



MARINE (SCOTLAND) ACT 2010

DISPOSAL OF MAINTENANCE DREDGINGS FROM ARBROATH HARBOUR

BEST PRACTICABLE ENVIRONMENTAL OPTION (BPEO) ASSESSMENT

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CONTENTS

1 INTRODUCTION

- 1.1 Background
- 1.2 Source of Materials
- 1.3 Description (nature and volume) of Materials
- 1.4 Options for Relocation/Removal of Materials
- 1.5 Programme of Work

2 DISCUSSION OF AVAILABLE DISPOSAL OPTIONS

- 2.1 Land Disposal
- 2.2 Land Incineration and Disposal
- 2.3 Sacrificial Landfill
- 2.4 Spreading on Agricultural Land
- 2.5 Reclamation
- 2.6 Foreshore Replenishment (Beach Nourishment)
- 2.7 Other Beneficial Uses
- 2.8 Sea Disposal

3 CHEMICAL ANALYSIS

4 FURTHER CONSIDERATION OF REMAINING DISPOSAL OPTIONS

- 4.1 Land Disposal
- 4.2 Landfill
- 4.3 Reclamation
- 4.4 Sea Disposal

5 COST COMPARISONS OF REMAINING DISPOSAL OPTIONS

6 CONCLUSIONS

- 6.1 Land disposal
- 6.2 Reclamation
- 6.3 Disposal at sea
- 6.4 Identification of BPEO

1 INTRODUCTION

1.1 Background

Arbroath harbour is located at the mouth of the Brothock Burn, Angus at 56° 33'N 2° 35'W, 16 miles north-east of Dundee and 51 miles south-east of Aberdeen.

The harbour use is presently home to a fleet of 30 commercial fishing boats, occasional visits by cargo vessels and several fare paying passenger boats offering day trips to anglers and sightseers.

Finger pontoons exist in the inner harbour of which 53 of the 59 berths are taken up by annual berthing by leisure craft. There are also approximately 200 visiting yachts to the harbour from both overseas and other UK ports between the months of April and September.

There is a patent slipway extending from the boatyard into the outer harbour which has two cradles and a slipway which can pull boats from the water for repairs up to 120 tonnes and 28m LOA.

A RNLI lifeboat is also stationed at Arbroath Harbour where the all weather boat is launched down a designated slipway from the RNLI shed into the navigational channel.

Although the harbour is tidal, with a mean spring range of around 4.5m and a neap range of about 2.2m, harbour gates at the entrance to the Inner Basin open and close at half tide, thus maintaining between 2m and 2.5m depth of water in the inner harbour at all times.

In order to maintain operational depths in the various areas of the harbour maintenance dredging requires to be carried out every 1 to 2 years. Dredging is now required in Arbroath Harbour and is programmed to be carried out in April 2021. Accompanying this report is a plan showing the extents of the areas to be dredged.

This report assesses the options available for such disposal and examines the Best Practical Environmental Option (BPEO) in accordance with the requirements of the Marine Scotland Act 2010.

1.2 Source of Materials

The programme of work involves the removal of approximately 12,000m³ of dredged material on an annual basis from Arbroath Harbour.

Materials to be removed from the inner and outer harbour areas and navigation channel comprise of silt/clay and sand. The loose materials have accumulated due to continual ongoing sediment deposition.

Apart from the discharge from the Brothock Burn and local surface water drains, it is believed that there is no other source discharge in the area which could potentially contaminate the sediments.

1.3 Description (nature and volume) of Materials

Three areas of the harbour are proposed to be dredged. The Inner Harbour (Area A), the outer harbour (Area B) and the navigational channel (Area C). The composition of the spoil to be removed from these areas is estimated at:

Silt	10,920 m ³	(91%)
Sand	1,080 m ³	(9%)

1.4 Options for Relocation/Removal of Materials

In order to maintain depths within Arbroath Harbour which acceptable to the daily operation of the harbour it is believed that Angus Council will continue to have a requirement for dredging and, therefore, for disposal of the material removed. It would appear that there are several options for disposal to consider:-

- a) Land incineration and disposal
- b) Landfill disposal
- c) Spreading on agricultural land
- d) Reclamation sites
- e) Foreshore replenishment
- f) Other beneficial uses
- g) Sea disposal

1.5 Programme of Work

The 2021 programme of work involves the removal of approximately 12,000m³ annually of sediments from the inner and outer harbours and navigation channel.

It is proposed that the dredging operation is to be carried out in April 2021. This work would then be carried out on an annual basis in 2022 and 2023 under the single 3-year licence.

In previous years the method of dredging has been by use of a grab or back hoe and the dredged material disposed at the prescribed spoil ground Arbroath FO020 located at 56deg 32.00'N, 002deg 32.50'W in the North Sea

The amount dredged (m³) by this process from Arbroath Harbour in the past five calendar years is as detailed below:

2015	2016	2017	2018	2019
8,230	12,050	12,000	6,118	2,890

2 DISCUSSION OF AVAILABLE DISPOSAL OPTIONS

Two main types of disposal are available for dredged materials, one being land based and the other being disposal at sea. All land based disposal options involve a number of steps which are the same. As a result, these will be described first to avoid repetition in further paragraphs.

2.1 Land Disposal

In order to transport the dredged material to land based disposal, the material must be brought ashore from the dredger. This could potentially be done by a grab emptying the hopper, though damage could be done to the hopper this way. The second option would be to dump the material close to the quayside and re-dredge it. This would also pose potential problems including navigational hazards and manoeuvrability issues for other vessels.

As dredging can only take place at specific states of the tide, these would coincide with the times the dredger can enter the inner harbour to offload the dredged material. This would lead to a doubling of the period of time required to complete the dredging leading to a considerable cost increase.

The material would then have to be transported to its final disposal site, however owing to the fact that the spoil will have a high water content, there would be safety implications in road transport of the spoil straight off the dredger. As a result, it would first be necessary to de-water the spoil prior to transportation by HGV.

Construction of de-watering pools or lagoons together with associated drainage requirements is not possible since the land, which would have to be acquired, is not available at Arbroath Harbour. In addition if land was available, the costs would be prohibitive.

Access to the quayside for HGV's is restricted at Arbroath due to the physical layout of the harbour and approach roads. Unloading the spoil from the vessel to HGV's would be hampered by tidal conditions and the movement of other vessels.

These steps pose a number of issues which would have to be dealt with prior to disposal; however these problems will be considered further in this assessment.

2.2 Land Incineration and Disposal

The dredged material is non combustible and cannot be made so. This method of disposal is not considered to be possible and may therefore be discounted.

2.3 Sacrificial Landfill

Within the Angus Council area there is only one landfill site licensed to accept material of this kind. The Forfar site is some 20 miles from Arbroath and in addition to the costs of dredging the material bringing it ashore and dewatering it, further costs would be incurred through transporting the material from the harbour to the disposal site. It is estimated that the charge is likely to be in the region of £12.00 per tonne. Although dredge spoil is not subject to landfill tax, there may be fees payable to the landfill operator.

The public are unlikely to find this disposal option acceptable when landfill space is in such high demand for domestic and municipal waste, especially considering there are alternative disposal options for dredged material. Similarly, local landfill operators are also likely to find this option unacceptable seeing as inert material such as dredge spoil shortens the life of their sites and reduces capacity for industrial and domestic controlled wastes.

Although not ideal, this option remains a possibility and so will be given further consideration.

2.4 Spreading on Agricultural Land

Much of the agricultural land in the Arbroath area is of prime quality and past informal discussions with Marine Scotland – Marine & Fisheries has shown that the disposal of the dredged material would not be acceptable due to the high salt content. The high salt content would mean that the land would be out of agricultural production until the salt had leached out of the soil. However, this process, after previous informal discussions with the Scottish Environment Protection Agency (SEPA), would prove to be unacceptable as it would lead to high levels of salt in water courses, and the resultant effect on the ecology of the area. As a result, this option is not considered feasible and will be discounted from further consideration.

2.5 Reclamation

Use of the dredged spoil in construction or reclamation work is strategically attractive as it reduces the use of existing disposal facilities, either marine or terrestrial, and provides a raw material which would otherwise have to be quarried or obtained from other natural sources.

Potentially the dredged spoil could require pre-treatment, ie. washing or crushing, prior to incorporation into a project. As a result, the handling arrangements would become more complicated involving the use of mobile plant or transport to a treatment site, subsequent transport of treated material and disposal of waste. The degree of pre-treatment of the spoil would depend on the amount of contamination with fine sediments and the required size of the material for the project in question.

It is unlikely that commitment from a prospective developer would be obtained to use the material without specific details on type, quantity and particle size of material. Without such commitment there is no security for this disposal route. In addition, it should be noted that many of the developments being considered are speculative at the current time and no potential projects to accept the dredged material have so far been identified.

Assuming that a project could be found to accept the spoils and it was not controversial, it is unlikely that the use of such spoil for construction or land reclamation would be viewed as acceptable by local people. Although the formal legal/planning process would address the local acceptability of projects, strong local objection could be expected from residents due to the transportation of the spoil material through population centres.

Dredged spoil would be considered a waste material for the purposes of transport, storage and treatment and would therefore be subject to the Environmental Protection Act 1990 and the Control of Pollution (Amendment) Act 1989. In addition, if the material was to be used as part of any coastal works, such as a sea defence or breakwater, the work would require a licence from Marine Scotland. All works will be subject to the relevant health and safety provisions under merchant shipping legislation and the Health and Safety at Work Act 1974.

Consultations have been undertaken regarding construction and reclamation with the Roads & Transportation Division of Angus Council who has confirmed there are no areas being developed within Arbroath now which require dredged materials for land reclamation purposes. This disposal option would remain a possibility in the future and will be given consideration then.

2.6 Foreshore Replenishment (Beach Nourishment)

The north side of the harbour is bounded by a high rocky promontory (Whiting Ness) extending nearly to Montrose and affording no possibility of pumping dredged materials ashore.

On the south side tidal rocks extend one mile thereafter a sand beach continues to the Tay estuary. No replenishment programme is currently anticipated within this area and enquiries made by the harbour authority have failed to identify any area within the vicinity requiring replenishment of this nature. It is also considered that harbour silt would be environmentally unacceptable as beach replenishment material and so this option is discounted from further consideration.

2.7 Other Beneficial Uses

Whilst some marine dredged materials can have significant uses in the manufacture of cement and to the building industry in general, it is not usually acceptable in an "as is" condition as so separation would be required. The sand would need to be washed of all mud, weeds, etc and this would involve specialist machinery which does not exist in a form capable of handling harbour spoil at Arbroath. If separation could be undertaken, it is doubtful if the 10% sand component of the dredged material could be separated economically, and so this disposal option is discounted from further consideration.

2.8 Sea Disposal

The deposition of dredged material would involve transport from the dredge area to a designated sea disposal site Arbroath FO020 (see attached plan AHD/2020/01) and it would be released by the dredger either via bottom dumping or by emptying the dredger hopper with the grab or back hoe excavator.

The disposal site is open water and is subject to considerable tidal flow and therefore will not pose any major environmental or fishing hazard. The site has been previously approved by Marine Scotland as a suitable disposal site and has been used for this purpose since the commencement of dredging operations last century without any known detrimental effect. In addition, the quantity of dredge spoil is small when compared with the outflow of sand and mud from the Tay estuary.

A licence application has been made to the Marine Scotland Licensing Operations Team. Were a licence to be granted, all works would be conducted in accordance with the relevant marine, health and safety legislation.

The following bodies have been advised or consulted:

- Marine Scotland (through licence application)
- RNLi
- Angus Council Harbour Joint Consultative Committee

No objections have been received from fishermen and other vessel operators to the proposed dumping site.

Disposal of dredged material at sea has historically been the preferred method at Arbroath and there is no evidence, as far as Angus Council is aware, to suggest that such operations

are in any way detrimental to the receiving environment. In addition, sea disposal avoids the operational difficulties, which would be experienced if the dredged material had to be offloaded onshore. It would be the option that would be most acceptable to the public as it avoids the large number of vehicle movements that would be required to transport the material away from Arbroath Harbour.

The dredged material would have minimal ecological implications, given that a disposal site has been identified where disposal of dredged material will not have significant adverse effect on the environment. Sea disposal of the material would represent only the relocation of material already present in the marine environment.

As the material is inert and marine in origin, it is entirely compatible with being disposed of in the sea. Disposal at sea is a relocation operation rather than one which would introduce any additional material into the marine environment.

3 CHEMICAL ANALYSIS

In previous years, heavy metal analysis of the dredged material by the former Fisheries Research Services, in Aberdeen has demonstrated that the spoil is suitable for sea disposal. Since the last maintenance dredging operation in January 2019 a recent chemical and particle size analysis has been carried out by James Hutton Ltd. on samples from the inner & outer harbours as well as the navigation channel of the harbour. These are the three areas of the harbour in which the maintenance dredging operation will take place. The results of the analysis is included as part of the licence application.

The chemical analysis identified that the average total solids was 48.6% and the average content of the samples were made up of 91% silt and 9% sand. The average Total Organic Carbon was only 4.01%.

The average levels of Trace Metals and Organotins detected in the samples were all below Action Level 1. The average level of Total Hydrocarbons within the samples was 26,333 ug/kg which is very low.

Some of the results of the analysis where testing was carried out for Polyaromatic Hydrocarbons were above Action Level 1. It is unlikely however that the this would have any environmental impact at the location of the disposal site at sea.

It is proposed that when dredging is being carried out further samples will be taken and submitted to Marine Scotland for further analysis.

4 FURTHER CONSIDERATION OF REMAINING DISPOSAL OPTIONS

Although a number of disposal options have been considered, several have been discounted from further consideration due to the fact that they are not feasible. The options which have been discounted from further consideration are:

- Land incineration and disposal
- Spreading on agricultural land
- Foreshore replenishment
- Other beneficial uses

The remaining four options can be looked at further in order that the BPEO might be identified.

4.1 **Land Disposal**

Both remaining land based disposal options would have high costs associated with them due to extra handling and effort required to bring the material ashore (e.g. extended period of dredging due to tides, construction of dewatering lagoons, double handling, transportation etc.), previous estimates of costs have shown that land disposal is approximately four times the cost of disposal at sea.

Land based disposal options would also involve unavoidable transport of the de-watered dredge spoil through Arbroath and along public roads. As a result, there would be increased HGV movements through the town which could be a nuisance to residents due to the increase in exhaust emissions, noise, odour and potential spillages. Adverse public reaction could therefore be expected.

The high levels of metals contained within the dredged material may have an adverse effect on the environment. This may also incur additional costs.

The following organisations have been consulted on the disposal to land option resulting in a negative response:

- Angus Council - Roads & Transportation Division
- RNLI

4.2 **Landfill**

In addition to the costs described above, disposal to landfill may also involve payment of an additional fee to the site operator.

Public acceptability of this option is likely to be low, due not only to the reasons described above, but also because of the increasing demand for landfill space for domestic and municipal waste. The fact that there are alternative disposal options will also not increase the acceptance of this option with either the public or site owners.

4.3 **Reclamation**

This option, as discussed previously, is one of the more strategically attractive options as it allows the reuse of a raw material. However, the potential additional costs of double handling the spoil and pre-treatment could also make this disposal option impractical.

The problems described above which are associated with bringing the material ashore, drying it and then transporting it are unlikely to make this option appealing to the public. The chemical & particle size analysis results also highlight that the material would not be suitable for reclamation.

However, the over-ruling factor is that there are not currently any local projects into which the dredged material could be incorporated, therefore at this time reclamation is not a feasible disposal option.

4.4 Sea Disposal

Sea disposal of dredge spoil has no additional costs other than those levied by the dredging contractor, for chartering the vessel, and the fee for sea disposal licence and so the capital costs are much less than those for land disposal options.

Public acceptability of this option is likely to be high as there should be minimal disturbance to maritime activities while using the sea disposal site off Arbroath. The following have been consulted/advised about the sea disposal option.

- Marine Scotland (through licence application)
- Angus Council Harbour Joint Consultative Committee
- RNLI

During previous dredging campaigns where dredged material has been dumped at sea no objections have been received from fisherman and other vessel operators.

Although the recent chemical analysis has indicated high levels of some metals within the material the environmental impact of disposing the material at sea at the designated disposal site will be far less than the impact of transporting & disposing of the material by way of any of the other options discussed within this report. As all the dredged spoil will be silt and sand, there is unlikely to be any impact to the water quality during sea disposal.

5 COST COMPARISONS OF DISPOSAL OPTIONS

Land Disposal / Landfill

Activity	Volume cubic m	Unit Cost £	Cost £
Hopper Dredger	12,000	6.00	72,000
Transfer to HGV	12,000	3.50	42,000
Transport by HGV	12,000	5.00	60,000
Disposal to Landfill	12,000	25.00	300,000
		TOTAL COST	£474,000

Sea Disposal

Activity	Volume cubic m	Unit Cost £	Cost £
Mobilisation			7,500
Sea Disposal	12,000	7.50	90,000
Licence			2,500
		TOTAL COST	£100,000

6 CONCLUSIONS

Summary of Primary Objections to Each Option

6.1 Land disposal

This is the least preferred of the four options on each of strategic, environmental and cost considerations.

Strategically this option is not favoured due to the rapidly increasing pressures on available landfill space. It is the view of local authorities and landfill operators that, where possible, current facilities should be conserved for municipal wastes.

In environmental terms, the additional lorry movements are likely to give rise to increased noise, dust and exhaust emission levels and interference for other road users. In cost terms, this option is more than four times more expensive than the sea disposal option.

6.2 Reclamation

This option is simply not feasible at the current time due to a lack of projects which could accept this type of material. If suitable projects could be identified and further information was available relating to the nature of the dredge spoil, then the operational and strategic viability of this option could be assessed more fully.

6.3 Disposal to Sea

This is the preferred option on overall strategic terms due to the lack of double handling and the minimal disruption. Sea disposal is also superior to the other two options on environmental terms as there is no evidence to suggest any adverse affects of the environment resulting from previous sea disposal operations. In cost terms it is also the preferred option.

6.4 Identification of BPEO

In conclusion, it has been demonstrated that sea disposal by the controlled excavation of the material and disposal at the appropriate site Arbroath FO020, given the suitability of the dredged materials, avoidance of environmental nuisance, minimal interference with other local activities and reasonable economic costs is the Best Practicable Environmental Option under the Marine Scotland Act 2010.