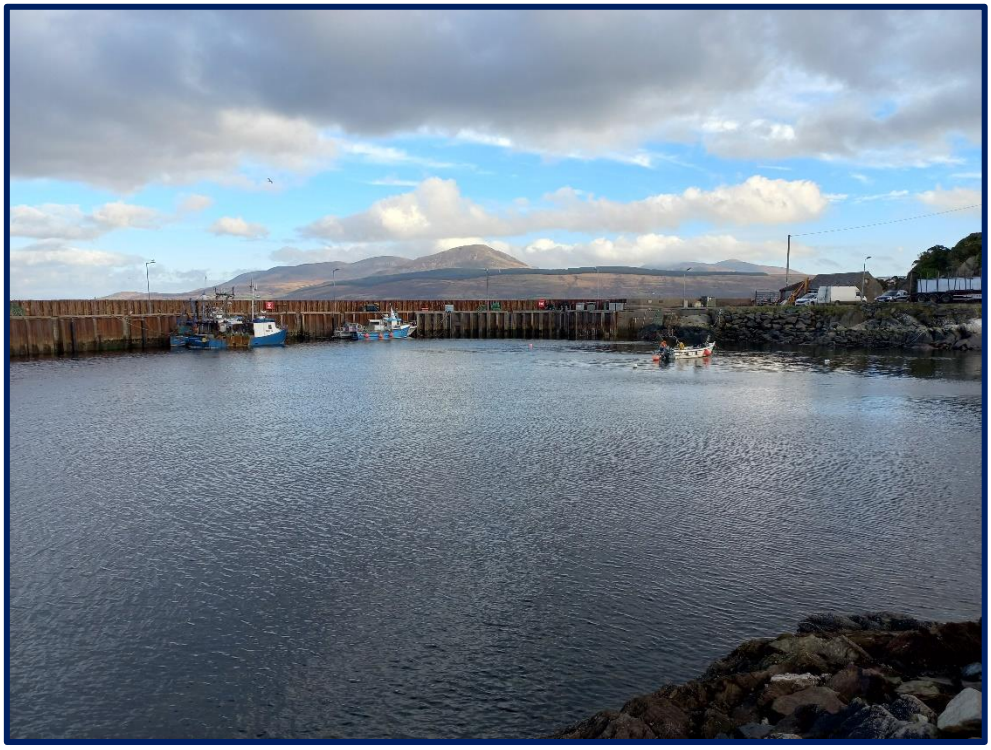
MOWI SCOTLAND LTD

CARRADALE HARBOUR PONTOON



DREDGE AND DISPOSAL
BEST PRACTICABLE ENVIRONMENTAL OPTION ASSESSMENT

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Doc Ref – 2239-WS-XX-XX-T-C-1002

Member of the Association
for Consultancy and Engineering

This document was prepared as follows:-

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Checked By	Gordon Brown	<Redacted>	12/08/2024
Approved By	Gordon Brown	<Redacted>	12/08/2024

and revised as follows:

REVISION STATUS INDICATOR

Page No	Date	Revision	Description of Change	Initial

This document has been reviewed for compliance with project requirements in accordance with Wallace Stone LLP Quality Management System.

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BEST PRACTICABLE ENVIRONMENTAL OPTION ASSESSMENT

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CARRADALE HARBOUR PONTOON

DREDGE AND DISPOSAL
BEST PRACTICABLE ENVIRONMENTAL OPTION ASSESSMENT

1. INTRODUCTION

This Best Practicable Environmental Option (BPEO) Report has been produced to support a dredge and disposal marine license application under the Marine Works (Scotland) Act 2020 for Carradale Harbour. The application will be submitted on behalf of MOWI Scotland Ltd. by Wallace Stone.

1.1 Report Aims and Objectives

The purpose of this report is to identify and assess the available options for the disposal of dredged materials, to support the submission of a marine license for dredge and disposal for Carradale Harbour.

The objectives are:

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

2. BACKGROUND

Argyll & Bute Council are the Statutory Harbour Authority (SHA) for Carradale Harbour and are therefore responsible for its management and maintenance. MOWI Scotland Ltd. plan to install a pontoon within the Harbour for shared use by themselves for commercial activities and private use by the local community. A critical part of the works will involve dredging of the seabed in an area around the proposed pontoons to provide suitable water depths and ensure the pontoons do not ground.

2.1 Description of Materials

The proposed dredge area is shown on drawing 2239-WS-XX-XX-D-C-2001 in Appendix A. The seabed contours shown on the drawing are based on the bathymetric survey undertaken by Aspect Land & Hydrographic Surveys Ltd. in May 2023 on behalf of Argyll & Bute Council.

The dredge area provides sufficient space for safe navigation for vessels to/from the proposed pontoon berth. It is proposed to dredge the inner section (south side) of this area to 1m below chart datum and the outer section (north side) to 2m below chart datum. The dredged area will have side slopes of approximately 1:3 to meet the existing seabed. In August 2023, Aspect Surveys undertook a geophysical survey by means of seismic reflection techniques to determine sub-seabed geological strata. This survey highlighted underlying rockhead close to the seabed surface. This means that there may be some areas where the specified dredge depth cannot be fully achieved.

The estimated volume of material to be extracted from the proposed dredge area is 590m^3. Testing of the vibrocore samples found the average specific gravity from the seabed material was around 2.50, hence the mass of material to be removed is 1,475 tonnes.

The sampling plan for the dredge area was developed by Wallace Stone and indicated the location of 3nr vibrocore sample locations (Refer to drawing 2239-WS-XX-XX-D-C-0051; Appendix B). A Marine License Exemption application was submitted to the Marine Scotland Directorates Licensing Operations team (MD-LOT) on 12th March 2020 and was approved on 20th March 2024.

The vibrocore sampling was conducted by Aspect Land & Hydrographic Surveys Ltd on 4th June 2024. It was proposed that the maximum depth of each vibrocore

would 2m due to the anticipated level of underlying rockhead. Details of the vibrocore samples are provided in Table 1 for information.

All vibrocore samples were analysed by the Laboratory SOCOTEC who are accredited by the United Kingdom Accreditation Service (UKAS) to ISO17025. Within each core, samples were taken at depth intervals outlined in Table 1. The results of the analyses have been summarised in this section; complete sample results are available in the spreadsheet entitled 'Pre-Disposal+Sampling+Results+Form MAR02348' submitted with the dredge and disposal license application.

Table 1 - Vibrocore Core Length and Sample Depth Intervals

Sample	Easting	Northing	WGS84 Latitude	WGS84 Longitude	Sample Length (m)	Sample Depth Range 1 (m)	Sample Depth Range 2 (m)
VC1	181894.204	638654.129	55.59252'N	5.46298'W	0.50	0.00 – 0.50	-
VC2	181906.171	638653.532	55.59252'N	5.46279'W	0.30	0.00 – 0.30	-
VC3	181925.918	638657.006	55.59256'N	5.46248'W	1.00	0.00 – 0.50	0.50 - 1.00

*VC = Vibrocore

Table 2 below presents a summary of the physical characteristics for each sample, including the particle size distribution (PSD) showing the sample composition. On average, samples contained 68.75% solid material, but individual samples ranged from 60.6% to 73.2% solids.

Table 2 - Physical Characteristics

Sample	Total Solids (%)	Gravel (%)	Sand (%)	Silt (%)	TOC (%)
VC1 [0.00 – 0.50]	73.2	0.00	73.31	26.69	1.25
VC2 [0.00 – 0.30]	70.1	6.50	62.52	30.98	1.32
VC3 [0.00 – 0.50]	60.6	0.00	80.18	19.82	1.14
VC3 [0.50 – 1.00]	71.1	16.46	68.10	15.43	1.72

All samples were tested for a suite of chemical parameters analysed against Action Levels (AL) as prescribed by MD-LOT in the Pre-disposal Sampling Guidance (Marine Scotland, 2017). The average samples were also compared to the Dutch Target and Intervention Values (the New Dutch List), (Ministerie can Volkshuisvesting, 2000) to understand the potential for onshore uses. Results from each sample returned values below the prescribed ALs for the following trace metals; Arsenic (As), Chromium (Cr), Mercury (Hg), Nickel (Ni). Several results from each sample returned readings above AL1 thresholds for the following trace metals and organotins; Cadmium (Cd), Copper (Cu), Lead (Pb), Zinc (Ni) and Tributyltin (TBT). Exceedances for each sample (taken as dry weight) are shown in Table 3 with ALs included for comparison. For parameters that exceeded AL1 as an individual sample by dry weight, the average sample result (as a wet weight) is included in Table 4.

Table 3 - Review of Action Level Exceedances

Sample Point	Cadmium (Cd) mg/kg (dry weight)	Copper (Cu) mg/kg (dry weight)	Lead (Pb) mg/kg (dry weight)	Zinc (Zn) mg/kg (dry weight)	Tributyltin (TBT) mg/kg (dry weight)
Marine Scotland AL1	0.4	50	50	130	0.1
Marine Scotland AL2	4	370	400	600	0.5
Sample Results					
VC1 [0.00 – 0.50]	0.4	50.8	43.4	150	0.0884
VC2 [0.00 – 0.30]	0.4	50.3	28	143	0.13
VC3 [0.00 – 0.50]	0.32	78.5	33.2	149	0.0608
VC3 [0.50 – 1.00]	0.48	86.1	71.8	211	0.263
Sample Point	**Cadmium (Cd) mg/kg (dry weight)**	**Copper (Cu) mg/kg (dry weight)**	**Lead (Pb) mg/kg (dry weight)**	**Zinc (Zn) mg/kg (dry weight)**	**Tributyltin (TBT) mg/kg (dry weight)**
New Dutch List Target Value	0.8	36	85	140	-
New Dutch List Intervention Value	12	190	530	720	-
Sampling Average	0.40	66.4	44.1	163.3	0.135

Table 4 - Average mg/kg (wet weight) for Exceedances

Sample Point	Cadmium (Cd) mg/kg (wet weight)	Copper (Cu) mg/kg (wet weight)	Lead (Pb) mg/kg (wet weight)	Zinc (Zn) mg/kg (wet weight)	Tributyltin (TBT) mg/kg (wet weight)
Average Across Dredge Area	0.29	47.1	32.5	117	0.095

Cadmium (Cd) was marginally in exceedance of AL1 (Cd AL1 = 0.4mg/kg) in three out of four samples. The average of all four samples was equal to the threshold at 0.4mg/kg. The exceedance is therefore not expected to result in any detrimental environmental impact and furthermore, the average wet weight concentration across all samples was 0.29mg/kg, below the dry weight AL1.

All samples showed the presence of Copper (Cu) above AL1 (Cu AL1 = 50mg/kg) but considerably lower than AL2 (Cu AL2 = 370mg/kg), with individual sample results ranging from 50.3mg/kg to 86.1mg/kg. The average wet weight concentration for Cu across all the samples was lower than the AL1 for dry weight (47.1mg/kg compared to AL1 = 50mg/kg). Subsequently, no adverse impact is expected from this slight exceedance of the guidance AL and the material is considered appropriate for sea disposal.

All samples, apart from VC3 [0.50-1.00], demonstrated Lead (Pb) results below AL1 (Pb AL1 = 50mg/kg). VC3 [0.50-1.00] resulted in a concentration of 71.8mg/kg which is significantly less than AL2 (Pb AL2 = 400mg/kg). The average dry weight across all the samples was below AL1 (44.1mg/kg compared to Pb AL1 = 50mg/kg), therefore exceedance for the entire dredge area is not expected and there are no adverse effects.

All samples showed the presence of Zinc (Zn) above AL1 (Zn AL1 = 130mg/kg) but considerably lower than AL2 (Cu AL2 = 600mg/kg), with individual sample results ranging from 143mg/kg to 211 mg/kg. The average wet weight concentration for Zn across all the samples was lower than the AL1 for dry weight (117mg/kg compared to AL1 = 130mg/kg). Subsequently, no adverse impact is expected from this exceedance of the guidance AL.

Two out of four of the samples (VC2 and VC3 [0.50–1.00]) showed level of Tributyltin (TBT) exceeding AL1 (TBT AL1 = 0.1mg/kg), but significantly less than AL 2 (TBT AL2 = 0.5mg/kg). The average wet weight concentration for TBT across all the samples was lower than the AL1 for dry weight (0.095mg/kg

compared to AL1 = 0.1mg/kg). Therefore, exceedance for the entire dredge area is not expected and there are no adverse effects.

All parameters returned an average wet weight concentration below AL1 and as such the dredge material is considered acceptable under the prescribed levels for disposal at sea in accordance with Marine Scotland's Pre-Disposal Sampling Guidance (Marine Scotland, 2017).

Concentrations of a range of Polyaromatic Hydrocarbons (PAH) were identified in exceedance of AL1 in the sample suite. These can be seen in detail in the Pre-disposal Sampling Results Form (submitted with this BPEO). When these results are taken as an average for wet weight across the dredge area, no PAH parameters were in exceedance of the respective AL1 (refer to 'PR_Details' tab of the Pre-disposal Sampling Results Form).

Note: When referring to the PR_Details tab, the Zinc AL2 exceedance is a formatting issue and should be ignored. The document is 'locked' by the laboratory to prevent tampering of results and can therefore not be altered.

3. BPEO METHOD

3.1 Introduction

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

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

3.2 Option Identification

In addition to the standard options considered (Do Nothing, Dispose to Sea and Dispose to Land), additional options for disposal of the material were investigated.

3.3 Screening to Eliminate Unsuitable Options

All options have been screened against a minimum criterion. These are the criteria each option must meet for it to be considered further. Any option which failed to meet one or more of the criteria was not taken forward to the detailed assessment of remaining options. The proposed option must be;

- Suitable for the characteristics of the dredge material;
- Technically viable; and
- Allows for the continued operation of Carradale Harbour.

3.4 Attribute Identification and Scoring

Attributes to be utilised in the options assessment were identified. Attributes were scored out of 5 for each option, with 1 being the worst performing and 5 being the best. Attributes are outlined in Appendix C. Options meeting the minimum criteria were scored against each attribute in Appendix D. Reasoning for the corresponding scores are provided in Appendix E.

3.5 Comparison of Options and Identification of the BPEO

Following the scoring of the options, a detailed comparison was undertaken to identify the BPEO.

4. ASSESSMENT OF OPTIONS

4.1 Identification of Options Available

Several options were identified for the disposal of the dredged material, including both terrestrial and marine options. Options identified are outlined below:

- Do nothing;
- Disposal to landfill;
- Spreading on agricultural land;
- Beach nourishment;
- Beneficial reuse of material;
- Disposal at sea; and
- Plough dredging

4.2 Screening of Options

The options were initially screened against the minimum criterion as outlined in Section 3.3 which eliminated five of the options. The reasoning for discounting certain options as not viable is outlined below.

4.2.1 Do Nothing

This option has been discounted as the existing bathymetry in the area of the proposed pontoon does not provide adequate depths of water for the vessels intended to utilise the berth. If the depth cannot be increased by dredging the seabed, then the pontoon scheme would not be feasible and there would be a social and economic impact on the harbour.

4.2.2 Spreading on Agricultural Land

This option has not been considered further due to the appropriateness of the material to be spread on agricultural land. The high saline content of the seabed material makes it unsuitable for spreading onto agricultural land without significant further treatment. Salinity is a key environmental limiting factor for the productivity of plant growth; many crops are salt sensitive therefore excess salinity is a threat to agriculture (Flowers, 2005).

The Marine Scotland AL are set regarding marine sediments, and as such may not be appropriate for consideration of land uses of the material, as the pathways to receptors, including humans, are very different. Hence, the

sample results were compared against the Dutch Target and Intervention Values (the New Dutch List), (Ministerie can Volkshuisvesting, 2000) for soil/sediment, utilised for the assessment of contaminated land. The New Dutch List utilises dry weight values. A comparison of the metals average dry weight of the dredge samples (detailed in Table 3) against the New Dutch List identified that the concentrations of Copper (Cu) at 66.4mg/kg and Zinc (Zn) at 163.3mg/kg exceed the target levels when averaged across the dredge area. However, the concentrations do not exceed the intervention values of 190mg/kg for Copper and 720mg/kg for Zinc. With regard to PAH, the New Dutch List combines 10 PAHs into one value (PAH(sum10)). The PAH(sum10) for the Carradale samples is 4.78 mg/kg, which is above the target level of 1 mg/kg, but below the intervention level of 40mg/kg.

The salinity issues, plus the fact that the dredge spoil is likely to be above the target values for PAH(sum10) make the option of spreading on agricultural land unsuitable due to the characteristic of the dredge material.

4.2.3 Plough Dredging

This option was not considered appropriate as this method of dredging would mean an increased burden to other areas of the harbour with the possibility of making these areas unnavigable due to material deposition decreasing the depth of water. Hence, it does not meet the minimum criterion for the continued operation of Carradale Harbour.

4.2.4 Beach Nourishment

This option has been discounted as the characteristics of the dredge material were deemed unsuitable for beach nourishment. Nourishment material should ideally be of the same/similar PSD as the recipient beach.

The silt content in the samples is inconsistent with typical beach material. Furthermore, the sediment colour, as shown in Appendix C, is predominantly black. This material colour, which infers high organic content, in combination with high silt levels, more closely represents soil than beach material. Deposition of black material to the beach would considerably alter the visual characteristic of the beach and is subsequently unsuitable for this purpose.

In addition, elevated Copper (Cu) and Zinc (Zn) concentrations above target levels for soils (refer to Table 3), may also make the material unsuitable for beach nourishment. Concerns could be raised for beach activities that put

people, specifically children, in close contact with beach material. Hence, deposition of material with metal concentrations in exceedance of guidelines to beaches is not recommended.

4.2.5 Beneficial Reuse of Material

Dredge material can be suitable for land reclamation or coastal remediation works if exhibiting the appropriate PSD and chemical characteristics. Material grade and quality are critical for this purpose. Suitable material is generally made up of sands and gravel. Large volumes are also usually required to ensure the costs of processing and transport are feasible.

The proposed project which includes installation of a pontoon and guide piles, does not require the use of any fill material for land reclamation or coastal remediation purposes. There are also no nearby projects which would require dredge material, nor would it be feasible to process and transport such a small volume.

For dredge materials to be reused by another project, the material needs to meet the engineering specification for the planned use. High silt levels give rise to settlement issues which can be problematic for coastal remediation, where land is already under pressure from weathering processes, and particularly for land reclamation works which will likely be subject to considerable load bearing. Whilst the VC3 samples exhibited a majority sand content, VC1 and VC2 showed silt levels of between 26.69% and 30.98% which is unlikely to be acceptable for engineered fill material. Hence, the material would be considered unsuitable for reuse in land reclamation or coastal remediation due to the material characteristics.

4.3 Assessment of Remaining Options

Following the screening process, the following options have been selected to take forward for further analysis:

- Disposal to landfill; and
- Disposal to sea

These options have been further discussed and analysed for their suitability to receive the dredged material based on the attributes identified in Appendix D. The options scoring is provided in Appendix E, with the reasoning for attribute scoring provided in Appendix F.

4.3.1 *Disposal to Landfill*

Disposing of dredged material to landfill can take up valuable space within a facility when space with the UK landfill network is at a premium. With disposal to landfill there are also logistical steps that will need to be completed before removal to these sites. Dredged material will need landing, dewatering, storage, and transport to a disposal site.

Landfill sites within a reasonable distance to Carradale Harbour are:

- Dhurrie Farm – 20 miles
- Lingerton – 38 miles

However, both locations are not currently operational as landfill sites and are therefore unable to be used for disposal of the dredge material.

The nearest operational landfill site is Auchencarroch Landfill which is in West Dunbartonshire, situated 104 miles from Carradale. A summary of the site data is provided in the table below. The table demonstrates that Auchencarroch could comfortably handle the volume of dredge material requiring disposal.

Table 5 - Landfill Information

Operator	Description	Annual Capacity Allowance	Proposed Annual Dredge Volume as a % of Annual Landfill Capacity
Barr Environment Ltd	Permitted to accept Non-Hazardous Waste	250,000 tonnes	0.59%

Furthermore, disposal to landfill requires material to be acceptable for the proposed landfill. Consideration would need to be made for effects on drainage and the chemical composition of the material leaching into the surrounding environment. Ultimately, the responsibility for accepting the waste material will be with the landfill operator, however the high salinity of the material has the potential to react with existing materials/chemicals within the landfill and subsequently may be environmentally and operationally unfavourable.

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 into 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.

Transport of material to a landfill site by Heavy Goods Vehicles (HGVs) would be expected to generate a considerable increase in HGV traffic. On the assumption that an HGV could hold 20 tonnes of dredged material, this would require 49 round trips to dispose of the material. Access to and from Carradale Harbour is via the B879. The section of the B879 into the Harbour has a steep incline and is considerably narrow with residential boundary walls running along the edge of the road. This route is therefore not deemed suitable for the increased usage of HGVs required to remove the dredge material from site. Connected with the use of HGVs is an increased cost of transportation, as well as the potential for short-term decrease in air quality within urban areas, increase in carbon emissions and increases in noise and vibration effects.

As previously mentioned, disposal to landfill would require dredged material to be dewatered and dried before transportation. This is expected to either require a large expanse of land or a smaller space that could delay dredging work. Both alternatives would put pressures on Carradale Harbour to provide space and equipment to process the material, potentially interfering with other users of the harbour area. Additionally, this activity could be expected to have adverse visual effects on the local area. The material will also be subject to landfill tax per tonne of material.

4.3.2 Disposal at Sea

There are numerous open dredge disposal sites in Scottish Waters for deposition of dredged material. The closest open disposal sites to Carradale Harbour are:

- Firth of Clyde - Campbeltown (MA060) = 10.5miles (17km)
- Firth of Clyde – Brodick (MA017) = 27 miles (44km)
- Firth of Clyde – Birch Point (MA019) = 27 miles (44km)

Due to the proximity and associated efficiencies with regard to transit to Campbeltown (MA060), this site was considered within the scoring of the 'disposal at sea' option.

The material has been assessed as suitable for sea disposal in line with Marine Directorate's Pre-Disposal Sampling Guidance (Marine Scotland, 2017) as described in Section 2.2.

Disposal of material is low in the waste hierarchy and as such doesn't align with the Zero Waste Policy, however, dredge disposal is standard practice and scored high in technical feasibility (see Appendix D and E).

4.4 Comparison of Options

Both options have been assessed and scored against the attributes set out in Appendix C. See Appendix D for scoring and Appendix E for reasoning. The 'Disposal at Landfill' option scored 3 or less against all of the attributes, with a total score of 18 out of 45. The 'Disposal at Sea' option scored 30 out of 45, the highest scoring option, and scored well with a 4 or higher on all but two categories. A score of 2 for policy is assigned as disposing of material is not in alignment with the Scottish Government's Zero Waste Policy.

5. CONCLUSION

Following assessment of options as discussed throughout this document, the best practicable environmental option for disposal of dredged material is for the disposal at sea to the Campbeltown (MA060) Sea Disposal Site.

6. REFERENCES

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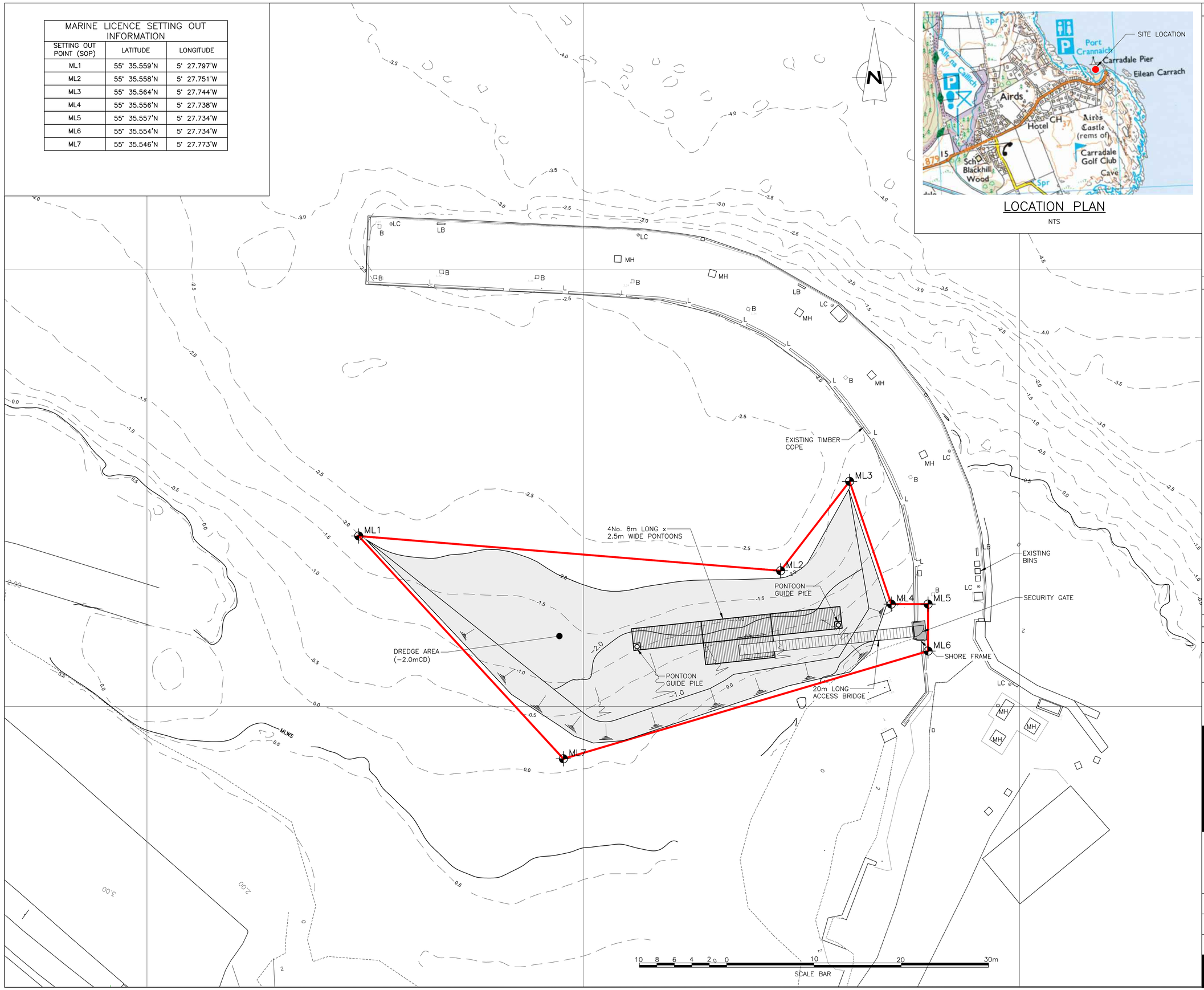
Appendix A – Proposed Dredge Area

MARINE LICENCE SETTING OUT INFORMATION

SETTING OUT POINT (SOP)	LATITUDE	LONGITUDE
ML1	55° 35.559'N	5° 27.797'W
ML2	55° 35.558'N	5° 27.751'W
ML3	55° 35.564'N	5° 27.744'W
ML4	55° 35.556'N	5° 27.738'W
ML5	55° 35.557'N	5° 27.734'W
ML6	55° 35.554'N	5° 27.734'W
ML7	55° 35.546'N	5° 27.773'W



LOCATION PLAN

NTS

GENERAL NOTES

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

   HAT +3.5mCD
   MHWS +3.1mCD
   MHWN +2.6mCD
   MLWN +1.1mCD
   MLWS +0.4mCD
   LAT −0.2mCD
4. CHART DATUM IS 1.62m BELOW ORDNANCE DATUM.

LEGEND

B = BOLLARD
L = LADDER
LC = LIGHTING COLUMN
LB = LIFE BUOY
MH = MANHOLE
= MARINE LICENSE BOUNDARY
= BATHY CONTOURS (CD)

REV	DATE	DETAILS	DRAWN	CHK'D	APP'D

AMENDMENTS

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MOWI SCOTLAND LTD

PROJECT

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DRAWING TITLE

MARINE LICENCE APPLICATION
PROPOSED SITE PLAN

DRAWN	CHECKED	APPROVED
AB	JA	GB
DATE: AUG 24	DATE: AUG 24	DATE: AUG 24
SCALE (A1): 1:200	STAGE: CONSENTS	REV: P01

DRAWING No.
2239-WS-XX-XX-D-C-0054

Appendix B – Proposed Vibrocore Locations

181800E

181850E

181900E

638700N

638650N

638600N

N

MLWS

MLWS

PROPOSED PONTOONS

DREDGE AREA
(−2.0mCD)

VC1

VC2

VC3

LC

LB

B

L

MH

VIBROCORE LOCATION

PROBE No.	EASTINGS (m)	NORTHINGS (m)	WGS84 LATITUDE	WGS84 LONGITUDE	SAMPLE LENGTH (m)
VC1	181894.204	638654.129	55.59252° N	5.46298° W	0.50
VC2	181906.171	638653.532	55.59252° N	5.46279° W	0.30
VC3	181925.918	638657.006	55.59256° N	5.46248° W	1.00

GENERAL NOTES

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

   HAT +3.6mCD
   MHWS +3.1mCD
   MHWN +2.3mCD
   MLWN +1.1mCD
   MLWS +0.4mCD
   LAT −0.2mCD
4. CHART DATUM IS 1.62m BELOW ORDNANCE DATUM.

LEGEND

- B = BOLLARD
- L = LADDER
- LC = LIGHTING COLUMN
- LB = LIFE BUOY
- MH = MANHOLE
- = PRIVATE BOAT MOORINGS
- = PRIVATE BOAT MOORINGS (TO BE REMOVED)
- = PLANNING BOUNDARY
- = BATHY CONTOURS (CD)

REV	DATE	DETAILS	DRAWN	CHK'D	APP'D
P03	12.08.24	DREDGE REVISED	AB	JA	GB

AMENDMENTS

CLIENT

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DRAWING TITLE

PROPOSED VIBROCORE LOCATIONS

DRAWN	CHECKED	APPROVED
JR	GB	GB
DATE: FEB 24	DATE: FEB 24	DATE: FEB 24

SCALE (A1)	STAGE	REV
1:250	CONSENTS	P03

DRAWING No.

2239−WS−XX−XX−D−C−0051

Appendix C – Material Colour Sample

CORE LOCATION	SAMPLE NUMBER	FOLK & WARD DESCRIPTION	TEXTURAL GROUP CLASSIFICATION
VC01	0.0 - 0.5	Very Fine Sand	Muddy Sand

CORE LOCATION	SAMPLE NUMBER	FOLK & WARD DESCRIPTION	TEXTURAL GROUP CLASSIFICATION
VC02	0.0 - 0.3	Very Fine Sand	Gravelly Muddy Sand

CORE LOCATION	SAMPLE NUMBER	FOLK & WARD DESCRIPTION	TEXTURAL GROUP CLASSIFICATION
VC03	0.0 - 0.5	Fine Sand	Muddy Sand

CORE LOCATION	SAMPLE NUMBER	FOLK & WARD DESCRIPTION	TEXTURAL GROUP CLASSIFICATION
VC03	0.5 - 1.0	Medium Sand	Gravelly Muddy Sand

Appendix D – Assessment 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	£250,000 to £500,000	£125,000 to £250,000	£50,000 to £125,000	<£50,000
Material Suitability	Is the chemical makeup and PSD of material suitable for the option selected?	Not all of the material is acceptable.	Requires significant mitigation to be made suitable.	Acceptable with mitigation.	Acceptable material for option.	Ideal material for option.
Distance	Impact location has on logistics for material movements.	Beyond 50 miles.	40-50 miles.	30-40 miles.	1-30 miles.	Within 1 mile.
Technically Feasibility	Is the option within the capabilities of ARA 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 regulatory 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 E – Option Scoring

Attribute	Disposal at Landfill	Disposal at Sea
Alignment with Policy	1	2
Cost	3	4
Material Suitability	3	4
Distance	1	4
Technical Feasibility	3	5
Environmental Effects	3	4
Impacts on Harbour Operations	2	3
Legislative Complexity	3	4
TOTAL	**18**	**30**

Appendix F – Scoring Reasoning

Attribute	Disposal at Landfill	Disposal at Sea
Alignment with Policy	1- Disposal to landfill doesn't align with the Scottish Government's Zero Waste Policy, it would also take up valuable landfill space.	2- Disposal at sea is low on the waste hierarchy and as such does not align to policy.
Cost	3- Costs will be associated with storage, handling and drying of material, procurement/hire of equipment, transport of material to designated site and landfill tax.	4- Estimated as lower cost than other options; dredge vessel would complete the disposal operation so no further costs associated with the works.
Material Suitability	3- Material has been assessed as Acceptable with Mitigation - as dewatering will be required.	4- Material is acceptable for the option of sea disposal under the Pre-Disposal Guidance issued by Marine Directorate.
Distance	1- Nearest operational a landfill site is over 100 miles from Carradale Harbour	4- Several available disposal sites less than 30 miles from Carradale Harbour
Technical Feasibility	3- The drying of material is relatively simple; however, it will need to be appropriately managed in terms of throughput due to space restrictions.	5- Disposal at sea is an established and well-practiced methodology.
Environmental Effects	3- There is the potential for environmental consequences with the inclusion of material into the landfill, though it is uncertain if this would be above standard environmental concerns associated with landfills. Further impact due to greenhouse gas emissions resulting from the use of HGVs to transport material.	4- Disposal at sea at an existing disposal site will have minimal environmental effects, temporary effects on water quality may occur.
Impacts on Harbour Operations	2- Space requirements to process materials ready for landfill expected to interfere with other harbour activities.	3- Dredging works are required to provide adequate depth at the new pontoon berth. Harbour operations will need to be managed around the dredging works.
Legislative Complexity	3- Disposal to landfill is in line with current legislation, appropriate waste licences would be required from SEPA, however these should not be overly complex.	4- Disposal at sea would be permitted under the dredge and disposal marine licence.