16.5 Mitigation

If the proposed development takes place, environmental monitoring and appropriate mitigation measures will be required, particularly during the works phase, to ensure that the impacts on water quality are minimised. An Environmental Management Plan (EMP) will address, in detail, every aspect of the works in order to minimise potential impacts and maximise potential benefits associated with the works. There are a range of mitigation measures available to ensure that the development will not impact on water quality. Contractors will be familiar with the requirements of best practice and relevant guidelines including:

- Good practice guidelines on the control of water pollution from construction sites developed by the Construction Industry Research and Information Association (CIRIA, 2001).
- Pollution prevention guidelines in relation to a variety of activities developed by the Environmental Agency (EA), the Scottish Environmental Agency (SEPA) and the Northern Ireland Environment Agency (NIEA).
- Environmental Agency Pollution Prevention Guidelines (PPG6);
- Fisheries Guidelines for Local Authority Works. Department of Communications, Marine & Natural Resources, Dublin, (Anonymous, 1998).

The following is a generalised list of actions which may be incorporated into the EMP to avoid or minimise impacts:

Monitoring

- Carry out environmental monitoring, with regular sampling of turbidity and suspended solid levels, to ensure no deterioration in water quality;
- Ensure regular checks by experienced ecologists to ensure that mitigation measures stipulated in development documentation are implemented by the contractor;

Project management and good practice

- Select appropriate equipment and dredging methods;
- Ensure appropriate timing of dredging and disposal operations, for example, during low tide and during good weather;
- Limit the duration of works;
- Ensure that treatment areas are suitable;
- Ensure that bunded areas for reception of treated dredged material are completed before dredging begins;
- Put in place all necessary precautions in relation to the delivery and storage of any fuels and other chemicals used should be employed. Storage of fuel, oils and chemicals should be on an impermeable base, a minimum of 10 metres away from the waters of the harbour and bay. Fuel storage areas should be bunded to provide adequate retention capacity and spill kits will be installed in the event of a leak or spillage occurring;

- Ensure that refuelling of plant and vehicles take place on impermeable surfaces, a minimum of 10 metres away from the water;
- Prepare management and emergency plans in relation to accidental spillages of fuels or oils from boats;
- Ensure good site management generally.
- Prevent loss of sediment from on-land works areas using silt traps or barriers;
- Prevent erosion from reclaimed areas by avoiding bare soils;

Ecological

- Avoid carrying out works during sensitive times for fish, shellfish, cetaceans etc;

Sustainability

- Promote the beneficial use of dredged material;
- Minimise requirements for maintenance dredging;
- Introduce measures to minimise waste and ensure correct handling, storage and disposal of waste will be required (most notably wet concrete and asphalt);

Communication and engagement

- Regular communication with relevant organisations and fisheries in the area;

Operational

- Provision of adequate and safe waste water infrastructure for boats using the marina;

Residual Impacts

Provided appropriate mitigations measures are fully implemented, the impact of the proposed development on the water quality in the area will be slight to moderate as indicated in the table below.

Table 16.3 Residual impacts

	Bantry Harbour (dredging)	Cove and Beicin (re-nourishment)	Abbey Strand (land reclamation)
Construction phase			
Suspended sediments	Minor	Minor	Minor
Sedimentation	Minor	Minor	Minor
Operational Phase			
Suspended sediments	Minor	Neutral	Neutral
Sedimentation	Minor	Neutral	Neutral

16.6 Flood Risk Assessment (FRA)

A flood risk assessment was carried out to assess the risk to the proposed development from all potential sources of flooding and propose suitable mitigation measures where appropriate. A FRA is a requirement of planning and will accompany the planning application for the proposed development.

The FRA is presented in full in Appendix 5 of this EIS. RPS have assessed the flood risk to the proposed development and determined the predominant source of flood risk emanates from coastal flooding.

Under The Planning System and Flood Risk Management Planning Guidelines (2009) the application site would be classified as Flood Zone A (i.e. within the 0.5% AEP flood extent). As the development is a marina it can be classified as a 'Water-compatible development' and is therefore appropriate for construction within the Flood Zone. A Justification Test was therefore not required to be completed.

The proposed development is therefore, in the opinion of RPS, compliant with The Planning System and Flood Risk Management Planning Guidelines (2009).

17.0 SUMMARY OF IMPACTS AND MITIGATION MEASURES

17.1 Introduction

Chapters 5.0 to 16.0 of this EIS assess the likely significant impacts arising from the proposed development. This section summarises the impacts identified and the reassures required to mitigate against them, where necessary. The key impacts and mitigation measures identified in the EIS are summarised in Table 17.1.

Table 17.1 Summary of Impacts and Mitigation Measures

Topic	Impact/Comment	Mitigation
Air and Climate		
Dust	The emission of dust from excavation and construction works and the storage and movement of materials.	Dust minimisation plan.
Air Emissions	Exhaust gases from construction vehicles and plant during the construction phase is expected to have a negligible impact on local air quality.	No mitigation measures required.
Noise		
Construction Noise	Construction activities will be short term and temporary. This may lead to some short-term disturbance; however, the noise and vibration impact at this stage of the project development will not be significant on the nearest residential properties.	General guidelines for limiting construction noise including limiting time for noisy activities, equipment selection, site design and location of plant, training and alternative work methods, screening for certain activities, contact with residents and inclusion of noise monitoring within the Construction Management Plan.
Construction Vibration	Due to the distance from sensitive properties construction vibration impacts will not be significant and if any, will be short – term and temporary	No mitigation measures required.
Traffic Noise	Changes in traffic during the operational phase of the development are likely to result in Barely Perceptible changes in noise level –	No mitigation measures required.

Topic	Impact/Comment	Mitigation
	therefore this is regarded as Negligible.	
Plant Noise	It is uncertain of the type, number, location and exact specification of plant and equipment to be installed at the proposed harbour development. As this is currently unknown there is the potential for noise impacts.	The exact specification of all plant will be carefully considered to prevent and minimise any disturbances to existing residents. This will include: selecting quieter equipment, use enclosures or sound attenuating "jackets" where necessary and mounting mechanical equipment on anti vibration mounts to minimise transmission of noise and vibration through to the building structure which in turn increases sound radiation into the atmosphere.
Material Assets		
Material Assets	No adverse impacts as a result of the proposals – adequate infrastructure in terms of water supply, sewerage infrastructure, electricity supply, navigation and future development already in place to deal with this development and future development.	No mitigation measures required.
Geology and Soils		
Solid Geology	There will be no impacts upon solid geology as a result of the proposed development.	No mitigation measures required.
Harbour Sediment	Sediment will be dredged from the harbour; this sediment has been extensively analysed for a wide range of metals and other parameters.	Due to contamination levels found in upper layers of sediments, this material will be removed and treated and used as fill for reclamation areas in the Inner Harbour and at the Abbey Site. The uncontaminated dredged material will be used for beach renourishment at the Cove Site.
Cultural Heritage		
Marine Archaeology	The construction phase measures represent direct and permanent impacts on the locations of the	Archaeological monitoring during construction work, including a finds retrieval strategy. Monitoring will require an archaeologist to be

Topic	Impact/Comment	Mitigation
	magnetometer anomalies and features observed in the course of the fieldwork conducted. However, the majority of those features are modern in date and so the long term impact will be of no consequence.	retained for the duration of the works as well as adequate personnel, facilities and procedures to deal with any investigations.
Marine Archaeology	Former ship's timber identified as an inherent archaeological interest.	The timber should be moved outside the development area to a secure underwater location at the west end of Abbey Strand in advance of works in this area.
Marine Archaeology	The south quay warrants further attention. It is suggested that the impact will be direct and positive, marking profound and permanent change.	Further work should be carried out to more fully record this historic structure in advance of its development. Detailed measured survey of the stonework and associated features on the south quay and including the three slipways.
Flora and Fauna		
Marine mammals	Potential for acoustic and physical disturbance during construction works.	Vigilance in relation to marine mammal activity.
Marine mammals	Potential for increased noise disturbance and risk of collision with marine mammals during operational phase.	Setting a speed limit in the area.
Birds	Disturbance and temporary displacement of birds during construction phase due to works as well as increase in suspended sediment concentrations during dredging.	Bird monitoring programme.
Birds	Potential for short-term and long term habitat loss, particularly in the area of the inner harbour.	Bird monitoring programme.
Terrestrial Fauna	Potential for minor disturbance to otters and other mammals, amphibians and reptiles activities during	Preference for construction taking place outside of breeding season. Controls on noise, lighting, pollution and speed restrictions in certain

Topic	Impact/Comment	Mitigation
	both the construction phase and operational phase.	areas.
Benthic and intertidal flora and fauna	The development will lead to permanent removal of the habitat as well as changes in habitat type such as some sub-tidal areas changing to intertidal soft-sediment or terrestrial habitat.	No mitigation measures required - although locally severe, would be considered minor as the habitats which will be permanently removed are common locally and regionally
Aquaculture & Fisheries		
Aquaculture & Commercial fisheries	Potential for release of heavy metals and contaminated sediment from dredging activities.	Mitigation measures to reduce the impacts from dredging include: Timing of works to coincide with colder water temperatures; • Ensuring all contaminated sediment is dredged using an appropriate method; • Use of silt curtains to prevent release of contaminated sediment beyond dredging boundary; • Appropriate stabilisation of dredge spoil
Aquaculture & Commercial fisheries	Habitat loss and change at the Abbey site which can be described as locally moderate adverse and permanent.	No mitigation measures required.
Aquaculture & Commercial fisheries	Potential for water and sediment pollution from operational activities within the harbour as well as at the proposed boat maintenance facility at the Abbey site.	Following good management and best practice guidelines to minimise potential for pollution as well as adequate procedures to deal with any pollution incidents.
Human Beings		
Human Beings	Disturbance from construction activities in terms of dust, noise and restrictions in access to the area.	Alternative access arrangements to the harbour and pier. Mitigation in relation to dust and noise are dealt with in Chapters 5 and 6 respectively.
Roads and Traffic		
	Increased traffic movements to and from the site during construction. The most invasive being generating an additional 20 vehicle	Scheduling to ensure peak site traffic movements do not coincide with peak traffic in the area. Flagmen present on the access road to the Cove site. Improvements

Topic	Impact/Comment	Mitigation
	movements to and from the harbour, 6 to and from the Abbey site and 1 to and from the Cove site during a peak hour. The available road networks are deemed capable of accommodating these traffic movements. The Cove site and access route represents the most sensitive of the three main sites.	to the access road to the Cove site as well as regular inspection and maintenance where required.
Landscape		
Visual	Temporary visual impacts limited to the theoretical ZVI during construction phase.	Mitigation includes: sensitive use of local materials for constructed elements; ii) careful integration of constructed elements with existing elements such as existing jettys and revetments; iii) general site housekeeping designed to minimise visual impact during construction stage.
Coastal Processes		
Sediment	Contaminated sediment has the potential to be carried outside the harbour boundary during dredging operations; however, only this is only likely to present a problem if there are prolonged winds from the east.	Monitoring – such as use of monitoring buoys or turbidity/suspended sediment sampling.
Sediment	Fine sediments placed at the Cove site have the potential to be move off-site.	Breakwaters have been included in the design of this scheme in order to retain finer grains of sediment which are most likely to be moved off-site.
Sediment	The inclusion of breakwaters has the potential to encourage scour around the new structure.	Inclusion of scour protection measures.
Water		
Water Pollution	Temporary increase in suspended sediment concentrations and sedimentation of the bed during dredging within the	Environmental Management Plan (EMP) and following of good practice. Monitoring programme during construction.

Topic	Impact/Comment	Mitigation
	harbour and beach renourishment at the Cove site. Potential for release of pollutants such as oils and wastewater.	
Water Pollution	Minor increase in suspended sediment concentrations and sedimentation of the bed within the harbour as a result of harbour operations. Potential for minor pollution.	Environmental Management Plan (EMP) and following of good practice guidelines. Provision of adequate wastewater facilities.

17.2 Interactions

This section describes the interactions between the various aspects of the environmental impact assessment of the proposed construction and operation of the harbour development at Bantry. This is a requirement of the European Community (Environmental Impact Assessment) (Amendments) Regulations, 1999. Table 17.2 identifies each chapter of the Environmental Impact Statement where the impacts or environmental effects of specific topics within the environmental statement interact between each other. Mitigating measures where necessary have been provided for in the appropriate chapter of the EIS. Please refer to the text below the table for a brief description of the interactions.

Table 17.2 Interactions

	Air & Climate	Noise	Material Assets	Geology & Soils	Cultural Heritage	Flora & Fauna	Aquaculture & Fisheries	Human Beings	Roads & Traffic	Landscape & Visual	Coastal Processes	Water
Air & Climate												
Noise	None											
Material Assets	None	None										
Geology & Soils	None	None	None									
Cultural Heritage	None	None	None	None								
Flora & Fauna	None	A	None	B	None							
Aquaculture & Fisheries	None	None	None	C	None	None						
Human Beings	D	E	None	None	None	None	None					
Roads & Traffic	F	G	None	None	None	None	None	H				
Landscape & Visual	None	None	None	None	None	None	None	I	None			
Coastal Processes	None	None	None	J	None	K	L	None	None	None		
Water	None	None	M	N	None	O	P	None	None	None	Q	

A - Interaction between Noise and Flora & Fauna

The noise generated throughout both the construction phase as well as during the operational phase of the project has the potential to cause disturbance to terrestrial and aquatic species.

B – Interaction between Geology & Soils and Flora & Fauna

The dredging operations involve disturbance to contaminated sediments within and outside the harbour wall. This has the potential to affect flora and fauna in the immediate vicinity of dredging operations through sedimentation and potential release of contaminants.

C – Interaction between Geology & Soils and Aquaculture and Fisheries

The dredging operations involve disturbance to contaminated sediments within and outside the harbour wall. This has the potential to affect aquaculture and fisheries in the immediate vicinity of dredging operations.

D – Interaction between Air & Climate and Human Beings

The emission of dust during the construction phase and emissions during the operational phase have the potential to impact upon human beings in the area.

E - Interaction between Noise and Human Beings

The noise generated throughout both the construction phase as well as during the operational phase of the project has the potential to cause disturbance to human beings in the area.

F - Interaction between Air & Climate and Roads & traffic

The additional traffic generated as a result of the construction phase, as well as increased traffic during the operation of the harbour has the potential to impact upon the air quality in the local area.

G – Interaction between Noise and Roads & traffic

The additional traffic generated as a result of the construction phase, as well as increased traffic during the operation of the harbour has the potential to result in increased noise in the local area.

H – Interaction between Human Beings and Roads & Traffic

The additional traffic generated as a result of the construction phase, as well as increased traffic during the operation of the harbour has the potential to have impacts upon human beings in the local area.

I – Interaction between Human Beings and Landscape & Visual

The potential visual impacts associated with the development, particularly during the construction phase have the potential to impact upon human beings in the area.

J – Interaction between Geology & Soils and Coastal Processes

Following dredging within the harbour, reclamation at the Abbey Site and renourishment at the Cove site, there may be changes to sediment transport as a result of coastal processes.

K – Interaction between Flora & Fauna and Coastal Processes
Changes in sediment transport regime as a result of the project has the potential to impact upon flora & fauna in the area.

L – Interaction between Aquaculture & Fisheries and Coastal Processes
Changes in sediment transport regime as a result of the project has the potential to impact upon aquaculture & fisheries in the local area.

M – Interaction between Material Assets and Water
There are interactions between the need for provision of adequate wastewater treatment facilities and water as these are required to alleviate the potential for release of pollution within the harbour area.

N – Interaction between Geology & Soils and Water
There are interactions between the dredging of sediment and the potential for contaminant release, sedimentation or increase in suspended sediment concentrations which would affect water quality.

O – Interaction between Flora & Fauna and Water
There is interaction between water quality and flora and fauna in the area as changes in water quality will have direct impactions for the type and diversity of species in the area.

P – Interaction between Aquaculture & Fisheries and Water
There is interaction between water quality and aquaculture & fisheries in the area as changes in water quality will impact directly upon aquaculture & fisheries.

Q – Interaction between Coastal Processes and Water
There is interaction between coastal processes and water quality as changes in sediment transport regime may result in increased levels of suspended sediment within the water column or sedimentation in certain areas.

17.3 Technical Difficulties

No technical difficulties were encountered which couldn't be overcome in the preparation of this Environmental Impact Statement.

17.4 Conclusions

This chapter presents a concise summary of the main impacts that are likely as a result of the proposed development. The key mitigation measures required to alleviate these impacts are briefly outlined in order to demonstrate the environmental impacts from the proposals are kept to a minimum.

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The following sub-consultants carried out specialist studies:

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Natura	Birds
ADCO Ltd	Terrestrial and Intertidal Archaeology
Irish Hydrodata Ltd	Underwater Archaeology
WYG Ireland	Air, Noise and Traffic

APPENDICES

APPENDIX 1

Results of Chemical Sediment Testing

Appendix 1A
Chemical Sampling Programme requested by Marine Institute

Analyses requirements for dredge material.

A recommended sampling plan is detailed below. Please take the samples as close as possible to the positions listed below. Your attention is drawn particularly to conditions **4, 5, 6 & 7**.

Please supply your analysing laboratory with a copy of these details and ensure that the quality assurance requirements are met.

Table 1: General sampling and analysis plan for Bantry Harbour sediments (see Figure 1 for details).

Sample No.	Longitude	Latitude	Parameters for analysis on < 2mm fraction
2	9°27'19.54"	51°40'51.14"	1, 2, 3a, 3b, 3c, 3d, 3e, 3f, 3g
3	9°27'23.64"	51°40'52.15"	1, 2, 3a, 3b, 3c, 3e, 3f
7	9°27'28.11"	51°40'50.06'	1, 2, 3a, 3b, 3c, 3e, 3f
8	9°27'34.26"	51°40'50.42"	1, 2, 3a, 3b, 3c, 3d, 3e, 3f, 3g
10	9°27'38.36"	51°40'48.87"	1, 2, 3a, 3b, 3c, 3e, 3f
11	9°27'40.19"	51°40'50.24"	1, 2, 3a, 3b, 3c, 3e, 3f
15	9°27'42.24"	51°40'52.06"	1, 2, 3a, 3b, 3c, 3d, 3e, 3f, 3g
17	9°27'43.63"	51°40'48.74"	1, 2, 3a, 3b, 3c, 3e, 3f
19	9°27'42.46"	51°40'47.05"	1, 2, 3a, 3b, 3c, 3d, 3e, 3f, 3g
21	9°27'46.70"	51°40'50.51"	1, 2, 3a, 3b, 3c, 3d, 3e, 3f, 3g

Table 2: Sampling for mercury and TBT in Bantry Harbour sediments (see Figure 1 for details).

Sample No.	Longitude	Latitude	Parameters for analysis on < 2mm fraction
1	9°27'16.83"	51°40'51.19"	1, 2, 3a, 3c (mercury, copper & aluminium only), 3f
4	9°27'24.45"	51°40'50.19"	1, 2, 3a, 3c (mercury, copper & aluminium only), 3f
5	9°27'25.47"	51°40'51.06"	1, 2, 3a, 3c (mercury, copper & aluminium only), 3f
6	9°27'28.69"	51°40'51.60"	1, 2, 3a, 3c (mercury, copper & aluminium only), 3f
9	9°27'34.92"	51°40'49.42"	1, 2, 3a, 3c (mercury, copper & aluminium only), 3f
12	9°27'39.68"	51°40'53.83"	1, 2, 3a, 3c (mercury, copper & aluminium

			only), 3f
13	9°27'41.51"	51°40'47.78"	1, 2, 3a, 3c (mercury, copper & aluminium only), 3f
14	9°27'42.31"	51°40'54.02"	1, 2, 3a, 3c (mercury, copper & aluminium only), 3f
16	9°27'42.90"	51°40'50.15"	1, 2, 3a, 3c (mercury, copper & aluminium only), 3f
18	9°27'43.41"	51°40'47.74"	1, 2, 3a, 3c (mercury, copper & aluminium only), 3f
20	9°27'45.39"	51°40'53.24"	1, 2, 3a, 3c (mercury, copper & aluminium only), 3f

In the event of chemistry results indicating any problems, toxicity tests will be required. You may wish to allow for this in taking additional sample (at least 1kg) at the time of original sampling. If this is the case, please ensure that this sample is **refrigerated and stored in the dark, in a sealed container.**

Parameter Code

1. water content, density (taking into account sample collection and handling)
2. granulometry including % gravel (> 2mm fraction), % sand (< 2mm fraction) and % mud (< 63µm fraction).
3. the following determinants in the sand-mud (< 2mm) fraction * :
   a) total organic carbon
   b) carbonate
   c) mercury, arsenic, cadmium, copper, lead, zinc, chromium, nickel, lithium, aluminium.
   d) organochlorines including HCH (Lindane), and PCBs (to be reported as the 7 individual CB congeners: 28, 52, 101, 118, 138, 153, 180).
   e) total extractable hydrocarbons.
   f) tributyltin (TBT) and dibutyltin (DBT)
   g) Polycyclic aromatic hydrocarbons (PAH) - Anthracene, Fluoranthene, Phenanthrene, Benz-[A]-anthracene, Benzo-[A]-pyrene, Benzo-[ghi]-perylene, Chrysene, Benzo(k) fluoranthene, Naphthalene, Indeno-[1,2,3-cd]-pyrene, Benzo-(B)-fluoranthene, Pyrene
   h) toxicity tests (Microtox or whole sediment bioassay) using appropriate representative aquatic species. (This requirement will depend on the results of the chemical analyses.)

**where the gravel fraction (> 2mm) constitutes a significant part of the total sediment, this should be taken into account in the calculation of the concentrations.*

4. It is advisable to collect sufficient samples to allow toxicity testing be carried out on the material. This may be required and will depend on the results of the above analyses.
5. Brief details of the methodologies used must be furnished with the results. This should include sampling, sub sampling and analytical methods used for each determinant
6. ***Appropriate marine CRM are to be analysed during each batch of analyses and the results to be reported along with sample results.***

7. The required detection limits for the various determinants are given below.

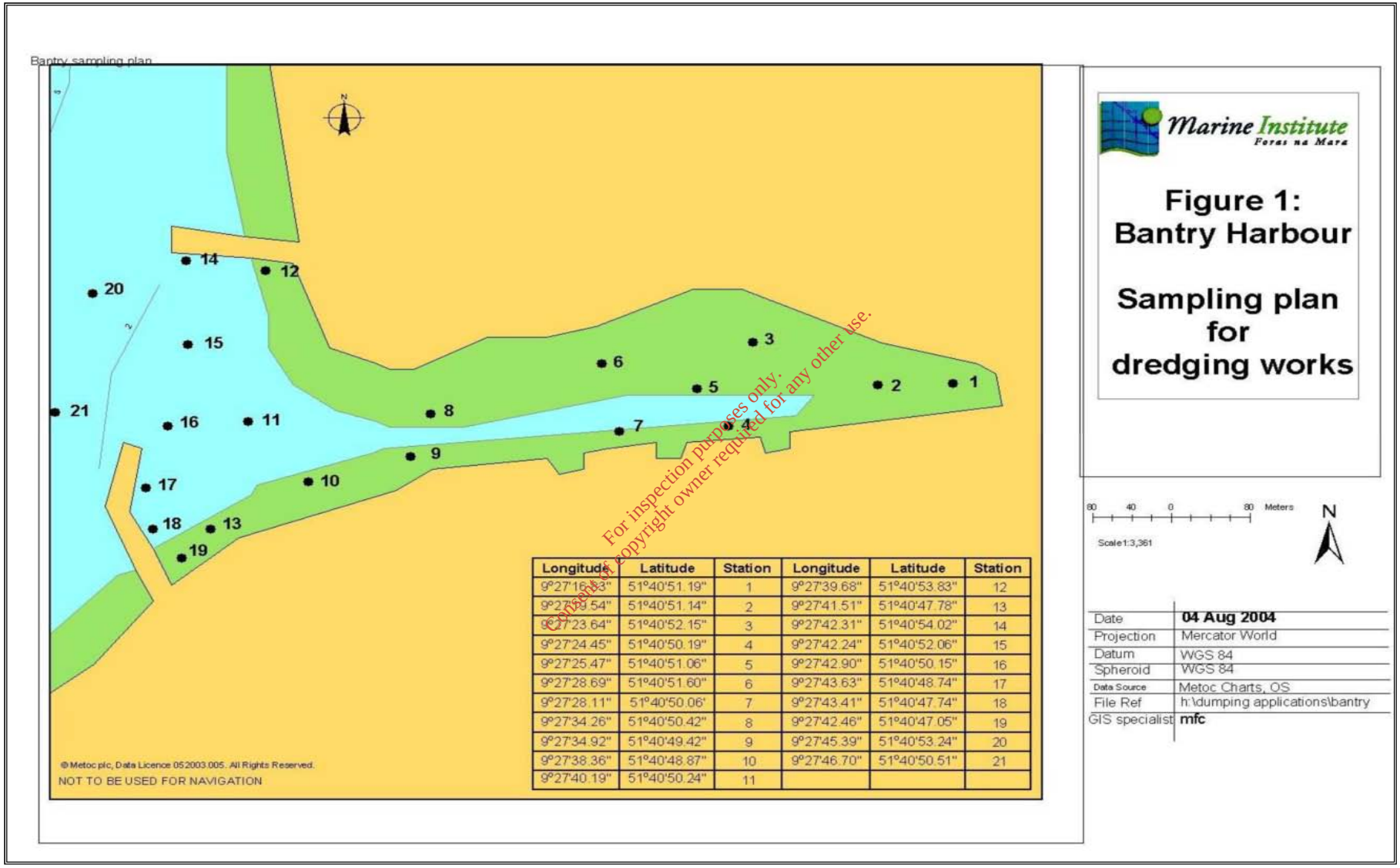
Contaminant	Concentration	Units (dry wt)
Mercury	0.05	mg kg^{-1}
Arsenic	1.0	mg kg^{-1}
Cadmium	0.1	mg kg^{-1}
Copper	5.0	mg kg^{-1}
Lead	5.0	mg kg^{-1}
Zinc	10	mg kg^{-1}
Chromium	5.0	mg kg^{-1}
Nickel	15	mg kg^{-1}
Total extractable hydrocarbons	10.0	mg kg^{-1}
TBT and DBT (not organotin)	0.01	mg kg^{-1}
CB28	1.0	µg kg^{-1}
CB52	1.0	µg kg^{-1}
CB101	1.0	µg kg^{-1}
CB118	1.0	µg kg^{-1}
CB138+163	1.0	µg kg^{-1}
CB153	1.0	µg kg^{-1}
CB180	1.0	µg kg^{-1}
HCB	1.0	µg kg^{-1}
OCPs	1.0	µg kg^{-1}
Acenaphthene	20	µg kg^{-1}
Benzo (a) anthracene	20	µg kg^{-1}
Benzo (a) pyrene	20	µg kg^{-1}
Benzo (b) fluoranthene	20	µg kg^{-1}
Benzo (ghi) perylene	20	µg kg^{-1}
Benzo (k) fluoranthene	20	µg kg^{-1}
Chrysene	20	µg kg^{-1}
Fluoranthene	20	µg kg^{-1}
Indeno (1,2,3 – cd) pyrene	20	µg kg^{-1}
Naphthalene	20	µg kg^{-1}
Phenanthrene	20	µg kg^{-1}
Pyrene	20	µg kg^{-1}

Reporting requirements

Reports should include the following information

- Date of sampling
- Treatment of samples and indication of sub sampling, compositing etc.
- Tabulated geophysical and chemical test results

- Summary method details
- Method performance specifications: Limit of detection, Precision, Bias
- Batch QC (CRM) results
- If determinant is not detected, report less than values, and indicate LoD/ LoQ used.
- Clear expression of units and indication of wet weight or dry weight basis
- Other quality assurance information (e.g. accreditation status)



Longitude	Latitude	Station	Longitude	Latitude	Station
9°27'16.33"	51°40'51.19"	1	9°27'39.68"	51°40'53.83"	12
9°27'29.54"	51°40'51.14"	2	9°27'41.51"	51°40'47.78"	13
9°27'23.64"	51°40'52.15"	3	9°27'42.31"	51°40'54.02"	14
9°27'24.45"	51°40'50.19"	4	9°27'42.24"	51°40'52.06"	15
9°27'25.47"	51°40'51.06"	5	9°27'42.90"	51°40'50.15"	16
9°27'28.69"	51°40'51.60"	6	9°27'43.63"	51°40'48.74"	17
9°27'28.11"	51°40'50.06'	7	9°27'43.41"	51°40'47.74"	18
9°27'34.26"	51°40'50.42"	8	9°27'42.46"	51°40'47.05"	19
9°27'34.92"	51°40'49.42"	9	9°27'45.39"	51°40'53.24"	20
9°27'38.36"	51°40'48.87"	10	9°27'46.70"	51°40'50.51"	21
9°27'40.19"	51°40'50.24"	11			

Appendix 1B Results of First Phase of Chemical Sediment Testing

Sample Number	Depth (m)	Lat	Long	Visual appearance life signs eg worms?	% Moisture	% >2mm	% <2mm >63um	% <63um	% OC	TEH g kg^{-1}	METAL Cu mg kg^{-1}	METAL Zn mg kg^{-1}	METAL Cd mg kg^{-1}	METAL Hg mg kg^{-1}
BH01	0.5	98932.555	48540.291		27	78	14.1	7.8	0.95	7.48	14.1	69.6	0.156	0.0230
BH03	0.5	98945.623	48495.64		63	33.5	35.2	31.3	4.30	234	71.6	259	0.482	0.576
BH04	0.5	98943.648	48457.282		84	3.5	38.5	58	5.02	422	91.0	238	0.758	1.97
BH05	0.5								2.70	107	20.3	72.2	0.218	0.233
BH06	0.5	99031.564	48475.676		14	73.5	21.4	5.1	0.75	37.4	14.6	63.3	0.0790	0.0170
BH07	0.5	99260.953	48498.68		16	82.4	15.5	2.2	0.49	453	235	1770	0.357	0.0700
BH09	0.5								1.01	63.5	14.8	66.2	0.0930	0.0500
BH10	0.5	99398.735	48533.56		20	82.4	16.2	1.4	0.55	17.44	13.3	71.4	0.134	0.180
BH11	0.5	99098.375	48533.461		30	63.7	31.9	4.3	3.89	17.98	15.9	108	0.203	0.198
BH12	0.5	99220.874	48562.641			95.1	4.5	0.4	<0.4	3.79	13.0	112	0.0850	0.0180
BH15	0.5	99289.325	48601.297		52	18.2	29.3	52.6	2.06	61.7	21.0	85.8	0.244	0.141
BH16	0.5	99007.324	48628.251		17	37.1	59.4	3.5	<0.4	13.9	4.06	33.1	0.0520	0.0243
GS01	0.5	99435.98	48542.63		113	6.2	40.5	53.3	4.62		62.9			1.00
GS02	0.5	99383.88	48542.12		43	69.2	22.8	8	<0.4	177	43.9	162	0.362	0.456
GS03	0.5	99305.74	48574.9		90	15	55.3	29.7	2.00	325	52.6	181	0.626	0.524
GS04	0.5	99288.97	48514.65		39	48.8	38.8	12.4	2.44		47.7			0.328
GS05	0.5	99269.91	48541.92		68	16.7	65.8	17.5	2.09		49.7			0.343
GS06	0.5	99208.38	48559.85		77	6.9	67.2	25.9	1.69		45.3			0.541
GS07	0.5	99218.57	48512.03		76	31	35.3	33.8	4.24	190	71.2	206	0.565	0.790
GS08	0.5	99100.65	48525.52		38	73.6	23.6	2.9	0.98	201	19.9	90.7	0.158	0.0250
GS09	0.5	99087.35	48494.87		111	25.5	63.4	11.1						
GS09	0.5								3.34		207			4.59
GS10	0.5	99020.92	48479.19		35	2.3	87.3	11.5	2.71	78.8	33.9	101	0.260	0.324
GS11	0.5	98986.61	48522.23		35	12	81.4	6.6	0.96	180	21.4	86.9	0.232	0.197

Sample Number	METAL Pb mg kg^{-1}	METAL As mg kg^{-1}	METAL Cr mg kg^{-1}	METAL Ni mg kg^{-1}	METAL Li mg kg^{-1}	METAL Al mg kg^{-1}	OT DBT µg kg^{-1}	OT TBT µg kg^{-1}	PCB 028 ug kg^{-1}	PCB 052 ug kg^{-1}	PCB 101 ug kg^{-1}	PCB 138 ug kg^{-1}	PCB 153 ug kg^{-1}	PCB 180 ug kg^{-1}
BH01	17.5	8.42	14.0	23.3	20.3	11600	<4.00	13.1						
BH03	254	10.4	32.0	28.3	28.1	19300	6.00	183						
BH04	106	13.3	24.9	21.8	26.6	15600	<5.00	236						
BH05	38.3	10.3	19.3	25.5	25.8	16600	<4.00	<4.00						
BH06	6.68	8.41	21.5	53.5	44.2	15700	<7.86	<3.00						
BH07	354	12.2	35.3	66.7	23.5	9770	52.4	90.0						
BH09	14.8	12.5	17.4	53.0	32.8	17600	<3.00	<3.00						
BH10	25.2	6.97	16.9	24.8	36.9	15700	<3.00	<3.00						
BH11	15.8	10.0	10.7	24.1	15.0	8580	<3.00	<3.00						
BH12	12.3	10.3	20.8	75.8	42.8	17000	<7.86	<3.00						
BH15	29.4	18.9	27.0	24.5	34.0	26500	<4.00	<4.00						
BH16	7.32	4.08	8.87	12.2	14.7	5490	<3.00	<3.00						
GS01						17400	<6.00	<6.00						
GS02	48.8	14.4	24.3	26.2	36.3	19600	<5.00	<5.00	<0.100	<0.100	<0.100	<0.100	2.84	11.7
GS03	65.8	18.7	24.1	25.4	31.7	16700	<5.00	23.6						
GS04						18300	<3.00	13.1						
GS05						14600	<8.00	<8.00						
GS06						14700	<5.00	21.0						
GS07	81.9	12.8	23.0	24.9	28.7	15300	<5.00	524						
GS08	11.7	11.4	23.5	87.1	42.4	16400	<3.00	10.5	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100
GS09							10.0	786						
GS09						8420	<13.1	<5.00						
GS10	29.7	11.4	13.3	21.7	26.0	9200	<10.5	200						
GS11	32.0	9.28	12.6	20.3	24.3	8830	<7.86	<3.00						

Sample Number	OT DBT µg kg^{-1}	OT TBT µg kg^{-1}	PCB 118 ug kg^{-1}	PAH Anthracene ug kg^{-1}	PAH Benzo a anthracene ug kg^{-1}	PAH Benzo (a) pyrene ug kg^{-1}	PAH Benzo b fluoranthene ug kg^{-1}	PAH Benzo ghi perylene ug kg^{-1}	PAH Benzo k fluoranthene ug kg^{-1}	PAH Chrysene ug kg^{-1}	PAH Fluoranthene ug kg^{-1}	PAH Indeno 1,2,3 – cd pyrene ug kg^{-1}	PAH Naphthalene ug kg^{-1}
BH01	<4.00	13.1											
BH03	6.00	183											
BH04	<5.00	236											
BH05	<4.00	<4.00											
BH06	<7.86	<3.00											
BH07	52.4	90.0											
BH09	<3.00	<3.00											
BH10	<3.00	<3.00											
BH11	<3.00	<3.00											
BH12	<7.86	<3.00											
BH15	<4.00	<4.00											
BH16	<3.00	<3.00											
GS01	<6.00	<6.00											
GS02	<5.00	<5.00	<0.100	80	320	332	461	50	170	260	667	60	40
GS03	<5.00	23.6											
GS04	<3.00	13.1											
GS05	<8.00	<8.00											
GS06	<5.00	21.0											
GS07	<5.00	524											
GS08	<3.00	10.5	<0.100	20	60	60	60	<30	30	50	100	10	<20
GS09	10.0	786											
GS09	<13.1	<5.00											
GS10	<10.5	200											
GS11	<7.86	<3.00											

Sample Number	PAH Phenanthrene ug kg^{-1}	PAH Pyrene ug kg^{-1}	OCP HCH Gamma ug kg^{-1}	OCP HCB ug kg^{-1}	Notes / comments:
BH01					
BH03					
BH04					
BH05					
BH06					
BH07					
BH09					
BH10					
BH11					
BH12					
BH15					
BH16					
GS01					
GS02	320	617	<5.00	<1.00	
GS03					
GS04					
GS05					
GS06					
GS07					
GS08	60	100	<5.00	<1.00	
GS09					
GS09					
GS10					
GS11					

Sample Number	Depth (m)	Lat	Long	Visual appearance life signs eg worms?	% Moisture	% >2mm	% <2mm >63um	% <63um	% OC	TEH g kg^{-1}	METAL Cu mg kg^{-1}	METAL Zn mg kg^{-1}	METAL Cd mg kg^{-1}	METAL Hg mg kg^{-1}
GS12	0.5	98998.62	48632.989		32	61.2	36	2.8	1.56		14.8			0.0100
GS13	0.5	98959.73	48446.72		49	0.5	74.8	24.8	0.830		27.1			0.268
GS14	0.5	98948.22	48639.87		25	8.5	89.8	1.7	<0.400		4.04			0.0170
GS15	0.5	98948.35	48579.27		28	4.6	91.1	4.3	<0.4	55.2	6.94	55.3	0.0900	0.0350
GS16	0.5	98934.49	48520.5		85	14	59.3	26.7	4.41		46.7			0.429
GS17	0.5	98919.59	48477.2		87	14.2	45.4	40.4	6.19	358	52.1	235	0.556	0.434
GS18	0.5	98923.2	48446.21		111	1.1	50	48.9	5.81		70.2			1.13
GS19	0.5	98941.02	48424.52		112	3.4	22.4	74.2	6.93	1019	68.8	256	0.730	1.18
GS20	0.5	98888.56	48616.95		81	1.3	55	43.7	<0.400		25.1			0.374
GS21	0.5	98861.71	48533.08		117	29.2	20.1	50.7	3.07	35.5	40.2	90.8	0.401	0.119

Sample Number	METAL Pb mg kg^{-1}	METAL As mg kg^{-1}	METAL Cr mg kg^{-1}	METAL Ni mg kg^{-1}	METAL Li mg kg^{-1}	METAL Al mg kg^{-1}	OT DBT µg kg^{-1}	OT TBT µg kg^{-1}	PCB 028 ug kg^{-1}	PCB 052 ug kg^{-1}	PCB 101 ug kg^{-1}	PCB 138 ug kg^{-1}	PCB 153 ug kg^{-1}	PCB 180 ug kg^{-1}
GS12						7110	<7.86	<3.00						
GS13						8660	<10.5	20.0						
GS14						4580	<7.86	<3.00						
GS15	13.7	4.42	8.49	13.3	15.3	5440	<10.5	<4.00	<0.100	<0.100	<0.100	<0.100	0.130	0.410
GS16						9170	<10.5	<4.00						
GS17	78.6	9.07	20.2	21.9	24.7	10800	<13.1	50.0						
GS18						14600	<15.7	200						
GS19	79.5	15.9	21.6	18.9	20.5	8650	262	300	<0.100	<0.100	<0.100	2.71	5.81	23.1
GS20						8800	<13.1	<5.00						
GS21	32.5	11.9	30.0	25.4	31.0	18300	<13.1	<5.00	<0.100	0.220	0.250	0.280	0.750	1.71

Sample Number	PCB 118 ug kg^{-1}	PAH Anthracene ug kg^{-1}	PAH Benzo a anthracene ug kg^{-1}	PAH Benzo (a) pyrene ug kg^{-1}	PAH Benzo b fluoranthene ug kg^{-1}	PAH Benzo ghi perylene ug kg^{-1}	PAH Benzo k fluoranthene ug kg^{-1}	PAH Chrysene ug kg^{-1}	PAH Fluoranthene ug kg^{-1}	PAH Indeno 1,2,3 – cd pyrene ug kg^{-1}	PAH Naphthalene ug kg^{-1}
GS12											
GS13											
GS14											
GS15	<0.100	<2.00	40	60	70	40	20	40	70	30	<20.0
GS16											
GS17											
GS18											
GS19	<0.100	1470	7350	6690	7990	3350	3380	5810	12200	2950	646
GS20											
GS21	0.130	20	100	100	160	80	50	80	200	70	<20.0

Sample Number	PAH Phenanthrene ug kg^{-1}	PAH Pyrene ug kg^{-1}	OCP HCH Gamma ug kg^{-1}	OCP HCB ug kg^{-1}	Notes / comments:
GS12					
GS13					
GS14					
GS15	<4.00	80	<5.00	<1.00	
GS16					
GS17					
GS18					
GS19	4150	10900	<5.00	<1.00	
GS20					
GS21	40	160	<5.00	<1.00	

Appendix 1C Results of Second Phase of Chemical Sediment Testing

Sample Number	Depth M	Lat	Long	% >2mm	% <2mm >63um	% <63um	% OC	METAL Cu mg kg^{-1}	METAL Hg mg kg^{-1}	METAL Al mg kg^{-1}
BH01	0.5	98932.555	48540.291	74.2	2.59	19.9	0.448	12.8	0.015	6280
BH01	2	98932.555	48540.291	48.3	3.72	40.8	1.43	13.2	0.0110	9580
BH01	3	98932.555	48540.291	12.63	2.65	83.5	1.59	15.1	0.00900	6150
BH04	0.5	98943.648	48457.282	0	8.26	82.3	1.86	67.4	2.21	9750
BH04	1.5	98943.648	48457.282	0	0	100	0.443	33.4	0.0510	20700
BH04	2.5	98943.648	48457.282	0	0	100	0.960	22.5	0.00700	20300
BH07	1	98943.648	48457.282	76.19	3.78	15.9	1.62	35.9	0.0190	9250
BH07	1.5	98943.648	48457.282	23.41	3.82	70.4	0.8	22.6	0.018	7850
BH07	2	98943.648	48457.282	35.58	11.78	44.5	4.82	13.4	0.016	8210
BH07	3	98943.648	48457.282	37.4	3.33	68.7	2.32	11.4	0.012	9020
BH10	0.5	99398.735	48533.56	95.57	0.03	3.53	0.4	19.5	0.153	8550
BH10	1	99398.735	48533.56	93.9	0	2.91	3.13	13.5	0.152	7150
BH11	1	99098.375	48533.461	44.37	4.4	47	1.78	46.9	0.0180	11400
BH11	2	99098.375	48533.461	74.99	3.43	17.6	0.522	32.9	0.0160	11000
BH11	3	99098.375	48533.461	45.05	3.47	49.7	0.4	32.2	0.0130	11500
BH15	0.5	99289.325	48601.297	13.4	17.76	48.9	0.980	18.2	0.0540	13100
BH15	1.5	99289.325	48601.297	55.12	20.42	19.9	0.4	13.9	0.0230	11900
BH16	0.5	99007.324	48628.251	74.08	11.94	24.4	0.611	9.86	0.0210	4670
BH16	1.5	99007.324	48628.251	11.9	2.2	85.2	0.402	4.79	0.0210	4040

Appendix 1D
Sampling Programme for Outer Harbour as specified by Marine Institute

Marine Institute
Foras na Mara

Ms Sinéad Henry
RPS Consultants
Boucher Road
Belfast

23 September 2011

Re: Bantry Harbour proposed Dredging Operations

Dear Sinéad,

Below you'll find a recommended analysis plan, for the additional material proposed for dredging in Bantry harbour. This is based on the following quantities from each zone:

- Area 4 – 5000m^3
- Area 5 – 6000m^3
- Area 6 – 9000m^3.

Unfortunately, previous analysis in 2010 of samples from areas 4 and 5 indicate elevated mercury concentrations and so full testing will be necessary to confirm or delineate.

Please ensure that your analysing laboratory is supplied with a copy of this plan so that quality requirements can be met. The lab should pay special attention to conditions in sections 3 and 4 below. **It is essential that sufficiently low limits of detection (LoDs) can be met, especially for the mercury and copper analyses in this instance, in order that** the sediment contaminant load can be calculated and the sediment classified accordingly. The LoDs are listed further on in the document.

1.0 Sample location and analyses required:

The samples positions highlighted in red in the accompanying drawing and listed in the table below are recommended to be analysed. Further sampling and analysis, at depth if necessary, may be required in the event that problem areas of heavy contamination are identified as a result of the initial testing.

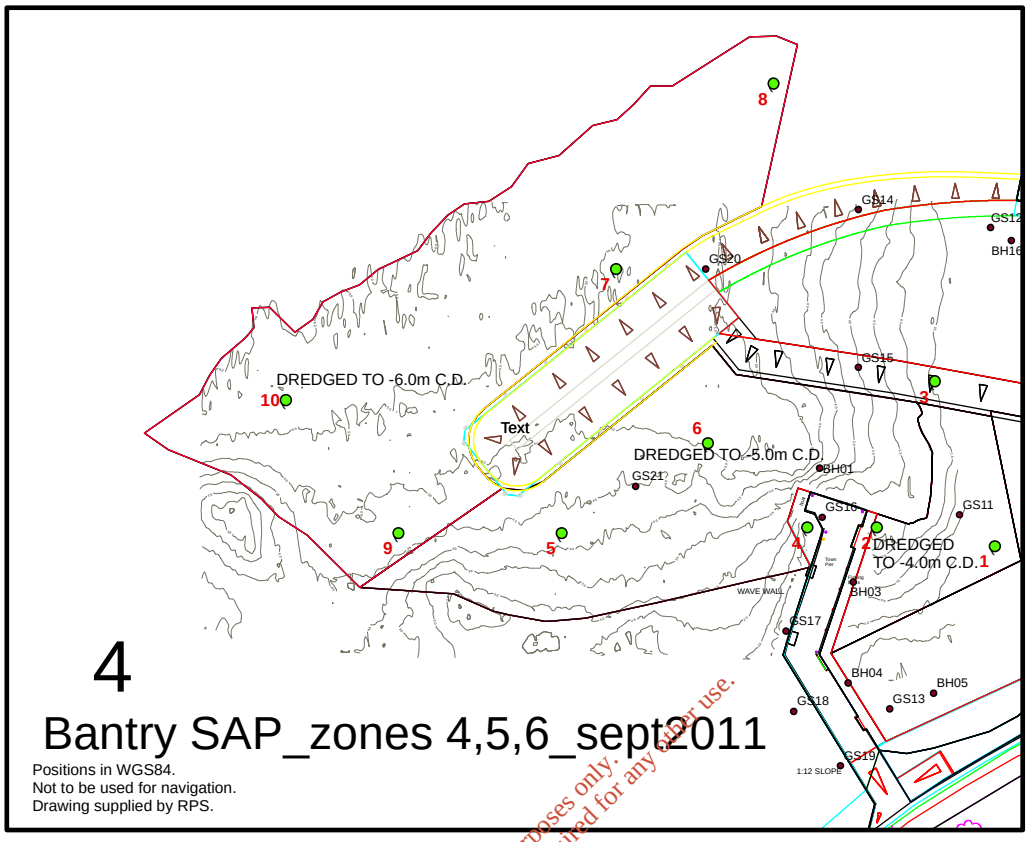


Figure 1. Positions for follow up sampling, Bantry 2011

Sample No.	Area	Lat	Long	Depth	Parameters for analysis
1	4	99001	48510	Surface	1, 2, 3, 4a, 4b, 4c, 4d, 4e, 4f, 4g
2	4	98955	48517	1.0	1, 2, 3, 4a, 4b, 4c, 4d, 4e, 4f, 4g
3	4	98977	48574	0.5m*	1, 2, 3, 4a, 4b, 4c, 4f
4	5	98928	48517	Surface	1, 2, 3, 4a, 4b, 4c, 4d, 4e, 4f, 4g
5	5	98833	48515	0.5m*	1, 2, 3, 4a, 4b, 4c, 4f
6	5	98890	48550	0.5m*	1, 2, 3, 4a, 4b, 4c, 4d, 4e, 4f, 4g
7	6	98854	48617	Surface	1, 2, 3, 4a, 4b, 4c, 4f
8	6	98915	48689	0.5m*	1, 2, 3, 4a, 4b, 4c, 4f
9	6	98770	48515	Surface	1, 2, 3, 4a, 4b, 4c, 4f
10	6	98727	48566	0.5m*	1, 2, 3, 4a, 4b, 4c, 4d, 4e, 4f, 4g

Table 1. Details of requirements for samples and analysis. * Depth of sample will be determined by depth of sediment available.

2.0 Parameter Code:

1. Visual inspection, to include colour, texture, odour, presence of animals etc
2. Water content, density (taking into account sample collection and handling)
3. **Granulometry including % gravel (> 2mm fraction), % sand (< 2mm fraction) and % mud (< 63µm fraction).**
4. The following determinants in the sand-mud (< 2mm) fraction * :
   - **f) total organic carbon**
   - g) carbonate
   - h) **mercury,** arsenic, cadmium, **copper**, lead, zinc, chromium, nickel, lithium, **aluminium**.
   - i) organochlorines including γ-HCH (Lindane), and PCBs (to be reported as the 7 individual CB congeners: 28, 52, 101, 118, 138, 153, 180).
   - j) total extractable hydrocarbons.
   - f) tributyltin (TBT) and dibutyltin (DBT)
   - g) Polycyclic aromatic hydrocarbons (PAH) - Acenaphthene, Acenaphthylene, Anthracene, Benzo (a) anthracene, Benzo (a) pyrene, Benzo (b) fluoranthene, Benzo (ghi) perylene, Benzo (k) fluoranthene, Chrysene, Dibenz (a,h) anthracene, Flourene, Fluoranthene, Indeno 1,2,3 – cd pyrene, Naphthalene, Phenanthrene, Pyrene.
   - h) Toxicity tests (Microtox or whole sediment bioassay) using appropriate representative aquatic species. (This requirement will depend on the results of the chemical analyses.)

**where the gravel fraction (> 2mm) constitutes a significant part of the total sediment, this should be taken into account in the calculation of the concentrations.*

3.0 Important notes:

3.1 Details of the methodologies used must be furnished with the results. This should include sampling, sub sampling and analytical methods used for each determinant

3.2 Appropriate marine CRM are to be analysed during each batch of analyses and the results to be reported along with sample results.

3.3 The required detection limits for the various determinants are given below.

Contaminant	Concentration	Units (dry wt)
Mercury	0.05	mg kg^{-1}
Arsenic	1.0	mg kg^{-1}
Cadmium	0.1	mg kg^{-1}
Copper	5.0	mg kg^{-1}
Lead	5.0	mg kg^{-1}
Zinc	10	mg kg^{-1}
Chromium	5.0	mg kg^{-1}
Nickel	15	mg kg^{-1}
Total extractable hydrocarbons	10.0	mg kg^{-1}
TBT and DBT (not organotin)	0.01	mg kg^{-1}
PCB – individual congener	1.0	µg kg^{-1}
OCP – individual	1.0	µg kg^{-1}

compound			
PAH – individual compound	20	µg kg^{-1}	

4.0 Reporting requirements

Reports should include the following information

4.1 Completed excel spreadsheet for results (***DredgeSampleDataSheet.xls***) including:

- 4.1.1 Date of sampling, location of samples eg ING or lat/long.
- 4.1.2 Treatment of samples and indication of sub sampling, compositing etc.
- 4.1.3 Tabulated geophysical and chemical test results
- 4.1.4 Summary method details
- 4.1.5 Method performance specifications: Limit of detection, Precision, Bias
- 4.1.6 Clear expression of units and indication of wet weight or dry weight basis
- 4.1.7 Blanks & in-house references to be run with each sample batch, and reported with sample results.
- 4.1.8 Certified and measured results for batch CRM

4.2 If determinant is not detected, report less than values, and indicate LoD/ LoQ used. Other quality assurance information (e.g. accreditation status)

If you require clarification on anything, please don't hesitate to contact me.

Best regards,

MCronin

Margot Cronin

Appendix 1E
Results of Chemical Sediment Testing from Outer Harbour sites

Sample Number	Depth M	Position Easting Position Latitude degree / mins/ decimal mins	Position Northing Position Longitude degree / mins/ decimal mins	Visual appearance life signs eg worms?	% Moisture	% >2mm	% <2mm >63um	% <63um	% OC	TEH g kg^{-1}
1	Surface	99000.56	48506.02		29.1	0	82.2	17.8	1.4	0.292
2	1	98955.12	48515.76		35.8	57.81	29.79	12.4	2.2	0.168
3	0.5	98974.58	48579.29		28.2	0	17.4	82.6	2.6	
4	Surface	98923.23	48510.65		33.1	85.4	2	12.6	3.3	0.083
5	0.5	98843.06	48516.5		56.7	0	26.7	73.3	2.9	
6	0.5	98890.24	48554.57		47.8	39.24	14.26	46.5	2.9	0.986
7	Surface	98851.46	48617.44		44.2	0	16.6	83.4	2.2	
8	0.5	98919.74	48688.95		39.1	0	25.7	74.3	3.1	
9	Surface	98769.13	48513.66		40.6	0	19	81	2.6	
10	0.5	98725.87	48568		47.5	2.22	58.88	38	1.6	0.176

Sample Number	METAL Cu mg kg^{-1}	METAL Zn mg kg^{-1}	METAL Cd mg kg^{-1}	METAL Hg mg kg^{-1}	METAL Pb mg kg^{-1}	METAL As mg kg^{-1}	METAL Cr mg kg^{-1}	METAL Mn mg kg^{-1}
1	27.9	129	0.398	0.197	35.6	9.52	18.4	NA
2	97.8	568	0.467	0.192	79.1	8.87	60	NA
3	27.5	119	0.192	86	37.4	15.9	42.4	NA
4	65.9	178	0.312	0.202	201	15.7	29	NA
5	30.2	124	0.257	0.128	40.8	17.9	37.1	NA
6	36.9	126	0.339	0.091	34.1	18.2	41.4	NA
7	31.6	133	0.224	0.117	75	20.5	44.1	
8	36.7	140	0.29	0.407	47.2	16.3	41.3	
9	30.3	130	0.204	0.196	40.5	16.9	46	
10	30.6	140	0.389	0.253	36.3	11	24.3	

Sample Number	METAL Ni mg kg^{-1}	METAL Li mg kg^{-1}	METAL Al mg kg^{-1}	OT DBT mg kg^{-1}	OT TBT mg kg^{-1}	OT Σ TBT + DBT mg kg^{-1}	PCB 028 ug kg^{-1}
1	23.9	27.2	9240	<0.003	0.01		<0.1
2	33.9	22	9470	<0.003	0.2		0.56
3	31.8	43.7	24300	<4	<3		
4	23	21.5	11900	0.062	0.08		<0.1
5	29.2	38.3	19900	<0.06	0.08		
6	28.3	40	24400	<0.05	0.02		<0.1
7	32.9	45.3	21800	<0.05	0.04		
8	30.8	40.7	22700	<0.05	0.07		
9	32.3	44.1	25100	<0.05	0.04		
10	23	27.4	12900	<0.05	<0.03		<0.1

Sample Number	PCB 052 ug kg^{-1}	PCB 101 ug kg^{-1}	PCB 138 ug kg^{-1}	PCB 153 ug kg^{-1}	PCB 180 ug kg^{-1}	PCB 118 ug kg^{-1}	PCB Σ 7 PCB ug kg^{-1}
1	<0.1	<0.1	0.16	0.76	3.04	<0.1	
2	<0.3	<0.4	0.52	1.92	6.28	<0.5	
3							
4	<0.1	0.72	0.8	2.08	3.16	0.52	
5							
6	<0.1	0.16	0.32	1.24	2.68	<0.1	
7							
8							
9							
10	<0.1	0.92	1.24	2.96	6.32	0.72	

Sample Number	PAH Acenaphthene ug kg^{-1}	PAH Acenaphthylene ug kg^{-1}	PAH Anthracene ug kg^{-1}	PAH Benzo a anthracene ug kg^{-1}	PAH Benzo (a) pyrene ug kg^{-1}	PAH Benzo b fluoranthene ug kg^{-1}	PAH Benzo ghi perylene ug kg^{-1}	PAH Benzo k fluoranthene ug kg^{-1}	PAH Chrysene ug kg^{-1}	PAH Dibenz a,h anthracene ug kg^{-1}
1	32.6	75.3	158	588	719	618	433	318	591	113
2	33.2	44	143	434	495	418	310	187	467	74.9
3										
4	20.6	15.4	95.3	218	224	198	141	92.6	199	31.9
5										
6	9.02	13.4	32.7	112	131	144	92.6	54.5	112	19.7
7										
8										
9										
10	40.7	58.4	141	588	780	691	483	297	658	107

Sample Number	PAH Flourene ug kg^{-1}	PAH Fluoranthene ug kg^{-1}	PAH Indeno 1,2,3 – cd pyrene ug kg^{-1}	PAH Naphthalene ug kg^{-1}	PAH Phenanthrene ug kg^{-1}	PAH Pyrene ug kg^{-1}	PAH Σ 13 ug kg^{-1}	OCP HCH Gamma ug kg^{-1}	OCP HCB ug kg^{-1}
1	63.7	994	435	119	383	939		<2	<1
2	67.9	705	291	109	383	755		<2	<1
3									
4	42.7	387	139	309	219	365		<2	<1
5									
6	20.8	189	95.3	<60	83.8	196		<2	<1
7									
8									
9									
10	65.7	1080	454	147	586	1060		<2	<1

APPENDIX 2

Cultural Heritage

Appendix 2A
Gazetteer of known Cultural Heritage data relevant to Bantry Harbour

Known archaeological and architectural heritage data or activity that occurs within the proposed development areas is highlighted in blue,

National Museum of Ireland Topographical Files

Based on inventories of objects and sites registered according to townland, the following townlands formed the basis of the current assessment: Abbey; Beach; Carrignagat; Castletown; Knocknamuck; Kinathfineen; Newtown; Reenrour East; Reenrour West; Seafield; Town Lots. The names Abbey Strand; Béicín Strand; Bantry and Bantry Bay were also assessed.

There are no known artefacts registered from within or adjacent to the development areas.
No mitigation is required of the known artefacts during the proposed development.

Registration No	Classification	Provenance	Distance to development
P1042	Gaming Piece, horn	near Bantry, Castletown townland	Outside, distance not determinable
P1043	Gaming Piece, horn	near Bantry, Castletown townland	Outside, distance not determinable
5049:W18	Box, metal	Bantry Bay	Outside, distance not determinable
1885:359	Bracelet, gold	near Bantry	Outside, distance not determinable
1902:27	Dish, pewter	near the Castle of Carriganat, Bantry	Outside, distance not determinable
1996:6	Axehead, stone	Bantry House, Seafield townland	Outside, distance not determinable

Department of Arts, Heritage and the Gaeltacht, Sites and Monuments Record

Descriptions based on Denis Power (compiler) *Archaeological inventory of county Cork vol. 1: West* Cork Archaeological Survey of Ireland (Stationary Office, Dublin 1992). Locations in Irish National Grid.

Note: unless otherwise indicated, Distance to Development refers to distance of the feature to the inner harbour area.

There are no known registered archaeological monuments registered within the development areas.
No mitigation is required on the registered monuments during the proposed development.

Reference No.	Classification	Townland	Description	Easting	Northing	Distance to development
CO118:002001	Bastioned Fort	Newtown	Star-shaped fort with preserved fosse and square-shaped fort. Built in 1650s, refortified 1672 and demolished 1689. Larger settlement associated to NE.	99661	49321	430m E of the Cove
CO118:002002	Country House	Newtown		99630	49414	450m E of the Cove
CO118:002005	Enclosure	Newtown	Raised sub-rectangular areas with slight traces of earthen bank on NW.	99798	49296	800m N
CO118:002006	Souterrain, possible	Newtown	Possible underground passage observed as depression in NW corner of CO118:002005.	99798	49296	800m N
CO118:019	Landscape Feature	Beach	Circular pillar (H 1.2m; circ. 3.7m), of stone and mortar.	97340	47910	642m SW of Abbey Strand
CO118:028	Garden Feature	Abbey	Earthen platform (H 1.4m; 12.4m E-W;55m N-S) surrounded by fosse (D 1.45m); trees planted in and around platform edge. Probable ornamental feature.	97960	48020	200m S of Abbey Strand
CO118:029	Redundant record	Abbey	No information available.	97940	48160	77m S of Abbey Strand
CO118:034001/02	Church and Graveyard	Townlots	Described in 1749 as a 'decent parish church', the standing building represents largely a rebuild of 1818, rectangular in plan with four blocked windows in S wall and three in N wall; E gable replaced by neo-Romanesque doorway.	99857	48472	490m E
CO118:033	Burial Ground	Dromleigh North	Burial ground inaccessible because of overgrowth.	99561	48006	580m SE
CO118:032	Ringfort	Seafield	Observed as a shadow on aerial photograph, this poorly preserved site is roughly circular in shape, 40m diameter.	98918	48118	360m SW
CO118:075	Country House, 'Bantry House'	Seafield	Eighteenth-century 3-storied 5-bay house commanding views over Bantry Bay, remodeled in nineteenth century.	98676	48164	400m SW
CO118:095	Settlement Cluster	Seafield	See excavations 01E0648 below	986541	48174	400m SW
CO118:003001	Burial Ground	Abbey	On NW side of road overlooking Bantry Bay to N. Shown on O.S. 1st ed. map as rectangular area; enlarged to E and NW on 2nd and 3rd eds; more recent enlargements to S and W. Area of 1st ed. burial gd. is	98170	48210	100m SE of Abbey Strand

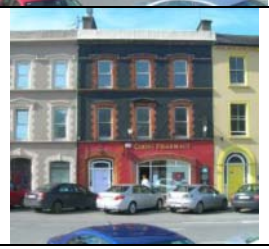
Reference No.	Classification	Townland	Description	Easting	Northing	Distance to development
			now in centre of graveyard and earliest gravestones (19th century) occur here. Site of Franciscan Friary (CO118-03002) to NW side.			
CO118:003002	Bantry Abbey, Franciscan Friary	Abbey	Site now occupied by graveyard (CO118-03001-); only visible remains are collection of sixteen late-medieval carved fragments in graveyard; mostly from door and indoor surround and parts of cloister arcading. Franciscan Friary in existence in 1466 and supressed in 1542; greatly damaged by English in 1568 and remains taken down by Domhnal O'Sullivan Bere in 1602.	98160	48220	87m SE of Abbey Strand
CO118:003003	Iron foundry	Abbey	On shore of Bantry Bay. An iron working site was set up here, near Franciscan Abbey (CO118-03002) before 1685. Site now occupied by graveyard (CO118-03001).	98230	48220	122m E of Abbey Strand

National Inventory of Architectural Heritage

Locations in Irish National Grid.

There are no known registered buildings or features of architectural heritage within the development areas.
No mitigation is required on the registered buildings and features of architectural heritage during the proposed development.

Reference No.	Name	Description		Easting	Northing	Distance to development
20834001	Bantry House Stable block	Detached square-plan former stable block, built c.1845, comprising five-bay two-storey entrance block (north-west) with integrated carriage arch to central bay, giving access to yard at rear (south-east), enclosed by multiple-bay two-storey wings. Sited to south-east of Bantry House. A classically inspired outbuilding forming part of an architectural set-piece, the formal design of which dates to the middle of the nineteenth century when Richard White, Viscount Berehaven and later second Earl of Bantry, undertook a large		98745	48185	340m SW

Reference No.	Name	Description		Easting	Northing	Distance to development
		remodelling of Bantry House.				
20834002	Bantry House Gate Lodge	Detached three-bay two-storey gate lodge, built c.1845, with integral carriage arch to central bay. Sited within flanking quadrant of roughly coursed rubble stone walls to north-east of Bantry House and at west entrance to Bantry town. An imposing Triumphal Arch style gate lodge exhibiting fine stone craftsmanship and retaining its early character and form.		99318	48468	30m S
None	Estate Office	Detached single-bay two-storey estate office, built *c*. early 20th century. Sited next to gate lodge and overlooking inner harbour.		99296	48468	30m S
20834003	M. Evans	Corner-sited end-of-terrace six-bay three-storey house, built c.1890, with recent flat-roofed attic projection and shopfront (north elevation). A finely executed Victorian elevation exhibiting well-crafted decorative detailing most notably the variety of window openings, all of which retain early timber sliding sash windows.		99455	48488	60m SE
20834004	James Lyons & Co.	Attached five-bay three-storey house, built c.1860, with shopfront to ground floor. A pleasing composition distinguished by the finely crafted doorcase, shopfront and window embellishments.		99533	48451	140m SE
20834005	Coen's Pharmacy	Terraced three-bay three-storey house, built c.1860, with replacement shopfront to ground floor.		99542	48449	155m SE

Reference No.	Name	Description		Easting	Northing	Distance to development
20834006	House of Craft	Corner-sited end-of-terrace L-plan four-bay three-storey house, built c.1860, having canted corner bay and shopfront to ground floor.		99551	48435	160m SE
20834007		Terraced three-bay three-storey house, built c.1840. Pitched slate roof with shared rendered chimneystack and cast-iron rainwater goods. Built as part of an attractive terrace, this house maintains its early character and form.		99565	48436	165m SE
20834008	The Gift Shop	Terraced three-bay three-storey house, built c.1840, with shopfront to ground floor.		99540	48431	175m SE
20834009	Tully Bookmakers	Terraced three-bay three-storey house, built c.1840, with shopfront to ground floor.		99576	48430	190m SE
20834058	Courthouse (former)	Attached three-bay two-storey Classical style former courthouse with central pedimented breakfront bay, built c.1830. Now in use as commercial premises and offices. Ashlar limestone walls with pediment to central breakfront bay, pilasters flanking central window, memorial plaques, string course and cornice. Venetian window with timber fixed pane windows and carved limestone dressings. An imposing courthouse which is one of a number in south-west Cork designed by renowned architect George Pain.		99612	48464	200m SE
20834082	Sandril House	End-of-terrace three-bay three-storey house, built c.1830, with wrought-iron porch addition. Set perpendicular to the main square, the siting of this building is unusual. 'Hotel' is marked by this site on the first edition Ordnance Survey map, and it is thought that this building is that nineteenth century hotel.		99592	48516	180m E

Reference No.	Name	Description		Easting	Northing	Distance to development
20834083	O'Mahony Farrelly Solicitors	Attached four-bay three-storey former house, built c.1820, now in use as office.		99585	48515	175m E
20834084	SP O'Luasa Dental Surgery	Semi-detached two-bay three-storey former house, built c.1820, now in use as surgery.		99577	48518	165m E
20834085	GW Biggs & Co Ltd	Attached six-bay two-storey building formerly with three integral carriage arches, built c.1830, now in use as offices. An interesting example of a late nineteenth century premises that has maintained many historic features which ensure the survival of its charming character.		99551	48529	140m E
20834086		Freestanding cast-iron water hydrant, erected c.1880, comprising base, fluted shaft, fluted cap and banding, with lion's head motif to north face. This water hydrant displays artistic detailing in its design, with the fine lion's head motif and fluted shaft enlivening this otherwise functional object. Water hydrants such as this played an important social and functional role in nineteenth and twentieth century Ireland, providing an easily accessible communal water source.		99553	48527	140m E
20834087		End-of-terrace five-bay two-storey over basement house, built c.1820. It may originally have been a pair of two- and three-bay houses.		99521	48596	113m E
20834088	St. Finbar's Boys National School	Detached four-bay single-storey school, built 1853, comprising two-bay central block with single-bay gable-fronted flanking projecting blocks. Recessed two-bay block to north-west. This school is an important landmark and adds considerably to the architectural and social heritage of Bantry town, built on a site donated by the Earl of Bantry in the		99424	48615	45m NE

Reference No.	Name	Description		Easting	Northing	Distance to development
		mid nineteenth century.				
20834089	St. Brendan the Navigator's C of I church	Freestanding double-height Gothic Revival style Church of Ireland church, built 1815, having three-bay nave, three-stage crenulated tower (north-west) and single-bay chancel (south-east). Later three-bay single-storey vestry (north-east). This Church of Ireland church exhibits fine craftsmanship in the coherent Gothic Revival features including finely carved hood mouldings, tower crenulations and pinnacles. Internally, timber detailing exhibits sophisticated and highly skilled carpentry and the fine stained glass windows add further artistic interest. The multiple memorials to the interior of the church in memory of various members of the Shelswell-White family are an indication of the historical ties between the church and the family at Bantry House.		99536	48553	119m E

In addition, one can consider the following features of architectural interest

Reference No.	Name	Description		Easting	Northing	Distance to development
None	Estate Office	Detached single-bay two-storey estate office, built *c*. early 20th century. Sited next to gate lodge and overlooking the inner harbour.		99296	48468	30m S
None	Anchor	Historic ship's anchor said to have been recovered off the northeast point of Whiddy Island, this fine example is thought to be associated with the French Armada fleet anchored in the area in 1798. The timber stock appears to a reconstruction. Situated on Wolfe Tone Square.		99569	48471	170m E

Reference No.	Name	Description		Easting	Northing	Distance to development
None	Sculpture	Bronze sculpture of Wolfe Tone, erected on Wolfe Tone Square.		99501	48505	120m E
None	Sculture	Bronze sculpture of St Brendan, erected on Wolfe Tone Square.		99569	48471	46m E

National Archives of Ireland: Office of Public Works, Piers and Harbour Structures

As stated in the online portal, <http://www.nationalarchives.ie/search-the-archives/>, a separate series of archival records referenced OPW/8/32 contain details of over 350 piers and harbours across Ireland. Much of the material dates from the 19th century, when piers and harbours were under the direction of the Commissioners of Irish Fisheries. The earliest document dates from 1708 and relates to Dublin Harbour, but mostly the collection dates from the 19th to early 20th century. The collection covers the Famine years when many applications were received for works under the Famine Relief Acts, making it an excellent source for the Famine period.

There are no entries in this archive for works at Bantry.

Department of Arts, Heritage and the Gaeltacht, Ports and Harbours Archive

There are a number of references to the quay at Bantry in the mid-1800s.

Ref. 1014.1, 2: in 1864, the existing piers at Bantry prior to 1860 were said to be inadequate; being regularly covered in water at high tides, and the harbour was silted up. Plans for new quays were drawn up in 1861 and in 1867 plans were submitted and work got under way. The pier was to be 400 feet long, 35 feet wide with bangotte and parapet at the western or weather end. It was built of local sandstone with the assistance of a government grant of £3,000.

Ref. 7023: in 1904, construction of a retaining wall is mentioned.

Ref. 7401: in 1906, construction of grid-iron alongside the railway pier is mentioned.

Ref. 8094: in 1909, dredging took place at the entrance to Bantry Harbour, and the spoil was dumped off Whiddy Island.

Department of Arts, Heritage and the Gaeltacht, Licensed archaeological intervention

Source: *Excavations Bulletin*, annual publication edited by Isabel Bennett and published on behalf of the DAHG by Wordwell, Bray, and partially available online at <www.excavations.ie>.

Note: unless otherwise indicated, Distance to Development refers to distance of the licensed event to the inner harbour area.

Licensed work refers to a process of archaeological enquiry, and is part of a mitigation strategy in its own right. Licensed work can vary from non-disturbance survey work to full excavation. The existence of such work in a given location does not resolve the archaeological requirement for further work associated with other projects unless it can be demonstrated categorically that the existing archaeological work has removed all cultural deposits properly down to natural layers throughout the area of the new development.

Licence No.	Name	Description	Easting	Northing	Distance to development
01E0648	Black Rock, Bantry House	Adjacent to SMR CO118:075, Bantry House. Excavation on a deserted village and 17th-century English town on what is known as the West Lawn of Bantry House. The site has remained undisturbed since it was abandoned in the 17th century. Geophysical survey identified two house structures and a number of boundary features. Excavation confirmed the presence of mid-17th century house, which was in turn built over a more substantial building, considered to be a timber-built administrative building to serve the English presence. Underlying both buildings was a ditch feature interpreted as a palisade trench, dating to the late 16th/early 17th century, which may have surrounded an early plantation settlement. Cultivation ridges dating to the 16th century were also uncovered, and these truncated a pre-existing domestic structure thought to be Gaelic in character (Colin Breen, in Bennett (ed.) *Excavations 2001* p. 31.123; see also Colin Breen, *The Gaelic Lordship of the O'Sullivan Beare* (Dublin 2005), pp 90-94, 136-139, 167-170.	98690	48140	400m SW
06D066, 06R0159	Abbey Point and Creamery Point, Bantry Bay	Underwater non-disturbance assessment in advance of two proposed slipways at Abbey Point and at the 'Narrows'; a stretch of water located between the southern shoreline of the harbour and the SE side of Whiddy Island. Location of possible abbey site and burial ground (CO118-029; 03001) located close by. Underwater survey at Abbey Point covered a 70m N-S by 80m E-W area around the Point, and this was complemented by an intertidal survey of a 300 m stretch of the corresponding foreshore. No material of archaeological significance observed in the surveys (Rex Bangerter, 2006; Bangerter in Bennett (ed.) *Excavations 2006*, p.62.276).	98261 TO 91222	48156 to 48257	Defines the east end of the Abbey Strand development area.

Licence No.	Name	Description	Easting	Northing	Distance to development
		Monitoring during the surbsequent construction phase did not reveal material of interest (Connie Kelleher, AHG pers. comm. 2012).			
05D0123, 05R0167	The Narrows, Bantry Bay	Underwater non-disturbance assessment in advance of proposed outfall pipeline associated with the Bantry Sewerage Scheme. Nothing of archaeological significance observed (Rex Bangerter, in Bennett (ed.) *Excavations 2006*, p. 62.277.	96855	48004	2.1km W
07D029, 07R0133	The Quays, Seafield, Bantry	Intertidal survey on the south side of Bantry Harbour. Trenches appear to have been cut but nothing of archaeological significance was observed (Avril Purcell, in Bennett (ed.) *Excavations 2007* p. 49.217.	99055	48460	Within the inner harbour development area, S side

Department of Arts, Heritage and the Gaeltacht, Historic Shipwreck Inventory

Additional sources: Edward J. Bourke, *Shipwrecks of the Irish Coast 1105-1993* (Dublin 1994*); Shipwrecks of the Irish Coast Volume 2 932-1997* (Dublin 1998); *Shipwrecks of the Irish Coast Volume 3 1582-2000* (Dublin 2000); Colin Breen, *Integrated marine investigations on the historic shipwreck La Surveillante*, Centre for Maritime Archaeology Monograph Series 1 (2001); http://www.wrecksite.eu

Locational data where available is converted to Irish National Grid.

Note: unless otherwise indicated, Distance to Development refers to distance of the feature to the inner harbour area.

There are no known shipwrecking events registered within or adjacent to the development areas.
No mitigation is required of these events during the proposed development.

Name	Date of Loss	Location	Easting	Northing	Description	Distance to development
Barbara	13/12/1812	Bantry Bay			This vessel was en route from London to Malta when heavy seas hit her. She put into Bantry Bay when she foundered.	Unknown
Betelgeuse	29/01/1979	Whiddy Island	94070.755	49423.792	51°41.269' N, 009°31.949' W. French registered oil tanker, exploded off Gulf Oil Jetty at Whiddy Island Terminal.	5km WNW
Bonaventure	1665	Bantry			This vessel sank in the Bay.	Unknown
Elizabeth and	20/10/1820	Off Bantry Bay			This vessel was en route from Tralee to	Unknown

Name	Date of Loss	Location	Easting	Northing	Description	Distance to development
Sally					Liverpool when she was lost.	
Frederick 'Busmanning'??	23/1/1862	Bantry Harbour			En route from Budeansk to Cork or Falmouth, this 301 ton wooden barque began leaking in bad weather and lost her main and mizzenmast. She made it into Bantry but was a partial loss.	Unknown
Holmfield M. V.	1963	N end Whiddy Island			600 ton vessel went aground.	Unknown
Infanta	14/11/1683	Bantry Bay			This Spanish galleon was carrying 1100 silver bars worth $300,000 when she sank. She may be wreck located in 120 metres, the rigging of which sometimes snags nets.	Unknown
H.M.Leandelr	18/6/1885	Bantry Bay			This steel cruiser formed part of the 'evolutionary squadron'. She went ashore on some rocks in the bay but was later got off. No lives were lost.	Unknown
La Surveillante	01/1797	Bantry Bay, N of Whiddy Island	93510.157	51216.487	**51°42.229' N 009°32.468' W French frigate scuttled in January 1797. Rediscovered in 1981 and the subject of significant investigation and study, the site lies partially buried in silt at a depth of 34m; it measures 40m long and 10m wide amidships, and large elements of the timber structure and material assemblage remain intact ,and some of which have been recovered.**	6.2km NW
Manhattan	19th century	Bantry Bay?			The bodies of two sailors from the "Llanehattan"? were washed in at Pulleen West of Castletownbere.	Unknown
Nabby	8/1/1805	Near Bantry Bay			This vessel was en route from Liverpool to Boston when she was lost.	Unknown
Ocean Queen	8/12/1886	Bantry			This 42-ton wooden fishing schooner was moored at Bantry, with no one aboard, when she was stranded and totally wrecked in a NW force 11 gales.	Unknown
Plover	23/1/1884	Near Bantry			This 20-ton wooden cutter was moored in	Unknown

Name	Date of Loss	Location	Easting	Northing	Description	Distance to development
		Pier			Bantry Bay, in ballast, when she became stranded and totally wrecked in a NW force 11 gale.	
Protector	28/9/1825	Off Bantry Head			This sloop of Berehaven foundered and the crew were lost.	Unknown
Rio Formosa	1878	Bantry Bay			This 163-ton Clyde Co. steamer was built in Chester in 1870. She was on the Cork-Kinsale-Schull-Bantry-Kenmare-Dingle route when she was wrecked.	Unknown
Sally and Jenny	15/1/1760	Bantry Bay			This vessel was en route from Philadelphia to cork when she was lost.	Unknown
Scelova	30/12/1796	20 leagues W of Bantry			Part of the French fleet, she foundered while returning to France.	Unknown
Sir George	13/3/1810	Bantry Bay			This vessel was en route from Martinique to Liverpool when she was wrecked.	Unknown
St. Ita		Bantry Bay, off Whiddy Island near Gerane Rock	92796.945	48079.772	51°40.530' N, 009°33.029' W, Fishing trawler. Mast not visible.	6.1km W
Thunderer M. V.	13/3/1810	Bantry Bay			This vessel was en route from Martinique to Liverpool when she was wrecked.	Unknown
Waterwitch	16/8/1898	Bantry			This 3-ton wooden steam trawler was moored in ballast at Bantry when one of the boiler tubes exploded. The vessel became a partial loss and one life was lost.	Unknown
Unknown	Nov. 1692	Bantry Bay			This 20-gun privateer of St. Malo, France, was wrecked in a storm.	Unknown
Unknown	Nov. 1692	Bantry			Bantry locals seized this privateer, with 130 men aboard. Seven of the crew were taken as prisoners to Kinsale.	Unknown
Unknown	28/04/1770	Bantry Bay			Ship from Dominico bound for Liverpool, wrecked, carrying cargo of coffee, cocoa and cotton. Master was Guyon.	Unknown
Unknown	20/2/1826	At Bantry			The cutwater of a 600 tons American ship was washed ashore. It had an elegant figurehead.	Unknown

Name	Date of Loss	Location	Easting	Northing	Description	Distance to development
Unknown	19th/20th century	Bantry Bay			She went on the rocks and was wrecked	Unknown
Unknown		Bantry Bay	92801.724	46456.459	51°39.655' N, 009°32.995' W. Barge, lighter. Approx 95ft long, no masts or winches (Commissioners of Irish Lights, 30/10/2001); in water depth of 12.55m; 26m long, 10m wide, 2.5m high, intact, no debris (GSI, 09/2009)	6.5km SW

Appendix 2B

Draft requirements for a geophysical survey for archaeological purposes. The Underwater Archaeology Unit, Department of Arts, Heritage and the Gaeltacht

[Note: document is amended to take account of the change in ministry from the Department of the Environment, Heritage and Local Government to the Department of Arts, Heritage and the Gaeltacht.]

General:

Geophysical survey is usually required as part of an underwater archaeological assessment. The results of the geophysical survey should therefore form part of the overall archaeological assessment report. This report should comprise of the following:

- Introduction/Summary of requirement for survey and brief background to proposed work/development including who is undertaking the proposed works and any reference numbers, detection device licence numbers, date of report, etc.
- Details of equipment and personnel used, including qualifications.
- Details of survey methodology.
- Site location map showing proposed development/works.
- Survey grid superimposed on location map.
- Impact Statement detailing the possible impact of the proposed works on known or potential underwater archaeology.
- Historical and Archaeological section detailing background to area to be impacted. This should included (where relevant) consultation with the National Shipwreck Inventory for the area, Ports and Harbours Archive and Record of Monuments and Places, all held by the National Monuments Service of the Department of Arts, Heritage and the Gaeltacht; Topographical Files of the National Museum of Ireland; Local sources and printed material such as books on shipwrecks, local journals and histories, etc.
- Track plots of the geophysical survey over the survey area.
- Raw geophysical data on CD to be included at end of report with details of software used.
- List of any anomalies identified and images of the anomalies with positions.
- Recommendations as to further archaeological mitigation requirements for the proposed works.

    - Section 2(2) of the 1987 (Amend.) National Monuments Act states that it is prohibited to use without the consent of the Minister for Department of Arts, Heritage and the Gaeltacht any detection devices in any place '*for the purpose of searching for archaeological objects'.* It is therefore necessary for any geophysical survey to be licenced by the National Monuments Service of the Department of Arts, Heritage and the Gaeltacht. Application forms are available from the licensing section of the Department of Arts, Heritage and the Gaeltacht, Room G.50, Custom House, Dublin 1.

    - It should be noted that all sites should be dealt with on an individual basis. As such, each site will have its own specific requirements. Therefore a method statement should be attached to the application when applying for the survey licence. A copy of this method statement should also be forwarded to the office of the Underwater Archaeology Unit, Custom

House, Dublin 1, so that the proposed methods are in line with the necessary requirements.

Specifications for geophysical survey undertaken for archaeological purposes:

Side-scan sonar:

- For archaeological purposes the side-scan sonar should have an operational frequency of 410/500 khz.
- Side-scan should be set at 50m survey line spacing
- If this is narrower then it should be corrected
- This should not be slant-range corrected
- There should be 100% coverage of sites and therefore overlap of areas may be required.

Magnetometer:

- A magnetometer should always be used in tandem with side-scan sonar
- Proton or caesium magnetometer should be used with 50m side spacing
- This should be used with DGPS

Sub-bottom profiler (optional):

- If using a sub-bottom profiler then the Chirp system is the preferred one as this gives the best resolution
- This should be used in conjunction with DGPS

General:

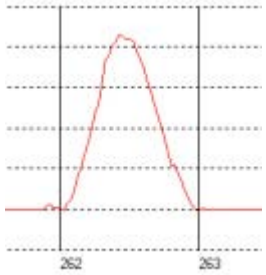
- Co-ordinates should preferably be given in National Grid references but supported by latitude and longitude.
- Track plots should also be recorded and included in the archaeological assessment report
- Track plots should be superimposed onto a locational chart
- All geophysical survey should be carried out by suitably qualified personnel. Preferably they should also have underwater archaeological experience. If this is not possible then the results must be viewed and interpreted by a qualified archaeo-geophysicist, details of whom should be included with the method statement accompanying the Detection Device licence application.
- A copy of the original Raw data/traces as well as the interpreted results of the geophysics should be sent to the Underwater Archaeology Unit of Department of Arts, Heritage and the Gaeltacht or should be included with the Underwater Archaeological Assessment Report. Further archaeological mitigation may be required once the data has been reviewed.

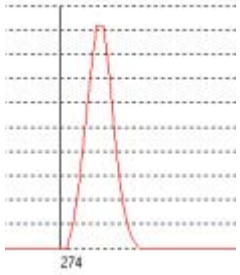
Appendix 2C

List of magnetometer anomalies observed in marine geophysical survey

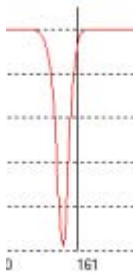
Source: Irish Hydrodata Ltd data logs and ADCO fieldwork

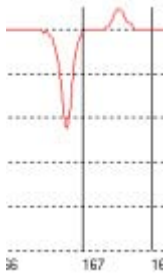
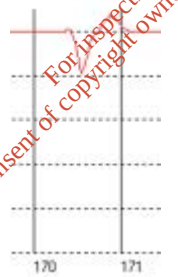
The Cove

Reference	Fix	Magnetic value	ING Easting	ING Northiing	Image	ADCO Dive Observations	Development Impact	Mitigation
mg1	210	7.45	99179.41	49229.14		Mooring	A breakwater is to be constructed in this location	Archaeological monitoring of seabed disturbances.
mg2	213	-4.12	99246.52	49233.78		Mooring	A breakwater is to be constructed in this location	Archaeological monitoring of seabed disturbances.
mg3	262	21.48	99128.75	49145.85		No anomaly was observed exposed on the seabed, indicating that the magnetic anomaly may be buried.	A breakwater is to be constructed in this location	Archaeological monitoring of seabed disturbances.

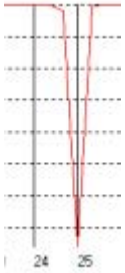
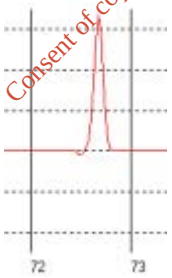
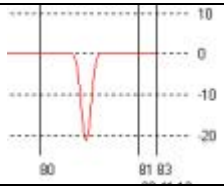
Reference	Fix	Magnetic value	ING Easting	ING Northiing	Image	ADCO Dive Observations	Development Impact	Mitigation
mg4	274	18.35	99081.63	49161.44		No anomaly was observed exposed on the seabed, indicating that the magnetic anomaly may be buried.	A breakwater is to be constructed in this location	Archaeological monitoring of seabed disturbances.
mg5	248	2.10	99138.69	49123.08		No anomaly was observed exposed on the seabed, indicating that the magnetic anomaly may be buried.	A breakwater is to be constructed in this location	Archaeological monitoring of seabed disturbances.

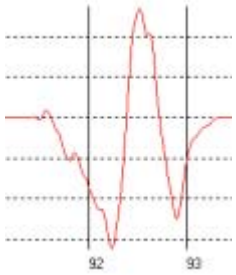
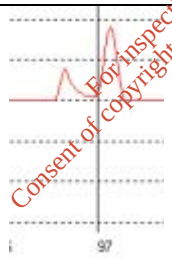
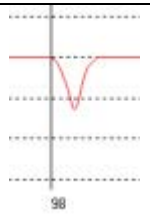
Béicín Strand

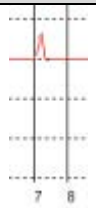
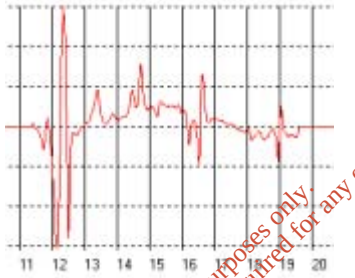
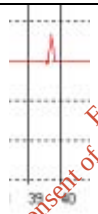
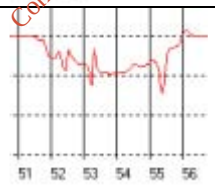
Reference	Fix	Magnetic value	ING Easting	ING Northiing	Image	ADCO Dive Observations	Development Impact	Mitigation
mg6	160	-97.83	99003.96	48713.92		Concrete groyne	Béicín Strand is being considered for the reuse of dredge material as part of the beach	Archaeological monitoring.

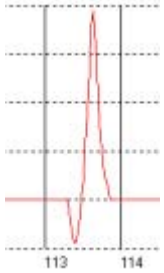
Reference	Fix	Magnetic value	ING Easting	ING Northiing	Image	ADCO Dive Observations	Development Impact	Mitigation
							nourishment component.	
mg7	167	9.35	99010.21	48852.73		A steel pipe, ADCO 05, was recorded extending from the foreshore *c*. 13 m south of the anomaly location.	Béicín Strand is being considered for the reuse of dredge material as part of the beach nourishment component.	Archaeological monitoring.
mg8	170	7.52	99025.4	48911.16		A cluster of rock in this location may be the source of the magnetic anomaly.	Béicín Strand is being considered for the reuse of dredge material as part of the beach nourishment component.	Archaeological monitoring.

Inner Harbour

Reference	Fix	Magnetic value	ING Easting	ING Northiing	Image	ADCO Dive Observations	Development Impact	Mitigation
mg9	25	-1522.47	99158.18	48563		Mooring block 	Dredging	Archaeological monitoring.
mg10	67	7.60	99302.93	48532.68		**Bicycle frame** 	Dredging	Archaeological monitoring.
mg11	72	33.69	99183.56	48518.01		No anomaly identified, indicating that it is buried in the soft covering silts	Dredging	Archaeological monitoring.
mg12	80	-21.23	98997.38	48491.67		No anomaly identified, indicating that it is buried in the soft covering silts	Dredging	Archaeological monitoring.

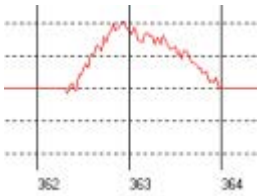
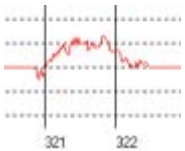
Reference	Fix	Magnetic value	ING Easting	ING Northiing	Image	ADCO Dive Observations	Development Impact	Mitigation
mg13	92	53.82	99153.26	48547.55		Mooring block, same as mg 18 	Dredging	Archaeological monitoring.
mg14	95	9.09	99222.33	48561.22		No anomaly identified, indicating that it is buried in the soft covering silts	Dredging	Archaeological monitoring.
mg15	97	36.36	99262.52	48564.55		No anomaly identified, indicating that it is buried in the soft covering silts	Dredging	Archaeological monitoring.
mg16	98	-25.52	99289.23	48566.98		No anomaly identified, indicating that it is buried in the soft covering silts	Dredging	Archaeological monitoring.

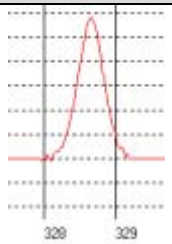
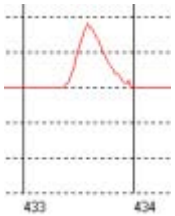
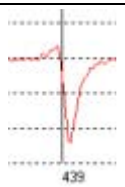
Reference	Fix	Magnetic value	ING Easting	ING Northiing	Image	ADCO Dive Observations	Development Impact	Mitigation
mg17	7	30.72	99030.24	48561.18		No anomaly identified, indicating that it is buried in the soft covering silts	Dredging	Archaeological monitoring.
mg18	12	149.36	99152.26	48547.1		Mooring block, same as mg 18 	Dredging	Archaeological monitoring.
mg19	39	32.27	98998.59	48437.62		Shopping trolley 	Dredging	Archaeological monitoring.
mg20	55	-72.23	99221.1	48542.42		Mooring 	Dredging	Archaeological monitoring.

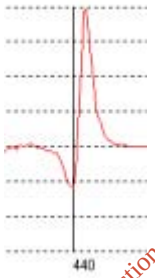
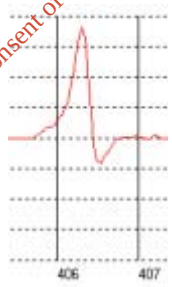
Reference	Fix	Magnetic value	ING Easting	ING Northiing	Image	ADCO Dive Observations	Development Impact	Mitigation
mg21	113	19.45	99281.87	48519.16		Shopping basket 	Dredging	Archaeological monitoring.

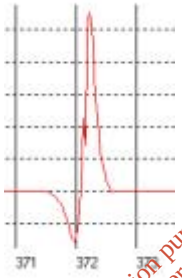
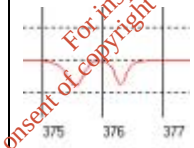
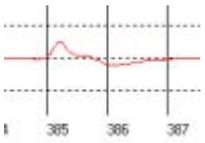
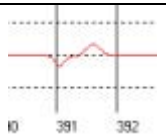
Abbey Strand

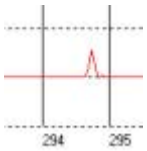
Reference	Fix	Magnetic value	ING Easting	ING Northiing	Image	ADCO Dive Observations	Development Impact	Mitigation
mg22	352	6.66	97982.96	48338.31		Mooring	The location is being considered for the reuse of dredge material as part of the land reclamation component.	Archaeological monitoring.

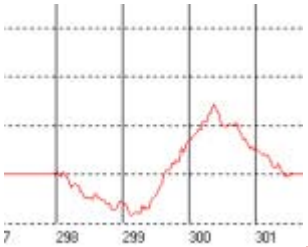
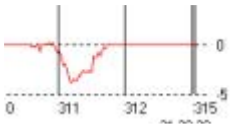
Reference	Fix	Magnetic value	ING Easting	ING Northiing	Image	ADCO Dive Observations	Development Impact	Mitigation
mg23	363	3.44	97715.77	48317.09		Location not inspected as it is outside the proposed development works area	None	None.
mg24	365	5.86	97656.61	48309.86		Location not inspected as it is outside the proposed development works area	None	None.
mg25	318	1.02	97581.11	48287.16		Location not inspected as it is outside the proposed development works area	None	None.
mg26	321	2.57	97675.77	48291.79		Location not inspected as it is outside the proposed development works area	None	None.

Reference	Fix	Magnetic value	ING Easting	ING Northiing	Image	ADCO Dive Observations	Development Impact	Mitigation
mg27	328	11.60	97824.22	48307.39		Mooring	None, the location is outside the proposed development works area.	None.
mg28	433	9.21	97863.69	48247.92		Mooring	None, the location is outside the proposed development works area.	None.
mg29	438	-5.13	97964.55	48253.16		No anomaly identified, indicating that it is buried in the soft covering silts	The location is being considered for the reuse of dredge material as part of the land reclamation component.	Archaeological monitoring.
mg30	438	1.24	97979.79	48254.86		No anomaly identified, indicating that it is buried in the soft covering silts	The location is being considered for the reuse of dredge	Archaeological monitoring.

Reference	Fix	Magnetic value	ING Easting	ING Northiing	Image	ADCO Dive Observations	Development Impact	Mitigation
							material as part of the land reclamation component.	
mg31	440	19.50	98006.34	48258.45		No anomaly identified, indicating that it is buried in the soft covering silts	The location is being considered for the reuse of dredge material as part of the land reclamation component.	Archaeological monitoring.
mg32	406	36.16	98081.25	48301.01		Mooring	The location is being considered for the reuse of dredge material as part of the land reclamation component.	Archaeological monitoring.

Reference	Fix	Magnetic value	ING Easting	ING Northiing	Image	ADCO Dive Observations	Development Impact	Mitigation
mg33	424	8.76	97652.83	48272.31		Location not inspected as it is outside the proposed development works area	None.	None.
mg35	372	110.27	97636.83	48249.36		Location not inspected as it is outside the proposed development works area	None.	None.
mg36	375	-15.41	97693.27	48251.5		Location not inspected as it is outside the proposed development works area	None.	None.
mg37	385	10.16	97852.7	48262.9		Mooring. Location is outside the proposed development works area	None.	None.
mg38	391	6.73	97982.92	48281.07		Timber pole with metal fastenings, ADCO 22.	The location is being considered	Move the timber from its present location

Reference	Fix	Magnetic value	ING Easting	ING Northiing	Image	ADCO Dive Observations	Development Impact	Mitigation
							for the reuse of dredge material as part of the land reclamation component.	to an underwater point on Abbey Strand that lies outside the development area. Archaeological monitoring.
mg39	393	-5.91	98025.83	48280.88		Mooring	The location is being considered for the reuse of dredge material as part of the land reclamation component.	Archaeological monitoring.
mg40	294	2.71	98019.21	48240.14		No anomaly identified, indicating that it is buried in the foreshore silts	The location is being considered for the reuse of dredge material as part of the land	Archaeological monitoring.

Reference	Fix	Magnetic value	ING Easting	ING Northiing	Image	ADCO Dive Observations	Development Impact	Mitigation
							reclamation component.	
mg41	300	7.20	97912.87	48237.17		No anomaly identified, indicating that it is buried in the foreshore silts	The location is being considered for the reuse of dredge material as part of the land reclamation component.	Archaeological monitoring.
mg42	302	18.67	97863.82	48238.41		No anomaly identified, indicating that it is buried in the soft covering silts	None, the location lies outside the proposed development area.	None.
mg43	311	-3.87	97701.24	48245.09		Location not inspected as it is outside the proposed development works area	None.	None.

Appendix 2D
Features observed in the course of the non-disturbance archaeological inspection and assessment

Source: ADCO fieldwork

Note: in the absence o f reference codes to other classifications, such as the SMR and the NIAH, the features are assigned a project number, ADCO1+.

The Cove

Ref No.	Classification	Townland	Easting	Northing
ADCO 1	Escarpment	Newtown	99288	49285
Description	Low linear break in slope extending *c*. 15m across lower end of foreshore, with the slope facing E and dropping *c*. 30 cm. The feature corresponds with an indication on the third edition OS six-inch sheet, and may represent a localized 'hard' feature for landing purposes.			
Development Impact	None			
Mitigation	None			

Ref No.	Classification	Townland	Easting	Northing
ADCO 2	Escarpment	Newtown	99265	49276
Description	Low linear break in slope extending *c*. 10m across the mid section of the foreshore, with the slope facing E and dropping *c*. 20 cm. The feature is roughly parallel with ADCO 01, which is located 20 m to the E, and may therefore be related to it and represent a localized 'hard' feature for landing purposes.			
Development Impact	None			
Mitigation	None			

Ref No.	Classification	Townland	Easting	Northing
ADCO 3	Mooring	Newtown	99312	49276
Description	Modern mooring used to secure local fishing boats			
Development Impact	None			
Mitigation	None			

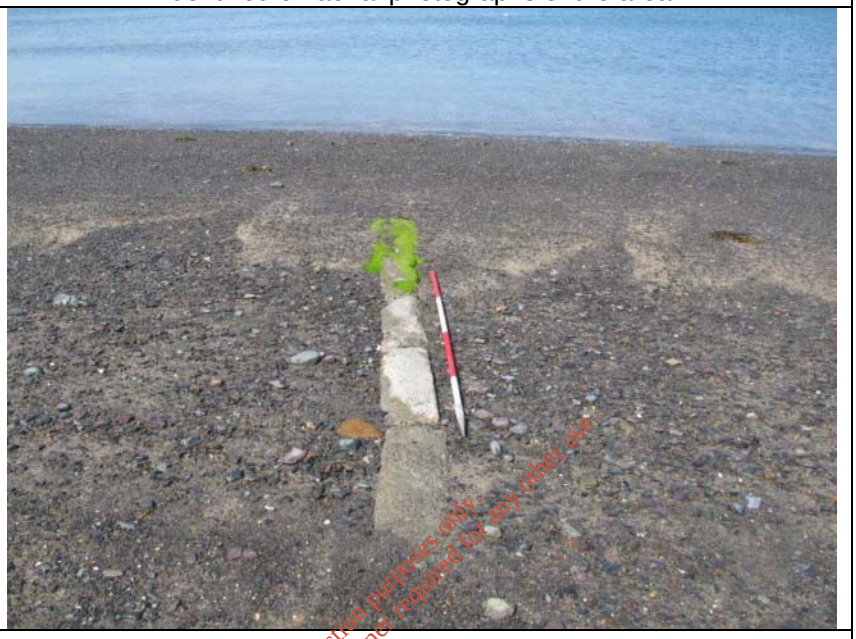
Béicín Strand

Ref No.	Classification	Townland	Easting	Northing
ADCO 4	Wooden post	Reenrour West	99092	49019
Description	Denuded stump of a timber post embedded into the foreshore and rising 40cm in height.			
Development Impact	The location is being considered for the reuse of dredge material as part of the beach nourishment component.			
Mitigation	Archaeological monitoring of any seabed excavation activity.			

Ref No.	Classification	Townland	Easting	Northing
ADCO 5	Outfall pipe	Reenrour West	99010	48836
Description	Seaweed–covered metal pipe extending seaward across the lower reaches of the intertidal foreshore. This feature is reasonably considered to be magnetic anomaly mg7.			
				
Development Impact	The location is being considered for the reuse of dredge material as part of the beach nourishment component.			
Mitigation	Archaeological monitoring of any seabed excavation activity.			

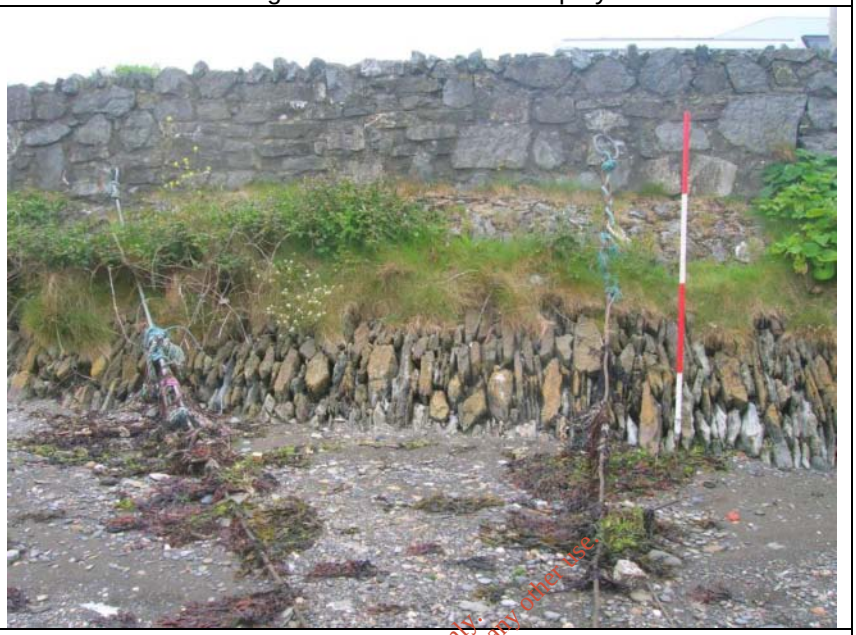
Ref No.	Classification	Townland	Easting	Northing
ADCO 6	Rock	Reenrour West	99019	48715
Description	Large natural rock, measuring in excess of 3m in length, 2m in width and 2m in height, sitting on foreshore.			
				
Development Impact	The location is being considered for the reuse of dredge material as part of the beach nourishment component.			
Mitigation	Archaeological monitoring of any seabed excavation activity.			

Ref No.	Classification	Townland	Easting	Northing
ADCO 7	Groyne	Reenrour West	99031	48714
Description	3m long line of reinforced concrete slab, 40cm wide, crossing lower foreshore at right angles to the shoreline. It corresponds with mg 6. A similar feature (ADCO 8) is observed 30m to the south, and both are part of a series of groynes identified on aerial photographs of the area.			
				
Development Impact	The location is being considered for the reuse of dredge material as part of the beach nourishment component.			
Mitigation	Archaeological monitoring of any seabed excavation activity.			

Ref No.	Classification	Townland	Easting	Northing
ADCO 8	Groyne	Reenrour West	99032	48685
Description	3.8m long line of reinforced concrete slab, 40cm wide, crossing lower foreshore at right angles to the shoreline. A similar feature (ADCO 7) is observed 30m to the north, and both are part of a series of groynes identified on aerial photographs of the area.			
				
Development Impact	The location is being considered for the reuse of dredge material as part of the beach nourishment component.			
Mitigation	Archaeological monitoring of any seabed excavation activity.			

Inner Harbour

Ref No.	Classification	Townland	Easting	Northing
ADCO 9	Mooring ring	Reenrour West	99194	48588
Description	Galvanized mooring ring secured to modern wall to secure light vessels to the north quay area.			
				
Development Impact	The existing masonry wall is to be replaced, resulting in a direct impact on this modern mooring ring.			
Mitigation	None			

Ref No.	Classification	Townland	Easting	Northing
ADCO 10	Mooring rings x 2	Reenrour West	99217	48588
Description	Two galvanized mooring rings set 5 m apart secured to modern wall to secure light vessels to the north quay area.			
				
Development Impact	The existing masonry wall is to be replaced, resulting in a direct impact on these modern mooring rings.			
Mitigation	None			

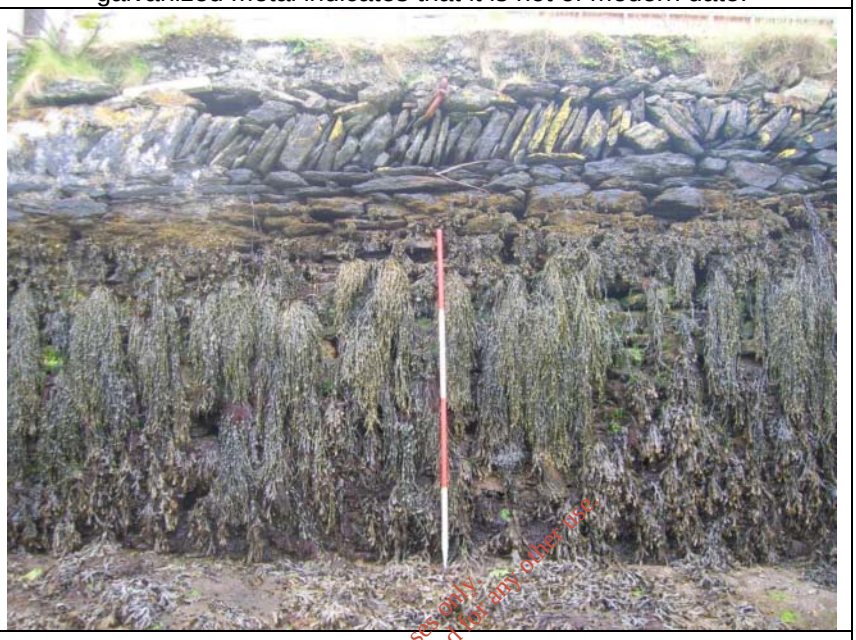
Ref No.	Classification	Townland	Easting	Northing
ADCO 11	Outfall	Reenrour West	99304	48609
Description	Modern steel outfall pipe embedded in concrete and inserted through existing stonework of the north quay area. The pipe is located more or less on the townland boundary with TownLots, which suggests that it carries a former stream into the inner harbour area.			
				
Development Impact	The existing masonry wall is to be replaced, and the rock armouring may be upgraded around this modern culvert.			
Mitigation	None			

Ref No.	Classification	Townland	Easting	Northing
ADCO 12	Quay and Outfall	Town Lots	99394	48525
Description	Stone-built south quay area comprising neatly laid horizontal slabs. A modern outfall pipe sheathed is a rubberized one-way valve is neatly integrated into the stonework, indicating the comparative recent date of this quay façade in this location, or at least its rebuilding.			
				
Development Impact	The quay wall will be concealed behind a new revetment that will be extended and it is to be a reclamation area.			
Mitigation	Detailed pre-development recording of the existing quay wall. Archaeological monitoring during development.			

Ref No.	Classification	Townland	Easting	Northing
ADCO13	Mooring ring	Town Lots	99382	48498
Description	Galvanized mooring ring set into concrete pad that forms the modern upper surface of the south quay wall in this location, used to secure light vessels to the south quay area.			
				
Development Impact	The quay wall will be concealed behind a new revetment that will be extended and it is to be a reclamation area.			
Mitigation	Detailed pre-development recording of the existing quay wall. Archaeological monitoring during development.			

Ref No.	Classification	Townland	Easting	Northing
ADCO14	Wood	Town Lots	99343	48500
Description	Water worn stump of vertical timber protruding c. 40 cm above the silt deposit on the intertidal foreshore of the inner harbour, downstream of Slipway 1 and close to the south quays.			
				
Development Impact	The location will be concealed below a new revetment that will be extended.			
Mitigation	Archaeological monitoring.			

Ref No.	Classification	Townland	Easting	Northing
ADCO15	Culvert, stone	Town Lots	99235	48497
Description	Sqaure-built stone culvert, measuring 55 cm wide and high, constructed at the base of the south quay wall, and extending straight back from the quayside.			
				
Development Impact	The location will be concealed below a new revetment that will be extended.			
Mitigation	Detailed pre-development recording of the existing quay wall. Archaeological monitoring during development.			

ef No.	Classification	Townland	Easting	Northing
ADCO16	Shackle	Town Lots	99151	48494
Description	Iron shackle embedded into the upper levels of the south quay, for use as a mooring aid. The fact that the piece is iron and not galvanized metal indicates that it is not of modern date.			
				
Development Impact	The location will be concealed below a new revetment that will be extended.			
Mitigation	Detailed pre-development recording of the existing quay wall. Archaeological monitoring during development.			

Ref No.	Classification	Townland	Easting	Northing
ADCO17	Anchor	Town Lots	99202	48495
Description	Modern galvanized small anchor, with one fluje protruding above the silt deposits.			
				
Development Impact	This area will be dredged as part of the development.			
Mitigation	Archaeological monitoring.			

Ref No.	Classification	Townland	Easting	Northing
ADCO18	Culvert	Town Lots	99094	48483
Description	Square-shaped stone-built culvert, measuring c. 40 cm wide and high, built into base of existing south quay wall.			
				
Development Impact	The location will be concealed below a new revetment that will be extended.			
Mitigation	Detailed pre-development recording of the existing quay wall. Archaeological monitoring during development.			

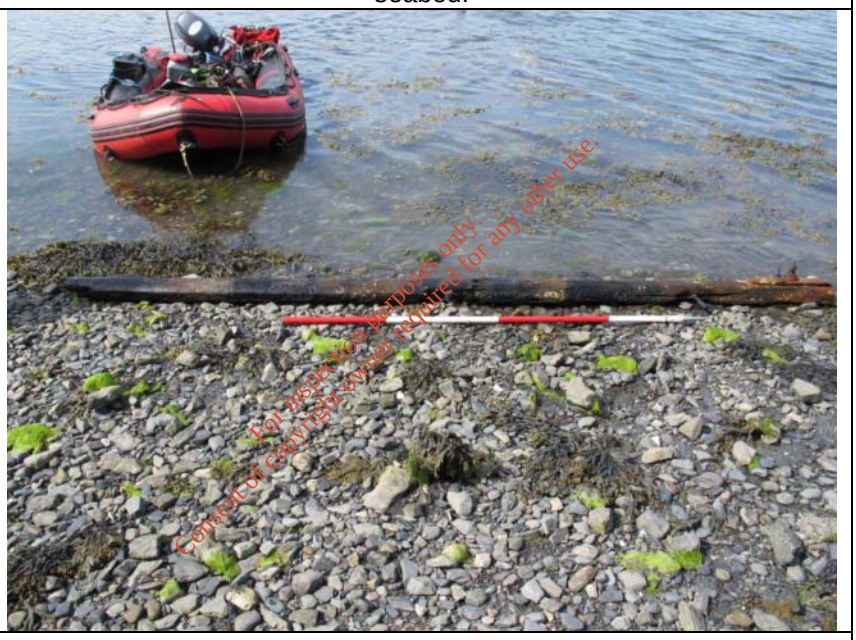
Ref No.	Classification	Townland	Easting	Northing
ADCO19	Slipway	Town Lots	99355	48500
Description	A stone-built double slipway measuring 22 m long and 9 m deep in overall dimensions is recessed behind the existing south quay wall. A pair of slips is constructed on either side of a 14.6 m long open recess providing access to vessels within the enclosed shelter of the slipway. The feature is well built and retains interesting original features, such as a battered wall profile and curved corners, which would have minimized damage to vessels bumping against the walls. The foot of the wall was not exposed. The builders used thin stone slabs throughout, just as are found on much of the south quay wall. The slabs measure up to 75 cm in length, 30 cm in height, and 20 cm in thickness. Nine 'courses' of this stonework was observed at the inner wall. The stones are laid flat over much of the feature except on the slipways themselves, where the stones are set on edge, forming a corrugated or cobbled surface to aid traction. Slightly larger slabs are chosen to present an edge to the uppermost surfaces of features; a series of two long narrow slabs measuring 2.5 m and 3.5 m in length define the eastern edge of the slipway, and a similar use of two long slabs (each 2.6 m long) is found overlooking the western slipway. The slipway is not entirely symmetrical in design, indicating the traditional approach to its construction. The outer quay wall of the eastern slip is 2.75 m deep. The slip is 6 m long and 3.6 m wide. The outer quay wall of the western slip is 3m deep. The slip is also 6 m long but it is 3.5 m wide. A galvanized mooring ring exists off the top of the eastern slip, while an older iron ring is found off the western slip. The slipway is festooned in seaweed but is still in use; the wreck of a local fishing boat is abandoned on the eastern half, while an active boat is tied up in the western half. See Figure 24 for a range of photographs.			
Development Impact	The slipway will not be affected directly by the scheme and is to remain as it is. However, a sheet-pile wall will be put in front of the slipway, positioned low enough to permit boat access to the slipway.			
Mitigation	Measured archaeological survey of the slipway in advance of any development works. Archaeological monitoring during construction. Liaison with any reconstitution works to ensure that the original fabric of the slipway is maintained where possible.			

Ref No.	Classification	Townland	Easting	Northing
ADCO20	Slipway	Town Lots	99284	48492
Description	A stone-built double slipway measuring 21 m long and 10.8 m deep in overall dimensions is recessed behind the existing south quay wall. A pair of slips is constructed on either side of a 13.5 m long open recess providing access to vessels within the enclosed shelter of the slipway. The feature is well built and retains interesting original features, such as a battered wall profile and curved corners, which would have minimized damage to vessels bumping against the walls. The foot of the wall was not exposed but the outer wall survives to a height of 2.2 m above the silts. Constructed in a similar fashion to the slipway to the east, the builders used thin stone slabs throughout, as are found on much of the south quay wall. The slabs measure up to 75 cm in length, 30 cm in height, and 20 cm in thickness. Eleven 'courses' of this stonework was observed at the inner wall. The stones are laid flat over much of the feature except on the slipways themselves, where the stones are set on edge, forming a corrugated or cobbled surface to aid traction. Slightly larger slabs were chosen to present an edge to the uppermost surfaces of features, but the present external surfaces of the slipway are capped with an old concrete slab, measuring up to 70 cm thick. The slipway is not symmetrical in design, indicating the traditional approach to its construction. The outer quay wall of the eastern slip is 2.75 m deep. The slip is 7.5 m long and 4 m wide. The outer quay wall of the western slip is 3.8 m deep and its internal façade runs at an oblique angle rather than at right angles. The slip is also 7 m long but it is 3.75 m wide. An iron mooring ring exists off the top of the eastern slip, and two iron pins are found off the western slip. The slipway is festooned in seaweed but is still in use; with two local fishing boats occupying the recessed space. See Figure 25 for a range of photographs.			
Development Impact	The slipway will not be affected directly by the scheme and is to remain as it is. However, a sheet-pile wall will be put in front of the slipway, positioned low enough to permit boat access to the slipway.			
Mitigation	Measured archaeological survey of the slipway in advance of any development works. Archaeological monitoring during construction. Liaison with any reconstitution works to ensure that the original fabric of the slipway is maintained where possible.			

Ref No.	Classification	Townland	Easting	Northing
ADCO 21	Slipway	Town Lots	99217	48485
Description	A stone-built single slipway measuring 17 m long and c. 10 m deep in overall dimensions is recessed behind the existing south quay wall. A slip is constructed on the eastern side of a 13.9 m long open recess providing access to vessels within the enclosed shelter of the slipway. The feature is well built and retains interesting original features, such as a battered wall profile and curved corners, which would have minimized damage to vessels bumping against the walls. The foot of the wall was not exposed but the outer wall survives to a height of 2.75 m above the silts. Constructed in a similar fashion to the slipways to the east, the builders used thin stone slabs throughout, as are found on much of the south quay wall. The stones are laid flat over much of the feature except on the slipway, where the stones are set on edge, forming a corrugated or cobbled surface to aid traction. The present external surfaces of the slipway are capped with an old concrete slab, measuring up to 60 cm thick. The western return of the slipway is straight-walled; the stonework appears somewhat rougher and a series of edge-set stone over a 110 cm extent suggests the inclusion of a relieving arch feature. The slip on the east side is 7.4 m long and 3.90 m wide, and the wall height at the lowermost point of the slipway is 1.90 m. The slipway has been impacted upon in recent times, with the construction of a new end wall, using a series of concrete cubes. There was little attempt made to integrate the new work with the older stonework. However, where walling above the uppermost levels of the slipway has been upgraded at pedestrian level, an attempt has been made to merge the new concrete-supported drystone façade with the existing structure. The slipway is festooned in seaweed but is still in use; with one fibre-glass yacht occupying the recessed space. See Figure 26 for a range of photographs.			
Development Impact	The slipway will not be affected directly by the scheme and is to remain as it is. However, a sheet-pile wall will be put in front of the slipway, positioned low enough to permit boat access to the slipway.			
Mitigation	Measured archaeological survey of the slipway in advance of any development works. Archaeological monitoring during construction. Liaison with any reconstitution works to ensure that the original fabric of the slipway is maintained where possible.			

Abbey Strand

Ref No.	Classification	Townland	Easting	Northing
ADCO 22	Brick	Abbey	98097	48260
Description	Iron-enriched brick identified by metal-detector. Measuring *c.* 20 cm long, 10 cm wide, 7 cm thick, this brick fragment was dark/purple in colour and water-worn but presented a very strong ferrous metal reading. It is located on the foreshore lying in apparent isolation. The location however is *c.* 100 m west of the site of an iron working site (CO118-03003), situated on the east side of Abbey Point close to the shore. The brick may reasonably be considered to be associated with that site,			
Development Impact	The location is being considered for the reuse of dredge material as part of the land reclamation component.			
Mitigation	Archaeological monitoring of any seabed excavation activity.			

Ref No.	Classification	Townland	Easting	Northing
ADCO 23	Timber	Abbey	97990	48274
Description	Magnetic anomaly mg 38. Half-sectioned wooden pole split along the grain, measuring *c*. 3.30 m in length but survives in two pieces. Retains a number of bored holes indicative of former treenails and has teredo worm infestation indicative of former use in a sea-going vessel. The worm infestation is most intensive in the central area, where the timber has broken in two. A sequence of later iron straps is added to one end, and the lengthwise split creates a timber that is rounded in one plain and flat on another; such action may suggest that this piece was reused, but for a purpose that is not known. The timber was removed from its find location for recording, and returned to the seabed.			
				
Development Impact	The location is being considered for the reuse of dredge material as part of the land reclamation component.			
Mitigation	Move the timber to a secure underwater location on Abbey Strand that lies outside the development area. Archaeological monitoring of any seabed excavation activity.			

APPENDIX 3

Flora and Fauna

Appendix 3A

Faunal Tables – Sub-tidal Grabs (Note: Grabs 1-6 were taken using a 0.1m^2 Van-Veen Grab. Grabs 7-9 were taken using a 0.25 m^2 Van-Veen Grab)

	Grab 1	Grab 2	Grab 3	Grab 4	Grab 5	Grab 6	Grab 7	Grab 8	Grab 9
Abra alba	3	-	-	7	-	-	-	-	-
Abra nitida	2	-	-	-	-	-	2	-	-
Ampelisca brevicornis	1	-	-	-	1	-	-	-	-
Ampharete balthica	29	-	1	57	44	1	18	18	-
Amphitritides gracilis	-	-	-	1	-	-	-	-	-
Anemone indet.	1	-	-	-	-	-	-	-	-
Anguilla anguilla	-	1	-	-	-	-	-	-	-
Aoridae indet.	4	-	-	1	-	-	-	-	-
Capitella capitata	-	-	-	4	2	-	-	-	1
Carcinas maenas	-	-	-	-	-	1	-	-	-
Cerastoderma edule	1	-	-	-	-	-	-	-	-
Chaetozone sp.	23	1	3	30	4	19	6	39	6
Ensis sp.	-	-	1	-	-	-	-	-	-
Eteone longa	-	-	-	1	-	-	-	-	1
Eulalia fragilis	-	-	-	1	-	-	-	-	-
Galathowenia oculata	-	-	1	-	-	31	-	-	-
Glycera tridactyla	-	-	-	2	-	2	-	-	-
Heteromastus filiformis	-	-	-	1	-	1	-	-	-
Jasmineira elegans	-	-	-	-	1	-	-	-	-
Leptochiton asellus	-	-	-	-	-	1	-	-	-
Linneus sp.	-	-	-	-	1	-	-	-	2
Lumbrineris sp.	-	-	-	1	-	-	2	-	1
Maldane sarsi	5	-	-	14	-	-	-	4	-
Mediomastus fragilis	4	-	-	1	-	-	-	-	-
Melita palmata	-	-	-	1	-	-	-	-	-
Nemertea indet	-	-	-	1	-	-	-	-	-
Nephtys hombergii	6	24	4	9	6	-	3	1	1
Nereis diversicolor	-	-	-	1	-	-	-	-	1
Notomastus latericeus	-	-	-	2	2	-	-	-	-
Oligochaetae spp.	2	2	-	10	1	38	-	1	3
Ophelia rathkei	-	-	-	-	-	-	-	1	-
Ophiura ophiura	-	-	-	1	-	2	-	-	-
Pholoe inornata	3	-	-	8	-	5	-	-	-
Phtisica marina	1	-	-	-	-	-	-	-	-
Phyllodoce sp.	-	-	-	-	1	-	-	-	-
Platyneris sp.	-	-	-	3	-	1	-	-	-
Podarkeopsis sp.	-	-	-	-	1	-	-	1	-
Pygospio elegans	-	-	-	7	-	-	-	-	-
Scololepis sp.	-	-	-	-	-	-	-	-	3

	Grab 1	Grab 2	Grab 3	Grab 4	Grab 5	Grab 6	Grab 7	Grab 8	Grab 9
Scoloplos armiger	-	-	6	-	-	-	-	1	3
Spio filicornis	41	3	1	16	2	33	-	-	11
Sthenelais boa	-	-	-	-	1	-	-	-	-
Terebellides stroemi	-	-	-	-	3	-	-	2	1
Thyasira flexuosa	-	-	-	-	3	-	1	1	-
Urothoe sp.	6	-	1	10	-	1	-	-	-
Venus sp.	-	-	-	-	-	-	-	-	1
Virgularia mirabilis	2	-	-	-	-	-	-	3	-

Appendix 3B - Appropriate Assessment Screening Report

Appropriate Assessment – Screening Report

1.0 Introduction

Natura Environmental Consultants was commissioned by RPS Consulting Engineers, to prepare an Appropriate Assessment Screening Report for the proposed Bantry Inner Harbour Development Scheme, County Cork.

The purpose of this report is to determine the effects, if any, the proposed development will have on a number of Natura 2000 sites identified as having potential to be impacted by the proposed development and to further assess if any of the predicted impacts have the potential to have significant adverse effects on the qualifying interests or on the conservation objectives of these Natura 2000 sites.

2.0 Regulatory context

The Habitats Directive (Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora) formed a basis for the designation of Special Areas of Conservation (SACs). Similarly, Special Protection Areas are legislated for under the Birds Directive (Council Directive 79/409/EEC on the Conservation of Wild Birds). Collectively, SACs and SPAs are referred to as Natura 2000 sites. In general terms, they are considered to be of exceptional importance in terms of rare, endangered or vulnerable habitats and species within the European Community. Under Article 6(3) of the Habitats Directive an Appropriate Assessment must be undertaken for any plan or project that is likely to have a significant effect on the conservation objectives of a Natura 2000 site. An Appropriate Assessment is an evaluation of the potential impacts of a plan or project on the conservation objectives of a Natura 2000 site. Where necessary, mitigation or avoidance measures should be proposed to preclude negative effects.

Article 6, paragraphs 3 of the Habitats Directive states that:
" Any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives. In the light of the conclusions of the assessment of the implications for the site and subject to the provisions of paragraph 4, the competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public".

The Stages in an Appropriate Assessment

There are four stages in an Appropriate Assessment as outlined in the European Commission Guidance document (2001). The following is a brief summary of these steps.

Stage 1 - Screening: This stage examines the likely effects of a project either alone or in combination with other projects upon a Natura 2000 Site and considers whether it can be objectively concluded that these effects will not be significant.

Stage 2 - Appropriate Assessment: In this stage, the impact of the project on the integrity of the Natura 2000 site is considered with respect to the conservation objectives of the site and to its structure and function. The report of this stage is known as a Natura Impact Statement (NIS).

Stage 3 - Assessment of Alternative Solutions: Should the Appropriate Assessment determine that adverse impacts are likely upon a Natura 2000 site, this stage examines alternative ways of implementing the project that, where possible, avoid these adverse impacts.

Stage 4 - Assessment where no alternative solutions exist and where adverse impacts remain: Where imperative reasons of overriding public interest (IROPI) exist, an assessment to consider whether compensatory measures will or will not effectively offset the damage to the Natura site will be necessary.

3.0 Methodology

Desk Study and Consultations

A desk study was carried out to collate the available information on the ecological environment. The National Parks and Wildlife Service (NPWS) database was consulted concerning designated conservation areas and their qualifying interests in the vicinity of the proposed development. This assessment was carried out with reference to the relevant guidance, in particular:

- *Assessment of Plans and Projects significantly affecting Natura 2000 Sites*: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC, European Commission (2001);
- *Managing Natura 2000 Sites:* The Provisions of Article 6 of the 'Habitats Directive' 92/43/EEC, European Commission (2000);
- EU Guidance document on Article 6(4) of the 'Habitats Directive' 92/43/EEC (2007);
- *Appropriate Assessment of Plans and Projects in Ireland: Guidance for Planning Authorities.* National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government. Dublin (2009, revised February 2010).

Review of Other Plans and Projects

In order to identify potential 'In Combination Effects', other relevant plans and projects were identified for the study area from the Cork County Council planning website.

4.0 Stage 1 – Screening for appropriate assessment

This stage of the process identifies the potential effects of a plan or project, either alone or in combination with other plans or projects, on a Natura 2000 site in view of its conservation objectives, and considers whether these effects will be significant.

The first step in the screening process is to determine whether the project or plan is directly connected with or necessary to the management of the Natura 2000 site. In this case the proposed project is not directly connected to or necessary to the management of any Natura 2000 site.

The next steps of the screening process are to describe the elements of the project, and local site or plan area characteristics, identification of relevant Natura 2000 sites, and compilation of information on their qualifying interests and conservation objectives, identification of potential impacts of the project, assessing the potential significant effects associated with the project on a Natura 2000 site(s) and finally a screening conclusion.

Description of the Project

The Bantry Inner Harbour Development Scheme aims to provide a sheltered harbour environment and marina with increased water depth and improved pier facilities in the Bantry area. The proposed works which will involve dredging of benthic sediments in the harbour, piling (sheet piles at extension to pier and some tubular piles for floating structures by breakwater) and possible rock breaking in the inner harbour.

Other Plans and Projects

Planning applications within the study area (Figure 1.1) were identified from the Cork County Council planning website, and reviewed to assess the potential for in-combination effects with the proposed development.

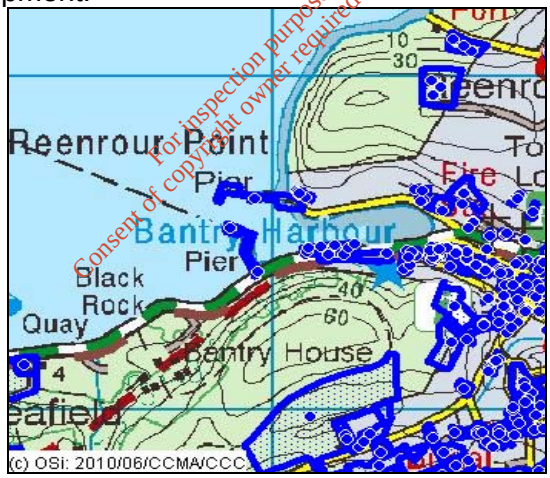


Figure 1.1: Planning applications within the study area (Cork County Council website)

Identification of Natura 2000 Sites

All Natura 2000 sites located within 10km of the proposed development are listed below. Three Natura 2000 sites were identified, all of which are SAC. Table 1.1 provides details of the three SAC, including their qualifying interests. A site synopsis for each of the three sites can be found in Appendix 1. All three Natura 2000 sites have the same conservation objective as follows:

Objective: To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected (NPWS, 2011a, 2011b and 2011c).

Table 1.1: Natura 2000 sites located within 10km of the proposed development

Site name	Site code	Distance from proposed plan	Qualifying interests
Glengarriff Harbour and Woodland SAC	000090	7km north west	Kerry slug (Geomalacus maculosus) Lesser horseshoe bat (Rhinolophus hipposideros) Otter (Lutra lutra) Common seal / Harbour seal (Phoca vitulina) Old sessile oak woods with Ilex and Blechnum in British Isles Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)
Caha Mountains SAC	000093	8.5km north west	Kerry slug (Geomalacus maculosus) Killarney fern (Trichomanes speciosum) Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Iso to-Nanojuncetea Natural dystrophic lakes and ponds Northern Atlantic wet heaths with Erica tetralix Alpine and Boreal heaths Blanket bog (*active only) Siliceous rocky slopes with chasmophytic vegetation
Derryclogher (Knockboy) Bog SAC	001873	9km north	Blanket bog (*active only)

Identification of Potential Impacts

This section identifies impacts associated with the construction and operational phases of the proposed development which could potentially have significant negative impacts on the qualifying interests and conservation objective(s) of those Natura 2000 sites listed in Table 1. The following are elements of the proposed project which could potentially give rise to impacts on Natura 2000 sites:

Dredging

Benthic dredging activity can result in significant damage to the biological environment. Dredging may alter characteristics of benthic habitats with subsequent effects on benthic flora and fauna. However, the severity of impact on marine mammals will be determined by the extent of dredging activity.

In addition to the physical act of sediment removal, pressure jetting and dredging activities can result in potential disturbance to marine mammals through increases in vessel activity and increases in local ambient marine noise levels. Acoustic disturbance can be a threat to marine mammals causing hearing damage (Richardson *et al.,* 1995). Furthermore, the suspension of disturbed particles in the water column can potentially affect water quality. Where contaminated substrates are disturbed this can lead to the consumption of contaminated prey items entering the food chain. Displacement can also occur resulting from impacts on available prey.

Pile driving

Pile driving is considered to be a potentially detrimental activity to marine mammals that are close to the proposed development because it produces a very high source level and broad bandwidth sound. Sound produced during pile-driving propagates through the air into water, through the water column and, to a lesser degree, through the sediment and from there back into the water column (Thompson *et al*., 2006).

Extended exposure to high levels of continuous noise and/or impulsive sounds with high rise times can lead to injuries of the hearing structures in cetaceans and pinnipeds resulting in permanent hearing loss and other injuries (Richardson *et al*., 1995).

In addition to potentially injuring marine mammals, pile driving and industrial noise can adversely impact behavior, communication and breeding. The radius of the zone of responsiveness to pile-driving noise has been provisionally defined as up to at least 20km for harbour porpoises and harbour seals (Thompson *et al*., 2006).

Other potential impacts to marine mammals include disturbance or displacement, long term effects resulting from habitat degradation and/or short term effects of sediment disturbance

Rock breaking

There are potential impacts to marine mammals from underwater noise resulting from rock breaking. The physiological effect of exposure to loud underwater noise can include temporary or permanent shifts in hearing thresholds, which degrade an animal's ability to forage and carry out other activities that depend on auditory acuity such as communication, navigation and mating. Other potential effects from rock breaking include chronic hearing damage from short/medium range exposure, disturbance or displacement as a result of noise, long term effects resulting from habitat degradation and/or short term effects of sediment disturbance.

Assessment of Likely Effects

Based on the above described elements of the project each Natura 2000 site described in section 4.3 has been reviewed to establish whether or not the project is likely to have a significant adverse effect on the integrity of the site as defined by its structure and function and its conservation objective(s). The assessment has been carried out according to the Cause – Pathway – Effect model.

Table 1.2: Screened list of SAC sites located within 10km of the proposed development

	Is there potential for:				
Site ID	**Site Name**	**Direct impacts e.g. habitat loss**	**Indirect impacts e.g. alteration to the hydrological regime**	**Surface or ground water contamination**	**Disturbance to protected species (Habitats Directive Annex II or IV)**
000090	Glengarriff Harbour and Woodland SAC	No	No	No	Yes
000093	Caha Mountains SAC	No	No	No	No
001873	Derryclogher (Knockboy) Bog SAC	No	No	No	No

Table 1.2 shows that only one of the three Natura 2000 sites, Glengarriff Harbour and Woodland SAC, has the potential to be significant impacted as a result of the proposed development owing to the fact that two of the qualifying species for this SAC are aquatic mammals. The remaining Natura 2000 sites are not considered further in this report.

Glengarriff Harbour and Woodland SAC (000090)

Harbour seals (also known as "common seals"), are semi-aquatic mammals (Pitcher & McAllister, 1981) that spend time ashore at terrestrial sites on which they haul-out to rest, breed, moult, engage in social activity and escape predation.

Haul-out sites used by harbour seals within Bantry Bay are predominantly located on the northern side of the bay, the exception being Gerrane rocks off Whiddy Island in the inner part of the bay (figure 1.2). The majority of these sites are in the inner part of Bantry Bay, in the northeast corner, Glengarriff harbour. Ten main discrete haul-out sites have been identified, some comprising of smaller adjacent sites, and are shown in figure 1.2. The nearest of these haul-out sites is 2-3 km from the site of the proposed development (Roycroft *et al*., 2007).

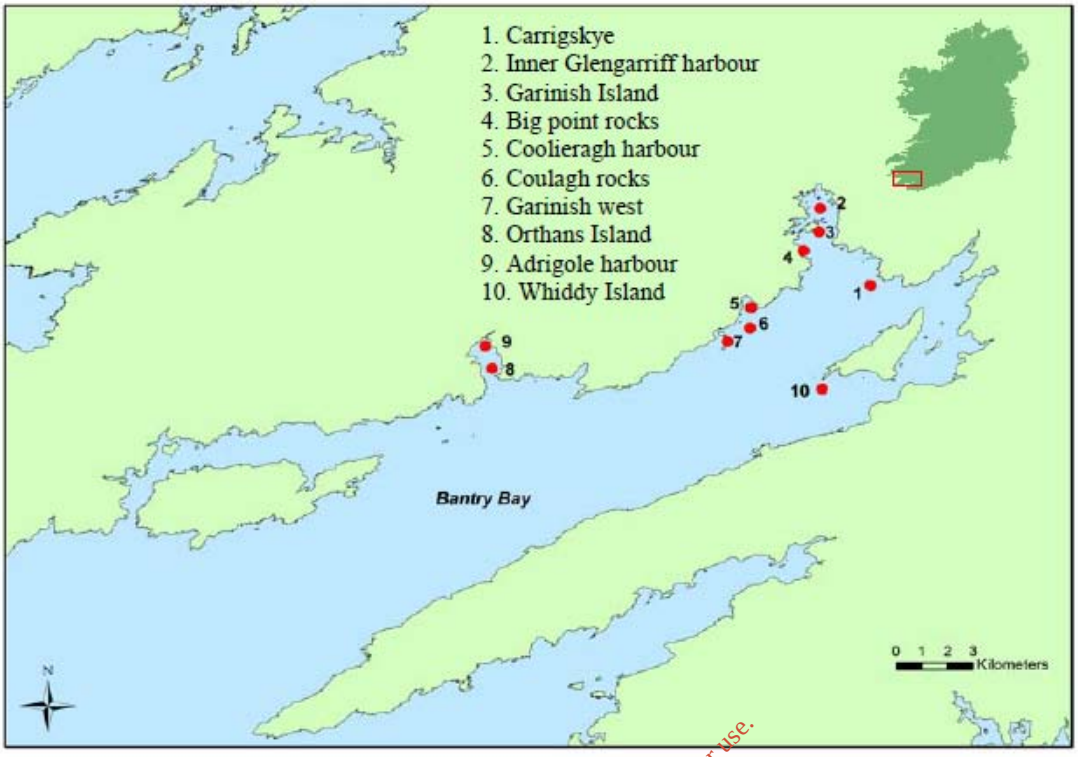


Figure 1.2: Harbour seal haul-out sites in Bantry Bay (Roycroft *et al*., 2007)

Patterns of seasonal abundance differed between haul-out sites. Within Bantry Bay sites 1 to 5 were generally used throughout the year with numbers increasing during the summer and autumn months. Highest numbers of seals were observed at sites 2 and 3. Sites 6 and 7 had limited use and generally only during summer months. Site 9 was used throughout the year but unlike the majority of sites within the bay, showed no obvious increase in numbers during summer/autumn and site 10 was only used during summer and autumn. Pups were recorded at all sites within Bantry Bay apart from sites 7 and 8. The most important sites for pupping within the bay, based on highest pup counts, were sites 2, 3 and 4 (Roycroft *et al*., 2007).

Interestingly the main sites used for pupping in Bantry Bay are those most exposed to human disturbance, primarily from ferries, boat-based eco-tourism and leisure craft. These haul-out sites, generally found near the head of the bays, are the most sheltered sites relative to all haul-out sites within the two bays, affording seals protection from large swell that frequently occurs in the bays. Additionally these sites are located in deeper water than that found in the immediate vicinity of other haul-out sites within the bays. Such advantages may outweigh the costs of potential disturbance and the reaction of seals to passing boats varied largely between haul-out sites, suggesting potential habituation to disturbance at some sites (Roycroft *et al*., 2007).

As the nearest breeding and moulting haul-out sites for harbour seals are approximately 2-3km from the proposed works (e.g. Carrigskye and rocks west of Whiddy island *see* Figure. 1.2) the proposed work will not cause disturbance at these terrestrial sites. Whilst numbers of harbour seals peak during summer/autumn months at haul-out sites, the aquatic environment is used year round by seals. Harbour seals are known to occasionally use the

harbour, however, the effects of dredging, pile driving and rock breaking will not have a significant impact on the local harbour seal population.

Otter is the other qualifying species at potential risk from disturbance during construction activites. Otter do occur along the coast but need to be close to freshwater to wash salt deposits from their fur (Hayden and Harrington, 2000). It is possible that otter which occur within the Glengarriff Harbour and Woodland SAC visit the area of the proposed development occassionally. Any disturbance to visiting otter is unlikely to have a significant effect on the local otter population.

Cumulative Impacts

The EC (2001) guidelines on the provision of Article 6 of the Habitats' Directive state that the phrase 'in combination with other plans or projects' in Article 3(3) of the Habitats Directive refers to the cumulative impacts due to plans or projects 'that are currently under consideration together with the effects of any existing or proposed projects or plans.'

A review of Cork County Council Planning website identified a number of planning applications in the locality of the proposed development. None of these are likely to have significant effects on the Natura 2000 sites listed in table 1, hence in combination effects are considered unlikely.

Screening Conclusion and Statement

Considering the distance involved between the site of the proposed development and the main haul-out sites of harbour seals (located predominantly on the north side of Bantry Bay over 7km away), there is no likelihood of dredging, piling and rock breaking having any significant impact on the local population of harbour seals or its conservation status. Similarly there is no likelihood of the local population of otter, which occurs in the Glengarriff Harbour and Woodland SAC, being significantly impacted by the proposed development. There will be no significant effects on any of the qualifying interests of the Glengarriff Harbour and Woodland SAC.

The findings of the screening report are that there will be no significant effects on any Natura 2000 site as a result of the proposed development. Therefore a stage 2 Appropriate Assessment is not required.

5.0 References

EU Habitats Directive (92/42/EEC), (1992). Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora.

EU Birds Directive (79/409/EEC), (1979). Council Directive 79/209/EEC of 2 April 1979 on the conservation of wild birds.

Hayden, T. and Harrington, R. (2000). Exploring Irish Mammals. Town House and County House Ltd. Dublin 3.

NPWS (2011) Conservation objectives for Glengarriff Harbour and Woodland SAC [000090]. Generic Version 3.0. Department of Arts, Heritage & the Gaeltacht.

NPWS (2011) Conservation objectives for Derryclogher (Knockboy) Bog SAC [001873]. Generic Version 3.0. Department of Arts, Heritage & the Gaeltacht.

NPWS (2011) Conservation objectives for Caha Mountains SAC [000093]. Generic Version 3.0. Department of Arts, Heritage & the Gaeltacht.

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Richardson, W. J., Greene, C.R., Malme, C. I. & Thompson, D. H. (1995). *Marine Mammals and Noise*. Academic Press, London, 576pp. In: RPS (2012). A report on the potential effects on marine mammals of Bantry Inner Harbour Development, Bantry Bay, Co. Cork.

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RPS (2012). A report on the potential effects on marine mammals of Bantry Inner Harbour Development, Bantry Bay, Co. Cork.

Thompsen, F., Ludemann, K., Kafemann, R. & Piper, W. (2006). Effects of offshore wind farm noise on marine mammals and fish. Hamburg, Germany on behalf of COWRIE Ltd. 66pp. In: RPS (2012). A report on the potential effects on marine mammals of Bantry Inner Harbour Development, Bantry Bay, Co. Cork.

SUB-APPENDIX A

[Site Synopses]

SITE NAME: CAHA MOUNTAINS

SITE CODE: 000093

The Caha Mountains consist of Old Red Sandstone and form part of the dramatic backbone of the Beara Peninsula, between Turner's Rock (on the Glengarriff-Kenmare Road) and the Healy Pass. Within the site there are a series of peaks and ridges up to 630 m high, radiating out from Caha Mountain itself. The southerly directed ridge forms a broad boggy plateau studded with small lakes - at about 420m. The area also features glacial valleys and corries, such as the one within which Barley Lake occurs. Generally, the terrain is rocky with many of the slopes featuring rock faces interspersed with grassy shelves. Substantial cliffs are present in the north-western half of the site.

The site is of high scientific interest due to the presence of a large area of blanket bog, an EU Habitats Directive Annex I priority habitat. Other habitats listed on Annex I also occur, namely alpine heath, siliceous rocks and scree, oligotrophic and dystrophic lakes and wet heath.

The best examples of blanket bog occur on the Glenlough plateau and in the saddle to the east of Knockastumpa. Knockastumpa bog has been described as one of the best saddle bogs in the country, due to its level of intactness, deep peat and wetness, little evidence of erosion, diversity of habitats and diverse flora. Glenlough Bog occupies an undulating plateau sprinkled with small lakes. The terrain is rocky but there are many patches of shallow, unflushed peat and occasional ombrotrophic domes on the more even slopes. There are some very wet areas ponded against ridges and on these scraws have developed. At the east of this area of bog some of the lakes are surrounded by a *Sphagnum* carpet where the shelter allows it. The bog areas support typical blanket bog vegetation, including the three Sundew species (*Drosera* spp.) and Bog Sedge (*Carex limosa*), with several noteworthy mosses (*Sphagnum imbricatum, S. molle, S. magellanicum* and *Campylopus shawii*).

Plant species of alpine heath and siliceous rocky slopes are associated with the summits and include Heather (*Calluna vulgaris*), Roseroot (*Rhodiola rosea*), Hard Fern (*Blechnum spicant*), Fir Clubmoss (*Huperzia selago*), Brittle Bladder-fern (*Cystopteris fragilis*), Bell Heather (*Erica cinerea*), Crowberry (*Empetrum nigrum*), St. Patrick's-cabbage (*Saxifraga spathularis*), Heath Bedstraw (*Galium saxatile*), Dwarf Willow (*Salix herbacea*) and Viviparous Fescue (*Festuca vivipara*). Of particular note in these habitats are the following plants, which are considered rare or restricted in their distribution: Recurved Sandwort (*Minuartia recurva*), Wilson's Filmy Fern (*Hymenophyllum wilsonii*), Green Spleenwort (*Asplenium viride*), and a moss *Cyclodictyon laetevirens*.

Wet heath is frequent at the site and occurs as a mosaic, often in association with blanket bog and upland grassland. The heath is often wet in character and has Cross-leaved Heath (*Erica tetralix*). Ling Heather (*Calluna vulgaris*), Sedges (*Carex* spp.), Rushes (*Juncus* spp.), Milkwort (*Polygala serpyllifolia*) and Tormentil (*Potentilla erecta*) are also found.

The upland grassland is dominated by Purple Moor-grass (*Molinia caerulea*) but other grasses present include Mat Grass (*Nardus stricta*), *Festuca* spp. and *Agrostis* spp.

Lakes are frequent throughout the site and especially on the Glenlough Mountain plateau. Most of the small lakes which occur within the bog and wet heath habitats are dystrophic in character. These have peat bottoms and often peat-stained water. Plant species are few, with White-beaked Sedge (*Rhynchospora alba*), Common Cottongrass (*Eriophorum angustifolium*), Bogbean (*Menyanthes trifoliata*) and bog mosses (*Sphagnum* spp.) being the mai species. The larger lakes, including Barley Lake, Glenkeel Lough, Lough Shanoge and Lough Dereenadarodia are typical upland oligotrophic systems. Plant species found in these lakes include Shoreweed (*Littorella uniflora*), Quillwort (*Isoetes lacustris*), Bog Pondweed (*Potamogeton polygonifolius*), and Branched Bur-reed (*Sparganium erectum*).

The site contains Killarney Fern (*Trichomanes speciosum*), a species listed on Annex II of the EU Habitats Directive. It also supports the only known population of Recurved Sandwort (*Minuartia recurva*) within Ireland and Britain. Both these species are listed in the Irish Red Data Book and are legally protected (Flora Protection Order, 1987).

Kerry Slug (*Geomalacus maculosus*) and Otter, species listed on Annex II of the EU Habitats Directive, are found within the site. Other important species present within the site include the Irish Hare, Common Lizard and Frog. Brown Trout occurs within some of the lakes of the plateau. These lakes were originally stocked by Lord Bantry in the nineteenth century but the populations have naturally maintained themselves.

A number of bird species listed in Annex I of the EU Birds Directive occur: Peregrine Falcon, Hen Harrier and Chough. The Peregrine breeds within the site, while the others probably breed. All these species are listed in the Irish Red Data Book, as is another bird found within the site, the migratory Ring Ouzel.

The main landuse within the site is sheep grazing, with over-grazing noticeable on many of the slopes, especially in the western edge of the site. Other landuses are generally small-scale and localised in nature. They include angling, water abstraction, drainage and peat extraction.

This large site is of outstanding scientific interest due to the diverse range of good quality habitats which occur, including blanket bog, heaths, screes, lakes and grasslands over a range of altitudes. Many rare species of plant and animal occur here, a number of which are legally protected at national and European level.

8.1.1997

SITE NAME: GLENGARRIFF HARBOUR AND WOODLAND

SITE CODE: 000090

Located to the south and north-west of Glengarriff Village in west Cork, this site consists of a glacial valley opening out into a sheltered bay with rocky islets. The valley contains Old Oak Woodland and Alluvial Forest, both habitats listed on Annex I of the EU Habitats Directive. The underlying rock of the area is Old Red Sandstone, with the soil varying from acid brown earths to alluvial brown earths and peat.

Glengarriff woodland consists of a sizeable area of broad-leaved semi-natural woodland comprised of Oak (*Quercus* sp.) and Holly (*Ilex aquifolium*), with much Downy Birch (*Betula pubescens*) and Rowan (*Sorbus aucuparia*). A little Yew (*Taxus baccata*) occurs and Strawberry Tree (*Arbutus unedo*) is scattered through the woods. The most frequent ground plants are Heather (*Calluna vulgaris*), Great Wood-rush (*Luzula sylvatica*), Bilberry (*Vaccinium myrtillus*) and ferns (*Pteridium aquilinum*, *Blechnum spicant* and *Dryopteris aemula*).

Wet woodland occurs along parts of the Canrooska and Glengarriff rivers. This is dominated by Willows (mainly *Salix cinerea* subsp. *oleifolia*) and Downy Birch, with Alder (*Alnus glutinosa*) also frequent. A rich herb layer is found, characterised by such species as Bugle (*Ajuga reptans*), False Brome (*Brachypodium sylvaticum*), Meadowsweet (*Filipendula ulmaria*) and Wood Sanicle (*Sanicula europaea*). The rivers flood regularly, depositing silt within the woodlands.

However, there is much small-scale variation in the habitat from heathy places with Heath Bedstraw (*Galium saxatile*), Star Sedge (*Carex echinata*) and Purple Moor-grass (*Molinia caerulea*), to rocks with Goldenrod (*Solidago virgaurea*), Navelwort (*Umbilicus rupestris*) or Filmy-fern (*Hymenophyllum* sp.). Common woodland herbs include Bugle (*Ajuga reptans*), Enchanter's-nightshade (*Circaea lutetiana*), Irish Spurge (*Euphorbia hyberna*), Common Cow-wheat (*Melampyrum pratense*) and Foxglove (*Digitalis purpurea*).

Although this is the site of an ancient woodland, it was once part of an estate and much of the Oak was planted around 1807-1810. Some exotic species were also introduced, such as Beech (*Fagus sylvatica*), Sycamore (*Acer pseudoplatanus*) and Rhododendron (*Rhododendron ponticum*). The last has invaded parts of the woodland posing a serious problem, however, it is being systematically removed. Other areas within the woodland have been planted with conifers including Sitka Spruce (*Picea sitchensis*), Scot's Pine (*Pinus sylvestris*) and Western Hemlock (*Tsuga heterophylla*).

In addition to the woodlands, the harbour is of great interest. This sheltered inlet of Bantry Bay, has a rocky shore vegetated with brown seaweeds (*Pelvetia canaculata*, *Fucus* spp. and *Ascophyllum nodosum*). The inlet also features rocky islets.

Adding to the diversity of the site is a wet meadow, adjacent to the woodlands, which supports species such as Ragged-robin (*Lychnis flos-cuculi*). Smooth Brome (*Bromus racemosus*), a very rare Red Data Book species of grass, occurs here within this habitat.

The site is notable for the presence in the woodlands of several rare species of Myxomycete fungus, namely *Echinostelium colliculosum, Cribraria tenella, Arcyria affinis, Stemonitis nigrescens, Symphytocarpus impexus, Fuligo muscorum, Diderma deplanatum* and *D. lucidum*.

Overall, the site supports a diversity of fauna. The rocky islets in the harbour support the largest colony of Common Seals (*Phoca vitulina*) in the south-west of Ireland (maximum count, including pups, 1989-94 = 226). This legally protected species is listed on Annex II of the EU Habitats Directive. Lesser Horseshoe Bats (*Rhinolophus hipposideros*), also an Annex II species, were formerly recorded in high numbers in Glengarriff Castle (e.g. 300+ recorded during summer 1985, 268 in winter 1989). However numbers decreased at the Castle from the late 1990's onwards. Since then, summer roosts within the SAC boundary have been found in three buildings. The highest combined counts for the three summer sites were taken in July 2002 with a total of 228 bats. Bats have also been confirmed hibernating in one of the buildings and have used two purpose-built hibernacula. A total of 114 hibernating bats were counted in winter 2002/2003. This site is of international importance for both summer roosting and hibernating Lesser Horseshoe Bats. Given the combination of winter, summer and foraging sites, the site is one of the most important for the species in the south-west. An important roost of approximately 100 Long-eared Bats (*Plecotus auritus*) is also present within the site. Both bat species are listed on Annex IV of the Habitats Directive. The woods, and the river flowing through it, are home to a range of other mammal species, including Otter, Stoat, Red Squirrel, Badger and Sika Deer. Bird life is also diverse, with species such as Sparrowhawk, Peregrine, Long-eared Owl, Woodcock, Heron, Jay, Dipper, Willow Warbler, Chiffchaff and Wood Pigeon.

Invertebrates, too, are well represented. Species found include the Kerry Slug (*Geomalacus maculosus*) a legally protected species, listed on Annex II of the EU Habitats Directive; damselflies, such as the Beautiful Demoiselle (*Calyopteryx virgo*, Order Zygoptera) and butterflies (Order Lepidoptera), such as Silver-washed Fritillary (*Argynnis paphia*), Green Hairstreak (*Callophrys rubi*), Purple Hairstreak (*Quercusia quercus*), Large Heath (*Coenonympha tullia*), Holly Blue (*Celastrina argiolus*) and Wood White (*Leptidea sinapis*). Freshwater Pearl Mussel (*Margaritifera margaritifera*) has been recorded from rivers in the site. Other invertebrates reflect the ancient nature of the woodland, for example, Ireland's only arboreal ant (*Lasius fuligniosis*, Order Hymenoptera), a longhorn beetle (*Laptura aurilenta*, Order Coleoptera) and a hoverfly (*Microdon analis*, Order Diptera). Meanwhile, the association between woodland and bog provides the necessary requirements for species such as the Large Marsh Grasshopper (*Stethophyma grossum*, Order Orthoptera) and a Horse-fly (*Hybonutra mohlfeldi*, Order Diptera).

Most of the woodlands are a National Nature Reserve and as such are primarily managed for nature conservation and amenity purposes. However, some commercial forestry still occurs within the site. The harbour supports mariculture (rope grown mussels) and tourism (boats visiting Garinish Island) industries. Neither activity appears to have affected seal numbers, although increased disturbance may pose a threat. One of the main threats to the site, however, is housing developments within the woodland.

This site is of importance because it is the only sizeable area of old Oak woodland remaining in west Cork and is considered second only to Killarney as an example of Oceanic Sessile Oak/Holly woodlands. Furthermore, the site supports populations of four animal species listed on Annex II of the Habitats Directive - Common Seal, Lesser Horseshoe Bat, Freshwater Pearl Mussel and Kerry Slug.

6.8.2003

SITE NAME: DERRYCLOGHER (KNOCKBOY) BOG

SITE CODE: 001873

Derryclogher (Knockboy) Bog is situated under the summit of Knockboy Mountain (707 m). The western boundary is marked by the ridge which runs from the summit northwards to a subsidiary summit (695 m) and a further ridge which runs westwards to Lough Boy (578 m). These ridges run along the county border. The extreme southern point of the site falls to 240 m while the extreme eastern point falls sharply to less than 150 m.

The Cummeendarrig River rises on the eastern flank of the Knockboy ridge as a series of parallel streams which coalesce and flow southwards to the head of Bantry Bay as the Coomhola River. The southern part of the site contains the headwaters of the Derryduff River. Two medium sized lakes occur, Lough Nambrackderg and Curramore Lough, as well as several small loughs.

The main conservation interest of the site is the active mountain blanket bog, an EU Habitats Directive Annex I priority habitat. The bogs occur as a complex mosaic with other upland habitats, namely grassland, heath, stream flushes and exposed rock. The bogs are mostly small (1-2 ha) but they occur with regularity on a series of gently sloping shelves across the mountainside. The largest expanses of bog are beneath the two lakes. Slope appears locally to define the composition of the bog vegetation, with the flattest areas being the wettest. The vegetation is dominated by Deer Sedge (*Trichophorum cespitosus*), Purple Moor-grass (*Molinia caerulea*), Bog Cottons (*Eriophorum angustifolium* and *E. vaginatum*) and a good diversity of mosses including *Campylopus atrovirens, Racomitrium lanuginosum*, and a variety of *Sphagnum* spp. The *Racomitrium* forms hummocks in the drier places. Some linear pools occur, with *Sphagnum cuspidatum* and *S. tenellum*, and White Beak-sedge (*Rhynchospora alba*) around the margins.

The more nutrient-rich areas which surround the bogs are dominated by *Molinia,* often with *Sphagnum palustre*, the Soft Rush (*Juncus effusus*), Star Sedge (*Carex echinata*) and the moss *Polytrichum commune*. *Sphagnum auriculatum* and *S. recurvum* are a feature of many of the flushed areas, with Bulbous Rush *(Juncus bulbosus*), Bogbean (*Menyanthes trifoliata*) and White Beak-sedge, particularly at the lower levels. Nearer the stream banks species such as Sharp-flowered Rush *(Juncus acutiflorus*), Common Sedge (*Carex nigra),* Sweet Vernal-grass (*Anthoxanthum odoratum*) and Common Sorrel (*Rumex acetosa*) occur, with Blinks *(Montia fontana*), Bog Pimpernel (*Anagallis tenella*) and the moss *Campylium stellatum* close to springs. The Kerry Butterwort *(Pinguicula grandiflora*) occurs locally.

This site is largely in a natural state. Although sheep grazing occurs throughout, it is at low density and has only caused some localised damaged to an area south of Curramore Lough. The site has not been burnt in the recent past. Some afforestation occurs outside of the site boundary and this is probably the main threat to the site.

This site is of conservation interest for its blanket bog habitat, which shows gradations to heath, grassland and stream flushes.

16.1.1997

Appendix 4A – Traffic Data – PICADY Analysis Results

Demand Set: 2012 WE
Modelling Period: 12:30-13:30

Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh. Min/ segment)	Delay (veh. Min/ segment)	Mean Arriving Vehicle Delay (min)
B-AC	0.00	10.10	0.000	-	0.00	0.00	-	0.00	0.00
C-A	4.18	-	-	-	-	-	-	-	-
C-B	0.00	8.70	0.000	-	0.00	0.00	-	0.00	0.00
A-B	0.00	-	-	-	-	-	-	-	-
A-C	0.00	-	-	-	-	-	-	-	-

Demand Set: 2012 PM
Modelling Period: 17:00-18:00

Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh. Min/ segment)	Delay (veh. Min/ segment)	Mean Arriving Vehicle Delay (min)
B-AC	0.00	10.10	0.000	-	0.00	0.00	-	0.00	0.00
C-A	5.45	-	-	-	-	-	-	-	-
C-B	0.00	8.70	0.000	-	0.00	0.00	-	0.00	0.00
A-B	0.00	-	-	-	-	-	-	-	-
A-C	0.00	-	-	-	-	-	-	-	-

Demand Set: 2014 WE
Modelling Period: 12:30-13:30

Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh. Min/ segment)	Delay (veh. Min/ segment)	Mean Arriving Vehicle Delay (min)
B-AC	0.00	10.09	0.000	-	0.00	0.00	-	0.00	0.00
C-A	4.30	-	-	-	-	-	-	-	-
C-B	0.00	8.70	0.000	-	0.00	0.00	-	0.00	0.00
A-B	0.00	-	-	-	-	-	-	-	-
A-C	0.00	-	-	-	-	-	-	-	-

Demand Set: 2014 PM
Modelling Period: 17:00-18:00

Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh. Min/ segment)	Delay (veh. Min/ segment)	Mean Arriving Vehicle Delay (min)
B-AC	0.00	9.95	0.000	-	0.00	0.00	-	0.00	0.00
C-A	5.60	-	-	-	-	-	-	-	-
C-B	0.00	8.70	0.000	-	0.00	0.00	-	0.00	0.00
A-B	0.00	-	-	-	-	-	-	-	-
A-C	0.00	-	-	-	-	-	-	-	-

Demand Set: 2029 WE
Modelling Period: 12:30-13:30

Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh. Min/ segment)	Delay (veh. Min/ segment)	Mean Arriving Vehicle Delay (min)
B-AC	0.00	9.71	0.000	-	0.00	0.00	-	0.00	0.00
C-A	7.75	-	-	-	-	-	-	-	-
C-B	0.00	8.70	0.000	-	0.00	0.00	-	0.00	0.00
A-B	0.00	-	-	-	-	-	-	-	-
A-C	0.00	-	-	-	-	-	-	-	-

Demand Set: 2029 PM
Modelling Period: 17:00-18:00

Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh. Min/ segment)	Delay (veh. Min/ segment)	Mean Arriving Vehicle Delay (min)
B-AC	0.00	9.44	0.000	-	0.00	0.00	-	0.00	0.00
C-A	10.10	-	-	-	-	-	-	-	-
C-B	0.00	8.70	0.000	-	0.00	0.00	-	0.00	0.00
A-B	0.00	-	-	-	-	-	-	-	-
A-C	0.00	-	-	-	-	-	-	-	-

Figure A1 – N71 Cork/Wolfe Tone Square PICADY Results

Demand Set: 2012 WE
Modelling Period: 12:30-13:30

Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh. Min/ segment)	Delay (veh. Min/ segment)	Mean Arriving Vehicle Delay (min)
B-AC	0.50	11.92	0.042	-	0.00	0.04	-	0.60	0.09
C-A	0.00	-	-	-	-	-	-	-	-
C-B	0.00	8.70	0.000	-	0.00	0.00	-	0.00	0.00
A-B	0.00	-	-	-	-	-	-	-	-
A-C	0.00	-	-	-	-	-	-	-	-

Demand Set: 2012 PM
Modelling Period: 17:00-18:00

Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh. Min/ segment)	Delay (veh. Min/ segment)	Mean Arriving Vehicle Delay (min)
B-AC	0.67	11.92	0.056	-	0.00	0.06	-	0.90	0.09
C-A	0.00	-	-	-	-	-	-	-	-
C-B	0.00	8.70	0.000	-	0.00	0.00	-	0.00	0.00
A-B	0.00	-	-	-	-	-	-	-	-
A-C	0.00	-	-	-	-	-	-	-	-

Demand Set: 2014 WE
Modelling Period: 12:30-13:30

Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh. Min/ segment)	Delay (veh. Min/ segment)	Mean Arriving Vehicle Delay (min)
B-AC	1.40	11.92	0.117	-	0.00	0.13	-	1.90	0.09
C-A	0.00	-	-	-	-	-	-	-	-
C-B	0.00	8.70	0.000	-	0.00	0.00	-	0.00	0.00
A-B	0.00	-	-	-	-	-	-	-	-
A-C	0.00	-	-	-	-	-	-	-	-

Demand Set: 2014 PM
Modelling Period: 17:00-18:00

Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh. Min/ segment)	Delay (veh. Min/ segment)	Mean Arriving Vehicle Delay (min)
B-AC	0.82	11.92	0.069	-	0.00	0.70	-	1.10	0.09
C-A	0.00	-	-	-	-	-	-	-	-
C-B	0.00	8.70	0.000	-	0.00	0.00	-	0.00	0.00
A-B	0.00	-	-	-	-	-	-	-	-
A-C	0.00	-	-	-	-	-	-	-	-

Demand Set: 2029 WE
Modelling Period: 12:30-13:30

Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh. Min/ segment)	Delay (veh. Min/ segment)	Mean Arriving Vehicle Delay (min)
B-AC	1.82	11.92	0.152	-	0.00	0.18	-	2.60	0.10
C-A	0.00	-	-	-	-	-	-	-	-
C-B	0.00	8.70	0.000	-	0.00	0.00	-	0.00	0.00
A-B	0.00	-	-	-	-	-	-	-	-
A-C	0.00	-	-	-	-	-	-	-	-

Demand Set: 2029 PM
Modelling Period: 17:00-18:00

Stream	Demand (veh/min)	Capacity (veh/min)	RFC	Ped. Flow (ped/min)	Start Queue (veh)	End Queue (veh)	Geometric Delay (veh. Min/ segment)	Delay (veh. Min/ segment)	Mean Arriving Vehicle Delay (min)
B-AC	1.37	11.92	0.115	-	0.00	0.13	-	1.90	0.09
C-A	0.00	-	-	-	-	-	-	-	-
C-B	0.00	8.70	0.000	-	0.00	0.00	-	0.00	0.00
A-B	0.00	-	-	-	-	-	-	-	-
A-C	0.00	-	-	-	-	-	-	-	-

Figure A2 – Harbour View/Wolfe Tone Square PICADY Results

Appendix 5 – Flood Risk Assessment

1.0 Introduction

RPS were commissioned by Bantry Bay Harbour Commissioners to carry out a site specific flood risk assessment for a major new marine leisure development at Bantry harbour, Co Cork. This Flood Risk Assessment will assess the risk to the proposed development from all potential sources of flooding and propose suitable mitigation measures where appropriate. This document is in support of a Planning Application for the development and has been prepared in accordance with The Planning System and Flood Risk Management Planning Guidelines (2009).

2.0 Site location and description

2.1 Site Location

The application site is located at Bantry Harbour, to the west of the town of Bantry, Co Cork. The proposed harbour development comprises of dredging the existing harbour, reclamation to create a fishing pier and an amenity area, and the construction of new pier walls and breakwaters. The resulting development will create a marina accommodating approximately 200 berths. Full details of the development can be found in Appendix A. Figure 2.1 shows the location of the site and Figure 2.2 shows the application site outline.

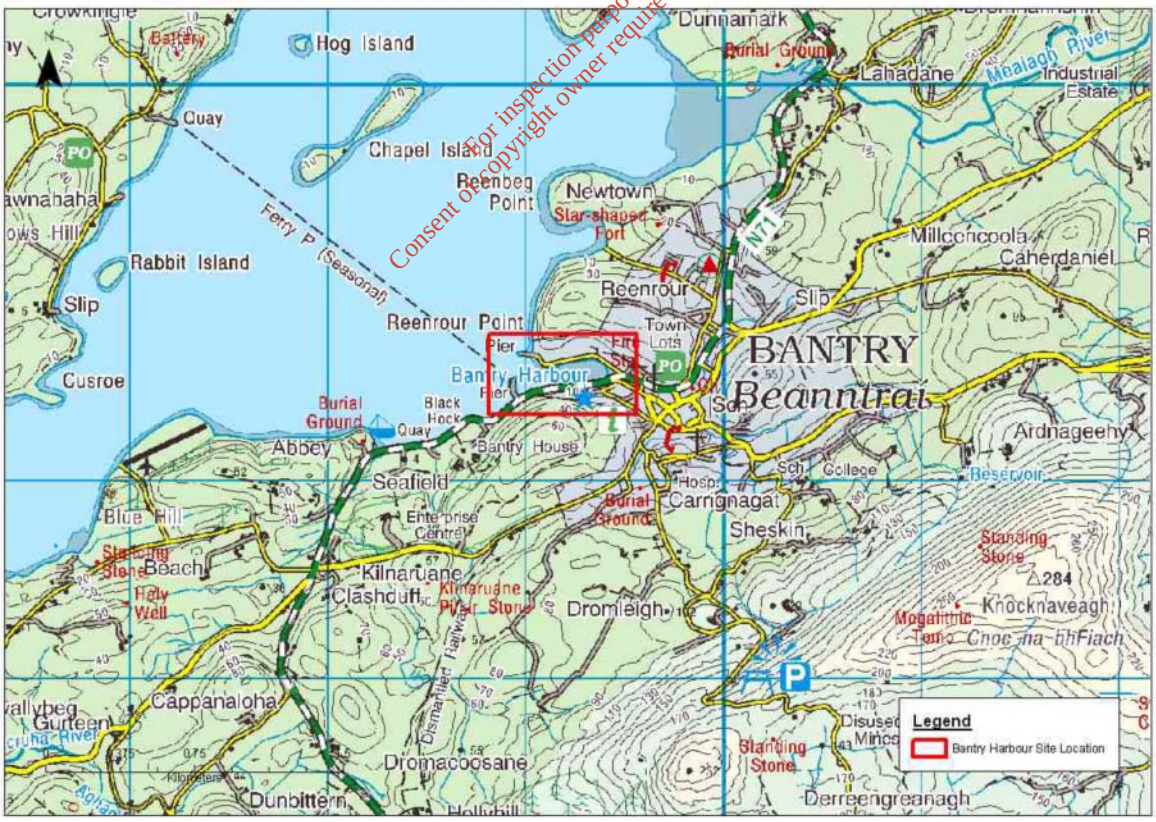


Figure 2.1 Site Location Plan

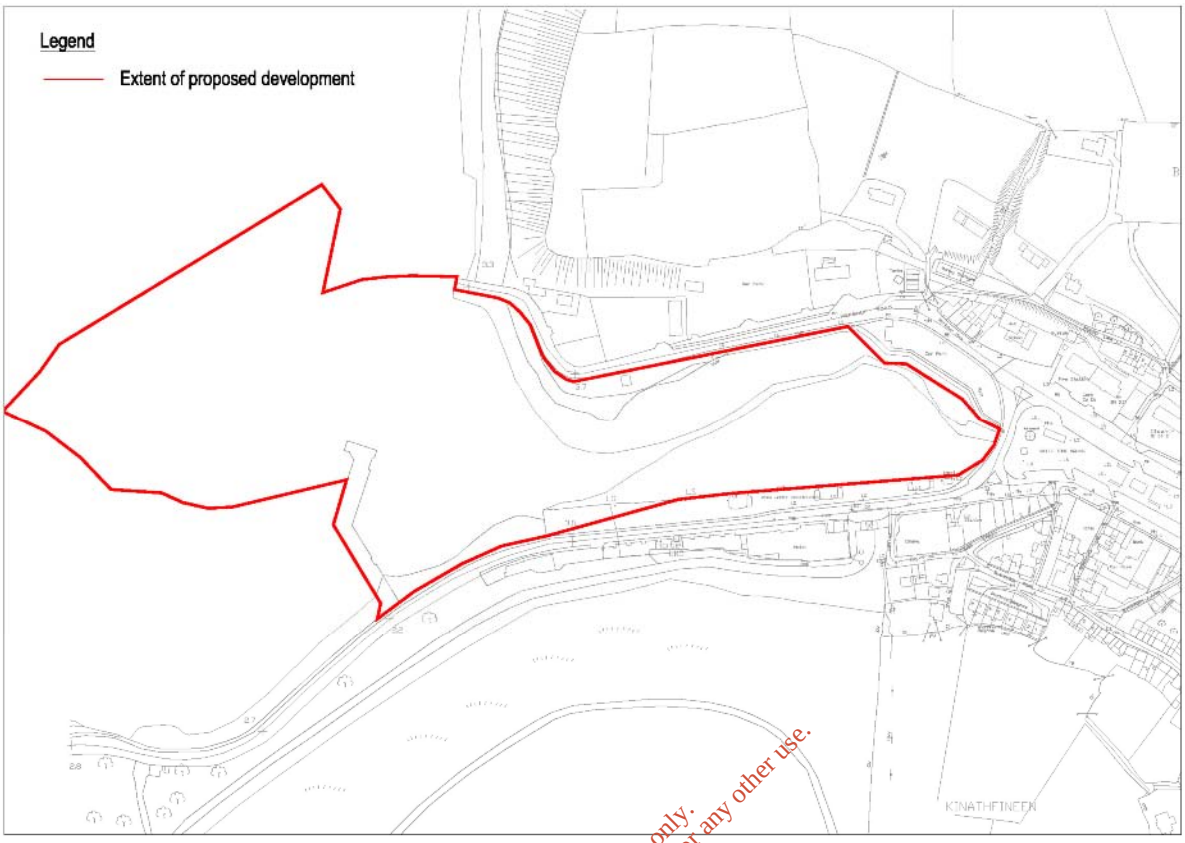


Figure 2.2 Proposed Development Location

2.2 Site description

The application site is currently used as a fishing harbour. Plates 2.1-2.6 show the existing harbour, and Figure 2.3 shows the location of these photos.

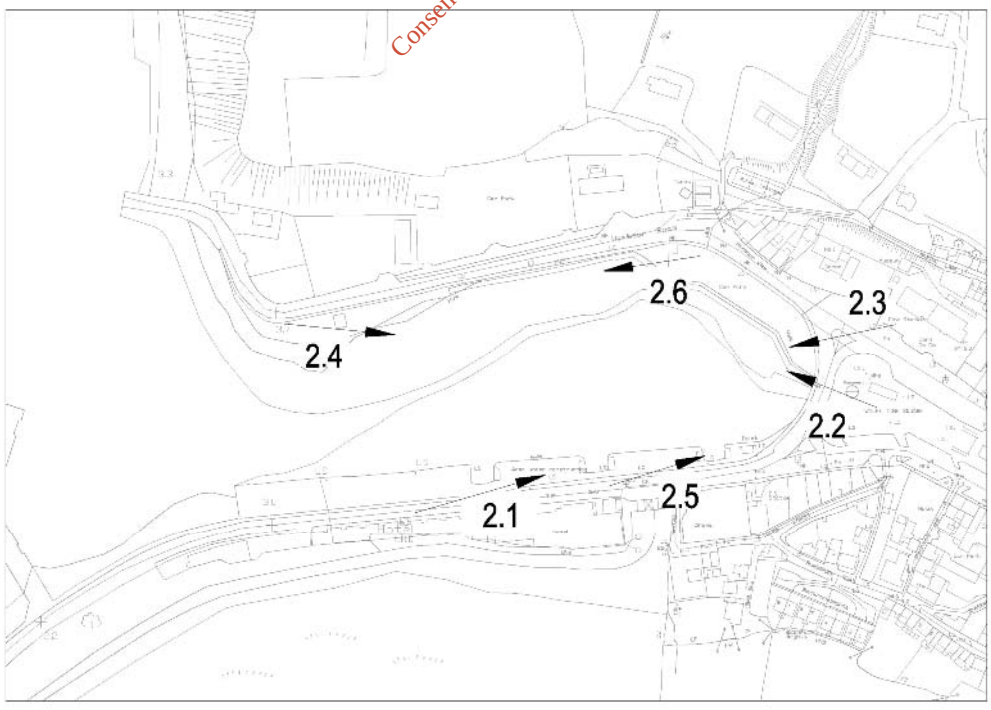


Figure 2.3 Location of Photographs

Plate 2.1 View along Fishing Docks

Plate 2.2 View from Public Car Park of Inner Harbour

Plate 2.3 View from Public Car Park out of Harbour

Plate 2.4 View of Inner Harbour towards Wolfe Tone Square

Plate 2.5 View of Dry Fishing Dock

Plate 2.6 View of Northern Embankment

2.3 Topography

The existing harbour is currently at levels of approximately -2.24m OD Malin (0m to Chart Datum) to -1.24m OD Malin (1m to Chart Datum). Mean Low Water Spring is at approximately -1.74m OD (0.5m CD) and therefore the harbour can dry out at low tide as shown in Plate 2.3 above. The areas surrounding the harbour vary in level at around 1.76m OD (4m CD). Some stretches of the harbour have existing masonry walls at a level of approximately 3.26m OD (5.5m CD).

2.4 Existing drainage infrastructure

A culvert discharges into the harbour at the eastern end as shown on Plate 2.7. This culvert carries storm drainage from the town of Bantry.

Photograph 2.7 Culvert Discharging to Harbour

3.0 Potential Sources of Flooding

3.1 Tidal flooding

RPS used a MIKE 21 flexible mesh coastal model to generate a range of extreme tidal water levels. This was achieved through using a tidal and storm surge model, which covers the entire Irish coastline, the English Channel to Dover, the Western English and Welsh coastlines as well as the Outer and Inner Hebrides and the West of mainland of Scotland. The model extends into the Atlantic Ocean off the continental shelve and was developed in house by RPS based on the flexible mesh 2D hydrodynamic software package called DHI MIKE 21 FMHD. Figure 3.1 shows the extent of the numerical model used. The model uses 15 tidal harmonics from a global tidal model on its open boundaries and the wind and pressure field is defined using data from the ERA40 re-analysis model and the most current operational analysis and forecast model operated by the European Centre of Medium Range Weather Forecast.

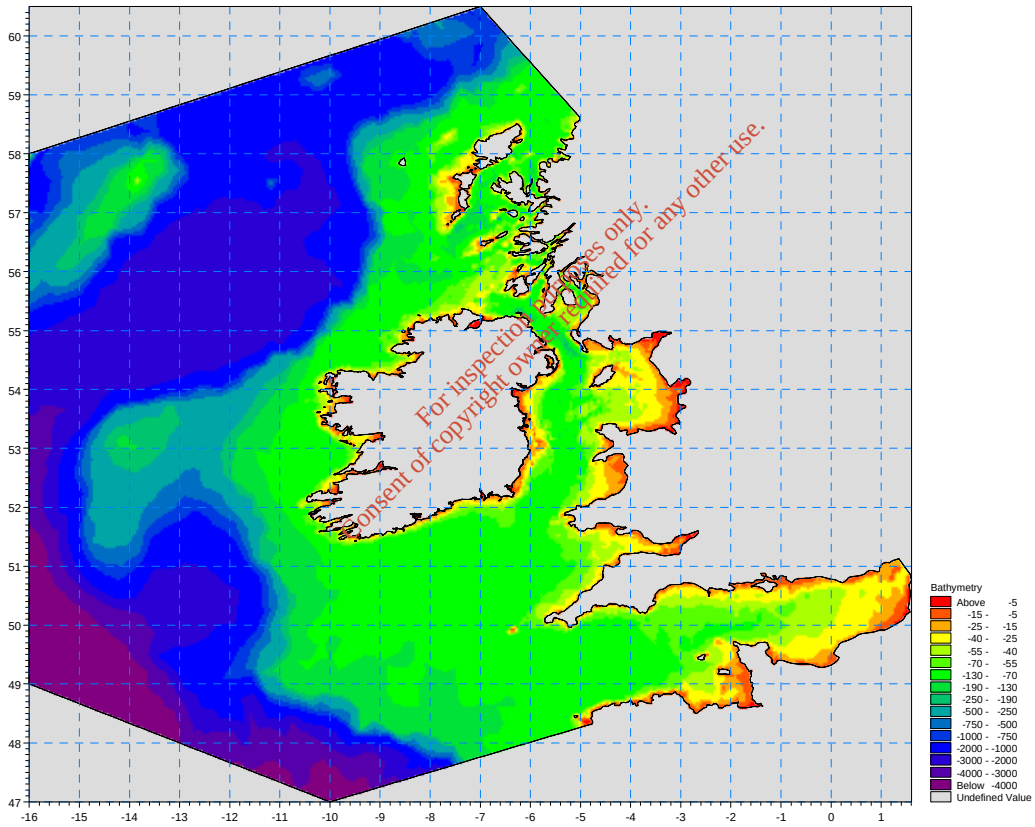


Figure 3.1 Extent of Irish Tidal and Storm Surge Model

The model was calibrated against a wide range of tidal measurements from various locations around Ireland and along the relevant UK coast. The model is utilised for both the Irish Coastal Protection Strategy commissioned by the Department of Communications, Marine and Natural Resources and the Northern Ireland Flood Mapping Programme commissioned by DARD Rivers Agency.

Table 3.1 shows the estimated extreme tidal water levels for each of the following return period events at a point in the model located close to Bantry Bay (see Figure 3.2 for location of the point).

Table 3.1 Predicted Present Day Tidal Flood Levels

Annual Exceedance Probability(AEP)	Return Period	Water Level Present Day (m OD)	Water Level Present Day (m CD)
50%	2	2.14	4.38
20%	5	2.25	4.49
10%	10	2.33	4.57
5%	20	2.42	4.66
2%	50	2.52	4.76
1%	100	2.60	4.84
0.5%	200	2.68	4.92
0.1%	1000	2.86	5.10

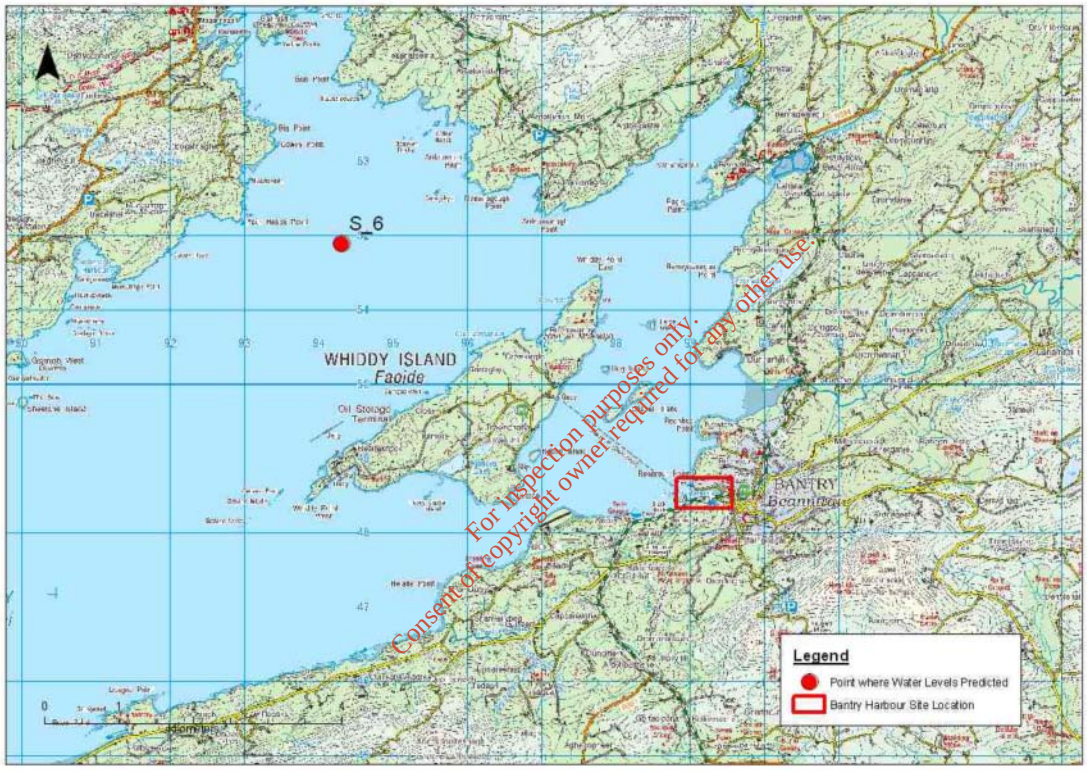


Figure 3.2 Location of Point where Water Levels were predicted

The UKCIP02 and the Scotland and Northern Ireland Forum For Environmental Research (SNIFFER) Report 2007) sets out likely scenarios for sea level rise in around the UK. They takes into account the effects of eustatic sea level rise, isostatic rebound, tectonic change and sediment consolidation. It states that the scenarios for sea level rise by the 2080s are between 23 and 36cm but a wider range of models reviewed by SNIFFER have produced a range between 9cm and 69cm. Based on this uncertainty, a level of between 40cm and 50cm, which is nearer the top of this range, would be a conservative estimate for the likely sea level rise by the year 2100 for Bantry Bay. Table 3.2 therefore presents predicted 1 in 200 year flood levels for the year 2100.

Table 3.2 Predicted 2100 Tidal Flood Levels

Annual Exceedance Probability (AEP)	Return Period	Water Level Present Day (m OD)	Water Level 2100 (m OD)	Water Level 2100 (m CD)
50%	2	2.14	2.64	4.88
20%	5	2.25	2.75	4.99
10%	10	2.33	2.83	5.07
5%	20	2.42	2.92	5.16
2%	50	2.52	3.02	5.26
1%	100	2.60	3.10	5.34
0.5%	200	2.68	3.18	5.42
0.1%	1000	2.86	3.36	5.60

RPS have used topographical survey data of the area in order to map the extent of tidal flooding in the vicinity of the site. Based on the present day predicted tidal flood level of 2.68m OD (4.92m CD) the entire site would be below this level and subsequently under the Planning System and Flood Risk Management Guidelines (2009) would be classified as Flood Zone A. Figure 3.3 shows the extent of a 0.5 % AEP tidal flood event.

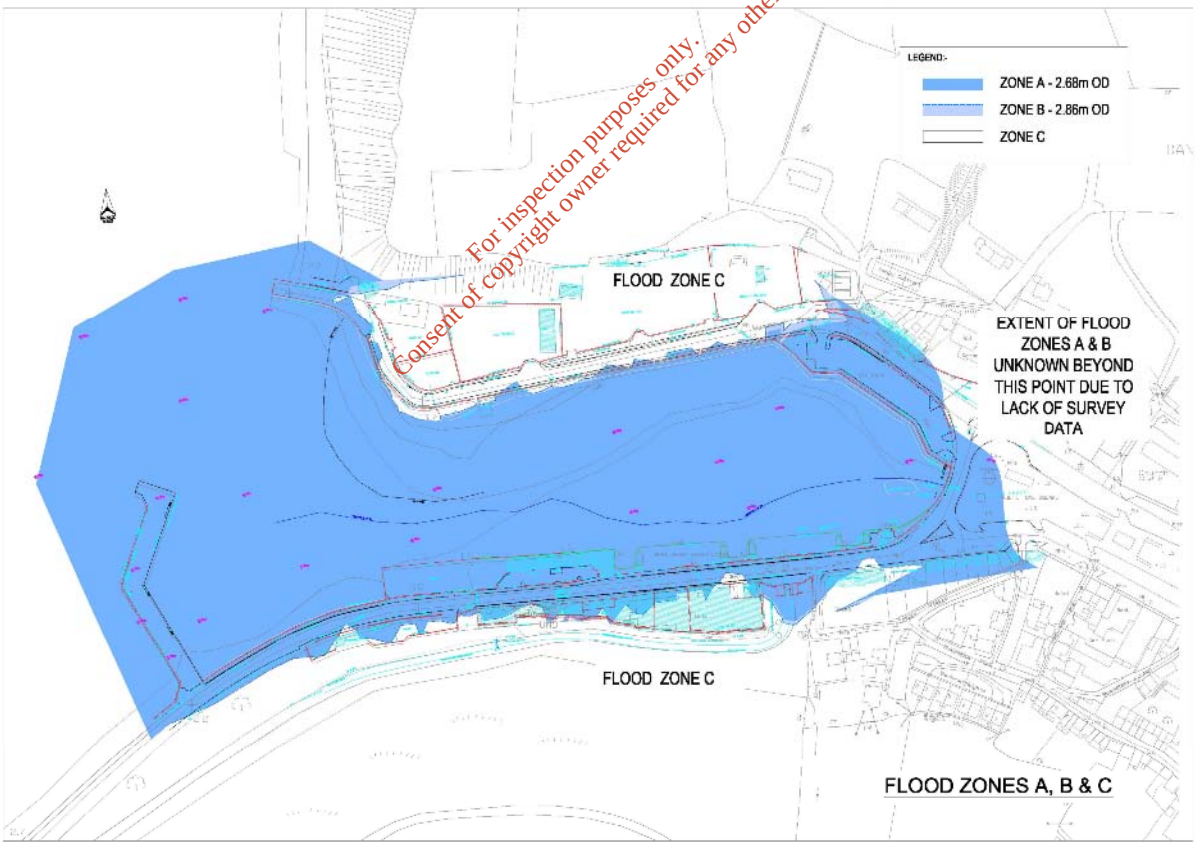


Figure 3.3 Flood Zoning for Application Site (Present Day Levels)

3.2 Fluvial flood risk

There are no significant watercourses within the site and therefore there will be no impact from fluvial flooding.

3.3 Pluvial flood risk

3.3.1 Overland Flow

Generally, in order for a site to be considered at risk from overland flow it characteristically has steep gradients either within or above the site and a reasonably large contributing catchment area. In this case the application site and the surrounding land are low lying and flat and but the contributing area would be considered small therefore the risk of significant flooding from overland flow would be considered low. In addition the type of proposed development, being quay walls and amenity areas would not be overly susceptible to this type of flooding.

3.3.2 Storm Water Drainage

Due to the nature of the development it will not produce a significant amount of additional storm drainage. Drainage from any new hard standing areas will be connected into the existing storm drainage system. The risk would therefore be considered to be low.

3.3.3 Foul drainage

No additional foul drainage will be required for the development and therefore there is no risk.

3.4 Summary of potential sources of flooding

It can be concluded that the overwhelming risk to the site comes from Tidal Flooding. The entire application site will be contained within Flood Zone A (0.5% AEP event). This zone is considered to be at high probability of flooding and most types of development would be considered inappropriate in this zone. However, The Planning System and Flood Risk Management Planning Guidelines (2009) states that *"water-compatible developments….that require a waterside location….would be considered appropriate".* Table 3.1 of the guidelines lists *'Docks, marinas and wharves'* as Water-compatible developments, and therefore, in line with the sequential approach set out in guidelines, a Justification test is not required for this development.

4.0 Flood Risk Mitigation Measures

As stated in section 3.4 the predominant source of flooding to the application site emanates from extreme coastal water levels. The mitigation measures outlined below will be required to ensure the risk from a design tidal level (2100, 0.5% AEP event) of 3.18m OD (5.42m CD) is minimised.

4.1 Proposed Finished Floor Levels

No buildings are to be constructed under the proposed development and therefore this is not applicable.

4.2 Proposed Development Levels

The proposed development involves dredging, reclamation and construction of a number of structures. Dredging is to be undertaken to -4.24m OD (-2m CD) and these areas will be permanently underwater as required to operate the marina. Where areas are being reclaimed to construct a fishing pier and an amenity area, the levels are being raised to 3.51m OD (5.75m CD). It is in these areas where any future development is likely to be constructed. and subsequently the proposed levels have been raised to provide an adequate freeboard above even the predicted 0.5% AEP, 2100 flood level (330mm). The top of breakwater will also be at a level of 3.51m OD (5.75m CD).

The pierside reclamation area to the south will be constructed to a level of 2.51m OD (4.75m CD) to tie in to the top of an existing wall and the existing road in the vicinity. This area will therefore but at risk of flooding during an extreme event equivalent to or in excess of a 1% AEP tidal event. However it should be noted that the only use proposed use will be for parking and no “built” development is proposed in this location. RPS would consider this to be acceptable given that tidal inundation will not be rapid, will be accompanied by associated bad weather and therefore it is unlikely that the quayside will be utilised during an event of this nature. The quayside itself will not be susceptible to flood damage given the materials from which it is constructed.

Figure 3.4 shows what the flood zones as described in Figure 3.3 would look like after the proposed harbour development has been constructed and levels have been altered.

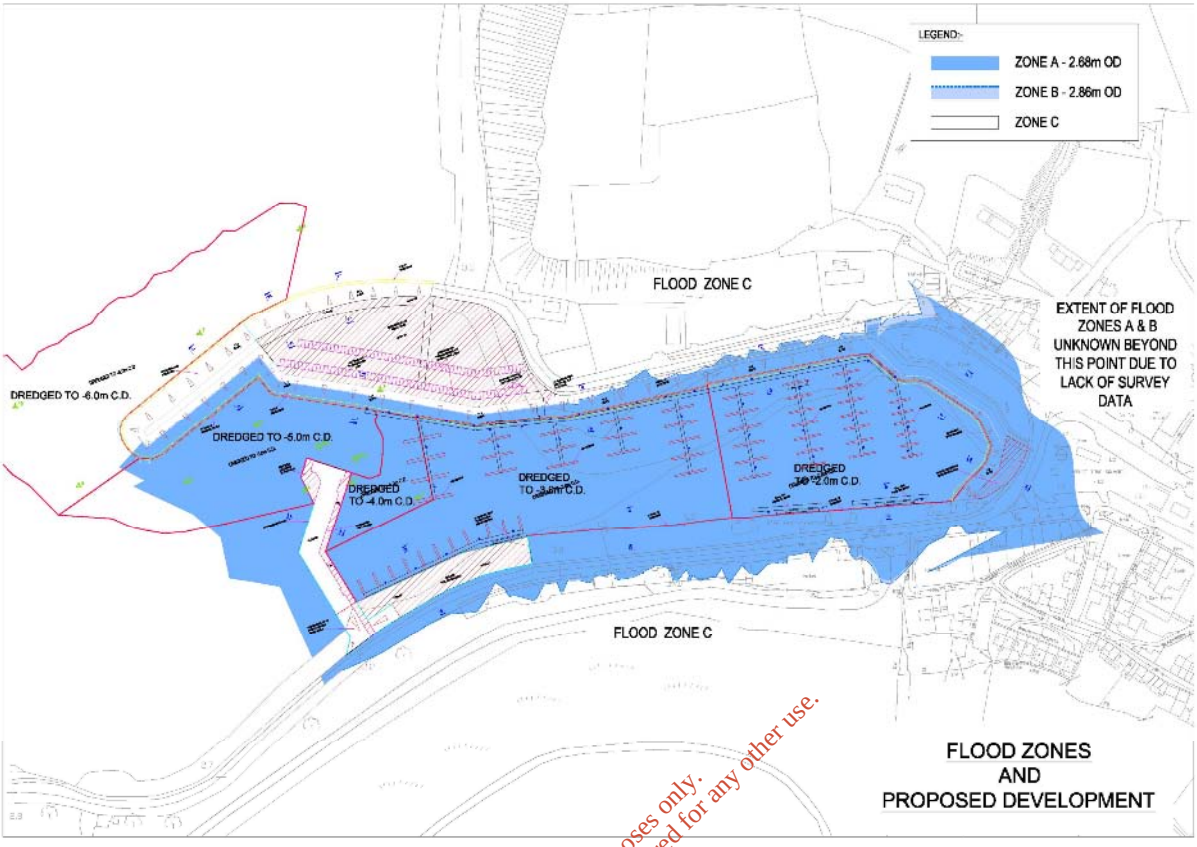


Figure 3.4 0.5 % AEP Tidal Flood Extent (Proposed development levels)

It should be noted that the proposed scheme for Bantry Harbour is not a flood risk alleviation scheme. The fact that levels are being raised in some areas throughout the harbour, does not serve to solve the overall flooding problem within Bantry.

4.3 Storm Drainage

As discussed previously, there is a limited amount of storm drainage generated by this development. Any connections required to the existing drainage network will be designed to the recognised standards as agreed with Cork County Council.

4.4 Residual Impacts

With any development adjacent to a watercourse or within a coastal floodplain there is always a residual flood risk. The required standard of protection can be exceeded and defences can be overtopped, however the 300m freeboard applied to the proposed development will reduce the impact of such events. In fact a predicted 1 in 1000 year event with sea level rise in the year 2100 will only have a predicted level of 3.36m OD (5.6m CD) based on current predictions and therefore any residual flood risk can be considered minimal.

5.0 Conclusion

RPS have assessed the flood risk to the proposed development and determined the predominant source of flood risk emanates from coastal flooding.

Under The Planning System and Flood Risk Management Planning Guidelines (2009) the application site would be classified as Flood Zone A (i.e. within the 0.5% AEP flood extent). As the development is a marina it can be classified as a 'Water-compatible development' and is therefore appropriate for construction within the Flood Zone. A Justification Test was therefore not required to be completed.

The proposed development is therefore, in the opinion of RPS, compliant with The Planning System and Flood Risk Management Planning Guidelines (2009).

Appendix 6 Photomontages for Landscape and Visual Impact Assessment

Viewpoint 1

Viewpoint 2

Viewpoint 3

Viewpoint 4

APPENDIX 7

Public Consultation

Appendix 7A – Information sent to Statutory and Non Statutory Consultees

Inland Fisheries Ireland
Sunnyside House
Macroom
County Cork

4th October 2011

Our Ref: Lt0006
File Ref: IBE0558

Re: EIA FOR BANTRY INNER HARBOUR DEVELOPMENT

Dear Sir/Madam

RPS has been appointed by Bantry Bay Harbour Commissioners as consulting engineers to provide both engineering consultancy and environmental services in relation to the redevelopment of Bantry Inner Harbour.

The use of the inner harbour at Bantry is currently constrained by the available water depth. It is proposed to dredge the inner harbour to provide sufficient water depth at low tides for the anticipated range of vessels using the harbour at present and in the future. Development plans for the harbour also include the reclamation of additional lands and improvements to the existing pier, together with environmental improvements and the provision of marina berthing facilities and amenity areas. A preliminary layout of the harbour development is enclosed for indicative purposes but is subject to change during the detailed design process.

It is proposed that the upper meter of sediment in the bay, which is contaminated with high concentrations of TBT and heavy metals, is treated on-site and incorporated into the reclaimed areas. However, a significant volume of uncontaminated sediments will arise from the dredging activities and there is no scope for using them in the design of the harbour development. The following schemes for the beneficial re-use of the uncontaminated sediments are under consideration:

- The preferred scheme is beach nourishment in the Cove Strand area (including two protective breakwater structures for sediment retention) and along Beicin Strand (see location on enclosed map);
- If the scheme at the Cove and Beicin site is not viable, land reclamation along the frontage at Abbey to provide an area for boat storage and maintenance facilities will be pursued (see location on enclosed map).

To inform the development of this project, and the Environmental Impact Assessment, we would be grateful if you could provide any information relevant to the proposed study area that you may hold, and/or highlight any issues that you feel should be addressed in the Environmental Impact Assessment.

It would assist our programme of work greatly if you would reply by Friday 28th October 2011 and we thank you in anticipation for your co-operation.

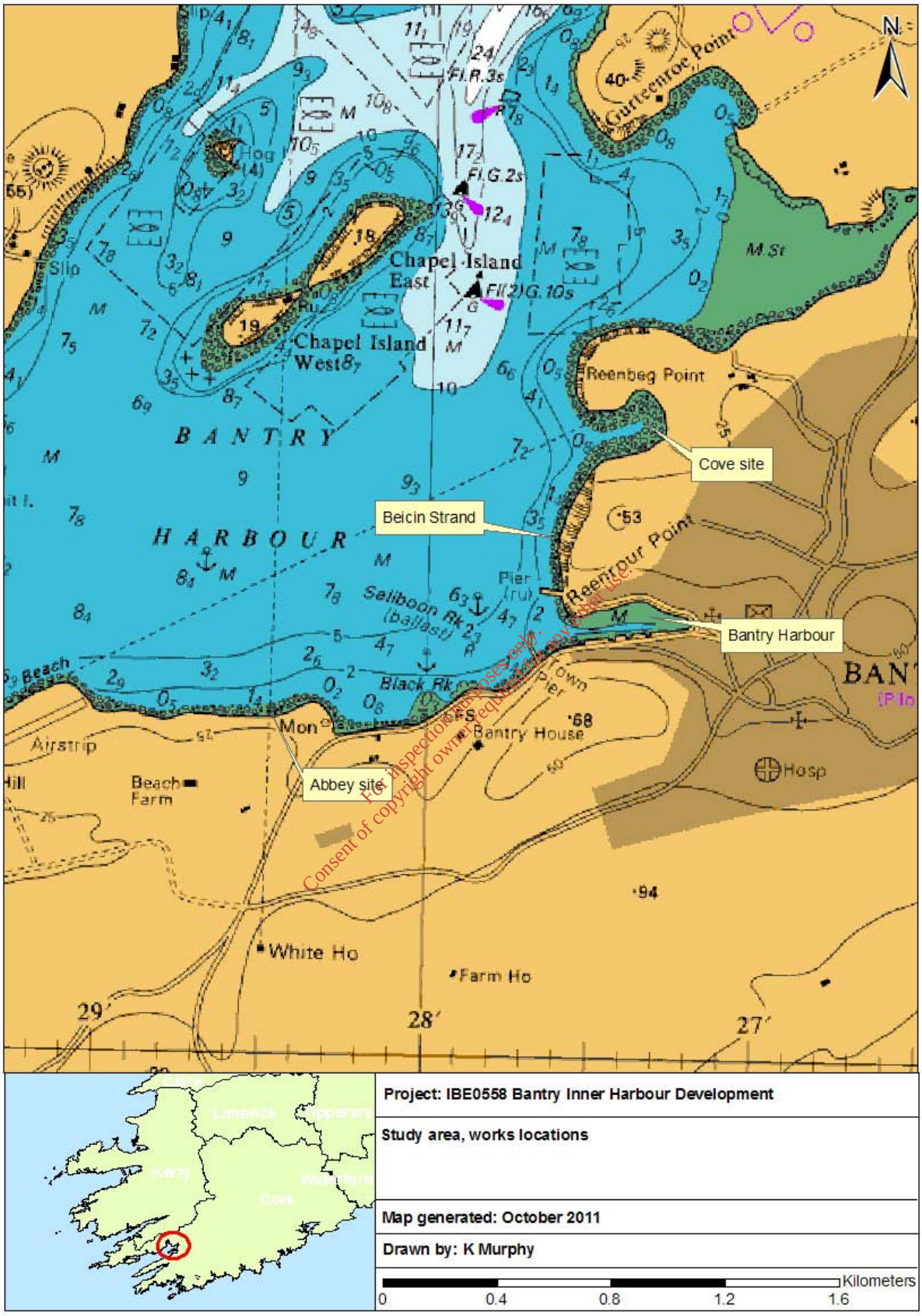
Yours sincerely

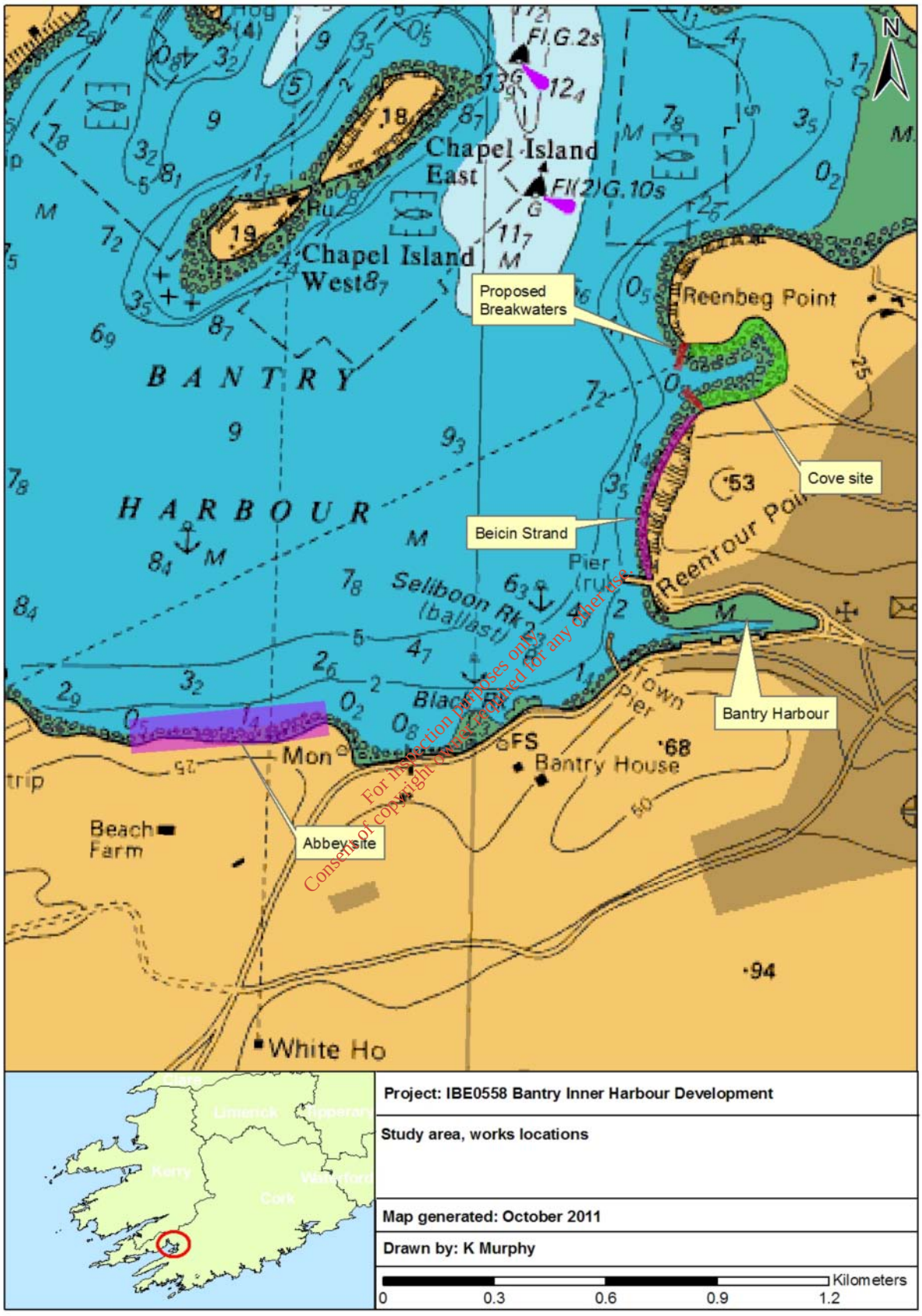
Katie Murphy
Katie.Murphy@rpsgroup.com
For RPS

Encl.

Map of study area

Indicative layout of harbour development





Appendix 7B Advert from Southern Star Newspaper, Saturday July 14 2012

July 2012:
1st Prize - €700.....Sheila Reilly, Colla Road, Schull;
2nd Prize - €200.....Jerry O'Donovan, Droum House, Leap;
3rd Prize - €100.....Jack Whooley, Ards, Scart, Bantry;
4th Prize - €100.....Tony & Helen Gallagher, "Crestview", Coronea, Skibbereen;
5th Prize - €100.....Brian O'Keeffe, Rooska, Bantry;
6th Prize - €100.....John Sweeney, Park Road, Dunmanway;
7th Prize - €100.....Jerry & Helen Connolly, Lissanuhig, Skibbereen;
8th Prize - €100.....O'Regan's, South Schull, Schull;
9th Prize - €100.....Ber & Jimmy Cotter, The Parade, Ballydehob;
10th Prize - €100.....Deirdre Crowley, Glenbannoo Upper, Bantry;
11th Prize - €100.....Johnny Pyburn, Lowertown, Schull;
12th Prize - €100.....Mary O'Sullivan, Gortnasowney, Dunmanway.

CoAction would like to thank everyone who subscribed to this year's series of monthly draws considering the current difficult financial climate and also is very grateful to all ticket-sellers and supporters of the Club Draw.

Bantry Bay Harbour Commissioners
Harbour Office, Wolfe Tone Square, Bantry, Co.Cork, Ireland

PROPOSED INNER HARBOUR DEVELOPMENT AT BANTRY

PUBLIC CONSULTATION

Bantry Bay Harbour Commissioners supported by their consultants RPS are currently progressing plans for the development of the Inner Harbour at Bantry. An Environmental Impact Statement (EIS) is being prepared to ensure that the development is fully integrated with the overall development of Bantry and that the environment is protected.

With a view to presenting the proposals to the public and to take account of the opinions of those who live, work or have an interest in the area, Bantry Bay Harbour Commissioners are hosting open public consultation sessions on Tuesday 17th July and Wednesday 18th July. Interested parties and members of the public are invited to attend the Public Consultation sessions as set out below where the Design Engineers and Environmental team will be present to answer queries and explain the proposed scheme in more detail.

Venue: Bantry Bay Harbour Commissioners, Harbour Offices, Wolfe Tone Square, Bantry, Co. Cork
Date & Time: Tuesday 17th July – 6pm to 9pm
Wednesday 18th July – 9am to 12 noon

For further information:
Ruth Barr, RPS, Elmwood House,
74 Boucher Road, Belfast, BT12 6RZ

Telephone: 048 90667914
Email: ruth.barr@rpsgroup.com

Southern Simmental Club

are holding a

FIELD EVENING

in conjunction with Teagasc and ICBF on the farm of Mr Billy Nicholson, Hoddersfield, Crosshaven,
on Saturday, July 21st at 2.30pm

Prizes of Simmental semen to the value of €2,000 on the evening of the event

Wesco Aluminium & PVC

HARTE BROS.

favourite for many years to come.

The screening is all part of a summer programme of events in Glandore to celebrate the restoration of the church tower, and to raise an additional €15,000 for the church bell.

This weekend, the Glandore Harbour Yacht Club will also be offering summer school lectures, as well as hosting a model boat exhibition on July 14th and 15th, and the dedication of the newly restored bell to the memory of the late Tim John O'Donoghue will take place at 3pm on Friday July 15th.

Buttons, Lord David Puttnam, will introduce the movie in Glandore on Friday night.

Eyeries gears up for family festival

BY JACKIE KEOGH

Sharon Shannon is the headline act at the Eyeries Family Festival.

THE fabulous Sharon Shannon is to be the headline act at a weekend family festival in Eyeries.

Following on from the huge success of last year's inaugural event, the Eyeries Family Festival is back for a second year – from July 20th to 22nd – with another entertaining programme.

After the official launch on Friday night, there will be a concert by the famous squeezebox player, but the rest of the weekend is packed with plenty for people of all ages and interests.

There will be a children's treasure hunt on Eyeries Strand and a family fun day with sports competitions and fun activities starting early on Saturday, followed by a fashion show in aid of Co-Action in the village hall at 6pm.

On Sunday, there will be a children's crab fishing competition and a GAA blitz for U10s as well as sheepdog trials, which enthralled all who saw them last year.

This year, there will also be a vintage tractor parade through the village, starting at noon, as well as a village-wide craft and food fair – the highlight being a barbecue and cookery demonstration by Martin Shanahan, the Kinsale-based chef and RTÉ star.

Marine Harvest have kindly sponsored this fish feast, and there will also be live music, street performances, guided walks and a wonderful art exhibition featured in 'The Windows of Eyeries'.

Councillor demands immediate cleaning of river beds in Clon

AS A result of the recent flooding and widespread destruction to businesses, homes and road network in the Clonakilty area, Cllr Noel O'Donovan (FG) has insisted immediate action is needed to lower the height of local river beds by undertaking necessary dredging works.

'Residents living in the areas most affected by the recent floods, primarily Clonakilty, Ballinascarthy and Rathbarry, are living in constant fear of the events of June 28th re-occurring once again', said Cllr

rious risk' of further floods and destruction in the future.

'To impress the urgent need for dredging works to be undertaken, I have put down a motion for next Monday's meeting of the Western Committee requesting that immediate river cleaning works be undertaken in both Rathbarry and Ballinascarthy villages and to indentify any other areas with similar problems.'

Traditionally this type of work has been 'notoriously difficult' to progress and has been frustrated by 'red tape and bu-

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Appendix 7C Questionnaire used at Public Consultation Sessions

Bantry Bay Harbour Commissioners
Harbour Office, Wolfe Tone Square, Bantry, Co.Cork, Ireland

PUBLIC CONSULTATION QUESTIONNAIRE

We would appreciate if you could take a few minutes to fill in our questionnaire in relation to Bantry Bay Harbour Commissioners plans to develop the Inner Harbour at Bantry.

What do you feel are the main issues with the proposed development?

Do you have any information you feel would be relevant to the Environmental Impact Statement?

If you wish, please provide your contact details below:

Name: _____

Address: _____

Phone Number: _____

Email: _____

Thank you for your cooperation