Port of Cromarty Firth

Phase 4 Development

Best Practicable Environmental Option Assessment Report

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1. General

1.1. Introduction

The Phase 3 Development at Invergordon Service Base has continued to attract commercial interest leading to an opportunity to expand the quayside and land to the immediate west and create the Phase 4 Development. This would accommodate a greater number of vessels of varying size, but of increasing draught.

To meet these opportunities, the Cromarty Firth Port Authority trading as the Port of Cromarty Firth (PoCF) now plan to undertake dredging works for the proposed Phase 4 Development by undertaking shallow dredging works at the toe of the proposed revetment structures at the north and west sides of the proposed land reclamation areas. In addition, deeper dredging works are proposed at the Berth 6 quayside, which will provide a continuation from Berth 5 to create a continuous berth of 369m in length, and provide a deep water berthing facility for commercial vessels including large cruise ships.

The capital dredging works will include the lowering of the sea bed along the Berth 6 quayside to approximately -12m Chart Datum (CD). The design of the quay wall will permit future dredging to -13.8m CD should any future vessels require this draught capability.

The proposed capital dredging works will require the removal of approximately 10,000m^3 from the shallow proposed toe revetment areas, and 100,000m^3 from the proposed deeper berth structure. Of these amounts it is intended to reuse some 40-60,000m^3 of suitable materials within the land reclamation operations, and the balance of the dredged materials to be disposed at sea.

In line with the Marine (Scotland) Act 2010, a license must be sought for any dredging activities where disposal of material is proposed. This report is presented in support of an application for a dredging license.

This report identifies the potential land based and marine based disposal options for the dredged material and compared them in order to identify the best practical environmental option (BPEO).

An Environmental Impact Assessment Report (EIAR) and a Pre-Screening Habitats Regulations Assessment Report have been produced for the full Phase 4 Development including the dredging works, as such the wider environmental issues associated with the project shall not be considered here.

1.2. Report Aims and Objectives

The main aim of this report is to assess the available disposal options for the dredged materials to support the submission of the marine license applications.

The key objectives of this report are to:

- Provide an overview of the requirement for dredging;
- Identify the location and estimated quantity of materials that are required to be dredged and provide a brief description of the methods likely to be involved to complete the works;
- Identify and assess the potential options for the disposal of dredged materials; and

- Provide recommendations with regards to the BPEO for the disposal.

1.3. Information Reviewed

Information has been obtained though review of the recent Marine Ground Investigation works within the proposed areas of the Phase 4 Development at Invergordon Service Base.

1.4. Limitations

At present the PoCF are in the process of appointing a Principal Contractor, who in turn will appoint a Dredging Contractor(s) under sub-contract to carry out the dredging works required as part of the Phase 4 Development. Once appointed, the proposed methodologies will be presented to Marine Scotland. Therefore for the basis of the EIA, license applications and this BPEO the techniques and production rates used are based on previous projects, technical expertise and where necessary assumptions are stated.

2. Introduction

2.1. Background to Application

Invergordon Service Base is situated on the north shore of the Cromarty Firth approximately 24 miles north of Inverness. The existing base is owned and operated by the PoCF.

The Phase 4 Development is the latest development phase which is required for PoCF to continue to attract commercial interest and resultant projects. Offshore renewable clients require co-located berthing and laydown, while larger cruise ships are coming on line. Hence optioneering with regard to the design of the Phase 4 Development has identified that the best solution is to provide a continuation of the Phase 3, Berth 5 at a similar draught. This will accommodate the largest cruise ships, or two smaller deep draft vessels.

It is estimated dredging will remove approximately 110,000m^3 of material to lower the seabed to create the proposed revetment structures and create the required berthing area as shown on the dredging plan and sections, Atkins drawing numbers 5121683-ATK-PH4-ZZ-DR-C-0015 and 0016. Dredging works will be undertaken in two campaigns. The initial campaign which will likely use a backhoe excavator working on a barge will create the toe of the proposed northern and western revetment structures within Areas A and B to depths of 1m and 3m respectively for a limited period between November and December 2018. The second campaign will be completed during 2019 (avoiding May) using a trailing suction or cutter hopper dredger to create the berthing areas within Areas C, D and E to depths of 5m and 6m. These dates do not mean that dredging works would require to operate for this period of time and the exact dates would be subject to the dredging contractors programme of works, plans and weather conditions, coupled with any other works and restrictions imposed through the normal operations of Invergordon Service Base. At present a Principal Contractor has not been appointed for the dredging operations. It is estimated that maintenance dredging will thereafter be required once every three to four years as part of the routine maintenance dredging.

2.2. Description of Materials

An intrusive investigation of the Phase 4 Development site was completed from a jack-up barge and included 15 No. cable percussive / rotary boreholes to a maximum depth of 45m with in-situ testing and sampling, 20 No. cone penetration tests, benthic survey, topographical survey of positions, and thereafter laboratory testing for geotechnical and geo-chemical assessment. During the survey environmental samples were obtained from the top, middle and bottom of the strata and areas that were anticipated to require to be dredged. As this survey work was completed in advance of the detailed design being completed some of the samples were taken slightly deeper than the now proposed design dredge depth.

Data from the sediment samples from the Cromarty Firth as part of a recent Ground Investigation is presented within the Marine License Application for Dredging and Sea Disposal form and the Pre-Disposal Sampling Results Form. 30 No. samples were obtained from the boreholes in the upper strata during the marine ground investigation conducted by Fugro GeoServices Limited (Fugro) during January to February 2017. The testing was conducted by Scientific Analytical Laboratories Limited (SAL) on behalf of Fugro as part of the Ground Investigation. The particle size distribution indicates the sediment generally consists of silty gravelly sands.

The sediments were also analysed for a suite of chemical parameters and screened against Marine Scotland Revised Action Levels (AL) 1 and 2 in order to identify any contamination which may be present. One exceedance for lead above AL1 but below AL2 was encountered at a depth below the maximum depth of proposed dredging works.

For the purposes of the BPEO the material is considered not to be contaminated.

3. BPEO Method

3.1. Introduction

In order to identify the BPEO, the following method has been employed.

- Identification of options available;
- Assessment of these options based on the criteria detailed below; and
- Comparison of the advantages and disadvantages of the options.

3.2. Identification of Options Available

As several of the options share common logistical steps to disposal all options have been divided in to land based disposal or marine based reuse / disposal categories (See Section 4).

3.3. Screening

A screening process has been carried out to remove options which are technically unfeasible from the assessment process. Where options have been screened out a reason is provided (see Section 5).

3.4. Assessment of Options

The options have been assessed based on the criteria listed below.

3.4.1. Strategic Considerations

Strategic considerations are considered based on the following:

Established Practice

Consideration regarding the techniques and technologies proposed. Is this an established method for disposal of dredge material? If so, the performance of the option can be assessed, and any potential obstacles anticipated.

Operational Aspects

Consideration if the method is operationally and technically feasible for implementation at Invergordon Service Base. This includes information on handling, spatial considerations, transport etc.

Availability of Sites / Facilities

The facilities and / or sites are available for the reuse or disposal in the vicinity of Invergordon Service Base.

Legislative Implications

Determining if any licenses / permissions are required in accordance with the relevant legislation and potential management control required.

Extent of Control

Determining whether PoCF will have control over each stage of the operation from dredging to disposal as required by the Environmental Protection (Duty of Care) Regulations 1991.

Third Party Considerations

A summary of the outcome of any consultations will relevant authorities or agencies. Assessing the public opinion on the works based on relevant information available and previous consultations.

3.4.2. Environmental Considerations

The criteria used to assess the environmental performance of the options are detailed in the following:

- Safety Considerations – Identifying any potential sources of hazard and the probability of risk to the public, site users or workers.
- Public Health Implications – Identifying any risks to public health based on predicted contaminant pathways and receptors.
- Pollution / Contamination and Waste Implications – Assessing if there is potential for contamination / pollution exceedances above Marine Scotland Action Levels.
- Interference with Other Legitimate Activities – Other potential disruptions including but not limited to activities including interference with traffic and users of the site and associated access roads.

- Amenity / Aesthetic Implications – Determining if there is likely to be any adverse impact on amenities in the area. Assessing if there is likely to be a visual impact as a result of reuse / disposal of the dredged materials.

3.4.3. Cost Considerations

It should be noted that cost estimates are based on information obtained from previous projects and / or professional judgement and no consultation has been carried out to determine specific costs for this site detailed in this document. Costs include but are not limited to site costs, transport hire / purchase costs, equipment hire / purchase costs, labour costs, site operation costs, and environmental monitoring costs.

3.5. Comparison of Options

The performance of each option was assessed according to the criteria mentioned above. A summary of the full assessment of the land and marine based disposal options is provided in Section 6.

4. Identification of Available Options

4.1. Introduction

As several of the options share common logistical steps to disposal, all options have been divided into land based disposal or marine based disposal categories.

The options identified for land based disposal include:

- Beach nourishment / coastal reclamation;
- Spreading on agricultural land;
- Aggregate production; and
- Disposal to landfill.

The options identified for marine based reuse / disposal are:

- Land reclamation at Phase 4 and sites outside of the Port; and
- Sea disposal.

4.2. Land Based Reuse / Disposal Options

The dredge materials which are deemed suitable for use by compliance with the construction performance specification should be placed directly within the land reclamation element of the project. During the shallow revetment toe dredge campaign, the materials will be cast aside into the project area by the excavator, and during the deeper dredge campaign pumped into the works areas using the trailing suction or cutter hopper dredger

If the dredge material are unsuitable for reuse then the materials are to be reused or disposed of on land there are a number of stages involved in conveying the materials to the site / facility for disposal. These involve landing, storage, dewatering, loading, and transporting the material and are further detailed below.

Step 1: Landing the Dredged Material

The material must be transferred to an onshore facility. Methods available include using an excavator, pumped discharge or grab. It is assumed that the material would be landed using an excavator to a site near Invergordon Service Base.

Step 2: Dewatering of the Dredged Material

If the dredged material is to be disposed of on land, dewatering of materials (to approximately 10% water content depending on the water content requirements to transfer and place the final material) is necessary in order to transport the material and / or create a material which is suitable for land based disposal. The methods used for dewatering dredge materials include the construction of settling lagoons and / or the use of a mobile centrifuge or hydro cyclone systems. Due to space constraints it is assumed that centrifuge or hydro cyclone system would be utilised to dewater the material.

Step 3: Storage of Dredged Material

When the dredged material has been landed and dewatered it will require a storage facility prior to transport for final disposal. Assuming a weight of 2 tonnes per $1m^3$ of dredge spoil, a space would be required to store approximately 130,000 tonnes of material. Based on a 5m high storage mound, an area of approximately 160m x 160m ($26,000m^2$) would be required. Such a storage area would also require an extended area around it to maintain safe working in the area and avoid issues with any adjacent works, roads etc due to slippage of materials. Dust mitigation and management would also require consideration within the method statement for the storage of the dredged material.

Step 4: Loading

To transport the material to disposal sites or facilities, construction of a loading facility adjacent to the storage and dewatering area is necessary. Hard standing areas would be necessary to allow HGVs to receive material loaded by mechanical excavators.

Step 5: Transport

It would be necessary to use sealed HGVs for the transport of material due to the potential for spillage nuisance. Based on consultation with a national contractor on a previous project, it is estimated that one HGV can transport 18 No. tonnes of material at a rate of approximately £165 per hour. The time and cost of this transport is dependent on the location of the reuse / disposal site and is detailed further in Section 5.

4.2.1. Beach Nourishment

Beach nourishment involves the deposit of the dredged material on a beach. Considered as a land based reuse option, this process would involve all the steps detailed above as well as possible desalination. This option specifically requires material of a similar colour and composition to the receiving beach.

4.2.2. Spreading on Agricultural Land

Certain agricultural wastes qualify for an exemption from waste management licensing for treatment to land. Disposal of marine spoil to agricultural land is likely to involve the additional step of desalinisation. This would require space for lagoons and construction of a suitable treatment facility to allow leaching of salt back into the Cromarty Firth.

4.2.3. Disposal to Landfill

Dispose of dewatered material to landfill.

4.3. Marine Based Reuse / Disposal Options

4.3.1. Coastal Reclamation

Coastal reclamation considered as a marine based reuse option would involve pumping the dredged material directly onto the Phase 4 project area or another reclamation site out with the Port. The potential for coastal reclamation is considered further below.

4.3.2. Sea Disposal

Disposal of the dredged material to sea involves the transport of material to a licensed marine disposal site by vessel.

5. Screening

Options have been assessed with regards the technical feasibility for this given project to identify whether or not they should be taken forward for detailed assessment. Table 5-1 details the findings of the assessment.

Table 5-1 Option Screening

Option	**Is it Technically Feasible?**	**Comments**
Land Based	Questionable	All land based solutions will require space near the development site to allow them to be implemented. Potential space constraints will make all land based options difficult to implement.
Beach Nourishment	Questionable	The shorelines around the Cromarty Firth are subject to ecological designations: Cromarty Firth Site of Special Scientific Interest (SSSI), Special Protection Area (SPA) and Ramsar. They are designated for their Marine mudflats, sandflats and ornithological interests. Changes to these habitats would need to be understood in detail and would require a Habitats Regulation Assessment (HRA) to be completed. The HRA would need to consider the availability of alternatives as such it is unlikely that this option could be implemented locally. Transporting the material to another area brings other issues such as increased cost which make it unattractive.

Spreading on Land	No	The material sampled during the Ground Investigation demonstrated a low organic content making it unlikely to be suitable for spreading on agricultural land.
Disposal to Landfill	Yes	An appropriate landfill site would need to be identified. Option taken forward for detail assessment in Section 6.
Marine Based – Coastal Reclamation	Yes / No	Information on particle size distribution obtained during the Ground Investigation works indicated that the material is partly likely to meet the standard specifications for infilled material for coastal reclamation. Option taken forward for detailed assessment in Section 6.
Sea Disposal	Yes	There are seven disposal sites near the Cromarty Firth; at Sutors (mouth of the Cromarty Firth), Helmsdale, Whiteness Sands (Sites B and C), Inverness, Lossiemouth and Buckie. For this project PoCF would propose to use the Sutors Site due to the proximity of the Site to the dredging area which would ensure the shortest length of return trips required given the volume of material to be dredged. In addition, PoCF has jurisdiction over this sea disposal site which would allow compliance with BPEO methodology for the Moray Firth Special Area of Conservation from the dredging area to the destination. Option taken forward for assessment in Section 6.

6. Detailed Option Assessment

6.1. Introduction

In this section the potential land based reuse and disposal, and marine based disposal options are described and the constraints for each option are outlined. For both land and marine based disposal there are several stages from dredging to the ultimate destination of the material. These are described in Section 4 to avoid repetition. The potential disposal options are then assessed against criteria detailed in Section 3.3 and the advantages / disadvantages of each are discussed.

6.2. Land Based Reuse / Disposal

6.2.1. Land Based Reuse

This reuse is in relation to the materials sampled and tested during the marine Ground Investigation within the Phase 4 Development only and subject to the materials achieving the Engineering Works Specification in terms of particle size distribution and chemical content. From a practical perspective this route provides programme advantage as the materials are processed immediately with no delay

with the transport off site, and the works are all completed by experienced dredging contractors without any interference to the wider port operations and environment.

6.2.2. Disposal to Landfill: Strategic Considerations

Established Practice

Dredged material is sometimes disposed of at landfill. However, these are normally small volumes as larger amounts of material use valuable landfill space.

Operational Aspects

This option presents logistical difficulties with regard to landing, dewatering, storage and transport of the dredged material, however the material sampled during the Ground Investigations was generally deemed chemically suitable for disposal at landfill.

A mobile dewatering unit such as a centrifuge would be required to dewater sediment.

Availability of Sites / Facilities

There are four landfills within three hours travelling time of Invergordon Service Base. These are detailed in Table 6-1.

Table 6-1 Existing Landfill Sites Near Invergordon Service Base

Landfill Site	Distance by Road/Approximate Travelling Time	Operator	Local Authority Area	Notes
Garnish Landfill Site Cell 3, by Aviemore	50 miles / 1 hour	The Highland Council	Highland	Permitted to accept waste until May 2022, annual capacity on permit of 25,000t
Seater Landfill Site, Bower, by Wick	90 miles / 2 hours	The Highland Council	Highland	Permitted to accept waste until April 2038, annual capacity on permit 65,000t
Duisky Landfill Site, Kinlocheil, Fort William	100 miles / 2/5 hours	Locheil Logistics Ltd	Highland	Permitted to accept waste until December 2047, annual capacity on permit 24,000t
Nether Dallachy Landfill Site	72 miles / 2 hours	Moray Council	Moray	Permitted to accept waste until December 2020, annual capacity on permit 120,000t

The landfill site operator is responsible for accepting waste. The Ground Investigation indicated the material consists mainly of sands and silts which is potentially problematic as it could interfere with drainage and leaching from the landfill site.

Ideally the total volume of material would be sent to one landfill site, however due to the total volume anticipated this would be more than the annual capacity of the landfill and / or take up the entire annual capacity. Thus, it would require to be split across several sites, which is not ideal as this would require additional time and vehicles therefore increasing costs. Based on an estimated total weight of approximately 130,000 tonnes of material, all landfill sites would be utilised, and it is unlikely that this is a practicable option.

Legislative Implications

The material would be classified as controlled waste for the purposes of transport, storage, and disposal. The Waste Management Regulations 1994 (Reference 2) require a waste management license for disposal. Section 34(7) of the Environmental Protection Act 1990 (Reference 3) and Section 1 of the Control of Pollution Act 1974 (Reference 4) will apply and it is likely compliance is possible.

Extent of Control

PoCF would not have direct control over the transport of the material, however they would carry out audits to demonstrate 'Duty of Care'. Additionally, it would be necessary to agree a final contract with the landfill site operator for the disposal of the waste.

Third Party Considerations

The National Waste Strategy for Scotland 1999 (Reference 5) prefers a reduction in the quantity of waste sent to landfill and therefore there may be objections from the Scottish Environment Protection Agency (SEPA) as waste regulators regarding the loss of landfill capacity to dredge material.

6.2.3. Disposal to Landfill: Environmental Considerations

Safety Considerations

Road safety risks associated with the transport of dredged materials have the potential to increase particularly if HGV's are travelling through settlements.

Public Health Implications

If HGV's are used to transport the materials through settlements there may be a limited, short term decrease in air quality due to exhaust fumes. There may also be increases in noise and vibration levels associated with the HGV's.

Pollution / Contamination and Waste Implications

Negligible levels of contaminants were present in the material sampled during the Ground Investigation and material was generally deemed to be suitable for disposal at a non-hazardous waste landfill from a contamination perspective.

The disposal of large quantities of sand and silts may however affect the hydrodynamics of the landfill site with knock on implications for leachate management during landfill operations and post closure.

Interference With Other Legitimate Activities

If this option was accepted it would result in a reduced space availability at the Invergordon Service Base which could impact existing and future contracts due to reduced space, and loss of revenue.

Amenity / Aesthetic Implications

There is potential for a visual impact during the material treatment operations, and a limited impact on amenities through the noise, and vibration of the HGV transport to the landfill.

6.2.4. Disposal to Landfill: Cost Considerations

Capital is required to purchase equipment for dewatering of the dredged material and construction of new areas of hard standing for storage and loading. However, it should be noted that due to the pre-existing spatial constraints it is considered unlikely that space will be available for the construction of such areas. Operational costs are associated with the final stage of transport of the materials to landfill. In addition, gate fees may also be imposed by the landfill operator. A dockside centrifuge facility capable of dewatering and desalinising 65,000m^3 of material would also be required.

If the various landfills are to be used, then it is assumed that two return trips per day could be made by one HGV based on an eight-hour working day. An estimated cost for hire of an excavator is £30 per hour and an estimated rate for haulage is £165 per 18 No. tonnes of material. Therefore using 24 No. HGVs, and 3 No. excavators to load produces an estimate of £702,000 total cost for haulage and loading of material.

The estimated costs for this option are summarised in Table 6-2.

Table 6-2 Disposal to Landfill Costs

Stage	Requirement	Cost Estimate
Landing of Material	Vessel hire, and equipment to pump material ashore.	£250,000
Construction of New Areas of Hardstanding	Labourers, materials, and equipment for construction of new areas.	£120,000
Dewatering of Material	Dockside centrifuge facility capable of dewatering and desalinising 65,000m3 of materials.	£100,000
Loading and Transport of Material	Hire of 24 No. sealed HGVs, and 3 No. excavators and staff for 150 days.	£702,000
Disposal at Landfill	Landfill tax at £2.50 per tonne of material. Likely additional gate fees	£325,000 (tax) £1,300,000 (gate fees)

	estimated at approximately £10 per tonne of material.	
Estimated Total		**Approx. £3M**

6.3. Marine Based Disposal Options

6.3.1. Sea Disposal: Strategic Considerations

Established Practice

Disposal of dredge arisings to sea is an established practice. Dredged material from the maintenance dredges of various areas around the Invergordon Service Base have been disposed of at sea for over 10 years as presented in Table 6-3.

Table 6-3 Previous Dredge Campaigns

Year	Area	Tonnes	CuM	Type
1992	QD & Approaches		38,500	TSHD
1997	QD & Approaches		44,230	Grab
2001	QD & Approaches		25,000	Grab
2007		19,140		Grab
2009		30,800		Grab
2011	QD & Approaches	96,739	32,407	TSHD
2014	Phase 3		26,586	Grab/Plough
2014	QD & Approaches		45,414	Grab
2016	QD & Approaches		36,205	TSHD
2017	Phase 3		6,800	Grab/Plough

Operational Aspects

There are no operational restrictions anticipated from disposal of the dredge arisings at a marine disposal ground.

Availability of Sites/Facilities

There are 66 No. open sea disposal sites in Scotland, seven of which are in the vicinity of the Cromarty Firth as detailed in Section 5. The Sutors site is under direct control of the PoCF.

Legislative Implications

Under the provisions of Marine Scotland, a dredging license is required. This requires the acceptance of the BPEO by the statutory consultees.

Extent of Control

PoCF have jurisdiction over the Sutors disposal site.

Third Party Considerations

The Sutors is a licensed disposal ground and the material contains low levels of contaminants, there are unlikely to be any regulatory objections assuming sea disposal was accepted as the BPEO.

6.3.2. Sea Disposal: Environmental Considerations

Safety Considerations

The operations are to take place at sea therefore the risk to public safety is low.

Public Health Implications

The operations are to take place at sea therefore the risk to public health is low.

Interference With Other Legitimate Activities

The dredging and disposal activities are due to be undertaken in two distinct campaigns. The initial campaign will be a minor volume with works completed at the end of 2018, whilst the second campaign will be longer but undertaken during 2019. Therefore, any disturbances are likely to be temporary and short lived. There may be delays to other users of the Cromarty Firth however these are not anticipated to be significant.

Amenity / Aesthetic Implications

There are unlikely to be any adverse visual impacts because of the dredging operation due to the remoteness of the Sutors disposal ground. The vessel will be visible from shore, however currently many vessels enter and exit the Cromarty Firth daily therefore one additional vessel is unlikely to have significant adverse visual impact.

6.3.3. Sea Disposal: Cost Considerations

Capital costs will be incurred during the process of transporting the material to the Sutors disposal site. These include the hire of the vessel, fuel expenses, and the hire of staff. However, these are expected to be less in comparison with other options discussed. Costs associated with this project are estimated in Table 6-4.

Table 6-4 Costs for Dredging Including Sea Disposal

Stage	Requirements	Cost Estimate

Mobilisation, demobilisation of equipment, surveys		£300,000
Transport of material from source to disposal site for Areas A and B, and or if suitable materials transportation into land reclamation area.	Vessel hire, labour costs	£100,000
Transport of material from source to disposal site for Areas C, D and E, and or if suitable materials transported into land reclamation area.	Vessel hire, labour costs	£600,000
Estimated Total		**Approx £1M**

7. Comparison of Options

7.1. Reuse

The intention of the dredging campaigns will be to reuse as much as possible of the suitable materials within the Phase 4 Development as possible, and avoid the other options of disposal to landfill, and sea. This option provides the best environmental, cost and programme certainty and avoids the need to dispose but also to import the fill materials.

7.2. Disposal of Landfill

Disposal to landfill poses several problems mainly related to the logistics of the option and the cost. Although this is an established practice, the National Waste Strategy for Scotland (1999) favours a reduction in the amount of waste disposed of to landfill therefore there is potential for objections from waste regulators. In addition, the nature of the material may not be acceptable to the site operator due to the potential for interference with drainage and leaching. Space would have to be made available for this material to be landed, stored and loaded which would also involve the creation of new areas of hard stand within the port. Capital is required for new equipment for dewatering the material and the cost of this is uneconomical in view of the small amount of materials to be dredged. In addition, hire of sealed heavy goods vehicles will incur additional costs for the transport of materials which may interfere with other legitimate users due to road congestion. There are minor public health and safety concerns and low risks anticipated in relation to pollution / contamination and ecology. In addition, the cost of this option is substantial in comparison with the other marine based reuse / disposal options.

7.3. Disposal to Sea

Disposal to sea demonstrates the fewest logistical and cost restrictions of all the disposal options considered. The Port of Cromarty Firth are likely to have control over all aspects of the operation at the Sutors site. The operation is to take place at sea so is unlikely to pose a significant risk to public health and safety. The material for disposal does not contain significant levels of contamination so

is likely to be considered fit for disposal at sea. There are ecological risks with this option, however with the appropriate control in place (use of a bottom-dumping dredger or equivalent alternative and an agreed code of practice) these are likely to be low. There may be temporary interferences with other users of the Cromarty Firth but these are not considered to be significant considering the lifespan of the project. Costs are expected to be low as the material would be dumped from a vessel to the site therefore requiring no additional equipment.

8. Conclusions

In accordance with the waste hierarchy reuse of materials as part of the Phase 4 Development is the Best Practicable Environmental Option. However, not all the material is expected to be suitable for reuse and as such disposal options need to be considered in conjunction with the reuse option.

After assessment of all options discussed above, it is considered that the Best Practicable Environmental Option for disposal is sea disposal to the Sutors site. Land based disposal options impose many additional special, time and cost constraints in comparison with sea-based disposal options and are therefore not considered a viable option for the disposal of the material especially given the restrictions of the Invergordon Service Base.

Disposal of the material to the Sutors site is recommended as it will allow the Port of Cromarty Firth to maintain control over all aspects of the operation and it is unlikely to pose significant risks to public health and safety. Cost estimates are expected to be significantly lower for this method of disposal and no additional space will be required at the existing port. Risks to the local ecology and specifically dolphins are expected to be able to be minimised by employing appropriate mitigation. A Spoil Disposal Marine Mammal Protocol has been drafted and is included in the Construction Environmental Management Document supporting the Phase 4 Development Marine Licence application. This incorporates the use of both marine mammal observers and passive acoustic monitoring to allow disposal at sea during times of poor visibility and hours of darkness. Disposals will be avoided during the month of May to prevent impacts on Diadromous Fish.

9. References

1. Marine (Scotland) Act, 2010. Available at: http://www.legislation.gov.uk/asp/2010/5/pdfs/asp_20100005_en.pdf. Accessed on 30.04.18.

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