

*Appendix G:*  
**Sediment Analysis and  
Assessment Data Report**



***PORT OF NGQURA:  
SEDIMENT SAMPLING AND  
ANALYSIS DATA REPORT***

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*Appendix G : Sediment Analysis and Assessment Data Report*

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## 1. SUMMARY

The CSIR was commissioned by Transnet to undertake a sediment sampling and analysis programme for the Port of Ngqura. The aim of the survey was to sample and analyse sediment samples taken within the Port of Ngqura and at the offshore dredge disposal site in Algoa Bay for a list of parameters that will enable a quality assessment to be performed as set out by the London Convention Criteria.

The Port of Ngqura is undergoing development as a bulk cargo handling and container facility. The current construction work taking place in the second phase of construction has elements that fall outside the original ROD. This study aims to assess the suitability of the material to be dredged for disposal at sea in terms of the London Convention (LC)

Samples were collected at the offshore dredge disposal site in Algoa Bay, at the new container berths and at the proposed admin craft harbour (see Figures 1 and 2).

The sediment samples were analysed for trace metals, particle size, organic carbon and hydrocarbons.

The required assessment outputs are the tabulation of results in tables 2,3,4, and 5. Guideline values have been included where relevant for ease of interpretation.

## 2. GLOSSARY

<i>Al</i>	Aluminium
<i>As</i>	Arsenic
<i>Cd</i>	Cadmium
<i>Cr</i>	Chromium
<i>Cu</i>	Copper
<i>Hg</i>	Mercury
<i>ISO/IEC 17025:2005</i>	General Requirements for the competence of testing and calibration laboratories
<i>London Convention</i>	Convention on Prevention of Marine Pollution by Dumping of Wastes and other Matter (London Convention 1972)
<i>Loss on ignition @550°C</i>	The mass of dried sample lost on ignition in a furnace. This gives an indication of the proportion of organic material present in the original sample
<i>Ni</i>	Nickel
<i>Pb</i>	Lead
<i>Zn</i>	Zinc

### 3. INTRODUCTION

The Sampling and Analysis Programme will be undertaken in order to be able to identify non-compliance issues with respect to dredging operations. The Programme consists of the following components:

- The mobilization of the necessary equipment and personnel to obtain surficial sediment cores or grabs in all potential dredge areas as presently defined by the Transnet.
- Biogeochemical (trace metals and total hydrocarbons) and preliminary sedimentological analysis (grain size) of the samples. The chemical analyses were carried out in a SANAS ISO/IEC 17025:2005 accredited laboratory.
- A tabulation of all analytical results including London Convention guideline values for South Africa.

The laboratory analyses undertaken for the samples collected in this phase of investigation included:

- **Sedimentological analysis:** Particle size analysis (gravel, sand and mud).
- **Chemical analysis:** Samples analysed for
  - Trace Metals (Aluminium, Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Nickel and Zinc)
  - Total Hydrocarbons
  - Loss on ignition @550°C (measured to give an indication of the amount of organic material present in the sediment)
  - Particulate Organic Nitrogen (PON) and Particulate Organic Carbon (POC).

#### 3.1 Goal

The goal of this report is to provide a tabulation of chemical analysis results to enable an assessment to be made as to the suitability of the dredge spoil for disposal at sea. This assessment will be achieved in a specialist report on *Marine ecology, sediment toxicology and dredging* to be prepared by *Dr Robin Carter* by using the guidelines from the London Convention for the interpretation of the results of the sediment sample analysis with a view to providing a basis for the assessment and management of the risks linked to dredged spoil disposal in coastal waters.

#### **4. APPLICABLE GUIDELINES**

The Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (London Convention (LC), formerly the London Dumping Convention (LDC)), 1972, entered into force in 1975. The Convention categorises two lists of substances that need to be monitored for waste disposal at sea:

Annex I (Black list) contains substances, which at the time of drafting the Convention were considered "highly hazardous" substances. These substances included mercury and mercury compounds, Cadmium and cadmium compounds, oils and petroleum products. Dumping of dredge materials containing these substances are prohibited unless:

- The physical, chemical conditions will ensure that they are "rapidly rendered harmless";  
or
- They are present only as "trace contaminants" and
- They should not make edible organisms unpalatable or endanger human health or that of domestic animals.

Annex II (Grey list) contains the category of substances and materials regulated under the Convention requiring special care (i.e. the issue of "special permits" for dumping). Substances falling in this category are Arsenic, Lead, Copper, Chromium, Nickel and Zinc.

The Convention does not assign clear or absolute values to their Action and Prohibition Level Ranges for Annex I substances; neither does it provide a definition of what should be considered to be "significant amounts" for Annex II substances. It was therefore proposed that the term "significant amounts" would be better defined by way of results of tests designed to establish the environmental impact in each specific case and would take into account quantities, concentrations, and the specific characteristics of the receiving area. Hence each controlling body and authority of a specific area adopted their own guidelines based on the criteria set out by the Convention.

**Table 1: The criteria adapted from the London (Dumping) Convention for use in South Africa**

**ANNEX I SUBSTANCES**

Suggested **Action/Prohibition** levels (based on values from the international literature):

	<b>Action level Range (<math>\mu\text{gg}^{-1}</math>)</b>	<b>Prohibition level (<math>\mu\text{gg}^{-1}</math>)</b>
Cadmium:	1.5 - 10.0	> 10.0
Mercury:	0.5 - 5.0	> 5.0
For a combined level of these two:	1.0 - 5.0	> 5.0
Oils:	1000 - 1500	> 1500
Total polycyclic aromatic hydrocarbons (PAHs)		> 2.5
Total polychlorinated biphenyls (PCBs)		> 0.1

**ANNEX II SUBSTANCES**

Suggested **Special care/ Prohibition** levels

	<b>Special care Level (<math>\mu\text{gg}^{-1}</math>)</b>	<b>Prohibition Level (<math>\mu\text{gg}^{-1}</math>)</b>
Arsenic	30 – 150	> 150
Chromium	50 – 500	> 500
Copper	50 – 500	> 500
Lead	100 – 500	> 500
Nickel	50 – 500	> 500
Zinc	150 – 750	> 750
Or a combined level of these substances	50 – 500	> 500

*Action Level and Special Care Levels* may be interpreted as the concentration range of substances in dredge spoils, which would require mandatory issuance of special permits and the use of certain dumping procedures, and techniques that can mitigate the potentially harmful effects of such substances in particular circumstances. *Prohibition Levels* are defined as the concentrations levels of substances in Annexes I and II, which is to be considered the threshold for dumping. Thus if dredge spoils exceed the prohibition levels these materials may not be dumped in coastal waters at all and land disposal should be considered.

## 5. METHODS FOR SAMPLING AND ANALYSIS

### 5.1 Sampling

Sediment samples were collected from the Port of Ngqura by the CSIR on 27 July 2006. Two sample collection methods were employed. The first method utilised a hand-deployed van Veen grab from a boat for the samples at the dredge spoil disposal site, the seaward side of berths 6 & 7 and those at the proposed Admin Craft Harbour. The second method involved collecting sub-samples from the sediment core stored in a Protekon container on site.

Samples were stored in sealed plastic bags and frozen for transport to the laboratory. Sub-samples were taken and stored frozen in sealed plastic zip-lock bags. The sample location global positioning system (GPS) positions are provided in Table 2.

All analyses were carried out in accredited laboratories at the CSIR. This accreditation includes regular inter-calibration exercises with the Quasimeme programme of the EU, which assesses quality of European Marine Laboratories. Sediments were dried in Freezedrier and milled to a homogeneous mass using a Fritsch - pulversette laboratory planetary ball mill with grinding balls and bowls made of Zirconium oxide. The milled sample was sub-sampled for trace metal and loss on ignition analyses. Hydrocarbon analyses were performed on additionally freeze-dried sub-samples.

**Table 2: Global Positioning System coordinates of grab sample sites. (Datum WGS 84)**

Lab No	Sample Id	Sample site Description	Sample site Coordinates
17986	DS 026.1	Offshore dredge disposal site Southern end	S33° 53.099 E25° 44.270
17987	DS 026.2		
17988	DS 026.3		
17989	DS 027.1	Offshore dredge disposal site Middle	S33° 52.187 E25° 44.415
17990	DS 027.2		
17991	DS 027.3		
17992	DS 028.1	Offshore dredge disposal site northern end	S33° 51.124 E25° 45.127
17993	DS 028.2		
17994	DS 028.3		
17995	HB WPT 033	New container berth	S33° 48.216 E25° 41.225
17996	HB WPT 035		S33° 48.253 E25° 41.252
17997	HB WPT 036		S33° 48.361 E25° 41.322
17998	HB WPT 037		S33° 48.444 E25° 41.384
17999	HB WPT 038		S33° 47.870 E25° 41.705
18000	HB WPT 039		S33° 47.897 E25° 41.750
18001	ADMIN HARBOUR 040	Admin Craft Harbour	S33° 47.917 E25° 41.805
18002	ADMIN HARBOUR 041		S33° 47.942 E25° 41.838
18003	ADMIN HARBOUR 042		S33° 47.865 E25° 41.679
BHQ6	BHQ6		S33° 48.516 E25° 41.269

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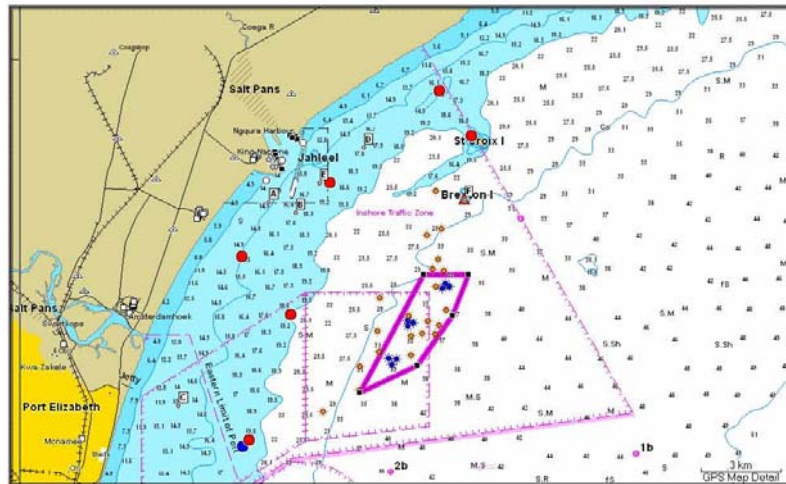


Figure 1: Chart of Algoa Bay showing sampling sites. The area enclosed in the purple lines denotes the dredge spoil disposal site. Blue stars, black squares and grey circles show CSIR (2006) sediment sampling sites.

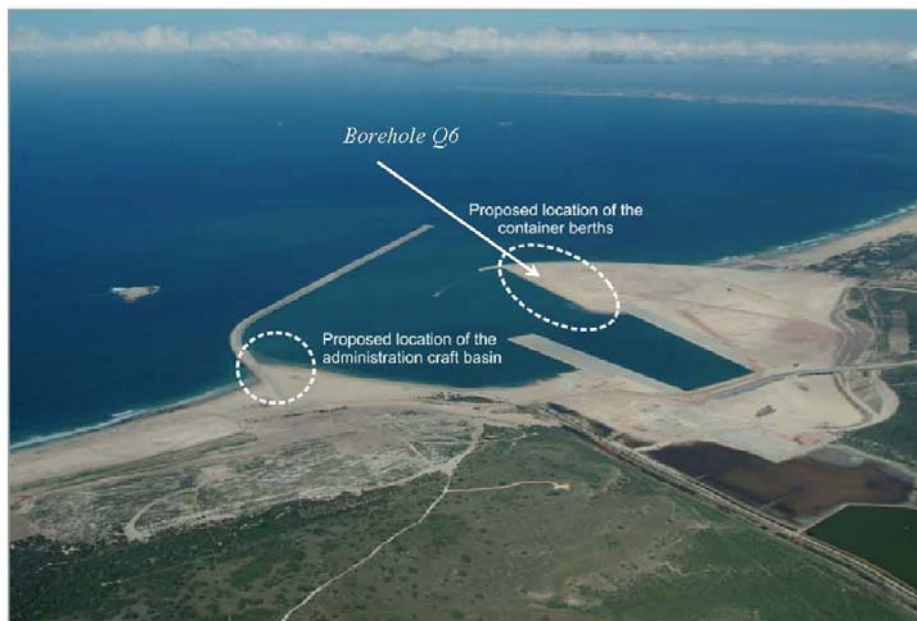


Figure 2: Aerial photo of the Port of Ngqura. The current infrastructure comprises the breakwaters, dredged entrance channel and turning basins, container berths and a quay for dry and liquid bulk berths. The proposed development areas are shown by the white circles with the position of borehole Q6 being indicated by the arrow.

## **5.2 Analysis**

### *5.2.1 Trace Metals*

Trace metals in the sediments were analysed using a Nitric Acid (HNO<sub>3</sub>) / Perchloric Acid (HClO<sub>4</sub>) / Hydrogen Peroxide (H<sub>2</sub>O<sub>2</sub>) / Microwave digestion (CSIR method MALS 4.5, Windt, C.N. and Taljaard, S., 2002) instead of the more aggressive Hydrofluoric Acid (HF) digestion technique (Loring and Rantala, 1992). The reason was that the emphasis in this study is on potential environmental toxicity rather than a purely geochemical requirement. The milder HNO<sub>3</sub> / HClO<sub>4</sub> / H<sub>2</sub>O<sub>2</sub> digestion releases metals linked to the most readily modified solid phases such as clay minerals and biogenic organic matter but not that which is linked to the biologically unavailable Silicate SiO<sub>2</sub> (Quartz) fractions. Analyses were carried out using a JY Ultima Inductively Coupled Plasma Optical Emission Spectrometer.

Quality control was carried out by digesting and analysing a marine sediment reference material (PACS-2 NCR material) and duplicate sample analysis after every 12 samples.

### *5.2.2 Percentage Loss on ignition*

The samples were analysed for percentage loss on ignition using the standard laboratory method. (CSIR method MALS 1.6 Windt, C.N. and Taljaard, S., 2002). Dried samples were ground in a Fritsch - pulversette laboratory planetary ball mill with grinding balls and bowls made of Zirconium oxide. Samples are weighed into pre-weighed ceramic dishes and heated to 550 °C for 5hrs. Samples are allowed to cool in desiccators before being reweighed on an analytical balance.

### *5.2.3 POC and PON*

The samples were analysed for POC and PON using the standard laboratory method CSIR (MALS 3.3). Dried samples were ground in a Fritsch - pulversette laboratory planetary ball mill with grinding balls and bowls made of Zirconium oxide. PON analysis was carried out without any further treatment to avoid the loss of the more labile reduced Nitrogen (Amino Acids) in the samples. This run also produced the Total Carbon (Carbonate and Organic Carbon) concentrations. Organic carbon was analysed by acidification of the sample with HCl, washing, drying and CHN analysis. CHN analysis was carried out using a Euro Vector Elemental Analyser Instrument.

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*5.2.4 Hydrocarbons*

EPA Method 3540 was used to extract the sediment samples into methylene chloride and EPA Method 8270 was used to analyse the extracts by means of a Varian Saturn 2000 Ion Trap Gas Chromatograph / Mass Spectrometer.

*5.2.5 Particle Size Distribution*

Samples were wet sieved through a standard range of Endecotts sieves using a Fritsch Analysette sieve shaker. Each sieve with its accumulated sediment fraction was dried and reweighed. The mass of the sieve subtracted from the mass of the sieve plus its accumulated sediment fraction gives the accumulated sediment mass retained by that particular sieve. Sieve apertures ranged in size from 63µm to 2mm. Gravel is classified as those particles >2mm, sand as those between 2mm and 63µm and mud as that fraction of the total which passes through a 63µm aperture sieve.

## 6. RESULTS

### 6.1 Trace Metals

All trace metal concentrations are shown in Table 3, expressed in mg.kg<sup>-1</sup> (dry weight basis).

**Table 3: Trace metal concentrations (mg.kg<sup>-1</sup>) measured from sediment grab samples and onshore borehole Q6 cores.**

Lab No	Sample Id	Al mg/kg	As mg/kg	Cd mg/kg	Cr mg/kg	Cu mg/kg	Hg mg/kg	Ni mg/kg	Pb mg/kg	Zn mg/kg	Total Trace metals mg/kg
17986	WPT 026.1	7563	5.6	<0.5	17.9	2.8	<0.5	4.8	7.8	21.3	60.2
17987	WPT 026.2	5820	5.4	<0.5	14.3	1.8	<0.5	3.4	6.3	17.8	49.0
17988	WPT 026.3	8364	5.7	<0.5	20.7	3.2	<0.5	5.8	8.2	23.5	67.2
17989	DS 027.1	3540	2.1	<0.5	8.6	1.5	<0.5	2.6	3.9	9.0	27.6
17990	DS 027.2	2273	2.1	<0.5	5.8	1.1	<0.5	1.3	3.0	5.9	19.1
17991	DS 027.3	3117	1.9	<0.5	8.1	1.2	<0.5	2.1	3.9	7.3	24.6
17992	DS 028.1	3449	1.7	<0.5	7.7	1.5	<0.5	2.4	4.4	8.6	26.4
17993	DS 028.2	18831	5.8	<0.5	42.6	9.9	<0.5	15.1	16.1	46.9	136.3
17994	DS 028.3	10024	3.0	<0.5	21.1	4.8	<0.5	8.3	8.8	24.5	70.4
17995	HB WPT 033	2211	2.4	<0.5	5.9	1.1	<0.5	1.4	4.0	6.9	21.8
17996	HB WPT 035	3314	2.5	<0.5	9.5	1.4	<0.5	2.5	3.8	9.0	28.6
17997	HB WPT 036	13893	4.2	<0.5	28.7	5.7	<0.5	10.5	13.7	34.7	97.5
17998	HB WPT 037	18844	6.4	<0.5	50.5	8.7	<0.5	14.4	23.0	51.2	154.1
17999	HB WPT 038	2561	2.8	<0.5	7.3	1.1	<0.5	1.7	4.8	7.1	24.8
18000	HB WPT 039	18298	4.9	<0.5	32.8	7.0	<0.5	12.1	16.8	43.3	116.8
18001	ADMIN HARBOUR 040	15365	5.1	<0.5	28.8	6.0	<0.5	10.2	15.4	38.4	104.0
18002	ADMIN HARBOUR 041	4456	2.7	<0.5	11.0	1.6	<0.5	3.1	7.1	13.2	38.8
18003	HB 042	3058	3.6	<0.5	8.1	<1.0	<0.5	1.8	5.0	8.2	26.7
18004	SITE#0	325	4.0	<0.5	9.2	<1.0	<0.5	2.2	4.9	16.8	37.1
LC limits	Special Care	N/A	30-150	1.5-10.0	50-500	50-500	0.5-5.0	50-500	100-500	150-750	50-500
LC limits	Prohibition	N/A	>150	>10.0	>500	>500	>5.0	>500	>500	>750	>500

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Table 3 continued: Trace metal concentrations (mg.kg<sup>-1</sup>) measured from sediment sub-samples from borehole Q6.

Lab No	Sample Id	Sample Depth (m)	Al mg/kg	As mg/kg	Cd mg/kg	Cr mg/kg	Cu mg/kg	Hg mg/kg	Ni mg/kg	Pb mg/kg	Zn mg/kg	Total Trace metals mg/kg
18060	47	21.5-23.0	24628	44.6	<0.5	29.1	9.2	<0.5	8.5	33.4	54.7	179.6
18061	48	20.0-21.5	33789	7.7	<0.5	37.1	21.9	<0.5	20.8	28.0	100.5	215.9
18062	49	19-20	44960	8.8	<0.5	42.6	22.9	<0.5	29.1	31.6	121.4	256.4
18063	50	18.5-19	43754	9.1	<0.5	45.1	15.6	<0.5	33.8	30.3	135.4	269.3
18065	52	16.45-17	10516	6.3	<0.5	18.8	7.3	<0.5	6.7	12.3	28.5	79.9
18066	53	16-16.45	4137	7.2	<0.5	10.9	1.7	<0.5	2.0	7.4	10.6	39.8
18067	54	15.45-16	17869	8.9	<0.5	26.7	9.3	<0.5	11.0	17.3	47.5	120.7
18068	55	15-15.45	4790	5.2	<0.5	13.0	2.2	<0.5	3.0	3.7	13.4	40.6
18069	56	14.45-15	9084	4.1	<0.5	15.5	5.9	<0.5	6.4	11.1	27.1	70.2
18070	57	14-14.45	23563	6.5	<0.5	46.7	10.7	<0.5	18.1	25.2	65.0	172.3
18071	58	13.45-14	12504	5.6	<0.5	19.6	8.8	<0.5	9.7	14.7	39.3	97.6
18072	59	13-13.45	14774	5.4	<0.5	35.4	6.4	<0.5	12.5	15.1	38.6	113.3
18073	60	12.45-13	16905	6.4	<0.5	26.6	8.7	<0.5	12.3	17.9	48.3	120.2
18074	61	12-12.45	2533	2.2	<0.5	9.0	1.2	<0.5	3.8	2.5	6.7	25.4
18075	62	10.45-11	8512	3.3	<0.5	17.2	5.3	<0.5	7.0	9.2	24.9	66.9
18076	63	10-10.45	3026	1.9	<0.5	10.3	1.7	<0.5	2.9	2.9	8.7	28.4
18077	64	9.45-10	2281	3.0	<0.5	7.0	1.6	<0.5	1.8	2.7	6.5	22.6
18078	65	9-9.45	2275	3.6	<0.5	8.4	1.1	<0.5	1.5	1.2	6.2	22.2
18079	66	8.45-9.0	3294	3.0	<0.5	9.6	1.8	<0.5	2.7	3.2	9.1	29.3
18080	67	8-8.45	1752	2.5	<0.5	6.0	<1.0	<0.5	2.0	<1.0	5.9	16.4
18081	68	7.45-8.0	7080	4.6	<0.5	17.2	5.5	<0.5	6.7	7.3	21.0	62.4
18082	69	7.0-7.45	2810	2.3	<0.5	10.0	1.7	<0.5	3.2	3.6	7.4	28.3
18083	70	6.45-7.0	10862	5.3	<0.5	21.8	6.6	<0.5	9.0	10.8	29.6	83.2
18084	71	6.0-6.45	1136	2.1	<0.5	6.6	<1.0	<0.5	2.1	<1.0	3.4	14.3
18085	72	5.45-6.0	20197	8.6	<0.5	34.3	9.7	<0.5	16.0	19.9	55.0	143.5
18086	73	5.0-5.45	8398	4.0	<0.5	18.0	3.8	<0.5	7.0	8.2	23.1	64.1
18087	74	4.45-5.0	16008	7.9	<0.5	34.4	9.2	<0.5	14.1	16.0	46.2	127.7
18088	75	4.0-4.45	22656	6.8	<0.5	38.7	11.3	<0.5	18.2	22.6	56.2	153.9
18089	76	3.45-4.0	17557	7.3	<0.5	36.5	17.2	<0.5	16.2	17.3	58.6	153.2
18090	77	3.0-3.45	24259	20.8	<0.5	38.6	9.5	<0.5	19.0	24.4	65.7	178.1
18091	78	2.0-2.45	25659	7.2	<0.5	45.8	10.9	<0.5	20.4	23.9	67.3	175.6
18092	79	1.0-1.45	21466	4.2	<0.5	40.4	10.6	<0.5	18.2	20.9	57.9	152.2
18093	80	0.0-1.0	13704	5.3	<0.5	28.5	10.0	<0.5	12.5	14.2	43.1	113.6
LC limits	Special Care	N/A	30-150	1.5-10.0	50-500	50-500	0.5-5.0	50-500	100-500	150-750	50-500	
LC limits	Prohibition	N/A	>150	>10.0	>500	>500	>5.0	>500	>500	>750	>500	

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**6.2 Particle Size Distribution, POC, PON and Percentage Lost on Ignition**

Table 4 summarises the percentage composition of the main sediment fractions, the percentage PON /POC as well as the percentage lost on ignition for the grab samples, while Table 5 summarises the percentage composition of the main sediment fractions as well as the percentage lost on ignition for borehole Q6.

**Table 4: Sedimentological and organic matter data obtained from sediment grab samples collected in the Port of Ngqura on 27 July 2006.**

Lab No	Sampled	Percent Gravel	Percent Sand	Percent Silt	Percent PON	Percent POC	C/N Ratio	Percent Lost on ignition @550°C
17986	DS 026.1	0.0	93.3	6.7	0.08	2.26	35.1	4.4
17987	DS 026.2	4.5	90.4	5.1	0.04	3.00	87.5	3.0
17988	DS 026.3	0.3	82.5	17.2	0.13	4.89	43.9	4.4
17989	DS 027.1	0.0	96.0	4.0	0.03	1.00	38.9	2.8
17990	DS 027.2	0.2	98.2	1.5	0.02	1.21	70.6	1.7
17991	DS 027.3	0.3	91.2	8.5	0.02	1.46	85.2	1.4
17992	DS 028.1	0.0	99.1	0.9	0.03	0.56	21.8	1.9
17993	DS 028.2	0.0	24.6	75.4	0.18	1.46	9.5	10.4
17994	DS 028.3	0.0	68.0	32.0	0.04	0.14	4.1	5.4
17995	HB WPT 033	21.5	63.6	15.0	0.04	4.16	121.3	2.6
17996	HB WPT 035	0.0	95.4	4.6	0.03	0.84	39.2	2.6
17997	HB WPT 036	0.0	18.1	81.9	0.06	0.67	13.0	6.8
17998	HB WPT 037	0.0	18.1	81.9	0.19	2.40	14.7	15.0
17999	HB WPT 038	0.3	91.7	7.9	0.03	1.58	61.4	2.6
18000	HB WPT 039	0.0	27.1	72.9	0.05	0.69	16.1	5.8
18001	ADMIN HARBOUR 040	0.0	39.3	60.7	0.04	1.02	29.8	6.2
18002	ADMIN HARBOUR 041	0.0	81.8	18.2	0.03	1.90	73.9	2.6
18003	ADMIN HARBOUR 042	0.0	98.0	2.0	0.02	3.29	191.9	2.1

*Appendix G : Sediment Analysis and Assessment Data Report*

**Table 5: Sedimentological and organic matter data obtained from sediment core sub-samples collected from Borehole Q6 in the Port of Ngqura on 27 July 2006.**  
**Depths are "below surface"**

Lab No	Sample Id	Sample Depth (m)	Percent Gravel	Percent Sand	Percent Silt	Percent Loss on ignition @ 550°C
18060	47	21.5-23.0	0.0	76.2	23.8	3.3
18061	48	20.0-21.5	0.0	46.2	53.8	3.1
18062	49	19-20	0.0	34.6	65.4	2.9
18063	50	18.5-19	0.0	34.8	65.2	3.5
18065	52	16.45-17	3.3	93.8	2.9	2.3
18066	53	16-16.45	4.1	84.5	11.4	2.7
18067	54	15.45-16	6.8	90.7	2.5	2.4
18068	55	15-15.45	1.2	95.2	3.6	1.9
18069	56	14.45-15	1.3	83.1	15.6	2.0
18070	57	14-14.45	0.0	5.8	94.2	9.2
18071	58	13.45-14	0.5	74.0	25.5	2.7
18072	59	13-13.45	0.0	21.2	78.8	7.3
18073	60	12.45-13	0.5	75.0	24.5	3.1
18074	61	12-12.45	0.0	98.2	1.8	2.9
18075	62	10.45-11	0.4	96.2	3.4	2.2
18076	63	10-10.45	18.5	81.5	0.0	1.8
18077	64	9.45-10	0.0	99.3	0.7	1.1
18078	65	9-9.45	0.0	100.0	0.0	1.9
18079	66	8.45-9.0	0.0	98.8	1.2	1.2
18080	67	8-8.45	0.0	100.0	0.0	1.7
18081	68	7.45-8.0	3.5	93.3	3.1	1.8
18082	69	7.0-7.45	17.8	81.5	0.7	2.0
18083	70	6.45-7.0	5.6	74.0	20.3	2.2
18084	71	6.0-6.45	0.0	70.8	29.2	2.6
18085	72	5.45-6.0	0.4	65.4	34.3	3.3
18086	73	5.0-5.45	7.8	54.4	37.8	2.5
18087	74	4.45-5.0	0.8	68.9	30.3	2.9
18088	75	4.0-4.45	56.6	19.1	24.3	3.7
18089	76	3.45-4.0	1.6	60.3	38.1	3.5
18090	77	3.0-3.45	0.0	29.5	70.5	3.5
18091	78	2.0-2.45	28.2	42.9	28.8	4.3
18092	79	1.0-1.45	6.6	49.2	44.3	2.9
18093	80	0.0-1.0	10.7	65.4	23.9	2.6

### 6.3 Hydrocarbons

**Table 6: Total petroleum hydrocarbons (TPH) (mg.kg-1).**

Lab Number	Sample Id	Date Analysed	TPH (mg/kg)
17995	HB WPT 033	19/09/2006	<50
17996	HB WPT 035	19/09/2006	<50
17997	HB WPT 036	19/09/2006	<50
17998	HB WPT 037	20/09/2006	<50
17999	HB WPT 038	19/09/2006	<50
18002	ADMIN HARBOUR 041	15/09/2006	<50
18084	6.0-6.45m section BHQ6	19/09/2006	<50
18093	0.0-1.0m section BHQ6	19/09/2006	<50
LC limits – Oils	Special Care		1000 – 1500
LC limits - Oils	Prohibition		>1500

## 7. DISCUSSION

The discussion of results is limited to observations of samples that exceed either the Special Care or Prohibition Levels of the LC.

### 7.1 Trace Metals

#### Chromium

Sample HB WPT 037 (lab number 17998) has chromium content of 50.5. This marginally exceeds the lower end of the Action Level. Range of 50. Analytical method uncertainty for Chromium at this level of quantification is 5.04%. In the light of the analytical uncertainty at this level as well as the fact that all the values are below the LC Special Care levels, the value of 50.5 is not considered significant.

## 8. REFERENCES

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