

To: Tara Higgins, EPA
From: Margot Cronin, MI
RE: Port of Cork, Dumping at Sea application, 2014
Date: 28 March 2014

Background: Analysis in June 2013 indicated elevated concentrations of chromium and nickel in some downstream areas. The concentrations were higher than had been noted in earlier analyses in 2003¹, 2008 and 2011. In the case of chromium, ten out of thirteen samples were in excess of the lower action level for dredged material (Marine Institute, 2006)². In the case of nickel, eleven out of thirteen samples were determined to be in excess of the upper action level. For both of these categories, further investigation is requisite in seeking a permit for Dumping at Sea³. Similar elevated concentrations have previously been reported for the City Quays and Tivoli areas, however, the quantities to be dredged in these areas are relatively low, and are a small proportion of the total amount to be dumped. Concentrations of metals in samples from the Blackrock Bend and further downstream have not given cause for concern in recent years.

Some possible explanations for the apparently elevated concentrations of chromium and nickel detected in the samples include:

1. Possible recent inputs to the sediment through e.g. licensed discharge, accidental spill, WID.
2. Sampling anomalies e.g. accidental contamination of samples by personnel or equipment
3. Laboratory anomalies e.g. accidental contamination by equipment, calculation error.

(It should be noted that nickel concentrations above the lower action level in marine sediment are not uncommon in many areas in Ireland and are thought to reflect natural geology. It is relatively unusual, however, to encounter so many samples with nickel concentrations above the upper action level.)

Further sampling was undertaken in November 2013 at five sampling sites selected to represent a wide range of concentrations. Three different grab samplers were used in order to examine sampling equipment as a contributing factor in the elevated results. All fifteen samples were sent for analysis, as well as five samples taken in June to be re-analysed at the same time. An undisclosed CRM was also included for analysis.

Results: The concentrations determined in analysis are summarised in Table 1 and demonstrated in figures 1 to 8, below.

¹ 2003 results for Cr appear to be significantly lower but this is due to the partial digest method used at the time by the analysing lab.

^{2,3} Marine Institute, 2006. Assessment of suitability of dredged material for disposal in Irish waters.

Reanalyses of the June samples demonstrated the following with regard to nickel and chromium:

- Results of the sample from City Quays were very similar to the June analysis
- Results of the sample from Lough Mahon were considerably lower than those of the June 2013 and earlier analyses.
- Results from the Haulbowline Industries sample were very similar to the June analysis
- Results from the Ringaskiddy-2 site were broadly similar to the June analysis
- Results from the Ringaskiddy-5 site were lower than the June 2013 results but in line with earlier analyses.

Results of the further (November) sampling demonstrated the following with regard to nickel and chromium:

- Results from City Quays samples were similar to previous results.
- Results from Ringaskiddy sites were lower than concentrations measured in June, but more in line with previous analyses.
- Results from other sites were similar or slightly higher than previously determined.

Result from samples taken with different samplers indicated the following with regard to chromium and nickel concentrations:

- Results from all three grabs would be considered largely similar in magnitude
- There were no particular trends associated with the use of one or other grab.

Discussion: Further sampling, analyses and reanalyses were carried out to address the points above.

1. Possible inputs to the sediment through e.g. licenced discharge, accidental spill, WID.

Inputs through discharges and spills have been eliminated as a source of elevated levels as the repeat analysis and subsequent re-sampling and analysis did not confirm the original results reported in June.

Although there was widespread dispersion of material as a result of WID of the City Quays sediment in 2012, sediment tracking and transport measurement studies, carried out to monitor impacts at sites around the harbour from Water Injection Dredging, showed (apart from one result of +8cm accretion at a site that showed erosion on all subsequent measurements) generally low levels of accretion, with +1.8 cm maximum. Dispersion of sediment from the City Quays area by WID is unlikely to have resulted in accretion to a depth of even 1cm in the harbour, and therefore is unlikely to have contributed to the elevated results obtained from 20cm grab samples.

2. Sampling anomalies e.g. accidental contamination of samples by personnel or equipment

Use of a variety of samplers did not demonstrate widely varying results, indicating that it is unlikely that the samples were contaminated by the sampling equipment. The company responsible for the sampling is well experienced and reliable, and no such anomalies have been associated with them in the past.

3. Laboratory anomalies e.g. accidental contamination by equipment, calculation error.

The laboratory responsible for the testing of the samples is well experienced and accredited for all metals tests on marine sediment. The concurrent and accurate testing of blind CRMs by the lab

indicates that the testing procedure is not likely to be at fault, and that dilution calculations are probably accurate.

It is worth noting that, in the recent past, chromium and nickel contamination of marine sediment samples was identified in a different laboratory, and was traced to the use of a worn stainless steel sieve. Although there is no evidence in this case, it cannot be entirely discounted as a possible source, as the analysing lab for these samples confirmed that it uses stainless steel sieves.

There appears to be little consistency and no particular pattern, either temporally or spatially, to the apparent spread or increase in contamination. No significant correlation emerges with particle size, organic carbon, aluminium or lithium. Although appearing to better reflect earlier analyses results, indicating a gradual improvement in sediment quality with distance from the city centre, results of the repeat analysis have been largely inconclusive in support of the June 2013 analyses results.

Conclusion / opinion: While it is possible that all of the results obtained may reflect the natural variation within the sediment itself, further investigation was merited in order to describe as accurate a picture as possible prior to assessment of the sediment for a Dumping at Sea permit, and in order to minimise adverse impact in the marine environment.

On the balance of probability, I'm reasonably satisfied that the sediment chemistry has probably not altered in any appreciable way in the years since the 2011 analyses. I'm also reasonably satisfied that, as this material has previously been disposed of at the Power Head dumpsite, there is not likely to be additional risk to the marine environment above that put in place in the past.

With regard to the use of WID as an interim measure, I believe there are still location-specific questions to answer regarding the technique, as highlighted by the sediment tracking studies from 2012. It is interesting to note that the position in the Netherland regarding WID activity is under consideration. WID is currently not permitted in harbour areas in the Netherlands because of water quality issues resulting from high turbidity. There is also the issue of suspended matter, which settles after a while in areas other than where initially dispersed, which is interpreted as dumping without beneficial use (for that system) and is therefore not allowed. Disposal on dumpsites at sea is considered beneficial since it is seen as adding sand and silt with nutrients in the coastal area.



Figure 1: Chromium, June 2011

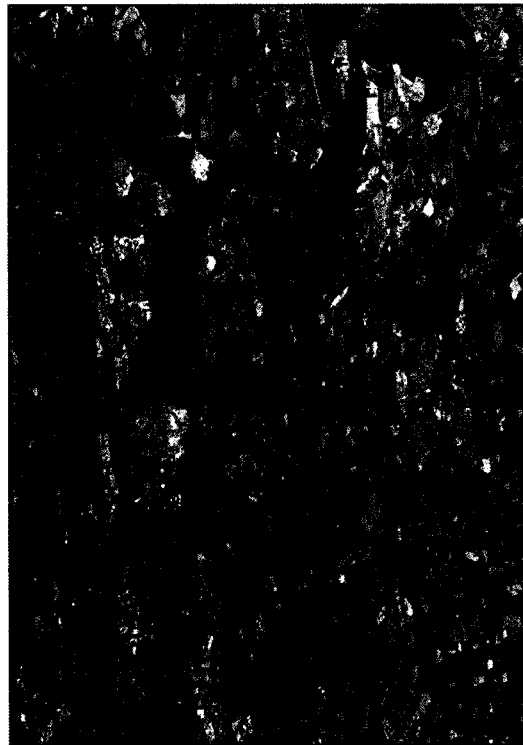


Figure 2: Chromium, June 2013



Figure 3: Chromium, June 2013 repeat



Figure 4: Chromium, November 2013

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Figure 5: Nickel, June 2011



Figure 7: Nickel, June 2013 repeat

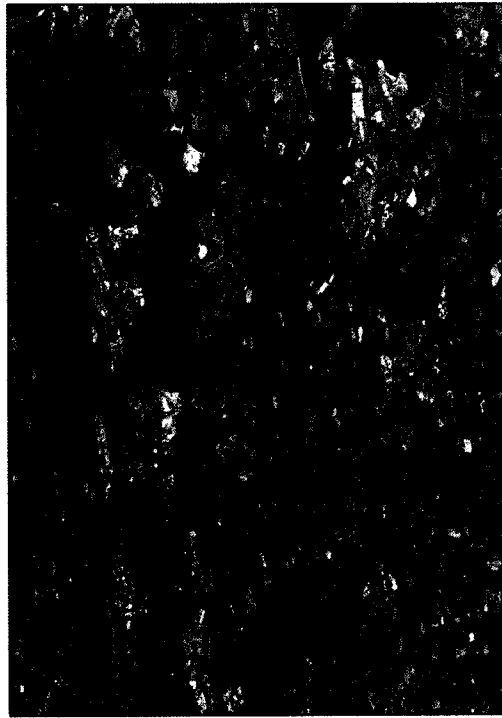


Figure 6: Nickel, June 2013

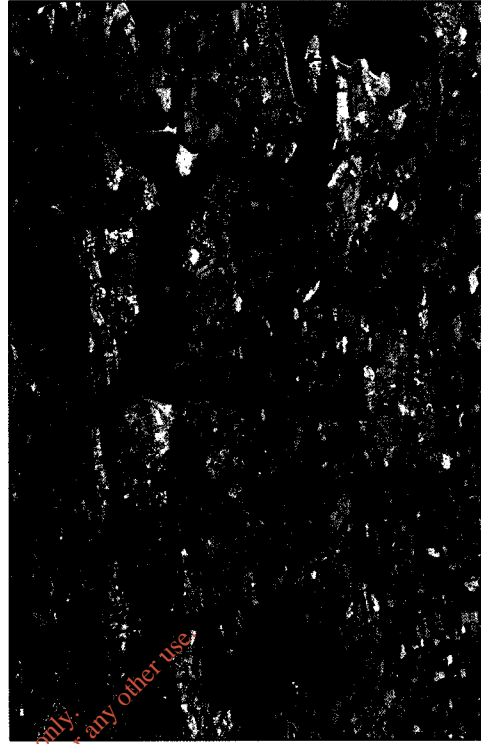


Figure 8: Nickel, November 2013

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Legend

- Green - < lower action level (AL1);
 - Orange - between AL1 and AL2;
 - Red - > upper action level
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Table 1: Summary of sediment chemistry, 2011 to 2013

CQ1	01/06/2011	50	0.21	40900	6.34	0.95	224		67.1		212
CQ2	01/06/2011	51	0.26	44000	8.99	0.75	154	89.2	78.5		214
CQ3	01/06/2011	51	0.15	44000	13.20	0.51	143	63.9	51.0		170
T1	01/06/2011	66	0.08	48200	12.00	1.32	119	64.5	71.9		
BB1	01/06/2011	60	0.07	45800	8.43	0.28	96	44.2	35.2	52	115
LM1	01/06/2011	56	0.07	43400	7.09	0.23	82	87.5	31.7	39	101
LM2	01/06/2011	26	0.07	43200	6.95	0.23	64	38.1	30.5	28	100
H1	01/06/2011	58	0.11	46900	10.50	0.37	100	97.4	48.0	51	149
R1	01/06/2011	35	0.08	44200	7.70	0.23	103	37.4	33.1	53	102
R2	01/06/2011	69	0.07	45100	7.61	0.21	81	43.1	31.4	38	94
R3	01/06/2011	43	0.07	44400	5.25	0.25	80	69.8	43.4	35	130
R4	01/06/2011	60	0.08	50000	12.00	0.29	115	39.2	41.2	59	121
R5	01/06/2011	84	0.11	52400	12.10	0.32	96	53.7	47.4	47	127
CQ1	19/06/2013	60	0.23	43400	8.93	0.62	195	70.8	63.7		215
CQ2	19/06/2013	56	0.17	40000	9.23	0.44	179	57.0	56.3		189
CQ3	19/06/2013	67	0.14	47800	9.00	0.35	180	47.4	45.5		186
T4	19/06/2013	62	0.10	46900	12.00	0.45	111	37.9	75.5	53	194
BB5	19/06/2013	65	0.10	50300	9.01	0.23	189	45.0	37.8		127
LM6	19/06/2013	64	0.10	46400	7.53	0.21	144	32.7	34.3		123
LM7	19/06/2013	12	0.05	40300	8.02	0.19	143	33.7	24.3		92
HI	19/06/2013	33	0.08	41000	7.51	0.19	85	28.5	30.5	45	106
R1	19/06/2013	46	0.07	42100	6.13	0.20	100	28.9	29.5	44	100
R2	19/06/2013	71	0.10	47400	3.39	0.18	182	37.1	33.1		106
R3A	19/06/2013	70	0.06	48800	8.14	0.18	130	28.7	33.4		114
R4	19/06/2013	63	0.07	45900	8.82	0.17	137	32.4	34.1		108
R5	19/06/2013	61	0.08	53800	10.00	0.23	252	38.0	37.2		121
CQ1 (repeat)	19/06/2013				8.51	0.62	202	70.2	58.2		213
LM7 (repeat)	19/06/2013				4.41	0.04	29	6.8	7.1	21	41
HI (repeat)	19/06/2013				11.00	0.21	81	29.9	31.3	38	100
R2 (repeat)	19/06/2013				10.10	0.15	135	27.3	32.5		108
R5 (repeat)	19/06/2013				9.53	0.16	103	31.9	31.7	54	110
CQ1-S1-A	01/11/2013				7.89	0.45	183	80.4	47.1		191
CQ1-S1-B	01/11/2013				8.13	0.53	238	61.6	55.2		199
CQ1-S1-C	01/11/2013				8.58	0.77	168	79.7	77.1		257
HI-S1-A	01/11/2013				9.50	0.24	99	32.1	34.8	55	120
HI-S1-B	01/11/2013				9.30	0.22	120	39.1	38.7		128
HI-S1-C	01/11/2013				9.63	0.23	105	33.2	37.1	57	125
LM7-S1-A	01/11/2013				6.49	0.13	75	22.2	17.0	39	74
LM7-S1-B	01/11/2013				6.89	0.14	67	32.5	18.8	31	82
LM7-S1-C	01/11/2013				8.94	0.25	83	39.0	24.2	49	100
R2-S1-A	01/11/2013				8.10	0.21	101	32.8	33.0	54	111
R2-S1-B	01/11/2013				9.00	0.39	134	34.2	45.3		100
R2-S1-C	01/11/2013				8.83	0.23	86	28.9	30.2	48	104
R5-S1-A	01/11/2013				8.85	0.22	141	28.9	32.5		108
R5-S1-B	01/11/2013				10.30	0.20	101	27.0	32.7	55	106
R5-S1-C	01/11/2013				9.02	0.20	98	33.3	31.8	49	114

Ann Kehoe

Subject: FW: Port of Cork DaS application
Attachments: Notes on sediment chemistry_2_mfc.pdf

From: margot.cronin@marine.ie
Sent: 28 March 2014 18:29
To: Tara Higgins
Cc: Francis X O Beirn; Terry McMahon
Subject: Port of Cork DaS application

Hi Tara,

Attached are my comments and views regarding the sediment chemistry in the Port of Cork Dumping at Sea application. If you need clarification on anything, just give me a shout.

Best regards,
Margot

Margot Cronin
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Is don té atá ainmnithe an teachtaireacht seo agus inte tá eolas rúnda. Muna tu an té atá ainmnithe níor chóir duit an ríomhphost seo a eis, sheacadá, scaipeadh ná a choipáil. Má fuir tú an ríomhphost seo tré thimpist cur a té a sheol é ar an eolas lathaireach tre ríomhphost agus scríos é ó do choras féin. Ní féidir a chinntú go bhfuil ríomhphost gan lucht ná sabhaltaí de bharr módh seachadadh ná ríomhphost. D'fhéadfach sé go ndéanfai tascradh ar an eolas, go mbeadh sé curtha as rocht, go gcaifí nó go scríosfí é, go mbeadh mólí ar, é easnamhach nó go mbeadh víreas curtha leis le linn a sheachadadh. Dá bhí sin ní glacann an té a sheol le son mhíleán maidir le easnamh nó butlín in abhar na teachtaireachta a tharláinn le linn a sheachadadh.

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