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Engineering and Environmental Consultants

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Ref: **MOS/16341**

21<sup>st</sup> July 2016

Office of Climate, Licensing & Resource Use

EPA Headquarters PO Box 3000

Johnstown Castle Estate

Co. Wexford

**Re: Waste Licence Application W0290-01 Article 16(1) Response**

Dear Sir/Madam,

Please find enclosed response to the Article 16(1) request dated 8<sup>th</sup> July 2016.

The response comprises;

- 1 original and 2 copies of the updated Non Technical Summary, Viridus Covering letter and ESI Letter detailing proposed leachate limits as requested.
- 2 copies of these files on CD

If you have any queries please contact the undersigned.

Yours sincerely

Michael O'Shea

For Malachy Walsh and Partners



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**For the Attention of:**

**Mr. Mike O'Shea, Project Engineer,**  
Malachy Walsh and Partners, Consulting Engineers,  
Park House, Bessboro Road, Mahon Technology Park,  
Blackrock, Cork.

**Date: - 20.07.16**

**Subject: - Bantry Inner Harbour Dredging & Redevelopment – EPA Request for Information.**

Dear Mike,

As requested, in response to the EPA Request for Information (RFI) notice in accordance with Article 16(1) of the Waste Management (Licensing) Regulations, to the Port of Cork Company dated 8<sup>th</sup> of July 2016, asking them to:

*“Based on, and with reference to, the details presented in the Environmental Quantitative Risk Assessment (EQRA) please provide proposed leachate limits for the treated sediment and demonstrate that the proposed limits are protective of the relevant surface water environmental quality standards.”*

Viridus Consulting Ltd., (VCL), have contacted ESI Ltd., (the UK based company who did the modelling for the original Bantry Inner Harbour Dredging Detailed EQRA), and asked them to provide the required proposed leachate limits which can be derived from the model that they completed for the original report.

The letter response from ESI with the requested leachate limits is presented as Appendix A below.

In addition to providing the proposed limits VCL contacted the EPA on Thursday July 14<sup>th</sup> to clarify the proposed sampling and laboratory testing regime that would provide the required leachate limit data.

It is proposed that the laboratory testing would be completed using the Monolithic Tank Test in accordance with NEN 7375:2004 where treated dredge samples are re-tested typically after 1, 2, 4, 9, 16 and 28 days.

The Monolithic Tank Test is considered to be representative of leaching occurring through diffusion and was the test used as part of the original Detailed EQRA where a dredge sample was tested for 1, 2, 4 and 9 days for a range of cement contents.

It is proposed that for the main works representative samples of the treated dredge mix would be acquired by the contractors site engineer every 1,000m<sup>3</sup> and sent to an independent laboratory for Monolithic Tank Testing for leachate concentrations. The treated dredge sample would be tested for 1, 2, 4, 9 and 28 days.



Contact Details: - Mobile +353 87 650 3582 [darragh.musgrave@viridus.ie](mailto:darragh.musgrave@viridus.ie)

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Registered office :- Quintas Partners, Heron House, Blackpool Park, Blackpool, Cork, Ireland.



Since the proposed dredge material Stabilisation/Solidification (S/S) treatment process will occur as the cement cures its remediation effect is expected to improve over time. Typically cement curing is deemed to be completed after about 28 days. However it is not practical for the project contractor, (or good for the local environment), that the treated material would be left in-situ for 28 days before leachate levels are tested and if found to be elevated above the proposed leachate limits potentially re-excavated after that time. Conversely assessing leachate results from material curing after just one or two days treatment would not accurately reflect the potential S/S effects on the treated dredge material.

Therefore we are proposing that monoliths of treated dredge material would be Tank Tested for 1, 2, 4 and 9 days and that if leachate levels exceed the proposed limits consecutively for three results then the material would be deemed unsuitable for deposition and would be excavated for either re-treatment and/or off-site disposal to a suitably licensed facility. This would ensure that the material would be given some time to cure and would not have to be re-excavated if an initial exceedance occurred after day 1 or 2 and would still ensure that potentially contaminated material would be identified within a reasonable time period. The tracking of deposited material will be undertaken by the contractor, (as outlined in the Waste Licence Application . see the MWP Figure presented in Appendix B below), which will enable treated material to be re-excavated as and if necessary.

I trust that the clarification information presented above and in Appendices A and B is suitable for your needs at this stage. Please contact me directly if you need to discuss any aspect of this response further.

Yours truly,



Darragh Musgrave,  
Senior Environmental Scientist,  
Viridus Consulting Ltd.



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Bantry Inner Harbour - Phase 1 Development  
VCL Letter Response to EPA RFI – July 2016  
**Appendix A – ESI Leachate Limits Letter**

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Darragh Musgrave  
Viridus Consulting Ltd  
Inch House (East)  
Whitegate  
County Cork  
Ireland

11 July 2016

Our Ref: 64605DM001.docx

Dear Darragh

## Re: Leachate limits for the stabilised and solidified sediments: Bantry Harbour

Thank you for the request to derive appropriate leachate limits for the in-situ solidified/stabilised dredged sediments at Bantry Harbour.

The original assessment presented in VCL (2016) considers the impact of sorption on the leachable contaminant concentrations. The only pathways for potential contaminants from the treated sediment source(s) is through direct contact with sea water in the inner harbour and/or rainwater percolating from the surface percolating through the material and reaching the sea water of the inner harbour.

As discussed in VCL (2016), significant dilution is provided by tidal flow in Bantry Harbour and this can be used to calculate allowable leachable concentrations for the in-situ stabilised/solidified sediments based on published EQS values. A summary of the methodology used to calculate environmentally protective leachable limits is given below.

### Methodology used to calculate appropriate leachate limits

The dilution multiplier of 0.003 presented in VCL (2016) is derived from a tidal prism calculation which calculates the potential volume of the solidified sediments that will become saturated during the neap tide. This conservative calculation (which does not take into account the presence of the geotextile lined perimeter engineered revetment structure, which will be located between the treated sediment and the inner harbour), assumes that the water influx into the solidified sediments equals the rate of the rise in tide.

An additional degree of safety has been applied in this assessment by increasing the hydraulic conductivity of the solidified and stabilised sediments by a factor of 10, thus increasing the contaminant flux, giving a dilution multiplier of 0.03.

The data used to derive the leachate limits for contaminants that have a published EQS are presented in Table 1. The proposed limits are calculated by dividing the annual average EQS by the dilution multiplier of 0.03.

The average sediment WAC eluent concentrations for the *untreated sediments* (VCL (2016): Table 7) and the ratio of the proposed limits to these observed concentrations are also presented in Table 1. It should be noted that once the development is complete, the eluent concentrations for the *in-situ treated sediments* will be significantly lower than those

presented here due to the high degree of sorption resulting from the stabilisation/solidification process.

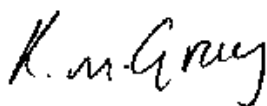
Mercury has the lowest ratio of the proposed limit to the sediment WAC, but since mercury has a high partition coefficient it sorbs strongly to the treated sediment, thus it is likely the eluent concentrations for the treated sediments will reduce significantly. It should also be noted that, as discussed in VCL (2016), the limit of detection associated with the mercury data is a factor of 10 higher the annual average EQS. As it is standard practice to replace non-detect measurements with concentrations at the limit of detection, professional judgement should be applied if the proposed limit for the leachable concentration of mercury is exceeded by the average of a dataset comprising a high proportion of non-detects.

**Table 1 Leachate limits for solidified stabilised sediments**

Determinand	AA EQS (mg/l)	MAC EQS (mg/l)	Proposed limits for leachable concentration of treated sediments (mg/l)	Average sediment WAC eluent (mg/l)	Ratio of proposed limit to sediment WAC
Arsenic	0.02	0.04	0.67	0.0091	74
Cadmium	0.0002	0.005	0.007	0.0001	52
Chromium	0.015	0.032	0.50	0.0254	20
Copper	0.005	0.01	0.17	0.0074	223
Lead	0.0072	0.02	0.24	0.0011	218
Mercury	0.00005	0.00007	0.0017	0.0007	2
Nickel	0.02	0.05	0.67	0.0027	246
Zinc	0.04	0.2	1.3	0.0131	102
Total Of 17 PAH's	0.005	0.005	0.17	Not available	-
Tributyl Tin	0.000002	0.000002	6.7E-05	Not available	-

I trust that this information is sufficient for your current requirements.

Yours sincerely



Kim Gray  
SENIOR CONSULTANT

2016 . Environmental Quantitative Risk Assessment For Bantry Inner Harbour Dredging Waste Licence Application

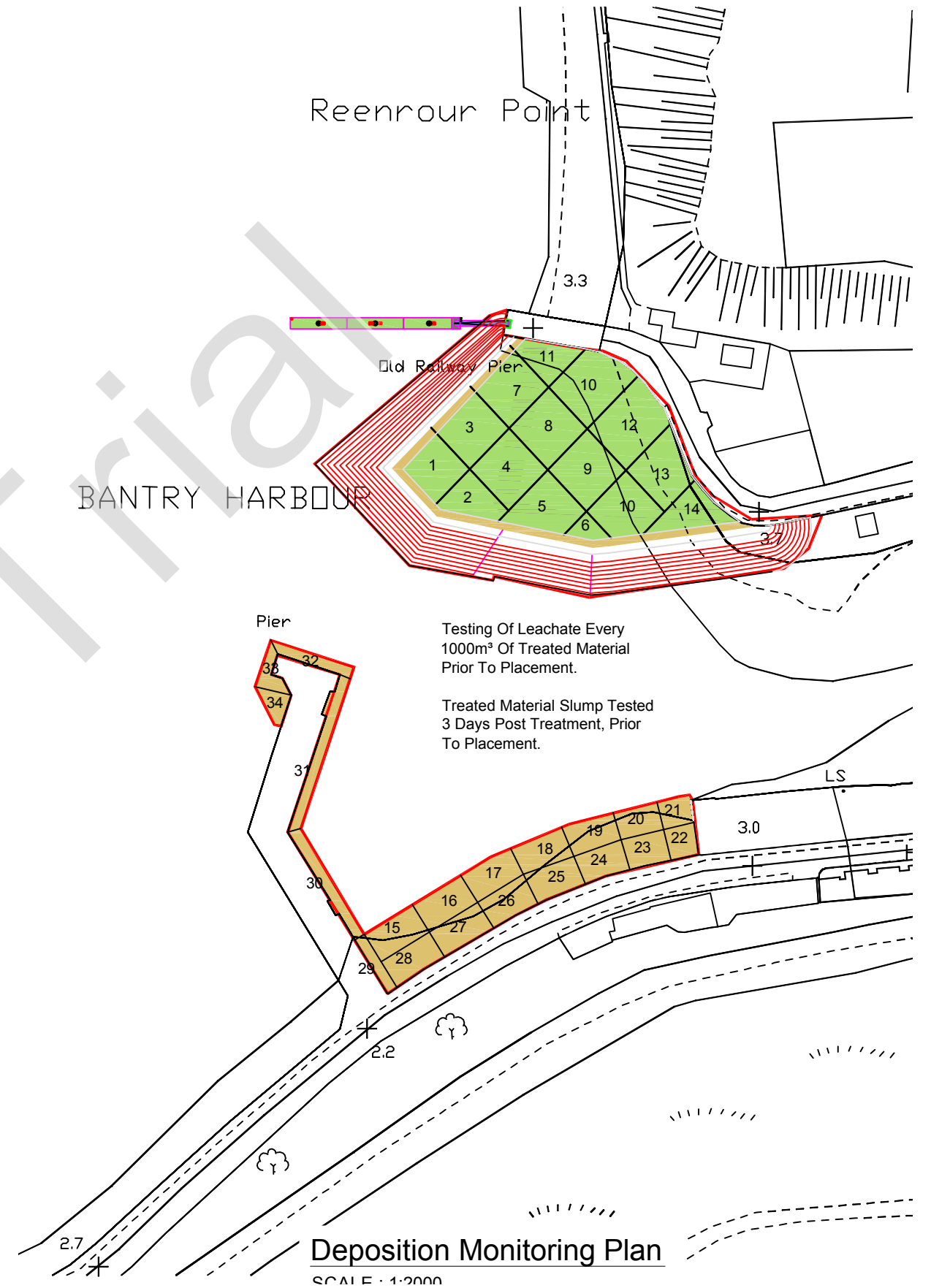
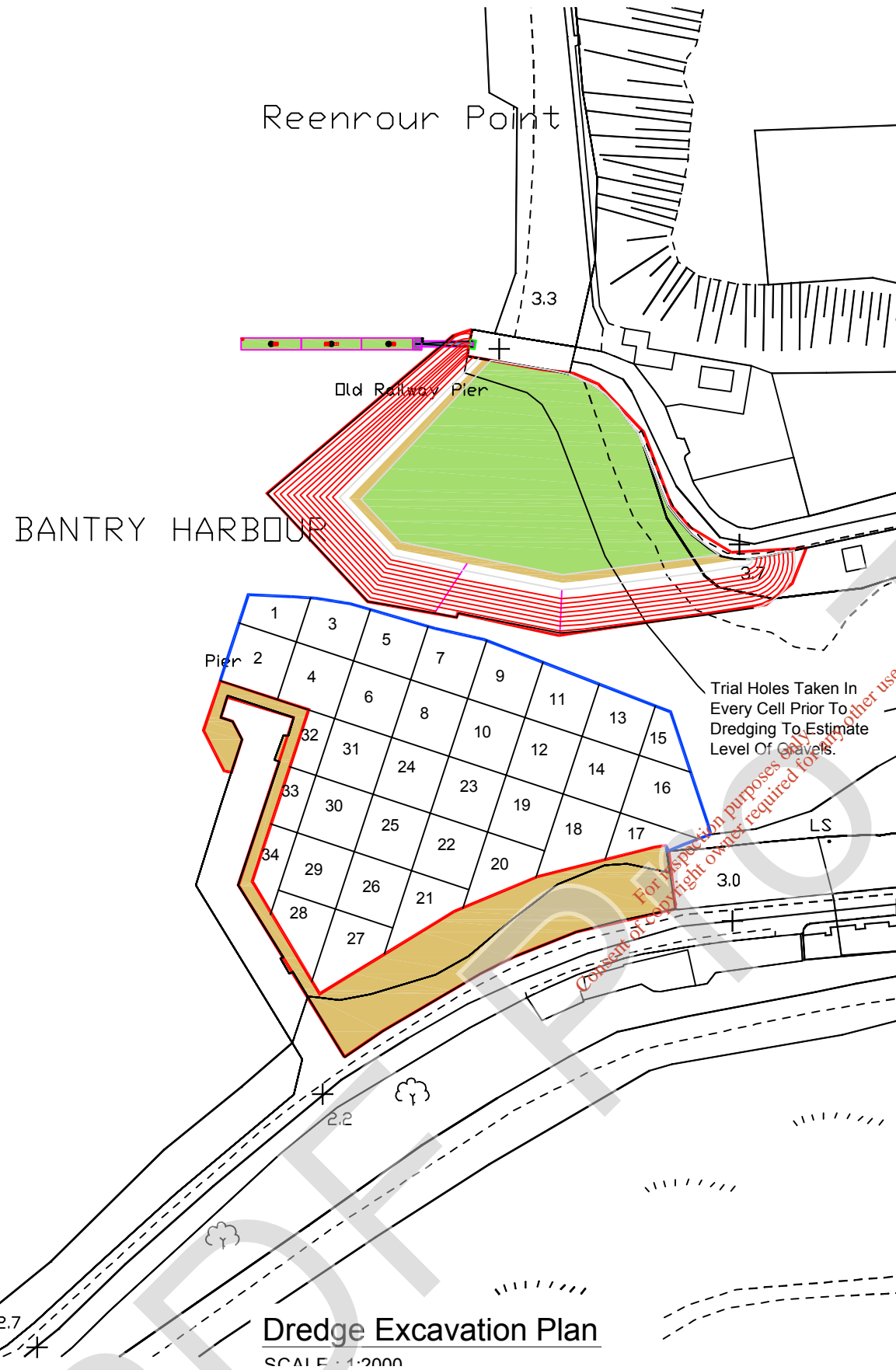
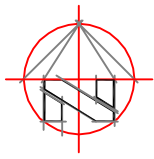


Bantry Inner Harbour - Phase 1 Development

VCL Letter Response to EPA RFI – July 2016

**Appendix B – MWP Dredge Management Figure**

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**Progress Print**

DATE \_\_\_\_\_

PURPOSE \_\_\_\_\_

Notes	
1.	All drawings are to be read in conjunction with all relevant Specifications, Bills of Quantities, Architectural, Services and Engineering drawings.
2.	Any discrepancies between these documents shall be brought to the attention of the Engineer.
3.	All dimensions are in millimetres unless noted otherwise.
4.	All levels are in metres related Ordnance Datum Mean Head.
5.	Drawings are not to be scaled.

Legend	
	Licence Boundary
	Dredge Footprint

Map Reproduced From Ordnance Survey Ireland  
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OSI Sheet No. 6654-B

Rev.	Date	Description	by	ch'd	app
A	01.03.16	ISSUED FOR WASTE LICENCE	BMP	MOS	PP

Client **PORT OF CORK**

Project	<b>BANTRY INNER HARBOUR DEVELOPMENT PHASE 1</b>
Title	<b>DREDGE EXCAVATION AND DEPOSITION MONITORING PLAN</b>

**Malachy Walsh and Partners**  
Engineering and Environmental Consultants  
Cork | Tralee | London | Limerick

Scale (A3)	<b>1:2000</b>	Drg. No.	<b>16341-7017</b>	Rev.	<b>A</b>
Drawn	<b>MOS</b>	Jan. 2016			
Checked	<b>DD</b>	Jan 2016			



## Attachment A

### Attachment A1 Non-Technical Summary

This Non-Technical Summary has been prepared in accordance with Article 12(1)(u) of the Waste Management (Licensing) Regulations S.I. 395 of 2004 (as amended). Sub-articles (a) to (t) of Article 12 are addressed below.

For clarity, the paragraph numbering is in accordance with the numbering of Article 12(1), (a) to (v).

Article 12(1)

#### a General Details

##### Applicant

The Port of Cork Company,  
Custom House Street, Cork  
Cork

Tel: 021-4273125

Fax: 021-4276484

##### Address for Correspondence

c/o Mr. Tim Murphy  
The Port of Cork Company  
Custom House Street

#### b Planning Authority

Cork County Council

#### c Sanitary Authority

Not Applicable

#### d Location

Name: Bantry Inner Harbour Phase 1 Works

Address: Seafield & Reenrou West

Bantry  
County Cork

Tel: 027-53277

Fax: 027-51202

e-mail: tmurphy@portofcork.ie

National Grid Reference	E 99040	N 48572
	E 99059	N 48466

#### e Nature of the Development

This Licence application relates to an installation for the recovery of dredge material at Bantry in Co. Cork as part of the Inner Bantry Harbour Development Phase 1 project.

The location of the proposed scheme is at Reenrou West and Seafield, Bantry Harbour, in Bantry Town, Co. Cork, Figure A.1. Bantry Town is located at the head of Bantry Bay which is one of the deepest natural harbours in Europe and the longest Bay in Ireland. The town itself has a good size harbour area known as the 'Inner Harbour' which makes up a substantial portion of the town's water front and is a significant backdrop and focal point for the town.

The Port of Cork (Bantry Bay Harbour Commissioners) commissioned the design of a scheme which will provide a sheltered harbour environment and marina with increased water depth

and improved pier facilities to promote fishing and tourism activities in the Bantry area. The scheme will also provide additional and improved recreational and amenity areas for the town. The scheme includes proposals for the beneficial re-use of dredged material.

Phase 1 Scope of Works will comprise:

- I. The refurbishment of the existing Town Pier; the construction of a length of Quayside; the construction of an Amenity Area and the installation of Marina and Breakwater type Pontoons,
- II. The protection of the proposed Amenity Area using a rock armour Perimeter Engineered Revetment Structure with aggregate core material and geotextile linings,
- III. Dredging of an area of the inner harbour to a depth of between -3m and -4m Chart Datum,
- IV. The reuse of dredge material as fill within the proposed pier structures and amenity area,
- V. The treatment of finer grained dredge material to solidify and stabilise it for use as an engineered backfill and also immobilise and retard any potential contaminants to enable it to be reused as fill material behind the proposed Town Pier, Quayside structures and within the proposed Amenity Area,



FIGURE A-1 SITE OVERVIEW & ENVIRONMENTAL SENSITIVITY OF PROPOSED SCHEME.

### **f Class of Activity**

A waste licence is being sought from the EPA for the recovery and treatment of dredged sediments, a portion of which is potentially contaminated non hazardous material. This comes under Class **R** of the fourth schedule of the waste management act 1996, as amended, the Recycling/reclamation of other inorganic materials, which includes soil cleaning resulting in recovery of the soil and recycling of inorganic construction materials. This is the Primary Activity.

Other Activities that may be undertaken are;

- **R11**, the use of waste obtained from any of the operations numbered R 1 to R 10 whereby the treated dredge material is used as engineering material within the structures and
- **R1** Storage of waste pending any of the operations numbered R 1 to R 12 (excluding temporary storage (being preliminary storage according to the definition of collection' in section 5(1)), pending collection, on the site where the waste is produced) whereby dredge material is stored in treatment cells or placed in transport barge prior to treatment, R5.

### **g Quantity and Nature of the Waste**

The seabed within the development area consists of a layer of fine grained material overlying a coarser grained material.

The fine grained dredge material can be divided into two types: potentially contaminated and clean. An analysis of sediment samples taken from the seabed surface indicates that some of the sediments are potentially contaminated, with hydrocarbons and heavy metals including Tributyl Tin (TBT) and Mercury (Hg). It will be necessary to treat both types of fine material before they can be used in the construction as engineered backfill. Both types will need to be dewatered / stabilised to improve their load carrying capacity, and to immobilize any potentially contaminated material and retard its potential leachability.

It is proposed to stabilise and place up to approximately 72,000 tonnes (45,000m<sup>3</sup>) of material annually into newly constructed retaining structures as part of the Bantry Inner Harbour Development. Of the 72,000 tonnes of dredged material treated and placed in the structures, 32,000 tonnes (20,000m<sup>3</sup>) will be inert coarser grained dredge material and 40,000 tonnes (25,000m<sup>3</sup>) will be finer grained dredge material. Based on the pollutants occurring in the top meter of sediment approximately 12,000m<sup>3</sup> (<30% of the total volume) is potentially contaminated non-hazardous material. Dredging works are scheduled from Nov 2016 to March 2017 and for Nov 2017 to March 2018 if necessary.

Analysis of the sediment sampling undertaken for this project in 2009 and 2015 classifies the contaminated dredged material as Non-Hazardous according to the HazWasteOnline Classification Tool which uses chemical thresholds from WM2: Hazardous Waste: Interpretation of the definition and classification of hazardous waste from the EU Waste Framework Directive. The material has been classified with the EWC Code: 17 05 06. Refer to the Hazard Assessment Tool Reports presented as an Appendix 8 - Attachment In the QRA Report.

### **h Raw Materials, Substances, Preparations and Energy**

The raw materials apart from the dredge material are:

- Aggregate Stone Materials
- Cement
- Rock armour
- Reinforcing steel
- Geotextile Membrane Materials
- Revetment core material (clean imported aggregate)
- Sheet Piles

The following fuels will be used by construction and dredging equipment:

- Diesel
- Petrol

#### Hydraulic Oil

Water will be required for dust suppression should it arise. It is estimated that between 8 and 12% cement will be added to the dredge material to solidify and stabilise it. The specific quantities of raw material for the design mix will be determined prior to the mix bench testing stage. No raw materials or fuels will be required during end use, maintenance and aftercare phases.

#### **i Plant, Processes and Operating Procedures**

It is proposed to use the stabilised dredge material in three locations. (1) as engineering fill behind a rock armoured Perimeter Engineered Revetment Structure (PERS) for the construction of a public amenity area, (2) as engineering fill behind sheet piles pier extension and (3) as engineering fill in and behind a new sheet piled quayside structure which will provide car park and floating marina landing area.

The plant involved is typical marine construction plant:

- Spud Leg Barge
- Back Hoe Dredger
- Transport Barge
- Long Reach Excavator
- Dump Truck
- Allu Mixer
- Water Bowser
- Sheet Piling Hammer

It is planned that the construction program for Inner Bantry Harbour Phase 1 will take 16 months. Normal working hours for the duration of the construction are 8 am to 6 pm weekdays and 8 am to 1 pm Saturday. Dredging operations are restricted to a window between beginning November 2016 to end of March 2017. The proposed dredging/treatment process is shown in the flow diagram below, Figure A.2.

Further detail on the process and operations of the project is provided in Attachment D.1 and D.2.

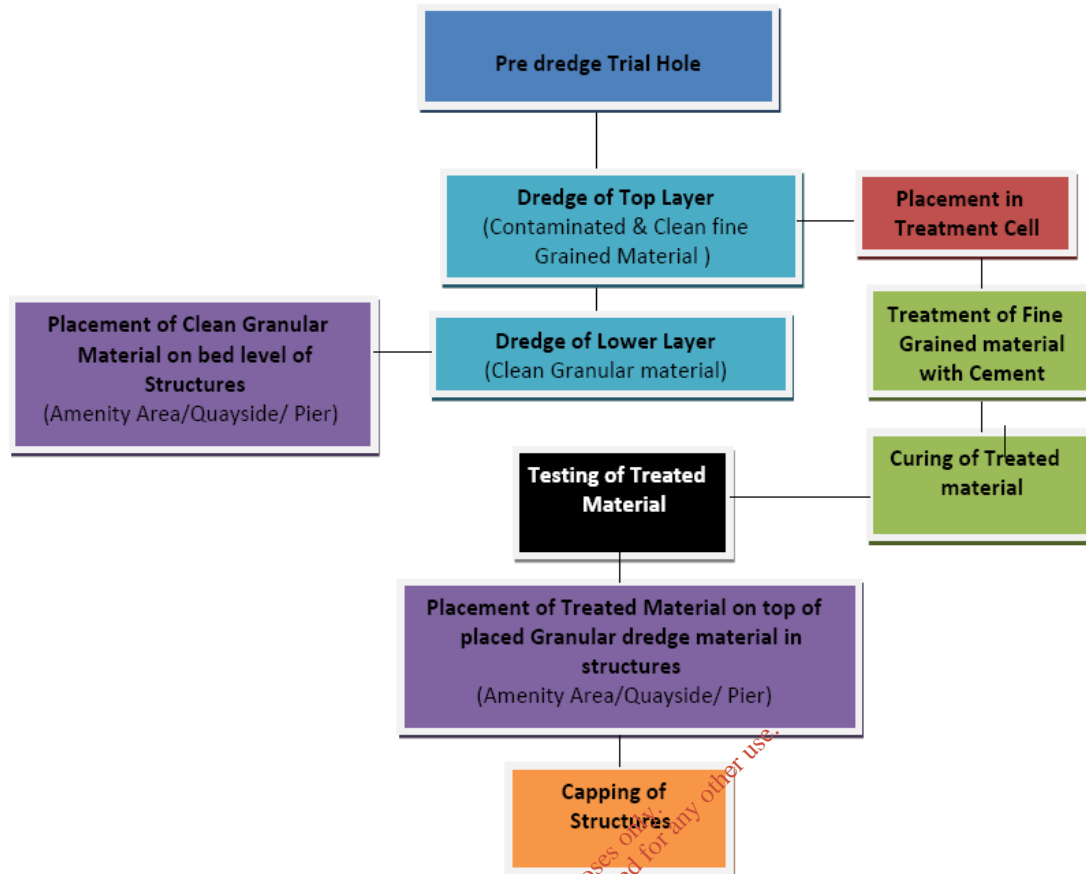


FIGURE A-2 PROCESS FLOW DIAGRAM

**1.2.1 Regarding Paragraphs a to g of section 40 of the Waste Management Act**

Section 40 (4) of the Waste Management Act 1996, amended by the Protection of the Environment Act 2003, sets out specific criteria of which the Agency must be satisfied before it will consider the granting of a license. The following statements have been addressed in more detail in each of the Attachments B to L.

Any emissions from the recovery activities in question will not result in the contravention of any relevant standard, including any standard for an environmental medium, or any relevant emission limit value, prescribed under any other enactment

The Treatment and re use of dredge material as detailed in this application and carried on in accordance with such conditions as may be attached to the license, will not cause environmental impact..

The best available technology not entailing excessive costs and best available techniques will be used to prevent or eliminate or, where that is not practicable, to limit, abate or reduce an emission from the activity concerned.

The activity concerned is consistent with the objectives of the relevant waste management plan or the hazardous waste management plan, as the case may be, and will not prejudice measures taken or to be taken by the relevant local authority or authorities for the purpose of the implementation of any such plan.

As this application pertains to the construction/enhancement of Inner Bantry Harbour, the Engineering Management personnel of the Port of Cork Company as applicant is deemed the fit and proper person to hold a waste license.

The Port of Cork Company has complied with the requirements under section 53.

Energy will be used efficiently in the carrying on of the activity concerned.

Any noise from the activity concerned will comply with, or will not result in the contravention of, any regulations under section 106 of the Act of 1992,

#### **k Emissions from the Site**

The potential emissions arising from the dredging, treatment and placement of material will be, noise, suspended sediments and leachates in surface water. These emissions are discussed in detail in the EIS, the environmental Quantitative Risk Assessment (QRA) Report and in Attachment I of this form.

The construction phase of the proposed development has the potential to give rise to:

- The emission of dust from excavation and construction works and the storage and movement of materials,
- Construction vehicles, generators etc., may give rise to carbon dioxide and nitrous oxide emissions. However the level of emissions will be insignificant compared to national greenhouse gas emissions.
- Dredging and placement of fill has potential to release suspended sediment and contaminant leachate, however both the EIS and the environmental QRA have shown that this will have a negligible impact on the surrounding environment

#### **l Effects of Emissions**

There will be no negative impacts from the emissions.

#### **m Monitoring and Sampling Points**

The control measures and monitoring strategy of the potential emissions has been developed as part of the waste licence to ensure all risks are suitably mitigated. Further details on the type frequency of monitoring is available in Attachment F of the Licence application form and also in the accompanying QRA Report. To ensure all monitoring and mitigation measures are implemented, the contractor will employ an environmental officer.

There are proposed monitoring points:

- AA-01- Dust emission at Western boundary of Quayside Reclamation
- AA-02- Dust emission at Western boundary of Amenity Area
- SW- A01 – surface water emission at the mouth of the inner harbour entrance
- SW – A02 – surface water emission at nearest mussel farm
- SW – M01 – surface water emission at adjacent to Dredge works
- N-01 – noise monitoring point 1 at Maritime Hotel
- N-02 – noise monitoring point 1 at Buildings adjacent to Harbour View
- N-03 – noise monitoring point 1 at Building adjacent to proposed amenity area

The proposed leachate limits for the treated sediment are detailed in the Letter of Response to the Article 16(1) request of 8<sup>th</sup> July 2016. It is proposed that the laboratory testing would be completed using the Monolithic Tank Test in accordance with NEN 7375:2004 if leachate levels exceed the proposed limits consecutively for three results then the material would be deemed unsuitable for deposition and would be excavated for either re-treatment and/or off-site disposal to a suitably licensed facility.

#### **n Arrangements for Prevention, Minimisation and Recovery of Waste Arising from the Activity**

As all the dredged sediment will be re-used as fill material the volume of waste material that will arise from the dredge treatment activity is anticipated to be low. It is expected to be mainly, tyres, glass, plastics and metals that have been discarded in the harbour basin. These materials will be segregated from the dredged sediments and sent off site for appropriate recovery or disposal.

**o Arrangements for Off-site treatment or Disposal of wastes**

As the expected volumes of waste required to be taken off-site are low, this will be undertaken by contractor KWD, who are in possession of an appropriate waste collection permit. This waste will be brought to an authorised treatment facility in possession of a waste facility permit or waste licence for recovery or recycling, or in the case of disposal, to an authorised waste licensed landfill facility

**p Measures including Emergency Procedures for authorised or expected Emissions**

A draft Environmental Liabilities Risk Assessment is included in Attachment J and Appendix 9 - Attachment J for further discussion and agreement with the Agency.

**q Closure and Restoration**

A draft Closure Plan is submitted to the Agency for agreement and can be found in Attachment K.

The proposed licenceable activity is as an integral part to the redevelopment works for Bantry Harbour and to the management of dredge material. Upon completion of the required dredging activity, treatment of the material dredged, construction of the planned pier and amenity area, the activity will be fully completed and will cease

**r Related to landfilling of waste and is not relevant to this development**

**s European Communities Control of Major Accident Hazards involving Dangerous Substances Regulation 2000**

Dangerous substances will not be generated during the waste activity as per

**t Council Directive of 17 December 1975 on the protection of groundwater against pollution caused by certain dangerous substances.**

There will be no discharge to groundwater, as all proposed waste activities take place in the foreshore where groundwater has been identified by the site investigations to be at depth (~7m below ground level) and isolated from the works by naturally occurring low permeability deposits and/or bedrock. There will be no groundwater use and it will not be affected.

**tbis Main alternatives**

Alternatives to reusing the treated dredge material within the construction works were considered. The removal of the material to landfill was considered as an alternative. The closest suitable licensed facility is over 200Km away from the site, in line with the principles of Self Sufficiency and Proximity this option was not deemed viable. In addition, the option of dumping at sea was considered, but in consultation with the Marine Institute, the contaminated dredge material was not considered suitable for management in this way.

**v Describe how the waste hierarchy in Section 21A of the Act is applied**

The waste hierarchy, as outlined in Section 21A of the Act, is applied as follows:

**TABLE A-1 WASTE HIERARCHY**

Waste Hierarchy	Activity
Prevention	Not possible as material has to be dredged as part of project.
Preparing for Re-use	Not considered applicable to the proposed development
Recovery	Treatment of finer grained dredge material with cement to stabilise and solidify for recovery as engineered backfill with potential contamination immobilised and

	<p>retardation.</p> <p>The placement of the treated engineered backfill material behind and into the various structures</p>
Other Recovery (including energy recovery)	<p>A small amount of waste items (tyres/other debris?) are expected to be encountered recovered during the dredging activity that will be removed from site and which may be managed through other recovery processes in appropriate facilities</p>
Disposal	<p>A small amount of waste items (debris) will be disposed of offsite during the dredging activity</p>

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