Lochmaddy Ferry Terminal Upgrade Environmental Impact Assessment Report

COMHAIRLE NAN EILEAN SIAR

Volume 2

Main Document

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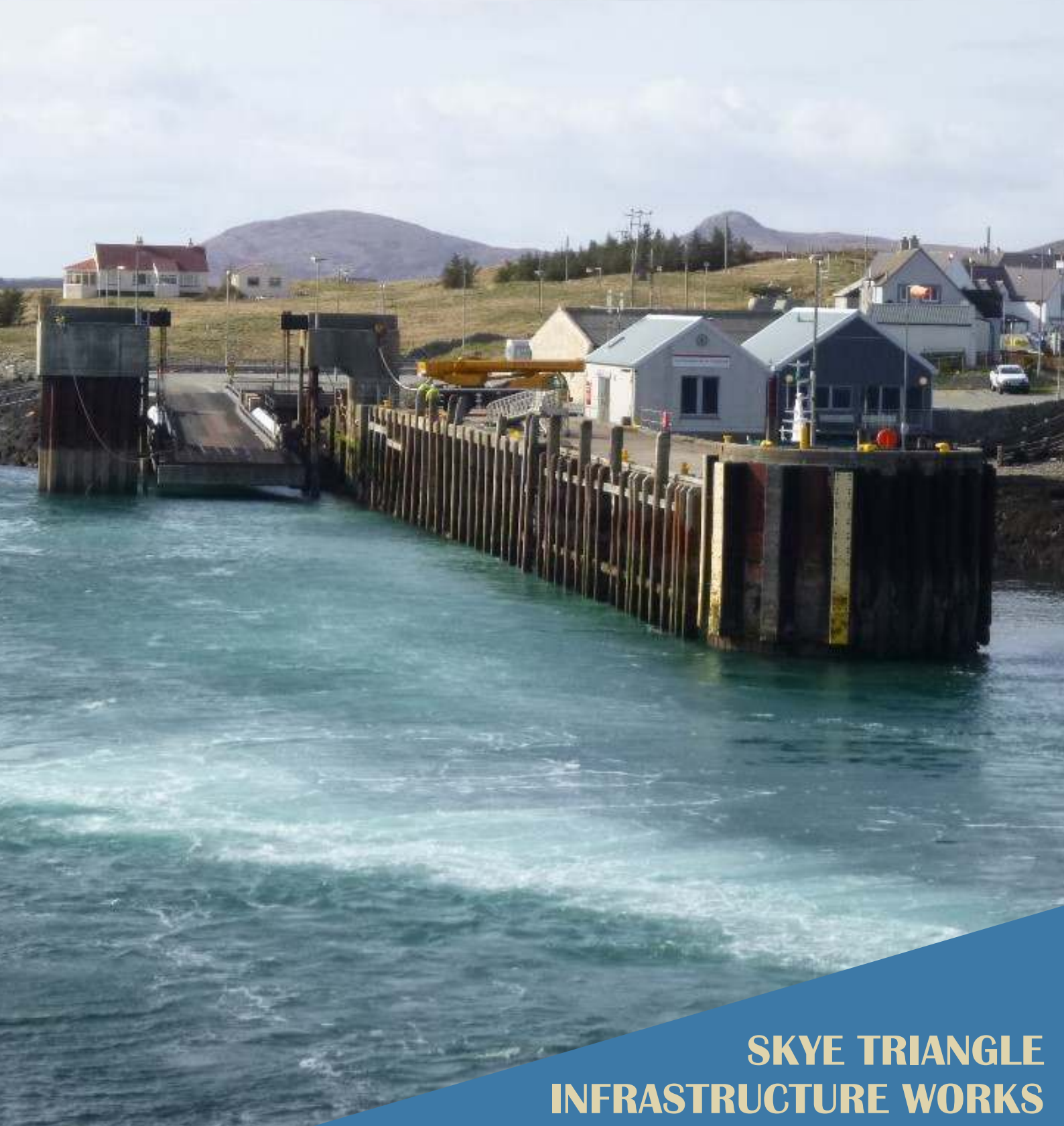

SKYE TRIANGLE INFRASTRUCTURE WORKS

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Chapter 1: Introduction

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1 Introduction

This Environmental Impact Assessment Report (EIAR) has been produced to support the construction and dredging Marine Licence applications and planning consent for their proposed upgrade of the Lochmaddy ferry terminal on the east coast of North Uist. Lochmaddy harbour is owned by Comhairle nan Eilean Siar (CnES). The upgrade works are being managed on their behalf by Caledonian Maritime Assets Ltd (CMAL) who have commissioned Affric Limited to produce this EIAR on their behalf.

A new ferry is being constructed for use on the Skye Triangle Route (Uig (Skye) - Tarbert (Harris) and Uig – Lochmaddy (North Uist)). The ferry is larger and can carry more passengers and vehicles than the existing vessel. The proposed upgrades are required to allow the safe berthing of the larger vessel and to provide facilities for more passengers and vehicles. The upgrades include the following components:

- Dredging to allow the larger ferry to berth and manoeuvre safely;
- Land reclamation to increase the marshalling area;
- Temporary works allowing the ferry service to operate throughout construction works;
- Demolition of the top of the existing pier roundhead to reduce its level to match the adjacent pier deck;
- Pier extension utilising a concrete caisson;
- Concrete repairs and strengthening to the existing concrete pier deck slab, cross beams and columns;
- Fender upgrade to the new and existing pier structure;
- Road lay-out upgrade to improve access to the ferry terminal;
- Carpark extension to increase exiting provision; and
- Upgrade of services to facilitate the new terminal layout, and to provide potable water bunkering and cold ironing of the new vessel.

Further detail on the project need, consideration of alternatives and construction phases is provided in Chapter 2: Project Description.

Marine licences for the construction of Lochmaddy ferry terminal upgrade works located below mean high water springs (MHWS) and associated capital dredging and disposal will be sought under the Marine (Scotland) Act 2010. This EIAR will be submitted in support of the marine licence applications as required by the Marine Works (Environmental Impact Assessment (EIA)(Scotland) Regulations 2017.

Works above the mean low water spring (MLWS) not within the existing harbour area are subject to planning consent under the Town and Country Planning (Scotland) Act 1997 as amended and hence this EIAR shall also support the application in line with the requirements of the Town and Country (EIA) (Scotland) Regulation 2017.

1.1 Objective

The objective of this EIAR is to:

- Explain the project need and alternatives considered;
- Provide a description of the proposals including features of the works incorporated to avoid, prevent or reduce significant adverse effects on the environment;
- Understand the environmental baseline for the proposed development area;
- Identify the potential direct, indirect and cumulative effects on the environment associated with the development;
- Assess the significance of the potential effects on the environment;
- Identify appropriate measures/mitigation to avoid, prevent or reduce adverse impacts and to maximise benefits; and
- Provide an appropriate level of detail to inform the marine licence and planning consent decision making process.

1.2 The EIA Team

Caledonian Maritime Assets Limited, on behalf of Comhairle nan Eilean Siar, commissioned Affric Limited to complete the EIA and produce the EIAR for the Lochmaddy ferry terminal upgrade. Affric have worked with the following associates to complete the assessment:

- Subacoustech Environmental Ltd;
- TNEI; and
- Wallace Stone LLP.

Further information on each company, key individuals' expertise and role in the project are provided in Appendix A.1.

1.3 EIAR Structure

This EIAR is made up of four volumes:

- Volume 1: Non-Technical Summary;
- Volume 2: Main Assessment;
- Volume 3: Appendices; and
- Volume 4: Drawings.

The numbering of the appendices provided in Volume 3 relates to the Volume 2 Chapters, i.e. Appendix A relates to Chapter 1 and Appendix E relates to Chapter 5. As not all chapters have appendices, not all letters are utilised. For example, Chapter 4 has no appendices so there is no Appendix D.

Mitigation identified within the EIAR has been incorporated into the Construction Environmental Management Document which will be submitted with the marine licence and planning consent applications.

Chapter 2: Project Description

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2 Project Description

2.1 Project Need

The Skye Triangle (Lochmaddy – Uig and Uig- Tarbert) ferry route is currently serviced by the MV Hebrides. The vessel was built in the year 2000 and utilises Marine Gas Oil (MGO). The popularity of the Skye triangle ferry route continues to grow, with high passenger numbers particularly in the summer months due to a booming tourist trade on the islands. This is leading to capacity issues with both the MV Hebrides and associated ferry terminal facilities.

The Vessel Replacement and Deployment Plan – Annual Report 2014 identified that the Skye triangle route exhibited the highest capacity utilisation of the eight CMAL ferry routes. The report identified that there was no current scope to enhance the timetable, hence the only short to medium term solution was to deploy a larger vessel on the route (Transport Scotland, 2015).

The most recent Vessel Replacement and Deployment Plan – Annual Report 2016 forecasts the annual peak 9-week vehicle capacity utilisations, which are the 9 weeks ending the 15th of August each year. The actual usage in 2016 was 73%, which was forecasted to increase to 84% in 2018. This forecast model assumed that a new ferry would be on the route from 2019, and as such the utilisation forecast reduces to 72% in 2019. It is now understood that the MV Hebrides will still be utilised on the route in 2019, and potentially into 2020. The forecast peak 9-week utilisations for 2019 and 2020, assuming the MV Hebrides is still servicing the route, would be 90% and 92.5% respectively (Transport Scotland, 2018).

As discussed in detail in Chapter 4: Statutory Context and Policy, there are numerous policies and requirements associated with air emissions from vessels which will come into force in the next few years. These are aimed at reducing greenhouse gas emissions including carbon dioxide (CO_2) and nitrogen oxides (NO_x), as well as air pollutants, including sulphur oxides (SO_x) and particulate matter.

Policy Outcome 6, of the Scottish Governments Third Report on Proposals and Policies for Climate Change (Scottish Government, 2018), states that the *"Proportion of ferries in Scottish Government ownership which are low emission has* [will have] *increased to 30% by 2032"*. The utilisation of liquified natural gas (LNG) fuelling options for ferries instead of MGO, which has a high contribution to SO_x emissions, is deemed key to fulfilling the policy outcome.

To address the increase in demand on the route, Transport Scotland have ordered a new larger vessel to replace the MV Hebrides. This vessel will be dual fuelled by MGO and LNG. The new increased capacity vessel is predicted to be 77% utilised during the peak 9-weeks by 2022 (Transport Scotland, 2018). Table 2.1.1 provides a comparison between the two vessels. The new vessel is the main driver to the project need; however, it is recognised that existing ferry terminal facilities are aging, and are already experiencing capacity issues. Each of the key requirements are discussed in turn in the remainder of this section.

Table 2.1.1: Vessel Comparison

Metric	Proposed New Vessel	MV Hebrides
Length (m)	102.4	99.4
Breadth (m)	17.5	15.8
Design Draught (m)	3.7 max, 3.45 normal, 3.2 min	3.2 max, 3.1 normal, 2.9 min
Displacement (t)	4,700	3,500
Gross Tonnage (t)	7,040 TBC	5,506
Vehicle Lane (m)	605 (135 x 4.5m Vehicles) (127-132 Cars and16 HGV's)	485 (98 x4.5m Vehicles)
No of Passengers	1000 max. 650 Internal seats	612
Service Speed (knots)	16.5	16.5/14.5

There is an ongoing need to provide a ferry service to the islands, hence any upgrade also needs to be constructed in manner which minimises impacts on this lifeline ferry service.

The dual fuel vessel will need to be supported by LNG refuelling facilities. There are plans to install an LNG refuelling tank at Uig to meet the ferry's needs. As such, there will be no requirement to store LNG at Lochmaddy.

2.1.1 Pier Upgrade

Restrictions, in terms of weather (wind and wave climate) and tide states, would need to be applied to allow the new larger, heavier vessel to berth at Lochmaddy. This would have significant effects on ferry timetables, reliability and operability. To ensure that the vessel is able to berth without restriction, the pier and associated fendering needs to be replaced and lengthened.

When there are strong winds from the north or south, the MV Hebrides aligns on the round head fenders and then pivots into position. The new ferry will need to be able to complete a similar manoeuvre in those wind conditions. To be able to ensure suitable water depths are available to the northeast of the pier for a longer vessel to implement this berthing technique, a pier extension of 30m is required. The pier extension will also provide a clearance of 30m from the north side of the pier to the -3.5m seabed contour, which will provide sufficient manoeuvring room for the vessel to berth safely, regardless of wind direction.

2.1.2 Dredge

As detailed in Table 2.1.1, the design draught of the proposed new vessel is 0.5m greater than the MV Hebrides. As such, it requires deeper water to allow it to manoeuvre and berth safely alongside the pier than the current ferry, without being tidally restricted. The maximum design draught is 3.7m, however there is a need to have an appropriate level of under keel clearance. This is typically 0.6m in ports, hence a depth of at least -4.3m Chart Datum is required in the ferry manoeuvring and berthing areas. In addition to the new Skye triangle vessel, there is a potential that other vessels in the ferry fleet may need to berth in Lochmaddy, for example if

there is a problem at another harbour, or when the regular vessel is out of service for maintenance purposes. The largest draught in the current fleet is 4.8m. Ideally the operational dredge would allow access to all vessels in the fleet in the majority of tidal states.

When dredging is carried out it is normal to 'over-dredge' to allow for a degree of sediment movement. In Loch Maddy, maintenance dredges have not been required, due to minimal sediment movement, and as such a berth and manoeuvring area dredge to a depth of -5m CD is deemed sufficient. Dredging to -5m CD will allow access to all vessels in the CalMac fleet, although tidal restrictions may apply to the deepest drafted ferries.

As discussed in Section 2.1.1, suitable water depths are also required in the area to the northeast of the pier to facilitate safe berthing in the event of strong northerly or southerly winds.

2.1.3 Marshalling Area

The new vessel provides an additional 120m of vehicle lanes compared to the MV Hebrides. This drives the need for an increase in marshalling area. CalMac Ferries Limited (CFL) usually requires marshalling areas to be able to accommodate 150% of the vessel's capacity, in order to provide adequate space to keep cars off the public road network in event of a delayed sailing. Delays could mean that passengers arriving for a subsequent sailing start to arrive while vehicles associated with the late sailing are still in the marshalling area. It is recognised that there are only one or two sailings a day from Lochmaddy, and hence the chance of having the delay scenario above is low. However, the aim of providing 150% of vessel capacity provides a level of future proofing in the event of changes to the scheduled ferry service.

The capacity of the vessel and the marshalling area in respect of actual vehicle numbers is determined by the length of the vehicles present. It is assumed that a standard vehicle is 4.5m for the purpose of discussion, but it is noted that the actual number of vehicles is determined by the specific vehicle mix e.g. fewer vehicles can be accommodated if there are more long vehicles such as HGVs, trailers etc. present. The current marshalling lanes can take 112% of the MV Hebrides vehicle capacity of 98 standard vehicles. The new ferry will be able to accommodate 135 standard vehicles; hence the marshalling area would ideally accommodate 203 vehicles, 91 more than the current capacity.

2.1.4 Additional Facilities

To facilitate and encourage the use of bicycles as opposed to motor vehicles, in line with the Cycling Action Plan for Scotland which has a vision that 'By 2020, 10% of all journeys taken in Scotland will be by bike' (Government, 2013), facilities for cyclists to securely store their bikes while awaiting the ferry are required. Bicycle access is currently from the terminal building, via the road next to the linkspan, which extends from the ferry terminal building to the linkspan. This access will be restricted to use by cyclists and pedestrians only.

Lochmaddy provides a direct link to Uig and the Scottish mainland for the transportation of goods. Lorry trailers can be dropped off prior to the ferry sailing and loaded onto the ferry by a shunter to make the crossings. They are off-loaded at the other end and parked awaiting collection. Hence there is a need for space to park lorries and trailers close to the Lochmaddy Ferry Terminal. Currently, there is no specific provision for trailer parking, and only four spaces

are provided for HGV and coach parking, meaning that lorries trailers are often left on the public roadways.

Carparking for staff and ferry customers is also required, including long stay parking to allow customers to leave their cars and travel as foot passengers on the ferry. Long stay parking encourages passengers to travel without their cars and utilise public transport to reach onward destinations from Uig, in alignment with a key behaviour the Scottish Government wish to encourage through their Climate Change Plan:

> *5. Becoming less reliant on the car (walking, cycling, using public transport and/or car-sharing instead of driving)* (Scottish Government, 2018).

There are currently only 18 car parking spaces for all activities (including staff parking), which does not provide adequate parking for passengers wishing to arrive by car, but travel as foot passengers. Also contributing towards the move away to reliance on the car is the facilitation of the use of public transport. Hence adequate provision is required for buses servicing the ferry terminal. Currently the turning area for buses in front of the ferry terminal is restricted and as such, the turning area needs to be improved to ensure safe provision of public transport.

Check in kiosk facilities will be required near the entrance to the marshalling area. The kiosk facilities should be relocated within the marshalling area. This is to limit the risk of queuing vehicles on the public road during busy periods, which would result if the kiosk was located at the entrance to the marshalling area.

2.2 Consideration of Alternatives

2.2.1 Do Nothing

The 'Do Nothing' option was ruled out due to the project needs discussed in Section 2.1. The ferry service to Lochmaddy is part of the lifeline services to North Uist and the Western Isles, and, as such, needs to be upgraded to meet current and future demand and ensure the continued economic benefits afforded by the tourist sector.

2.2.2 Location

The construction of a ferry terminal in a new location was considered, and although this would likely improve constructability, and minimise the disruption to service, it would require everything to be installed and built from scratch, with no benefit of continuing to use existing infrastructure. This option would be expensive and would likely have higher environmental impacts as it would have had to be located on a currently undeveloped area. Hence, an alternative location for the full development was not sought and the project is an upgrade of the existing facilities at Lochmaddy.

The location of all the works are determined by the location of the existing pier, as the services to support the marshalling and loading of the vessel need to work with the existing linkspan infrastructure. In addition, the other facilities need to be suitably close, to allow the ferry terminal to operate safely, efficiently and effectively.

The marshalling area cannot be extended to the north, as the public road (A865) borders that edge of the marshalling area. There is some opportunity to the north east of the existing marshalling area, but this is limited by the presence of two residential properties. Hence only limited additional marshalling space will be provided to the north east, and not enough to meet all the space requirements. Land reclamation to the south west is not possible due to the position of the pontoons. To the north west of the existing marshalling area is the marina facilities and access to the pontoons, which is via a bridge over an intertidal bay. The area to the northwest provided the best option for land reclamation, as the marina facilities and walkway could be relocated and accommodated within a new layout. There is also an opportunity to level the land north of the existing marina facilities, providing additional space for development. The land reclamation and levelling of land to the northwest, in combination with the expansion to the northeast, is sufficient to provide the HGV trailer parking and additional marshalling area required.

The existing parking area is on a spit of land to the north east of the ferry terminal building. The option to extend parking in this area is available. Having all the car parking in one area allows appropriate provision to be made for safe pedestrian access to the ferry terminal building and the pier, hence this solution was taken forward.

2.2.3 Pier Upgrade

The existing pier was constructed at three different times and was inspected to identify whether the existing sections could be repaired, strengthened and re-fendered. This was identified as being possible and was considered the most cost-effective option. Further details of the strengthening and repairs required are provided in Section 2.4.1. To ensure the ferry can berth throughout the upgrade works, temporary fendering arrangements will be required on the existing pier during the construction works.

As discussed in Section 2.1.1 there is also a need to extend the pier. The pier extension design had to take into account available water depths, the shoreline location and geology. The pier needed to be extended sufficiently to the south east to allow the vessel to carry out a pivoting manoeuvre on the end of the pier in event of strong northerly or southerly winds.

Interruption to the ferry service during construction works needs to be minimised. The temporary works required to construct a piled extension to the south east of the existing pier would mean that the pivot manoeuvre required in certain wind conditions wouldn't be possible. Hence the ferry service would be affected throughout the duration of the extension works, resulting in an alternative approach being sought. A concrete caisson, which can be cast offsite, floated to site, and installed very quickly was preferred for this location as it would give rise to minimise disruption to the ferry service.

2.2.4 Design Basis

The outputs of the options analyses detailed above determined the location of the proposed development and the design for the proposed pier works. The spatial restrictions imposed by these decisions considerably reduced the availability of alternative options for the remainder of the project elements. Instead, the remaining elements of the project had to be designed to

accommodate the project needs within the space available. An outline of the process which informed the designs is provided below.

2.2.4.1 Dredge

As discussed in Section 2.1.2, water depths of -5m CD are preferred for future ferry use. An area adjacent to the linkspan and existing pier has current water depths of around -4m CD and hence this area requires dredging as shown in Drawing 1975-903. Drawing 1975-202 provides 3D model outputs from surveys of the existing pier and berth area, together with example dredge cross sections. There is a small quantity of rock, immediately adjacent to the existing pier, which will need to be broken out.

The manoeuvring area to the north would ideally also be -5m CD for the full 30m beyond the pier. However, at the northern extremities only -3.5m CD is available. Hence some dredging is required in this area. The shape of the dredge area to the north of the pier follows the contours of the underlying rockhead, as shown by the green lines in Drawing 1975- 203, such that as much of the area as possible will be reduced to -5m CD, whilst avoiding the need to remove rock.

The caisson needs to be installed on an appropriate base. To facilitate the base creation, an area around the footprint of the caisson will be dredged to -8.5m CD. The existing seabed level in this area varies from -7m CD in the south to -4m CD in the north. As shown on Drawing 1975-203, the majority of the rock level is below -8.5m CD in the area to be dredged. There is a small section in the north corner of the caisson footprint where the rock level is higher than -8m CD and hence this will need to be broken out.

2.2.4.2 Marshalling Area

As discussed in Section 2.2.2 the marshalling area will be extended to the north east and north west. The current marshalling area, as shown in Drawing 1975-001, includes lanes which turn through 90 degrees, which cannot be utilised by longer vehicles and HGVs. There is currently no check in facilities provided, meaning that staff walk from car to car collecting tickets. It is not ideal from a health and safety perspective to have staff working amongst vehicles when other vehicles are still arriving.

The additional marshalling area therefore hasn't just been designed to provide more vehicle space. It has also been configured to provide straight marshalling lanes and suitably located check in kiosk facilities.

2.2.4.3 Road Layout

As shown in Drawing 1975-001, the existing access to the marshalling area from the west along the A865 requires a right turn across the outbound traffic coming from the ferry terminal building, travelling west on the A865. Vehicles disembarking the ferry exit via a give way junction onto the A865. The widening of the marshalling area means that the access and egress to the area is now further to the west, closer to the access road to the Lochmaddy hotel. Utilising a standard give way junction in this new location would not be ideal. As such, an alternative solution to ensure safe access and egress to the marshalling area, terminal building and the hotel was sought. The solution proposed is a mini roundabout, which provides safe access to all areas, as well as improving traffic flow.

2.2.4.4 Cold Ironing

Discussions with Scottish and Southern Electricity (SSE) were initiated to ascertain the existing local electricity supply capacity, and whether the option was available to provide cold ironing capabilities for vessel berthing overnight at Lochmaddy. It was identified that the existing ferry terminal substation doesn't have sufficient capacity, and as such an upgraded substation would be required. The substation needs to be as close as possible to the cold ironing point, as well as to the existing substation and connection points to the national grid. This is to minimise cable lengths and associated transmission losses. There is space in the vicinity of the existing substation to facilitate the upgrade, as shown in Drawing 1975-901.

2.2.4.5 Additional Facilities

The hard-standing area created to the northwest of the existing marshalling area, within the area gained by levelling the hillside and land reclamation, provides the space to relocate the marina facilities and to create seven bays for lorry/trailer parking. The layout of the HGV parking takes into account swept path analysis as discussed further in Chapter 12: Traffic, Access and Navigation.

The marina facilities will be relocated close to the revised pontoon access bridge, and the area will be fenced off from the rest of the ferry terminal for security reasons. Parking has been provided adjacent to the marina facilities, such that users don't have to walk through the marshalling area to gain access.

Footpaths have been designed to ensure safe access to the terminal building from the village, the bus stop and the carpark.

As discussed in Section 2.2.2, additional parking will be provided adjacent to the existing parking area, increasing the capacity of the existing carpark by 16 spaces. 5 additional spaces will be created at the west side of the existing parking area, in an area currently used for HGV parking. The HGV's will instead utilise the proposed dedicated HGV parking area to the northwest of the marshalling area, as discussed above.

Designs for the improvements to the marshalling area access and turning area for buses and HGV's at the end of the A865, have taken account of swept path analysis (see Chapter 12). This is to avoid the need for large vehicles to reverse, or conduct 3-point turns.

To ensure that appropriate bus-stop, drop off/pick up, disabled parking and footpath facilities can be provided adjacent to the terminal building, while accommodating the HGV and bus turning area, a minor area of reclamation to the north of the terminal building is required.

2.3 Location

Lochmaddy is located on the east coast of North Uist and is the largest settlement on the island. The ferries that utilise this terminal provide the shortest link between the Uists and Scottish mainland road network, via Uig and the road links on Skye. The harbour is situated to the south east of the main village, within the shelter of the Loch Nam Madadh (Loch Maddy) sea loch. Lochmaddy falls within the administrative area of the Comhairle nan Eilean Siar (CnES). The ferry terminal has a grid reference centre point of NF 920 680 (Drawing 49L.02.01).

The full development, with a total area of 3.11 hectare (ha), is delineated by Drawing 1975-907. As described in detail in Chapter 4, the development is subject to a combination of consenting regimes. Works on the ~0.59ha area shown in green on Drawing 1975-907 will be completed under powers granted by the Comhairle nan Eilean Siar (Various Harbours) Harbour Revision Order 2002.

Planning consent is sought for the areas shown in red on Drawing 1975-935, comprising a total area of approximately 0.98Ha, including the following:

- An area bound by straight lines joining points 1, 3, 4, 5, 6, 7, 8, 9, 10 and the mean low water spring (MLWS) line between points 1 and 10;
- The rectangle with the corners at points 11 to 14; and
- An area delineated by straight lines joining points 15 ,16, 18, 19, 20 and 21.

A construction Marine License is sought for the area shown in orange in Drawing 1975-936. The area is bounded by straight lines between points 17, 18, 21 to 35, 37, 36, and 2 on the seaward side, and on the landward side by mean high water spring (MHWS) between points 2 and 17. The total area is approximately 1.14ha.

The dredging Marine Licence is sought for the area shown in purple on Drawing 1975-937. The area is bounded by straight lines between points 25 through to 29, and 31 through to 35, with 35 joining to point 25 to provide an enclosed area of ~1.22Ha. The Stornoway dredge disposal site reference number HE035 has been identified as the preferred option for the disposal of dredge spoil (Affric Limited, 2019).

The positions for all points referred to above and shown in the relevant drawings are provided in Table 2.3.1.

It should be noted that there are overlaps in consenting boundaries. For example, areas between the MHWS and MLWS are subject to both planning consent and marine licensing. The dredge area and marine construction boundaries also overlap.

Table 2.3.1: Development Bounding Points

Point Number	Latitude Longitude	Northing	Easting
1	57°35.820'N 07°09.590'W	868066.577	91854.744
2	57°35.822'N 07°09.587'W	868071.001	91858.202
3	57°35.840'N 07°09.565'W	868102.110	91882.515
4	57°35.855'N 07°09.529'W	868127.098	91920.440
5	57°35.859'N 07°09.527'W	868134.865	91922.976
6	57°35.876'N 07°09.507'W	868164.013	91944.989
7	57°35.850'N 07°09.472'W	868113.327	91975.898
8	57°35.818'N 07°09.517'W	868057.673	91926.969
9	57°35.809'N 07°09.515'W	868040.321	91927.811
10	57°35.803'N 07°09.517'W	868029.795	91924.753
11	57°35.822'N 07°09.482'W	868062.291	91962.698
12	57°35.837'N 07°09.462'W	868088.032	91983.899
13	57°35.833'N 07°09.454'W	868080.876	91991.581
14	57°35.819'N 07°09.472'W	868055.305	91971.669
15	57°35.820'N 07°09.366'W	868050.402	92077.874
16	57°35.820'N 07°09.310'W	868045.841	92132.870
17	57°35.807'N 07°09.313'W	868021.017	92128.641
18	57°35.802'N 07°09.313'W	868012.673	92127.221
19	57°35.810'N 07°09.367'W	868031.991	92074.928
20	57°35.813'N 07°09.416'W	868040.212	92027.026
21	57°35.801'N 07°09.409W	868017.190	92031.597
22	57°35.795'N 07°09.390'W	868004.819	92050.195
23	57°35.788'N 07°09.397'W	867992.638	92042.117
24	57°35.770'N 07°09.338'W	867954.801	92097.974
25	57°35.790'N 07°09.318'W	897990.755	92120.477
26	57°35.794'N 07°09.231'W	867991.603	92208.121
27	57°35.783'N 07°09.220'M	867970.521	92217.142
28	57°35.763'N 07°09.292'W	867938.047	92142.763
29	57°35.746'N 07°09.310'W	867908.048	92122.442
30	57°35.758'N 07°09.350'W	867933.366	92084.558
31	57°35.772'N 07°09.399'W	867964.057	92038.635
32	57°35.742'N 07°09.433'W	867910.960	91999.818
33	57°35.765'N 07°09.500'W	867958.461	91936.277
34	57°35.798'N 07°09.459'W	868016.702	91982.012
35	57°35.763'N 07°09.345'W	867943.107	92090.655
36	57°35.775'N 07°09.445'W	867974.143	91982.549
37	57°35.791'N 07°09.435'W	868001.686	92004.178

2.4 The Project Components

Drawing 1975-901 shows the overview of the full proposed development. Each of the project components are described in this section.

2.4.1 Pier Upgrade

2.4.1.1 Temporary Works

Pneumatic fenders will be installed along the existing berth to push out the berthing line, allowing the ferry service to continue to operate throughout the pier repair and extension works. Scaffolding will be installed below the existing pier sections to facilitate the repair works.

2.4.1.2 Pier Repairs and Strengthening

The existing pier was constructed in three stages, the inner most mass-pour concrete section, middle piled 1950's section and an outer piled 1980's section (as shown on Drawing 1975-902). There is a need to carry out varying degrees of repair and strengthening works to the existing pier. The works on the existing pier will ensure that the structure is of a suitable strength to withstand the greater horizontal berthing forces associated with the new heavier vessel, and allow the pier to continue to function for many years with minimal maintenance.

Works to the 1950's middle pier section will include concrete repairs to the existing concrete pier deck, cross beams and columns, adding additional rebar and spraying concrete to coat structures under the pier, including the existing concrete piles. In addition, steel braces and rock dowels will be installed and connected by concrete supports to reinforce the structure.

The metal piles of the outer 1980's section will be wrapped in Denso, to prevent corrosion and hence preserve the structure. The roundhead at the end of the outer section will be cut down to facilitate tie in with the caisson.

2.4.1.3 Pier Extension

The pier will be extended utilising a concrete caisson. The extension is approximately 35m long, providing an overall pier length of 145m. The caisson is 12.5m wide, providing a wider working area than afforded by the rest of the pier which is 9.8m wide. New concrete decking will join the caisson to the end of the existing pier. The caisson will be placed onto a preconstructed base.

2.4.1.4 Fendering

Parallel Motion Fenders (PMF) will be installed on new piles along the berth face of the existing pier and attached directly onto the caisson. The fenders have been appropriately sized for the larger heavier vessels that may be utilised on the ferry route, to allow them to berth in a variety of conditions. The wooden fenders on the northern face of the inner concrete section and middle sections of the pier will be replaced like with like.

2.4.2 Dredge

Dredging to a depth of -5mCD will be completed to allow the larger ferry to berth and manoeuvre safely. Dredging is also required for the caisson base as discussed in Section 2.2.4.

2.4.3 Marshalling and Hard Standing Area

As discussed in Section 2.2.2, the marshalling area will be increased, and a hard-standing area created by extending to the north east and north west of the existing marshalling area. The area to the north east is currently part of a residential garden and slopes up from the marshalling area. Hence, material will be removed to bring the height down to that of the adjacent existing marshalling area, and a retaining wall installed to ensure the stability of the remaining garden.

To the northwest, the small hill between the existing marina facility area and the access road to the hotel will be removed to reduce the height to the level of the existing access road. The material won will be utilised to reclaim the intertidal area which the existing pontoon access bridge passes over.

Marshalling lanes 4 to 6 and 16 to 19, as shown on Drawing 1975-901, will be located primarily on the newly won areas. The existing marshalling area will be reconfigured, including the straightening of the lanes. The new marshalling area layout will be able to accommodate 198 vehicles; 146% of the total vehicle capacity of the new ferry. The marshalling area will be appropriately drained and lit, as described in Section 2.4.5, and an asphalt surface installed to provide a durable surface. The surface will be cambered towards the drains.

The 17.5m long and up to 29.2m wide HGV trailer park area will be able to accommodate seven trailers or HGV's. The trailer park, the hardstanding in front of it to facilitate access, and the marina facility and parking located to the north west of the marshalling area will be drained and lit as described in Section 2.4.5. A concrete surface will be installed in the HGV trailer park and access hardstanding, cambered towards the drains. The marina facility and marina parking area will have an asphalt surface, again graded to direct surface water towards drains.

The marshalling area will be fenced off from the footpath to the north and the disembarking lane on its northwest side. There is a section of fence around the seaward edge of the marshalling area past the southeast end of the marina carparking spaces. Double swing barrier gates will be fitted across the marshalling area entrance and a single swing gate across the disembarking lane to prevent access to the marshalling area when the terminal is closed, as shown in Drawing 1975-151. The hardstanding area will not be fenced off, as access will be required to the marina and by HGV trailers at any time of day. Fencing is provided around the marina facilities for security and safety reasons.

2.4.4 Road Layout

The proposed mini roundabout will take the form of a painted button. As shown on Drawing 1975-151, access to the marshalling area, terminal building and the Lochmaddy Hotel will be directly from the roundabout. Vehicles disembarking the ferry and heading for the Lochmaddy Hotel will be filtered to the left and will join onto the Hotel Road utilising a give way, and hence will not pass round the roundabout. The road in front of the hotel is narrow in places, with parking directly from it. Hence, it has been agreed with the hotel that this will become a one-way road, with entry from the east end at the roundabout, and exit to the northwest of the hotel, via the existing junction.

The public footpath is on the south edge of the A865. Hence, pedestrian crossings have been provided around the southern edges of the roundabout to ensure a safe walking route between the village and the ferry terminal facilities (Drawing 1975-151). Drop kerbs with tactile paving are provided where the pavement meets the road at crossing points, in alignment with Volume 7 of the Design Manual Road and Bridges (Highways Agency).

The turning area adjacent to the ferry terminal building will be widened. This required the installation of a retaining wall to the north of the ferry terminal to allow the road to be widened and a path provided from the carpark.

2.4.5 Services Upgrade

Upgrade of services to facilitate the new terminal layout, water bunkering and cold ironing of the new vessel will be carried out.

To facilitate cold ironing, a new substation will be installed, and the existing substation upgraded, the locations of which are shown in Drawing 1975-151. A new 8m^3 water tank with associated works is also proposed to buffer water bunkering operations for the ferry. All necessary pumps, standby pump, pipework and control systems will be installed.

The new drainage system design is shown in Drawings 1975-351, 1975-361, 1975-362 and 1975-363. Channel and filter drains will be utilised to collect surface water from the lorry/trailer park, the access hard standing, and marina facilities area. The access road and marshalling area will be drained utilising gully drains, leading into carrier drains, and finally to a Class 1 oil interceptor. The drains from the existing marshalling area, which currently discharge directly to sea, will be rerouted to the oil interceptor. The outflow from the oil interceptor is to a new outfall point in the rock armoured slope of the reclaimed area (Drawing 1975-351). The drains and interceptors have been designed to accommodate the maximum flow through the existing surface drains together with the additional volume expected to arise from the new land reclamation areas.

Surface water run-off from the carpark extension will be to a swale, which will provide one level of treatment prior to discharge to sea as shown in Drawing 1975-591. The caisson will include a surface water drainage channel directing surface water to a separate Class 1 oil interceptor, which will remove any silts and oils present prior to discharge to the sea from an outfall on the side wall of the caisson.

Lighting will be provided for the marshalling area, hardstanding, carpark and pier as shown on Drawings 4511-E(61)01 and 4511-E(61)02. The lighting is directional to minimise light pollution to adjacent residential properties and habitats. The lighting has been designed in zones, which can be turned on and off as required. The street lighting is on a rural system, such that it turns off at a pre-defined time during the night. The carpark lighting will be connected into this system and hence switch on and off with the street lighting. The hard standing will be lit on the same timescale as the street lighting but at a lower lux level. When the marshalling area lighting is switched on, the hardstanding lighting level will increase to 50 lux. The marshalling and pier area lights will be turned on and off as required for operational purposes.

2.4.6 Additional Facilities

The check-in kiosks will be situated within the marshalling area. They will take the form of two prefabricated white glass reinforced plastic (GRP) kiosks positioned end to end on a raised concrete 'island' in marshalling lane 12, as shown in Drawing 1975-151.

The carpark extension covers an area of around 320m^2. It will be finished with an asphalt surface and line painted on the extension and the existing HGV parking area to provide an additional 21 spaces, giving 39 spaces in total to the north of the terminal building. The parking adjacent to the harbour office shall also be retained, including the disabled space.

The layout of the turning area and facilities including bus stop, drop off and pick up areas and disabled parking are shown on Drawing 1975-151.

A cycle shelter has been provided near the entrance to the linkspan, as shown in Drawing 1975-151, to facilitate the secure storage of bicycles for ferry terminal staff and passengers.

2.5 Project Phases

2.5.1 Construction

Generally, construction works will be conducted between 7am to 8pm Monday to Saturday, with Saturday work generally finishing earlier. No Sunday working is anticipated to occur. However, work out with these hours may be required on an infrequent basis to suit tides and ferry movements, or for other operational reasons. Approval will be sought from the relevant authorities prior to this occurring. The indicative construction programme is provided in Appendix B.1. The description below refers to the task numbers in the programme where appropriate. Some tasks are carried out in parallel to minimise the duration of the project and hence disturbance caused.

2.5.1.1 Mobilisation

The construction compound will be set up during the mobilisation stage (Task 2). This will include stripping the earth and laying a crushed stone surface on the site of the carpark extension and an area to the east of this, north of the terminal building. The carpark drainage swale may also be installed at this point. Temporary offices and welfare facilities will be installed. Temporary services will be required, including telecommunications, water and power. Power is likely to be provided by generators. Foul water discharges from the welfare facilities will be captured in a tank, which will be emptied by an appropriate contractor and taken offsite for onward treatment and disposal. Hence there will be no connections made to the local sewer.

The site compound will be fenced off to prevent public access for safety and security reasons.

2.5.1.2 Dredging

Task 3 on the programme, dredging, is planned for the winter months when the number of vessels utilising the pontoons and moorings are likely to be lowest. To facilitate dredging adjacent to the linkspan, the pontoon anchors will be relocated for the duration of the dredge works and reinstated once dredging is complete. During this time there may be restriction on the use of the berths at the east end of the pontoons, but the rest of the pontoons will be available for use.

The dredging techniques that could be utilised are:

- Backhoe Dredging (BHD) – Dredging vessel has a large backhoe excavator mounted on it. Material is excavated from the seabed and deposited in the vessel's internal hopper or transferred to an independent Split Hopper Barge (SHB). Once the hopper/SHB is full, the material will be taken to the sea disposal location where the hopper bottom doors open, discharging the material.
- Trailer Suction Hopper Dredge (TSHD) - Dredging vessel has a trailing suction head that scrapes the sea bed and lifts the material into its internal hopper by large pumps. The dredged material is collected in the hopper, and the pumping water is then discharged over weirs back to the sea. Once the vessel's hopper is full it is disposed of in the same manner as the BHD technique.

It is unlikely that a TSHD will be suitable for use in all areas requiring dredge. Hence, if it is to be used, it will be in combination with a BHD. Alternatively, a BHD could be utilised for all the works.

Based on the results of a geophysical survey, it is assumed that the there is no requirement to remove a significant bulk of rockhead material. However, discrete areas of rockhead will require removal adjacent to the pier and for the caisson foundations. These will be removed using non-blasting techniques, such as breakout from the pier with an excavator mounted pneumatic pecker, or using divers to drill and utilise non-explosive chemical break out techniques.

The dredge material will be transported to the disposal ground near Stornoway.

2.5.1.3 Land Reclamation and Levelling

The hillside to the north west corner of the site and an area of garden to the north east of the site will be excavated, utilising standard construction techniques. No blasting will be utilised. The hillside is primarily rock, which will be utilised to create a rock bund along the seaward edge of the proposed reclamation area. Once in place, geotextile membrane will be laid, and the remaining material won from the levelling works utilised to infill the land reclamation. Rock suitable for use as primary armour will be imported for installation on the seaward side of the land reclamation to achieve the final finish. The oil interceptor and drainage pipework will be installed within the land reclamation area. The infilled area and hillside area will all be graded to reach the required levels. The garden retaining wall will also be installed to ensure the stability of the remaining garden.

The pontoon access bridge will remain in place, while the rock bund and initial infill works are being carried out around it, until the new connection to the pontoon can be established. The bridge supports will be incorporated into the land reclamation. The bridge and any section of the supports above the reclamation level will then be taken out of service, and demolished.

The existing marina facilities will have to be relocated to facilitate the infill works. Hence, the programme shows Task 5 being carried out through the winter months to minimise inconvenience.

The retaining wall to the east of the existing turning area will be installed and any additional ground works required to prepare the car park extension area completed. This may require temporary restrictions for vehicle access to the terminal building. If so, alternative provision will be put in place, such as temporary relocation of the bus stop.

2.5.1.4 Surfacing and Layout

As part of Task 6, the marshalling, parking, access arrangements and turning area will be prepared.

The drains from the existing marshalling area will be connected into new drains leading to the interceptor. This will require discreet sections of the existing marshalling area to be excavated. The existing outfalls will be blocked. In addition, any ducting required for the services will be installed and lighting column foundations dug.

Once the groundworks have been completed, the marshalling area, new roundabout, marina facilities and carpark extension will be asphalted, and the hard-standing area concreted. Road furnishings and pavements will be installed. Road markings including the mini roundabout, pedestrian crossings, marshalling lanes, and parking bays will be painted. If access to the carpark extension is precluded due to the construction compound, that area will be surfaced at the demobilisation stage (see Section 2.5.1.11)

As shown in the programme, the aim is to complete the bulk of the works on the marshalling, parking, road layout and turning circle areas (Task 6) before the busy summer months.

2.5.1.5 Services

Once the groundworks and surfacing have been completed the services will be installed as part of Task 7. The lighting masts will be installed. Fencing will be erected, and gates installed. The existing sub-station will be upgraded with a larger transformer, and the new substation will be installed.

The water tank will be installed, and the pipework and cables will be laid to facilitate the cold ironing and water bunkering connections to the pier.

In addition, the marina facilities will be installed in their new location, ensuring that all the appropriate service connections are in place.

2.5.1.6 Pier Repair and Strengthening

Prior to works to the pier commencing, temporary pneumatic fenders will be installed to allow berthing of the ferry throughout the works (Task 8). The berthing line will be moved out from the existing pier to allow works to be carried out on the pier edge without disrupting ferry operations.

To facilitate access to the existing pier sections which require renovation and strengthening, temporary access scaffolding will be installed under the pier (Task 9). The scaffolding will be sheeted to capture any falling debris, minimising the potential for materials to be dropped into the sea.

The existing pier edge will be broken out (Task 10) before forming a new quay edge using reinforced concrete; as part of Task 11. The new pier edge on the inner section of the existing pier will include recessed areas to accommodate the new fendering system.

Any weak or damaged areas on the existing structures will be chipped out and refilled with concrete, utilising hand tools. A spray on cementitious coating (Flexcrete 851) will be utilised on concrete surfaces to repair and increase the lifespan of the existing infrastructure. Where necessary beams may be moved and replaced including the installation of additional rebar. Precast and in-situ concrete works may be required.

The middle section of the existing pier needs to be strengthened to resist the horizontal berthing forces associated with the heavier vessel. Steel braces will be installed by divers. Brackets will be attached to the piles, which the top of the bracing struts can be pinned into. The seabed fixing will require holes to be drilled into the underlying rock, and dowels will be set into the holes. The struts will be fitted to these with bolts and anchor plates. A concrete block with structural fibre and underwater concrete admixture will then be cast over the dowels and end of the bracing strut. Drawing 1975-905 shows the indicative configuration of the struts.

The steel piles of the outer pier section will be wrapped in Denso to extend their lifespan. This is an alternative to painting and will be easier to apply in the marine environment. Divers will be required to facilitate this work. This is Task 12 on the programme.

2.5.1.7 Existing Pier Fendering

PMFs will be attached to the existing pier during Task 13. Once the existing pier has been repaired and strengthened, the fendering support system will be installed.

For the PMFs on the outer section of the existing pier, six fender piles will be required. In order to install the fender piles, vibro piling will be utilised initially to drive the piles to the rockhead. Percussion piling will then be required to seat the piles into the rockhead, and reach the design depth. Once piling is complete, a drill rod will be inserted down centre of the piles, and holes driven into the underlying rock, into which toe pins will be installed, as shown in Drawing 1975-905. The toe pins will then be grouted into place, securing them to the piles. Once the piles are in place, a sleeve will be placed over the pile and fixed to the pier deck. The PMF will then be installed onto the fender sleeve.

The middle section of the existing pier, having been reinforced during Task 11, will be able to accommodate the PMF fixings directly. The PMFs will be lifted into place and bolted and welded onto supporting steelwork.

The edge of the inner section of the existing pier, having had its deck edge cut back, will have steel frames fixed to the existing concrete face. The PMFs will be lifted into place and chained and bolted into deck sockets.

All the fender installation works will be carried out around the ferry timetable to allow it to berth as normal and continue to provide the lifeline service.

2.5.1.8 Roundhead Preparations

The existing roundhead is higher than the proposed final deck level for the pier. As such, it will be cut down utilising pecker to the required height as part of Task 15.

2.5.1.9 Caisson Delivery and Installation

As detailed in the indicative programme (Appendix B.1) the caisson will be constructed in dry dock (Task 4) and preparation works made for its arrival in parallel to other construction activities.

The location of the caisson production will be determined through the competitive tender process, but it is assumed that it will be produced at an offsite facility, prior to being floated and towed to Loch Maddy.

The preparation works for the caisson include dredging (Task 3) as discussed in Section 2.5.1.2 to provide a base that the foundations can be formed upon. The caisson foundation formation is Task 14 on the programme. It will include placing rock to form a mattress for a concrete foundation, including two recessed areas for the foundation crest as shown in Drawings 1975-211 and 1975-212. The rock mattress will be capped with concrete to ensure the level tolerance is meet. The concrete strip foundation will be 50mm proud of the adjacent rock mattress. All concrete pours will be carried out in-situ, utilising preformed metal shuttering and marine concrete.

Once the foundation is ready, the caisson will be transported to site (Task 16). It will not however be towed directly to its final location. It will be temporarily moored to the north of its final destination to allow the PMF and furnishings to be fitted (Task 17) without obstructing the ferry berth.

Once the caisson is fully prepared, it will be installed into position over the caisson foundation and filled with water to sink it into place. Once in place concrete will be pumped through the pipe in the centre of the caisson to fill the 50mm gap between the mattress and the caisson, as shown in Drawing 1975-225.

Scour protection will be placed around the caisson. This will be made up of concrete bagwork topped with scour mats, which will be bolted into the caisson base as shown in Drawing 1975-227.

The caisson then needs to be infilled with rock fill. Pumps will be utilised to reduce the water level in the caisson to make room for the infill material. The material will be brought to site by road and tipped into the caisson. The material will be allowed to settle prior to more water being pumped out to accommodate more infill material. This will be repeated until the caisson is fully infilled as part of Task 18.

2.5.1.10 Incorporation of Caisson into Pier

There will be a gap between the roundhead and the caisson. A concrete slab, including both precast and in-situ concrete, will be utilised to bridge this gap (Task 19).

The caisson, having been infilled, will have the oil/silt separator and drainage pipework placed, and then the slab laid (including both precast and in-situ pour elements), which will include

the surface drainage channel. The pier services upgrade will then be completed, including the provision of lighting, the cold-ironing connection points and water bunkering facilities (Task 20).

2.5.1.11 Demobilisation

Once the pier works are complete, the temporary fenders will be removed (Task 21), and the new permanent fenders will become operational.

The construction compound will then be removed, and works required to reinstate the area completed. This may include the surfacing of the carpark extension and works on the swale (Task 23).

2.5.2 Operation

As the project is an extension of an existing ferry terminal, significant changes in operation from the current conditions are not expected. The new ferry will be working a similar timetable and route. This ferry terminal upgrade is proposed to allow for the berthing and operation of a larger ferry which has a greater vehicle and passenger carrying capacity than the current ferry as detailed in Table 2.1.1.

The marshalling area will be capable of handling up to 146% of the vehicle capacity of the new ferry, which will ensure there is no back up of vehicles onto the public road network. The new roundabout will ensure safe access to the marshalling area and exit onto the A865 for vehicles disembarking the ferry.

The cold ironing of the ferry when berthed overnight and the use of LNG when in the harbour area will reduce operational noise levels and provide contributions towards climate change targets as discussed in Chapter 10: Noise (In-air) and Chapter 4: Statutory Context and Policy. The inclusion of oil/silt interceptors in the surface water drainage for the full marshalling area will aid in the protection of water quality as discussed in Chapter 13: Water Quality and Coastal Processes.

Maintenance dredging is not expected to be a regular requirement during operations.

2.5.3 Demolition/Reinstatement

As a lifeline ferry service, there are no future plans to discontinue use of this site. Therefore, it is not considered necessary to plan for demolition and reinstatement works for closure of this site.

2.6 References

Affric Limited. (2019). Lochmaddy Ferry Terminal Upgrade Capital Dredge - Best Practicable Environmental Options Report

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Chapter 3: Methodology

Contents

3 Methodology

3.1 Overview of Approach and Methodology

One of the main purposes of the Environmental Impact Assessment (EIA) process is to influence and improve design through iteration. Environmental impacts have been considered throughout the project, from the development option stage and through into the design stages of the project as discussed in Chapter 2: Project Description. Where possible, environmental considerations have been incorporated into the design. The siting and design of the improvement works has been heavily influenced by aspects identified through the EIA process, including: stakeholder opinion, possible noise impacts, the status of existing infrastructure and the seabed conditions in the area.

An environmental specialist has been involved throughout the design process and, where necessary, appropriate topic experts have been consulted to inform the design. The project design therefore has avoided and minimised impacts wherever possible and, as such, there are embedded 'primary mitigation measures' to avoid or reduce negative effects. These have been incorporated within the assessment of effects.

In addition, it is assumed that standard construction practices, such as those outlined in Guidance for Pollution Prevention documents (tertiary mitigation), have been applied in the assessment process and these are captured within the Schedule of Mitigation.

This section sets out the process undertaken in order to provide a methodical and robust assessment of environmental impacts, that is used across all chapters of the Environmental Impact Assessment Report (EIAR) and aligns to the legislative requirements.

3.2 Screening

A screening request was submitted to Marine Scotland under Part 2 Regulation 11 of the Marine Works (EIA)(Scotland) Regulations 2017, on the 28th June 2017. A screening opinion was received from Marine Scotland on the 24th August 2017. The opinion was that the proposed works falls under paragraph 1(e), 10(g) and 10(m) of the EIA Regulations and, having considered the location and the characteristics of the potential impacts, an EIAR was required.

3.3 Scoping

A formal scoping request was submitted to Marine Scotland under Regulation 14 of the Marine Works (EIA)(Scotland) Regulations 2017 on the 21st September 2017. A scoping response was received from Marine Scotland on the 15th November 2017. The Marine Scotland scoping response requested that impacts from major accidents and disasters, specifically severe storms, flood and tidal surges, and transport accidents, were considered. After further discussion with SEPA and Marine Scotland it was agreed that severe storms and tidal surges could be scoped out. Transport accidents and flood are considered in Chapters 12: Traffic, Access and Navigation and 13: Water Quality and Coastal Processes respectively. No major accident and disaster chapter has been included. A copy of the email discussion has been provided in Appendix C.2.

A formal scoping request was also submitted to Comhairle nan Eilean Siar (CnES) under the Town and Country Planning (EIA) (Scotland) Regulations 2017 on the 25th September 2017 and they responded on the 26th October 2017.

The main points made in the scoping opinions have been identified and considered in the production of this document; a summary table is provided in Appendix C.1. The scoping summary table also details how each point has been addressed and directs the reader to the relevant sections of this EIAR. Table 3.3.1 provides a summary of the output of the scoping process. Items scoped out (grey) have not been assessed through the EIAR process, and those in orange have been subjected to a full assessment as laid out in Section 3.4. Mitigation measures have been included within the Schedule of Mitigation for those identified in green.

Table 3.3.1: Proposed Scoping for the EIA Assessment

Topic	Construction and Site Preparation	Operation
Air Quality and Climate Change		
Archaeology and Cultural Heritage		
Biodiversity and Nature Conservation – Terrestrial	Otters	
Biodiversity and Nature Conservation – Ornithology		
Biodiversity and Nature Conservation – Marine	Marine Mammals, Fish and Benthic Ecology	
Seascape, Landscape and Visual		
Land and Soil Quality –Terrestrial		
Land and Soil Quality – Marine	Elements covered in Water Quality and Costal Processes.	
Population, Socio-economics and Human Health		
Noise and Vibration – In-Air		
Noise and Vibration – Under Water		
Natural Resource Usage and Waste		
Traffic, Access & Navigation		
Water Quality and Coastal Process		
Major Accidents and Disasters	Elements covered in water quality.	Elements covered in Traffic, Access and Navigation.

Key

	No Effect/Not Applicable – Scoped Out
	Negligible Effect – Scoped Out
	Potential Effect –Scoped Out - mitigation included in Schedule of Mitigation
	Potential Effect – Scoped In

3.4 Baseline Assessment

Baseline assessments have been completed for each of the EIA topic areas to be considered as part of this assessment. The following sources of information have been utilised in the compilation of baseline data:

- Desk based studies, making use of publicly available reports and data;
- Stakeholder dialogue, to identify additional data sources and information; and
- Site surveys and monitoring, when appropriate.

Full details of data sources used, and survey and monitoring methods employed for each topic are provided within the topic-specific sections.

The baseline information is utilised to understand the value of each environmental receptor, and its sensitivity to the potential impacts associated with the upgrade works. This is then utilised to assess the significance of the effect each impact is predicted to have.

3.5 Assessment Methodology

The assessment criteria being applied to this EIA are detailed within this section. For each of the environmental topics being assessed, the appropriate professional guidelines for EIA have been applied and followed when considered necessary, along with any other relevant guidance documents and best practice techniques. As a result, where the standard assessment criteria and terminology set out below are not followed for a specific environmental topic, this will be identified within the relevant environmental chapter of the EIAR, along with specific information on the preferred assessment criteria that have been applied.

The environmental assessment is conducted in two stages. The first stage characterises the nature of the impacts (positive or negative) and the second determines the level of significance of the effects. An effect results from the consequences of a change (or impact) acting on a resource / receptor. The precise nature of the effect will depend on the interaction between the degree of impact (e.g. extent, duration, magnitude, permanence etc.) and the sensitivity, value, or number of the resources / receptor in each case.

The assessment identifies the origins of environmental impacts, positive (beneficial) and negative (adverse), from the project and predicts their effects on resources or receptors. A resource is any environmental component affected by an impact (e.g. items of environmental capital such as habitats, aquifers, landscape, views and community facilities). A receptor is any environmental or other defined feature (e.g. human beings) that is sensitive to or has the potential to be affected by an impact.

The assessments of whether the effects of the proposals on the particular resources or receptors were made by suitably qualified and experienced practitioners. Where possible, quantitative analyses was undertaken to support the impact assessments. Where the subject did not lend itself to quantitative analysis, qualitative analysis based on the relevant literature and similar studies were utilised to provide a robust assessment. This was determined for each environmental topic, depending on the nature of the receptor.

Each potential impact was assessed in terms of its receptor's sensitivity or value (e.g. nature conservation value, landscape value or amenity value), followed by an assessment of the magnitude of the impact, and thus determination of whether or not significant effects result. For each significant effect identified, appropriate secondary mitigation measures are prescribed. The residual effects are determined for each significant effect; taking into account all proposed mitigation.

3.5.1 Sensitivity / Value of Resource / Receptors

Sensitivity values were assigned to individual resources or receptors, using a set of criteria and terminology defined within each technical chapter. This is often categorised in accordance with EIA guidance documents, as appropriate for each environmental topic.

Where categories were used to describe value or sensitivity of a resource or receptor, these are defined within the 'Assessment Methodology' section of the individual chapters. Typically, receptor sensitivity or value will be classed as negligible, low, medium or high.

3.5.2 Impact Severity

In considering the impact severity a range of factors are taken into account as applicable to the subject matter. The factors utilised are based on the Institute of Ecology and Environmental Monitoring (IEEM) guidelines of ecological assessment (CIEEM, 2018) but are applicable to most topic areas. They include the:

- Positive or Negative
- Extent: spatial or geographical area affected;
- Magnitude (Scale): size, amount, intensity, volume;
- Duration: typically: short, medium, long-term and permeant or temporary;
- Frequency and timing: how often and when (time of day or seasonality); and
- Reversibility: can the effect be reversed or is it irreversible.

Impacts can be positive or negative, it is clearly stated within the assessment whether impacts are positive or negative.

The magnitude of the impact takes into account the extent, scale, frequency and timing as applicable for the subject area. The magnitude of impact terminology and criteria will be defined within each environmental chapter, but in most cases includes an overall magnitude term of negligible; minor, small or low; moderate or medium; and major, high or large. In some instances, a fifth category of very large is utilised to align with topic specific guidance.

The duration of the impact is also noted, as permanent or temporary. Temporary impacts can be further sub-divided if necessary, in accordance with the following definitions, although use of this terminology is highly dependent on other factors within the environmental topic being assessed (e.g. lifecycle of flora and fauna species):

- Short-term: less than 1 year in duration;
- Medium-term: between one to three years in duration; and

- Long-term: more than three years in duration.

Whether or not an impact is reversible is also noted.

The initial assessment of impacts takes account of primary and tertiary mitigation (see Section 3.5.5). Potential significant adverse effects are then reassessed to understand the residual effects taking account of all mitigation proposed.

3.5.3 Indirect and Cumulative Impacts, and Impact Interactions

As well as direct impacts (resulting from the project itself), impacts can also be indirect or cumulative. There can also be interactions between multiple impacts resulting from one or more projects. Where this terminology is used within any assessment, the definitions for these are outlined below (as taken from 'Guidelines for the assessment of indirect and cumulative impacts as well as impact interactions' (European Commission, 1990)):

- Indirect: impacts on the environment, which are not a direct result of the project, often produced away from or as a result of a complex pathway. Sometimes referred to as second or third level impacts, or secondary impacts;
- Cumulative: impacts that result from incremental changes caused by other past, present or reasonably foreseeable future actions together with the project; and
- Impact interactions - the interactions between impacts whether between the impacts of just one project or between the impacts of other projects in the area.

3.5.4 Determination of Significant Effects

For each impact identified, a determination of whether or not it will result in a significant effect was made; taking into account both the sensitivity / value of the resource / receptor, and the magnitude of impact. Table 3.5.1 provides an example of how these two elements can be combined to give an overall significance category. Topic specific variations to significance determination are provided in the topic chapters.

Table 3.5.1: Categorising Significance of Effects

Magnitude of Impact	Sensitivity/Value of Receptor			
	High	Medium	Low	Negligible
Major/Large/High	Major	Moderate	Minor	Negligible
Moderate/Medium	Moderate	Moderate	Minor	Negligible
Minor/Small/Low	Minor	Minor	Negligible	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible

Key

	Significant Effect

The categories provide a threshold to determine whether or not significant effects may result from the proposed development. A typical categorisation is shown in Table 3.5.2. Effects can be both beneficial or adverse.

Table 3.5.2 Categorisation and Definition of Effects

Category	Definition
Negligible	No detectable change to the environment resulting in no significant effect.
Minor	A detectable, but non-material change to the environment resulting in no significant effect.
Moderate	A material, but non-fundamental change to the environment, resulting in a possible significant effect.
Major	A fundamental change to the environment, resulting in a significant effect.

Key

	Significant Effect

For the purposes of this particular EIAR, a significant effect will be defined as moderate in level or higher (Table 3.5.1 and Table 3.5.2) and considered to be a 'likely significant effect' in terms of EIA. The duration and reversibility of the effect will also be noted as discussed in Section 3.5.2.

For adverse significant effects, secondary mitigation will be proposed where practicable in order to prevent, reduce, or offset the significant adverse effect. Effects determined as minor or lower will be considered to have no likely significant effect. Where an impact could be reduced by the application of recognised best practice, this will be identified irrespective of its significance. This will assist in reducing all effects, whether they are significant in EIA terms or not.

3.5.5 Approach to Mitigation

The Institute of Environmental Monitoring and Assessment (IEMA) define three categories of mitigation in their EIA guidance for Shaping Quality Development (IEMA, 2015). These categories are used throughout this EIAR and are outlined below:

- **Primary (Inherent) Mitigation**: Modifications to the location or design of the development made during the pre-application phase that are an inherent part of the project, and do not require additional action to be taken.
    - E.g. Identifying a key habitat or archaeological feature that should remain unaffected by the development's layout and operation.
- **Secondary (Foreseeable) Mitigation:** Actions that will require further activity in order to achieve the anticipated outcome. These may be imposed as part of the planning consent, or through inclusion in the EIAR.
    - E.g. Adoption of a Marine Mammal Protection Plan to limit the effects of disturbance through piling noise.

- **Tertiary (Inexorable) Mitigation:** Actions that would occur with or without input from the EIA feeding into the design process. These include actions that will be undertaken to meet other existing legislative requirements, or actions that are considered to be standard practices used to manage commonly occurring environmental effects.
    - E.g. Considerate contractors' practices that manage activities which have potential nuisance effects.

As per the above IEMA categories, all the primary and tertiary mitigation embedded in the design and proposed construction techniques are set out in the Project Description (Chapter 2), with topic specific elements discussed in the individual topic chapters. The primary and tertiary mitigation measures will be used when assessing the significance of effects, since both these forms of mitigation are certain to be delivered. Thus, any effects that might arise without the primary and tertiary mitigation, do not need to be identified as potential effects, as there is no potential for them to arise.

Secondary mitigation measures will be proposed where practicable for any potential significant adverse effects that are identified. Mitigation measures will then be developed, as required, taking into account current guidance, precedents from similar projects, effectiveness and feasibility of solutions, and incremental costs.

It may only be possible to reduce the severity of potential adverse effects through secondary mitigation, as some cannot be eliminated entirely. Residual effects are those that remain after mitigation has taken place, these are assessed in the same way as detailed in Section 3.5.4.

A Schedule of Mitigation and Construction Environmental Management Document (CEMD) have been produced and in line with The Highland Council (The Highland Council, 2010) and IEMA's guide to Delivering Quality Development (IEMA, 2016). The CEMD including the Schedule of Mitigation will be submitted with the Marine Licence application. However, it should be noted that it is a 'live' document and as such will be updated as required to take account of additional detail from the design and specific information once the Construction Contractor is appointed. Any material changes to the content will be discussed and agreed with Marine Scotland and the relevant statutory consultees prior to implementation. CMAL will manage any potential operational impacts by updating their existing environmental management systems.

3.6 Consultation

As discussed in Chapter 4: Statutory Context and Policy, the project was required to carry out Pre-application Consultation, and a Pre-application Consultation Report has been produced for submission with the marine licence and planning consent applications. It should however be noted that in addition to the scoping mentioned in Section 3.3, there has been additional dialogue with Marine Scotland and Statutory Consultees.

The Skye Triangle project, which includes the Lochmaddy ferry terminal upgrade, has regular steering group meetings which includes representation from:

- Caledonian Marine Assets Limited (CMAL) – the owners of the ferry, the owners of Tarbert ferry terminal and project managers for the upgrade of the Lochmaddy ferry terminal;
- CnES – the Council whose ward the Lochmaddy ferry terminal is located within and owners of the Lochmaddy ferry terminal;
- The Highland Council – owners of the Uig ferry terminal;
- Transport Scotland –funders of the ferry and associated upgrades; and
- CalMac – the operators for the ferry.

Marine Scotland have attended the steering group meetings by invitation. Additional meetings and discussions have been held with SNH, SEPA and CnES with regard to the content of the EIAR. These are discussed as required within the topic specific chapters.

3.7 Cumulative Effects

A review of planned developments has been carried out to identify which should be considered within the EIAR. A review of those that need to be taken account of has then been completed to understand which topic-specific chapters need to consider.

3.7.1 Onshore Developments

The Comhairle nan Eilean Siar eplanning website (Comhairle nan Eilean Siar, 2018) was searched for developments entering the planning system in Lochmaddy between the 11st February 2017 and the 11th February 2019. Within a 1km radius of the proposed harbour development, 6 planning applications were made and 5 approved, with the sixth awaiting a decision. Four applications relate to the building or modification of residential properties. One relates to the instalment of an antennae, support pole and smart meter equipment on an existing building. The final application relates to the proposed Lochmaddy development itself. None of these projects in planning are of a scale to have a significant environmental effect, nor are they likely to have cumulative effects with the harbour development.

3.7.2 Offshore Development

Current marine renewable energy projects, construction, cable and National Renewable Infrastructure Plan projects are listed on the Scottish Government website and associated maps (Marine Scotland, 2018a, 2018b, 2018c, 2018d). Each project type has been considered in turn to identify projects which could have in-combination or cumulative effects.

The majority of the potential significant environmental effects of the Lochmaddy Ferry Terminal Upgrade are associated with the construction phase. Operational traffic effects will not have cumulative effects with other marine projects, nor will impacts on seascape, landscape and visual amenity. Hence only projects with potential to overlap with the construction period for the ferry terminal could have cumulative effects. Similarly, projects need to be within a reasonable proximity to have cumulative effects, projects on the east coast of Scotland are highlight unlikely to have cumulative effects with the Lochmaddy harbour development and as such will not be considered further. The majority of the proposed offshore renewable energy projects are on the east coast of Scotland, the closest four offshore energy

projects to Lochmaddy are identified and considered in Table 3.7.1. Primarily due to their locations no cumulative effects are predicted with any renewable energy projects.

Construction, Cable and National Renewable Infrastructure Plan projects on the North and West coasts of Scotland are considered in more detail in Table 3.7.1 to identify whether or not there is a possibility of cumulative effects.

Table 3.7.1: Marine Project for Cumulative Consideration

Project type	Status	Proposal	Approx. distance from Lochmaddy	In/Out	Reason for inclusion/exclusion
Wave	Post-Construction	Lewis Wave Power, 40MW Oyster Wave Array	103km straight line 122km by sea	Out	Located on the west coast of Lewis, hence the land between the two projects significantly reduces the chances for interactions. Lewis Wave Power was owned by Aquamarine Power ltd, who went into administration in 2015. Hence it is unlikely that the project will be built.
Wave	Post Consent	WaveNet – Mingary, 6 unit wavenet array	120km straight line 130km by sea	Out	Small development located within the Mingary Bay localising associated environmental effects, hence no cumulative effects are expected.
Wave and Wind	Pre-Consent	Katanes Floating Energy Park, 5 combined floating wind and wave energy devices.	220km straight line 245km by sea	Out	Significant distance between the two development, project is relatively small scale. Unclear when it will be constructed. Due to distance it is unlikely to have cumulative effects with Lochmaddy.
Wind	Post Consent	Dounreay Tri Floating Wind Demonstration Project	220km straight line 245km by sea	Out	Project is currently on-hold, it is unclear if and when construction will restart
Construction Project	Pre-Application	Ardrossan Harbour, Quay Improvement Works removal and construction of a new quay wall and linkspan replacement.	260km straight line 380km by sea	Out	An EIAR is not required for this project due to scale and location, it highly unlikely that there would any cumulative effects with the Lochmaddy ferry terminal upgrade.
Construction Project	Pre-Application	Sound of Mull Artificial Reef Trust (SMART) provision of an artificial reef by sinking a decommissioned Royal Navy Vessel.	140km straight line 150km by sea	Out	Scoping was carried out in 2013, it is unclear the current status of this project. Unlikely that there would be cumulative effects with the Lochmaddy project.

Project type	Status	Proposal	Approx. distance from Lochmaddy	In/Out	Reason for inclusion/exclusion
Construction Project	Pre-Application	Millport Coastal Flood Protection Scheme	245km straight line 385km by sea	Out	Significant distance to Lochmaddy with land in between, unlikely to have cumulative effects.
Construction Project	Pre-Application	Hunterston Marine Construction Yard	250km straight line 400km by sea	Out	An EIAR was not required for the project, as it was not considered to have significant effects Significant distance apart with land in between, unlikely to have cumulative effects.
Construction Project	Pre-Application	Tarbert Ferry Terminal Upgrade Upgrade including dredging, land reclamation and piling works.	35km straight line 40km by sea	In	Potential overlap in construction works, near enough to have effects on the same receptors, and use of same dredging disposal site.
Construction Project	Pre-Application	Uig Ferry Terminal Development – Upgrades including dredging and piling works.	45km straight line and by sea	In	Potential overlap in construction works, near enough to have effects on the same receptors.
Construction Project	Pre-Application	Stornoway Port Authority – Newton Marina Includes dredging	80km straight line 90km by sea	In	Potential overlap in construction works and use of same dredging disposal site.
Construction Project	Pre-Application	Stornoway Port Authority – Deep Water Port, Arnish Includes piling, dredging and land reclamation.	80km straight line 90km by sea	In	Potential overlap in construction works and use of same dredging disposal site.

Project type	Status	Proposal	Approx. distance from Lochmaddy	In/Out	Reason for inclusion/exclusion
Construction Project	Application	Kilfinichen Pier Development – Construction of a timber pier on Mull	150km straight line 160km by sea	Out	Small development, the main effects are associated with otter. Due to the distance between the developments being much further than otters ranges, there will be no cumulative effects.
Construction Project	Application and Determination	Clyde Waterfront Renfrew Riverside Construction of a new opening bridge across the River Clyde	215km straight line 450km by sea	Out	Significant distance to Lochmaddy with land in between, unlikely to have cumulative effects.
Construction Project	Application and Determination	Scottish Woodlands – Installation of temporary floating pier	120km straight line 145km by sea	Out	An EIAR was not required for the project, as it was not considered to have significant effects. Significant distance apart with land in between, unlikely to have cumulative effects.
Construction Project	Application and Determination	North Ayrshire Council – Coastal Protection & Footpath, Fairlie	235km straight line 380km by sea	Out	Very small project not requiring and EIAR, and hence due to the distance is unlikely to have cumulative effects.
Construction Project	Application and Determination	Scottish Canals Ardrishaig Pier Repair and Extension	205km straight line 405km by sea	Out	Project was screened to not need an EIAR due to the scale and lack of potential for significant effects. Due to the considerable distance it is highly unlikely that there will be cumulative effects with this project.
Construction Project	Post - Determination	Marine Harvest – Kyleakin Feed Mill, Skye new pier construction	90km straight line 95km by sea	Out	Construction works are Kyleakin are almost complete, unlikely to overlap with the Lochmaddy works.

Project type	Status	Proposal	Approx. distance from Lochmaddy	In/Out	Reason for inclusion/exclusion
Construction Project	Application	Installation of a Finfish Farm – Grey Horse Channel Outer, Cheesebay, North Uist	10km straight line 12km by sea	Out	Significant distance to Lochmaddy with land in between, unlikely to have cumulative effects.
Cable	Application and Determination	SSE Western Isles Interconnector. HVDC cable between mainland Scotland and Arnish.	80km straight line 85km by sea	Out	The cable is close to the Stornoway dredge spoil disposal site; however, it is unlikely that dredge disposal and cable laying activities will be carried out at the same time. Cable installation gives rise to very localised effects, hence no cumulative effects with works at Tarbert are expected or dredge disposal is predicted.
Cable	Pre-Application	Havfrue Telecommunications Cable from Norway to United States	180km to nearest point	Out	Timeline isn't clear, but potential to overlap with Lochmaddy, impacts associated with cable lays are very localised hence it is highly unlikely there will be any cumulative effects, between the projects.
Removal of any Substance or Object	Pre-Application	Wild Seaweed Harvesting	5km to nearest predicted viable resource	Out	The scoping response states that the current application area is too large and as such it is unclear which areas consent will be submitted for, first. Hence it is currently unclear whether an application will be made for harvesting within the vicinity of the construction works, or whether harvesting will overlap with the construction period. The impacts of seaweed harvesting are very different, from those associated with construction. Currently there are too many uncertainties and a lack of information to be able to complete a meaningful cumulative assessment.

The three Skye Triangle projects will have overlapping construction programmes and are in the close enough to potentially have cumulative effects. It is likely that the developments planned by Stornoway Harbour: the Deepwater Berth and the Marina development will have overlapping construction periods. As Lochmaddy will be utilising the same dredging disposal site as the Stornoway projects and the Tarbert project there is a potential for cumulative effects with these projects.

3.7.3 Topic Consideration

Each of the projects identified in Section 3.7.1 and 3.7.2 as having the potential for cumulative effects have been considered in more detail to identify the environmental topic areas for which there are potential cumulative effects (Table 3.7.2). Only where there is a potential cumulative effect have the projects been taken forward for consideration in the topic-specific chapter. Those effects being taken forward for cumulative assessment are shown in light blue in Table 3.7.2.

Table 3.7.2: Environmental Topic's with Potential Cumulative Effects

Topic	Tarbert Ferry Terminal Upgrade	Uig Ferry Terminal Upgrade	Stornoway Port Authority – Newton Marina	Stornoway Port Authority – Deep Water Port, Arnish
Marine Mammals	Associated with dredge disposal.	No combination effects due to distance.	Associated with dredge disposal.	
Benthic Ecology	Effects very localised, no cumulative effects.			
Fish	Associated with dredge disposal.	No combination effects due to distance.	Associated with dredge disposal.	
Noise (in-air)	Effects very localised, no cumulative effects.			
Noise (under-water)	No additive noise affects due to the distance between projects.			
Traffic, Access and Navigation	Adherence to Stornoway Port Authorities navigational instructions during disposal will minimise collision risk in the unlikely event the dredge vessels meet at the disposal ground.	Potential changes to ferry time table during construction.	Dredging disposal programmes do not overlap. Hence, only one vessel will be in the vicinity of the disposal grounds at a time.	
Water Quality and Coastal Processes	Associated with dredge disposal.	Effects very localised, no cumulative effects.	Associated with dredge disposal.	

Key

	No further assessment required.
	To be taken forward for cumulative assessment.

3.8 References

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Chapter 4: Statutory Context & Policy

Contents

4 Statutory Context & Policy

This chapter provides a summary of the statutory requirements for the proposed upgrade to the Lochmaddy ferry terminal, as well as highlighting the policies that may apply to the determination of the marine licence and planning consent applications. In addition, statutory requirements specific to a given topic area are discussed in the relevant topic chapters.

4.1 Consenting Permitting and License Process

4.1.1 Marine Licence

Under the Marine (Scotland) Act 2010 a number of 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 the Mean High Water Spring (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.

The land reclamation to increase the marshalling area, the works on the existing pier, the pier extension and the temporary works to allow the ferry service to operate throughout construction will be subject to a marine construction licence. In addition, there will be a requirement for dredging and dredged spoil disposal, which also requires a Marine Licence. Hence two marine licence applications have been submitted to MS-LOT.

4.1.2 Onshore Consenting

Under the Town and Country Planning (Scotland) Act 1997, any type of development, i.e. carrying out of building, engineering, mining or other operation in, on, over or under land, or the making of any material change in the use of any building or other land over the mean low water springs will require planning consent. The exception to this is developments falling under the permitted development rights of the harbour under the Harbours Act 1964.

The Comhairle nan Eilean Siar (Various Harbours) Harbour Revision Order 2002 gives the authority the power to provide various facilities within the harbour area, which includes all areas which were utilised as harbour facilities in 2002. As such onshore works within the Harbour Area will be completed under the Harbour Order. Planning consent is being sought from Comhairle nan Eilean Siar (CnES) for works above MLWS out with the Harbour Area.

4.1.3 Environmental Impact Assessment

As discussed in Section 3.2 of Chapter 3, Marine Scotland and CnES have confirmed that the upgrade of the Lochmaddy ferry terminal requires an EIAR under the Marine Works (EIA) (Scotland) Regulations 2017 and the Town and Country Planning (EIA) (Scotland) Regulations 2017. Hence this EIAR has been produced to support both the marine licence and the planning application processes.

4.1.4 Pre-Application Consultation

The Marine Licensing (Pre-application Consultation (PAC)) (Scotland) Regulations 2013, prescribe the marine licensable activities that are subject to PAC and, in combination with the Marine (Scotland) Act 2010, set out the nature of the pre-application process. The Lochmaddy ferry terminal development falls within Regulation 4(d) as a construction activity within the marine area exceeds 1000m^2, therefore requiring the project to go through the PAC process.

The Planning etc (Scotland) Act 2006, requires PAC to be completed for major projects in accordance with the Town and Country Planning (Development Management Procedure (Scotland) Regulations 2013. Major projects are defined by the Town and Country Planning (Hierarchy of Developments) Scotland Regulations 2009. The project would be classed as an 'Other Development' under Section 9 of the Major Development Schedule, which defines major developments if the area of the site is or exceeds 2 hectares. The planning consent area is less than 1 hectare and as such the planning application is not subject to PAC. However, the overall Lochmaddy ferry terminal upgrade project exceeds the 2 hectares, hence compliance with the Town and Country Planning (Development Management Procedure (Scotland) Regulations 2013 has been ensured.

The PAC process completed and reported in the Lochmaddy Ferry Terminal Upgrade - Pre-Application Consultation Report (Affric Limited, 2019) ensure compliance with both the terrestrial and marine legislation.

4.2 Policy Context

4.2.1 National Marine Plan

As the project is partly below the 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), most of which apply to the proposed Lochmaddy ferry terminal upgrade works. Many GENs are specific to environmental topics; these are identified in Table 4.2.1, along with the considerations made during design development in order to meet the requirements.

The NMP lays out sector specific objectives and policies, for shipping, ports, harbours and ferries. Table 4.2.2 details the objectives and relevant policies how the Lochmaddy ferry terminal upgrade contributes towards these.

Table 4.2.1 Scottish National Marine Plan GENs applicable to the Lochmaddy Development

General Planning Principles	Requirements	Lochmaddy Development Considerations	EIAR Chapter
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.	The Lochmaddy ferry terminal facilitates the Skye Triangle Ferry Service, which in addition to being a lifeline route, is popular with tourists. This is reflected in the forecasted utilisation figures for the ferry. Hence the project is essential to facilitating the economic benefit of the tourist sector to the islands.	2
GEN 3: Social Benefit	Sustainable development and use which provides social benefits is encouraged when consistent with the objectives and policies of this Plan.	The Lochmaddy ferry terminal facilitates the Skye Triangle Ferry Service, which is a lifeline route. Hence the project is essential in ensuring appropriate links from North Uist to Skye and mainland Scotland.	2
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 project construction methods have taken account of the need to continue to operate a ferry service, and to minimise the effects on local vessels, essential marine deliveries and visiting recreational vessels. Once operational the ferry terminal activities can co-exist with other users of the harbour area.	2 & 12
GEN 5: Climate Change	Marine planners and decision makers must act in the way best calculated to mitigate, and adapt to, climate change.	The introduction of shore-based power (cold ironing) for the ferry when it overnights in the harbour will give rise to a carbon saving. In addition, as part of the wider Skye Triangle project it facilitates the dual fuel vessel and use of Liquid Natural Gas (LNG) with its associated lower emissions.	2
GEN 6: Historic Environment	Development and use of the marine environment should protect and, where appropriate, enhance heritage assets in a manner proportionate to their significance.	No heritage assets have been identified that could be affected by the project. However, the Construction Environmental Management Document (CEMD) includes a protocol for archaeological discoveries in case anything is found during the works.	
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.	Significant impacts on landscape and seascape are not expected and were scoped out of the EIAR.	3

General Planning Principles	Requirements	Lochmaddy Development Considerations	EIAR Chapter
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.	The design took account of coastal processes and flooding details of which are provided in Chapter 12: Water Quality and Coastal Processes	13
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. (c) Protect and, where appropriate, enhance the health of the marine area.	Ecological features of interest have been considered within this EIAR. Legal requirements have been taken into consideration throughout. Mitigation measures are outlined in each of the Chapters 5-9, in the Schedule of Mitigation (Chapter 14) and in the CEMD. There are no significant residual impacts on any Priority Marine Features due to the proposed development.	5-9, 14
GEN 10: Invasive Non-native Species	Opportunities to reduce the introduction of invasive non-native species to a minimum or proactively improve the practice of existing activity should be taken when decisions are being made.	The possible sources of invasive non-native species associated with the project have been identified and appropriate mitigation identified to minimise the chance of their introduction. Mitigation measures are identified in Chapter 13: Water Quality and Coastal Processes and in the Schedule of Mitigation (Chapter 14) and in the CEMD.	13 & 14
GEN 11: Marine Litter	Developers, users and those accessing the marine environment must take measures to address marine litter where appropriate. Reduction of litter must be taken into account by decision makers.	Potential sources of litter and measures to prevent it entering the marine environment have been identified in Chapter 13: Water Quality and Coastal Processes. The measures are included in the Schedule of Mitigation Chapter 14 and the CEMD to minimise the production of marine litter.	13 & 14
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.	A water framework assessment has been completed in Chapter 13: Water Quality and Coastal Processes, taking into account the findings of Ground Investigations and Ecology Chapters 5-9.	13

General Planning Principles	Requirements	Lochmaddy Development Considerations	EIAR Chapter
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.	Underwater noise emissions from piling have been modelled in Chapter 11, and potential impacts on marine mammals and fish assessed in topic specific Chapters 6 & 7. Marine mammal mitigation has been identified in Chapter 6, the Schedule of Mitigation (Chapter 14) and the CEMD. No significant residual effects persist.	11
GEN 14: Air quality	Development and use of the marine environment should not result in the deterioration of air quality and should not breach any statutory air quality limits.	It is acknowledged that there is a potential for dust associated with construction works to be detrimental to air quality, however with standard mitigation details in Chapter 14: Schedule of Mitigation and the CEMD no significant effects will occur. In addition, as part of the wider Skye Triangle project, the works facilitate the introduction of the dual fuel vessel and use of Liquid Natural Gas (LNG) which has lower Sulphur, nitrogen and particulate emissions than the marine fuel oil currently utilised.	2 & 14
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.	CnES and their consultants have had open and honest dialogue with stakeholders in the development of the marine licence and planning application submission and will publish the submission to ensure transparency.	PAC Report
GEN 18: Engagement	Early and effective engagement should be undertaken with the general public and all interested stakeholders to facilitate planning and consenting processes.	Pre-Application Consultation (PAC) has been completed and a report provided to support the Marine Licence application.	PAC Report
GEN 19: Sound evidence	Decision making in the marine environment will be based on sound scientific and socio–economic evidence.	Information provided in this EIAR is based on current available scientific evidence, to inform the decision-making process.	All
GEN 21: Cumulative impacts	Cumulative impacts affecting the ecosystem of the marine plan area should be addressed in decision making and plan implementation.	Cumulative impacts are considered as part of the assessment as detailed in Chapter 3 and the relevant topic-specific chapters.	3

Table 4.2.2 NMP Shipping, Port, Harbours and Ferries Objectives Comparison

Objective/ Policy	Requirements	Lochmaddy Ferry Terminal Upgrade Contribution
Objective 1	Safeguarded access to ports and harbours and navigational safety.	The construction method developed ensures that berthing capability is provided throughout the works to ensure that the ferry can continue to operate safely during the construction works.
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 pier upgrades, increase marshalling and parking areas and all facilitate the use of a larger ferry on the Skye triangle route which in turn facilitates the increase in the number of passengers and cargo movements through the harbour.
Objective 3	Safeguarded essential maritime transport links to island and remote mainland communities.	The main driver for the project is to facilitate the introduction of a new larger ferry to safeguard transport links to the western isles.
Objective 4	Linking of ferry services with public transport routes and active travel routes to help encourage sustainable travel where possible.	The development has included facilities for cyclists to encourage sustainable travel. The ferry terminal is located at the end of the village of Lochmaddy, and as such connects into the villages public transport services.
Objective 5	Best available technology to mitigate and adapt to climate change, where possible, supporting efficiencies in fleet management and ensuring port infrastructure and shipping services are able to adapt to the consequences of climate change. Consideration of the provision of facilities for shoreside power in new developments to allow for this to be provided when markets require it, if it becomes cost effective to do so.	The development will facilitate a new duel fuel ferry, which can utilise LNG to minimise the release of greenhouse gases while sailing. Shoreside power is being installed to allow the ferry to cold iron when overnighting in Lochmaddy. Hence, the development contributes towards this objective.
TRANSPORT 3	Ferry routes and maritime transport to island and remote mainland areas provide essential connections and should be safeguarded from inappropriate marine development and use that would significantly interfere with their operation. Developments will not be consented where they will unacceptably interfere with lifeline ferry services.	The construction method described in Chapter 2: Project Description ensures that berthing capability is provided throughout the works to ensure that the lifeline ferry service can continue to operate safely during the construction works.

Objective/ Policy	Requirements	Lochmaddy Ferry Terminal Upgrade Contribution
TRANSPORT 5	Port and harbour operators should take into account future climate change and extreme water level projections, and where appropriate take the necessary steps to ensure their ports and harbours remain viable and resilient to a changing climate. Climate and sea level projections should also be taken into account in the design of any new ports and harbours, or of improvements to existing facilities.	The design of the marshalling area took account of coastal processes and flooding details of which are provided in Chapter 13: Water Quality and Coastal Processes.
TRANSPORT 7	Marine and terrestrial planning processes should co-ordinate to: Provide co-ordinated support to ports, harbours and ferry terminals to ensure they can respond to market influences and provide support to other sectors with necessary facilities and transport links. Consider spatial co-ordination of ferries and other modes of transport to promote integrated and sustainable travel options.	The predicted increase in ferry users is one of the reasons for the new ferry being commissioned, this is linked to the peak demands attributed to the popularity of the islands to tourists.

4.2.2 Planning Policy

The development plan 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 city's; 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 policy.

4.2.2.1 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, 2014a). Within Section 5: A Connected Place it states that:

> *'We will reduce the disadvantage of distance for our coastal and island communities'*

It is specifically recognised in Section 5.36 that:

> *'Air and ferry services will continue to play an essential role – as a lifeline service but also supporting economic activity and the delivery of public services.'*

As discussion in the Project Need Section of Chapter 2: Project Description, one of the drivers for the new ferry is the increased demand on the service due to a growing tourism sector. The development of the ferry terminal to accommodate a larger vessel will both ensure the lifeline service and support the growing economic activity on North Uist and the wider Western Isles. As such the project directly aligns with this policy.

NPF3 does not identity any national developments in the Lochmaddy Area.

All SPP was consolidated into one overall policy document in February 2010. The SPP is also subject to regular updates, and a revised version was published in 2014 (Scottish Government, 2014b). With regard to 'A Connected Place' the SPP identified policy principles that the planning system should support patterns of development which:

- Optimise the use of existing infrastructure;
- Reduce the need to travel;
- Provide safe and convenient opportunities for walking and cycling for both active travel and recreation, and facilitate travel by public transport;
- Enable the integration of transport modes; and
- Facilitate freight movement by rail or water.

The proposed upgrade works enhance the existing infrastructure, which is at the end of the village of Lochmaddy and as such allows for people in the village to walk, cycle or utilise public transport to reach the ferry terminal. The upgrade works include improving the turning area, which will benefit the buses which already drop off/ pick up passengers from outside the ferry

terminal building. Cycling facilities are being provided along with safe footpaths. Additional long stay parking will allow passengers to leave their cars in Lochmaddy and utilise public transport once they reach Uig. The pier extension will allow larger ferries and more or larger cargo vessels to berth safely facilitating addition freight movements by water. As such the project is in alignment with the SPP, connected place policies.

Relevant PANs for the Lochmaddy ferry terminal Upgrade which were used to support the EIA include:

- PAN 1/2011: Planning and Noise and associated Technical Advice Note Assessment of Noise (Scottish Government, 2011);
- PAN 60: Planning for Natural Heritage (Scottish Government, 2008);
- PAN 69 Flood Risk (Scottish Government, 2015);
- PAN 75: Planning for Transport (Scottish Government, 2005); and
- PAN 79: Water and Drainage (Scottish Government, 2006).

4.2.2.2 Local

Lochmaddy falls within the area of the Outer Hebrides Local Development Plan (Comhairle nan Eilean Siar, 2018). The latest plan was adopted in 2018. The plan lays out visions and objectives for the Outer Hebrides and then goes on to detail policies, including those which planning applications would be assessed against. The project has been aligned to the LDP where appropriate, Table 4.2.3 detailing how this has been achieved.

Table 4.2.3: Applicable Outer Hebrides Local Development Plan Policies

Policy No.	Policy	Lochmaddy Ferry Terminal Upgrade Considerations
PD1: Placemaking and Design	Development proposals for new buildings will be permitted where they satisfy the following criteria: a) SITING should relate to the townscape and streetscape or the settlement pattern and landform, and avoid dominating the sky line. The orientation of the development while respecting the foregoing should also relate to the characteristics of the surrounding area.	The check in kiosks are the only building being erected, they are small so will not affect the skyline. They will be sited within the marshalling area and as such will be related to the character and use of the surrounding area.
	b) DESIGN - the development should be designed for the site ensuring design, scale, form and mass respects the surrounding built and natural environment. The mass of larger buildings should generally be managed by either breaking up the design elements or by use of appropriate materials. The proportions, detailing, materials and colours, should be neutral or make a positive contribution to the character of the surrounding area. For infill development, in streetscapes, details of the height of neighbouring buildings will usually be required to be shown on the proposal drawings.	The check in kiosks are a standard design and will not affect the character of the surrounding area.
PD2: Car Parking and Roads Layout	Road design and car parking should be suited to the type, location, scale and circumstances of the development. Subsequent development will be assessed cumulatively.	
	New Development will be assessed against all of the following: a) The Car Parking Standards in Tables 1-3 (Appendix 3), subject to provisions of this policy, and redevelopment or extension or change of use which would qualify for application of the Car Parking Standards;	Standards do not specifically stipulate requirements for ferry terminals. Sufficient parking provided for Employees and additional car, HGV and trailer parking is being provided to suit ferry operations. Marshalling areas provided to suit ferry operations.
	b) Car parking spaces should be a minimum of 2.5m x 5m. Specific standards for accessible parking are included at Table 4 and Fig 1 (Appendix 3);	Car parking has been designed to these standards.
	c) Cycle storage will be required for new public buildings, community facilities, schools, major business premises and flatted dwellings.	Dedicated Cycle Storage has been provided.
	Where car parking requirements cannot be met, the applicant will be required to justify the proposed provision and non-conformity with the Standard.	Standards have been met.

Policy No.	Policy	Lochmaddy Ferry Terminal Upgrade Considerations
	Roads Layout	
	All new vehicular accesses must meet the following criteria: a) The access road must enter the main road at right angles. The gradient of the access should not be greater than 1 in 10 for the first 10m;	The marshalling area access will be via a new round about. The gradient requirements will be met.
	b) If a gate is to be installed, it should be located at a minimum distance of 7.5m from the main road as per Fig 4 Appendix 3	The gate to the marshalling area is less than 7.5m from the main road. However, the gate will be opened by staff parking near the terminal building, not by pulling off the main road in front of the gate.
	c) Where a development accesses onto an adopted or surfaced unadopted road the first three meters on an access will be surfaced with bitumen or concrete. If the development accesses an unsurfaced unadopted road there will be no requirement to surface an access or surface the road;	All new road surfacing, including at accesses, will be bituminous surfacing
	d) Vehicles should be visible at a minimum distance of 90m from a point on the access road, 5m back from the main road. Relaxation on visibility splays may be acceptable depending on the road status and site location. Visibility should be taken at a height of 1m;	The marshalling area access road visibility meets these requirements.
	e) Where a new vehicular access is provided, it should be possible to enter and exit the access in a forward gear. Off road turning should be provided commensurate with the parking requirements for the development; and	The installation of the roundabout will ensure this, which is a significant improvement from the current situation.
	f) Where a new access comes on to an existing adopted footpath, dropped kerbs must be installed in accordance with the New Roads and Street works Act 1991 and to the Comhairle standards as detailed in Appendix 3. The kerb and footpath must be reinstated to the satisfaction of the Comhairle at the developer's expense.	Dropped kerbs have been specified appropriately.
PD6: Compatibility of Neighbouring Uses	All development proposals shall ensure that there is no unacceptable adverse impact on the amenity of neighbouring uses. Where appropriate proposals should include mitigation measures to reduce the impact on the amenity of neighbouring uses.	Neighbours have been considered as receptor groups throughout the design and EIA process and appropriate mitigation identified to minimise effects.
EL 1: Flooding	Flood Risk Assessments	

Policy No.	Policy	Lochmaddy Ferry Terminal Upgrade Considerations
	Information which demonstrates compliance with Scottish Planning Policy (SPP) will be required for development proposals within or closely bordering a medium to high risk flood area (1:200 year extents (0.5% Annual Probability), or greater), as identified by the flood risk management dataset issued by SEPA.	Flood events and probabilities have been considered in Chapter 13: Water Quality and Coastal Processes.
	Where it can be demonstrated that the location is essential for operational reasons e.g., harbours, piers, offshore energy and fisheries related activities, development proposals will be allowed in flood risk areas subject to sustainable flood management measures being incorporated at design stage that mitigate against flood risk.	The development relates to a harbour and as such has to be located in a coastal area.
	Allowances for Climate Change.	Design has included consideration of climate change effects in relation to extreme water level, flooding and storm events to generate a robust design as detailed in Chapter 13: Water Quality and Coastal Processes.
	The following allowances, or subsequent revised allowances, for climate change should be used when calculating estimated design flood levels: Fluvial: at least 20% should be added to the estimated design flood peak; Coastal: The following UK Climate Change Projections (UKCP09) sea level rise projections should be used to derive an allowance above the extreme still water design flood level: • Lewis and Harris - 0.55m • North Uist and Berneray - 0.53m • Benbecula, South Uist and Barra - 0.52m	This has been taken account of in the flood considerations detailed in Chapter 13: Water Quality and Coastal Processes.
EI2: Water and Waste Water	New developments will be required to adopt the principles of Sustainable Drainage Systems (SuDS). The Comhairle will support retrofitting of SuDS and the controlling of surface water through the use of permeable surfaces and green roofs.	Due to the coastal location SuDS is not appropriate, however appropriate surface water treatment has been incorporated into the drainage design.
EI3: Water Environment	Development proposals should avoid adverse impact on the water environment. All proposals involving activities in or adjacent to any water body must be accompanied by sufficient information to enable a full	Due to the development type it has to be in the water environment.

Policy No.	Policy	Lochmaddy Ferry Terminal Upgrade Considerations
	assessment to be made of the likely effects, including environmental effects, of the development. Where a site contains or is adjacent to a watercourse or the sea then all the following must be demonstrated: a) the site layout avoids development within the water environment unless the location is essential for operational reasons, e.g. for navigation and water-based uses. A minimum buffer strip of 6m should be incorporated between the water body and the proposed development, to enable access and maintenance all year round. Engineering activities such as culverts, bridges, watercourse diversions, bank modifications or dams should be avoided unless there is no practicable alternative;	
	b) the management or enhancement of existing and new habitats such as the provision of riparian/green corridors, natural flood management within flood plains, control of invasive non-native species, removal of redundant structures such as weirs or culverts;	The potential for introduction on invasive non-native species is considered in Chapter 13: Water Quality and Coastal Processes. With appropriate mitigation the risk of introduction is very low.
	c) no significant effect both during construction and after completion on: • Water quality in groundwater, adjacent watercourses or areas downstream; • Existing groundwater abstractions within 250m; • Water quantity and natural flow patterns and sediment transport processes in all water bodies.	Potential water quality effects are discussed in Chapter 13: Water Quality and Coastal Processes. Note impacts are associated with coastal waters only.
	For Major developments, where a site contains or is adjacent to a wetland or boggy area then a Phase 1 habitat survey should be carried out for the whole site and a 250 m buffer around it. Where a Groundwater Dependent Terrestrial Ecosystem is identified then the site layout should avoid it and drainage designed to ensure groundwater flows to the habitat are maintained	A phase 1 habitat survey was completed in 2017 to inform the Scoping for the EIAR, No Groundwater Dependent Terrestrial Ecosystems were identified.
EI4: Waste Management	Space to accommodate the provision of recycling facilities must be designed and built into all new industrial, commercial, retail and residential	Appropriate recycling facilities are provided in the terminal building.

Policy No.	Policy	Lochmaddy Ferry Terminal Upgrade Considerations
	development proposals both during the construction phase as well as the completed development.	
	Preparation of a Site Waste Management Plan will be required to accompany proposals for Major developments and developments involving significant demolition works. For all other developments, waste will be managed in accordance with the Waste Hierarchy. Details of how waste is to be managed should be provided as part of the sustainability label required through Policy PD4 Zero and Low Carbon Buildings.	Waste management planning has been considered in the Schedule of Mitigation (Chapter 14) and the CEMD in line with the waste hierarchy.
EI9: Transport Infrastructure	The priority areas for the upgrading and development of the transport infrastructure within, and serving the Outer Hebrides, are:	
	c) ports and harbours, including ferry facilities for mainland and inter island connections.	The proposal is a harbour upgrade associated with the Skye Triangle ferry service and hence aligns with this policy.
	b) any significant adverse effects on the qualities for which the area has been designated are clearly outweighed by social, environmental or economic benefits of national importance.	
NBH2: Natural Heritage	Development which is likely to have a significant effect on a Natura site and is not directly connected with or necessary to the conservation management of that site will be subject to an Appropriate Assessment by the Comhairle.	A habitat regulations appraisal, pre-screening report has been provided in Appendix E.1.

4.2.3 Climate Change Policy

Scottish Government published its Third Report on Proposals and Policies 2018-2032 for Climate Change in February 2018 (Scottish Government, 2018). The document lays out a path to a sustainable, inclusive low carbon society. The vision is to reduce Scotland's emissions by 66% against 1990 levels by 2032. Transport is one of the seven sectors which has a pathway defined to help achieve the vision. In 2015, marine transport was estimated to give rise to the equivalent of 1.4 million tonnes of carbon dioxide, 11% of the country's total transport emissions. Policy outcomes have been identified for the transport sector, including the following specific to ferries:

- 5: "*By 2032, low* emission solutions have [will] been widely adopted at Scottish ports and airports" (Scottish Government, 2018).
- 6: "Proportion of ferries in Scottish Government ownership which are low emission has [will have] increased to 30% by 2032".

As discussed in Chapter 2: Project Description, these are key drivers to the whole project.

4.3 References

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Chapter 5: Biodiversity

Contents

5 Biodiversity

5.1 Introduction

This general biodiversity chapter lays out the guidance and regulations relevant to ecological receptors and the impact assessment methodology that the following topic-specific chapters then utilise:

- Chapter 6: Marine Mammals;
- Chapter 7: Benthic Ecology;
- Chapter 8: Fish Ecology; and
- Chapter 9: Otters.

5.2 Regulations, Guidance and Sources of Information

5.2.1 Legislation

5.2.1.1 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 (UK Marine SAC Project), which form the Natura 2000 network of protected sites.

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 are commonly termed European Protected Species (EPS).

5.2.1.2 The Marine (Scotland) Act 2010

The act contains provisions for new Marine Protected Areas (MPAs) in Scottish territorial waters and sets out duties to ensure Scotland's seas are managed sustainably. In order to help meet this requirement, the Joint Nature Conservation Committee (JNCC) and Scottish Natural Heritage (SNH) have produced a list of habitats and species occurring in Scottish waters, which are noted for their conservation importance; these are referred to as Priority Marine Features (PMFs). A subset of the PMFs, called MPA search features, will be used to help identify possible areas for MPAs and develop the network in Scottish waters. MPAs are discussed further in Section 5.2.2.

5.2.1.3 Wildlife and Countryside Act 1981 and Nature Conservation (Scotland) Act 2004

The Wildlife and Countryside Act 1981 (WCA) (as amended in Scotland) was originally conceived to implement the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) and the Birds Directive in Great Britain. It has been extensively amended since it first came into force.

Schedule 5 of the WCA provides special protection to selected animal species other than birds, through section 9(4) of the Act, against damage to "*any structure or place which [any wild animal included in the schedule] uses for shelter and protection*", and against causing disturbance whilst in such places.

The WCA contains measures for preventing the establishment of non-native species which may be detrimental to native wildlife, prohibiting the release of animals and planting of plants listed in Schedule 9. It also provides a mechanism making the above offences legal through the granting of licenses by the appropriate authorities.

Important amendments to the WCA have been introduced in Scotland including the Nature Conservation (Scotland) Act 2004 (in Scotland) (NCSA). Part 3 and Schedule 6 of this Act make amendments to the WCA, strengthening the legal protection for threatened species. The Nature Conservation (Scotland) Act 2004 (in Scotland) is also the instrument under which Sites of Special Scientific Interest (SSSI) are protected in Scotland.

The Wildlife and Natural Environment (Scotland) Act 2011 provided a new licensing element to the WCA within Scotland, specifically for certain non-avian protected species 'for any other social, economic or environmental purpose'. This licensing purpose is qualified by two constraints; "*that undertaking the conduct authorised by the licence will give rise to, or contribute towards the achievement of, a significant social, economic or environmental benefit; and that there is no other satisfactory solution*".

5.2.2 Designations

Designated protected areas represent the very best of Europe's landscapes, plants and animals, rocks, fossils and landforms. Their protection and management will help to ensure that they remain in good health for all to enjoy, both now and for future generations. They may be designated to meet the needs of international directives and treaties, national legislation and policies, or more local needs and interests.

5.2.2.1 International Designations

5.2.2.1.1 Special Areas of Conservation

SACs are internationally important for threatened habitats and species. They form part of the Natura Site network, alongside Special Protection Areas. They are also selected for a number of habitats and species, both terrestrial and marine, which are listed in the Habitats Directive.

Where a potential site to be designated as a SAC has been identified, and the details of that site have been put out to public consultation, it is referred to as a candidate SAC (cSAC); cSACs are afforded full legislative protection, and as such will be considered to have equal value as SACs.

5.2.2.1.2 OSPAR

The Convention for the Protection of the Marine Environment of the North-East Atlantic (the OSPAR Convention) is the mechanism by which fifteen governments of Western Europe work together to protect the marine environment of the North-East Atlantic. OSPAR incorporates a wide range of marine issues, from work on pollution and dumping at sea, to the conservation of marine biodiversity.

In 2003, the government committed to establishing a well-managed, ecologically coherent network of Marine Protected Areas (known as the OSPAR MPA commitment). Marine Special Areas of Conservation (mSACs) designated under the Habitats Directive, have been submitted as the UKs initial contribution to the OSPAR network. Whilst OSPAR covers many different issues, the focus of SNHs current work is on delivering the OSPAR MPA commitment. A list of marine habitats and species considered to be under threat or in decline within the north-east Atlantic has been produced by OSPAR (known as the OSPAR Threatened and Declining List). The known distribution of these habitats and species in waters around the UK has been mapped on the National Biodiversity Network website. The habitats and species on the OSPAR Threatened and Declining List have been considered through SNH's Priority Marine Features (PMFs) work, as discussed in Section 5.2.1. Together with mSACs and marine Special Protection Areas (mSPAs) (also designated under the Habitats Directive) Scotland will achieve the OSPAR commitment of establishing a well-managed, ecologically coherent network of MPAs.

5.2.2.2 National Designations

National designations cover a range of different types of protected area and are made by a variety of local and national authorities. Some of these designations focus on nature conservation, while others are concerned with special landscapes. The management of multi-functional protected areas (such as our National Parks), seeks to balance the needs of people, landscape and nature.

5.2.2.2.1 Sites of Special Scientific Interest

Sites of Special Scientific Interest (SSSI) are those areas of land and water (to the seaward limits of local authority areas), that SNH considers to best represent our natural heritage; its diversity of plants, animals and habitats, rocks and landforms, or a combination of such natural features. They are the essential building blocks of Scotland's protected areas for nature conservation. Many are also designated as Natura sites (SPAs and SACs). The national network of SSSIs in Scotland forms part of the wider Great Britain series. SNH designates SSSIs under the Nature Conservation (Scotland) Act 2004. SSSIs are protected by law. It is an offence for any person to intentionally or recklessly damage the protected natural features of an SSSI.

5.2.2.2.2 Marine Protected Areas

Scotland (along with the rest of the UK), has designated a number of Marine Protected Areas (MPAs) which include SACs an SSSIs. The term "MPA" can be used for several different types of protected areas within the marine environment. The Marine (Scotland) Act has established a new power for Marine Protected Areas in the seas around Scotland, to recognise features of national importance and meet international commitments for developing a network of MPAs. Where a potential site to be designated as an MPA has been identified, and the details of the

site put out to public consultation, it is referred to as a proposed MPA (pMPA); pMPAs are afforded full legislative protection, and as such will be considered to have equal value as MPAs.

5.2.2.3 Local Designations

Local natural heritage designations identify areas that are important to people, generally in a Council area. Local nature conservation sites and special landscape areas may be known locally by other names, but all are used to direct local planning policies and highlight local sites of interest. Local nature reserves are areas of at least locally important natural heritage value, which local authorities own or manage, to provide opportunities for people to find out about their environment. Local designations are generally made by local authorities, though many are proposed by special interest and conservation groups, such as local Regionally Important Geological Sites (RIGS) Groups or the Scottish Wildlife Trust.

5.2.3 Habitats Regulation Appraisal

When a project may have a likely significant effect on a Natura Site (UK Marine SAC Project), 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 EIAR. Appendix E.1. provides a Habitats Regulations Appraisal Pre-Screening Report, produced to aid the competent authority's assessment of the designated sites which may have their qualifying interests potentially affected by the proposed Lochmaddy ferry terminal upgrade.

5.3 Impact Assessment Methodology

The assessment of the significance of predicted impacts on ecological receptors is based on both the 'value' of a receptor and the 'nature and magnitude' of the impact that the development will have on it. Effects on biodiversity may be direct (e.g. the loss of species or habitats), or indirect (e.g. effects due to noise, dust or disturbance), on receptors located within or outwith the respective survey area. The Ecological Impact Assessments (EcIAs), in principle, followed the assessment methodology outlined in Chapter 3: Methodology, with the specific ecological assessment methods and criteria detailed below.

5.3.1 Evaluation of Ecological Receptors

The evaluation methodology has been adapted from the Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine (CIEEM, 2018). A key consideration in assessing the effects of any development on flora and fauna is to define the areas of habitat and the species that need to be considered. This requires the identification of a potential zone of influence, which is defined as those areas and resources that may be affected by biophysical changes caused by project activities, however remote from the respective survey area.

The approach that has been undertaken throughout the ecological assessments is to identify 'valued ecological receptors' i.e. species and habitats that are both valued in some way and could be affected by the proposed development and separately, to consider legally protected

species. Both species populations and habitats have been valued using a broad geographical basis with full details in Table 5.1.

The approach taken in these assessments is that a species population or habitat area that is of Regional or greater importance in biodiversity conservation terms is considered to be a valued ecological receptor. Therefore, if a species population is considered to be of High Local value or less, the proposed development is not anticipated to have as great an effect on the species population as a whole. Exceptions are made if the species population or habitat area has been identified as having a high social or economic value, or if the species is legally protected, for example if they are a Schedule 1 or Schedule 5 species, or an EPS.

Table 5.1 Nature Conservation Receptor Evaluation Criteria

Value	Criteria
International	• An internationally important site (UK Marine SAC Project) or a site proposed for, or considered worthy of designation; • A regularly occurring substantial population of internationally important species (E.G. EPS listed on Annex IV of the Habitats Directive).
National	• A nationally designated site (Joyce et al.), or a site proposed for, or considered worthy of such designation; • A viable area of habitat type listed in Annex I of the Habitats Directive or of smaller areas of such habitat which are essential to maintain the viability of a larger whole; or • A regularly occurring substantial population of a nationally important species, e.g. listed on Schedule 5 & 8 of the 1981 Wildlife and Countryside Act.
Regional	• Areas of internationally or nationally important habitats which are degraded but are considered readily restored; • Viable habitats or populations of a species identified as a PMF, or smaller areas/populations which are essential to maintain the viability of a larger area/population as a whole; • Regionally important population/assemblage of an EPS, Schedule 1 and/or 5 species. • Regionally important assemblages of other species or habitats.
High Local	• Locally important population/assemblage of an EPS, Schedule 1 and/or 5 species; or • Sites containing viable breeding populations of species known to be county rarities, or supplying critical elements of their habitat requirements.
Moderate Local	• Undesignated sites, features or species considered to appreciably enrich the habitat resource within the local context (within 2km radius from the site) and may benefit from mitigation as a good practice measure.
Low Local	• Undesignated sites, features or species considered to appreciably enrich the habitat resource within the immediate environs of the site and may benefit from mitigation as a good practice measure.
Negligible	• Common and widespread or modified habitats or species.
Negative	• Invasive, alien species often scheduled under Section 14, Schedule 9 of the Wildlife and Countryside Act 1981 (as amended).

The approach of these assessments is to consider the value of the site for the species under consideration, rather than the nature conservation importance of the species itself, although this is a factor in the evaluation process with the level of use of the site (number of individuals using the site and nature and level of use) taken into consideration. An assessment is then

made of the value of the site to that species, based upon a combination of data sources, professional judgment and knowledge of the site and wider area.

5.3.2 Legal Protection of Species

There is a need to identify all legally protected species that could be affected by the proposed development, to ensure that the development complies with all relevant nature conservation legislation. It is, therefore, appropriate to take into full consideration the legal protection of a species within the evaluation process.

5.3.3 Nature and Magnitude of Impact

Impacts can be: permanent or temporary; direct or indirect; adverse or beneficial; reversible or irreversible; and may also have a cumulative function with other activities out with the assessed development. These factors are taken into consideration in the context of the sensitivity of the valued ecological receptor and the range of potential effects. To identify whether impacts are significant or not, it is important to undertake the assessment in terms of the integrity (coherence of the ecological structure and function), and conservation status (ability of the receptor to maintain its distribution and/or extent/size) of the receptor.

Table 5.2 provides an overview of the range of impact magnitudes referred to within this assessment. In addition, impacts may also be positive in nature.

Table 5.2 Definition of Magnitude of Impact

Magnitude	Description
Negligible / None	Very slight change from the baseline conditions. Changes barely detectable, approximating to the 'no change' situation. Any effects likely to be reversible within 12 months and not affect the conservation status or integrity of the receptor.
Low	Minor shift away from baseline conditions. Effects will be detectable but unlikely to be of a scale or duration to have a significant effect on the conservation status or integrity of the receptor in the short term (1-5 years). Overall baseline character of site will not alter substantially.
Medium	Clear effect on the conservation status or integrity of the receptor in the short to medium term (6-15 years), although this is likely to be reversible or replaceable in the long-term (15 years plus).
High	Total loss of, or major alteration to conservation status or integrity of a receptor with situation likely to be irreversible, even in the long term. Fundamental alteration to the character and composition of the Site.

5.3.4 Impact Significance

The significance of an effect is a product of the value of the ecological receptor and the magnitude of the impact on it, moderated by professional judgment. Table 5.3 illustrates a matrix based on these two parameters which is used for guidance in the assessment of significance. In terms of the EIA Regulations, only effects which are 'moderate' or 'major' are considered significant, the others constituting a non-significant effect. The level of effect has been assessed as either major, moderate, minor or negligible, or beneficial in accordance with the definitions provided in Chapter 3: Methodology.

Table 5.3 Significance of Effects Matrix

Magnitude of Impact	Value				
	International	National	Regional	Moderate Local/ High Local	Low Local /Negligible
High	Major	Major	Moderate	Moderate	Minor
Medium	Major	Moderate	Moderate	Minor	Minor
Low	Moderate	Minor	Minor	Minor	Negligible
Negligible	Minor	Negligible	Negligible	Negligible	Negligible

Key

	Significant Effect

5.4 Summary

The legislation, policy and guidance which are relevant to ecological receptors potentially affected by the Lochmaddy ferry terminal upgrade have been briefly stated. The definitions of the designated sites, at international, national and local levels, have been described and the individual designations will be related to the ecological topics. The impact assessment methodology specific to the ecology assessments to take place in Chapters 6-9 has been laid out.

5.5 References

CIEEM, 2018. Guidelines for Ecological Impact Assessment (Special Committee on Seals) in UK and Ireland: Terrestrial, Freshwater, Coastal, and Marine. *Chartered Institute of Ecology and Environmental Management, Winchester.*

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Chapter 6: Marine Mammals

Contents

6 Marine Mammals

6.1 Introduction

This chapter presents the marine mammal Ecological Impact Assessment (EcIA) for the construction phase of proposed Lochmaddy ferry terminal upgrade. Impacts on marine mammals resulting from the operation and decommissioning the development have been scoped out of the assessment in agreement with Marine Scotland. Marine mammal receptors are considered in this chapter and are evaluated in the context of nature conservation legislation and relevant planning policy (see Chapter 4: Statutory Context & Policy and Chapter 5 Biodiversity). Impacts on receptors are identified and subject to detailed impact assessment. Mitigation is proposed, cumulative impacts are considered, and finally the residual impacts and their significance are assessed.

This chapter is supported by Chapter 11: Noise and Vibration (Underwater).

6.2 Regulations and Sources of Information

As discussed in Chapter 5, international and national legislation assists in identifying sensitive marine mammal species whose presence on a site should be given greater consideration during assessment. This legislation also allows for designation of sites for marine mammal interests.

6.2.1 European and International Legislation

All species of cetacean occurring in UK waters are listed in Annex IV of the Habitats Directive as European Protected Species (EPS) where the deliberate killing, disturbance or the destruction of these species or their habitat is banned.

In addition, species listed in Annex II of the Habitats Directive, which are native to the UK should be conserved through the designation of Special Areas of Conservation (SACs). Two species of cetacean present in UK waters are listed in Annexe II; the bottlenose dolphin *Tursiops truncatus* and the harbour porpoise *Phocoena phocoena*. Since 1994 all SACs, in combination with Special Protection Areas (SPAs) comprise the UK contribution to the Natura 2000 ecological network of protected sites.

Although not afforded the strict protection of EPS through the Habitats Directive, pinniped species occurring in UK waters are listed in Annex V of the Habitats Directive, and as such are defined as species of community interest; therefore, taking in the wild may be subject to management measures. Two species, the grey *Halichoerus grypus,* and common *Phoca vitulina* seals, are also listed in Annex II of the Habitat Directive, as species whose conservation requires the designation of SACs.

For the purpose of this assessment species listed on Annexes II, IV, and V of the Habitats Directive are considered sensitive species.

6.2.2 National Legislation

All cetaceans are listed under Schedule 2 of the Habitats Regulations meaning it is an offence to deliberately or recklessly:

- Capture, injure or kill an EPS; or
- Deliberately disturb any cetacean.

The Wildlife and Countryside Act 1981, and Nature Conservation (Scotland) Act 2004 provide further protection to marine mammals. Cetaceans are listed in Schedule 5 of the Wildlife and Countryside Act 1981, which prohibits their deliberate killing, injuring or disturbance. The Nature Conservation (Scotland) Act 2004 makes amendments to the Wildlife and Countryside Act in Scottish waters, including the addition of 'reckless' acts to offences against species protection, which makes it an offence to intentionally or recklessly disturb a cetacean.

The Marine (Scotland) Act 2010 makes it an offence to disturb seals at any designated haul out location and to kill, injure or take seals anywhere.

6.2.3 Other Guidance

As discussed in Chapter 5: Biodiversity, the Joint Nature Conservation Committee (JNCC) and Scottish Natural Heritage (SNH) have produced a list of Priority Marine Features (PMFs) to ensure Scotland's seas are managed sustainably as required by the Marine (Scotland) Act 2010. Thirteen cetacean species, and both grey and common seals are included in the PMF list (Tyler-Walters et al., 2016). Inclusion in the PMF list does not provide any additional legal protection, however, due consideration must be provided in Impact Assessments, and as such all PMFs are considered sensitive for the purpose of this assessment. Further guidance for sensitive species was sought from the latest Biodiversity Action Plans (BAPs).

Guidance is also provided by JNCC and SNH regarding possible mitigation measures to reduce impacts on marine mammal species. These include:

- JNCC, 2010. JNCC Guidelines for minimising the risk of injury to marine mammals from piling noise; and
- SNH, Undated. The Scottish Marine Wildlife Watching Code.

Marine Scotland's The Protection of Marine EPSs from Injury and Disturbance: Guidance for Scottish Inshore Waters (Marine Scotland, 2014) was also considered when conducting this impact assessment.

6.3 Assessment Methodology

6.3.1 Desk Study

A desk study and literature search was undertaken to inform the characterisation of the existing marine mammal baseline conditions. The following data sources were consulted to aid in identifying and assessing the marine mammals which may be utilising the proposed development area, and surrounding waters, including gaining information on population sizes, seasonal trends, foraging characteristics, and associated designated sites:

- SNH interactive map facility at SiteLink (SNH, 2018);
- The UK PMF list (Tyler-Walters et al., 2016);
- National Marine Plan Interactive (Marine Scotland, 2018);
- Management Units for cetaceans in UK waters (IAMMWG, 2015);
- Scientific Advice on Matters Related to the Management of Seal Populations: 2017 (SCOS, 2017);
- Atlas of Cetacean Distribution in North-West European Waters (Reid et al., 2003); and
- Various scientific reports and journal articles regarding marine mammal distribution and movements in the north east Atlantic region.

6.3.2 Impact Assessment Methodology

The evaluation of receptors, magnitude of impact and significance evaluation follows the methodology laid out in Chapter 5: Biodiversity, Section 5.3.

6.4 Baseline

6.4.1 Designated Sites

There are several designated sites in the Inner and Outer Hebrides, that may be relevant to the proposed development area. The sites relevant to marine mammals are shown in Table 6.4.1, along with their marine mammal qualifying features. Figure 6.4.1 provides a map showing the locations of the designated sites relative to the proposed development. A description of the sites and reasons why they were or weren't taken forward for assessment are provided in the remainder of this section.

Table 6.4.1: Designated Sites Relevant to Marine Mammal Interests

Site	Direction and Distance by Sea	Value	Marine Mammal Qualifying Feature(s)	Taken Forward for Assessment?
Sea of Hebrides pMPA	3.7km E	National	• Minke whale (*Balaenoptera acutorostrata*)	No
Inner Hebrides & the Minches cSAC	4.5km E	International	• Harbour porpoise (*Phocoena phocoena*)	Yes
Ascrib, Isay, & Dunvegan SAC	30km E	International	• Common seal (*Phoca vitulina*)	Yes
Monach Islands SAC	52km W	International	• Grey seal (*Halichoerus grypus*)	No
Sound of Barra SAC	60km S	International	• Common seal (*Phoca vitulina*)	No
North-East Lewis pMPA	77km NE	National	• Risso's dolphin (*Grampus griseus*)	No
Treshnish Isles SAC	130km SE	International	• Grey seal (*Halichoerus grypus*)	No
North Rona SAC	196km NE	International	• Grey seal (*Halichoerus grypus*)	No
South East Islay Skerries SAC	230km SE	International	• Common seal (*Phoca vitulina*)	No

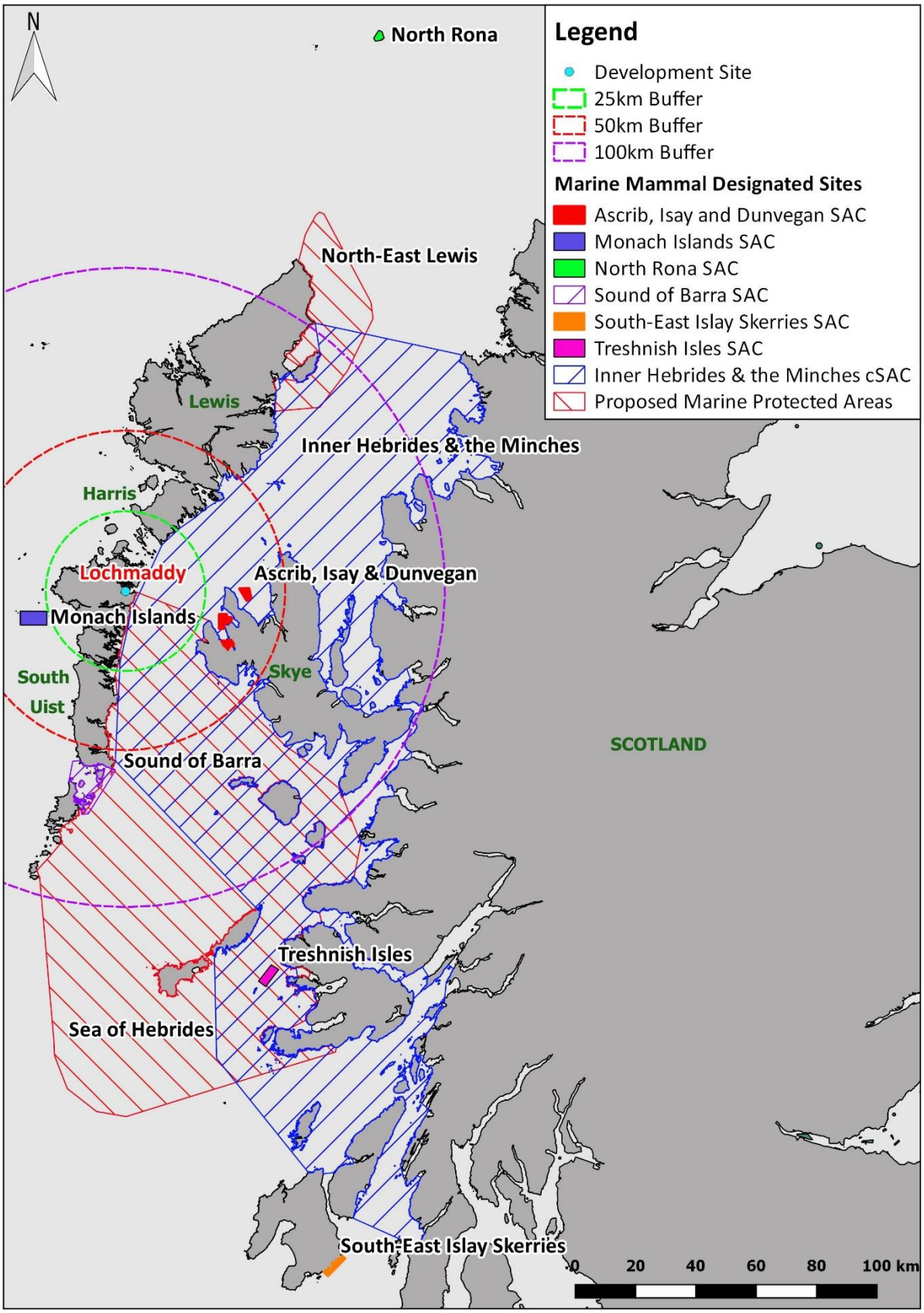

Figure 6.4.1: Map Showing Locations of the Designated Sites Relevant to Marine Mammal Interests

6.4.1.1 Inner Hebrides & the Minches cSAC

The Inner Hebrides & the Minches candidate SAC (cSAC) is designated for the conservation of harbour porpoise (*Phocoena phocoena*), under the European Habitats Directive. The area is of key importance to the UK part of the harbour porpoise management unit, and 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 site is taken forward for assessment because is situated within 5km of the proposed development, hence, there is potential connectivity between the construction operations and the designated features of the cSAC.

6.4.1.2 Ascrib, Isay, & Dunvegan SAC

The Ascrib, Isay, & Dunvegan SAC is designated in part due to its importance to the UK common seal (*Phoca vitulina*) population, under the European Habitats Directive. The complex of skerries, islets, undisturbed mainland shores and offshore islands in north-west Skye consistently support a breeding colony of the common seals, and represents one of the larger discrete colonies in the UK, holding around 2% of the UK population (JNCC, 2018). This site is taken forward for assessment as it is within the foraging range of common seals from the development site, so there is the potential connectivity.

6.4.1.3 Monach Islands SAC

The Monach Islands SAC is designated in part due to its importance as a grey seal (*Halichoerus grypus*) breeding colony, under the European Habitats Directive. Located the west of North Uist, the site offers a wide area of largely undisturbed habitat for breeding grey seals and there is easy access to the grassy swards and dune systems. These islands hold the largest breeding colony in the UK, contributing over 20% of annual UK pup production (JNCC, 2018). As detailed in Section 6.4.2.3, grey seals are only rarely present in the waters surrounding the development and spoil ground, hence, impacts on the designated features of the SAC are very unlikely, so this site will not be considered further.

6.4.1.4 Sound of Barra SAC

The Sound of Barra SAC is designated in part due to its importance to common seals, under the European Habitats Directive. The site comprises a mixture of islands, extensive rocky reefs, sandbanks and shallow channels in a broad stretch between the southern end of South Uist and the north coast of Barra in the Outer Hebrides (JNCC, 2018). The site is primarily designated due to the presence of the Annex I habitats including reefs and sandbanks, however common seals are included as a designated feature, since the area is considered to support a significant presence of this species (JNCC, 2018). Given the relatively short distances of common seal foraging trips, (typically 50 km)(SCOS, 2017), it is considered unlikely that common seals from the Sound of Barra SAC will be in the vicinity of the proposed development or spoil ground, so this site will not be considered further.

6.4.1.5 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). As detailed in Section 6.4.2.3, grey seals are only rarely present in the waters surrounding the development or spoil ground, hence, impacts on the designated features of the SAC are very unlikely, so this site will not be considered further.

6.4.1.6 North Rona SAC

The North Rona SAC is designated as a grey seal breeding colony, under the European Habitats Directive. Located off the north-west tip of mainland Scotland North Rona is a remote island in the North Atlantic, and remains undisturbed by humans for much of the year. Grey seals utilise much of the island, which supports the third largest breeding grey seal colony in the UK, contributing approximately 5% to the UK pup production (JNCC, 2018). As detailed in Section 6.4.2.3, grey seals are only rarely present in the waters surrounding the development or spoil ground, hence, impacts on the designated features of the SAC are very unlikely, so this site will not be considered further.

6.4.1.7 South East Islay Skerries SAC

The South East Islay Skerries SAC is designated due to its support of a nationally important common seal population, under the European Habitats Directive. The uninhabited skerries and islands of the SAC are extensively used as pupping, moulting, and haul-out sites by the common seals, which are estimated to represent between 1.5-2% of the UK population (JNCC, 2018). Given the relatively short distances of common seal foraging trips, (typically 50 km)(SCOS, 2017), it is considered unlikely that common seals from this SAC will be in the vicinity of the proposed development or spoil ground, so the site will not be considered further.

6.4.1.8 Proposed Marine Protected Areas

There are two proposed Marine Protected Areas (pMPAs) within 80km by sea of the proposed development, these are:

- The Sea of Hebrides pMPA, designated in part for minke whales, is located approximately 3.5km by sea south-east of the proposed development; and
- The North-East Lewis pMPA, designated in part for Risso's dolphins, is located approximately 77km by sea north-east of the Lochmaddy ferry terminal. It is noted that the Stornoway spoil ground is located within this site.

These sites were proposed as possible Nature Conservation MPAs in 2014, but have not been taken to consultation, and as such are not afforded policy protection. These sites will not be specifically considered in this assessment for the following reasons:

- Both pMPAs overlap substantially with the Inner Hebrides and the Minches cSAC which is designated for harbour porpoises;
- These sites have a value of National, whereas the cSAC is of International value, therefore the significance of effect will be greater for potential impacts on the cSAC;

- Potential impacts on the minke whale and Risso's dolphin features of the pMPAs resulting from the proposed development will be broadly similar to those on the harbour porpoise feature of the cSAC;
- Any mitigation measures identified for the harbour porpoise features of the cSAC will be equally effective for minke whales and Risso's dolphin; and
- Both minke whales and Risso's dolphins are specifically considered in the species assessments.

6.4.2 Species Accounts

Lochmaddy is located on the east coast of North Uist, on the western shore of the Little Minch. The Little Minch is a strait in the north-east Atlantic, which is bounded to the west by North Uist, and to the east by the Isle of Skye. The Little Minch joins the Minch to the north (together known as the Minches), and the Sea of Hebrides to the South. The area comprises of a fairly shallow basin, averaging 110m in depth, but with some areas reaching nearly 200m deep. Strong ocean currents in the waters surrounding the Minches cause turbulence, bringing nutrients to the surface, which results in enhanced productivity of plankton in the area. This in turn leads to aggregations of cephalopods and fish, providing a key food source for marine mammals, making the Minches an important region for serval cetacean and pinniped species (Reid et al., 2003).

Eight species of cetacean are regularly recorded in the Minches (Reid et al., 2003). Five of these species are considered to occur commonly or be resident in the area including; harbour porpoises, white beaked dolphins, Risso's dolphins, killer whales, and minke whales. The remaining 3 species are regular visitors, but less common and not thought to be resident, these include; bottlenose dolphins, short beaked common dolphins, and Atlantic white sided dolphins (Reid et al., 20003). Two species of pinniped are resident in the Minches and the surrounding waters; the common and grey seal. Both species use coastal sites for breeding/pupping and hauling out, and feed in inshore and offshore waters.

The species identified above as occurring in the vicinity of the proposed development area are considered in turn below. It is noted that according to the definitions provided in Chapter 5, all marine mammal receptors in UK waters have a value of **International**.

6.4.2.1 Regularly Occurring Cetaceans

*Harbour Porpoise (*Phocoena phocoena*)*

The harbour porpoise is distributed throughout temperate and subarctic waters of the North Pacific and North Atlantic oceans and is the most abundant cetacean to occur in north west European shelf waters (Evans et al., 2003). They are the UK's smallest, and most abundant cetacean, with the highest densities occurring along the North Sea coast, around the Northern Isles and the Outer Hebrides (Northridge et al., and Reid et al., 2003). As such they are expected to be one of the most frequently encountered cetaceans during the construction of the proposed development. The harbour porpoises occurring within the vicinity of the development are likely to be members of the West Scotland management unit, which is estimated to be composed of 21,462 individuals (IAMMWG, 2015).

The harbour porpoise is found within Scottish waters throughout the year (Evans et al., 2003), with limited information on seasonal movements of harbour porpoise (Reid et al., 2003). However, numerous studies have been conducted to model harbour porpoise distributions within Scottish waters (SNH, 2016). These studies utilised visual and acoustic harbour porpoise observation data, combined with environmental variables. The studies concluded that the waters of the Minches, together with the Sea of Hebrides, provide valuable habitat to harbour porpoises, and consistently support some of highest densities of this species within the UK (SNH, 2016).

*White-Beaked Dolphin (*Lagenorhynchus albirostris*)*

The UK is in the Southern extent of the range of white beaked dolphins, and as such the UK distribution is centred in the north; Scottish shelf waters are considered to be the main stronghold of this species in Europe particularly in the Minches, to the north of the Outer Hebrides, the outer Moray Firth, and off the coast of Aberdeenshire (Northridge et al, 1995, and Reid et al, 2003). The species typically inhabits waters of moderate depth, but less than 200m (Reid et al., 2003).

White-beaked dolphins from British and Irish waters are considered a single population of 15,895 individuals (IAMMWG, 2015). The high densities of this species reported in the Minches make it likely that this species will be present within the vicinity of the development. Sightings of white-beaked dolphin in the UK peak between June and October, although they are present year-round (Reid et al., 2003).

*Risso's Dolphin (*Grampus griseus*)*

Risso's dolphins in UK waters are primarily concentrated in the Minches in north west Scotland, in parts of the Irish Sea and off south west Ireland (Reid et al., 200). Risso's dolphins in the North Sea, west of Scotland and Irish and Celtic seas are considered a single population, however, no population estimate for the species is available as they are comparatively uncommon (IAMMWG, 2015). There is some evidence of seasonal distribution changes in this species, with highest sighting rates in the Minches being recorded between May and September. Conversely, detection rates in offshore waters near the continental shelf break were more frequent during the winter months of October to May (Reid et al. 2003).

*Minke Whale (*Balaenoptera acutorostrata*)*

The minke whale is the most common baleen species recorded in British shelf waters, including in the north-eastern Atlantic, where high densities are present off the west coast of Scotland, particularly in the Minches (Reid et al, 2003, and Evans 2008). They feed mainly in shallower water (<200m deep) over the continental shelf, rather than out in the open ocean. They regularly appear around sandbanks or where upwellings bring nutrients and fish near the surface, or in the strong currents around headlands and small islands (Reid et al., 2003). Minke whales are considered to be a coastal species, preferentially occurring in areas closer to the coast than approximately 7km (MacLeod et al., 2007).

Minke whales throughout British and Irish waters are considered a single population of 23,528 individuals, although this is considered to be an underestimate (IAMMWG, 2015). Densities of minke whale are found to be greatest during summer months, between May to September, although there is evidence to suggest that some individuals remain in Scottish waters all year round (Macleod et al., 2004).

Killer Whale (Orcinus orca)

Killer whales occur frequently in the deep North Atlantic, and in coastal waters of north-west Europe. In UK waters, the highest densities of killer whales are recorded off north-eastern Scotland and the Shetland coast, although regular sightings are also noted off north west Scotland (Reid et al., 2003). Killer whales are present all year-round throughout Scottish waters, although they are primarily recorded in coastal waters during the summer months (Evans et al., 2010).

The majority of killer whales present in Scottish waters are transient visitors from pods based in Iceland, the Faroe Islands, and Norway (Evans et al., 2010). However, there is a small resident pod of killer whales that are based on the west coast of Scotland, known as the 'West Coast Community'. The West Coast Community is a pod of 8 animals, and is considered to be declining, as no calves have ever been recorded with the pod (HWDT, 2018). These resident animals are most frequency sighted in the Sea of Hebrides, to the south of the development area, however they are known to forage in the Minches (HWDT, 2018).

6.4.2.2 Other Cetaceans

*Bottlenose Dolphin (*Tursiops truncatus*)*

Bottlenose dolphins are distributed throughout the UK shelf waters, primarily close to shore. Two larger aggregations are found in the Moray Firth, approximately 115km by sea to the north west of the survey corridor, as well as in Cardigan Bay (Wales) (Reid et al., 2003), both of which are designated as SACs.

There are six management units for bottlenose dolphins in UK waters (IAMMWG, 2015). Bottlenose dolphins are most commonly recorded within the 20m depth contour, and individuals occurring within the vicinity of the development are likely to belong to Coastal West Scotland and Hebrides (CWSH) management unit, which is estimated to include 45 individuals (Cheney et al., 2013). Bottlenose dolphins in the CWSH management unit have been shown to move throughout the west coast of Scotland (Cheney, et al., 2013), but are more frequently sighted off the north-east coast of Lewis (Reid et al., 2003). Hence, they are considered unlikely to be present in the immediate vicinity of the development.

*Short-Beaked Common Dolphin (*Delphinus delphis*)*

Common dolphins are one of the most abundant cetacean species, and is the most numerous offshore cetacean in the north-east Atlantic (Reid et al.' 2003). Common dolphins from British and Irish waters are considered a single population of 56,556 individuals (IAMMWG, 2015). However, the Outer Hebrides is towards the northern extent of the species' range, which, combined with the coastal nature of the Minches means that this offshore species is not likely to be present in high numbers (Reid et al., 2003). There have been few sightings in the vicinity of the development site (Reid et al, 2003; Marine Scotland, 2018). The majority of sightings on the west coast of Scotland are to the north or south of the development; at the continental shelf break, or in the Sea of Hebrides respectively (Marine Scotland, 2018).

*Atlantic White-Sided Dolphin (*Lagenorhynchus acutus*)*

Atlantic white-sided dolphins are predominantly an offshore, deep-water species, and are most frequently encountered at the continental shelf break, in areas of steep seabed relief, to the north-west of Outer Hebrides (Reid et al., 2003). Atlantic white-sided dolphins from British and Irish waters are considered a single population of 46,249 individuals (IAMMWG, 2015).

Little is known about the temporal movements of this species, although they are occasionally recorded in shallower continental shelf waters, including the Minches (Reid et al, 2003).

6.4.2.3 Pinnipeds

*Common Seal (*Phoca vitulina vitulina*)*

In UK waters, common seals are widespread around the west coast of Scotland, throughout the Hebrides and Northern Isles. Common seal haul outs are generally situated in sheltered waters, on tidal sandbanks and rocky skerries. The UK common seal count population estimate for 2016 was 43,500 (SCOS, 2017).

Common seals in the UK are divided into management units; the Lochmaddy ferry terminal is situated within the Western Isles management unit, where the population is currently estimated to be at least 2,739 individuals. The population of the Western Isles management unit is assessed to be stable, with no significant increased or decreases in recent years (SCOS, 2017). Common seals present in the vicinity of the development may also be members of the large West Scotland management unit, which has an estimated population of 15,184. This population is increasing rapidly, at an estimated 5.3% per year since 2009 (SCOS 2017).

Common seals are present in UK waters year-round. Pups are born during the summer in June and July. During this period, females spend a high proportion of time ashore with their pups (Hammond et al., 2003; SCOS, 2017). Common seals moult in August (SCOS, 2017) and numbers at haul out sites are highest at this time. There are 6 designated common seal haul out sites within 25km (by sea) from the proposed development. Details of these sites are provided in Table 6.4.2, and the locations are illustrated in Figure 6.4.2.

Table 6.4.2: Designated seal haul outs within 25km by sea of the proposed development site.

Name	Species	Type	Direction & Distance by Sea
Inner Loch Maddy	Common Seal	Non-Breeding	3.9km North
Loch a' Bhaigh	Common Seal	Non-Breeding	15.5km North
Loch Langais	Common Seal	Non-Breeding	15.6km South-West
Gairbh-Eilean Ronaigh	Common Seal	Non-Breeding	16.3km South
Flodda	Common Seal	Non-Breeding	23.3km South-West
Oronsay (N. Uist)	Common Seal	Non-Breeding	24.3km North-West

The Scottish government commissioned a study to combine seal tracking telemetry data with haul out specific population estimates to generate predicted at sea usage maps for both grey and common seals. This resulted in maps of predicted at-sea common seal densities in 5x5km cells in Scottish waters. (Russel et al., 2017). This showed that common seal habitat utilisation in the north-west of Scotland is concentrated to the south-east of the Outer Hebrides, with the highest usage observed in the Sea of Hebrides. Predicted common seal usage of the western Little Minch is comparatively low, with densities of approximately 5 – 10 seals per 5x5km cell anticipated within Loch Maddy, in the immediate vicinity of the proposed Lochmaddy ferry terminal upgrade (Russel et al., 2017). An overview of predicted common seal usage in the north-west of Scotland is provided in Figure 6.2.

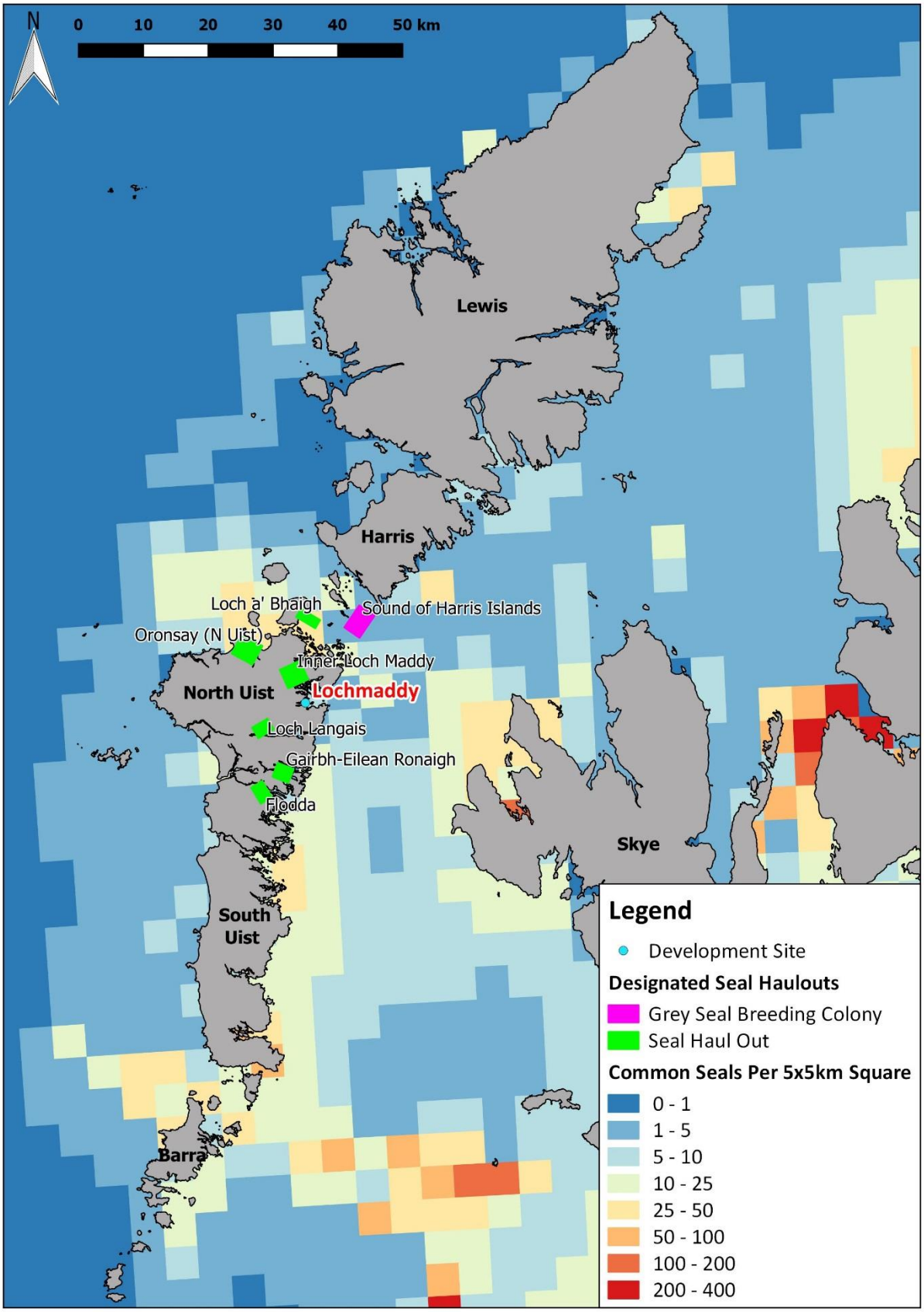

Figure 6.4.2. Predicted common seal habitat usage in north-west Scotland, and designated seal haul outs within 25km of the proposed development. Usage data after Russel et al., 2017

*Grey Seal (*Halichoerus grypus*)*

Grey seals occur only in the north Atlantic and Barents and Baltic Seas, with their main concentrations located along the Canadian and US eastern seaboards and in north east Europe (SCOS, 2017). The UK contains around 38% of the total world breeding population of grey seals and 88% of those, breed in Scotland, with major concentrations in the Outer Hebrides and Orkney (SCOS, 2017). In 2016 the total UK grey seal population was estimated to be 141,000 individuals (SCOS, 2017).

The proposed Lochmaddy ferry terminal upgrade is situated within the Western Isles grey seal management unit, where the population is currently estimated to be at least 15,691 individuals (SCOS, 2017). Grey seals present in the vicinity of the development may also be members of the large West Scotland management unit, which has an estimated population of 19,547. Both the West Scotland and Western Isles grey seal populations are assessed as being stable, with increases of <0.1% observed since 2010 (SCOS 2017).

Grey seals haul outs are generally located on remote uninhabited stretches of coast, and often in more exposed area compared to common seals (SCOS, 2017). Breeding occurs in the autumn, with peak pupping between August and December (SCOS, 2017) although in northern Scotland most pupping occurs between October and late November (Hammond et al., 2003). Moulting occurs between December and April (Hammond et al., 2003; SCOS, 2017). Designated breeding grey seal haul out sites are concentrated in the Northern Isles, Orkney and Shetland, and in the Outer Hebrides. Non-breeding haul out sites are also concentrated at these locations, in addition to various sites along the west coast of Scotland. A single designated grey seal haul out site is located within 25km by sea from the proposed development. This is the Sound of Harris Islands designated breeding haul out, which is situated approximately 13.5km by sea to the north-east, as shown in Figure 6.4.3.

The at-sea grey seal usage maps commissioned by Marine Scotland show that grey seal activity in the north-west of Scotland is concentrated to the west of Outer Hebrides, particularly around the Monach Islands (Russel et al., 2017). Grey seal densities in the Minches and Sea of Hebrides are comparatively low (Russel et al., 2017)., and hence it is unlikely that grey seals will be present in the immediate vicinity of the proposed development. An overview of predicted grey seal usage in the north-west of Scotland is provided in Figure 6.4.3.

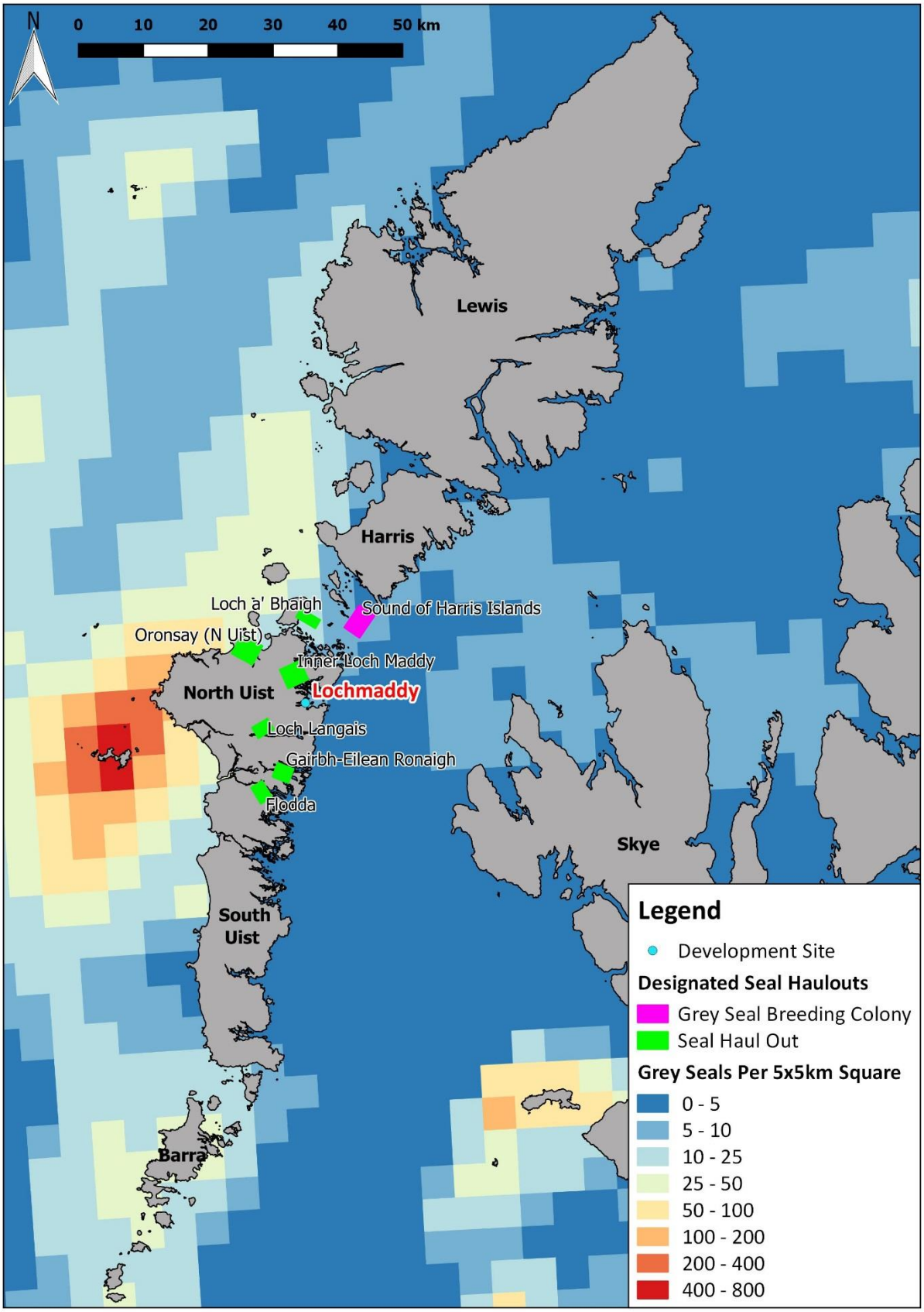

Figure 6.4.3: Predicted grey seal habitat usage in north-west Scotland, and designated seal haul outs within 25km of the proposed development. Usage data after Russel et al., 2017.

6.5 Impact Assessment

6.5.1 Underwater Noise

Underwater noise emissions will result from the construction activities associated with the proposed Lochmaddy ferry terminal upgrade. Further detail on the proposed construction techniques is provided in Chapter 2: Project Description. Marine mammals use acoustics for communication, navigation, and foraging, and as such are particularly sensitive to underwater noise. Underwater noise emissions can result in disruption of foraging behaviour, displacement, masking of communications, disturbance, and injury. Underwater noise modelling has been undertaken for construction techniques likely to be required for the proposed development, the results of which are presented in Chapter 11: Noise and Vibration (Underwater). This section will consider the underwater noise emissions and potential associated impacts on marine mammals arising from:

- Vibro piling;
- Impact piling;
- Dredging;
- Rock breaking; and
- Vessel movements.

In addition, general marine construction techniques will be required, such as rock revetment construction, and rock armour placement to facilitate the reclamation works. However, experience from previous projects have shown that these activities do not result in underwater noise emissions of a magnitude that have the potential to cause significant negative impacts on marine mammals (Affric, 2015 & Affric, 2018), as such, these aspects are not considered further.

The outputs of the noise modelling were compared against the latest marine mammal auditory injury impact criteria provided by the National Marine and Fisheries Service (NMFS) (NMFS, 2016), in order to estimate the ranges from the works at which different magnitudes of acoustic impact may occur. The NMFS criteria groups marine mammals into functional hearing groups and applies filters to the unweighted noise to approximate the hearing response of the receptor. The hearing groups given in the NMFS (2016) criteria, together with marine mammal receptors relevant to the Lochmaddy ferry terminal upgrade are summarised in Table 6.5.1.

Table 6.5.1: Functional Hearing Groups, and Relevant Marine Mammal Receptors (after NMFS, 2016)

Hearing Group	Relevant Marine Mammal Receptors	Generalised Hearing Range
Low Frequency (LF) Cetaceans	Minke Whales	7Hz to 35kHz
Mid Frequency (MF) Cetaceans	All dolphins identified in section 7.4.2 Killer Whales	150Hz to 160kHz
High Frequency (HF) Cetaceans	Harbour Porpoises Inner Hebrides and the Minches cSAC	275Hz to 160kHz
Phocid Pinnipeds (PW) (Underwater)	Grey Seals Common Seals The Ascrib, Isay, & Dunvegan SAC	50Hz to 86kHz

NMFS (2016) presents unweighted peak criteria (SPL_{peak}) and cumulative, frequency weighted sound exposure criteria (SEL_{cum}) for impulsive noise. For non-impulsive noises, only cumulative, frequency weighted sound exposure criteria are provided. The criteria are in relation to the onset of 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. The NMFS (2016) injury criteria for impulsive noises and non-impulsive noises are summarised in Tables 6.5.2 and 6.5.3 respectively. Further information is provided in Chapter 11: Noise and Vibration (Underwater), and Appendix K.1.

Table 6.5.2: Acoustic Injury Criteria for Marine Mammals in Relation to Impulsive Noise (after NMFS, 2016)

Impulsive Noise	TTS Criteria		PTS Criteria	
Hearing Group	SELcum (weighted) dB re 1 µPa2s	SPLpeak (unweighted) dB re 1 µPa	SELcum (weighted) dB re 1 µPa2s	SPLpeak (unweighted) dB re 1 µPa2s
LF Cetaceans	168	213	183	219
MF Cetaceans	170	224	185	230
HF Cetaceans	140	196	155	202
PW Pinnipeds	170	212	185	218

Table 6.5.3: Acoustic Injury Criteria for Marine Mammals in Relation to Non-Impulsive Noise (after NMFS, 2016)

Non-Impulsive Noise	TTS Criteria	PTS Criteria
Hearing Group	SEL_{cum} (weighted) dB re 1 μPa^2s	SEL_{cum} (weighted) dB re 1 μPa^2s
LF Cetaceans	179	199
MF Cetaceans	178	198
HF Cetaceans	153	173
PW Pinnipeds	181	201

6.5.1.1 Vibro Piling

As described in Chapter 2: Project Description, a new fendering system is required at the Lochmaddy ferry berth, in order to accommodate the new larger vessel. This will involve the installation of 6 No. 660mm diameter tubular fender piles, to provide a berthing face for the ferry.

Vibro piling will be used in preference to impact piling, in so far as ground conditions permit. It is likely that the piles will be driven as far as possible using a vibro hammer, prior to being driven to full depth with an impact hammer.

It is estimated that approximately 20min of vibro piling will be required to drive each pile. This gives an estimated total vibro piling duration of approximately 2hrs. However, this will not be continuous, and the piling works are expected to be conducted over a period of approximately 2 months. As detailed in Chapter 10: Noise and Vibration (In-Air) and Chapter 14: Schedule of Mitigation, piling will only be conducted between the hours of 07:00 to 19:00 to minimise the effects of noise disturbance on local residents.

Vibro piling uses a vibrating hammer, resulting in a continuous broad band noise, which in general has a reduced sound pressure level compared to impact piling (Nedwell et al., 2003, Affric, 2015, & Graham et al., 2017). Since vibro piling is a continuous noise source, the outputs from the noise model were assessed against the frequency weighted SEL_{cum} non-impulsive noise criteria. The cumulative exposure levels have been calculated using a stationary animal, remaining at a fixed range from the piling works for 1hr of piling. This is a conservative approach, and if a fleeing animal was assumed, the impact ranges would be reduced. The maximum expected impact ranges for marine mammal functional hearing groups are presented in Table 6.5.4 below.

Table 6.5.4: Maximum Predicted Marine Mammal Weighted SEL_{cum}(1hr) Impact Ranges Resulting from Vibro Piling Operations

Hearing Group	Impact Ranges	
	PTS	TTS
LF Cetaceans	10 m	200 m
MF Cetaceans	3 m	40 m
HF Cetaceans	40 m	500 m
PW Pinnipeds	10 m	100 m

The greatest impact range is predicted for HF cetaceans as a result of vibro piling, where noise levels could result in TTS for a stationary animal remaining within 500m of the noise source during 1hr of continuous piling, and PTS could occur for a stationary animal within 40m. As detailed in Table 6.5.1, the only relevant HF cetacean receptors are harbour porpoises and the Inner Hebrides & the Minches cSAC.

The proposed development is situated in the shallow confined waters of the South Basin, at the south western extent of Loch Maddy; within 500m of the piling works the water depth is generally less than 10m, and does not provide any valuable habitat for harbour porpoises. The Inner Hebrides & the Minches cSAC is located ~4.5km to the east, and as such the TTS range does not extend into the designated site. It is recognised that these impact ranges are in relation to injury, and sound levels which could result in disturbance will persist significantly further. However, as shown for impact piling in Figure 6.5.1, the islands of Faihore and Ruigh Liath act as effective barriers, containing the majority of the noise emissions within the South Basin, and minimising the propagation of elevated noise levels outwith Loch Maddy into the Little Minch. Due to the extremely localised nature of the predicted vibro piling impact ranges,

combined with the lack of valuable harbour porpoise habitat within the affected area, it is considered extremely unlikely that animals will be present in the zone where they may be subject to TTS or PTS. The potential effects on harbour porpoises and the Hebrides & the Minches cSAC are therefore assessed as **negligible, short term** and **reversible** and the resulting effect is **minor: non-significant**.

The next largest impact range for LF cetaceans, where TTS may result for a stationary animal within 200m of the piling works. The PTS range for LF cetaceans is only 10m, hence it is concluded that there is no potential to cause permanent hearing damage, since is unfeasible that an animal would remain within 10m of the piling works for 1hr. The only relevant LF cetacean receptors are minke whales, however the waters within 200m of the works are very confined, and less than 7m deep, hence it is extremely unlikely that minke whales will be present in the affected area. The potential effects on minke whales are therefore assessed as **no-change**.

With regard to various dolphin species receptors and killer whales identified in Section 6.4.2, the TTS impact range for MF cetaceans is predicted to be 40m, while the PTS range is just 3m. It is extremely unlikely that any dolphin species or killer whale will be in such close proximity to the piling works, within the confined South Basin. The potential effects on all relevant dolphin species and killer whales are therefore assessed as **no-change**.

A pinniped may be subjected to TTS if the animals remains within 100m of the works for 1hr of piling. The PTS range is just 10m, hence there is no potential for permanent hearing damage to be sustained, as it is unfeasible that a seal would remain in such close proximity to the works for a duration of 1hr. Grey seals are extremely unlikely to be present within 100m for the proposed development, since their distribution is concentrated to the west of the outer Hebrides, and Russel et al. (2017) provides a predicted density in the area of ~6 animals per 25km^2 (see Figure 6.4.3). As such the potential effects of vibro piling noise on grey seals is assessed as **no-change**. Common seals are more likely to be present in the vicinity of the piling works, however the area does not provide any valuable habitat for this species, and the predicted TTS zone will not occlude access to the Inner Lochmaddy designated common seal haul out, which is located 3.9km to the north. Due to the extremely localised nature of the TTS impact zone, absence of risk of permanent hearing damage, and lack of suitable habitat, the potential effects on common seals and the Ascrib, Isay, & Dunvegan SAC are assessed as **negligible, short term** and **reversible** and the resulting effect is **minor: non-significant**.

6.5.1.2 Impact Piling

While vibro piling will be used in preference to impact piling, ground investigations conducted to inform the design of the development have revealed that impact piling will be necessary in addition to vibro piling to drive the piles to their design depth. It is anticipated that approximately 30min of impact piling will be required to seat each pile, resulting in a total estimated impact piling duration of approximately 3hrs, spread over the 2 month piling period. As such, the amount of impact piling works associated with this project is extremely limited.

The use of impact piling hammers will result in emissions of broadband underwater noise, with maximum energy in the frequency range of 150Hz to 1.2kHz. The frequency and sound power level of the piling noise means it has the potential to cause injury and disturbance to the marine mammal receptors in the vicinity of the development site. Hammer energies of between 50-150kJ are expected to be required to seat the piles, but only the 150kJ results are considered here as the worst case scenario.

Impact piling is an impulsive noise source, and hence it is appropriate to assess the potential marine mammal impacts against both the unweighted SPL_{peak} and the frequency weighted SEL_{cum} impulsive noise criteria. In order to adopt a conservative approach, the greater of the two impact ranges resulting from the different criteria was carried forward to the assessment, which in all cases resulted from the SEL_{cum} criteria. The cumulative exposure levels have been calculated using a stationary animal, remaining at a fixed range from the piling works for 1hr of piling. This is also considered to be a conservative approach, and if a fleeing animal was assumed, the impact ranges would be reduced. The maximum expected impact ranges for marine mammal functional hearing groups are presented in Table 6.5.5 below.

Table 6.5.5: Maximum Predicted Marine Mammal Weighted SEL_{cum}(1hr) Impact Ranges Resulting from Impact Piling Operations

Hearing Group	Impact Ranges 660mm Pile 150 kJ (1 hour)	
	PTS	TTS
LF Cetaceans	380 m	1.4 km
MF Cetaceans	2 m	56 m
HF Cetaceans	280 m	1.2 km
PW Pinnipeds	86 m	570 m

The greatest impact range resulting from impact piling a 660mm pile with a 150kJ blow energy is for LF cetaceans, which in this case pertains to minke whales, where TTS may result for a stationary animal within 1.4km of the piling works, and PTS within a range of 380m. Since the waters within 380m of the works are very confined, and less than 10m deep, it is extremely unlikely that minke whales will be present in the affected area where they may suffer PTS. While still rather shallow, at less than 15m deep, the waters within the 1.4km TTS zone are less confined, making it possible that minke whales could be present in the area where they may suffer injury. This notwithstanding, the area does not provide any valuable habitat for the species, so it is still considered unlikely that minke whales would be present in this region.

It is recognised that these impact ranges are in relation to injury, and sound levels which could result in disturbance will persist significantly further. However, as highlighted in Figure 6.5.1, the islands of Faihore and Ruigh Liath act as effective barriers, containing the majority of the noise emissions within the South Basin, and minimising the propagation of elevated noise levels outwith Loch Maddy into the Little Minch. The localised nature of the impact zones, and limited duration of the impact piling, combined with lack of suitable minke whale habitat results in the impact being assessed as **low, short term** and **reversible** and the overall effect is **moderate: significant**.

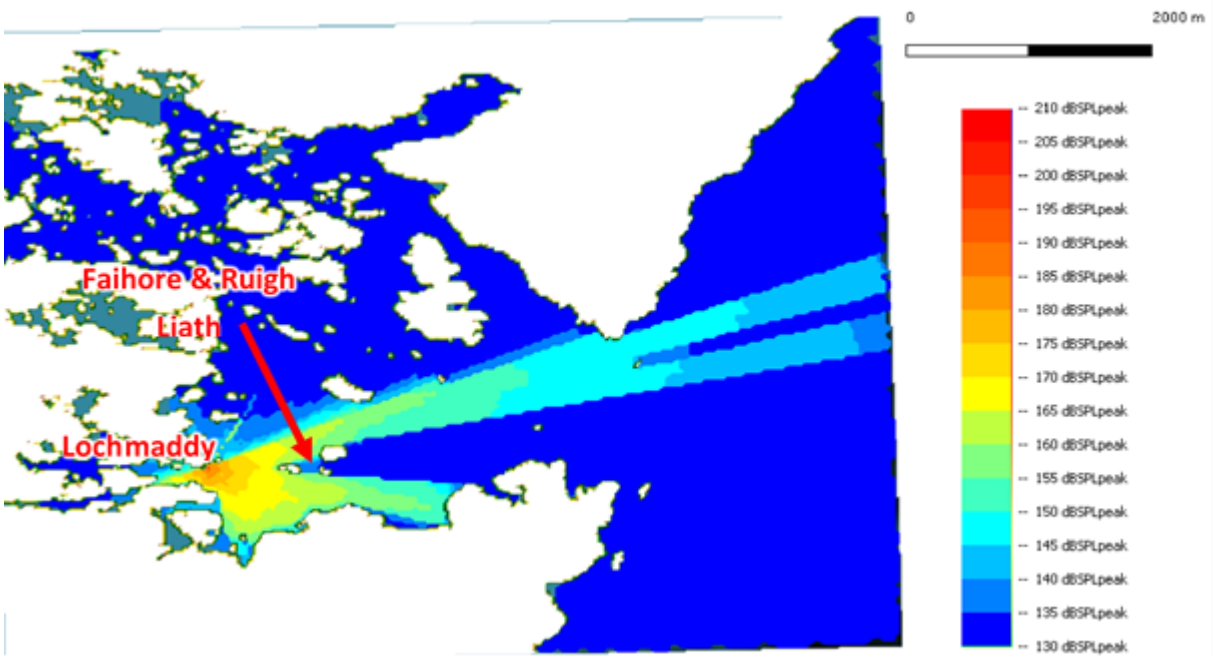

Figure 6.5.1: Model of Noise Propagation from a 660mm Pile with 150kJ Blow Energy to Highlight the Barrier Effects from Faihore and Ruigh Liath

The next largest impact range is predicted for HF cetaceans, where noise levels could result in TTS for a stationary animal remaining within 1.2km of the noise source during 1hr of continuous piling, and PTS could occur for a stationary animal within 280m. As detailed in Table 6.5.1, the only relevant HF cetacean receptors are harbour porpoises and the Inner Hebrides & the Minches cSAC.

The PTS zone only occludes the very shallow and confined waters of the South Basin, which is not considered to provide any valuable habitat for harbour porpoises. The TTS zone does extend further into Loch Maddy. However, the waters here are still confined and shallow, and are not expected to be regularly utilised by harbour porpoises. The Inner Hebrides & the Minches cSAC is located ~4.5km to the east, and as such the TTS range does not extend into the designated site. It is noted that a slight elevation from baseline noise levels is predicted outwith Loch Maddy, which will affect the periphery of the cSAC, as shown in Figure 6.5.1. However, noise levels within the site are not expected to exceed 140dB re 1µPa, and the extent is extremely limited, so this is not considered a significant change.

It is possible that harbour porpoises may be present in the areas where they could be subjected to noise levels with the potential to cause disturbance, TTS and PTS. However, the characteristics of the affected region mean that harbour porpoise density in the area is expected to be low. This combined with localised nature of the impact ranges mean that the number of animals affected will be very low, and hence the impact is unlikely to result in a detectable population level change in the short term. Only very slight increases from baseline noise levels are expected within the Hebrides & the Minches cSAC, and this is within an extremely localised area. Hence the potential effects of impact piling on harbour porpoises

and their associated designated site are assessed as **low, short term** and **reversible**, and the resulting effect is **moderate: significant.**

The predicted impact zones for MF cetaceans are 2m and 56m for PTS and TTS respectively, resulting from impact piling a 660mm pile. It is unfeasible that any of the dolphin species or killer whales identified in Section 6.4.2 would remain within 56m of the pilling works for a duration of 1hr, and hence there is no risk of temporary or permanent hearing damage for these species. It is recognised that these impact ranges are in relation to injury, and sound levels which could result in disturbance will persist further into the Little Minch, but as above the barrier effects and distances involved mean that only minor increases from baseline are expected, within a very limited area. The area where dolphins and killer whales may be subject to disturbance is therefore very localised, so the number of animals possibly subjected to disturbance will be low. The potential effects on all relevant dolphin species and killer whales are therefore assessed as **negligible, short term** and **reversible** and the overall effect is **minor: non-significant**.

With regard to pinnipeds, the TTS and PTS zones for a 910mm pile extend to 570m and 86m respectively. As detailed in Sections 6.4.2.3 and 6.5.1.1, grey seals are extremely unlikely to be present within the affected area, and as such impacts on this species are assessed as **negligible, short term** and **reversible** and the overall effect is **minor: non-significant**. Common seals may be present in the TTS zone, but are extremely unlikely to remain in the PTS zone for an hour during continuous piling, so while there is a risk of temporary auditory injury, there is no potential for permanent hearing damage. Noise levels which could result in disturbance to common seals will propagate further than the TTS zone, and may result in localised avoidance of the waters on the approaches to the designated Inner Loch Maddy common seal haul out. While common seals may suffer temporary hearing damage or disturbance due to the piling works, the localised and extremely short term nature of these impacts mean that the number of animals affected will be very low. Hence, the impact is unlikely to result in a detectable population level change in the short term. Therefore, the potential effects of impact piling common seals are assessed as **low, short term** and **reversible**, and the resulting effect is **moderate: significant.** No direct impacts on the Ascrib, Isay, & Dunvegan SAC are expected, and the potential temporary injury and disturbance of common seals is not of a magnitude likely to negatively affect the conservation objectives of the site. As such the impacts on the SAC are assessed as **negligible, short term** and **reversible** and the overall effect is **minor: non-significant**.

6.5.1.3 Dredging

As detailed in Chapter 2: Project Description, dredging works will be required to increase the depth at the ferry berth and adjacent manoeuvring area to the north to accommodate the larger vessel, and remove unsuitable foundation material under the caisson footprint. The dredging is likely to be conducted using a combination of back-hoe, and plough dredgers. Chapter 11 identifies underwater noise levels resulting from dredging operations at similar projects, and these were compared against the weighted SEL_{cum} criteria.

With regard to back-hoe dredging, it was found that a marine mammal would need to be continuously present within 50m works for 19hr in order to exceed the TTS criteria. It is extremely unlikely that an animal would remain this close to the works for such an extended period, and as such no impacts on marine mammals are expected from dredging underwater noise emissions. As such the impacts on all marine mammal receptors are assessed as **no-change**.

Noise impacts on marine mammals from plough dredging are only associated with vessel noise, hence are assessed as **no-change**, as per the assessment in 6.5.1.5.

6.5.1.4 Rock Breaking

The ground investigation conducted to inform the dredging operations have indicated that the presence of shallow bedrock within the dredge pockets may mean that rock breaking is required to achieve the target depths. However, if present, the extent of rock is anticipated to be very limited, hence rock breaking requirements will be negligible in comparison to the overall dredge volume. Rock breaking will be conducted through non-explosive techniques such as excavator mounted hydraulic peckers, and chemical rock splitting. The noise resulting from the use of hydraulic peckers is taken forward for assessment as the worst case scenario. Noise modelling was conducted using published underwater noise levels resulting from rock breaking. Rock breaking is assumed to be a non-impulsive noise source, hence the outputs from the noise model were assessed against the frequency weighted SEL_{cum} non-impulsive noise criteria. The cumulative exposure levels have been calculated using a stationary animal, remaining at a fixed range from the dredging works, for 8hr of rock breaking. This is a conservative approach, and if a fleeing animal was assumed, the impact ranges would be significantly reduced. The maximum expected rock breaking impact ranges for marine mammal functional hearing groups are presented in Table 6.5.6 below.

Table 6.5.6: Maximum Predicted Marine Mammal Weighted SEL_{cum}(8hr) Impact Ranges Resulting from Rock Breaking Operations

Hearing Group	Impact Ranges	
	PTS	TTS
LF Cetaceans	20 m	300 m
MF Cetaceans	1 m	40 m
HF Cetaceans	50 m	600 m
PW Pinnipeds	7 m	100 m

The PTS zones resulting from rock breaking are extremely localised (<50m) for all functional hearing groups, and were calculated using an 8hr cumulative exposure level. There is no possibility that any marine mammal species would remain within 50m of the rock breaking works continuously for 8hr, and hence rock breaking poses no risk of permanent acoustic injury to any marine mammal receptor. The TTS zones extend further, to a maximum of 600m for harbour porpoises, however these again were calculated using an 8hr cumulative exposure level. Given the confined, shallow waters and lack of valuable marine mammal habitat present within 600m of the development, it is extremely unlikely that marine mammals would remain in the 600m TTS zone for 8hr of continuous rock breaking. Therefore, the number of animals which may be affected by rock breaking noise emissions is very low. As such the impacts on

all marine mammal receptors are assessed as **negligible, short term** and **reversible,** and the overall effect is **minor: non-significant**.

6.5.1.5 Vessel Movements

Several vessels will be required in order to facilitate the construction of the Lochmaddy ferry terminal upgrade. These include work boats, tugs, dredging vessels, and safety boats. As detailed in Chapter 11: Noise and Vibration (Underwater), the underwater noise emissions generated by the vessels used during the construction works are likely to be considerably lower than the noise emissions from the existing ferry movements and berthing manoeuvres. Therefore, the underwater noise from construction vessel movements do not constitute an appreciable change from baseline conditions. As such, the impacts on all marine mammal receptors resulting from underwater noise emissions associated with construction vessel movements is assessed as **no-change**.

6.5.2 Water Quality

During construction there could be the following effects on water quality in relation to the marine mammal species:

- Increased sediment loading in the water column, resulting from dredging, spoil disposal, infilling and site surface water runoff; and
- Spillage of hazardous materials from machinery, equipment, and marine plant involved in the construction.

These potential effects will be considered in turn.

6.5.2.1 Increased Sediment Loading

The rock placement, infilling works, dredging and spoil disposal operations, and site surface water runoff detailed in Chapter 2: Project Description and Chapter 13: Water Quality all have the potential to increase sediment loading in the water column, through the release of fines into the marine environment. Further information is provided in Chapter 13: Water Quality. Increased sediment loading in the water column, and the resultant increase in turbidity can reduce the foraging success of marine mammals, particularly visual predators such as seals. Increased turbidity may also cause marine mammals to avoid the affected area; potentially resulting in displacement of animals or interruption of transiting animals. As such, negative effects may result for species which regularly utilise the waters in the vicinity of the development site and spoil ground for foraging, socialising, or migration (Priotta et al., 2013).

Effective management of the site surface water runoff, through the mitigation measures identified in Chapter 13 will prevent sediment laden run-off entering the marine environment. Hence no impact on marine mammals is expected from site surface water runoff, and this aspect will not be considered further.

Rock placement, infilling works, and dredging will all be conducted within the boundary of the ferry terminal upgrade. Affric's monitoring of the sediment loading resulting from similar rock placement, infilling, and dredging activities during previous port developments showed that sediment plumes resulting from these activities dispersed rapidly, and were confined to the immediate vicinity of the working areas. Very similar construction techniques, in similar

ground conditions will be utilised during the construction of the Lochmaddy ferry terminal upgrade, and there are not strong tidal currents in the area which could transport suspended sediments further from the site. As such, the extent of the sediment loading is expected to be localised, and confined to the immediate vicinity of the works.

Since the development is located in the confined shallow (≤5m deep) waters of the South Basin, at the south west extent of Loch Maddy, it is considered extremely unlikely that cetaceans will be present in the immediate vicinity of the works. As discussed in Section 6.4.2.3, grey seals are also unlikely to be present in this area, since their distribution is concentrated to the west of the Outer Hebrides. As such the potential water quality impacts on all cetacean species, the Inner Hebrides and the Minches cSAC, and grey seals are assessed as **No Change**.

Due to the proximity of the Inner Loch Maddy designated common seal haul out, it is possible that common seals will be present within the immediate vicinity of the works. However, the nature of the waters surrounding the works site mean the area does not offer any valuable habitat to common seals, so localised increases in sediment loading are unlikely to result in a meaningful reduction in foraging success, or displacement from a valuable area. Hence, the potential effects on common seals, are assessed as **negligible, short term,** and **reversible.** The resulting effect is **minor: non-significant.**

Dredged spoil disposal will take place at the Stornoway designated disposal ground, located south of Arnish point off the Isle of Lewis coast. The spoil ground is approximately 850m from the Inner Hebrides and the Minches cSAC, and hence spoil disposals have the potential to negatively impact the harbour porpoise features of this site. In addition, Risso's dolphins and common seals are known to regularly frequently the waters around north-east Lewis. This notwithstanding, marine mammal densities in the vicinity of the spoil ground are not expected to be high. This is the because the spoil ground is located within 200m of the coast in shallow water less than 20m deep; such areas are not considered to be valuable habitat for cetaceans, and there are no designated seal haul outs within 25km by sea of the spoil ground.

Affric's observations of similar spoil sea-disposal operations show that during disposals conducted using vessels with bottom opening doors, the resulting increased sediment loading dropped out and dispersed quickly. The dredged spoil disposal operations are likely to give rise to between 15-20 disposals, depending on the size of the vessels used. Hence, the impact on all marine mammal species, and the Inner Hebrides and the Minches cSAC will be localised and short term. Due to the low value habitat at the spoil ground, low predicted marine mammal densities, and the localised temporary nature of the increased sediment loading resulting from spoil disposals, the impact is assessed as **negligible, short term,** and **reversible,** and the resulting effect is **minor: non-significant.**

6.5.2.2 Release of Hazardous Substances

A release of oils or other potential pollutants has the potential to result in both short and long-term impacts on both cetaceans and seals. Short term effects include reduction in the thermal properties of seals' fur, resulting in hypothermia and potentially death, as well as poisoning of both seals and cetaceans through inhalation or ingestion of the contaminant, resulting in

sickness or death. Both seals and cetaceans may also avoid a contaminated area, which could impact foraging behaviour. In the longer term, both seals and cetaceans may accumulate toxic pollutants through the ingestion of contaminated food, or through a prolonged exposure to low levels of pollution. Such a toxic build-up may lead to reductions in reproductive success, illness, and increased mortality rates (Gubbay & Earll 2000).

The proposed development is not located within any of the sites designated for the conservation of marine mammals, and as explained in Chapter 13: Water Quality, it is extremely unlikely that a spill from the development would leave the immediate vicinity of the proposed development, so no direct significant effects are possible. However, a spill could result in indirect significant effects to the mobile designated features of these sites (cetaceans and seals); if they are present within the contaminated area for long enough to ingest a toxic load of the contaminant, or for it to accumulate on their skin or fur.

For all marine mammal receptors, the magnitude of potential impacts arising from a release of contaminants would depend on the nature and quantity of material released into the environment. There is the potential for a spill of hazardous material to have long term major impacts, through changes to the health and behaviour of the receptors on a regional scale. However, the adoption of the mitigation measures and standard industry best practice techniques for pollution prevention identified in Chapter 13, as well as in Chapter 14: Schedule of Mitigation, significantly reduce or remove the risk of such an event occurring. As such, it is considered extremely unlikely that release of hazardous material of a scale with the potential to negatively impact marine mammals or their designated sites will occur; therefore, the potential effect is assessed as **negligible, short term,** and **reversible,** and the resulting effect is **minor: non-significant.**

6.5.3 Physical Injury

The concurrent underwater noise, disturbance, and increased sediment loading in the immediate vicinity of marine construction vessels and equipment make it extremely unlikely that a marine mammal would enter an area where it is at risk of being injured through a direct interaction with site equipment. This aspect will therefore not be further assessed.

During dredged spoil disposal operations however, there is the potential for a marine mammal 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. Spoil disposal will take place at the Stornoway designated disposal ground, located south of Arnish point off the Isle of Lewis coast. The spoil ground is approximately 850m from the Inner Hebrides and the Minches cSAC, and hence spoil disposals have the potential to negatively impact the harbour porpoise features of this site. In addition, Risso's dolphins and common seals are known to regularly frequently the waters around north-east Lewis. This notwithstanding, marine mammal densities in the vicinity of the spoil ground are not expected to be high. This is the because the spoil ground is located within 200m of the coast in shallow water less than 20m deep; such areas are not considered to be valuable habitat for cetaceans, and there are no designated seal haul outs within 25km by sea of the spoil ground.

Therefore, the probability of a marine mammal being in the spoil ground, and directly under the spoil vessel at the time of release is extremely low. Hence it is unlikely that one animal would be injured in this way. This potential effect therefore is unlikely to affect the conservation status of a marine mammal receptor, and the magnitude of impact is assessed as **low, reversible** and **short term,** and the resulting effect is **moderate: significant**.

6.6 Mitigation Measures

Where potential significant effects on marine mammals have been identified in Section 6.5, appropriate mitigation will be provided in order to reduce the magnitude of the effect. A summary of the marine mammal mitigation proposed for the Lochmaddy ferry terminal upgrade is outlined below, while detailed procedures of how the mitigation will be implemented is provided in the Construction Environmental Management Document (CEMD) in the form of a Marine Mammal and Basking Shark Protection Plan.

6.6.1 Piling Marine Mammal Mitigation

The impact piling underwater noise modelling showed there is the potential for the piling operations to cause disturbance and auditory injury to the marine mammal species likely to be present in the vicinity of the development site. Significant impacts were only identified for minke whales, harbour porpoises and common seals, resulting from impact piling. However, in line with best practice, the piling marine mammal mitigation identified below will apply to all marine mammal species, and will be implemented for both vibro and impact piling operations.

The mitigation measured are aligned to 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). However, in line with Section 4 of JNCC protocol, the developer may propose an amended protocol, if it is deemed that the standard protocol is unduly restrictive.

It is noted that the standard piling protocol is designed for offshore windfarm piling, where typical pile diameters are in the region of 4000mm, and the unweighted peak source pile driving levels are in excess of 240dB re 1μPa (Brooker et al., 21012). In comparison, the piles used un this development are 660mm in diameter, and the maximum predicted unweighted peak source level resulting from impact piling is 205.4dB re 1μPa (Chapter 11, and Appendix K.1). Since the Decibel scale is logarithmic, the offshore windfarm peak unweighted source levels for which the JNCC protocol is designed are over 3 orders of magnitude greater than those anticipated to result from the Lochmaddy ferry terminal piling works. For this reason, together with the low marine mammal densities expected in the area affected by the piling noise emissions, and barrier effects present due to the local bathymetry, the JNCC protocol provides a disproportionate level of mitigation for the proposed piling works, which is not justified by the perceived risk to marine mammals. As such, the JNCC protocols will be 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 6.6.1.

The impact piling marine mammal mitigation will provide the following measures:

- A 400m mitigation zone will be established around the piling rig;
- Trained marine mammal observers (MMO) will conduct a 20min pre-watch prior to the commencement of piling operations;
    - If the 400m mitigation zone remains clear of marine mammals during the watch, permission will be given to commence piling; but
    - If a marine mammal is sighted within the mitigation zone, piling will be delayed until the zone has been clear of marine mammals for at least 10min.
- If conditions are unsuitable for visual observations (darkness, fog reducing visibility to <400m, or sea states >Beaufort 4); passive acoustic monitoring (PAM) will be utilised by a trained PAM operator to monitor the mitigation zone;
    - 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 for at least 15min.
- Once piling has commenced there will be no requirement to stop works if a marine mammal enters the mitigation zone, as long as piling has been continuous, with no breaks exceeding 10min;
- If a break in piling operations exceeds 10min the following conditions will apply:
    - If an MMO/PAM operator has been on watch during the break, and the mitigation zone remains clear of marine mammals, piling can recommence immediately;
    - If an MMO/PAM operator has been on watch during the break, and a marine mammal is observed within the mitigation, piling will not recommence until the zone has been clear of marine mammals for at least 10min; and
    - If no marine mammal observations have been conducted during a break exceeding 10min, a 20min pre-watch will be conducted before piling can recommence, as detailed above.
- 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.

Table 6.6.1: Summary of Modifications to the JNCC Piling Marine Mammal Protocols

Aspect	Change	Rationale
Mitigation Zone Radius	The mitigation zone radius is reduced from 500m to 400m.	The maximum predicted PTS range is 380m, which is conservatively calculated using a 1hr cumulative SEL for a stationary animal. Therefore, mitigating to 500m is disproportionate.
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 400m zone do not exceed 10m, prolonged deep dives cannot occur. In addition, the reduction of the mitigation zone to 400m 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. 15min is allowed for PAM watches due to the increase uncertainty with this technique.
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 of windfarm piling operations), the 400m 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.

6.6.2 Dredged Spoil Disposal Marine Mammal Mitigation

The disposal of dredged spoil at the Stornoway designated spoil ground has the potential to cause injury to marine mammals through contact with falling debris, as well as foraging impairment and displacement through increased sediment loading. In order to mitigate this significant impact, mitigation will be implemented for spoil disposal operations. The dredged spoil disposal marine mammal mitigation will provide the following measures:

- A 200m mitigation zone will be established around the disposal vessel;
- Trained marine mammal observers (MMO) will conduct a 20min pre-watch prior to the commencement of spoil disposal;
    - If the 200m mitigation zone remains clear of marine mammals during the watch, permission will be given to commence disposal; and

- If a marine mammal is sighted within the mitigation zone, disposal will be delayed until the zone has been clear of marine mammals for at least 5min.

- If conditions are unsuitable for visual observations (darkness, fog reducing visibility to <300m, or sea states >Beaufort 4); passive acoustic monitoring (PAM) will be utilised by a trained PAM operator to monitor the mitigation zone;
  - 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 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.

6.6.3 Scottish Marine Wildlife Watching Code

In order to prevent excessive harassment of marine mammals by vessels working on the Lochmaddy ferry terminal upgrade, all vessels will be required to follow the guidance set out in SNH's 'Scottish Marine Wildlife Watching Code' (SNH, Undated). This document provides best practice guidance on how to navigate vessels in the vicinity of marine mammals.

6.7 Cumulative Impacts

As detailed in Chapter 3: Methodology, four offshore projects were scoped into the cumulative assessment, these are detailed in Table 6.7.1.

Table 6.7.1: Offshore Projects Scoped into the Cumulative Assessment

Project	Distance	Details	Potential Cumulative Effects
Tarbert Ferry Terminal Upgrade	45km by sea	Upgrades including dredging, land reclamation and piling works.	Potential overlap in construction works, and use of same dredging disposal site.
Uig Ferry Terminal Upgrade	47km by sea	Upgrades including dredging and piling works.	Potential overlap in construction works.
Stornoway Port Authority – Newton Marina	88km by sea	Includes dredging	Potential overlap in construction works, and use of same dredging disposal site.
Stornoway Port Authority – Deepwater Port, Arnish	88km by sea	Includes piling, dredging and land reclamation.	Potential overlap in construction works, and use of same dredging disposal site.

The only aspects of the Lochmaddy ferry terminal upgrade assessed as having the potential to result in significant impacts on marine mammals are underwater noise emissions from piling works, and the risk of physical injury during dredged spoil disposal operations. Hence, these are the only aspects which may results in cumulative impacts with the projects identified in Table 6.7.1.

With regard to underwater piling noise emissions, the propagation models demonstrate that the elevated noise levels are confined to the immediate vicinity of the development, within Loch Maddy. As such, there is no possibility that the area affected by the Lochmaddy ferry

terminal upgrade piling noise emissions will overlap with the areas affected by the piling noise emissions from Tarbert ferry terminal upgrade, Uig ferry terminal upgrade, or the Stornoway Deepwater Port project. Given the low densities of marine mammals expected to be present within the area affected by the Lochmaddy ferry terminal upgrade piling noise, it is also unlikely that animals exposed to piling noise at Lochmaddy, will also be subjected to piling noise from the other developments. Therefore, the cumulative underwater noise impacts on marine mammals resulting from the piling works at the 3 projects are assessed as **no-change**.

Due to the fact that this development and the Tarbert Ferry Terminal upgrade, together with Stornoway Port Authority's Newton Marina and Arnish Deepwater Port projects will utilise the same spoil ground, there is the potential for a cumulative physical injury impact on marine mammals through interactions with falling spoil during disposals. However, it has been identified that the provision of appropriate mitigation will effectively mitigate this risk for the Lochmaddy ferry terminal upgrade. Assuming that a similar level of mitigation is provided for the Lochmaddy ferry terminal upgrade and Stornoway Port Authority's projects, the cumulative impacts will be reduced, and are assessed as **minor: non-significant**.

6.8 Residual Effect

Following the identification of appropriate mitigation detailed in Section 6.6, for the impacts assessed to be significant in Section 6.5, these aspects have been reassessed in order to ascertain the residual impacts.

6.8.1 Piling: Underwater Noise

The implementation of piling marine mammal protocols will ensure that animals are not present within the area where they may suffer acoustic injury when piling is commenced. As a result, the risk of injury is effectively removed. A residual risk remains that marine mammals may be displaced from the vicinity of the piling works during piling operations. However, this effect is expected to be limited to periods when piling operations are ongoing, and the piling operations will not be conducted on a 24hr per day basis, will be localised and of very short duration. The residual effect is therefore assessed as **negligible, short term** and **reversible**, meaning that the residual effect on marine mammals and their designated sites is **non-significant.**

6.8.2 Dredged Spoil Disposal: Physical Injury

The implementation of the dredged spoil disposal marine mammal protocols will ensure that marine mammals are not present beneath the disposal vessel at the time of disposal. This effectively removes the risk of injury to marine mammals through interactions with falling debris. Therefore, the residual effect is assessed as **no-change**.

6.9 Summary

In total, eleven significant effects on marine mammal receptors were identified as potentially resulting from the construction of the Lochmaddy ferry terminal upgrade. These were associated with two discrete activities, impact piling and dredge spoil disposal. Through the adoption of effective and proportional marine mammal mitigation during the construction of the Development, all effects are reduced to non-significant.

Table 6.9.1 summarises the effects assessed for marine mammal receptors, the mitigation measures identified to control them and the potential for residual significant adverse effects. Significant effects are highlighted in yellow.

Table 6.9.1 Summary of Marine Mammal Impacts and Mitigation

Receptor and Value		Phase	Predicted Impact	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
Inner Hebrides & the Minches cSAC	International	Construction	**Vibro Piling Noise:** Injury/Disturbance of qualifying features.	Negligible Negative Short Term Reversible	Minor: Non-Significant	Piling Marine Mammal Mitigation.	Negligible Negative Short Term Reversible	Minor: Non-Significant
			Impact Piling Noise: Injury/Disturbance of qualifying features.	Low Negative Short Term Reversible	Moderate: **Significant**	Piling Marine Mammal Mitigation	Negligible Negative Short Term Reversible	Minor: Non-Significant
			Back-Hoe & Plough Dredging Noise: Injury/Disturbance of qualifying features.	None	No-Change	No specific mitigation required.	None	No-Change
			Rock Breaking Noise: Injury/Disturbance of qualifying features.	Negligible Negative Short Term Reversible	Minor: Non-Significant	No specific mitigation required.	Negligible Negative Short Term Reversible	Minor: Non-Significant
			Vessel Movement Noise: Injury/Disturbance of qualifying features.	None	No-Change	No specific mitigation required.	None	No-Change
			Increased Sediment Loading from Site Surface Water Runoff: Disturbance/Displacement/Reduced Foraging Success of qualifying features.	None	No-Change	No specific mitigation required.	None	No-Change

Receptor and Value		Phase	Predicted Impact	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
Inner Hebrides & the Minches cSAC	International	Construction	**Increased Sediment Loading from Dredging, Rock Placement and Infilling**: Disturbance/Displacement/Reduced Foraging Success of qualifying features.	None	No-Change	No specific mitigation required.	None	No-Change
			Increased Sediment Loading from Spoil Disposal at Stornoway: Disturbance/Displacement/Reduced Foraging Success of qualifying features.	Negligible Negative Short Term Reversible	Minor: Non-Significant	Spoil Disposal Marine Mammal Protocols.	Negligible Negative Short Term Reversible	Minor: Non-Significant
			Release of Hazardous Substances: Injury/Displacement of qualifying features.	Negligible Negative Short Term Reversible	Minor: Non-Significant	No specific mitigation required.	Negligible Negative Short Term Reversible	Minor: Non-Significant
			Spoil Disposal at Stornoway: Injury of qualifying features through interactions with falling spoil.	Low Negative Short Term Reversible	Moderate: **Significant**	Spoil Disposal Marine Mammal Protocols.	None	No-Change
Ascrib, Isay, & Dunvegan SAC	International	Construction	**Vibro Piling Noise:** Injury/Disturbance of qualifying features.	None	No-Change	Piling Marine Mammal Mitigation	None	No-Change
			Impact Piling Noise: Injury/Disturbance of qualifying features.	Negligible Negative Short Term Reversible	Minor: Non-Significant	Piling Marine Mammal Mitigation	Negligible Negative Short Term Reversible	Minor: Non-Significant

Receptor and Value		Phase	Predicted Impact	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
Ascrib, Isay, & Dunvegan SAC	International	Construction	**Back-Hoe & Plough Dredging Noise:** Injury/Disturbance of qualifying features.	None	No-Change	No specific mitigation required.	None	No-Change
			Rock Breaking Noise: Injury/Disturbance of qualifying features.	Negligible Negative Short Term Reversible	Minor: Non-Significant	No specific mitigation required.	Negligible Negative Short Term Reversible	Minor: Non-Significant
			Vessel Movement Noise: Injury/Disturbance of qualifying features.	None	No-Change	No specific mitigation required.	None	No-Change
			Increased Sediment Loading from Site Surface Water Runoff: Disturbance/Displacement/Reduced Foraging Success of qualifying features.	None	No-Change	No specific mitigation required.	None	No-Change
			Increased Sediment Loading from Dredging, Rock Placement and Infilling: Disturbance/Displacement/Reduced Foraging Success of qualifying features.	None	No-Change	No specific mitigation required.	None	No-Change
			Increased Sediment Loading from Spoil Disposal at Stornoway: Disturbance/Displacement/Reduced Foraging Success of qualifying features.	Negligible Negative Short Term Reversible	Minor: Non-Significant	Spoil Disposal Marine Mammal Protocols.	Negligible Negative Short Term Reversible	Minor: Non-Significant

Receptor and Value		Phase	Predicted Impact	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
Ascrib, Isay & Dunvegan SAC	International	Construction	**Release of Hazardous Substances**: Injury/Displacement of qualifying features.	Negligible Negative Short Term Reversible	Minor: Non-Significant	No specific mitigation required.	Negligible Negative Short Term Reversible	Minor: Non-Significant
			Spoil Disposal at Stornoway: Injury of qualifying features through interactions with falling spoil.	Low Negative Short Term Reversible	Moderate: **Significant**	Spoil Disposal Marine Mammal Protocols.	None	No-Change
Harbour Porpoise	International	Construction	**Vibro Piling Noise:** Injury/Disturbance.	Negligible Negative Short Term Reversible	Minor: Non-Significant	Piling Marine Mammal Mitigation	Negligible Negative Short Term Reversible	Minor: Non-Significant
			Impact Piling Noise: Injury/Disturbance.	Low Negative Short Term Reversible	Moderate: **Significant**	Piling Marine Mammal Mitigation	Negligible Negative Short Term Reversible	Minor: Non-Significant
			Back-Hoe & Plough Dredging Noise: Injury/Disturbance.	None	No-Change	No specific mitigation required.	None	No-Change
			Rock Breaking Noise: Injury/Disturbance.	Negligible Negative Short Term Reversible	Minor: Non-Significant	No specific mitigation required.	Negligible Negative Short Term Reversible	Minor: Non-Significant
			Vessel Movement Noise: Injury/Disturbance.	None	No-Change	No specific mitigation required.	None	No-Change
			Increased Sediment Loading from Site Surface Water Runoff: Disturbance/Displacement/Reduced Foraging Success.	None	No-Change	No specific mitigation required.	None	No-Change

Receptor and Value		Phase	Predicted Impact	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
Harbour Porpoise	International	Construction	**Increased Sediment Loading from Dredging, Rock Placement and Infilling**: Disturbance/Displacement/Reduced Foraging Success.	None	No-Change	No specific mitigation required.	None	No-Change
			Increased Sediment Loading from Spoil Disposal at Stornoway: Disturbance/Displacement/Reduced Foraging Success.	Negligible Negative Short Term Reversible	Minor: Non-Significant	Spoil Disposal Marine Mammal Protocols.	Negligible Negative Short Term Reversible	Minor: Non-Significant
			Release of Hazardous Substances: Injury/Displacement.	Negligible Negative Short Term Reversible	Minor: Non-Significant	No specific mitigation required.	Negligible Negative Short Term Reversible	Minor: Non-Significant
			Spoil Disposal at Stornoway: Injury through interactions with falling spoil.	Low Negative Short Term Reversible	Moderate: **Significant**	Spoil Disposal Marine Mammal Protocols.	None	No-Change
Minke Whale	International	Construction	**Vibro Piling Noise:** Injury/Disturbance.	None	No-Change	Piling Marine Mammal Mitigation	None	No-Change
			Impact Piling Noise: Injury/Disturbance.	Negligible Negative Short Term Reversible	Moderate: **Significant**	Piling Marine Mammal Mitigation	Negligible Negative Short Term Reversible	Minor: Non-Significant
			Back-Hoe & Plough Dredging Noise: Injury/Disturbance.	None	No-Change	No specific mitigation required.	None	No-Change

Receptor and Value		Phase	Predicted Impact	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
Minke Whale	International	Construction	**Rock Breaking Noise:** Injury/Disturbance.	Negligible Negative Short Term Reversible	Minor: Non-Significant	No specific mitigation required.	Negligible Negative Short Term Reversible	Minor: Non-Significant
			Vessel Movement Noise: Injury/Disturbance.	None	No-Change	No specific mitigation required.	None	No-Change
			Increased Sediment Loading from Site Surface Water Runoff: Disturbance/Displacement/Reduced Foraging Success.	None	No-Change	No specific mitigation required.	None	No-Change
			Increased Sediment Loading from Dredging, Rock Placement and Infilling: Disturbance/Displacement/Reduced Foraging Success.	None	No-Change	No specific mitigation required.	None	No-Change
			Increased Sediment Loading from Spoil Disposal at Stornoway: Disturbance/Displacement/Reduced Foraging Success.	Negligible Negative Short Term Reversible	Minor: Non-Significant	Spoil Disposal Marine Mammal Protocols.	Negligible Negative Short Term Reversible	Minor: Non-Significant
			Release of Hazardous Substances: Injury/Displacement.	Negligible Negative Short Term Reversible	Minor: Non-Significant	No specific mitigation required.	Negligible Negative Short Term Reversible	Minor: Non-Significant
			Spoil Disposal at Stornoway: Injury through interactions with falling spoil.	Low Negative Short Term Reversible	Moderate: **Significant**	Spoil Disposal Marine Mammal Protocols.	None	No-Change

Receptor and Value		Phase	Predicted Impact	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
All Relevant Dolphin Species	International	Construction	**Vibro Piling Noise:** Injury/Disturbance.	None	No-Change	Piling Marine Mammal Mitigation	None	No-Change
			Impact Piling Noise: Injury/Disturbance.	Negligible Negative Short Term Reversible	Minor: Non-Significant	Piling Marine Mammal Mitigation	Negligible Negative Short Term Reversible	Minor: Non-Significant
			Back-Hoe & Plough Dredging Noise: Injury/Disturbance.	None	No-Change	No specific mitigation required.	None	No-Change
			Rock Breaking Noise: Injury/Disturbance.	Negligible Negative Short Term Reversible	Minor: Non-Significant	No specific mitigation required.	Negligible Negative Short Term Reversible	Minor: Non-Significant
			Vessel Movement Noise: Injury/Disturbance.	None	No-Change	No specific mitigation required.	None	No-Change
			Increased Sediment Loading from Site Surface Water Runoff: Disturbance/Displacement/Reduced Foraging Success.	None	No-Change	No specific mitigation required.	None	No-Change
			Increased Sediment Loading from Dredging, Rock Placement and Infilling: Disturbance/Displacement/Reduced Foraging Success.	None	No-Change	No specific mitigation required.	None	No-Change
			Increased Sediment Loading from Spoil Disposal at Stornoway: Disturbance/Displacement/Reduced Foraging Success.	Negligible Negative Short Term Reversible	Minor: Non-Significant	Spoil Disposal Marine Mammal Protocols.	Negligible Negative Short Term Reversible	Minor: Non-Significant

Receptor and Value		Phase	Predicted Impact	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
All Relevant Dolphin Species	International	Construction	**Release of Hazardous Substances**: Injury/Displacement.	Negligible Negative Short Term Reversible	Minor: Non-Significant	No specific mitigation required.	Negligible Negative Short Term Reversible	Minor: Non-Significant
			Spoil Disposal at Stornoway: Injury through interactions with falling spoil.	Low Negative Short Term Reversible	Moderate: **Significant**	Spoil Disposal Marine Mammal Protocols.	None	No-Change
Killer Whale	International	Construction	**Vibro Piling Noise:** Injury/Disturbance.	None	No-Change	Piling Marine Mammal Mitigation	None	No-Change
			Impact Piling Noise: Injury/Disturbance.	Negligible Negative Short Term Reversible	Minor: Non-Significant	Piling Marine Mammal Mitigation	Negligible Negative Short Term Reversible	Minor: Non-Significant
			Back-Hoe & Plough Dredging Noise: Injury/Disturbance.	None	No-Change	No specific mitigation required.	None	No-Change
			Rock Breaking Noise: Injury/Disturbance.	Negligible Negative Short Term Reversible	Minor: Non-Significant	No specific mitigation required.	Negligible Negative Short Term Reversible	Minor: Non-Significant
			Vessel Movement Noise: Injury/Disturbance.	None	No-Change	No specific mitigation required.	None	No-Change
			Increased Sediment Loading from Site Surface Water Runoff: Disturbance/Displacement/Reduced Foraging Success.	None	No-Change	No specific mitigation required.	None	No-Change

Receptor and Value		Phase	Predicted Impact	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
Killer Whale	International	Construction	**Increased Sediment Loading from Dredging, Rock Placement and Infilling**: Disturbance/Displacement/Reduced Foraging Success.	None	No-Change	No specific mitigation required.	None	No-Change
			Increased Sediment Loading from Spoil Disposal at Stornoway: Disturbance/Displacement/Reduced Foraging Success.	Negligible Negative Short Term Reversible	Minor: Non-Significant	Spoil Disposal Marine Mammal Protocols.	Negligible Negative Short Term Reversible	Minor: Non-Significant
			Release of Hazardous Substances: Injury/Displacement.	Negligible Negative Short Term Reversible	Minor: Non-Significant	No specific mitigation required.	Negligible Negative Short Term Reversible	Minor: Non-Significant
			Spoil Disposal at Stornoway: Injury through interactions with falling spoil.	Low Negative Short Term Reversible	Moderate: **Significant**	Spoil Disposal Marine Mammal Protocols.	None	No-Change
Common Seal	International	Construction	**Vibro Piling Noise:** Injury/Disturbance.	Negligible Negative Short Term Reversible	Minor: Non-Significant	Piling Marine Mammal Mitigation	Negligible Negative Short Term Reversible	Minor: Non-Significant
			Impact Piling Noise: Injury/Disturbance.	Low Negative Short Term Reversible	Moderate: **Significant**	Piling Marine Mammal Mitigation	Negligible Negative Short Term Reversible	Minor: Non-Significant
			Back-Hoe & Plough Dredging Noise: Injury/Disturbance.	None	No-Change	No specific mitigation required.	None	No-Change

Receptor and Value		Phase	Predicted Impact	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
Common Seal	International	Construction	**Rock Breaking Noise:** Injury/Disturbance.	Negligible Negative Short Term Reversible	Minor: Non-Significant	No specific mitigation required.	Negligible Negative Short Term Reversible	Minor: Non-Significant
			Vessel Movement Noise: Injury/Disturbance.	None	No-Change	No specific mitigation required.	None	No-Change
			Increased Sediment Loading from Site Surface Water Runoff: Disturbance/Displacement/Reduced Foraging Success.	None	No-Change	No specific mitigation required.	None	No-Change
			Increased Sediment Loading from Dredging, Rock Placement and Infilling: Disturbance/Displacement/Reduced Foraging Success.	Negligible Negative Short Term Reversible	Minor: Non-Significant	No specific mitigation required.	Negligible Negative Short Term Reversible	Minor: Non-Significant
			Increased Sediment Loading from Spoil Disposal at Stornoway: Disturbance/Displacement/Reduced Foraging Success.	Negligible Negative Short Term Reversible	Minor: Non-Significant	Spoil Disposal Marine Mammal Protocols.	Negligible Negative Short Term Reversible	Minor: Non-Significant
			Release of Hazardous Substances: Injury/Displacement.	Negligible Negative Short Term Reversible	Minor: Non-Significant	No specific mitigation required.	Negligible Negative Short Term Reversible	Minor: Non-Significant
			Spoil Disposal at Stornoway: Injury through interactions with falling spoil.	Low Negative Short Term Reversible	Moderate: **Significant**	Spoil Disposal Marine Mammal Protocols.	None	No-Change
Grey Seal	International	Construction	**Vibro Piling Noise:** Injury/Disturbance.	None	No-Change	Piling Marine Mammal Mitigation	None	No-Change

Receptor and Value		Phase	Predicted Impact	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
Grey Seal	International	Construction	**Impact Piling Noise:** Injury/Disturbance.	Negligible Negative Short Term Reversible	Minor: Non-Significant	Piling Marine Mammal Mitigation	Negligible Negative Short Term Reversible	Minor: Non-Significant
			Back-Hoe & Plough Dredging Noise: Injury/Disturbance.	None	No-Change	No specific mitigation required.	None	No-Change
			Rock Breaking Noise: Injury/Disturbance.	Negligible Negative Short Term Reversible	Minor: Non-Significant	No specific mitigation required.	Negligible Negative Short Term Reversible	Minor: Non-Significant
			Vessel Movement Noise: Injury/Disturbance.	None	No-Change	No specific mitigation required.	None	No-Change
			Increased Sediment Loading from Site Surface Water Runoff: Disturbance/Displacement/Reduced Foraging Success.	None	No-Change	No specific mitigation required.	None	No-Change
			Increased Sediment Loading from Dredging, Rock Placement and Infilling: Disturbance/Displacement/Reduced Foraging Success.	None	No-Change	No specific mitigation required.	None	No-Change
			Increased Sediment Loading from Spoil Disposal at Stornoway: Disturbance/Displacement/Reduced Foraging Success.	Negligible Negative Short Term Reversible	Minor: Non-Significant	Spoil Disposal Marine Mammal Protocols.	Negligible Negative Short Term Reversible	Minor: Non-Significant

Receptor and Value		Phase	Predicted Impact	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
Grey Seal	International	Construction	**Release of Hazardous Substances**: Injury/Displacement.	Negligible Negative Short Term Reversible	Minor: Non-Significant	No specific mitigation required.	Negligible Negative Short Term Reversible	Minor: Non-Significant
			Spoil Disposal at Stornoway: Injury through interactions with falling spoil.	Low Negative Short Term Reversible	Moderate: **Significant**	Spoil Disposal Marine Mammal Protocols.	None	No-Change

Key

	Significant Effect

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Chapter 7: Benthic Ecology

Contents

7 Benthic Ecology

7.1 Introduction

This chapter presents the benthic Ecological Impact Assessment for the construction phase of proposed Lochmaddy ferry terminal Upgrade. Impacts on benthic ecology resulting from the operation and decommissioning the development have been scoped out of the assessment in agreement with Marine Scotland. Benthic receptors are considered in this chapter and are evaluated in the context of nature conservation legislation and relevant planning policy (see Chapter 3: Statutory Context & Policy and Chapter 5: Biodiversity). Impacts on receptors are identified and subject to detailed impact assessment. Mitigation is proposed, cumulative impacts are considered, and finally the residual impacts and their significance are assessed.

7.2 Regulations, Guidance and Sources of Information

Regulations and guidance pertaining to ecology and biodiversity are outlined in Chapter 5: Biodiversity. This section specifically details the regulations and guidance relevant to benthic ecology.

7.2.1 European and International Regulations

Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora, known as the 'Habitats Directive' was adopted in 1992. The Directive is the means by which the European Union meets its obligations under the Bern Convention. In order to comply with Article 3 of the directive, Special Areas of Conservation (SACs) must be designated in UK territorial waters in order to provide a network of high-quality conservation sites for habitats and species listed under Annexes I and II of the Directive. A total of thirteen marine habitats are detailed in Annex I of the Directive, while eight benthic species are listed in Annex II.

As such, species listed in Annexes I and II of the Habitats Directive are considered sensitive species for the purposes of this assessment.

Annex I habitats which may be present in the vicinity of the development include:

- Sub-tidal sandbanks;
- Estuaries;
- Intertidal mudflats and sandflats; and
- Reefs.

7.2.2 National Legislation

The Marine (Scotland) Act 2010 has established new powers to designate Marine Protected Areas (MPAs) in Scottish Territorial Waters, including those for nature conservation. There are no designated MPAs for the presence of benthic or intertidal habitats or species within the vicinity of the proposed development.

7.2.3 Other Guidance

The Marine (Scotland) Act 2010 sets out duties on Scottish Ministers to ensure Scotland's seas are managed sustainably. In order to help meet this requirement, the Joint Nature Conservation Committee (JNCC) and Scottish Natural Heritage (SNH) have produced a list of habitats and species occurring in Scottish waters, which are noted for their conservation

importance. These are referred to as Priority Marine Features (PMFs) (Tyler-Walters *et al.*, 2016). Inclusion in the PMF list does not provide any additional legal protection, however due consideration must be provided in Impact Assessments, and as such all PMFs are considered sensitive for the purpose of this assessment.

7.2.4 Sources of Information

The following sources of information were consulted in the compilation of this benthic ecological impact assessment:

- Appendix G.1: Lochmaddy Pier Improvements – Subtidal Benthic Ecology Survey Report (APEM, 2018);
- Guidance on Survey and Monitoring in Relation to Marine Renewables Developments in Scotland. Volume 5: Benthic Habitats (Saunders *et al.*, 2011);
- Marine Habitat Classification of the British Islands (JNCC, 2018);
- International Convention for the Control and Management of Ships' Ballast Water and Sediments (International Maritime Organization, 2004);
- Guidance for Pollution Prevention 5: Works and Maintenance in or Near Water (NIEA, 2017);
- UK BAP Priority Species and Habitats (JNCC, 2016);
- International Union of Conservation of Nature Red List of Threatened Species (International Union of Conservation of Nature, 2016);
- SNH Site Link (SNH, 2018); and
- Handbook for Marine Intertidal Phase 1 Biotope Mapping Survey (Davis *et al.*, 2001).

7.3 Method of Assessment

7.3.1 Baseline Methodology

7.3.1.1 Benthic Survey

Aspect Land & Hydrographic Surveys (ALHS) were appointed to conduct a benthic survey. The survey was carried out to gain an understanding of the benthic habitats, sediment type and suitability of the dredge spoil for infilling purposes. The survey was undertaken in line with SNH's Guidance on Survey and Monitoring in Relation to Marine Renewables Developments in Scotland, Volume 5: Benthic Habitats (Saunders et al., 2011).

The survey was conducted between the 4th and 9th of April 2018 from the vessel Remote Sensor, covering the areas to be dredged. The survey included five video transects and five 0.1m^2 Day grab samples.

Full details of the benthic survey operations are provided in Appendices G.1, with a summary of the survey methods outlined below.

7.3.1.1.1 Video Transects

Underwater video transects were completed using a Drop-Down Video (DDV) camera system. Drawing 49L.07.01 shows the locations of the video transects, while the start and end points of each transect are provided in Table 7.3.1. The video camera was an Imenco 'Tiger Shark' still camera, mounted on a frame, together with lighting and a flash. Footage was captured by the

camera system, looking vertically downwards onto the seabed as the survey vessel navigated along the transects. Output video footage was recorded on the survey vessel. Still images were captured by the survey platform. Additional images were taken where interesting features were observed.

Table 7.3.1: Start and End Point Coordinates of the Video Transects (APEM, 2018).

Video Transect	Start Coordinates		End Coordinates	
	X	Y	X	Y
Transect 1	91958.27	867917.06	92019.64	867988.41
Transect 2	92151.21	867898.95	92071.97	897991.04
Transect 3	92188.46	867943.79	92150.35	867991.10
Transect 4a	92309.16	897993.32	92091.82	867960.74
Transect 4b	92091.87	867960.33	92090.89	867960.50
Transect 5a	92123.29	867926.51	92092.59	867933.32
Transect 5b	92104.53	867925.50	92010.77	867995.03

Video footage and still images from the video survey were analysed by an experienced marine benthic taxonomist to identify the benthic biotopes and notable taxa. Results were recorded and identified biotope complexes mapped.

7.3.1.1.2 Grab Sampling

Benthic grab sampling was conducted using a 0.1m^2 Day grab. Due to a fault with the camera system, the grab sampling was conducted prior to the video transects. The grab sampling locations were informed by an ecological interpretation of the local ground conditions, based on the results of a previously conducted vibrocore survey. The representativeness of the sampling locations was retrospectively verified during the underwater video survey, and the selected locations were found to provide a good appraisal of the biotopes present on site. Drawing 49L.07.01 shows the locations of the grab sampling sites, while Table 7.3.2 provides their coordinates. Throughout this chapter the benthic grab sample station will be referred to by their reference code detailed in Table 7.3.2.

Table 7.3.2: Coordinates of Grab Sample Stations (APEM, 2018).

Grab Sample Station	Reference Code	X	Y
Station 1	G01	92169.44	867971.42
Station 2	G02	92095.73	867959.07
Station 3	G03	91973.27	867948.23
Station 4	G04	92135.25	867903.33
Station 5	G05	92245.89	867987.34

Two grab samples were taken at each sampling location, one for particle size distribution (PSD) analysis and a further for macrobenthic analysis. Samples were considered of acceptable size if a minimum of 5l of sediment per sample was collected. Where insufficient sediment was collected, two further attempts would be made at the same location, and if these were also unsuccessful a further three attempts were made at least 50m from the original location. Samples retained for macrobenthic analysis were sieved on board the survey vessel using a 1.0mm sieve. Biological samples retained in the sieves were fixed in 4% buffered formaldehyde solution in seawater for transport to laboratories.

At station 2, the initial grab sample was rejected due to a large stone blocking the jaws of the grab. However, during the second attempted a sufficient volume was retrieved.

7.3.1.1.3 Macrobenthic Analysis of Grab Samples

Analysis of biological samples followed APEM's in-house standard operating procedures that comply with the North East Atlantic Marine Biological Analytical Quality Control Scheme (NMBAQC) guidance. Prior to identification of taxa to the lowest practical taxonomic level from retained biological samples, samples were sieved through a stack of sieves of 4.0, 2.0, and 1.0mm meshes, in line with United Kingdom Technical Advisory Group (UKTAG) guidance. Laboratory identification also adhered to the Taxonomic Discrimination Protocol (TDP) developed by the NMBAQC scheme. All identification was conducted by an experienced taxonomist using appropriate taxonomic literature. At least one example of each taxon identified was retained in the laboratory reference collection.

7.3.1.1.4 PSD Analysis of Grab Samples

The analysis of grab samples for PSD was conducted in line with the 'NMBAQC scheme best practice guidance on PSD for PSD supporting analysis'. Sediment sample analysis involved a combination of dry sieving and laser diffraction. PSD data was then entered into the GRADISTAT statistics package for the analysis of unconsolidated sediments. This provided sediment classifications according to the Folk sediment classification pyramid, detailed in Figure 7.3.3. Statistical analysis including mean particle size, skewness and kurtosis were also undertaken (APEM, 2018).

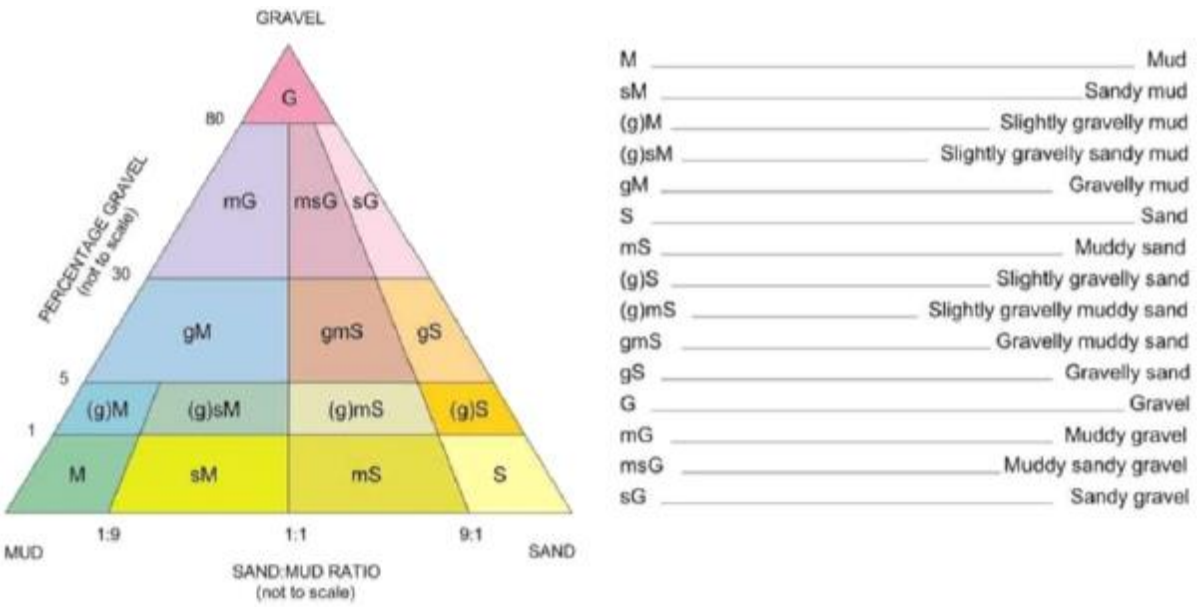

Figure 7.3.3: Sediment Classification Pyramid, taken from (Folk *et al.*, 1970)

7.3.2 Impact Assessment Methodology

The methodology utilised to assess the potential effects resulting from the development on the benthic ecology of the area is described in Chapter 5: Biodiversity.

7.4 Baseline

7.4.1 Statutory Designates Sites

The proposed project footprint lies within and is surrounded by the Loch nam Madadh Special Area of Conservation (UK Marine SAC Project, 2018) designated for intertidal mudflats and sandflats, lagoons, reefs, subtidal sandbanks, shallow inlets and bays. Parts of the development footprint also fall within Loch nam Madadh Site of Special Scientific Interest (SSSI), which includes the intertidal zone of Loch Maddy. The SSSI is designated for rocky shore, marine mudflats and Foxtail stonewort (*Lamprothamnium papulosum)*. In addition, approximately 1.3km north east of the development site lies the Loch an Duin SSSI, designated for brackish water cockle *(Cerastoderma glaucum)*. Parts of the Loch an Duin SSSI is also designated as a RAMSAR site for saline lagoons and tidal rapids. Furthermore, the Tong Saltings SSSI lies approximately 27km by sea North of the proposed Stornoway dredge spoil and is designated for marine mudflats.

7.4.2 Environment

The area within the immediate vicinity of Lochmaddy is a complex area of islands with tidal rapids, inlets and brackish lochs, on the east coast of North Uist. The sea loch, Loch Maddy consists of a glaciated coastline that was submerged by rising sea levels (SNH, 2009). The proposed development is situated in the South Basin in the south western extent of Loch Maddy. Loch Maddy is an area of sheltered water which meets the Little Minch at its eastern extent. The waters surrounding the development are relatively shallow, with Loch Maddy having a maximum depth of approximately 40m, while in the immediate vicinity of the development, the South Basin has a maximum depth of approximately 9m at its eastern extent, shoaling rapidly to less than 5m in the areas adjacent to the ferry terminal.

7.4.3 Benthic Survey Results

A full description of the benthic survey analysis and results are available in Appendix G.1 with a summary of the results presented here.

7.4.3.1 Video Transects

Four biotope complexes were identified by the video transects conducted, as detailed in Drawing 49L.07.02. Biotope complex SS.SMp.KSwSS.LsacR.Mu (Laminaria saccharina with red and brown seaweeds on lower muddy sediments) and IR.HIR.Ksed (Sand or gravel-affected or disturbed kelp and seaweed communities) were widespread across all transects, but SS.SMp.KSwSS.LsacR.Mu was the most common complex. LR.LLR.F.Fserr.FS (*Fucus serratus* on full salinity lower eulittoral mixed substrata) and IR.MIR.KR.L.dig (Laminaria digitata on moderately exposed sublittoral fringe rock) were also identified, but only in a small localised area (APEM, 2018). It is noted that biotope SS.SMp.KSwSS.LsacR.Mu is a Scottish Priority Marine Feature (PMF).

7.4.3.2 Grab Samples – Macrobenthic

Analysis of macrobenthic grab sampled identified only the biotope complex SS.SMp.KSwSS.LsacR.Mu (*Laminaria saccharina* with red and brown seaweeds on lower muddy mixed sediments) across the five sampling stations. Analysis of the macrobenthic samples also identified numerous benthic species, *Melinna palmata* being the most abundant with 623

individuals identified across the five samples. High numbers of *Kurtuekka bidentate* (n=293), *Thyasira flexuosa bidentate (n=210)* and *Lumbrineris cingulate* (n= 208) were also recorded across all stations (APEM, 2018).

An individual juvenile Modiolus was recorded at station 5, but PMF habitat associated with the species was not identified in the survey area. Similarly, a specimen of *Mytilus edulis* was recorded at Station 2 in the absence of the PMF habitat. A single juvenile *Arctica islandica* and six *Virgularia mirabilis* were also recorded at Station 3 and 5 respectively.

No other species designated under the Conservation (Natural Habitats, &c.) Regulations 1994, Conservation of Habitats and Species Regulations 2010, or as a Scottish PMF were identified during the benthic survey operations (APEM, 2018).

At Stations 1,2 and 5 the genus of red algae *Gracilaria* was recorded. Within the genus of *Gracilaria*, there is the potential for the non-native marine species (NNMS) *Gracilaria multipartite* and *Gracilaria vermiculophylla* to be present within the survey area. However, no confirmed specimens of these species were noted. A literature review identified no records of *Gracilaria multipartite* in Scotland, with populations restricted to Cornwall, south Devon, Dorset and areas around Belfast (NBN atlas, 2017a). Similarly, no populations of *Gracilaria vermiculophylla* are known in the area (NBN atlas, 2017b). It is therefore considered to be unlikely that invasive *Gracilaria* species are present. The recorded Aoridae and Chironomidae families may also have the potential to contain non-native species, although none were identified as being present (APEM, 2018). A review of the available literature did not provide any evidence to suggest invasive species from these families are likely to be present in the area.

At Station 1 the NNMS *Bonnemaisonia hamifera* was recorded. However, it is noted that this species is considered to be well established in the U.K., and is already recorded as being widespread in Loch Maddy, and also present at Arnish Point, in the immediate vicinity of the proposed spoil ground (NBN atlas, 2019). *Limnoria quadripunctata*, also a possible non-native species to the UK, was recorded in Station 2, however, the natural range of this species is unclear, and it may in fact be native to the UK (Borges *et al.*, 2014).

7.4.3.3 Grab Samples - PSD

Table 7.4.1 details the results from the PSD analysis of the grab samples. PSD analysis classified samples from Stations 1 and 2 using the Folk (1954) classification guide as gravelly mud. At Stations 3, 4 and 5 as gravelly muddy sand, mud and sandy mud were determined respectively (APEM, 2018).

Table 7.4.1: Visual Description and Folk (1954) Classification of Day Grab Samples (APEM, 2018)

Grab Sample Station	Blott and Pye (2012) classification	Folk (1954) Classification
Station 1	Slightly Gravelly Sandy Mud	Gravelly Mud
Station 2	Slightly Gravelly Sandy Mud	Gravelly Mud
Station 3	Slightly Gravelly Sandy Mud	Gravelly Muddy Sand
Station 4	Very Slightly Sandy Mud	Mud
Station 5	Sandy Mud	Sandy Mud

7.4.3.4 Predictive Biotope Mapping

A synergistic analysis of the microbenthic count, video transects, and PSA data informed the predictive biotope mapping. Biotopes were allocated following the JNCC National Marine Habitat Classification for Britain and Ireland guidance.

Drawing 49L.07.03 details the categorised subtidal benthic biotopes. Synthesis of the data collected identified four biotope complexes. The biotope complex SS.SMp.KSwSS.LsacR.Mu (*Laminaria saccharina* with red and brown seaweeds on lower muddy mixed sediments) was the most widespread habitat. The biotopes IR.HIR.Ksed (Sediment-affected or disturbed kelp and seaweed communities), LR.LLR.F.Fserr.FS (*Fucus serratus* on full salinity lower eulittoral mixed Substrata) and IR.MIR.KR.Ldig (*Laminaria digitata* on moderately exposed sublittoral fringe rock) are predicted to be more localised habitats, and confined to the shallower waters near the coastline in the north of the survey area (APEM, 2018).

7.4.4 Identification of Receptors

Table 7.4.2 details all receptors taken forward for assessment. The benthic surveys identified multiple biotope complexes in the vicinity of the proposed development. The habitats within the footprint of the develop and their associated floral and faunal communities will be directly affected by any impacts arising from the proposed development, and are therefore considered as receptors. Potential indirect impacts on benthic habitats and species out with the development footprint, but within the vicinity of the site, may also result from the construction activities. These include the potential spread of sediment plumes during dredging and infilling, and the release of hazardous substances. Therefore, benthic habitats and species in the waters directly adjacent to the development are also considered as receptors.

The development site lies within the Loch nam Madadh SAC, and as detailed in Section 7.5.1, approximately 2,200m^2 of this site will be permanently lost during the land reclamation process. However, with respect to benthic receptors, the qualifying features of this SAC are:

- Intertidal mudflats and sandflats;
- Brackish lagoons;
- Reefs;
- Large shallow inlets and bays; and
- Subtidal sandbanks.

None of these features have been identified within development footprint, or the immediate vicinity. As such, the loss of habitat within the site, which equates to <0.001% of site's total area, does not have the potential to adversely impact the benthic qualifying features of the

SAC. Hence, the SAC's benthic conservation objectives will not be affected, and the site is not considered further by this assessment.

The development boundary also falls within the Loch nam Madadh SSSI, whose benthic qualifying features include reefs, foxtail stonewort, tidal lagoons, and mudflats. No reefs, foxtail stonewort, tidal lagoons, or mudflats have been identified within the project boundary, or adjacent areas. As detailed above, approximately 2,200m^2 of the SSSI will be lost to land reclamation, which equates to 0.07% of the total SSSI area. However, since none of the SSSI's benthic qualifying features are present within the vicinity of the development, the proposed construction will not adversely affect the site's management objectives. Therefore, the Loch nam Madadh SSSI will not be considered further by this assessment.

The Loch an Duin SSSI is designated for the brackish water cockle (*Cerastoderma glaucum*) with respect to benthic receptors. Brackish water cockles were not identified during the benthic habitat surveys, and the site is approximately 1.3km north east from the proposed development. It is therefore considered very unlikely that the construction of the ferry terminal upgrade will result in direct or indirect impacts on this SSSI or it's benthic qualifying features. Hence, the Loch an Duin SSSI is not taken forward for assessment. Parts of the Loch an Duin SSSI are also designated as a RAMSAR site for the presence of saline lagoons. The RAMSAR site is not taken forward due to the geographic distance between the development and the nearest saline lagoons.

Dredged material is unsuitable for infilling purposes and will be disposed of at the Stornoway designated dredge disposal site. Consequently the benthic habitat within the disposal site is also considered as a receptor, since dredge disposal can affect primary production of phytoplankton, and the growth and survival of benthic organisms (Karel, 1999). The large distance between the Stornoway dredge disposal site and Tong Saltings SSSI make it extremely unlikely for habitat connectivity to exist. Therefore, the SSSI site not taken forward for assessment.

Table 7.4.2: Ecological Value of Receptors Considered

Receptor	Description	Receptor Ecological Value
SS.SMp.KSwSS.LsacR.Mu	*Laminaria saccharina* with red and brown seaweeds on lower muddy mixed sediments.	National
IR.HIR.Ksed	Sediment-affected or disturbed kelp and seaweed communities.	Low local
LR.LLR.F.Fserr.FS	*Fucus serratus* on full salinity lower eulittoral mixed Substrata.	Low local
IR.MIR.KR.Ldig	*Laminaria digitata* on moderately exposed sublittoral fringe rock.	Moderate local
Intertidal benthic communities in vicinity of the development.	Specific habitat and species unknown, however majority of the intertidal habitat in the direct vicinity of the development is artificial, consisting of rock armour and quay walls.	Negligible
Dredge disposal site benthic communities.	Specific habitat and species unknown. Anticipated to be low quality due to existing use as a disposal site.	Negligible

7.5 Impact Assessment

Construction activities may result in a potential variety of direct and indirect impacts on the benthic environment within the proposed development area and on the identified receptors in Section 7.4.4. The assessment of these impacts follows the methodology outlined in Chapter 5: Biodiversity and assesses the potential effects resulting from the construction phase of the project as outlined in Chapter 2: Project Description.

7.5.1 Habitat Loss

The project description in Chapter 2 highlights the requirement to extend the existing marshalling and carpark area. In order to facilitate this, land reclamation will be conducted in an intertidal bay to the west of the existing marshalling area. As a result of this reclamation, approximately 2,200m^2 of shoreline will be lost as a potential habitat and foraging areas for intertidal benthic communities.

While there will be a permanent loss of intertidal benthic flora, fauna, and habitat in the footprint of the reclamation area, it is not expected that this will have a population-level effect on the wider Loch Maddy intertidal benthic communities. This is due to the fact that the scale of habitat loss is relatively small (<0.03%) in relation to the estimated total area of intertidal zone available within Loch Maddy. The location of the works at the end of the Loch is such that it will not result in habitat fragmentation. The extremely localised nature of the habitat loss, together with the lack of fragmentation risk, results in the impact being assessed as **low** and **permanent**. The affected intertidal benthic communities in the vicinity of the development have been assigned a value of **negligible**, as detailed in Table 7.4.2, hence, the resulting effect of habitat loss through land reclamation is considered to be **negligible: non-significant**.

In addition to the land reclamation, dredging is required to facilitate operations by deepening the waters around the upgraded ferry berth. This is to increase the area available for vessel manoeuvring, thus allowing the new larger ferry to berth safely in a range of weather conditions. Dredging will also be conducted to facilitate the formation the foundation bund to accommodate the caisson which will be installed to extend the existing pier. The total footprint of these three proposed dredge areas is approximately 5,500m^2, which equates to approximately 0.02% of the total area of Lochmaddy. This will directly affect the benthic flora and fauna receptors living on and within the sediments in the area.

The potential impacts on benthic receptors are a reduction of species diversity and density of macrofauna, due to the resulting physical disturbance (Newell *et al.*, 2004). The biotopes affected include:

- SS.SMp.KSwSS.LsacR.Mu;
- IR.HIR.Ksed;
- LR.LLR.F.Fserr.FS; and
- IR.MIR.KR.Ldig.

However, the dredging activities will not necessarily result in permanent habitat loss, due to the ability of benthic flora and fauna communities to recover following dredging. This is shown

by studies of aggregate dredge areas off the Isle of Wight, which demonstrated that benthic communities recovered following disturbance by dredging activity, with recovery rates dependent on habitat type and previous ecological status (Newell *et al.*, 2004). Given the relatively small area affected, in the context of the wider Loch Maddy, the potential impact of the habitat loss resulting from the capital dredge is therefore assessed as **low, reversible, and medium term.** The affected biotopes have been assigned values of between **negligible** and **national**, hence the overall effect is **negligible to minor: non-significant.**

7.5.2 Remobilisation of Sediments

The dredging and spoil disposal, rock armouring and infilling works detailed in Chapter 2: Project Description all have the potential to increase sediment loading, through the release of fines into the marine environment. Further information is provided in Chapter 13: Water Quality and Coastal Processes.

Effective management of the site surface water runoff, through the mitigation measures identified in Chapter 13: Water Quality and Coastal Processes will prevent sediment-laden run-off entering Loch Maddy. Hence no impact on benthic communities is expected from site surface water drainage.

Rock placement, infilling works, and dredging will all be conducted within the boundary of the ferry terminal upgrade. Affric's monitoring of the sediment loading resulting from similar rock placement, infilling, and dredging activities during previous port developments showed that sediment plumes resulting from these activities dispersed rapidly, and were confined to the immediate vicinity of the working areas (Affric Limited, 2018). Very similar construction techniques, in similar ground conditions will be utilised during the proposed Lochmaddy construction works. As such, the extent of the sediment loading is expected to be localised, and confined to the immediate vicinity of the works. Therefore, the potential impacts on all benthic receptors identified in Section 7.4.4 are assessed as **negligible, short term** and **reversible.** The overall effect level is therefore **negligible to minor: non-significant**.

The dredge disposal will give rise to increased sediment loading in the water column in the immediate vicinity of the Stornoway dredge disposal site. Affric's observations of similar spoil sea-disposal operations showed that during disposals using vessels with bottom opening doors, the resulting increased sediment loading dropped out and dispersed quickly. The dredged spoil disposal operations are likely to give rise to approximately 21 round trips, assuming a 390m^3 dredge vessel hopper. As such the impacts will be short term and confined to the immediate vicinity of the disposal site, which is unlikely to result in any significant change from baseline conditions due to the existing use of this site as a spoil ground. The impact on benthic communities in the vicinity of the disposal site associated with increased sediment loading in the water column are therefore assessed as **low, short term** and **reversible**, constituting a **negligible: non-significant** effect.

A further factor to be considered is the redeposition of sediments mobilised during the construction works. Miller *et al* (2002) undertook field and laboratory tests to better understand the effects of sedimentation on marine benthos. Their research showed heavy redepositing rates of sediments, depending on species resilience, can increase the mortality of

benthic flora and static fauna through smothering. If sediment deposition exceeds one meter it can result in the extermination of the benthic community. Pioneering species can colonize effected areas, potentially leading to altered benthic communities (Miller *et al.*, 2002). A literature review by Wilber and Clarke showed benthic habitats are capable of recovering following a sedimentation event, with recovery rates pending on multiple biological and physical factors, including sediment depth (Wilber *et al.*, 2007).

As discussed above, sediment plumes arising from sediment disturbance are anticipated to be localised, hence redepositing of sediments are also likely to remain close to the working area, with a spill over effect on benthic communities adjacent to the working area. Furthermore, the degree of sediment remobilisation is expected to be low, hence only low rates of deposition are expected. Therefore, the potential impacts resulting from redeposition of sediments following mobilisation by construction activities on all benthic receptors identified in Section 7.4.4 are assessed as **low, short term** and **reversible**. Hence the overall effect is **negligible to minor non-significant.**

Spoil from the capital dredge will be disposed of at the established Stornoway dredge disposal site. The Stornoway spoil ground has previously been used to dispose of dredge spoil. It is likely that the previous spoil deposits at the site will have reduced the quality of the benthic flora and fauna communities in that area, through repeated burial and smothering of the habitat. Therefore, the value of the habitat at the spoil ground is assessed as **negligible**. Since the site is an existing spoil ground, the proposed disposal of spoil, and resulting sediment deposition from the Lochmaddy ferry terminal upgrade is not considered to be a significant change from the baseline conditions. The potential impacts on benthic communities at the spoil site are therefore assessed as **negligible, medium term** and **reversible**, constituting a **negligible: non-significant** effect.

7.5.3 Remobilisation of Sediment-Bound Contaminates

The disturbance of the sediment during dredging, and subsequent disposal of dredged spoil, may lead to remobilisation of sediment-bound contaminants. Excessive levels of inorganic and organic contaminants within the sea water pose a direct risk to bottom-dwelling flora and fauna, with either acute or chronic effects like damage to DNA and reproduction (Borja *et al.*, 2011). Prolonged exposure also results in indirect effects with pollutants accumulating in the lower trophic level organisms, allowing it to move through the food chain with potential impacts upon the marine ecological process, ecological relationships and ecosystem services (van Maren *et al.*, 2016). Filter-feeding organisms are particularly at risk (Henry *et al.*, 2017).

A geotechnical marine survey of the proposed dredge areas identified elevated levels of inorganic contaminates including copper (Cu), mercury (Hg) and nickel (Ni). Elevated levels of Polyaromatic Hydrocarbons were also found. Full details is provided in the Lochmaddy Ferry Terminal Upgrade Capital Dredge Best Practicable Environmental Option Report (Affric Limited, 2019). While some individual samples contained contamination levels exceeding prescribed limits by Marine Scotland, the averages of all sample results are low, and as such no effects are predicted on marine life. Therefore, the remobilisation of sediment contaminates during dredging and proposed disposal of spoil is assessed as **negligible**, **short term** and

reversible, constituting a **negligible** to **minor: non-significant** effect on all receptors within the boundary of the ferry terminal upgrade and a **negligible: non-significant** effect on benthic communities at the dredge disposal site.

7.5.4 Release of Hazardous Substances

The accidental release of hydrocarbons and other hazardous substances in the event of a loss of containment during the construction works may result in contamination of the marine environment, with the potential to disrupt benthic ecosystems (Daly *et al.*, 2016). Analysis of oil spills on benthic communities by Lee et al (2013), showed contamination can alter the ecological function of macrofaunal communities (Lee *et al.*, 2013).

There is the potential for the release of hazardous substances to have direct effects on benthic features within the vicinity of the development. The magnitude of potential impacts on benthic receptors arising from a release of contaminants would depend on the nature and quantity of material released into the environment. There is the potential for a spill of hazardous material to have long-term, major impacts, through changes to the health and behaviour of the receptors on a regional scale.

However, the adoption of the mitigation measures and standard industry best practice techniques for pollution prevention identified in Chapter 13: Water Quality and Coastal Processes significantly reduces or removes the risk of such an event occurring. As such, it is considered extremely unlikely that the release of a hazardous material would be of a scale to negatively impact the benthic communities of the South Basin, within Loch Maddy. Therefore, the potential impact is assessed as **negligible, short term,** and **reversible**, constituting a **negligible to minor: non-significant** effect for all benthic receptors.

7.5.5 Introduction of Non-Native Marine Species

NNMS are flora or fauna that have been introduced either accidentally or intentionally beyond their natural marine range. Such species may establish themselves within a habitat without impairing the integrity of the ecosystem. However, some can modify habitats and endanger local biodiversity (Bax *et al.*, 2003). As discussed in Section 7.4.3.2 , two species of NNMS, *Bonnemaisonia hamifera* and *Limnoria quadripunctata*, were recorded within the proposed development area during the benthic survey operations.

As detailed in Chapter 13: Water Quality and Coastal Processes, there is a risk that further NNMS could be introduced to Loch Maddy via various vectors associated with the proposed Lochmaddy ferry terminal upgrade, including construction machinery, material imports, and vessels involved in site works and delivery of materials, including via hull biofouling and ballast water exchange. Furthermore, delivery of the caisson to site may also provide a vector for the NNMS, depending on its point of origin (Philip, 2009).

The introduction of NNMS could result in serious ecological consequences for the benthic communities of Loch Maddy, and adjacent waters. However, the adoption of the mitigation measures outlined in Chapter 13, including cleaning and inspection of plant and equipment, and the implementation of appropriate ballast water management systems, significantly reduces or removes the risk of such an event occurring. As such it is considered extremely

unlikely that the general construction works, and associated machinery, vessels, and material imports could lead to the introduction of NNMS. The potential impact on all relevant benthic receptors is therefore assessed as **negligible** and **irreversible**, constituting a **negligible** to **minor: non-significant** effect.

As detailed in Chapter 13, the concrete caisson will be constructed offsite in a dry dock, on the west coast of Scotland, and potentially in the Firth of Clyde. Using the Firth of Clyde as worst case scenario, in terms of NNMS, the caisson would originate from waters which are known to have established populations of invasive species including carpet sea squirt (*Didemnum vexillum*), *Tricelleria inopinata* and wireweed (*Sargassum muticum*) (Firth of Clyde Forum, 2012). However, the assessment outlined in Chapter 13 found that due to the fact that the caisson will be constructed in a drydock, the structure would only be exposed to potential sources of NNMS while it is in transit. Due to the short transit time, and constant movement through the water of the caisson during delivery, it was considered extremely unlikely that NNMS would attach to the caisson and be transported to Loch Maddy. The potential impact on all relevant benthic receptors is therefore assessed as **low** and **irreversible**, constituting a **negligible** to **minor: non-significant** effect.

It is noted that the benthic survey identified two MNNS within the survey area, these being *Bonnemaisonia hamifera* and *Limnoria quadripunctata*. Disposal of dredged material at the Stornoway spoil ground therefore acts as potential vector to transport these species to the spoil ground. *Bonnemaisonia hamifera* has been present in the British Isles since the late 1800's, and is considered to be widely distributed throughout the west coast (JNCC, 2006). According to the National Biodiversity Network, the species has been recorded at Arnish Point, immediately adjacent to the spoil ground (NBN atlas, 2019). As such it is highly likely that the species is already present at the Stornoway spoil ground, and hence transport of the species via dredge disposals would not be a change from baseline and is therefore assessed as **no change**. While *Limnoria quadripunctata* is considered by some to be an invasive species (APEM, 2018), it is not listed by either the JNCC or the GB Non-Native Species Secretariat as being invasive. This is due to the fact that the natural range of this species is unclear, and it may in fact be native to the UK (Borges, Merckelbacl, & Cragg, 2014). Therefore, transport of this species between Loch Maddy and the Stornoway spoil ground is not considered to constitute a risk of MNNS introduction, and hence is assessed as **no change**.

7.6 Mitigation Measures

No significant impacts on benthic ecology have been identified as a result of the construction of the proposed Lochmaddy ferry terminal upgrade. As such, no specific mitigation measures are required to reduce impacts on benthic ecological receptors. The reason for the lack of significant impacts is in part due to the embedded mitigation provided by the design and location of the development, together with the implementation of secondary mitigation and following standard industry good practice to minimise deterioration of water quality.

7.7 Cumulative Impacts

Chapter 3: Methodology identifies four projects which have potential cumulative effects on benthic ecology. The potential cumulative effects are associated with the shared use of the dredge disposal site at Stornoway only.

There will be an additive effect between the projects, increasing the volume of dredge spoil, and consequently frequency of elevated sediment loading, and smothering events are anticipated. This has the potential to increase the cumulative magnitude of impact on benthic communities inhabiting the Stornoway spoil ground. However, as discussed in Section 7.5.1, the area is not considered to hold high benthic habitat value. Therefore, the cumulative impact is assessed as **minor: non-significant.**

The combined disposals operation may also result in a cumulative increase in the resuspension of sediment bound contaminants that can negatively impact benthic ecology. However, it is assumed that contamination levels will be at a level acceptable for disposal by Marine Scotland as disposals will be licenced, making it unlikely for any negative effects from resuspension of contaminants to occur. Therefore, the cumulative impacts of the resuspension of sediment-bound contaminants on benthic communities inhabiting the Stornoway spoil ground are assessed as **minor: non-significant**.

7.8 Residual Effects

The potential impacts on benthic ecology are not assessed as significant, and no specific mitigation has been proposed. Subsequently, it is not necessary to assess residual effects.

7.9 Summary

A benthic survey, involving video transects and day grabs, has been undertaken to understand the benthic ecology and habitat types in the development footprint of Loch Maddy. This identified that the proposed development area contained multiple biotope complexes as detailed in Section 7.4.3.

The literature review found that multiple designated sites with benthic ecology features lie within the vicinity of the development and dredge disposal site. However, these sites were not taken forward for assessment as none of their qualifying features where identified within the development footprint and only localised impacts predicted.

Several potential impacts on the benthic receptors were identified as a result of the Lochmaddy ferry terminal upgrade construction works, but as detailed in Table 7.9.1, none of the impacts were found to be significant. This was due to the localised and temporary nature of the impacts, the quality and value of the receptors, together with the implementation of existing mitigation identified to preserve water quality during the construction of the development.

Table 7.9.1 Summary Table of Impact Assessment on Benthic Receptors

Receptor and Value		Phase	Predicted Impact	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
SS.SMp.KSwSS.LsacR.MuIR.HIR.Ksed LR.LLR.F.Fserr.FS IR.MIR.KR.Ldig	Between negligible and national	Construction	Habitat loss due to capital dredge.	Low Medium-term Reversible	Negligible - Minor: Non-significant	No specific mitigation required.	Low Medium-term Reversible	Negligible - Minor: Non-significant
			Sediment loading of the water column with potential to cause burial and smothering of benthic communities.	Low Short-term Reversible	Negligible - Minor: Non-significant	No specific mitigation required.	Low Medium-term Reversible	Negligible - Minor: Non-significant
			Remobilisation of sediment-bound contaminates	Negligible Short-term Reversible	Negligible - Minor: Non-significant	No specific mitigation required.	Negligible Short-term Reversible	Negligible - Minor: Non-significant
			Loss of containment of hazardous substances.	Negligible Short-term Reversible	Negligible - Minor: Non-significant	No specific mitigation required.	Negligible Short-term Reversible	Negligible - Minor: Non-significant
			Introduction of NNMS due to machinery, vessels and material imports.	Negligible Irreversible	Negligible - Minor: Non-significant	No specific mitigation required.	Negligible Irreversible	Negligible - Minor: Non-significant
			Introduction of NNMS due to delivery of a concrete caisson from west coast of Scotland.	Low Irreversible	Negligible - Minor: Non-significant	No specific mitigation required.	Negligible Irreversible	Negligible - Minor: Non-significant

Receptor and Value		Phase	Predicted Impact	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
Intertidal benthic communities in vicinity of the development.	Negligible	Construction	Loss of habitat due to land reclamation.	Low Permanent	Negligible: Non-significant	No specific mitigation required.	Low Permanent	Negligible: Non-significant
			Sediment loading of the water column with potential to cause burial and smothering of benthic communities.	Low Short-term Reversible	Negligible - Minor: Non-significant	No specific mitigation required.	Low Medium-term Reversible	Negligible: Non-significant
			Remobilisation of sediment-bound contaminates.	Negligible Short-term Reversible	Negligible - Minor: Non-significant	No specific mitigation required.	Negligible Short-term Reversible	Negligible: Non-significant
			Loss of containment of hazardous substances.	Negligible Short-term Reversible	Negligible - Minor: Non-significant	No specific mitigation required.	Negligible Short-term Reversible	Negligible: Non-significant
			Introduction of NNMS due to machinery, vessels and material imports.	Negligible Irreversible	Negligible - Minor: Non-significant	No specific mitigation required.	Negligible Irreversible	Negligible: Non-significant
			Introduction of NNMS due to delivery of a concrete caisson from west coast of Scotland.	Low Irreversible	Negligible - Minor: Non-significant	No specific mitigation required.	Negligible Irreversible	Negligible: Non-significant

Receptor and Value		Phase	Predicted Impact	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
Dredge disposal site benthic communities.	Negligible	Construction	Increased sediment loading of the water column.	Negligible Short-term Reversible	Negligible: Non-significant	No specific mitigation required.	Negligible Short-term Reversible	Negligible: Non-significant
			Redeposition of mobilised sediments leading to burial and smothering of benthic flora and fauna.	Low Short-term Reversible	Negligible: Non-significant	No specific mitigation required.	Low Short-term Reversible	Negligible: Non-significant
			Remobilisation of sediment-bound contaminates.	Negligible Short-term Reversible	Negligible: Non-significant	No specific mitigation required.	Negligible Short-term Reversible	Negligible: Non-significant
			Loss of containment of hazardous substances.	Negligible Short-term Reversible	Negligible - Minor: Non-significant	No specific mitigation required.	Negligible Short-term Reversible	Negligible: Non-significant

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Chapter 8: Fish Ecology

Contents

8 Fish Ecology

8.1 Introduction

In this chapter the Ecological Impact Assessment (EcIA) for the construction phase of the proposed Lochmaddy ferry terminal upgrade will be considered. Impacts on fish ecology resulting from the operation and decommissioning the development have been scoped out of the assessment. Fish receptors are considered in this chapter and are evaluated in the context of nature conservation legislation and relevant planning policy (see Chapter 4: Statutory Context & Policy, and Chapter 5: Biodiversity). Impacts on receptors are identified and subject to detailed impact assessment. Mitigation is proposed, cumulative impacts are considered, and finally the residual impacts and their significance are assessed.

Due to the coastal nature of the proposed development, the potential for the construction works to result in negative impacts on fish species is extremely limited. As such the scope of this EcIA will only include relevant species which are provided legislative protection for their conservation importance. Fish species completing their entire lifecycle in freshwater habitats are not considered in this assessment, as impacts arising from the construction phase on freshwater habitats are not possible.

8.2 Regulations, Guidance and Sources of Information

Regulations and guidance pertaining to ecology and biodiversity are outlined in Chapter 5: Biodiversity. This section specifically details the regulations and guidance relevant to fish ecology.

8.2.1 European and International Regulations

Species listed in Annex II of the Habitats Directive which are native to the UK should be conserved through the designation of Special Areas of Conservation (SACs). Atlantic salmon (*Salmo salar*) present in UK waters are listed in Annex II. Atlantic salmon are also listed in Annex V of the Habitats Directive. As such they are also defined as a species of community interest.

Following the drastic decline in European eel (*Anguilla angeuilla*) populations, the EC Regulation 1100/2007 was developed and adopted in 2010. The EC Regulations aims to restore European eel stocks to heathy levels was adopted. In 2010 Scotland published its own Eel Management Plan (DEFRA, 2010) under the EC Regulations.

8.2.2 National Legislation

The Conservation (Natural Habitats, &c.) Regulations 1994 (the Habitats Regulations) provide protection to SACs, including the qualifying features of these sites. Atlantic salmon associated with a SAC designation are therefore protected under the Habitats Regulations.

The Wildlife and Countryside Act 1981, and Nature Conservation (Scotland) Act 2004 provide further protection to certain fish species in Scotland. Basking sharks (*Cetorhinus maximus*) are afforded full protection under Schedule 5 of the Wildlife and Countryside Act 1981, which prohibits their deliberate killing, injuring or disturbance. The Nature Conservation (Scotland) Act 2004 makes amendments to the Wildlife and Countryside Act in Scottish waters, including the addition of 'reckless' acts to offences against protected species, which include basking

sharks, making it an offence to intentionally or recklessly kill, injure, harass or disturb the relevant species.

The Salmon and Freshwater Fisheries Act 1975 makes it an offence to knowingly take, kill or injure, or attempt to take, kill or injure, any salmon, trout or freshwater fish, which is unclean or immature. The Act also makes it an offence to cause or knowingly permit to flow, or put or knowingly permit to be put, into any waters containing fish or into any tributaries of waters containing fish, any liquid or solid matter to such an extent as to cause the waters to be poisonous or injurious to fish or the spawning grounds, spawn or food of fish.

8.2.3 Other Guidance

As discussed in Chapter 6: Biodiversity, the Joint Nature Conservation Committee (JNCC) and Scottish Natural Heritage (SNH) have produced a list of Priority Marine Features (PMFs) to ensure Scotland's seas are managed sustainably as required by the Marine (Scotland) Act 2010. The PMF list includes multiple diadromous, elasmobranch, marine demersal and pelagic fish species, some of which are anticipated within the waters surrounding the proposed development, as detailed in Section 8.4.3. Inclusion in the PMF list does not provide any additional legal protection, however due consideration must be provided in Impact Assessments, and as such all relevant PMFs are considered sensitive for the purpose of this assessment. Further guidance for sensitive species was sought from the latest Biodiversity Action Plans (BAPs).

Guidance is also provided by SNH's Scottish Marine Wildlife Watching Code (SNH, 2017c) regarding possible mitigation measures to reduce impacts on basking sharks.

8.3 Method of Assessment

8.3.1 Baseline Methodology

8.3.1.1 Desk Study

To allow the identification of relevant fish receptors, and thus assess potential impacts arising from the project, the baseline environment had to be established. A desk-based review of published literature was undertaken. Sources of information consulted included:

- SNH interactive map facility at SiteLink (SNH, 2018);
- Western Isles District Salmon Fisheries Board (Western Isles District Salmon Fisheries Board, 2018);
- The UK PMF list (Tyler-Walters et al., 2016);
- National Marine Plan Interactive (Marine Scotland, 2018);
- The Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR) List of Threatened and/or Declining Species and Habitats (OSPAR Commission, 2017b);
- OSPAR Intermediate Assessment 2017 (OSPAR Commission, 2017a);
- Scotland's Marine Atlas: Information for the National Marine Plan (Baxter et al., 2011); and
- Various scientific reports and journal articles regarding marine fish distribution and movements in the north east Atlantic region.

8.3.2 Impact Assessment Methodology

The evaluation of receptors, magnitude of impact and significance evaluation follows the methodology laid out in Chapter 5: Biodiversity.

8.4 Baseline

8.4.1 Designated Sites

There are several designated sites in the Inner and Outer Hebrides that may be relevant to the proposed development area. The sites relevant to fish are shown in Table 8.4.1, along with their fish qualifying features. Figure 8.4.1 provides a map showing the locations of the designated sites relative to the proposed development. A description of the sites and reasons why they were or weren't taken forward for assessment are provided in the remainder of this section.

Table 8.4.1: Designated Sites Relevant to Fish Receptors

Site	Direction and Distance by Sea	Value	Fish Feature(s)	Taken Forward for Assessment?
Sea of Hebrides pMPA	3.7km East	National	Basking shark (*Cetorhinus maximus*)	Yes
North Harris SAC	45km North	International	Atlantic salmon (*Salmo salar*)	No
Langavat SAC	95km North	International	Atlantic salmon (*Salmo salar*)	No

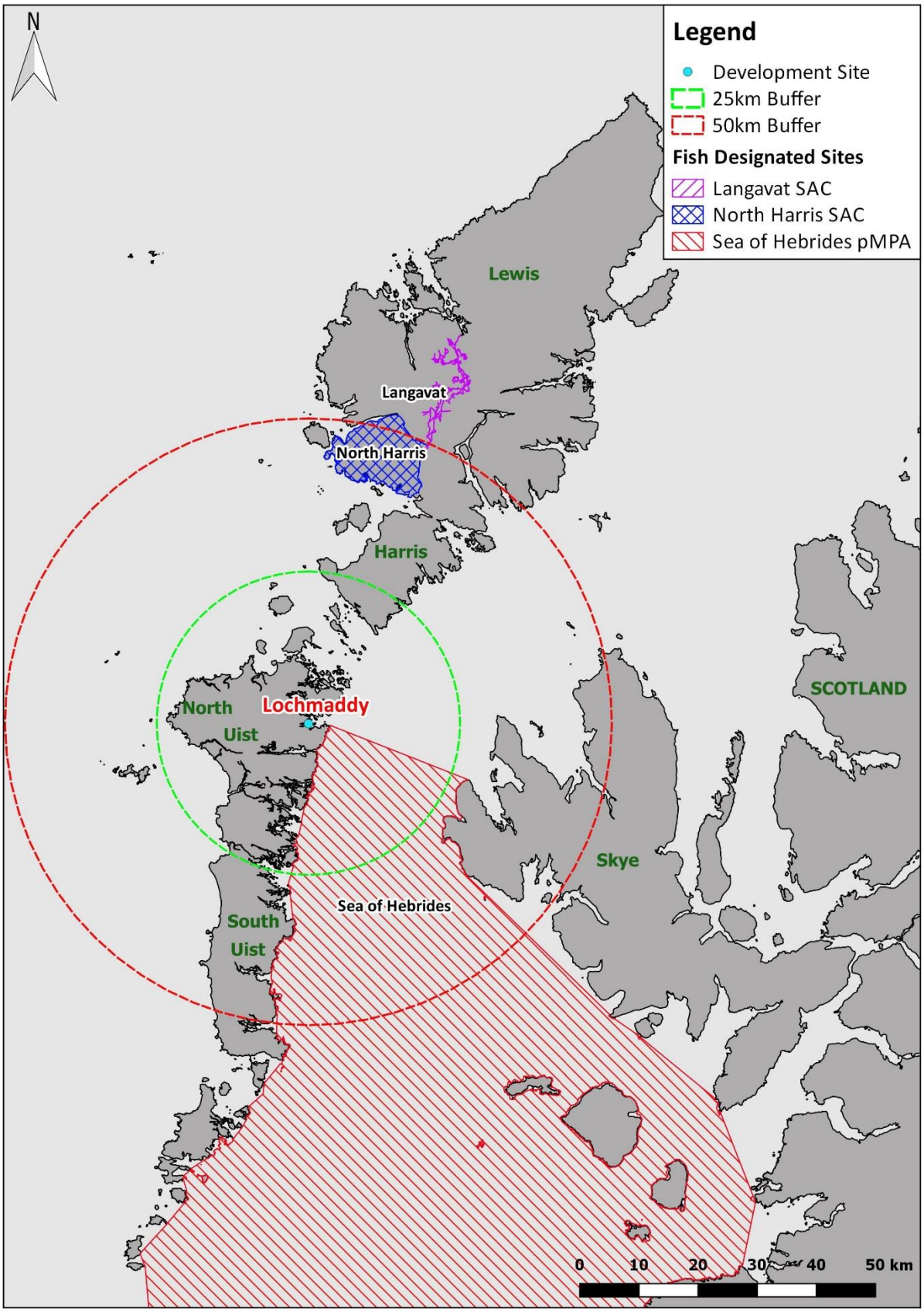

Figure 8.4.1: Map Showing Locations of the Designated Sites Relevant to Fish Receptors

8.4.1.1 Sea of Hebrides Proposed Marine Protected Area (pMPA)

The Sea of Hebrides pMPA, designated in part for basking sharks, is located approximately 3.7km by sea from the proposed development. This site was proposed as a possible Nature Conservation MPAs in 2014, but has not been taken to consultation, and as such is not afforded policy protection, but is conservatively considered in this assessment.

It has been shown that densities of basking sharks within the site are consistently high, but particularly in the south and east of the area (SNH, 2014). Basking sharks are known to travel considerable distances while foraging, exceeding several hundred kilometres (Sims, 2008b), and as such it is possible the qualifying features of this site may be present in the vicinity of the development. Therefore, there is potential connectivity between this site of **national** value, and the proposed development, so it will be taken forward for assessment.

8.4.1.2 North Harris SAC

The North Harris SAC is designated in part due to its importance to Atlantic salmon, under the European Habitats Directive. Located on the west coast of Harris, the site contains numerous rivers and streams which provide spawning habitat for Atlantic salmon. However, the rivers and streams within this site all feed into the west coast of Harris, which is approximately 45km by sea from the proposed development. It is considered extremely unlikely that salmon migrating to or from the rivers within this site will be present in the waters surrounding the Lochmaddy ferry terminal, on the east coast of North Uist. As such, no connectivity is anticipated between the qualifying fish features of this site and the marine works at Lochmaddy, and hence this site is not taken forward for assessment.

8.4.1.3 Langavat SAC

The Langavat SAC is designated for the conservation of Atlantic salmon, under the European Habitats Directive. The network of rivers and lochs provides valuable spawning habitat for Atlantic salmon. However, this site meets the marine environment at Loch Ceann Hùlabhaig, on the west coast of Lewis. This is approximately 95km by sea, and on the opposite side of the Outer Hebrides, from the proposed development. It is therefore considered extremely unlikely that salmon migrating to or from the Langavat SAC will be present in the waters surrounding the Lochmaddy ferry terminal. As such, no connectivity is anticipated between the qualifying fish features of this site and the marine works at Lochmaddy, and hence this site is not taken forward for assessment.

8.4.2 Habitat

The proposed development is situated in the South Basin in the south western extent of Loch Maddy, on the east coast of North Uist. Loch Maddy is an area of sheltered water which meets the Little Minch at its eastern extent. While numerous small streams flow into the loch, there are no significant rivers which meet the marine environment in Loch Maddy. The waters surrounding the development are relatively shallow, with Loch Maddy having a maximum depth of approximately 40m, while in the immediate vicinity of the development, the South Basin has a maximum depth of approximately 9m at its eastern extent, shoaling rapidly to less than 5m in the areas adjacent to the ferry terminal.

8.4.3 Species Account

The literature review provided little specific data on fish species inhabiting the waters surrounding the Lochmaddy ferry terminal. However, it was identified that the relevant protected receptors that should be considered by this assessment include:

- Diadromous fish, including Atlantic salmon, sea trout, and European eel; and
- Basking sharks.

8.4.3.1 Diadromous Fish Species

There are two categories of diadromous fish, anadromous and catadromous: anadromous fish reproduce in freshwater rivers but spend the rest of their adult lives in salt water, while catadromous fish reproduce in saltwater, and spend the rest of their lifecycle in freshwater.

The Western Isles are known to be inhabited by three diadromous species, Atlantic Salmon (*Salmo salar),* Sea Trout *(Salmo trutta* morpha *trutta)* and European Eel *(Anguilla angeuilla).*

Atlantic Salmon

Atlantic salmon (*Salmo salar*) are wildly distributed in Scotland's river systems but are also widely found across temperate and Arctic regions of the northern hemisphere. The fish are anadromous (migrate from sea to spawn in freshwater), living in freshwater as juveniles then migrate to sea as post-smolts, where they mature. Once sexual maturity is reached, they return to their native rivers to spawn (Godfrey, Stewart, Middlemas, & Armstrong, 2014).

Migratory routes of Atlantic salmon to spawning sites are poorly understood, since returns to the Scottish coast occur from a range of directions. However, the greatest returns are expected from northerly and westerly marine waters, given the distribution of marine feeding areas (Malcolm, Godfrey, & Youngson, 2010). Juvenile salmon populations within the Western Isles river systems are generally lower compared to salmon supporting rivers elsewhere in Scotland (Godfrey, 2005). The lower number of juvenile salmon within the Western Isles possibly arises from watercourse obstructions, or nutrient poor waters (OHFT, 2012). Juvenile salmon densities in the Western Isles are higher in smaller burns and tributaries, compared to the larger rivers systems of the Western Isles (OHFT, 2012), making them an important ecological feature in sustaining the local salmon populations.

Data on smolt runs in the Western Isles is limited and dated. Data from 1998 and 1999 indicated the two to three-year-old smolts migrate from freshwater systems to sea, while occasionally, fish were recorded to remain in freshwater systems for four years prior to migrating to sea. Smolt runs in the Outer Hebrides generally occur in the summer, but migrating smolts are also regularly recorded during spring months (OHFT, 2012). Studies in Norwegian fjords identified that in general, the depth of migrating smolts is at shallow depth (<10m) (Finstad, Økland, Thorstad, BjØrn, & McKinley, 2005). This is supported by a further study in Norwegian waters that indicated 49-99% of swimming time was at 1-3 m depth during the day (Davidsen et al., 2008). No data for post-smolt diving depth in Scottish waters exists (Malcolm et al., 2010). Similarly, no swimming depth data is available for grilse (salmon that returned to freshwater after only one-year) (Malcolm et al., 2010).

The routes of returning salmon to rivers systems within the Western Isles are unknown. Data from 1998 to 1999 indicated that 90% of returning salmon were grilse and spent only one year at sea, with an average length of 60cm (OHFT, 2012). Adult Atlantic salmon runs usually occur between November to December, but in larger river systems it may extend from October to late February (SNH, 2017a). Knowledge of the swimming depth of adult Atlantic salmon in Scottish waters is limited, but it is suggested extended periods are spent at shallow depth between 0 - 40m (Malcolm et al., 2010). Research at Montrose Bay identified that adult Atlantic salmon usually move up river systems from marine habitats with the flood tide and utilise ebb to return to sea (Urquhart & Shearer, 2010). However, it cannot be determined if this applies to salmon runs in the Western Isles.

Electrofishing surveys conducted by the Outer Hebrides Fisheries Trust identified two freshwater systems in the vicinity of the proposed development that sustain Atlantic salmon. Loch Struth Mhoir is connected to the sea via Loch Houram which in turn enters the sea 1.5km north of the ferry terminal and was found to sustain a salmon population. Loch Sgealtair is connected to the sea via Loch na Ciste, which in turn enters the sea 1.1km west of the terminal with salmon appearing to be only occasionally present. Note that fish migrating to this loch will transit past the works. However, there is a causeway between Loch na Ciste and Sgealtair, hence, this migration route is already significantly degraded, which is likely to explain why Atlantic Salmon are now only found occasionally in this waterbody.

Sea Trout

Like Atlantic salmon, sea trout (*Salmo trutta* morpha *trutta)* may spend a variable number of years in freshwater habitats prior to migrating. Sea trout post-smolts may stay within estuaries for extended periods of time, prior to moving into the wider sea (Malcolm et al., 2010). Research by Pemberton (Pemberton, 1976) on the west coast of Scotland concluded sea trout post-smolts move from rivers to sea lochs/estuaries between April and early June, prior to moving to the open sea in late June to July, eventually returning in August to September. This study, however, was very localised with overall knowledge of post-smolt migratory movement limited. Swimming depth of sea trout post-smolts is also relatively unknown. A study from the sea Loch Ewe identified that most fish swam within 10m of the surface waters, although dives to 20m were also observed (Malcolm et al., 2010).

Many freshwater systems of the Western Isles support populations of sea trout. Similarly to salmon, trout densities in smaller streams and tributaries are higher than larger river networks in the Outer Hebrides (OHFT, 2012). Immature sea trout, regionally called Finnock, are young sea trout that return to freshwater after only one year within the sea. These are common in Scottish estuaries, where they move in and out with the tides to feed (Scottish Government, 2017). Finnock may move to large freshwater bodies to over-winter, prior to returning to sea during the spring months (Malcolm et al., 2010; Scottish Government, 2017). Proportions of sea trout returning as Finnock in the Western Isles vary between years (OHFT, 2012).

Returning sexually mature sea trout migration routes to watercourses in the Western Isles are unknown. Timings of runs on the west coast of Scotland are well understood, with runs generally occurring from April to June (Jonstone, Walker, Urquhart, & Thorne, 1995;

Middlemas, Stewart, Mackay, & Armstrong, 2009; Pemberton, 1976; Scottish Government, 2017). Migrated fish remain in freshwaters until the autumn, waiting for river levels to rise before returning to sea (Malcolm et al., 2010). The movement of the adult fish into rivers is expected to occur with high tide and returns to sea during ebb tide, but no conclusive data is available (Malcolm et al., 2010). The mean swimming depth of adult sea trout depend on season, water temperature, habitat and time of day. However, research in Norwegian fjords concluded a mean swimming depth of mature sea trout to be 1.7m below the surface. Lower swimming depths generally occurred during night time (Eldøy et al., 2017). Knowledge of swimming depth in Scottish waters is limited but estimated to be at <3m below surface (Malcolm et al., 2010). However, knowledge of overall swimming routes within estuaries in Scottish waters area is poorly understood (Malcolm et al., 2010).

In the vicinity of the proposed works lie two freshwater systems that sustain a population of sea trout. Loch Struth Mhoir is connected to the sea via Loch Houram which in turn enters the sea 1.5km north of the ferry terminal. Loch Sgealtair is connected to the sea via Loch na Ciste, which in turn enters the sea 1.1km west of the terminal. Note that fish migrating to this loch will transit past the works. However, there is a causeway between Loch na Ciste and Sgealtair, so this is unlikely to be a major migration route.

European Eel

The European eel (*Anguilla angeuilla)* is a critically endangered catadromous (migrates from freshwater to sea to spawn) fish which is widely distributed across European freshwater and estuarine habitats (Daverat et al., 2006; SNH, 2017b). Since the 1970s, the population of European eel has declined up to 99% in some parts of its distribution range (Correia et al., 2018). The lifecycle consists of 4 stages: Glass eel, Elver, Yellow eel and Silver eel. Adults (silver eel) may pass through Scottish coastal waters during migration, but no conclusive data is available (Malcolm et al., 2010). Silver eels inhabit over 80% of catchments in the Western Isles (OHFT, 2012).

Distribution and populations dynamics of European eels in the Western Isles however are poorly understood, and no evidence is available to suggest that this species is present in the riverine environments close to the proposed development. However, if European eels are present in Loch Struth Mhoir or Loch Sgealtair, individuals migrating to/from the Minch from their riverine habits would pass through Loch Maddy, passing between 1.5km and 1.1km north and west of the terminal works respectively.

In northern mainland Europe, adult eel migratory peak rates are reported from August to October (Malcolm et al., 2010). In Scotland, data from the River Dee shows adults beginning to leave freshwaters in June, peaking in August or September, but continuing to October (Malcolm et al., 2010). However, wide variations in migratory timings are recorded, possibly due to temperature (Vøllestad et al., 1986), rainfall or lunar cycles (Lowe, 1952; Malcolm et al., 2010). The absence of data and no alternative evidence make it reasonable to suspect that the majority of adult eels migrate to spawning sites via the north of Scotland between October and January (Malcolm et al., 2010), although migration routes from the Western Isles are unknown.

Juveniles are expected to arrive earliest in the north and west, arriving in September off Shetland and the Western Isles. The migration continues for several months after the mid-winter peak, although glass eels may arrive throughout the year (Tesch, Westerberg, & Karlsson, 1990). Upon arrival, some individuals may enter the freshwater systems within their first year of arrival, while some stay within costal and estuarian waters until matured (Daverat et al., 2006). Their movement to freshwater systems appears to be seasonal, possibly driven by water temperature; with temperatures rising between 12-14°C increasing upstream movement (Acou, Legault, Laffaille, & Feunteun, 2009), though river flow also influences migration (Edeline, Lambert, Rigaud, & Elie, 2006).

Swimming depth of juvenile and adult eels in Scotland are also uncertain. In the North Sea, studies suggest swimming depths of 1-17m (10m average) below the surface. The study identified that eels rarely spend time in deeper parts of the water column due to it being too cold (Palstra & van den Thillart, 2010). No data regarding swimming depth for juvenile eels is available.

8.4.3.2 Basking Shark

The basking shark *(Cetorhinus maximus)* is the largest coastal-pelagic shark found within Scottish waters, growing to lengths larger than 11 meters and weighting around 4 tonnes (Sims, 2008a). The species is a 'ram filter-feeding shark' and requires to remain in areas of high plankton concentrations. Basking sharks are selective zooplankton feeders, with research showing a preference for high energy calanoid copepods such as *Calanus finmarchicus* (Sims, Fox, & Merrett, 2005). Feeding generally occurs from surface waters to depths of 320m (Skomal, Wood, & Caloyianis, 2004). Monitoring of the species feeding behaviour shows that basking sharks aggregate in coastal waters of continental shelfs dominated by transitional waters, where steep bathymetry combined with strong ocean currents result in areas of high phyto and zooplankton density (Drewery, 2012).

In Scottish waters, basking sharks are particularly prevalent on the west coast during summer months, with highest densities observed in the Sea of Hebrides (Paxton, Scott, & Rexstad, 2014). There is some evidence to suggest that relatively high summer densities of this species are also found in the waters to the west of the Outer Hebrides, although the sparse availability of data casts some doubt over this finding (Paxton et al., 2014). Basking shark are not expected to be present in high densities within the Minch, to the east of the Outer Hebrides, although some sightings have been recorded (Marine Scotland, 2018). The shallow enclosed waters of Loch Maddy are not anticipated to provide valuable habitat for basking sharks, with only a single basking shark sighting within the loch, which dates to 2008 (Marine Scotland, 2018). As such it is considered unlikely that this species will be present in the immediate vicinity of the ferry terminal works. This is also true of the Stornoway spoil ground, where basking shark densities are expected to be very low.

Seasonal oceanic cycles cause fluctuating phytoplankton and zooplankton densities in Scottish waters. These variations in phytoplankton and zooplankton availability make basking sharks a highly migratory animal, with no resident populations in UK waters (Sims, Southall, Richardson, Reid, & Metcalfe, 2003). Therefore, populations of basking sharks are not anticipated near the

Western Isles in winter when phytoplankton and zooplankton levels are low (Drewery, 2012). No population estimates for basking sharks in Scotland exist and wider aspects of their ecology including reproduction in Scottish territories is relatively unknown (Drewery, 2012). However, recent research by SNH indicates basking sharks may gather in large numbers of Scotland's Western coast to potentially mate, though data is still insufficient to fully conclude mating of basking sharks in Scottish waters (Witt et al., 2016).

8.4.4 Identification of Receptors

Table 8.4.2 provides a summary of the fish receptors relevant to the proposed development which are taken forward for assessment, together with their assigned ecological value.

Table 8.4.2: Summary of Identified Diadromous Receptors and their Ecological Value

Receptor	Ecological Receptor Value	Justification
Sea of Hebrides pMPA	National	Marine (Scotland) Act (2010)
Atlantic Salmon (*Salmo salar)*	International	Habitats Directive Annex II Species
Sea Trout (*Salmo trutta* morpha *trutta)*	National	Priority Marine Feature (PMF)
European Eel (*Anguilla angeuilla)*	International	IUCN Red List "Critically Endangered"
Basking Shark *(Cetorhinus maximus)*	National	Wildlife and Countryside Act 1981 Schedule 5

8.5 Impact Assessment

Construction activities may result in a potential variety of direct and indirect impacts on the identified receptors. The assessment of these impacts follows the methodology outlined in Chapter 5: Biodiversity and assesses the potential effects resulting from the construction phase of the project as outlined in Chapter 2: Project Description.

8.5.1 Increased Sediment Loading

The rock placement, infilling works, and dredging and spoil disposal operations, detailed in Chapter 2: Project Description all have the potential to increase sediment loading in the water column through the release of fines into the marine environment. Further information is provided in Chapter 13: Water Quality and Coastal Processes.

Behavioural changes in fish receptors resulting from increased water column sediment loading are more likely than injury or mortality due to their ability to move away from the affected area (Wenger et al., 2017). Increased sediment loading can lead to reduced foraging efficiency and provoke an avoidance response, which in turn can lead to barrier effects for migrating species; preventing migrating fish passing through affected areas, thus blocking routes to and from the sea (Robertson, Scruton, & Clarke, 2007; Stuart-Smith, Richardson, & White, 2004; Wenger et al., 2017). Multiple studies have highlighted that impacts on fish from increased sediment loading are dependent on the concentration of the sediment in the water column and exposure time, with avoidance responses unlikely, unless concentrations are relatively high (Wenger et al., 2017).

Studies in the Dutch Wadden Sea identified shifts in local abundance of salmonids associated with increased sediment loading, although these occurred when turbidity levels remained high for several years (Jonge, Essink, & Boddeke, 1993; Wenger et al., 2017). It has been shown that outward migrating smolt are particularly sensitive to increased sediment loading (Wenger et al., 2017). Studies of increased sediment loading on elasmobranchs identified similar avoidance of areas with high water column sediment loading (Higham, Stewart, & Wainwright, 2015).

Very little information is available on the sensitivity of European eels to increased water column sediment loading. This assessment therefore assumes that the effects of increased sediment loading on European eels are analogous to those described for salmonids.

Rock placement, infilling works, and dredging will all be conducted within the boundary of the ferry terminal upgrade. Affric's monitoring of the sediment loading resulting from similar rock placement, infilling, and dredging activities during previous port developments showed that sediment plumes resulting from these activities dispersed rapidly, and were confined to the immediate vicinity of the working areas (Affric Limited, 2018). Very similar construction techniques, in similar ground conditions, will be utilised during the construction of the Lochmaddy ferry terminal development. As such, the extent of the sediment loading is expected to be localised, and confined to the immediate vicinity of the works at the ferry terminal.

Two freshwater systems in the vicinity of the development have been identified in Section 8.4.3.1 as supporting diadromous fish populations, these being; Loch Struth Mhoir, connected to Loch Maddy via Loch Houram, and Loch Sgealtair which enters Loch Maddy via Loch na Ciste. Loch Houram meets Loch Maddy approximately 1.5km north of the proposed development, and as such diadromous fish migrating to or from Loch Struth Mhoir are very unlikely to be present in the waters affected by increased sediment loading.

Fish migrating to or from Loch Sgealtair via Loch na Ciste will transit past the works, in a channel approximately 200m wide. Due to the localised nature of the potential increased sediment loading, it is unlikely that this channel will be entirely occluded by sediment laden water. In addition, the presence of the causeway between Loch na Ciste and Loch Sgealtair means that this migration route is already substantially degraded, making it unlikely that this is a valuable migration route to significant numbers of diadromous fish.

This assessment therefore finds that the increased sediment loading is unlikely to result in disruption to diadromous fish migration, and any potential impacts will be localised and temporary. Furthermore, these receptors are highly mobile, so are capable of avoiding sediment plumes if they are present in the area. As such the potential effect on all diadromous fish receptors are assessed as **negligible, short term, and reversible**. The resulting impacts on Atlantic salmon and European eels are therefore **minor: non-significant,** and **negligible: non-significant** for sea trout.

Basking sharks are extremely unlikely to be present in the immediate vicinity of the works due to the shallow confined waters, which offer no valuable habitat to the species. As such the potential impacts on basking sharks and the Sea of Hebrides pMPA are assessed as **no change.**

Dredged spoil disposal will take place at the Stornoway designated disposal ground, located south of Arnish point off the Isle of Lewis coast. No notable watercourses discharge into the immediate vicinity of the spoil ground, and while some basking shark sightings have been made within 5km of the ground, the density of this species is expected to be low (Marine Scotland, 2018). As such it is still considered unlikely that relevant fish receptors will be present in the immediate vicinity of the spoil ground.

Affric's observations of similar spoil sea-disposal operations show that during disposals conducted using vessels with bottom opening doors, the resulting increased sediment loading dropped out and dispersed quickly. The dredged spoil disposal operations are likely to give rise to up to 21 disposals, assuming a 390m^3 dredger vessel hopper capacity. Hence the impact on all relevant fish receptors will be localised and short term. Due to the low value habitat at the spoil ground, and the fact that the fish receptors are highly mobile and capable of avoiding areas of increased sediment loading resulting from spoil disposals, the impacts on all fish receptors are assessed as **negligible, short term,** and **reversible.** Therefore, the resulting effect is **negligible to minor: non-significant.**

8.5.2 Release of Hazardous Substances

The accidental release of hydrocarbons and other hazardous substances in the event of a loss of containment during the construction works may result in contamination of the marine environment, potentially affecting fish (Wenger et al., 2017). The impacts of a release of a hazardous substance can be acute; high concentrations or substances especially toxic to aquatic environments resulting in increased mortality rates over short periods (Hutchinson, Lyons, Thain, & Law, 2013; Wenger et al., 2017). Alternatively, spill events may cause chronic impacts, where pollutants affect species physiology over extended periods while accumulating in organic tissue, allowing contamination to pass through the wider ecosystem (Hamilton, Rolshausen, Uren Webster, & Tyler, 2017; Oleksiak, 2008). Effects including physiological harm, behavioural disturbance, reduced fertility and mortality in fish have been reported after both short and long-term exposure to contaminants following a pollution event. The studies also identified that juveniles are more vulnerable to pollution events than adults, requiring lower dosages for effects to occur (Costa et al., 2011; Limburg & Waldman, 2009; Wenger et al., 2017).

Loss of chemicals and fuels may arise from onshore equipment, vessels and marine plant utilised during the construction phase. Vessels associated with construction are expected to carry potential pollutants, with hydrocarbon-based fuels, lubricants and hydraulic fluids being the biggest potential pollution sources. The assessment assumes that all vessels and equipment are well maintained, operated by suitably trained personnel and with standard pollution prevention procedures outlined in Chapter 13: Water Quality and Coastal Processes in place. In addition, all vessels are required to comply with the International Convention for the Prevention of Pollution from Ships (MARPOL) regulations. The regulations cover the

prevention of chemical and hydrocarbon spills during both routine operations and incidents. The operating vessels will also have shipboard oil pollution emergency plans (SOPEP), which will minimise the potential impacts of any loss of containment that may occur.

For all relevant fish receptors, the magnitude of potential impacts arising from a release of contaminants would depend on the nature and quantity of material released into the environment. There is the potential for a spill of hazardous material to have long term major impacts, through changes to the health and behaviour of the receptors on a regional scale. However, the adoption of the mitigation measures and standard industry best practice techniques for pollution prevention identified in Chapter 13, as well as in Chapter 14: Schedule of Mitigation, significantly reduces or removes the risk of such an event occurring. As such it is considered extremely unlikely that release of hazardous material of a scale with the potential to negatively impact the relevant fish receptors or the Sea of Hebrides pMPA will occur; therefore, the potential effect is assessed as **negligible, short term,** and **reversible,** and the resulting effect is **negligible to minor: non-significant.**

8.5.3 Underwater Noise

Underwater noise emissions will result from the construction activities associated with the proposed Lochmaddy ferry terminal upgrade. Further detail on the proposed construction techniques is provided in Chapter 2: Project Description. Underwater noise emissions can result in disturbance, displacement, and injury of fish receptors. Underwater noise modelling has been undertaken for construction techniques likely to be required for the proposed development, the results of which are presented in Chapter 11: Noise and Vibration (Underwater). The following sources of underwater noise emissions will be associated with the proposed development and were considered by the underwater noise model:

- Impact piling;
- Vibro piling;
- Dredging;
- Rock breaking; and
- Vessel movements.

In addition, general marine construction techniques will be required, such as rock revetment construction, and rock armour placement to facilitate the reclamation works. However, experience from previous projects have shown that these activities do not result in underwater noise emissions of magnitudes that have the potential to cause significant negative impacts on fish (Affric Limited, 2015, 2018), as such, these aspects were not assessed by the model.

As detailed in Chapter 11, the outputs of the piling noise model were compared against the latest fish auditory injury impact criteria provided by (A. Popper et al., 2014), in order to estimate the ranges from the piling works at which different magnitudes of acoustic impact may occur. It was found that the greatest potential acoustic impacts on fish are associated with impact piling, hence this is considered the worst-case scenario, and is taken forward for detailed ecological assessment below. All other noise sources were significantly less powerful than impact piling, and the impact range estimation did not identify any potential for significant impacts on relevant fish receptors, hence they are not considered further.

The Popper criteria groups fish into functional hearing groups, based on whether or not they have a swim bladder, and whether the swim bladder is involved in its hearing. The hearing groups given in the Popper et al. (2014) criteria, together with the receptors relevant to the Lochmaddy ferry terminal upgrade, are summarised in Table 8.5.1.

Table 8.5.1: Functional Hearing Groups, and Relevant Fish Receptors (after Popper et al., 2014)

Hearing Group	Relevant Fish Receptors	Sensitivity to Underwater Noise
Fish: No Swim Bladder	Basking Shark Sea of Hebrides pMPA	Least Sensitive
Fish: Swim Bladder Not Involved in Hearing	Atlantic Salmon Sea Trout European Eel	↓
Fish: Swim Bladder Involved in Hearing	None	Most Sensitive

Popper et al. (2014) presents unweighted peak criteria (SPL_{peak}) and cumulative sound exposure criteria (SEL_{cum}) for impact piling noise. The criteria are in relation to the onset of mortality and potential mortal injury, recoverable injury, and Temporary Threshold Shift (Cutts, Hemingway, & Spencer), where a temporary reduction in hearing sensitivity may occur in individual receptors. The Popper et al. (2014) injury criteria for the hearing group relevant to the proposed development are summarised in Table 8.5.2, with further information provided in Chapter 11: Noise and Vibration (Underwater).

Table 8.5.2: Summary of Criteria for Physical Injury on Fish from Impact Piling Noise (after Popper et al. 2014)

Impact Piling	Mortality & Potential Mortal Injury	Impairment	
Type of Fish		Recoverable Injury	TTS
Fish: No Swim Bladder	> 219 dB SEL_{cum} > 213 dB SPL_{peak}	> 216 dB SEL_{cum} > 213 dB SPL_{peak}	> 186 dB SEL_{cum}
Fish: Swim Bladder Not Involved in Hearing	210 dB SEL_{cum} > 207 dB SPL_{peak}	203 dB SEL_{cum} > 207 dB SPL_{peak}	> 186 dB SEL_{cum}

Where insufficient data is available for impact piling effects on fish (behavioural and masking effects), qualitative criteria are presented, summarising the effect of the 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) (AN Popper et al., 2014)). The impact piling masking and behavioural response criteria for the hearing groups relevant to this assessment are summarised in Table 8.5.3. Note that the qualitative nature of these criteria means that impact ranges cannot be calculated.

Table 8.5.3: Summary of the Qualitative Effects on Fish from Impact Piling Noise (after Popper et al. 2014) (N=Near-field, I=Intermediate-field, F=Far-field)

Impact Piling Type of Fish	Masking	Behaviour
Fish: No Swim Bladder	(N) Moderate (I) Low (F) Low	(N) High (I) Moderate (F) Low
Fish: Swim Bladder Not Involved in Hearing	(N) Moderate (I) Low (F) Low	(N) High (I) Moderate (F) Low

Potential fish impacts from impact piling were assessed against both the unweighted SPL_{peak} and the SEL_{cum} criteria. In order to adopt a conservative approach, the greater of the two impact ranges resulting from the different criteria was carried forward to the assessment, which in all cases resulted from the SEL_{cum} criteria. The maximum expected impact ranges for relevant fish species are presented in Table 8.5.4.

When the qualitative behavioural and masking criteria for impact piling are reviewed, it is shown that all relevant fish receptors within tens of metres from the pile driving will be subjected to a moderate level of masking, reducing to low level effects for animals further from the source. High behavioural responses (such as startle response, and strong avoidance resulting in exclusion) can be expected in the near field, reducing to moderate level (changes in swim speeds, and a reduction of time spent in an area) in the intermediate field, within hundreds of metres from the source. In the far field, once the range to the source exceeds 1,000m, the behavioural response is reduced to low.

Table 8.5.4: Maximum Predicted Fish Impact Ranges Resulting from Impact Piling Operations

Impact	Pile Type	Maximum Impact Range	
		Fish: No Swim Bladder	Fish: Swim Bladder Not Involved in Hearing
Mortality & Potential Mortal Injury	660mm Piles 150 kJ SEL_{cum} (1 hour)	< 1m	5m
Recoverable Injury	660mm Piles 150 kJ SEL_{cum} (1 hour)	1m	31m
TTS	660mm Piles 150 kJ SEL_{cum} (1 hour)	270m	270m

With regard to the diadromous fish receptors, an animal would need to be within 5m of the piling works for a period exceeding 1hr in order to suffer potential mortality or mortal injury, and within 31m for the works for 1hr of continuous piling to be subjected to a risk of recoverable injury. It is considered extremely unlikely that these mobile receptors would remain within such close proximity to active piling works for periods exceeding 1hr, and as such it is concluded that no risk of injury exists.

The TTS impact range is predicted to extend 270m from the piling works, which will occlude the entrance to the narrow sea loch that may be used by sea trout, and possibly Atlantic salmon migrating to or from Loch Sgealtair. It is considered unlikely that a fish would remain in this zone for one hour, so the likelihood of injury is very low, although it may result in avoidance of the area during piling works. This, combined with the predicted behavioural effects resulting from the piling noise, could therefore affect fish migration to and from Loch Sgealtair, although it is noted that the degradation of this route due to the presence of the causeway means that it is unlikely to be a valuable migration pathway. No other fish migration routes will be affected. Since only approximately 6hr of impact piling are expected to be required during the whole upgrade works, any impacts on diadromous fish migrating to or from Loch Sgealtair will be extremely short term. Due to the localised and extremely short term nature of the predicted acoustic impacts on diadromous fish, together with the very low likelihood of

causing injury, the piling noise impacts are assessed as **negligible, short term,** and **reversible**. The overall effect is therefore **minor: non-significant**.

Basking sharks do not have swim bladders, making them less sensitive to underwater noise than the diadromous receptors. In order to suffer either mortal or recoverable injury, a basking shark would need to remain within 1m of the works during 1hr of continuous piling. This would not happen, and hence no risk of injury to this species exists. The maximum TTS range for basking sharks is predicted to extend 270m from the piling works. The waters within 270m of the works are <10m deep, and extremely confined, making them unsuitable for such a large fish. Therefore, basking sharks are not anticipated to be present in the area where they may be subject to TTS. This species may be subject to behavioural disturbance within 1,000m of the piling works. The Sea of Hebrides pMPA is located 3.7km from the piling works so no direct effects on this site are expected. Furthermore, the waters within 1,000m of the works are still shallow and confined, and do not provide any valuable habitat to basking sharks. As such, the impacts on basking shark and Sea of Hebrides pMPA are assessed as **negligible, short term,** and **reversible**. The overall effect is therefore **negligible: non-significant**.

8.6 Mitigation Measures

No significant impacts on relevant fish receptors have been identified as a result of the construction of the proposed Lochmaddy ferry terminal upgrade. As such, no specific mitigation measures are required. The reason for the lack of significant impacts is in part due to the embedded mitigation provided by the design and location of the development, together with the implementation of secondary mitigation and following standard industry good practice to minimise deterioration of water quality.

It is however noted that as detailed in Chapter 6: Marine Mammals, pre-start watches will be conducted in order to mitigate potential impacts on marine mammals resulting from piling and spoil disposal operations. While the impacts on basking sharks resulting from piling and spoil disposal operations were assessed as being non-significant, as a matter of best practice, the marine mammal protocols will also apply to basking sharks. The detailed protocols are provided in the Construction Environmental Management Document (CEMD).

8.7 Cumulative Impacts

Chapter 3: Methodology identifies three projects which have potential cumulative effects on fish species. The potential cumulative effects are associated with the shared use of the dredge disposal site at Stornoway only.

There will be an additive effect between the projects, increasing the volume of dredge spoil, and consequently the frequency and potentially the duration of elevated sediment loading events. This has the potential to increase the cumulative magnitude of impact on fish receptors at the Stornoway spoil ground. However, as discussed in section 8.5.1, the area is not considered to be valuable habitat for any of the relevant fish receptors, so densities of fish are expected to be low. Therefore, the cumulative impact is assessed as **minor: non-significant.**

8.8 Residual Effects

The potential impacts on relevant fish receptors are not assessed as significant, and no specific mitigation has been proposed, subsequently it is not necessary to assess residual effects.

8.9 Summary

No significant impacts arising from the construction phase of the Lochmaddy ferry terminal Development on fish receptors (Section 8.4.4) were identified. Table 8.9.1 summarises the impacts assessed for diadromous fish receptors; the mitigation measures identified to control them.

Table 8.9.1: Summary of Fish Ecology Impacts and Mitigation

Receptor and Value		Phase	Predicted Impact	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
Atlantic Salmon	International	Construction	Disturbance/foraging impairment/disruption of migration due to increased sediment loading from rock placement, infilling works, and dredging.	Negligible Short Term Reversible	Minor: Non-Significant	No specific mitigation required.	Negligible Short Term Reversible	Minor: Non-Significant
			Disturbance/foraging impairment/disruption of migration due to increased sediment loading from dredge disposal.	Negligible Short Term Reversible	Minor: Non-Significant	No specific mitigation required.	Negligible Short Term Reversible	Minor: Non-Significant
			Mortality and reduced productivity resulting from the resuspension of sediment bound contaminants from dredge disposal.	Negligible Short Term Reversible	Minor: Non-Significant	No specific mitigation required.	Negligible Short Term Reversible	Minor: Non-Significant
			Mortality and reduced productivity resulting from the release of hazardous substances in the event of a loss of containment.	Negligible Short Term Reversible	Minor: Non-Significant	No specific mitigation required.	Negligible Short Term Reversible	Minor: Non-Significant
			Injury/Disturbance/ disruption of migration due to underwater noise from piling operations.	Negligible Short Term Reversible	Minor: Non-Significant	No specific mitigation required.	Negligible Short Term Reversible	Minor: Non-Significant
Sea Trout	National	Construction	Disturbance/foraging impairment/disruption of migration due to increased sediment loading from rock placement, infilling works, and dredging.	Negligible Short Term Reversible	Negligible: Non-Significant	No specific mitigation required.	Negligible Short Term Reversible	Negligible: Non-Significant

Receptor and Value		Phase	Predicted Impact	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
Sea Trout	National	Construction	Disturbance/foraging impairment/disruption of migration due to increased sediment loading from dredge disposal.	Negligible Short Term Reversible	Negligible: Non-Significant	No specific mitigation required.	Negligible Short Term Reversible	Negligible: Non-Significant
			Mortality and reduced productivity resulting from the resuspension of sediment bound contaminants from dredging works.	Negligible Short Term Reversible	Negligible: Non-Significant	No specific mitigation required.	Negligible Short Term Reversible	Negligible: Non-Significant
			Mortality and reduced productivity resulting from the release of hazardous substances in the event of a loss of containment.	Negligible Short Term Reversible	Negligible: Non-Significant	No specific mitigation required.	Negligible Short Term Reversible	Negligible: Non-Significant
			Injury/Disturbance/ disruption of migration due to underwater noise from piling operations.	Negligible Short Term Reversible	Negligible: Non-Significant	No specific mitigation required.	Negligible Short Term Reversible	Negligible: Non-Significant
European Eel	International	Construction	Disturbance/foraging impairment/disruption of migration due to increased sediment loading from rock placement, infilling works, and dredging.	Negligible Short Term Reversible	Minor: Non-Significant	No specific mitigation required.	Negligible Short Term Reversible	Minor: Non-Significant
			Disturbance/foraging impairment/disruption of migration due to increased sediment loading from dredge disposal.	Negligible Short Term Reversible	Minor: Non-Significant	No specific mitigation required.	Negligible Short Term Reversible	Minor: Non-Significant
			Mortality and reduced productivity resulting from the resuspension of sediment bound contaminants from dredge disposal.	Negligible Short Term Reversible	Minor: Non-Significant	No specific mitigation required.	Negligible Short Term Reversible	Minor: Non-Significant

Receptor and Value		Phase	Predicted Impact	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
European Eel	International	Construction	Mortality and reduced productivity resulting from the release of hazardous substances in the event of a loss of containment.	Negligible Short Term Reversible	Minor: Non-Significant	No specific mitigation required.	Negligible Short Term Reversible	Minor: Non-Significant
			Injury/Disturbance/ disruption of migration due to underwater noise from piling operations.	Negligible Short Term Reversible	Minor: Non-Significant	No specific mitigation required.	Negligible Short Term Reversible	Minor: Non-Significant
Basking Shark	International	Construction	Disturbance/foraging impairment/disruption of migration due to increased sediment loading from rock placement, infilling works, and dredging.	None	No Change	No specific mitigation required.	None	No Change
			Disturbance/foraging impairment/disruption of migration due to increased sediment loading from dredge disposal.	Negligible Short Term Reversible	Minor: Non-Significant	No specific mitigation required.	Negligible Short Term Reversible	Minor: Non-Significant
			Mortality and reduced productivity resulting from the resuspension of sediment bound contaminants from dredge disposal.	Negligible Short Term Reversible	Minor: Non-Significant	No specific mitigation required.	Negligible Short Term Reversible	Minor: Non-Significant
			Mortality and reduced productivity resulting from the release of hazardous substances in the event of a loss of containment.	Negligible Short Term Reversible	Minor: Non-Significant	No specific mitigation required.	Negligible Short Term Reversible	Minor: Non-Significant
			Injury/Disturbance/ disruption of migration due to underwater noise from piling operations.	Negligible Short Term Reversible	Minor: Non-Significant	No specific mitigation required.	Negligible Short Term Reversible	Minor: Non-Significant

Receptor and Value		Phase	Predicted Impact	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
Sea of Hebrides pMPA	National	Construction	Disturbance/foraging impairment/disruption of migration due to increased sediment loading from rock placement, infilling works, and dredging.	None	No Change	No specific mitigation required.	None	No Change
			Mortality and reduced productivity resulting from the resuspension of sediment bound contaminants from dredging works.	None	No Change	No specific mitigation required.	None	No Change
			Mortality and reduced productivity resulting from the release of hazardous substances in the event of a loss of containment.	Negligible Short Term Reversible	Minor: Non-Significant	No specific mitigation required.	Negligible Short Term Reversible	Minor: Non-Significant
			Injury/Disturbance/ disruption of migration due to underwater noise from piling operations.	Negligible Short Term Reversible	Minor: Non-Significant	No specific mitigation required.	Negligible Short Term Reversible	Minor: Non-Significant

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Chapter 9: Otters

Contents

9 Otters

9.1 Introduction

This chapter presents the Ecological Impact Assessment (EcIA) for Eurasian otters (*Lutra lutra*) relating to the construction phase of proposed Lochmaddy Ferry Terminal Upgrade. Impacts on otters resulting from the operation and decommissioning the development have been scoped out of the assessment in agreement with Marine Scotland, as detailed in Chapter 3: Methodology. The assessment on otters is evaluated in the context of nature conservation legislation and relevant planning policy (see Chapter 4: Statutory Context & Policy and Chapter 5: Biodiversity). Impacts on otters are identified and subject to detailed impact assessment. Mitigation is proposed, cumulative impacts are considered, and finally the residual impacts and their significance are assessed.

This assessment is supported by Appendix I.1 - Lochmaddy Ferry Terminal Habitat and Otter Survey Report.

9.2 Regulations, Guidance and Sources of Information

9.2.1 European and International Legislation

Otters are listed in Annex IV of the Habitats Directive as European Protected Species (EPS) where the deliberate killing, disturbance or the destruction of these species or their habitat is banned.

In addition, otters are listed under Annex II of the Habitats Directive. Annex II species, which are native to the UK should be conserved through the designation of Special Areas of Conservation (SACs). Since 1994, all SACs, in combination with Special Protection Areas (SPAs) comprise the UK contribution to the Natura 2000 ecological network of protected sites.

It is therefore noted that according to the definitions provided in Chapter 5, otters have a value of **International**, in the context of this EcIA.

9.2.2 National Legislation

Otter are included in Schedule 2 of the Habitats Regulations, meaning it is an offence to:

- Deliberately or recklessly capture, injure or kill, harness, damage or destroy a breeding site or resting place of an EPS or a group of EPS;
- Disturb an EPS while it is occupying a structure or place which it uses for shelter or protection;
- Disturb an EPS while it is rearing or otherwise caring for its young;
- Obstruct access by an EPS to a breeding or resting place;
- Disturb an EPS in a manner that is, or circumstances which are, likely to significantly affect the local distribution or abundance of that species; and
- To disturb an EPS in a manner that is, or in circumstances which are likely to impair its ability to survive, breed or reproduce, or rear or otherwise care for its young.

The Wildlife and Countryside Act 1981, and Nature Conservation (Scotland) Act 2004 provide further protection to otters. Otters are listed under Schedule 5 of the Wildlife and Countryside Act 1981, which prohibits their deliberate killing, injuring or disturbance. The Nature Conservation (Scotland) Act 2004 makes amendments to the Wildlife and Countryside Act in

Scotland, including the addition of 'reckless' acts to offences against species protection, which makes it an offence to intentionally or recklessly injure, kill or disturb otters, or damage their breeding or resting places. The Nature Conservation (Scotland) Act 2004 also provides protection Sites of Special Scientific Interest (SSSI), which may be designated for otters.

It should be noted that the legislative framework provides protection for otter shelters, whether the otter is present or not.

9.2.3 Other Guidance

As discussed in Chapter 5: Biodiversity, the Joint Nature Conservation Committee (JNCC) and Scottish Natural Heritage (SNH) have produced a list of Priority Marine Features (PMFs) to ensure Scotland's seas are managed sustainably as required by the Marine (Scotland) Act 2010. Otters are included in the PMF list (Tyler-Walters et al., 2016). Inclusion in the PMF list does not provide any additional legal protection, however, due consideration must be provided in Impact Assessments. Further guidance for otters was sought from the latest Biodiversity Action Plans (BAPs).

In addition to the general guidance outlined in Chapter 5, the following guidance relevant to assessment and management of otters was consulted:

- Ecology of the European Otter: Conserving Natura 2000 Rivers (Chanin, 2003a);
- Monitoring the Otter *Lutra lutra* (Chanin, 2003b); and
- Otters: The British Natural History Collection (Chanin, 2013).

9.3 Assessment Methodology

9.3.1 Baseline

A baseline otter survey was undertaken in June 2017, this covered the terrestrial areas of the project including those shown in Drawings 1975-907 plus a 250m buffer (where access was permitted). The survey was undertaken in accordance with the approach detailed by Monitoring the Otter *Lutra lutra* (Chanin, 2003b). This predominantly relied upon the interpretation of field signs rather than direct observation of the animal, due to the often-elusive nature of otters. This included a search for:

- Otter spraint (faeces);
- Feeding remains (partially eaten prey items);
- Otter holts (den);
- Footprints;
- Couches or lay-ups (resting place above ground); and
- Pathways and slides into water.

All evidence identified during the survey were noted, mapped as features of interest, and photographed. Full details of the survey are available in Appendix I.1.

9.3.2 Impact Assessment Methodology

The evaluation of receptors, magnitude of impact and significance evaluation follows the methodology laid out in Chapter 5: Biodiversity, Section 5.3.

9.4 Baseline

9.4.1 Designated Sites

There are several designated sites in the Inner and Outer Hebrides, that may be relevant to the proposed development area. The sites relevant to Otters within 10km of the development areas are shown in Table 9.4.1. Figure 9.4.1 provides a map showing the locations of the designated sites relative to the proposed development areas. A description of the sites and reasons why they were or weren't taken forward for assessment are provided in the remainder of this section.

Table 9.4.1: Designated Sites Relevant to Otters Within 10km of the Development Areas

Site	Direction and Distance	Value	Relevant Qualifying Feature(s)	Taken Forward for Assessment?
Loch nam Madadh SAC	Immediately Adjacent	International	• Otter (*Lutra lutra*)	Yes
Loch an Duin SSSI	1.3 km NE	National	• Otter (*Lutra lutra*)	No
Lewis Peatlands SAC	9.7 km W/SW of Spoil Ground	International	• Otter (*Lutra lutra*)	No

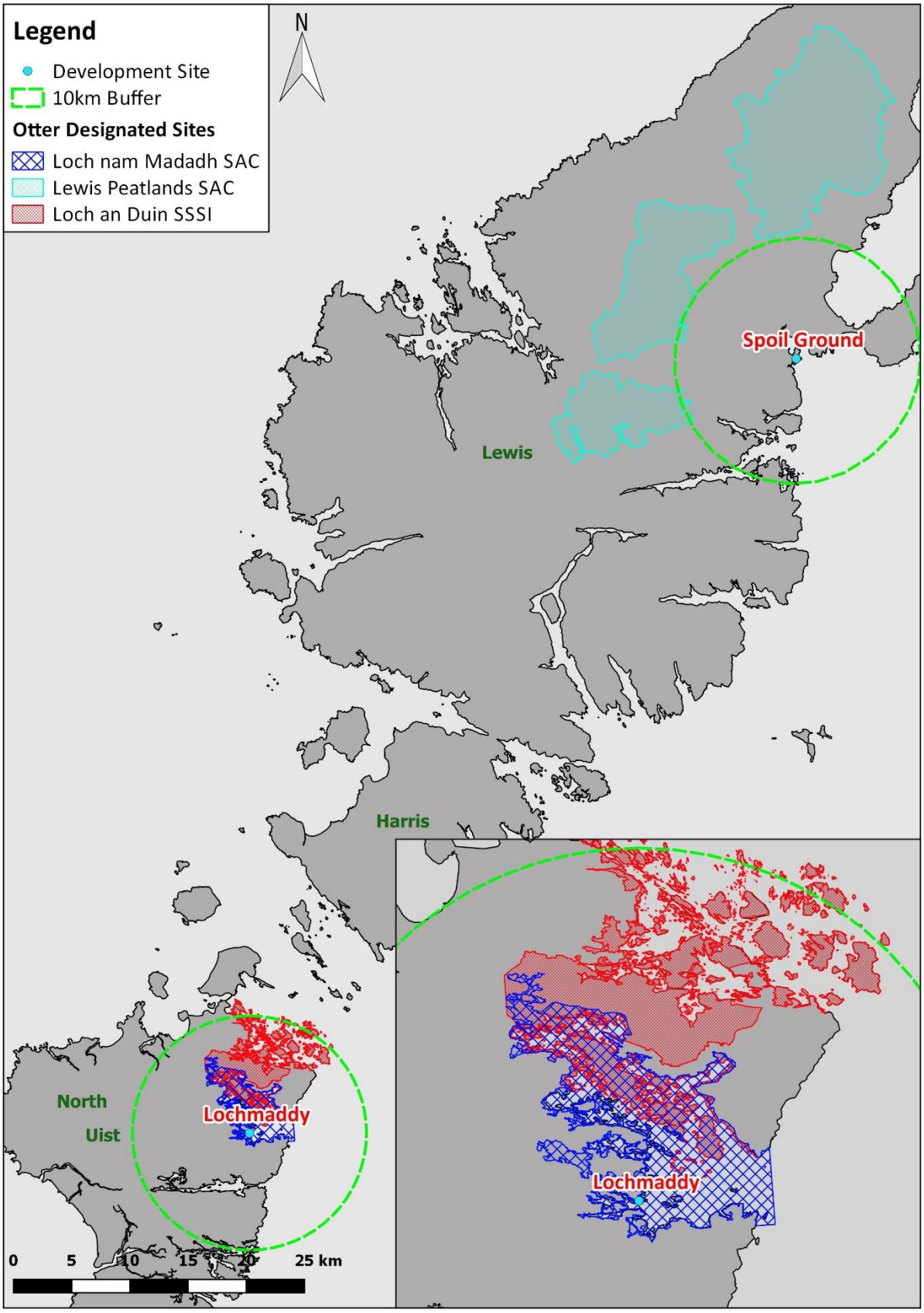

Figure 9.4.1: Map Showing Locations of the Designated Sites Relevant to Otters.

9.4.1.1 Loch nam Madadh SAC

The Loch nam Madadh SAC is designated in part for the conservation of otters. The site has an area of approximately 2320Ha, comprising of marine habitat, lagoons, mud and sand flats. The large, sheltered loch is surrounded by an extensive shoreline, and contains numerous islets, islands and bays. The site is described as supporting a key, dense otter population, due to the ample availability of food and shelter resources for the species, this is attributed to the highly productive nature of the area (JNCC, 2019). The most recent site condition report pertaining to the Loch nam Madadh otters found 100% otter occupancy, within the 8 areas surveyed (Findlay et al., 2015).

The marine elements of the proposed development are within the boundary of this site, while and terrestrial elements are bounded by it. As such, the development has the potential to result in both direct impacts on this site, as well as indirect impacts to the otter qualifying features. The SAC is therefore taken forward for further assessment.

9.4.1.2 Loch an Duin SSSI

The Loch and Duin SSSI, is a highly complex area of islands, islets, lagoons, intertidal areas, reefs, series, and pools in the North East of North Uist. The site is designated in part for the conservation of otters. At it's closest point the SSSI is within 1.3km of the proposed ferry terminal upgrade, and connectivity exists between the development and site site's qualifying features, due to the mobile nature of otters.

However, this site will not be taken for assessment for the following reasons:

- The SSSI overlaps considerably with the Loch nam Madadh SAC, hence otter presence and utilisation of the SSSI is expected to be analogous to that within the SAC;
- The proposed development lies within and immediately adjacent to the Loch nam Madadh SAC, where as the SSSI is a minimum of 1.3km away. Therefore, the magnitude of effect on the otter qualifying features will be greatest for the SAC;
- The SSSI has a national value, whereas the Loch nam Madadh SAC is of International value. Hence, the overall effect significance will be greater for the SAC; and
- Any mitigation measures identified for the otter features of the SAC will be equally effective for the otter features of the SSSI.

As such, in order to avoid duplication, the Loch nam Madadh will be assessed as the worst case, with impacts on the SSSI assumed to be less significant.

9.4.1.3 Lewis Peatlands SAC

The Lewis Peatlands SAC is an region of inland water bodies, bogs, marshes, fens, heath, and rocky areas, with an area totalling 27955Ha. The water body features of this site are known to support a population of otters, but the species is not the primary reason for site selection (JNCC, 2019). The site is located approximately 9.7km inland from the Stornoway spoil disposal ground, which is approximately 200m offshore. It is highly unlikely that otter's resident in this designated site will utilise the waters of the spoil ground, due to the overland distance between the SAC and the coast, and together with the distance between the coast and spoil ground. As such, a lack of connectively exists for the otter features of the SAC and the spoil disposal operations, hence the site is not taken forward for further assessment.

9.4.2 Species Account

The coastal habitat within the region of Lochmaddy offers good quality foraging habitat and numerous potential places of shelter (holts and couches) for otters. Otters within a coastal environment most often use natural places of shelter, in close proximity to the shoreline, but may use human sites where suitable or if natural features are limited. Availability of fresh water in close proximity to holts is of key importance to coastal otters.

Natal holts are generally located in areas of low disturbance and can be a significant distance inland depending on the surrounding habitat and suitability of holt features. Natal holts tend to be inconspicuous with very limited or no sprainting, making identification more difficult. Otters can breed at any time of year and across the UK roughly equal numbers of cubs are born in each calendar month (Macdonald & Barrett 1993). In northern Scotland some degree of seasonality is present with slight increases in frequency of births during the spring and summer months. Weaning occurs between three and four months and cubs remain with their mother for up to 18 months. Home ranges of otters can vary significantly, extending up to 40km in the riverine environment, while in the coastal environment ranges are reduced to between 2-10km (Chanin, 2003a).

The results of the 2017 otter survey are presented in Appendix I.1, with otter features and signs highlighted in Figure 9.4.2. There were numerous signs of otter, and potential lay-ups identified in the vicinity of the proposed development:

- A confirmed otter lay-up was identified approximately 50m east of the existing carpark, indicated by a red star on Figure 9.4.2. Numerous fresh spraints were found at this location, indicating the site was active at the time of the survey;
- An otter was observed fishing in the water to the north of the existing ferry terminal pier, shown as a magenta diamond in Figure 9.4.2;
- Three potential lie-ups were found in peat and boulder habitat to the east and north of the proposed development, indicated by green squares on Figure 9.4.2. No spraints were found near these sites, suggesting that they were not utilised at the time of the survey; and
- Evidence that the islands to the west of the proposed development were utilised by otters, including vegetation which has been affected by sprainting, was detected via a remote survey using a telescope. An otter run was found on the westernmost island, as shown by a red line on Figure 9.4.2.

The survey therefore found that otters are utilising the shoreline to the east and north of the proposed development, as well as the islands to the west. However, it was noted that due to the lack of fresh water bodies available to otter, in the immediate vicinity of the development, it is very unlikely that holts will be present in the area.

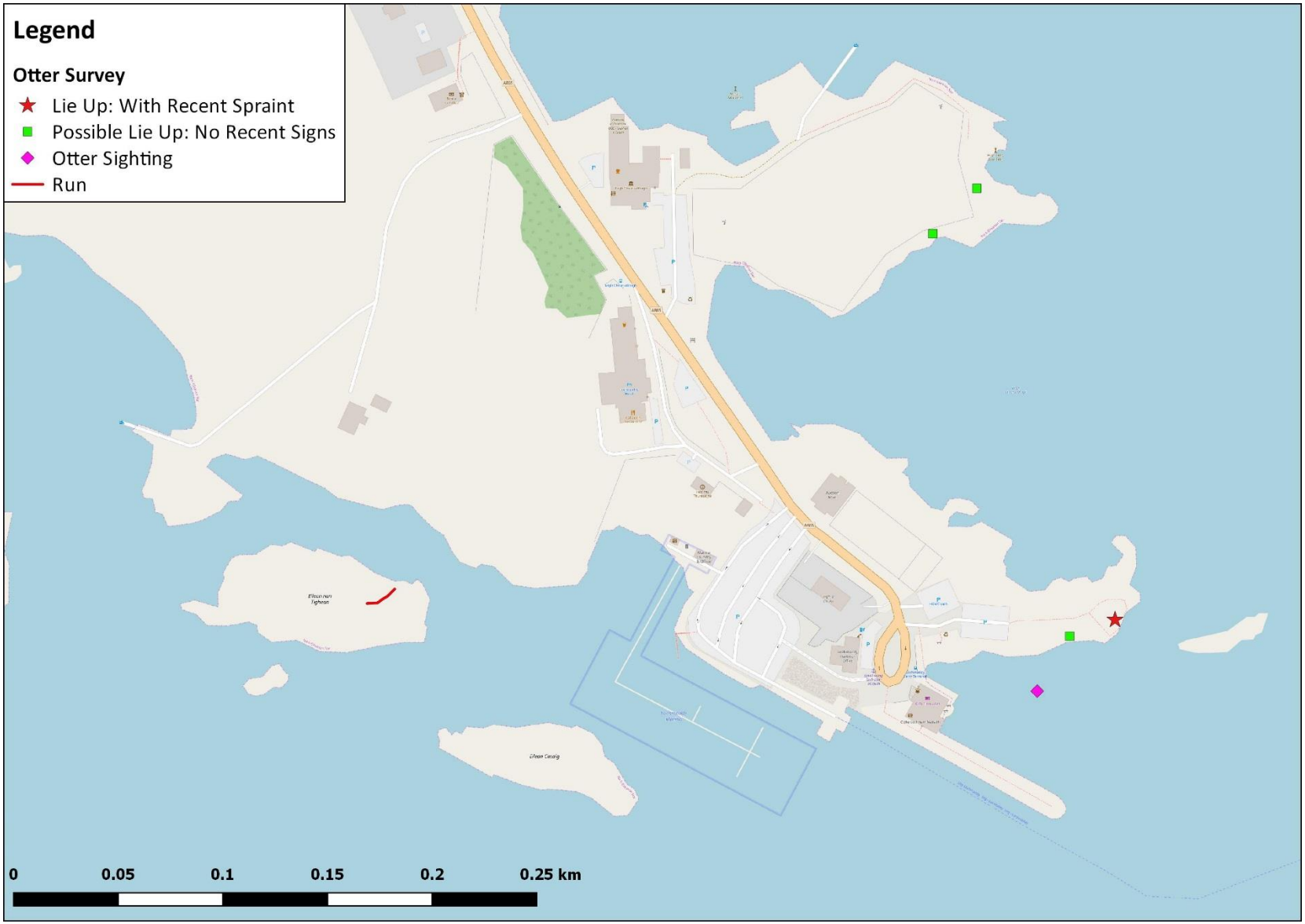

Figure 9.4.2: Map Showing Locations of Otter Signs Observed During the 2017 Baseline Survey.

9.5 Impact Assessment

9.5.1 Disturbance

During construction the following activities have the potential to affect otters:

- Presence, movements and noise emissions of onshore plant, vehicles and workforce required for ground works, infilling, piling, and surfacing operations; and
- Presence, movements, and noise emissions of marine plant and work boats associated with dredging and caisson installation.

The above activities will give rise to increased in-air noise emissions in the immediate vicinity of the development as discussed in Chapter 10. Underwater noise levels will also be increased locally during the piling and marine operations, as detailed in Chapter 11. Increases in both in air and underwater noise has the potential to lead to otter disturbance. Furthermore, the presence of vehicles, plant, and personnel in the area during construction works will increase visual disturbance of otters. This is particularly relevant, as the site compound is located to the east of the existing car park, in the area which was found to have the highest level of otter activity. Lighting of working areas, and the site compound may also be required, but lighting will be directional, and switched off when not in use.

The sources of disturbance detailed above have the potential to result in displacement of otters from the vicinity of the development area while construction is ongoing. The construction works are expected to last 9 to 10 months, and will normally be restricted to the hours of 7am to 8pm Monday to Saturday. Therefore, the disturbance will not be continuous, and otters will be able to return to the area when the site is inactive. Otters are highly mobile animals, with relatively extensive home ranges. The otter survey did not suggest that the development site was of any significant value to otters, and as such it is likely that ample alternative habitat is available locally. It is also noted that the development is located within an existing ferry terminal, and as such the otter's resident in this area are accustomed to a significant degree of disturbance from noise, vehicle movements, human presence and light emissions resulting from the existing operations.

As such, while the construction of the proposed development will likely result in local disturbance and displacement of local otters, it is unlikely that this is will have noticeable detrimental effects at an individual or population level. Therefore, the effects on otters, are assessed as being **low**, **localised**, and **temporary**, giving rise to a **moderate: significant** impact. The low magnitude of effect on local otters only, means this is extremely unlikely to affect the conservation objectives of the wider Loch nam Madadh SAC, hence the magnitude of effect on this site is **negligible**, resulting in **minor**, **non-significant** impact.

9.5.2 Loss of Habitat

The project description in Chapter 2 highlights the requirement to extend the existing marshalling and carpark areas. In order to facilitate this, land reclamation will be conducted in an intertidal bay to the west of the existing marshalling area. As a result of this reclamation, approximately 2,200m^2 of shoreline will be lost as a potential habitat and foraging areas for otters.

While there will be a permanent loss of intertidal otter habitat in the footprint of the reclamation area, it is not expected that this will have an individual or population-level effect on otters. This is due to the fact that the otter survey did not identify evidence in this area of use by otter, and the availability of ample similar alternative habitat locally. It is noted that the reclamation will also remove otter habitat from the Loch nam Madadh SAC, however the loss equates to <0.01% of the site's area, and as such is highly unlikely to affect the conservation objectives of the site. Therefore, the habitat loss is assessed has resulting in a **permanent**, effect of **negligible** magnitude, on otters and the Loch nam Madadh SAC, and the resulting impacts on both receptors are **minor: non-significant**.

The site compound located adjacent to the existing carpark to the northeast of the ferry terminal will cover an area of 1,700m^2. The area was identified in the otter survey as being suitable for otters with an active layup located approximately 30m to the east. While otters have been confirmed to use this area, similar habitat is widely available in the local area, and hence the loss of this area for the 9-10month construction period is not expected to result in detrimental effects to otters or the conservation objectives of the Loch nam Madadh SAC. The resulting effects on these receptors are assessed as **temporary**, **negligible** magnitude, with an overall significance of **minor: non-significant**.

Once the construction works are completed, the majority of the contractor's compound will be removed and the land reinstated. However, some of this area will be used to form a permanent extension to the existing car park. As such, this will give rise to a permanent habitat loss of 320m^2, the very small scale of this habitat loss, together with the proximity to the existing carpark means that no effects on otters or the conservation objects of the Loch nam Madadh SAC are anticipated. The resulting impact is therefore assessed as **no change**.

9.5.3 Water Quality

During construction there could be the following effects on water quality in relation to the otters:

- Increased sediment loading in the water column, resulting from dredging, spoil disposal, and infilling; and
- Spillage of hazardous materials from machinery, equipment, and marine plant involved in the construction.

These potential effects will be considered in turn.

9.5.3.1 Increased Sediment Loading

The rock placement, infilling works, dredging and spoil disposal operations, detailed in Chapter 2: Project Description and Chapter 13: Water Quality all have the potential to increase sediment loading in the water column, through the release of fines into the marine environment. Further information is provided in Chapter 13: Water Quality. Increased sediment loading in the water column, and the resultant increase in turbidity may reduce the foraging success of the otter, however although it is thought otters hunt primarily by sight it is also understood that they are successful foragers at night and in murky or turbid waters by utilising their whiskers (vibrissae) to detect the presence of fish (Chanin, P. 2013). Increased turbidity may also cause

otters to avoid affected areas, although as stated above, the species is known to be relatively tolerant of turbid waters.

Rock placement, infilling works, and dredging will all be conducted within the boundary of the ferry terminal upgrade. Affric's monitoring of the sediment loading resulting from similar rock placement, infilling, and dredging activities during previous port developments showed that sediment plumes resulting from these activities dispersed rapidly, and were confined to the immediate vicinity of the working areas. Very similar construction techniques, in similar ground conditions will be utilised during the construction of the Lochmaddy ferry terminal upgrade, and there are not strong tidal currents in the area which could transport suspended sediments further from the site. As such, the extent of the sediment loading is expected to be localised and confined to the immediate vicinity of the works.

While otters do utilise the waters in the immediate vicinity of the development, they are also documented as being relatively tolerant of increased sediment loading. Furthermore, they are highly mobile animals, and due to the availability of alternative marine habitat locally, are likely able to be able to avoid affected areas if needed, without suffering adverse individual or population level effects. As such, the effects of increase sediment loading on otters and the Loch nam Madadh SAC are **localised**, **temporary**, and **negligible**, hence the impact on both receptors is **minor: non-significant**.

9.5.3.2 Release of Hazardous Substances

The accidental release of oil and other marine pollutants is an extremely unlikely event during construction provided the mitigation laid out in Chapter 13: Water Quality and Coastal Processes is followed. However, should such an event occur, depending on the quantities accidentally released, there could be lethal and sub-lethal effects on otters, including both direct immediate impacts on their health, and indirect longer-term impacts to their lifecycle and behaviour:

- Direct effects include:
  - Contamination of their fur leading to a loss of water proofing, and displacing air in the fur, affecting the animal's thermoregulation and buoyancy. This can lead to death through hypothermia, and the inability to swim, or forage; and
  - Poisoning resulting in sickness or death, through the ingestion or inhalation of the contaminants. Ingestion occurs through preening and foraging in contaminated areas.
- Indirect effects include:
  - Displacement from foraging areas if species avoid the contaminated area;
  - A reduction in prey availability if prey species are affected by the contamination event; and
  - Long-term accumulation of contaminants such as poly aromatic hydrocarbons, through foraging on contaminated prey items, leading to illness, reduction in reproductive success, and increased mortality rates.

The magnitude of potential impacts arising from a release of contaminants would depend on the nature and quantity of material released into the environment. There is the potential for

a spill of hazardous material to have long term major impacts, through changes to the health and behaviour of otters on a regional scale. However, the adoption of the mitigation measures and standard industry best practice techniques for pollution prevention identified in Chapter 13, as well as in Chapter 14: Schedule of Mitigation, significantly reduce or remove the risk of such an event occurring. As such, it is considered extremely unlikely that release of hazardous material of a scale with the potential to negatively impact otters or the Loch nam Madadh SAC will occur; therefore, the potential effects on both receptors are assessed as **negligible, short term,** and **reversible,** and the resulting impacts are **minor: non-significant.**

9.5.4 Physical Injury and Entrapment

The increased levels of human activity, plant movements and other factors as detailed above, in the vicinity of construction make it extremely unlikely that an otter would enter an area where it is at risk of being injured through a direct interaction with site equipment while construction works are ongoing. There is also not expected to be a significant increase in road traffic resulting from construction, as detailed in Chapter 12, hence no deviation from baseline otter road injury risk is anticipated. These aspects are therefore not assessed further.

It is however possible that otters in the area will enter the construction site during periods when construction works are not ongoing. In this event, otters may seek shelter in stored materials, such as pipes and rock stock piles, excavations, or in items of plant or equipment. This will result in an increased risk of injury or accidental mortality, if equipment or materials are moved while an otter is still in-situ. Furthermore, otters may become trapped in excavations or pipes, resulting in increased stress, and potentially injury through starvation and dehydration. This **temporary** impact is assessed as having a magnitude of **low**, resulting in a **moderate: significant** effect to the local otter population. Due to the highly localised nature of this effect, it is not anticipated to adversely affect the population objectives of the Loch nam Madadh SAC, hence impacts on this site are assessed as **negligible**, **non-significant.**

9.5.5 Barrier Effects

Due to the fact that the proposed development is an extension to existing infrastructure, no permanent barrier or habitat fragmentation effects are anticipated. However, site fencing used during the construction phase may result in temporary barrier effects, which have the potential to interrupt otter transit routes. This is particularly true for the site compound which is to be situated on the peninsula north of the pier, an area which is currently open ground, and has been shown to be utilised by otters. This **temporary** impact is assessed as having a magnitude of **low**, resulting in a **moderate: significant** effect to the local otters. Due to the highly localised nature of this effect, it is not anticipated to adversely affect the population objectives of the Loch nam Madadh SAC, hence impacts on this site are assessed as **negligible**, **non-significant.**

9.6 Mitigation Measures

Where potential significant effects on otters have been identified in Section 9.5, appropriate mitigation will be provided in order to reduce the magnitude of the effect. A summary of the otter mitigation proposed for the Lochmaddy ferry terminal upgrade is outlined below, while

detailed procedures of how the mitigation will be implemented is provided in the Construction Environmental Management Document (CEMD) in the form of an Otter Protection Plan (OPP).

9.6.1 Disturbance Mitigation

The following measures will be implemented to reduce the impacts on otters resulting from disturbance:

- A pre-construction otter survey will be undertaken no more than 4 weeks prior to construction works commencing, the survey will extend to at least 250m from proposed works. This survey will include vantage point surveys to identify if there any cubs present in the area. Immediately upon completion of this survey the need to apply for an EPS Licence will be reassessed;
- All Site Operatives will be briefed on the legislation, ecology and field signs of otter through an Otter Toolbox Talk. Briefings will be clear and unambiguous ensuring that all work stops, and advice sought from a suitably experience ecologist where any concerns are raised. In addition, an Otter Advice Note will be made available in the site welfare facilities, detailing the legal responsibilities on site, the importance of maintaining levels of awareness in relation to otters, and procedures to follow should concerns be identified;
- If otters' approach closer than 50m to ongoing works, either on land or within the marine environment, then works should cease until such time that the otter(s) has moved further than 50m away from works; and
- To minimise the potential impacts on breeding otters within the area (if present), works will not be commenced if highly dependent cubs are present within 300m. Cubs are generally within or very close to a holt during the first 2-3 months. The potential presence of cubs will be assessed during the pre-construction surveys.

9.6.2 Injury and Entrapment Mitigation

The following measures will be implemented to reduce the risk of otter injury or entrapment:

- All machinery, material, or equipment stored on site will be subject to checks for otter prior to work commencing each day to ensure otter are not present; and
- All exposed pipes (excluding culverts once in place) will be capped when not required and any trenches or other excavations will be fitted with a 45-degree escape ramp to prevent entrapment of otters.

It is also noted that as detailed in Chapter 6: Marine Mammals, pre-start watches will be conducted in order to mitigate potential impacts on marine mammals resulting from piling operations. While the impacts on otters resulting from piling operations were assessed as being non-significant, as a matter of best practice, the piling marine mammal protocols will also apply to otters. The detailed protocols are provided in the Construction Environmental Management Document (CEMD).

9.6.3 Injury and Entrapment Mitigation

In order to prevent barrier effects:

- All fencing will have a gap of 200mm between ground level and the lower part of the fence to allow otters to pass freely underneath.

9.7 Cumulative Impacts

As detailed in Chapter 3: Methodology, there are no other projects which will have the potential to result in cumulative effects on otters or their designated sites.

9.8 Residual Effect

In the absence of mitigation, some impacts on otters resulting from the construction and operation of the Lochmaddy Pier Upgrade were assessed in Section 9.5 to have the potential to result in significant negative impacts on otters. These potential impacts are particularly associated with the possible disturbance, injury, entrapment and barrier effects. As a result, a comprehensive mitigation strategy has been proposed in Section 9.6, in the form of an OPP.

The OPP will reduce the predicted magnitudes of impact on otters, by minimising the potential for disturbance, injury, entrapment and barrier effects. As such, adherence to the OPP, reduces the magnitude of all potential impacts on otters to **negligible**, and as such the residual effect of the proposed development is assessed as **minor**: **non-significant**.

No potential significant effects on the Loch nam Madadh SAC were identified, however, implementation of the OPP will further reduce the magnitude of effects on this site.

It is noted that the potential need for an EPS licence remains. The mitigation strategy outlined in Section 9.6 will form the basis of any EPS licence application, should it be required upon completion of pre-construction surveys.

9.9 Summary

In total, three significant effects on the local otter population were identified as potentially resulting from the construction of the Lochmaddy ferry terminal upgrade. These were associated with;

- The potential for disturbance resulting from general site works;
- The risk of injury and entrapment through interactions with site plant, equipment, and structures; and
- Temporary barrier effects resulting from site fencing.

These impacts are expected to be highly localised, and hence no significant adverse impacts on the Loch nam Madadh SAC are anticipated. Through the adoption of effective and proportional otter mitigation during the construction of the Development, all effects are reduced to non-significant.

Table 9.9.1 summarises the effects assessed for otter receptors, the mitigation measures identified to control them and the potential for residual significant adverse effects. Significant effects are highlighted in yellow.

Table 9.9.1 Summary of Otter Impacts and Mitigation

Receptor and Value		Phase	Predicted Impact	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
Otters	International	Construction	**Disturbance:** Resulting from noise, human/equipment presence & movement.	Low Negative Localised Temporary	Moderate: **Significant**	OPP including preconstruction surveys, and halting works if otters in close proximity.	Negligible Negative Localised Temporary	Minor: Non-Significant
			Habitat Loss: Loss of intertidal habitat/foraging areas resulting from land reclamation.	Negligible Negative Permanent	Minor: Non-Significant	No specific mitigation required.	Negligible Negative Permanent	Minor: Non-Significant
			Habitat Loss: Loss of terrestrial habitat/foraging areas resulting from site compound.	Negligible Negative Short Term Reversible	Minor: Non-Significant	No specific mitigation required.	Negligible Negative Short Term Reversible	Minor: Non-Significant
			Habitat Loss: Loss of terrestrial habitat/foraging areas resulting from car park extension.	Negligible Negative Permanent	Minor: Non-Significant	No specific mitigation required.	Negligible Negative Permanent	Minor: Non-Significant
			Water Quality: Increased sediment loading resulting from dredging and infilling leading to displacement and reduced foraging success.	Negligible Negative Short Term Reversible	Minor: Non-Significant	No specific mitigation required.	Negligible Negative Short Term Reversible	Minor: Non-Significant
			Water Quality: Release of hazardous substances resulting in injury/displacement.	Negligible Negative Short Term Reversible	Minor: Non-Significant	As detailed in Chapter 13: Water Quality and Coastal Processes.	Negligible Negative Short Term Reversible	Minor: Non-Significant
			Injury & Entrapment: Through interactions with site plant, equipment and structures.	Low Negative Localised Temporary	Moderate: **Significant**	OPP including pre start checks for plant and provision of escape ramps.	Negligible Negative Localised Temporary	Minor: Non-Significant

Receptor and Value		Phase	Predicted Impact	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
Otters	International	Construction	**Barrier Effects:** resulting from the installation of site fencing.	Low Negative Localised Temporary	Moderate: **Significant**	OPP including 200mm gap below site fencing.	Negligible Negative Localised Temporary	Minor: Non-Significant
Loch nam Madadh SAC	International	Construction	**Disturbance:** Resulting from noise, human/equipment presence & movement.	Negligible Negative Localised Temporary	Minor: Non-Significant	OPP including preconstruction surveys, and halting works if otters in close proximity.	Negligible Negative Localised Temporary	Minor: Non-Significant
			Habitat Loss: Loss of intertidal habitat/foraging areas resulting from land reclamation.	Negligible Negative Permanent	Minor: Non-Significant	No specific mitigation required.	Negligible Negative Permanent	Minor: Non-Significant
			Habitat Loss: Loss of terrestrial habitat/foraging areas resulting from site compound.	Negligible Negative Short Term Reversible	Minor: Non-Significant	No specific mitigation required.	Negligible Negative Short Term Reversible	Minor: Non-Significant
			Habitat Loss: Loss of terrestrial habitat/foraging areas resulting from car park extension.	Negligible Negative Permanent	Minor: Non-Significant	No specific mitigation required.	Negligible Negative Permanent	Minor: Non-Significant
			Water Quality: Increased sediment loading resulting from dredging and infilling leading to displacement and reduced foraging success.	Negligible Negative Short Term Reversible	Minor: Non-Significant	No specific mitigation required.	Negligible Negative Short Term Reversible	Minor: Non-Significant
			Water Quality: Release of hazardous substances resulting in injury/displacement.	Negligible Negative Short Term Reversible	Minor: Non-Significant	As detailed in Chapter 13: Water Quality and Coastal Processes.	Negligible Negative Short Term Reversible	Minor: Non-Significant

Receptor and Value		Phase	Predicted Impact	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
Loch nam Madadh SAC	International	Construction	**Injury & Entrapment:** Through interactions with site plant, equipment and structures.	Negligible Negative Localised Temporary	Minor: Non-Significant	OPP including pre start checks for plant and provision of escape ramps.	Negligible Negative Localised Temporary	Minor: Non-Significant
			Barrier Effects: resulting from the installation of site fencing.	Negligible Negative Localised Temporary	Minor: Non-Significant	OPP including 200mm gap below site fencing.	Negligible Negative Localised Temporary	Minor: Non-Significant

Key

	Significant Effect

9.10 References

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Chapter 10: Noise and Vibration (In-Air)

Contents

10 Noise and Vibration (In-Air)

10.1 Introduction

Environmental, or community noise is a broad term that encompasses noise emitted from many sources, including road, rail & air traffic, industry, construction, public work and neighbourhood noise. All of these sources potentially contribute adversely to the overall noise environment. It is therefore reasonable to expect communities to be sensitive to any change in their acoustic environment as a result of a proposed development.

This chapter considers the likely significant noise effects associated with the proposed upgrade works. Specifically, the chapter considers the construction activities that are likely to occur within Lochmaddy Ferry Terminal as well as any changes in noise levels that may arise from an increase in road traffic associated with changes in operations.

This chapter considers in-air noise effects only. Marine noise effects are dealt with in Chapter 11: Noise and Vibration (Underwater).

The Chapter does not consider decommissioning noise effects, as no decommissioning is anticipated.

The specific objectives of this chapter are to:

- Identify potential noise sensitive receptors in the vicinity of the Lochmaddy Ferry Terminal and quantify the existing baseline sound levels at these locations;
- Calculate the likely levels of construction noise at the nearest receptors to determine the potential for significant noise effects associated with the construction tasks;
- Assess the likely increase in road traffic noise at the nearest receptors to determine the potential for significant noise effects associated with changes in operations; and,
- Indicate any requirements for mitigation measures in order to provide sufficient levels of protection for nearby receptors.

The chapter is supported by:

- Appendix J.1: Baseline Noise Level Data;
- Appendix J.2: Construction Noise Assessment Data;
- Drawing 49L.10.01 (In-Air Noise Assessment Study Area); and
- Drawings 49L.10.02 through to 49L.10.08 (Noise Assessment Contour Plots).

All sound level monitoring, calculations, assessment and authoring of this chapter have been undertaken by TNEI Services Ltd (TNEI). All of the TNEI team contributing to this chapter are appropriately qualified and affiliated with the Institute of Acoustics (IOA), as detailed in Appendix A.1.

10.1.1 Nomenclature

Please note the following terms and definitions, which are used throughout this chapter:

- **Emission** refers to the sound level emitted from a sound source, expressed as either a sound power level or a sound pressure level;
- **Immission** refers to the sound pressure level received at a specific location from a noise source(s);
- **SWL** indicates the sound power level in decibels (dB);
- **SPL** indicates the sound pressure level in decibels (dB);
- **NSR** (Noise Sensitive Receptor) identified receptors which are sensitive to noise;
- **NMP** (Noise Monitoring Point) refers to any location where baseline or specific noise levels have been measured; and
- **NAL** (Noise Assessment Location) refers to any location where the noise immission levels are calculated and assessed.

Unless otherwise stated, all noise levels refer to free field levels i.e. noise levels without influence from any nearby reflective surfaces.

10.2 Source of Information

10.2.1 Planning and Legislative Framework

The overarching European legislation in relation to terrestrial environmental noise is the '*Environmental Noise Directive*' (The European Parliament and the Council of the European Union, 2002) (END). The END aims to limit people's exposure to environmental noise but does not prescribe noise limits. Instead, it requires each member state to provide data on noise exposure, and to develop action plans to prevent or reduce noise exposure, and to preserve existing quiet areas. In Scotland the END is transposed and implemented within *'The Environmental Noise (Scotland) Regulations'* (Scottish Statutory Instruments, 2006).

At a national level the relevant policy documents are: Planning Advice Note (PAN) 1/2011 – *'Planning and Noise,'* (The Scottish Government, 2011) and the associated *Technical Advice Note (TAN) – 'Assessment of Noise' (*The Scottish Government, 2011).

PAN 1/2011 provides little guidance in respect of construction noise, other than recommending that the use of planning conditions is not the preferred method for controlling temporary construction noise. Specifically, the document states:

"32. While planning conditions can be used to limit noise from temporary construction sites, it is most effectively controlled through the Control of Pollution Act 1974 (COPA74) and the Pollution and Prevention Control Act 1999 for relevant installations. Notice can be served in advance of works and site conditions set to control activities."

BS5228:1997 *'Noise and vibration control on construction and open sites. Code of practice for basic information and procedures for noise and vibration control'* parts 1 to 5 (BSI, 1997) is the approved Code of Practice under COPA74, however, it is the 2009 version of the Standard which should be used for Environmental Impact Assessments (EIA) and planning applications. In this regards the TAN states:

"However, under Environmental Impact Assessments and for planning purposes i.e. not in regard to the Control of Pollution Act 1974, the 2009 version of BS 5228 is applicable. The 2009 version of the standard consists of Parts 1 and 2 for noise and vibration respectively."

With regards to road traffic noise, PAN1/2011 states; *"Road traffic noise impact assessments should take account of level, potential vibration, disturbance and variation in noise levels throughout the day, the pattern of vehicle movements and the configuration of the road system."*

The PAN itself does not provide any guidance as to the assessment method to be used, however, within the TAN, an example assessment is provided based on the guidance contained within '*Design Manual for Roads and Bridges*,' (DMRB).

10.2.2 Relevant Guidance

10.2.2.1 BS5228

The BS5228:2009 standard provides useful guidance on practical noise control. Part 1, provides recommendations for basic methods of noise control including sections on community relations, training, occupational noise effects, neighbourhood nuisance and project supervision. The annexes provide information on noise sources, noise calculation procedures, mitigation measures and their effectiveness.

Part 1 also contains sound power level data for a variety of construction plant. This data was obtained from field measurements of actual plant operating on construction and open sites in the United Kingdom and is therefore appropriate to use as source level data for construction noise predictions.

The 2009 version of BS5228 was subject to an additional update in 2014. Accordingly, the construction noise assessment in this chapter has been undertaken in accordance *with BS5228 1:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites. Noise'*, (BSI, 2009), hereafter referred to as BS5228.

10.2.2.2 DMRB

Guidance with regards to noise generated from new or upgraded road developments is provided within the Design Manual for Roads and Bridges (DMRB), Volume 11, Section 3, Part 7, (Nov 2011). DMRB notes:

> *"3.3 The assessment approach has been designed to be proportionate, consequently the level of assessment will depend upon the potential for impacts to occur, and this will in turn depend upon the scale of the proposed road project, the site and local circumstances, and the location of sensitive receptors. This approach can be equally applied to all road projects, including new construction, improvement and maintenance".*

No new roads or road upgrades are proposed. However, in the absence of any other UK guidance, DMRB has been used to assess the potential increase in noise levels associated with the proposed development traffic flows.

The guidance provides three levels of assessment, namely Scoping, Simple and Detailed and the requirement for which level of assessment is required is determined dependent upon threshold criteria being met, in relation to the predicted change in noise level.

10.3 Assessment Methodology

10.3.1 Study Area

Noise Sensitive Receptors (NSRs) are properties, people or fauna which are sensitive to noise and, therefore, may require protection from nearby noise sources. The Study Area for the noise assessment has been defined through the identification of the closest NSRs to the development. Specifically, the study area has been defined on the assumption that if noise levels are within acceptable levels at the closest receptors then they will also be acceptable at more distant locations.

Table 10.3.1 details the study area and the closest identified human NSRs to the Development that are considered in the NIA.

Table 10.3.1: Nearest Identified NSR Groups

NSR Group ID	NSR Descriptor
NSR01	Group of two houses within immediately north of the Ferry Terminal.
NSR02	Closest dwellings on A865 and at the beginning of main residential area.
NSR03	Lochmaddy Hotel & Taigh Chearsabhagh Museum & Arts Centre.

Rather than predicting noise levels for each individual NSR, the assessment focuses on a set of Noise Assessment Locations (NALs). The NALs are chosen to represent the closest or most exposed receptors to the proposed construction activities for each NSR group. The NALs are shown on Drawings 49L.10.02 to 49L.10.08 and detailed in Table 10.3.2.

The houses located immediately to the north of the ferry terminal (NSR01) will be subject to noise immission levels on multiple facades, depending on the location and type of activities occurring. As such, each house has been allocated two assessment locations which consider the front and rear of each property.

In terms of non-human NSRs, otters are active in the area, including the peninsula immediately north of the terminal building. The output of the noise modelling completed, in the form of noise contours, has informed the assessment of effects on otters provided in Chapter 9: Otters.

Table 10.3.2: Noise Assessment Locations

NAL ID	NAL Descriptor	Grid Reference
NAL01	Lochmaddy Hotel	NF91915 68154
NAL02A	Harbour House 01 Front	NF91987 68073
NAL02B	Harbour House 01 Rear	NF91978 68061
NAL02C	Harbour House 02 Front	NF92006 68055
NAL02D	Harbour House 02 Rear	NF91996 68046
NAL03	Museum & Arts Centre	NF91914 68242
NAL04	Closest Lochmaddy Residential Area	NF91848 68301

10.3.2 Baseline Data Collection

Unattended baseline sound level monitoring was undertaken on both the 5th and 6th of June 2018 at four locations for both daytime, evening and night-time periods. Periods of attended monitoring were undertaken during the day on both the 5th and 6th of June in order to make subjective observations with regards to the local noise environment. The Noise Monitoring Locations (NMLs) are shown on Drawing 49L.10.01 and detailed in Table 10.3.3.

Table 10.3.3: Noise Monitoring Locations

NML ID	NML Descriptor	Grid Reference
NML01	Dwellings immediately north of the ferry terminal	NF91990 68051
NML02	Closest Lochmaddy Residential Area	NF91814 68387
NML03	Lochmaddy Hotel	NF91910 68138
NML04	Area of otter activity	NF92102 68041

In addition to measuring ambient noise levels in the absence of the ferry, the noise level monitoring at NML01 was extended to quantify the noise levels attributable to typical ferry activity at the dwellings located immediately north of the ferry terminal.

All measurements were made with the sound level meter (SLM) mounted on a tripod at approximately 1.2 – 1.5 metres above the ground and away from nearby reflective surfaces i.e. building façades, fences etc.

The noise monitoring equipment consisted of a Cirrus Optimus Green integrating SLMs, all fitted with a standard wind shield. All noise monitoring equipment (calibrator, SLMs and

microphones) used for the study are categorised as Class 1, as specified in IEC 61672-1 '*Electroacoustics. Sound level meters. Specifications*' (International Electrotechnical Commission, 2002). The equipment was calibrated on site at the beginning and end of each measurement period with no significant deviations noted. Appendix J.1 contains the equipment and laboratory calibration details.

10.3.3 Impact Assessment Methodology

10.3.3.1 Construction Assessment Method

Annex E, part E.3.2 of BS5228, clearly sets criteria for assessing the significance of construction noise effects and gives examples of acceptable limits for construction noise.

Table E.1 of BS5228 (represented here as Table 10.3.4) contains an example of the significance criteria that can be used to assess construction activities.

Table 10.3.4: Example of Threshold of Potential Significant Effect at Dwellings (dB(A))

Assessment Category and Threshold Value Period	Threshold Value $L_{Aeq,T}$ dB		
	Category A(A)	Category B(B)	Category C(C)
Night-Time (23:00 – 07:00)	45	50	55
Evenings and Weekends	55	60	65
Daytime (07:00 – 19:00) and Saturdays (07:00 to 13:00)	65	70	75
(A) Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than these values; (B) Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are the same as category A values; (C) Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are higher than category A values;			

The threshold values can be considered limits for the construction noise levels (quantified using the L_{Aeq} noise metric). The limits in each category are to be used where the existing noise level at each location, rounded to the nearest 5dB, is below the level given for a particular time of day. BS5228 provides the following advice regarding the threshold limits:

> *"Note: 1 A potential significant effect is indicated if the $L_{Aeq,T}$ noise level arising from the site exceeds the threshold level for the category appropriate to the ambient noise level.*
>
> *Note 2: If the ambient noise level exceeds the Category C threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a potential significant effect is indicated if the total $L_{Aeq,T}$ noise level for the period increases by more than 3dB due to site noise.*
>
> *Note 3: Applied to residential receptors only."*

Therefore, the assessment of significance of effects for construction noise reflects a specific noise threshold for the locality (set relative to the existing ambient noise levels) for a particular period of the day, rather than an absolute noise level.

It is noted that the threshold values in BS5228 are to be applied to residential receptors only. However, it is assumed that staff or owners of the hotel may reside within the building. For the purposes of this assessment therefore, it has been deemed appropriate to consider the BS5228 threshold values for the assessment of the hotel.

10.3.3.2 Road Traffic Assessment Method

DMRB states, in paragraph 3.5:

> *"The threshold criteria used for traffic noise assessment during the day is a permanent change in magnitude of 1 dB $L_{A10,18h}$ in the short term (i.e. on opening) or a 3 dB $L_{A10,18h}$ change in the long term (typically 15 years after project opening). For night time noise impacts, the threshold criterion of a 3 dB $L_{night,\ outside}$ noise change in the long term should also apply but only where an $L_{night,\ outside}$ greater than 55 dB is predicted in any scenario."*

With regards to how noise levels vary with traffic flow, DMRB states in paragraph A1.8 ii:

> *"A change in noise level of 1 dB $L_{A10,18h}$ is equivalent to a 25% increase or a 20% decrease in traffic flow, assuming other factors remain unchanged and a change in noise level of 3 dB $L_{A10,18h}$ is equivalent to a 100% increase or a 50% decrease in traffic flow;".*

Therefore, to estimate the likely noise level increase, the predicted traffic flows with the development in place are compared to the predicted traffic flows in the same year, without the proposed development.

10.3.3.3 Evaluation of Receptors

TAN (1/2011) states:

> *"The initial process requires the identification of all noise sensitive receptors (NSR) that may potentially be affected by the development and to prioritise each NSR according to their level of sensitivity."*

Table 2.1 of the TAN, presented here as Table 10.3.5, presents the levels of sensitivity associated with a variety of receptors.

Table 10.3.5: Level of Sensitivity Associated with NSRs

Sensitivity	Description	Examples of NSR
High	Receptors where people or operations are particularly susceptible to noise.	• Residential, including private gardens where appropriate. • Quiet outdoor areas used for recreation. • Conference facilities. • Theatres/Auditoria/Studios. • Schools during the daytime. • Hospitals/residential care homes. • Places of worship.
Medium	Receptors moderately sensitive to noise, where it may cause some distraction or disturbance.	• Offices. • Bars/Cafes/Restaurants where external noise may be intrusive. • Sports grounds when spectator noise is not a normal part of the event and where quiet conditions are necessary (e.g. tennis, golf, bowls).
Low	Receptors where distraction or disturbance from noise is minimal.	• Buildings not occupied during working hours. • Factories and working environments with existing high noise levels. • Sports grounds when spectator noise is a normal part of the event. • Night Clubs.

The nearest identified NSRs are all residential receptors, except for the Lochmaddy Hotel and the Museum & Arts Centre. During the daytime the hotel can be considered a receptor with Medium Sensitivity i.e. bars, cafes, restaurants; however, for evenings and night-times when guests may be sleeping, the hotel would be considered a High Sensitivity receptor.

All other receptors considered within the assessment are classed as High Sensitivity.

10.3.3.4 Magnitude of Impact

The assessment of construction noise against fixed guideline noise level limits is simply a case of pass or fail and as such cannot be used to determine the magnitude of impact.

DMRB provides a classification method of Magnitude of Noise Impacts, based upon the change in noise levels before and after the completion of the development. The noise parameter chosen in DMRB is a statistical calculation based on the louder events i.e. the threshold of the noisiest 10% rather than the average noise level used in other guidelines. This

is described using the noise metric dB LA10. Paragraph 3.37 of DMRB states that a change in road traffic noise of 1 dB $L_{A10\ (18hours)}$ in the short term (e.g. when a project is opened) is the smallest that is considered perceptible.

It is reasonable to anticipate that perceived impacts will increase with increasing change in noise levels, and this is the approach illustrated in DMRB Table 3.1, reproduced here as Table 10.3.6.

Table 10.3.6: DMRB Magnitude of Impacts in the Short Term

Noise change, $L_{A10\ (18hours)}$ Magnitude of Impact	Noise change, $L_{A10\ (18hours)}$ Magnitude of Impact
0	No change
0.1-0.9	Negligible
1-2.9	Minor
3-4	Moderate
5+	Major

10.3.3.5 Significance of Effect

Having due regard to the existing ambient noise levels at NSRs around the proposed development, the BS5228 threshold values (as detailed in Table 10.3.3) have been used for the construction noise assessment for the residential receptors. In the absence of specific noise limit guidance with regards to the Hotel and the Community Centre, the BS5228 threshold values have also been adopted for the assessment of these receptors.

Any predicted levels above the relevant category threshold (A, B or C) is assessed as a significant effect; whilst predicted levels below the relevant category threshold is assessed as a non-significant effect.

The assessment criteria, including Significance of Effect, used for the road traffic noise assessment is as detailed Table 10.3.7.

Table 10.3.7: Significance of Effects (Road traffic Noise)

Magnitude of Impact	Level of Significance Relative to Sensitivity of Receptor		
	High	Medium	Low
Major	Major	Moderate	Minor
Moderate	Moderate	Moderate	Minor
Minor	Minor	Minor	Negligible
Negligible	Negligible	Negligible	Negligible

Key

	Significant Effect

10.3.4 Methodology for the Prediction of Noise

In order to predict the noise immission levels attributable to the construction of the Proposed Development, noise propagation models are produced using the propriety noise modelling software CadnaA. Within the software, complex models can be used to simulate the propagation of noise according to a range of international calculation standards.

$L_{Aeq(12hours)}$ noise levels have been predicted in accordance with the methods provided in Annex F of BS5228. The noise models use the octave band sound power level of the proposed construction plant as their acoustic input data, and calculate on an octave band basis, attenuation due to geometric spreading, atmospheric absorption and ground effects.

For the purposes of this assessment, all noise level predictions have been undertaken using a receiver height of 1.5m above local ground level. Hard ground (G=0) attenuation has been assumed at all built up locations, roads and the sea. Undeveloped areas outside of Lochmaddy have been modelled as soft ground (G=1). Air absorption based on a temperature of 10°C and 70% relative humidity has been assumed.

All items of plant and activities have been modelled as single point sources and located at the positions closest to the nearest receptors, simulating the likely worst-case situation for any given scenario.

Noise levels have been calculated at the NALs, which have been chosen to represent the most exposed facades and/or outdoor amenity areas of the closest NSRs.

10.3.5 Limitations of Assessment

The noise propagation models are intended to give a good approximation of the specific noise level and the contribution of each individual source. However, it is expected that actual levels are unlikely to be matched exactly with modelled values and the following limitations in the model should be considered:

- The predicted barrier attenuation provided by local topography, embankments, walls, buildings and other structures in the intervening ground between source and receiver can only be approximated and not all barrier attenuation will have been accounted for;
- Unless specifically stated, the models assume all fixed noise sources are operating simultaneously, estimating a worst-case source noise level; and
- All mobile plant (excavators, dozers, rollers etc) have been modelled as a point source operating within the centre of their anticipated work areas. This will give an approximation of the overall noise levels from mobile plant at receptor locations; however, in reality noise levels will fluctuate as construction plant and activities move around the activity area.

10.4 Baseline Information

The site is an existing ferry terminal within a rural village setting. Therefore, noise levels are expected to be generally low, although ambient noise levels in the area will fluctuate with the arrival, departure and berthing of the existing ferry. The main sound sources within the village

are typically road traffic and the ferry itself, including the ferry's engines, which currently runs while it berths overnight, three nights a week.

10.4.1 Results of Noise Monitoring

Table 10.4.1 details the measured three, one-hour L_{Aeq} ambient sound levels for daytime, evening and night-time periods at each of the residential NMLs without the ferry present. At all of the NMLs there was limited variability in sound levels over time and as such, the three-hour sound levels can be thought of as representative for the entire period of interest i.e. daytime (12 hours), evening (4 hours) and night-time (8 hours). At NML04 only a 30-minute daytime measurement was undertaken.

Note the ferry was not berthed overnight when the baseline measurements were taken.

Table 10.4.1: Measured ambient sound levels, dB $L_{Aeq(t)}$

Noise Monitoring Location		Ambient Sound Level, dB $L_{Aeq(t)}$		
NML ID	Descriptor	Daytime	Evening	Night-time
NML 01	Dwellings immediately North of the Ferry Terminal	41	40	34
NML 02	Closest Lochmaddy Residential Area	56	54	28
NML 03	Lochmaddy Hotel	43	37	30
NML 04	Area of otter activity	$40_{(30mins)}$	-	-

Subjective observations made during the monitoring noted the following:

- Sounds that were audible at NML01 upon kit installation were predominantly from distant traffic noise (faint), birdsong, some very occasional local traffic and some resident activity (speech, movement etc.). Upon collection of the kit, the ferry was in the port and passengers were preparing to board and therefore an increased level of traffic was observed. NML01 was installed within a resident's garden, where a small fan for a heating system was present and operated on a periodic basis. The influence of this was filtered from the data.
- Sounds that were audible at NML02 were predominantly from birdsong and the occasional passing car. The faint lapping of water was also heard occasionally.
- Sounds that were audible at NML03 were predominantly from the occasional car passing, some birdsong and some resident/hotel guest activity. In addition, the continual, yet low level sound from a micro wind turbine about 200m away was just audible.

- Sounds that were audible during the monitoring period at NML04 were predominantly from distant engine noise from passing boats (faint), loud intermittent gull calls, occasional traffic, faint lapping of water and some tourist activity (chat, car doors etc.).

Additional attended daytime monitoring was undertaken at NML01 for the arrival and departure of the ferry. Noise monitoring (in 1-minute periods) started at 10:50 and the ferry arrived into port at 11:05.

In the 15 minutes prior to the arrival of the ferry, passenger activity was observed; passengers were milling around the marshalling area, mostly with the engines switched off. Several passengers entered and left the ferry terminal building. Occasionally, cars and lorries entered the marshalling area, either to reverse and turn around or to park. Lorries with idling engines were the dominant noise source.

As the ferry approached to dock, passengers began to return to their cars, with some turning their engines on. The ferry was berthed at 11:07 after around 2 minutes of alarms sounding on board the ferry. The lowering of the ferry access ramp was the dominant noise source at this stage. By 11:12 cars and lorries began to exit the ferry which was fully unloaded by 11:16. Cars and lorries in the marshalling area then began to prepare to board, but generally only switched their engines on when they were instructed to move. The dominant noise source throughout was from the idling of the ferry engines, as opposed to the idling of car engines. Vehicles boarded the ferry from 11:20 until 11:32. Alarms were heard periodically throughout the boarding process, culminating with the ramp alarm at 11:33. The ramp was fully raised by 11:35. All lorries that had exited the ferry had left the terminal by 11:37. The idling/refrigeration sounds coming from these lorries were dominant at certain times. The ferry began to leave at 11:43 and has fully exited the harbour by 11:50.

The 40-minute (11:05-11:45) LAeq measured at NML01 during the unloading, loading and departure of the ferry was 54 dB.

The 1-hour LAeq measured at NML01 during the arrival and departure of the ferry and including the immediate period before the ferry arrived i.e. as cars and passengers arrived at the terminal, was 53 dB.

10.4.2 Summary of Noise Monitoring

Having due regard to the existing ambient noise levels at NSRs around the proposed development, the BS5228 threshold values (as detailed in Table 10.3.4) have been determined each of the NML groups. Table 10.4.2 details the Assessment Category to be used after rounding the measured ambient sound levels to the nearest 5dB.

Table 10.4.2: BS5228 Threshold Categories per NML

Noise Monitoring Location		Threshold Value Category		
NML ID	Descriptor	Daytime	Weekend/Evening	Night-time
NML 01	Dwellings immediately North of the Ferry Terminal	Category A	Category A	Category A
NML 02	Closest Lochmaddy Residential Area	Category A	Category A	Category A
NML 03	Lochmaddy Hotel	Category A	Category A	Category A

10.5 Noise Impact Assessment

Noise levels will vary throughout the construction period as construction activities, plant and locations vary. For much of the working day the noise associated with construction activities would be less than predicted, as the assessment has assumed all equipment is operating at full power, whereas in practice, equipment load, the number of active plant and their precise locations may vary throughout the day. This approach has been adopted to represent a worst-case assessment.

At this stage, a detailed plant list is not available, so a generic plant list based upon experience of similar projects has been used, as well as input from the Wallace Stone the Projects Design Engineers on the likely plant to be used.

10.5.1 Construction Noise Assessment

For completeness, Table 10.4.2 presented the appropriate assessment Threshold Categories for daytime, evening/weekend and night-time working. However, it is anticipated that the hours of construction would be limited to weekday daytime periods only. Should working outside of these hours become necessary for any reason then the associated noise level limits will need to be considered.

Construction will require a number of tasks as detailed in Chapter 2: Project Description, the programme of construction tasks is provided in Appendix B.1 and has been utilised to inform this assessment.

Many of the construction tasks will involve the use of the same plant. Therefore, to avoid repetition, not all tasks have been included within the noise models. Rather, four construction scenarios have been modelled, which represent the worst-case situations that may occur i.e. multiple construction tasks overlapping. The following paragraphs provide a brief overview of each modelled scenario, which should be read in conjunction with Appendix J.2.

Appendix J.2 details the anticipated duration of works as well as the plant likely to be used for each task. Also included within the appendices are details of each plant item considered within the modelled scenarios, as well as the associated sound power levels.

Scenario 01: Placement of Rock Armour and Earthworks

The noise model predicts the noise immission levels anticipated during programme tasks 5 and 6, construction works in the marshalling and hardstanding areas and the carpark extension, considering all of the plant associated with the placement of rock armour, the earth works required to infill behind the rock armour and to surface the area. During these tasks, plant (and activities) will move around the site and noise levels at receptors will vary accordingly. As such, the modelling has been split into three additional scenarios as follows;

- Scenario 1a predicts the noise levels that will occur when the majority of construction activities are occurring towards the north western section of the marshalling area, during task 5 and 6. This scenario presents the worst-case noise levels that are likely to occur at the hotel (NAL01);
- Scenario 1b predicts the noise levels that will occur when the construction activities move towards the dwellings located immediately north of the ferry terminal, required during task 6. This scenario presents the worst-case noise levels that are likely to occur at these dwellings (NAL02 a, b, c and d);
- Scenario 1c predicts the noise levels that will occur when construction activities east of the marshalling area associated with the carpark extension in task 6. This scenario presents the worst-case noise levels that are likely to occur on the peninsula north of the terminal building utilised by otters.

Scenario 02: Repairs to Existing Concrete

Scenario 02 considers activities associated with repairs to existing concrete on the pier (task 11). The noise sources considered within this scenario are also representative of the sources and activities that will also occur during tasks 8, 9 and 10.

Scenario 03: Fendering to Existing Pier

Scenario 03 considers the piling activities and installation of fendering to the pier. This is a unique activity that represents the activities likely to occur in task 13 only.

Scenario 04: Caisson Installation

Scenario 04 models the construction activities that will occur during the installation of the caisson (task 18). However, the same plant and similar activities will also be used during tasks 3, 14 and 19.

10.5.1.1 Construction Noise Impacts

Table 10.5.1 presents the noise immission levels for each assessed scenario at each of the NALs. In addition, Drawings 49L.10.02 through to Drawing 49L.10.08 present noise contour plots, which detail the predicted noise immission levels for all of the nearest NSRs.

Table 10.5.1: Predicted Construction Noise immission Levels, dB $L_{Aeq(12hours)}$

NAL ID	NAL Descriptor	Scenario 1a Hotel	Scenario 1b Dwellings	Scenario 1c Otter area	Scenario 2	Scenario 3	Scenario 4
NAL 01	Lochmaddy Hotel	70	66	63	41	52	46
NAL 02A	Harbour House 01 Front	68	81	66	47	52	49
NAL 02B	Harbour House 01 Rear	68	82	61	42	57	46
NAL 02C	Harbour House 02 Front	54	58	66	50	61	56
NAL 02D	Harbour House 02 Rear	66	74	66	49	56	51
NAL 03	Museum & Arts Centre	54	54	56	39	49	46
NAL 04	Beginning of Lochmaddy Residential Area	43	41	45	30	46	40

For all NALs the BS5228 Threshold Criteria is Category A during weekday daytime hours, which equates to a guideline noise level limit of 65 dBA $L_{Aeq(12\ hours)}$. Table 10.5.2 presents the assessment of the predicted levels against the daytime noise level limits. Green cells indicate noise immission levels are below the threshold levels.

Table 10.5.2: Margin Above/Below (+/-) Daytime Weekday Noise Level Limits, dB

NAL ID	NAL Descriptor	Scenario 1a Hotel	Scenario 1b Dwellings	Scenario 1c Car Park Extension	Scenario 2	Scenario 3	Scenario 4
NAL01	Lochmaddy Hotel	+5	+1	-2	-24	-13	-19
NAL02 A	Harbour House 01 Front	+3	+16	+1	-18	-13	-16
NAL02 B	Harbour House 01 Rear	+3	+17	-4	-23	-8	-19
NAL02 C	Harbour House 02 Front	-11	-7	+1	-15	-4	-9
NAL02 D	Harbour House 02 Rear	+1	+9	+1	-16	-9	-14
NAL03	Museum & Arts Centre	-11	-11	-9	-26	-16	-19
NAL04	Beginning of Lochmaddy Residential Area	-22	-24	-20	-35	-19	-25
NAL01	Lochmaddy Hotel	+5	+1	-2	-24	-13	-19

During tasks 5 and 6 construction activities the predicted levels are higher than the threshold values as follows:

- When the majority of construction activities are occurring to the north west of the marshalling area (modelled as Scenario1a) noise levels are anticipated to exceed the threshold levels by up to 5dB at the hotel and 3dB at the dwellings immediately north of the terminal.
- When construction activities occur at the closest point to the dwellings immediately north of the terminal (modelled as Scenario 1b) noise levels are anticipated to exceed the threshold levels by up to 17 dB.
- When construction activities associated with the carpark extension are being undertaken (modelled as Scenario 1c) noise levels are anticipated to exceed the threshold levels by just 1 dB.

For all other NALs considered within the assessment, no exceedances of the threshold values are anticipated during tasks 5 and 6.

It should be noted that the predicted levels assume that all plant is stationary and working continually for a 12-hour period. In practice, there may be occasions where the instantaneous noise level does equal the level presented in Table 10.5.1, as plant operate at the closest points to the receptors. However, for much of the working day the noise associated with construction

activities would be less than predicted. In reality, only a certain proportion of plant would be operating at any one time, while others maybe idling or turned off. Similarly, plant will only operate directly next to receptors for a small percentage of the time. Tasks 5 and 6 are anticipated to last approximately 16 weeks. During this period the construction activities modelled in Scenario 1a may occur for the full 16 weeks. However, the activities modelled for Scenarios 1b and 1c are only likely to last for approximately 4 weeks.

The predicted noise levels at all of the NALs for scenarios 2, 3 and 4 are below the 65dBA weekday daytime thresholds.

The hotel is classed as medium sensitive receptor during daytime periods. No operations are anticipated during the evenings, weekends or night-time.

Accordingly, comparison of the predicted levels against the Category A Threshold Values for each receptor and each scenario indicates that construction noise impacts are likely to be **significant** during the tasks 5 & 6 construction works and **non-significant** during all of the other construction tasks.

10.5.2 Operation

10.5.2.1 Vessel Noise

The new vessel is still under construction; however, the specification includes requirements with regard to in-air noise emissions, which will result in levels lower than the MV Hebrides. The use of LNG when in harbour will aid in minimising source noise levels, when the vessel is entering the harbour area, berthing and loading and unloading.

As discussed in Chapter 2 the MV Hebrides overnights at Lochmaddy three nights a week. The new vessel will work to the same timetable and hence shall also overnight three nights a week. However, the introduction of an onshore power supply allowing the new vessel to plug in at night, will allow it to switch off its engines. Once cold ironing is in use, the overnight noise levels when the vessel is in are likely to be close to those measured with no vessel present. At the houses immediately north of the ferry terminal this is 34 dBA, which is around 20 dB lower than those levels measured at the same location during the berthing of the ferry.

10.5.2.2 Increased Traffic

As the capacity of the new ferry will be increased, so will the potential number of vehicles arriving and exiting the ferry terminal for each ferry movement. With regards to vehicles arriving prior to boarding the ferry, noise levels are unlikely to increase. Subjective observation during sound level surveys has shown that vehicles arrive gradually over a period of time prior to embarkation. Once in the ferry terminal the drivers typically switch off their engines and no significant sources of noise are present whilst waiting for the ferry to arrive or embarkation to commence. Therefore, the anticipated increases in road traffic noise are related to disembarkation only.

Traffic flow data related to the existing ferry operations as well as the anticipated future traffic flows associated with the proposed development are detailed within Chapter 12: Traffic, Access

and Navigation. In particular, the chapter provides the forecast increase in vehicles during the July Peak times.

Table 10.5.3 details the average number of vehicles arriving i.e. disembarking per sailing during peak periods. The data is derived from actual count data for 2016 and is predicted (including the Proposed Development) for 2022.

Table 10.5.3: July (Peak Month) Traffic Numbers (Rounded)

Year	Total Number of Vehicles	% Increase from 2016
2016	57	
2022	72	26

The percentage increase in road traffic flows around ferry arrival and departure times for all assessed routes is just over 25%. Therefore, the associated noise level increase would be expected to be around 1 dBA. It should be noted, however, that the DMRB assessment methodology is based upon an 18-hour noise metric, whereas the traffic flows considered here are only for immediately after the ferry has docked, as vehicles disembark. As such, use of the data presented in Table 10.5.3 leads to a conservative noise assessment, as the percentage traffic flow increase is assessed on a single event basis that will last for only a few minutes for a maximum of twice a day, rather than looking at the total percentage increase over an 18-hour day, which would be significantly lower. The actual change in the L10, 18-hour noise level will therefore be less than 1 dBA. As such, the threshold criteria used for the noise assessment in DMRB of "*a permanent change in magnitude of 1 dB LA10,18h,*" will not be met and the DMRB assessment does not need to be progressed further.

10.5.2.3 Operational Noise Impact

Operational noise levels from the berthing of the vessel overnight are anticipated to be reduced by approximately 20 dB and as such this will have a beneficial effect on the local noise environment. Cold ironing will give rise to a **beneficial, major: significant** effect on the houses immediately north of the ferry terminal and the hotel. There will be some a beneficial minor, non-significant effect associated with the use of LNG during ferry berthing.

The beneficial effects of reduced ferry noise will reduce with distance. Hence, the next nearest residential properties will have a **beneficial, moderate: significant** effect at night and **no change** during the day.

Cold ironing reduces noise levels for the overnighting vessel. As the Museum & Arts Centre is not occupied overnight, it will not benefit in the same way as other receptors. Hence, the effect on this receptor is **no change.**

With due regard to the DMRB Magnitudes of Impact (Table 10.3.6) the predicted noise level increase from road traffic is classed as *Negligible*.

Considering the above and in accordance with the assessment criteria detailed in Table 10.3.7, the Significance of Impact is deemed to be *Negligible and the* operational noise impacts are classed as **non-significant.**

10.6 Mitigation Measures

10.6.1 Construction

Section 8 of BS5228 recommends a number of simple control measures, which would be implemented as a means of best practice.

The principal contractor would:

- Keep local residents informed of the proposed working schedule, where appropriate, including the times and duration of any abnormally noisy activity that may cause concern;
- Ensure that haulage vehicles would not arrive at or leave the site between 19.00 and 07.00 hours;
- Ensure all vehicles and mechanical plant would be fitted with effective exhaust silencers and 'smart' reversing alarms and be subject to programmed maintenance;
- Select inherently quiet plant where appropriate - all major compressors, pumps and generators would be 'sound reduced' models fitted with properly lined and sealed acoustic covers, which would be kept closed whenever the machines are in use;
- Ensure all ancillary pneumatic percussive tools would be fitted with mufflers or silencers of the type recommended by the manufacturers;
- Instruct machine operator to shut down machines between work periods or throttled down to a minimum;
- Ensure regular maintenance of all equipment used on site, including maintenance related to noise emissions;
- Ensure that vehicles are loaded carefully to ensure minimal drop heights so as to minimise noise during this operation; and
- Ensure all ancillary plant such as generators and pumps are positioned so as to cause minimum noise disturbance and if necessary, temporary acoustic screens or enclosures should be provided.

With regard to construction task 6 carried out close to the 2 dwellings immediately north of the terminal (NAL02), modelled as Scenario 1b, specific mitigation is required to reduce impacts on the local residents. BS5228 encourages an open dialogue to be maintained between the developer and residents that may be affected by noise and in this regard stating:

> *"In general, the longer the duration of activities on a site, the more likely it is that noise from the site will prove to be an issue, assuming NSPs [noise sensitive properties] are likely to be significantly affected. In this context, good public relations and communication are important. Local residents might be willing to accept higher levels of noise if they know that such levels will only last for a short time. It is then important that construction activities are carried out in accordance with the stated schedule and that the community is informed of their likely durations".*

As there are only two properties affected, bespoke mitigation can be developed to meet the resident's particular needs. This may include:

- Daily timing of works, to avoid periods when they are more likely to be impacted e.g. early mornings, or meal times;
- Programming of works, potential to coincide with residents' holidays;
- Duration of works, residents may have a preference for the works to be completed over a short number of days or for a few hours each day spread over a longer period of time.
- Physical mitigation including the installation of noise barriers to mitigate noise levels reaching the residents. An example of a 2.5m high acoustic barrier placed as shown in Figure 10.6.1 would reduce noise levels at NAL02B by up to 15dB for mobile plant working up close to the property. It is noted that the barrier itself would be intrusive.

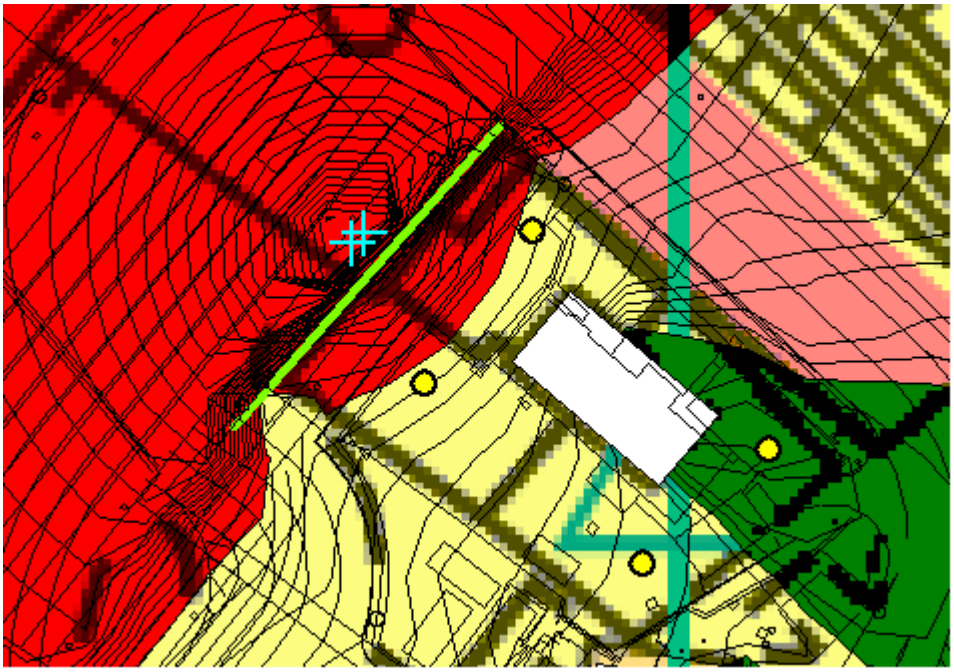

Figure 10.6.1: Example Noise Barrier Installation

Discussion with the homeowners, will inform the specific mitigation incorporated, to minimise the effects on the two properties most affected. A combination of the potential mitigation measures is likely to be required.

Once a main contractor is appointed, careful consideration will be given to the type of plant to be used for each stage of construction as well as construction work schedules.

Noise level monitoring will be undertaken close to the nearest NSRs at times when new construction tasks occurs in order to quantify noise levels and identify any requirements for additional mitigation measures. A noise monitoring protocol and schedule, as well as a protocol for handling any noise related complaints, will be contained within the Construction Environmental Management Document (CEMD).

10.6.2 Operation

There are no mitigation measures proposed or required to lessen the noise impacts associated with the operational noise.

10.7 Residual Effects

Use of best practice noise control measures will reduce construction noise levels to lower levels than reported in the noise assessments. During construction task 6 activities, construction noise impacts may be **significant** for two receptors. However, maintaining an open dialogue with the residents should help to limit these impacts.

10.8 Summary of Effects

This chapter has assessed the impact of noise from the construction of the proposed development as well as operational noise, specifically in regards to road traffic noise and ferry noise.

Given the proximity to noise sensitive properties, temporary adverse construction noise effects are anticipated during construction activities immediate adjacent to the properties (task 6). However, during other proposed construction tasks, no adverse effects are anticipated. The assessment of construction noise concludes that noise impacts will be **significant** during construction works in the immediate vicinity of residential properties and **non-significant** during all other tasks.

Noise levels from the operation of the ferry will be reduced. It is not possible to quantify the level of reduction at this stage, although the specifications of the vessel currently in construction details maximum noise output values that are lower than the existing ferry. During the night-time the new ferry will no longer need to operate its engines for power generation and noise levels at night-time will drop significantly. The assessment of operational noise concludes that noise impacts attributable to the ferry will be **significant and beneficial**.

In terms of road traffic noise levels, increases will be in very small amounts (less than 1 dB) that will occur at peak times only. The assessment of road traffic noise concludes that noise impacts will be **non-significant.**

Table 10.8.1 presents the summary of noise effects.

Table 10.8.1 Summary of Impacts

Receptor and Value		Phase	Predicted Impact	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
Lochmaddy Hotel	Medium (daytime) High (evening & night-time)	Construction	Noise from construction activities.	n/a	Non-Significant	No specific mitigation required.	Non-Significant Adverse Short-term	Non-Significant
		Operational	Ferry berthing using LNG.	Minor Beneficial Permanent	Non-Significant	n/a	Minor Beneficial Permanent	Non-Significant
		Operational	Cold ironing of vessel overnight.	Major Beneficial Permanent	Major: Significant	n/a	Major Beneficial Permanent	Major: Significant
		Operational	Noise from road traffic.	Negligible Adverse Permanent	Negligible	No specific mitigation required.	Negligible Adverse Permanent	Non-Significant
Houses immediately north of the Ferry Terminal	High	Construction	Noise from construction activities in the immediate vicinity of the properties (Task 6).	n/a	Significant	Bespoke mitigation required to be determined through dialogue with residents.	Significant Adverse Very Short-Term	Significant
		Construction	Noise from other construction activities.	n/a	Non-Significant	No specific mitigation required.	Non-Significant Adverse Short-term	Non-Significant
		Operational	Ferry berthing using LNG.	Minor Beneficial Permanent	Non-Significant	n/a	Minor Beneficial Permanent	Non-Significant

Receptor and Value		Phase	Predicted Impact	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
		Operational	Cold ironing of vessel overnight.	Major Beneficial Permanent	Major: Significant	n/a	Major Beneficial Permanent	Major: Significant
		Operational	Noise from road traffic.	Negligible Adverse Permanent	Negligible	No specific mitigation required.	Negligible Adverse Permanent	Non-Significant
Museum & Arts Centre	High	Construction	Noise from construction activities.	n/a	Non-Significant	No specific mitigation required.	Non-Significant Adverse Short-term	Non-Significant
		Operational	Ferry berthing using LNG. Cold ironing of vessel overnight.	Negligible Beneficial Permanent	Non-Significant	n/a	Negligible Beneficial Permanent	Non-Significant
		Operation	Noise from road traffic.	Negligible Adverse Permanent	Negligible	No specific mitigation required.	Negligible Adverse Permanent	Non-Significant
Closest Lochmaddy Residential Area	High	Construction	Noise from construction activities.	n/a	Non-Significant	No specific mitigation required.	Non-Significant Adverse Short-term	Non-Significant
		Operational	Ferry berthing using LNG.	Minor Beneficial Permanent	Non-Significant	n/a	Minor Beneficial Permanent	Non-Significant
		Operational	Cold ironing of vessel overnight.	Moderate Beneficial Permanent	Moderate: Significant	n/a	Moderate Beneficial Permanent	Moderate: Significant

Receptor and Value		Phase	Predicted Impact	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
		Operational	Noise from road traffic.	Negligible Adverse Permanent	Negligible	No specific mitigation required.	Negligible Adverse Permanent	Non-Significant

Key

	Significant Effect

10.9 References

BSI (2014). *BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites. Noise*. UK: British Standards Institute.

Department for Transport (2011). *Design Manual for Roads and Bridges, Volume 11, Section 3, Part 7, Noise*. UK: Department for Transport

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Chapter 11: Noise and Vibration (Underwater)

Contents

11 Noise and Vibration (Underwater)

11.1 Introduction

There is the potential for underwater noise to be generated during the construction works, and an increase marine noise can affect marine mammals and fish. During the construction of the Lochmaddy ferry terminal upgrade, impact and vibro piling, dredging, rock breaking and vessel movements have the potential to result in elevated levels of underwater noise. Noise has the potential to disturb and possibly injure marine mammals and fish, thus could result in negative individual and population level effects. Different species have different hearing abilities and hence any given sound will be perceived differently by each species.

Only the construction phase of the proposed development is considered in this chapter. Operational and decommissioning noise emissions were scoped out of the EIAR in agreement with Marine Scotland.

11.2 Source of Information

11.2.1 Planning and Legislative Framework

The Scottish Government has released general policies as part of the Scotland's National Marine Plan in favour of sustainable development and use of the marine environment which include:

- ***GEN 13 Noise:*** *Development and use of the marine environment should avoid significant adverse effects of man-made noise and vibration, especially on species sensitive to such effects* (Scottish Government, 2015a).

The Scottish government has released a series of good environmental status descriptors within Scotland's National Marine Plan. These include:

- ***GES 11:*** *Introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment.* (Scottish Government, 2015b).

11.2.2 Relevant Guidance

There are no internationally agreed standards with regards to the assessment of underwater noise and it is current practice to undertake assessments based on criteria provided in the scientific literature or guidance published by regulatory authorities. For this assessment, the criteria are based on:

- National Marine Fisheries Service (NMFS). (2016). *Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing: Underwater Acoustic Thresholds for Onset of Permanent and Temporary Threshold Shifts;* and
- Popper A N *et al.* (2014). *Sound Exposure Guidelines for Fishes and Sea Turtles.*

11.3 Assessment Methodology

11.3.1 Baseline Data Collection

No baseline data has been collected in the course of this assessment and no published data is available for the existing underwater noise levels within Lochmaddy harbour.

11.3.2 Impact Assessment Methodology

An underwater noise model will be developed, in order to predict the noise emission levels and frequencies at different ranges from the site, resulting from the different phases of the development. The phases considered will include:

- Vibro piling,
- Impact piling,
- Rock breaking, and
- Backhoe dredging.

The underwater noise model will inform the marine ecological impact assessments provided in Chapters 6 and 8.

11.3.3 Identification and Assessment of Mitigation

This Chapter only identifies the estimated impact ranges for sensitive receptors, resulting from the construction of the Lochmaddy ferry terminal upgrade. No consideration is made to the significance of these impacts with regard to marine mammals or fish on an individual or population level. The ecological assessments are conducted in Chapter 6: Marine Mammals, and Chapter 8: Fish. Where necessary, appropriate mitigation measures are identified in the topic specific chapters. As such, no mitigation will be presented in this chapter.

11.3.4 Assessment of Residual Effects

Since no mitigation is proposed in this Chapter, the residual effects cannot be considered.

11.3.5 Limitations of Assessment

The assessment will be carried out using established modelling, based on data derived from the literature, along with measurements undertaken by Subacoustech Environmental of similar equipment. No direct measurements of environmental parameters in the vicinity of the site, or of noise levels produced by the specific sources are available to inform the assessment, and as such the results are considered indicative of what might be expected from a typical operation.

11.4 Baseline Information

No data is available for marine baseline noise levels within Lochmaddy Harbour, and no baseline monitoring was conducted. The current source of in water noise would be limited to vessel traffic; the arrival and departure of the ferry using the terminal and any other vessels entering the area. In addition, Acoustic Deterrent Devices (ADDs) may be utilised by the nearby fish farm (~3 km NE of the terminal) to deter seals from the fish stocks, and these will contribute to the baseline underwater noise levels in the vicinity.

11.5 Noise Impact Assessment

Underwater noise modelling has been undertaken to estimate the received sound pressure levels in the region, with particular concern for the impacts on marine mammals and fish.

As the site area in Lochmaddy harbour is relatively small, a single representative modelling location has been selected for modelling (approximate coordinates: 57°35.78'N, 007°09.38'W) this is shown by the red marker in Figure 11.5.1.

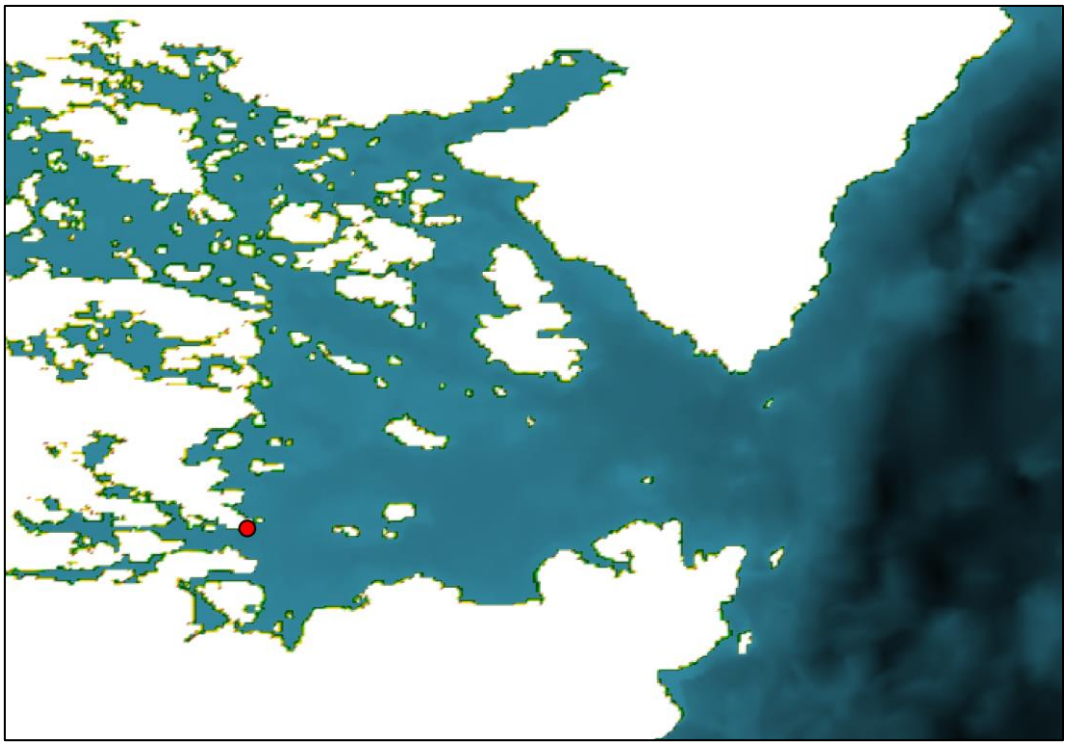

Figure 11.5.1: Image showing the location of Lochmaddy ferry terminal and the surrounding bathymetry (bathymetry supplied by Find Mapping Ltd © British Crown and OceanWise, 2017. All rights reserved. Not to be used for Navigation.)

11.5.1 Underwater Noise Modelling Approach

Three underwater noise modelling methodologies have been used for this assessment based on the likely severity of impact of each noise source based on noise levels previously measured by Subacoustech.

- High noise sources (impact piling) have been assessed using detailed modelling considering all environmental parameters;
- Moderate sources (vibro piling and rock breaking) use a simple modelling approach based on a conservative worst case; and
- Low noise sources (dredging and vessel movements) have been considered qualitatively based on previously measured data.

11.5.1.1 Impact Piling

Detailed modelling has been undertaken impact pile driving.

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

- A parabolic equation (PE) method for lower frequencies (12.5 Hz to 250 Hz); and
- A ray tracing method for higher frequencies (315 Hz to 100 kHz).

The PE method is widely used within the underwater acoustics community but has computational limitations at high frequencies. Ray tracing is more computationally efficient at higher frequencies but is not suited to low frequencies (Etter, 1991). This study utilises the software implementation of these numerical solutions in dBSea v2.

These solvers account for a wide array of input parameters, including bathymetry, sediment data, sound speed and source frequency content to ensure as detailed results as possible. These input parameters are described in the following sections.

Environmental input data

The bathymetry data used in the modelling was supplied by Find Mapping Ltd; this data has a resolution of 1 arc second (a grid of squares measuring approximately 30 m by 60 m). A high tide of 4.8 m (Mean High Water Springs) has been used throughout the modelling as this represents a conservative approach with regards to noise propagation.

Sound speed data has been calculated using temperature and salinity data from Marine Scotland (Bresnan *et al*. 2016) using the equation from Mackenzie (1981). Results show a variation in sound speed from 1489.8 m/s at the surface to 1491.7 m/s at 120 m.

Based on data from Hansom *et al*. (2007) the seabed properties used for modelling were assumed to be predominantly gravel with limited coarse sand patches. Geo-acoustic properties for the seabed were based on available data from Jensen *et al*. (2011), and are provided in Table 11.5.1.

Table 11.5.1: Seabed geo-acoustic properties used for modelling

Seabed type	Compressive sound speed in substrate (ms^{-1})	Density profile in substrate (kg/m^3)	Attenuation profile in substrate (dB/wavelength)
Sand	1650	1900	0.8
Gravel	1800	2000	0.6

Impact piling source levels

The proposed impact piling operations at Lochmaddy assumes the installation of 660 mm diameter piles using a blow hammer energy of between 50 and 150 kJ. In order to cover a range of the likely noise levels both 50 kJ and 150 kJ impact piling has been modelled.

The source levels used for the modelling of these two hammer energies is based on Subacoustech's extensive database of impact piling noise, with the predicted source level calculated from the blow energy and water depth of a piling location. These have been shown to be the primary factors determining the subsea noise levels produced. As the model assumes that the noise source acts as a single point, the water depth at the noise source (accounting for tide) has been used to adjust the source level to allow for the length of the pile in contact with the water.

The unweighted SPLpeak source levels estimated for Lochmaddy are:

- 197.1 dB re 1 µPa SPL_{peak} (50 kJ blow energy)
- 205.4 dB re 1 µPa SPL_{peak} (150 kJ blow energy)

These source levels equate to single strike SEL source levels of 173.2 dB re 1 μPa^{2}s for a 50 kJ hammer and 181.6 dB re 1 μPa^{2}s for a 150 kJ hammer.

The third octave levels used for modelling are illustrated in Figure 11.5.2. As the frequency content is determined by the dimensions of the pile, the shape of the two spectra are the same for both blow energies, with the overall source levels adjusted.

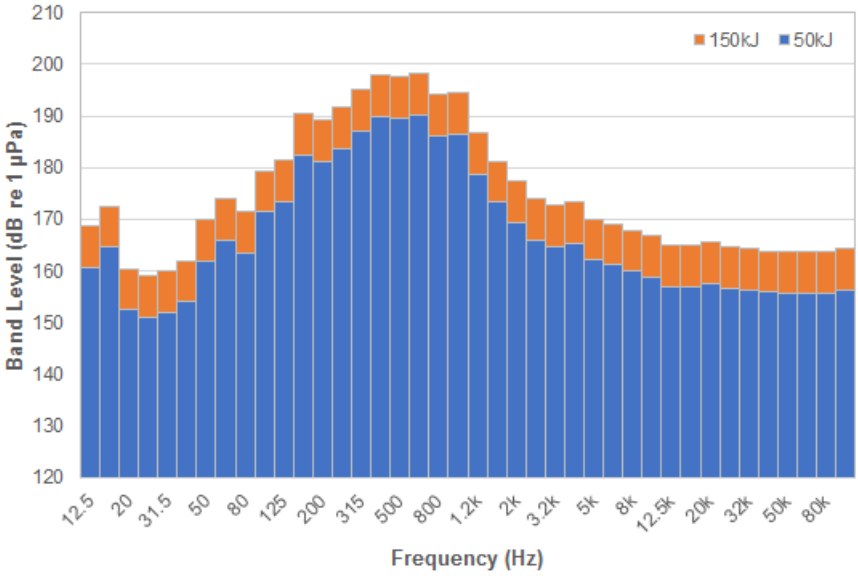

Figure 11.5.2: Source third octave band levels to be used to model impact piling (SPL_{peak})

11.5.1.2 Vibro-Piling and Rock Breaking

Modelling of noise from vibro piling and rock breaking have been undertaken using a simple modelling approach; Subacoustech's SPEAR model. This methodology has been chosen due to either low levels of noise or limited data availability. This simple modelling methodology comprises of using existing measurement data from similar activities taken by Subacoustech and others and modifying the source level to best match the scenario being modelled.

Source levels used for vibro piling have been based on third octave band measurements undertaken by Subacoustech of the vibro piling of ~500 mm tubular piles in Brighton Marina using a PVE Dieseko 2350VM pile vibrator.

Source levels used for rock breaking are based on data from a report by Marshall Day Acoustics (Lawrence, 2016) involving the use of a hydraulic pecker and is, at the time of writing, the best available information on underwater noise levels from rock breaking activities.

The unweighted RMS source levels (and 1 s SEL) used for the SPEAR modelling are given in Table 11.5.2.

Table 11.5.2: Unweighted RMS source levels used for SPEAR modelling

Metric	Vibro piling	Rock breaking
RMS Source level @ 1 m	188.0 dB re 1 μPa	175.4 dB re 1 μPa

11.5.1.3 Other noise sources

The low-level noise sources (backhoe dredging and vessel movements) have been assessed qualitatively in this report using measured noise levels from the Subacoustech noise measurement database.

11.5.2 Assessment Criteria

The impacts of underwater sound on marine animals can be broadly summarised into three categories:

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

The metrics and criteria that have been used in this study to assess the possible environmental effects are based on the latest guidance from the U.S. National Marine and Fisheries Service (NMFS) concerning underwater noise and its effects on marine mammals, NMFS, (2016), and Popper *et al.* (2014) for the impacts of noise on species of fish.

11.5.2.1 Marine mammals

The NMFS (2016) guidance groups marine mammals into functional hearing groups and applies filters to the unweighted noise to approximate the hearing response of the receptor. The hearing groups given in the NMFS (2016) are summarised in Table 11.5.3.

The auditory weighting functions for each hearing group are provided in Figure 11.5.3.

Table 11.5.3: Marine mammal hearing groups (from NMFS, 2016)

Hearing Group	Example Species	Generalised Hearing Range
Low Frequency (LF) Cetaceans	Baleen Whales	7 Hz to 35 kHz
Mid Frequency (MF) Cetaceans	Dolphins, Toothed Whales, Beaked Whales, Bottlenose Whales (including Bottlenose Dolphin)	150 Hz to 160 kHz
High Frequency (HF) Cetaceans	True Porpoises (including Harbour Porpoise)	275 Hz to 160 kHz
Phocid Pinnipeds (PW) (underwater)	True Seals (including Harbour Seal)	50 Hz to 86 kHz

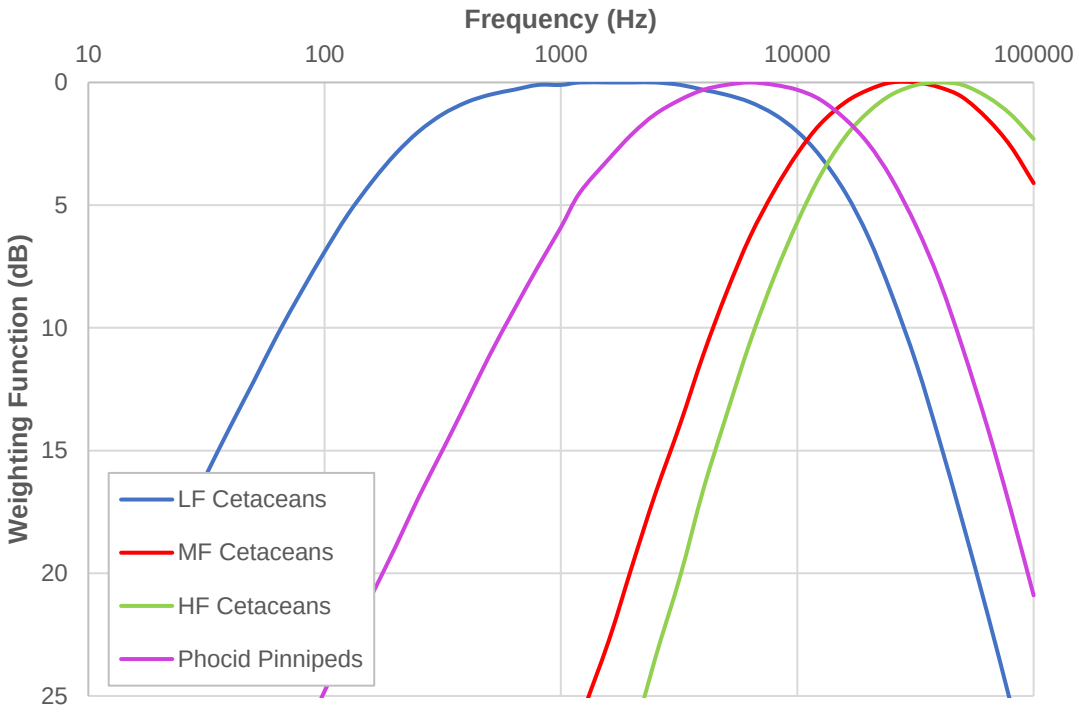

Figure 11.5.3: Auditory weighting functions for low frequency (LF) cetaceans, mid frequency (MF) cetaceans, high frequency (HF) cetaceans, phocid pinnipeds (PW) (underwater) (from NMFS, 2016)

NMFS (2016) presents unweighted peak criteria (SPL_{peak}) and cumulative, 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. Table 11.5.4 and Table 11.5.5 summarise the NMFS (2016) criteria for onset of risk of PTS and TTS for each of the key marine mammal hearing groups for impulse and non-impulsive noise.

In the assessment of cumulative SEL values, a stationary animal model has been used as a conservative approach, assuming that the receptor stays at the same range from a noise source for its entire duration.

Table 11.5.4: Assessment criteria for marine mammals from NMFS (2016) for impulsive noise (impact piling)

Impulsive Noise	TTS Criteria		PTS Criteria	
Hearing Group	SEL_{cum} (weighted) dB re 1 μPa²s	SPL_{peak} (unweighted) dB re 1 μPa	SEL_{cum} (weighted) dB re 1 μPa²s	SPL_{peak} (unweighted) dB re 1 μPa²s
LF Cetaceans	168	213	183	219
MF Cetaceans	170	224	185	230
HF Cetaceans	140	196	155	202
PW Pinnipeds	170	212	185	218

Table 11.5.5: Assessment criteria for marine mammals from NMFS (2016) for non-impulsive noise (vibro piling and rock breaking)

Non-Impulsive Noise	TTS Criteria	PTS Criteria
Hearing Group	SEL_{cum} (weighted) dB re 1 μPa²s	SEL_{cum} (weighted) dB re 1 μPa²s
LF Cetaceans	179	199
MF Cetaceans	178	198
HF Cetaceans	153	173
PW Pinnipeds	181	201

To undertake the modelling for the NMFS (2016) criteria with regards to the weighted criteria, the source levels were first adjusted using the auditory weighting functions shown in Figure 11.5.3. The resulting noise levels are presented in Table 11.5.6 and Table 11.5.7.

Table 11.5.6: Summary of the NMFS (2016) weighted source levels at 1 metre used for detailed modelling

Hearing Group	Impact piling Source Level (50 kJ) (Single Pulse SEL)	Impact piling Source Level (150 kJ) (Single Pulse SEL)
Unweighted	173.2 dB re 1 μPa²s	181.6 dB re 1 μPa²s
LF Cetaceans	172.4 dB re 1 μPa²s	180.8 dB re 1 μPa²s
MF Cetaceans	144.6 dB re 1 μPa²s	153.0 dB re 1 μPa²s
HF Cetaceans	142.5 dB re 1 μPa²s	150.9 dB re 1 μPa²s
Phocid Pinnipeds	163.3 dB re 1 μPa²s	171.7 dB re 1 μPa²s

Table 11.5.7: Summary of the NMFS (2016) weighted source levels at 1 metre used for simple modelling

Hearing Group	Vibro Piling Source Level (1 second SEL)	Rock Breaking Source Level (1 second SEL)
Unweighted	188.0 dB re 1 μPa^{2}s	175.4 dB re 1 μPa^{2}s
LF Cetaceans	185.6 dB re 1 μPa^{2}s	174.8 dB re 1 μPa^{2}s
MF Cetaceans	172.0 dB re 1 μPa^{2}s	157.5 dB re 1 μPa^{2}s
HF Cetaceans	167.2 dB re 1 μPa^{2}s	154.9 dB re 1 μPa^{2}s
Phocid Pinnipeds	183.6 dB re 1 μPa^{2}s	169.1 dB re 1 μPa^{2}s

11.5.2.2 Fish

The effects of noise on fish have been assessed using criteria from Popper *et al*. (2014), which gives specific criteria for mortality and potential mortal injury, recoverable injury and TTS, masking and behaviour from various stimuli, including impact piling and continuous noises. Species of fish are grouped by whether or not they have a swim bladder, and whether the swim bladder is involved in its hearing. The criteria are given as unweighted SPL_{peak}, RMS, and SEL_{cum} values and are presented alongside the results.

Where insufficient data is available, Popper *et al.* (2014) gives qualitative criteria, summarising the effect of the 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). This also includes information for masking and behavioural effect. These qualitative effects are reproduced in Table 11.5.8 and Table 11.5.9.

Table 11.5.8: Summary of the qualitative effects on fish from impact piling noise from Popper et al. (2014) (N=Near-field, I=Intermediate-field, F=Far-field)

Impact Piling Hearing Group	Recoverable Injury	TTS	Masking	Behaviour
Fish: no swim bladder	-	-	(N) Moderate (I) Low (F) Low	(N) High (I) Moderate (F) Low
Fish: swim bladder not involved in hearing	-	-	(N) Moderate (I) Low (F) Low	(N) High (I) Moderate (F) Low
Fish: swim bladder involved in hearing	-	-	(N) High (I) High (F) Moderate	(N) High (I) High (F) Moderate

Table 11.5.9: Summary of the qualitative effects on fish from shipping and other continuous noises from Popper et al. (2014) (N=Near-field, I=Intermediate-field, F=Far-field)

Shipping and Other Continuous Noise / Hearing Group	Recoverable Injury	TTS	Masking	Behaviour
Fish: no swim bladder	(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 not involved in hearing	(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) High (I) High (F) High	(N) High (I) Moderate (F) Low

11.5.3 Construction Assessment

11.5.3.1 Impact Piling

Unweighted SPL_{peak}

The SPL_{peak} noise level from impact piling for a 660 mm diameter pile using blow energies of 50 and 150 kJ are presented in Figure 11.5.4 and Figure 11.5.5 for the maximum level in the water column. A cross section of a north-easterly transect (70°) was also generated which showed that the noise is evenly distributed through the water column with slightly higher noise levels in the mid-water depths. These results have been analysed for their potential impact on marine mammals and fish, using the criteria detailed in section 11.5.2, and the predicted impact ranges are presented in Tables 11.5.10 and 11.5.11.

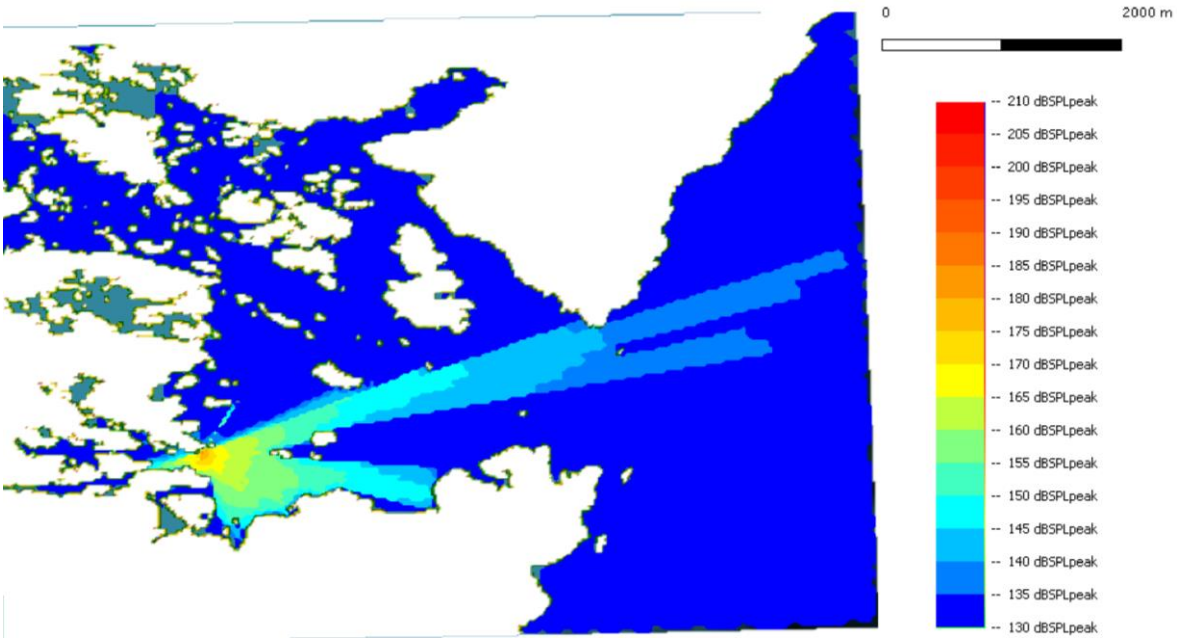

Figure 11.5.4: Impact piling (50 kJ blow energy), unweighted SPL_{peak}

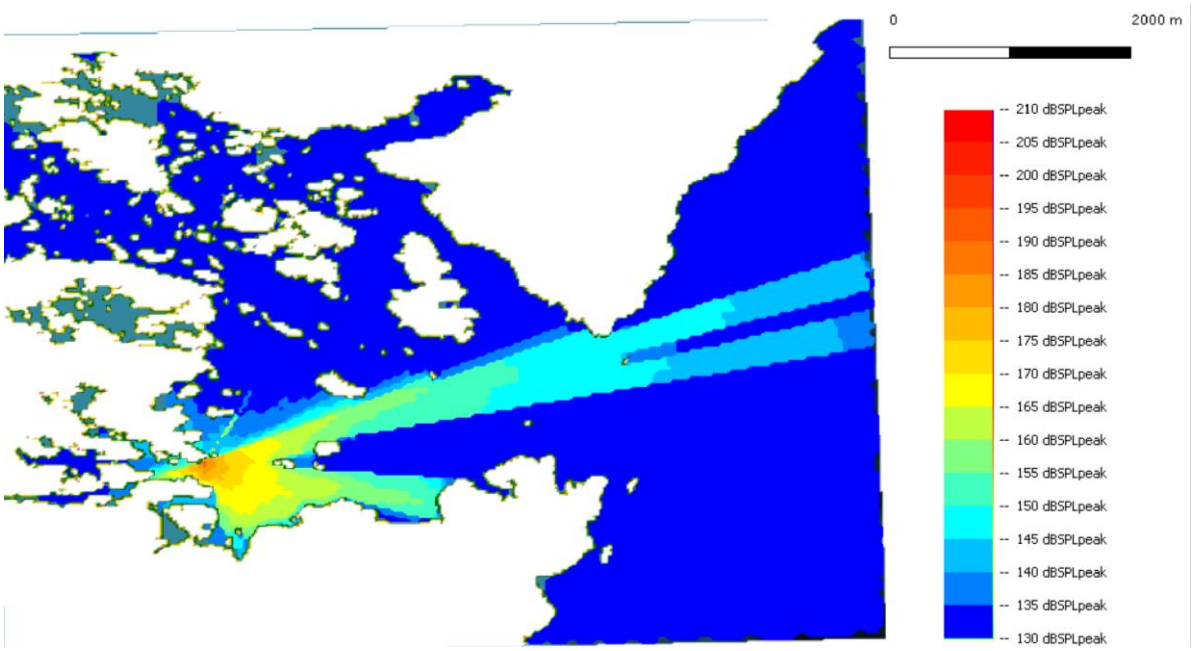

Figure 11.5.5: Impact piling (150 kJ blow energy), unweighted SPL_{peak}

Table 11.5.10: Maximum ranges to NMFS (2016) SPL_{peak} injury criteria for marine mammals from impact piling noise for two hammer sizes based on the maximum level in the water column

Threshold	Criteria SPL_{peak} (Unweighted)	Impact Piling (50 kJ) SPL_{peak} Maximum Range	Impact Piling (150 kJ) SPL_{peak} Maximum Range
LF Cetaceans TTS	213 dB re 1 µPa	< 1 m	< 1 m
MF Cetaceans TTS	224 dB re 1 µPa	< 1 m	< 1 m
HF Cetaceans TTS	196 dB re 1 µPa	1 m	9 m
PW Pinnipeds TTS	212 dB re 1 µPa	< 1 m	< 1 m
LF Cetaceans PTS	219 dB re 1 µPa	< 1 m	< 1 m
MF Cetaceans PTS	230 dB re 1 µPa	< 1 m	< 1 m
HF Cetaceans PTS	202 dB re 1 µPa	< 1 m	2 m
PW Pinnipeds PTS	218 dB re 1 µPa	< 1 m	< 1 m

Table 11.5.11: Maximum ranges to Popper et al. (2014) SPL_{peak} injury criteria for species of fish from impact piling noise for two hammer sizes based on the maximum level in the water column

Threshold	Criteria SPL_{peak} (Unweighted)	Impact Piling (50 kJ) SPL_{peak} Maximum Range	Impact Piling (150 kJ) SPL_{peak} Maximum Range
Fish (no swim bladder) injury	213 dB re 1 µPa	< 1 m	< 1 m
Fish (with swim bladder) injury	207 dB re 1 µPa	< 1 m	< 1 m

Cumulative SEL (SEL_{cum})

The noise from impact piling is a multiple pulse source and as such cumulative SEL values have been calculated assuming piling lasting 1 hour (a typical duration for continuous impact piling). Table 11.5.12 and Table 11.5.13 present the impact ranges for marine mammal and fish assuming a stationary receptor. If a fleeing receptor were assumed for these results, the predicted impact ranges would be reduced.

Table 11.5.12: Maximum ranges to NMFS (2016) weighted SEL_{cum} injury criteria for marine mammals from impact piling noise for two hammer sizes assuming a stationary animal and 1 hour of piling based on the maximum level in the water column

Threshold	Criteria SEL_{cum} (Weighted)	Impact piling (50 kJ) SEL_{cum} (1 hour) Maximum Range	Impact piling (150 kJ) SEL_{cum} (1 hour) Maximum Range
LF Cetaceans TTS	168 dB re 1 μPa²s	780 m	1.4 km
MF Cetaceans TTS	170 dB re 1 μPa²s	12 m	56 m
HF Cetaceans TTS	140 dB re 1 μPa²s	620 m	1.2 km
PW Pinnipeds TTS	170 dB re 1 μPa²s	200 m	570 m
LF Cetaceans PTS	183 dB re 1 μPa²s	120 m	380 m
MF Cetaceans PTS	185 dB re 1 μPa²s	< 1 m	2 m
HF Cetaceans PTS	155 dB re 1 μPa²s	97 m	280 m
PW Pinnipeds PTS	185 dB re 1 μPa²s	29 m	86 m

Table 11.5.13: Maximum ranges to Popper et al. (2014) unweighted SEL_{cum} injury criteria for species of fish from impact piling noise for two hammer sizes assuming a stationary animal and 1 hour of piling based on the maximum level in the water column

Threshold	Criteria SEL_{cum} (Unweighted)	Impact piling (50 kJ) SEL_{cum} (1 hour) Maximum Range	Impact piling (150 kJ) SEL_{cum} (1 hour) Maximum Range
Fish (no swim bladder) mortality and potential mortal injury	219 dB re 1 μPa²s	< 1 m	< 1 m
Fish (no swim bladder) recoverable injury	216 dB re 1 μPa²s	< 1 m	1 m
Fish (with swim bladder not involved in hearing) mortality and potential mortal injury	210 dB re 1 μPa²s	< 1 m	5 m
Fish (with swim bladder involved in hearing) mortality and potential mortal injury	207 dB re 1 μPa²s	1 m	11 m
Fish (with swim bladder) recoverable injury	203 dB re 1 μPa²s	4 m	31 m
Fish TTS	186 dB re 1 μPa²s	92 m	270 m

11.5.3.2 Vibro Piling and Rock Breaking

Underwater noise from the piling using a vibratory pile driver along with rock breaking have been modelled using Subacoustech's SPEAR model. This is a simple model which uses Subacoustech's measurement database to estimate noise levels with range.

For vibro piling, ranges have been calculated for a stationary animal, and are based on 1 hour of operation in a given 24-hour period (the same duration given for impact piling). The ranges for rock breaking have assumed a stationary animal, and rock breaking being undertaken for up to 8 hours in a given 24-hour period. The predicted ranges are given in Table 11.5.14 and Table 11.5.15.

Table 11.5.14: Ranges to NMFS (2016) SEL_{cum} non-impulsive injury criteria for marine mammals from vibro piling and rock breaking noise

Threshold	Criteria SEL_{cum} (Weighted)	Vibro Piling (1 hour)	Rock Breaking (8 hours)
LF Cetaceans TTS	179 dB re 1 μPa^{2}s	200 m	300 m
MF Cetaceans TTS	178 dB re 1 μPa^{2}s	40 m	40 m
HF Cetaceans TTS	153 dB re 1 μPa^{2}s	500 m	600 m
PW Pinnipeds TTS	181 dB re 1 μPa^{2}s	100 m	100 m
LF Cetaceans PTS	199 dB re 1 μPa^{2}s	10 m	20 m
MF Cetaceans PTS	198 dB re 1 μPa^{2}s	3 m	1 m
HF Cetaceans PTS	173 dB re 1 μPa^{2}s	40 m	50 m
PW Pinnipeds PTS	201 dB re 1 μPa^{2}s	10 m	7 m

Table 11.5.15: Ranges to Popper et al. (2014) SPL_{RMS} continuous noise injury criteria for species of fish from vibro piling and rock breaking noise

Threshold	Criteria SPL_{RMS} (Unweighted)	Vibro Piling	Rock Breaking
Fish (with swim bladder involved in hearing) recoverable injury	170 dB re 1 μPa (for 48 hours)	18 m	2 m
Fish (with swim bladder involved in hearing) TTS	158 dB re 1 μPa (for 12 hours)	87 m	14 m

11.5.3.3 Other Noise Sources

Backhoe Dredging

Backhoe dredging is undertaken by an excavator mounted on a barge. All machinery is located on the deck of the barge, above the waterline. Noise radiates into the water through the hull of the barge or from the action of the excavator on the seabed. No noise generating plant is below the waterline. Measurements undertaken by Subacoustech indicate that an unweighted RMS source level of up to 165 dB re 1 μPa with dominant frequencies between 80 Hz and 1 kHz, could be expected based on measurements of the dredger Zenne undertaken in an Irish estuary. Measurement data show that underwater noise levels from backhoe dredging reduce quickly with range to approximately 133 dB re. 1 μPa within 50 m from the source.

For marine mammals, when NMFS weightings are applied levels are further reduced such that a stationary animal located at 50 m from the source would need to be exposed for a minimum of 19 hours in a 24-hour period for the TTS criteria to be exceeded.

For fish, the source level is below the recoverable injury criteria specified in Popper *et al.* (2014). The range at which the Popper *et al.* (2014) TTS criteria would be exceeded is less than 5 m.

Vessel Movements

Underwater noise from vessels varies significantly depending on the size, speed and operating conditions. Underwater noise from small vessels of the type typically used for inshore development projects (workboats, tugs, safety boats, and dredging barges) have been measured on a range of sites including the River Thames and Tilbury Docks by Subacoustech and source levels at 1 m have been found to be in the range of 140 dB to 160 dB RMS re. 1 µPa with peak frequencies occurring between 100 Hz and 800 Hz.

At the time of writing no detail about the type of vessels or number of movements was available to enable a detailed assessment. However, no vessels likely to be involved in the construction works are likely to exceed the noise level of the existing ferry. Overall, vessel movements are likely to produce a lower noise level than the other sources considered in this report, and as such are not expected to have a significant impact, so are not considered further.

11.6 Mitigation Measures

As detailed in Section 11.3.3, no specific mitigation is identified in this chapter, since this will depend on the magnitude of effect anticipated for the marine animals, as identified in the ecological impact assessments. However, the preferential use of vibro hammers to drive the piles to refusal, before using impact piling is considered to be embedded primary mitigation, since it will reduce the overall sound energy emissions from the piling works.

It is also noted that the marine mammal mitigation protocols may have included the provision of a soft start (a slow ramp up of blow energy), to provide animals with the opportunity to leave the vicinity of the noise source before the maximum noise level is reached. The assessment does not include a soft start and assumes a stationary animal, a conservative worst case.

11.7 Summary of Effects

The impact ranges seen in the preceding sections vary significantly depending on the functional hearing (species) group and the NMFS (2016) criteria that defines the onset of PTS and TTS.

NMFS (2016) requires that where an assessment includes both SPL_{peak} and SEL_{cum} then the greater of the two impact ranges should be used in the assessment. For impact piling, the SPL_{peak} criteria gave rise to the greatest ranges across all functional groups. The greatest impact ranges were seen for HF cetaceans. This is not unexpected given the particularly strict SPL_{peak} criteria specified by NMFS (2016).

Despite this, the SPL_{peak} ranges should still be considered conservative as physical processes in propagation alter the shape of the waveform and reduce the peaks with increasing range.

NMFS (2016) refers to this effect (p27, paragraph 2) but it is not easily quantified or accounted for in the modelling.

For continuous noise sources (vibro piling and rock breaking), SPL_{peak} was not considered as the source is continuous not impulsive.

The maximum range to the PTS criteria for each species and activity is provide in Table 11.1 below.

Table 11.1 Maximum range to PTS criteria for each activity and species groups

Activity	LF Cetaceans	MF Cetaceans	HF Cetaceans	PW Pinnipeds	Fish
Impact piling 150 kJ (1 hour)	380 m	< 10 m	280 m	86 m	31 m
Impact piling 50 kJ (1 hour)	120 m	< 10 m	97 m	29 m	< 10 m
Vibro piling (1 hour)	10 m	< 10 m	40 m	10 m	18 m
Rock Breaking	20 m	< 10 m	50 m	< 10 m	< 10 m
Backhoe Dredging	< 20 m	< 10 m	< 50 m	< 10 m	< 10 m

11.8 References

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Chapter 12: Traffic, Access and Navigation

Contents

12 Traffic, Access and Navigation

12.1 Introduction

This Chapter of the EIAR addresses the potential impact of the proposed upgrade of the Lochmaddy ferry terminal on the surrounding transport network and navigation. Impacts of the development on transport, access and marine navigation during the construction and operational phases have been considered. Impacts have been identified, quantified and, if necessary, mitigated through the introduction of measures to control or reduce the impact, as identified within this chapter.

12.2 Regulations, Guidance and Sources of Information

Transport and navigation policies relevant to the project included in the National Marine Plan (Scottish Government, 2015) and the Local Development Plan (Comhairle nan Eilean Siar, 2018) are identified in Chapter 4: Statutory Context and Policy.

12.2.1 Traffic and Access

Relevant planning policy and guidelines have been considered to ensure an appropriate assessment is completed. This assessment therefore takes cognisance of relevant policy documents. These include:

- National Transport Strategy (Scottish Executive, 2006);
- HITRANS Regional Transport Strategy Draft (HITRANS RTS) (The Highland and Islands Transport Partnership, 2017);
- Planning Advice Note (PAN) 75: Planning for Transport (Scottish Executive, 2005).
- The Transport Strategy for the Highlands and Islands 2008 – 2021 (The Highland and Islands Transport Partnership, 2008); and
- Development Planning Management Transport Assessment Guidance (Transport Scotland, 2012).

12.2.1.1 The National Transport Strategy

The National Transport Strategy (Scottish Executive, 2006) considers Scotland's transport needs over the medium to long-term and it sets out five high level objectives to:

- Promote economic growth;
- Promote social inclusion;
- Protect our environment and improve our health;
- Improve safety of journeys; and
- Improve integration by making journey time planning and ticketing easier.

The National Transport Strategy is currently under review and a finalised National Transport Strategy is due to be released in summer 2019.

12.2.1.2 Regional Transport Strategy

HITRANS RTS Draft identifies the need:

"To deliver connectivity across the Highlands and Islands which enables sustainable economic growth and helps communities to actively participate in economic and social activities" (The Highland and Islands Transport Partnership, 2017).

The main objectives of the Strategy are to:

- Support Sustainable economic growth across the region; and
- Reduce barriers to participation in employment, learning, social, leisure, health and cultural activities.

It aims to achieve these aims through:

- Improving/maintaining the safety of transport and travel; and
- Improving the quality, accessibility, affordability and integration of travel.

12.2.1.3 Planning Advice Note

PAN 75 states that:

> "*Transport assessment is a tool that enables delivery of policy aiming to integrate transport and land use planning*"*(Scottish Executive, 2005);*

and that

> "*All planning applications that involve the generation of person trips should provide information which cover the transport implications of the development. The level of detail will be proportionate to the complexity and scale of impact of the proposal*" (Scottish Executive, 2005).

There will be an increase in traffic associated with the upgrade of the Lochmaddy Ferry Terminal. As such, an assessment has been completed within this chapter. The increases are not such that a stand-alone transport assessment would be proportionate.

12.2.1.4 The Transport Strategy for Highlands and Islands 2008 – 2021

The 2008-2021 Transport Strategy for the Highlands and Islands requires Transport Plans to enhance economic wellbeing; promote safety, social inclusion and equal opportunity; plan for a sustainable transport system; and integrate across boundaries with other partnerships. Its strategies and objectives are set out below:

1. Vision – Enhance the region's viability;
2. Delivery objective – Improving interconnectivity of the whole region to strategic services and destinations;
3. Primary outcome objective – Economy:
    a. Enable the region to compete & support growth;
4. Supporting outcome objectives:
    a. Enable people to participate in everyday life;
    b. Improve safety and security of travel;
    c. Manage the impacts of travel on the region's environmental assets; and
    d. Improve health of the region's people.

12.2.2 Navigation

From a navigation perspective, harbour authorities are required to work to the Port Marine Safety Code (PMSC) (Department for Transport and Maritime & Coastguard Agency, 2016). This code lays out the harbour authorities' accountability for Marine Safety, the key measures required to secure marine safety, and their duties and powers. The Marine Safety Management System (MSMS) is the principal mechanism to ensure operations are safely managed. This is based on formal risk assessments and refers to an appropriate approach to incident investigation.

12.2.3 Sources of Information

Various datasets have been used in the assessment presented in this chapter and these include:

- Ferry Operations;
- Bus Timetables; and
- CrashMap;
- Census data; and
- National Marine Plan Interactive.

12.2.3.1 Ferry Operations

To gain an understanding of the 'typical' day to day operations of the ferry terminal, CMAL provided historical passenger data and numbers. This information provided the ship occupancy levels for each sailing for the years 2016 and 2017.

12.2.3.2 Bus Timetables

Public transport information in terms of the bus timetables for buses stopping at Lochmaddy were reviewed.

12.2.3.3 CrashMap

The assessment utilised available Road Traffic Accident Data for the most recent 5 years 2014 to 2018 within the local area using CrashMap (CrashMap, 2018).

12.2.3.4 Census Data

The National Records for Scotland's most recent censes was completed in 2011. Information with regard to population and car ownership for North Uist (National Records of Scotland, 2011) was utilised to inform the assessment.

12.2.3.5 National Marine Plan Interactive

National Marine Plan Interactive (Marine Scotland, 2018) has been utilised to identify relevant navigational information. Layers utilised included the Automatic Identification System (AIS) data for a range of vessel types. The information provided in these layers is from 2012 to 2015 primarily.

12.3 Assessment Methodology

12.3.1 Traffic and Access

Many of the transport impacts of the proposed development will not be new impacts, as the existing harbour operations will remain unchanged. Therefore, existing trip levels will be included within the baseline activities, and hence the focus will be on the increase in trips that will result from the upgrade works.

In accordance with Transport Assessment Guidelines (Transport Scotland, 2012), the following potential net impacts generated by the development have been considered to help understand the requirement for mitigation measures:

- Change in traffic conditions e.g. increased queuing and delays;
- Change in public transport conditions e.g. increased waiting for public transport;
- Change in access to parking – e.g. for local residents and businesses;
- Effects on car users; e.g. impacts on ferry and non-ferry traffic;
- Effect on pedestrians; and
- Effects on local residents.

These have been reviewed using both qualitative and quantitative approaches, with baseline data reviewed to determine the likely effect the above impacts will have.

12.3.1.1 Baseline

Baseline conditions have been derived through site visits, desktop surveys and review of publicly available data, including that detailed in Section 12.2.3.

12.3.1.2 Evaluation of Receptors

Potential receptors have been identified and their sensitivity assessed. Sensitivity is defined as per Table 12.3.1.

Table 12.3.1: Traffic and Access Receptor Sensitivity

Sensitivity	Criteria
High	Pedestrians and cyclists, local amenity and road safety.
Medium	Public Transport - buses, taxis, and ferry.
Low	Private vehicles and general traffic on the highway including access and servicing.

12.3.1.3 Magnitude of Impact

Based on the type of potential consequences occurring and the magnitude of the consequence, Table 12.3.2 identifies the scale that will be used to evaluate the significance.

Table 12.3.2: Magnitude of Impact Criteria

Magnitude of Impact	Characteristics
Major	Substantial Deterioration / Improvement compared to the current scenario e.g. high impact on a regionally or nationally important resource.
Moderate	Noticeable deterioration / improvement compared to the current scenario e.g. moderate to high impact on a locally important resource.
Minor	Slight deterioration / improvement compared to the current scenario e.g. low impact on a locally important resource.
Negligible	No noticeable alterations to the current scenario.

12.3.1.4 Significance Evaluation

For each impact identified, a determination of whether it will result in a significant effect will be made by taking into account the sensitivity of receptor and magnitude of impact. Table 12.3.3 will therefore be used to determine the overall significance category.

Table 12.3.3: Magnitude of Impact Criteria

Magnitude of Impact	Sensitivity of Receptor			
	High	Medium	Low	Negligible
Major	Major	Moderate	Minor	Negligible
Moderate	Moderate	Moderate	Minor	Negligible
Minor	Minor	Minor	Negligible	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible

Key

	Significant Effect

12.3.2 Navigation

The navigation assessment considers effects on receptors at a strategic level. It is not a navigation risk assessment (NRA). If project specific NRAs are required for any elements of the works, they will be completed by the port as part of its MSMS, in line with the PMSC.

12.3.2.1 Baseline

A desk-based review of information with regard to the facilities available, ferry timetables and navigation information was conducted. The National Marine Plan Interactive website (Marine Scotland, 2018) was utilised to gather information with regard to anchorages and vessel traffic.

12.3.2.2 Evaluation of Receptors

Potential receptors have been identified, and their sensitivity assessed in line with Table 12.3.4.

Table 12.3.4: Navigation Receptor Sensitivity

Sensitivity	Criteria
High	• Lifeline Services – Ferry, Lifeboat, Essential Deliveries.
Medium	• Contributors to the local economy – recreational flotilla, cruise ships, commercial deliveries, locally vessels. • Receptors affecting ≥50% of ferry passengers.
Low	• Individual visiting vessels - individual recreational vessels. • Receptors affecting <50% of ferry passengers.

12.3.2.3 Magnitude of Impact

Potential impacts on navigation associated with the construction and operational phases of the project have been identified. The magnitude of the impacts has been assessed utilising the criteria provided in Table 12.3.5.

Table 12.3.5: Magnitude of Impact Criteria

Magnitude of Impact	Characteristics
Major	Substantial deterioration / improvement in access, services or navigational issues/risks for vessels.
Moderate	Noticeable deterioration / improvement in access, services, or navigational issues/risks for vessels.
Minor	Slight deterioration / improvement in access, services or navigational issues for vessels.
Negligible	No noticeable alterations to the current situation.

12.3.2.4 Significance Evaluation

The evaluation of significance has been completed utilising Table 12.3.3, the receptor sensitivity being based on Table 12.3.4 and the magnitude of impact being based on Table 12.3.5. The duration of the effect is also determined as per Section 3.5.2 of Chapter 3: Methodology.

12.3.3 Mitigation

Where necessary, secondary mitigation has been identified in a line with the approach detailed in Chapter 3: Methodology.

12.3.4 Assessment of Residual Effects

Residual effects, taking account of the secondary mitigation identified, are assessed, as described in Sections 12.3.1 and 12.3.2, to identify the residual effect significance.

12.4 Baseline Information

12.4.1 Traffic and Access

12.4.1.1 Existing Traffic Conditions

There are no traffic counters on the Outer Hebrides, so baseline data is limited. The entire North Uist has a population, according to the 2011 census results, of 1,619 people. There are 791 households, with an average of 1.3 cars/vans per household, equating to a total of 1,030 cars and vans. The population is distributed over the 303km^2 Island, which equates to 5.34 people per km^2 (National Records of Scotland, 2011).

The A865 runs north from Lochboisdale through South Uist, over to and through the centre of the Isle of Benbecula to North Uist. Once on North Uist, the A865 runs clockwise around the western and northern coasts of the island, terminating at the Lochmaddy ferry terminal. The A867 links the north-eastern end of A865, with the A865 on the west of North Uist, extending from the western extent of Lochmaddy village to just north of Clachan an Luib. Hence the A867 and A865 provide a circular route around North Uist. The final 700m of the eastern end of the A865 to the Lochmaddy Terminal is a dead end, with all minor roads off it also culminating in dead-ends.

The village of Lochmaddy is spread out, with a number of minor roads off the A865 providing access to residential and commercial properties. There are however a number of residential, public and commercial properties including shops, the Taigh Chearsabhagh Museum & Arts Centre, the Lochmaddy Primary School, Lochmaddy Hotel, and a church, which are immediately adjacent to the A865.

The Lochmaddy Auction Mart is located immediately to the north of the ferry terminal, adjacent to the A865. On market days there will be an increased number of livestock vehicles utilising the A865 and the surrounding area. There are typically four livestock sales per year (Dingwall & Highland Marts Limited, 2019).

In accordance with the Design Manual for Roads and Bridges (DMRG), TA79/99 Traffic Capacity for Urban Roads, the A865 is an Urban All-Purpose (UAP) road class UAP4. The carriageway width varies through the village. Assuming the worst case of 6.1m in width, then TA79/99 prescribes that the maximum hourly one-way flow capacity for this class of road in each direction to be 900 vehicles. Considering the total number of permanent cars and van on the island is 1,030, the road is operating well within its design capacity.

There are currently 18 carpark spaces available for ferry terminal staff and passengers, and 4 lorry parking bays next to the market. The existing turning area adjacent to the terminal building is not sufficient to allow large rigid bodied coaches to turn, without encroaching on existing parking bays, or needing to perform a 3 (or more) point turn.

12.4.1.2 Road Safety

The speed limit from just east of the junction with the A865 and A867 is 40mph, reducing to 30mph through the village. There is a part-time 20mph speed limit (when the lights flash) where the A865 passes the school.

Two accidents have occurred in the vicinity of the project site within the last five years. A serious accident, involving one vehicle and one casualty, happened on the 11th July 2016 on the minor road which loops through the village of Lochmaddy, joining the A865 just to the east of the A867/A865 junction and close to the village shop. A slight accident occurred on the A867 approximately 300m south of the A865/A867 north junction. This occurred on the 27th May 2015 and involved one vehicle and two casualties (CrashMap, 2018). There have been three other slight accidents in the last five years on the A867 and A865 circular route around North Uist, and one fatality occurring on the A867 in a single vehicle accident occurring on the 28th June 2014.

It is noted that only one of the accidents of the A865 and A867 in North Uist involved more than one car. This is presumably due to the low level of traffic utilising the roads. There are no obvious accident 'black spots'.

12.4.1.3 Existing Ferry Related Activity

Table 12.4.1 provides a summary of the average number of vehicles per ferry sailing for each month of the year through 2016. As discussed in Section 12.4.2.2, the ferry operates up to 12 times a week on the summer timetable, but only half of that on the winter timetable. The ferry is least utilised through the winter months of January to March, and low vehicle numbers are experienced even with a reduced ferry service. Vehicle numbers rise from April into the summer months. Peak usage is July, likely to be associated with tourist traffic. December is the busiest winter month, presumably associated with the festive period.

Table 12.4.1: Average Ferry Vehicle Usage - 2016

Month	Total Vehicles	Cars	Commercial Vehicles	Coaches
January	21.4	18.4	2.9	0.0
February	25.9	22.3	3.5	0.1
March	27.5	23.7	3.8	0.1
April	40.2	34.6	5.5	0.1
May	42.0	36.2	5.8	0.1
June	44.8	38.6	6.1	0.1
July	56.7	48.8	7.8	0.1
August	48.2	41.5	6.6	0.1
September	39.2	33.8	5.4	0.1
October	43.3	37.2	5.9	0.1
November	49.3	42.4	6.8	0.1
December	56.2	48.4	7.7	0.1

Key

	Summer Timetable
	Winter Timetable

Table 12.4.1, provides averages per sailing. However, the current ferry has the capacity to carry around 98 vehicles on and off the island at Lochmaddy. Hence worst case traffic flow resulting from ferry a single ferry sailing is currently 98 vehicles.

12.4.1.4 Public Transport Provision

The is a bus stop immediately adjacent to the ferry terminal building, at the end of the A865.

Lochmaddy is serviced by multiple regular and on demand bus services that cover the bus network around North Uist. The number of bus services to/from the Lochmaddy Ferry Terminal was determined using the bus timetables available on the Comhairle nan Eilean Siar (CnES) website (CnES, 2019). This information was then used in conjunction with the summer ferry timetable for Uig to Lochmaddy, shown in Figure 12.4.1, to ascertain the number of bus services which are compatible with ferry sailings. Foot passengers need to check-in at least 30 minutes before departure and, as such, buses arriving at Lochmaddy Pier 30 minutes to 1 hour prior to ferry departure were deemed compatible. Buses departing Lochmaddy Pier 15 minutes to 1 hour following ferry arrival were assessed as being compatible. The winter timetable for the ferry has fewer sailings, but at similar times. As such the public transport connectivity is similar to the summer provision.

As detailed in Table 12.4.2, approximately 23 buses arrive and depart Lochmaddy Pier each day, Monday to Saturday. There are no bus services operating on a Sunday. There are bus services compatible with 15 of the 24 ferry arrival/departures. There is no bus provision for nine summer ferry services: the 07.15 departures on a Monday and Thursday, the Saturday 07.30 departure, the 20.40 departure on a Friday, the 00.25 Saturday arrival and the four Sunday arrivals/departures. There is a bus compatible with the Friday 20.40 sailing, but only between the 21st June to 30th August, noting that this ferry sailing operates from the 4th May to 9th September.

Table 12.4.2: Summary of Bus Services to/from Lochmaddy Ferry Terminal

Number	Route	Services per Day	Additional Bookable Services	Compatible with Ferry Departure	Compatible with Ferry Arrival	Comments
W16/17	Eriskay to Berneray (Northbound) Spine Route Summary	3	4	2	1	**Bus arrival** 15.30 arrival Mon-Sat in Time for ferry departure Tue and Thu at 1615 and 1645 on Sat **Bookable service** 11.10 arrival Mon-Sat in time for ferry departure Mon, Wed and Fri at 11.45 **Bookable Service** 11.30 departure Mon-Sat in time for ferry arriving Mon, Wed and Fri at 11.15
W16/W17	Berneray to Eriskay (Southbound) Spine Route Summary	4	2	3 (1 additional bookable service from 21 June till 30 Aug)	2	**Bus arriva**l 10.10 arrival Mon – Sat early for the ferry departure at 11.45 Mon, Wed, Fri **Bus arrival** 16.05 arrival Mon-Sat in time for ferry departure at 16.45 on Sat **Bus arrival** 18.35 arrival Mon-Sat early for ferry departure at 20.40 from 21 June till 30 Aug only **Bookable service** 19.50 arrival in time for ferry departure at 20.40 on Fri from 21 June till 30 Aug only **Bus departing** 16.35 departure Mon-Sat for ferry arriving Tue and Thu at 15.45 and 16.15 on Sat
DRT3 (F)	Balivanich to Lochmaddy	0	1	1	0	**Bookable Service** 11.10 arrival Mon-Fri in time for ferry Departure Mon, Wed and Fri at 11.45
DRT3 (G)	Lochmaddy to Berneray Area	0	1	0	1	**Bookable Service** 11.30 departure Mon-Fri in time for ferry Arrival Mon, Wed and Fri at 11.15

Number	Route	Services per Day	Additional Bookable Services	Compatible with Ferry Departure	Compatible with Ferry Arrival	Comments
W16	Balivanich (Northbound) to Grimsay - Lochmaddy - Berneray & Sollas	4	4	2	2	**Bus arrival** 15.30 arrival Mon-Sat in time for Ferry departure Tue and Thu at 16.15 and 16.45 on Sat **Bookable Service** 11.10 arrival Mon-Fri in time for ferry departure Mon, Wed and Fri at 11.45 **Bus departing** 15.50 departure Mon-Sat in time for ferry arrival Tue and Thu at 15.45 **Bus departing** 16.20 departure Schooldays, Mon-Thu in time for ferry arrival Tue and Thu at 15.45
W16	Sollas, Berneray, Lochmaddy & Grimsay (Southbound) to Balivanich	4	4	3	1	**Bus arrival** 1010 arrival Mon-Fri in time for ferry departing Mon, Wed and Fri at 1145 **Bookable Service** 15.05 arrival departure in time for ferry departing 1645 on Tue, Thu and Sat **Bookable Service** 19.50 arrival Mon-Sat (based on 2017 timetable) in time for ferry Departing 2040 from 4 May till 9 September **Bus departing** 16.35 departing Mon-Sat in time for ferry arriving Tue and Thu at 1545 and 1615 on Sat
W16	Sideroad service to/from Sidinish, Baleshare & Claddach Carinish (Northbound)	2	2	0	0	None
W16	Sideroad service to/from Sidinish, Baleshare & Claddach Carinish (Southbound)	2	2	1	0	**Bus arrival** 1010 Mon-Sat in time for ferry departing Mon, Wed and Fri at 1145 **Bookable Service** (1100 arrival) Mon-Fri in time for ferry departing Mon, Wed and Fri at 1145

Number	Route	Services per Day	Additional Bookable Services	Compatible with Ferry Departure	Compatible with Ferry Arrival	Comments
W18	North Uist Loop – Clachan – Bayhead – Sollas – Lochmaddy (clockwise)	2	2	2	1	**Bus arrival** (10.10 arrival) Mon-Fri in time for ferry departing Mon, Wed and Fri at 1145 **Bookable Service** (15.05 arrival) Mon-Fri in time for ferry departing Tue and Thu at 1615 **Bus departing** (16.35 departure) Mon-Sat in time for ferry arriving Tue and Thu at 1545 and Sat 1615
W18	North Uist Loop – Lochmaddy – Sollas – Bayhead – Clachan (anti-clockwise)	2	4	1	2	**Bookable Service** (10.30 arrival) Mon-Sat in time for ferry Departing Mon, Wed and Fri at 1145 **Bookable Service** (11.30 departure) Mon-Fri in time for ferry arrival Mon, Wed and Fri at 1115 **Bookable Service** (15.50 departure) Mon-Sat in time for ferry arrival Tue 1545 and Thu at 1545

12.4.2 Navigation

12.4.2.1 Navigation Safety

CnES is the Statutory Harbour Authority, and as such is responsible for navigational safety in the harbour area, including the location of the proposed upgrade works.

In September 2016 there was an incident involving the ferry which struck the pontoons and the seabed. No-one was hurt in the incident. The cause of the incident was a technical failure of the vessel, which was unable to reduce speed sufficiently for the routine docking procedure.

12.4.2.2 Ferry Sailings

Figure 12.4.1 shows the summer 2019 timetable of ferry sailing, which runs from the 29th of March to the 20th of October. The winter timetable runs from 21st of October to March and has fewer sailings. The winter 2019/20 timetable is not yet available, although an example winter timetable is provided in Figure 12.4.2. Future winter and summer timetables are expected to be very similar to previous time tables, with six sailings a week from Lochmaddy in the winter months and twelve a week in the summer months.

NORTH UIST TEXT CODE 22

UIG (SKYE) - LOCHMADDY (NORTH UIST) Table 22

Operates 29 March - 3 May and 10 September - 20 October				
DAY	Uig Depart	Lochmaddy Arrive	Lochmaddy Depart	Uig Arrive
MON	0930	1115	1145	1330
	1830	2015	-	-
TUE	-	-	0715	0900
	1400	1545	1615	1800
WED	0930	1115	1145	1330
	1930	2115	-	-
THU	-	-	0715	0900
	1400	1545	1615	1800
FRI	0930	1115	1145	1330
	1830	2015	-	-
SAT	-	-	0730	0915
	1430	1615	1645	1830
SUN	-	-	1100	1245
	1835	2020	-	-
Operates 4 May - 09 September				
DAY	Uig Depart	Lochmaddy Arrive	Lochmaddy Depart	Uig Arrive
MON	0930	1115	1145	1330
	1830	2015	-	-
TUE	-	-	0715	0900
	1400	1545	1615	1800
WED	0930	1115	1145	1330
	1930	2115	-	-
THU	-	-	0715	0900
	1400	1545	1615	1800
FRI	0930	1115	1145	1330
	1830	2015	2040 A	2225 A
	2240 AB	0025 AB	-	-
SAT	-	-	0730	0915
	1430	1615	1645	1830
SUN	0930	1115	1145	1330
	1835	2020	2040	2225

CODE	
A	Operates from 21 June - 30 Aug only
B	Arrives following morning

Figure 12.4.1: Summer Ferry Timetable

NORTH UIST

TEXT CODE 22

UIG (SKYE) - LOCHMADDY (NORTH UIST)

Table 22

DAY	Uig Depart	Lochmaddy Arrive	Lochmaddy Depart	Uig Arrive
MON WED FRI	0940	1125	1150	1335
	1800	1945	-	-
TUE SAT	-	-	0730	0915
	1400	1545	1610	1755
THU	-	-	0730	0915
	0940	1125	1150	1335
SUN	-	-	1115	1300
	1430	1615	-	-
OPERATES 12 MAR - 29 MAR 2018				
MON WED FRI	-	-	0725	0920
	0915	1110	1135	1330
	0950	1145	1230	1425
	1515	1710	1735 A	-
	1820	2010	-	-
TUE SAT	-	-	0725	0920
	1200	1355	0930	1125
	1405	1600	1620	1815
THU	-	-	0725	0920
	0940	1130	0930	1120
	1400	1550	1230	1420
SUN	-	-	1055	1250
	1415	1610	-	-
OPERATES 26 DEC 2017 AND 2 JAN 2018 ONLY				
DAY	Uig Depart	Lochmaddy Arrive	Lochmaddy Depart	Uig Arrive
TUE	0940	1125	1150	1335

CODE

A	Departs for Tarbert, arriving 1930

Figure 12.4.2: Example Winter Ferry Timetable

12.4.2.3 Other Harbour Uses

The Lochmaddy Harbour Area includes the ferry pier, which in addition to the ferry's linkspan on the southern side, can also be utilised by smaller vessels on its northern side.

To the south of the existing marshalling area, there are pontoons operated by Comann na Mara. The pontoons can accommodate 26 vessels with draughts of up to 3m. Access to the pontoons is via a raised walkway from facilities owned by Comann na Mara, located to the west of the existing marshalling area. The walkway extends over the area where land reclamation is proposed.

There is a mooring area 150m to the south west of the linkspan. However, its use has decreased in recent years due to the availability of the pontoon and associated facilities.

Three designated anchoring areas are located in the Loch Maddy Harbour Limits. However, they are all away from the ferry terminal and will not be directly affected by the construction works.

AIS information available on the National Marine Plan interactive (NMPi) website (Marine Scotland, 2018) is for the years 2012 to 2015. It identifies that there are on average between 50 and 150 transits per week in the Lochmaddy Harbour area. The ferry service accounts for up to 24 of these. The vessel type specific AIS layers provided on the NMPi were reviewed to identify the vessel types utilising the area, the findings of which are summarised in Table 12.4.3.

Table 12.4.3: Average Weekly AIS Vessel Transit Summary (2012-2015) (Marine Scotland, 2018)

Vessel Category	Number of Transit per Week	Comments
Recreational Vessels	2 to 10	Small craft do not carry AIS so could be an underestimation.
Fishing Vessels	2 to 10	
Port Service Craft	2 or less	These are the lowest classification available, these vessels are likely to transit through the area sporadically.
Non-Port Service Craft	2 or less	
High Speed Craft	2 or less	
Dredging or Underwater Operational Vessels	5 or less	
Passenger Vessels (Ferry)	20 to 50	From ferry time table it is 24 in summer months.
Total	**50 to 150**	

Based on the underpinning data regarding vessel types, it is likely that vessel transits will be at the lower end of the 50 to 150 category, and for there to be a higher number of movements in the summer months due to the recreational vessels and the summer ferry timetable. AIS is only mandatory for all ships over 300 gross tonnes, so these figures don't necessarily include the movements of smaller recreational and fishing vessels. It should be noted that no leisure vessel movements are permitted while the ferry is arriving or departing.

Vessels other than the ferry regularly utilising the ferry pier are the road salt delivery vessel and the fish farm support vessels, which utilise the northern side of the ferry pier primarily.

CnES fully comply with the obligations and responsibilities under the PMSC and have mechanisms in place for consultation and engagement of all harbour users. There is a MSMS in place which is subject to regular review and audit. The MSMS was developed after consultation with harbour users and is based on a formal risk assessment process.

12.5 Impact Assessment

12.5.1 Construction

Material delivery is the main source of marine and road traffic typically associated with harbour construction projects. However, in this instance a large proportion of the material required is for land reclamation. This material will be won from the removal of an area of rock to the west of the existing marshalling area, which needs to be levelled to facilitate the expansion of the marshalling area to the north of the proposed land reclamation, as detailed in Chapter 2: Project Description. The reuse of material will minimise the need for import and export of materials from site.

The demolition activities to remove obsolete structures will give rise to around 65 tonnes of waste, requiring 4 HGV trips to remove the material for suitable waste disposal.

The following materials will need to be imported:

- Primary armouring ~ 2,700 tonnes;
- Concrete ~ 2,700 tonnes;
- Steel ~ 294 tonnes;
- Caisson Rock Fill ~ 7,800 tonnes;
- Bituminous materials ~1,000 tonnes; and
- The pre-fabricated concrete caisson.

The concrete caisson will be delivered by sea, as will the steel work. The aggregate materials may come by road or sea. Pessimistically, it is assumed that 14,200 tonnes of material will be delivered by road. Assuming a typical HGV delivery of 20 tonnes per load, that equates to 710 HGV movements over the duration of the project. The infilling of the caisson requires 7,800 tonnes of material, and is expected to take in the region of 4 weeks to complete. Assuming a 5-day working week, then this would equate to approximately 20 HGV deliveries a day (40 one-way movements). The remaining vehicle movements, associated with 320 deliveries and a handful of bulk waste disposals, will occur over at least 16 weeks, equating to around 8 one-way HGV movements a day.

It is anticipated that during the peak construction period, the construction staff are likely to generate a number of vehicular movements which are estimated at:

- 13 private cars; and
- 5 squad vans.

Giving rise to 36 one-way movements per day.

Worst case, there will be an increase of 56 one-way movements in any given day (28 in each direction). This is equivalent to 3.1% of the A865's hourly capacity. Hence, even if all movements were in one hour, there would be no significant effect on the road network. In reality the movement will be spread across the working day, avoiding ferry arrival/departure times when practicable.

Marine movements will include:

- The delivery of the caisson, which will be floated into the area and worked upon before being placed in position;
- Dredging operations, potentially using a dredger, tug and barges;
- Dredge disposals where the dredger or tug and barges will transit from Loch Maddy to the disposal ground at Stornoway (up to 21 round trips);
- A work boat to complete marine construction works; and a
- A safety boat to support marine construction works.

12.5.1.1 Pedestrians, Cyclists and Road Users

During construction works at the mouth of the existing marshalling area, required to create the new mini roundabout and pavements, temporary arrangements will be put in place to allow pedestrians, cyclists and cars to safely navigate around the work site. The works will mainly be off the line of the existing road. However, if required, the works will be temporarily

halted during busy periods (ferry arrivals) to minimise disturbance. Pedestrians and cyclists are classed as a highly sensitive receptors, and road users are a low sensitive receptor in accordance with Table 12.3.1. The effects are a temporary deterioration for these receptors, but as this will only affect a very short proportion of their journeys, and they are transiting through, the magnitude of the impact is assessed as minor. This gives rise to an **adverse minor: non-significant short-term** effect on pedestrians and cyclists, and **adverse negligible: non-significant short-term** effects on road users.

The turning area at the end of the A865 adjacent to the terminal building will be reconfigured. During this time access for vehicles is likely to be restricted, with alternative temporary drop off areas provided. Pedestrian access to the terminal building will be maintained, but will require temporary re-routing to ensure public safety during certain construction tasks. The impact is reversible and of minor magnitude, leading to an **adverse minor: non-significant short-term** effect on pedestrians and cyclists, and **adverse negligible: non-significant short-term** effects on road users.

12.5.1.2 Public Transport Users

The construction works will have no effect on the bus timetables and as such there will be no change in the availability of public transport associated with the works. However, during works to reconfigure the turning area adjacent to the terminal building, the bus stop may need to be temporarily moved slightly further from the terminal building. It will be ensured that the distance is minimised, and that there is safe pedestrian access between the temporary bus stop and the ferry terminal building. Public transport is a medium sensitive receptor. The impacts are short-term, reversible adverse and of minor magnitude, leading to an **adverse minor: non-significant short-term** effect.

12.5.1.3 Road Safety

All construction traffic will access the site by the A865, and potentially via the A867 and A865 if coming from the south. It will pass through the village of Lochmaddy where the speed limit is 30 mph. The A865 passes the Lochmaddy Primary School, whose playground runs parallel to the road. The speed limit is 20mph past the school and there is fencing and a 'kissing gate' to prevent children running out onto the road. As such, the chance of an accident is very low. There are footpaths adjacent to the A865 through the majority of the village. Hence, pedestrians are not expected to be walking on the road. HGV's can be considered to be intimidating. However, the worst-case scenario is 40 HGV movements passing through the village each day, but this will only last for four weeks, before reducing significantly for the rest of the works. The impact magnitude is considered to be minor on the highly sensitive receptor of road safety, school children and other residents of the village, leading to a **short-term adverse minor: non-significant** effect.

12.5.1.4 Local Amenity

The additional HGV movements that will be generated during the Construction Stage will not have any direct impact on local residential streets. The HGV route will be restricted to the A865 and potentially the A867. The construction site has also been designed to accommodate the internal storage of vehicles. Sufficient car parking will be allocated on-site to avoid the need

for construction workers to park their vehicles on the local road network. Dust mitigation laid out in the Construction Environmental Management Document (CEMD) (Affric Limited, 2019) will further reduce the likelihood of any adverse effects associated with the construction stage on local amenity (a high sensitive receptor). The magnitude of impacts on local amenity are deemed to be minor giving rise to an **adverse minor: non-significant temporary short-term** effect for the majority of the construction works time.

The livestock sales at the Lochmaddy Auction Mart, which occur four times a year, warrant separate consideration. During the sales there will be an increase in vehicles and pedestrians present in the immediate vicinity of the construction works. It is also noted that there will be livestock present, which could be sensitive to the additional vehicle movements and construction activities. Depending on the construction works ongoing at the time of the sales, the availability of vehicle parking could be reduced, which could in turn lead to congestion in other parts of the village, and issues associated with moving livestock in and out of the mart. The construction vehicle movements could also exacerbate road safety risks, associated with the livestock vehicle movements. Hence on livestock sale days, the magnitude of impact on local amenity is classed as moderate to major, giving rise to an **adverse moderate: significant very short-term** effect.

12.5.1.5 Navigational Risk

During dredging there will be between 1 to 3 vessels working in the vicinity of the pier, the actual number being dependant on whether the dredger utilises an internal hopper or whether barges are utilised for spoil disposal. The caisson will be brought into Loch Maddy by tugs and anchored prior to final movement into place. Other construction activities will require the use of a workboats. Numerous boats moving in a small confined area, especially when the ferry it is arriving or departing, has the potential to increase risk of collision.

Prior to and during construction, CnES will keep the risk assessments and marine activity operating procedures under review. Engagement with the other harbour users will be increased to provide the necessary consultation, information and communications to reduce risks to As Low as Reasonably Practicable (ALARP), in conjunction with appropriate mitigating measures being identified and implemented. This is part of the PMSC requirements, and as such, can be considered tertiary mitigation. Taking into account the existing processes to ensure safety and the potential for navigational safety issues, the magnitude of effect is deemed to be low. There are a range of receptors, including the ferry service, which have high sensitivity, the effect significance is therefore **adverse minor: non-significant, medium term.**

12.5.1.6 Ferry Operations

As discussed in Chapter 2: Project Description, the project design and construction phasing has taken account of the need for the ferry to continue to operate throughout the construction works. There remains a risk however, that some elements of works planned between ferry arrivals are delayed (due to weather or technical downtime for example) and the berth cannot be cleared in time for the ferry to dock. In this instance, the ferry would be diverted to another available harbour, potentially Tarbert or Lochboisdale, or if need be cancelled. Based on the fact that all work will be carefully planned, with relevant risk assessments and mitigation in

place, in the event of an issue arising, it can be assumed that the situation would be resolved prior to the subsequent ferry's arrival. Although this is undesirable, it is not unusual for ferries to be diverted or cancelled for reasons such as weather. Hence, on the assumption that a delay resulting in the ferry berth being occluded would only affect one arrival/ departure from Lochmaddy, the impact magnitude is deemed to be minor. The ferry has a high receptor sensitivity; therefore, the effect is deemed to be **adverse minor: non-significant, short-term.**

At some points during the construction works, there will be no pedestrian access from the pier, and all access will be via the linkspan. This will affect less than 50% of the ferry's users, which in alignment with Table 12.3.4, have a low sensitivity. The magnitude is deemed to be a moderate effect, as it will be a noticeable detriment to the service. The resultant effect is **adverse minor: non-significant, short-term**.

12.5.1.7 Pontoon and Mooring Use

To facilitate dredging some of the pontoon anchors will need to be temporarily repositioned. The repositioning prior to dredge will take less than a week to complete, as will the reinstatement. As the anchors will be relocated one at a time it will be safe for vessels to be moored to the pontoon during anchor relocation works. Similarly, the pontoon will be serviceable throughout the dredging works. However, to facilitate access to move anchors, and to complete the dredging works safely, the berths on the east end of the pontoon may need to be taken out of service. This will reduce the number of berths available. The preference is to carry out these works in the winter months to minimise disturbance to visiting vessels, and to ensure sufficient berthing capacity is available throughout the works.

Moorings will be available for use throughout the dredging and construction works. However, access to and from the moorings from shore may be via a slightly longer route so as to avoid construction activities and vessels.

Access to the pontoons is via a raised walkway which crosses the intertidal area where the land reclamation is planned. Hence the construction works have been designed around this to ensure that access via the walkway can be retained, until the replacement access from the south east corner of the reclamation area, as shown in Drawing 1975-909, is available.

The marina facilities located to the west of the existing marshalling area are in the middle of what will be the extension to the marshalling area and lorry park, as such, they will be relocated to the reclaimed land immediately adjacent to the new access to the pontoons (Drawing 1975-909). There may be a short period of time where the marina facilities need to be temporarily relocated elsewhere or taken out of service to facilitate the land reclamation works.

The local vessel owners utilising the pontoon and moorings are a medium sensitive receptor. As all the elements discussed above overlap and potentially cumulate into a larger overall effect, the impact magnitude is defined taking account of all elements to be moderate magnitude impact, giving rise to an **adverse moderate: significant short-term** effect.

Visiting recreational users are of a low sensitivity and depending on when they happen to visit are likely to only be affected by one of the aforementioned elements during their visit. Hence,

the impact magnitude on them is minor giving rise to an **adverse negligible: non-significant short-term** effect.

12.5.1.8 Ferry Pier Use

Access to the north side of the pier shall be maintained for third party users during the works as far as practicable, although some restrictions may apply for health and safety reasons.

Access to the ferry berth will be maintained and could be utilised for essential deliveries. However, vessels will need to vacate this area to allow the ferry to berth. The ability for materials to be offloaded onto the pier will be determined by the status of the construction works at the time. The impact magnitude on essential deliveries is assessed as moderate, and this receptor is highly sensitive, the overall effect is therefore **short-term adverse moderate: significant**.

There is a potential for working restrictions on the use of the north side of the ferry pier, the most regular user of the berth being the fish farm vessels which require access to facilitate their ongoing operations. The local vessels are medium sensitive receptors, the magnitude of impact on them is deemed to be moderate, giving rise to a **short-term adverse moderate: significant** effect.

12.5.2 Operation

As discussed in Chapter 2; Project Description, ferry use is increasing, which is one of the main drivers for the procurement of the new ferry and the need for the ferry terminal upgrades. Hence, the project will facilitate the increase in vehicles arriving to and leaving from the island, but is not the cause of it. The ferry will operate to a similar timetable as the existing ferry, and any increases in vehicle numbers will be minimal.

As discussed in Section 12.4.1.1 the peak month for ferry travel is July. The predicted average traffic levels per ferry in July is predicted in Table 12.5.1. As discussed in Chapter 2, the new vessel has 120m more vehicle lane available compared to the MV Hebrides. As such, it can accommodate 135 (4.5m long vehicles) compared to the 98 that can be accommodated on the MV Hebrides. However, it is unlikely that the vessel would be filled with only cars, hence a current and future worst-case scenario based on the typical make up of vehicle types is provided in Table 12.5.1

Table 12.5.1: Predicted Average Traffic Numbers for July

Year/Scenario	Total Vehicles	Cars	Coaches	Commercial Vehicles
2016	56.70	48.82	0.11	7.77
2017	63.61	55.65	0.13	7.83
2018	65.28	57.27	0.13	7.88
2019	67.00	58.93	0.14	7.94
2020	68.48	60.34	0.14	8.00
2021	69.99	61.79	0.14	8.06
2022	71.56	63.27	0.14	8.14
Current Worst Case	84	75	1	8
Future Worst Case	112	100	1	11

The ferry traffic will continue to use the A865 to the ferry, and the marshalling area will be increased in size to accommodate 198 vehicles. During the peak month of July, it is predicted that by 2022, traffic levels will increase by 6.8% on current 2019 usage, the bulk (95%) of the increase being associated with cars. The worst-case scenario current to future identifies a potential for a 25% increase in vehicle numbers between the MV Hebrides and the new ferry. The additional 28 vehicles would arrive or depart the ferry terminal in the same hour. The increase is equivalent to 3.1% of the road's hourly design capacity, with total number of vehicles, assuming a full new ferry, being 12.4% of the road's capacity. Given the fact this would only occur over 24 hours a week (12 in each direction) in the summer months, approximately 12 hours in winter, then the overall effect will be barely noticeable and will not change traffic conditions.

The road design layout has been informed by swept path analysis, to ensure that all manoeuvres can be completed safely as detailed in Appendix L.1.

12.5.2.1 Pedestrians, Cyclists and Road Users

Safe pedestrian access to the terminal building has been ensured by providing footpaths and pedestrian crossings around the roundabout at the entrance to the marshalling area. The footpaths have been designed to an appropriate width to ensure there is no reason for pedestrians to utilise the road.

For those who need to use a car to reach the terminal, the car park immediately north of the terminal building is being extended by 21 spaces, providing a total of 39 spaces. A designated pedestrian path will be constructed between the carpark and the terminal building. The parking spaces can be utilised for long-stay, allowing people to travel on the ferry without their cars, and utilise public transport once they reach Uig. Disabled parking spaces have been provided immediately adjacent to the terminal building.

The increased ferry size could lead to a larger volume of traffic arriving at the terminal during peak season. To accommodate the additional vehicles and prevent queuing onto the public road, the new marshalling area has been sized to provide a 46% over-capacity. The check in facility is partway down the marshalling area, to provide adequate space for vehicles to queue off the public road. Staff actively monitor ticket sales and vehicle queuing and mitigate any excessive queuing by opening the marshalling area early.

A mini roundabout in the form of a painted button on the road, will be provided at the entrance to the marshalling area. This will aid access to the marshalling area during busy times.

There will be minor impacts on cyclists, as the volume of traffic will increase marginally. Cyclists will benefit from the provision of a cycle shelter in the marshalling area, adjacent to the upper end of the linkspan. Access to it will be via the road next to the linkspan, which extends to the ferry terminal building. This access will be restricted to use by cyclists and pedestrians only.

Improvements in facilities for highly sensitive receptors; pedestrians and cyclists; are minor beneficial giving rise to **beneficial minor: non-significant permanent** effects.

Road users are unlikely to experience significant increases in delays, due the relatively small increase in traffic per day, low levels of existing traffic movements, together with the improved marshalling facilities, hence the magnitude of impact on road users is negligible giving rise to a **negligible: non-significant permanent** effect.

12.5.2.2 Public Transport Users

Passenger numbers are predicted to rise by 5.5% from 2019 levels. This includes a combination of people utilising public transport and their own vehicles. Hence the increased demand on public transport is not expected to be great.

The harbour is located in a good area for public transport with buses compatible with 15 of the 24 services. A number of the buses need to be booked in advance as they only operate when needed. This would suggest that there is currently capacity in the public transport network. Ideally there would be bus services compatible with all ferry arrivals and departures. This is an existing issue and will not be changed by the upgrading works.

The bus turning area has been widened to improve safe turning as detailed in Appendix L.1 Drawing 1975-967. The drop off areas and bus stops will remain adjacent to the ferry terminal building. The impact magnitude on public transport users is therefore negligible, giving rise to a **negligible: non-significant permanent** effect.

12.5.2.3 Road Safety

There will be beneficial effects resulting from the upgrade works in terms of the road infrastructure improvements including a new roundabout and widening of the turning area at the end of the A865. The widened turning area will remove difficult turning manoeuvres currently undertaken by buses and HGV's in front of the terminal building. Road safety is a high sensitivity receptor, the magnitude of effect is minor giving rise to a **beneficial minor: non-significant** effect.

12.5.2.4 Local Amenity

Improved facilities for HGV, trailer and car parking will reduce issues associated with parking on the A865. The greater capacity on the ferry will result in greater availability of tickets for sailings. The effects on local amenity will therefore be beneficial of moderate magnitude giving rise to a **permanent beneficial moderate: significant** effect.

12.5.2.5 Navigational Risk

Once operational the ferry will operate to a timetable similar to the current one, with summer and winter services. The vessel is larger but the appropriate upgrades, including dredging, will have been completed to take account for this. Hence **no change** in overall navigational risk is predicted once the new ferry becomes operational. Specific risks and management techniques may change, but that will be addressed by CnES as the statutory harbour authority via the MSMS processes.

12.5.2.6 Ferry Operations

The ferry terminal upgrade will allow the larger ferry to be accommodated in a wide variety of sea states and weather conditions. The larger ferry provides a range of benefits as discussed in Chapter 2: Project Description. However, the ferry terminal upgrade will lead to **no change** in the overall operation of the ferry service. It is noted that if the terminal was not upgraded there would be constraints associated with the larger ferry berthing on the existing structure which would be detrimental to ferry services.

12.5.2.7 Pontoon and Mooring Use

The operation of Lochmaddy ferry terminal, once upgraded, will not change the pontoons marine access or activities. There are however onshore changes. The marina facilities will be located closer to the pontoons, with a shorter access bridge. The marina facilities will be fenced off from the rest of the ferry terminal, improving safety and security of the facilities. Parking will be provided adjacent to the facilities, an improvement on the current situation. The impact magnitude on local vessels (medium sensitive receptors) is moderate, leading to a **beneficial moderate: significant permanent** effect. Visiting recreational vessels (low sensitive receptors) are less likely to benefit from the provision of parking and as such will the impact magnitude on them will be minor, giving rise to a **beneficial negligible: non-significant permanent** effect.

There will be **no change** to the mooring area, during the operational phase.

12.5.2.8 Ferry Pier Use

The lengthening of the ferry pier will facilitate the berthing of larger vessels on the south side between ferry activities, and additional room for berthing on the northside with improved manoeuvring due to the dredging works. In additional the upgrade of the existing sections of the pier will ensure their longevity. Hence, local vessels (medium sensitive receptor) and essential deliveries (high sensitive receptor) will be subject to a moderate magnitude of impact, giving rise to a **beneficial moderate: significant permanent** effect.

12.6 Mitigation Measures

12.6.1 Construction

Secondary mitigation measures are required for the four significant adverse effects identified during the construction phase.

12.6.1.1 Local Amenity

The local amenity effects on the Lochmaddy Livestock Mart will only occur when there is a livestock sale, which could occur up to four times during the construction period. The sale is planned well in advance, so it is possible for construction activities to be planned around it. Early discussion with Dingwall and Highland Marts Ltd, who operate the sale, will allow specific mitigation to be agreed. Specific mitigation measures will be dependant on the construction activities ongoing at the time, although could include:

- Having no construction HGV deliveries on the day of the sale;
- Construction works affecting the A865 being made safe and stopping on the day of the sale;
- Identification and provision of additional safe parking areas for those attending the sale;
- Appropriate signage, barriers and cones to facilitate use of safe areas for parking and pedestrian access; and
- Cessation of any loud works which could disturb livestock.

12.6.1.2 Pontoon and Mooring Use

Dredging to be carried out through winter months when the number of vessels utilising the pontoon and mooring is low, and hence there should be enough berths without those on the east end on the pontoon to accommodate all local vessels, and any visiting recreational vessels. The design and layout of the new pontoon facilities area have been discussed with the pontoon operators. Any temporary arrangement will also be discussed and agreed with them prior to implementation. Good two-way communications with the pontoon operator and local vessel owners will aid in minimising effects.

12.6.1.3 Ferry Pier Use

Good communications with those providing essential deliveries, with regard to specific restrictions associated with the use of the ferry pier, will allow planning around the ferry timetable to allow deliveries to be made via the ferry berth.

Arrangements will be put in place for road salt required for the winter of 2019/2020 to be delivered earlier than normal, prior to construction works commencing, to avoid any potential issues associated with unloading the vessel.

The crew of the fish farm vessels which utilise the pier most frequently will be inducted by the construction contractor to allow them to access their vessel safely throughout the construction works.

There will be continual liaison between the harbour master and the construction contractor so that he is aware of any restrictions with regard to the pier's use, such that he can work with vessel owners to ensure that they can utilise the pier safely as required.

Every effort will be made to complete works on time to minimise the duration of the inconvenience caused.

12.6.2 Operation

There are no significant adverse effects identified associated with the operational phase as such no secondary mitigation is required.

12.7 Residual Effects

12.7.1 Construction

By implementing the mitigation identified in Section 12.6.1, the magnitude of the impacts and associated effects are reduced. These are discussed below.

12.7.1.1 Local Amenity

By planning for the livestock sales and working with the operators of the Lochmaddy Livestock Mart to identify specific mitigation such as that detailed in Section 12.6.1.1, the magnitude of effects can be reduced to minor, giving rise to an **adverse minor: non-significant temporary very short-term** effect.

12.7.1.2 Pontoon and Marina Use

Taking account of the mitigation identified in Section 12.6.1.2, the magnitude of impact on the local vessel pontoon and mooring users reduces to minor giving rise to an **adverse minor: non-significant temporary short-term** effect.

12.7.1.3 Ferry Pier Use

The mitigation identified in Section 12.6.1.3 will ensure that essential deliveries can be made throughout the construction phase. As such, the magnitude of impact is reduced to minor, giving rise to an **adverse minor: non-significant temporary short-term** effect.

The effect on the local vessels utilising the ferry pier reduce from moderate to minor, taking account of the mitigation identified in Section 12.6.1.3. This gives rise to an **adverse minor: non-significant temporary short-term** effect.

12.7.2 Operation

There are no detrimental significant effects associated with the operational phase. Hence no specific mitigation had been identified and the effect levels assessed in Section 12.5.2 remain valid.

12.8 Cumulative Effects

The only project identified in Chapter 3; Methodology as having the potential for cumulative construction effects with the Lochmaddy ferry terminal upgrade works is the Uig ferry terminal upgrade works. It is also recognised that the travel benefits associated with the operational phase due to being able to accommodate the new vessel will only be realised if Uig is also upgraded to accommodate the new vessel.

12.8.1 Uig Ferry Terminal Upgrade

The ferry service from Uig is expected to continue as usual throughout the majority of the Uig ferry terminal upgrade construction programme, with the exception of the period of time required to complete the Uig linkspan and berthing roundhead upgrades. The closure is expected to last up to approximately 12 weeks. The timing of this closure is yet to be

confirmed. However, it is most likely to occur either in the spring or autumn period, therefore avoiding the peak summer season, when vehicle and passenger throughput is at its highest.

Disruption to the ferry service could affect a range of ferry users including:

- Local residents who use the ferry service on a regular basis;
- Visitors who intend to use the service from Uig to travel to Tarbert; and
- Businesses who transport their merchandise via the ferry service.

Additional ferry capacity on alternative routes between the mainland and the Outer Hebrides will be considered by Calmac Ferries Ltd if necessary. Therefore, it is considered unlikely that the works will significantly affect visitor numbers to the Outer Hebrides. Details of alternative and/or additional services to be provided on other routes, including an amended service to Lochmaddy and Tarbert, have yet to be confirmed.

A reduced frequency or reliability of ferry service could be expected to result in reduced tourist and visitor numbers arriving in Lochmaddy, as they favour alternative routes for example from Stornoway. This would result in a corresponding reduction in visitor footfall and associated income in Lochmaddy. Lochmaddy would still expect to receive a proportion of the visitors arriving at other ports as they tour around the island by road.

Alternative services may be from Lochmaddy to Ullapool hence, depending on their onward destination, passengers may have further to travel, as they will land in Ullapool instead of Uig.

Passenger and vehicle numbers are expected to recover rapidly with the resumption of normal service on the Skye Triangle ferry service, on completion of the Uig linkspan replacement and berthing roundhead construction activities.

Disruption to the ferry service as a result of Uig linkspan replacement and berthing roundhead operations is considered likely to result in a **moderate: significant short-term** effect.

Key to minimising the effect is good communication of the temporary arrangements well in advance of the works, to allow ferry users to plan accordingly. With this taken account of its effects for the majority of ferry users should be reduced to **minor: non-significant short-term** residual effect.

12.9 Summary of Effects

The additional movement of vehicles on the road to deliver materials during the construction phase have been minimised by the winning of material for the land reclamation works from the onshore works. Standard construction mitigation will be utilised to minimise the effects of the increased vehicle movements on road safety and local amenity, and as such, no significant effects are expected to occur for the majority of the construction phase.

It has been identified that there is a potential for significant effects when there are livestock sales at the Lochmaddy Livestock Mart due to the increased activity adjacent to the ferry terminal. Therefore, specific mitigation appropriate to the construction works ongoing at the time will be identified and implemented, reducing this impact to non-significant.

During construction, there are significant impacts on local vessel users associated with the pontoon and mooring access and the use of the ferry pier. The effects can be appropriately mitigated to ensure no residual significant effects.

The construction works will also give rise to inconvenience to ferry users in that foot access from the pier will not always be available. The Uig ferry terminal upgrade works, which is part of the wider Skye Triangle projects to facilitate the new ferry, will lead to an alternative ferry service to Lochmaddy being put in place, for up to 12 weeks.

The operational phase of the project brings multiple benefits including additional parking for cars, HGV's and trailers, and improved road layouts including a safer turning area. Pedestrians will benefit from safe walkways and cycle storage facilities are being provided, all of which support the introduction of the new larger vessel on the Uig Lochmaddy route.

Table 12.9.1 provides a summary of impacts, mitigation and residual effects.

Table 12.9.1: Summary of Effects

Receptor and Value		Phase	Predicted Impact	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
Pedestrians, Cyclists	High	Construction	Works around the entrance to the marshalling area, will require pedestrians, cyclists and road users to be rerouted at times. Potentially delaying movements.	Minor Adverse Temporary Short Term	Minor: Non-Significant	The development of a Traffic and Pedestrian Plan. To ensure safe access during construction works.	Minor Adverse Temporary Short Term	Minor: Non-Significant
Road Users	Low	Construction		Minor Adverse Temporary Short Term	Negligible: Non-Significant		Minor Adverse Temporary Short Term	Negligible: Non-Significant
Pedestrians, Cyclists	High	Construction	Work on the turning area will restrict access to vehicles. Pedestrian and cyclists may be rerouted at times.	Minor Adverse Temporary Short Term	Minor: Non-Significant		Minor Adverse Temporary Short Term	Minor: Non-Significant
Road Users	Low	Construction		Minor Adverse Temporary Short Term	Negligible: Non-Significant		Minor Adverse Temporary Short Term	Negligible: Non-Significant
Public Transport	Medium	Construction	Work on the turning area will restrict access to vehicles. A temporary bus stop further from the terminal building may be required.	Minor Adverse Temporary Short Term	Minor: Non-Significant		Minor Adverse Temporary Short Term	Minor: Non-Significant
Road Safety	High	Construction	Increased traffic including HGV's due to construction activities.	Minor Adverse Temporary Short Term	Minor: Non-Significant	Monitoring/managing of deliveries to avoid ferry arrival times.	Minor Adverse Temporary Short Term	Minor: Non-Significant

Receptor and Value		Phase	Predicted Impact	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
Local Amenity	High	Construction	There is the potential for dirt and debris to be thrown up from construction vehicles. There will be a requirement for construction staff parking.	Minor Adverse Temporary Short Term	Minor: Non-Significant	Implement dust mitigation as identified in the Construction Environmental Management Document. Monitoring to ensure there is no deterioration in the road surface. Encourage carshare and monitor staff parking on-site.	Minor Adverse Temporary Short Term	Minor: Non-Significant
			On days of livestock sales, construction traffic and road works could impact upon parking and access to the Mart.	Moderate Adverse Temporary Very Short Term	Moderate: Significant	Early discussion with Dingwall and Highland Marts Ltd to identify and agree specific mitigation.	Minor Adverse Temporary Very Short Term	Minor: Non-Significant
Ferry	High	Construction	Navigational Risk due to ongoing marine construction activities.	Minor Adverse Temporary Short Term	Minor: Non-Significant	Prior to and during construction, CnES will review the risk assessments and marine activity operating procedures. Engagement with the harbour users will be increased.	Minor Adverse Temporary Short Term	Minor: Non-Significant
Local Vessels	Medium	Construction						
Visiting Vessels	Low	Construction			Negligible: Non-Significant			Negligible: Non-Significant

Receptor and Value		Phase	Predicted Impact	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
Ferry	High	Construction	Access for ferry berthing obstructed by works. Causing ferry, delay, cancelling or rerouting.	Minor Adverse Temporary Short Term	Minor: Non-Significant	Works planned around the ferry timetable. As a contingency measure ferry can be delayed or diverted to Tarbert or Lochboisdale, to avoid cancellation when practicable. Good communication with passengers to make them aware of the potential inconvenience.	Minor Adverse Temporary Short Term	Minor: Non-Significant
Ferry Passengers (<50%)	Low	Construction	No pedestrian access to the ferry from the pier.	Moderate Adverse Temporary Short Term	Minor: Non-Significant	Good communication with passengers to make them aware of the potential inconvenience.	Moderate Adverse Temporary Short Term	Minor: Non-Significant
Local Vessels	Medium	Construction	Berths available on pontoons reduced, during dredging works.	Moderate Adverse Temporary Short Term	Moderate: Significant	Dredging to be carried out through winter months when the number of vessels is low	Minor Adverse Temporary Short Term	Minor: Non-Significant

Receptor and Value		Phase	Predicted Impact	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
Visiting Vessels	Low		Onshore marina facilities temporarily relocated or unavailable. Changes to access from land to pontoon. Mooring access route increased.	Minor Adverse Temporary Short Term	Negligible: Non-Significant	and hence enough berths available. Any temporary arrangement to be discussed and agreed pontoon operators. Good two-way communications with the pontoon operator and local vessel owners.		
Local Vessels	Medium	Construction	Access to the ferry pier affected by construction works.	Moderate Adverse Temporary Short Term	Moderate: Significant	The crew of the fish farm vessel to be inducted by the construction contractor, to allow safe access their vessel. Good communication between the Harbour Master, construction contractor and vessel owners to ensure continual safe pier use. Ensure works are completed on time to minimise the duration of the inconvenience caused.	Minor Adverse Temporary Short Term	Minor: Non-Significant

Receptor and Value		Phase	Predicted Impact	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
Essential Deliveries	High	Construction	Access to the ferry pier affected by construction works, including ability to offload cargo.	Moderate Adverse Temporary Short Term	Moderate: Significant	Good communications with regard to restrictions with delivery vessel owners, to allow planning around the ferry timetable. Arrangements to deliver materials prior to the construction works commencing.	Minor Adverse Temporary Short Term	Minor: Non-Significant
Ferry	High	Construction	Uig ferry terminal upgrade works prevent docking at Uig for up to 12 weeks.	Moderate Adverse Temporary Short Term	Moderate: Significant	Alternative ferry arrangements to be put in place. Good communication of the temporary arrangements well in advance of the works.	Minor Adverse Temporary Short Term	Minor: Non-Significant
Pedestrians, Cyclists	High	Operation	Improved footpaths and provision of cycle storage.	Minor Beneficial Permanent	Minor: Non-Significant	None required.	Minor Beneficial Permanent	Minor: Non-Significant
Road Users	Low	Operation	Increased traffic volumes.	Negligible Adverse Permanent	Negligible: Non-Significant	None required.	Negligible Adverse Permanent	Negligible: Non-Significant
Public Transport	Medium	Operation	Minor increase on public transport demands.	Negligible Adverse Permanent	Negligible: Non-Significant	None required, capacity in the existing services.	Negligible Adverse Permanent	Negligible: Non-Significant

Receptor and Value		Phase	Predicted Impact	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
Road Safety	High	Operation	Improved road safety due to widened turning area and improved access and marshalling arrangements.	Minor Beneficial Permanent	Minor: Non-Significant	None required.	Minor Beneficial Permanent	Minor: Non-Significant
Local Amenity	High	Operation	Increased car, HGV and trailer parking. Greater capacity on the lifeline ferry service.	Moderate Beneficial Permanent	Moderate: Significant	None required.	Moderate Beneficial Permanent	Moderate: Significant
Local Vessels	Medium	Operation	Facilities closer to pontoons, with fencing improving safety and security. Provision of parking adjacent to the facilities.	Moderate Beneficial Permanent	Moderate: Significant	None required.	Moderate Beneficial Permanent	Moderate: Significant
Visiting Vessels	Low	Operation		Minor Beneficial Permanent	Negligible: Non-Significant	None required.	Minor Beneficial Permanent	Negligible: Non-Significant
Local Vessels	Medium	Operation	Additional berthing available on the northside of the ferry pier. Longer berthing face available on the ferry berth.	Moderate Beneficial Permanent	Moderate: Significant	None required.	Moderate Beneficial Permanent	Moderate: Significant
Essential Deliveries	High	Operation						

Key

	Significant Effect

12.10 References

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Chapter 13: Water Quality & Coastal Processes

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Contents

13 Water Quality & Coastal Processes

13.1 Introduction

This chapter provides an assessment of effects on water quality and coastal processes associated with the construction and operation of the Lochmaddy ferry terminal. Mitigation measures to minimise effects are identified and potential cumulative impacts are discussed.

13.2 Regulations, Guidance and Sources of Information

13.2.1 Water Framework Directive

The Water Framework Directive's (2000/60/EC) (WFD) primary purpose is to create a framework to protect groundwater, coastal waters, transitional and inland surface waters. The framework details multiple aims which include:

- Prevention and protection of aquatic environments and enhancement of their ecosystem status in regard to the water needs of wetland and terrestrial ecosystems which rely upon aquatic environments;
- Enhancement of aquatic environments through the introduction of measures to reduce discharges, emissions and losses of hazardous substances; and
- Continuation of progressive reduction of groundwater pollution and further prevention of its pollution.

Under the WFD, member states are to achieve "*good ecological status*" of their coastal, transitional and inland waters. Protection and restoration of member states' ground waters to maintain the dependent surface water and terrestrial ecosystems are also required. In Scotland, the Water Environment and Water Services (Scotland) Act 2003 transposed the Directive into Scottish Law.

The Directive also requires that classified waterbodies are given legal protection. In Scotland this was incorporated into law under the Environmental Liability (Scotland) Regulations 2009, making it an offence to adversely affect a classified waterbody so that its status or potential under the WFD is deteriorated.

13.2.2 Bathing Water Directive (2006/7/EC)

The Bathing Water Directive 76/160/EC came into force in 1975 and is a further piece of European legislation that should be considered. The main objective of the directive is to protect public health and that of the aquatic environment including coastal and inland areas, which include rivers and lakes, from pollution. It placed a mandatory duty upon member states to conduct regular monitoring of designated bathing sites which must comply with specific standards set out within the Directive. In 2006 the Directive was revised (2006/7/EC), introducing higher standards but simplifying classifications of designated bathing sites by only considering two measurements (19 laboratory tests previously), intestinal enterococci and *Escherichia coli* (Mansilha et al., 2009). New compliance categories which included excellent, good, sufficient and poor were also introduced while placing a duty upon the member state to ensure all bathing waters meet the criteria categorised as sufficient, in addition to taking action to increase numbers of designated sites to categories of excellent and good. In Scotland

the revised Directive was transposed into law through the Bathing Waters (Sampling & Analysis) Direction 2008 and the Bathing Waters Regulations 2008.

13.2.3 The Water Environment (Shellfish Water Protected Areas: Environmental Objectives etc.) (Scotland) Regulations 2013

The Water Environment (Shellfish Water Protected Areas: Designation) (Scotland) Order 2013 identifies waters as 'shellfish water protected areas. In 2016, 84 waters were identified under the order (Marine Scotland, 2016). Under the Shellfish Regulations, specific environmental objectives are placed upon the identified designated sites with regular monitoring of the water quality conducted by the Scottish Environment Protection Agency (SEPA) (Marine Scotland, 2016).

13.2.4 The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (As Amended)

The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended) (CAR) is intended to control activities which have the potential to cause pollution to the water environment. Such activities are controlled at three different levels depending on the potential risks. These are:

- General Binding Rules (GBRs) – cover low-risk activities for which there is no need to contact the Scottish Environment Protection Agency (SEPA). However, a person undertaking an activity controlled by the GBRs must abide by any rule in the Regulations which is applicable to the activity;
- Registration – also covers low-risk activities, but those which may cause a cumulative risk to the water environment. Such activities must be registered with SEPA, who may impose conditions but only so far as to describe the activity; and
- Licensing – for higher risk activities which require site-specific rules, or where constraints on an activity are required. Such activities will be regulated through a CAR license which must be sought through SEPA.

2017 amendments to CAR included the requirements for oil storage, previously provided for in the Water Environment (Oil Storage) (Scotland) Regulations. These requirements are now included as GBR.

13.2.5 Relevant Guidance

The following guidance documents are relevant and were utilised in the development of this Chapter:

- GPP 5: Works and maintenance in or near water (Environment and Heritage Service, SEPA, & Environment Agency, 2017);
- Guidance on Marine Non-Native Species (GreenBlue, 2010);
- Marine Biosecurity Planning: Guidance for Producing Site and Operation-Based Plans for Preventing the Introduction of Non-native Species (Payne, Cook, & Macleod, 2014);
- Environment Agency's WFD Assessment guidance (Environmental Agency, 2017);
- Marine Scotland in the Pre-disposal Sampling Guidance (Marine Scotland, 2017); and
- The Alien Invasive Species and the Oil and Gas Industry Guidance (IPIECA & OGP, 2010).

13.3 Assessment Methodology

13.3.1 Baseline

To inform the project design and to understand the seabed conditions, 9 vibrocores were taken by Aspect Land & Hydrographic Surveys Ltd (ALHS) in December 2017 (Provided in Appendix M.1). However, only samples from five vibrocores were sent to the laboratory for chemical and physical analysis. The other cores were utilised to better understand the seabed geological conditions.

Pre-disposal sample analysis results form has been completed with the results of the chemical analysis of the five vibrocore analysed. The sample analysis results informed the production of the Lochmaddy Ferry Terminal Upgrade Capital Dredge - Best Practicable Environmental Options (BPEO) Report (Affric Limited, 2019). The pre-disposal sample analysis results form and the BPEO Report have been submitted in support of the dredge and disposal marine licence application.

In addition, the following data sources were consulted to identify the baseline water quality conditions:

- National Marine Plan Interactive (Marine Scotland, 2018);
- Charting Progress 2 Feeder Report: Ocean Processes (UKMMAS, 2010b);
- Charting Progress 2 Feeder Report: Clean and Safe Seas (UKMMAS, 2010a); and
- River Basin Management Plan 2015-2027 (Scottish Government, 2015).

Wallace Stone completed an Assessment of Tidal Flood Levels which is provided as Appendix M.2. The current 1 in 200 year and 1 in 1000-year flood levels were requested from Scottish Environment Protection Agency (SEPA), who provided this information for consideration in the assessment.

13.3.2 Impact Assessment Methodology

Potential impacts upon the water quality and coastal processes resulting from the Lochmaddy ferry terminal upgrade works have been assessed utilising the methodology below.

13.3.2.1 Magnitude of Impact

To determine the risk associated with the construction and operation of the Lochmaddy ferry terminal upgrade with regards to water quality and climate change, a risk-based approach that uses probability and impact magnitude to determine the significance of impact has been utilised. Table 13.3.1 provides levels of impact and examples of what would constitute these levels.

Table 13.3.1: Definitions of Magnitude of Impact

Magnitude of Impacted of Impact	Examples of Impact Magnitude
High	Material change in water quality, coastal processes or flood risk. Characteristics may include: • Significant increase/decrease in diffuse pollution levels. • Ecological impact, increase/decrease in mortality figures. • Medium to long-term impacts on the coast. • Significant increase/decrease in flood risk.
Medium	Change in water quality, coastal processes or flood risk. Characteristics may include: • Minor increase/decrease in diffuse pollution levels. • Measurable changes in water quality. • Minor harm to the ecosystem, increase/decrease in productivity. • Medium term reversible impacts on water quality or coast. • Minor increase/decrease flood risk.
Low	Small changes to the water quality, coastal processes or flood risk. Characteristics may include: • Increase/decrease in localised pollution levels. • Short term reversible impacts on water quality of coast. • No impacts on the ecosystem. • Minor localised increase/decrease in flood risk.

13.3.2.2 Likelihood of Impact Occurring

The likelihood of an impact occurring is also assessed. A qualitative approach is taken to predict the likelihood of an impact based on the probability of an impact occurring and professional judgement rather than data frequency. The likelihood categories are displayed in Table 13.3.2 with their definitions.

Table 13.3.2: Likelihood Categories and their Definitions

Likelihood	Definition
Certain/near-Certain	> 1 in 1 year
Probable	< 1 in 1 year but > 1 in 10 years
Unlikely	< 1 in 10 years but > 1 in 100 years
Extremely Unlikely	< 1 in 100 years

13.3.2.3 Significance of Effect

The significant of effect is derived by considering the magnitude of impact and probability of the impact occurring. Determination of whether the identified effect is categorised as significant or non-significant utilised the matrix set out in Table 13.3.3.

Table 13.3.3: Significance of Effects Matrix

Magnitude of Impact	Probability			
	Certain	Probable	Unlikely	Extremely Unlikely
High	Major	Moderate	Moderate	Minor
Medium	Moderate	Moderate	Minor	Negligible
Low	Minor	Minor	Negligible	Negligible

Key

	Significant Effect
	Non-Significant Effect

13.3.3 Identification and Assessment of Mitigation

The identification of mitigation is as described in Chapter 3: Methodology.

13.3.4 Assessment of Residual Effects

Where secondary mitigation is identified, the magnitude and likelihood of the impact will be reassessed as per Table 13.3.1 and 13.3.2 and the overall significance of effect reassessed in line with Table 13.3.3 to understand the resultant residual effect.

13.3.5 Water Framework Directive

In the absence of Scottish guidance, the Environment Agency's WFD Assessment guidance (Environmental Agency, 2017) was used in the completion of the WFD assessment. As there is a potential for upgrade works to give rise to potential impacts on water quality, an Environment Agency's WFD assessment scoping template was completed, to provide an understanding of the need for WFD assessment topic areas. The completed WFD scoping is provided in Appendix M.3.

Table 13.3.4 identifies the receptors and issues identified during the WFD scoping that require additional assessment. A number of the elements have been assessed in other chapters of the EIAR. These are sign posted in Table 13.3.4.

A WFD assessment synergising information from all the relevant chapters is provided in Section 13.5.3. As stated in the WFD, temporary effects due to short-duration activities like construction or maintenance do not count as deterioration, if the water body would recover in a short time without any restoration measures. Therefore, the WFD assessment will concentrate on permanent impacts associated with construction and operation.

Table 13.3.4: WFD Potential Risk and Where Considered

Receptor	Risk issue	Where Considered
Hydromorphology	Flood and Coastal Processes.	Considered within this Chapter.
Biology: habitats	Potential disturbance and loss of low sensitivity habitats.	Considered within this Chapter. Ecological impacts are considered in Chapter 6: Marine Mammals, Chapter 7: Benthic Ecology and Chapter 9: Otters.
Biology: fish	None	However, fish are considered in Chapter 8: Fish Ecology.
Water Quality	Loss of containment of contaminants during construction and operations.	Considered within this Chapter.
Protected Areas	Potential disturbance and loss habitat within protected areas.	Considered within this Chapter. Ecological qualifying features of designated sites are considered in Chapter 6: Marine Mammals, Chapter 7: Benthic Ecology and Chapter 9: Otters.
Invasive non-native species.	Via ballast water and biofouling associated with equipment, materials and vessels required for construction.	The introduction of Invasive non-native species is considered in this chapter, the potential ecological effect is considered in Chapter 7: Benthic Ecology.

13.4 Baseline

Full details of all vibro-core operations and associated sample analysis are provided in Appendix M.1 with a summary of the survey results outlined.

13.4.1 Sediment Loading

Occurrence of sediment loading within the water column of aquatic bodies is a natural phenomenon due to the natural abundance of particulate matter, such as sands and minerals, with the levels of remobilised sediment fluctuating. Multiple combining factors result in naturally occurring increases of sediment loading, such as storms, which increase in frequency in winter months in the Scottish waters, resulting in remobilised sediment from the seabed entering the water column (Gohin, Bryère, & Griffiths, 2015; Schulz, Badewien, & Ziekinski, 2015). The fluctuations of sediment loading levels are important to the marine ecosystem, as remobilised sediments influence primary production, heat transfer, sedimentation rates, and act as a natural cleansing cycle of the water column by attaching to some contaminates and dragging these down to the seabed, where they are buried over time (UKMMAS, 2010b). High levels of remobilised sediments can alter light penetration in the marine water column,

impacting ecological process like photosynthesis and, over prolonged periods, can alter energy fluxes throughout the marine food web (Remy, Hillebrand, & Flöder, 2017).

Data on sediment loading levels in the Minch and Western Scotland is relatively scarce and fragmented to localised studies. Studies identified suspended particulate matter (SPM) concentrations in Western Scotland to be highly volatile and dependent on a range of physical forcing factors and seabed characteristics (UKMMAS, 2010a). Lighter sediment types like silt are more readily remobilised if disturbed and stay suspended over longer periods, allowing greater geographical dispersal. Heavier sediment types like sand require greater kinetic energy to be resuspended and, due to their greater mass, quickly fall back to the seabed, hence geographic spread is more limited (Jones, Bessell-Browne, Fisher, Klonowski, & Slivkoff, 2016).

Particle size distribution (PSD) analysis was carried out on the vibrocore samples. The average results were 57.6% solids of which 60.8% was silt, 24% sand and 15.2% gravel.

13.4.2 Sediment Contaminants

To inform the condition of the marine sediment across the dredge areas, vibrocore samples were taken for chemical analysis. Detailed sediment analysis results are available in the spreadsheet entitled 'Lochmaddy Ferry Terminal Upgrade - Vibrocore Pre-disposal Sampling Results Form' (SOCOTEC, 2018). This has been supplied with the dredge licence application. The data from the excel sheet has been reviewed in detail as part of the BPEO (Affric Limited, 2019) with a summary of the results provided here.

All samples were tested for a suite of chemical parameters analysed against the Action Levels (AL) prescribed by Marine Scotland in the Pre-disposal Sampling Guidance (Marine Scotland, 2017). Sample concentrations were also compared against identified Probable Effect Levels (PEL) and Intermit Sediment Quality Guidelines (ISQG) developed by Environment Canada (CCME, 2002).

The average concentrations for all measured trace metals and organotin compounds across the dredge area were below AL1. However, there were individual sample exceedances for Copper, Mercury and Nickel. No other trace metals or organotin exceeded prescribed action levels. None of the vibrocore samples contained metals or organotins exceeding AL2 (Affric Limited, 2019).

Analysis of organic contaminants identified that AL1's were breached by some samples for multiple polycyclic aromatic hydrocarbons (PAHs). Sample results were compared against PEL's where they were available for PAH's. All results were at least 82% below the PEL, thus no effects are predicted on marine life from the presence of those PAHs. Of those PAH's with no PEL, Perylene has the highest average concentration at 0.236 mg/kg, 236% above the relevant AL1. It is noted that PEL's, where they are available, are on average 6.73 times higher than the AL1 for the relevant compound. It is surmised that if a PEL was derived for Perlyene, it would be in the region of 0.6mg/kg. Hence it is likely that all PAH's are at levels too low to have a probable effect on the environment.

The average total hydrocarbon content (THC) concentrations identified across the dredge area fell below the AL1 levels.

13.4.3 SEPA Coastal Water Monitoring

The Lochmaddy ferry terminal lies within SEPA water quality monitoring zone Loch Maddy. SEPA categorised the water quality as having an overall high status and chemical pass in 2017 (SEPA, 2018b).

Dredge material was classified as being unsuitable for infilling purposes due to its high silt content (Affric Limited, 2019), hence it will be disposed of at Stornoway dredge disposal site. The spoil grounds lie in the Gob na Greige to Rubha Raerinis SEPA monitoring zone. The zone in 2017 was classified as having an overall good status and chemical pass (SEPA, 2018c). To the north of Gob na Greige to Rubha Raerinis lies the Stornoway Harbour water quality monitoring zone. SEPA also categorised the water quality of this zone as having an overall good status and chemical pass in 2017 (SEPA, 2018c).

13.4.4 Bathing Waters

No designated bathing waters are located within the Western Isles (SEPA, 2018a).

13.4.5 Shellfish Waters

A review of the proposed dredge area and the immediate areas adjacent to the proposed dredge identified the closest active shellfish farm and shellfish protected area to be approximately 3km by sea north-east from the development footprint (Marine Scotland, 2018). However, the geographic separation between the development site and shellfish sensitive area make it unlikely that it will be affected by construction or operational activities and as such it doesn't need to be considered as a receptor.

Approximately 10km by sea from the Stornoway dredge disposal grounds lies the designated shellfish water Loch Leurbost. But similar, to the site located nearer to the development, the designated water of Loch Leurbost is not considered further due to the distance and land barriers from the dredge disposal site (Marine Scotland, 2018).

13.4.6 Non-Native Marine Species (NNMS)

Baseline information regarding the presence of non-native marine species is detailed in Chapter 7: Benthic Ecology.

13.4.7 Drainage

Existing drainage in the marshalling area consists of gullies with associated outfall pipes which discharge directly onto the existing seaward rock armour slope. Surface water arising at the existing pier deck drains over the quay edge.

13.4.8 Flood

SEPA provided flood levels for Lochmaddy, based on the coordinates NG 92100 867900. The 1 in 200-year costal water level is 3.37m above ordinance datum (AOD) and the 1 in 1000-year coastal water level is 3.47m AOD. These figures are based on the extreme still water level calculation using the Coastal Flood Boundary Method. This method does not take into account the potential effects of wave action, climate change, funnelling or local bathymetry. SEPA recommend that when considering a development, it is necessary to add a freeboard

allowance to account for these factors, as well as an allowance for climate change (SEPA Evidence and Flood Advice, 2018).

Analysis of tidal flood levels by Wallace Stone identified that potential still water levels of 3.4m AOD and wave run up levels of 3.95m AOD are possible during extreme conditions within a period of highest astronomical tide (HAT) in a 200-year return period (Appendix M.2), excluding effects of climate change.

13.5 Impact Assessment

13.5.1 Construction

13.5.1.1 Increased Sediment Loading

Dredging, dredge disposal, the placement of infill material and the filling of the caisson all have the potential to increase sediments in the water column. This can cause increased sediment loading and can have negative effects on ecological receptors (see Chapters 6-9). In the case of dredging, sediments are in the water column primarily because they have been 'dropped' into it. As such they are passing down through the water column, hence, are not strictly speaking suspended solids.

Suspended solids are small solid particles which remain in suspension in the water as they are colloidal; particles which are so small that gravity doesn't cause them to settle out, or particles which remain in suspension due to the motion of the water.

Alternatively, sediments can be temporarily suspended in the water column due to agitation caused by works and drop out of suspension when agitation ceases. There may be a small proportion of sediments that are suspended due to their size, but this is unlikely to be the bulk of material. As such the terminology utilised throughout this chapter and Chapters 6-9, refers to increased sediments in the water column to cover all aspects.

SEPA requires that any dredging activity takes place out with the bathing water season if there are bathing waters within 2km of the development. As there are no bathing waters on the western isles, no impacts on bathing waters are expected.

13.5.1.1.1 Dredging

As discussed in Chapter 2: Project Description, dredging works include: berth dredge, manoeuvring dredge and the caisson foundation pocket. The three proposed dredging areas cover approximately 5,500m^2 and will give rise to an estimated 5,200m^3 of dredge spoil. A dredge licence for 8,000m^3 has been applied for to allow for insitu changes. Dredging of the three areas is estimated to require approximately 10 weeks to complete. However, this depends on final selection of the dredging method(s) and access.

Disturbance of the seabed deposits within the dredge footprints will result in **certain** sediment loading of the water column. However, the shallow nature of Loch Maddy means sediment agitated during dredging or falling from the excavator bucket during removal will quickly drop through the relatively shallow water column back to the seabed. Affric's monitoring of the sediment loading resulting from similar dredging activities during previous port developments showed that sediment plumes resulting from these activities dispersed rapidly, and were

confined to the immediate vicinity of the working areas (Affric Limited, 2018). As such, the extent of the sediment loading is expected to be localised, and confined to the immediate vicinity of the works, within Loch Maddy. As such the potential effect on water quality is assess as **low**, **short-term**, and **reversible**, constituting to a **minor: non-significant** effect.

13.5.1.1.2 Dredge Disposal

Dredge spoil will be disposed of, to the Stornoway spoil disposal site. Dredge disposal will be from the dredge vessel or barges via bottom opening doors. These allow materials to drop directly from the bottom of the vessel hopper/barge into the water, minimising the energy associated with the drop, as well as the duration of the disposal. The spoil drops in a single event under gravity to the seabed. Small sediment particles will be temporarily suspended in the water column which can give rise to a visible plume. Up to 21 round trips are predicted, assuming a 390m^3 dredge vessel hopper capacity, to complete the dredge disposal operations.

Affric's observations of similar spoil sea-disposal operations show that during disposals conducted using vessels with bottom opening doors, the resulting increased sediment loading dropped out and dispersed quickly (Affric Limited, 2018). Hence the impact on water quality will be localised and short term. The shallow waters of the dredge disposal site (<20m) will assist in the quick settling of the introduced dredge spoil. Due to the predicted quick settling, and the localised temporary nature of the increased sediment loading resulting from spoil disposals, the impact is assessed as **certain**, **low, short term,** and **reversible,** and the resulting effect is **minor: non-significant.**

13.5.1.1.3 Land Reclamation

The project description in Chapter 2 highlights the requirement to extend the existing marshalling area by approximately 3,600m^2, approximately 2,000m^2 of which will be reclaimed from the intertidal area immediately to the west of the existing marshalling area. Rock armouring, imported from a quarry with low fines, will be placed on the seaward edge of the land reclamation area. Geotextile material will be laid prior to material won from the hillside being utilised as infill.

Due to the low fines content of the rock armour and the use of geotextiles, the chance of increased sediment loading is low. Any changes would be of a low magnitude, giving rise to a **minor: non-significant temporary** effect on water quality is predicted.

13.5.1.1.4 Caisson Filling

Seawater will be pumped into the caisson, to sink it into place, as described in Chapter 2: Project Description, once in place this will be pumped out again and the space replaced with infill material. This will be a stepwise process, allowing infill material to settle prior to water being discharged. As such it is highly unlikely to give rise to increase sediment loading and hence is **no change** to water quality is predicted.

As the caisson is classed as a vessel and the water is abstracted from the sea, and the water is discharged back to it, the process doesn't fall under CAR.

13.5.1.2 Potential Loss of Containment

A number of potential pollution sources will be present on the construction site and vessels utilised in the construction process, including:

- Fuel oil/diesel associated with construction plant, vessels and vehicles;
- Hydraulic fluids and oils associated with construction plant and vessels;
- Concrete; and
- Cement wash.

Materials will be appropriately stored and handled in line with standard construction industry practice. However, if a loss of containment were to happen then there could be harm caused to the environment. As such the risk of pollution impacts on water quality are assessed in Table 13.5.1. The assessment utilises the source, pathway, receptor model with Loch Maddy being the receptor considered in this chapter. Effects on other receptors are considered within Chapters 6 to 9.

Table 13.5.1: Loss of Containment Impact Assessment

Source	Scenario	Pathway	Probability	Impact Magnitude	Impact Significance
Fuel Storage Bowser (20m^3 of Diesel)	Loss of full containment.	Spillage to ground potential to reach water.	**Unlikely** Oil will be stored in line with the CAR GBR's hence loss of all 20m^3 is unlikely.	**Medium** Medium term reversible impacts on water quality.	**Minor: Non-significant**
Refueling Activities	Loss of full containment during refuelling (<20l).	Spillage to ground potential to reach water.	**Probable** Multiple refuelling activities carried out, increasing probability of human error.	**Low** Short term localised reversible impacts on water quality.	**Minor: Non-significant**
Vehicles or Plant	Accidental damage to fuel tank, loss of contents (<100l).	Spillage to ground potential to reach water.	**Unlikely** Appropriately trained and certified drivers / operators. Banksmen in place when reversing or carry out manouvers.	**Low** Short term localised reversible impacts on water quality.	**Minor: Non-significant**
Plant – Hydraulic Fluids	Loss of hydraulic fluid, due to pipe burst.	Spillage to ground potential to reach water.	**Probable** Hydraulic pipes fail from time to time.	**Low** Short term localised reversible impacts on water quality.	**Minor: Non-significant**
Concrete Spray (Flexcrete Cementation Coating 851)	Loss of concrete sprey into the sea during pier repair works.	Spillage to ground and directly into sea.	**Probable** Small volumes of concrete are anticipated to drop of sprayed structures during application.	**Low** Short term localised reversible impacts on water quality.	**Minor: Non-signficant**

Source	Scenario	Pathway	Probability	Impact Magnitude	Impact Significance
COSHH Store: Hydraulic Fluids, Maintenance Oils, Chemicals.	Loss of containment during handling etc. Of hydraulic fluids, maintenance oils, chemicals, will all be small volumes 5l to 200l.	Spillage to ground potential to reach water.	**Unlikely** Appropriate storage and usage of materials in line with COSHH asessments.	**Low** Short term localised reversible impacts on water quality.	**Minor: Non-significant**
Large Vessel e.g. Backhoe or Suction Dredger	Accidential damage to fuel tank of dredging vessels and loss of contents (<500m^3).	Spillage directly to water.	**Extremley Unlikely** Masters of the vessels will be appropriately trained. Dredger shouldn't be working near submerged structures.	**High** Significant increase in diffuse pollution levels.	**Minor: Non-significant**
Workboat	Accidental damage to fuel tank loss of contents (<10m^3) for example while manoeuvring around the construction site.	Spillage directly to water.	**Unlikely** Masters of the vessels will be appropriately trained. Aware of any underwater obstacles associated with the construction site (re part completed revetments).	**Medium** Medium term reversible impacts on water quality.	**Minor: Non-significant**

13.5.1.3 Introduction of Non-Native Marine Species (NNMS)

The introduction of NNMS has the potential to result in severe ecological impacts which, in turn, can result in major costs due to the difficulty in trying to eradicate a species once it has been introduced. The vector with the greatest risk of introducing NNMS associated with the Lochmaddy ferry terminal upgrade are the vessels associated with the construction phase. Vessels travelling from already contaminated ports and harbours, or different ecoregions, can transport NNMS via their ballast water and, to a more limited extent, through biofouling (marine growth) on hulls (Yang et al., 2018). There is also the potential that other equipment could introduce NNMSs via sediment trapped in the equipment from previous deployments.

The duration of an introduction of NNMS is considered to be long-term to permanent, due to the difficulties in eradicating an NNMS once it is established. As such, the magnitude of impact resulting from the introduction of an NNMS is assessed as **high.** Ecological impacts of NNMS introduction are specifically considered in Chapter 7: Benthic Ecology.

With regard to the potential for introduction of NNMS via vessel ballast water, the International Maritime Organization ratified the International Convention for the Control and Management of Ships' Ballast Water and Sediments Management (Ballast Water Management (BWM) Convention) in September 2017. This requires all commercial vessels to adopt an approved ballast water management plan, involving either the exchange of ballast water out with coastal waters, or the treatment of ballast water to denature potential NNMSs. The developer will require that all vessels employed to facilitate the construction of the Lochmaddy ferry terminal upgrade are fully IMO compliant, including the BWM Convention. As such, the ballast water source for NNMS is effectively removed. The probability of NNMS being introduced is therefore assessed as **extremely unlikely**, resulting in a **minor: non-significant** effect.

Implementation of the BWM Convention does not mitigate the risk of an NNMS being introduced via biofouling on a vessel. However, this source is considered to carry a lower risk of NNMS introduction than ballast water. The vessels required for the upgrade works are limited to dredging vessels, a work boat and a small number of deliveries. Therefore, the probability of NNMS introduction occurring through biofouling of vessels is assessed as **extremely unlikely**, and the resulting effect is **minor: non-significant**.

The probability of NNMS being introduced via sediments trapped on equipment mobilised to facilitate the construction phase is considered to be **extremely unlikely**. This is due to the fact that the sediment which could act as a source are likely to dry during transit to site, greatly reducing the probability of an NNMS surviving the transit to the development site. The resultant effect is therefore assessed as **minor: non-significant**.

It is acknowledged that the concrete caisson will be constructed offsite in a dry dock. The caisson construction site is currently unknown but is likely to be on the west coast of Scotland, and potentially within the Firth of Clyde. Once completed, the caisson will be floated and towed to the Lochmaddy ferry terminal. The level of risk will be determined by the location of the dry dock the caisson is constructed within and the adjacent waters it needs to pass through. If, for example, the caisson is constructed in the Firth of Clyde, the caisson would need to be towed

through an area which is documented as containing multiple NNMS, including carpet sea squirt (*Didemnum vexillum*), *Tricelleria inopinata* and wireweed (*Sargassum muticum*) (Firth of Clyde Forum, 2012). These species, if transported into Loch Maddy and take hold, could harm the ecology in Loch Maddy, and potentially spread to the shellfish farm posing a socio-economic risk. The risks of this occurring in the absence of secondary mitigation is **unlikely** to **probable**. The resultant effect is therefore assessed as **moderate: significant, permanent**.

13.5.1.4 Litter

Waste arising during construction may include various materials, such as wood utilised for shuttering, off-cuts of rebar metals and packaging materials associated with both constructions works and the welfare facilities. The removal of existing marine infrastructure as detailed in Chapter 2: Project Description may also give rise to the release of litter currently entangled in the marine infrastructure. Where the waste streams are not appropriately managed, they may enter the marine environment and give rise to marine litter.

Marine litter poses a variety of short and long term adverse environmental impacts such as loss of biodiversity and degradation of ecosystem function (Potts & Hastings, 2011). Marine litter of lesser bio or photodegradability, in particular plastics, also provide dispersal opportunities for NNMS (Potts & Hastings, 2011).

Appropriate waste segregation and receptacles will be provided on the construction site to allow the waste hierarchy to be implemented. The likelihood of litter reaching the marine environment without secondary mitigation is assessed as **probable**. The quantities will be small; hence the impact magnitude is deemed to be **low**. As litter could include plastics, the effects are **long-term**, constituting to a **minor: non-significant** effect.

13.5.2 Operation

13.5.2.1 Surface Water Drainage

13.5.2.1.1 Marshalling Area, Hard Stranding and Marina Facility

The new drainage system design is shown in Drawings 1975-351, 1975-361, 1975-362 and 1975-363. Channel and filter drains will be utilised to collect surface water from the lorry/trailer park, the hard standing and marina facilities area. The access road and marshalling area will be drained utilising drain gully's into carrier drains to a Class 1 oil interceptor. The drains from the existing marshalling area, which currently discharge directly to sea, will be rerouted to the oil interceptor. The outflow from the oil interceptor is to a new outfall point in the rock armouring slope of the reclaimed area (Drawing 1975-351). The drains and interceptors have been sized to allow for the maximum flow through the existing surface drains and the volume expected to arise from the new land reclamation areas.

The interceptors will remove both oils and silts arisings from surface water run-off and will discharge into Loch Maddy. The discharge of surface water is of a scale that will fall under the GBR's of The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended). As such, compliance with GBR10(a), 11 and 21 will be ensured such that there will be no degradation in water quality of the Loch Maddy from the development.

The inclusion of the oil and silt interceptors is an improvement on the current drainage system which will give rise to a certain, long term beneficial effect which will minorly improve diffuse pollution levels and hence have a medium magnitude. The overall effect on water quality is identified as **beneficial long-term moderate: significant** effect.

13.5.2.1.2 Carpark

Surface water run-off from the carpark extension will be to a swale, which will provide one level of treatment prior to discharge to sea as shown in Drawing 1975-591. One level of treatment is appropriate for the low pollution hazard level associated with a non-residential carpark with infrequent changes, in alignment with the Sustainable Urban Drainage (SuDS) Manual. The resultant discharge gives rise to **no change** in effects on water quality to that of the existing parking arrangements.

13.5.2.1.3 Pier

The existing pier has no drainage, surface water running off the side of the structure straight to sea. There will be **no change** to this. The caisson will include a surface water drainage channel directing surface water to an oil interceptor, which will remove any silts and oils present prior to discharge. If there is a need to use a crane to empty or load vessels, it would be positioned on the caisson, hence the drain and interceptor are appropriately located with regard to potential risks of loss of containment of potentially polluting substances. The inclusion of the interceptor in the caisson is good practice and may prevent pollution incidents associated with the caissons use, but it will lead to **no change** in water quality.

13.5.2.2 Foul Drainage

The marina facilities which are being relocated to the reclaimed area include a laundry cabin, and a toilet & shower block. The facilities will accommodate less than 15 people. The foul effluent from these facilities is currently routed to a package waste water treatment plant (model - Tricel UK6), the output of which is discharged to sea. The intent is to relocate these facilities to the new area. The outfall will be out through the new rock revetment but will lead to **no change** in terms of water quality. It is however recognised that the discharge will need to be registered with SEPA under CAR.

13.5.2.3 Potential Loss of Containment

Activities and potentially polluting materials utilised at the ferry terminal will not change due to the upgrading works. As such **no change** to the potential for loss of containment is predicted.

The oil storage tanks associated with the marina facilities will be relocated onto the reclaimed area. The requirements of GBR28 for the storage of oil under CAR will continue to be met. There is a slight improvement in that the tank will be located in an area where the surface water drains to an oil interceptor, providing additional protection in event of an incident. This is already assessed in Section 13.5.2.1 and as such is not reassessed here.

13.5.2.4 Introduction of Non-Native Marine Species

As the operation of the ferry terminal will not change from its current use, once it had been upgraded, the risk of introducing NNMS is assessed as **no change.**

13.5.2.5 Litter

Litter arising during the operation of the Lochmaddy ferry terminal is anticipated to primarily originate from members of the public utilising the site. The larger ferry will potential give rise to more people utilising the facility. Therefore, the impact of litter on the marine environment from the operational phase cannot be classed as no change. It is assessed as **unlikely**, **low** and of **long-term**, constituting to a **negligible: non-significant** effect.

13.5.2.6 Coastal Processes

The dredging and reclamation to extend the marshalling area and reconstruction of the pier has the potential to alter the wave climate, wave directions and geomorphological processes within Loch Maddy.

As shown in Drawing 1975-903 the proposed dredging works will result in lowering the seabed levels by between 0.5 and 2m.

Each of the areas to be dredged include an element of sloping into the surrounding seabed to ensure stability. The dredge to the north east of the pier to facilitate manoeuvring has been designed such that the coastline sediments will be removed, but the rock will remain insitu. As such there is no change to the base coastal structure that would lead to a change in coastal processes.

The majority of the existing pier takes the form of an open piled structure, allowing water to flow through it. The extension takes the form of a solid caisson, which will not allow the free movement of water around it. However, as the Minch is to the east of the development, the main water movements will be onto the narrower end face of the caisson, with water being deflected around it, with negligible increases in water flows to either side.

The existing marshalling area includes sections which were previously reclaimed from the sea. The original land reclamation led to the creation of a small intertidal bay. The proposed land reclamation will fill in this small bay, such that the line of the existing marshalling area edge will continue until it reaches the existing land to the northwest. The perimeter of the proposed land reclamation is rock armoured slopes. This is the same shore protection method as adopted for the existing marshalling area. Rock armoured slopes absorb wave energy and reduce wave reflection within the area of the works and adjacent areas. As a result, wave climate from the land reclamation is expected to be similar to existing conditions.

Changes to coastal processes are deemed to be **extremely unlikely**, and if they were to occur, they will be of **low** magnitude, giving rise to a **negligible: non-significant** effect.

13.5.2.7 Flood

Wallace Stone have compared the proposed construction levels against potential flood event heights (see Appendix M.2). This has informed the design heights for the ferry terminal upgrade. All existing ferry terminal infrastructure is above the still water 1 in 1,000-year flood height of 3.47mAOD identified by SEPA. As discussed in Section13.4.8, Wallace Stone have identified that during extreme conditions within a period of highest astronomical tide (HAT) in a 200-year return period, wave run up levels could reach 3.95m AOD.

The existing road level at the linkspan abutment is 3.88mAOD. Hence, there is an existing potential that it could flood in extreme conditions, but as shown in Drawing 1975-SK909 in Appendix M.2 only a small area would be affected. The western edge of the existing marshalling area is 4.16m AOD. The reclaimed area will be at a similar height to tie into the existing marshalling area, rising to 4.29m on the western extremity of the land reclamation and higher inland. The works will not change the area adjacent to the link span as such there is **no change** to the flood risk of the marshalling area.

The carpark extension is at 7m AOD. Hence there is no flood risk in this area.

13.5.3 Water Framework Directive

The WFD scoping assessment provided in Appendix M.3, identified the need to assess hydromorphology, habitats, water quality, protected areas and invasive non-native species.

The Joint Nature Conservation Committee's (JNCC's) Pressure-Activity Database has been utilised to identify potential impacts associated with construction and operational activities (Table 13.5.2). The pressures have been assessed within other sections of this report, which have informed the deterioration assessment provided in Table 13.5.2.

No significant chemical, biological or hydro-morphological affects are predicted. As such there will be no reduction in the status of the Loch Maddy WFD water body.

Table 13.5.2: Summary of WFD Impacts

Activity	Pressure Theme	Pressure	Chapter No.	Deterioration Assessment	Significance of Residual Effect
Land Reclamation	Hydrological Changes (inshore/ local)	Water flow (tidal current) changes – local.	13	Extremely likely potential that there will be changes due to the installation of the caisson and the land reclamation.	Negligible: Non-significant
Land Reclamation	Physical Loss	Physical change (to another seabed type).	7	2,000m^2 area to be lost, the habitat is not of particular high value.	Negligible to minor: Non-significant
Piling	Physical Damage	Penetration and/or disturbance of the substrate below the surface of the seabed.		The geology of the seabed where the piling works is to be completed is not of particular value. Penetrations will cause disturbance but will not deteriorate the overall value.	Negligible: Non-significant
Dredge, Dredge Disposal and Land Reclamation	Physical Damage	Changes in suspended solids.	13	Localised, short-term increases in suspended solids have been predicted, however these do not have the potential to affect the WFD status.	Minor: Non-significant
Land Reclamation	Physical Damage	Siltation rate changes.		No changes to siltation rates are predicted.	
Dredging Land Reclamation	Physical Damage	Habitat structure changes - removal of substratum.	7	The habitat that will be lost due to the infilling and land reclamation a limited area in the context of Loch Maddy, and it is not assessed as a rare or sensitive habitat type.	Negligible to Minor: Non-significant
Piling	Other physical pressures	Underwater noise changes.	6, 7 & 11	Increased noise levels associated with piling, will be temporary and reversible and as such will not have a long-term effect on Loch Maddy. Appropriate mitigation has been identified to minimise effects on fish and marine mammals.	Minor: Non-significant

Activity	Pressure Theme	Pressure	Chapter No.	Deterioration Assessment	Significance of Residual Effect
Dredging General Construction and Operation Activities	Pollution and Other Chemical Changes	Non-synthetic compound contamination – overall.	6,7,8 and 12	The ground conditions have not identified contaminates in the seabed at a level that are likely to have ecological effects if they are released during construction works. Appropriate material and waste management during construction works will minimise pollution risks. Potential loss of containment issues have been assessed in this chapter. Appropriate mitigation will reduce the risk of pollutants reaching a water course, the volumes release and the spread of pollution. Main potential pollution sources are oils, fuels and cement washings during construction activities. Potential pollution effects have been assessed in the ecological chapters.	Minor: Non-significant
	Pollution and Other Chemical Changes	Non-synthetic compound contamination - Transition elements & organo-metals.			
	Pollution and Other Chemical Changes	Non-synthetic compound contamination - Hydrocarbon & PAH Contamination.			
	Pollution and Other Chemical Changes	Synthetic compound contamination.			
Operations	Other Physical Pressures	Introduction of light.	2	Lighting designed such that it will be focused on the operational areas and be optimised from the tasks in hand, it will be switched off when not in use thereby it should not affect ecological or human receptor.	Negligible: Non-significant
Vessel Movements	Other Physical Pressures	Death or injury by collision.	12	There will be no increase in vessel numbers associated with operations, and negligible increase associated with construction. Marine mammal vessel interactions have been assessed regarding disturbance effects and collision risks.	No-Change
Construction and Operations	Biological Pressures	Introduction or spread of non-indigenous species.	7 &12	The introduction of MNNS is considered to be very unlikely, however appropriate mitigation has been identified in line with best practice.	Minor: Non-significant

Activity	Pressure Theme	Pressure	Chapter No.	Deterioration Assessment	Significance of Residual Effect
Construction and operations	Shoreside Industry and operations	Litter	12	Sources of litter have been identified however with appropriate mitigation; litter effects can be minimised.	Negligible: Non-significant

13.6 Mitigation Measures

The only potentially significant effect identified in Section 13.5 was the introduction of NNMS when importing the caisson. Specific mitigation is identified in Section13.6.1.3 to avoid this significant effect. In addition, mitigation has been identified in line with best practice to minimise construction and operational risks and effects on water quality, wherever practicable.

13.6.1 Construction

13.6.1.1 Increased Sediment Loading

At the start of each activity that could give rise to increased sediment in the water column will be observed, to ensure that any plumes arising are localised and disperse quickly. If increases in sediments loading are not as predicted, the construction technique will be reviewed to identify areas for improvement to prevent reoccurrence.

13.6.1.2 Potential Loss of Containment

13.6.1.2.1 Fuels, Oils and Chemicals

The fuel bowser will be under strict management controls to prevent pollution incidents. It will be kept secure and locked when not in use to protect it from oil thefts, and to comply with the requirements of the relevant GBR's of the Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended), it will be double skinned and stored in an appropriate area away from watercourses and drains where it cannot be 'crashed into'. Refuelling will be carried out in designated areas by trained operatives following site refuelling procedures. The refuelling procedure will take into account best practice laid out in PPG6 (Environmental Agency, NIEA, & SEPA, 2012).

Where practicable, bio-degradable hydraulic fluids will be utilised in machinery during construction. All oils and chemicals will be subject to Control of Substances Hazardous to Health (COSHH) assessments under the COSHH Regulations 2002. All COSHH assessments will include a section on the environment to highlight any precaution or mitigation requirements.

Appropriately bunded oil and chemical storage cabinets will be provided on site. These will be kept locked, with the key under management control to ensure appropriate use and accountability. Furthermore, appropriate spill plans aligned to the pollution control hierarchy and spill kits will be in place. Construction operatives will be trained in the plans and in the use of spill kits to ensure that loss of containment incidents can be dealt with promptly to prevent or minimise pollution.

13.6.1.2.2 Concrete Works and Wash

As detailed in Chapter 2: Project Description, there is a need for concrete repair works that will be undertaken over water using concrete spray (Flexcrete Cementation Coating 851). Excess material could drip/fall into the marine environment during application. Similarly, debris may fall into the marine environment during demolition works, such as the removal of the deck edge. To minimise falling debris reaching the aquatic environment, scaffolding utilised to carry out the works will be covered with sheeting to catch any drips or falling debris.

Concrete works are also required underwater as discussed in Chapter 2. For these works only concrete specified for underwater works will be utilised to reduce the risk to the marine environment.

Cement washings will be carried out in a designated area. Washing arisings will be collected for onsite treatment. This will include settlement and, if required, pH correction. The liquids will be tankered off site for appropriate disposal. The solids will be disposed of as solid waste.

13.6.1.3 Introduction of Non-Native Marine Species

Once the location of the dry dock for the caisson construction has been identified, a NNMS risk assessment will be undertaken. Mitigation appropriate to the specific risks posed will be identified. If a specific NNMS is identified then it is likely that the dock will be flooded immediately prior to transport to Lochmaddy, to minimise the time the caisson is in contaminated water. This will ensure exposure to contaminated waters is too short for the NNMS to settle on and recruit to the structure, particularly since the concrete caisson will be in constant transit.

Furthermore, contractors will be required to ensure all plant and equipment brought to site is properly cleaned prior to arrival. All equipment will be inspected prior to mobilisation on site and any equipment carrying excessive sediment deposits will be returned to the supplier.

13.6.1.4 Litter

Prior to construction works on site commencing, a litter sweep will be conducted to prevent the escape of existing litter on site into the marine environment. All personnel working on the project will undertake site induction. This will include a section on waste management and the use of the waste receptacles provided. It will be made clear that littering will not be tolerated. Waste receptacles shall be covered. Construction staff will be encouraged to collect any litter they see in the construction areas and, if deemed necessary, litter sweeps will be carried out. The use of single use plastics will be discouraged, reusable water bottles supplied to all personnel and reusable crockery and cutlery will be provided in the welfare facilities. All generated waste will be segregated to facilitate appropriate recycling.

13.6.2 Operation

No potential significant impacts on water quality associated with the operation of the Lochmaddy ferry terminal upgrade were identified. As such no specific mitigation is required. Best practice to minimise litter will be implemented including ensuring that appropriate waste receptacles are provided within the ferry terminal. If external bins are provided, they will be located well away from the seafront, and of a suitable design to prevent them becoming a source of marine litter. Staff will be encouraged to collect any litter they see on the ferry terminal and, if deemed necessary, litter sweeps will be carried out periodically.

13.7 Cumulative Effects

Chapter 3: Methodology identifies three projects which have potential cumulative effects on water quality. The potential cumulative effects are associated with the shared use of the dredge disposal site at Stornoway only. Tarbert has the most dredge spoil to be disposed of. It is unlikely that the projects dredge disposal activities will overlap.

There will be an additive effect between the projects, increasing the volume of dredge spoil, and consequently the frequency of elevated sediment loading. This has the potential to increase the cumulative magnitude of impact on water quality surrounding the Stornoway spoil ground. However, the shallow nature of the dredge disposal site (<20m) will result in dredge spoil dropping out quickly. Due to the predicted quick resettling, and the localised temporary nature of the increased sediment loading resulting from spoil disposals, the impact is assessed as **minor: non-significant.**

13.8 Residual Effects

The assessment of potential impacts on water quality identified a moderate significant effect from NNMS through the delivery of the concrete caisson. Completion of a NNMS risk assessment, specific to the location of the caisson construction, will allow appropriate secondary mitigation to be identified. As discussed in Section 13.6.1.3 it is possible to reduce the likelihood of introduction of NNMS to Lochmaddy by for example minimising exposure time of the concrete caisson to water potentially infested by NNMS. Assuming the risk assessment is completed, and the appropriate mitigation implemented, the residual likelihood is assessed as extremely unlikely. The impact magnitude remains high giving rise to a **permanent minor: non-significant** effect.

No other adverse significant effects on water quality were identified.

13.9 Summary of Effects

As detailed in Table 13.9.1, only one significant residual effect was identified, and it is beneficial. The installation of silt/oil interceptors into the surface water drainage system provides an improvement on the current situation.

There are a variety of risks of water pollution but with the implementation of standard construction and operational practices these can be minimised. The mitigation required to prevent NNMS being introduced to Lochmaddy during the caisson delivery will be specific to the location of the dry dock it is constructed in. Therefore, a specific risk assessment with mitigation identification step will be completed prior to construction, and the mitigation implemented appropriately.

A WFD assessment has been competed which identified that there would be no deterioration in the status of the Loch Maddy water body associated with the construction and operation of the upgraded Lochmaddy ferry terminal.

Table 13.9.1: Summary of Impacts

Nature of Impact	Probability	Impact Magnitude	Significance of Effect	Mitigation Summary	Residual Probability	Residual Impact Magnitude	Significance of Residual Effect
Construction							
Increased Sediment in Water Column – Dredging.	Certain	Low Adverse Short-term	Minor: Non-significant	The start of each activity will be observed, to ensure that any plumes arising are localised and disperse quickly.	Certain	Low Adverse Short-term	Minor: Non-significant
Increased Sediment in Water Column – Dredge Disposal.	Certain	Low Adverse Short-term	Minor: Non-significant		Certain	Low Adverse Short-term	Minor: Non-significant
Increased Sediment in Water Column – Land Reclamation.	Certain	Low Adverse Short-term	Minor: Non-significant		Certain	Low Adverse Short-term	Minor: Non-significant
Loss of Containment: Fuel Storage Bowser (20m^3 of Diesel).	Unlikely	Medium Adverse	Minor: Non-significant	Compliance with Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended). Adoption of appropriate spill prevention and response procedures.	Extremely Unlikely	Low Adverse	Minor: Non-significant
Loss of Containment: Refuelling Activities.	Probable	Low Adverse	Minor: Non-significant	Compliance with Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended). Adoption of appropriate spill prevention and response procedures.	Unlikely	Low Adverse	Negligible: Non-significant
Loss of Containment: Vehicles or Plant.	Unlikely	Low Adverse	Minor: Non-significant	Compliance with Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended). Adoption of appropriate spill prevention and response procedures.	Extremely Unlikely	Low Adverse	Negligible: Non-significant

Nature of Impact	Probability	Impact Magnitude	Significance of Effect	Mitigation Summary	Residual Probability	Residual Impact Magnitude	Significance of Residual Effect
Loss of Containment: Plant – Hydraulic Fluids.	Probable	Low Adverse	Minor: Non-significant	Compliance with Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended). Adoption of appropriate spill prevention and response procedures.	Unlikely	Low Adverse	Negligible: Non-significant
Drips from Concrete repair works	Probable	Low Adverse	Minor: Non-significant	Scaffolding to utilised to carry out the concrete works will be covered with sheeting to catch any drips or falling debris.	Unlikely	Low Adverse	Negligible: Non-significant
Loss of Containment: COSHH Store: Hydraulic Fluids, Maintenance Oils, Chemicals.	Unlikely	Low Adverse	Minor: Non-significant	Compliance with Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended). Compliance with the COSHH Regulations 2002 Adoption of appropriate spill prevention and response procedures.	Extremely Unlikely	Low Adverse	Negligible: Non-significant
Loss of Containment: Large Vessel e.g. Backhoe or Suction Dredger.	Extremely Unlikely	High Adverse	Minor: Non-significant	Vessels required to comply with MARPOL convention. Adoption of appropriate spill prevention and response procedures.	Extremely Unlikely	High Adverse	Negligible: Non-significant
Loss of Containment: Workcat.	Unlikely	Medium Adverse	Minor: Non-significant	Vessels required to comply with MARPOL convention. Adoption of appropriate spill prevention and response procedures.	Extremely Unlikely	Medium Adverse	Negligible: Non-significant
Discharge of Wastewaters from Vessels.	Probable	Low Adverse Shor-term	Minor: Non-significant	Vessels required to comply with MARPOL convention.	Probable	Low Adverse Shor-term	Minor: Non-significant

Nature of Impact	Probability	Impact Magnitude	Significance of Effect	Mitigation Summary	Residual Probability	Residual Impact Magnitude	Significance of Residual Effect
Introduction of NNMS – Ballast Water.	Extremely Unlikely	High Adverse Long-term	Minor: Non-significant	Adherence to the BWM Convention.	Extremely Unlikely	High Adverse Long-term	Minor: Non-significant
Introduction of NNMS – Biofouling.	Extremely Unlikely	High Adverse Long-term	Minor: Non-significant	Excessive biofouling to be removed from vessels prior to mobilisation to site.	Extremely Unlikely	High Adverse Long-term	Minor: Non-significant
Introduction of NNMS – Contaminated Plant and Equipment.	Extremely Unlikely	High Adverse Long-term	Minor: Non-significant	All plant and equipment will be thoroughly cleaned prior to mobilisation to site.	Extremely Unlikely	High Adverse Long-term	Minor: Non-significant
Introduction of NNMS – Concrete Caisson delivery.	Unlikely	High Adverse Long-term	Moderate: Significant	Site specific NNMS risk assessment to be undertaken for site of caisson construction. Caisson to be constructed in dry dock and immediately transported to Lochmaddy once exposed to water.	Extremely Unlikely	High Adverse Long-term	Minor: Non-significant
Litter	Probable	Low Adverse Long-term	Minor-Non-significant	Pre-construction litter sweeps will be carried out. Waste receptacles will be covered, and littering will not be tolerated.	Unlikely	Low Adverse Long-term	Negligible: Non-significant
Operations							
New Surface Water Drainage System Resulting in Changes to Water Quality.	Certain	Medium Beneficial Long-term	Moderate: Significant	Inclusion of oil/silt interceptors. Appropriate maintenance of oil/silt interceptor.	Certain	Beneficial Long-term	Moderate: Significant

Nature of Impact	Probability	Impact Magnitude	Significance of Effect	Mitigation Summary	Residual Probability	Residual Impact Magnitude	Significance of Residual Effect
Litter	Unlikely	Low Adverse Long-term	Negligible: Non-significant	Waste receptacles provided in the terminal building. External bins located well away from the seafront, and of a suitable design to prevent escape of litter. Staff will be encouraged to collect any litter they see on the ferry terminal/ Litter sweeps will be carried out when necessary.	Unlikely	Low Adverse Long-term	Negligible: Non-significant
Coastal Processes	Extremely Unlikely	Low Adverse Long-term	Negligible: Non-significant	No specific mitigation required.	Extremely Unlikely	Low Adverse Long-term	

Key

	Significant Effect

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Chapter 14: Schedule of Mitigation

Contents

14 Schedule of Mitigation

14.1 Introduction

Mitigation measures, which have been identified throughout the Environmental Impact Assessment (EIA) process, are collated within this Chapter to form the Schedule of Mitigation (SoM) for the Lochmaddy ferry terminal upgrade.

14.2 Schedule of Mitigation

Mitigation was taken account of during the scoping process, to scope out of the EIA Report (EAIR) topics where no significant effects were predicted. The mitigation identified at that stage has been incorporated into the final schedule of mitigation provided in Tables 14.3.1 and 14.3.2.

The mitigation measures identified in the topic specific EIAR chapters for the different stages and impacts of the Lochmaddy ferry terminal upgrade are also included in Table 14.3.1 and 14.3.2. Table 14.3.1 collates all the mitigation measures identified for the construction stage of the project. Table 14.3.2 provides the mitigation to be implemented during the operational stage of the upgraded ferry terminal. References to the relevant sections of the EIAR and other associated guidance documents are provided in both tables.

14.3 Mitigation Implementation

14.3.1 Construction Mitigation

A Construction Environmental Management Document (CEMD) has been drafted based on the mitigation included in Table 14.3.1. This document will be a working document utilised by the construction contractor during the construction planning and construction activities. The CEMD will inform the production of the construction contractor Risk Assessment Method Statements (RAMS) for the works. In addition to specific mitigation identified in the tables, compliance with all relevant environmental legislation will be ensured.

Appropriate resources will be put in place to ensure the CEMD requirements can be met, including appropriately trained and experienced:

- Environmental Clerk of Works (ECoW);
- Passive Acoustic Monitoring (PAM) operator; and
- Marine Mammal Observers.

The ECOW will ensure compliance by carrying out site walkovers and audits as appropriate.

14.3.2 Operational Mitigation

The operational mitigation will be incorporated into CnES and/or CalMac's existing management systems as required to ensure that they are implemented appropriately.

Table 14.2.1: Schedule of Mitigation – Construction Mitigation

Topic	Aspect	Mitigation/Enhancement	Guidance	Source
Air Quality	Dust	Dust suppression in line with PPG6 (e.g. sprinklers and water trucks) will be used in open areas and stockpiles as appropriate.	PPG 6: Working at Construction and Demolition Sites.	Scoping Report
Air Quality	Greenhouse Gas (GHG), Water and Soil Quality	Regular maintenance will be undertaken on equipment.	PPG 6: Working at Construction and Demolition Sites.	Scoping Report
Air Quality	Dust	All areas will be finished with concrete, tarmac or replanted.		Scoping Report
Air Quality	GHG Emissions	Marshalled vehicles will be requested to switch off engines while waiting.		Scoping Report
Archaeology and Cultural Heritage	Archaeological Finds	A protocol for archaeological discoveries is included within the CEMD to ensure it is utilised in the unlikely event of an archaeological find.	Offshore Renewables Protocol for Archaeological Discoveries (The Crown Estates).	Scoping Report
Land and Soil Quality	Waste Management and Pollution Prevention	Hazardous waste and contaminated water will be disposed of correctly.		Scoping Report
Land and Soil Quality	Pollution Prevention	Chemicals and hydrocarbons will be stored in secondary containment, where applicable.		Scoping Report
Land and Soil Quality	Waste Management and Pollution Prevention	Adequate spill response equipment will be available on site.		Scoping Report
Land and Soil Quality	Pollution Prevention	Designated wash down areas for concrete contaminated equipment and tools will be installed.		Scoping Report
Natural Resource Usage and Waste	Waste Management	Existing built infrastructure will be re-used or upgraded wherever possible.		Scoping Report
Natural Resource Usage and Waste	Waste Management	The waste hierarchy will be employed.	PPG 6: Working at Construction and Demolition Sites.	Scoping Report

Topic	Aspect	Mitigation/Enhancement	Guidance	Source
Natural Resource Usage and Waste	Waste Management and Resource Usage	Construction employees will be limited to those required.		Scoping Report
Natural Resource Usage and Waste	Waste Management	Waste will be appropriately segregated to facilitate recycling and separate bins will be provided on site.	PPG 6: Working at Construction and Demolition Sites.	Scoping Report
Population, Human Health and Socio-Economy	Social-Economics	The local supply of workforce will be encouraged.		Scoping Report
Marine Mammals	Underwater Noise from Piling	A piling marine mammal and basking shark protocol will be in place and implemented.	Joint Nature Conservation Committee (JNCC), Statutory nature conservation agency protocol for minimising the risk of injury to marine mammals from piling noise.	EIAR Chapter 6, Section 6.6.1
Marine Mammals	Injury to Marine Mammals from Dredge Disposal	A dredge spoil disposal marine mammal and basking shark protocol will be in place and implemented.		EIAR Chapter 6, Section 6.6.2
Marine Mammals	Disturbance and Harassment of Marine Mammals by Vessels Associated with Construction	All vessels will be required to follow the guidance set out in SNH's 'Scottish Marine Wildlife Watching Code'.	Scottish Marine Wildlife Watching Code.	EIAR Chapter 6, Section 6.6.3
Fish Ecology	Underwater Noise from Pilling	The marine mammal piling protocol implemented will also apply to basking sharks.	Joint Nature Conservation Committee (JNCC), Statutory nature conservation agency protocol for minimising the risk of injury to marine mammals from piling noise.	EIAR Chapter 8, Section 8.6

Topic	Aspect	Mitigation/Enhancement	Guidance	Source
Fish Ecology	Injury to Fish from Dredge Disposal	The marine mammal dredge disposal protocol implemented will also apply to basking sharks.		EIAR Chapter 8, Section 8.6
Otters	Disturbance, Physical Injury and Barrier Effects.	A pre-construction otter survey will be completed. If necessary, an EPS licence will be sought.		EIAR Chapter 9, Section 9.6
Otters	Disturbance, Physical Injury and Barrier Effects.	An otter protection plan will be developed and implemented including: • Capping of stored pipes; • Escape ramps in excavations; • Checks for otters prior to works commencing; and • Gaps under fencing.		EIAR Chapter 9, Section 9.6
Otters	Disturbance, Physical Injury and Barrier Effects.	Site construction operatives will be briefed on the legislation, ecology and field signs of otter through an Otter Toolbox Talk. An Otter Advice Note will be produced and made available to construction operatives.		EIAR Chapter 9, Section 9.6
Noise and Vibration (In-Air)	Construction Noise	Works will be conducted between 7am to 8pm Monday to Saturday, with Saturday work generally finish earlier.	PPG 6: Working at Construction and Demolition Sites.	Scoping Report
Noise and Vibration (In-Air)	Construction Noise	Local residents are to be kept informed of the proposed working schedule, where appropriate, including the times and duration of any abnormally noisy activity that may cause concern.	BS 5228: 2009 Code of practice for noise and vibration control on construction and open sites.	EIAR Chapter 10, Section 10.6.1
Noise and Vibration (In-Air)	Construction Noise	Haulage vehicles will not arrive at or leave the site between 19.00 and 07.00 hours.	BS 5228: 2009 Code of practice for noise and vibration control on construction and open sites.	EIAR Chapter 10, Section 10.6.1
Noise and Vibration (In-Air)	Construction Noise	All vehicles and mechanical plant will be fitted with effective exhaust silencers and 'smart' reversing alarms and be subject to programmed maintenance.	BS 5228: 2009 Code of practice for noise and vibration control on construction and open sites.	EIAR Chapter 10, Section 10.6.1

Topic	Aspect	Mitigation/Enhancement	Guidance	Source
Noise and Vibration (In-Air)	Construction Noise	Inherently quiet plant where appropriate will be selected - all major compressors, pumps and generators will have 'sound reduced' models fitted with properly lined and sealed acoustic covers, which will be kept closed whenever the machines are in use.	BS 5228: 2009 Code of practice for noise and vibration control on construction and open sites.	EIAR Chapter 10, Section 10.6.1
Noise and Vibration (In-Air)	Construction Noise	All ancillary pneumatic percussive tools will be fitted with mufflers or silencers of the type recommended by the manufacturers.	BS 5228: 2009 Code of practice for noise and vibration control on construction and open sites.	EIAR Chapter 10, Section 10.6.1
Noise and Vibration (In-Air)	Construction Noise	Machine operators will be instructed to shut down machines between work periods or throttled down to a minimum.	BS 5228: 2009 Code of practice for noise and vibration control on construction and open sites.	EIAR Chapter 10, Section 10.6.1
Noise and Vibration (In-Air)	Construction Noise	Regular maintenance of all equipment used on site, including maintenance related to noise emissions will be conducted.	BS 5228: 2009 Code of practice for noise and vibration control on construction and open sites.	EIAR Chapter 10, Section 10.6.1
Noise and Vibration (In-Air)	Construction Noise	Vehicles will be loaded carefully to ensure minimal drop heights to minimise noise during this operation.	BS 5228: 2009 Code of practice for noise and vibration control on construction and open sites.	EIAR Chapter 10, Section 10.6.1
Noise and Vibration (In-Air)	Construction Noise	All ancillary plant such as generators and pumps are positioned to cause minimum noise disturbance and if necessary, temporary acoustic screens or enclosures should be provided.	BS 5228: 2009 Code of practice for noise and vibration control on construction and open sites.	EIAR Chapter 10, Section 10.6.1
Noise and Vibration (In-Air)	Construction Noise	Specific mitigation to be developed in discussion with the residents of the houses situated in the terminal area.	BS 5228: 2009 Code of practice for noise and vibration control on construction and open sites.	EIAR Chapter 10, Section 10.6.1

Topic	Aspect	Mitigation/Enhancement	Guidance	Source
Noise and Vibration (In-Air)	Construction Noise	Noise level monitoring will be undertaken close to the nearest Noise Sensitive Receptors at times when new construction tasks occurs in order to quantify noise levels and identify any requirements for additional mitigation measures.	BS 5228: 2009 Code of practice for noise and vibration control on construction and open sites.	EIAR Chapter 10, Section 10.6.1
Noise and Vibration (In-Air)	Construction Noise	A noise monitoring protocol and schedule, as well as a protocol for handling any noise related complaints will be development and contained in the CEMD.	BS 5228: 2009 Code of practice for noise and vibration control on construction and open sites.	EIAR Chapter 10, Section 10.6.1
Noise and Vibration (Underwater)	Underwater Noise from Piling	It is preferred that vibro hammers to drive the piles to refusal are used, before using impact piling.	Joint Nature Conservation Committee (JNCC), Statutory nature conservation agency protocol for minimising the risk of injury to marine mammals from piling noise.	EIAR Chapter 11, Section 11.6
Traffic, Access and Navigation	Construction works affecting traffic, cyclist and pedestrian movements.	The development of a Traffic and Pedestrian Plan to ensure safe access during construction works.		EIAR Chapter 12, Section 12.5.1
Traffic, Access and Navigation	Road Safety	Monitoring/managing of deliveries to avoid ferry arrival times.		EIAR Chapter 12, Section 12.5.1
Traffic, Access and Navigation	Impacts on livestock sale traffic and access.	Early discussion with Dingwall and Highland Marts Ltd to identify and agree specific mitigation for livestock sales.		EIAR Chapter 12, Section 12.6.1.1

Topic	Aspect	Mitigation/Enhancement	Guidance	Source
Traffic, Access and Navigation	Relocation of Marina Facilities	Any temporary arrangement for the Marina Facilities will also be discussed and agreed with the operator and implemented as agreed.		EIAR Chapter 12, Section 12.6.1.2
Traffic, Access and Navigation	Impact on Ferry Pier from Construction	Good communications with regard to restrictions with delivery vessels owners, to allow planning around the ferry timetable.		EIAR Chapter 12, Section 12.6.1.3
Traffic, Access and Navigation	Impact on Ferry Pier from Construction	Arrangements to deliver materials prior to the construction works commencing.		EIAR Chapter 12, Section 12.6.1.3
Traffic, Access and Navigation	Impact on Ferry Pier from Construction	The crew of the fish farm vessel to be inducted by the construction contractor, to allow them to access their vessel safely throughout the construction works.		EIAR Chapter 12, Section 12.6.1.3
Traffic, Access and Navigation	Impact on Ferry Pier from Construction	Continual liaison between the harbour master and the construction contractor regarding restrictions on piers use, and safety risks posed.		EIAR Chapter 12, Section 12.6.1.3
Traffic, Access and Navigation	Navigational Safety	Prior to and during construction, CnES will review the risk assessments and marine activity operating procedures.		EIAR Chapter 12, Section 12.5.1
Traffic, Access and Navigation	Navigational Safety	Engagement with the harbour users will be increased.		EIAR Chapter 12, Section 12.5.1
Traffic, Access and Navigation	Access to ferry berth obstructed.	Works planned around the ferry timetable.		EIAR Chapter 12, Section 12.5.1
Traffic, Access and Navigation	Access to ferry berth obstructed.	As a contingency measure ferry can be delayed or diverted to Tarbert or Lochboisdale, to avoid cancellation when practicable.		EIAR Chapter 12, Section 12.5.1

Topic	Aspect	Mitigation/Enhancement	Guidance	Source
Traffic, Access and Navigation	Access to ferry berth obstructed.	Good communication with passengers to make them aware of the potential inconvenience, associated with ferry delays or rerouting.		EIAR Chapter 12, Section 12.5.1
Traffic, Access and Navigation	No access to the ferry from the pier.	Good communication with passengers to make them aware of the potential inconvenience associated with no pier access.		EIAR Chapter 12, Section 12.5.1
Traffic, Access and Navigation	Reduced availability of pontoon berths.	Dredging to be carried out through winter months.		EIAR Chapter 12, Section 12.5.1
Traffic, Access and Navigation	Reduced availability of pontoon berths.	Any temporary arrangement to be discussed and agreed pontoon operators.		EIAR Chapter 12, Section 12.5.1
Traffic, Access and Navigation	Reduced availability of pontoon berths.	Good two-way communications with the pontoon operator and local vessel owners.		EIAR Chapter 12, Section 12.5.1
Traffic, Access and Navigation	Uig not available for docking for 12 weeks.	Alternative ferry arrangements to be put in place.		EIAR Chapter 12, Section 12.8.1
Traffic, Access and Navigation	Uig not available for docking for 12 weeks.	Good communication of the temporary arrangements well in advance of the works.		EIAR Chapter 12, Section 12.8.1
Water Quality and Coastal Processes	Increased Sediment Loading	The start of each activity that could give rise to increased sediment loading in the water column will be observed, to ensure that any plumes arising are localised and disperse quickly. Where increases in sediments are not as predicted, the construction technique will be reviewed to identify areas for improvement to prevent reoccurrence.		EIAR Chapter 13, Section 13.6.1.1

Topic	Aspect	Mitigation/Enhancement	Guidance	Source
Water Quality and Coastal Processes	Loss of Containment: Fuel on Site	Fuel bowsers on site will be under strict management control incompliance with the requirements of the relevant GBR's.	The Water Environment (Controlled Activities) (Scotland Regulations 2011 (as amended) A Practical Guide.	EIAR Chapter 13, Section 13.6.1.2.1
Water Quality and Coastal Processes	Loss of Containment: Fuel on Site	Refuelling will be carried out in designated areas, by trained operatives following site refuelling procedures. The refuelling procedure will take into account best practice laid out in PPG6.	PPG 6: Working at Construction and Demolition Sites.	EIAR Chapter 13, Section 13.6.1.2.4
Water Quality and Coastal Processes	Loss of Containment: Fuel on Site	Where practicable, bio-degradable hydraulic fluids will be utilised in machinery during construction.		EIAR Chapter 13, Section 13.6.1.2.6
Water Quality and Coastal Processes	Loss of Containment: Fuel on Site	All oils and chemicals will be subject to Control of Substances Hazardous to Health (COSHH) assessments including a section on the environment to highlight any precaution or mitigation requirements.	COSHH Regulations 2002.	EIAR Chapter 13, Section 13.6.1.2.7
Water Quality and Coastal Processes	Loss of Containment: Fuel on Site	Appropriately bunded oil and chemical storage cabinets will be provided on site. These will be kept locked, with the key under management control to ensure appropriate use and accountability.	PPG 6: Working at Construction and Demolition Sites.	EIAR Chapter 13, Section 13.6.1.2.9
Water Quality and Coastal Processes	Loss of Containment: Fuel on Site	Appropriate spill plans aligned to the pollution control hierarchy and spill kits will be in place with construction operatives being trained in the plans and in the use of spill kits.	GPP 21: Pollution Incident Planning.	EIAR Chapter 13, Section 13.6.1.2.11
Water Quality and Coastal Processes	Drips from concrete repair works.	Scaffolding to utilised to carry out the concrete works will be covered with sheeting to catch any drips or falling debris.		EIAR Chapter 13, Section 13.6.1.2.2
Water Quality and Coastal Processes	Concrete Works and Wash	For concrete works under water, only concrete specified for underwater works will be utilised.		EIAR Chapter 13, Section 13.6.1.2.2

Topic	Aspect	Mitigation/Enhancement	Guidance	Source
Water Quality and Coastal Processes	Concrete Works and Wash	Cement washings will be carried out in a dedicated area.	PPG 6: Working at Construction and Demolition Sites.	EIAR Chapter 13, Section 13.6.1.2.2
Water Quality and Coastal Processes	Concrete Works and Wash	Cement washing arisings will be collected for onsite treatment. This will include settlement and, if required, pH correction. The liquids will be tankered off site for appropriate disposal. The solids will be disposed of as solid waste.	PPG 6: Working at Construction and Demolition Sites.	EIAR Chapter 13, Section 13.6.1.2.2
Water Quality and Coastal Processes	Introduction of Non-Native Marine Species	Once the location of the dry dock for the caisson construction has been identified, a NNMS risk assessment will be undertaken. Mitigation appropriate to the specific risks posed will be identified.		EIAR Chapter 13, Section 13.6.1.3
Water Quality and Coastal Processes	Introduction of Non-Native Marine Species	Contractors will be required to ensure all plant and equipment brought to site is properly cleaned prior to arrival.	GPP 5: Works and Maintenance In or Near Water.	EIAR Chapter 13, Section 13.6.1.3
Water Quality and Coastal Processes	Introduction of Non-Native Marine Species	All equipment will be inspected prior to mobilisation on site; any equipment carrying excessive sediment deposits will be returned to the supplier.	GPP 5: Works and Maintenance In or Near Water.	EIAR Chapter 13, Section 13.6.1.4
Water Quality and Coastal Processes	Litter	Prior to construction works on site commencing, a litter sweep will be conducted to prevent the escape of existing litter on site into the marine environment.		EIAR Chapter 13, Section 13.6.1.4
Water Quality and Coastal Processes	Litter	All personnel working on the project will undertake site induction; this will include a section on waste management and the use of the waste receptacles provided.		EIAR Chapter 13, Section 13.6.1.4
Water Quality and Coastal Processes	Litter	Waste receptacles will be covered	PPG 6: Working at Construction and Demolition Sites.	EIAR Chapter 13, Section 13.6.1.4
Water Quality and Coastal Processes	Litter	Construction staff will be encouraged to collect any litter they see in the construction areas and, if deemed necessary litter sweeps will be carried out.		EIAR Chapter 13, Section 13.6.1.4

Topic	Aspect	Mitigation/Enhancement	Guidance	Source
Water Quality and Coastal Processes	Litter	The use of single use plastics will be discouraged, reusable water bottles will be supplied to all personnel and reusable crockery and cutlery will be provided in the welfare facilities.		EIAR Chapter 13, Section 13.6.1.4

Table 14.3.2: Schedule of Mitigation – Operational Mitigation

Topic	Aspect	Mitigation/Enhancement	Guidance	Source
Water Quality	Litter	Best practice to minimise litter will be implemented including ensuring that appropriate waste receptacles are provided within the ferry terminal. If external bins are provided, they will be located well away from the seafront, and of a suitable design to prevent them becoming a source of marine litter.		EIAR Chapter 13, Section 13.6.2
Water Quality	Litter	Staff will be encouraged to collect any litter they see on the ferry terminal and, if deemed necessary, litter sweeps will be carried out periodically.		EIAR Chapter 13, Section 13.6.2
Air Quality	GHG Emissions	Marshalled vehicles will be requested to switch off engines while waiting.		Scoping Report

Chapter 15: Conclusion

Contents

15 Conclusion

The Lochmaddy ferry terminal upgrade is required to facilitate the berthing of the new ferry which is being constructed to replace the MV Hebrides on the Skye Triangle ferry route (Lochmaddy-Uig and Uig-Tarbert). The larger vessel is dual fuelled and has been procured to meet rising demand, while facilitating compliance with a number of Scottish Government policy commitments and targets regarding sustainable travel and reduction of greenhouse gas emissions.

The design has been an iterative process, leading to a proposal which meets all the functional and policy requirements while minimising environmental effects. The pontoons, the pontoon access from shore and the associated marina facilities have been accommodated within the design.

Lochmaddy is an operational harbour. As such, it has been ensured that all vessels, not only the ferry, can continue to operate throughout the construction works, with minimal disturbance to operations. The proposed construction plan has ensured that access to the pontoons will be maintained throughout the construction works.

Having completed a scoping exercise, the Environmental Impact Assessment (EIA) focused on the topics areas in which there was a potential for significant effects. Impacts have been assessed and appropriate mitigation identified where required, to minimise adverse effects. The significant effects identified, taking account of primary and tertiary mitigation for all topic areas are summarised in Table 15.1.

There were 22 significant adverse effects associated with the construction works without secondary mitigation. Once secondary mitigation was taken into account, the number of residual adverse significant effects reduced to one. The remaining significant effect is associated with noise impacts on the two residential properties located immediately north of the ferry terminal. When earthworks are being carried out adjacent to these properties noise levels will be significantly higher than baseline. The loudest works should not last more than 4 weeks. The developer and construction contractor will work with the residents to identify mitigation specific to them to minimise the construction noise effects.

No adverse significant effects have been identified for the operational phase. There are, however, eight beneficial significant effects associated with operations. Three relate to the introduction of cold ironing, allowing engines to be switched off during ferry overnighting at Lochmaddy. The receptors benefiting the most from this are the Lochmaddy Hotel and the two residential properties immediately north of the ferry terminal.

Water quality improvements will arise from the inclusion of an oil/silt interceptor into the surface water drainage system and the rerouting of existing marshalling area drains to it. The interceptors will reduce emissions to Loch Maddy of solids and immiscible substances such as oil, which can be detrimental to the environment. The improvement of facilities in terms of parking, marshalling capacity, turning areas, additional berthing capacity all bring benefits to those utilising the ferry terminals facilities. Facilitating the introduction of the new ferry will also bring a range of benefits to Lochmaddy and North Uist as whole.

Table 15.1.1: Summary of Significant Effects in the Absence of Mitigation

Receptor	Nature of Impact	Receptor Sensitivity/ Probability	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
Construction							
Inner Hebrides & the Minches cSAC	Impact pilling leading to potential injury/disturbance of qualifying features through noise.	International	Low Negative Short-term Reversible	Moderate: Significant	Piling Marine Mammal Mitigation	Negligible Negative Short Term Reversible	Minor: Non-Significant
	Spoil disposal at Stornoway potentially resulting in injury of qualifying features through interaction with falling spoil.	International	Low Negative Short-term Reversible	Moderate: Significant	Spoil Disposal Marine Mammal Protocols.	None	No-Change
Ascrib, Isay & Dunvegan SAC	Spoil disposal at Stornoway potentially resulting in injury of qualifying features through interaction with falling spoil.	International	Low Negative Short-term Reversible	Moderate: Significant	Spoil Disposal Marine Mammal Protocols.	None	No-Change
Harbour Porpoise	Impact pilling leading to potential injury/disturbance.	International	Low Negative Short Term Reversible	Moderate: Significant	Piling Marine Mammal Mitigation	Negligible Negative Short Term Reversible	Minor: Non-Significant
	Spoil disposal at Stornoway potentially resulting in injury through interaction with falling spoil.	International	Low Negative Short-term Reversible	Moderate: Significant	Spoil Disposal Marine Mammal Protocols.	None	No-Change

Receptor	Nature of Impact	Receptor Sensitivity/ Probability	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
Mike Whale	Impact pilling leading to potential injury/disturbance.	International	Negligible Negative Short Term Reversible	Moderate: Significant	Piling Marine Mammal Mitigation	Negligible Negative Short Term Reversible	Minor: Non-significant
	Spoil disposal at Stornoway potentially resulting in injury through interaction with falling spoil.	International	Low Negative Short-term Reversible	Moderate: Significant	Spoil Disposal Marine Mammal Protocols.	None	No-Change
All Relevant Dolphin Species	Spoil disposal at Stornoway potentially resulting in injury through interaction with falling spoil.	International	Low Negative Short-term Reversible	Moderate: Significant	Spoil Disposal Marine Mammal Protocols.	None	No-Change
Killer Whale	Spoil disposal at Stornoway potentially resulting in injury through interaction with falling spoil.	International	Low Negative Short-term Reversible	Moderate: Significant	Spoil Disposal Marine Mammal Protocols.	None	No-Change
Common Seal	Impact pilling leading to potential injury/disturbance.	International	Low Negative Short-term Reversible	Moderate: Significant	Piling Marine Mammal Mitigation	Negligible Negative Short Term Reversible	Minor: Non-significant
	Spoil disposal at Stornoway potentially resulting in injury through interaction with falling spoil.	International	Low Negative Short-term Reversible	Moderate: Significant	Spoil Disposal Marine Mammal Protocols.	None	No-Change

Receptor	Nature of Impact	Receptor Sensitivity/ Probability	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
Grey Seal	Spoil disposal at Stornoway potentially resulting in injury through interaction with falling spoil.	International	Low Negative Short-term Reversible	Moderate: Significant	Spoil Disposal Marine Mammal Protocols.	None	No-Change
Houses within Ferry Terminal	Noise from construction activities in the immediate vicinity of the properties (Task 6).	High	N/A	Significant	Bespoke mitigation required to be determined through dialogue with residents.	Significant Adverse Very Short-Term	Significant
Otters	Disturbance: Resulting from noise, human/equipment presence & movement.	International	Low Negative Localised Temporary	Moderate: **Significant**	Otter Protection Plan (OPP) including preconstruction surveys, and halting works if otters in close proximity.	Negligible Negative Localised Temporary	Minor: Non-Significant
Otters	Injury & Entrapment: Through interactions with site plant, equipment and structures.	International	Low Negative Localised Temporary	Moderate: **Significant**	OPP including pre start checks for plant and provision of escape ramps.	Negligible Negative Localised Temporary	Minor: Non-Significant
Otters	Barrier Effects: resulting from the installation of site fencing.	International	Low Negative Localised Temporary	Moderate: **Significant**	OPP including 200mm gap below site fencing.	Negligible Negative Localised Temporary	Minor: Non-Significant
Local Amenity	On days of livestock sales, construction traffic and road works could impact upon parking and access to the Mart.	High	Moderate Adverse Temporary Very Short Term	Moderate: Significant	Early discussion with Dingwall and Highland Marts Ltd to identify and agree specific mitigation.	Minor Adverse Temporary Very Short Term	Minor: Non-Significant

Receptor	Nature of Impact	Receptor Sensitivity/ Probability	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
Local Vessels	Berths available on pontoons reduced, during dredging works.	Medium	Moderate Adverse Temporary Short Term	Moderate: Significant	Dredging to be carried out through winter months when the number of vessels is low and hence enough berths available. Any temporary arrangement to be discussed and agreed pontoon operators. Good two-way communications with the pontoon operator and local vessel owners.	Minor Adverse Temporary Short Term	Minor: Non-Significant
	Access to the ferry pier affected by construction works.		Moderate Adverse Temporary Short Term	Moderate: Significant	The crew of the fish farm vessel to be inducted by the construction contractor, to allow safe access their vessel. Good communication between the Harbour Master, construction contractor and vessel owners to ensure continual safe pier use. Ensure works are completed on time to minimize the duration of the inconvenience caused.	Minor Adverse Temporary Short Term	Minor: Non-Significant

Receptor	Nature of Impact	Receptor Sensitivity/ Probability	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
Essential Deliveries	Access to the ferry pier affected by construction works, including ability to offload cargo.	High	Moderate Adverse Temporary Short Term	Moderate: Significant	Good communications with regard to restrictions with delivery vessels, to allow planning around the ferry timetable. Arrangements to deliver materials prior to the construction works commencing.	Minor Adverse Temporary Short Term	Minor: Non-Significant
Ferry	Uig ferry terminal upgrade works prevent docking at Uig for up to 12 weeks.	High	Moderate Adverse Temporary Short Term	Moderate: Significant	Alternative ferry arrangements to be put in place. Good communication of the temporary arrangements well in advance of the works.	Minor Adverse Temporary Short Term	Minor: Non-Significant
Marine Water Quality	Introduction of NNMS through concrete caisson delivery.	Unlikely	High Adverse Long-term	Moderate: Signficant	Site specific NNMS risk assessment to be undertaken for site of caisson construction. Caisson to be constructed in dry dock and immediately transported to Lochmaddy once exposed to water.	Extremely Unlikely	Minor: Non-significant
Operations							
Lochmaddy Hotel	Cold ironing of vessel overnight.	Medium (daytime) High (evening & night-time	Major Beneficial Permanent	Major: Significant	None required.	Major Beneficial Permanent	Major: Significant

Receptor	Nature of Impact	Receptor Sensitivity/ Probability	Impact Magnitude	Significance (Absence of Secondary Mitigation)	Mitigation Summary	Residual Impact Magnitude	Significance of Residual Effect
Houses within Ferry Terminal	Cold ironing of vessel overnight.	High	Major Beneficial Permanent	Major: Significant	None required.	Major Beneficial Permanent	Major: Significant
Closest Lochmaddy Residential Area	Cold ironing of vessel overnight.	High	Moderate Beneficial Permanent	Moderate: Significant	None required.	Moderate Beneficial Permanent	Moderate: Significant
Local Amenity	Increased car, HGV and trailer parking. Greater capacity on the lifeline ferry service.	High	Moderate Beneficial Permanent	Moderate: Significant	None required.	Moderate Beneficial Permanent	Moderate: Significant
Local Vessels	Facilities closer to pontoons, with fencing improving safety and security. Provision of parking adjacent to the facilities.	Medium	Moderate Beneficial Permanent	Moderate: Significant	None required.	Moderate Beneficial Permanent	Moderate: Significant
	Additional berthing available on the northside of the ferry pier. Longer berthing face available on the ferry berth.		Moderate Beneficial Permanent	Moderate: Significant	None required.	Moderate Beneficial Permanent	Moderate: Significant
Essential Deliveries		High	Moderate Beneficial Permanent	Moderate: Significant	None required.	Moderate Beneficial Permanent	Moderate: Significant
Marine Water Quality	New Surface Water Drainage System Resulting in Changes to Water Quality.	Certain	Medium Beneficial Long-term	Moderate: Significant	Appropriate maintenance of oil/silt interceptor.	Beneficial Long-term	Moderate: Significant

Key

	Significant Effect

The production of this Environmental Impact Assessment Report was led by Affric Limited working closely the Comhairle nan Eilean Siar, Caledonian marine Assets Ltd and their engineers Wallace Stone. The production was a joint effort between environmental experts from various firms. The result we hope is much more than a document to support a marine licence and planning consent application, rather the joint iterative design process has resulted in a high-quality project with appropriate mitigation to minimise adverse effects and maximise the benefits.

Thanks to all those who have contributed, for their hard work, professionalism, sense of humour and tolerance through the EIA process. Special thanks to those now on the other side of their world for the fun and friendship built during this project.

Glossary

Glossary

Acronym	Definition
AA	Appropriate Assessment
ADD	Acoustic Deterrent Device
AIS	Automatic Identification System
AL	Action Level
ALARP	As Low As Reasonably Practicable
ALHS	Aspect Land & Hydrographic Surveys
AOD	Above Ordinance Datum
ATC	Automatic Traffic Counter
BAP	Biodiversity Action Plan
BHD	Backhoe Dredging
BSI	British Standard Institution
BPEO	Best Practicable Environmental Option
BWM	Ballast Water Management
CAR	Controlled Activities Regulations
CD	Chart Datum
CEMD	Construction Environmental Management Document
CEMP	Construction Environmental Management Plan
CFL	CalMac Ferries Limited
CIEEM	Chartered Institute of Ecology and Environmental Management
CMAL	Caledonian Marine Assets Limited
CnES	Comhairle nan Eilean Siar
CO_2	Carbon Dioxide
COPA74	Control of Pollution Act 1974
COSHH	Control of Substances Hazardous to Health
cSAC	candidate Special Area of Conservation
Cu	Copper
CWSH	Coastal West Scotland and Hebrides
dB	Decibels
DDV	Drop Down Video
DEFRA	Department for Environment, Food & Rural Affairs
DMRB	Design Manual for Roads and Bridges
EcIA	Ecological Impact Assessment
ECoW	Environmental Clerk of Works
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
END	The European Parliament and the Council of the European Union 2002
EPS	European Protected Species
GBR	General Binding Rules
GEN	General Planning Principles
GHG	Greenhouse Gas
GPP	Guidance of Pollution Prevention

Acronym	Definition
GRP	Glass Reinforced Plastic
GT	Gross Tonnage
ha	Hectare
HAT	Highest Astronomical Tide
HF	High Frequency
HRA	Habitats Regulation Appraisal
Hg	Mercury
HGV	Heavy Goods Vehicle
HITRANS RTS	HITRANS Regional Transport Strategy
IEEM	Institute of Ecology and Environmental Monitoring
IEMA	Institute of Environmental Monitoring and Assessment
IOA	Institute of Acoustics
ISQG	Intermit Sediment Quality Guidelines
JNCC	Joint Nature Conservation Committee
km	kilometres
LDP	Local Development Plan
LF	Low Frequency
LNG	Liquified Natural Gas
m	metres
MARPOL	Convention for the Prevention of Pollution from Ships, 1973 as modified by the protocol of 1978
MF	Mid Frequency
MGO	Marine Gas Oil
MHWS	Mean High Water Spring
MLWS	Mean Low Water Spring
MMO	Marine Mammal Observers
MPA	Marine Protected Areas
MS-LOT	Marine Scotland - Licensing Operations Team
mSAC	marine Special Area of Conservation
MSMS	Marine Safety Management System
mSPA	marine Special Protection Areas
NAL	Noise Assessment Location
NCSA	Nature Conservation (Scotland) Act 2004
Ni	Nickel
nm	Nautical Miles
NMBAQC	North East Atlantic Marine Biological Analytical Quality Control Scheme
NMFS	National Marine and Fisheries Service
NML	Noise Monitoring Location
NMP	National Marine Plan
NMPi	National Marine Plan interactive
NNMS	Non-Native Marine Species
NO_x	Nitrogen Oxides
NOAA	National Oceanic and Atmospheric Administration

Acronym	Definition
NPF	National Planning Framework
MPH	Miles Per Hour
NRA	Navigation Risk Assessment
NSR	Noise Sensitive Receptor
OD	Ordnance Datum
OPP	Otter Protection Plan
OSPAR	Convention for the Protection of the Marine Environment of the North-East Atlantic
PAC	Pre-application Consultation
PAH	Polycyclic Aromatic Hydrocarbon
PAM	Passive Acoustic Monitoring
PAN	Planning Advice Note
PE	Parabolic Equation
PEL	Probable Effect Level
PM	Particulate Matter
PMF	Parallel Motion Fenders
pMPA	proposed Marine Protection Area
PMF	Priority Marine Feature
PMSC	Port Marine Safety Code
PPG	Pollution Prevention Guidelines
PSD	Particle Size Distribution
PTS	Permanent Threshold Shift
PW	Phocid Pinnipeds - Marine mammal functional group of pinnipeds, hearing threshold weighting according to their hearing sensitivity in water.
RIGS	Regionally Important Geological Sites
SAC	Special Areas of Conservation
SDP	Strategic Development Plans
SEL	Sound Exposure Level
SEL_{cum}	Cumulative Sound Exposure Level
SEPA	Scottish Environment Protection Agency
SHB	Split Hopper Barge
SLM	Sound Level Meter
SNH	Scottish Natural Heritage
SO_x	Sulphur Oxides
SOPEP	Shipboard Oil Pollution Emergency Plans
SPA	Special Protection Areas
SPL	Sound Pressure Level
SPL_{peak}	Peak Sound Pressure Level
SPM	Suspended Particular Matter
SPP	Scottish Planning Policy
SSE	Scottish and Southern Electricity
SSSI	Sites of Special Scientific Interest
SWL	Sound Power Level

Acronym	Definition
t	Tonnage
TA	Transport Assessment
TAN	Technical Advice Note
TDP	Taxonomic Discrimination Protocol
THC	Total Hydrocarbons
TNEI	TNEI Services Ltd
TSHD	Trailing Suction Hopper Dredge
TTS	Temporary Threshold Shift
UAP	Urban All-Purpose
UK	United Kingdom
UKEEZ	United Kingdom Exclusive Economic Zone
UKTAG	United Kingdom Technical Advisory Group
WCA	Wildlife and Countryside Act 1981
WFD	Water Framework Directive