



Lochmaddy Ferry Terminal Upgrade

Capital Bedrock Removal Dredge Best Practicable Environmental Option Report



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1 Introduction

This Best Practicable Environmental Option (BPEO) report has been produced to support the dredge marine licence application under the Marine Works (Scotland) Act 2010 for the Lochmaddy Ferry Terminal Upgrade. The application is being made in respect of the removal of bedrock following rock cutting below Mean High Water Springs (MHWS).

1.1 Reports Aims and Objectives

The purpose of this report is to identify and assess the available options for the use/disposal of rock material broken and removed from the seabed, hereafter referred to as 'dredging'.

The objectives are:

- To provide an overview of the required dredging works;
- Describe the proposed areas for which a dredging campaign is required, including estimated quantity of dredged material likely to be removed;
- Describe the BPEO methodology employed to complete the assessment; and
- To identify and assess options for disposal of dredged material to determine the BPEO for disposal of dredge spoil.

2 Background

Lochmaddy Ferry Terminal is owned by Comhairle nan Eilean Siar (CnES); however, the upgrade works are being managed on their behalf by Caledonian Maritime Assets Ltd (CMAL). As a new ferry is being constructed for use on the Skye Triangle Route (Uig (Skye) – Tarbert (Harris) and Uig – Lochmaddy (North Uist)) which can carry more passengers and vehicles than the existing vessel, proposed upgrades to the existing Lochmaddy Ferry Terminal are required. The upgrades will allow safe berthing of the larger vessel and will provide facilities for more passengers and vehicles.

The original dredge and disposal licence (Licence ref: 07001/19/0) for the works was granted on the 1st of November 2019, with a period of validity up until the 31st of December 2021. Due to the principal contractor going into liquidation and the Covid-19 global pandemic, an extension to the dredge and disposal licence was sought and awarded on the 20th of December. The licence (New licence ref: MS-00009575) was only extended for a one-year period due to sampling guidelines.

Due to unforeseen circumstances and poor weather preventing marine plant from operating, the required dredge depths have not been met at the inner pier area and a new dredge licence application is required. It is also understood that, under part 5.5 of the OSPAR Guidelines for the Management of Dredged Material at Sea (Agreement 2014-06) (OSPAR Commission, 2014), it needs to be proven that dredged material meet national assessment criteria, by way of sampling, at least every three years. As more than 3 years has elapsed since dredge samples/analysis were provided alongside the original marine licence application, usually new sampling would be required. In this instance, the dredge activities will be related to the removal of rock below MHWS. All soft sediments above the rock, which would normally be subject to sampling, have already been removed and disposed of at Stornoway Deposit Site (HE035), as per licence MS-00009595. As bedrock cannot be sampled and there is already an understanding of the geology of the Lochmaddy site, this BPEO has not been informed with



sampling analysis results. This approach has been verified by Marine Scotland in response to a letter reference 49_LET_MS9 (Please see Appendix 1), sent on the 18th of November 2022.

2.1 Dredge Areas and Volumes

The proposed dredge is in the current berthing area which requires to be deepened in order to facilitate a larger vessel. An estimated total of 500m³ of bedrock (hereafter referred to as 'dredge spoil') will arise from the dredge to -5m below CD (Chart Datum). To be conservative a specific gravity of 2.7 has been assumed for the dredged bedrock and therefore, the mass sought by the dredge licence will be 1350 tonnes.

The dredge spoil will be cut by a long reach excavator and breaker, operating from either the pier or from a floating barge.

3 BPEO Method

3.1 Introduction

In identifying the BPEO for this proposed dredge, the following methodology has been employed:

- Identification of options available for the disposal of material;
- Screening to eliminate unsuitable options;
- Scoring of remaining options; and
- Comparison of options and identification of the BPEO.

3.1.1 Option Identification

Options for disposal of the material were identified through discussions with CnES and their engineers, Wallace Stone and construction contractor.

3.1.2 Screening

All options have been screened against minimum criteria which each option had to meet in order to be taken forward for detailed consideration. Any option which failed to meet one or more of the criteria was not taken forward to the detailed assessment. The criteria used were:

- The proposed option must be suitable for the characteristics of the dredge material;
- It must be technically viable;
- It must allow for the development of the Lochmaddy Ferry Terminal within the existing development programme; and
- Allow for continued use of the Lochmaddy Ferry Terminal during construction, with no operational impacts to the ferry service.

3.1.3 Scoring

Options were scored against a list of attributes. This approach ensures that the same considerations are given to each option so that they can be compared fairly. Attributes were identified to ensure that environmental, technical and cost considerations were taken account of in the decision-making process.

Attributes were scored out of 5, with 1 being the worst performing and 5 being the best. The definitions for each criterion were decided prior to the options being assessed. Each score has



been designated a colour to aid visual comparison. The attributes and scoring definitions and colour codes are provided in Appendix 1.

Options meeting the minimum criteria were scored against each of the attributes (Appendix 2) and reasoning for this scoring provided (Appendix 3).

3.1.4 Comparison of Options and Identification of the BPEO

Following the scoring of the options, detailed comparisons were undertaken to identify the BPEO.

4 Assessment of Options

4.1 Identification of Options Available

Several options were initially identified for the disposal of the proposed dredge material, including both terrestrial and marine based options. The options identified are outlined below. A “do nothing” scenario is included for consideration in line with standard practice for BPEO assessments.

- Do Nothing;
- Disposal to Landfill;
- Spreading on Agricultural Land;
- Re-use within the Development;
- Bring to Land for use as Aggregate;
- Plough Dredging;
- Deposit at Sea to the Existing Stornoway Deposit Site (HE035); and
- Deposit at Sea to a New Spoil Deposit Site.

4.2 Unfeasible Options

Options were screened against the minimum criteria as outlined in Section 3.1.2. This process eliminated five of the eight options as they do not meet one or more of the screening criteria. The reasons why the five options have been discounted are discussed below.

4.2.1 Do Nothing

To not undertake dredging would have a significant impact on the proposed development. In order to facilitate a larger vessel at the ferry terminal, the inner dredge requires to be dredged to a sufficient depth to allow the vessel to berth in all tidal states. Hence, to do nothing would not allow to project to be completed as per the original requirement and consent.

4.2.2 Disposal to Landfill

There are several logistical steps associated with the disposal to landfill option that would require completion before removal of the material to a landfill site. Dredged material would need to be landed, stored and transported to a disposal site. This process would require CnES to set aside space to store the dredging spoil, and space is extremely limited in Lochmaddy. The disposal would also be subject to landfill tax at £98.60 per tonne of material. Based on the potential dredge tonnage to be up to 1000t, this would equate to tonnes this would equate to £98,600 in tax.



Further to the financial impact and lack of infrastructure available to store dredging spoil, no suitable landfill site has been identified as being technically feasible for the disposal of material. The landfill site closest to the dredge site, Rueval Landfill Site near Benbecula, has no remaining capacity. The only open landfill site in the Western Isles is Bennadrove on the Isle of Lewis which would incur further transportation costs. Furthermore there are logistical issues due to the ferry crossing involved.

In addition to the financial and logistical implications, the Scottish Government launched a Zero Waste Plan for Scotland in 2010 with a vision for a zero-waste society. The plan has a target to recycle 70% of material and a maximum of 5% to landfill by 2025 for all Scotland's waste (Scottish Government, 2010). The disposal of dredged material to existing landfill sites, therefore, does not align with the Scottish Government Policy where the onus is on reducing the amount of material being sent to a landfill site.

4.2.3 Spreading on Agricultural Land

This option has not been considered further due to the nature of the dredging spoil. The material will be hard bedrock and of no benefit to arable land. This option is therefore screened out as the physical characteristics of the dredge spoil make this option technically unviable.

4.2.4 Plough Dredging

Plough dredging has not been considered further as it is not a technically feasible option. The area requiring dredging is made up of hard bedrock which means that a plough dredging vessel would not be able to carry out the required task.

4.2.5 Deposit at Sea to New Spoil Deposit Site

The option requires a new spoil deposit site to be consented near Lochmaddy Ferry Terminal and was screened out, as the legislative process is complex and lengthy. A suitable site would need to be found, baseline surveys required, and assessments completed before a site could be designated. The requirement for characterisation of the candidate Spoil Deposit Site and Marine Scotland – Licensing Operations Team (MS-LOT) consultation with stakeholders can take up to a year to process, dependent on existing information and it is therefore unlikely to be permitted within the existing development programme.

4.3 Assessment of Feasible Options

Following the screening process, the options taken forward for further consideration are:

- Re-use within the Development;
- Bring to Land for use as Aggregate; and
- Deposit at Sea to the Existing Stornoway Spoil Deposit Site (HE035).

Each of these options have been analysed against the attributes identified in Appendix 1. The options scoring is provided in Appendix 2 with the reasoning for attribute scoring provided in Appendix 3. Where referred to, scores are provided in brackets below.

4.3.1 Re-use within the Development

The construction activities associated with the proposed development include infilling a concrete caisson that forms an extension to the existing pier. The concrete caisson is currently on site and will be placed at the end of the existing pier in late January 2023. The concrete



caisson requires 3850m³ of infill material and the resulting dredge spoil has potential to be suitable for reuse for this purpose. The re-use of dredge material is near the top of the waste hierarchy and is therefore consistent with the Scottish Government's policy of a Zero Waste Scotland by 2025. In addition, the re-use of dredge spoil as part of the development is in line with the Waste Directive Framework (Directive 2008/98/EC) and The Waste (Scotland) Regulations 2012 and positively implements and aligns with policy (5). For material to be suitable for re-use from a construction perspective, it needs to be both chemically and physically suitable. The fact the dredged material is solely comprised of bedrock, means it is physically suitable for re-use within the development without any further processing (5).

This option is not necessarily influential on the construction programme, as the caisson will already be in situ and able to take infill as soon as dredge arisings are available. The caisson will be sunk utilising water in the first instance until material is available; this aligns with the methodology discussed and assessed within the Environmental Impact Assessment Report (EIAR) (Affric, 2019). Infilling works can take place concurrently with rock removal and therefore dredge material will always be available (5). It is assumed that any bedrock, requiring to be stockpiled on land prior to being utilised inside the concrete caisson will be negligible. There will be no cost associated with storing the dredge material on land. While there are marine and land-based plant costs associated with the reuse of dredge material within the development, it is offset by the savings associated with purchasing less aggregate for infilling the caisson (5).

In addition to cost savings associated with the re-use of aggregate within the development, once on land, there will be minimal transport of dredge spoil required (5). The dredge material will not be a source of dust due to the physical nature of bedrock or increase number of vehicles on public roads. Standard management measures for stockpiling small quantities of rock will be implemented as per the Construction Environmental Management Document (CEMD) and marine construction licence (4), hence any potential environmental impacts are deemed trivial (4).

The re-use of material is standard practice and would not require any further licences or permits as it will be permitted as part of the Marine Licence Process for the proposed development. However, in order to temporarily store dredge arisings onshore, registration for waste exemption under paragraph 19 of The Waste Management Licensing (Scotland) Regulations 2011 will be required. This is obtained through the submission of a registration form to the Scottish Environmental Protection Agency (SEPA) (4). Note that SEPA have already confirmed that this would be suitable.

As dredge activities are occurring within an operational harbour, management of existing operations around dredge work will be required, which will ensure minimal disruption to operations. It is noted that all dredging activities will have to cease around the ferries arrival and departure, as would infilling the caisson with the dredge spoil. Therefore, only trivial impacts on harbour operations are expected through this option (4).

The option to re-use dredge spoil within the development scored a 41 out of 45.

4.3.2 Bring to Land for Use as Aggregate

This option explores the use of dredge material as aggregate at various developments in the area. In order to achieve this, dredge material will need to be loaded into trucks and



transported to a quarry for storage until it can be utilised at other developments. The nearest quarry to the Lochmaddy Ferry Terminal is the Druim Reallasger, operated by Breedon and located less than a mile away.

The re-use of material is near the top of the waste hierarchy and is therefore consistent with the Scottish Government's policy of a Zero Waste Scotland by 2025. In addition, the re-use of dredge spoil as an aggregate at other developments in the Western Isles is in line with the Waste Directive Framework and The Waste (Scotland) Regulations 2012 (5). For material to be suitable for re-use from a construction perspective, it needs to be both chemically and physically suitable. The fact the dredged material is solely comprised of bedrock ensures it is physically suitable for re-use within the development (5).

While the dredging spoil is suitable for use as aggregate for various developments, transporting the dredge spoil from marine plant to land could lead to an extension of the construction timeline (4). The dredge spoil will then need to be transported to Druim Reallasger Quarry (4) for temporary storage and possible processing, before being removed and used for a development project in the area. The cost of resale of this aggregate however may offset the transport from the ferry terminal to the quarry (5).

While the process of re-using dredge spoil is standard practice, it requires some processing before being used as an aggregate, such as crushing and screening (4). The temporary storage, processing and re-use of the material in other developments will need to comply with the relevant waste legislation (4). In order for the quarry to store and process the dredge spoil for resale, registration for waste exemption under paragraph 13 of The Waste Management Licensing (Scotland) Regulations 2011 will be required. This is obtained through the submission of a registration form to the Scottish Environmental Protection Agency (SEPA).

The transportation of the dredge spoil has the potential to lead to traffic impacts with increased vehicle traffic to and from the harbour to the quarry. In addition, there is potential for dust generation during both the transport and storage of the dredge spoil (3). The landing of dredge spoil from the marine plant will require a large area of quay side space, which is already limited, for storage of dredge material until it can be collected and transported to the quarry. This will considerably impact on current operations within the harbour, particularly during ferry departure and arrivals. (3).

The option for re-use of the dredge spoil as an aggregate for other developments scored 37 out of 45.

4.3.3 Deposit at Sea to the Existing Stornoway Deposit Site (HE035)

There are numerous open dredge and disposal sites located within Scottish Waters for deposition of dredged material. Deposit of dredge spoil to HE035 requires dredge material to be disposed of directly from marine plant or transferred from land-based dredge plant to marine plant for deposit.

The deposit of dredged spoil at sea to HE035 does not fully align with the Scottish Governments' policy of Zero Waste Scotland (2) as it is low on the waste hierarchy. However, due to the physical characteristics of bedrock, the materials are appropriate to be disposed of at sea and the dredge spoil will drop through the water column rapidly with low risk of sedimentation (5).



Dredge disposal operations may lead to smothering of benthic flora and fauna at the dredge disposal site. However, prior use of the disposal site will have already degraded the benthic environment in the location. Therefore, environmental impacts are trivial (4).

HE035 has been identified as the most appropriate disposal site due to its geographical location in relation to the development, although the site is located approximately 90km north-east of the proposed dredge (2). Initial mobilisation of equipment to conduct dredging operations is minimal, but the 180km round trip required to dispose of dredge material at the Stornoway dredge disposal site can negatively impact the timescales required to complete the dredging campaign (3). The long distance to the disposal grounds also increases the project cost due to the mobilisation of marine place and the timescales involved (3).

The disposal of material to sea disposal sites is established industry practice and as such this option scores highly (5) on the technically feasible attribute. Also, as the activity is standard practice, the legislative complexities involved are relatively simple with little management required to comply with legislation (4).

In addition, existing operations would need to be managed around the dredging works. However, to minimise disruption to the ferry service, a design has been developed to allow as far as practicably possible, normal ferry operation whilst conducting dredging operations. Hence, minimal impacts on harbour operations are expected through this option (4).

The option to deposit dredge spoil to sea to HE035 scored 34 out 45.

4.4 Comparison of Options

The re-use of the dredge spoil within the development scored highest of the three options assessed, with re-use as aggregate within other developments scoring second highest and disposal at the existing deposit site scoring lowest.

As all of the dredge arisings are suitable for reuse in the development and it has scored highest, this is the BPEO.

5 Conclusion

Multiple options were considered, a number of which were screened out early in the process. Of those taken forward for full assessment, the option for 'Re-use Within the Development' scored the highest against a range of attributes, followed closely by 'Bring to Land for use as Aggregate' and 'Deposit at Sea to the Existing HE035'. The BPEO for the management of dredged spoil was therefore determined to be 'Re-use Within the Development'. It must be noted that should re-use within the development not be deemed appropriate, then reuse as aggregate scored strongly, also aligns with the waste hierarchy and would be a good second option.



6 References

Affric Limited. 2019. Lochmaddy Ferry Terminal Upgrade Environmental Impact Assessment Report Volume 2

Scottish Environmental Protection Agency. 2021. Landfill Sites and Capacity Map. Retrieved from <https://www.sepa.org.uk/data-visualisation/waste-sites-and-capacity-tool/>. Accessed on 21st December 2022.

The Scottish Government. 2010. Scotland's Zero Waste Plan.

OSPAR Commission. 2014. OSPAR Guidelines for the Management of Dredged Material at Sea (Agreement 2014-06)

7 Glossary

Acronym	Definition
BPEO	Best Practicable Environmental Option
CD	Chart datum
CEMD	Construction Environmental Management Document
CMAL	Caledonian Maritime Assets Limited
CnES	Comhairle nan Eilean Siar
EIAR	Environmental Impact Assessment Report
m	Metre
m ³	Metre squared
MHWS	Mean High Water Spring
SEPA	Scottish Environmental Protection Agency
t	Tonnes



Appendix 1: Attributes

Attribute	Description	1	2	3	4	5
Alignment with Policy	How complex are the regulator requirements and what risks are posed.	In direct conflict with policy.	Does not fully align with policy.	No policy implications.	In the spirit of policy.	Positively implements policy.
Cost	Financial Cost of the Option	>£ 500 000	£300 000 to £500 000	£150,000 to £300,000	£50,000 to £150,000	<£50,000
Timescale	Impact of works on project programme.	Dredge would extend the project programme.	High risk dredge couldn't be completed within required timescale.	Slight risk dredge couldn't be completed within required timescale.	Allows dredge to be completed within required timescale.	Allows dredge to be completed comfortably within required timescale.
Distance	Impact location has on logistics for material movements.	Beyond 50 miles	40-50 miles	30-40 miles	1-30 miles	Within 1 Mile
Technical Feasibility	Is the option within the capabilities of Comhairle nan Eilean Siar to carry out?	Technology not proven.	Complex requirements, but proven technology.	Simple proven technology available.	Practicable with basic management.	Standard practice
Environmental Effects	Potential environmental effects associated with implementing the option.	Very Significant	Significant	Minimal	Trivial	None
Impacts on Harbour Operations	Level of interference with normal harbour operations.	Very Significant	Significant	Minimal	Trivial	None
Legislative Complexity	How complex are the regulator requirements and what risks are posed.	Significant risk additional permits, licences or consents will not be granted.	Requires significant additional permits, licences or consents.	Requires additional permits, licences or consents.	Minor management required to comply with legislation	Complies with all relevant legislation.



Appendix 2: Options Scoring

Attribute	Re-use within the Development	Bring to Land for use as Aggregate	Deposit at Sea to HE035
Alignment with Policy	5	5	2
Cost	5	5	3
Timescale	5	4	3
Material Suitability	5	5	5
Distance	5	4	5
Technically Feasibility	4	4	4
Environmental Effects	4	3	4
Impacts on Harbour Operations	4	3	4
Legislative Complexity	4	4	4
Total	41	37	34



Appendix 3: Reasoning for Attribute Scoring

Attribute	Re-use within the Development	Bring to Land for use as Aggregate	Deposit to Sea to HE035
Alignment with Policy	The option to re-use dredge spoil directly aligns and positively implements the Zero Waste Scotland Policy, The Waste (Scotland) Regulations 2012 and Waste Framework Directive.		Deposit at sea is low on the waste hierarchy and as such does not align to policy.
Cost	Bringing dredge spoil to land can be expensive, however this can be offset by saving on the cost of infill material for the development.	Bringing dredge spoil to land can be expensive. In addition, there is a cost associated with the transporting of dredge spoil for temporary storage and processing at the quarry, prior to use at other developments. However, the resale of aggregate will help offset the cost of transport.	Substantial cost associated with utilising a marine plant to take material to the marine Spoil Deposit Site from land.
Timescale	Re-use of the dredge spoil inside the concrete caisson will have negligible impacts on the construction programme. Dredging and subsequent infill works can occur simultaneously.	There will be a possible extension of construction timeline due to the transfer of marine dredge spoil to a quarry.	There will be a possible extension of the construction timeline due to the transfer of dredge spoil to the marine Spoil Deposit Site and the distance between the Deposit Site and Lochmaddy Ferry Terminal.
Material Suitability	The physical characteristics of the dredge spoil is suitable for re-use in the caisson.	The physical characteristics of the dredge spoil is suitable for re-use as an aggregate for various development projects in the area.	The dredge spoil is acceptable for the option of deposit at sea.
Distance	The benefit of utilising the dredge spoil within the development means that limited transport is required (i.e. no transport further than 1 mile).	The quarry, which will be used to store the aggregate before being transported to its intended development, is approximately 1 mile from the ferry terminal.	HE035 is 90km away from Lochmaddy Ferry Terminal and dredge disposal trips will therefore be a 180km round trip.
Technically Feasibility	The re-use of material is standard practice and with the suitability of the material, it is practicable with basic management. The material will need to be transported from marine to land and will need to be managed as per the CEMD.		The deposit to sea is an established and well-practised methodology. The material will need to be transported from land to marine Spoil Deposit Site, which will need to be managed as per the CEMD and relevant licences.



Attribute	Re-use within the Development	Bring to Land for use as Aggregate	Deposit to Sea to HE035
Environmental Effects	Limited transport required and due to the nature of the dredge spoil, no dust will be generated. In addition, the lack of space at the harbour for storage of dredge spoil means that the material will need to be used soon after it is received on land.	Significant traffic impacts, particularly during ferry arrivals and departures, resulting from transport to quarry and onto future use.	The disposal of dredge spoil is unlikely to have an impact of benthic flora and fauna, as the site has been used for past disposals and is therefore already degraded. The characteristics of dredge spoil will not give rise to suspended solids.
Impacts on Harbour Operations	There would be no effects to the harbour operations when transporting dredge spoil to infill the caisson, as all works on the pier cease whilst the ferry is berthed.	The landing of dredge spoil from the marine plant will require a large area of quay side space, which is already limited, resulting in significant impacts on harbour operations.	The disposal of dredge spoil to HE035 will have negligible effects on normal harbour operations and can be worked around the ferry timetable.
Legislative Complexity	Ensure waste legislation is complied with to allow material to be stored and re-used. This includes a waste exemption licence from SEPA.		Deposit to sea would be permitted under the dredging marine licence.