Mallaig Outer Harbour Improvements Splay Berth & Deepening

Supporting Document

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MALLAIG HARBOUR AUTHORITY

Affric making it happen

Document Control

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Contents

1 Introduction

This Supporting Document has been produced on behalf of Mallaig Harbour Authority (MHA) to support the Marine Licence applications for the proposed Mallaig Outer Harbour Improvements (MOHI) Splay Berth & Deepening development, referred to as the MOHI development throughout this document.

The purpose of this report is to ensure that an appropriate level of information is provided to allow the licences to be determined whilst demonstrating compliance with the legal framework and planning policies in Scotland.

This report provides a description of:

- The location of the proposed development;
- The proposed development;
- The Statutory context in terms of legislation and Planning policies;
- Construction methods and an outline programme of works;
- Environmental aspects; and
- Mitigation in place to minimise negative effects.

2 Project Overview

MHA are proposing to construct a new splay berth, ferry overnight berth, and to deepen the waters within the Outer Harbour area of Mallaig Harbour. The development, including the deepening, will cover a total area of 33,000m^2 and will provide additional berthing space, operational quayside, and laydown space, primarily for the fishing and aquaculture sectors, plus a berth for an additional CalMac ferry. The harbour improvements will accommodate an increased number of vessels and the dredge will allow for deeper draughted vessels, including well boats, to enter the Outer Harbour in all tide states.

2.1 Location

Mallaig is a port situated on the west coast of Scotland in the region of Lochaber (Drawing 69.01.02). The town is situated approximately 42 miles from Fort William at the end of the A830, also known as the Road to the Isles. Mallaig harbour (National Grid Reference: NM 67585 97217) is a working fishing port and there are ferries from here to the Inner and Outer Hebrides, the Small Isles, and the Knoydart Peninsula.

Mallaig falls within the Lochaber area of The Highland Council (THC). The harbour is managed by the MHA and the Harbour Limits encompass the whole of the Harbour basin and approach channel. These extend south and west from the Harbour mouth in an arc towards the small island of Eilean na h-Acairseid and north across the mouth of Loch Nevis to the headland of An Faochag on Knoydart, with a southern limit within Loch Nevis itself at approximately 4km south of the village of Inverie, see Figure 2.1.

The area of the proposed development is located within the Outer Harbour and extends out into the shipping channel, as shown in Drawing MOHI-WS2175-XX-00-DR-C-9106. The areas proposed for development, construction and dredging, are indicated by the purple and red line boundaries.

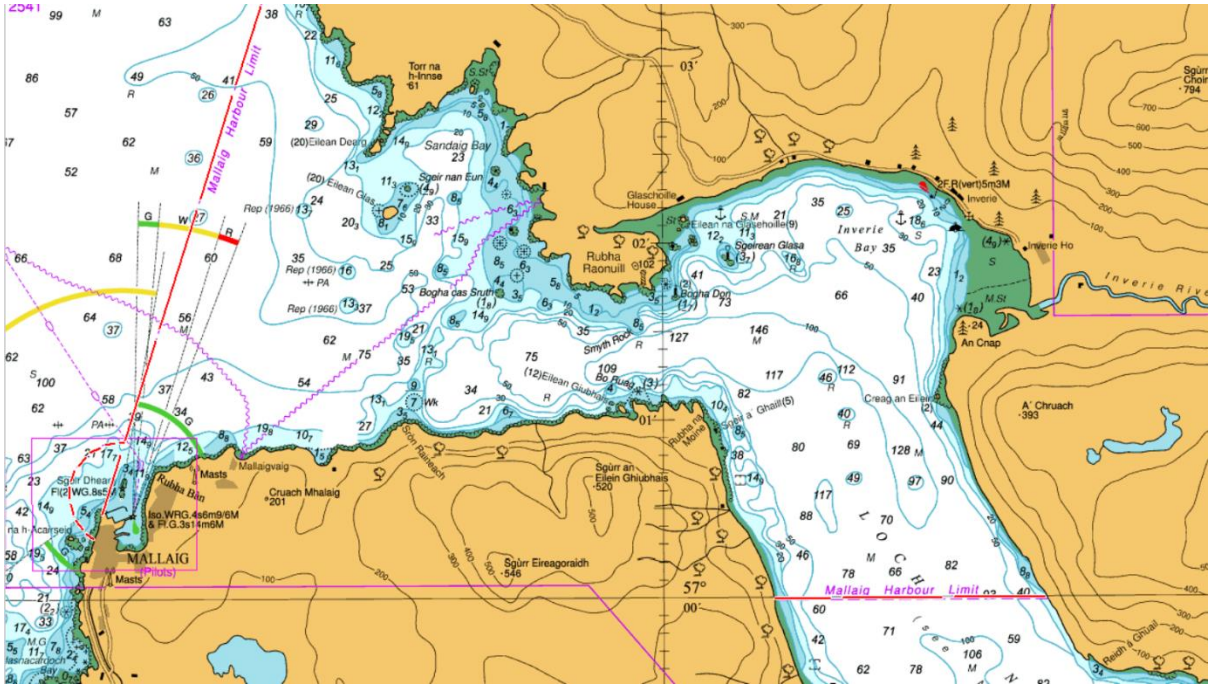

Figure 2.1: Mallaig Harbour Limits

3 Statutory Context

This section provides a summary of the statutory requirements for the proposed MOHI project.

3.1 Legislation

3.1.1 Marine Licensing

Under the Marine (Scotland) Act 2010 activities listed in Part 4, Section 21 of the Act require a Marine Licence issued by the Marine Scotland Licensing Operations Team (MS-LOT). This includes any activity where the project intends to do any of the following below Mean High Water Springs (MHWS):

- Deposit or remove substances or objects in the sea either on or under the seabed;
- Construct/alter/improve any works in or over the sea or on or under the seabed;
- Remove substances or objects from the seabed; or
- Dredging activity.
- Sea Disposal of dredged material

Accordingly, the aspects of this development below MHWS will require a Marine Construction Licence and a Dredging & Sea Disposal Licence.

3.1.2 Permitted Development Rights

The Outer Harbour works were constructed under The Mallaig Harbour Revision Order 1995. In addition to permitting the works to be carried out, the Order gives Mallaig Harbour Authority to renew works, the power to deviate from works as listed within the Order and to carry out any subsidiary works, associated with the construction of the Outer Harbour.

3.1.3 Pre-Application Consultation

The Marine Licensing (Pre-application Consultation (PAC)) (Scotland) Regulations 2013 as amended, prescribes the marine licensable activities that are subject to PAC and in combination with the Marine (Scotland) Act 2010, sets out the nature of the pre-application process. The Proposed Project falls within Regulation 4(d) as a construction activity within the marine area exceeds 1,000m^2 therefore requiring the project to go through a PAC process compliant with marine legislation.

3.1.4 Environment Impact Assessment

A formal Screening Opinion was requested from Marine Scotland under regulation 10(1) of The Marine Works (Environmental Impact Assessment (EIA)) (Scotland) Regulations 2017 ('EIA Regulations'). A Screening Report (Affric, 2021a), see Appendix 1, was submitted to inform the Screening Decision. It was determined that an EIA was not required. The Screening Opinion decision is provided in Appendix 2.

3.1.5 The Habitats Directive

The European Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora, also referred to as the 'Habitats Directive' (European Commission, 1992). The primary aim of the Habitats Directive is to maintain biodiversity within the Member States and is transposed into Scottish law by a combination of the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended in Scotland), commonly known and the 'Habitat Regulations' together with the Habitats Regulations 2010 (in relation to reserved matters).

The Habitats Regulations identify several habitats or species whose conservation interest requires the designation of Special Areas of Conservation (SACs), which form the Natura 2000 network of protected sites, in conjunction with Special Protection Areas (SPA).

In addition, the Regulations make it an offence (subject to exceptions) to deliberately capture, kill, disturb, or trade in the animals listed in Schedule 2, or pick, collect, cut, uproot, destroy, or trade in the plants listed in Schedule 4. However, these actions can be made lawful through the granting of licenses by the appropriate authorities. These species protected by Schedules 2 and 4 are commonly termed European Protected Species (EPS). Schedule 2 includes all cetaceans in Scottish waters.

3.1.5.1 Habitats Regulations Appraisal

When a project may have a likely significant effect on a Natura Site (SAC or SPA), a Habitats Regulation Appraisal (HRA) and, when required, an Appropriate Assessment (AA) needs to be completed by the competent authority. The legislative context for carrying out an HRA is based on the Habitats Directive (92/43/EEC), in particular Article 6(3), and The Conservation (Natural Habitats, &c.) Regulations.

Information the competent authority requires in order to carry out an HRA and AA has been provided within this Environmental Report. Appendix 3 provides a Habitats Regulations Appraisal Report, produced to aid the competent authority's assessment of the designated sites which may have their qualifying interests potentially affected by the proposed development.

3.2 Policy Context

3.2.1 Scotland's National Marine Plan

As the project is partly below MHWS and within 12 nautical miles (nm) of the Scottish Coastline it falls within the remit of the Marine (Scotland) Act 2010. The 2015 Scottish National Marine Plan (NMP) covering inshore waters is a requirement of the Act. The NMP lays out the Scottish Minister's policies for the sustainable development of Scotland's seas and provides General Planning Principles (GENs), some of which apply to this development.

Many GENs are specific to environmental topics; these are identified in Table 3.2.1 below, along with the considerations made during design development to meet the requirements.

The NMP lays out sector specific objectives for Recreation and Tourism and, Shipping, Ports, Harbours and Ferries. Table 3.2.2 details the relevant objectives and how the MOHI development contributes towards these.

Table 3.2.1: Applicable Scottish National Marine Plan GENs (Marine Scotland, 2015)

General Planning Principles	Requirements	MOHI Development Considerations
GEN 2 Economic benefit	Sustainable development and use which provides economic benefit to Scottish communities is encouraged when consistent with the objectives and policies of this Plan.	Construction will create direct and indirect employment associated with the development. Increased berthing space for fishing boats has the potential to provide economic benefit in terms of operational job creation with increased space for fishing and aquaculture industries which continue to be one of the main sources of employment in Mallaig. Increased berthing space for ferries will provide economic benefit in securing and increasing ferry related jobs at the Harbour and numbers of tourists visiting and passing through Mallaig.
GEN 4: Co-existence	Proposals which enable coexistence with other development sectors and activities within the Scottish marine area are encouraged in planning and decision-making processes, when consistent with policies and objectives of the Plan.	The development supports the fishing and aquaculture industries whilst ensuring continual use of the harbour by visiting craft. The development also has the potential to support the tourism industry with increasing berthing space for an additional ferry.
GEN 7: Landscape/ Seascape	Marine planners and decision makers should ensure that development and use of the marine environment take seascape, landscape, and visual impacts into account.	The development is situated 1.5km southwest of the Knoydart National Scenic Area (NSA) designated for coastal and mountain scenery. As the development is outside these areas, is low lying and located within an already existing harbour, it will not affect the NSA.
GEN 8: Coastal process and flooding	Developments and activities in the marine environment should be resilient to coastal change and flooding, and not have unacceptable adverse impact on coastal processes or contribute to coastal flooding.	A rock armour slope will be installed as part of land reclamation works will help to absorb wave energy in the Outer Harbour. In addition to this, a rock armour revetment will be installed on the outside edge of the Stub Breakwater to further manage wave energy reducing the transmission of northerly waves into the Outer Harbour. Wave modelling was carried out and confirmed that construction will maintain wave energy dissipation at a similar

General Planning Principles	Requirements	MOHI Development Considerations
		level to the existing arrangement. Modelling did not predict any changes to coastal processes in the wider harbour area. It should be noted that the height of the development is +7.43m CD, above that which would be expected to be affected by flooding.
GEN 9: Natural heritage	Development and use of the marine environment must: a. Comply with legal requirements for protected areas and protected species. b. Not result in significant impact on the national status of Priority Marine Features. Protect and, where appropriate, enhance the health of the marine area.	Ecological features of interest have been considered within the Marine Licence application and legal requirements have been taken into consideration throughout. There are no residual significant effects in any ecological features or designated sites from the proposed development, see Section 5 – Environmental Considerations and Section 6 – Mitigation.
GEN 12: Water quality and resource	Developments and activities should not result in a deterioration of the quality of waters to which the Water Framework Directive, Marine Strategy Framework Directive or other related Directives apply.	Seabed sampling was carried out to inform a Best Practice Environmental Option (BPEO) assessment for the management of dredge material. Construction will be carried out in line with best practice and, up to date pollution prevention guidance.
GEN 13: Noise	Development and use in the marine environment should avoid significant adverse effects of man-made noise and vibration, especially on species sensitive to such effects.	An Underwater Noise Assessment has been completed to understand the potential impacts associated with piling and blasting activities on ecological receptors and to inform the inclusion of appropriate mitigation to protect marine mammals and fish.
GEN 15: Planning alignment A	Marine and terrestrial plans should align to support marine and land-based components required by development and seek to facilitate appropriate access to the shore and sea.	The design is fully compliant with the National Planning Framework (NPF3), the Highland-wide Local Development Plan, and the West Highlands and Islands Local Development Plan, alongside the requirements under the Scottish NMP. The design allows for more space for berthing and operational space and will therefore allow for increased access to the shore.

General Planning Principles	Requirements	MOHI Development Considerations
GEN 16: Planning alignment B	Marine plans should align and comply where possible with other statutory plans and should consider objectives and policies of relevant non-statutory plans where appropriate to do so.	The proposed development aligns with the planning policy framework as detailed in Section 3.2.2 and with the Mallaig Harbour Masterplan.
GEN 17: Fairness	All marine interests will be treated with fairness and in a transparent manner when decisions are being made in the marine environment.	Pre-application consultation was carried out in the early stages to allow for stakeholder engagement. There has been ongoing engagement with stakeholders regarding design and various assessments have been carried out.
GEN 18: Engagement	Early and effective engagement should be undertaken with the general public, and all interested stakeholders to facilitate planning and consenting processes.	Consultation was carried out to meet the requirements of the Marine Licensing (PAC) (Scotland) Regulations 2013, as modified by The Marine Works and Marine Licensing (Miscellaneous Temporary Modifications) (Coronavirus) (Scotland) Regulations 2020 to allow for online PAC events to be held during the coronavirus pandemic. The project has been the subject of the public consultation, and the PAC process was started over 6 months before the Marine Licence application, ensuring early engagement. A PAC report has been produced and is submitted as part of the marine licence application, document reference 69/REP/05. Statutory consultees were consulted early during the process as discussed in sections 4.6.1 and 4.6.6 in the PAC report.

Table 3.2.2: Applicable Scottish National Marine Plan Sector Specific Objectives Comparison

Sector	Objective	Requirements	MOHI Development Considerations
Shipping, Ports,	Objective 1	Safeguarded access to ports and harbours and navigational safety.	The development will provide additional berthing not only supporting the fishing and tourism industries but providing

Sector	Objective	Requirements	MOHI Development Considerations
Harbours and Ferries			additional safety for vessels (including ferry vessels) in poor weather conditions.
	Objective 2	Sustainable growth and development of ports and harbours as a competitive sector, maximising their potential to facilitate cargo movement, passenger movement and support other sectors.	The improvements to the Outer Harbour allow for growth within the fishing and aquaculture sectors. Additional berthing will facilitate cargo movements, delivering a product which will be sold to other sectors, I.e., the food and drink industry and, passenger movements providing berthing for an additional ferry.

3.2.2 Planning Policy Framework

The planning system in Scotland, which provides the framework for considering planning applications, is made up of four main documents:

- The National Planning Framework (NPF);
- Scottish Planning Policy (SPP);
- Strategic Development Plans (SDPs) produced for the Scotland's four largest cities; and
- Local Development Plans (LDPs) produced for each council area.

The Scottish Government provides advice and technical planning information in the form of Planning Advice Notes (PANs), to support the implementation of the framework.

Additionally, the development will be designed according to several specific planning policy documents which are detailed below.

3.2.2.1 National

The NPF is a requirement of the Planning (Scotland) Act 2006 and sets out the strategy for long-term development within Scotland. The third NPF (NPF3), was published in 2014 and sets out the strategy for development for the next 20 to 30 years (Scottish Government, 2014).

Within Section 2, A Successful, Sustainable Place, it notes,

> "*We will create high quality, diverse and sustainable places that promote well-being and attract investment.*"

More specifically, section 2.36 notes the importance of the aquaculture industry as part of the Scottish economy and an important employer, often in small communities. An example of this would be the village of Mallaig. The development supports the aquaculture industry in providing additional services within the Mallaig Harbour area which in turn supports local jobs.

3.2.2.2 Regional

The Highland-wide Local Development Plan (HwLDP) is the Highland Council's vision for the whole area (excluding the area covered by the Cairngorms National Park which has its own plan) and sets out how land can be used by developers for the next 20 years (The Highland Council, 2012). The Vision within the HwLDP states that:

> *"By 2030, Highland will be one of Europe's leading regions by creating sustainable communities, balancing population growth, economic development, and the safeguarding of the environment across the area."*

The development aligns with this in creating a sustainable community by ensuring that the facilities remain current to continue to support and grow the fishing industry and those employed by it. The construction of the development will also provide job opportunities for a range of ages.

3.2.2.3 Local

The West Highlands and Islands LDP was adopted in 2019 and provides a vision and spatial strategy for future development in the West Highland and Islands area, identifying development sites and priorities for the main settlements over the next 20 years (The Highland Council, 2019).

The vision of the LDP has four main outcome themes:

- Growing Communities,
- Employment,
- Connectivity and Transport, and
- Environment and Heritage.

The Mallaig Outer Harbour Improvements will contribute to the LDP by providing direct employment opportunities through the construction period and by supporting the existing fishing and aquaculture industry of which is one of the main sources of employment in the area.

Mallaig is classified as a 'Main Settlement' in the LDP and as such, specifically highlighted as:

> "W*here the majority of future development should be directed."*

Mallaig's Harbour plays a fundamental role in its economy supporting many jobs with the town being historically and predominantly a fishing port. The LDP, Section 1.46, also notes the assistance in delivering connectivity and transport and specifically notes a harbour extension in Mallaig to support this. The expansion of the outer harbour will provide additional connectivity to Mallaig with the addition of increased berthing space and will form part of the bigger masterplan outlined by MHA. The LDP also notes the requirement for wave climate improvements within the outer harbour. This development has incorporated aspects into the design including a rock armour slope and a rock armour revetment to dissipate wave energy and reduce the transmission of northerly waves into the Outer Harbour.

3.2.2.4 Planning Advice Notes (PANs)

The Scottish Government provides advice and technical planning information in the form of Planning Advice Notes (PANs). As the development will not be consented under the planning regulations, the PANs have been considered as examples of best practice guidance throughout the design.

4 Project Description

4.1 Development Description

The Mallaig Outer Harbour Splay Berth will provide additional berthing length of approximately 60m and additional quayside operational and laydown space of over 4000m^2, see Drawing MOHI-WS2175-XX-00-DR-C-9104. The Outer Harbour will also be deepened to -6m Chart Datum (CD) to accommodate deeper drafted vessels, and dredged seabed adjacent to structures will be protected against scour. Table 4.1.1. notes the total areas of the development areas.

In addition, to the development of the Outer Harbour Splay Berth and associated dredging, discussed in Sections 4.1.1 and 4.1.2, other works related to, and which will support the aims of the development in creating additional operating space, are discussed in Section 4.1.3. These activities will not involve works below Mean High Water Springs (MHWS) and as such are not subject to Marine Licensing.

Table 4.1.1: Development Areas

Construction boundaries	Total area (m^2)	Drawing reference
The total footprint of the development	33,000m^2	-
Marine Construction Licence Area	23,024m^2	MOHI-WS2175-XX-XX-D-C-9106
Dredge Licence Area	31,174m^2	MOHI-WS2175-XX-XX-D-C-9106
Area to be dredged (excluding buffers)	20,100m^2	MOHI-WS2175-XX-XX-DR-C-0006

4.1.1 Outer Harbour Splay Berth

The works to form the proposed Mallaig Outer Harbour Splay Berth will be located in the undeveloped area at the north-west corner of the Outer Harbour basin, between the Ice Quay and the Outer Breakwater Quay in the area referred to hereafter as the slot (see Drawing MOHI-WS2175-XX-00-DR-C-9104 and Figure 4.1).

Figure 4.1: Overview of Mallaig Harbour

The slot was originally designated for development as a boat yard, but this was never built. It is therefore proposed that this area should be utilised to increase berthing space and laydown area for current and future harbour users.

The slot will be infilled using dredge material (blasted rock, plus sand and gravel) to create a hard standing area as discussed in Section 4.2.2. The quay will be a suspended reinforced concrete deck on tubular steel piles which will join onto the Ice Quay at one end and the Outer Breakwater Quay at the other end and back onto the reclaimed area of the slot. A rock armour slope on the seaward end of the land reclamation, under the quay, will help to dissipate wave energy in the Outer Harbour. The suspended deck and land reclamation will be at a height of +7.43m CD. An additional rock armour revetment is proposed to be installed on the outside edge of the Stub Breakwater to further manage wave energy by reducing the transmission of northerly waves into the Outer Harbour. Wave modelling has confirmed that the finished construction of open piled deck over rock armoured revetment will maintain wave energy dissipation at this corner of the harbour basin at a similar level to the existing arrangement of the slot with an intertidal rocky shore and a small armour revetment at its inshore end.

Quay furniture including fenders, ladders and bollards will be provided. Services will also be required including operational lighting for the quay and reclaimed area which will need to be installed for safety and security reasons and, power supplies and drainage.

The fish harvesting pipeline will be rerouted, if required, to facilitate construction and avoid operational clashes.

4.1.2 Ferry Berthing

It is also proposed that berthing for an additional ferry vessel will be constructed within the Outer Harbour, along the north edge of the Steamer Pier immediately inshore from the Stub Breakwater which is currently not fendered and unable to be used for berthing. This will involve the installation of steel bearing piles, construction of an access deck and the installation of fender piles to form a berthing face. This will also require the installation of bollards and safety ladders.

4.1.3 Deepening of Outer Harbour

Dredging of approximately 85% of the footprint of the Outer Harbour basin, plus the entrance, will be carried out to increase the depth from the current level, typically between -4m and -5m CD, to a new level of -6m CD, see Drawing MOHI-WS2175-XX-00-DR-C-0006. The dredge volume is made up of approximately 18,500m^3 (37,000t) of overburden and approximately 10,000m^3 (27,000t) of bedrock in situ.

The area was dredged during the harbour build in 1995 with around a third of the area of the basin requiring blasting to remove bedrock. The overburden for the dredge proposed comprises of sand and shattered rock fragments, up to cobble size, left from the previous dredge.

A Best Practice Environmental Option (BPEO) assessment, 69/REP/02 (Affric, 2021b), has been carried out to determine the use/disposal route for this material to support the dredge licence application. Grab sampling of overburden sand/silt was carried out in accordance with the Marine Scotland Pre-disposal Sampling Guidance (Marine Scotland, 2017) to understand the

chemical characteristics. It is noted that it was not possible to analyse the bedrock or shattered larger rock fragments which make up a significant proportion of the dredge material.

Scour protection in the form of proprietary precast concrete scour mats will be installed along dredged edges within the harbour basin, to protect the integrity of existing quay structures.

4.2 Construction

4.2.1 Outer Harbour Splay Berth

Initial works will comprise the removal of the existing revetment rock armour, which will be stored onshore within the harbour area for reuse, at the seaward end of the slot. Rock fill, primarily from selected dredged material, but supplemented where necessary by imported fill, will be placed, and compacted to infill the inner end of the slot and bring it above high tide level.

Between the north end of the ice quay and the western end of the outer breakwater quay, a concrete beam will be constructed on the seabed (rockhead), to act as a support to the toe of the proposed rock armoured revetment. Sockets will be cast within the beam to hold the toes of the front row of tubular steel bearing piles which support the front edge of the proposed splay berth deck slab. The slot will be reclaimed prior to the front row of piles being installed.

The slot will be reclaimed by infilling the area with compacted suitable dredged material (sand, gravel, and rock) with the outer face being trimmed by an excavator to produce a sloping revetment ready to receive rock armour. The tubular bearing piles that support the front edge of the quay slab will then be placed into the sockets in the concrete toe beam, supported by temporary steel bracing. The tubular steel bearing piles that support the deck slab beyond this towards shore will be installed through the reclamation fill.

As described above, piling techniques will include pile placement into sockets (front of quay piles), vibro installation through fill (all other piles) and percussive piling to prove bearing for short periods estimated at between 5 to 15 minutes per pile. Between 60 and 65 tubular steel piles of 600 to 700mm diameter are expected to be installed to support the quay slab. As pile installation proceeds drilling into rock of grouted steel anchors or toe pins within some of the piles will be carried out, where required by the design, to resist lateral or uplift forces by securing the pile toes to the rockhead.

Following completion of piling, rock armour will be placed by land-based crane & grab or long reach backhoe to cover the outer face of the reclamation revetment, reusing the existing armour previously removed and stored, supplemented with additional import if required. Similarly, the additional rock armour revetment on the outside edge of the Stub Breakwater will be installed using the same methods and reusing material where possible with additional import if required.

A suspended reinforced concrete slab will be installed on top of the tubular piles to complete the Splay Berth quay deck. This will include a combination of the installation of precast concrete and in-situ concrete pours. The area of concrete quay deck constructed over rock armoured revetment is expected to total 1310m^2.

Services tunnels will be constructed in the filled area behind the quay deck, quay furnishings such as bollards, fendering, lighting columns, and the fish pipeline, if required, will be installed, and the reclamation area fill will be surfaced with crushed stone (Type 1), concrete or asphalt, as required, to provide a permanent surface for access, laydown, or future development behind the new quay.

4.2.2 Ferry Berthing

The piles to be installed along the area of the Steamer Pier for additional ferry berthing will be vibro piled through existing harbour bed deposits. A short period impact driving will then be required to prove bearing capacity. Where seabed deposits are not deep enough to restrain piles, drilling and socketing of piles will be carried out. Fender piles of steel and timber will be vibro installed and drilled and socketed into rockhead.

4.2.3 Deepening of Outer Harbour

As described in the introduction to this section, it is proposed to deepen a substantial portion of the Outer Harbour basin and its approaches to a depth of -6m CD. This will be achieved by removing both overburden material and bedrock. The area of bedrock which requires removal is situated entirely within the confines of the harbour basin and will require drilling and blasting to allow it to be dredged.

Pre-split drill and blast techniques will be used to form the edges of the dredge close to existing quay walls, in advance of bulk blasting of bedrock, to minimise the risk of undercutting of existing structures and to limit transmission of vibration to those structures. Drilling and blasting are expected to be carried out from floating or jack-up plant. Drilling and blasting of the armour toe trench and concrete toe beam may also be carried out from marine plant or, could be carried out from a temporary bund of dredged or rock fill material deposited locally in the harbour basin. This would then be removed following the completion of blasting.

Dredging is expected to be carried out by backhoe or grab dredger working from floating plant, and by long reach excavator working from shore, temporary bund, or quayside.

As previously noted, it is proposed that the bulk of the dredge material will be used in infill works. The remainder is being considered for any local developments in the area and, where unsuitable for use as construction fill due to its clay or silt content, for disposal at the closest dredge disposal site, HE070 (57.05856°N, -5.89101°E), located off Armadale on the Isle of Skye, see BPEO assessment for full details.

Precast concrete scour mats will be installed at the edges of dredged areas within the harbour basin, placed by crane and diver.

4.2.4 Schedule of Works

An indicative programme is provided in Figure 4.2. This programme indicates the schedule and duration of works but will be subject to change based on the construction contractor's input.

2175 - MOHI - Splay Quay and Harbour Deepening
Outline Construction Programme for Marine Licence Rev C 28/10/21

28/10/21

ID	Name	Duration
1	Site Mobilisation / Compound Set up	2w
2	Set up temporary ice/ fuel/ water measures	1w
3	Set up Vibration Monitoring / Environmental Mitigation Measures	1w
4	Drill cut off trench/pre-split around structure walls and splay quay	8w
5	Blast cut off trench / survey and remove any high spots	8w
6	Drill & Blast main area of rock in OH basin	24w
7	Install grout around toe of existing Outer Breakwater Quay Sheet Piles	6w
8	Dredge blasted rock for shore reclamation	10w
9	Dredge excess blasted rock for sea disposal or onshore use (as required)	10w
10	Dredge soft material from harbour entrance and take to disposal site.	10w
11	Dive on quay wall toes. Carry out remedial works to sheet piles	12w
12	Install Scour Mats along quay wall toes	4w
13	Carry out any remedial works to quay surfaces	12w
14	Remove armour from top of existing slopes	2w
15	Install OB Quay piled return wall	4w
16	Remove armour toe to the front of piled return wall and last of dredge	4w
17	Install deck and Fender piles, with odex spigots and grout.	20w
18	Install new ferry lay up berth and fenders	8w
19	Construct concrete toe beam with inserts to allow front pile installation	4w
20	Install rock armour	8w
21	Construct suspended concrete deck slab	12w
22	Drill and install tension anchors	4w
23	Install drainage pipework. Interceptor and manholes	4w
24	Install fenders and quay furnitures	4w
25	Completion 6F and Type 1 to reclamation	2w
26	Move generator. Install service trench,	6w
27	Install lighting columns and electrical works	4w
28	Install water pipes	4w
29	Kerb and surfacing works at road junction	3w
30	Project Completion & Hand over	3w

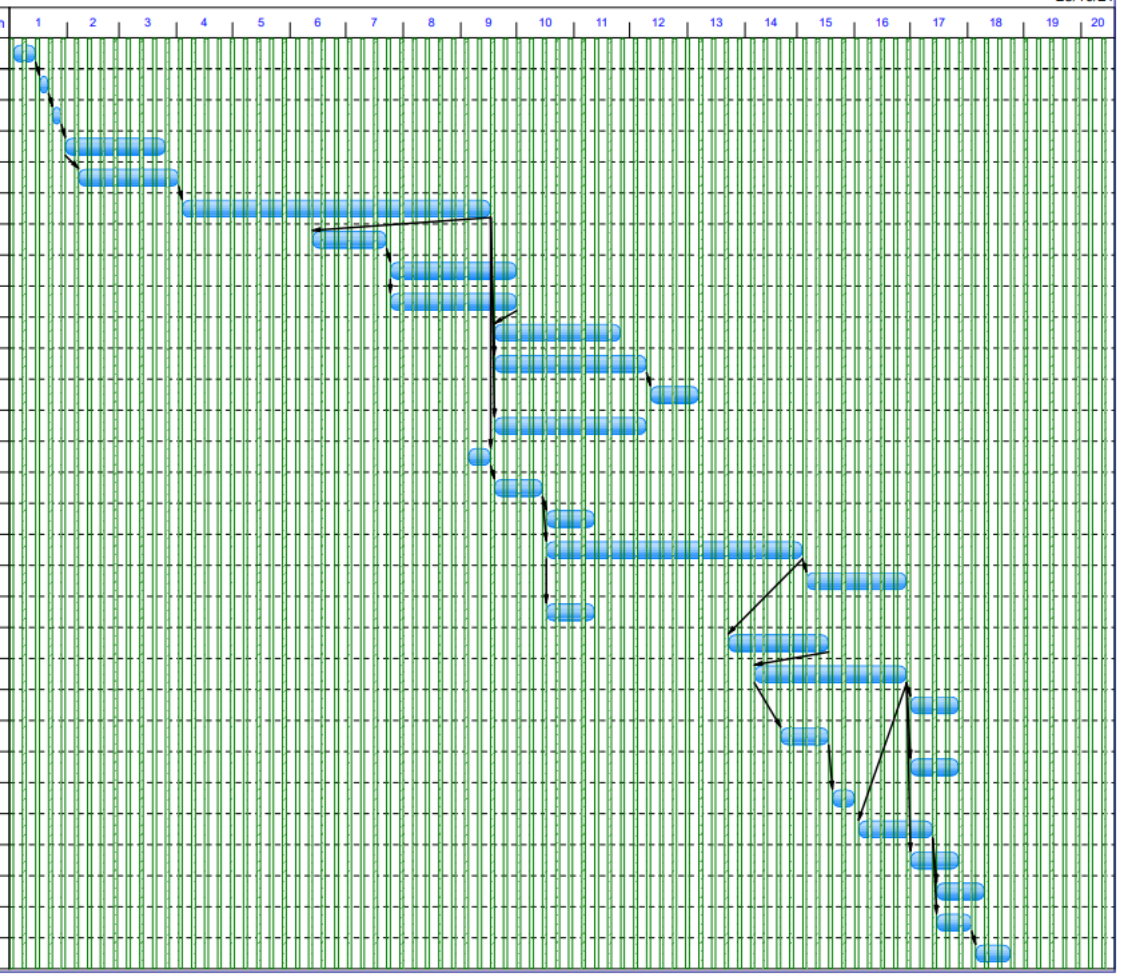

Figure 4.2: Indicative Construction Programme

4.3 Operation

It is anticipated that the development will be utilised primarily by fishing and aquaculture work boats of up to a few hundred tonnes and the additional operational quayside space and laydown will be used primarily by aquaculture and marine services operators and suppliers. The new ferry berth will primarily be used for overnight berthing of one of the CalMac vessels operating from the port.

4.4 Demolition/Reinstatement

There are no plans to discontinue the use of this site in the future, therefore, it is not considered necessary to plan for demolition or reinstatement works for its closure.

5 Environmental Considerations

The Screening Report, see Appendix 1, identified known sensitivities in the vicinity of the works. It then considered the potential environmental effects of the project during the construction and operational phases of the project (see Tables 5.1 and 5.2 of Appendix 1). The aspects identified as having the potential for likely significant effects without mitigation in the Screening Report tables are further considered within this document.

Mitigation was proposed to minimise adverse environmental impacts. Mitigation included activities to be carried out prior to construction, a number of these have since been completed, the output of which are discussed in this section.

5.1 Construction

As detailed in the Screening Report, see Appendix 1, without mitigation there are potentially three likely significant negative effects arising from the construction stage of the project. Table 5.1.1 details the three aspects, the previously identified mitigation measures, and their current status.

Table 5.1.1: Construction Effects and Sensitivities

Aspect		Source	Sensitivities	Mitigation Measures	Status
Residues and Emissions	Underwater Noise	Plant and vessel movements. Rock infill/material placement. Vibro and impact piling. Dredging. Blasting.	Biodiversity – Marine mammals. Basing sharks. The Inner Hebrides and Minches SAC.	All plant/vessels used will be well maintained. Rock infill and material placement will occur within the harbour basin with the Outer Harbour wall acting as noise a barrier. Any rock removal by blasting will be withing the confines of the outer harbour basin. The basin entrance faces due east across a 120m wide channel between it and the shore, limiting the propagation of noise to open water beyond the harbour entrance channel. The majority of the dredging activity to remove deposits above rockhead level will also be contained within the confines of the outer harbour basin, with a similar limitation on noise propagation to areas beyond the harbour. An EPS licence will be in place with the appropriate mitigation measures including a Marine Mammal Observation protocol for loud activities (blasting and piling) determined by results of the underwater noise assessment.	Underwater noise modelling completed, see Appendix 4. The output of this is discussed in section 5.1.1 and has informed the development of the Marine Mammal Protocol, see section 6.2.1. A protocol will also be implemented during piling works, see section 6.2.2. EPS licence being applied for.
	Water and Seabed Quality (Marine)	Dredge disposal, especially of larger particle sizes causing physical damage as the fall through the water column.	Biodiversity – Marine mammals, The Inner Hebrides and Minches SAC.	EPS licence detailing mitigation measures to prevent physical injury to marine mammals and basking shark during any dredge disposal.	Dredge disposal protocol included in section 6.2.3. Dredging will also be carried out in line with the route, conditions and mitigation detailed within the BPEO, discussed in Section 5.1.2 with mitigation detailed in Section 6.2.4.

Aspect		Source	Sensitivities	Mitigation Measures	Status
					EPS licence being applied for.
Traffic, Transport, Access, and Navigation	Navigation	Construction works including dredge and disposal, vessel, and plant movements. Impacts on berth availability (ice plant and outer breakwater quay). Additional navigational hazards within the Outer Harbour.	Berth users (fishing boats and aquaculture vessels)	Minimise time berths are unavailable. Effort to be made when bad weather is predicted i.e., storms to make berths available. Good communication with harbour users including appropriate Notice to Mariners posted. Input from the Harbour Master pre and during construction works. Harbour Master retains control of safety during works, coordinating movements as required. Harbour will arrange Ice deliveries to alternative location within harbour for vessels requiring ice unable to utilise the ice quay due to construction works.	Discussed in Section 5.1.3. The mitigation is still appropriate and will be implemented when required, see sections 6.1.2 and 6.2.5.

5.1.1 Underwater Noise

Blasting of rock and piling works will be undertaken during construction giving rise to underwater noise. These activities will be carried out within the Outer Harbour where the existing quay wall will act as a barrier to underwater noise. In addition, the alignment of the basin entrance towards the shore will mean that noise levels reduce rapidly within a localised area.

Underwater noise has the potential to have an adverse impact on marine megafauna including basking sharks, otter, and marine mammals such as harbour porpoise designated under the nearby Inner Hebrides and The Minches SAC. As noted in Table 5.1.1, an underwater noise assessment has been carried out by Subacoustech Environmental (2021), (provided in Appendix 4), to inform specific mitigation measures which will be required to minimise impacts on marine mammals and basking sharks.

Underwater noise modelling has been carried on a precautionary basis using the maximum instantaneous charge considered feasible for blasting. This value was a TNT-equivalent charge weight of 60kg. The maximum instantaneous blast charge at a representative location within the Outer Harbour was used in the modelling as a worst-case scenario. This representative location was the harbour entrance.

It should be noted that the actual charge weights used by the Contractor in carrying out the works are considered likely to be lower than the maximum proposed (and modelled), depending on the Contractor's modelling of blasts and their findings when undertaking initial blasts for the works.

5.1.1.1 Marine Mammal Hearing Thresholds

To understand how the outputs of the noise modelling will impact upon marine mammals, it is first imperative to understand the sensitivities of each marine mammal. The hearing groups (sensitives) as given by Southall *et al.* (2019) are summarised Table 5.1.2. Table 5.1.2 also lists the species within each group most likely to be encountered within the vicinity of the development.

Table 5.1.2: Functional Hearing Groups, and Relevant Marine Mammal Receptors (Southall *et al*, 2019)

Hearing Group	Relevant Marine Mammal Receptors	Generalised Hearing Range
Low Frequency Cetaceans (LF)	Minke Whale	7Hz to 35kHz
High Frequency (HF) Cetaceans	Common dolphin Bottlenose dolphin	150Hz to 160kHz
Very High Frequency Cetaceans (VHF)	Harbour Porpoise Inner Hebrides and the Minches SAC	275Hz to 160kHz
Phocid Carnivores in Water (PCW)	Grey Seal Harbour Seal	50Hz to 86kHz

5.1.1.2 Auditory Injury Criteria for Marine Mammals

The outputs of the noise modelling were compared with the latest marine mammal auditory injury criteria provided by Southall *et al* (2019) in order to estimate the ranges from the works at which different magnitudes of acoustic impact may occur. The criteria groups marine

mammals into functional hearing groups and applies filters to the unweighted noise to approximate the hearing response of the receptor.

Southall *et al.* (2019) presents single strike, unweighted sound pressure level peak criteria (SPL_{peak}) and cumulative (i.e., more than a single sound impulse) weighted sound exposure level criteria (SEL_{cum}) for both permanent threshold shift (PTS), where unrecoverable hearing damage may occur, and temporary threshold shift (TTS), where a temporary reduction in hearing sensitivity may occur in individual receptors. It should be noted that, as blasting is a singular event, sound exposure levels can be considered as a single strike (SEL_{ss}) rather than cumulative.

Tables 5.1.3 present the Southall *et al.* (2019) criteria for PTS and TTS risk for each of the key marine mammal hearing groups when considering impulsive noise (blasting and piling) sources. Table 5.1.4 shows a summary of the single strike impact ranges specific to blasting at the MOHI development at which marine mammals would be affected. It should be noted that ranges listed as 260m mean that noise levels do not drop below the criteria outlined in Table 5.1.3, before they reach the coastline opposite the Outer Harbour opening.

Table 5.1.3: Impulsive criteria for PTS and TTS in marine mammals (Southall *et al.* 2019).

Functional Hearing Group	Impulsive			
	Unweighted SPL_{peak} (dB re 1 µPa)		Weighted SEL_{cum} (dB re 1 µPa^{2}s)	
	PTS	TTS	PTS	TTS
LF Cetaceans	219	213	183	168
HF Cetaceans	230	224	185	170
VHF Cetaceans	202	196	155	140
PCW Pinnipeds	218	212	185	170

Table 5.1.4: Summary of the impact ranges from borehole blasting for marine mammals using the impulsive Southall et al. (2019) weighted SEL_{SS} criteria.

Southall *et al.* (2019) Weighted SEL_{ss} (Impulsive)			Maximum range (m)
PTS	LF cetacean	183 dB re 1 µPa	170m
	HF cetacean	185 dB re 1 µPa	30m
	VHF cetacean	155 dB re 1 µPa	240m
	Phocid pinniped	185 dB re 1 µPa	70m
TTS	LF cetacean	168 dB re 1 µPa	260m
	HF cetacean	170 dB re 1 µPa	110m
	VHF cetacean	140 dB re 1 µPa	260m
	Phocid pinniped	170 dB re 1 µPa	240m

5.1.1.3 Auditory Injury Criteria for Basking Shark

Outputs of the noise modelling have also been compared against the latest fish auditory injury impact criteria provided by Popper *et al.* (2014) in order to estimate the ranges from the works at which different magnitudes of acoustic impact may occur. The criteria groups fish into functional hearing groups, as shown in Table 5.1.5.

Table 5.11.5: Functional Hearing Groups, and Relevant Fish Receptors (Popper *et al.* 2014)

Functional Hearing Group	Relevant Fish Receptors	Sensitivity to Underwater Noise
Fish: No Swim Bladder (P-)	Basking Shark	Least Sensitive
Fish: Swim Bladder Not Involved in Hearing (P-)	None	↓
Fish: Swim Bladder Involved in Hearing (P+)	None	Most Sensitive

Table 5.1.6 shows a summary of the impact ranges specific to blasting at the MOHI development at which fish species, and more specifically basking shark, would be affected.

Table 5.11.6: Summary of the Impact Ranges from Borehole Blasting for fish using the Popper *et al.* (2014) SPL_{peak} Criteria for Explosions

Popper *et al.* (2014) Unweighted SPL_{peak} (Explosions)		**Maximum range (m)**
All fish groups and sea turtles Mortality and potential mortal injury	234 dB re 1 µPa	40 m
	229 dB re 1 µPa	70 m

5.1.1.4 Acoustic Impacts from Blasting

The modelled impact ranges for marine mammals and basking shark are displayed in Figures 4.3 – 4.7 of the Subacoustech Environmental Underwater Noise Assessment (provided in Appendix 4).

The mitigation measures proposed in the form of a Marine Mammal and Basking Shark protocol (as discussed in Section 6.2.1) are proportionate to the impacts outlined below. In addition, the protocols will also apply to otter if, identified within the vicinity of works.

5.1.1.4.1 Marine Mammals

For LF cetaceans, which in this case pertains to minke whales, blasting will have a range of PTS ~170m from the source and a range of TTS 260m from the source. However, given that water depths within 300m of the Outer Harbour do not exceed 20m, with areas within the Outer Harbour much shallower, it is extremely unlikely that minke whales will be present in areas where they may suffer PTS or TTS. In addition, the shallow nature of these areas does not provide a suitable environment for biologically important behaviours such as foraging.

For HF cetaceans, which in this case pertains to short-beaked common and bottlenose dolphins, blasting will have a range of PTS ~30m from the source and a range of TTS ~110m from the source. However, given that water depths within the 300m of the Outer Harbour do not exceed 20m, with areas within the Outer Harbour much shallower, it is extremely unlikely that high-frequency cetaceans will be present in the area where they may suffer PTS or TTS. In addition, like with LF cetaceans, the shallow nature of these areas does not provide a suitable environment for biologically important behaviours such as foraging.

For VHF cetaceans (i.e., harbour porpoise), blasting will have a range of PTS ~240m from the source and a range of TTS 260m from the source. Due to the nature of, and characteristics of the Outer Harbour area however, it is unlikely that harbour porpoise will be present within areas of PTS or TTS. These areas provide unsuitable habitat for harbour porpoise and are generally much shallower (~ 0-20m water depth) than their preferred foraging depths (~20 – 50m). Although the impact ranges will not encroach and extend into the area designated as the Inner Hebrides and The Minches SAC for harbour porpoise, due to the proximity of the Inner Hebrides and The Minches SAC to the Outer Harbour, their presence within areas of disturbance cannot be ruled out.

Although effects of disturbance are not predicted to be directly injurious, it is possible for sound levels to create a disturbance effect known as vocalisation masking. Masking of vocalisations occurs when sound interferes with a marine mammals' ability to perceive and distinguish different sounds. Although it is still relatively unclear on how masking affects each marine mammal species, it is understood that masking could inhibit vocalisations relating to foraging and breeding success (National Research Council (U.S.), 2003). Some researchers however, have shown that marine mammals may have the ability to increase the amplitude of their vocalisations as a short-term response to increased noise levels (Clark et al., 2009; Parks, 2011) and prevent inhibition from occurring.

5.1.1.4.2 Seals

With regards to pinnipeds (PW), the zone of PTS extended to approximately ~70m from the source, with zones of TTS extending to areas as far as ~240m from the source. Low density distributions of common seals have been recorded within Mallaig Harbour and as such, are extremely unlikely to be present during blasting works. Grey seals are known to be present within the Mallaig Harbour area for much of the year. As such, it can be anticipated that grey seals will be within close proximity to the proposed development.

Disturbance effects for seal species include startle/panic responses to blasting activities.

5.1.1.4.3 Basking Shark

Basking sharks do not have swim bladders, making them less sensitive to underwater noise than diadromous receptors that do (Table 5.1.5). In order to suffer either mortal or recoverable injury, a basking shark would need to be within 70m of a single blast. Given that water depths within 100m of the works are <10m deep, and extremely confined, these areas are unsuitable for such a large fish. Therefore, basking sharks are not anticipated to be present in the area where they may be subject to acoustic injury. However, as best practice, the marine mammal protocol for blasting as outlined in Section 6.2.1 will also apply to basking shark.

5.1.1.5 Acoustic Impacts from Piling

It is recognised that piling will also have the potential to impact marine mammals and basking shark and as such, mitigation is proposed in Section 6.2.2, proportionate to the impacts outlined below.

Noise modelling was not specifically carried out for piling (vibration or procession piling), as it was recognised that the noise levels associated with piling would be much lower than those associated with blasting. For example: impact piling (150kJ) of a 910mm diameter pile would be expected to give rise to an unweighted SEL_{SS} of 181.6dB re1µPa^{2}s (Affric, 2019), whereas the 60kg TNT blast unweighted source had SEL_{SS} of 230.3dB re1µPa^{2}s. The piles to be utilised

in the Mallaig development are likely to be 600 to 700mm diameter and hence will have an even lower associated noise source level. Vibro-piling techniques give rise to lower noise source levels than percussion piling, this technique will be employed for the majority of the works as described in Section 4.2.1.

The location of the blast modelled was at the entrance to the harbour, whereas the pilling locations are within the slot 130m further inside the Outer Harbour, and alongside the steamer pier which is behind the Stub Breakwater.

Due to the tidal nature of the slot the piling activities will be carried out in shallow water, minimising the transmission of power from the pile into the water column in the form of noise. As such, it is deemed highly unlikely that the SEL_{CUM} PTS and TTS will be breached outwith the Outer Harbour area. Hence it is unlikely that these works will have the potential to cause acoustic injury and disturbance effects to marine mammals or basking sharks.

As harbour porpoise and grey seals are the most likely receptors to be affected by piling works, these are the only species assessed, although the mitigation proposed will apply to all marine mammal species and basking shark.

5.1.1.5.1 Grey Seal (Halichoerus grypus)

When considering effects on seal species, it is unlikely that zones of PTS and TTS extend outwith the area of the Outer Harbour. Although disturbance effects may still be present immediately outwith the Outer Harbour area, these would be minimal due to masking effects from the walls of the harbour. When considering the Inner Harbour area, both bathymetry and seabed sediment characteristics strongly influence the propagation of sound through repeated reflections and scattering of sound at both the seafloor and sea-surface interface. Given that the water environment is extremely shallow at the Inner Harbour area, the range at which seals might be disturbed may be even less than that of blasting outwith the Outer Harbour when considering absorption and masking effects. It is also noted that the disturbance effects are associated with lower noise levels over a period of time, as opposed to blasting which is a very short duration loud event which is more likely to cause a startle/panic response.

5.1.1.5.2 Harbour Porpoise (Phocoena phocoena)

When considering the Inner Hebrides and Minches SAC and harbour porpoise, it is not anticipated that harbour porpoise would be present immediately outwith the Outer Harbour area or within the Outer or Inner Harbour area due to shallow water depths and current levels of vessel activity. As harbour porpoise are more sensitive to the effects of underwater noise, effects of disturbance immediately outwith the Outer Harbour area and to the north of this area may be greater than those when compared with seals. These, however, are anticipated to be minimal due to masking effects from the harbour walls of the Outer Harbour.

5.1.2 Marine Mammal Risk of Physical Injury

Disturbance effects inducing startle/panic responses in marine mammals, as described in Section(s) 5.1.1.4 and 5.1.1.5, have the potential to increase collision risks with stationary items and cause harm. Mitigation measures to mediate the risks of startle/panic responses are outlined in Section 6.2.

As discussed in Section 5.1.3, during dredged spoil disposal operations, there is the potential for a marine mammal, or basking shark, to be directly under the disposal vessel when the spoil is released. In this event, the animal could be injured or killed by falling debris.

The closest dredge disposal site at Armadale (HE070) is situated within the Inner Hebrides and Minches SAC, designated for harbour porpoise. Other marine mammals and basking sharks could also be encountered in this area.

Mitigation measures will include the implementation of a Marine Mammal and Basking Shark protocol where observations are carried out prior to disposal at sea to ensure no animals are present prior to the deposit of dredged material (see Section 6.2).

5.1.3 Water and Seabed Quality (Marine)

Blasting, dredging and dredge reuse/disposal will give rise to increased sediment in the water column. The area to be dredged within the Outer Harbour is largely made up of bed rock and sands, with siltier material at the entrance of the harbour. Sedimentation will be highest in this area; however, this will be localised. The dredge is limited in depth and will therefore minimise the volume and duration of dredging.

Sediment sampling and analysis has been completed to inform BPEO assessments to identify the best management of spoil arising from the dredging works in support of the dredge licences. Sampling and analysis confirmed that the chemical and physical characteristics make the material suitable for reuse within the development however, the excess material if no alternative uses are found require disposal.

Dredge disposal would give rise to localised sedimentation and smothering effects at the dredge disposal site however, dredge disposal sites are not expected to have high quality benthos. The closest dredge disposal site at Armadale (HE070) has been considered within the BPEO assessment. The disposal site is situated within the Inner Hebrides and Minches SAC, designated for harbour porpoise. Other marine mammals and basking sharks could also be encountered in this area.

Disposal of materials could result in physical injury to marine mammals and basking sharks, if they are in the immediate vicinity of the dredge vessel when material is being deposited. Mitigation measures will include the implementation of a Marine Mammal and Basking Shark protocol where observations are carried out prior to disposal at sea to ensure no animals are present prior to the deposit of dredged material. This is discussed further in Section 6.2.1. The protocol will also apply to otter if identified within the vicinity of works.

5.1.4 Navigation

During construction, there will likely be impacts on berth availability at the ice quay and outer breakwater quay. It is possible that there will also be additional navigational hazards during works, i.e., during dredging and piling works where a piling rig and dredger will be in the area. In addition, vessels may be unable to access the ice plant during construction hours. MOWI well boats utilise a berth on the Outer Breakwater Quay during the night for transfer of salmon to their Harvest Station, and the works will require to be arranged such that this arrangement can continue. Dredging which may be carried out through the night and access for fishing boats and other vessels during the day will need to be managed by Contract conditions setting out limitations on working areas and requiring close cooperation between the Contractor and the Harbour Master. Navigational effects will be appropriately managed through the implementation of mitigation detailed in Section 6.1.2.

5.2 Operations

As detailed in the Screening Report, see Appendix 1, without mitigation there is potentially one likely significant negative effect arising from the operational stage of the project. Table 5.2.1 details this aspect, the previously identified mitigation measures, and their current status.

Table 5.2.1: Operational Effects and Sensitivities

Aspect		Source	Sensitivities	Mitigation Measures	Status
Residues and Emissions	Light Emissions	Port lighting	People, Biodiversity – Ornithology	A lighting assessment will be carried out in accordance with the Scottish Executive Guidance Note, 'Controlling light pollution and reducing lighting energy consumption' and the 'Safety in Ports (SIP) 009 – Guidance on Lighting' note. Note this includes the need to consider environmentally sensitive and designated sites hence ornithological considerations will be included within the lighting design. Lighting assessment will inform the design and include mitigation measures. These may include directional lighting, low level lighting, etc.	Lighting assessment carried out. Discussed in Section 5.2.1. Lighting will be installed in line with the lighting assessment which has identified appropriate mitigation, see Section 6.3.1.

5.2.1 Light Emissions

The potential for lighting associated with the operational phase of the development to impact upon the local population of Manx shearwaters (*Puffinus puffinus*) has been highlighted. Manx shearwaters are known to fly towards the lights of Mallaig whilst departing their nesting sites on the Isle of Rum and starting their migration south, stranding themselves in and around the town. This occurs particularly during strong westerly winds and low moonlight.

Factors thought to influence shearwaters include colour temperature, measured on the Kelvin scale, with studies demonstrating that artificial lighting with a cool bluish colour has a greater impact on seabirds (Longcore *et* al, 2017) a low kelvin level towards the red end of the visible light spectrum is less attractive to nocturnally migrating birds flying over the sea (Rebke *et al*., 2019). In addition to this, overspill and directionality can also have a negative impact. Increased light levels and unfavourable conditions could exacerbate the risk of shearwaters grounding themselves and therefore a sympathetic lighting design is required. A lighting assessment has been carried out addressing these potential issues with mitigation measures detailed in Section 6.3.1.

6 Mitigation

6.1 Pre-Construction Requirements

The Screening Report identified a number of pre-construction requirements, most of which have been completed and are discussed in Section 5, hence only those still to be completed have been included within this section.

6.1.1 Underwater Noise and Vibration & Marine Mammal Physical Injury

An EPS licence is being sought from Marine Scotland to allow for the piling, blasting and dredging works to be carried out in an area where there is the potential for EPS to be present and where the activity could potentially case injury or disturbance.

6.1.2 Navigation

Appropriate Notice to Mariners will be posted prior to works commencing, and input from the Harbour Master will be sought with regards to the planning of construction works, such that navigational risks are minimised. Plans will also take account of the ferry timetable.

6.1.3 Task Planning

The detailed design process has taken account of the environmental sensitivities identified in Section 4 of the Screening Report (Appendix 1). Where potential effects arise from the construction works appropriate mitigation has been identified. Risk Assessment Method Statements will be in place for all construction tasks, these will include consideration of task specific environmental risks include detail mitigation techniques to be employed. Mitigation measures will be in alignment with construction guidance as discussed in Section 6.2.6.

6.2 Construction Mitigation

6.2.1 Underwater Noise and Vibration & Marine Mammal Physical Injury

A Marine Mammal Mitigation Plan has been produced and is provided in Appendix 5, the relevant sections of which will be implemented during blasting, piling and spoil disposal activities.

6.2.2 Water and Seabed Quality (Marine)

Works will be undertaken in line with the conditions stated on the dredge licence and will follow the disposal route identified from the BPEO assessment. Disposal at the disposal site will be undertaken in line with the appropriate mitigation identified within the EPS licence to prevent injury during the depositing of material.

6.2.3 Navigation

The Harbour Master will retain control of navigational safety during works, coordinating movements as required. Appropriate Notice to Mariners will continue to be posted during the works.

In addition to this, efforts will be made to minimise the amount of time berths are unavailable and where bad weather is predicted, i.e., storms, efforts will be made to make berths available to provide shelter for vessels.

The Harbour will also arrange for ice to be delivered to an alternative location within the harbour whilst vessels are unable to access the ice quay during construction works.

6.2.4 Additional Mitigation

Due to the potential effects the projects could have on a range of stakeholders during the construction phase, stakeholder communications will be carried out throughout the works. This may include both verbal and written communications. The MHA's website will be kept up to date with regards to progress and the next stages of the works.

In addition to the specific mitigation identified to manage effects discussed within this document and that previously identified within the screening report, construction guidance will be followed to minimise other potential negative effects of the projects, this is likely to include:

- Guidance on the Assessment of Dust from Demolition and Construction (IAQM, 2014);
- Pollution Prevention Guidance 6 (PPG6) – for Working at Construction and Demolition Sites (Environmental Agency et al., 2012);
- Coastal and Marine Environmental Site Guide: C584 (Budd, John, Simm, & Wilkinson, 2003);
- Guidance for Pollution Prevention 8 (GPP8) – Safe storage and disposal of used oils (SEPA, Natrual Resources Wales, & NIEA, 2017);
- Pollution Prevention Guidance 7 (PPG7) – The safe operation of refuelling facilities (Environment and Heritage Service, SEPA, & Environment Agency, 2011); and
- Guidance for Pollution Prevention 5 (GPP5) – Works and maintenance in or near water (NIEA, 2017).

In addition, relevant General Binding Rules from the Water Environment (Controlled Activities) (Scotland) Regulations 2011 as amended will be applied. This will include GBRs relating to oil storage.

6.3 Operational Mitigation

6.3.1 Light Emissions

A number of measures have been identified from the lighting design assessment and will be implemented in order to minimise impacts on migrating manx shearwater from the Isle of Rum to the west of Mallaig.

The lighting design has taken the existing MOWI harvest building at 9.4m high and two large oil tanks at 12.5m high to the west of the Outer Harbour into account. Eight new lighting columns will be installed at 8m, and further lighting fitted to three existing columns, also at 8m. The existing infrastructure, shown in Drawing MOHI-WS2175-XX-XX-D-C-9007, is higher than where the proposed new lighting will be installed and will therefore in the first instance, offer shielding, reducing visibility from the west. Of the proposed new lighting columns, five of these are located within the area of the slot with another located on existing ground adjacent to the fuel tanks and the remaining two on either side (east and west) of the disused ice plant building to the south of the slot.

In terms of directionality, lighting will have zero angle of tilt and be directed only downwards towards specific working harbour areas. The luminaires specifically chosen have a zero rating for upward light, therefore avoiding the effect of 'sky glow' i.e. they will not increase the brightness of the night sky. The optical distribution of the specified luminaires will be in particular, directed away from the west to mitigate against the potential effect on migrating birds.

Overspill was considered within the lighting design with further shielding taken into account. The luminaires chosen for use on site have shielding to the rear which will reduce the overspill of light, therefore reducing intrusion of light onto surrounding areas. This reduces the effect of luminaire intensity and light intrusion through windows on adjacent properties and will be less attractive to migrating birds. In addition, deflectors and baffles will also be utilised to further act to reduce overspill.

The colour of lighting used has also been considered. Low energy LED luminaires with a warm colour appearance (below 3300 kelvin) as opposed to cool (above 5,300) have been chosen to mitigate the effect on migrating birds. It is proposed that luminaires of 3000 kelvin are used in this project in order to minimise impacts on shearwaters whilst maintaining a level of lighting within the Outer Harbour area suitable for safe working.

The design will also incorporate measures to reduce energy usage. This will include controlling lighting by photocell technology ensuring lighting switches on and off when daylight light is at certain levels. It is recognised that not all areas will require the same levels of lighting at all times and therefore it is proposed that a lighting cabinet with an override switch will be installed to reduce lighting levels during periods where less hazardous activities are taking place. Lighting levels will be able to be altered between high and low levels of illumination depending on harbour activities. During the shearwater migration period, light levels can be reduced where quayside operations do not require full illumination to ensure safe working.

7 Summary

Mallaig Harbour Authority wish to develop a Splay Berth Quay and deepen the area of the Outer Harbour in order to provide an increase in berthing space and quayside operating space. The deepening of the harbour will allow larger draughted boats to have access to the Outer Harbour without tidal restriction.

Potential effects have been identified and mitigation measures have been identified for these aspects to reduce the resultant effects such that they are unlikely to be significant. Mitigation measures have also been identified for aspects without significant effects as a way of minimising the environmental impact and maintaining best practice. A summary of all mitigation measures during construction and operational phases is shown in Tables 7.1.1 and 7.1.2 below.

Table 7.1.1: Summary of Construction Mitigation

Aspect		Source	Sensitivities	Mitigation measures
Use of Natural Resources	Use of Material (e.g., steel)	Rock for rock armour. Infill materials for land reclamation, in addition to dredge material. Steel for tubular piles. Concrete for quay deck and beam. Concrete or asphalt for surfacing.	None	Efficient use of resources and re-use of materials including rock armour. Appropriate design for long life in marine environment including corrosion protection of steel elements.
	Use of Land and/or Soil	Dredge spoil from deepening of harbour.	None	The volumes of material dredged will be minimised through design and re-used as infill.
Employment	Job Creation	The construction project will create direct and indirect employment associated with the development.	People - Economy	Encourage local supply chain involvement.
Residues and Emissions	In-Air Noise	Infilling works in reclamation area. Removal of rock armour. Rock armour placement. Piling. Dredging. Blasting.	People – Community of Mallaig	The majority of works, except dredging, will be carried out between 7am – 7pm. The works are being undertaken in a busy harbour where generation of noise from activities such as berthing and loading/unloading of vessels on a 24hour basis is a common activity. No blasting will be carried out between the hours of 8am and 6pm
	Vibration	Blasting	Harbour Infrastructure	Appropriate blast plan developed and adhered to.
	Underwater Noise	Plant and vessel movements. Rock infill/material placement. Vibro and impact pilling.	Biodiversity - Marine Mammals.	All plant/vessels used will be well maintained. Rock infill and material placement will occur within the harbour basin with the Outer Harbour wall acting as noise a barrier.

Aspect		Source	Sensitivities	Mitigation measures
		Dredging. Blasting.	Basking Sharks Biodiversity - Inner Hebrides and Minches SAC.	Any rock removal by blasting will be withing the confines of the outer harbour basin. The basin entrance faces due east across a 120m wide channel between it and the shore, limiting the propagation of noise to open water beyond the harbour entrance channel. The majority of the dredging activity to remove deposits above rockhead level will also be contained within the confines of the outer harbour basin, with a similar limitation on noise propagation to areas beyond the harbour. Dredging outwith the harbour walls will be dredging soft materials and will not be expected to generate significant noise levels. An EPS licence to be in place. MMMP provided in Appendix 5 to be implemented for marine mammals and basking sharks.
	Air Quality (Emissions - dust)	Rock infill. Material placement. Plant and vehicle movements.	People - Harbour users and facilities.	Dust management in line with good construction practice. This includes limiting stockpiles of materials and localised dampening and road sweeping, if required.
	Air Quality (Greenhouse Gases and Climate Change)	Plant and vehicle movements. Material imports.	Possible climate change contribution.	Plant and vehicles will be well maintained. Re-use of materials to limit the amount of bulk material being imported to site. Road transport to be minimised where practicable.
	Water Quality (Marine – Pollution)	Risk of unplanned emissions / release of pollutants from, i.e. • Waste material • Oil/fuel storage and handling • Plant/machinery fault	Water Quality. Biodiversity – Marine. Biodiversity – Inner Hebrides and Minches SAC.	Works conducted in line with standard best practice and existing guidelines: • Storage and handling; • Waste management; • Surface water management; and • Pollution prevention plan and spill management plan in place during construction. Plant and machinery will be appropriately maintained.

Aspect		Source	Sensitivities	Mitigation measures
	Water and Seabed Quality	Increased sediment in the water column associated with blasting dredging and dredge disposal.	Biodiversity – Marine Mammals Biodiversity – Inner Hebrides and Minches SAC (Harbour Porpoise)	Dredge limited in depth, minimising volume, and duration of dredge. Disposal route identified through the dredge licensing BPEO assessments processes. Reuse of dredge spoil in construction works as far as practicable.
	Water and Seabed Quality	Dredge disposal, especially of larger particle sizes causing physical damage as the fall through the water column.	Biodiversity – Marine Mammals Basking Shark Biodiversity – Inner Hebrides and Minches SAC (Harbour Porpoise)	EPS licence to be in place. The MMMP provided in Appendix 5 will also apply to otter where relevant.
	Light Emissions	Light for construction.	Visual impact. Biodiversity – Marine, Terrestrial and Ornithology.	Works will also be carried out in accordance with best practice and in line with guidance notes, Scottish Executive Guidance Note, 'Controlling light pollution and reducing lighting energy consumption' and the 'Safety in Ports (SIP) 009 – Guidance on Lighting.' Measures include: • Over-lighting will be avoided and designed to industry recommended levels; • All lights will be carefully directed to where they are most needed and will be designed to minimise light pollution; and • Construction lighting will be switched off when not required and all works will be carried out during the set working hours.
	Traffic and Transport	Vehicle movements along the A830	Traffic. Transport.	The reuse of dredge material reduces the requirement to deliver construction materials. Some materials may be delivered by sea.

Aspect		Source	Sensitivities	Mitigation measures
Traffic, Transport, Access, and Navigation		delivering construction materials.		Traffic Management has been considered within the Construction Traffic Management Plan.
	Navigation	Construction works, including dredge and disposal, and vessel and plant movements. Impacts on berth availability (ice plant and outer breakwater quay). Additional navigational hazards within the Outer Harbour.	Berth users (Fishing boats & Aquaculture vessels).	Minimise time berths are unavailable. Effort to be made when bad weather is predicted i.e., storms to make berths available. Good communication with harbour users including appropriate Notice to Mariners posted. Input from the Harbour Master pre and during construction works. Harbour Master retains control of safety during works, coordinating movements as required. Harbour will arrange Ice deliveries to alternative location within harbour for vessels requiring ice unable to utilise the ice quay due to construction works.

Table 7.1.2: Summary of Operational Mitigation

Aspect		Source	Sensitivities	Any mitigation measures?
Residues and Emissions	In-Air Noise and Vibration	A slight increase in noise may result from increased vessel movements within the harbour.	People.	No mitigation required. Sensitive noise receptors including residential properties are too far from the development to experience noticeable increases in noise levels.
	Water Quality (Marine – Pollution)	Risk of unplanned emissions / release of pollutants from quayside operations.	Water Quality.	Harbour operations conducted in line with best practice and existing guidelines: • Storage and handling; • Waste management; and • Port's spill procedures.
	Light Emissions	Port lighting.	People. Biodiversity – Ornithology.	A lighting assessment has been carried out in accordance with the Scottish Executive Guidance Note, 'Controlling light pollution and reducing lighting energy consumption' and the 'Safety in Ports (SIP) 009 – Guidance on Lighting' note. Note this included the need to consider environmental sensitivities. The lighting assessment has informed the design. Measures include the use of low energy LEDs with a low kelvin level. Lights

Aspect		Source	Sensitivities	Any mitigation measures?
				will limit sky glow and have shielding to reduce overspill and intrusion into surrounding areas. Lighting will be directed only downwards towards specific areas. Optical distribution of lights will in particular be directed away from the west where birds migrate from. The design will allow for switching off when not required.
	Underwater Noise	Increased number of fishing or other vessels in area.	Biodiversity – Marine Mammals.	Already a working port, berthing capacity increase is not large enough to significantly change vessel numbers.
Employment	Job Creation	Operational jobs – increased space for fishing and aquaculture industries, potential to increase activity in area and associated jobs	People - Economy	Encourage local supply chain involvement.
Landscape and Visual	Landscape and Visual	Development of Outer Harbour Splay Berth.	Landscape - Knoydart National Scenic Area.	Low lying project, inside an area already developed. No further mitigation required.

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9 Glossary

AA	Appropriate Assessment
BPEO	Best Practicable Environmental Option
CD	Chart Datum
dB	decibel
EIA	Environmental Impact Assessment
EPS	European Protected Species
GENs	General Planning Principles
HF	High Frequency cetaceans
HRA	Habitat Regulations Appraisal
HwLDP	The Highland-wide Local Development Plan
JNCC	Joint Nature Conservation Committee
K	Kelvin
km	kilometres
LDPs	Local Development Plans
LF	Low Frequency cetaceans
m	metres
MHA	Mallaig Harbour Authority
MHWS	Mean High Water Spring
MLWS	Mean Low Water Spring
MMMP	Marine Mammal Protection Plan
MMO	Marine Mammal Observer
MOHI	Mallaig Outer Harbour Improvements
MS-LOT	Marine Scotland Licensing Operations Team
nm	Nautical miles
NMP	National Marine Plan
NPF	National Planning Framework
NPF3	National Planning Framework 3
NSA	National Scenic Area
Pa	Pascal
PAC	Pre - Application Consultation
PANs	Planning Advice Notes
PCW	Phocid Carnivores in Water
PPG	Pollution Prevention Guidance
PTS	Permanent Threshold Shift
SAC	Special Area of Conservation
SDPs	Strategic Development Plans
SEL_{cum}	Cumulative Sound Exposure Level
SEL_{ss}	Single Strike Sound Exposure Level
SPA	Special Protection Area
SPL	Sound Pressure Level
SPL_{peak}	Peak Sound Pressure Level
SPP	Scottish Planning Policy
THC	The Highland Council
TTS	Temporary Threshold Shift
VHF	Very High Frequency cetaceans

Appendix 1 – Screening Report

Mallaig Outer Harbour Improvements
Splay Berth & Deepening

MALLAIG HARBOUR AUTHORITY

Date:06/05/2021

MALLAIG HARBOUR AUTHORITY

Affric making it happen

Document Control

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MALLAIG HARBOUR AUTHORITY

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Contents

1 Introduction

Mallaig Harbour Authority (MHA) are proposing to construct a new splay berth and deepen the waters within the Outer Harbour area of Mallaig Harbour. The development, including the deepening, will cover a total area of 33,000m^2 and will provide additional berthing space, operational quayside, and laydown space, primarily for the fishing and aquaculture sectors. The harbour improvements will accommodate an increased number of vessels and the dredge will allow for deeper draughted vessels, including well boats, to enter the Outer Harbour in all tide states.

The development of Mallaig Harbour began in 1846, prior to EIA regulations, however, if the harbour were to be built today, it would fall under Section 8(2) of Schedule 1 of the Marine Works (Environmental Impact Assessment (EIA)) (Scotland) Regulations 2017. It is considered that the proposed development is an extension to a Schedule 1 development, and as such, falls under item 14 in the table provided in Schedule 2. Hence, a formal Screening Opinion is therefore requested from Marine Scotland under regulation 10(1) of the aforementioned legislation to determine whether an EIA will be required to support the Marine Construction and Dredge Licence applications for the proposed development. It is noted that vessels in excess of 1,350tonnes will not be able to utilise the new splay berth, hence the project does not fall under Schedule 1 Section 8 and hence require an EIA in its own right. Vessels in excess of 1,350tonnes can already utilise the outer breakwater quay in the Outer Harbour.

This report provides the information requested under Section 10 of the EIA Regulations, in order to inform the corresponding screening opinion, namely a description of:

- The location of the proposed works;
- The proposed works;
- The environmental sensitivities of the geographical area;
- The aspects of the environment likely to be significantly affected by the proposed works;
- The likely significant effects; and
- The features of the proposed works or proposed measures envisaged to avoid or prevent significant adverse effects on the environment.

2 Location

Mallaig is a port situated on the west coast of Scotland in the region of Lochaber (Drawing 69.01.02). The town is situated approximately 42 miles from Fort William at the end of the A830, also known as the Road to the Isles. Mallaig harbour (National Grid Reference: NM 67585 97217) is a working fishing port and there are ferries from here to the Inner and Outer Hebrides, the Small Isles, and the Knoydart Peninsula.

Mallaig falls within the Lochaber area of The Highland Council (THC). The harbour is managed by the MHA and the Harbour Limits encompass the whole of the Harbour basin and approach channel. These extend south and west from the Harbour mouth in an arc towards the small island of Eilean na h-Acairseid and north across the mouth of Loch Nevis to the headland of An Faochag on Knoydart, with a southern limit within Loch Nevis itself at approximately 4km south of the village of Inverie.

The area of the proposed development is known as the Outer Harbour and is shown in Drawing MOHI-WS2175-XX-00-DR-C-9105 P02. The area proposed for development is indicated by the red line boundary.

3 Background and Need

3.1 History

The original pier in Mallaig was built in 1846 with the road extended to the pier in 1879 and salt and barrel stores built in 1883. With the coming of the railway in 1901, Mallaig Harbour developed into the premier fishing port on the west coast of Scotland, supporting the valuable herring industry. In more recent years, the harbour has been expanded and upgraded to accommodate Roll-on, Roll-off (RoRo) ferries, meet the modern requirements of the fishing and aquaculture sectors and to encourage leisure users. Recent improvements have included prevention of corrosion of steel piled quays by cathodic protection, re-fendering of the Fish Pier, provision of a passenger ferry access pontoon, a large area of resurfacing on the road to the Outer Breakwater, resurfacing of a large area of the Steamer (ferry) pier, and provision of secure car parking areas. In 2011, a 1200 tonne storage building and a 50-berth marina for leisure craft were also established at the port.

The MHA was formed via The Mallaig Harbour Revision Order 1968. The MHA made an application for a harbour revision in 2011 and now operate under The Mallaig Harbour Revision Order 2012 which enables the Authority to carry out its business under the Modernisation of Trust Ports Legislation. The MHA is legally responsible for the management and operation of the harbour and its ongoing development.

3.2 Current Use

Mallaig is a working harbour with multiple users including the fishing industry, ferry services, aquaculture industry and users of the recreational marina.

The aquaculture industry utilises Mallaig Harbour for fish feed storage and distribution and Mallaig is a key hub for this sector. The harbour is an important site for storage, landing, processing, and packaging of fish and crustaceans for transport and is the leading port on the west coast of Scotland for prawn (*Nephrops*) landings.

A salmon harvesting station within the Outer Harbour area is operated by MOWI. Salmon are transported by sea to the harvest station in Mallaig harbour before being shipped onwards to MOWI's processing plant in Fort William. The fish are discharged from well boats moored on the Outer Breakwater Quay to the harvesting station through a pipeline which runs from the Outer Breakwater Berth along the edge of the quay to the harvest station. MOWI also use the Harbour to service offshore sites on the islands of Muck and Rum.

Scottish Sea Farms Limited also use Mallaig Harbour as an operational base for their sites in Loch Nevis. The Scottish Salmon Company use the harbour as a back-up location for unloading harvested salmon. Ferguson Transport & Shipping also have an operating base in the harbour.

Regular ferry services, operated by Caledonian MacBrayne Ferries Ltd (CalMac), operate from the steamer pier in Mallaig Harbour. These provide year-round links from Mallaig with the Isle of Skye, South Uist and the Small Isles. A passenger ferry operates from the Passenger Access

Pontoon at the inshore end of the Fish Pier, providing transport to and from the remote Knoydart Peninsula via Loch Nevis. A freight only service transports bulk, loose cargoes and heavy plant to the Small Isles and Knoydart Peninsula. A number of vessels also operate as marine related tourism businesses from Mallaig Harbour Passenger Pontoon and from the Inner Harbour Marina.

The Outer Harbour basin was constructed in 1996-98 with a depth of -4m Chart Datum (CD) and has three quays for berthing (Outer Breakwater Quay, Ice Quay and Feed Berth Quay). The Outer Breakwater Quay can accommodate vessels in excess of 1350 tonnes and up to a maximum length of around 80 metres when tidal conditions allow. The Ice Quay provides berthing mainly for fishing vessels and small aquaculture service vessels all under 1350 tonnes, and access for ice from a containerised Plant at the northern end of the quay. The Feed Berth is located on the inshore end of the north face of the Steamer Pier and provides berthing of vessels of up to around 1000 tonnes collecting fish feed from the adjacent feed store building.

The area between the ice quay and outer breakwater quay, labelled the "slot," see Figures 1 and 2 below, was left undeveloped in the 1996-98 development, is currently not in use and is unsuitable for berthing due to a lack of any quay faces and the presence of shallow bed rock which is exposed at low tide. This area is approximately 65m in width and 50m in length.

Figure 1: Overview of Mallaig Harbour

Figure 2: The Slot

3.3 Need

The need for the development is primarily to ease peak congestion in the Harbour by providing additional berthing for fishing and aquaculture related vessels. The increase in berthing space provision will also offer opportunity for increased use of the basin by other vessels at off-peak times, all yielding additional turnover for the Harbour. The MHA's current Masterplan details proposals for improving wave climate in the Outer Harbour along with freeing up berth and quayside space due to the high demand for berthing and refuge within the harbour basin, particularly during bad weather when fishing and other vessels seek shelter.

To meet the demand for berthing within the harbour, additional berthing quay length is required. The only area of the harbour that has the potential for development without impairing other activities is the "slot." This area was aside in 1996 as a potential site for a boatyard however, this plan never came to fruition and the area has remained undeveloped. By utilising this space and building the Outer Harbour Splay Berth, additional berthing can be provided.

A second driver for the development is the Harbour Authority's urgent requirement for more operating space with quay access. The space is required to meet the needs of commercial fishing and aquaculture related activities, particularly for the loading and unloading of fish and fish feed, and to offer some limited opportunity for onshore expansion in a harbour which is severely limited by lack of shoreside development area. By building the Outer Harbour Splay Berth and the reclamation behind it, additional laydown space will be created to support expanded quayside operations and offer the potential for future harbour development.

The Harbour Order for the creation of the Outer Harbour Development of 1996-98 allowed for dredging of the basin and its approaches to a depth of 6 metres below Chart Datum. However, when the Outer Harbour came to be constructed it was only dredged to a depth of -4m CD, to suit budget limitations at that time, but the design of the Works allowed for a future dredging to a depth of -6m CD at a later date. The outer basin has operated with the restricted depth of -4m CD to date, but over the last ten years or so there has been increased demand to accommodate deeper draughted vessels. The current depth of the basin has meant that any vessel with a draught greater than 4m is only able to use the harbour on a tidally restricted basis, arriving after one low water and leaving before the next, to avoid grounding. With small cargo, fish farm well boat, support boat and trawler draughts generally increasing, the "tidal curfew" on larger vessels using the Outer Harbour increasingly limits MHA's ability to offer facilities to the range of vessels wishing to use their Port. There has been a particularly severe impact from limited depth on use of the harbour by fish farm well boats (normal draught of 5m plus) which typically seek to discharge at Mallaig on a daily basis. These vessels are forced to plan their arrivals and departures around tides which change by approximately one hour every day, rather than working to a schedule to suit normal staffing and shift working at the Mallaig harvest station. Proposals within the current Harbour Masterplan include deepening of the Outer Harbour to allow access for deeper draughted vessels generally, to improve the Harbour's offer to all potential Harbour users, and thereby to improve its commercial resilience and profitability.

In particular it is anticipated that the proposed increase in basin depth to -6m CD will not only ease the tidal curfew issues experienced by fish farm well boats but will also increase the potential for use of the harbour by small cargo vessels and larger trawlers.

The MHA recognises its important role in generating direct and indirect employment within the town of Mallaig and the local area. Employment in Mallaig has a high dependency on tourism with many local jobs within the hospitality industry. The outbreak of the coronavirus, COVID-19, resulted in a national lockdown during 2020 with limited international travel during the peak tourist season. The ongoing restrictions, local lockdowns and uncertainty surrounding the virus have had a heavy impact on the local economy and employment due to its reliance on the tourism industry. MHA see the development of the Splay Berth area as offering improved opportunity for preservation and expansion of local jobs which are independent of the tourist industry, improving the variety of local employment opportunities. Employment within Mallaig is discussed further in Section 5.5 People.

4 Characteristics of Development

The Mallaig Outer Harbour Splay Berth will provide additional berthing length of approximately 60m and additional quayside operational and laydown space of over 4000m^2, see Drawing MOHI-WS2175-XX-00-DR-C-9104 P02. The Outer Harbour will also be deepened to -6m CD to accommodate deeper drafted vessels.

In addition, to the development of the Outer Harbour Splay Berth and associated dredging, discussed in Sections 4.1.1 and 4.1.2, other works related to, and which will support the aims of the development in creating additional operating space, are discussed in Section 4.1.3. These activities will not involve works below Mean High Water Springs (MHWS) and as such are not subject to Marine Licensing.

4.1 Development Description

4.1.1 Outer Harbour Splay Berth

The works to form the proposed Mallaig Outer Harbour Splay Berth will be located in the undeveloped area at the north-west corner of the Outer Harbour basin and between the Ice Quay and the Outer Breakwater Quay in the area referred to hereafter as the slot (see Drawing MOHI-WS2175-XX-00-DR-C-9104 P02).

As noted previously the slot was originally designated for development as a boat yard but this was never built. It is therefore proposed that this area should be utilised to increase berthing space and laydown area for current and future harbour users.

The "slot" will be infilled using dredge material (blasted rock, plus sand and gravel) to create a hard standing area as discussed in Section 4.2.2. The quay will be a suspended reinforced concrete deck on tubular steel piles which will join onto the Ice Quay at one end and the Outer Breakwater Quay at the other end and back onto the reclaimed area of the slot. A rock armour slope on the seaward end of the land reclamation, under the quay, will help to dissipate wave energy in the Outer Harbour The suspended deck and land reclamation will be at a height of +7.43m CD. An additional rock armour revetment is proposed to be installed on the outside edge of the Stub Breakwater to further manage wave energy by reducing the transmission of northerly waves into the Outer Harbour.

Quay furniture including fenders, ladders and bollards will be provided. Services will also be required including operational lighting for the quay and reclaimed area which will need to be installed for safety and security reasons and potentially power supplies and drainage.

The fish harvesting pipeline will be rerouted, if required, to facilitate construction and avoid operational clashes.

4.1.2 Deepening of Outer Harbour

Dredging of approximately 85% of the footprint of the Outer Harbour basin, plus the entrance, will be carried out to increase the depth from the current level, typically between -4m and -5m CD, to a new level of -6m CD, see Drawing MOHI-WS2175-XX-00-DR-C-9105 P02. The dredge volume is made up of approximately 18,500m^3 (37,000t) of overburden and approximately 10,000m^3 (27,000t) of bedrock in situ.

The area was dredged during the harbour build in 1995 with around a third of the area of the basin requiring blasting to remove bedrock. The overburden for the dredge proposed comprises of sand and shattered rock fragments, up to cobble size, left from the previous dredge.

It is acknowledged that a Best Practice Environmental Option (BPEO) assessment will be required to determine the use/disposal route for this material to support the dredge licence application. Grab sampling of overburden sand/silt will be carried out to understand the chemical characteristics. It is noted that it will not be possible to sample/analyses the bedrock or shattered larger rock fragments which make up a significant proportion of the dredge material.

4.1.3 Other Works

Other works proposed in the area of the Splay Berth are expected to include permanent surfacing of the area between the ice plant and feed store building providing additional space suitable for quayside operations.

4.2 Construction

4.2.1 Outer Harbour Splay Berth

Initial works will comprise the removal of the existing revetment rock armour, which will be stored onshore within the harbour area for reuse, at the seaward end of the slot. Rock fill, primarily from selected dredged material, but supplemented where necessary by imported fill, will be placed, and compacted to infill the inner end of the slot and bring it above high tide level.

Between the north end corner of the ice quay and the western end corner of the outer breakwater quay, a concrete beam will be constructed on the seabed (rockhead), to act as a support to the toe of the proposed rock armoured revetment. Sockets will be cast within the beam to hold the toes of front row of tubular steel bearing piles which support the front edge of the proposed splay berth deck slab. The slot will be reclaimed by infilling the area with compacted suitable dredged material (sand, gravel, and rock) with the outer face being trimmed by an excavator to produce a sloping revetment ready to receive rock armour. The tubular steel bearing piles that will support the deck slab will be installed through the reclamation fill until they reach the (currently exposed) rockhead surface below and will then be driven for a short period to ensure full bearing capacity on rock is achieved. The tubular bearing piles that support the front edge of the quay slab will then be placed into the sockets in the concrete toe beam, supported by temporary steel bracing (above MHWS) and driven for a short period to ensure full bearing capacity on rock is achieved.

As described above, piling techniques will include pile placement into sockets (front of quay piles), vibro installation through fill (all other piles) and percussive piling to prove bearing for short periods estimated at between 5 to 15 minutes per pile. Between 60 and 65 tubular steel piles of 600 to 700mm diameter are expected to be installed to support the quay slab. As pile installation proceeds drilling into rock of grouted steel anchors or toe pins within some of the piles will be carried out, where required by the design, to resist lateral or uplift forces by securing the pile toes to the rockhead.

Following completion of piling, rock armour will be placed by land-based crane & grab or long reach backhoe to cover the outer face of the reclamation revetment, reusing the existing armour previously removed and stored, supplemented with additional import if required. A suspended reinforced concrete slab will be installed on top of the tubular piles to complete the Splay Berth quay deck. The area of concrete quay deck constructed over rock armoured revetment is expected to total 1310m^2. Wave modelling has confirmed that the finished construction of open piled deck over rock armoured revetment will maintain wave energy dissipation at this corner of the harbour basin at a similar level to the existing arrangement of the slot with an intertidal rocky shore and a small armour revetment at its inshore end.

Services tunnels will be constructed in the filled area behind the quay deck, quay furnishings such as bollards and fendering will be installed, and the reclamation area fill will be surfaced

with crushed stone (Type 1), concrete or asphalt, as required, to provide a permanent surface for access, laydown, or future development behind the new quay.

4.2.2 Deepening of Outer Harbour

As described in the introduction to this section, it is proposed to deepen a substantial portion of the Outer Harbour basin and its approaches to a depth of 6m below Chart Datum. This will be achieved by dredging of overburden and rock. The area of bedrock which requires dredging is situated entirely within the confines of the harbour basin and will require drilling and blasting prior to its removal.

Pre-split drill and blast techniques will be used to form the edges of the dredge in advance of bulk blasting of bedrock close to existing quay walls, to prevent as far as possible any undercutting of structures and to limit transmission of vibration to those structures. Drilling and blasting are expected to be carried out from floating or jack-up plant. Drilling and blasting of the armour toe trench and concrete toe beam may also be carried out from marine plant or, could be carried out from a temporary bund of dredged or rock fill material deposited locally in the harbour basin. This would then be removed following the completion of blasting.

Dredging is expected to be carried out by backhoe or grab dredger working from floating plant, and by long reach excavator working from shore, temporary bund, or quayside.

As previously noted, it is proposed that the bulk of the dredge material will be used in infill works. The remainder is being considered for any local developments in the area at the time of the works and for disposal at the closest dredge disposal site, HE070 (57.05856°N, -5.89101°E), located off Armadale on the Isle of Skye, subject to the findings of the BPEO assessment which will accompany the marine licence application for the Dredging and Disposal works.

4.2.3 Other Works

Surfacing works to the reclaimed area behind the new quay deck will be carried out using imported crushed rock, asphalt, and reinforced concrete ground slabs.

4.3 Operation

It is anticipated that the development will be utilised primarily by fishing and aquaculture work boats of up to a few hundred tonnes and the additional operational quayside space and laydown will be used primarily by aquaculture and marine services operators and suppliers.

4.4 Demolition/Reinstatement

There are no plans to discontinue the use of this site in the future, therefore, it is not considered necessary to plan for demolition or reinstatement works for its closure.

5 Known Sensitivities

5.1 Biodiversity

5.1.1 Designated Sites

Table 5.1 details the Statutory Nature Conservation Designated Sites; Marine Protected Area (MPA), Special Scientific Interest (SSSI), Special Area of Conservation (SAC), and Special Protection Area (SPA), within approximately 10km of the proposed development. Locations of designated sites identified within the vicinity of the site are shown in Drawing 69.01.01. Sites unlikely to be affected by the development due to their location and/or associated designated features (e.g., Terrestrial biological features that will not interface with the site), are show in grey. Due to the nature of the works being predominantly in the marine environment, marine specific designations have the potential to be affected and are described in more detail in subsequent sub-sections.

Table 5.1 Designated Sites within 10km

Site	Designation	Distance & Direction	Designated Features (relevant designation)	Comments
Inner Hebrides and Minches	SAC	180m West	Annex II species: Harbour porpoise (*Phocoena phocoena*).	Included in screening – Due to proximity of works and mobile species.
Blar na Caillich Buidhe	SSSI	5.1km South	Blanket bog, Lichen assemblage and Upland Oak Woodland.	Not considered further – Due to distance from works and immobile species.
Loch Morar	SSSI	4.3km SSE	Native pinewood and Oligotrophic loch.	Not considered further – Due to distance from works and immobile species.
Aird Thuirinis – Port na Long	SSSI	8.6km NWW	Moine.	Not considered further – Due to distance from works and immobile species.
Sea of the Hebrides	MPA(NC)	10.5km WSW	Basking shark (*Cetorhinus maximus*), Minke whale (*Balaenoptera acutorostrata*), Fronts and Marine Geomorphology of the Scottish Shelf Seabed.	Included in screening – Due to basking shark and minke whale being mobile species extending a 10km range.
Coille Delavil	SSSI	11km NW	Blanket bog, Dragonfly assemblage, Flood-plain fen, and Lichen assemblage.	Not considered further – Due to distance from works and limited species range.

5.1.2 Marine

Important marine receptors are present within the vicinity of Mallaig Harbour with designations in place. The Sea of the Hebrides MPA is designated for basking shark (*Cetorhinus maximus*) and minke whale (*Balaenoptera acutorostrata*). At its closest point, the site is approximately 10.5km away from the boundary of the MPA. Both these species ranges extend further than 10.5km and they are also afforded protection when outwith the MPA.

Basking sharks are considered a vulnerable species and are afforded full protection under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended). They are also a priority marine feature in Scotland's seas. Minke whales are common in Scottish waters during the summer months, often spotted feeding close to shore. They are a European Protected Species (EPS) and afforded protection under the Habitats Regulations 1994. Records of basking shark and minke whale around the Mallaig Harbour area have been identified from the National Biodiversity Network (NBN) Atlas (National Biodiversity Network Atlas, 2020).

The Inner Hebrides and Minches SAC is situated adjacent to Mallaig Harbour with the boundary of the SAC approximately 180m to the west. The SAC is designated for Harbour Porpoise *(Phocoena phocoena*) which are also afforded protection when out with the SAC. The SAC is a Natura site and as such, it falls under the Habitats Regulations, hence an appraisal will need to be undertaken by the competent authority (Marine Scotland) to identify if an appropriate assessment is required. Records of harbour porpoise have also been identified in the area from the NBN Atlas (NBN Atlas, 2020). Like the minke whale, harbour porpoise are also listed as an EPS and afforded protection under the Habitats Regulations 1994. The Armadale disposal ground, HE070, sits within the Inner Hebrides and Minches SAC.

Records of common dolphin (*Delphinus delphis*), bottlenose dolphin (*Tursiops truncatus*), harbour seal (*Phoca vitulina*) and grey seal *(Halichoerus grypus*) have also been identified within the area close to Mallaig Harbour (NBN Atlas, 2020). Records of grey seals have been identified within the harbour area itself. Anecdotal reports have also confirmed the presence of a grey seal frequenting the inner harbour area (Communication with Wallace Stone, 2020). Grey seals are afforded protection under the Marine (Scotland) Act 2010.

A search for benthic receptors was carried out within the Mallaig Harbour area using the National Marine Planning Interactive (Marine Scotland, 2020). No protected features were identified. As previously noted, the harbour was dredged in the past and blasting was carried out to break up the bedrock. In addition to bedrock, overburden of sand and rock fragments are present. This substrate, along with the area being a long running working harbour is therefore unlikely to provide high quality habitat for benthic ecology or provide spawning or nursery grounds for fish. There are also no major rivers within the Mallaig Harbour area and therefore it is unlikely any migratory fish species will be affected.

5.1.3 Terrestrial

As detailed in Table 5.1, SSSI designations within the vicinity of the site will not be considered further due to a lack of connectivity with the site.

A search of the NBN Atlas (NBN Atlas, 2020) identified 19 mammal species within 5km of the development. For the majority of the species identified there is a lack of connectivity to their natural habitats as the development is within a busy working harbour on the edge of the town.

A record of a European Otter (*Lutra lutra*) was identified close to the harbour area and two further records are shown further in land nearby. Otter use both coastal and riverine habitats and could therefore utilise the harbour area. It should be noted that these records are over 10 years old. The Masterplan for Mallaig Harbour (January, 2017), however, notes the presence of otters around the harbour area.

The Outer Harbour does provide suitable habitat for otter. Rock armour on the outer breakwater could provide shelter however, this is very exposed. Otter are likely to utilise the

harbour primarily for foraging and feeding. Otters are listed as an EPS and are protected under the Habitats Regulations 1994.

5.1.4 Ornithology

As shown in Table 5.1, there are no designated sites near the development of which has birds as a qualifing feature.

A total of 163 species of bird have been recorded within a 5km radius of Mallaig Harbour (National Biodiversity Network Atlas, 2020). Of the 163 species identified, there are 7 species which are afforded protection under Schedule 1 of the Wildlife and Countryside Act 1981 (as amended); Kingfisher (*Alcedo atthis*), Brambling (*Fringgilla montifringilla*), Black Throated Diver (*Givia arctica*) , Great Northern Diver (*Givia immer*), Red Throated Diver (*Givia stellata*), Hen Harrier (*circus cyaneus*), Snow Bunting (*Plectrophenax nivalis*), Slavionian Grebe (*Podiceps auritus*) and the White Tailed Eagle (*Haliaeetus albicilla)*.

Numerous records of manx shearwaters (*Puffinus* puffinus) exist around Mallaig Harbour and the surrounding area. Manx shearwaters are classified as Amber under the Birds of Conservation Concern 4: the Red List for Birds 2015. Manx shearwaters breed in large numbers on the Isle of Rum, west of Mallaig, and fledge between late August and early October departing their nest sites and migrating as far as South America. Local reports and a recent study note that these fledglings can become 'grounded' in the Mallaig area. Grounded refers to birds crash landing in cities and towns close to their nest sites. Shearwaters, along with storm petrels, are nocturnal species and can be attracted to artifiical light. Spyozs *et al* noted that increased grounding tended to occur during times of high inshore winds blowing the birds off course and on moonless nights where artifical light would stand out more (Sypozs *et al*, 2018; Oban Times, 2019). A local initiative is in place which recovers stranded birds from the area and releases them back at sea if appropriate. The Masterplan for Mallaig Harbour notes the presence of manx shearwaters in the harbour area.

All bird species are afforded protection during the breeding bird season under the Wildlife and Countryside Act 1981 (as amended). Some gull species are known to utilise harbour areas during the breeding bird season although no records have shown this at Mallaig Harbour. The area of the proposed development is not considered an important breeding site for the Schedule 1 species listed above due to the lack of available habitat and high levels of disturbance which comes with a working port and town.

5.2 Cultural Heritage

There are 23 Canmore and 10 Canmore maritime entries (Historic Environment Scotland, 2020) within a 1km radius of the proposed development site. No wrecks have been identified within the footprint of the development area. Outwith the harbour area, four wrecks have been identified. Given the nature in which they came to grief (grounding\stranding), it is likely that all of these vessels are no longer in situ, however, they are detailed in the Table 5.2 below and illustrated on Drawing 69.01.03.

There also 6 listed buildings within 1km of the site which are also detailed in Table 5.2 and illustrated on Drawing 69.01.04.

Table 5.2 Details of Listed Buildings and Canmore Interests within 1km of the Development Site

Site/Description	Index No. Primary Reference	Designation /Status	Location (OS NGR)	Mapped Point
Commemorative Monument, Mallaig Harbor Memorial to Those Lost at Sea, on Steamer Pier, Mallaig Harbour	Canmore 333486	Historic Environment Record	NM 67633 97133	-
Harbour and Pier, Mallaig Harbour Mallaig Harbour completed 1901 by the West Highland Extension Rly. The original concrete steamer pier and fishing Harbour has recently been extended by sheet piling, with the formation of a second pier (1977). There are five fish-curing sheds of various dates, with the typical adjustable wooden roof ventilators.	Canmore 108367	Historic Environment Record	NM 67742 97150	-
Statue, Mallaig Harbour Fisherman, Child, and Anchor, on Steamer Pier, Mallaig Harbour	Canmore 333485	Historic Environment Record	NM 67852 97244	-
Beacon, Sgeir Dearg, Mallaig Harbour Period Unassigned	Canmore 293230	Historic Environment Record	NM 67766 97544	-
Canmore Maritime, Sgeir Dearg, Mallaig Harbour (Classified as steel steam drifter, in ballast; registration number cited as BF 1396, and date of loss cited as 4 October 1914). Wallflower: this vessel stranded on Red Rocks, Mallaig. Capt. Slater.	CAS 213154	Historic Environment Record	NM 67701 97500	1
Canmore Maritime, Sgeir Dearg, Mallaig Harbor (Classified as steam drifter: date of loss cited as 4 August 1931). Ocean Retriever II: this vessel was wrecked on beacon rock [Beacon Rock], [at the] entrance to Mallaig Harbour. Harbour reports remains of two boilers noted still present in last few years, partially visible on an extreme low tide.	CAS 293427	Historic Environment Record	NM 67701 97500	2

Site/Description	Index No. Primary Reference	Designation /Status	Location (OS NGR)	Mapped Point
Wreck, Sgeir Dearg, Mallaig Harbour (Classified as Pleasure [Fishing] [Vessel]: date of loss cited as 19 July 1978). Peggy: this vessel stranded on Sgeir Dhearg. Likely all gone Harbour reports this vessel was recovered & repaired in Mallaig Boatyard	WRK 293229	Historic Environment Record	NM 66796 97469	3
Wreck, Mallaig [Fishing] [Vessel]: date of loss cited as 20 April 1987). Heather Bloom, Harbour reports this vessel was raised & removed.	WRK 321832	Historic Environment al Record	NM 68128 97779	4
Annie's Brae, Roman Catholic Church of St Patrick In Davies Brae, two simple but dignified landmarks: Reginald Fairlie's St. Patrick's Church (RC), 1935, a functional, low-lying apsed hall typical of Fairlie's simpler Catholic churches which provide for the requirements of the liturgy with straightforward elegance and no fuss and J. G. Falconer's gothic apsed and buttressed St. Columba's Church of Scotland, perched on a crag above the road	Canmore 108388	Historic Environment al Record	NM 67508 96905	-
Mallaig Station Mallaig Station, 1901, possibly James Miller Terminus station building deviating from the standard chalet-style structures along this line in providing a domestic-looking street frontage combining dwelling above office, with access through to an island platform, now shorn of its canopy. In its earlier days, the track continued beyond the Station and over the inshore end of what is now the Steamer Pier, to the water's edge.	Canmore 108368	Historic Environment al Record	NM 67561 97054	-
1-4 Victoria Place Railway Buildings, Victoria Place, c.1901 Interesting group of social housing arranged in four blocks of four flats each, back-to-back across a drying green.	Canmore 108617	Historic Environment al Record	NM 67483 96894	-
5-8 Victoria Place Railway Buildings, Victoria Place, c.1901 Interesting group of social housing arranged in four blocks of four flats each, back-to-back across a drying green.	Canmore 252333	Historic Environment al Record	NM 67468 96873	-
9-12 Victoria Place Railway Buildings, Victoria Place, c.1901 Interesting group of social housing arranged in four blocks of four flats each, back-to-back across a drying green.	Canmore 252334	Historic Environment al Record	NM 67485 96865	-

Site/Description	Index No. Primary Reference	Designation /Status	Location (OS NGR)	Mapped Point
13-16 Victoria Place Railway Buildings, Victoria Place, c.1901 Interesting group of social housing arranged in four blocks of four flats each, back-to-back across a drying green.	Canmore 252335	Historic Environment al Record	NM 67500 96880	-

5.3 Landscape and Visual

Mallaig Harbour lies 1.5km South West of the Knoydart National Scenic Area (NSA) (Drawing 69.01.05). The Knoydart NSA encompasses an area of 39,500ha and is designated for being one of the last remote and wildest places within mainland Britain. The Knoydart NSA has some of the grandest coastal and mountain scenery on the west coast and is an example of previously glaciated landscape. The designation is also related to the experience and visual impact of the mountains at sea level and for dramatic and contrasting sea lochs in Loch Hourn and Loch Nevis. As the development is outside of these areas, low lying and in an already developed area, it is highly unlikely the works will compromise the integrity of the nearby NSA.

5.4 Land, Air and Water

5.4.1 Land

The underlying geology of the development is classed as raised marine beach deposits of a sand and gravel composite (British Geological Survey, 2020). The marine geology is recorded by Marine Scotland as a metasandstone and metamudstone (Marine Scotland, 2020). The area in relation to the development in the Outer Harbour has previously been dredged to the base rock with minimal sediment layer remaining within the Outer Harbour area.

Within the specific area of the Outer Harbour, there is little to no sediment layer, however, grab samples will be taken where possible to determine the status of the material.

5.4.2 Air

Mallaig Harbour is not within an air quality management zone. There is only one Air Quality Management Area in the whole of the Highland Council Area (Air Quality in Scotland, 2019) which is within Inverness city centre and covers a small area on a busy junction between three streets. No air quality data exists for the development area however, it is anticipated that air quality will be high based on the rural, coastal location.

5.4.3 Water

Mallaig Harbour is surrounded by three coastal water bodies; Loch Nevis (ID: 200098), the Sound of Sleat (ID: 200109) and Ardnamurchan to Southern Skye (ID: 200355), all of which are classified as overall 'good' status in the Scottish River Basin District (SEPA, 2020).

There are no bathing waters monitored by SEPA within the development footprint. The closest bathing waters to Mallaig is Ganavan Bay, near Oban, approximately 65km south of the harbour. There are no freshwater watercourses within the proposed development area.

5.5 People

The total population of Mallaig as of the 2011 census was 858 with the highest occurring age group between 30 and 60 years old (National Records of Scotland, 2011).

As of 2011, 442 residents were recorded as being in employment with the main sectors being transport and storage, wholesale and retail, agriculture, forestry and fishing and accommodation and food. It was estimated that the harbour supports approximately 200Full Time Equivalent (FTE) jobs within multiple business which operate from the harbour such as MOWI, CalMac and Ferguson Transport (Mallaig Harbour Authority, 2017; de Jong and Varley, 2018). This means that approximately half of Mallaig's workforce work in jobs related to the harbour. Of the employment related to the harbour, 65 of these are within the fishing industry and a further 44 within aquaculture (MHA, 2020).

The fishing industry continues to be one of the main sources of employment within Mallaig. It was recorded in 2014 that 6.8% of the people living in Mallaig were employed in fishing, farming and agriculture compared to 1.5% across Scotland (de Jong and Varley, 2018 & Office for National Statistics, 2014). There is a high level of membership to The Mallaig & North-West Fishermen's Association (MNWFA), one of the largest fisherman's trade associations in the UK. Members include those operating a range of boats from single operated creel boats to the large commercial white fish trawlers (Scottish Fishermen's Federation, 2020).

It is expected that there will be creels deployed in the vicinity of the Harbour by local fishermen however, as the works to be undertaken are entirely located within the existing Harbour basin and navigation channel where laying of creels is not permitted, no conflict with existing creels is anticipated. No fish farms were noted within the immediate area of Mallaig Harbour and the nearest, salmon farms operated by Scottish Sea Farms are located in Loch Nevis, approximately 6km, 8km and 10.5km away.

The ice plant, located on the ice quay, is utilised by a number of fishing vessels. Although vessels berth alongside the ice plant and load ice directly, there is the opportunity for ice to be decanted into insulated bins and transferred elsewhere on the Harbour to be loaded onto fishing vessels, and this will need to be managed throughout the construction period. The MOWI harvest station has an independent source of ice.

Mallaig is a popular tourist destination. Situated at the end of the Road to the Isles, it is a gateway to the Scottish Islands with ferry links to the Isle of Skye, South Uist and the Small Isles. CalMac saw an increase of 33,490 passengers between 2012 and 2016 (de Jong and Varley, 2018; CalMac, 2017). This increase is due to the increasing popularity of the Scottish Islands as holiday destinations (and the introduction of Road Equivalent Tariff). The Jacobite Steam Train made famous by the Harry Potter films and coined the 'Hogwarts Express' travels along the West Highland Line which terminates in Mallaig. Mallaig also hosts a food festival, 'Taste the Wild' which in its first year in 2016, was held on the harbour and involved 22 local producers and restaurants.

The town has a variety of local services including a small supermarket, a convenience store, two hotels, Bed & Breakfasts, self-catering accommodation and a variety of cafes, restaurants, pubs, and shops supporting the tourism industry (Mallaig Harbour Authority, 2020).

Within Scotland, 7.2% of employment is tourism related. An estimated 11.8% of the local population in Mallaig are employed within the accommodation and food services sector (de

Jong and Varley, 2018). In 2019, unemployment in the Lochaber area was estimated at 1.6% which is low when compared to a Scottish National Average of 3.2% (HIE, 2019).

Mallaig also has a primary and secondary school and a medical health centre which offers GP services and minor surgeries. For major medical requirements, the closest hospital is the Belford Hospital in Fort William, 42 miles by road.

5.6 Traffic, Transportation and Navigation

The development is situated within the harbour area and approximately 152m away from the nearest road. Road access to Mallaig is via the A830 from Fort William and which terminates in Mallaig. Annual average daily traffic estimates using two count points on the A830 over the previous 5 years are detailed in Table 5.6. One count point, 50729, is situated by Arienskill, by Lochailort, approximately 28.3km from Mallaig and the other, 30799, by Kinlocheil, approximately 50.7km from Mallaig.

Table 5.3: A830 Annual Average Daily Traffic Estimates

		Motorcycles	Cars and Taxis	Buses and Coaches	Light Goods	HGV	Total
Count point 30799	2015	584	1379	32	25	158	2018
	2016	586	1421	32	26	163	2168
	2017	559	1420	33	27	169	2209
	2018	525	1415	32	28	172	2233
	2019	486	1427	31	28	171	2241
	Average	**548**	**1412**	**32**	**27**	**167**	**2174**
Count point 50729	2015	293	989	34	34	72	1422
	2016	317	1018	35	35	74	1480
	2017	338	1018	36	35	77	1504
	2018	354	1014	35	37	78	1518
	2019	352	1023	33	37	78	1524
	Average	**331**	**1012**	**35**	**36**	**76**	**1490**

A number of incidents, approximately 40, have occurred along the A830 from Mallaig to Fort William, in the last five years. Most of these are classed as slight however, 3 serious incidents and a fatality have occurred within approximately 30km of Mallaig. A serious incident occurred on the 27th of June 2016 to the south of the town and involved 3 vehicles. Another serious incident occurred on the 27th of July 2019 and involved 1 vehicle near Arisaig. A further serious incident occurred on the 25th of August 2019 by Lochailort and involved 4 vehicles. The fatality occurred within 30km of Mallaig on the 27th of June 2015 and involved 1 vehicle.

As noted in Section 5.5: People, the town also has a rail connection with Fort William. In addition to The Jacobite Steam Train, which is mainly a tourist attraction, Scotrail provide services daily between Mallaig and Fort William. Additional services also run from Mallaig to Glasgow and the central belt.

CalMac operates a ferry service to the Inner and Outer Hebrides and Small Isles. The ferry also transports cargo to the Islands and is part of the lifeline services for the islands.

The marina within Mallaig Harbour serves as a stopover for sail boats and pleasure crafts. Mallaig is often used as a base from which sailboats can explore the nearby islands.

6 Potential Effects

6.1 Construction

Table 6.1 provides a description of the environmental aspects requiring consideration resulting from the construction of the proposed Mallaig Outer Harbour Splay Berth. It outlines the sensitivities as detailed in Section 6, identifies any likely significant effects, and proposes mitigation measures, if required, for negative effects on the environment.

Table 6.1: Construction Effects and Sensitivities

Aspect		Source	Sensitivities	Likely Significant Effect (excluding mitigation)	Any mitigation measures?
Use of Natural Resources	Use of Material (e.g., steel)	Rock for rock armour. Infill materials for land reclamation, in addition to dredge material. Steel for tubular piles. Concrete for quay deck and beam. Concrete or asphalt for surfacing.	None	NO	Efficient use of resources and re-use of materials including rock armour. Appropriate design for long life in marine environment including corrosion protection of steel elements.
	Use of Land and/or Soil	Dredge spoil from deepening of harbour.	None	NO	The volumes of material dredged will be minimised through design and re-used as infill.
Employment	Job Creation	The construction project will create direct and indirect employment associated with the development.	People - Economy	YES - Positive	Encourage local supply chain involvement.
Residues and Emissions	In-Air Noise	Infilling works in reclamation area. Removal of rock armour. Rock armour placement. Piling. Dredging. Blasting.	People - Community of Mallaig	NO - Development will be within the north west corner of the harbour with approximately 152m to the nearest road and 180m to the nearest residential property. The area is already a working harbour and ferry port and will be subject to noise throughout the day. Vessel movements and operations are also ongoing through the night.	All works, except dredging (not blasting), will be within the set working hours.

Aspect		Source	Sensitivities	Likely Significant Effect (excluding mitigation)	Any mitigation measures?
	Vibration	Blasting	Harbour Infrastructure	NO – Blast vibration studies are being undertaken to allow the blast to be designed such that existing quays and structures thereon will not be structurally impacted.	Appropriate blast plan developed and adhered to.
	Underwater Noise	Plant and vessel movements. Rock infill/material placement. Vibro and impact pilling. Dredging. Blasting.	Biodiversity - Marine Mammals. Basking Sharks Biodiversity - Inner Hebrides and Minches SAC.	YES – Negative, primarily due to pilling and blasting as the noisiest activities.	All plant/vessels used will be well maintained. Rock infill and material placement will occur within the harbour basin with the Outer Harbour wall acting as noise a barrier. Any rock removal by blasting will be withing the confines of the outer harbour basin. The basin entrance faces due east across a 120m wide channel between it and the shore, limiting the propagation of noise to open water beyond the harbour entrance channel. The majority of the dredging activity to remove deposits above rockhead level will also be contained within the confines of the outer harbour basin, with a similar limitation on noise propagation to areas beyond the harbour. An EPS licence will be in place with the appropriate mitigation measures including a Marine Mammal Observation protocol for loud activities (blasting and piling) determined by results of an underwater noise assessment.

Aspect		Source	Sensitivities	Likely Significant Effect (excluding mitigation)	Any mitigation measures?
	Air Quality (Emissions - dust)	Rock infill. Material placement. Plant and vehicle movements.	People - Harbour users and facilities.	NO – the nearest industrial receptor is approximately 45m from the development area. Other sensitive dust receptors including residential properties are too far from the development.	Dust management in line with good construction practice. This includes limiting stockpiles of materials and localised dampening and road sweeping, if required.
	Air Quality (Greenhouse Gases and Climate Change)	Plant and vehicle movements. Material imports.	Possible climate change contribution.	NO	Plant and vehicles will be well maintained. Re-use of materials to limit the amount of bulk material being imported to site. Road transport to be minimised where practicable.
	Water Quality (Marine – Pollution)	Risk of unplanned emissions / release of pollutants from, i.e. • Waste material • Oil/fuel storage and handling • Plant/machinery fault	Water Quality. Biodiversity – Marine. Biodiversity – Inner Hebrides and Minches SAC.	NO	Works conducted in line with standard best practice and existing guidelines: • Storage and handling; • Waste management; • Surface water management; and • Pollution prevention plan and spill management plan in place during construction. Plant and machinery will be appropriately maintained.
	Water and Seabed Quality	Increased sediment in the water column associated with blasting dredging and dredge disposal.	Biodiversity – Marine Mammals Biodiversity – Inner	NO	Dredge limited in depth, minimising volume, and duration of dredge. Disposal route will be identified through the dredge licensing BPEO assessments processes. Reuse of

Aspect		Source	Sensitivities	Likely Significant Effect (excluding mitigation)	Any mitigation measures?
			Hebrides and Minches SAC (Harbour Porpoise)		dredge spoil in construction works as far as practicable.
	Water and Seabed Quality	Dredge disposal, especially of larger particle sizes causing physical damage as the fall through the water column.	Biodiversity – Marine Mammals Basking Shark Biodiversity – Inner Hebrides and Minches SAC (Harbour Porpoise)	YES - Negative	EPS licence detailing mitigation measures to prevent physical injury to marine mammals and basking shark during any dredge disposal.
	Light Emissions	Light for construction.	Visual impact. Biodiversity – Marine, Terrestrial and Ornithology.	NO - Works will be carried out in an already lit area with navigation lights in use and street lighting throughout hours of darkness with construction lighting only added where required.	Works will also be carried out in accordance with best practice and in line with guidance notes, Scottish Executive Guidance Note, 'Controlling light pollution and reducing lighting energy consumption' and the 'Safety in Ports (SIP) 009 – Guidance on Lighting.' Measures include: • Over-lighting will be avoided and designed to industry recommended levels; • All lights will be carefully directed to where they are most needed and will be designed to minimise light pollution; and

Aspect		Source	Sensitivities	Likely Significant Effect (excluding mitigation)	Any mitigation measures?
					• Construction lighting will be switched off when not required and all works will be carried out during the set working hours.
Traffic, Transport, Access, and Navigation	Traffic and Transport	Vehicle movements along the A830 delivering construction materials.	Traffic. Transport.	NO	The reuse of dredge material reduces the requirement to deliver construction materials. Some materials may be delivered by sea. Traffic Management will be considered within the Construction Environmental Management Document (CEMD).
	Navigation	Construction works, including dredge and disposal, and vessel and plant movements. Impacts on berth availability (ice plant and outer breakwater quay). Additional navigational hazards within the Outer Harbour.	Berth users (Fishing boats & Aquaculture vessels).	YES – Negative	Minimise time berths are unavailable. Effort to be made when bad weather is predicted i.e., storms to make berths available. Good communication with harbour users including appropriate Notice to Mariners posted. Input from the Harbour Master pre and during construction works. Harbour Master retains control of safety during works, coordinating movements as required. Harbour will arrange Ice deliveries to alternative location within harbour for vessels requiring ice unable to utilise the ice quay due to construction works.

There were three potentially significant effects arising from the construction stage of the project as identified in Table 6.1. One of these has been identified as positive however, the remaining three will require mitigation and are discussed below.

6.1.1 Underwater Noise

Blasting of rock and piling works will be undertaken giving rise to underwater noise. These activities will be carried out within the Outer harbour basin where the existing quay wall will act as a barrier to underwater noise, and the alignment of the basin entrance towards shore will mean that noise levels reduce rapidly within a localised area. Underwater noise can have an adverse impact on basking sharks, otters and marine mammals including the features of the Inner Minches and Hebrides SAC.

An underwater noise assessment is planned, and modelling will be completed to understand the scale of the effects and to inform mitigation requirements as detailed in Section 7.

6.1.2 Water and Seabed Quality (Marine)

Blasting, dredging and dredge reuse/disposal will give rise to increased sediment in the water column. The area to be dredged is largely made up of bed rock and sands with siltier material at the entrance of the harbour. Sedimentation will be highest in this area; however, this will be localised. The dredge is limited in depth and will therefore minimise the volume and duration of dredging.

A BPEO assessment required for the dredge licence will identify the reuse/disposal route. The bulk of the dredge material will be used as infill in the reclamation area, however, some leftover material may require disposal.

Dredge disposal would give rise to localised sedimentation and smothering effects at the dredge disposal site. The closest dredge disposal site at Armadale (HE070) will be considered within the BPEO assessment. The disposal site is situated within the Inner Hebrides and Minches SAC, designated for harbour porpoise. Other marine mammals and basking sharks could also be encountered in this area.

Disposal of materials could result in physical injury to marine mammals and basking sharks. This will be considered within the EPS licence application and mitigation measures may include the implementation of a Marine Mammal and Basking Shark protocol where observations are carried out prior to disposal at sea.

6.1.3 Navigation

During construction, there will likely be impacts on berth availability at the ice quay and outer breakwater quay. It is possible that there will also be additional navigational hazards during works, i.e., during dredging and piling works where a piling rig and dredger will be in the area. In addition, vessels may be unable to access the ice plant during construction hours. MOWI well boats utilise a berth on the Outer Breakwater Quay during the night for transfer of salmon to their Harvest Station, and the works will require to be arranged such that this arrangement can continue. Dredging which may be carried out through the night and access for fishing boats and other vessels during the day will need to be managed by Contract conditions setting out limitations on working areas and requiring close cooperation between the Contractor and the Harbour Master.

6.2 Operations

Table 6.2 provides a description of the environmental aspects arising during operations of the Mallaig Harbour Outer Splay Berth. It outlines sensitivities as per Section 5, identifies likely significant effects and proposes mitigation measures for negative effects, if required, on the environment.

Table 6.2: Operational Effects and Sensitivities

Aspect		Source	Sensitivities	Likely Significant Effect (excluding mitigation)	Any mitigation measures?
Residues and Emissions	In-Air Noise and Vibration	A slight increase in noise may result from increased vessel movements within the harbour.	People.	NO	No mitigation required. Sensitive noise receptors including residential properties are too far from the development to experience noticeable increases in noise levels.
	Water Quality (Marine – Pollution)	Risk of unplanned emissions / release of pollutants from quayside operations.	Water Quality.	NO	Harbour operations conducted in line with best practice and existing guidelines: • Storage and handling; • Waste management; and • Port's spill procedures.
	Light Emissions	Port lighting.	People. Biodiversity – Ornithology.	YES - Negative	A lighting assessment will be carried out in accordance with the Scottish Executive Guidance Note, 'Controlling light pollution and reducing lighting energy consumption' and the 'Safety in Ports (SIP) 009 – Guidance on Lighting' note. Note this includes the need to consider environmentally sensitive and designated sites hence ornithological considerations will be included within the lighting design. Lighting assessment will inform the design and include mitigation measures. These may include directional lighting, low level lighting, etc.

Aspect		Source	Sensitivities	Likely Significant Effect (excluding mitigation)	Any mitigation measures?
	Underwater Noise	Increased number of fishing or other vessels in area.	Biodiversity – Marine Mammals.	NO	Already a working port, berthing capacity increase not large enough to significantly change vessel numbers.
Employment	Job Creation	Operational jobs – increased space for fishing and aquaculture industries, potential to increase activity in area and associated jobs	People - Economy	YES - Positive	Encourage local supply chain involvement.
Landscape and Visual	Landscape and Visual	Development of Outer Harbour Splay Berth.	Landscape - Knoydart National Scenic Area.	NO	Low lying project, inside an area already developed.

There were two likely significant effects arising from the operational stage of the project as identified in Table 6.2. These include one positive impact being the benefit of more job opportunities and one negative resulting in increased light emissions which is discussed further below.

6.2.1 Light Emissions

Lighting installed for the operational phase of the development may have a negative impact on the local population of Manx shearwaters (*Puffinus puffinus*). Manx shearwaters are known to fly towards the lights of Mallaig whilst departing their nesting sites on the Isle of Rum and starting their migration south, stranding themselves in and around the town. This occurs particularly during strong westerly winds and low moonlight. Increased light levels could exacerbate this and hence sympathetic lighting design is required.

7 Mitigation

Mitigation identified to avoid significant negative effects along with general mitigation measures to minimise other environmental effects are detailed within this section. These will form the basis of the mitigation which will be submitted in support of the marine licence applications.

7.1 Pre-Construction Requirements

7.1.1 Underwater Noise and Vibration (Marine Mammals)

It is recognised that a Marine Mammal EPS licence will be required due to disturbance caused by construction activities. An underwater noise assessment including modelling of blasting will be carried out and will form the basis for the mitigation measures required. These will be detailed in the EPS application and are likely to include the implementation of a Marine Mammal and Basking Shark Protocol which will involve carrying out observations to ensure no marine mammals or basking sharks are in the area prior to blasting to avoid physical harm and prior to piling to minimise disturbance effects and physical harm from underwater noise. The underwater noise assessment will also be considered and submitted as part of the marine licence applications.

7.1.2 Water and Seabed Quality

Grab samples will be taken in alignment with Marine Scotland's Pre-disposal Sampling Guidance, the results for which will be utilised in the BPEO assessment to identify the most appropriate use/disposal route for dredged material.

If appropriate dredge spoil will be reused in the construction as far as practicable. Disposal of excess dredge material at the disposal ground if appropriate, will consider physical injury of marine mammals and the implementation of Marine Mammal and Basking Shark Protocol as mitigation in the Marine Mammal EPS licence application.

7.1.3 Light Emissions

A lighting assessment will be carried out and will be used to inform the design. The assessment will be carried out using the Safety in Ports (SIP) 009 – Guidance on Lighting and the guidance note Controlling light pollution and reducing lighting energy consumption (Scottish Executive, 2007). The assessment will identify ways in which impacts on Manx shearwater can be reduced and may include mitigation measures such as directional, beam focused and low Kelvin level,

a measure of the colour temperature of light, as far as practicable. A lower Kelvin towards the red end of the visible light spectrum is less attractive to Manx shearwaters and will be considered for use if practicable. Extra measures may be appropriate during the key period between late August and early October when birds are fledging and are more susceptible to grounding. Ecological lighting mitigation will need to be balanced with Health and Safety and operational requirements of the port, hence ecological mitigation measures will be implemented where practicable and safe to do so.

7.1.4 Traffic and Transport

Traffic Management will be considered with a Traffic Management Plan forming part of the CEMD. This will take account of sensitive receptors which may include taking tourist or ferry traffic etc. into account. Mitigation measures can include timing deliveries to avoid the busiest times.

7.1.5 Navigation

Prior to construction commencing, good communication with the Harbour Master will be required and appropriate Notice to Mariners will be posted.

Input from the Harbour Master will be sought with regard to the planning and programming of construction works to ensure navigational risks are minimised. Management and planning of works will be required to allow for berth accessibility. Plans will also take account of the ferry timetable.

7.1.6 General Mitigation

The detailed design process will take account of the environmental sensitivities identified in Section 5. Where potential effects arise from construction works, appropriate mitigation will be identified and detailed within the CEMD. Risk Assessment Method Statements will be in place for all construction tasks. These will include any environmental precautions and mitigation measures as highlighted within the CEMD. Mitigation measures will be in alignment with construction guidance as noted in Section 7.2.5.

7.2 Construction Mitigation

7.2.1 Underwater Noise and Vibration (Marine Mammals)

Mitigation measures developed as detailed in Section 7.1.1 will be implemented, to ensure physical harm and disturbance of marine mammals is avoided as far as practicable.

7.2.2 Water and Seabed Quality

Works will be undertaken in line with the conditions stated on the dredge licence and will follow the disposal route identified from the BPEO assessment. Disposal at the disposal site will be undertaken in line with the appropriate mitigation identified within the Marine Mammal EPS licence. This is likely to include undertaking marine mammal monitoring prior to disposal to prevent injury during dumping.

7.2.3 Light Emissions

Construction works will be carried out following the Scottish Executive Guidance Note, 'Controlling light pollution and reducing lighting energy consumption' and the 'Safety in Ports (SIP) 009 – Guidance on Lighting. This includes avoiding over lighting and carefully directing

light to areas where it is most needed, minimising light pollution where possible. Any additional construction lighting will be switched off when not required.

Construction of the lighting infrastructure will be installed as per design of which will have been informed by the lighting assessment and the appropriate guidance.

7.2.4 Traffic and Transport

The traffic management mitigation measures considered in the CEMD will be implemented and adhered to. Good communication will be maintained with the local community and notice provided of works commencing and any potential additional traffic on the roads.

7.2.5 Navigation

Good communication with the Harbour Master will be maintained with Appropriate Notice to Mariners posted during the works. The Harbour Master will retain control of navigation within the Harbour during the works, coordinating vessel movements as required.

Works will be arranged to minimise the amount of time berths are unavailable, and efforts will be made when bad weather is predicted, i.e., storms, to make berths available.

Works will also minimise the amount of time access to the ice plant will be restricted and ice deliveries will be made to alternative berths for vessels when required.

7.2.6 General Mitigation

In addition to the specific mitigation identified to manage effects that could be significant in the absence of mitigation, construction guidance will be followed to minimise other potential negative effects of the projects, this is likely to include:

- Guidance on the Assessment of Dust from Demolition and Construction (IAQM, 2014);
- Guidance for Pollution Prevention 1 (GPP1): Understanding your environmental responsibilities – good environmental practices. (NRW, NIEA & SEPA, 2020);
- Guidance for Pollution Prevention 5 (GPP5) – Works and maintenance in or near water (NIEA, 2018);
- Pollution Prevention Guidance 6 (PPG6) – Working at construction and demolition sites (Environmental Agency et al., 2012);
- Pollution Prevention Guidance 7 (PPG7) – The safe operation of refuelling facilities (Environment and Heritage Service, SEPA, & Environment Agency, 2011);
- Guidance for Pollution Prevention 8 (GPP8) – Safe Storage and Disposal of Used Oils (SEPA, Natrual Resources Wales, & NIEA, 2017);
- Coastal and Marine Environmental Site Guide: C584 (Budd, John, Simm, & Wilkinson, 2003); and,
- Guidance Note: Controlling Light Pollution and Reducing Lightning Energy Consumption (Scottish Executive, 2007).

8 Summary

Mallaig Harbour Authority wish to develop a Splay Berth Quay and deepen the area of the Outer Harbour in order to provide an increase in berthing space and quayside operating space. The deepening of the harbour will allow larger draughted boats to have access to the Outer Harbour without tidal restriction.

The project falls under the Marine (Scotland) Act 2010. Screening opinions are sought from Marine Scotland with regards to the Mallaig Outer Harbour Improvements Splay Berth and Deepening development under Regulation 10(1) of the Marine Works (EIA) (Scotland) Regulations 2017.

Potentially significant effects were identified without mitigation. However, mitigation measures have been identified for these aspects which reduce the resultant effects such that they are unlikely to be significant.

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10 Glossary

Acronym	Definition
CalMac	Caledonian MacBrayne
CD	Chart Datum
CEMD	Construction Environmental Management Document
EIA	Environmental Impact Assessment
EPS	European Protected Species
FTE	Full Time Employment
HES	Historic Environment Scotland
HIE	Highlands and Islands Enterprise
km	kilometres
m	metres
MHA	Mallaig Harbour Authority
MHWS	Mean High Water Spring
MLWS	Mean Low Water Spring
MNWFA	The Mallaig North West Fishermen's Association
MPA	Marine Protected Area
MS	Marine Scotland
NBN	National Biodiversity Network
NGR	National Grid Reference
NSA	National Scenic Areas
SAC	Special Areas of Conservation
SEPA	Scottish Environment Protection Agency
SLA	Special Landscape Areas
SPA	Special Protection Area
SSSI	Sites of Special Scientific Interest
THC	The Highland Council

Appendix 2 – Screening Opinion: Marine Scotland

marinescotland

Scottish Government
Riaghaltas na h-Alba
gov.scot

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E: ms.marinelicensing@gov.scot

Kirsty Macdonald
Affric Limited
Lochview Office
Loch Duntelchaig
Farr
IV2 6AW

Date: 08 July 2021

Dear Ms. Macdonald,

SCREENING OPINION UNDER THE MARINE WORKS (ENVIRONMENTAL IMPACT ASSESSMENT) (SCOTLAND) REGULATIONS 2017 (AS AMENDED)

Thank you for your screening opinion request dated 6 May 2021 in regards to the proposed works at Mallaig Harbour, including the construction of a new berth and rock armour revetments, dredging, deposit of dredge material and land reclamation ("the Proposed Works").

The Scottish Ministers consider the Proposed Works to fall under paragraph 14 of schedule 2 of The Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (as amended) ("the 2017 MW Regulations"), with the Proposed Works meeting the corresponding threshold described in column 2 of schedule 2. Consequently, the Scottish Ministers are obliged to adopt a screening opinion as to whether the Proposed Works are, or are not, an Environmental Impact Assessment ("EIA") project under the 2017 MW Regulations.

Under regulation 10(5) of the 2017 MW Regulations, the Scottish Ministers have consulted with NatureScot (formerly Scottish Natural Heritage), the Scottish Environment Protection Agency ("SEPA"), The Highland Council and Historic Environment Scotland ("HES") as to their view on whether the Proposed Works are an EIA project. The Highland Council has been unable to provide a consultation response. Copies of the consultation responses received are attached for your review (at Appendix I).

When making a determination as to whether schedule 2 works are an EIA project, the Scottish Ministers must take into account such of the selection criteria set out in schedule 3 of the 2017 MW Regulations as are relevant to the Proposed Works. In this regard, the Scottish Ministers have considered the following:

Characteristics of the works

The Proposed Works include the construction of a new splay berth within the Outer Harbour to provide approximately 60 metres ("m") of additional berthing space and laydown space of over 4,000 square metres in the area identified as the "The slot" in Figure 1 below. In addition, the Proposed Works will involve the deepening of the Outer Harbour basin from its current depth of -4m chart datum ("CD") to -6m CD and the removal of existing revetment.

Figure 1 The Layout of the Outer Harbour, Mallaig

A concrete toe beam will be constructed on the seabed between the 'Outer Breakwater Quay' and the 'Ice Quay' (shown in Figure 1) to support a new rock armour revetment. The slot will be reclaimed by infilling the area with compacted suitable dredge material (sand, gravel and rock), supplemented where necessary with imported infill material and the outer face will be trimmed by an excavator to produce a sloping revetment. Between 60 and 65 piles ranging between 600 millimetres ("mm") to 700 mm in diameter will be installed through a mixture of placement within sockets, vibro installation and percussive piling. The percussive piling will occur for short periods estimated at between 5 to 15 minutes per pile. In addition, where required, within some piles grouted steel anchors or toe pins will be drilled into rock. Rock armouring will be placed to cover the outer face of the reclaimed area, reusing the existing armour previously removed and supplemented with additional import if necessary before the concrete deck slab is lifted into place.

The deepening of the Outer Harbour basin will involve dredging 85% of the basin footprint together with the entrance to the Outer Harbour which will amount to approximately 64,000 wet tonnes of dredge material. Approximately 37,000 wet tonnes of the dredge material will comprise of sand and existing rock fragments, with the remaining 27,000 wet tonnes to be generated from drilling and blasting the bedrock in situ. The drilling and blasting works are likely to be carried out from floating or jack up plant, however in and around where the toe

beam is to be constructed, the blasting may be carried out from a temporary bund of dredge or rock fill material, this will be removed following the completion of blasting. The bulk of the dredge material is proposed to be used as infill for the reclamation works and the excess will potentially be deposited at the nearest dredge deposit site.

Location of the works

The site is located within Mallaig Harbour, 180m away from the Inner Hebrides and Minches Special Area of Conservation ("SAC") which is designated for harbour porpoise (*Phocoena phocoena*) and 10.5 kilometres ("km") away from the Sea of Hebrides Marine Protected Area which is in part designated for basking shark (*Cetorhinus maximus*) and minke whale (*Balaenoptera acutorostrata*). These features have the potential to be affected by noise from the Proposed Works, in particular from the piling and blasting works.

The rock removal by blasting and drilling will however all be carried out within the confines of the Outer Harbour basin, with the existing Outer Breakwater Quay (as shown in Figure 1 above) acting as a noise barrier. In addition, the basin entrance of the Outer Harbour faces due east across a 120m wide channel between it and the shore, therefore limiting the propagation of noise to open water beyond the harbour entrance channel.

The applicant has identified that blasting, dredging and dredge reuse/disposal can give rise to increased sediment in the water column and have a likely significant effect on the water and seabed quality. As a long running working harbour however it is unlikely to provide high quality habitat for benthic ecology or provide spawning or nursery grounds for fish. In addition, there are also no major rivers within the Mallaig Harbour area and therefore it is unlikely any migratory fish species will be affected. Whilst some of the dredge material is anticipated to be reused as infill for the reclamation works, it is proposed that the remainder will go to the Armadale dredge deposit site. Sampling and analysis of the proposed dredge material will be carried out prior to the submission of the marine licence applications to assess if the material is suitable for deposit at the Armadale site. If the material is considered suitable it is anticipated that it will disperse through natural processes. Consequently, it is considered unlikely that the proposed dredging and deposit activities will result in any adverse impacts on the water quality.

It is noted that the Armadale site is located in the Inner Hebrides and Minches SAC. The applicant has identified that the deposit of dredge material at the site could give rise to injury to marine mammals and potentially basking sharks. It is proposed by the applicant however that this can be mitigated against as part of a Marine Mammal and Basking Shark protocol.

NatureScot ("NS") advised that the Proposed Works would not have a significant effect on the environment and it did not consider the works to be an EIA project. NS agreed with the screening report conclusions and considered that the main impacts of the Proposed Works could be addressed through targeted and detailed reports as part of the final application.

Historic Environment Scotland ("HES") advised that significant effects on the marine historic environment are unlikely. HES noted that the Outer Harbour was constructed relatively recently (between 1996 and 1998) and was dredged to -4m CD and therefore any surviving marine historic environment assets within the area of the Proposed Works were likely to have already been removed.

In addition SEPA have stated that they considered that the Proposed Works do not constitute an EIA project.

Finally, the applicant has identified that there may be additional navigational hazards as a result of the Proposed Works however proposes that these can be mitigated through appropriate Notice to Mariners being posted, planning works around the ferry timetable and the contractor being in close communication with the Harbour Master.

Characteristics of the potential impact

The Scottish Ministers are content that the potential impacts associated with the location of the Proposed Works can be effectively addressed through the embedded design of the Proposed Works and further mitigated through the HRA process and the implementation of a Marine Mammal Mitigation Plan ("MMMP") to avoid any significant adverse effects on the environment. The Scottish Ministers advise that the MMMP must be submitted alongside the marine licence applications together with the underwater noise assessment, including modelling, which is to be completed to inform the specific mitigation measures in the MMMP. The Scottish Ministers further advise that the MMMP must include consideration of the potential impacts on basking sharks as identified above.

Conclusion

In view of the findings above, the Scottish Ministers are of the opinion that the Proposed Works are not an EIA project under the 2017 MW Regulations and, therefore, an EIA is not required to be carried out in respect of the Proposed Works.

If you increase, alter or extend the Proposed Works, you are advised to contact Marine Scotland - Licensing Operations Team again to confirm if the screening opinion is still valid.

A copy of the screening opinion has been forwarded to The Highland Council planning department. The screening opinion has also been made publicly available through the Marine Scotland Information website: http://marine.gov.scot/ml/screening-splay-berth-deepening-mallaig-harbour.

If you require any further assistance or advice on this matter, please do not hesitate to contact me.

Yours sincerely,

Thomas Inglis
Marine Scotland - Licensing Operations Team

Annex One

1.1 SEPA Response

OFFICIAL – BUSINESS

Dear Kate

THE MARINE WORKS (ENVIRONMENTAL IMPACT ASSESSMENT) (SCOTLAND) REGULATIONS 2017 (AS AMENDED) ("the EIA Regulations")
CONSULTATION UNDER PART 2, REGULATION 10(5) OF THE EIA REGULATIONS
Mallaig Harbour Authority - Splay Berth Deepening - Mallaig Harbour

Thank you for consulting SEPA on the above proposal. We can confirm that in relation to the aspects of the environment on which we usually provide advice to you we consider that EIA is not required. Please see our standing advice - lups-gu13.pdf (sepa.org.uk) – for further advice and guidance.

Kind regards

Susan Haslam
Senior Planning Officer
SEPA Planning Service – planning.north@sepa.org.uk

1.2 NatureScot Response

Dear Kate, thank you for consulting us requesting our screening opinion .
It is our opinion that the proposal will not have a significant effect on the environment and therefore we do not consider that this is an EIA project.
We agree with the screening report conclusions, as to what the main impacts are and we consider that these can be addressed through targeted and detailed reports as part of the final application.
Regards
Corrina
I am working from home. You can contact me by email or on my work number above between 8.00am and 4.30pm.
Corrina Mertens | Area Officer, South Highland

NatureScot | Scottish Natural Heritage | Torlundy | Fort William | Inverness-shire | PH33 6SW| **t:**01463701644 [redacted]
nature.scot | @nature_scot | *Scotland's Nature Agency* | *Buidheann Nàdair na h-Alba*

1.3 HES Response

HISTORIC ENVIRONMENT SCOTLAND | ÀRAINNEACHD EACHDRAIDHEIL ALBA

By email to:
MS.MarineLicensing@gov.scot

Marine Scotland
Marine Laboratory
375 Victoria Road
Aberdeen
AB11 9DB

Longmore House
Salisbury Place
Edinburgh
EH9 1SH

Enquiry Line: 0131-668-8716
HMConsultations@hes.scot

Our case ID: 300051447

08 June 2021

Dear Marine Scotland

The Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017
Mallaig Harbour Authority - Splay Berth Deepening - Mallaig Harbour
Request for Screening Opinion

Thank you for your consultation which we received on 19 May 2021 seeking our comments on an Environmental Impact Assessment (EIA) screening opinion for the above proposed development. This letter contains our comments for our historic environment interests. That is World Heritage Sites, scheduled monuments and their setting, category A-listed buildings and their setting, gardens and designed landscapes and battlefields on their respective Inventories and Historic Marine Protected Areas (HMPAs). In this case our advice also includes matters relating to marine archaeology outwith the scope of the terrestrial planning system.

The relevant local authority's archaeological and conservation advisors may also be able to offer advice for their interests. This may include unscheduled archaeology, category B- and C-listed buildings and conservation areas.

Our Screening opinion
We are content that an EIA is not required for this proposed development for matters within our historic environment remit as identified above.

Our advice
We note that the outer harbour basin where the proposed works are located was constructed relatively recently in 1996-98 and that the area was dredged down to -4m CD with an allowance for future increase to -6m CD at that time. It is likely that any surviving marine historic environment assets within the proposed area for the development would have been removed during the construction works at that time. We are therefore content that significant effects on the marine historic environment are unlikely.

We are content that there are no terrestrial assets within our remit which would be likely to experience any significant effects to their setting.

HISTORIC ENVIRONMENT SCOTLAND | ÀRAINNEACHD EACHDRAIDHEIL ALBA

We are therefore content that further detailed environmental assessment is not required for our historic environment remit.

We hope this is helpful. Please contact us if you have any questions about this response. The officer managing this case is Victoria Clements who can be contacted by phone on 0131 668 8730 or by email on Victoria.Clements@hes.scot.

Yours faithfully

Historic Environment Scotland

Historic Environment Scotland – Longmore House, Salisbury Place, Edinburgh, EH9 1SH
Scottish Charity No. **SC045925**
VAT No. **GB 221 8680 15**

Appendix 3 – Habitats Regulations Assessment

Mallaig Outer Harbour Improvements

Habitat Regulations Appraisal

Date: 02/11/2021

Document Number: 69/REP/03

MALLAIG HARBOUR AUTHORITY

Affric making it happen

Document Control

	Name	Title	Signature	Date
Author	Kirsty Macdonald	Senior Environmental Consultant	[redacted]	21/10/2021
Reviewer	Jack Clarkson	Senior Environmental Consultant		21/10/2021
Authoriser	Innes Beaton	Operations Director		02/11/2021

Effective Date:	**02/11/2021**

Revision No:	Signature	Comments	Date
1A	[redacted]	For internal review	29/10/2021
1B		For client review	02/11/2021
1		For issue	02/11/2021

MALLAIG HARBOUR AUTHORITY

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Contents

1 Introduction

In support of the Marine Licence application for the proposed Mallaig Outer Harbour Improvements (MOHI) development, this Habitats Regulations Appraisal (HRA) provides information required for the competent authority to carry out an HRA, and, where required, an Appropriate Assessment (AA).

This report is designed to be read in conjunction with the MOHI Supporting Document (Affric, 2021) and directs the reader to the section of the Supporting Document which are relevant to the designated site or qualifying features being discussed.

1.1 Legislative Basis

A HRA is required for this development due to its proximity to multiple Natura 2000 sites. These include Special Areas of Conservation (SACs) and Special Protection Areas (SPAs). The legislative context for this requirement is based on Article 6(3) of the Habitats Directive (92/43/EEC), Article 4(4) of the Birds Directive (2009/147/EC) and is implemented in Scotland through The Conservation (Natural Habitats, &c Regulations 1994 (as amended) (the Habitats Regulations).

In Scotland, the Scottish Planning Policy document ensures that Ramsar sites, which are normally included in an HRA assessment, overlap with Natura sites, and are therefore protected under the same legislation. Therefore, Ramsar sites do not need considered separately as part of this HRA Screening report.

If a likely significant effect (LSE) is predicted on a Natura Site at the first stage of the HRA, then an AA must then be carried out. The AA must demonstrate that the proposal will not adversely affect the integrity of the site (NatureScot, 2021a).

It is the responsibility of the competent authority to carry out the HRA based on robust, scientific information provided by the project developer about the proposed project. It is not the role of the developer to make an assessment on whether the proposal will have an adverse effect on any associated Natura sites.

1.2 Terminology

The terminology employed as part of the HRA process relates to LSEs. The use of the word 'significant' relates to potential ecological connectivity. Assessment of LSEs take a precautionary approach and ask whether a project may have an effect, or have the possibility of having an effect, on a Natura site (NatureScot, 2021b). A project component is said to have an LSE on a designated site if, there is ecological connectivity with the site's qualifying interests or there is the potential for the conservation objectives of the designated site to be undermined. Where an LSE "*cannot be excluded, on the basis of objective information*" (European Court of Justice C-127/02, 2004) an AA is required. The conservation objectives of the site provide the framework for considering the potential for LSEs.

1.3 Objectives

The objectives of this HRA report are to summarise:

- The proposed development details;
- The Natura 2000 sites considered, with reference to the MOHI development, along with these sites' qualifying interests and conservation objectives; and,
- Details on the qualifying interests for each of the scoped-in Natura sites.

This information will aid the competent authority in carrying out an HRA. This HRA Pre-Screening Report provides a reference as to where the relevant information required to complete the HRA is located within the supporting document, and as such should be read in conjunction with it and not as a stand-alone document. An indication of whether LSEs are expected is given for each designated site, but it is up to the competent authority carrying out the HRA to ascertain whether LSEs are present, and therefore whether an AA is needed for each designated site.

2 Project Summary

Mallaig Harbour Authority (MHA) are proposing to construct a new splay berth and deepen the waters within the Outer Harbour area of Mallaig Harbour. Mallaig is a port situated on the west coast of Scotland in the region of Lochaber. The harbour (National Grid Reference: NM 67585 97217) is currently a working fishing and ferry port with ferries to the Inner and Outer Hebrides, the Small Isles, and the Knoydart Peninsula.

The development, including the deepening, will cover a total area of 33,000m^2 and will provide additional berthing space, operational quayside, and laydown space, primarily for the fishing and aquaculture sectors with some additional berthing along the steamer pier for a ferry. The harbour improvements will accommodate an increased number of vessels and the dredge will allow for deeper draughted vessels, including well boats, to enter the Outer Harbour in all tidal states. Construction activities will include blasting to mobilise bedrock to enable dredging to be carried out, infill works using dredged material, and the installation of tubular steel piles to support a suspended deck. Construction activities may also include the disposal of dredged material at the Armadale disposal site, HE070, located off the village of Armadale in the southeast of the Isle of Skye.

Further details on the project description as well as each individual element of the proposed project can be found in the Section 4: Project Description of the Supporting Document.

3 Designated Sites

The designated sites and their qualifying interests relevant to the development are shown in Table 3.1. The sites specifically considered and included within Table 3.1 are those within 20km of the development (irrespective of qualifying interest). Sites designated for mobile, marine species which are within the typical home ranges of the designated species were also included.

The sites, or species within the sites, are scoped in or out depending on the level of ecological connectivity to the proposed works. A reduced list of designated sites and features is then taken forward for further assessment. Explanations for why certain sites or qualifying features are excluded is laid out in Section 3.1.

Table 3.1: Designated Sites Relevant to the Proposal

Site	Distance and Direction from Construction Site	Qualifying Feature(s) and Latest Assessed Condition	Included in Further Assessment? (in/out)
Special Areas of Conservation			
Inner Hebrides & The Minches	180m West	Harbour porpoise (*Phocoena phocoena)* **Favourable maintained**	IN – There is the potential for construction activities to impact on the qualifying features of the SAC due to the proximity of the construction site to the SAC, the Armadale disposal site being located within the SAC, and the mobile nature of the designated feature.
Sound of Arisaig (Loch Ailort to Loch Ceann Traigh)	17km South	Subtidal sandbanks **Favourable maintained**	OUT – Not in close proximity to the development or disposal site.
Treshnish Isles	68km Southwest	Grey seal (*Halichoerus grypus*), Reefs **Favourable maintained**	IN – Mobile feature which can range up to 100km. Reefs will not be considered further due to the immobile nature and considerable distance from the development and disposal site.
Special Protection Areas			
Moidart and Ardgour	16km Southeast	Golden Eagle (*Aquila chrysaetos*), breeding **Favourable maintained**	OUT – There is no breeding habitat within the Mallaig Harbour area and there is sufficient distance between the site and a nest site to not cause disturbance. The disposal site is located further away.

3.1 Reasons for Designated Sites or Species Exclusions

3.1.1 Sound of Arisaig (Loch Ailort to Loch Ceann Traigh) SAC

The Sound of Arisaig (Loch Ailort to Loch Ceann Traigh) SAC is designated for subtidal sandbanks. The SAC is located approximately 17km south of the development. Due to the considerable distance from the development to the designated site and localised nature of the feature, construction activities will not have any direct effects, therefore the SAC does not require further assessment. The disposal site is located further away from the site than the proposed development location.

3.1.2 Moidart and Ardgour SPA

Moidart and Ardgour SPA is designated for breeding golden eagle and is located approximately 16km southeast of the development. No breeding habitat is located within the harbour area and the designated site is a considerable distance from the development. Generally, golden eagles can be disturbed at nest sites within 1km. The development is a considerable distance away and therefore no disturbance to breeding golden eagles would be expected. This SPA does not therefore, require further assessment. The disposal site is located further away from the site and offers no habitat for golden eagle.

3.2 Designated Site Information - For Assessment

The Conservation Objectives of each of the designated sites taken forward are provided under each designated site section. Information on where the assessment for the qualifying features or species for each site is then provided. Reference to the relevant sections of the Mallaig Outer Harbour Improvements Supporting Document (Affric, 2021) are provided.

3.2.1 Inner Hebrides & The Minches SAC

The Inner Hebrides & the Minches SAC is designated for the conservation of harbour porpoise, under the European Habitats Directive. The area is of key importance to the UK as part of the harbour porpoise management unit. The Inner Hebrides & the Minches SAC is estimated to support approximately 5,438 individuals for at least part of the year, equating to approximately 32% of the management unit (SNH, 2016). It is suggested that these areas, relative to the rest of the continental shelf, include the best habitat for harbour porpoises, and have been used consistently by the species over the last two decades (SNH, 2016). The Inner Sound, west of Mull, the Sea of the Hebrides and the Sound of Sleat were identified by Embling et al. (2010) as areas with the highest predicted density of harbour porpoises in the seas around western Scotland. In addition, Marubini et al. (2009) found that the marine areas around the Small Isles, in the Inner Sound and north of Skye as have the highest modelled density of harbour porpoises.

The conservation objectives for the Inner Hebrides & The Minches SAC are shown in Table 3.2.

The LSEs for this designated site and it's qualifying features are associated with underwater noise and water quality as described in Sections 5.1.1 and 5.1.2 of the Environmental Supporting Document. Mitigation associated with these LSEs is also proposed within Section 6 of the Environmental Supporting Document. With mitigation in place, no effects are anticipated to undermine the conservation objectives of the designated site. It will be ensured that the qualifying interests of the designated sites are not present in the vicinity of works at the time of construction. Thus, harbour porpoise are unlikely to be physically harmed by construction activities.

A summary of the LSE considerations without mitigation however, are provided in Table 3.3 below.

Connectivity has been identified between the Inner Hebrides & Minches SAC and the proposed development due to the proximity of the construction site, the disposal site being located within the SAC and the mobile nature of the site's qualifying feature, harbour porpoise. This, combined with techniques to be used in construction of the development, means that there is the potential for the works to have an LSE on the site. It is therefore likely that an AA will be required.

Table 3.2 Inner Hebrides & The Minches SAC Conservation Objectives

Conservation Objective of the Designated Site
Overarching Conservation Objective: To ensure that the habitat of the qualifying species, or disturbance to the qualifying species, does not significantly deteriorate the condition of the site. The site must maintain an appropriate condition to achieve favourable conservation status.
Further Conservation Objective: To ensure for the qualifying species that the following are maintained in the long term: • No significant disturbance that can contribute to a decline in the ability of the qualifying feature's ability to survive; • High density of species across the site; • Population of the species as a viable component of the site; • Distribution of the species within site; • Distribution and extent of habitats supporting the species; and • Structure, function and supporting processes of habitats supporting the species.

Table 3.3 Inner Hebrides & The Minches SAC Qualifying Feature

Qualifying Feature	Summary of Assessment
Harbour porpoise (*Phocoena phocoena*)	In the absence of mitigation procedures, there is potential to cause localised, moderate disturbance and possible injury to harbour porpoises designated under the SAC. A small section of the proposed dredge works are situated close to the designated site, and as such, increased sediment suspension could arise within this area of the SAC during dredging. Harbour porpoise use echolocation to find, track and intercept individual prey items (Miller & Wahlberg, 2013) and it is therefore unlikely that increased sedimentation will impair their foraging abilities within and outwith the SAC. Harbour porpoise may be impacted by underwater noise emissions associated with piling and blasting activities, relating to possible impacts on hearing such as temporary threshold shifts (TTS) and permanent threshold shifts (PTS). In extreme cases, masking and/or habitat avoidance relating to foraging (Wisniewska *et al.,* 2016) and injury to, or death of individuals, may occur. As floating plant in the marine environment will be utilised, pollutants released into the water as a result of the release of hydraulic oils or fluids from dredge vessels and the spillage of onboard fluids and/or chemicals could have negative, direct or indirect, implications on harbour porpoise, including fatality. In the unlikely event of a pollution event however, the scale of the event is likely to be too small to affect large areas of the designated site and indeed its qualifying features. The disposal ground for the dredge material however is situated within the designated site and as such, there is a risk of injury to harbour porpoise during disposal itself as a result of falling material. In addition, disposal vessel movements to and from the disposal site could pose an additional risk of ship strikes. As vessel movements during disposal will not increase

	significantly beyond those already operable within the SAC, such impacts are unlikely but could have detrimental effects on harbour porpoise. Without mitigation, LSEs are unlikely when taking into consideration the likelihood of exposure to new pollution indices and LSEs associated with sediment suspension are unlikely. LSE cannot be ruled out for underwater noise emissions during piling and blasting works. Overall, when mitigation measures are applied, there is little potential to cause disturbance and possible injury to harbour porpoise designated under the SAC, hence effects on site integrity are not anticipated.

3.2.2 Treshnish Isles SAC

The Treshnish Isles SAC is designated primarily due to its importance to breeding grey seals, under the European Habitats Directive. The site comprises a chain of remote, uninhabited islands and skerries to the north-west of the Isle of Mull. The islands and skerries support a breeding grey seal colony which is estimated to contribute just under 3% of the annual UK pup production (JNCC, 2018). Grey seals are frequently seen in the Inner Harbour area of the MOHI development. As the upper limits of grey seal foraging ranges (~100 km) (SCOS, 2017) are noticeably less than that of the distance between the Treshnish Isles SAC and the MOHI, impacts on the designated features of this SAC could occur.

The conservation objectives for the Treshnish Isles SAC are shown in Table 3.3

The LSEs for this designated site and it's qualifying features are associated with underwater noise and water quality, as described in Sections 5.1.1 and 5.1.2 of the Environmental Supporting Document. Mitigation associated with these LSEs is also proposed within Section 6 of the Environmental Supporting Document. With mitigation in place, no effects are anticipated to undermine the conservation objectives of the designated site. It will be ensured that the qualifying interests of the designated sites are not present in the vicinity of works at the time of construction. Thus, grey seals are unlikely to be physically harmed by construction activities or subject to significant disturbance, as such the conservation objectives of the SAC are unlikely to be impacted.

A summary of the LSE considerations on the qualifying features without mitigation however, are shown in Table 3.4 below.

Connectivity has been identified between the Treshnish Isles SAC and the proposed development due to the proximity of the construction and disposal sites being located within the range of the SAC's qualifying feature, grey seal. This, combined with techniques to be used in construction of the development, means that there is the potential for the works to have an LSE on the site. It is therefore likely that an AA will be required.

Table 3.3 Treshnish Isles SAC Conservation Objectives

Conservation Objective of the Designated Site
Overarching Conservation Objective: To avoid deterioration of the qualifying habitat thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features.
Further Conservation Objective: To ensure for the qualifying species that the following are maintained in the long term: • Population of the species as a viable component of the site • Distribution of the species within the site • Distribution and extent of the habitats supporting the species • Structure, function and supporting processes of habitats supporting the species • No significant disturbance of the species.

Table 3.4 Treshnish Isles SAC Qualifying Feature

Qualifying Feature	Summary of Assessment
Grey Seal (*Halichoerus grypus*)	In the absence of mitigation procedures, there is potential to cause moderate disturbance and possible injury to grey seals designated under the SAC. The construction of MOHI development is situated outwith the designated site. Grey seal foraging ranges are wide ranging and can often extend as far as 100km between haul out sites (SCOS, 2018). The upper limits of the range of grey seals are comparative to the distances grey seals can travel to haul out sites (75 – 100km per day) (McConnell *et al.*, 1999) between the Treshnish Isles SAC and the proposed MOHI development, presenting the possibility that they could be present within the development site. Thus, there is a risk of injury to grey seal as a result of falling material during dredge disposal and blasting and piling works. Such impacts are unlikely but could have detrimental effects on grey seals as a viable component of the SAC if they become injured and have arrived from the SAC. Pollutants released into the water as a result of the release of hydraulic oils or fluids from vessels and the spillage of onshore fluids and/or chemicals can have negative, direct, or indirect, implications on grey seal. In the unlikely event of a pollution incident, the scale of the event is likely to be too small to affect the designated site and its qualifying features if they are present in the construction area. Grey seals may be impacted by underwater noise emissions associated with piling and blasting activities, relating to possible impacts on hearing such as temporary threshold shifts (TTS) and permanent threshold shifts (PTS). In extreme cases habitat avoidance relating to foraging and injury to, or death of individuals, may occur. Dredging works have the potential to increase sediment suspension in the water column. Grey seals do not use acoustics or echolocation to find, track, and intercept individual prey items as they are visual predators. Increased sediment suspension in the water column therefore has the potential to inhibit grey seal foraging and cause seals to avoid affected areas as visual acuity decreases (Todd *et al.*, 2015). Increased sediment suspension therefore has the potential to cause significant disturbance to grey seals of the

	Treshnish Isles SAC if they are foraging within the vicinity of the development. In addition, disposal of dredge material puts grey seals at risk of injury to during disposal itself as a result of falling material. In addition, disposal vessel movements to and from the disposal site could pose an additional risk of ship strikes. As vessel movements during disposal will not increase significantly beyond those already operable within the vicinity of Mallaig Harbour, such impacts are unlikely but could have detrimental effects on grey seals. Without mitigation, LSEs are unlikely when taking into consideration the likelihood of exposure to new pollution indices, falling material and vessel collisions. LSEs associated with sediment suspension will be minor. In addition, moderate LSE cannot be ruled out for underwater noise emissions during piling and blasting works. Overall, when mitigation measures are applied, there is little potential to cause disturbance and possible injury to grey seals designated under the SAC, hence impacts on the site integrity are not predicted.

4 Cumulative & In-Combination Effects

Cumulative and in-combination effects of the development were considered as part of the HRA process. As there are no other projects planned in the Mallaig Outer Harbour area it is unlikely that there will be any cumulative or in-combination effects that could impact upon the qualifying species at a population level.

5 Conclusion

There are no predicted residual, adverse impacts for any of the qualifying features of the designated sites assessed as part of this HRA. Furthermore, no cumulative or in-combination effects are anticipated. Information from this report can be used by the competent authority, in conjunction with the relevant sections of the supporting document as identified in this report, to carry out the HRA and any necessary AAs. It will be up to the competent authority to ascertain whether the proposal will adversely affect the integrity of the designated sites to be considered.

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7 Glossary

Acronym	Definition
AA	Appropriate Assessment
HRA	Habitats Regulations Appraisal
km	kilometres
LSE	Likely Significant Effects
m	metres
MHA	Mallaig Harbour Authority
PTS	Permanent Threshold Shift
SAC	Special Area of Conservation
SPA	Special Protection Area
TTS	Temporary Threshold Shift

Appendix 4 – Underwater Noise Assessment

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Underwater noise propagation modelling for blast and dredging noise in Mallaig Harbour, Scotland

Richard Barham

12 October 2021

Subacoustech Environmental Report No. P297R0102

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This report is a controlled document. The report documentation page lists the version number, record of changes, referencing information, abstract and other documentation details.

List of contents

Glossary

Term	Definition
Decibel (dB)	A customary scale commonly used (in various ways) for reporting levels of sound. A difference of 10 dB corresponds to a factor of 10 in sound power. The actual sound measurement is compared to a fixed reference level and the "decibel" value is defined to be $10\log_{10}(actual/reference)$ where $(actual/reference)$ is a power ratio. Because sound power is usually proportional to sound pressure squared, the decibel value for sound pressure is $20\log_{10}(actual\ pressure/reference\ pressure)$. The standard reference for underwater sound is 1 micropascal (µPa). The dB symbol is followed by a second symbol identifying the specific reference value (e.g., re 1 µPa).
Peak pressure	The highest pressure above or below ambient that is associated with a sound wave.
Peak-to-peak pressure	The sum of the highest positive and negative pressures that are associated with a sound wave.
Permanent Threshold Shift (PTS)	A permanent total or partial loss of hearing caused by acoustic trauma. PTS results in irreversible damage to the sensory hair cells of the air, and thus a permanent reduction of hearing acuity
Sound Exposure Level (SEL)	The constant sound level acting for one second, which has the same amount of acoustic energy, as indicated by the square of the sound pressure, as the original sound. It is the time-integrated, sound-pressure-squared level. SEL is typically used to compare transient sound events having different time durations, pressure levels, and temporal characteristics.
Sound Pressure Level (SPL)	The sound pressure level is an expression of sound pressure using the decibel (dB) scale; the standard frequency pressures of which are 1 µPa for water and 20 µPa for air.
Temporary Threshold Shift (TTS)	Temporary reduction of hearing acuity because of exposure to sound over time. Exposure to high levels of sound over relatively short time periods could cause the same amount of TTS as exposure to lower levels of sound over longer time periods. The mechanisms underlying TTS are not well understood, but there may be some temporary damage to the sensory cells. The duration of TTS varies depending on the nature of the stimulus.
Unweighted sound level	Sound levels which are "raw" or have not been adjusted in any way, for example to account for the hearing ability of a species.
Weighted sound level	A sound level which has been adjusted with respect to a "weighting envelope" in the frequency domain, typically to make an unweighted level relevant to a particular species. Examples of this are the dB(A), where the overall sound level has been adjusted to account for the hearing ability of humans in air, or the filters used by Southall *et al*. (2019) for marine mammals.

Acronyms

Acronym	Definition
HF	High-Frequency Cetaceans (Marine mammal hearing group from Southall *et al*., 2019)
LF	Low-Frequency Cetaceans (Marine mammal hearing group from Southall *et al*., 2019)
PCW	Phocid Carnivores in Water (Marine mammal hearing group from Southall *et al*., 2019)
PTS	Permanent Threshold Shift
RMS	Root Mean Square
SE	Sound Exposure
SEL	Sound Exposure Level
SEL_{cum}	Cumulative Sound Exposure Level
SEL_{ss}	Single Strike Sound Exposure Level
SPL	Sound Pressure Level
SPL_{peak}	Peak Sound Pressure Level
$SPL_{pk\text{-}to\text{-}pk}$	Peak-to-peak Sound Pressure Level
SPL_{RMS}	Root Mean Square Sound Pressure Level
TTS	Temporary Threshold Shift
VHF	Very High-Frequency Cetaceans (Marine mammal hearing group from Southall *et al*., 2019)

Units

Unit	Definition
dB	Decibel (sound pressure)
Hz	Hertz (frequency)
kg	Kilogram (mass)
kHz	Kilohertz (frequency)
km	Kilometre (distance)
m	Metre (distance)
ms^{-1}	Metres per second (speed)
Pa^2s	Pascal squared seconds (acoustic energy)
µPa	Micropascal (pressure)

1 Introduction

Harbour deepening works are proposed within the Outer Harbour area of Mallaig Harbour, located on the west coast of Scotland. As part of this, Subacoustech Environmental Ltd. has undertaken underwater noise modelling and analysis covering the noise from borehole blasting and dredging operations in respect of the potential impact on marine mammals and fish that may be present in Mallaig Harbour.

1.1 Survey area

Mallaig is a port situated on the west coast of Scotland in the region of Lochaber. The area of the proposed harbour deepening is known as the Outer Harbour and its location, as well as the modelling location used for this study, are shown in Figure 1-1.

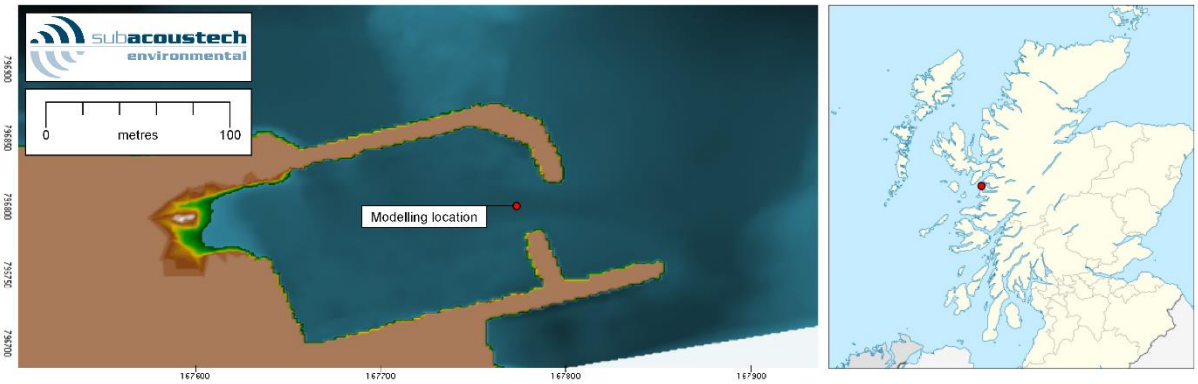

Figure 1-1 Location of the Outer Harbour in Mallaig Harbour and the modelling location used for this study

1.2 Borehole blasting

In order to break up bedrock, borehole blasting will be used. This involves a drilled hole filled with explosives which are subsequently detonated to break up and loosen the bedrock, which can be cleared by dredging. Subacoustech have been requested by the client to assume a worst case, maximum instantaneous charge that would have a TNT-equivalent charge weight of 60 kg, and this value has been used in the assessment.

1.3 Dredging

It is assumed that backhoe dredging will be utilised in order to clear the substrate and bedrock for the harbour deepening. This involves a hydraulic excavator mounted on a pontoon, often on a rotating table. Due to the low noise level produced by dredging compared to blasting, dredging has only been assessed with a simple modelling approach.

1.4 Assessment overview

This report presents a detailed assessment of the potential underwater noise from works in the Outer Harbour of Mallaig Harbour and covers the following:

- Review of background information on the units for measuring and assessing underwater noise (section 2.1);
- The underwater noise metrics and criteria used to assess the possible environmental effect in marine receptors (section 2.2);

- Discussion of the approach, input parameters and assumptions for the noise modelling undertaken (section 3);
- Presentation of the modelling and interpretation of the results using suitable noise metrics and criteria (section 4); and
- Summary and conclusions (section 5).

2 Measurement of underwater noise

2.1 Underwater noise

Sound travels much faster in water (approximately 1,500 ms^{-1}) than in air (340 ms^{-1}). Since water is a relatively incompressible, dense medium, the pressure associated with underwater sound tends to be much higher than in air. As an example, background noise levels in the sea of 130 dB re 1 µPa for UK coastal waters are not uncommon (Nedwell *et al*. 2003; Nedwell *et al.* 2007).

It should be noted that stated underwater noise levels should not be confused with noise levels in air, which use a different scale.

2.1.1 Units of measurement

Sound measurements underwater are usually expressed using the decibel (dB) scale, which is a logarithmic measure of sound. A logarithmic scale is used because, rather than equal increments of sound having an equal increase in effect, typically each doubling of sound level will cause a roughly equal increase of "loudness."

Any quantity expressed in this scale is termed a "level." If the unit is sound pressure, expressed on the dB scale, it will be termed a "sound pressure level."

The fundamental definition of the dB scale is given by:

$$Level = 10 \times \log_{10}\left(\frac{Q}{Q_{ref}}\right)$$

where Q is the quantity being expressed on the scale, and Q_{ref} is the reference quantity.

The dB scale represents a ratio. It is therefore used with a reference unit, which expresses the base from which the ratio is expressed. The reference quantity is conventionally smaller than the smallest value to be expressed on the scale so that any level quoted is positive. For example, a reference quantity of 20 µPa is used for sound in air since that is the lower threshold of human hearing.

When used with sound pressure, the pressure value is squared. This is equivalent to expressing the sound as:

$$Sound\ pressure\ level = 20 \times \log_{10}\left(\frac{P_{RMS}}{P_{ref}}\right)$$

where P_{RMS} is the root mean square (RMS) pressure under consideration, P_{ref} is the reference pressure. For underwater sound, a unit of 1 µPa is typically used as the reference unit (P_{ref}); a Pascal is equal to the pressure exerted by one Newton over one square metre, one micropascal equals one millionth of this.

A doubling in the RMS pressure is therefore equivalent to an increase in sound pressure level of approximately 6 dB.

2.1.2 Sound Pressure Level (SPL)

The Sound Pressure Level (SPL) is normally used to characterise noise and vibration of a continuous nature, such as drilling, boring, continuous wave sonar, or background sea and river noise levels. To calculate the SPL, the variation in sound pressure is measured over a specific period to determine the RMS level of the time-varying sound. The SPL can therefore be considered a measure of the average unweighted level of sound over the measurement period.

Where SPL is used to characterise transient pressure waves, such as that from underwater blasting, seismic airgun or impact piling, it is critical that the period over which the RMS level is calculated is quoted. For instance, in the case of a pile strike lasting a tenth of a second, the mean taken over a tenth of a second will be ten times higher than the mean averaged over one second. Often, transient sounds such as these are quantified using “peak” SPLs or Sound Exposure Levels (SELs).

Unless otherwise defined, all SPL noise levels in this report are referenced to 1 µPa.

2.1.3 Peak Sound Pressure Level (SPL_{peak})

Peak SPLs (SPL_{peak}) are often used to characterise transient sound from impulsive sources, such as percussive impact piling. SPL_{peak} is calculated using the maximum variation of the pressure from positive to zero within the wave. This represents the maximum change in positive pressure (differential pressure from positive to zero) as the transient pressure wave propagates.

A further variation of this is the peak-to-peak SPL ($SPL_{pk\text{-}pk}$) where the maximum variation of the pressure from positive to negative is considered. Where the wave is symmetrically distributed in positive and negative pressure, the peak-to-peak pressure will be twice the peak level, or 6 dB higher (see section 2.1.1).

2.1.4 Sound Exposure Level (SEL)

When considering the noise from transient sources, the issue of the duration of the pressure wave is often addressed by measuring the total acoustic energy (energy flux density) of the wave. This form of analysis was used by Bebb and Wright (1953, 1954a, 1954b, 1955), and later by Rawlins (1987), to explain the apparent discrepancies in the biological effect of short and long-range blast waves on human divers. More recently, this form of analysis has been used to develop criteria for assessing injury ranges for fish and marine mammals from various noise sources (Popper *et al*., 2014 and Southall *et al*., 2019).

The SEL sums the acoustic energy over a measurement period, and effectively takes account of both the SPL of the sound and the duration for which it is present in the acoustic environment. Sound Exposure (SE) is defined by the equation:

$$SE = \int_0^T p^2(t)dt$$

where p is the acoustic pressure in Pascals, T is the total duration of the sound in seconds, and t is the time in seconds. The SE is a measurement of acoustic energy and has units of Pascal squared seconds (Pa^2s).

To express the SE on a logarithmic scale by means of a dB, it must be compared with a reference acoustic energy level (${p^2}_{ref}$) and a reference time (T_{ref}). The SEL is then defined by:

$$SEL = 10 \times \log_{10}\left(\frac{\int_0^T p^2(t)dt}{{p^2}_{ref}T_{ref}}\right)$$

By selecting a common reference pressure (p_{ref}) of 1 µPa for assessments of underwater noise, the SEL and SPL can be compared using the expression:

$$SEL = SPL + 10 \times \log_{10} T$$

where the SPL is a measure of the average level of broadband noise and the SEL sums the cumulative broadband noise energy.

This means that, for continuous sounds of less than one second, the SEL will be lower than the SPL. For periods greater than one second, the SEL will be numerically greater than the SPL (i.e., for a continuous sound of 10 seconds duration, the SEL will be 10 dB higher than the SPL; for a sound of 100 seconds duration the SEL will be 20 dB higher than the SPL, and so on).

2.2 Analysis of environmental effects

Over the last 20 years there has been increasing interest in noise from human activities in and around underwater environments and how it can have an impact on the marine species in the area. The extent to which intense underwater sound might cause adverse impacts in species is dependent upon the incident sound level, sound frequency, duration of exposure, and/or repetition rate of an impulsive sound (see, for example, Hastings and Popper, 2005). As a result, scientific interest in the hearing abilities of aquatic species has increased. Studies are primarily based on evidence from high level sources of underwater noise such as blasting or impact piling, as these sources are likely to have the greatest immediate environmental impact and therefore the clearest observable effects, although interest in chronic noise exposure is increasing.

The impacts of underwater sound on marine species can be broadly summarised as follows:

- Physical traumatic injury and fatality;
- Auditory injury (either permanent (PTS) or temporary (TTS)); and
- Disturbance.

The following sections discuss the underwater noise criteria used in this study with respect to species of marine mammals and fish that may be present in and around Mallaig harbour.

The main metrics and criteria that have been used in this study to aid assessment of environmental effects come from two key papers covering underwater noise and its effects:

- Southall *et al*. (2019) marine mammal noise exposure injury criteria;
- Popper *et al*. (2014) sound exposure guidelines for fishes.

At the time of writing these are the most up to date and authoritative criteria for assessing environmental effects for use in impact assessments.

2.2.1 Marine mammals

The Southall *et al*. (2019) paper is effectively an update of the previous Southall *et al.* (2007) paper and provides identical thresholds to those from the National Marine Fisheries Service (NMFS) (2018) guidance for marine mammals.

The Southall *et al*. (2019) guidance groups marine mammals into categories of similar species and applies filters to the unweighted noise to approximate the hearing sensitivities of the receptor. The hearing groups given in Southall *et al*. (2019) are summarised in Table 2-1 and Figure 2-1. Further groups for sirenians and other marine carnivores in water are also given, but these have not been used for this study as those species are not commonly found around the survey area.

Hearing group	Generalised hearing range	Example species
Low-frequency cetaceans (LF)	7 Hz to 35 kHz	Baleen whales
High-frequency cetaceans (HF)	150 Hz to 160 kHz	Dolphins, toothed whales, beaked whales, bottlenose whales (including bottlenose dolphin)
Very high-frequency cetaceans (VHF)	275 Hz to 160 kHz	True porpoises (including harbour porpoise)
Phocid carnivores in water (PCW)	50 Hz to 86 kHz	True seals (including harbour seal)

Table 2-1 Marine mammal hearing groups (from Southall et al., 2019)

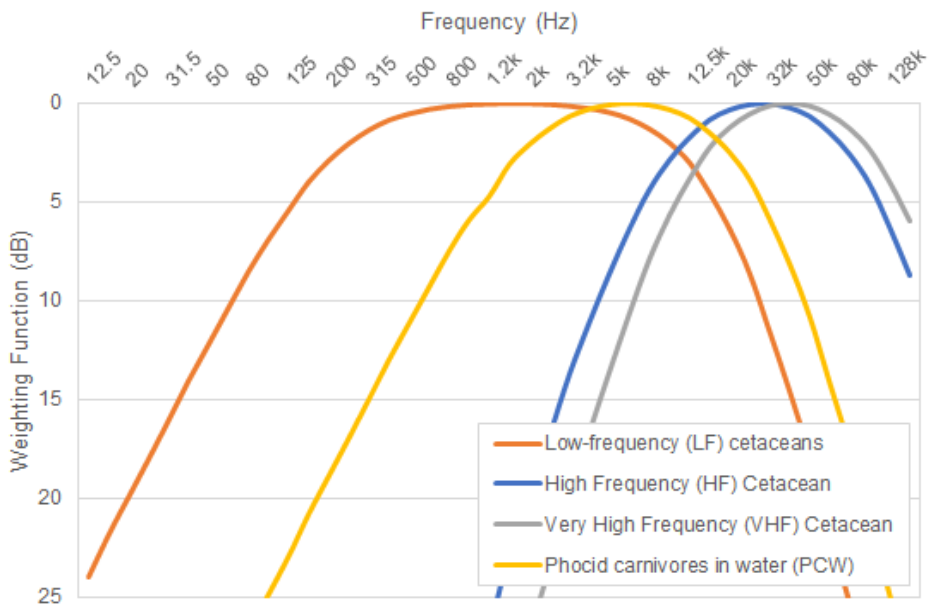

Figure 2-1 Auditory weighting functions for low-frequency cetaceans (LF), high-frequency cetaceans (HD), very high-frequency cetaceans (VHF), and phocid carnivores in water (PCW) (from Southall et al., 2019)

Southall *et al*. (2019) presents single strike, unweighted peak criteria (SPL_{peak}) and cumulative (i.e., more than a single sound impulse) weighted sound exposure criteria (SEL_{cum}) for both permanent threshold shift (PTS), where unrecoverable hearing damage may occur, and temporary threshold shift (TTS), where a temporary reduction in hearing sensitivity may occur in individual receptors. It should be noted that, as borehole blasting is a singular event, the SEL_{cum} can be considered SEL_{ss} (single-strike).

Table 2-2 and Table 2-3 present the Southall *et al.* (2019) criteria for the onset of PTS and TTS risk for each of the key marine mammal hearing groups considering impulsive (borehole blasting) and non-impulsive (dredging) sources.

Southall *et al*. (2019)	Impulsive			
	Unweighted SPL_{peak} (dB re 1 µPa)		Weighted SEL_{cum} (dB re 1 µPa^{2}s)	
	PTS	TTS	PTS	TTS
Low-frequency cetaceans (LF)	219	213	183	168
High-frequency cetaceans (HF)	230	224	185	170
Very high-frequency cetaceans (VHF)	202	196	155	140
Phocid carnivores in water (PCW)	218	212	185	170

Table 2-2 Impulsive criteria for PTS and TTS in marine mammals (Southall et al., 2019)

Southall *et al*. (2019)	Non-impulsive	
	Weighted SEL_{cum} (dB re 1 µPa^{2}s)	
	PTS	TTS
Low-frequency cetaceans (LF)	199	179
High-frequency cetaceans (HF)	198	178
Very high-frequency cetaceans (VHF)	173	153
Phocid carnivores in water (PCW)	201	181

Table 2-3 Impulsive criteria for PTS and TTS in marine mammals (Southall et al., 2019)

2.2.2 Fish

The large number of, and variation in, fish species leads to a greater challenge in production of a generic noise criterion, or range of criteria, for the assessment of noise impacts. Whereas previous studies applied broad criteria based on limited studies of fish that are not present in UK waters (e.g., McCauley *et al*., 2000) or measurement data not intended to be used as criteria (Hawkins *et al*., 2014), the publication of Popper *et al*. (2014) provides an authoritative summary of the latest research and guidelines for fish exposure to sound and uses categories for fish that are representative of the species present in UK waters.

The Popper *et al*. (2014) study groups species of fish by whether they possess a swim bladder, and whether it is involved in its hearing; groups for sea turtles and fish eggs and larvae are also included. The guidance also gives specific criteria for a variety of noise sources. For this study, criteria for explosions (borehole blast) and continuous noise sources (dredging) have been considered. These are summarised in Table 2-4 and Table 2-5.

Type of animal	Mortality and potential mortal injury
Fish: no swim bladder	229 – 234 dB SPL_{peak}
Fish: swim bladder is not involved in hearing	229 – 234 dB SPL_{peak}
Fish: swim bladder involved in hearing	229 – 234 dB SPL_{peak}
Sea turtles	229 – 234 dB SPL_{peak}
Eggs and larvae	> 13 mm s^{-1} peak velocity

Table 2-4 Criteria for mortality and potential mortal injury, recoverable injury and TTS in species of fish and sea turtles from explosions (Popper et al., 2014)

Type of animal	Impairment	
	Recoverable injury	TTS
Fish: swim bladder involved in hearing	170 dB SPL_{RMS} (48 hours)	158 dB SPL_{RMS} (12 hours)

Table 2-5 Criteria for recoverable injury and TTS in species of fish from contiuous sounds (Popper et al., 2014)

Where insufficient data are available, especially for lower-level impacts such as behavioural effects, Popper *et al*. (2014) also gives qualitative criteria that summarise the effect of noise as having either a high, moderate or low effect on an individual in either the near-field (tens of metres), intermediate-field (hundreds of metres), or far-field (thousands of metres). These qualitative effects are reproduced in Table 2-6 and Table 2-7.

Type of animal	Impairment			Behaviour
	Recoverable injury	TTS	Masking	
Fish: no swim bladder	(N) High (I) Low (F) Low	(N) High (I) Moderate (F) Low	N/A	(N) High (I) Moderate (F) Low
Fish: swim bladder is not involved in hearing	(N) High (I) High (F) Low	(N) High (I) Moderate (F) Low	N/A	(N) High (I) High (F) Low
Fish: swim bladder involved in hearing	(N) High (I) High (F) Low	(N) High (I) High (F) Low	N/A	(N) High (I) High (F) Low
Sea turtles	(N) High (I) High (F) Low	(N) High (I) High (F) Low	N/A	(N) High (I) High (F) Low
Eggs and larvae	(N) High (I) Low (F) Low	(N) High (I) Low (F) Low	N/A	(N) High (I) Low (F) Low

Table 2-6 Summary of the qualitative effects on species of fish from explosions (Popper et al., 2014) (N = Near-field; I = Intermediate-field; F = Far-field)

Type of animal	Mortality & potential mortal inj.	Impairment			Behaviour
		Recoverable injury	TTS	Masking	
Fish: no swim bladder	(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
Fish: swim bladder is not involved in hearing	(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
Fish: swim bladder involved in hearing	(N) Low (I) Low (F) Low	See Table 2-5	See Table 2-5	(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

Table 2-7 Summary of the qualitative effects on species of fish from continuous sounds (Popper et al., 2014) (N = Near-field; I = Intermediate-field; F = Far-field)

2.2.2.1 Particle motion

The criteria defined in the above section all define the noise impacts on fishes in terms of sound pressure or sound pressure-associated functions (i.e., SEL). It has been identified by researchers (e.g., Popper and Hawkins, 2018; Nedelec *et al*., 2016; Radford *et al.*, 2012) that species of fish, as well as invertebrates, actually detect particle motion rather than pressure. Particle motion describes the back-and-forth movement of a tiny theoretical 'element' of water, substrate or other media as a sound wave passes, rather than the pressure caused by the action of the force created by this movement. Particle motion is usually defined in reference to the velocity of the particle (often a peak particle velocity, PPV), but sometimes the related acceleration or displacement of the particle is used. Note that species in the "Fish: swim bladder involved in hearing" category, the most sensitive species in the tables above, are sensitive to sound pressure.

Popper and Hawkins (2018) state that in derivation of the sound pressure-based criteria in Popper *et al.* (2014) it may be the unmeasured particle motion detected by the fish, to which the fish were responding: there is a relationship between particle motion and sound pressure in a medium. This relationship is very difficult to define where the sound field is complex, such as close to the noise source or where there are multiple reflections of the sound wave in shallow water. Even these terms "shallow" and "close" do not have simple definitions.

The primary reason for the continuing use of sound pressure as the criteria, despite particle motion appearing to be the physical quantity to which many fish react or sense, is a lack of data (Popper and Hawkins, 2018) both in respect of predictions of the particle motion level as a consequence of a noise source such as piling, and a lack of knowledge of the sensitivity of a fish, or a wider category of fish, to a particle motion value. There continue to be calls for additional research on the levels of and effects with respect to levels of particle motion. Until sufficient data are available to enable revised thresholds based on the particle motion metric, Popper *et al.* (2014) continues to be the best source of criteria in respect to fish impacts (Andersson *et al.,* 2016; Popper and Hawkins*,* 2019).

3 Modelling methodology

Two modelling methodologies have been used for this assessment based on the likely severity of impact of each of the noise sources based on noise levels previously measured by Subacoustech Environmental.

- Borehole blasting has been assessed using detailed modelling considering all environmental parameters; and
- Dredging has been considered qualitatively based on previously measured data.

The methods described in this section, and utilised within this report, meet the requirements set by the NPL Good Practice Guide 133 for underwater noise measurement (Robinson *et al*., 2014).

3.1 Detailed modelling inputs

To estimate the likely noise levels during borehole blasting operations, modelling has been carried out using an approach that is widely used and accepted by the acoustics community, in combination with publicly available environmental data and information provided by Affric.

Modelling of underwater noise is complex and can be approached in several different ways. Subacoustech Environmental have chosen to use a numerical approach that is based on two different solvers:

- A parabolic equation (PE) method for lower frequencies (16 Hz to 250 Hz); and

- A ray tracing method for higher frequencies (315 Hz to 20 kHz).

The PE method is widely used within the underwater acoustics community but has computational limitations at higher frequencies. Ray tracing is more computationally efficient at higher frequencies but is not suited to low frequencies (Etter, 1991). This study utilises the dBSea implementation of these numerical solutions.

A maximum frequency of 20 kHz has been used in this study due to the low-frequency characteristics of borehole blasting and available blast measurement data.

The modelling has been undertaken at a single representative location to predict the levels of underwater noise from borehole blasting activity. The modelling location used for modelling is 57° 00.487148'N, 005° 49.578206'W and is shown in Figure 1-1.

3.1.1 Bathymetry

The bathymetry data used was supplied by Affric, based on multi-beam echosounder data, and covers the Outer Harbour and surrounding areas including the surrounding harbour walls. The data has a resolution of approximately 0.5 m.

3.1.2 Sound speed profile

The speed of sound in water, shown in Figure 3-1, has been calculated using temperature and salinity data near Mallaig Harbour obtained from Marine Scotland's National Marine Plan Interactive (NMPi) tool[1]. The calculations were based on equations from Mackenzie (1981).

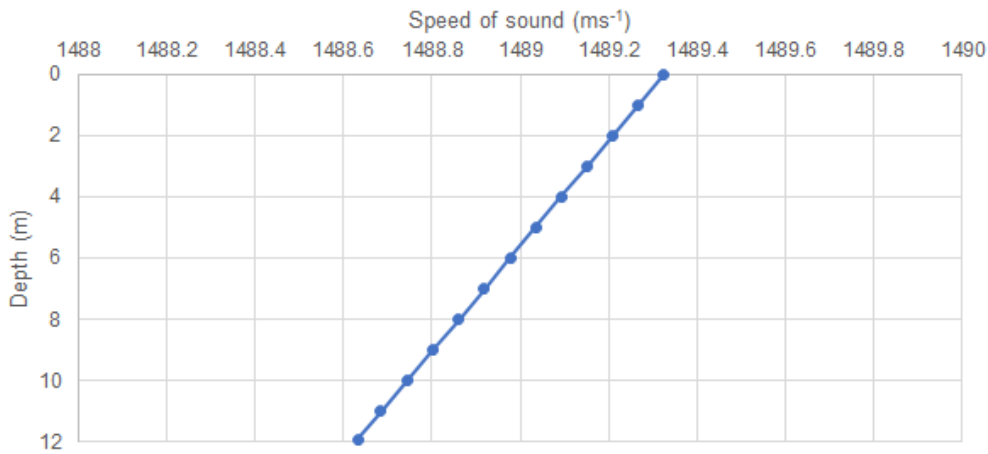

Figure 3-1 Sound speed profile used for modelling at Mallaig Harbour

3.1.3 Seabed properties

Based on data provided by Affric the seabed properties used for modelling were assumed to be a 0.5 to 1 m thick layer of sediment consisting of medium dense, slightly silty, fine to coarse sand, covering bedrock consisting of Psammite. Geo-acoustic properties for the seabed were based on available data from Jensen *et al*. (2011), Jensen *et al*. (1994) and Alden (2020) and are provided in Table 3-1.

[1] Marine Scotland (2021). *National Marine Plan Interactive (NMPi)*. Available from https://marinescotland.atkinsgeospatial.com/nmpi [Accessed September 2021].

Seabed type	Compressive sound speed profile in substrate (ms^{-1})	Density profile in substrate (kg/m^3)	Attenuation profile in substrate (dB/wavelength)
Sediment: Slightly silty sand	1,650	1,900	0.8
Bedrock: Psammite	3,000	2,500	0.1

Table 3-1 Seabed geo-acoustic properties used for modelling

3.1.4 Borehole blasting

The proposed borehole blasting operations at Mallaig Harbour assume a 60 kg charge detonated within a drilled borehole in order to break bedrock for harbour deepening.

Estimation for the source noise level of explosive charge buried in a borehole was carried out in accordance with the methodology of Soloway and Dahl (2014), Arons (1954) and the Marine Technical Directorate (MTD) (1996). Free field SPL_{peak} and SEL_{ss} were calculated for the 60 kg charge before values were adjusted to factor in the borehole as recommended in MTD (1996).

The unweighted source levels estimated for borehole blasting are:

- 257.6 dB re 1 µPa (SPL_{peak}); and
- 230.3 dB re 1 μPa^2s (SEL_{ss}).

The 1/3rd octave levels used for modelling are illustrated in Figure 3-2, this is based on data from Salomons *et al*. (2021) for blasting noise in shallow water conditions adjusted for the calculated source levels given above.

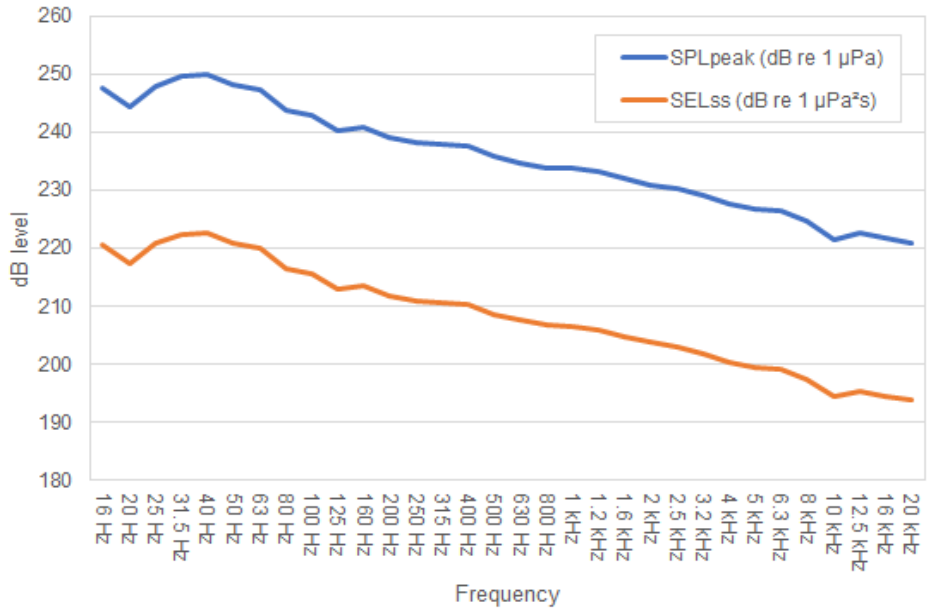

Figure 3-2 1/3rd octave source level frequency spectra used in this modelling for a 60 kg charge borehole blast

It is worth noting that a 60 kg charge weight is the worst-case scenario being considered for harbour deepening in the Outer Harbour. From previous experience this is a very large charge weight for an enclosed harbour and the actual device(s) used would be expected to be considerably smaller.

3.2 Simple modelling

Modelling of dredging has been undertaken using a simple modelling approach: Subacoustech Environmental's SPEAR model. This methodology has been chosen due to the relatively low levels of noise expected and is designed using existing measurement data from similar activities taken by Subacoustech Environmental and modifying the source level to best match the scenario being modelled.

3.2.1 Dredging

The source level used in this modelling for backhoe dredging has been based on third octave measurements undertaken by Subacoustech Environmental at various locations around the UK and abroad. The unweighted SPL_{RMS} source level (1 s SEL) used for the dredging modelling is 165.0 dB re 1 µPa @ 1 m. Where SEL_{cum} criteria are considered (Southall *et al*., 2019), it has been assumed that the dredging will be operational for 12 hours per day.

The simple modelling is based on a basic geometric spreading model of the form $SL = N \log_{10} R - \alpha R$ where SL is the source level, R is the range and values for N and α are based on approximations from field measurements. In contrast, the PE / ray tracing solution is based on physical approximations of underwater wave propagation and considers variations in bathymetry, seabed type and sound speed profile for multiple depths and for each frequency band. With the simple methodology these factors are intrinsic to the conditions of the measurements. In practice, the complex numerical modelling is extremely resource intensive and it is common practice to use different modelling techniques according to the source being modelled and the anticipated impact range (Robinson *et al*., 2014).

3.3 Weighted source levels

To undertake the modelling for the Southall *et al*. (2019) criteria, the source levels have to be adjusted using the auditory weighting functions shown in Figure 2-1. This can significantly alter the third octave levels and hence source level for each functional group as shown in Figure 3-3.

Noise from borehole blasting is predominantly low-frequency in nature and reduces significantly at frequencies above 125 Hz. The third octave frequency levels given in Figure 3-3 show that the weightings for borehole blasting only make a modest difference to source levels for LF cetaceans and a more significant reduction for the other groups. A summary of the weighted source levels, including those for backhoe dredging, is given in Table 3-2.

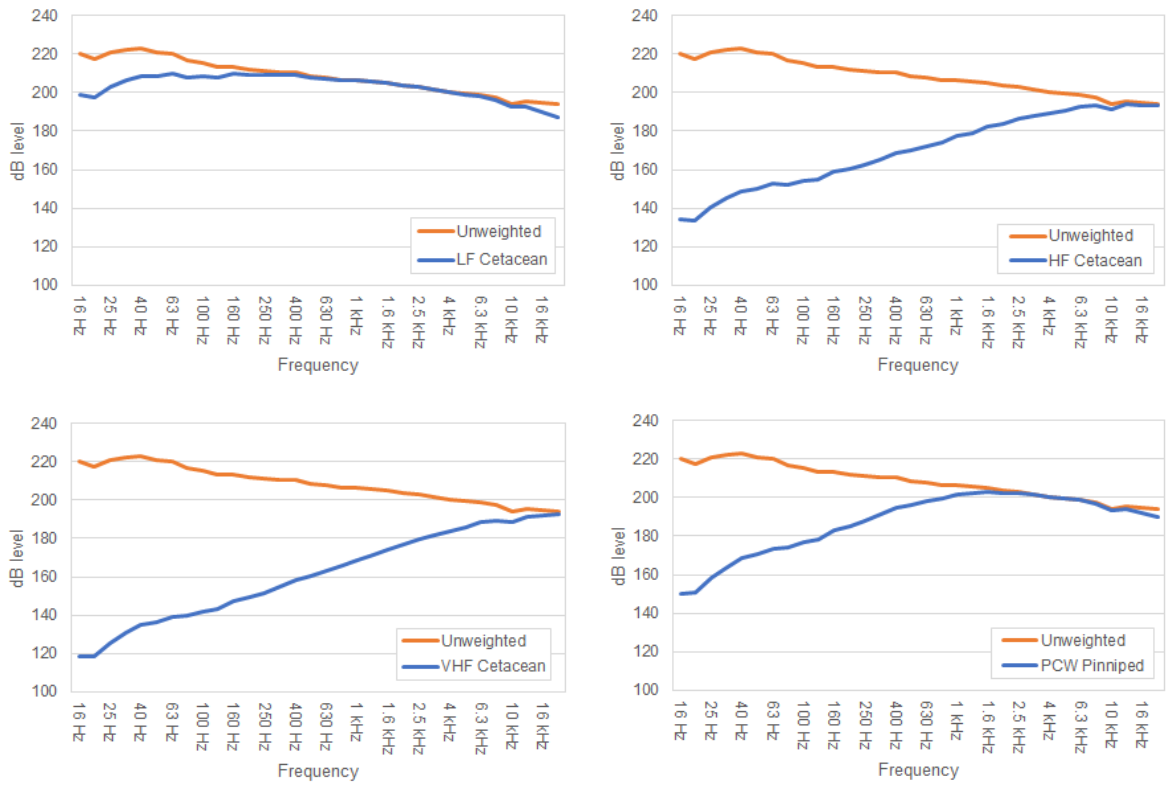

Figure 3-3 Unweighted and Southall et al. (2019) weighted SEL_{ss} source level third octave values for borehole blasting

	Borehole blasting (60 kg)	Backhoe dredging
Unweighted	230.3 dB re 1 µPa @ 1 m (SEL_{ss})	165.0 dB re 1 µPa @ 1 m (SPL_{RMS})
LF cetaceans	221.1 dB re 1 µPa @ 1 m (SEL_{ss})	158.7 dB re 1 µPa @ 1 m (SPL_{RMS})
HF cetaceans	202.1 dB re 1 µPa @ 1 m (SEL_{ss})	118.3 dB re 1 µPa @ 1 m (SPL_{RMS})
VHF cetaceans	199.2 dB re 1 µPa @ 1 m (SEL_{ss})	116.3 dB re 1 µPa @ 1 m (SPL_{RMS})
Phocid pinnipeds	212.2 dB re 1 µPa @ 1 m (SEL_{ss})	141.9 dB re 1 µPa @ 1 m (SPL_{RMS})

Table 3-2 Summary of the Southall et al. (2019) weighted source levels for marine mammals

4 Modelling results

4.1 Borehole blasting

The unweighted noise levels from borehole blasting in the Outer Harbour are presented in Figure 4-1 and Figure 4-2 for the maximum level in the water column. These results have been analysed for their potential impact on marine mammals and fish using the criteria detailed in section 2.2 in Figure 4-3 to Figure 4-7, Table 4-1, Table 4-2 and Table 4-3.

As modelling can only be undertaken based on line-of-sight with the source, it is restricted by the walls at the entrance to the harbour. Although there will inevitably be ‘leakage’ to the sides of the modelling results, the restriction of the harbour wall will mean that this level will be considerably lower and the noise levels modelled directly outside the harbour will be the worst case. Additionally, the position modelled for the blasting is close to the mouth of the harbour. Where charges are detonated further from the open water, the noise levels will be lower than those modelled. Stated results for the maximum ranges in the tables in this section thus represent the maximum range to which the impact thresholds are reached at any trajectory from the entrance to the harbour.

Ranges listed as 260 m mean that the noise levels reach the coastline to the east of the modelling location before they reach the criteria, and these ranges are denoted with an asterisk.

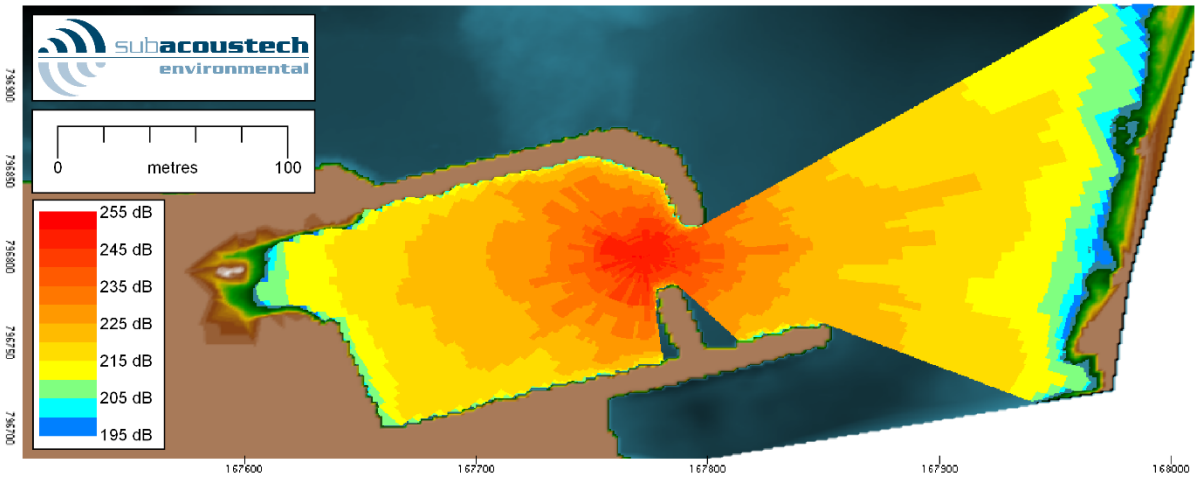

Figure 4-1 Contour plot showing the modelling unweighted SPL_{peak} noise from borehole blasting with a 60 kg charge weight in the Outer Harbour of Mallaig Harbour

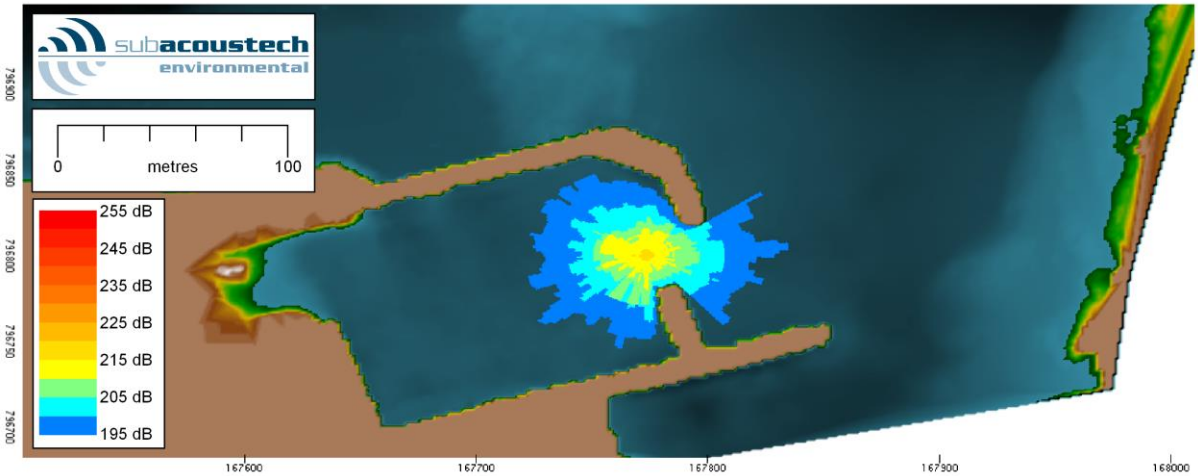

Figure 4-2 Contour plot showing the modelling unweighted SEL_{ss} noise from borehole blasting with a 60 kg charge weight in the Outer Harbour of Mallaig Harbour

4.1.1 Marine mammals

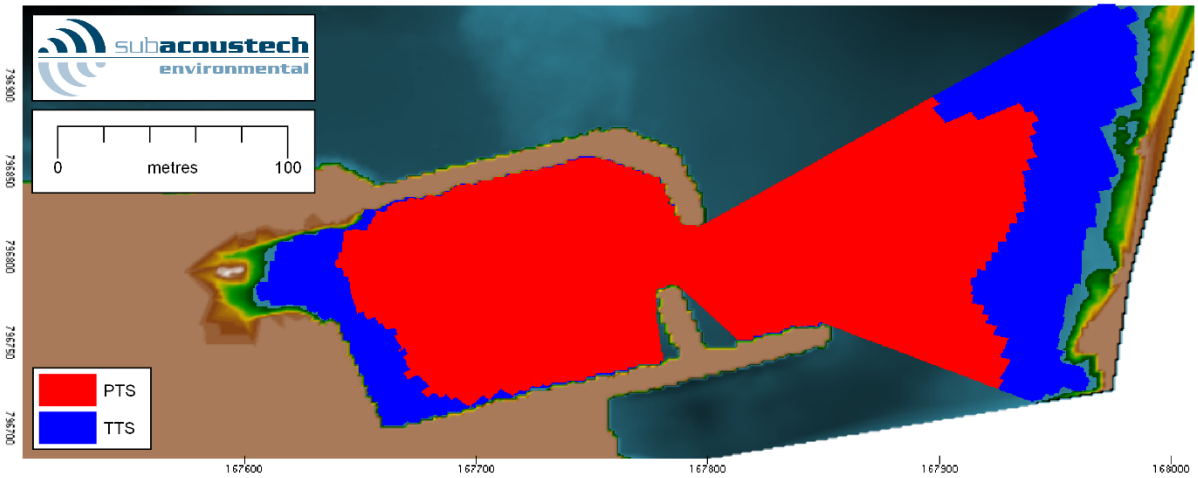

Figure 4-3 Modelled impact range contour plot for a 60 kg charge borehole blast considering PTS and TTS in Low-Frequency Cetaceans (LF) using the Southall et al. (2019) weighted SEL_{ss} criteria

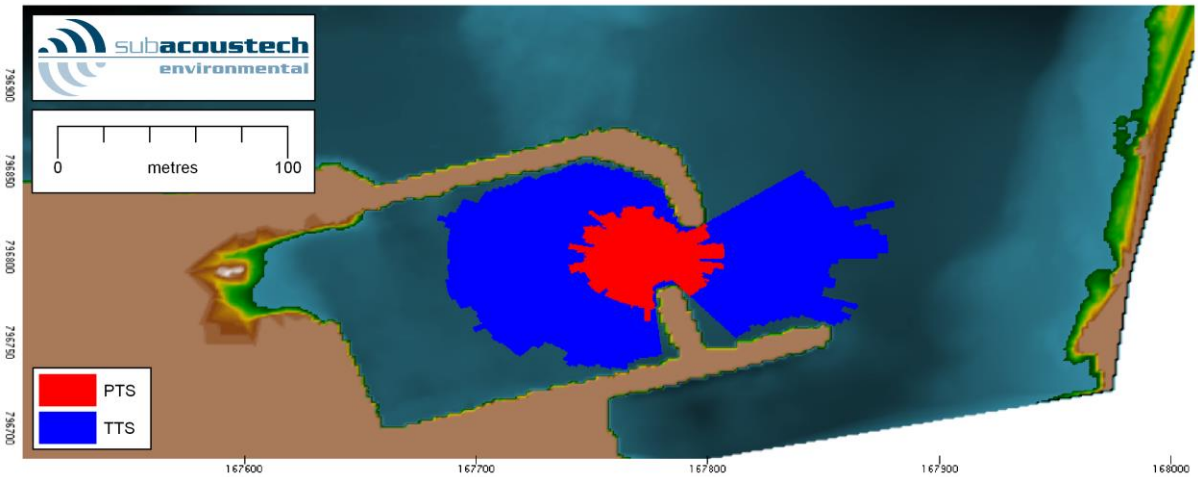

Figure 4-4 Modelled impact range contour plot for a 60 kg charge borehole blast considering PTS and TTS in High-Frequency Cetaceans (HF) using the Southall et al. (2019) weighted SEL_{ss} criteria

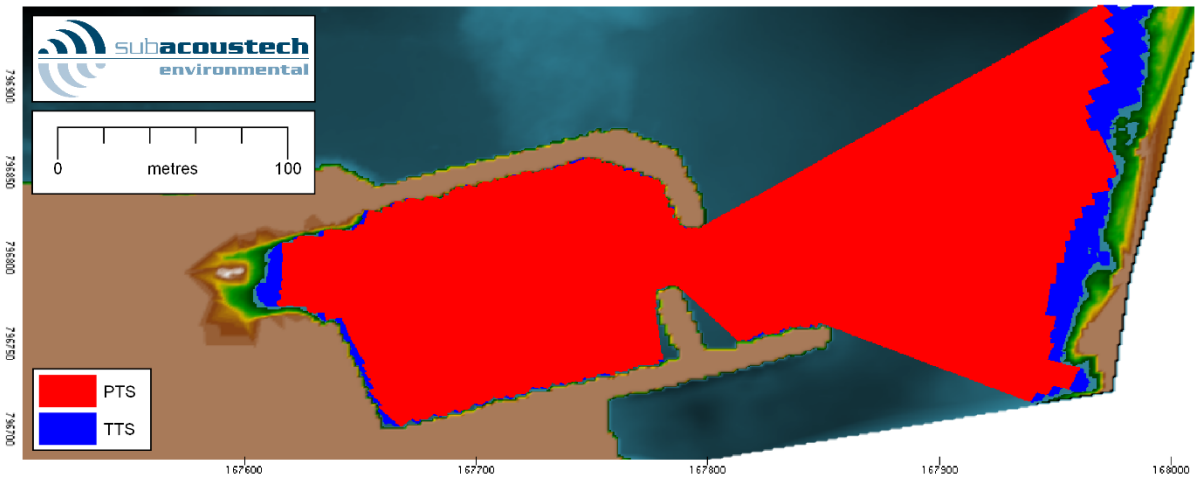

Figure 4-5 Modelled impact range contour plot for a 60 kg charge borehole blast considering PTS and TTS in Very High-Frequency Cetaceans (VHF) using the Southall et al. (2019) weighted SEL_{ss} criteria

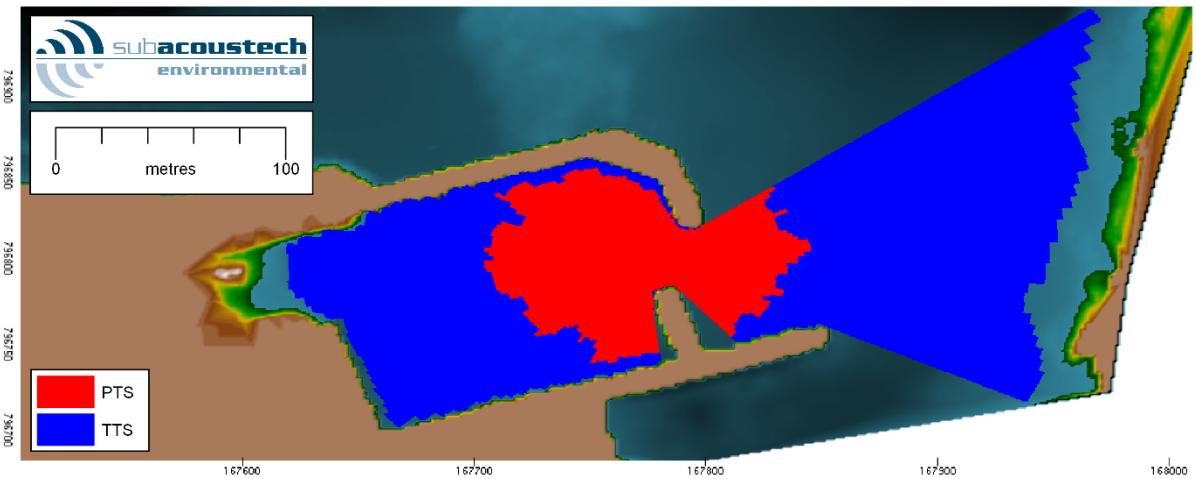

Figure 4-6 Modelled impact range contour plot for a 60 kg charge borehole blast considering PTS and TTS in Phocid Pinnipeds in Water (PCW) using the Southall et al. (2019) weighted SEL_{ss} criteria

Southall *et al*. (2019) Unweighted SPL_{peak} (Impulsive)			**Maximum range (m)**
PTS	LF cetacean	219 dB re 1 µPa	150 m
	HF cetacean	230 dB re 1 µPa	60 m
	VHF cetacean	202 dB re 1 µPa	260 m*
	Phocid pinniped	218 dB re 1 µPa	160 m
TTS	LF cetacean	213 dB re 1 µPa	230 m
	HF cetacean	224 dB re 1 µPa	90 m
	VHF cetacean	196 dB re 1 µPa	260 m*
	Phocid pinniped	212 dB re 1 µPa	230 m

Table 4-1 Summary of the impact ranges from borehole blasting for marine mammals using the impulsive Southall et al. (2019) unweighted SPLpeak criteria

Southall *et al*. (2019) Weighted SEL_{ss} (Impulsive)			**Maximum range (m)**
PTS	LF cetacean	183 dB re 1 µPa	170 m
	HF cetacean	185 dB re 1 µPa	30 m
	VHF cetacean	155 dB re 1 µPa	240 m
	Phocid pinniped	185 dB re 1 µPa	70 m
TTS	LF cetacean	168 dB re 1 µPa	260 m*
	HF cetacean	170 dB re 1 µPa	110 m
	VHF cetacean	140 dB re 1 µPa	260 m*
	Phocid pinniped	170 dB re 1 µPa	240 m

Table 4-2 Summary of the impact ranges from borehole blasting for marine mammals using the impulsive Southall et al. (2019) weighted SEL_{ss} criteria

4.1.2 Fish

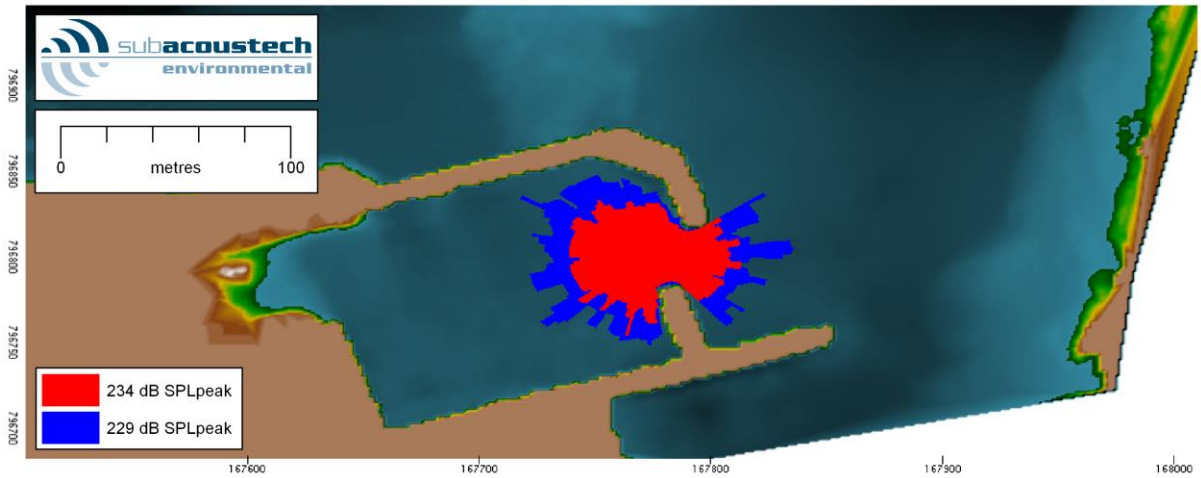

Figure 4-7 Modelled impact range contour plot for a 60 kg charge borehole blast considering mortality and potential mortal injury in fish using the Popper et al. (2014) unweighted SPL_{peak} criteria for explosions

Popper *et al*. (2014) Unweighted SPL_{peak} (Explosions)		**Maximum range (m)**
All fish groups and sea turtles Mortality and potential mortal injury	234 dB re 1 µPa	40 m
	229 dB re 1 µPa	70 m

Table 4-3 Summary of the impact ranges from borehole blasting for fish using the Popper et al. (2014) SPL_{peak} criteria for explosions

4.1.3 Discussion

The majority of the impact ranges for borehole blasting clearly cover the entire enclosed Outer Harbour area, as well as the direct line of sight to the east of the harbour towards the coast. Although the above figures do not show sound extending beyond the line-of-sight of the modelling location, the sound from the blasting will enter these areas. It is also likely that a much lower level of noise will be transmitted through and under the harbour walls into the open water to the north of the Outer Harbour. The contribution of noise from this additional path is expected to be negligible compared to the direct path as the worst-case scenario.

The results presented above for borehole blasting are based on the maximum predicted noise level in the water column. This approach has been used as it is not possible to predict the depth at which a marine mammal will be at the time of a single impulsive event. Due to the blast occurring in the seabed, the maximum noise levels are expected to be at the bottom of the water column, closest to the noise source.

Given the proximity to harbour walls and areas of coast, only the maximum ranges have been presented in the tables above. Any attempt to present a mean range would be subject to considerable bias from many very short transects and would therefore be misleading. Due to the geographically constricted location, the greatest distance modelled from the blasting location was 260 m, with the majority of transects around the source centre-point being less than 200 m.

4.2 Dredging

Underwater noise from backhoe dredging activity has been modelled using Subacoustech's SPEAR model. This is a simple model which uses Subacoustech Environmental's measurement database to estimate noise levels with range.

For cumulative criteria, impact ranges have been calculated for a stationary animal and are based on 12 hours of operation in any 24-hour period. The predicted ranges are given in Table 4-4 and Table 4-5. A maximum TTS range is predicted out to 30 m from backhoe dredging activities for the LF cetacean marine mammal hearing group. It is worth noting that a receptor in this group would have to stay at a range closer than 20 m from the noise source for 12 hours in order to receive a TTS effect, and so the risk of any PTS as a result of dredging is considered negligible.

Southall *et al*. (2019) Weighted SEL_{cum} (Non-impulsive)			**Impact range (m)** Stationary receptor
PTS	LF cetacean	199 dB re 1 µPa	< 10 m
	HF cetacean	198 dB re 1 µPa	< 10 m
	VHF cetacean	173 dB re 1 µPa	< 10 m
	Phocid pinniped	201 dB re 1 µPa	< 10 m
TTS	LF cetacean	179 dB re 1 µPa	20 m
	HF cetacean	178 dB re 1 µPa	< 10 m
	VHF cetacean	153 dB re 1 µPa	< 10 m
	Phocid pinniped	181 dB re 1 µPa	< 10 m

Table 4-4 Summary of the impact ranges from backhoe dredging for marine mammals using the non-impulsive Southall et al. (2019) weighted SEL_{cum} criteria assuming a stationary receptor

Popper *et al*. (2014) Unweighted SPL_{RMS} (Continuous sound)		**Impact range (m)**
Fish: swim bladder involved in hearing Recoverable injury	170 dB re 1 µPa (48 hours)	< 10 m
Fish: swim bladder involved in hearing TTS	158 dB re 1 µPa (12 hours)	< 10 m

Table 4-5 Summary of the impact ranges from backhoe dredging for fish using the Popper et al (2014) SPL_{RMS} criteria for continuous sound

5 Summary and conclusions

Subacoustech Environmental has undertaken a study of underwater noise propagation for Affric covering borehole blasting and dredging activities as part of harbour deepening operations in Mallaig Harbour, western Scotland.

Noise levels have been assessed in terms of the criteria provided by Southall *et al*. (2019) for marine mammals and Popper *et al*. (2014) for fish and sea turtles. In the case of the Southall *et al*. (2019) criteria, the 1/3rd octave band spectrum of the source level has been weighted according to the LF, HF, VHF, and PCW frequency weightings stipulated in the guidelines

The level of underwater noise from borehole blasting has been estimated using a parabolic equation (PE) method for lower frequencies and a ray tracing solution at higher frequencies. The modelling considers a wide variety of input parameters including source level noise, frequency content, seabed properties and the sound speed profile in the water column. Full account is taken of the bathymetry in the surrounding area. A representative location in the Outer Harbour has been modelled to give worst case ranges.

The modelling showed that the majority of the potential impact ranges for borehole blasting cover the entire Outer Harbour area, as well as the channel to the east of the harbour towards the coast. It is also likely that the blast noise will extend further into the open channel of Mallaig Harbour to the east, and a portion of the sound may travel through the harbour wall into the waters to the north. For a worst-case scenario, the modelled impact ranges can be considered to extend in any direction, although will in practice be significantly lower where line-of-sight is broken.

A simple modelling approach has been carried out to assess the effects of backhoe dredging in the area. This showed that a stationary receptor would have to stay at a range 20 m or closer for 12 hours in order to receive a noise exposure equivalent to the TTS threshold.

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Appendix 5 - Marine Mammal Mitigation Plan

Mallaig Outer Harbour Improvements – Marine Mammal Mitigation Plan (MMMP)

MALLAIG HARBOUR AUTHORITY

Date: 02/03/2022

MALLAIG HARBOUR AUTHORITY

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Document Control

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Author	Jack Clarkson	Senior Environmental Consultant	[redacted]	02/03/2022
Reviewer	Fiona Henderson	Director		02/03/2022
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MALLAIG HARBOUR AUTHORITY

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Contents

1 Introduction

This Marine Mammal Mitigation Plan (MMMP) has been produced on behalf of Mallaig Harbour Authority (MHA) for the proposed Mallaig Outer Harbour Improvements (MOHI) development. This document fulfils the requirement for a MMMP requested within the Screening Opinion issued for the MOHI development.

All UK cetacean species are listed under Annex IV of the European Habitats Directive and are therefore included in Schedule 2 of the Habitats Regulations 1994 as European Protected Species (EPS). Under regulation 39(1) of the Habitats Regulations 1994, it is an offence to deliberately or recklessly kill, injure, harass, or disturb an EPS.

Pinnipeds are not listed as Annex IV EPS species under the Habitats Directive however, both common and grey seals are included in Annex II, meaning that their core habitat must be protected under the Natura 2000 Network and managed in accordance with their ecological requirements. Under the Marine (Scotland) Act 2010, it is an offence to kill, injure or take a seal, as well as to deliberately or recklessly harass a seal at a significant haul out site.

In line with best practice, the marine mammal mitigation plan will also apply to basking shark (*Cetorhinus* maximus) and otter (*Lutra lutra*). Basking sharks are afforded full protection under Schedule 5 of the Wildlife and Countryside Act 1981. Otter are listed as a European Protected Species and are afforded full protection under the European Directive 92/43/EEC (the Habitats Directive). It is possible that both species may also be present within the vicinity of the proposed development. Records of basking shark and otter have been identified within close proximity to Mallaig Harbour.

The mitigation measures within this MMMP are based on the Joint Nature Conservation Committee's (JNCC) Statutory nature conservation agency protocol for minimising the risk of injury to marine mammals from piling noise (JNCC, 2010). The mitigation proposed takes into account the assessment of underwater noise included within the MOHI Supporting Document submitted with the Marine Licence application.

2 Blasting

2.1 Mitigation Strategy

The use of two Marine Mammal Observers (MMOs) has been proposed due to the nature of blasting being a loud impulsive and potentially startling sound. During blasting, no vessels will be moving within the area and blasts themselves will last seconds (<10s). However, it is recognised that a startled/panicked animal could still collide with a stationary item and cause harm to itself.

2.2 Mitigation Plan

The blasting mitigation is as follows:

- A 300m mitigation zone will be established around the location of the blast (see Drawing 69.01.07 in Appendix 1). In addition, the mitigation zone will include the inner harbour area;
- Trained MMOs will conduct a 20-minute pre-watch prior to the commencement of blasting operations;

- One of these MMOs will be positioned on the outer quay throughout the entire watch, providing a view to the north and the inner harbour area.
- A second MMO will be mobile, walking the coastline or, on a boat within the inner harbour, checking the inner harbour area including the marina, around vessels and below the fish pier where seals are known to reside.
- If the 300m mitigation zone and inner harbour remains clear of marine mammals during the watches, permission will be given to commence blasting.
- Watches must be carried out in visible conditions and appropriate sea state (i.e., light, no fog/harr reducing visibility, sea state ≤3 (Beaufort <4). It should be noted however, that a Beaufort level of >3 does not necessarily correspond to sea states in which visual observations cannot be undertaken. As such, care should be taken to ensure that visual techniques are utilised as much as possible to maximise the probability of detection of non-vocalising species within mitigation zones.

All marine mammal observations will be recorded using the JNCC marine mammal reporting forms template.

3 Piling

3.1 Mitigation Strategy

A Piling Marine Mammals and Basking Shark Protocol will be implemented during piling works in order to minimise the risk of disturbance to animals which may be in the vicinity of the proposed development site.

The mitigation measures are based on the Joint Nature Conservation Committee's (JNCC) Statutory nature conservation agency protocol for minimising the risk of injury to marine mammals from piling noise (JNCC, 2010). It is recognised that the standard Joint Nature Conservation Committee (JNCC) piling protocol is designed for offshore windfarm piling (JNCC 2010) and therefore the mitigation has been adapted as appropriate for piling within the confines of the Outer Harbour at Mallaig.

The JNCC protocol currently provides a disproportionate level of mitigation for the proposed piling works, which is not justified by the perceived risk to marine mammals (see Supporting Document). As such, the JNCC protocols has been modified in order to ensure the piling marine mammal mitigation is proportionate to the perceived risk to marine mammals, and not unduly restrictive. A summary of the changes made to the JNCC protocols, together with the supporting rationale is provided in Table 3.1.

Table 3.1: Summary of Modifications to the JNCC Piling Marine Mammal Protocols

Aspect	Change	Rationale
Mitigation Zone Radius	The mitigation zone has been amended from a 500m radius a to a zone appropriate to the complexity of the marine landscape, see Figure 3.1.	Piling noise source levels will be lower than that of blasting. Zones of PTS and TTS are therefore likely to be lower for each marine mammal species during piling operations when compared with blasting of rock. In addition, the areas to be piled are located within the confines of the Outer Harbour walls with piles being installed into pre-drilled sockets and through reclaimed ground. Noise will be absorbed in part by infill material

Aspect	Change	Rationale
		and the harbour walls, resulting in limited propagation of sound outwith the Outer Harbour area. As such, the mitigation zone will only encompass the area within the Outer Harbour walls, and a small area immediately outwith the Outer Harbour area. The zone outwith the Outer Harbour is bounded by the coastline to the east, the Inner Harbour to the south and a shallow channel to the north with skerries bordering it, see Figure 3.1.
Pre-Watch Duration	The duration of the pre watch (both visual and acoustic) is reduced from 30min to 20min.	The 30min pre watch is designed to maximise detection probability within the mitigation and allow for deeper diving marine mammals which may be present in the zone, but submerged and undetectable for extended periods. However, given that water depths within the 300m zone do not exceed 20m, so prolonged deep dives cannot occur. In addition, the reduction of the mitigation zone to 300m increases detection probability within the mitigation zone. Therefore, a 20min watch is sufficient to ensure the mitigation zone is clear of marine mammals. A 30min watch will not increase detection probability but will result in unwarranted delays to operations.
Delays After Detection in Mitigation Zone	The delay following a detection within the mitigation zone during the pre-watch is reduced from 20min to 10min.	For the reasons stated above, a period of 10min following the last detection within the mitigation zone provides sufficient confidence that the mitigation zone is clear of marine mammals, allowing piling to commence.
Soft Start	No soft start will be provided.	The purpose of the soft start is to allow animals which may be present (but undetected) within the injury zones to move away before full power piling is reached. However, given the shallow waters, significantly reduced acoustic injury zones (compared to windfarm piling operations), the mitigation zone, and low anticipated marine mammal densities, the risk of an animal being present but undetected within the injury zone is extremely low. As such, additional delays resulting from implementing a soft start is not justified by a meaningful reduction in marine mammal risk for this development. It should be noted that vibro piling will be used with percussive only used in final stages and therefore vibro piling in itself would act as a soft start.

3.2 Mitigation Plan

The piling mitigation is as follows:

- Mitigation zones are established within the Outer Harbour walls, and a small area immediately outwith the Outer Harbour area. The zone outwith the Outer Harbour is bounded by the coastline to the east, the Inner Harbour to the south and a shallow channel to the north with skerries bordering it (see Figure 3.1);

- A single trained marine mammal observer (MMO) will conduct a 20-minute pre-watch prior to the commencement of piling operations;
    - The MMO will be positioned on the outer breakwater quay throughout the entire watch where the confines of the Outer Harbour, the waters to the north of the Outer harbour, and the waters to the east can all be observed to the north;
    - If the designated mitigation zones remain clear of marine mammals during the watches, permission will be given to commence piling.
    - Watches must be carried out in visible conditions and appropriate sea state (i.e., light, no fog/harr reducing visibility, sea state ≤3 (<Beaufort 4). As aforementioned, a Beaufort level of >3 does not necessarily correspond to sea states in which visual observations cannot be undertaken. As such, care should be taken to ensure that visual techniques are utilised as much as possible to maximise the probability of detection of non-vocalising species within mitigation zones.

All Marine Mammal Observations will be recorded using the JNCC marine mammal reporting forms template.

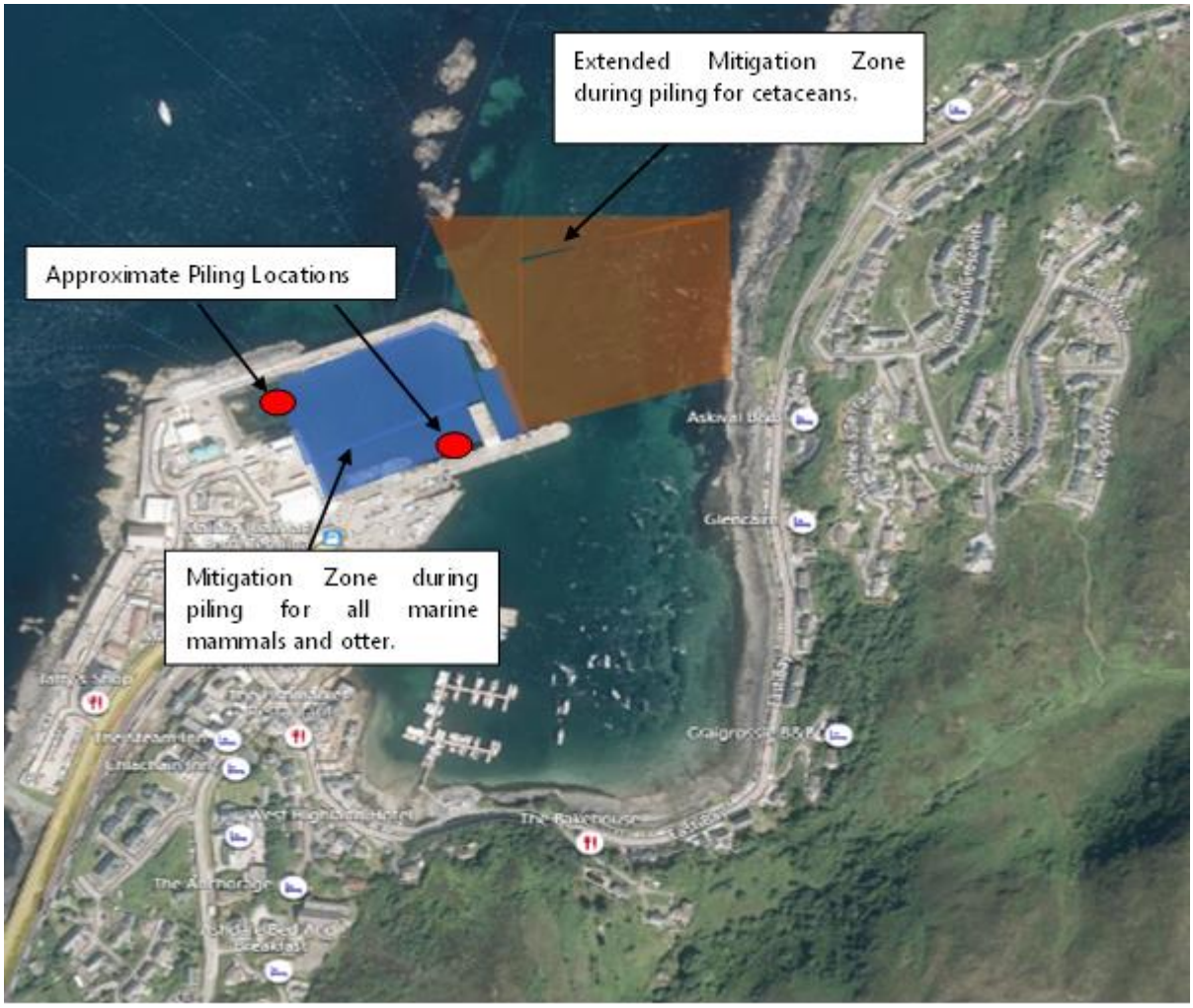


Figure 3.1: Amended mitigation zone for Mallaig Harbour during piling works

4 Spoil Disposal

4.1 Mitigation Strategy

As the Armadale spoil ground is situated approximately ~250m from land, consideration can be given in conducting marine mammal watches from land to remove the need for watches to be conducted from the vessel. Passive Acoustic Monitoring (PAM) will not be required during spoil disposal, as disposal activities are unlikely to take place during the night or in adverse weather conditions. In addition, PAM systems will not detect basking shark, seals, or otter. However, if the spoil disposal contractor wishes to dispose during the night, then it would be up to the contractor to arrange a PAM system to be in place during these disposal events.

4.2 Mitigation Plan

At this stage, spoil disposal marine mammal mitigation will provide the following measures and will apply to cetaceans (whales, dolphins, porpoise), seals, basking shark, and otter:

- A 250m mitigation zone will be established around the disposal vessel during disposal. A mitigation zone is placed around the vessel as opposed to the disposal site as the vessel will be in transit during disposal;
- Trained marine mammal observers (MMO) will conduct a 20min pre-watch prior to the commencement of spoil disposal, either on board the disposal vessel or from land;
    - If the 250m mitigation zone remains clear of marine mammals and/or basking shark during the watch, permission will be given to commence disposal; and
    - If animals are sighted within the mitigation zone, disposal will be delayed until the zone has been clear of marine mammals for at least 5min.
    - Spoil disposal events will only occur when the visible conditions and sea state are conducive for visual mitigation practices (i.e., daylight hours, visibility to 500m from the observation point on land, and graded sea states of ≤3 (Beaufort <4). As aforementioned, a Beaufort level of >3 does not necessarily correspond to sea states in which visual observations cannot be undertaken. As such, care should be taken to ensure that visual techniques are utilised as much as possible to maximise the probability of detection of non-vocalising species within mitigation zones.

If the spoil disposal contractor wishes to dispose during the night, then:

- Passive acoustic monitoring (PAM) will be utilised by a trained PAM operator to monitor the mitigation zone, should disposals be occurring;
    - A PAM watch of the mitigation zone will have a minimum duration of 20min;
    - If a marine mammal is detected within the mitigation zone during a PAM watch, disposal will be delayed until the zone has been clear of marine mammals, basking sharks and/or otter for at least 10min.

All MMO/PAM operations will be recorded using the JNCC marine mammal reporting forms template and submitted to Marine Scotland once the works are complete.

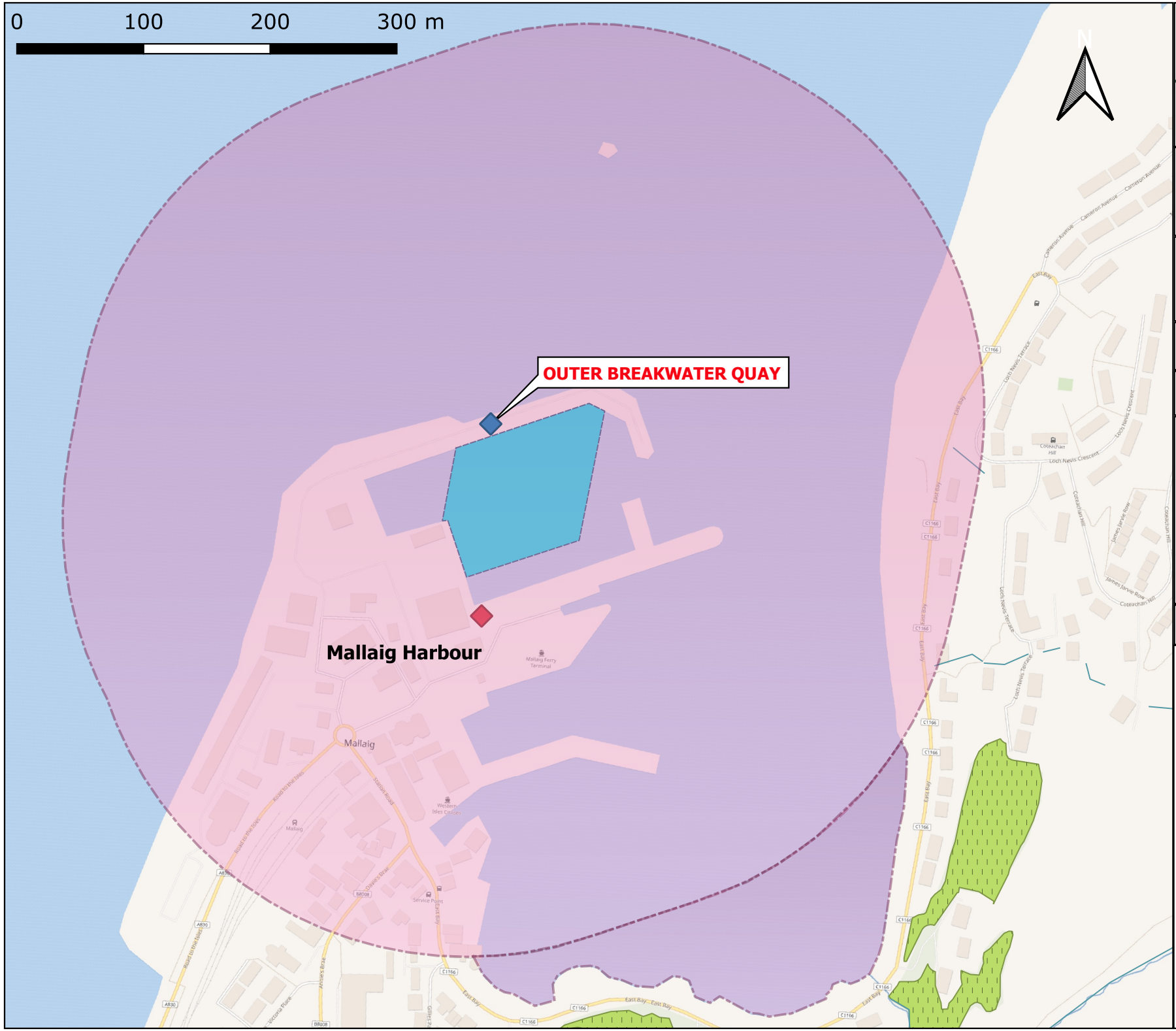
5 References

JNCC. (2010). Statutory nature conservation agency protocol for minimising the risk of injury to marine mammals from piling noise. https://data.jncc.gov.uk/data/31662b6a-19ed-4918-9fab-8fbcff752046/JNCC-CNCB-Piling-protocol-August2010-Web.pdf

6 Glossary

Acronym	Definition
EPS	European Protected Species
JNCC	Joint Nature Conservation Committee
m	metres
MOHI	Mallaig Outer Harbour Improvements
MMO	Marine Mammal Observer

Drawing



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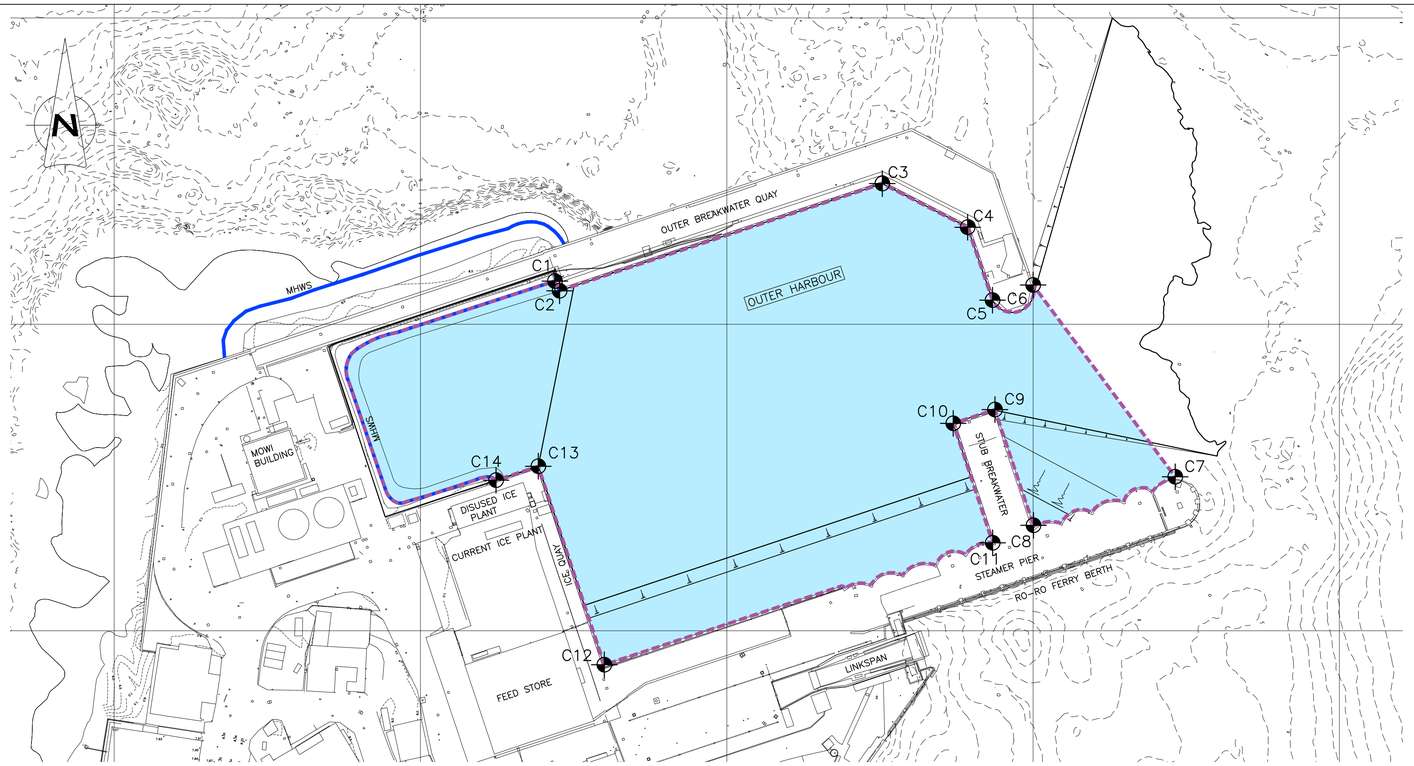
Title: 69.01.07 Marine Mammal Exclusion Zone

Projection: OSGB 1936/British National Grid EPSG: 27700

Page 1	Rev No: 1	Drawing Date: 28/02/2022

- Mallaig Harbour Location
- Blast Area
- MMO Watch Zone
- Tidal Water

Drawings



MARINE CONSTRUCTION LICENCE SITE BOUNDARY

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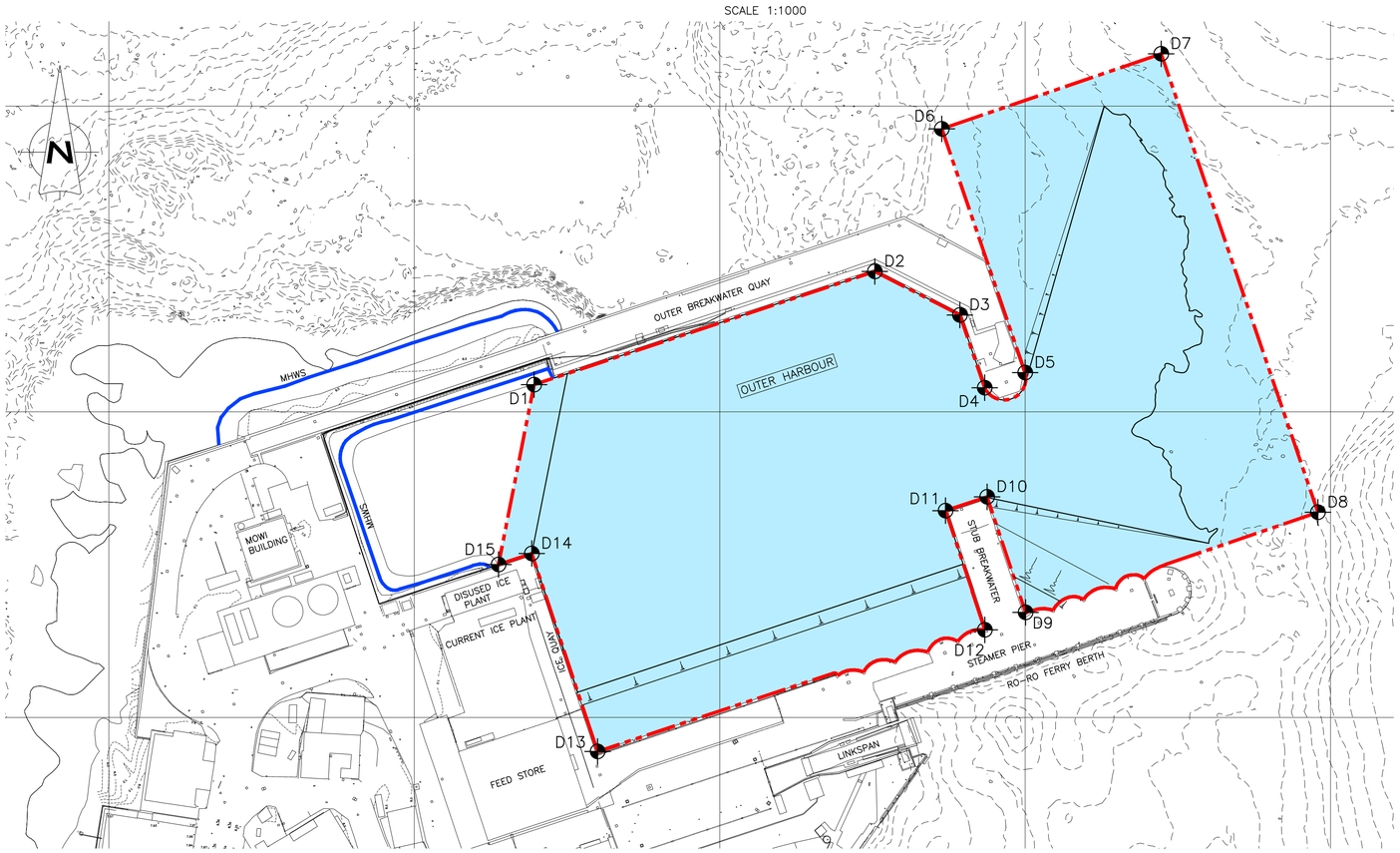

DREDGE LICENCE SITE BOUNDARY

SCALE 1:1000

MARINE CONSTRUCTION LICENCE COORDINATES		
POINT	LATITUDE LONGITUDE	NATIONAL GRID REF
C1	N57°0.497' W05°49.706'	NM 67644 97314
C2	N57°0.495' W05°49.704'	NM 67645 97311
C3	N57°0.517' W05°49.603'	NM 67751 97346
C4	N57°0.511' W05°49.574'	NM 67779 97332
C5	N57°0.498' W05°49.565'	NM 67787 97308
C6	N57°0.501' W05°49.552'	NM 67800 97313
C7	N57°0.469' W05°49.503'	NM 67846 97250
C8	N57°0.459' W05°49.548'	NM 67800 97234
C9	N57°0.479' W05°49.562'	NM 67788 97272
C10	N57°0.476' W05°49.575'	NM 67774 97268
C11	N57°0.455' W05°49.561'	NM 67787 97229
C12	N57°0.430' W05°49.683'	NM 67660 97189
C13	N57°0.464' W05°49.708'	NM 67638 97254
C14	N57°0.462' W05°49.721'	NM 67625 97249

DREDGE LICENCE COORDINATES		
POINT	LATITUDE LONGITUDE	NATIONAL GRID REF
D1	N57°0.494' W05°49.710'	NM 67639 97309
D2	N57°0.517' W05°49.603'	NM 67751 97346
D3	N57°0.511' W05°49.574'	NM 67779 97332
D4	N57°0.498' W05°49.565'	NM 67787 97308
D5	N57°0.501' W05°49.552'	NM 67800 97313
D6	N57°0.543' W05°49.583'	NM 67773 97393
D7	N57°0.559' W05°49.514'	NM 67845 97417
D8	N57°0.479' W05°49.455'	NM 67896 97267
D9	N57°0.459' W05°49.548'	NM 67800 97234
D10	N57°0.479' W05°49.562'	NM 67788 97272
D11	N57°0.476' W05°49.575'	NM 67774 97268
D12	N57°0.455' W05°49.561'	NM 67787 97229
D13	N57°0.430' W05°49.683'	NM 67660 97189
D14	N57°0.464' W05°49.708'	NM 67638 97254
D15	N57°0.462' W05°49.719'	NM 67628 97250

GENERAL NOTES

1. ALL LEVELS ARE IN METRES AND RELATE TO CHART DATUM.
2. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
3. TIDE LEVELS, ARE AS FOLLOWS
   HAT +5.6mCD
   MHWS +5.0mCD
   MLWS +0.8mCD
   LAT 0.0mCD
4. CHART DATUM IS 2.62m BELOW ORDNANCE DATUM.
5. LEVEL INFORMATION BASED ON ASPECT SURVEYS BATHYMETRIC SURVEY DATED MAY 2016.

LEGEND

- MHWS (APPROX)
- DREDGE SITE BOUNDARY
- MARINE CONSTRUCTION LICENCE SITE BOUNDARY
- WORKS BELOW MHWS

REV	DATE	DETAILS	DRAWN	CHK'D	APP'D

AMENDMENTS

CLIENT
MALLAIG HARBOUR AUTHORITY

PROJECT
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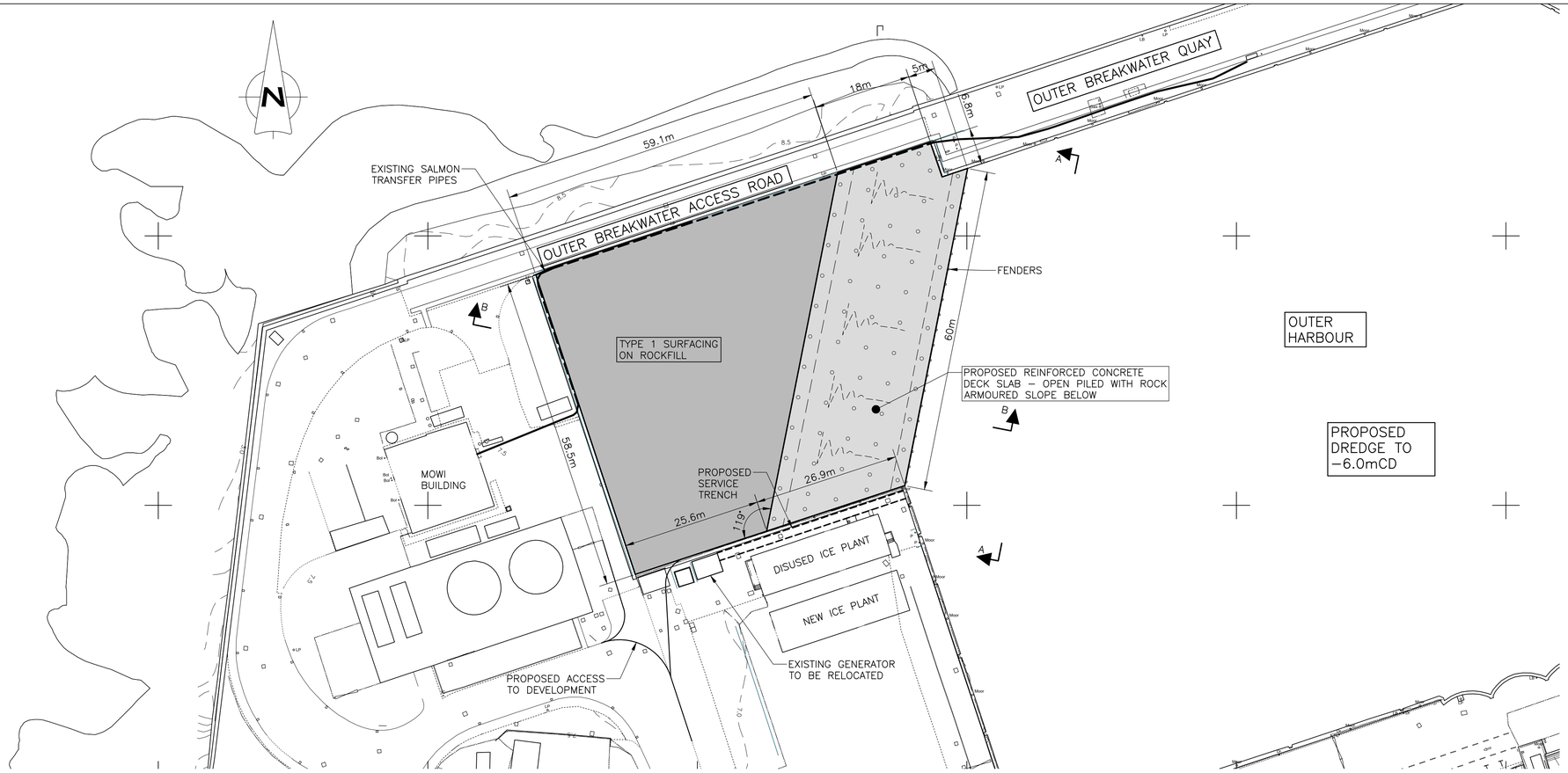
DRAWING TITLE
PROPOSED DREDGE LICENCE BOUNDARY & MARINE CONSTRUCTION LICENCE BOUNDARY

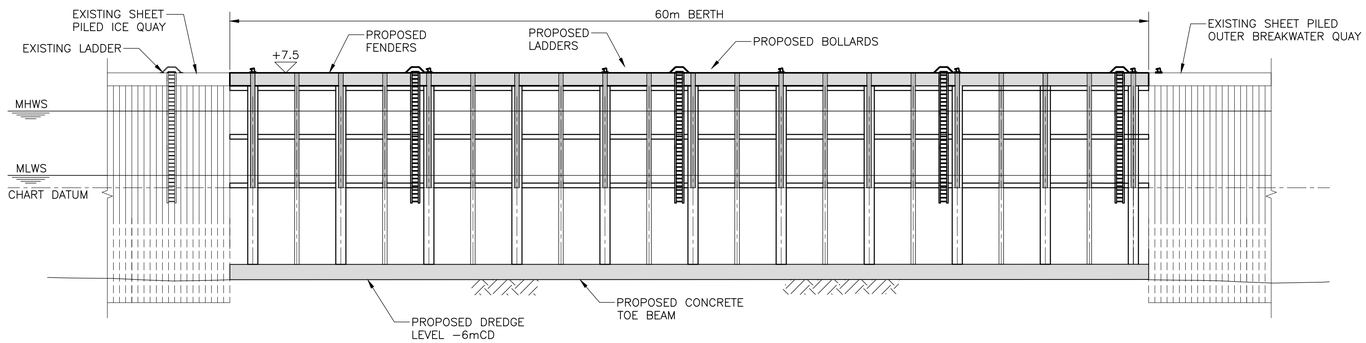
DRAWN	CHECKED	APPROVED
TC	RD	GB
DATE OCT 21	DATE OCT 21	DATE OCT 21
SCALE (A1) AS SHOWN	STAGE PRELIMINARY	REV P01

DRAWING No.
MOHI-WS2175-XX-XX-D-C-9106



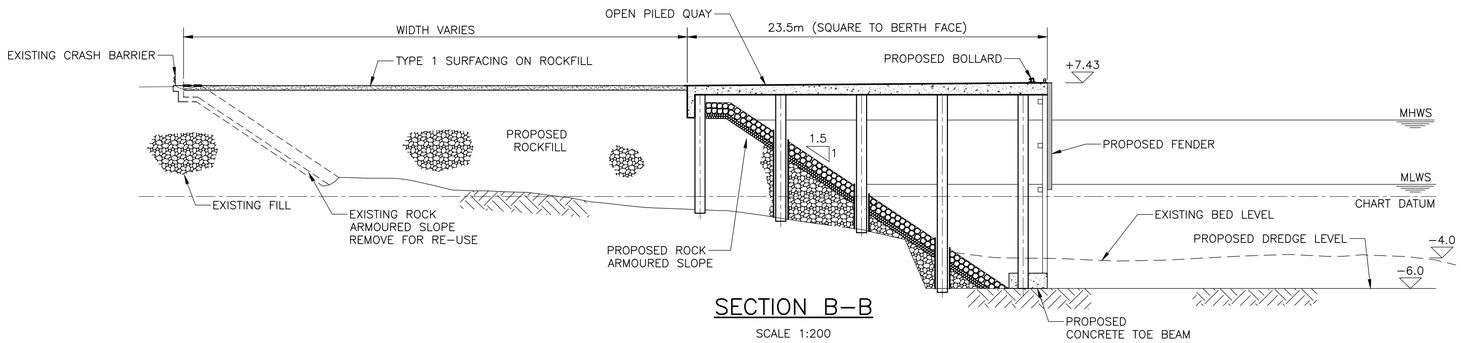
PLAN

SCALE 1:500



SECTIONAL ELEVATION A–A

SCALE 1:200



SECTION B–B

SCALE 1:200

GENERAL NOTES

1. ALL LEVELS ARE IN METRES AND RELATE TO CHART DATUM.
2. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
3. TIDE LEVELS, ARE AS FOLLOWS
   HAT +5.6mCD
   MHWS +5.0mCD
   MLWS +0.8mCD
   LAT 0.0mCD
4. CHART DATUM IS 2.62m BELOW ORDNANCE DATUM.
5. LEVEL INFORMATION BASED ON ASPECT SURVEYS BATHYMETRIC SURVEY DATED MAY 2016.

REV	DATE	DETAILS	DRAWN	CHK'D	APP'D
P02	11.12.20	GENERAL REVISIONS	JA	EC	GB

AMENDMENTS

CLIENT
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DRAWING TITLE
OUTER HARBOUR SPLAY BERTH GENERAL ARRANGEMENT

DRAWN	CHECKED	APPROVED
TC	EC	GB
DATE OCT 20	DATE DEC 20	DATE DEC 20
SCALE (A1) AS SHOWN	STAGE PRELIMINARY	REV P02

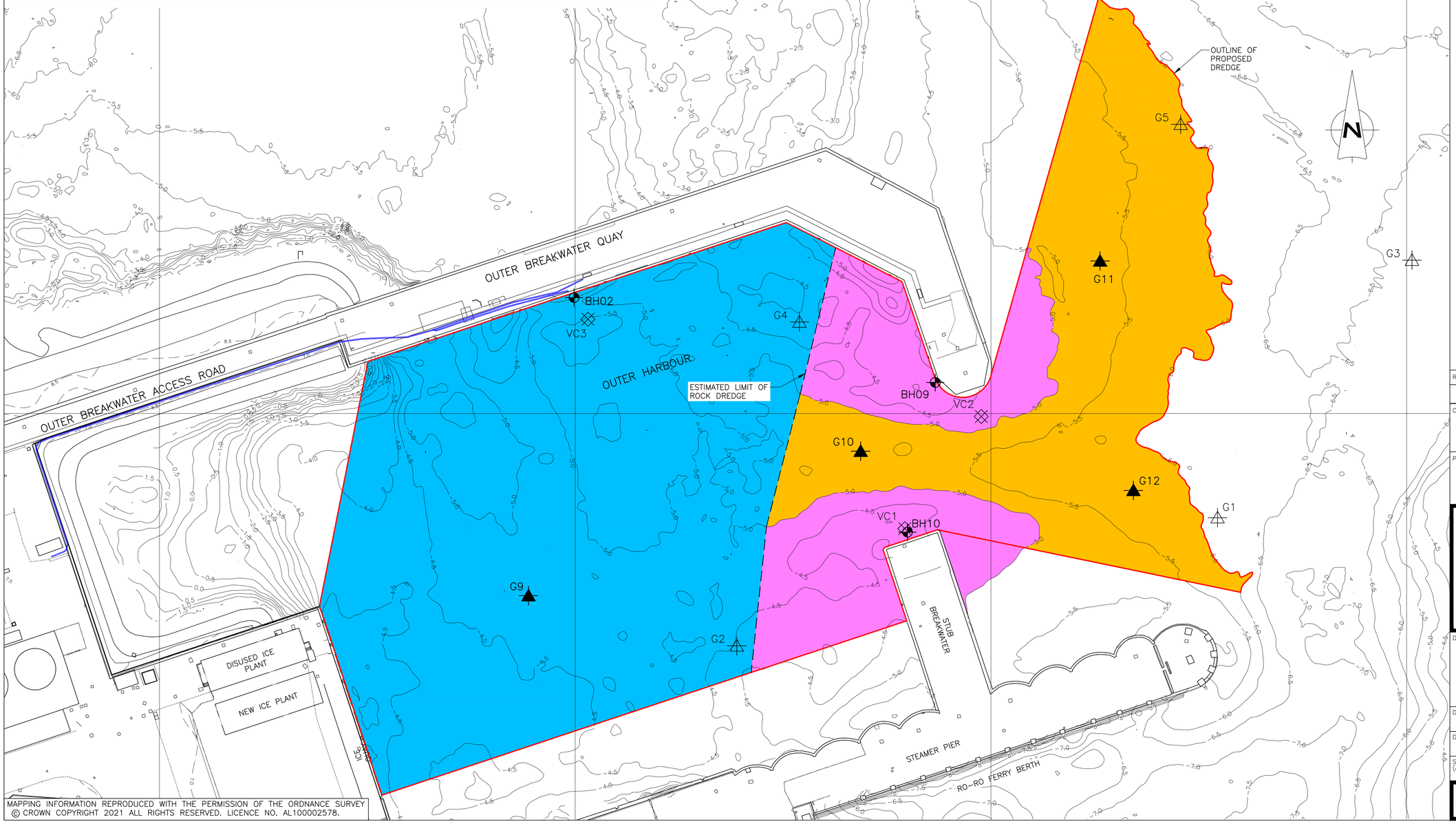
DRAWING No.
MOHI–WS2175–XX–00–DR–C–9104

PREVIOUS PRE-DREDGE SAMPLE INFORMATION (NOV 2013/14)

SAMPLE NO.	TYPE	APPROX. BED LEVEL (mCD) (2013 SURVEY)	BASE SAMPLE LEVEL (mCD)	EASTINGS	NORTHINGS	DEGREES & MINUTES	REMARKS
VC1	VIBROCORE	−4.20	−5.72	167779.299	797272.316	57° 00.478' N 5° 49.571' W	
VC2	VIBROCORE	−4.80	−6.93	167797.692	797299.284	57° 00.493' N 5° 49.555' W	
VC3	VIBROCORE	−5.30	−5.69	167703.065	797322.672	57° 00.503' N 5° 49.649' W	
G1	VAN VEEN GRAB	−6.10	−6.10	167854.513	797274.964	57° 00.482' N 5° 49.498' W	
G2	VAN VEEN GRAB	−4.40	−4.40	167738.881	797244.152	57° 00.462' N 5° 49.610' W	
G3	VAN VEEN GRAB	−6.20	−6.20	167901.269	797336.861	57° 00.516' N 5° 49.455' W	NOT WITHIN PROPOSED DREDGED AREA
G4	VAN VEEN GRAB	−4.50	−4.50	167753.936	797322.001	57° 00.504' N 5° 49.600' W	
G5	VAN VEEN GRAB	−5.90	−5.90	167845.630	797369.528	57° 00.532' N 5° 49.512' W	
G6	VAN VEEN GRAB	−5.40	−5.40	167799.123	797417.161	57° 00.557' N 5° 49.560' W	NOT WITHIN PROPOSED DREDGED AREA
G7A	VAN VEEN GRAB	UNKNOWN	UNKNOWN	167826.673	797511.927	57° 00.608' N 5° 49.538' W	NOT WITHIN PROPOSED DREDGED AREA
G8A	VAN VEEN GRAB	UNKNOWN	UNKNOWN	167899.206	797622.411	57° 00.670' N 5° 49.473' W	NOT WITHIN PROPOSED DREDGED AREA

PROPOSED PRE-DREDGE SAMPLE INFORMATION

SAMPLE NO.	TYPE	APPROX. BED LEVEL (mCD) (2016 SURVEY)	BASE SAMPLE LEVEL (mCD)	EASTINGS	NORTHINGS	DEGREES & MINUTES	REMARKS
BH02	BOREHOLE	+4.50	−6.00	167699.713	797327.870	57° 00.505' N 5° 49.653' W	SAMPLING AND TESTING TO BE IN ACCORDANCE WITH MARINE SCOTLAND PRE-DREDGE SAMPLING GUIDANCE
BH09	BOREHOLE	−4.50	−6.00	167786.613	797307.466	57° 00.497' N 5° 49.567' W	SAMPLING AND TESTING TO BE IN ACCORDANCE WITH MARINE SCOTLAND PRE-DREDGE SAMPLING GUIDANCE
BH10	BOREHOLE	−4.50	−6.00	167779.919	797271.484	57° 00.478' N 5° 49.571' W	SAMPLING AND TESTING TO BE IN ACCORDANCE WITH MARINE SCOTLAND PRE-DREDGE SAMPLING GUIDANCE
G9	VAN VEEN GRAB	−4.90	−4.90	167688.761	797256.208	57° 00.467' N 5° 49.660' W	SAMPLING AND TESTING TO BE IN ACCORDANCE WITH MARINE SCOTLAND PRE-DREDGE SAMPLING GUIDANCE
G10	VAN VEEN GRAB	−5.70	−5.70	167768.670	797290.937	57° 00.488' N 5° 49.583' W	SAMPLING AND TESTING TO BE IN ACCORDANCE WITH MARINE SCOTLAND PRE-DREDGE SAMPLING GUIDANCE
G11	VAN VEEN GRAB	−5.30	−5.30	167826.255	797336.681	57° 00.514' N 5° 49.529' W	SAMPLING AND TESTING TO BE IN ACCORDANCE WITH MARINE SCOTLAND PRE-DREDGE SAMPLING GUIDANCE
G12	VAN VEEN GRAB	−5.20	−5.20	167834.272	797281.505	57° 00.485' N 5° 49.518' W	SAMPLING AND TESTING TO BE IN ACCORDANCE WITH MARINE SCOTLAND PRE-DREDGE SAMPLING GUIDANCE



GENERAL NOTES

1. ALL LEVELS ARE IN METRES AND RELATE TO CHART DATUM.
2. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
3. TIDE LEVELS, ARE AS FOLLOWS
   HAT +5.6mCD
   MHWS +5.0mCD
   MLWS +0.8mCD
   LAT 0.0mCD
4. CHART DATUM IS 2.62m BELOW ORDNANCE DATUM.
5. LEVEL INFORMATION BASED ON ASPECT SURVEYS BATHYMETRIC SURVEY DATED MAY 2016.
6. PREVIOUS PRE-DREDGE SAMPLES INFORMATION BASED ON ASPECT SURVEYS DATED DECEMBER 2013.
7. PROPOSED DREDGE −6mCD.

LEGEND

G1 = PREVIOUS 2013 VAN VEEN GRAB SAMPLE
VC1 = PREVIOUS 2013 VIBROCORE SAMPLE
G9 = PROPOSED VAN VEEN GRAB SAMPLE
BH09 = PROPOSED BOREHOLE
= SOFT DREDGE < 1m DEEP
= SOFT DREDGE UP TO 1.5m DEEP
= SOFT DREDGE < 1m DEEP AND ROCK ABOVE −6mCD

REV	DATE	DETAILS	DRAWN	CHK'D	APP'D

AMENDMENTS

CLIENT
MALLAIG HARBOUR AUTHORITY

PROJECT
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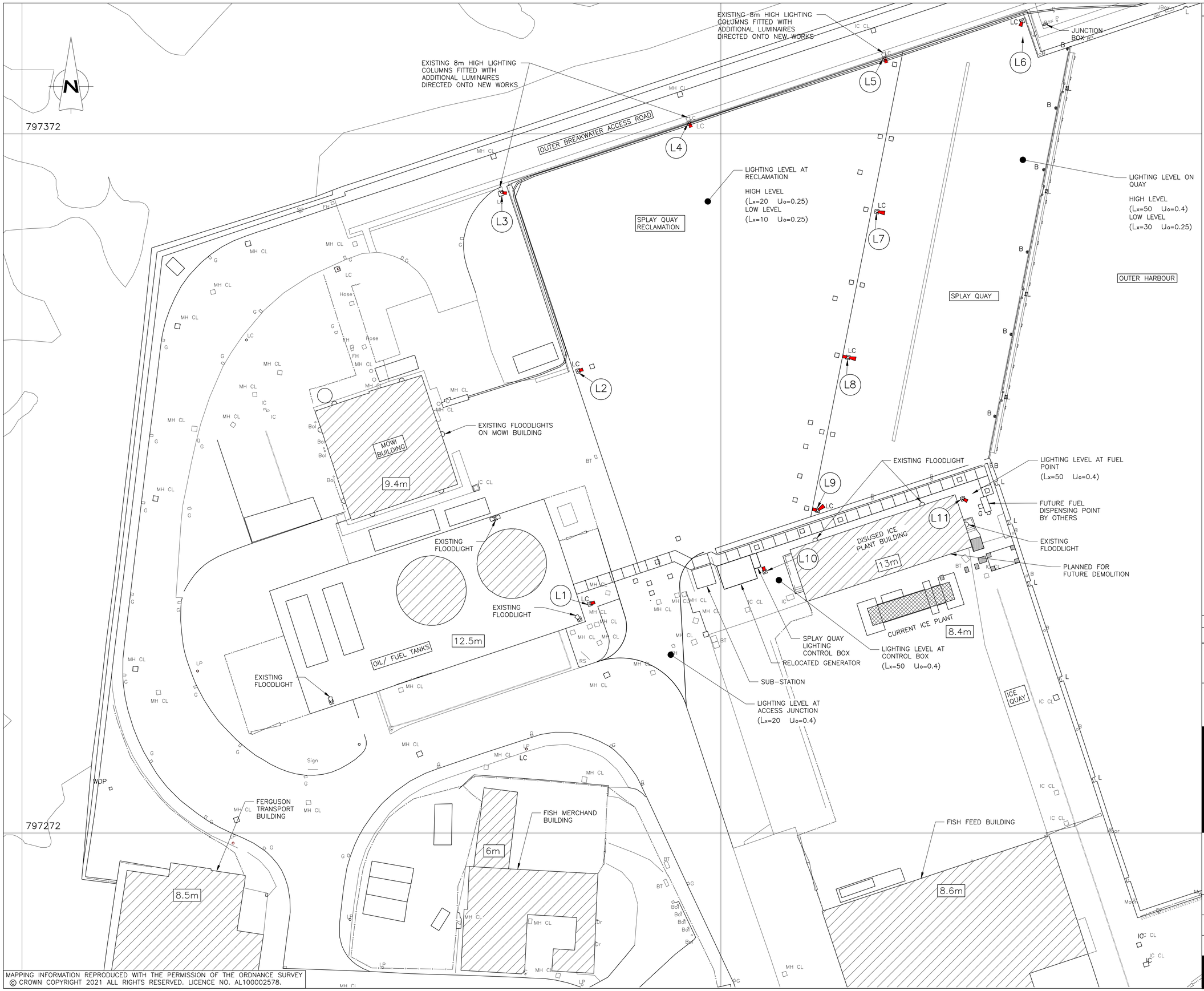
DRAWING TITLE
MARINE SCOTLAND PRE-DREDGE SAMPLING LOCATIONS

DRAWN	CHECKED	APPROVED
TC	EC	GB
DATE JUL 21	DATE JUL 21	DATE JUL 21
SCALE (A1) 1:500	STAGE PRELIMINARY	REV P01

DRAWING No.
MOHI-WS2175-XX-00-DR-C-0006



GENERAL NOTES

1. ALL LEVELS ARE IN METRES AND RELATE TO CHART DATUM.
2. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
3. TIDE LEVELS, ARE AS FOLLOWS

HAT	+5.6mCD	(+2.98mOD)
MHWS	+5.0mCD	(+2.38mOD)
MLWS	+0.8mCD	(−1.82mOD)
LAT	0.0mCD	(−2.62mOD)

4. CHART DATUM IS 2.62m BELOW ORDNANCE DATUM.
5. PROPOSED LIGHTING COLUMNS MAX 8m HIGH.
6. ALL NEW LIGHTING TO BE CONTROLLED BY A PHOTOCELL. SWITCHED ON AT LOW LIGHT TO 'HIGH LEVEL' AND REDUCED TO 'LOW LEVEL' USING AN OVERRIDE SWITCH AT LIGHTING CONTROL BOX.
7. LIGHTING COLUMNS L1, L2, L6, L7, L8, L9, L10 & L11 ARE ALL NEW.
8. LIGHTING COLUMNS L3, L4 & L5 ARE EXISTING WITH ADDITIONAL LUMINAIRES.

POINT FEATURE LEGEND:

PROPOSED LIGHTING COLUMN	LC	CATCH PIT	CP
MANHOLE	MH	EXISTING LIGHTING COLUMN	LC
DRAWPIT	DP	LUMINAIRE REFERENCE	L1
		BUILDING/STRUCTURE HEIGHT ABOVE ADJACENT GROUND	9.4m

REV	DATE	DETAILS	DRAWN	CHK'D	APP'D

AMENDMENTS

CLIENT
MALLAIG HARBOUR AUTHORITY

PROJECT
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DRAWING TITLE
PROPOSED LIGHTING SERVICES LAYOUT

DRAWN	CHECKED	APPROVED
AB	RD	GB
DATE SEP 21	DATE NOV 21	DATE NOV 21
SCALE (A1) 1:250	STAGE PRELIMINARY	REV P01

DRAWING No.
MOHI-WS2175-XX-XX-D-C-9007