

Lumsden Point General Cargo Facility

Sediment Quality Report

301012-01660 – SED-REP-01

25 Sept 2013

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PROJECT 301012-01660 - LUMSDEN POINT GENERAL CARGO FACILITY

REV	DESCRIPTION	ORIG	REVIEW	WORLEY- PARSONS APPROVAL	DATE	CUSTOMER APPROVAL	DATE
A	Issued for internal review	<u> </u> N Wilson	<u> </u> H Houridis	<u> </u> H Houridis	30 May 2013	<u> </u> N/A	
B	Issued for client review	<u> </u> N Wilson	<u> </u> H Houridis	<u> </u> H Houridis	19 June 2013	<u> </u>	
0	Issued for use	<u> </u> N Wilson	<u> </u> H Houridis	<u> </u> P Mellor	5 July 2013	<u> </u>	
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CONTENTS

EXECUTIVE SUMMARY	1
ACRONYMS	2
1. INTRODUCTION	3
1.1 Scope of work	5
2. DATA SOURCES	6
3. DATA ANALYSIS	8
4. RESULTS	10
4.1 Physical characteristics	10
4.2 Chemical and nutrient characteristics	10
5. CONCLUSIONS	12
6. REFERENCES	13

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EXECUTIVE SUMMARY

The Port Hedland Port Authority (PHPA) plans to develop a General Cargo Facility at Lumsden Point. Two Handymax berths totalling 500 metres (m) in length will be developed. As part of this development, dredging of surface marine sediments to a depth of -13.5 m chart datum (CD) within the berth pocket and -12 m CD in the access channel will be undertaken. An area of land immediately behind the berths will also be developed.

A literature review of the sediment quality within the dredge footprint was conducted to determine the suitability of the dredge material for onshore disposal. An analysis of chemicals and nutrients in sediments within the dredge area identified that contaminants, if present, are generally below respective NAGD Screening levels except for nickel and chromium in a few individual samples. The 95% UCL values calculated on concentrations of all contaminants in sediments across the samples within the dredge footprint were below the NAGD screening levels. All samples were below DEC (2010) Environmental and Health-A Investigation Levels.

ACRONYMS

BHPBIO	BHP Billiton Iron Ore
BTEX	Benzene, Toluene, Ethylbenzene and Xylenes
CD	Chart Datum
DEC	Department of Environment and Conservation
DMMA	Dredge Material Management Area
EIL	Ecological Investigation Levels
NAGD	National Assessment Guidelines for Dredging
PAHs	Polycyclic Aromatic Hydrocarbons
PCBs	Polychlorinated Biphenyls
PSD	Particle Size Distribution
PHPA	Port Hedland Port Authority
QA/QC	Quality Assurance/Quality Control
TBT	Tributyltin
TOC	Total Organic Carbon
TPH	Total Petroleum Hydrocarbons
UCL	Upper Confidence Limit
WP	WorleyParsons

1. INTRODUCTION

The Port Hedland Port Authority (PHPA) plans to develop a General Cargo Facility at Lumsden Point.

The proposed works include:

- two Handymax berths totalling a length of 500 m;
- dredging up to -13.5 m chart datum (CD) for the berth pocket;
- dredging up to -12 m CD for the access channel;
- an area of land immediately backing a wharf behind the two berth areas;
- causeway access from land-based facilities to the wharf area; and
- disposal of dredge material onshore to an approved Dredge Material Management Area (DMMA).

Lumsden Point is located at the junction of South Creek and South East Creek, within the existing inner harbour of Port Hedland. The site has present seabed levels ranging from 0.0 m CD to less than -6.0 m CD. The site is sheltered from swell, but experiences strong tidal currents as a result of the high tidal range experienced in the region. Figure 1 presents the proposed areas of development.

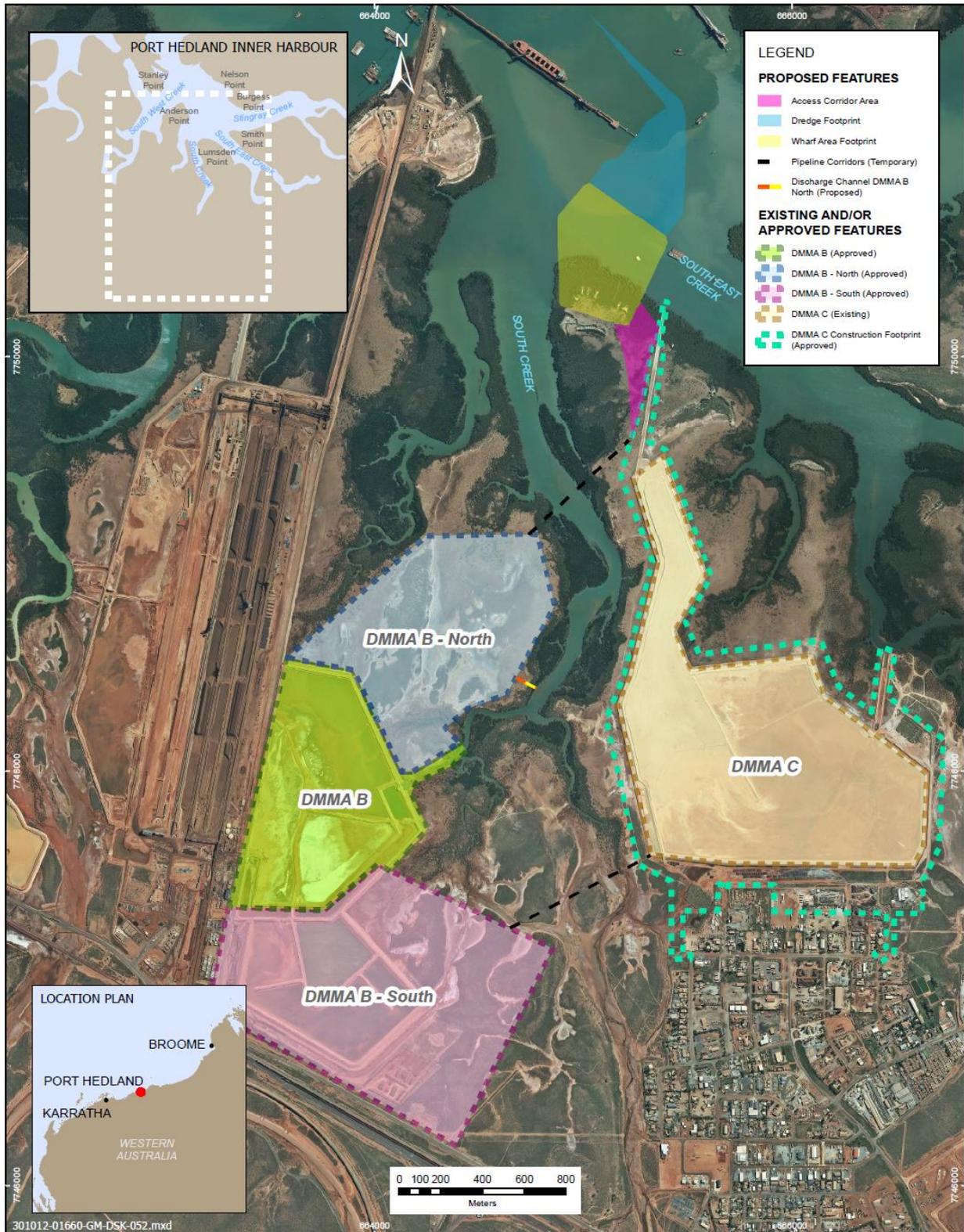


Figure 1: Proposed development footprint of the Lumsden Point General Cargo Facility.

1.1 Scope of work

There has been considerable testing of sediments in the Port of Port Hedland in the past to support a number of maintenance and capital dredging projects. As such, the sediment quality of the location is very well understood.

To assess the sediment quality within the proposed dredge footprint and its suitability for onshore disposal, a review of all (recent) relevant studies was undertaken. In total, four previous studies were reviewed as part of the assessment, including:

- Marine Sediment Sampling Programme for Proposed Third Berth, Port Hedland (URS 2008);
- RGP6 Port Facilities Tug Harbour Sampling and Analysis Plan (BHPBIO 2010b);
- RGP6 Definition Phase - Inner Harbour Geotechnical Investigation Factual Report (WorleyParsons 2010); and
- Small Vessel Cyclone Mooring Facility: SAP Implementation Report (GHD 2011).

The sample locations from the four studies that fell within the Lumsden Point General Cargo Facility dredge footprint were selected and the results compared to the National Assessment Guidelines for Dredging (NAGD) (Commonwealth of Australia 2009) and Department of Conservation (DEC) (DEC 2010) screening and assessment guidelines.

This report provides a summary of this literature review and provides the results of the assessment.

2. DATA SOURCES

Sediment analyses were undertaken at 25 sites by URS for FMG (URS 2008), 32 sites during a BHPBIO survey (BHPBIO 2010b), and 10 locations by WorleyParsons for a geotechnical investigation for BHPBIO (BHPBIO 2010a). 48 locations have also been sampled by GHD for the PHPA cyclone mooring facility project. These sampling locations are presented in Figure 2. As part of the review, sample sites located within the dredge footprint of the proposed Lumsden Point General Cargo Facility were selected from Figure 2, and are presented in Table 1.

Table 1: Sediment sample locations relevant to Lumsden Point General Cargo Facility dredge footprint

Survey	Relevant sample site location names
BHBIO (2010a)	LPT 13, LPT 19 (not sampled), LPT 20, LPT 28, LPT 30, LPT 31
URS (2008)	PH 8
WP (2010a)	THBH 04
GHD (2011)	SP9, SP10, SP11, SP12, SP13, SP14, SP15, SP16, SP17, SP18, SP19, SP20, SP21, SP22, SP23, SP24

Within the Lumsden Point General Cargo Facility dredge footprint, an area of seabed has already been dredged as part of the Stingray Creek cyclone mooring project. The sample sites that are within areas that have already been dredged and are therefore no longer representative of the sediment present are shown in Table 2.

Table 2: Sediment sample locations previously dredged within the proposed dredge footprint

Survey	Relevant sample site location names
BHBIO (2010a)	LPT 14, LPT 27
URS (2008)	PH 9, PH 10
WP (2010a)	THBH 01

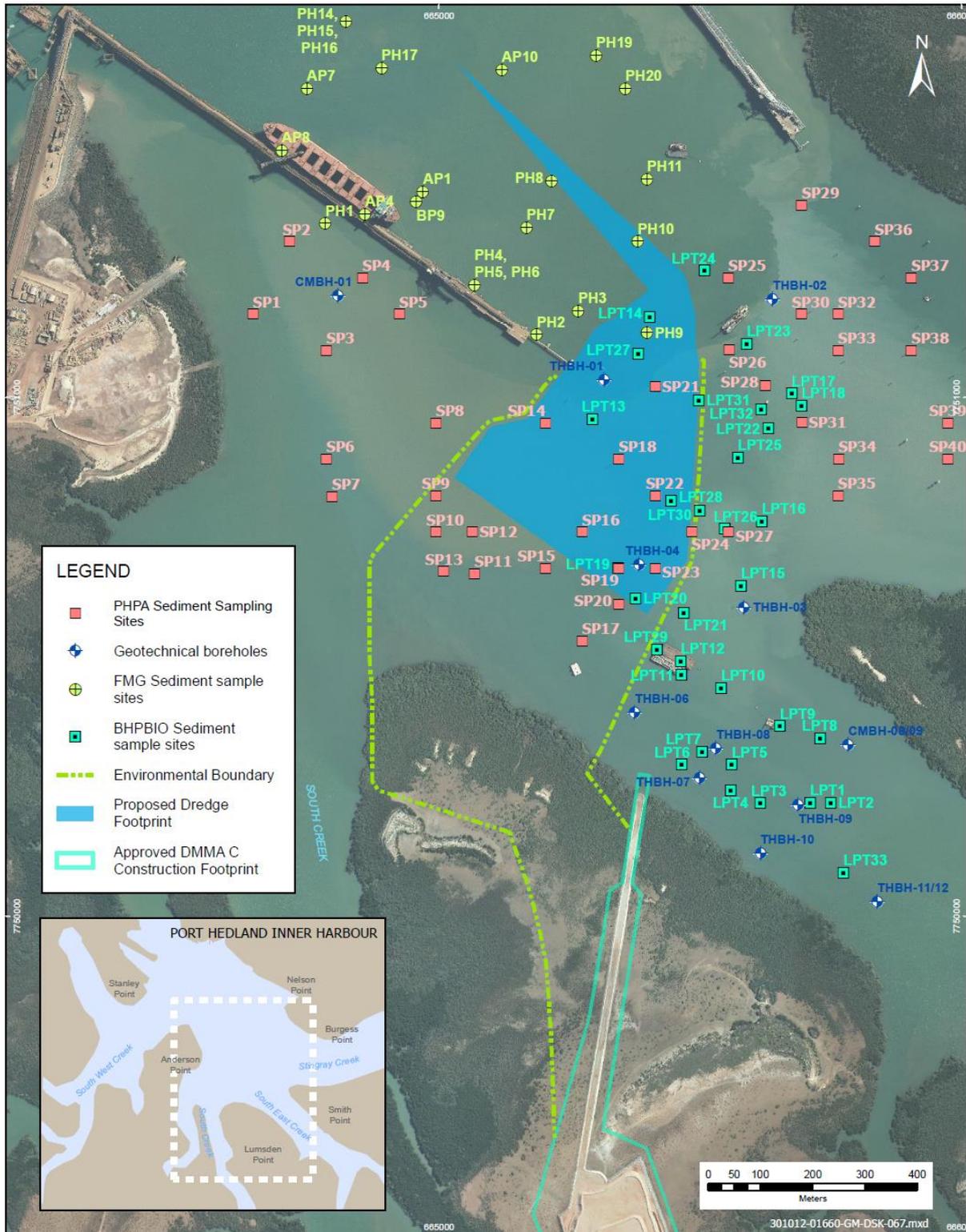


Figure 2: Sediment sampling sites from previous studies with proposed dredge footprint of the Lumsden Point Project

3. DATA ANALYSIS

Data analysis and interpretation was undertaken in accordance with the NAGD (Commonwealth of Australia 2009). All laboratory analyses were undertaken by a certified laboratory with QA/QC controls in place. Review of the previous studies and the associated QA/QC reports, found that all laboratory QA/QC measures were in accordance with recommended guidelines.

The BHPBIO (2010) study tested all 32 samples for the following analytes:

- PSD and moisture;
- Metals (antimony, arsenic, cadmium, chromium, cobalt, copper, lead, manganese, mercury, nickel, selenium, silver, zinc);
- Nitrogen and phosphorus;
- Total Organic Carbons (TOC);
- TPHs;
- TBT;
- PAH;
- Organophosphorus pesticides; and
- Organochlorine pesticides.

Of the 32 samples taken, 5 of these were within the relevant dredge footprint for this project.

The URS (2008) study tested all 25 samples for TBT and metals (arsenic, cadmium, copper, chromium, lead, mercury, nickel and zinc). One of these sample sites were within the proposed Lumsden Point General Cargo Facility dredge footprint.

The WorleyParsons (2010) study tested core samples (up to 4 at each sample site) for the following analytes;

- Metals (antimony, arsenic, barium, cadmium, cobalt, chromium, copper, mercury, manganese, nickel, lead, silver, selenium, tin, zinc);
- TOC;
- Nitrogen and Phosphorus;
- TPH
- PAH (top horizon only);
- Organophosphorus pesticides (top horizon only);
- Organochlorine pesticides (top horizon only);
- PCB (top horizon only); and
- TBT (top horizon only).

A total of 10 site locations were sampled, with only one of these being within the Lumsden Point General Cargo Facility dredge footprint.

The GHD (2011) study analysed 74 samples within 48 locations (up to 2 sample depths). All samples were tested for metals (aluminium, antimony, arsenic, barium, cadmium, copper, chromium, lead, mercury, nickel, manganese, silver, iron and zinc), TOC and TBT. 20 samples were also analysed for BTEX, PAH and TPH. Within the 48 locations, 16 of these were within the Lumsden Point General Cargo Facility dredge footprint with a total of 24 samples.

4. RESULTS

4.1 Physical characteristics

Particle size distribution (PSD) was conducted in five of the samples within the dredge footprint. These results indicate that the material mainly consists of fine to coarse sand (0.06-2.00 mm), with relatively low proportions of gravel, fine silt and clay particles. PSD analysis for the Cyclone Mooring Facility proposal only presented an average of all PSD samples including those not within the Lumsden Point General Cargo Facility dredge footprint. The results of this study also showed that over 50 % of the material was sand, with lower proportions of gravel, silt and clay (GHD 2011), similar to results presented below.

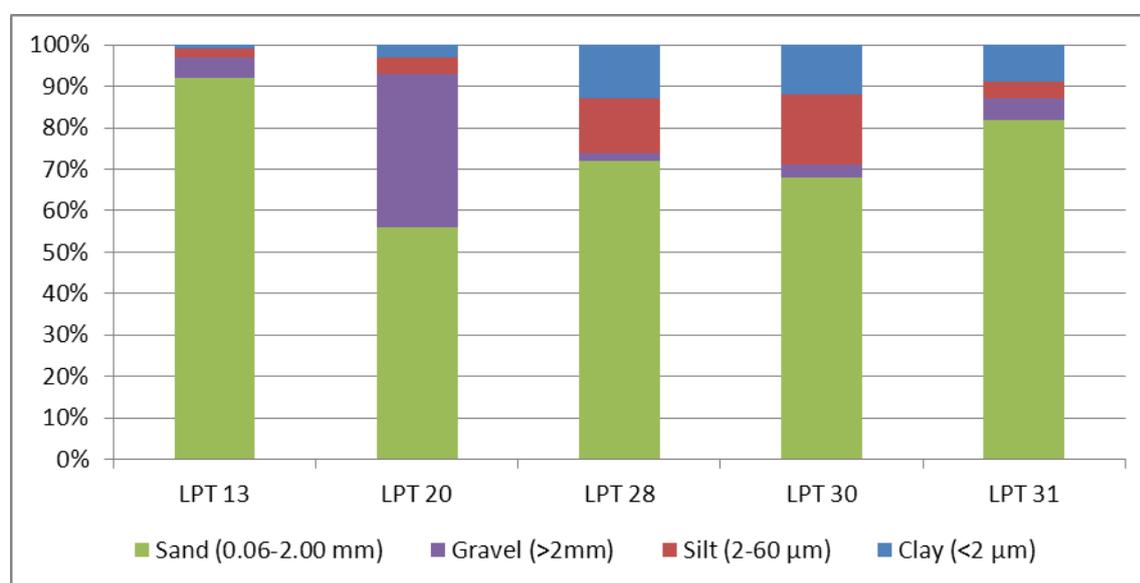


Figure 3: Particle Size Distribution results from sites within dredge footprint (BHPBIO 2010).

4.2 Chemical and nutrient characteristics

Of the 23 locations (34 samples) relevant to the proposed Lumsden Point General Cargo Facility dredge footprint, most were found to contain chemical or nutrient values below the NAGD screening levels (Commonwealth of Australia 2009) and EIL (DEC 2010) guidelines (Figure 4). All antimony, silver, cadmium, organotins, organochlorine pesticides, organophosphorus pesticides, PAHs and PCBs were below the limit of reporting and therefore below the assessment levels and are presented in the laboratory reports of the previous studies (URS 2008; BHPBIO 2010b; WorleyParsons 2010; GHD 2011).

Only two individual analytes were found to exceed assessment levels as highlighted in Figure 4. One samples exceeded the NAGD screening level of 80 mg/kg chromium with 81 mg/kg, and 3 samples exceeded the nickel screening level of 21 mg/kg with a maximum of 31 mg/kg. However the 95% UCL of these analytes were not exceeded and these did not exceed the NAGD or DEC assessment levels.

Sample	Date sampled	Moisture Content	Total Organic Carbon	Arsenic	Chromium	Copper	Cobalt	Lead	Manganese	Nickel	Selenium	Zinc	Mercury	Barium	Molybdenum	Tin	^ Nitrate as N (Sol.)	Total Kjeldahl Nitrogen as N	^ Total Nitrogen as N	Total Phosphorus as P	C10 - C14 Fraction	C15 - C28 Fraction	C29 - C36 Fraction	C10 - C36 Fraction (sum)
Units		%	%	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
PQL		0.1	0.01	0.4	0.1	0.1	0.5	0.5	0.5	0.1	0.1	0.5	0.01	0.1	0.1	1	0.1	20	20	1	3	3	3	3
NAGD PQL		0.1	0.1	1	1	1	0.5	1	10	1	0.1	1	0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	100
NAGD Screening Level		NA	NA	20	80	65	NA	50	NA	21	NA	200	0.15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	550
ANZECC (2000) ISQG - Low		NA	NA	20	80	65	NA	50	NA	21	NA	200	0.15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DEC (2010) EIL		NA	NA	20	400	100	50	600	500	60	NA	200	1	300	40	50	NA	NA	NA	2000	500	1000	NA	NA
DEC (2010) HIL-A		NA	NA	100	120,000	1,000	100	300	1,500	600	NA	7000	15	15000	390	47000	NA	NA	NA	NA	NA	NA	NA	NA
PH8	22/10/07	17.7		9.7	15.9	3.7		2.2		3.7		14	0.02											
LPT 13	12/8/10	19.8	0.04	5.41	12.9	<0.1	1	1	39	1.9	<0.1	6.7	<0.01	1.4	0.1	0.5	<0.1	<20	<20	10	<3	<3	<5	<3
LPT 20	11/8/10	17.2	0.1	4.82	19.8	3	1.8	2	54	5.1	<0.1	10.7	<0.01	5.5	0.2	0.3	<0.1	120	120	85	<3	6	<5	6
LPT 28	12/8/10	28.5	0.24	8.37	36.6	9.3	4.3	4.6	96	14.5	0.2	23.8	<0.01	33.4	0.4	0.6	0.2	390	390	131	<3	7	<5	7
LPT 30	12/8/10	26.3	0.24	9.12	38.4	8.4	4.4	4.7	96	15	0.2	24.8	<0.01	32	0.4	0.7	<0.1	180	180	99	<3	<3	<5	<3
LPT 31	12/8/10	18.1	0.05	5.82	22	4.8	2.2	2.4	51	6.9	0.2	12.4	<0.01	12.4	0.2	0.4	0.1	40	40	40	<3	18	34	52
THBH 04: 6.40-7.00	13/3/10	12.9	0.01	4.9	46	18	5.7	4.5	36	18	<0.5	13	<0.01	13	<0.5	<1.0	0.1	31	31	15				
THBH 04: 2.0-2.4	3/12/10	2.7	0.03												<0.5	<1.0	<0.1	<20	<20	15				
THBH 04: 10.25-10.40	13/3/10	11.6	0.01	4.1	41	8.5	3.8	4	120	18	<0.5	6.1	<0.01	29	<0.5	<1.0	0.3	54	54	13				
THBH 04: 14.8-15.0	13/3/10	26.2	0.02	2	42	7.9	2.4	2.1	52	17	<0.5	13	<0.01	12	<0.5	<1.0	0.1	<20	<20	13				
SP-9 0-0.5	22/9/11	17.6	0.17	9.1	42	12		4.4	180	16		15	<0.01	45										
SP-9 0.5-1	22/9/11	13.7	0.06	7.1	56	16		5.3	120	21		13	<0.01	43										
SP-10 0-0.5	22/9/11	19.3	0.12	6.3	59	14		5.5	82	20		14	<0.01	44										
SP-11 0-0.5	26/9/11	25.9	0.26	9.4	39	8.5		3.2	89	16		19	<0.01	15										
SP-11 0.5-1	26/9/11	24.6	0.2	13	52	18		5.7	150	22		19	0.03	8.8										
SP-12 0-0.5	22/9/11	23.7	0.24	9.7	41	9.9		4.4	83	15		16	<0.01	19										
SP-13 0-0.5	26/9/11	20.7	0.14	7.8	39	10		3.8	82	13		17	<0.01	23										
SP-14 0-0.5	26/9/11	18.6	0.19	9.5	23	4.9		2.2	76	7.5		13	<0.01	7.2										
SP-15 0-0.5	23/9/11	22.7	0.22	10	29	5.4		2.4	65	9.2		13	0.01	6.8										
SP-15 0.5-1	23/9/11	13.2	0.06	6.9	58	12		5.3	57	23		9.5	0.01	6.2										
SP-16 0-0.5	23/9/11	16.6	0.1	7.4	29	4.4		2.3	53	9.6		11	<0.01	5.5										
SP-16 0.5-1	23/9/11	10	0.05	7.1	81	11		5.9	58	31		9.3	0.01	8.1										
SP-17 0-0.5	23/9/11	18.3	0.15	7.8	37	6.4		3.4	59	14		11	<0.01	7.3										
SP-17 0.5-1	23/9/11	15.4	0.05	5.3	43	7		4.2	46	17		8.7	<0.01	5.7										
SP-18 0-0.5	23/9/11	14.1	0.08	6.3	19	2.6		1.3	58	4.7		8	<0.01	3.6										
SP-19 0-0.5	23/9/11	17.1	0.18	7.1	25	4.2		2.1	72	7.6		9.9	<0.01	5.1										
SP-19 0.5-1	23/9/11	20	0.18	8.1	30	5		2.3	79	8.9		7.7	<0.01	3.7										
SP-20 0-0.5	25/9/11	18.7	0.13	8.6	24	4		1.9	59	7.6		10	<0.01	4.5										
SP-20 0.5-1	25/9/11	19.8	0.3	11	46	8.4		3.4	110	18		13	<0.01	5.9										
SP-21 0-0.5	24/9/11	23.1	0.18	8.7	31	8.6		2.8	90	11		17	0.01	14										
SP-22 0-0.5	23/9/11	19.3	0.1	6.4	56	13		5.1	81	21		12	<0.01	22										
SP-23 0-0.5	25/9/11	13.9	0.1	7.5	23	3.8		1.8	61	6.5		7.3	<0.01	3.9										
SP-23 0.5-1	25/9/11	16.5	0.09	6.4	30	6.9		2.6	47	15		8.7	<0.01	3.2										
SP-24 0-0.5	24/9/11	28.9	0.26	9	39	11		3.6	100	14		20	0.01	20										
Minimum		2.7	0.01	2	12.9	<0.1	1	1	36	1.9	<0.1	6.1	<0.01	1.4	0.1	0.3	<0.1	<20	<20	10	<3	<3	<5	<3
Maximum		28.9	0.3	13	81	18	5.7	5.9	180	31	0.25	24.8	0.03	45	0.4	0.7	0.3	390	390	131	<3	18	34	52
Mean		18.61	0.133	7.568	37.14	8.202	3.2	3.406	78.16	13.6	0.181	12.93	0.00691	14.66	0.256	0.5	0.106	93.89	93.89	50.75	NA	6.8	8.8	13.6
Standard Deviation		5.539	0.082	2.174	14.73	4.407	1.59	1.395	32.1	6.537	0.0843	4.653	0.00508	12.87	0.095	0.112	0.0882	125.2	125.2	47.58	NA	6.751	14.09	21.61
95% UCL		20.22	0.158	8.209	41.48	9.501	4.265	3.817	87.78	15.52	0.238	14.3	0.00839	18.52	0.314	0.569	0.16	171.5	171.5	82.62	NA	13.24	22.23	34.21
Normal (N) Log-normal (L) Neither (X)		N	N	N	N	N	N	N	L	N	X	L	X	L	X	N	X	L	L	N	X	X	X	X

Figure 4: Sediment quality results from sites within dredge footprint. Highlighted cells represented exceedences of the corresponding screening level.

5. CONCLUSIONS

The literature review of four previous studies found that 34 samples have previously been taken within the Lumsden Point General Cargo Facility proposed dredge footprint. These samples were taken in accordance with the NAGD and DEC guidelines.

An analysis of chemicals and nutrients in sediments within the dredge area identified that contaminant substances, if present, are generally below their respective NAGD Screening levels. Nickel was present above the NAGD Screening Level of 21 mg/kg in 3 samples, and chromium was above the NAGD Screening Level of 80 mg/kg in 1 sample. However the 95% UCL values calculated on concentrations of all contaminants in sediments across the samples were below the NAGD screening levels.

All samples were below DEC (2010) Environmental and Health-A Investigation Levels.

6. REFERENCES

BHPBIO (2010a). RGP6 Definition Phase Inner Harbour Geotechnical Investigation. Implementation of the Environmental Sampling Programme - Hunt Point Load Out Facility, Prepared for BHPBIO by WorleyParsons.

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