Iarnród Éireann
Irish Rail

Rosslare ORE Hub

EIAR Technical Appendices

Technical Appendix 7:

Soils, Geology, Hydrogeology and Contamination

Appendix D: Environmental Contaminant Testing

venterra | GDG GAVIN & DOHERTY GEOSOLUTIONS | NICHOLAS O'DWYER an RSK company | Co-funded by the European Union

Batch				Batch 1								Batches 2 & 3																											
Sample ID				MAR02231.01	MAR02231.02	MAR02231.03	MAR02231.04	MAR02231.05	MAR02231.06	MAR02231.07	MAR02231.08	MAR02235.001	MAR02235.002	MAR02235.003	MAR02235.005	MAR02235.006	MAR02235.007	MAR02235.008	MAR02235.009	MAR02235.010	MAR02235.011	MAR02235.012	MAR02235.013	MAR02235.014	MAR02235.015	MAR02235.016	MAR02235.017	MAR02235.018	MAR02235.019	MAR02235.020	MAR02235.021	MAR02235.022	MAR02235.023	MAR02235.024	MAR02235.025	
Sample Date				12/02/2024	12/02/2024	12/02/2024	12/02/2024	12/02/2024	12/02/2024	12/02/2024	12/02/2024	20/02/2024	20/02/2024	20/02/2024	21/02/2024	15/02/2024	21/02/2024	21/02/2024	21/02/2024	19/02/2024	19/02/2024	19/02/2024	21/02/2024	21/02/2024	21/02/2024	21/02/2024	21/02/2024	21/02/2024	21/02/2024	21/02/2024	14/02/2024	21/02/2024	21/02/2024	21/02/2024	21/02/2024	
		Guidance: Guidelines for the Assessment of Dredge Materials for Disposal in Irish Waters																																					
		Proposed Lower Level	Proposed Upper Level																																				
Arsenic	mg/kg	9	70	5	5.3	5.1	5.8	8.2	18.7	5.7	4.8	9.8	6.1	8.2	16.9	11.2	15.5	16.4	9.7	19.3	13.7	12.3	16.3			18.9	16.9	16.6	21.2	9.3	16.6	14.8	7.5	16.1	13	10.9		
Cadmium	mg/kg	0.7	4.2	<0.03	<0.03	<0.03	<0.03	<0.03	0.05	<0.03	<0.03	0.1	0.05	0.07	0.39	0.14	0.15	0.39	0.17	0.11	0.27	0.08	0.17			0.17	0.14	0.19	0.36	0.09	0.26	0.28	0.14	0.19	0.21	0.17		
Chromium	mg/kg	120	370	19.4	17.9	24.8	28.4	47.9	71.3	25.5	29.5	35.7	23.4	30.4	93.6	109	92.3	100	51	34.6	70.8	34.2	89.3			95.2	44.2	107	109	32.4	77.2	58.7	34.3		94.6	49.8		
Copper	mg/kg	40	110	6.5	6.2	6.2	5.3	12.6	22.3	9.9	8.6	12.6	21.3	16.4	27	30.3	24.2	26	14.6	13.5	22.4	14.7	24.5			22.8	24.4	30	33.2	9.1	22.1	26.2	7.6	19.2	53.9	13.8		
Lead	mg/kg	60	220	9	8.1	10.2	12.5	11.7	18.3	10.6	11.4	15.8	7.3	11	23.5	15.9	19.6	23.1	19.4	33.4	18.7	15.6	19.3			20.6	54.4	23.8	26.3	11.7	19.2	16.8	12.4	26.8	24.8	19		
Mercury	mg/kg	0.2	0.7	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.1	0.02	<0.01	0.02	<0.01	0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01	0.05	0.02	0.06	0.02	<0.01	0.08	<0.01	0.04	0.02	<0.01		
Nickel	mg/kg	21	60	8.6	6.3	8.4	10.2	19.6	37.1	10.1	10.2	14.6	10.2	13.0	47.3	48.1	42.0	47.8	23.2	16.4	37.4	16.6	42.6			44.6	24.8	51.8	53.3	14.7	40.1	31.1	12.7	36.6	47.3	20.4		
Zinc	mg/kg	160	410	20.9	19.1	25.7	32.9	40.2	71	30.5	29.9	36.6	26.5	30.6	93.4	89.2	81.2	93.9	69.9	94.9	75.6	39.3	79.3			86.2	69.1	98.8	106	36.6	73.7	82.9	38.3	80.5	93.1	61		
Aluminium	mg/kg			24900	14700	28600	35300	42900	69400	30000	30700	32600	25600	81200	26500	78100	85400	82600	53800	37500	75000	42200	79600			86700	50000	90200	83800	31000	68800	77600	30700	54100	73000	45000	Aluminium and lithium are metals occurring in abundance in the Earth's crust. They are conservative elements and are rarely elevated as a result of pollution. Aluminium is a major constituent of the clay fraction, while lithium is enriched within that fraction. A fairly constant ratio exists between aluminium and other metals, and between lithium and other metals, thus making them suitable as normalizers to identify artificially elevated concentrations of metals.	
Lithium	mg/kg																																						
Dibutyltin (DBT)	ug/kg	100	500	<5	<1	<5	<5	<1	<5	<5	<5	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<5	<1	<1	<1	<5	<5	<5	Organotins. Σ TBT & DBT 100ug/l & 500ug/l respectively	
Tributyltin (TBT)	ug/kg			<5	<1	<5	<5	<1	<5	<5	<5	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<5	<1	<1	<1	<5	<5	<5		
Acenaphthene	ug/kg			<5	<5	<5	<5	<5	<5	<5	<5	1.64	<1	3.12	<1	<1	1.77	1.26	<5	<1	1.59	<1	1.26	<1	1.60	1.8	<1	1.77	<1	<1	1.62	<1	1.72	9.05	<5	8.73		
Acenaphthylene	ug/kg			<5	<5	<5	<5	<5	<5	<5	<5	1.59	<1	3.22	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<5	<5	<5		
Anthracene	ug/kg			<5	<5	<5	<5	<5	<5	<5	<5	<1	<1	2.52	<1	<1	<1	1.40	4.60	<1	1.21	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<5	<5	<5		
Benzo (a) anthracene	ug/kg			<5	<5	9.80	8.13	<5	<5	<5	7.38	<1	<1	<1	1.16	<1	2.59	3.54	10.00	<1	3.19	<1	2.11	<1	2.89	2.80	<1	2.85	<1	2.34	2.26	<1	3.42	14.10	5.94	14.70		
Benzo (a) pyrene	ug/kg			<5	<5	10.50	11.30	<5	<5	7.72	7.02	<1	<1	<1	1.22	<1	3.48	4.31	10.70	<1	4.25	<1	2.55	<1	3.75	3.57	<1	3.75	<1	2.52	3.79	<1	3.97	14.00	7.30	16.10		
Benzo (b) fluoranthene	ug/kg			9.49	<5	18.90	26.20	6.62	12.00	16.10	14.10	<1	<1	<1	2.97	1.66	8.33	12.00	18.70	<1	10.10	<1	6.17	2.54	9.17	8.56	1.55	10.00	<1	5.56	9.63	2.35	10.60	40.50	10.90	32.10		
Benzo (ghi) perylene	ug/kg			<5	<5	8.99	17.30	<5	13.10	13.50	9.82	<1	<1	<1	1.93	1.40	10.70	14.00	15.90	<1	11.60	<1	8.38	1.94	11.20	12.10	<1	12.00	<1	3.30	10.80	1.31	12.30	24.70	<5	16.10		
Benzo (k) fluoranthene	ug/kg			6.53	<5	13.10	18.70	<5	13.50	12.40	11.20	<1	<1	<1	1.88	<1	2.38	2.82	15.60	<1	3.31	<1	1.76	<1	2.91	2.48	<1	1.68	<1	3.11	2.62	<1	2.04	28.00	7.90	20.10		
Chrysene	ug/kg			<5	<5	14.60	13.80	<5	14.40	10.80	11.50	<1	<1	<1	2.70	1.84	11.30	13.80	17.50	<1	11.40	<1	7.27	1.71	11.00	10.30	<1	10.90	<1	3.45	10.70	1.87	11.90	25.90	9.48	25.80		
Dibenz (a,h) anthracene	ug/kg			<5	<5	<5	<5	<5	<5	<5	<5	<1	<1	<1	<1	<1	<1	1.66	<5	<1	1.35	<1	1.23	<1	1.59	1.40	<1	1.71	<1	<1	1.22	<1	1.57	<5	<5	2.90	PAHs (Polycyclic aromatic hydrocarbon)	
Flourene	ug/kg			<5	<5	<5	7.70	<5	<5	<5	<5	6.11	<1	10.10	7.69	<1	5.16	10.60	11.60	<1	4.21	<1	3.49	1.13	4.04	4.81	1.00	4.94	1.30	2.26	4.08	1.64	5.17	18.00	<5	23.00		
Fluoranthene	ug/kg			9.27	<5	11.20	19.80	6.24	7.69	13.90	16.60	2.89	<1	4.75	3.05	<1	5.96	7.61	18.70	<1	6.62	<1	4.08	<1	5.68	5.70	<1	5.85	<1	5.38	5.68	1.17	5.92	30.60	<5	32.60		
Indeno (1,2,3–cd) pyrene	ug/kg			65.00	<5	10.40	20.20	<5	<5	15.20	10.30	<1	<1	<1	1.39	<1	2.05	3.12	13.00	<1	2.80	<1	2.12	<1	2.47	2.6	<1	2.66	<1	4.16	2.47	<1	2.95	25.80	<5	21.00		
Naphthalene	ug/kg			7.30	<5	14.60	18.70	<5	9.85	12.80	8.97	3.00	1.24	8.77	9.22	2.00	7.07	7.19	34.70	2.03	4.12	<1	5.36	4.16	5.44	6.14	2.21	8.04	2.77	7.01	4.57	5.49	7.38	52.20	8.91	58.70		
Phenanthrene	ug/kg			10.10	<5	10.50	20.50	<5	24.90	18.70	21.70	10.60	<1	12.00	5.99	3.58	19.30	21.30	33.60	<1	18.70	<1	13.3	3.42	16.90	16.9	1.97	18.60	2.35	5.18	17.50	4.19	19.10	38.60	10.20	48.60		
Pyrene	ug/kg			7.15	<5	9.08	14.70	<5	10.70	10.80	12.90	6.43	<1	8.46	3.64	1.45	9.02	12.30	16.40	<1	9.09	<1	5.9	1.78	8.15	8.28	<1	8.83	<1	3.88	8.05	2.45	8.52	23.20	7.42	26.30		
PAH 16 Total	ug/kg	4000	-	<159.84	<80	<156.67	<217.03	<82.86	<146.14	<161.92	<156.49	<41.26	<16.24	<60.94	<46.84	<21.93	<92.11	<117.91	<236.00	<17.03	<94.54	<16	<66.98	<25.68	<88.79	<89.44	<18.73	<95.58	<19.42	<52.15	<86.99	<27.47	<98.56	<359.65	<108.05	<356.73		
THC (total hydrocarbon content)	ug/kg	1000000		18700	8250	23800	207000	9100	199000	17100	123000	3850000	27500	6900000	29000	3340	17700	32800	41100	920	21200	251	10800	1220	14400	15400	1720	16300	11200	4810	37100	4630	22000	49900	13300	61400	Total extractable hydrocarbons in guidance	
alpha-Hexachlorcyclohexane	ug/kg																																						
beta-Hexachlorcyclohexane	ug/kg																																						
gamma-Hexachlorcyclohexane	ug/kg			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.12	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.11	<0.1	<0.1	<0.1	<0.1	<0.1		
Dieldrin	ug/kg																																				OCP (Organochlorine pesticides)	
Hexachlorobenzene	ug/kg			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.19	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		
p,p'-Dichorodiphenyldicloroethylene	ug/kg			<0.1	<0.1	<0.1	<0.1	<0.1	0.17	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.11	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.15	0.11	<0.1		
p,p'-Dichorodiphenyltrichloroethane	ug/kg			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.13	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		
DDD	ug/kg			<0.1	<0.1	<0.1	<0.1	<0.1	0.31	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.42	0.25	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.11	<0.1	<0.1		
PCB28	ug/kg			<0.08	<0.08	<0.08	<0.08	0.0900	0.4600	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	0.1253	0.0866	0.0907	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	0.1900	<0.08	<0.08		
PCB52	ug/kg			<0.08	<0.08	<0.08	<0.08	<0.08	0.2800	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	0.1151	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08		
PCB101	ug/kg			<0.08	<0.08	<0.08	<0.08	<0.08	0.2300	<0.08	0.1000	<0.08	<0.08	<0.08	<0.08	<0.08	0.2303	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	0.1300	<0.08	<0.08		
PCB118	ug/kg			<0.08	<0.08	<0.08	0.1100	<0.08	0.2200	<0.08	0.1600	<0.08	<0.08	<0.08	<0.08	<0.08	0.3261	0.1485	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	0.1500	<0.08	<0.08		
PCB138	ug/kg			<0.08	<0.08	<0.08	0.0800	<0.08	0.2300	<0.08	0.1200	0.1636	<0.08	<0.08	<0.08	<0.08	0.4052	0.1833	0.1587	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	0.1700	<0.08	<0.08		
PCB153	ug/kg			<0.08	<0.08	<0.08	<0.08	0.1000	0.2100	<0.08	<0.08	0.1334	<0.08	<0.08	<0.08	<0.08	0.1746	0.0991	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08		
PCB18	ug/kg			<0.08	<0.08	<0.08	<0.08	<0.08	0.2100	<0.08	0.1500	<0.08	<0.08	<0.08	<0.08	<0.08	0.2847	0.0917	0.1591	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	0.1500	<0.08	0.1300		
PCB (Σ ICES 7)	ug/kg	7	1260	<0.56	<0.56	<0.56	<0.59	<0.59	1.84	<0.56	<0.77	<0.69703	<0.56	<0.56	<0.56	<0.56	1.661238	<0.769214	<0.728472	<0.56	<0.56	<0.56	<0.56	<0.56	<0.56	<0.56	<0.56	<0.56	<0.56	<0.56	<0.56	<0.56	<0.56	<0.9500	<0.56	<0.6100		

Below Lower Level

Between Lower and Upper Level

Above Upper Level

No guidance

GDG
GAVIN & DOHERTY
GEOSOLUTIONS