Appendix 8 Sediment Sampling and Analysis Plan: 2014 and 2019.

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GLADSTONE PORTS CORPORATION LIMITED

Port of Bundaberg Maintenance Dredging

Sediment Sampling and Analysis Plan: 2014 and 2019

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PORT OF BUNDABERG MAINTENANCE DREDGING
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PROJECT 301001- 00665 - PORT OF BUNDABERG MAINTENANCE DREDGING

REV	DESCRIPTION	ORIG	REVIEW	WORLEY-PARSONS APPROVAL	DATE	CLIENT APPROVAL	DATE
A	Issued for Customer Review	J Kennedy	K Dawson	J Kennedy	17-03-10	N/A	

GLADSTONE PORTS CORPORATION LIMITED
PORT OF BUNDABERG MAINTENANCE DREDGING
SEDIMENT SAMPLING AND ANALYSIS PLAN: 2014 AND 2019

CONTENTS

1. INTRODUCTION

1.1 Background

The Port of Bundaberg is situated 19.3 km downstream from the City of Bundaberg, 4.8 km from the mouth of the Burnett River, and has an entrance channel 11 km in length. The channel is 103 m in width, with a minimum 9.5 m navigable depth (LAT) and leads into a swing basin 1,165 m in length and 320 m in width.

There are two main wharves. The Sir Thomas Hiley Wharf is used for the shipment of sugar and the John T. Fisher Wharf is used for the bulk loading point for molasses.

Gladstone Ports Corporation Limited (GPCL) manages the Port of Bundaberg. GPCL is required under the Queensland *Transport Infrastructure Act 1994* to maintain navigable depths within the port navigation areas.

The need for maintenance dredging of navigation channels arises periodically due to sedimentation of existing channels. Declared operation depths are determined for various channels, and these depths are routinely monitored via hydrographic surveys. When the channel depth approaches the minimum operational depth (via sedimentation), the need for maintenance dredging arises. In the case of the Port of Bundaberg, sedimentation may either be a gradual and predictable process, or may be rapid and unpredictable, as is the case when flood events lead to sudden sedimentation of port berths and channels, thus, maintenance dredging in the Port of Bundaberg can be separated into two categories:

- routine maintenance dredging;
- flood related emergency dredging.

Routine maintenance dredging is undertaken on an approximately annual basis using the trailing suction hopper dredge TSHD 'Brisbane', with material placed at sea in the approved Port of Bundaberg spoil ground. If required, flood related emergency dredging would be undertaken using the TSHD 'Brisbane' or similar large dredge and the resulting material placed at the spoil ground.

The need for maintenance dredging is assessed by the Chief Executive Officer upon review of routine hydrographic surveys.

As part of seeking a new routine maintenance and emergency dredging Sea Dumping Permit, GPCL is required to develop a sediment sampling and analysis plan (SAP) to outline the methodology to be implemented for studies to characterise the chemical and physical nature of the sediments to be dredged and make an assessment of its suitability for unconfined placement at sea, compliant with the requirements of the *National Assessment Guideline for Dredging (NAGD)* (Commonwealth of Australia, 2009). The NAGD supersedes the previous guidelines, the *National Ocean Disposal Guidelines for Dredged Material* (NODGDM; Commonwealth of Australia, 2002).

This document provides the proposed plan for the sampling and analysis of sediments both within the port area and entrance channel to obtain an appreciation of the characteristics of routine maintenance dredging sediments and upstream of the port in the Burnett River estuary to broadly characterise sediments that could enter the port during a flood event. The approach taken in this SAP replicates that undertaken in 2009 for maintenance dredging sediment characterisation, and will provide the basis for sampling and analysis completed under the Long Term Management Plan 2010-2020.

GPCL seeks approval of this SAP by the Commonwealth as part of its application for a long term sea dumping permit.

1.2 Objectives of the SAP

The aim of this SAP is to develop a set of procedures that will provide a statistically valid representation of the physico-chemical properties of sediments to be dredged, and an assessment of the likely impacts of sea disposal of the dredged sediment. The specific objectives of the SAP are to:

- provide a brief summary of the dredging operations relevant to the SAP;
- provide a summary of the catchment and land-use activities with the potential to impact upon dredged material quality;
- identify a contaminants list for testing of sediments, based on potential contaminant sources and results of prior testing;
- identify the number of samples required to provide an adequate representation of the mean and upper 95% confidence interval for contaminants list analytes;
- develop protocols for the collection and handling of sediment samples for analysis;
- identify the types of analyses to be performed on sediment samples;
- outline quality assurance and quality control (QA/QC) procedures for the collection, handling and laboratory analysis of samples;
- describe statistical techniques to determine the status of potential contaminants within dredged material; and
- prescribe a reporting framework for all data, results and conclusions which will address the requirements of BPC and the Determining Authority.

1.3 Description of the Proposed Dredging

Until recently, routine maintenance dredging within the port was undertaken using the TSHD 'Brisbane' in the middle and sea reaches of the port (refer **Figure 1-1**) with placement of material at the approved spoil ground, supplemented by extraction and land-based disposal by the cutter suction dredge 'John G. Francis'. The 'John G. Francis' undertook maintenance dredging in the inner and middle reaches of the port, again with land-based disposal.

Port of Bundaberg has recently reviewed land-use planning objectives for the port and its approach to dredging and spoil disposal. The draft land-use plan for the port retains onshore dredge material relocation areas for dredging works associated with marina maintenance and reserves an area for future onshore disposal needs when port spoil may be unsuitable for placement at sea. Previously, up to seven onshore materials relocation areas were set aside for land-based placement of clean material. This approach sterilised land-use for a large amount of port land and some of these areas were constrained by to potential environmental issues, such as proximity to environmentally sensitive areas and other factors.

Consistent with the new approach of placing clean material at sea and reserving land areas for future contaminated material, and due to unviable economics, the cutter suction dredge 'John G. Francis' has been decommissioned and sold. Land-based disposal using the TSHD 'Brisbane' was considered but is cost prohibitive due to the high annual mobilisation costs of onshore piping equipment, which would increase dredging costs by more than half. This is not sustainable in a port that currently receives only about twelve vessels per year.

Consequently, the new approach to dredging is for routine maintenance dredging of the port and entrance channel areas to be undertaken using the TSHD 'Brisbane' on an approximately annual basis. Based on previous dredged volumes from within the port, it is anticipated that up to 90,000 m^3 of material would be dredged from the inner, middle and sea reaches of the port on an annual basis and placed at the approved offshore spoil ground.

The description and coordinates of the reaches, as defined in the current Sea Dumping Permit, are as follows:

Inner Reach of the channel is that portion of the channel located within the area bounded by the Burnett River between the following coordinates. It includes the Inner Reach as defined on the chart AUS 242 and the maintained area upstream including the swing basin, adjacent to the bulk sugar terminal wharf and the entrance/departure channel (WGS 84 datum) (see **Figure 1-1**).

- 24°45'26.662" South and 152°23'13.891" East
- 24°45'30.758" South and 152°23'16.444" East
- 24°46'25.601" South and 152°22'47.536" East
- 24°46'23.527" South and 152°22'56.874" East

Middle Reach of the channel is that portion of the channel located within the area bounded by the Burnett River between the following coordinates (WGS 84 datum) (see **Figure 1-1**):

- 24°45'14.045" South and 152°24'08.539" East
- 24°45'17.392" South and 152°24'08.852" East
- 24°45'26.662" South and 152°23'13.891" East

- 24°45'30.758" South and 152°23'16.444" East

Sea Reach of the channel is that portion of the channel located within the area bounded by the following coordinates (WGS 84 datum) (see **Figure 1-1**):

- 24°45'13.756" South and 152°28'06.852" East
- 24°45'17.107" South and 152°28'06.859" East
- 24°45'14.045" South and 152°24'08.539" East
- 24°45'17.392" South and 152°24'08.852" East

Maintenance dredging in each of these areas typically requires removal of up to 1m depth of sediments.

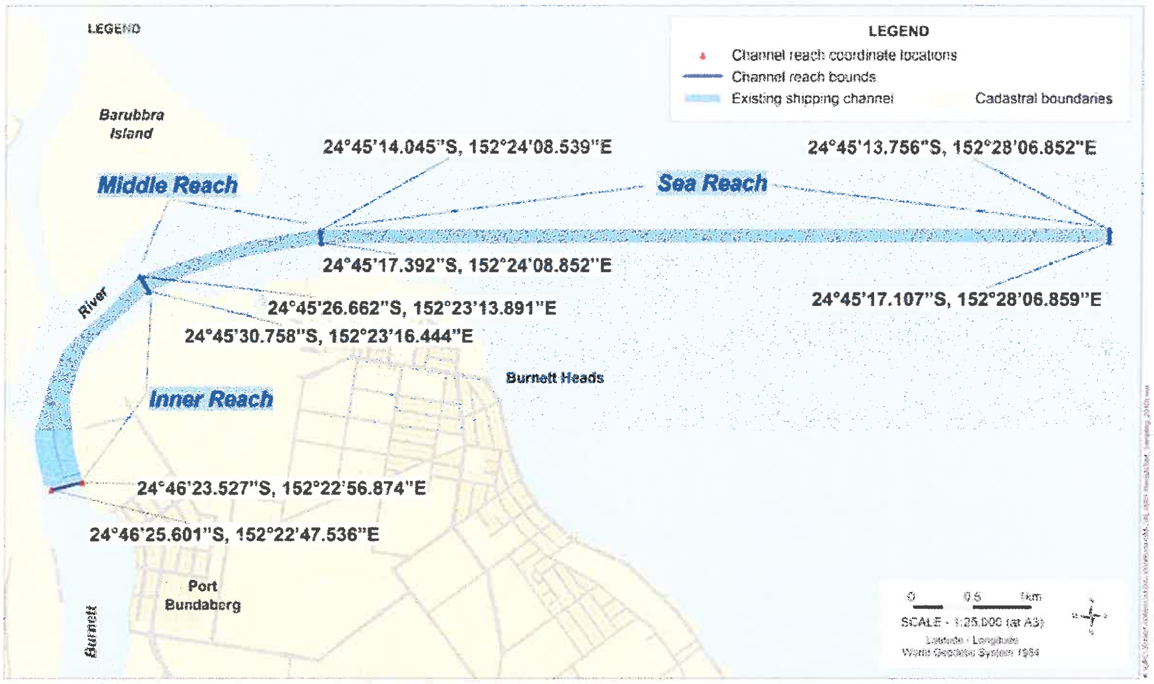


Figure 1-1 – Location of areas to be dredged

2. COMPILATION AND REVIEW OF EXISTING INFORMATION

2.1 History of the Dredge Area and the Catchment

The estuarine area of the Burnett River has been significantly affected by upstream developments resulting in a significant reduction of natural stream and sediment flows to the estuary. Other modifications include port and industrial development at the river mouth. The catchment has 15% vegetation cover remaining. In the upper and middle catchment, land uses include beef grazing, forestry and horticulture. The lower floodplain is dominated by sugar cane.

The history of dredging and offshore dredge spoil disposal in the Port of Bundaberg since 1974 is summarised as follows:

- 1974 – major flood maintenance dredging;
- 1975/76 – development dredging;
- 1977 – development dredging;
- 1988 – maintenance dredging;
- 1989 – maintenance dredging;
- 1996 – development dredging plus maintenance dredging;
- 2001 – development dredging plus maintenance dredging;
- 2004 – maintenance dredging;
- 2007 – maintenance dredging; and
- 2008 – maintenance dredging.

During recent years, maintenance dredging has been undertaken using the Port's own cutter suction dredge 'John G. Francis' and the Trailing Suction Hopper Dredge 'Brisbane' (or its predecessor 'Sir Thomas Hiley'), which is owned and operated by the Port of Brisbane Corporation. The majority of dredging was undertaken during annual campaigns by the TSHD 'Brisbane' or 'Sir Thomas Hiley' and placed at the spoil ground.

The purchase of the Port's cutter suction dredge 'John G. Francis', gave the capacity for the Port to undertake more of it's own maintenance dredging on an ongoing basis, primarily in the inner reaches of the channel, and this material was piped to on-shore materials relocation areas or used for reclamation. The 'John G. Francis', however, was found to be very uneconomical and onshore spoil disposal presented a range of issues, such as proximity to environmentally sensitive areas, raising groundwater levels and regional acid sulfate soils issues. Consequently, it was decommissioned and sold in 2008. Dredging again focuses on annual dredging campaigns using a Trailing Hopper Suction

Dredge such as the 'Brisbane' and placement of material at sea if it is suitable for unconfined sea disposal according to the NAGD framework for assessment of potential contaminants.

Historically, all dredged material was located to approved placement areas at sea. However, during operation of the 'John G. Francis', all material from those works was relocated on-shore or used for reclamation.

Resulting from recommendations in the Port Development Plan (Connell Wagner 1994), a decision was made in 1994 to provide a minimum dredged depth of 8.3 metres to provide good accessibility to the Port for vessels of approximately 25,000 DWT. This capital dredging (including some maintenance of other areas) was undertaken in 1996 under a previous Sea Dumping Permit. This major dredging campaign resulted in the placement of some 600,000 m^3 of material (wet load in hopper) on the designated spoil ground.

Approximately 18,000 m^3 of maintenance dredging by the Sir Thomas Hiley was undertaken during 2000. In 2001, the Bundaberg Port Authority undertook development dredging to increase the channel design depth from 8.3 m to 9.5 m and increase the channel width from 76 m to 103 m. This involved the removal of approximately 1.8 million m^3 of material. This development allowed the Port to accommodate fully laden Handimax class vessels of 40,000 DWT. Of the material dredged, approximately 1.4 million m^3 was placed at sea on the spoil ground used previously in 1996. The remainder was placed onshore in the Material Relocation Area (MRA). During May 2004, a total of 22,000m^3 of spoil was dredged in the Sea Reach area and placed at the spoil ground by the Brisbane. 21,400 m^3 and 34,000 m^3 of maintenance dredging material were extracted and the material placed at the spoil ground in 2007 and 2008 respectively.

Between 1996 and 2009, the Bundaberg Port Authority has held four permits for the sea dumping of dredged material. None of these permits have been fully utilised, since no significant flood deposition of sediment in the Port has occurred.

2.1.1 Sources and History of Contamination

The current imports and exports at the Port of Bundaberg (molasses and bulk sugar) are unlikely to contribute to the contamination of the sediments. The only significant potential source of pollution is the antifoulant Tributyltin (TBT) found on the larger ships that have docked at the Port. Historically, levels of TBT in sediments have been within acceptable levels according to relevant contaminant guideline screening levels of the time. Recent testing in 2009 did not detect any organotins in sediments, either within the port general operations area or entrance channel (WorleyParsons, 2009a) or adjacent to the Sir Thomas Hiley wharf where larger vessels dock (WorleyParsons, 2009b).

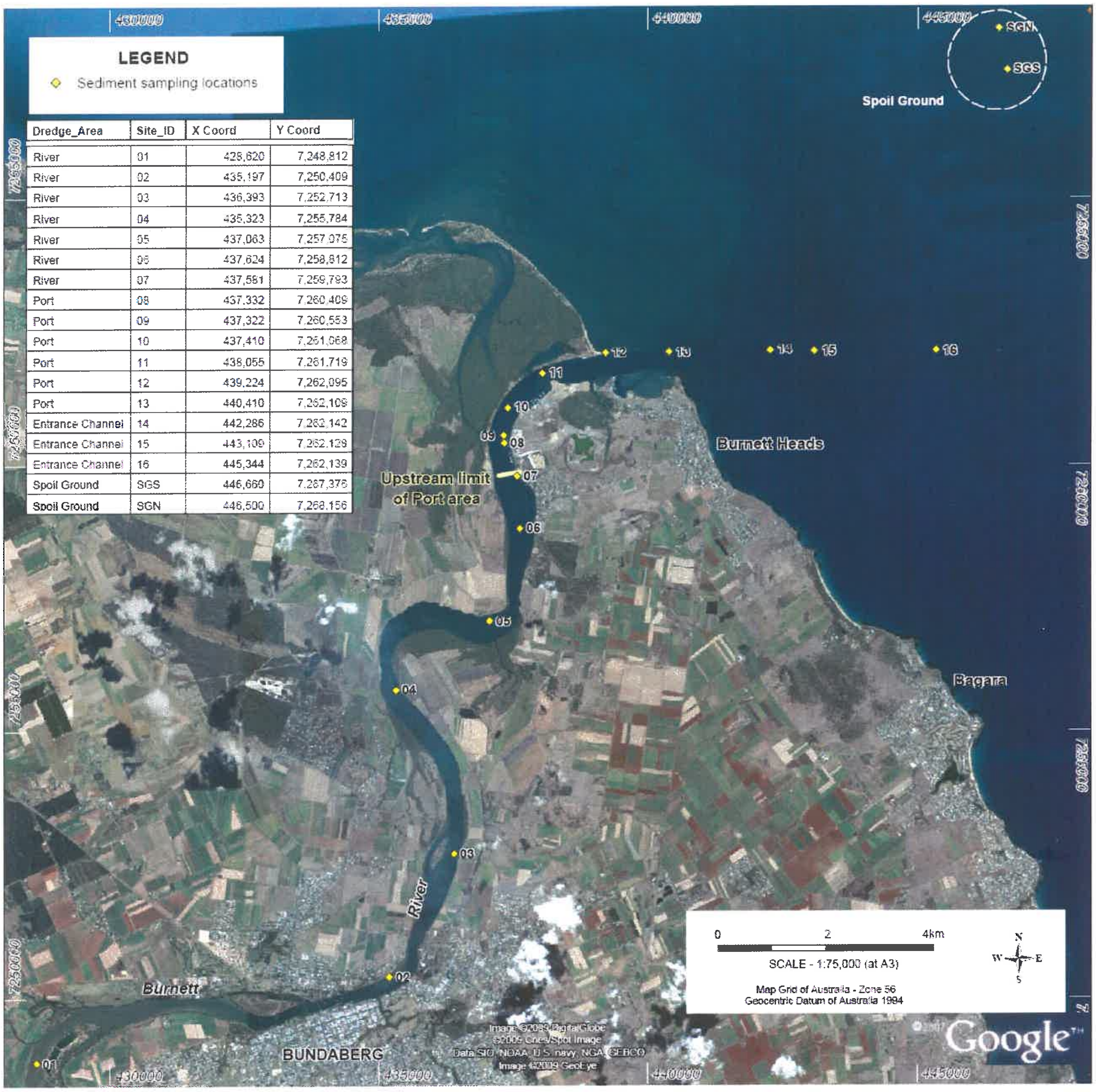
2.1.2 History and Results of Sediment Quality Investigations

Detailed sediment quality investigations have been undertaken at the port in 1987, 1995, 1999, 2004, and 2009.

Results of the 2009 maintenance dredging sediment characterisation are within the five-year NAGD currency period and are summarised below. Results from the 2004 study are also provided to provide further information and a comparison of data. Results of the 2009 sediment characterisation for development dredging of the insurance trench are not summarised, however the study determined that sediments were below respective screening levels for metals and there were no detections of organotins.

PHYSICAL ANALYSES

The physical characteristics of the material to be dredged have been assessed in 1987, 1995, 1999, 2000, 2004 and 2009. A graphical summary percentage gravel, sand, silt and clay particle size classes for the two most recent surveys in 2004 and 2009 at 16 entrance channel, port area and upstream sampling locations (refer to **Figure 2-1** for locations) is presented graphically in **Figure 2-2**.



Dredge_Area	Site_ID	X Coord	Y Coord
River	01	428,620	7,248,812
River	02	435,197	7,250,409
River	03	436,393	7,252,713
River	04	435,323	7,255,784
River	05	437,063	7,257,075
River	06	437,624	7,258,812
River	07	437,581	7,259,793
Port	08	437,332	7,260,409
Port	09	437,322	7,260,553
Port	10	437,410	7,261,068
Port	11	438,055	7,261,719
Port	12	439,224	7,262,095
Port	13	440,410	7,262,109
Entrance Channel	14	442,286	7,262,142
Entrance Channel	15	443,109	7,262,129
Entrance Channel	16	445,344	7,262,139
Spoil Ground	SGS	446,660	7,267,376
Spoil Ground	SGN	446,500	7,268,156

Figure 2-1 2004 and 2009 sediment sampling locations for maintenance dredging material characterisation

Note: Spoil ground locations sampled only in 2009.

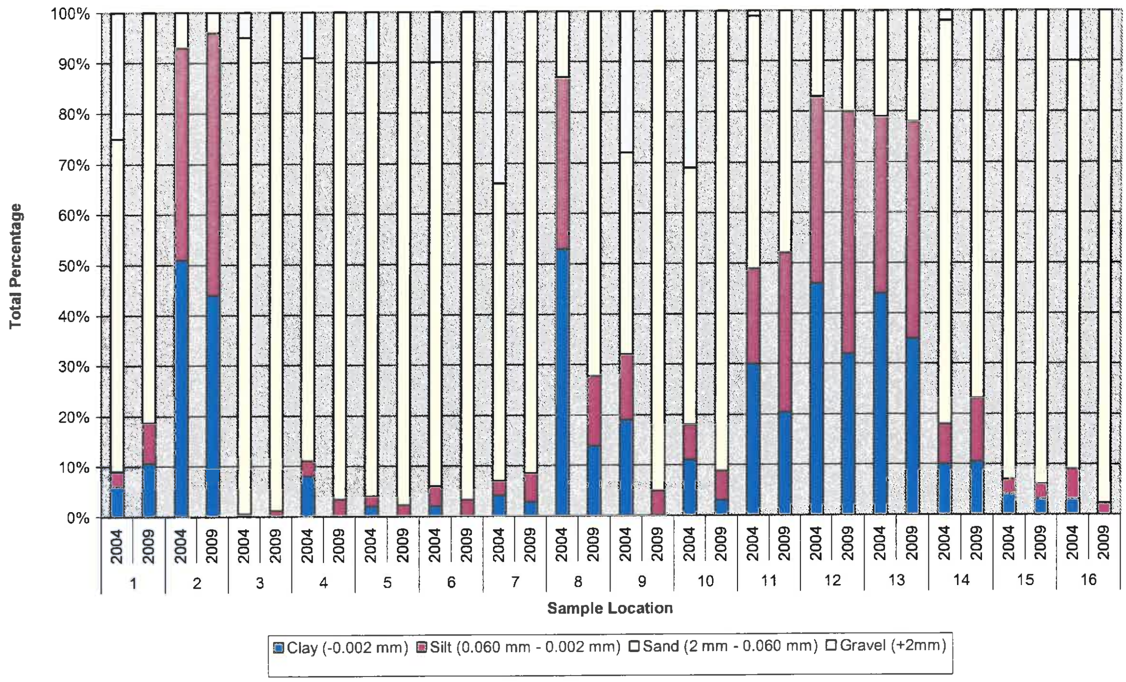


Figure 2-2 2004 and 2009 particle size distribution summaries (percentage of total sample in gravel, sand, silt and clay classes).

The particle size distributions of the sediments are relatively consistent over time, dominated by sands and sandy clays in the river (sites 1,3-7), some siltier material in the port area (sites 8-13) and upstream near the Bundaberg City town reach (Site 2), and sands in the entrance channel sites 14-16). Only the sediments in the port area and entrance channel will be maintenance dredged.

2.2 Contaminant Status

Contaminant status of sediments has been assessed in 1987, 1995, 1999, 2000, 2004 and 2009. A summary of results from the two most recent maintenance dredge sediments in 2004 and 2009 are provided in this section.

In summary, sediment concentrations of organic substances including polychlorinated biphenyls (PCBs), organotins (including Tributyltin, TBT), organochlorine pesticides (OCPs) and total petroleum hydrocarbons (total TPHs) are below practical quantitation limits (PQLs)[1]. Total polynuclear aromatic hydrocarbon (total PAH) concentrations are recorded around the PQL.

Trace metals have been the primary contaminant group recorded since surveys began in 1987.

In 1987, levels of cadmium and mercury exceeded the current screening guideline. All metal concentrations declined markedly from 1987 to 1995 when the mean concentrations of all contaminants in port sediments were below the screening level. Upstream of the port, however, nickel was elevated at some locations, so it was hypothesised that elevations were due to urban stormwater inputs. In 1999, nickel levels were elevated, this time in port sediments. In 2004, the means (at their 95% upper confidence level; 95%UCL) of metals were below the NODGDM/NAGD screening levels within port and entrance channel sediments. Upstream of the port, elevated nickel was again found at one site near Bundaberg city (Site 2), however it was identified that the nickel was tightly bound to the fine sediments, and found have low bioavailability (through dilute acid extraction analysis), which is indicative of being derived from terrigenous origin. In 2009, there was a general decrease in metals contaminant concentrations in Port and Entrance Channel sediments, again with the means (at their 95%UCL) being lower than respective NAGD screening levels. Detection of arsenic at concentrations marginally above NODGDM/NAGD screening levels in 2004 and 2009 at the very outermost site in the entrance channel (site 16) is considered to be due to natural occurrence in shallow underlying clays.

Overall, maintenance dredging sediments are consistently found to be suitable for unconfined disposal at screening level of assessment. Tributyltin, the primary contaminant of concern in most Australian port areas is consistently below PQLs.

2004 RESULTS

Sediment samples were tested from 16 sampling locations from both the Port and Entrance Channel areas as well as upstream of the Port (SKM, 2004) (refer **Figure 2-1**). The results of chemical testing for sediments within the Port and Entrance Channel area (Sites 8-16) are summarised as follows (refer to **Table 2-1** to **Table 2-3**):

- Polychlorinated biphenyls were below detection;
- Organochlorine pesticides were below detection;
- Total petroleum hydrocarbons were below detection;
- The 95% UCL was below screening guidelines for all metals, organotins and PAHs;

[1] Practical quantitiation limits (PQLs) are the lowest chemical analysis level that can be reliably achieved within specified limits of precision and accuracy during routine operating conditions of analytical equipment.

- One sample from the outer entrance channel (Site 16, 4.8km from the river mouth) contained arsenic concentration above the screening level but this was rationalised to be due to the underlying clay which would not be extracted during dredging operations as it was below the declared depth for the Port;
- Sediments upstream in the vicinity of Bundaberg City (Site 2, 17.4 km upstream from the river mouth) had total nickel concentrations above the screening level of NODGDM, but below the maximum level;
- Elutriate testing for nickel resulted in water concentrations well below the *Australian Water Quality Guidelines for Fresh and Marine Waters* (ANZECC 2000) trigger level;
- Metal contaminant concentrations were strongly correlated with clay and silt percentage and therefore unlikely to be bioavailable; and
- Based on the results, the material for dredge spoil material was suitable for disposal at sea.

Table 2-1 Metals and metalloid concentration statistics in Port and Entrance Channel sediments, 2004

Parameter	Mean ±SD	95% UCL	PQL (mg/kg)	NODGDM Screening Level (mg/kg)
Antimony	0.6±0.2	0.7	0.5	2
Arsenic	9.0±10.6	15.5	1	20
Cadmium	0.56±0.17	0.7	1	1.5
Chromium	18.0±8.3	23.1	1	80
Copper	11.4±7.6	16.2	1	65
Lead	5.8±3.4	7.9	1	50
Mercury	0.1±0.0	0.1	0.01	0.15
Nickel	10.8±4.9	13.8	1	21
Silver	0.6±0.2	0.7	0.1	1
Vanadium	35.4±13.1	43.6	2	---
Zinc	25.2±14.6	34.2	1	200

Table 2-2 Normalised organotin compound concentration statistics in Port and Entrance Channel sediments, 2004

Parameter	Mean ±SD	95% UCL	PQL (µgSn/kg)	NODGDM Screening Level (µgSn/kg)
Total Organic Carbon (%)	0.49±0.40		0.02	--
Monobutyltin	0.2±0.1		0.5	--
Dibutyltin	0.3±0.3		0.5	--
Tributyltin	0.1±0.0		0.2	--
Normalised TBT	0.2±0.1	0.2	0.2	5

Table 2-3 Normalised polycyclic aromatic hydrocarbon concentration statistics in Port and Entrance Channel sediments, 2004

Parameter	Mean ±SD	95% UCL	PQL (µg/kg)	NODGDM Screening Level (µg/kg)
Acenapthalene	5±1	5.6	10	44
Acenapthene	5±1	5.6	10	16
Anthracene	6±3	7.4	10	85
Fluorene	5±1	5.6	10	19
Napthalene	5±1	5.6	10	160
Phenanthrene	6±5	10.0	10	240
Low Molecular Weight PAH's	31±11	38.0	60	552
Benzo[a]anthracene	8±9	14.6	10	261
Benzo[a]pyrene	7±5	9.7	10	430
Dibenz[a,h]anthracene	5±1	5.6	10	63
Chrysene	7±6	11.6	10	384
Fluoranthene	13±21	26.0	10	600
2-methylnapthalene	5±1	5.6	10	70
Pyrene	11±16	21.9	10	665
High Molecular Weight PAH's	56±58	93.4	70	1700
Total PAH	87±67	130.6	130	4000

2009 CONTAMINANTS DATA SUMMARY

Sediment samples were tested from both the Port and Entrance Channel area as well as upstream of the Port (refer **Figure 2-1**). Trace metals were tested at all sites, while organotins and acid sulphate soils were tested from the port area. The results of chemical testing for sediments within the Port and Entrance Channel area (Sites 8-16) are summarised as follows (refer **Table 2-4** to **Table 2-5**):

- Organotins were not detected in any sample;
- All metal contaminant substances were below screening levels at the 95%UCL of the mean;
- Within the port and entrance channel dredge area, one site recorded an exceedance of the screening level for arsenic. This site (site 16) is the outer-most sampling site in the Entrance Channel, approximately 4.8 km from the river mouth. This is consistent with testing results from 2004;
- The were no chemical impediments to unconfined placement of dredged material at sea; and
- Generally, sediments have enough acid neutralising capacity to neutralise any acid produced. If not, then minor liming may be required if the material was to be brought on land.

Table 2-4 Metals and metalloid concentration statistics in port and entrance channel sediments, 2009

Parameter	Mean ±SD	95% UCL	PQL (mg/kg)	NAGD Screening Level (mg/kg)
Antimony	0.33±0.23	0.47	0.5	2
Arsenic	5.5±8.7	13.2	1	20
Cadmium	0.08±0.08	0.14	1	1.5
Chromium	14.6±8.5	19.8	1	80
Copper	7.7±6.3	11.6	1	65
Lead	3.6±2.3	5.0	1	50
Mercury	0.09±0.006	0.013	0.01	0.15
Nickel	8.5±4.7	11.4	1	21
Silver	<0.1±0	<0.1	0.1	1
Zinc	17.8±11.2	24.8	2	200

Table 2-5 Normalised organotin compound concentration statistics in port and entrance channel sediments, 2009

Parameter	Mean ±SD	95% UCL	PQL (µgSn/kg)	NAGD Screening Level (µgSn/kg)
Total Organic Carbon (%)	0.75±0.41	1.01	0.01	—
Monobutyltin	<0.5±0	<0.5	1	—
Dibutyltin	<0.5±0	<0.5	1	—
Tributyltin	<0.5±0	<0.5	1	—
Normalised TBT	<0.5±0	<0.5	1	9

2.3 Dredge Areas, Volumes and Potential Contamination Classifications

Areas of maintenance dredging within the port can be differentiated as follows:

- **Port area**, which includes the inner and middle reaches identified in Section 1.3, and the insurance trench which is to be developed in 2010/2011; and
- **Entrance channel**, which is the sea reach identified in Section 1.3.

As indicated in Section 2.1.1, the Burnett River upstream of the port would be a likely contributor to any contaminants within the port sediments through point-source and diffuse inputs. Consequently, testing of sediments upstream of the port is proposed to provide information on characteristics of sediments that may enter the port and require emergency dredging following a flood event.

The NAGD requires assigning a potential contamination classification to each dredge area, within the categories of "probably contaminated', 'suspect' or 'probably clean'. Unfortunately, no guidance is provided regarding the application of these terms.

Previous testing of sediments in the entrance channel, port area and upstream indicates that they are 'probably clean', whereby all contaminant parameters were either below the PQL or below NODGDM or NAGD screening levels. There have been no new potential sources of contamination since the 2004 and 2009 sediment characterisation studies were undertaken. A summary of dredge volumes and consideration of potential contaminant status is presented in **Table 2-6**. On the basis of the port and entrance channels being 'probably clean', assessment of both these areas would be undertaken using combined results, consistent with previous sediment characterisation studies.

Table 2-6 – Dredge volumes and potential contaminant classification for each dredge area

Dredge area	Approximate Annual Dredge Volume (m^3)	Classification	Justification
Port area + including insurance trench	17,500 + 20,000	Probably clean	Current data indicates all parameters tested were either below PQLs or below screening levels.
Entrance channel	52,500	Probably clean	Current data indicates all parameters tested were either below PQLs or below screening levels.
River area	Not applicable as not dredged	Probably clean	Current data indicates all parameters tested were either below PQLs or below screening levels.

2.4 Contaminants List

Appendix A of the NAGD requires that a contaminants list is to be developed and should include:

- Toxic substances known, from previous investigations, to occur in dredge area sediments at levels greater than one-tenth of the Screening Levels, or
- Based on historical review, substances potentially present at such levels in the sediments to be dredged.

It is noted in relation to the first point, that levels one-tenth of screening levels may be lower than the NAGD PQL. Previously in the NODGDGM, contaminants of concern largely related to contaminants above PQL. Consequently, our interpretation of the first point relates to substances greater than one-tenth the screening level, or the PQL if the PQL is higher than one-tenth the screening level.

Table 2-7 identifies contaminants that qualify for inclusion in, or exclusion from, a contaminants list based on results from the 2004 and 2009 surveys.

Table 2-7 – Contaminants list qualification review

Contaminant	Included / Excluded	Justification
Metals		
Antimony	Included	Not detected but detection level > PQL and detection level not less than 10% of screening level
Arsenic	Included	Exceeds one-tenth screening level
Boron	Excluded	No screening level or PQL in NAGD. Tested in 2004 at request of DEWHA.
Cadmium	Included	Not detected but detection level > PQL and detection level not less than 10% of screening level
Chromium	Included	Exceeds one-tenth screening level
Copper	Included	Exceeds one-tenth screening level
Lead	Included	Exceeds one-tenth screening level
Mercury	Included	Not detected but detection level > PQL and detection level not less than 10% of screening level
Nickel	Included	Exceeds one-tenth screening level
Selenium	Excluded	Previous levels very low. No screening level in NAGD
Silver	Included	Not detected but detection level > PQL and detection level not less than 10% of screening level

Contaminant	Included / Excluded	Justification
Vanadium	Excluded	No screening level in NAGD
Zinc	Included	Exceeds one-tenth screening level
Organotins	Included *	Below PQLs but may be present at levels exceeding one-tenth screening levels in the port area
Total PAHs	Excluded	Less than one-tenth screening level
Organochlorine Pesticides	Excluded	Below PQLs
PCBs	Excluded	Below PQLs
Total TPHs	Excluded	Below PQLs
Radionuclides	Excluded	No potential sources in catchment

Notes: * Proposed only for port sediments, not river or entrance channel sediments.

Apart from the contaminants listed in **Table 2-7**, the following additional analyses are proposed to provide information regarding physical characteristics:

- Particles size distribution (to 2 µm)
- Total organic carbon
- Moisture content

2.5 Consideration of Environmental Factors

Environmental factors that may potentially affect contamination in the sediments include hydrological conditions, particularly flooding events and particle-size. As stated in Section 2.1.1, imports and exports at the Port of Bundaberg are unlikely to contribute to the contamination of the sediments. The only significant potential source of pollution is the antifoulant TBT found on the larger ships that visit the Port. Other contamination that could be found in port sediments would likely have originated from upstream sources. Whilst sediments continually deposit into the port area and require maintenance dredging, a significant flood could result in major deposition within the port and require maintenance dredging. To provide information on potential upstream contaminants, GPCL proposes to continue survey of six sampling locations upstream of the port for metals.

Environmental considerations that may limit or hinder sampling are few. The bed depth within the port and entrance channel varies between approximately -9.5m to -11.5m in the swing basin. If approved, the insurance trench to be developed in 2010/2011 would have a depth of -12.5m.

Because of the depth, sediment collection using any sort of coring device deployed from a vessel is impractical, so divers are typically used to collect sediment samples using a piston corer. Due to high turbidity in the estuary, divers need to be commercially qualified and experienced in operating in low visibility waters. Sediments within the estuary can occasionally have high sand or gravel content, which may be released from coring equipment. To minimise this, divers will use expandable plugs to plug the end of the coring equipment prior to return to the surface.

3. SAMPLING AND ANALYSIS OF SEDIMENTS

3.1 Rationale

The sampling and analysis design proposed reflects that undertaken for the sediment characterisation undertaken in 2004 and 2009, which will allow direct temporal comparison of results. This includes sampling at seven locations upstream of the port area, six locations within the port area and three sites in the entrance channel. In addition, a further four sampling locations will be sampled within the insurance trench of the port area, which is to be developed during the 2010/2011 dredging maintenance dredging campaigns. Proposed sample collection methods are the same as in 2004 and 2009, using diver operated piston coring. Based on current 2009 results, the proposed suite of contaminants for analysis is reduced to metals and organotins. Other contaminant groups were either not detected or below one-tenth the screening level previously and no new potential pollution sources have been established within the catchment since 2009. In accordance with the Long Term Management Plan 2010-2020, testing for other contaminant substances may be undertaken should another potential contaminant source be identified within the port during the permit period.

3.2 Sampling Locations and Horizons

Section 2.3 identifies that up to 90,000m^3 would be dredged annually from the port area (including insurance trench) and the entrance channel. Under Table 6 of the NAGD, that volume of maintenance material would require sampling at 17 locations. However, previous testing has identified that the material is probably clean, so half the number of sampling sites is proposed, making nine locations within the dredge area, being consistent with the number of sites historically sampled within the port area and entrance channel. It is proposed, however, to undertake additional sampling within the insurance trench area following its development.

Table 3-1 summarises the number of samples proposed within the port area, insurance trench and entrance channel, with the total number (13) exceeding half the full number of samples required for the annual dredging volume (9). Included in the table is the number of sampling locations proposed to be sampled upstream of the port area. The location of sampling sites is indicated in **Figure 3-1**.

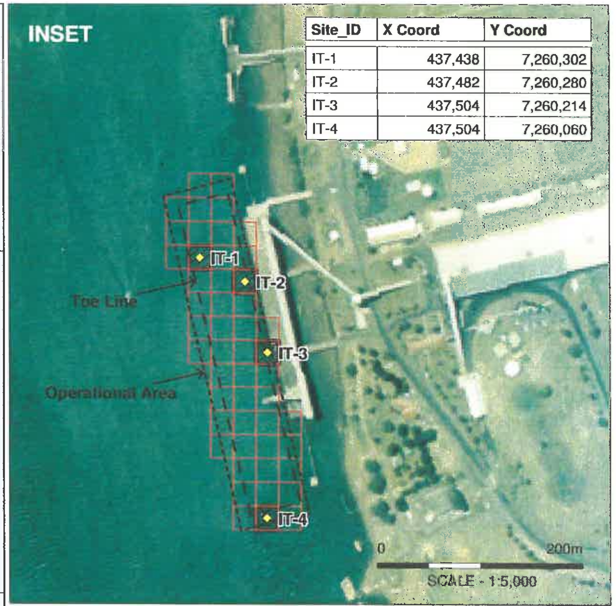
Table 3-1 – Establishment of sample site numbers for sediment characterisation

Dredge Area	Approximate Annual Dredge Volume (m^3)	Historical Sample Location Numbers	Proposed Sample Location Numbers	Location Identifiers
Upstream	Not applicable	7	7	1-7
Port area	17,500	6	6	8-13
Insurance Trench	20,000		4	IT 1 – IT 4
Entrance Channel	52,500	3	3	14-16
Total	**90,000**	**16**	**20**	

Historically, maintenance dredging in the Port of Bundaberg has typically required the extraction of up to about 1m of sediments. Consistent with the approved sampling methodology of the 2009 survey, sediments would be collected using a 1.0m piston corer and samples would be taken from a composite of the whole core. This is justified by 2009 sediment core logs from the port area demonstrating that maintenance dredging sediments are primarily homogenous, silty clays while entrance channel cores were largely silty sand. Other thin layers may be present within the stratigraphy, but typically are less than 10-15cm in thickness. Entrance channel sediments are also relatively consistent in physical nature through the profile.

Sampling within the insurance trench is also proposed to be via 1.0m piston coring on the basis that it has an area of 23,880m^2 and would hold approximately 20,000m^3 of material, making less than 0.85m sediment depth on average.

Dredge_Area	Site_ID	X Coord	Y Coord
River	01	428,620	7,248,812
River	02	435,197	7,250,409
River	03	436,393	7,252,713
River	04	435,323	7,255,784
River	05	437,063	7,257,075
River	06	437,624	7,258,812
River	07	437,581	7,259,793
Port	08	437,332	7,260,409
Port	09	437,322	7,260,553
Port	10	437,410	7,261,068
Port	11	438,055	7,261,719
Port	12	439,224	7,262,095
Port	13	440,410	7,262,109
Entrance Channel	14	442,286	7,262,142
Entrance Channel	15	443,109	7,262,128
Entrance Channel	16	445,344	7,262,139



Site_ID	X Coord	Y Coord
IT-1	437,438	7,260,302
IT-2	437,482	7,260,280
IT-3	437,504	7,260,214
IT-4	437,504	7,260,060

LEGEND

- Sediment sampling locations
- Insurance trench sampling grid
- 2010 sampling location
- Existing spoil ground
- Cadastral boundaries

1999 aerial imagery supplied by Port of Bundaberg (2007)

Rev	Date	Revision Description	ORIG	CHK	ENG	APPD
0	18/03/2010	Issued for use	KM	MM	JAK	

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PORT OF BUNDABERG

GLADSTONE PORTS CORPORATION

LONG TERM MANAGEMENT PLAN FOR MAINTENANCE DREDGING AND DISPOSAL PORT OF BUNDABERG 2010 - 2020

Fig 3-1 Proposed Sediment Sampling Locations

Project No: 301001-00665 | Figure: 00665-00-GM-DAL-0001 | Rev: 0

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3.3 Proposed Sediment Quality Attributes for Analysis

3.3.1 Sediment Characterisation

For sediment characterisation, the suite of contaminants to be tested include those identified as in the contaminants list (refer to Section 2.4) as well as physical characteristics and acid sulfate soils analysis. For clarity, the following parameters comprise the list of physical and chemical analytes for sediment characterisation:

- Metals and metalloids:
  - Antimony (Sb);
  - Arsenic (As);
  - Cadmium (Cd);
  - Chromium (Cr);
  - Copper (Cu);
  - Lead (Pb);
  - Mercury (Hg);
  - Nickel (Ni);
  - Silver (Ag); and
  - Zinc (Zn).
- Organics:
  - Organotins (MBT, DBT and TBT) (port area and insurance only);
- Total organic carbon (port area and insurance trench only);
- Moisture content;
- Particle size distribution (to 2 μm);

3.3.2 Elutriate and Bioavailability Analyses

Based on previous sampling, any exceedance of screening levels at the 95%UCL of the mean, would most likely relate to metal substances. To minimise the need to recollect material for Phase 3 elutriate and bioavailability testing, hold samples will be taken at each sampling location and stored at the laboratory in the event that further testing is required.

If elutriate and bioavailability (i.e. dilute acid extraction for metals) testing are required, hold samples from the locations of the four highest port and entrance channel locations would be analysed, being the number of locations required for phase 3 testing according to Table 7 in Appendix D of the NAGD for the given volume of dredging. Elutriate water would be collected from the Port of Bundaberg spoil ground.

If elutriate and bioavailability analysis (via porewater assessment) is required for organic contaminants, fresh material will need to be collected due to the volume of sediment required, particularly for organotin porewater analysis. Material would be collected from the four sampling locations with the highest total concentrations for the relevant contaminant.

3.4 Frequency of Sampling

Sampling is planned to be undertaken prior to the annual dredge campaign, in 2014 and 2019. Should a significant potential source of contaminants be identified with the port area, then an additional sediment survey will be undertaken, if required, to identify whether contamination of sediments is occurring. The timing for any additional survey and the scope of analyses will be reviewed by GPCL in consultation with DEWHA.

3.5 Sample Collection Methods and Sampling Horizons

3.5.1 Standard Operating Procedures

Samples would be collected at each sampling location via diver-operated piston coring. The piston corer would be 1.0 m in internal barrel length and of 60mm internal diameter. Diving operations would be undertaken using qualified and experienced commercial divers, deployed from a boat. Cores would be extracted to 1m length or to prior refusal.

The vessel to be used as the platform for the sampling will a registered vessel, which will be operated by a licensed coxswain. The vessel will include:

- onboard hand-held GPS (reliably accurate to at least ± 10 m);
- onboard depth sounder (reliably accurate to ± 0.25 m); and
- a sample preparation table that can be easily rinsed clean using ambient seawater.

All working areas of the vessel will be thoroughly checked, cleaned and prepared for sediment sampling activities prior to each day's sampling. Any potential sources of contamination (e.g. galvanised or oily surfaces) will be cleaned, covered and taped down to avoid accidental contamination of any sample. Any lead dive weights will be stowed away from sample preparation and containment areas on the boat.

Specific forms will be completed in the field (one for each sampling location) to document both collection details and sediment description for later compilation onto a standardised core description log. A copy of the proposed field collection form is provided in Appendix 1. Photographs will be taken of samples obtained at each sampling location.

Sample handling onboard the vessel will include sample homogenisation and containment for dispatch to analytical laboratories under chain of custody documentation. Samples will be homogenised in large stainless steel mixing bowls using gloved hands (powderless latex or nitrile gloves). New gloves will be used for each sample to avoid potential cross-contamination. At each location a separate sample (representative of those processed for laboratory analyses) will be collected and extruded into plastic core-sock for core-logging at the end of the each day.

Samples for analysis will be stored in containers provided by the laboratory for the analyses requested. A list of sampling containers to be used is provided in **Table 3-2**. Sample containers will be appropriately labelled (using indelible ink to write the sample location number and date on both the label and lid of the container) and will be stored either in refrigerators or in eskies with ice packs, without delay, and will remain in refrigerated condition until dispatched to the analytical testing laboratory, where they will be maintained at 4°C or otherwise deemed appropriate for the preservation of samples by the laboratory.

Table 3-2 – Sample containers

Analyte	Containers per sample
Chemical suite	1 x 500 ml solvent washed, glass jar with a Teflon lined lid
Particle size	1 x plastic bag to hold a minimum of 500 g sample
Elutriate water (sea water)	1 x 15 L seawater in clean polythene carbouoy (1.5L per sample)

3.5.2 Hold Samples

A 500 ml hold sample (i.e. a small duplicate split taken from the homogenised sample material) for each of the 13 port area, insurance trench and entrance channel sampling locations will be submitted to the analytical laboratory. This material will be stored under appropriate conditions, for any potential further analysis. Also stored will be elutriate water collected from the spoil ground.

3.6 Contingency Plan

The potential for disruption to sediment collection will be minimal due to the sheltered nature of the Burnett River estuary and protection from significant wave action by Fraser Island and Hervey Bay. Weather forecasts will be reviewed prior to mobilisation to the field and rescheduled if conditions are likely to significantly disrupt sample collection. If significant weather conditions arise during sample collection, weather forecasts will be reviewed and sample collection will be either temporarily suspended on site, or the team will be demobilised and scheduled for remobilisation.

The potential for contingency due to gear failure will be minimised by having backup piston coring equipment. Vessel failure would be managed by using either one of GPCL's vessels or by chartering a suitable vessel from the charter fleet located within the port or a from a local dive operator.

3.7 Laboratory Analysis

Table 3-3 provides summary details regarding the laboratory method information for the suite of total tests to be undertaken on sediment samples.

Table 3-3 – Method information for sediments

Activity / Test	Method Reference	Method Summary	Practical Quantitation Limit
Moisture content	Gravimetric	Oven-dry overnight, measure weight	0.1%
Particle size distribution	Sieve and hydrometer	Sieve and hydrometer	To 2µm
Total organic carbon	Handbook of soil & water	Dilute acid treatment, high temperature dry combustion, infrared detection.	0.01%
Organotins	In-house (Abalos *et al* 1997, Attaar 1996)	Acidified solvent extraction, ethylation, derivitisation, GC/MS (EI mode)	0.5 µgSn/kg
Trace Metals	USEPA 3050 / 200.7 ICP/AES	Nitric/hydrochloric acid digestion, ICP/AES	0.1 mg/kg
Mercury	USEPA 3050 / 7471A CVAAS	Nitric/hydrochloric acid digestion, CV/AAS	0.01 mg/kg

3.8 Summary of Sampling and Analysis

A total of 20 locations are proposed to assess sediment quality characteristics from the port area, insurance trench, entrance channel and estuary upstream from the port.

A summary of the proposed sampling scheme is presented in **Table 3-4**. The table includes those samples to be analysed for field quality control/quality assurance purposes.

Table 3-4 – Proposed sample locations and samples analysed for various sediment quality attributes for each dredge area.

Dredge Area	Sample Location	Moisture Content	PSD	TOC	Metals (Sb,As,Cd,Cr,Cu, Pb,Hg,Ni,Ag,Zn)	Organotins (MBT,DBT,TBT)
River	1					
	2					
	3					
	4					
	5					
	6					
	7					
Port Area	8					
	T1					
	T2					
	9					
	D1					
	Interlab 1					
	10					
	11					
	12					
	13					
	IT 1					
	IT 2					
	T3					
	T4					
	IT 3					
	IT 4					
Entrance Channel	14					
	15					
	16					

Legend

Normal samples

Triplicate seperate samples

Triplicate split samples

3.9 Laboratory Analysis

All laboratories used for analyses will be NATA accredited for the methods used and will be experienced in the analysis of marine sediments.

3.10 Sampling and Analysis Quality Control

3.10.1 Quality Control – Field Sampling

Quality Control during sampling will be ensured by:

- Using suitably qualified environmental staff experienced in sediment sampling, field supervision and sediment logging;
- Using a surveyed vessel which is thoroughly inspected and washed down;
- Containing samples in appropriately cleaned, pre-treated and labelled sample containers;
- Keeping samples cool (4°c) after sampling and during transport where they would be stored in eskies with pre-frozen ice bricks;
- Transportation of samples under chain of custody documentation;
- Generating additional QC samples in accordance with the NAGD (refer Section 3.10.2 below);
- 'Blind labelling' all field QC triplicate samples in the field with QC field numbers which do not relate to sampling location names; and
- Decontaminating all sampling equipment, including mixing bowls etc., between sampling locations via a decontamination procedure involving a wash with ambient sea water and a laboratory grade detergent, and successive rinsing with deionised water.

3.10.2 Quality Control – Analysis

NAGD (Appendix F) specifies that field quality control samples should include (per batch of 20 or fewer):

- In cases where volatile substances such as some chlorinated organics are being determined, one container (trip) blank filled with inert material, for example chromatographic sand;
- On 10 per cent of locations, one field triplicate (that is three separate samples taken at the same location) to determine the variability of the sediment physical and chemical characteristics;

- On five per cent of locations, samples should be thoroughly mixed then split into three containers to assess laboratory variation, with one of the three samples sent to a second (reference) laboratory for analyses; and
- One sample that has been analysed in a previous batch (if more than one batch is sent) to determine the analytical variation between batches.

In consideration of this, the following QAQC protocol has been developed:

- No trip blanks will be taken and analysed as volatile organic carbon compounds, such as chlorinated hydrocarbons and BTEX, are not being assessed.
- The total number of field replicate samples that will be collected within the study area has been calculated based on total number sites within the combined port and entrance channel dredge areas since both areas are 'probably clean', based on prior survey results. No replicate samples are proposed for the river locations as these will not be dredged as part of routine maintenance dredging (replicate sampling sites are indicated in **Table 3-4**);
- All samples will be sent to the laboratories as single batches.

The analytical laboratory will need to comply with the laboratory and quality assurance procedures specified in Appendix F of the NAGD, which require:

The laboratory quality assurance program should include the following quality control samples to be analysed in each batch (10-20 samples). This is in addition to its own internal procedures to ensure analytical procedures are conducted properly and produce reliable results:

- One laboratory blank sample;
- For metals, one Standard Reference Material (SRM), that is, a sample of certified composition such as MESS-1 or BCSS-1, or BEST-1 (for mercury), or a suitable internal laboratory standard calibrated against an SRM. The laboratory standard should be a ground sediment sample, not a liquid sample, to test both the recovery of the extraction procedure and the analysis;
- For organics, one sample spiked with the parameters being determined (or a surrogate spike for certain organics) at a concentration within the linear range of the method being employed – this will determine whether the recovery rate of the analytical method is adequate or not (that is, that all the chemicals present in the sample are actually being found in the analysis); and
- One replicate sample to determine the precision of the analysis; the standard deviation and coefficient of variation should be documented.

A validation of the analytical data obtained will be undertaken in accordance with Appendix F of the NAGD to confirm it is of a quality suitable for undertaking an assessment of dredge material suitability for sea disposal. This validation will include a consideration of results for blanks, standards and spikes, and replicate and duplicate samples. Relative percent differences and relative standard deviations between quality control duplicate and triplicate samples will be compared against relevant criteria.

3.11 Analysis of Results

3.11.1 Sediment Analysis for Total Sediment Concentrations

Contaminant levels for sediments will be compared against the Screening concentrations listed in Table 2 of Appendix A of the NAGD to assess whether the material is suitable for placement at sea or if further testing is required (e.g. elutriate, bioavailability and/or toxicity assessment).

The comparison against guideline levels involves the comparison of mean contaminant concentrations at the upper 95% confidence level (95%UCL) of the mean. For the purposes of calculation of 95% UCLs, values below detection limit will be set to one-half of the laboratory detection limit (LOR) in accordance with NAGD recommendations. Results for organic parameters are normalised to 1% TOC where the recorded value is within the range of 0.2 – 10%. If TOC values are outside this range, then the highest or lowest of the 0.2 – 10% range is adopted as appropriate. Means, standard deviations and 95%UCLs will be calculated for the combined port, insurance trench and entrance channel area samples to enable suitable statistical power to be achieved, particularly in the entrance channel where three samples are taken. All areas are probably clean and combining both areas has been considered acceptable by the Determining Authority in previous Port of Bundaberg maintenance dredging SAPs (2004 and 2009).

Means, standard deviation and 95% UCLs will not be calculated for contaminant groups that are found to have concentrations below detection levels at all sampling locations.

The methods proposed to be used to calculate the 95% UCLs are based on the methods recommended in Appendix A of the NAGD (P58, Comparison of Data to Screening Levels). Normality of datasets will be determined using Shapiro-Wilks test in ProUCL Version 4 (4.00.02) developed by the US EPA. Datasets will be determined as being either *normal*, *log-normal* or *other* in their distributions. Normal datasets will be analysed using the 1-tailed student's t UCL. Log-normal and other datasets were analysed using non-parametric bootstrap analysis. The H-Lands UCL will not be used for the analysis of log-normal data as this method is only appropriate for datasets of more than 30 samples, which is significantly more than the number of samples for respective dredge areas being assessed.

Under the NAGD, if the 95%UCL values for all substances are below relevant screening levels, it is considered unlikely that sediment contaminants will have adverse effects on organisms living in or on that sediment. The sediment is therefore considered non-toxic and there are no chemical obstacles to unconfined placement at sea in the approved spoil ground.

3.11.2 Elutriate Analyses

Elutriate analyses would be undertaken using sediments prepared in a 1:4 suspension of Port of Bundaberg spoil ground seawater.

The elutriate concentrations at the 95th percentile for the relevant dredge area will be compared with the relevant trigger level in the ANZECC/ARMCANZ (2000) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, following the procedures outlined in Appendix A of the NAGD.

3.11.3 Bioavailability Analyses

Dilute acid extraction results for metals will be analysed similar to total sediments but rather using a weak acid (1M HCl) for metals extraction. Analysis of results will be as indicated in Section 3.11.1 for total metal contaminants.

For organic contaminants, collected sediment samples would be pressure squeezed or centrifuged to provide the chemical laboratory with porewater for chemical analysis. The 95th percentile of porewater concentrations would be compared with the relevant trigger level in the ANZECC/ARMCANZ (2000) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, following the procedures outlined in Appendix A of the NAGD.

3.12 Reporting

A report containing the following information will be prepared at the conclusion of sampling and analysis program:

- Executive Summary;
- Introduction and description of the study area;
- Details of the sampling methodology including any deviations from the approved SAP;
- A figure showing the sampling locations;
- Descriptions of the core samples, based upon the photographs and core logs;
- Descriptions of any observations or anomalies during sampling and/or analysis;
- Table of laboratories used and the analytical methods employed;
- Quality Assurance Procedures and Results;
- Summary table of results for each parameter analysed;
- Comparison and interpretation of the results as indicated in Section 3.11;
- Conclusions;
- Recommendations; and
- Appendices containing all laboratory reports and Quality Assurance and Quality Control analyses.

4. REFERENCES

ANZECC/ARMCANZ (2000). *Australian and New Zealand Guidelines for Fresh and Marine Water Quality.* Australian and New Zealand Environment and Conservation Council/Agriculture and Resource Management Council of Australia and New Zealand.

Commonwealth of Australia (2002). *National Ocean Disposal Guidelines for Dredged Material.* Commonwealth of Australia, Canberra.

Commonwealth of Australia (2009). *National Assessment Guideline for Dredging*. Commonwealth of Australia, Canberra.

SKM (2004). *Maintenance Dredging SAP Implementation for the Port of Bundaberg – September 2004*. Report prepared for the Bundaberg Port Authority by Sinclair Knight Merz.

WorleyParsons (2009a). *Port of Bundaberg Maintenance Dredging: Sediment Characterisation Report*. Report prepared for the Bundaberg Port Corporation.

WorleyParsons (2009b). *Port of Bundaberg Insurance Trench Capital Dredging: Sediment Characterisation Report*. Report prepared for the Bundaberg Port Corporation.

Appendix 1 - Proposed field data collection sheet

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Port of Bundaberg
Sediment Quality Assessment

CLIENT: Gladstone Ports Corporation Limited

DATE OF CORING:_____

TIME OF CORING:________

Collection Details

General location of core of sampling location	
Site/location number	
Sample Id.s assigned	
Easting/Longitude of core location (from onboard GPS)	
Northing/Latitude of core location (from onboard GPS)	
Water depth at core location	
Sample collector	
Type of core sampler	
Sea state at time of coring	
Conditions (e.g. weather, sea state, wind speed, level of shipping traffic)	
General comments	

Port of Bundaberg Sediment Quality Assessment

Sediment Description

Sample Location	
Date / Sample Time	
Depth retained	

Strata Change (m)	Colour* (refer AS1726)	Field texture**	Moist.	Consist	Sand grain size	Plasticity	% stones	Shell/grit and/or biota	Odour

* Colour: black, white, grey, red, brown, orange, yellow, green, blue. Pale, dark, mottled. *e.g. grey mottled red-brown clay.*
**Field Texture: clay, silt, sand, gravel, etc

Appendix 9 International Maritime Organisation Reporting Template

Sea Dumping Permit International Reporting Requirements

Please fill in this form and return it by **email only** to the Department of the Environment, Water, Heritage and the Arts by 31 January each year. This information is required for Australia's International reporting obligations under the London Protocol. Email: portsandmarine@environment.gov.au

Permit Holder:

Address:
Submitted by:
Phone:
Email:

Date: *(dd/mm/yyyy)*

Sea Dumping Permit number:

Permit start date: *(dd/mm/yyyy)*

Permit end date: *(dd/mm/yyyy)*

Approved dumping site/s:

Geographical position

Latitude	Longitude

Permit quantity:

Quantity dumped (cubic metres/number) in the preceding calendar year:

Description of material Please tick relevant box or boxes

Capital Dredged Material ☐, Maintenance Dredged Material ☐, Fish Waste ☐,

Vessels ☐, Platforms ☐, Sewage Sludge ☐, Organic Material of Natural Origin ☐,

Bulky Waste ☐, CO_2 ☐, Inert-Inorganic Geological Material ☐.

Comments: