water Management Convention standards, and Development of a Biosecurity Risk Assessment and, if needed, a Rapid Response Plan for any detected IAS	Not Significant

Table 8-37: Summary of the Post-mitigation Residual Effects on all IEFs arising during the Operation Phase

Impact/Activity/Receptor	Quality of Effect	Pre-mitigation Significance Rating	Mitigation Measures	Post-mitigation/ Residual Significance Rating
Permanent Loss of Habitat or Change of Habitat Type due to Presence of Infrastructure				
Benthic habitats	Negative	Slight	None	Slight
Fish and shellfish species	Negative	Slight	None	Slight
Death of Injury by Collision				
Marine mammals	Negative	Imperceptible	None	Imperceptible

Impact/Activity/Receptor	Quality of Effect	Pre-mitigation Significance Rating	Mitigation Measures	Post-mitigation/ Residual Significance Rating
Basking shark and marine turtles	Negative	Imperceptible	None	Imperceptible
Pollution Control	Negative	Slight	Best-practice construction environmental management maintained, including bunded fuel storage, spill kits, regular equipment checks to prevent hydrocarbon leaks	Not Significant
Invasive Alien Species	Negative	Slight	Biosecurity measures implemented, including include cleaning and inspection of all marine plant, equipment, and vessels, before deployment on site, sourcing raw materials from terrestrial, non-marine locations and avoiding material with prior aquatic exposure, ensuring that ballast water management practices comply with IMO Ballast Water Management Convention standards, regular monitoring of new structures for colonisation by non-native species, especially during the initial years of operation, Development of a Biosecurity Risk Assessment and, if needed, a Rapid Response Plan for any detected IAS	Not Significant

8.7 Cumulative Effects

The likely significant cumulative effects of the proposed development in-combination with existing or planned projects were considered and assessed. The study area was defined as the marine waters of Cashla Bay from Cashla Point to Clynagh Bay and surrounding coastal waters within 10km of Cashla Point. This broad area of study was identified in recognition of the fact that marine species can be highly mobile. The study area also encompasses all known seal haul-out sites in the bay. The zone of impact of certain pressures can be extensive, for example, suspended sediments can be transported over extended distances due to tidal action, while underwater noise from construction projects can be above ambient noise levels several kilometres from the noise source.

The Galway County Council public planning viewer and An Bord Pleanála cases map viewer were both searched for relevant existing, proposed and approved marine projects within the study area. Three projects were identified for cumulative effect assessment;

1. GCC. Reg. Ref. 21/300 - Permission granted in 2021 for Phase 3 of a new small craft harbour, reclamation of foreshore and dredging of a new small craft harbour basin at Ros an Mhíl Fishery Harbour Centre, Ros an Mhíl, Co. Galway. Construction has not commenced.
2. GCC. Reg. Ref. 18/547 - Permission granted in 2018 for refurbishment of existing slipway to improve low tide access. Raising and widening of slipway deck and the addition of a berthing face. Extension of existing rubble mound breakwater and re-grading of rock revetment to provide further protection of the small draft Harbour.
3. GCC Reg. Ref. 15/115 – Permission granted in 2015 for Small Craft Harbour, reclamation of foreshore and dredging of a new small craft harbour approach channel and basin.
4. GCC Reg. Ref. 22/1076 – Reclamation of a waterlogged area to the south of the Department of Agriculture, Food and the Marine's public carpark. Construction has not commenced.
5. GCC Reg. Ref. 20/1633 – Construction of Boat Maintenance and Repair Centre with Office and Storage space, new pier and mobile boat lift, boat and car storage space and construction of a Sewage Treatment Plant. Not constructed but site preparation works has commenced.

The first phase of the Small Craft Harbour construction (Ref. 15/155) and refurbishment of the existing slipway (Ref 18/547) was completed prior to commencement of works on the deep water quay. As such, no pathway exists for cumulative effects during the construction phase of the proposed development.

The further development (Phase 3) of the small craft harbour (Ref. 21/300) has been approved but construction has not commenced. No start date for works on the small boat harbour could be found, but procurement for the works began in September 2024. As such, there is a potential impact pathway for effects during the construction of this phase of small harbour craft development and outstanding works on the deep water quay.

The small harbour development will consist of a 91 berth floating pontoon system and will require the dredging, drilling and blasting of 18,200m^3 of soft material and bedrock, the reclamation of 5,000m^2 of foreshore, and the installation of approximately 18 no. steel piles which will be socketed into rock. A Dumping-at-Sea licence will also be required for the dumping of dredged material at Cashla Point.

The identification of potential impacts has been undertaken by considering the relevant characteristics from both these projects. The identification of potential impacts has been undertaken by considering the outcome of the residual effects assessment and the potential for a pathway for those impacts to have direct and/or indirect effects on identified receptors.

Underwater noise from blasting was identified as the sole cumulative impact requiring assessment. Due to the potential for cumulative impacts, blasting at the deep water quay should be co-ordinated so as not to coincide with blasting or installation of steel piles at the small harbour development, and allow at least 24hrs between consecutive blasting or pilling operations at either site. If operations are co-ordinated in this manner, and considering that proposed blasting for the deep water quay development will consist of a low number of blasts proposed (maximum of 4-10), the momentary and occasional extremely short duration of impact from each blast, the use of an MMO and recommended mitigation measures outlined above, and the smaller scale of the small harbour development, it is considered unlikely that underwater noise from blasting at the deep water quay will give rise to cumulative impacts resulting in injury or disturbance to sensitive IEFs.

8.8 Conclusion

This Chapter of the EIAR has assessed all identified pressures on identified marine IEFs arising from construction and operations of the proposed deep water quay development at Ros an Mhíl.

Residual impacts were identified for the permanent loss of benthic marine habitat to land habitat resulting from the reclamation of land and construction of the pier wall, however, the impacted benthic habitats are widespread in Irish waters including the Connemara coast, and are not identified as habitats of conservation concern or protected under any national or international Legislation or Agreement. No significant residual impacts were identified for any other IEF identified.

It is concluded, in light of the above presented evidence, that the construction of the project in line with mitigation measures outlined above, will have minimal adverse impacts on the receiving environment either individually or cumulatively with other developments in the area.

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