

Bantry Bay
Seaward side

Bantry Town
Landward side

31000 N.T.S.

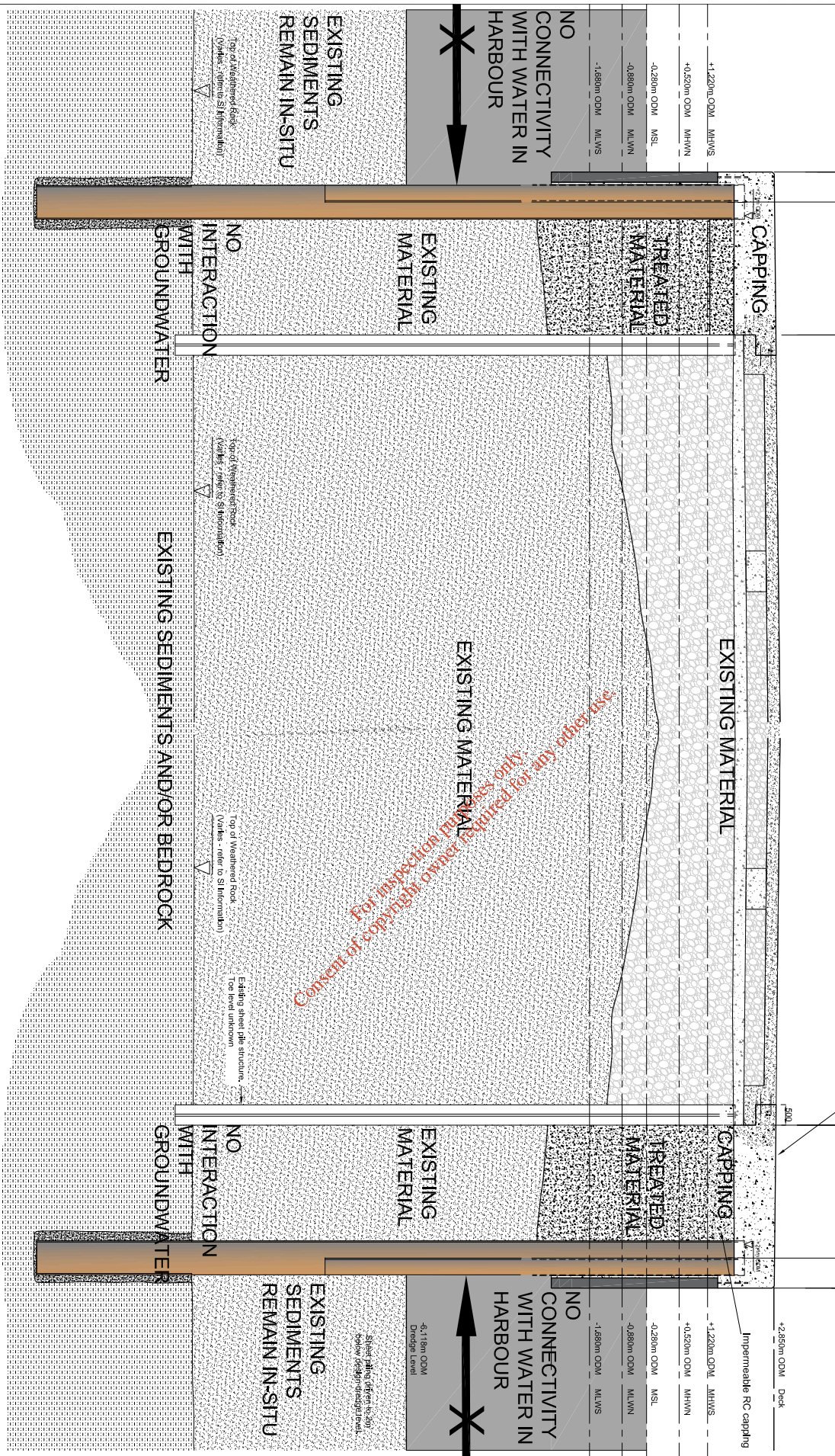
proposed widened Pier Head

Existing Pier
Pier Head

Pier Head symmetrical about C-C

New deck slab

Proposed quay edge



Transverse Section Through Pier Head (Looking Northwards)
SCALE: 1:50

Notes

1. All dimensions are in millimetres (MM),
2. All levels are in metres related to Ordnance Datum Mean,
3. Drawings are not to be scaled.

Legend

+1.220m ODL MHWS	Impermeable RC capping
+0.520m ODM MHWN	
-0.280m ODM MSL	
-0.880m ODM M/LWN	
-1.680m ODM M/LWS	

Reference Drawings

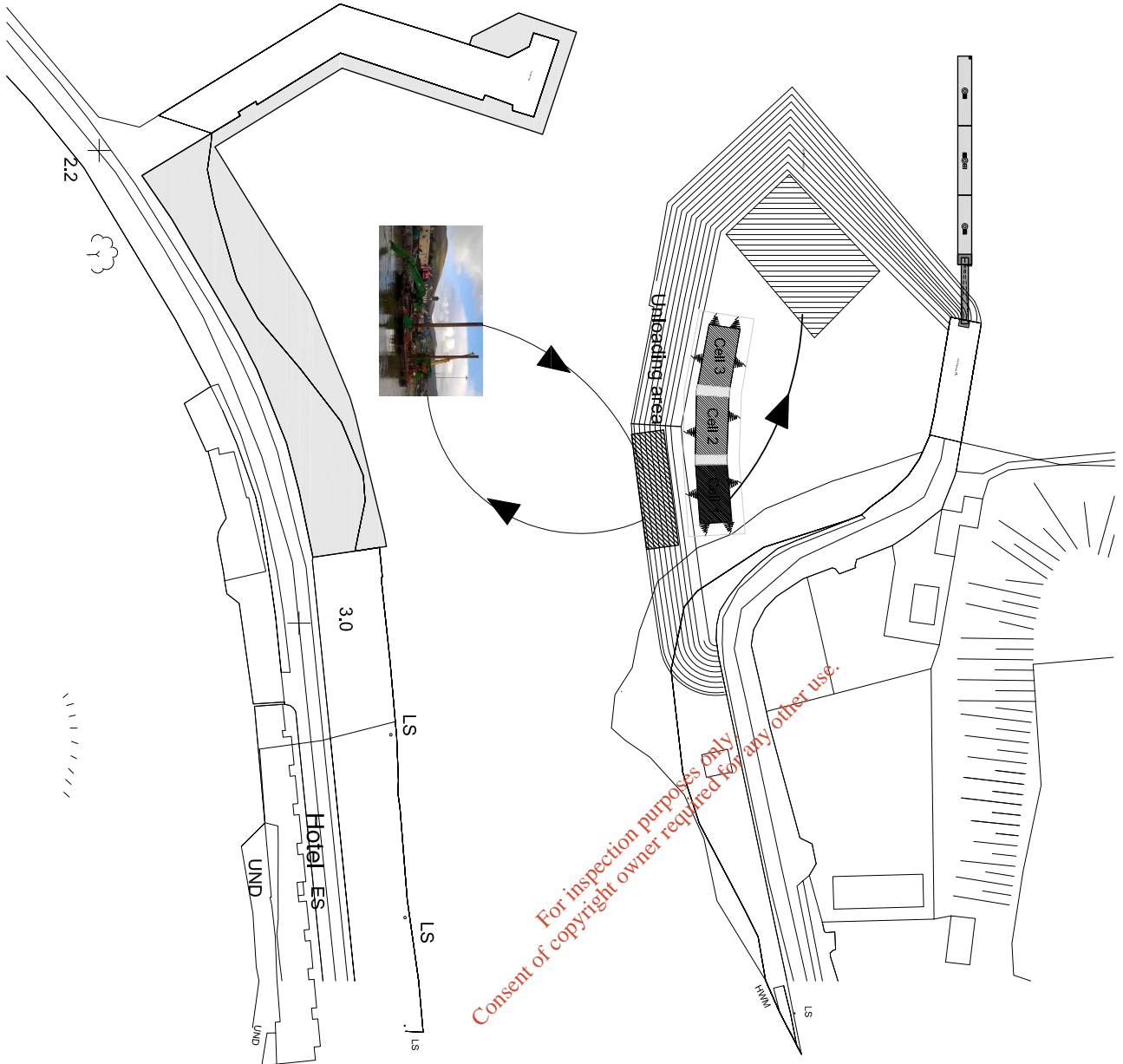
4.119m ODM
Design Level
Slab shall differ to 500
below design level.

Author	Checked	Drawn	Date	Description
Y. KILGUS	ESS/ED/CR/BA	SH/MS/JP		Bantry Bay Inner Harbour Development Phase 1

This Conceptual Site Model For Pathways From Fishing Pier Head
Client: Port Of Cork



<p>First Floor Malachy Walsh and Partners Engineering and Environmental Consultants 100, 101, 102 Cork</p>	<p>14 Tel: +353 (0)1 454000 Fax: +353 (0)1 454000 Email: dw@malwalsh.com</p>
<p>Contract No: 150 Drawn: SJ Checked: CH Approved: PC</p>	<p>Issue No: 1 Date: 26/05/2015 Date: 26/05/2015 Date: 26/05/2015</p>
<p>16341 - FIG.07</p>	<p>Scale: A</p>



For inspection purposes only.
Consent of copyright owner required for any other use.

Phase 1 :
Cell 1 filled with dredged spoil

Phase 2 :
Commence placing dredged gravel material

Phase 3 :
Commence stabilising material in Cell 1 and loading dredged material into Cell 2

Phase 4 :
Commence unloading stabilised material from Cell 1 and placing over the gravel. The material in Cell 2 is being stabilised and newly dredged material is being unloaded into Cell 3.

Notes

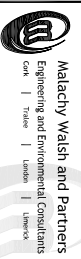
1. All dimensions are in millimetres (UNO)
2. Drawings are not to be scaled.
3. All levels are to Ordnance Datum Mean High unless otherwise noted.
4. Conversion for Mean High to Chart Datum : 0.00m ODM = 2.18m CD.
5. Schematic Drawing for Information Purposes Only.

Legend

Reference Drawings

Ref. No.	Description	Author
1	1:10 Scale	ISS/ST/CR/2004
2	2:10 Scale	ISS/ST/CR/2004
3	3:10 Scale	ISS/ST/CR/2004
4	4:10 Scale	ISS/ST/CR/2004
5	5:10 Scale	ISS/ST/CR/2004
6	6:10 Scale	ISS/ST/CR/2004
7	7:10 Scale	ISS/ST/CR/2004
8	8:10 Scale	ISS/ST/CR/2004
9	9:10 Scale	ISS/ST/CR/2004
10	10:10 Scale	ISS/ST/CR/2004

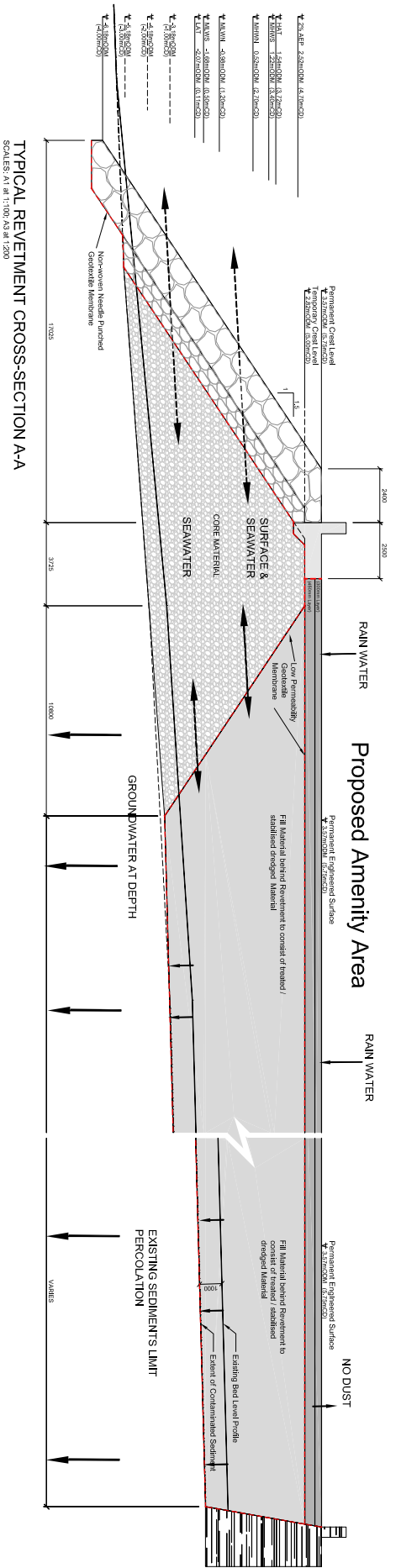
This Part of CA



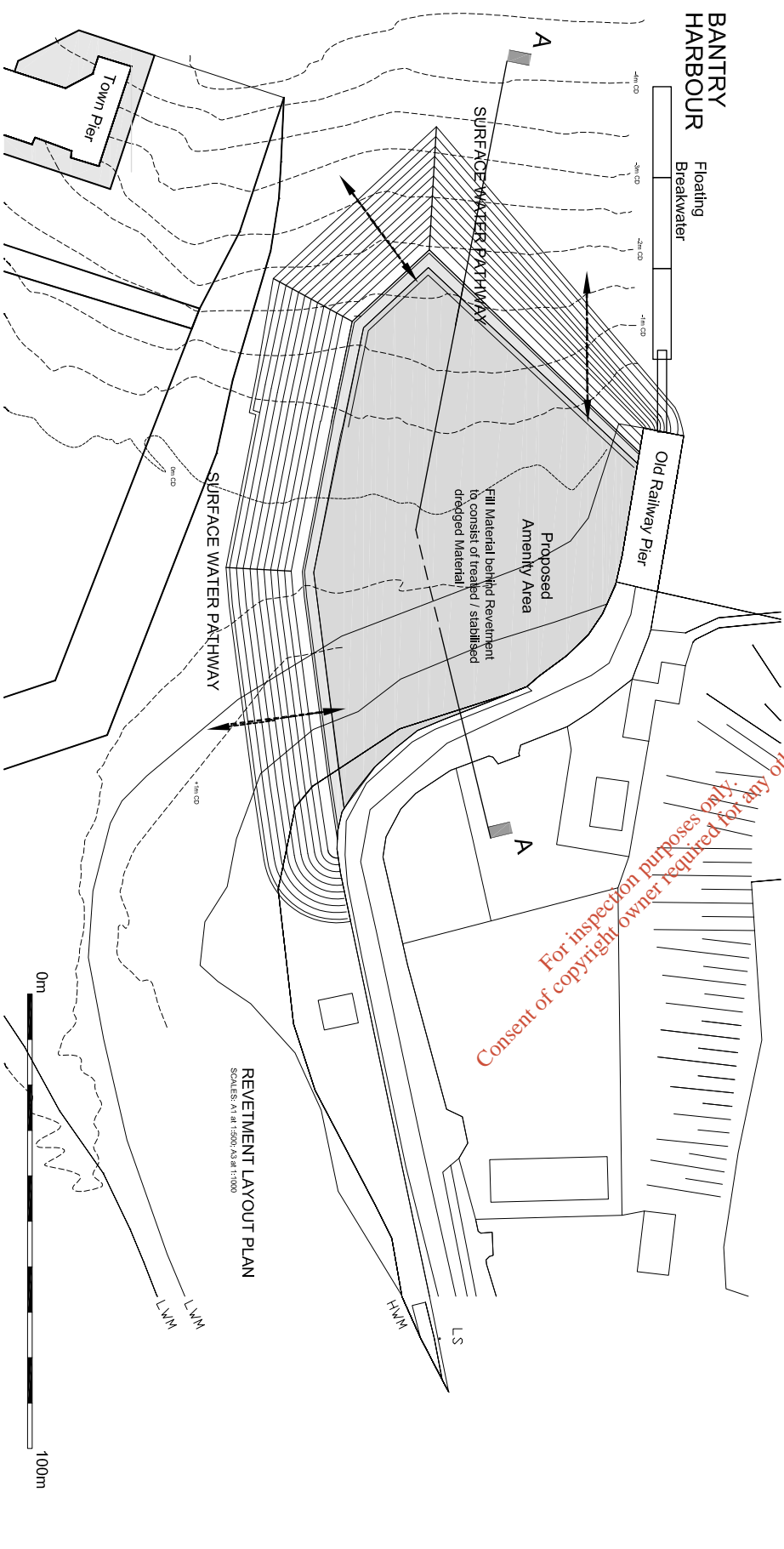
Malachy Walsh and Partners
Engineering and Environmental Consultants
Civil | Marine | Transport | London | Liverpool

First Floor
Malachy Walsh and Partners
100, Victoria Road
Liverpool, L3 5JY
Tel: +44 (0)151 454500
Fax: +44 (0)151 454501
Email: d.walsh@malw.co.uk

Scale: A1	UTM	Fig. No.	Rev.
Drawn: JWS	10/2/16	16341-FIG.08	A
Checked: JWS	10/2/16		
Approved: JWS	10/2/16		



TYPICAL RETEWMENT CROSS-SECTION A-A
 SCALES: A1 at 1:100; A3 at 1:200



RETEWMENT LAYOUT PLAN
 SCALES: A1 at 1:500; A3 at 1:1000

Notes

1. All dimensions are in millimetres (UNO)
2. Drawings are not to be scaled.
3. All levels are to Ordnance Datum Mean High unless otherwise noted.
4. Conversion for Males Head to Chart Datum: 0.00m ODM = 2.18m CD.

Legend

Reference Drawings

No.	Description	Date	By	Check
1	ISSUED FOR PERMITS	18/02/2016	SP	MS
2	REVISION	18/02/2016	SP	MS
3	REVISION	18/02/2016	SP	MS
4	REVISION	18/02/2016	SP	MS
5	REVISION	18/02/2016	SP	MS

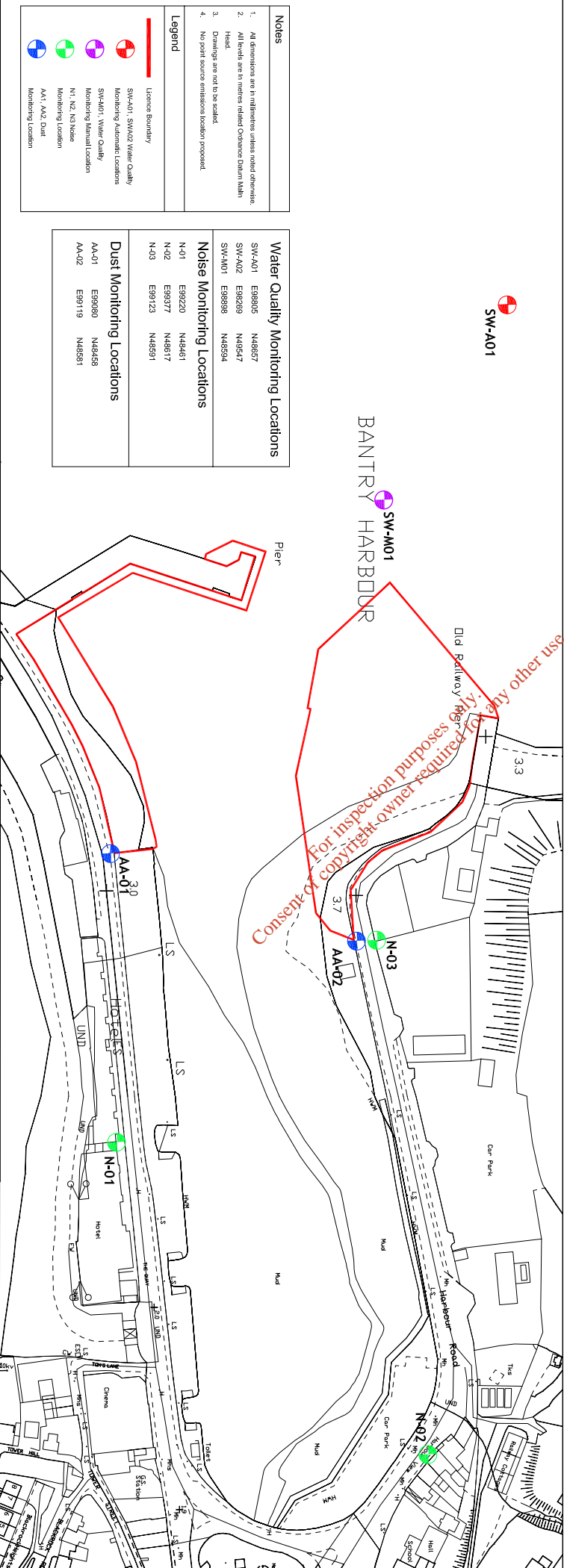
Malacky Walsh and Partners
 Consulting Engineers
 Civil | Marine | Landscaping | Environmental
 1st Floor, Malacky Walsh and Partners, 100, The Quadrant, London, E1 1RN
 Tel: +44 (0)20 7460 8000
 Fax: +44 (0)20 7460 8001
 Email: enquiries@malackywalsh.com

Project: Bantry Pier Harbour Development
 Phase: 1
 Title: Conceptual/Standard For Permits - Amenity Area
 Date: Part of O&M

Scale: A1: As Shown
 Drawing No: 16341-FIG.09
 Date: 18/02/2016
 Checked by: SP
 Approved by: MS



Baseline Water Quality Monitoring Outer Harbour (NTS)



Notes

1. All dimensions are in millimetres unless noted otherwise.
2. All levels are in metres unless stated otherwise.
3. Drawings are not to be scaled.
4. No point source emissions location proposed.

Legend

- SW-A01, SW-M02 Water Quality Monitoring Automatic Locations
- SW-M01, Water Quality Monitoring Manual Location
- N1, N2, N3 Noise Monitoring Location
- AA1, AA2 Dust Monitoring Location

Water Quality Monitoring Locations

SW-A01	E89806	N48857
SW-A02	E89209	N48547
SW-M01	E89898	N48594

Noise Monitoring Locations

N-01	E89220	N48461
N-02	E89377	N48517
N-03	E89123	N48591

Dust Monitoring Locations

AA-01	E89080	N48548
AA-02	E89119	N48591

Map Reproduced From Ordnance Survey/Ireland
By Permission Of The Government.
Licence Number EN0015716
OSI Sheet No. 665445



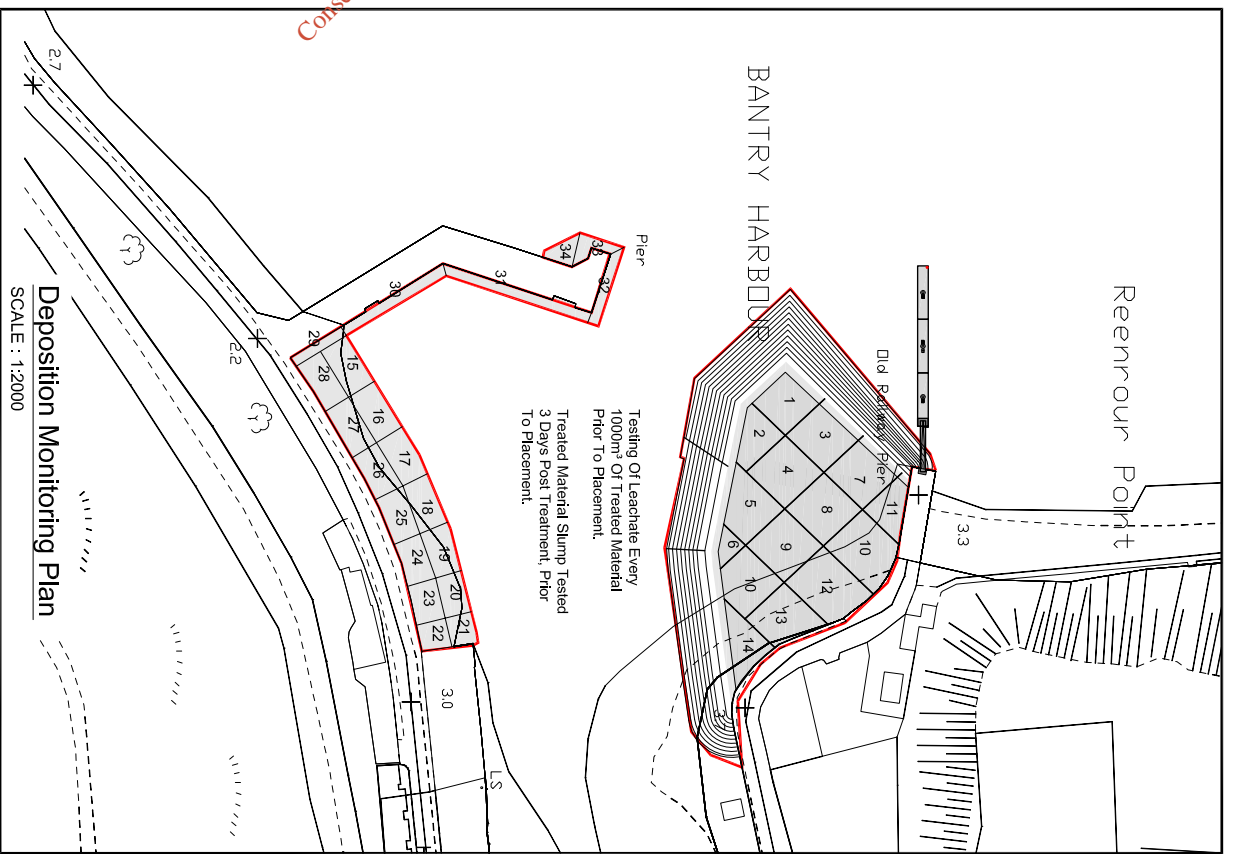
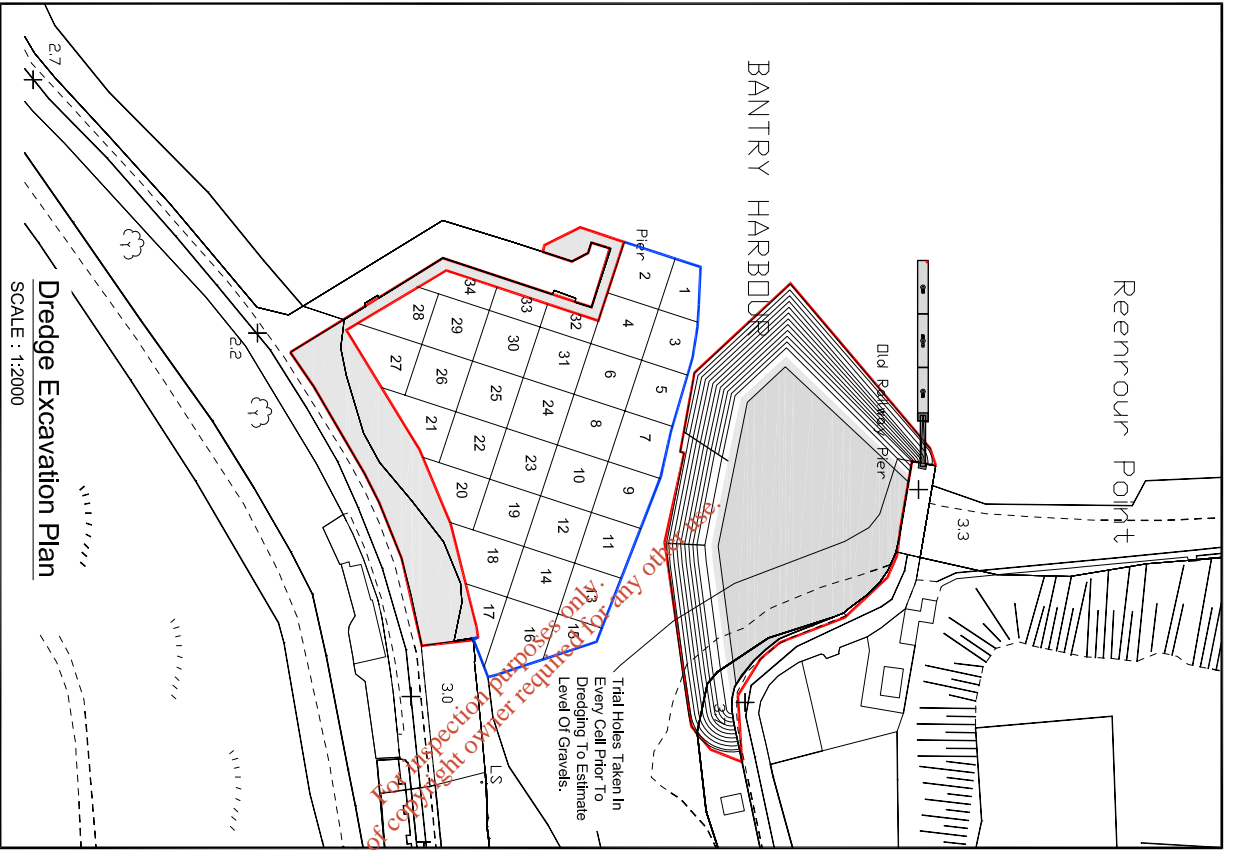
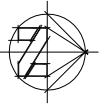
Rev.	Date	Description	by	chkd	app
A	04.03.16	ISSUED FOR ORA	BMP	MOS	PP

Client: PORT OF CORK
Project: BANTRY INNER HARBOUR DEVELOPMENT PHASE 1
Title: MONITORING PLAN



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

Scales (A3)	1:2000	Dwg. No.	16341-FIG.10	Rev.	A
Drawn	MOS	Jan. 2016			
Checked	PP	Jan. 2016			



Notes

1. All dimensions are in millimetres unless noted otherwise.
2. All levels are in metres related Ordnance Datum Mean High.
3. Drawings are not to be scaled.

Legend


- Licence Boundary
- Dredge Footprint

Map Reproduced From Ordnance Survey/Ireland
By Permission Of The Government.
Licence Number EN 00/197/16
OSI Sheet No. 6654-45

Rev.	Date	Description	by	ch'd	app
A	04.03.16	ISSUED FOR ORA	BMP/MOSI	PP	

Client: PORT OF CORK

Project: BANTRY INNER HARBOUR DEVELOPMENT PHASE 1
Title: DREDGE EXCAVATION AND DEPOSITION MONITORING PLAN



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

Scales (A3) 1:2000
Drawn MOS Jan. 2016
Checked PP Jan. 2016

Dwg. No. **16341 - FIG.11**

Rev. A



Bantry Inner Harbour - Phase 1 Development
Environmental Quantitative Risk Assessment
Report Tables 1 to 9

*For inspection purposes only.
Consent of copyright owner required for any other use.*

**Table 1: Bantry Inner Harbour - Phase 1 Development Tier 2 QRA
Soil Data from SI 2009 compared to Marine Intitute Levels
(All samples from sea floor to 0.5m)**

MI Sediment Quality Guideline Limits		Borehole Samples											Grab Samples										
Lower Level	Upper Level	Parameter	BH01	BH03	BH4	BH5	BH6	BH16	GS10	GS11	GS12	GS13	GS14	GS15	GS16	GS17	GS18	GS1	GS20	GS21			
mg/kg	mg/kg		11600	19300	15600	16600	15700	5490	9200	8830	7110	8660	4580	5440	9170	10800	14600	8650	8800	18300			
9	70	Aluminium	8.42	10.4	13.3	10.3	8.41	4.08	11.4	9.28				4.42		9.07	14600	15.9	8800	18300			
0.7	4.2	Arsenic	0.156	0.482	0.758	0.218	0.079	0.052	0.26	0.232				0.09		0.556		0.73		0.401			
120	370	Cadmium	14	32	24.9	19.3	21.5	8.87	13.3	12.6				8.49		20.2		21.6		30			
40	110	Chromium	14.1	71.6	91	20.3	14.6	4.06	33.9	21.4	14.8	27.1	4.04	6.94	46.7	52.1	70.2	68.8	25.1	40.2			
60	218	Copper	17.5	254	106	38.3	6.68	7.32	29.7	32				13.7		78.6		79.5		32.5			
		Lead	20.3	28.1	26.6	25.8	44.2	14.7	26.0	24.3				15.3		24.7		20.5		31.0			
0.2	0.7	Lithium	0.023	0.576	1.97	0.233	0.017	0.0245	0.324	0.197	0.01	0.268	0.017	0.035	0.429	0.434	1.13	1.18	0.374	0.119			
21	60	Mercury	23.3	28.3	21.8	25.5	53.5	12.2	21.7	20.3				13.3		21.9		18.9		25.4			
160	410	Nickel	69.6	259	238	72.2	63.3	33.1	101	86.9				55.3		235		256		90.8			
		Zinc																					
		Dibutyltin	0.004	0.006	0.005	0.004	0.00786	0.003	0.0105	0.00786	0.00786	0.0105	0.00786	0.0105	0.0105	0.0131	0.0157	0.262	0.0131	0.0131			
		Tributyltin	0.0131	0.183	0.236	0.004	0.003	0.003	0.2	0.003	0.003	0.02	0.003	0.004	0.004	0.05	0.2	0.3	0.005	0.005			
0.1	0.5	Σ TBT& DBT	0.0171	0.189	0.241	0.008	0.01086	0.006	0.2105	0.01086	0.01086	0.0305	0.01086	0.0145	0.0145	0.0631	0.2157	0.562	0.0181	0.0181			

Copyright Reserved. No part of this document may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of Viridus Consulting Ltd. For any other use.

**Table 2: Bantry Inner Harbour Phase 1 Development Tier 2 QRA
Soil Data from SI January 2015 Compared to Marine Institute Levels**

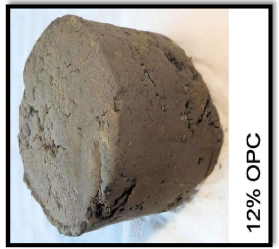
MI Sediment Quality Guideline Limits		Sample ID	SL02	SL03	SL05	SL06	SL07.1	SL07.2	SL07.3	SL07.4	SL08	SL09	SL10	SL11	SL12	SL13	SL14	SL15	
Lower Level	Upper Level	Depth (m)																	
mg/kg	mg/kg																		
9	70	aluminium	42400	36600	41000	45000	41200	38600	44000	42600	51300	40400	46500	40200	40600	50700	49800	78900	
0.7	4.2	Arsenic	14.4	7.77	8.72	15.8	11.7	11.1	8.94	14.5	13.3	14.3	8.77	15.3	13.7	20.7	11.1	14.8	
120	370	Cadmium	0.68	0.3	0.38	0.79	4.34	0.37	0.28	0.51	0.93	0.71	0.32	0.76	0.64	0.82	0.26	4.2	
40	110	Chromium	47.7	36.7	43.1	54.2	42.2	40.2	46.4	46.9	50	57.6	45.6	47	47.4	64.5	50.5	78.6	
60	218	Copper	43.2	11.8	25.4	50.6	12.8	16.5	15	18.6	42.1	63.8	26.7	49.5	35.4	36.1	10.1	22.8	
		Lead	58.7	35.9	39.4	66.4	39	27.4	26.2	37	34.2	65.6	27.6	65.7	50.3	54.9	17.5	16.1	
0.2	0.7	Lithium	29.6	30.2	30.8	32.6	32.3	28.9	33.3	25.8	41.2	26.8	33.4	25.9	25.7	35.6	32.3	37.7	
21	60	Mercury	2.37	0.14	4.61	0.63	0.65	0.34	0.08	0.06	0.44	0.39	0.3	0.49	0.4	0.36	0.09	0.04	
160	410	Nickel	23.5	23.6	24.4	26.9	24.4	26.8	30.5	34.1	30.1	29.8	27.1	24.6	23.9	31.2	28.6	37	
		Zinc	169	69	101	188	78.8	88	110	164	86.8	216	105	203	152	167	68.7	255	
ug/kg	ug/kg																		
1.7	180	PCBS	101	0.1	0.1	0.22	0.1	0.1	0.1	0.1	0.1	0.25	0.1	0.1	0.1	0.26	0.1	0.1	
2.7	180	PCB 28	0.22	0.2	0.1	0.22	0.1	0.1	0.1	0.1	0.1	0.25	0.1	0.1	0.1	0.26	0.1	0.1	
3.0	180	PCB 52	0.22	0.28	0.1	0.22	0.1	0.1	0.1	0.1	0.1	0.25	0.1	0.1	0.1	0.26	0.1	0.1	
0.6	180	PCB 101	0.22	0.83	0.1	0.22	0.1	0.1	0.1	0.1	0.1	0.25	0.1	0.1	0.1	0.26	0.1	0.1	
7.9	180	PCB 118	1.34	0.2	2.25	1.51	0.2	0.1	0.1	0.1	0.2	1.49	0.1	0.96	0.92	2.32	0.1	0.1	
40	180	PCB 138	2.68	0.2	3.65	3.45	0.39	0.1	0.1	0.1	0.41	2.73	0.2	2.3	2.02	3.86	0.1	0.1	
12	180	PCB 153	8.9	0.28	8.14	11	1.17	0.34	0.1	0.1	0.82	8.69	0.54	5.76	6.06	11.6	0.1	0.1	
68	1260	PCB 180	114.61	2.09	14.44	16.84	2.16	0.94	0.7	0.7	1.83	13.91	1.24	9.42	9.4	18.82	0.7	0.7	
mg/kg	mg/kg	Total 7 PCBs																	
		TBT & DBT																	
		Dibutyltin	0.01	0.03	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.17	0.01	
		Tributyltin	0.06	0.05	0.01	0.04	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.02	0.01	0.01	
0.1	0.5	Σ TBT& DBT	0.07	0.08	0.02	0.05	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.02	0.03	0.03	0.18	0.02	

Table 3: Bantry Inner Harbour Phase 1 Development Tier 2 QRA.
All Soil Data Results from SI Jan 2015.

Determinand	Units	Average	Min	Max	count	SL02	SL03	SL05	SL06	SL07.1	SL07.2	SL07.3	SL07.4	SL08	SL09	SL10	SL11	SL12	SL13	SL14	SL15	
dry solids (at 105°C)	%	67.5	38.9	95.0	18	44.8	72.1	71.2	46.4	67.6	87.8	88.6	95.0	73.0	40.3	74.5	52.1	54.4	36.9	78.5	85.0	
carbonate % dry matter	%	7.8	1.0	19.6	18	3.82	19.6	4.42	6.78	10.6	10.6	9.24	0.95	6.06	14.6	2.63	7.81	1.13	18.6	9.78	5.66	
total organic carbon*	%	1.9	0.4	5.2	18	3.37	14.3	3.40	1.23	3.40	0.96	0.36	0.60	0.81	4.11	0.41	5.22	2.94	3.33	0.56	0.82	
total petroleum hydrocarbons by GC/MS (C10 - C40)	mg/kg	13.4	10.0	36.2	18	36.2	10	10	17.9	10	10	10	10	10	28.6	10	10	10	11.8	10	10	10
fluoranthene (Flt)	mg/kg	0.0	0.0	0.2	18	0.0	0.0	0.01	0	0.01	0.01	0.01	0.01	0.01	0	0.01	0.01	0.01	0	0.2	0.01	0.01
tributyltin (TBT)	mg/kg	0.0	0.0	0.1	18	0.1	0.1	0.01	0.1	0.01	0.01	0.01	0.01	0.01	0	0.01	0.01	0.01	0	0.01	0.01	0.01
density (on dry solid)	g/cm3	1.1	0.3	1.5	18	0.7	1.2	1.1	0.7	1.0	1.1	1.5	1.4	1.1	0	0.7	0.3	0.9	0.8	1.2	1.3	1.3
aluminium*	mg/kg	45812.5	38620.0	78920.0	18	42400	36800	41000	45000	41200	38600	44000	42600	51300	40400	46500	40200	40600	50700	49800	78900	78900
arsenic*	mg/kg	12.8	7.8	20.7	18	14.4	7.77	8.72	15.8	11.7	11.1	8.94	14.5	13.3	14.3	8.77	15.3	13.7	20.7	11.1	14.8	14.8
cadmium*	mg/kg	1.0	0.3	4.3	18	0.68	0.30	0.38	0.79	4.34	0.37	0.28	0.51	0.83	0.71	0.32	0.76	0.64	0.82	0.26	4.20	4.20
chromium*	mg/kg	49.9	36.7	76.6	18	47.7	36.7	43.1	54.2	42.2	40.2	46.4	46.9	50.0	57.6	46.6	47.0	47.4	64.5	50.5	78.6	78.6
copper*	mg/kg	30.0	10.1	63.8	18	43.2	11.8	25.4	50.6	12.8	16.5	18.6	18.6	42.1	63.8	26.7	49.5	35.4	36.1	10.1	22.8	22.8
lead*	mg/kg	41.4	16.1	66.4	18	58.7	35.9	39.4	66.4	27.4	26.2	37.0	37.0	34.2	65.6	27.6	65.7	50.3	54.9	17.5	16.1	16.1
lithium*	mg/kg	31.4	25.7	41.2	18	29.6	30.2	30.8	32.6	32.3	28.9	33.3	25.8	41.2	26.8	33.4	25.9	25.7	35.6	32.3	37.7	37.7
mercury*	mg/kg	0.7	0.0	4.6	18	2.37	0.14	4.61	0.63	0.65	0.34	0.08	0.06	0.44	0.39	0.30	0.49	0.40	0.36	0.09	0.04	0.04
nickel*	mg/kg	27.9	23.5	37.0	18	23.5	23.6	24.4	26.9	24.4	26.8	30.5	34.1	30.1	29.8	27.1	24.6	23.9	31.2	28.6	37.0	37.0
zinc*	mg/kg	138.8	68.7	295.0	18	169	69.0	101	188	78.8	88.0	110	164	86.8	1	105	203	152	167	68.7	255	255
Hexavalent chromium*	mg/kg	1.0	1.0	1.0	18	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
naphthalene	ug/kg	18.5	2.2	44.0	18	39.5	14.3	13.8	30.8	11.2	4.44	3.61	2.21	21.9	32.0	23.6	18.8	19.8	44.0	12.5	3.77	3.77
acenaphthylene	ug/kg	153.6	0.1	780.0	18	99.8	141	18.4	50.5	180	4.21	3.27	2.42	171	780	248	42.6	173	566	16.6	0.1	0.1
acenaphthene	ug/kg	79.8	0.1	244.0	18	135	39.8	17.8	55.0	39.8	3.53	2.71	5.26	173	172	169	31.7	162	244	12.1	0.1	0.1
fluorene	ug/kg	131.6	2.4	443.0	18	164	970	21.1	84.1	85.5	3.87	3.27	2.42	307	288	281	41.9	261	443	19.9	2.84	2.84
phenanthrene	ug/kg	243.1	2.7	808.0	18	724	283.3	175	729	70.1	13.0	30.0	21.3	120	444	96.5	401	215	808	8.41	2.71	2.71
anthracene	ug/kg	73.5	2.9	261.0	18	261	19.7	60.6	241	28.2	6.38	9.14	7.58	51.0	153	35.2	139	68.1	80.8	5.35	2.94	2.94
fluoranthene	ug/kg	785.3	3.9	2320.0	18	2330	134	668	2120	288	51.8	66.0	17.4	470	1530	435	1620	667	1330	27.0	3.89	3.89
pyrene	ug/kg	628.4	4.0	2020.0	18	2020	126	574	1810	236	47.3	54.5	17.5	470	1290	379	1320	568	1080	26.2	4.00	4.00
benzo(a)anthracene	ug/kg	402.6	3.7	1380.0	18	1380	103	486	170	42.5	33.5	20.2	306	360	834	244	845	367	473	19.6	3.65	3.65
chrysene	ug/kg	84.7	0.1	292.0	18	230	15.0	65.3	206	25.8	6.83	5.08	4.74	36.0	159	37.6	156	292	103	12.0	0.1	0.1
benzo(b)fluoranthene	ug/kg	511.6	4.0	1750.0	18	1750	112	538	1950	241	55.1	29.9	27.4	332	1050	294	1000	492	787	22.4	4.00	4.00
benzo(k)fluoranthene	ug/kg	210.1	3.3	1020.0	18	572	38.7	185	77.5	19.5	11.6	11.6	8.42	114	827	238	797	367	533	9.43	3.30	3.30
benzo(e)pyrene	ug/kg	400.4	11.1	1370.0	18	1370	95.6	423	1160	181	51.0	31.1	22.9	274	1020	96.4	317	157	237	24.8	11.1	11.1
indeno(1,2,3-c)pyrene	ug/kg	232.3	0.1	768.0	18	768	54.5	243	651	109	15.9	14.2	11.9	159	489	134	461	224	360	11.5	0.1	0.1
dibenz(a,h)anthracene	ug/kg	88.7	0.1	288.0	18	288	26.4	96.2	250	65.2	15.9	14.2	10.3	59.6	179	50.7	164	86.3	125	11.6	0.1	0.1
benzo(g,h,i)perylene	ug/kg	271.1	0.1	918.0	18	918	62.2	286	798	190	30.5	15.9	14.4	182	549	154	522	257	417	11.8	0.1	0.1
aldrin	ug/kg	1.0	1.0	1.3	18	1.12	1	1	1.08	1	1	1	1	1	1.24	1	1	1	1.29	1	1	1
alpha-hexachlorocyclohexane (alpha-HCH)	ug/kg	1.0	1.0	1.3	18	1.12	1	1	1.08	1	1	1	1	1	1.24	1	1	1	1.29	1	1	1
beta-hexachlorocyclohexane (beta-HCH, beta-BHC)	ug/kg	1.0	1.0	1.3	18	1.12	1	1	1.08	1	1	1	1	1	1.24	1	1	1	1.29	1	1	1
delta-hexachlorocyclohexane (delta-HCH)	ug/kg	1.0	1.0	1.3	18	1.12	1	1	1.08	1	1	1	1	1	1.24	1	1	1	1.29	1	1	1
gamma-hexachlorocyclohexane (indane)	ug/kg	1.0	1.0	1.3	18	1.12	1	1	1.08	1	1	1	1	1	1.24	1	1	1	1.29	1	1	1
hexachlorobenzene (HCB)	ug/kg	1.0	1.0	1.3	18	1.12	1	1	1.08	1	1	1	1	1	1.24	1	1	1	1.29	1	1	1
dieldrin	ug/kg	1.0	1.0	1.3	18	1.12	1	1	1.08	1	1	1	1	1	1.24	1	1	1	1.29	1	1	1
endrin	ug/kg	1.0	1.0	1.3	18	1.12	1	1	1.08	1	1	1	1	1	1.24	1	1	1	1.29	1	1	1
p,p'-DDD	ug/kg	1.0	1.0	1.3	18	1.12	1	1	1.08	1	1	1	1	1	1.24	1	1	1	1.29	1	1	1
p,p'-DDE	ug/kg	1.0	1.0	1.3	18	1.12	1	1	1.08	1	1	1	1	1	1.24	1	1	1	1.29	1	1	1
p,p'-DDE	ug/kg	1.0	1.0	1.3	18	1.12	1	1	1.08	1	1	1	1	1	1.24	1	1	1	1.29	1	1	1
2,4,4'-trichlorobiphenyl (PCB congener 28)	ug/kg	6.4	0.1	101.0	18	101	0.1	0.1	0.22	0.1	0.1	0.1	0.1	0.1	0.25	0.1	0.1	0.1	0.26	0.1	0.1	0.1
2,2',5,5'-tetrachlorobiphenyl (PCB congener 52)	ug/kg	0.1	0.1	0.3	18	0.22	0.2	0.1	0.22	0.1	0.1	0.1	0.1	0.1	0.25	0.1	0.1	0.1	0.26	0.1	0.1	0.1
2,2',4,4',5-pentachlorobiphenyl (PCB congener 101)	ug/kg	0.1	0.1	0.3	18	0.22	0.28	0.1	0.22	0.1	0.1	0.1	0.1	0.1	0.25	0.1	0.1	0.1	0.26	0.1	0.1	0.1
2,2',4,4',5-pentachlorobiphenyl (PCB congener 118)	ug/kg	0.2	0.1	0.8	18	0.22	0.83	0.1	0.22	0.1	0.1	0.1	0.1	0.1	0.25	0.1	0.1	0.1	0.26	0.1	0.1	0.1
2,2',3,4,4',5-hexachlorobiphenyl (PCB 138)	ug/kg	0.7	0.1	2.3	18	1.34	0.2	2.25	1.51	0.2	0.1	0.1	0.1	0.2	1.49	0.1	0.96	0.92	2.32	0.1	0.1	0.1
2,2',4,4',5,5'-hexachlorobiphenyl (PCB 153)	ug/kg	1.4	0.1	3.9	18	2.68	0.2	3.65	3.45	0.39	0.1	0.1	0.1	0.41	2.73	0.2	2.30	2.02	3.86	0.1	0.1	0.1
2,2',3,4,4',5,5'-heptachlorobiphenyl (PCB 180)	ug/kg	4.0	0.1	11.6	18	8.93	0.28	8.14	11.0	1.17	0.34	0.1	0.1	0.82	8.69	0.54	5.76	6.08	11.6	0.1	0.1	0.1

**Table 5: Bantry Inner Harbour Development Phase 1 Tier 2 QRA
Sample SST2 Monolith Tank Test Results - 1, 2, 4 Day Water Data.**

Determination	Chemist Job No.:	15-24484	15-24494	15-24494	15-24494	15-24494	15-24484	15-24871	15-24871	15-24871	15-25416	15-25416	15-25416
Quotation No.:	Client: Malachy Walsh and Partners	207035	207036	207037	207038	207039	207039	208570	208570	208571	211949	211950	211951
Order No.:	Chemist Sample ID:	207035	207036	207037	207038	207039	207039	208570	208570	208571	211949	211950	211951
	Client Sample No.:	8	10	12	6	8	10	4	4	4	8	10	9
	Sample Type:	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER
	Top Depth (m):	8	10	12	6	8	10	4	4	4	8	10	9
	Bottom Depth (m):	15-Oct-2015	15-Oct-2015	15-Oct-2015	16-Oct-2015	16-Oct-2015	16-Oct-2015	22-Oct-2015	22-Oct-2015	22-Oct-2015	29-Oct-2015	29-Oct-2015	29-Oct-2015
	Date Sampled:	15-Oct-2015	15-Oct-2015	15-Oct-2015	16-Oct-2015	16-Oct-2015	16-Oct-2015	22-Oct-2015	22-Oct-2015	22-Oct-2015	29-Oct-2015	29-Oct-2015	29-Oct-2015
	Accepted:	U	U	U	U	U	U	U	U	U	U	U	U
	SOP Units:	g/l	g/l	g/l	g/l	g/l	g/l	g/l	g/l	g/l	g/l	g/l	g/l
	LOD:	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080
Arsenic (Dissolved)	U	1450	0.31	0.11	0.10	0.10	0.10	1.0	2.1	2.3	1.1	1.1	1.0
Calcium (Dissolved)	U	1450	17	28	6.3	6.1	9.4	1.0	0.29	0.080	0.080	0.080	0.080
Chromium (Dissolved)	U	1450	4.7	4.3	2.4	2.5	2.5	1.2	4.4	9.0	4.4	4.4	5.2
Copper (Dissolved)	U	1450	0.50	0.50	0.50	0.50	0.50	2.9	4.7	3.5	1.0	1.0	1.0
Mercury (Dissolved)	U	1450	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Nickel (Dissolved)	U	1450	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Lead (Dissolved)	U	1450	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Selenium (Dissolved)	U	1450	2.3	3.1	1.1	1.1	1.0	1.4	3.1	2.2	1.0	2.9	1.3
Inc (Dissolved)	U	1450	7.0	4.0	2.0	2.8	3.6	1.3	1.8	1.4	4.6	1.2	1.3
Total TPH (C6-C40)	U	1670	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Benzene	U	1760	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Toluene	U	1760	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Ethylbenzene	U	1760	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
m & p-Xylene	U	1760	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
o-Xylene	U	1760	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10



Laboratory photos of the monolith samples made for the Tank Testing.

**Table 6: Bantry Inner Harbour Phase 1 Development Tier 2 QRA
Potential Sediment Concentrations During Dredging Compared to Average EQS Values.**

Determinand	Units	LOD	AA EQS (mg/l)	Number of samples	Minimum soil concentration (mg/kg)	Average soil concentration (mg/kg)	Maximum soil concentration (mg/kg)	Average dredged concentrations (mg/l)	Average dredged concentrations with soprtion (mg/l)
Moisture	%	0.02		6	9.60E+00	3.11E+01	4.60E+01	1.24E-03	1.24E-03
pH				6	7.50E+00	8.22E+00	8.90E+00	3.29E-04	3.29E-04
Acid Neutralisation Capacity	mol/kg	0.002		6	6.00E-03	1.63E-02	2.70E-02	6.53E-07	6.53E-07
Aluminium (Total)	mg/kg	100		40	2.90E+03	2.39E+04	7.89E+04	9.57E-01	9.57E-01
Arsenic	mg/kg	1	2.00E-02	34	4.08E+00	1.23E+01	2.40E+01	4.91E-04	4.89E-04
Cadmium	mg/kg	0.1	2.00E-04	34	5.20E-02	6.43E-01	4.34E+00	2.57E-05	2.50E-05
Chromium	mg/kg	1	1.50E-02	34	8.49E+00	3.26E+01	7.86E+01	1.30E-03	1.20E-03
Copper	mg/kg	0.5	5.00E-03	40	1.04E+00	3.78E+01	2.10E+02	1.51E-03	9.74E-04
Lead	mg/kg	0.5	7.20E-03	34	6.68E+00	4.56E+01	2.54E+02	1.82E-03	2.85E-04
lithium*	mg/kg			28	1.47E+01	2.87E+01	4.42E+01	1.15E-03	1.15E-03
Mercury	mg/kg	0.1	5.00E-05	40	1.00E-02	4.99E-01	4.61E+00	2.00E-05	1.84E-05
Nickel	mg/kg	0.5	2.00E-02	34	1.22E+01	2.58E+01	5.35E+01	1.03E-03	1.01E-03
Selenium	mg/kg	0.2	2.00E-01	22	2.00E-01	1.01E+02	2.55E+02	4.04E-03	4.03E-03
Zinc	mg/kg	0.5	4.00E-02	18	3.31E+01	1.17E+02	2.59E+02	4.67E-03	4.61E-03
LOI	%	0.1		6	3.00E+00	6.40E+00	8.80E+00	2.56E-04	2.56E-04
Total Organic Carbon	%	0.2		22	3.60E-01	1.96E+00	5.22E+00	7.82E-05	7.82E-05
Total TPH >C10-C40	mg/kg	10		22	1.00E+01	1.31E+00	3.62E+01	5.25E-04	5.25E-04
Total Of 17 PAH's	mg/kg	2	5.00E-03	22	4.29E-02	4.70E+00	1.30E+01	1.88E-04	1.88E-04
Tributyl Tin	mg/kg	0.01	2.00E-06	40	0.00E+00	5.75E-02	5.62E-01	2.30E-06	2.12E-06
Total BTEX	mg/kg	10		6	1.00E-02	1.35E-02	3.10E-02	5.40E-07	5.40E-07
Total PCBs (7 Congeners)	mg/kg	0.1	1e-6	16	7.00E-04	1.30E-02	1.15E-01	5.21E-07	4.32E-07

Note: Average concentration of TBT increased by highest sample result in GS19 (0.562mg/kg) which will not now be excavated.

**Table 7: Bantry Inner Harbour Phase 1 Development Tier 2 QRA.
Potential Leachate Concentrations from Untreated Contaminated Sediments.**

Surface Water Regs'0		Dilution factor				0.003		
Eluate mg/l	AA EQS (mg/l)	MAC EQS (mg/l)	No. of samples	Count above MAC EQS	Average leachate (mg/l)	Diluted average leachate	Maximum leachate (mg/l)	Diluted maximum leachate
Arsenic	0.02	0.04	58	0	9.07E-03	2.72E-05	3.10E-02	9.30E-05
Barium	100000	100000	52	0	1.49E-02	4.47E-05	4.30E-02	1.29E-04
Cadmium	0.0002	0.005	58	0	1.28E-04	3.83E-07	3.00E-04	9.00E-07
Chromium	0.015	0.032	58	14	2.54E-02	7.62E-05	1.20E-01	3.60E-04
Copper	0.005	0.01	58	13	7.36E-03	2.21E-05	3.70E-02	1.11E-04
Mercury	0.00005	0.00007	58	58	7.33E-04	2.20E-06	4.70E-03	1.41E-05
Molybdenum	100000	100000	52	0	4.54E-02	1.36E-04	2.10E-01	6.30E-04
Nickel	0.02	0.05	58	0	2.71E-03	8.13E-06	1.40E-02	4.20E-05
Lead	0.0072	0.02	58	0	1.10E-03	3.31E-06	5.00E-03	1.50E-05
Antimony	100000	100000	52	0	3.77E-03	1.13E-05	2.50E-02	7.50E-05
Selenium	100000	100000	58	0	1.26E-02	3.77E-05	5.10E-02	1.53E-04
Zinc	0.04	0.2	58	0	1.31E-02	3.92E-05	3.50E-02	1.05E-04
Chloride	100000	100000	52	0	8.98E+02	2.69E+00	3.80E+03	1.14E+01
Fluoride	100000	100000	52	0	4.71E-01	1.41E-03	1.10E+00	3.30E-03
Sulphate	100000	100000	52	0	1.56E+02	4.69E-01	4.60E+02	1.38E+00
Total Dissolved Solids	100000	100000	52	0	1.93E+03	5.80E+00	7.20E+03	2.16E+01
Phenol Index	100000	100000	52	0	3.33E-02	9.98E-05	1.20E-01	3.60E-04
Dissolved Organic Carbon	100000	100000	52	0	3.22E+00	9.66E-03	9.10E+00	2.73E-02

Notes:
 This data summarises the eluate concentrations from WAC Test results shows that dilution is sufficient to reduce any elevated concentrations of Cr, Cu, and Hg to below EQS concentrations prior to any S/S treatment.
 Mercury is reported as above the MAC EQS in all samples as the laboratory detection limit was above the required EQS value.
 Dilution Factor is based on MWP Tidal Prism Calculations (see Table 9) of sea ward edge of sediment in amenity area.
 Results are based on all WAC Data from 2015 sampling work including single and double stage laboratory testing.

Table 8: Bantry Inner Harbour Development Phase 1 Tier 2 QRA. Potential Leachate Concentrations in Treated Sediment Material.

Determinand	Units	LOD	AA EQS (mg/l)	MAC EQS (mg/l)	Average soil concentration (mg/kg)	Maximum soil concentration (mg/kg)	Average porewater concentrations (mg/l)				Diluted average porewater concentrations (mg/l)				Diluted maximum porewater concentrations (mg/l)				
							Using average Kd		Using max Kd		Using average Kd		Using max Kd			Using average Kd		Using max Kd	
							10	20	50	10	20	50	10	20		50	130		
Metastave pH	%	0.02			8.22E+00	8.90E+00													
Acid Neutralisation Capacity	mol/kg	0.002																	
Aluminium (Total)	mg/kg	100			1.63E-02	2.70E-02													
Arsenic	mg/kg	1	2.00E-02	4.00E-02	2.39E+04	7.89E+04	2.40E+01	1.52E+01	1.62E+03	4.09E-04	1.62E+03	1.59E-01	7.93E-03	3.17E-03	1.22E-03				
Cadmium	mg/kg	0.1	1.00E-02	2.00E-02	3.29E+01	7.89E+01	3.78E+01	1.35E-02	6.73E-03	4.04E-06	2.69E-04	1.92E-03	2.15E-03	4.50E-04	4.70E-04				
Chromium	mg/kg	0.5	5.00E-03	1.00E-02	3.78E+01	2.10E+02	7.89E+01	2.49E-04	1.25E-04	4.99E-05	6.99E-04	3.25E-03	6.93E-03	2.50E-04	2.50E-04				
Lead	mg/kg	0.5	7.00E-03	2.00E-02	4.59E+01	2.54E+01	2.87E+01	3.07E-04	1.53E-05	6.14E-06	9.21E-07	1.71E-03	6.93E-04	2.77E-04	1.07E-04				
Lithium*	mg/kg	0.1	5.00E-05	7.00E-05	2.87E+01	4.41E+01	4.41E+01	2.35E-02	2.39E-02	2.39E-02	7.04E-01	3.62E-02	8.55E-05	3.42E-05	1.32E-05				
Mercury	mg/kg	0.5	2.00E-02	5.00E-02	1.01E+02	5.35E+01	5.35E+01	5.71E-02	1.08E-05	4.23E-06	6.35E-07	1.88E-03	9.78E-05	3.91E-05	1.50E-05				
Nickel	mg/kg	0.2	1.72E-02	2.00E-02	1.72E+02	2.59E+02	2.59E+02	1.26E-01	6.29E-02	2.52E-02	3.71E-03	1.19E-01	3.18E-01	1.59E-01	6.35E-02				
Selenium	mg/kg	0.5	4.00E-02	2.00E-01	6.40E+00	8.80E+00	8.80E+00	3.33E-01	1.77E-02	7.08E-03	1.09E-03	7.83E-01	3.92E-01	1.57E-02	2.44E-02				
Zinc	mg/kg	0.1			1.60E+01	1.60E+01	1.60E+01	5.24E-01	5.24E-01	5.24E-01	1.57E-01	7.20E+01	7.20E+01	7.20E+01	7.20E+01				
Total Organic Carbon	%	0.2			1.98E+01	5.22E+00	5.22E+00	1.60E+01	1.60E+01	1.60E+01	4.80E-02	4.27E+01	4.27E+01	4.27E+01	4.27E+01				
Total Cd	mg/kg	10			1.07E+02	1.07E+02	1.07E+02	1.07E+02	1.07E+02	1.07E+02	3.22E-01	2.96E+02	2.96E+02	2.96E+02	2.96E+02				
Total Of 17 PAHs	mg/kg	2	5.00E-03	5.00E-03	4.70E+00	1.30E+01	1.30E+01	1.79E-01	1.79E-01	1.79E-01	5.36E-04	4.98E-01	4.98E-01	4.98E-01	4.98E-01				
Tributyl Tin	mg/kg	0.01	2.00E-06	2.00E-06	2.47E-06	2.47E-06	2.47E-06	2.47E-06	2.47E-06	2.47E-06	4.93E-07	2.41E-04	2.41E-04	2.41E-04	2.41E-04				
Total BTEX	mg/kg	10			9.08E-03	9.08E-03	9.08E-03	9.08E-03	9.08E-03	9.08E-03	1.98E-04	2.09E-02	2.09E-02	2.09E-02	2.09E-02				
Total PCBs (7 Congeners)	mg/kg	0.1	1e-6	1e-6	2.29E-06	2.29E-06	2.29E-06	2.29E-06	2.29E-06	2.29E-06	1.14E-07	2.01E-05	2.01E-05	2.01E-05	2.01E-05				

Notes:

This table exhibits a range of leachate concentrations that would be expected based on a range of achievable Partition Coefficients.

The data shows that the SIS treatment process can reduce the potential leachate concentration to values below the EQS prior to any dilution factor being applied (Note that leachate concentrations using the average Kd values are generally of the order of the emali eluate concentrations measured in the WAC testing indicating accuracy in the values used).

Partition Coefficient Data Used in Calculations:

Parameter	Average Koc (L/kg)	Kd (L/kg)	Justification
Arsenic	137.5	137.5	Average of values in LandSim 2.5
Cadmium	750	750	Average of values in LandSim 2.5
Chromium	2200	2200	Average of values in LandSim 2.5
Copper	13770	13770	Average of values in LandSim 2.5
Lead	135000	135000	Average of values in LandSim 2.5
Mercury	2142.5	2142.5	Average of values in LandSim 2.5
Nickel	410	410	Average of values in LandSim 2.5
Zinc	300.5	300.5	Average of values in LandSim 2.5
Total TPH >C10-C40	62	1.24	Koc for Benzene (USEPA 2009)
Total Of 17 PAHs	1190	23.8	Koc for Naphthalene (USEPA 2009)
Tributyl Tin	106000	2120	Average of values in LandSim 2.5
Total BTEX	62	1.24	Koc for Benzene (USEPA 2009)
all PCBs (7 Congeners)	259000	5180	Average of values in LandSim 2.5

**Table 9: Bantry Inner Harbour Development Phase 1 Tier 2 QRA
Tidal Prism Calculations for Seaward Edge of Amenity Area.**

Frontage	Height of fl Area of flow	Head	Length	k	m ³ /s	m ³ /hr	m ³ /flood tide	Max rate of tide rise	Sp	Np
m	m						m ³ /flood tide	m ³ /hr	m ³ /hr	m ³ /hr
150	2.9	435	0.1	65	1	0.669230769	2409	22.356	3	1.5
150	2.9	435	0.1	65	0.1	0.066923077	241	1.496	0.000167	8.33333E-05
150	2.9	435	0.1	65	0.01	0.006692308	24	150	Volume of flow to follow tide rise	
150	2.9	435	0.1	65	0.001	0.000669231	2	15	m ³ /s	0.35
150	2.9	435	0.1	65	1.00E-05	6.69231E-06	0	0	m ³ /hr	2520
150	2.9	435	0.1	65	1.00E-06	6.69231E-07	0	0		1260
150	2.9	435	1.5	65	1	10.03846154	36138	224.420	Conclusions	
150	2.9	435	1.5	65	0.1	1.003846154	3614	22.442	Tide level in rock armour will follow tide	
150	2.9	435	1.5	65	0.01	0.100384615	361	2.244	Tide level in fine sands and silt will NOT follow tide rise and fall - very little flow.	
150	2.9	435	1.5	65	0.001	0.010038462	36	2.24		
150	2.9	435	1.5	65	1.00E-05	0.000100385	0	2		
150	2.9	435	1.5	65	1.00E-06	1.00385E-05	0	0		
150	2.9	435	1	65	1	6.692307692	24092.308	149613.2		
150	2.9	435	1	65	0.1	0.669230769	2409.2308	14961.32		
150	2.9	435	1	65	0.01	0.066923077	240.92308	1496.132		
150	2.9	435	1	65	0.001	0.006692308	24.092308	149.6132		
150	2.9	435	1	65	1.00E-08	6.69231E-08	0.0002409	0.001496		
150	2.9	435	1	65	1.00E-09	6.69231E-09	2.409E-05	0.000015		
150	2.9	435	0.5	65	1	3.346153846	12046	74.807		
150	2.9	435	0.5	65	0.1	0.334615385	1205	7.481		
150	2.9	435	0.5	65	0.01	0.033461538	120	748		
150	2.9	435	0.5	65	0.001	0.003346154	12	75		
150	2.9	435	0.5	65	1.00E-05	3.34615E-05	0	1		
150	2.9	435	0.5	65	1.00E-06	3.34615E-06	0	0		
150	2.9	435	0.1	65	1	0.669230769	2409	14.961		
150	2.9	435	0.1	65	0.1	0.066923077	241	1.496		
150	2.9	435	0.1	65	0.01	0.006692308	24	150		
150	2.9	435	0.1	65	0.001	0.000669231	2	15		
150	2.9	435	0.1	65	1.00E-05	6.69231E-06	0	0		
150	2.9	435	0.1	65	1.00E-06	6.69231E-07	0	0		
150	2.9	435	0.1	65	1.00E-08	4.35E-08	0.00	0		
150	2.9	435	0.1	65	1.00E-09	4.35E-09	0.00	0		
150	2.9	435	1.5	65	1.00E-06	2.84E-03	10.21	63	20.7	10.35
150	2.9	435	1.5	65	1.00E-09	2.84E-06	0.01	0	22.5	11.25

Volume of flow into Length m³/hr to match tide level

Sp m³/hr Np m³/hr

Porosity

100.05 max volume of material

divided by 33750 estim tidal prism volume (np)

factor to reduce leachate when = 0.002964

diluted

For a Hyd Grad of 1.5m at neap tide the width of amenity area with 2.9m face to be saturated by incoming tide is a maximum of 0.23m

Volume of material saturated

this allows for a min dilution of 100.05 m³



Bantry Inner Harbour - Phase 1 Development
Environmental Quantitative Risk Assessment
Appendix A – PGL SI Report 2009

*For inspection purposes only
Consent of copyright owner required for any other use*



Unit 12, Owenacurra Business Park, Midleton, Co. Cork
T +353 21 4631600 F +353 21 4638690 E geotechnical@priority.ie

BANTR INNER HARBOUR SITE INVESTIGATION

FACTUAL REPORT

NO. PC 030

For inspection purposes only.
Consent of copyright owner required for any other use.

Client: Bantry Bay Harbour Commissioners

Engineer: RPS Consulting Engineers,
Elmwood House,
74 Boucher Road,
Belfast

This page is intentionally blank

*For inspection purposes only.
Consent of copyright owner required for any other use.*



REPORT CONTROL SHEET

Client	Bantry Bay Harbour Commissioners					
Engineer	RPS Consulting Engineers					
Project Name	Bantry Inner Harbour Site Investigation					
Report Name	Bantry Inner Harbour Site Investigation Factual Report					
Project Number	PC9030					
This Report Comprises of	RCS	TOC	Text	No. of Appendices	Drawings	Electronic data
	1	1	17	5	5	*.pdf, *.dwg, *.ags, *.xls

Revision	Status	Author(s)	Approved By	Issue Date
D01	Draft	SC	GH	27.10.2009
D02	Draft	GH/ SC	NL	13.01.2010
F01	Final	<i>Greg Hayes</i>	<i>Neil Leonard</i>	23.03.2010

This page is intentionally blank

*For inspection purposes only.
Consent of copyright owner required for any other use.*

TABLE OF CONTENTS

1	INTRODUCTION	1
1.1	SCOPE OF WORKS.....	1
1.2	REPORTING	1
2	THE SITE	2
2.1	SITE LOCATION & DESCRIPTION	2
2.2	SITE GEOLOGY.....	3
3	FIELDWORK	5
3.1	GENERAL	5
3.2	EXPLORATORY HOLES	6
3.3	GROUNDWATER MONITORING	6
3.4	IN-SITU TESTING	7
4	LABORATOR TESTING	
4.1	SOIL TESTING	9
4.2	ROCK TESTING	10
5	GROUND CONDITIONS	11
5.1	GROUNDWATER	13
6	GEOTECHNICAL RE IEW	14
7	SUMMAR	17

For inspection purposes only.
Consent of copyright owner required for any other use.

APPENDICES

APPENDIX A	EXPLORATOR HOLE RECORDS
APPENDIX B	BATH METRIC – SUB BOTTOM PROFILE
APPENDIX C	LABORATOR RESULTS
APPENDIX D	PHOTOGRAPHIC RECORDS
APPENDIX E	EXPLORATION LOCATION PLAN GEOLOGICAL LONG SECTIONS