

Peterhead Smith Quay Extension: Ground Investigation Works (GIW)

Environmental Appraisal

Peterhead Port Authority (PPA)

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1. Introduction

Peterhead Port Authority (PPA) proposes an 80 m extension to the western end of the existing 120 m long Smith Quay. The quay is used by many industries, such as renewable energy, oil and gas decommissioning and the pelagic fishing sector.

A prerequisite for the potential future proposed extension is the completion of a ground investigation. A Marine Licence is therefore required, as for all works below Mean High Water Springs (MHWS). A Marine Licence application needs to be submitted to the Marine Directorate in line with the following legislation:

- The Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017;
- The Marine (Scotland) Act 2010 (Marine Licences); and
- The Marine Licensing (Pre-application Consultation) (Scotland) Regulations 2013.

This environmental appraisal has been prepared to assist the Marine Directorate in its decision-making process regarding the ground investigation Marine License application. This report precedes a further environmental appraisal which will be prepared and submitted in support of marine licence and other applications in relation to the quay extension works themselves.

This environmental appraisal presents a description of the location and the proposed Ground Investigation Works (GIW) and outlines the potential effects the proposed ground investigation could have on the project area and the integrity of designated sites in the local area.

2. Location



Figure 1 Smith Quay location (source: Google Earth)

Smith Quay is a 120 m long suspended deck quay to the west of the existing outer harbour quays at Peterhead with a separate berthing/mooring dolphin at its western end and reclamation behind the quay (Figure 1). In 2010, 100,000 m³ of rock and soft materials were dredged and suitable material was combined with imported material to construct 9,000 m² of reclamation behind the quay. Other than by sea, Smith Quay is accessible via road (Merchant's Quay) and access to the quay is secured by a fence with no public access.

The proposed activity involves GIW adjacent to the existing Smith Quay to provide geotechnical information on the seabed conditions to inform the engineered design.

3. The Proposed Ground Investigation Works

3.1. Activity Description

Ground investigation surveys are required to gather the necessary information about the seabed for the construction of the proposed quay extension. The objectives of the investigation include the following:

- undertake overwater boreholes, overwater vibrocores and overwater hydraulic grab samplers;
- undertake seabed profiling;
- retrieve soil samples and rock cores;
- take samples of the surface marine sediments for soil classification and contamination testing to assess suitability for dredging and disposal or reuse of the sediment.

Specifically, the works will include:

- 6 No. overwater soils and rotary cored boreholes for retrieval of representative, high-quality soil samples and rock cores;
- 3 No. overwater vibro-core samples of superficial seabed deposits for retrieval of representative, high-quality seabed material samples for geo-environmental testing purposes;
- 2 No. overwater hydraulic grab samples for retrieval of superficial seabed deposits samples for geo-environmental testing purposes;
- Sub-bottom Profiling (SBP);
- In-situ standard penetration test at regular depth intervals through superficial deposits within all boreholes;
- Sampling of soils and coring of rock for detailed geological logging and laboratory testing;
- Geotechnical laboratory testing of soil samples and rock cores;
- Geo-environmental laboratory testing of soil samples; and
- Factual reporting including provision of digital AGS data and as-built exploratory hole location plan.

An as-built borehole location plan indicating the location of the boreholes is provided in **Appendix A: Ground Investigation Plan**. Providing further information on the GIW, a Method Statement has been submitted as a separate supporting document for this marine license application.

3.2. Programme

The GIW will be undertaken as soon as possible, following receipt of necessary permissions and survey mobilisation. The works are expected to take place over a period of approximately 3 weeks. Vibrocore activities are anticipated to take no more than 1 week.

For reference, it is anticipated that construction works for the quay itself will commence in Q2 2026 and will take approximately 18 months.

4. Methodology

Receptor groups considered in this environmental appraisal reflect the categories previously used for the Smith Quay extension Environmental Impact Assessment (EIA) screening opinion request.

4.1.1. Protected areas

Protected areas within 1 km or 15 km of the project area were identified, depending on the nature of interest features (see below). The ranging behaviour of mobile species such as seabirds, marine mammals and fish was not considered relevant in the context of identifying potential connectivity with protected sites because of the restricted nature of the works within the harbour area.

The site classifications considered were as follows:

- Seal Haul Out Sites (Scottish Government, 2023)
- Geological Conservation Review sites (GCR) (Scottish National Heritage, 2022)
- Special Protection Areas (SPAs) (NatureScot, 2023)
- Special Areas of Conservation (SACs) (NatureScot, 2023)
- UK Ramsar sites (JNCC, 2019)
- Sites of Special Scientific Interest (SSSIs) (NatureScot, 2024)

- Local nature conservation sites (LNCS) (Aberdeenshire) (Aberdeen Council, 2016)
- Marine Protected Areas (MPA) (NatureScot, 2023)

It is noted that the GIW will not take place within the boundaries of any designated site. Therefore, a small 1 km boundary was applied to identify designated sites with benthic habitat features.

There are underwater noise impacts associated with the borehole drilling, vibrocoring, hydraulic grab sampling and seabed profiling which could affect migratory and noise sensitive species such as fish and marine mammals. The best available data on the noise levels of these sampling techniques (see Section 7.3) suggests that seabed profiling is the activity with the highest underwater noise levels. These levels would be expected to drop to approximately 60-80 dB at distances of 500-750 m (Pace, Robinson, Lumsden & Martin, 2021). Considering this and the configuration of geographic features such as the bay, and breakwaters suggests a 1 km boundary would be sufficient in distance.

Marine mammal species have been included in this assessment based on whether the available data on their distributions suggests that they are likely to use the waters surrounding the Peterhead port (see Section 5.3).

A 15 km buffer was used in relation to seabirds also. While this group, marine mammals and fish may range much more widely than this it was not considered appropriate to use ranging behaviour to identify protected sites given the limited nature of the works and restriction to the harbour area.

As the GIW are located in the marine environment, within an existing busy port environment, there is no impact pathway or expected connection with onshore receptors, including terrestrial birds, their nests, or foraging activities. Therefore, these are not included in the assessment.

Similarly, there are no expected impacts on socio-economic activities, given the short-term nature of the GIW and their location within the port. All GIW activities will be carefully managed and coordinated around routine port activities.

5. Environmental Sensitivities

5.1. Protected Sites

The location of the proposed GIW does not overlap with any designated sites. However, there are several protected sites present within the local area and scoping boundary in Section 4.1.1. This range is considered to represent a very conservative distance to encompass remote effects from pressures for a project of this scale but is used purely as a pragmatic measure to highlight potentially relevant sites and not as a formal screening. These sites and their nearest distance to the project site are listed in Table 1 and shown in Figure 2 and Figure 3.

Table 1 Designated sites that fall within 1 km of the Peterhead project site listed

Site	Designation	Distance Direction	Designated/qualifying features	Evaluation
Rattray Head to Peterhead	LNCS	0.8 km north	Variety of coastal habitats including sand dunes.	No connection expected
			Good diversity of plant species including several species that are rare in NE Scotland.	No connection expected
			Adjacent fields are important for roosting and feeding geese, waders and wildfowl.	No connection expected

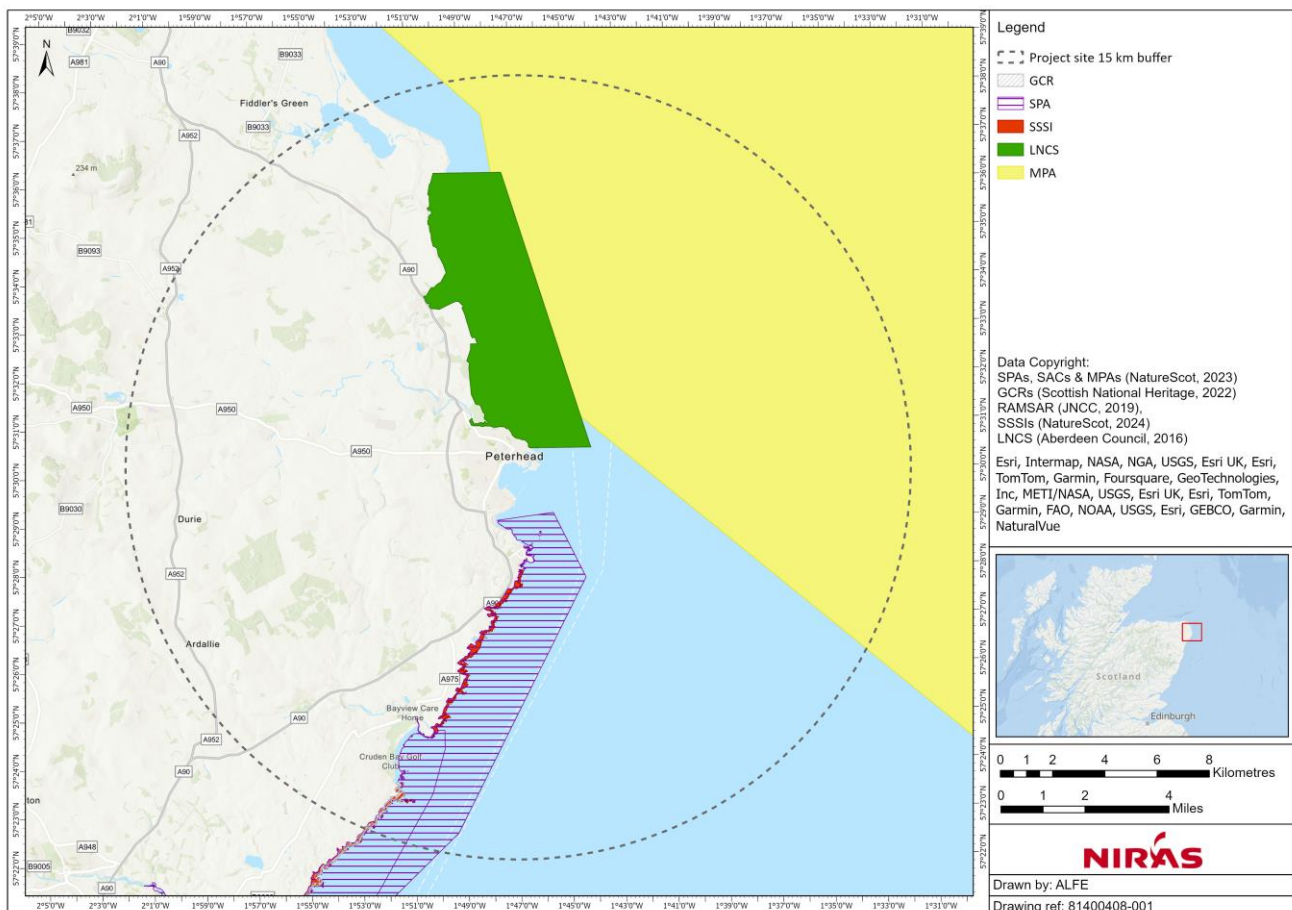


Figure 2 Designated sites

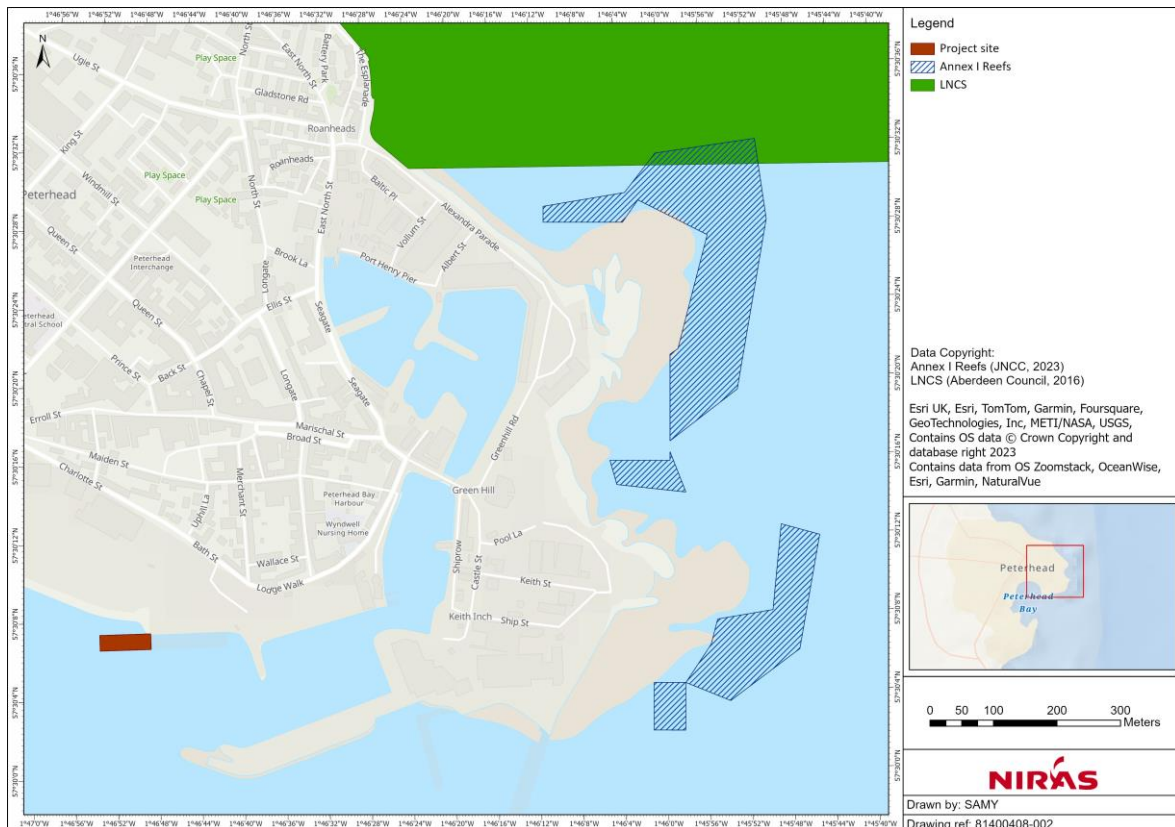


Figure 3 Indicated distribution of reefs and presence of a LNCS within 1 km of the Project site

5.2. Marine Habitats

The proposed GIW will take place in Peterhead Bay, a sheltered natural inlet protected from the open sea by two breakwaters. It is one of Europe's largest fishing ports, it is a deepwater port and provides space for small commercial fishing vessels, as well as tankers up to 50,000 dwt. The breakwaters form an artificial barrier to the open sea. The proposed GIW will take place close to the quay next adjacent to previously developed structures.

Habitats, including any protected or priority marine features, are potentially sensitive to a range of pressures including direct damage, habitat loss/change under any extended footprint, suspended sediment mobilisation and smothering and release of contaminants.

The intertidal habitats were previously accessed in 2014 to assess the development of a fish market and the deepening of the port. The intertidal habitats within the search area were designated as part of the Integrated Habitat System (IHS) which is the most recent and comprehensive dataset for the Peterhead Harbour area. The IHS is an integration of existing classifications in the UK: Biodiversity Broad, Biodiversity Priority, Annex I Habitats Directive and Phase 1. The intertidal habitats identified within the bay and harbour area were: The intertidal habitats identified within the bay and harbour area were:

- Littoral rock;
- Man-made littoral rock; and
- Other littoral sediment.

No sensitive, rare or threatened benthic communities or habitats protected under Annex I of the Habitats Directive are known to exist in the vicinity of Peterhead.

There were no benthic survey or habitat data available specifically for Peterhead Harbour, however, survey data collected as part of the Marine Nature Conservation Review (MNCR) was used to give an indication of the benthic ecology present within the vicinity of Peterhead Harbour. Surveys used to inform the MNCR were undertaken between 1987 and 1998, commissioned by the Nature Conservancy Council and subsequently by JNCC.

The benthic community in the Peterhead area is typical of that found in other areas of the North Sea where the substratum comprises sand, gravel, rock and bedrock. Characteristic species of this habitat include polychaetes (*Spirorbis sp.*, and *Nereididae*), echinoderms (*Asterias rubens*, *Henrica oculata* and *Ophiothrix fragilis*), crustaceans (*Cancer pagurus*, *Carcinus maenas* and *Pagurus bernhardus*) and cnidarians (*Urticina felina*).

A Phase 1 intertidal survey was completed on the 5th March 2014 to support the deepening of the report and construction of the fish market. The survey investigated the habitats present within Peterhead Bay. The survey area comprised the intertidal habitats between Learwick's Point to the north of the bay stretching south towards the marina to the south of the bay. The survey did not include any of the intertidal habitats to the north or east of Peterhead Harbour.

The intertidal survey identified a number of biotopes which are listed in Table 2 and presented on Figure 4. The intertidal area within the bay is dominated by three main substrates, rock, boulder field and sand. A broad characterisation of the bay splits the intertidal area into three main areas. Rock and boulder fields, present in the north and south of the survey zone which extended from the upper shore into the sublittoral, were divided by an area of sand which extended from the upper shore into the sublittoral. These areas were separated from amenity grassland which borders the bay by an area of coarse sand (biotope class: LS.LSA.St).

The sand substrate (IR.MIR.KR.LdigTX.Ft) in the central region of the survey zone did not extend as far into the bay as the rocky substrate found to the north and south of the bay. The sand substrate area in the lower shore (IR.MIR.KR.LdigTX.Ft) contained small areas of rock which were dominated by barnacles (*Semibalanus balanoides*) and algae of the family Fucaceae (*Fucus spiralis*, *F. serratus* and *Ascophyllum nodosum*). With the exception of these rocky areas no fauna were found in this area. The lower shore (IR.MIR.KR.LdigTX.Pk) is sublittoral, creating a lagoon which is separated from the remaining sublittoral further out in the bay by an elevated boulder ridge (LR.LLR.F.Fserr) and a large boulder field (IR.MIR.KR.Ldig.Bo) which connects with the rocky substrate to the north of the bay. At low tide water drains from this lagoon through a channel (LS.LSAMoSa.BarSa) which separates the elevated boulder ridge from the rocky substrate in the south of the bay. No fauna was evident in this channel with this confirmed through the use of a 1 mm sieve.

The elevated boulder ridge and boulder fields (LR.LLR.F.Fserr, LR.HLR.FT.FSer.TX and LR.LLR.Ffspi.X) which form a boundary between the sand substrate (IR.MIR.KR.LdigTX.Pk) and the sublittoral outer bay was relatively species poor when compared with other boulder areas within the bay. The boulder ridge connected with further boulder fields to the north of the survey zone (LR.HLR.FT.FSer.TX and LR.HLR.MusB.Sem.Sem) which were bounded by the Harbour wall (LR.Rkp). These boulder fields were dominated by algal species (*Fucus serratus*, *F. spiralis* and *Ascophyllum nodosum*) and barnacles (*Semibalanus balanoides*).

The boulder areas to the south of the survey zone were algal dominated with algal zonation characteristic throughout the shore. The upper shore (LR.HLR.MusB.Sem.Sem) contained a thin band of *Pelvetia canaliculata* and *Fucus spiralis*, which are characteristic of the upper shore environment, which were replaced by *F. spiralis*, *F. serratus* and *Ascophyllum nodosum* in the mid to lower shore (LR.HLR.FT.FSer.TX). Although the southern part of

the survey zone was noted as being more species rich, anoxic sediment was noted beneath some of the boulders, a feature not noted to the north of the survey zone.

The sublittoral fringe which bordered the intertidal area was dominated by kelp, *Laminaria digitata*, *Saccharina latissima* and *Alaria esculenta*. Three of the biotopes listed in Table 2 are associated with UKBAP Priority Habitat Descriptions (JNCC, 2011). SS.SMP.KSwSS and LR.HLR.FT.FSerTX are included as constituent communities of Tide-swept Channels however, it is not considered that the habitats represented by these biotopes within Peterhead Bay are illustrative of the Tide-swept Channels habitat as covered under the UKBAP. IR.MIR.KR.Ldig.Bo is listed as part of the habitat description for Intertidal Underboulder Communities. However, an investigation of the habitat during the Phase 1 intertidal habitat survey did not conclude that this was an area of high biodiversity, with biodiversity especially low in the area stretching south into Peterhead Bay.

It should be noted that SS.SMP.KSwSS and LR.HLR.FT.FSerTX in addition to being associated with UKBAP Priority Habitat Descriptions are also listed as Priority marine features (PMFs).

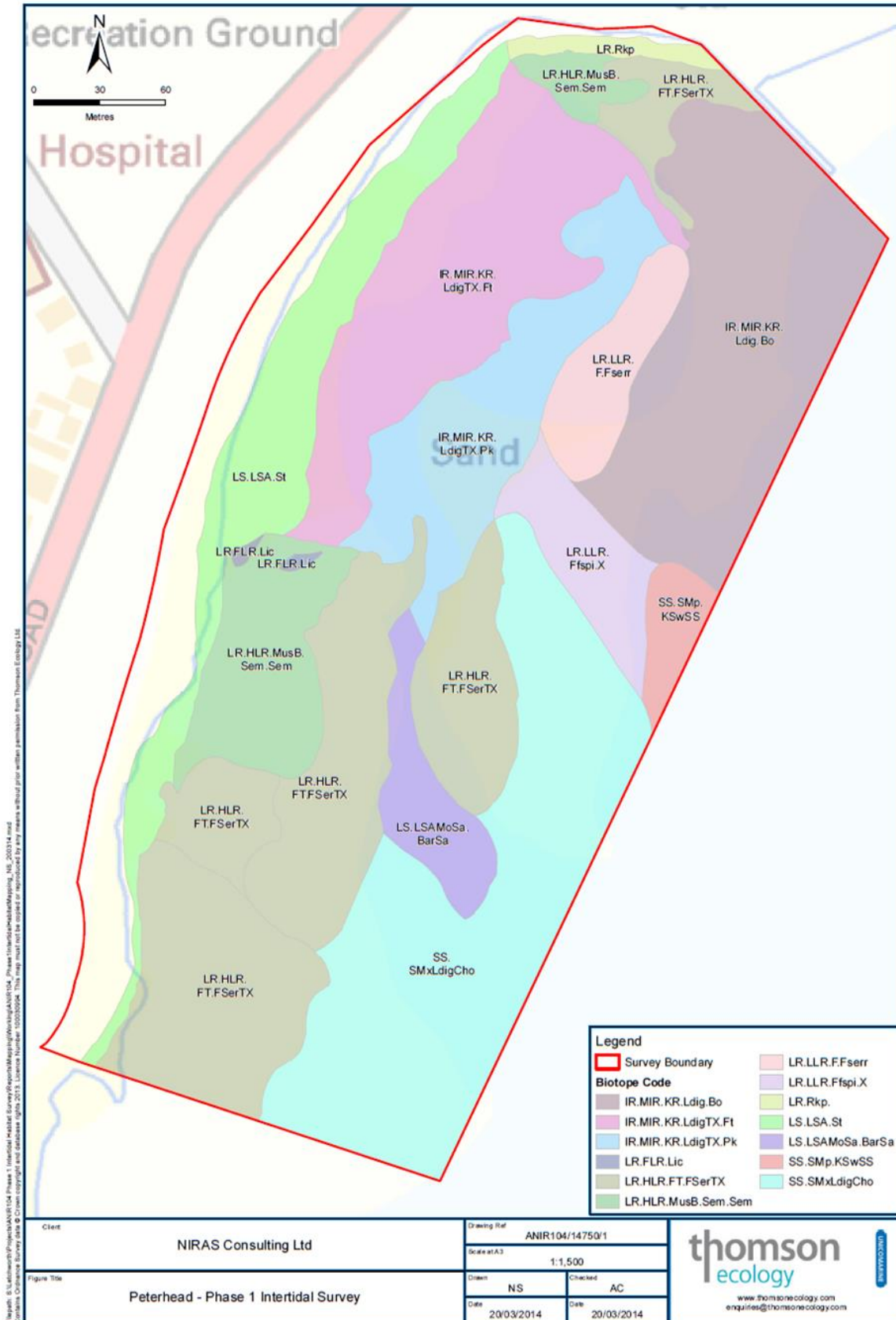


Figure 4 Intertidal biotopes recorded at low tide in Peterhead Bay during the intertidal survey on the 5th March 2014

Table 2 Biotopes recorded during the intertidal survey at low tide within Peterhead Bay on the 5th March 2014

Biotope code	Marine Habitat Classification (Connor et al., 2004)	Dominant community and characteristic species as recorded during survey	Substratum/Notes
LR.Rkp.	N/A	<i>Semibalanus balanoides</i> <i>Patella vulgata</i> <i>Fucus serratus</i>	Artificial sea wall; large boulders
LR.HLR.MusB.Sem	<i>Semibalanus balanoides</i> , <i>Patella vulgata</i> and <i>Littorina</i> spp. On exposed to moderately exposed or vertical sheltered eulittoral rock	<i>Semibalanus balanoides</i> <i>Fucus serratus</i> <i>Ascophyllum nodosum</i> <i>Corallina officinalis</i>	Scattered boulder field
LR.HLR.FT.FSerTX	<i>Fucus serratus</i> with sponges, ascidians and red seaweeds on tide-swept lower eulittoral mixed substrata	<i>Semibalanus balanoides</i> <i>Fucus serratus</i> <i>Fucus spiralis</i> <i>Ascophyllum nodosum</i>	Elevated boulder ridge
IR.MIR.KR.LdigBo	<i>Laminaria digitata</i> and under-boulder fauna on sublittoral fringe boulders	<i>Halichondria panacea</i> <i>Fucus vesiculosus</i> <i>Laminaria digitata</i>	Lower shore medium boulder field, concrete Harbour wall at northern end
LS.LSA.St	Strandline	<i>Fucus serratus</i> <i>Fucus spiralis</i>	Upper shore, coarse sand
IR.MIR.KR.LdigTX.Ft	<i>Laminaria digitata</i> on tide-swept, infralittoral mixed substrata	<i>Semibalanus balanoides</i> <i>Fucus serratus</i> <i>Fucus spiralis</i> <i>Ascophyllum nodosum</i> <i>Littorina littorea</i>	Mid-shore, sand, mid-tidal pebble/cobble band, scattered boulders
IR.MIR.KR.LdigTX.Pk	<i>Laminaria digitata</i> park and foliose red seaweeds on tide swept, lower infralittoral mixed substrata	<i>Fucus vesiculosus</i>	Lower shore, sand, sparse boulders
LR.LLR.F.Fserr	<i>Fucus serratus</i> on sheltered lower eulittoral rock	<i>Semibalanus balanoides</i> <i>Fucus serratus</i> <i>Fucus spiralis</i> <i>Ascophyllum nodosum</i>	Elevated boulder ridge
LR.LLR.F.fspi.X	N/A	<i>Fucus serratus</i> <i>Fucus spiralis</i> <i>Fucus vesiculosus</i> <i>Ascophyllum nodosum</i>	Drainage channel, boulder rich
SS.SMp.KSwSS	Kelp and seaweed communities on sublittoral Sediment	<i>Fucus vesiculosus</i> <i>Laminaria digitata</i>	Lower foreshore, sandy with rocky patches

Biotope code	Marine Habitat Classification (Connor et al., 2004)	Dominant community and characteristic species as recorded during survey	Substratum/Notes
LR.HLR.MusB.Sem.Sem	<i>Semibalanus balanoides</i> , <i>Patella vulgata</i> and <i>Littorina</i> spp. On exposed to moderately exposed or vertical sheltered eulittoral rock	<i>Semibalanus balanoides</i> <i>Fucus spiralis</i>	Upper shore boulder field
LR.HLR.FT.FSerTX	<i>Fucus serratus</i> with sponges, ascidians and red seaweeds on tide-swept lower eulittoral mixed substrata	<i>Semibalanus balanoides</i> <i>Fucus spiralis</i> <i>Fucus serratus</i> <i>Ascophyllum nodosum</i>	Mid-shore boulder slope
LS.LSA-MoSa.BarSa	Barren littoral coarse sand	No fauna present	Mid/lower shore drainage channel, clean coarse sand
LR.HLR.FT.FSerTX	<i>Fucus serratus</i> with sponges, ascidians and red seaweeds on tide-swept lower eulittoral mixed substrata	<i>Fucus vesiculosus</i> <i>Laminaria digitata</i>	Foreshore boulder field
SS.SMxLdigCho	N/A	<i>Fucus spiralis</i> <i>Fucus vesiculosus</i> <i>Laminaria digitata</i>	Lower sand/small boulder field
LR.HLR.FT.FSerTX	<i>Fucus serratus</i> with sponges, ascidians and red seaweeds on tide-swept lower eulittoral mixed substrata	<i>Semibalanus balanoides</i> <i>Fucus serratus</i> <i>Fucus spiralis</i> <i>Ascophyllum nodosum</i>	Upper shore boulder field and channels
LR.HLR.FT.FSerTX	<i>Fucus serratus</i> with sponges, ascidians and red seaweeds on tide-swept lower eulittoral mixed substrata	<i>Fucus spiralis</i>	Upper shore boulder field

5.3. Marine Mammals

Marine mammals are potentially sensitive to a range of pressures including direct damage, disturbance due to noise and vibrations, and release of contaminants. Marine mammals are highly sensitive to noise which can result in permanent or temporary threshold shifts in hearing, masking of vocalisations, temporary displacement or physical injury if exposed to sufficiently high sound pressure levels. Section 7.3.1 describes the assessment criteria applied in evaluation of the noise impacts on marine mammals.

All cetaceans are European Protected Species (EPS) as a result of their listing in Annex IV of the EU Habitats Directive (species of community interest in need of strict protection). The Conservation (Natural Habitats, &c.) Amendment (Scotland) Regulations 2007 contains a definition of the disturbance offence for EPS (Regulation 39) which states:

39.—(1) It is an offence—

(a) deliberately or recklessly to capture, injure or kill a wild animal of a European protected species;

(b) deliberately or recklessly—

(i) to harass a wild animal or group of wild animals of a European protected species;

(ii) to disturb such an animal while it is occupying a structure or place which it uses for shelter or protection;

(iii) to disturb such an animal while it is rearing or otherwise caring for its young;

(iv) to obstruct access to a breeding site or resting place of such an animal, or otherwise to deny the animal use of the breeding site or resting place;

(v) to disturb such an animal in a manner that is, or in circumstances which are, likely to significantly affect the local distribution or abundance of the species to which it belongs;

(vi) disturb such an animal in a manner that is, or in circumstances which are, likely to impair its ability to survive, breed or reproduce, or rear or otherwise care for its young;
or

(vii) to disturb such an animal while it is migrating or hibernating;

(c) deliberately or recklessly to take or destroy the eggs of such an animal; or

(d) to damage or destroy a breeding site or resting place of such an animal.

(2) Subject to the provisions of this Part, it is an offence to deliberately or recklessly disturb any dolphin, porpoise or whale (cetacean).

Annex II of the Habitats Directive requires the establishment of a network of sites that will contribute to the protection of the species listed. Harbour porpoise and bottlenose dolphin are two of the cetacean species listed while both grey and harbour seal are included.

Bottlenose dolphins have been included in the assessment on the basis that while outside of the scoping boundary, Moray Firth SAC (92 km northwest) is designated for bottlenose dolphins, it is a priority marine feature and conservation objectives of the site seek to protect the entirety of the east coast population which use the SPA as part of their range (NatureScot, 2024).

Harbour porpoise which are an Annex II species have also been included due to having a known population distribution abundance along the eastern Scottish Sea (Marine Scot, 1997). Their estimated population density has been modelled as between 0.25-0.50 or 0.50-0.75 in the waters surrounding the Peterhead Bay area (Lacey et al., 2016), a moderate level of usage in comparison to other areas of UK waters.

There are no known grey seal breeding colonies in the region though telemetry tracks show they can be present along the entire east coast of Scotland (Hague, Sinclair, Sparling, 2020). Russel et al., (2017) in the ongoing Sea Mammal Research Unit (SRMU) project apply telemetry and environmental data to predict that between

10-50 seals use the waters surrounding the Peterhead Bay, indicating that the area is of moderate significance to them. Grey seal have been reported in local news media as frequently making use of the Peterhead harbour often in large numbers (Broomfield, 2020). The closest seal haul-out site to Peterhead Bay is just over 23 km to the south at the entrance to the Ythan Estuary.

Seal haul-out sites are designated under Section 117 of Marine (Scotland) Act 2010. Seal haul-outs are locations on land where seals come ashore to rest, moult or breed, but they may range further afield for foraging and have been included in this assessment accordingly.

5.4. Fish

The proposed GIW works will take place in the harbour environment and does not have any nearby river mouths or estuary connections and migratory fish are not likely present in the harbour area. While no protected or notable fish species have been identified in the desk study; a range of coastal fish species will most likely be present and the neighbouring Southern Trench MPA is known to attract shoals of mackerel, herring and cod (Marine Scotland, 2019).

Popper et al. (2014) provide guidelines on impact ranges and effects for different types of species groups based on Popper et al. (2005) and Halvorsen et al. (2011, 2012a, b). While Table 3 presents data on pile driving studies, the results can be used as a proxy to indicate the risk of fish disturbance that the activities involved in the proposed GIW. As data on the precise meterage of noise impacts is not likely comparable between contexts a ranking is provided as follows: 'N' or 'near' is considered as tens of meters, 'I' or 'intermediate' in the hundreds of meters and 'F' or 'far' in the thousands of meters.

Table 3 Pile driving noise impacts on fish (adapted from Popper et al., 2014). N' or 'near' is considered within tens of meters, 'I' or 'intermediate' within the hundreds of meters and 'F' or 'far' within thousands of meters

Species	Mortality and potential mortal injury	Impairment			Behaviour
		Recoverable injury	TTS	Masking	
Fish: no swim bladder (particle motion detection)	>219 dB SEL cum or >213 dB peak	>216 dB SEL cum or >213 dB peak	>186 dB SEL cum	(N) Moderate (I) Low (F) Low	(N) High (I) Moderate (F) Low
Fish: swim bladder is not involved in hearing (particle motion detection)	>210 dB SEL cum or >207 dB peak	203 dB SEL cum or >207 dB peak	>186 dB SEL cum	(N) Moderate (I) Low (F) Low	(N) High (I) Moderate (F) Low
Fish: swim bladder involved in hearing (primarily pressure detection)	>207 dB SEL cum or >207 dB peak	203 dB SEL cum or >207 dB peak	186 dB SEL cum	(N) High (I) High (F) Moderate	(N) High (I) High (F) Moderate
Eggs and Larvae	>210 dB SEL cum or	(N) Moderate (I) Low	(N) Moderate (I) Low	(N) Moderate (I) Low	(N) Moderate (I) Low

Species	Mortality and potential mortal injury	Impairment			Behaviour
		Recoverable injury	TTS	Masking	
	>207 dB peak	(F) Low	(F) Low	(F) Low	(F) Low

5.5. Marine Ornithology

Several species of sea bird are known to inhabit the Buchan Ness to Colliston Coast SPAm, Bullers of Buchan Coast SSSI, Ythan Estuary, Sands of Forvie and Meikle Loch and Collieston to Whinnyfold Coast SSSI/GCR. While the proposed GIW are not expected to impact any bird species nests or permanent habitats, noise impacts may deter diving birds which forage. The potential for the GIW to disturb birds which may visit the project area, e.g. to forage, needs to be considered. A 1 km buffer for underwater noise has been applied. The designated species of the above sites that may forage in the noise buffer of the GIW works include; common black-legged kittiwake, guillemot, herring gull, European shag, Northern fulmar, guillemot, kittiwake and eider.

6. Embedded Mitigation Measures

The following measures will be planned into the works and implemented to ensure that environmental impacts are minimised, notwithstanding any additional mitigation which may be identified following further consideration of impacts in support of consent applications.

While Marine Mammals Observers are not expected to be required, should any marine mammals be observed within the immediate area, borehole drilling operations will pause immediately until they have left the area of their own accord. Survey operators will be briefed on these requirements before the commencement of the survey.

A Construction Environmental Management Plan (CEMP), inclusive of standard construction mitigation measures, best practices in construction management, and strict adherence to all relevant regulations, will be implemented to minimise environmental impacts. Throughout the construction phase, there is an expectation of waste, and its handling will align with a CEMP and best practices. Marine pollution prevention and contingency planning measures will be following PPA's existing Oil Spill Contingency Plan (OSCP). Any unsuitable or contaminated materials encountered during the construction process will be extracted and subject to offsite disposal in accordance with all regulatory requirements, including through obtaining appropriate Scottish Environment Protection Agency (SEPA) licenses if required. Materials suitable for reuse will be retained during construction.

Considering the nature of the proposed development, it is not expected that there will be significant impacts on human health. The risks to human health, including construction-related noise and air quality effects during construction, will be mitigated through measures detailed in a CEMP. As per PPA's requirement, all key Contractors need to follow the Control of Substances Hazardous to Health (COSHH) Regulations 2002 (as amended) and assess and manage the risks that arise from the use of hazardous substances. This will include any arrangements to deal with accidents, incidents or emergencies.

7. Impact Assessment

7.1. Designated sites

The proposed GIW will not take place in a designated site and are of temporary duration. The works are not expected to have any significant effects on the designated benthic species of the protected sites (see Section 5.1). However, there may be implications for diving birds and marine mammals protected by the sites and these are assessed below.

A habitats regulations assessment may be considered in light of the below assessments, though no impacts are expected on any designated sites within the Natura network are expected.

7.2. Marine Habitats

The Method Statement indicates that damage to the seabed floor will be localised and the extent of these works will be limited to an approximate size of the grab sample and borehole drilling equipment used. The affected area has previously been previously disturbed by port deepening activities. As mentioned in Section 5.2, no sensitive habitats or protected marine features are known to be extant in Peterhead Bay.

The proposed GIW are also considered insignificant enough in size to change the hydrodynamic patterns within the harbour and thereby is unlikely to impact the infralittoral rock which Peterhead Bay consists of (Scottish Government Marine Directorate, 2023). Peterhead Bay in general is exposed to wave and tide action, despite the presence of the outer breakwaters. Therefore, there is unlikely to be any accumulation of silty sediments under those conditions from the GIW that might significantly affect adjacent habitats.

7.3. Marine Mammals

7.3.1. Criteria for evaluating marine mammals' noise impacts

For the survey area and surroundings, the principal marine mammal species of interest (i.e. likely to occur) are minke whale, grey seal, bottlenose dolphin and harbour porpoise. To support key underwater noise assessment recent scientific literature is referred to. Species-specific frequency-weighted $L_{E,cum,24h}$ threshold values (NOAA, 2018), (Southall B. , et al., 2019) were considered for temporary threshold shift (TTS) and permanent threshold shift (PTS) are used, see Table 4, referring to criteria for both impulsive and non-impulsive noise as provided.

In differentiating between impulsive and non-impulsive criteria for PTS and TTS criteria, the following characterisation from (NOAA, 2018) is followed:

- **Impulsive:** Sounds that are typically transient, brief (duration < 1 s), broadband, and consist of high peak sound pressure with rapid rise time and rapid decay.
- **Non-impulsive:** Sounds that can be broadband, narrowband, or tonal, brief, or prolonged, continuous, or intermittent, and typically do not have a high peak sound pressure with rapid rise nor decay time.

Source types which fall under the impulsive PTS/TTS criteria include impact pile driving, airguns, explosives, and certain geophysical survey equipment types, such as sparkers and boomers.

For the non-impulsive PTS and TTS criteria, source types include vibratory pile driving, noise from operational wind turbines, vessel noise, geotechnical equipment types and certain geophysical equipment types, such as the SBP and USBL units.

Numerous studies have recognised that hearing sensitivity varies in different animals based on the frequencies involved. Southall et al. (2007) proposed relatively broad marine mammal hearing groups, with differences and room for potential iterations needed. For the purposes of this assessment, each hearing group will be used qualitatively to assign greater sensitivity based on group, e.g. a low frequency sound will be interpreted as having a greater impact on a low frequency marine mammal. The frequency parameters for each of the hearing groups of the relevant species are listed in Table 4 and can be described as follows:

- Very High Frequency (VHF): This group comprises of true porpoises, several dolphins and several other species. The VHF group has its lowest behavioural disturbance threshold of 46.4 (dB re 1 μ Pa) at approximately 100 kHz.
- High Frequency (HF): The high frequency cetacean group consists of most delphinid species such as bottlenose dolphin, common dolphin and several whale species. The HF group has its lowest behavioural disturbance threshold of 46.2 (dB re 1 μ Pa) at approximately 60 kHz.
- Phocid Carnivores in Water (PCW): This group contains all of the true seals, including harbour and grey seals. The PCW group has its lowest behavioural disturbance threshold of approximately 43.7 (dB re 1 μ Pa) and 10kHz.
- Low Frequency (LF): The LF group consists of the baleen whales. The LF group has its lowest behavioural disturbance threshold of approximately 50 (dB re 1 μ Pa) and 5-10 kHz, with disturbance also possible at of approximately 80 (dB re 1 μ Pa) at very low frequencies of 0.001 kHz however this group lacked direct data and relied on extensive extrapolation (Southall et al., 2019).

Table 4 Threshold criteria for marine mammals. PTS and TTS criteria (NOAA, 2018) for hearing group classifications in (Southall B., et al., 2019). "xx" notation refers to species specific weighted levels.

Species	Swim speed [m/s]	Threshold criteria (PTS and TTS: $L_{E,cum,24h,xx}$ [dB re. 1 $\mu Pa^2 s$])				
		$L_{E,cum,24h,xx}$ [dB re. 1 $\mu Pa^2 s$]				$L_{p,125ms,xx}$ [dB re. 1 μPa]
		PTS		TTS		Avoidance behaviour
		Non-impulsive	impulsive	Non-impulsive	Impulsive	Impulsive*
Harbour Porpoise (Very High Frequency)	1.5	173 dB	155 dB	153 dB	140 dB	103 dB
Bottlenose dolphin (High Frequency)	1.9	198 dB	185 dB	178 dB	170 db	-
Grey Seal (Phocid Carnivores in Water)	1.5	201 dB	185 dB	181 dB	170 dB	-
Minke Whale (Low Frequency)	1.6	199 dB	183 dB	179 dB	168 dB	-

*No threshold has been established for non-impulsive noise types. It is considered likely that use of the impulsive criteria for non-impulsive noise, will lead to an overestimation of the impact range.

There are currently no scientifically established threshold criteria for the avoidance behaviour effect of activities with non-impulsive noise characteristics for marine mammals. For those equipment types having a non-impulsive characteristic, impact ranges are therefore not directly calculated, but estimated using best available information in the respective evaluations.

7.3.2. Expected Noise levels of the proposed ground investigation works

7.3.3. Borehole drilling

There are very few measurements of underwater noise from drilling activities (Erbe & McPherson, 2017), but studies where underwater noise from geotechnical drilling activities has been measured, show that the noise is limited to a low-frequency range, though still higher than the most sensitive frequency range of minke whale. Reported source levels are between $SPL_{RMS} = 142 - 145 \text{ dB re. } 1 \mu\text{Pa @ } 1\text{m}$, with primary frequency content located between 30 Hz – 2 kHz (Erbe & McPherson, 2017), which mostly see frequency spectrum as measured in Figure 4.

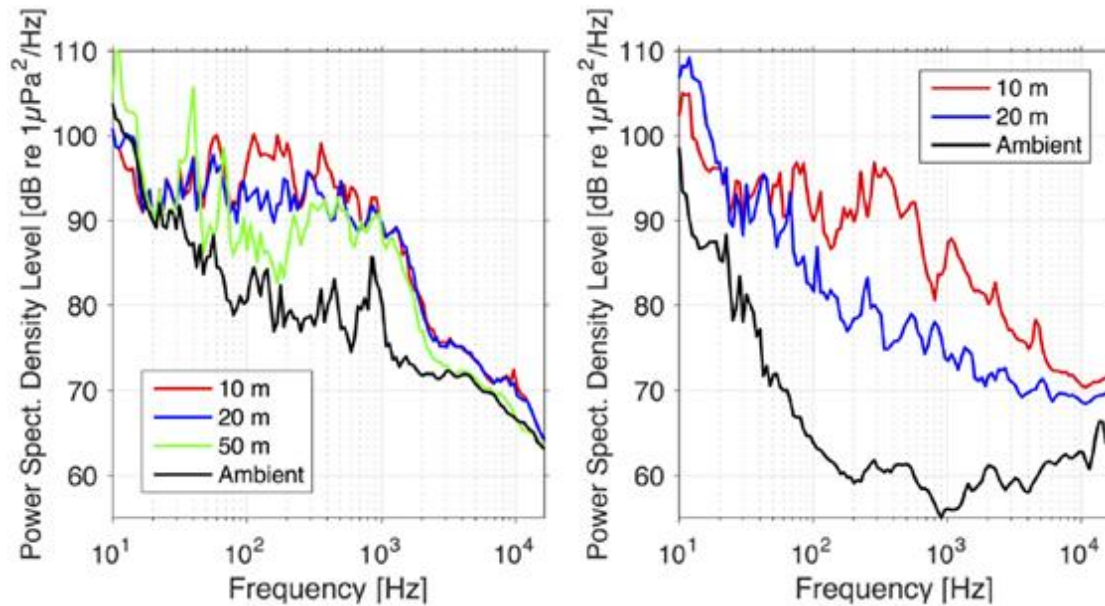


Figure 4. Frequency spectrum from underwater noise measurements of shallow water geotechnical drilling at Geraldton (left) and James Price Point (right) (Erbe & McPherson, 2017)

To understand the potential underwater noise emission in metrics relevant to the marine mammals of interest, the frequency spectrum shown in Figure 4 was frequency weighted (filtered) with the VHF-weighting curve for harbour porpoise, and PCW-weighting curve for seals, as proposed by NMFS (2018) and Southall et al. (2019). The weighted noise levels should more accurately represent what the marine mammals hear.

Given an unweighted source level of $SPL_{RMS} = 145 \text{ dB re. } 1 \mu\text{Pa @ } 1\text{m}$, and based on the reported frequency spectra, the corresponding VHF-weighted source level was assessed to be $SPL_{RMS(VHF)} \approx 110 - 115 \text{ dB re. } 1 \mu\text{Pa @ } 1\text{m}$, and PCW-weighted source level of $SPL_{RMS(PCW)} \approx 120 - 125 \text{ dB re. } 1 \mu\text{Pa @ } 1\text{m}$.

Drilling is considered a stationary activity, characterized by a non-impulsive continuous noise output. After drilling begins, it continues until completion of the activity. It is therefore considered a predictable noise activity. Frequency wise, it is considered comparable to vessel noise, however with a significantly lower source level. Behavioural effects are therefore considered likely to be less than that of a moving vessel.

The duration of drilling activity has not been estimated; therefore, a worst-case approach is assumed with continuous drilling for 24 hours. For a stationary marine mammal, this would correspond to adding $\sim 50 \text{ dB}$ to the source level. For harbour porpoise, the cumulative underwater noise level at 1 m distance would therefore be $SEL_{C24h(VHF)} \approx 160 - 165 \text{ dB re. } 1 \mu\text{Pa @ } 1\text{m}$, and for seal, $SEL_{C24h(PCW)} \approx 170 - 175 \text{ dB re. } 1 \mu\text{Pa @ } 1\text{m}$.

With a PTS threshold criterion for continuous noise of 173 dB, PTS is therefore unlikely to ever occur. For the TTS threshold criteria of 153 dB, it is however possible, that a stationary harbour porpoise could experience TTS up to 10 m distance. Harbour porpoises are not stationary however, as they constantly hunt for food, and when including an avoidance response in the calculation of the cumulative noise dose, it is unlikely that the harbour porpoise would experience TTS even if located at 1 m distance from the drill at activity onset. Minke whale are similarly highly mobile species and have higher PTS and TTS thresholds than harbour porpoises and similar inferences can be drawn. For harbour seal, conservatively assuming stationary behaviour over 24 hours, even the TTS threshold criteria is not met at 1 m distance, and is therefore considered unlikely to occur. The calculated impact ranges for the drilling activity, are summarised in Table 5.

Table 5 Impact range for drilling activity, assuming fleeing behaviour.

Species	Impact range (m from activity)	
	$SEL_{C24h, <weighting>}$	
	TTS	PTS
Harbour porpoise	< 1 m	< 1 m
Harbour seal	< 1 m	< 1 m
Minke Whale	< 1 m	< 1 m

7.3.4. Vibrocore

Vibrocore equipment may be used to gather core samples. A vibrocorer functions by means of a vibratory hammer driving a hollow steel cylinder into the seabed soil until a target depth is reached, after which the cylinder and vibratory hammer is pulled back up from the seabed and the core can be extracted from within the cylinder.

Measurement of underwater sound emissions from vibrocore equipment with a simultaneously active dynamic positioning system was investigated in (Reiser, Funk, Rodrigues, & Hannay, 2011). In Figure 5 the frequency spectrum of the measured underwater noise emission is provided for the two measurement positions, 207 m (left side plot) and 74 m (right side plot). The duration of a vibrocore activity has been estimated to be 10 – 45 minutes per deployed location, over the course of a week, depending on soil conditions and target depth.

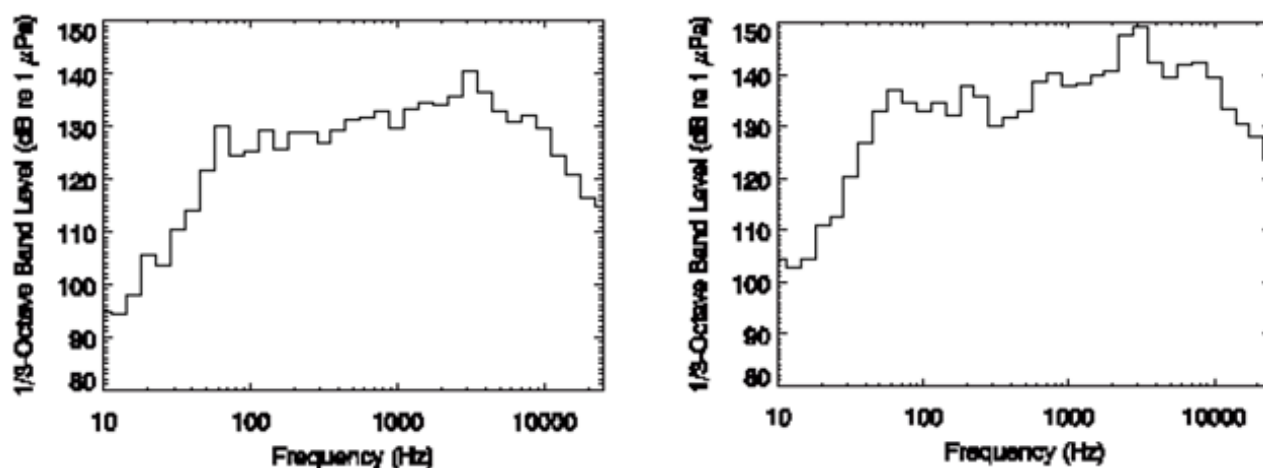


Figure 5 Frequency spectrum in 1/3 octave bands from measurement of underwater noise from vibrocore operation at 207 m distance (left) and 74 m (right), (Reiser, Funk, Rodrigues, & Hannay, 2011)

In order to determine impact ranges from the limited information provided in (Reiser, Funk, Rodrigues, & Hannay, 2011), the broadband recorded levels were calculated both unweighted, as well as VHF- and PCW-weighted, based on the 1/3 octave levels presented in Figure 5.

In (Reiser, Funk, Rodrigues, & Hannay, 2011), the source level $SPL_{RMS} = 187.4 \text{ dB re. } 1 \mu\text{Pa @ } 1\text{m}$ was also proposed based on a back-calculation from the measurements.

For the 74 m measurement distance, the sound levels are estimated to be:

- Unweighted broadband: $SPL_{RMS} \approx 154 \text{ dB @ } 1\text{m}$
- VHF-weighted broadband: $SPL_{RMS(VHF)} \approx 139 \text{ dB @ } 1\text{m}$
- PCW-weighted broadband: $SPL_{RMS(PCW)} \approx 152 \text{ dB @ } 1\text{m}$

Similarly, for the 207 m measurement distance, the sound levels are estimated to be:

- Unweighted broadband: $SPL_{RMS} \approx 146 \text{ dB @ } 1\text{m}$
- VHF-weighted broadband: $SPL_{RMS(VHF)} \approx 130 \text{ dB @ } 1\text{m}$
- PCW-weighted broadband: $SPL_{RMS(PCW)} \approx 144 \text{ dB @ } 1\text{m}$

Translating this into sound propagation loss factors as a function of distance, it corresponds to approximately 18 dB/decade. The measurement data would suggest that this approximation is fair both unweighted and PCW-weighted, and slightly conservative VHF-weighted.

Vibrocoreing is a stationary activity, with a continuous non-impulsive noise output. It is considered a predictable noise activity in that it does not move during the duration of the activity. Frequency wise, it is considered a broadband signal with significant energy up to 10 kHz. In terms of source level, it is in the same range as cargo, cruise, and container ships, as per reported source levels in (Jiménez-Arranz, Banda, & Cook, 2020). While it is not directly comparable to vessel noise, which is typically considered to have less energy in the higher frequency range, it is instead a stationary non-moving source, and therefore more predictable. Behaviour effects are therefore considered likely to be less than that of a moving cargo, cruise, or container ship.

The specific duration of the vibrocore activity is not available, but based on other geotechnical survey activities and literature (GEO, 2009), NIRAS estimates a conservative operational time of up to 1 hour per sample and up to 10 samples taken pr. 24 hour period. For a stationary marine mammal, this would correspond to adding ~36 dB to the source level. For harbour porpoise, the cumulative underwater noise level at a 1 m distance would therefore be $SEL_{C24h(VHF)} \approx 166 \text{ dB re. } 1 \mu\text{Pa @ } 207\text{m}$, and for seal $SEL_{C24h(PCW)} \approx 180 \text{ dB re. } 1 \mu\text{Pa @ } 207\text{m}$.

Assuming 18 dB/decade propagation loss, the distance to the PTS threshold criteria for a stationary harbour porpoise is calculated to be ~75 m, and ~900 m to the TTS criteria. For a fleeing harbour porpoise, the distances reduce to < 10 m for PTS, and 175 m for TTS.

For seal, assuming stationary behaviour, the corresponding distances are ~200 m for TTS and ~20 m for PTS, while the distances assuming fleeing behaviour are < 10 m for TTS and < 1 m for PTS. The impact ranges calculated for the use of vibrocore, are summarised in Table 6.

Table 6 Impact range for vibrocore activity, assuming fleeing behaviour

Species	Impact range (m from activity)	
	$SEL_{C24h, <weighting>}$	
	TTS	PTS
Harbour porpoise	175 m	< 10 m
Harbour seal	< 10 m	< 1 m

7.3.5. Hydraulic grab sampling

Very little data related to grab sampling or grab dredging noise has been published (Central Dredging Association, 2011). However, one study indicated that the sound levels of this activity were only slightly above background levels at 1 km from the source. Therefore, it can be assumed that the associated noise is highly unlikely to affect any receptor listed in Section 5 to any significant degree.

7.3.6. Seabed profiling

The Kongsberg TOPAS PS 120 creates a very detailed profile of the uppermost part of the seabed, typically the uppermost 20 m below the seabed. It emits two high frequency pulses, called the primary frequencies, with both pulses typically in the frequency range of 70 – 100 kHz. The frequency separation between the two pulses dictates the secondary frequency, created inside the water column as the difference between the two primary frequencies: $f_{sec} = f_{pri2} - f_{pri1} [Hz]$.

The source level of the Kongsberg TOPAS PS 120 is listed as $SL = 238 \text{ dB re. } 1\mu Pa @ 1m$. It is a complex sound source as the sound emission is heavily focused towards the seabed. The horizontal emission of underwater noise is therefore significantly lower than the source level would indicate, compared to the emission directly downward into the seabed.

In a sound source verification study for geophysical survey activities in the Danish North Sea (Pace, Robinson, Lumsden, & Martin, 2021), acoustic measurements were carried out for an SBP (the Innomar Medium 100), with a comparable source level listed as $SL = 237 \text{ dB re. } 1\mu Pa @ 1m$. In the study, the sound level was recorded in the horizontal direction at distances ranging from 10s of meters to 750 m. In Figure 6, all measured data points in the horizontal direction are presented as the individual pulse SEL, along with a logarithmic curve fit. The trend indicates an equivalent source level of 193 dB and a rapid decay of approximately 37 dB/decade in the horizontal direction.

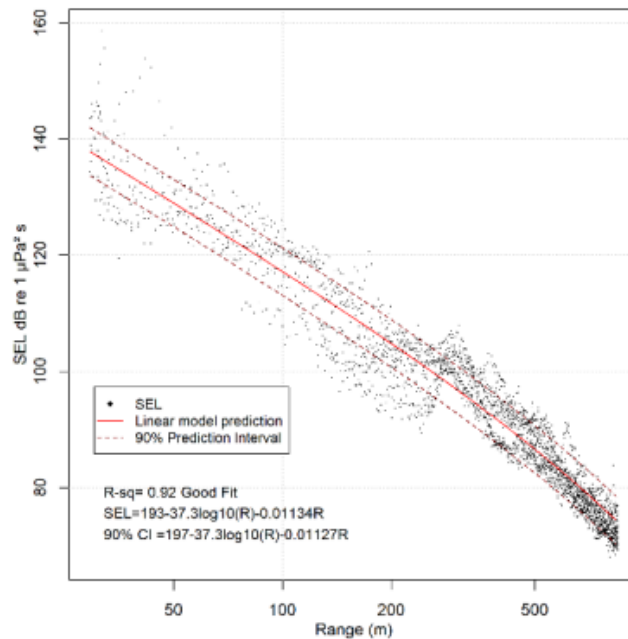


Figure 6 Sound Exposure Level measurements and curve fit for Innomar Medium 100, during a sound source verification study in the North Sea (Pace, Robinson, Lumsden, & Martin, 2021)

7.3.7. Marine Mammals Impacts Assessment

The projected noise levels (see Section 7.3.2) of the proposed GIW fall below the marine mammal injury thresholds as specified in Section 7.3.1. There is a theoretical risk of TTS to harbour porpoise, which have the lowest dB threshold of all the cetacean species listed, from borehole drilling at a very close distance of < 10 m if animals did not move away, but the low likelihood of porpoise occurring within the inner part of the harbour, close to ongoing survey works, suggests that this is not a realistic risk.

The projected noise levels (see Section 7.3.2) of the proposed GIW fall below the marine mammal injury thresholds for all marine mammal species as specified in Section 7.3.1, negating the risk of any PTS injury.

There is no theoretical risk of TTS to grey seal, bottlenose dolphin and minke whale. Harbour porpoise may have a theoretical risk of TTS, from borehole drilling and vibrocoring at a very close distance of < 10 m but only if the animals did not move away. The low likelihood of porpoise occurring within the inner part of the harbour with existing levels of vessel traffic, close to ongoing survey works, suggests that this is not a realistic risk. Furthermore, should a TTS effect occur this may not necessarily constitute harm to marine mammals.

While no threshold for disturbance from underwater noise to marine species has been established, any disturbance would likely be confined to the harbour area behind the breakwaters meters from the proposed GIW.

Grey seals do occur in the harbour area and there is therefore some potential for localised and temporary disturbance of individuals to occur, if they are present close to the area of works. Following embedded mitigation measures this has a very low likelihood of occurring.

In light of the expected noise levels (Section 7.3.2) and sensitivities of marine mammals to the GIS (Section 5.3) no significant impacts to any marine mammal species are expected.

Furthermore, given the very low likelihood of the presence of cetaceans, and low risk of disturbing grey seals, combined with the sound levels involved having little chance of causing harm, or significant disturbance. It is the conclusion of this assessment that a European Protected Species licence will not be required.

The risk of impacts from pollution events associated with the proposed GIW to marine mammals is low and will be limited to negligible levels through the implementation of embedded mitigation in the form of a Construction Environmental Management Plan.

7.4. Fish

Based on information presented in Section 5.4, it is assumed that there is some risk that fish which are less than 1 km away from the proposed GIW may be subject to temporary disturbance from underwater noise, but this is not considered to be significant in the context of the location which is not, for example, adjacent to a freshwater inlet important for migratory fish, or a restricted breeding or spawning area based on review of Scottish NMPI open data sets. The works are also taking place within a busy harbour area subject to relatively high levels of background noise from vessel operations etc.

The risk of impacts from pollution events associated with the proposed GIW to fish are low and will be limited to negligible levels through the implementation of embedded mitigation in the form of a Construction Environmental Management Plan.

7.5. Marine Ornithology

The GIS will take place in a harbour area which already subject to relatively high levels of vessel activity. The presence of the surface vessel undertaking the GIW will therefore represent a negligible disturbance to marine ornithological receptors.

Underwater noise from the survey has some potential to cause localised disturbance of diving seabirds; however, this would amount to no more than temporary and highly localised disturbance within an area which is not understood to be of high importance for piscivorous or other diving seabirds.

No significant adverse impacts are therefore expected. The proposed GIW may disturb foraging birds through noise impacts, however there is already a high level of commercial vessel traffic and associated activity. The proposed works would not present a significantly elevated level of noise for long periods of time. The low importance of marine habitats to the in-scope bird species also reduces the likelihood of foraging. Accordingly, the proposed GIW will not pose significant impacts to bird species and the risks of sustained disturbance are low.

8. Summary and conclusion

This report has been prepared to assist the Marine Directorate in its decision-making process regarding the ground investigation marine license application of the Peterhead Port Authority regarding the ecological constraints and impacts involved.

The main environmental sensitivities and risks of environmental impact involve noise impacts to marine mammals. It has been concluded that the works present a negligible risk to marine mammals due to the noise levels not exceeding PTS thresholds, with even a very low risk of TTS thresholds being breached, indicating a very low risk of disturbance to marine mammals. The risk is reduced as the receptor species involved are highly mobile species and the marine habitats are also not considered as highly valuable to them and other potentially

affected species. Additionally, a high level of commercial vessel activity further reduces the risk further that many of the species vulnerable to noise impacts will come into contact with the noise of the proposed ground investigation works.

Embedded mitigation in the form of a CEMP and the pausing of all works upon any sighting of marine mammals in the port area can be considered sufficient mitigation due to the nature and location of the works.

An EPS licence is also considered unnecessary due to the low likelihood of occurrence of EPS within any area where they would be subject to disturbance. The expected limitation of any disturbing levels of underwater noise within the harbour limits is important in this regard.

A summary of potential effects has been prepared in Table 7 below.

Table 7 Summary of potential effects

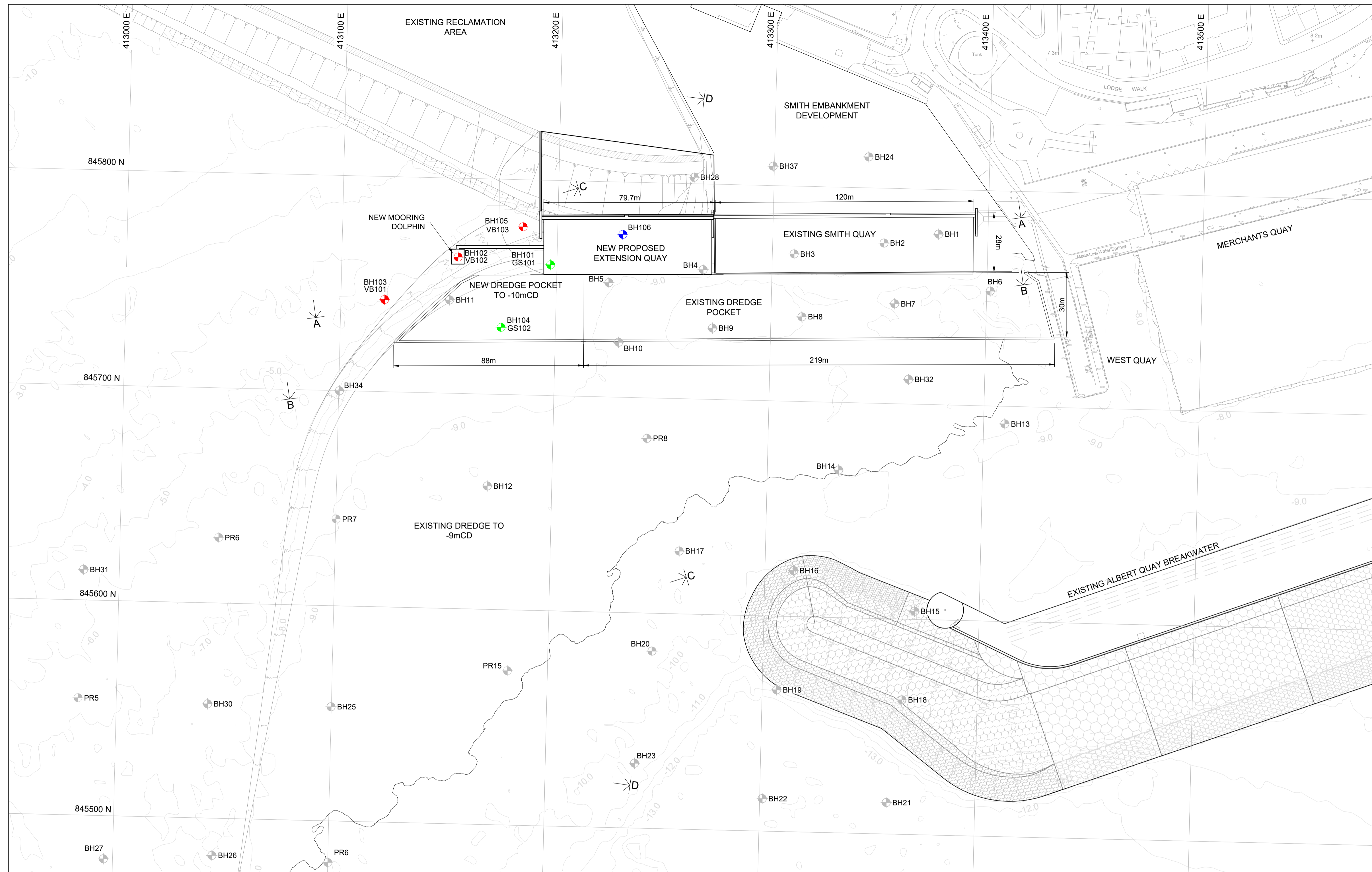
Receptor	Pressures/impact pathways	Potential Effect(s)	Expected impact significance (adverse unless indicated otherwise)	Proposed mitigation
Land and Water	Release of contaminants and production of waste	Potential release of unplanned emissions from the sediments into the adjacent onshore or marine environments.	Not significant	Embedded Mitigation: good industry practice. Any contaminated materials encountered during the works would be extracted and subject to offsite disposal in accordance with all regulatory requirements.
Biodiversity	Summary of key issues, please see Section 5-6 for further detail			
	Noise and vibration, physical presence/disturbance	Disturbance of sensitive receptors (e.g. marine mammals)	Not significant	Embedded mitigation: good practice to be defined by a CEMP.
	Habitat damage	Limited seabed sampling will occur in a low sensitivity area adjacent to the harbour.	Not significant	No mitigation planned.

9. References

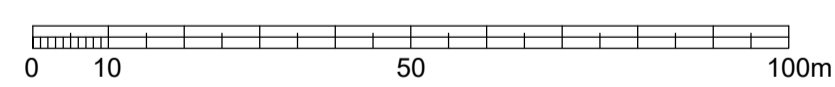
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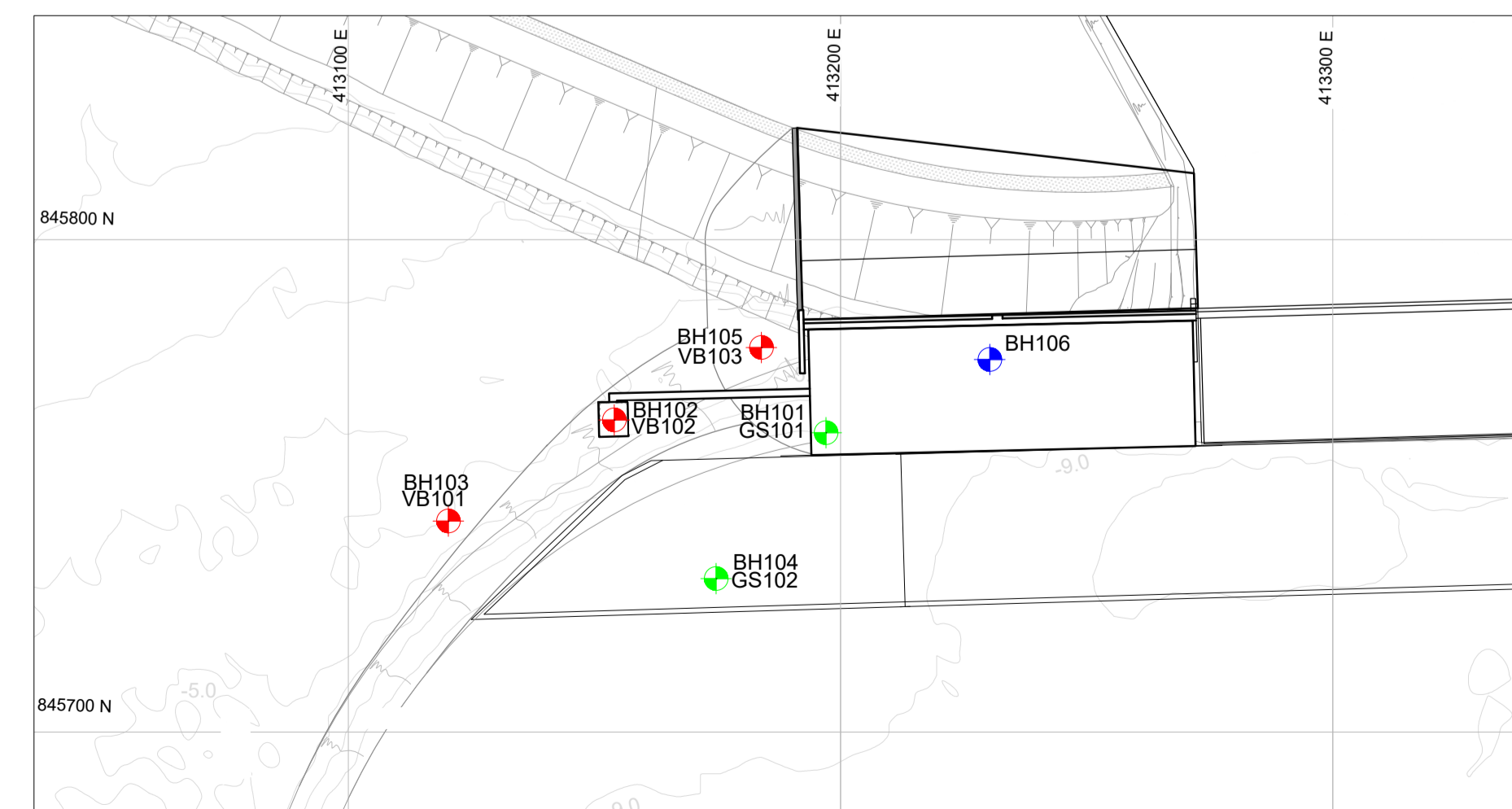
GENERAL ARRANGEMENT, 1:1000



NEW BOREHOLES POSITIONS			
Borehole No.	Easting	Northing	Target Termination Level (m CD)
BH101	413197.048	845760.773	-27.5
BH102	413154.018	845763.369	-27.5
BH103	413120.320	845742.841	-15
BH104	413174.709	845731.172	-12
BH105	413183.890	845778.117	-12
BH106	413230.277	845775.677	-27.5

GRAB SAMPLERS POSITIONS		
Grab Sampler No.	Easting	Northing
GS101	413197.048	845760.773
GS102	413174.709	845731.172

VIBROCORERS POSITIONS		
Vibrocorer No.	Easting	Northing
VB101	413120.320	845742.841
VB102	413154.018	845763.369
VB103	413183.890	845778.117



NEW BOREHOLES ONLY, 1:1250

NOTES

- ALL LEVELS TO CHART DATUM.
- ALL DIMENSIONS IN METRES UNLESS NOTED OTHERWISE.
- SMITH QUAY EXTENSION IS INDICATIVE.
- EXISTING BOREHOLES AND PROBE POINTS TAKEN FROM FUGRO GROUND INVESTIGATION (AUG 2007)

LEGEND

- EXISTING BOREHOLES & PROBE
- NEW BOREHOLES
- BOREHOLES + VIBROCORES
- BOREHOLES + GRAB SAMPLES

Rev.	Date	Description	App'd
0	12-07-24	FOR INFORMATION	ACW

Client :



Title :
**SMITH QUAY EXTENSION
 DEVELOPMENT
 SITE INVESTIGATION
 CONCEPT 1 - NEW BOREHOLES**



Project No: 81400408

Drawn	Checked	Approved	Scale (at A1): As Shown
MAAO	KLO	ACW	Date: Jul 2024

Drg No: 81400408-24 New Boreholes GA

Rev: 0