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Gladstone Ports Corporation

Report for Western Basin Dredging and Disposal Project

Water Quality Report

October 2009

INFRASTRUCTURE | MINING & INDUSTRY | DEFENCE | PROPERTY & BUILDINGS | ENVIRONMENT

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1. Introduction

1.1 Background

The Gladstone Ports Corporation (GPC) contracted GHD to undertake scientific studies in support of the development of an Environmental Impact Statement (EIS) for the proposed Western Basin Dredging and Disposal Project (the "Project"). The Project has been declared 'Significant Project' under the *State Development and Public Works Organisation Act 1971,* and as such will be assessed under the statutory conditions and regulations of this Act. The Australian Government Minister for the Department of Environment, Water, Heritage and the Arts (DEWHA) determined that the Project is also a 'controlled action'. Accordingly the Project will also be assessed against controlling provisions under the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act).

The EIS comprises multiple elements, including sections on the description and assessment of potential impacts on the benthic marine ecological values of the Project Area. This document provides a summary of the water quality monitoring performed to date and recommendations for incorporation into the EIS. Additional documents that complement this report are the Review of Previous Water and Sediment Quality (Appendix A), Sediment Quality Report (GHD 2009a), Western Basin Dredging Strategy (GHD 2009b), Coastal Processes Report (GHD 2009c), the Numerical Modelling Studies Report (WBM 2009, Appendix J of main EIS) and the Marine Ecology Report (GHD 2009d). Readers should be familiar with all relevant documents to assist in providing context to the findings reported here.

1.2 Project Location

The area monitored for water quality encompasses the Western Basin Reclamation Area, the areas of capital and maintenance dredging, and the areas with the potential to be impacted by the construction and operation of the proposed Project ("Project Area").

The Project Area is located 10 km north of Gladstone City and is comprised of shallow subtidal and intertidal mud flats and deeper water channels. An area within the Project Area is identified for reclamation works and several areas identified for dredging works.

A number of locations were monitored for water quality through vessel-based and continuous logger monitoring over 4 months from April-July 2009. The locations of water quality stations and logger deployment sites were selected on the likelihood that they are expected to be impacted by the proposed reclamation and dredging works and reference areas against which potential impacts and shifts in water quality can be assessed in future. Accordingly, areas targeted for sampling included the Western Basin Reclamation Area, the existing channels, areas targeted for future dredging works and offsite areas in The Narrows, Fisherman's Landing Basin and Pelican Banks, and southeast of Curtis Island. These areas are hereafter referred to as the Study Area.

1.3 Purpose and Scope

This report is based on a combination of a review of available information regarding the water quality of the Project Area, field measurements to support this EIS (vessel-based and continuous loggers), additional logger data from the Port Curtis Seagrass Water Quality study (Wilson *et al*. 2008), vessel-based turbidity and total suspended solids (TSS) data provided by WBM, elutriate data provided by

QGC, and hydrodynamic and plume simulations from the Numerical Modelling Studies Report (WBM 2009).

The purpose of this report is to supply sufficient information on the water quality values of the Project Area and adjacent surrounds such that the impacts of the proposed project on these values, including any cumulative impacts related to associated/adjacent projects, can be assessed. Information and recommendations on mitigation measures identified in this report will be used to support the findings of the EIS.

1.4 Approach to the Study

The present and predicted (from the Project) water quality of the areas potentially affected by the Project are described and assessed to facilitate a risk based assessment of potential impacts.

Water quality technical studies specifically for this EIS included:

- Summary of physico-chemical measurement of temperature, conductivity, dissolved oxygen (DO), pH, oxidation-reduction potential (ORP) and turbidity from multi-probe *in situ* and laboratory instruments at/from twelve water quality stations throughout the Project Area over five monthly sampling events (April, May, June, July, August);
- Vessel-based collection of water samples with subsequent laboratory analysis of anthropogenic contaminants, metals, metalloids and nutrients at twelve water quality stations throughout the Project Area; and
- Collection of continuous time series of turbidity, photosynthetically available radiation (PAR), accumulated suspended solids deposition (ASSD), water depth and wave height at 5 to 10 locations by JCU.

Additionally, the following technical studies and data sets were also used in this Water Quality Report:

- Hydrodynamic and plume numerical modelling predictions of the effect of the Project on the hydrodynamics, flushing and turbidity (i.e. TSS) of the Project Area from the Numerical Modelling Studies Report (WBM 2009, Appendix J of main EIS);
- Elutriate water quality data of anthropogenic contaminants, metals, metalloids and nutrients by QGC and provided to GPC for use in this EIS;
- Additional continuous logger turbidity data from the Port Curtis Seagrass Water Quality study (Wilson *et al*. 2008);
- Simultaneous vessel-based spot measurements of TSS and turbidity by GHD and WBM; and
- Relevant information from the Review of Previous Water and Sediment Quality (GHD 2009).

2. Description of Water Quality Environmental Values

2.1 Water Quality Environmental Values

The environmental values of an area are determined by the existing beneficial uses of that area including conservation values and significance, human uses and spiritual and cultural significance. In order to determine the water quality parameters that are relevant to an area it is important to establish the existing condition and use of the area.

Various water types within the project area have been identified on the basis of the classification system in the Queensland Water Quality Guidelines 2006 (QWQG 2006), Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC 2000), and by information in both the State Coastal Plan – Queensland's Coastal Policy (State Coastal Plan) and the Curtis Coast Regional Coastal Management Plan (Curtis Coastal Plan, EPA 2003) for coastal resource types. The project area is located within the Central Coast region and the relevant water type is inshore marine waters (QWQG 2006). The coastal resources (as listed in the Coastal Plans) that require consideration for the project include coastal wetlands, soft-bottom (benthic) systems, mid-water column (pelagic) systems, coastal and estuarine waters, indigenous traditional owner cultural resources, and cultural sites. Whilst not all the coastal resources listed are necessarily water types, many align with the water types listed in the QWQG (2006), and therefore are assessed with those parameters.

The Environmental Protection Act 1994, Section 9, defines 'environmental value' (EV) as:

> *(a) a quality or physical characteristic of the environment that is conducive to ecological health or public amenity or safety; or*
>
> *(b) another quality of the environment identified and declared to be an environmental value under an environmental protection policy or regulation.*

Environmental values have been extracted from the Environmental Protection (Water) Policy 1997 (EPP (Water)), the State Coastal Plan and Curtis Coastal Plan for this project and are discussed in the following sections and summarised in Table 2-1.

2.1.1 Environmental Protection (Water) Policy 1997

The Environmental Protection (Water) Policy 1997 (EPP (Water)) is subordinate legislation to the Environmental Protection Act 1994 and applies to all Queensland waters. As stated in the EPP (Water), section 6:

The purpose of this policy is to be achieved by providing a framework for—

> *(a) identifying environmental values for Queensland waters; and*
>
> *(b) deciding and stating water quality guidelines and objectives to enhance or protect the environmental values; and*
>
> *(c) making consistent and equitable decisions about Queensland waters that promote efficient use of resources and best practice environmental management; and*
>
> *(d) involving the community through consultation and education, and promoting community responsibility.*

Part 3, section 7 of the policy states:

*(1) The **environmental values** of waters to be enhanced or protected under this policy are:*

> *(a) for a water in schedule 1, column 1—the environmental values stated in the document opposite the water in schedule 1, column 2; or*
>
> *(b) for another water—the qualities in subsection (2).*

(2) For subsection (1)(b), the qualities are—

> *(a) for high ecological value waters—the biological integrity of an aquatic ecosystem that is effectively unmodified or highly valued; and*
>
> *(b) for slightly to moderately disturbed waters—the biological integrity of an aquatic ecosystem that is affected adversely to a relatively small but measurable degree by human activity; and*
>
> *(c) for highly disturbed waters—the biological integrity of an aquatic ecosystem that is measurably degraded and of lower ecological value than waters mentioned in paragraph (a) or (b); and*
>
> *(d) suitability for—*
>
> > *(i) primary recreational use; or*
> >
> > *(ii) secondary recreational use; or*
> >
> > *(iii) visual recreational use; and*
> >
> > *(e) suitability for minimal treatment before supply as drinking water; and*

Note—

For guidelines that apply to water after it has been treated or is to be used for drinking, see—

> *(a) the guidelines about drinking water published by Queensland Health; or*
>
> *(b) the document called 'Australian drinking water guidelines 2004', developed by the National Health and Medical Research Council and the Natural Resource Management Ministerial Council.*
>
> *(f) suitability for agricultural use; and*
>
> *(g) suitability for aquacultural use; and*
>
> *(h) suitability for producing aquatic food for human consumption; and*
>
> *(i) suitability for industrial use; and*
>
> *(j) the cultural and spiritual values of the water.*

(3) However, if a natural property of the water precludes enhancement or protection of a particular environmental value, subsection (1)(b) does not apply to the value.

(4) For subsection (1)(a), a document is taken to state environmental values for a water if it states one or more values (however described) that are equivalent to a quality or qualities in subsection (2)

(5) In this section—

> ***cultural and spiritual values**, of a water, means places, objects, or uses, in or near the water, that have anthropological, archaeological, historic, sacred or scientific significance or value.*

> ***primary recreational use**, of a water, means full body contact with the water, including, for example, diving, swimming, surfing, waterskiing and windsurfing.*
>
> ***secondary recreational use**, of a water, means contact other than full body contact with the water, including, for example, boating and fishing.*
>
> ***visual recreational use**, of a water, means viewing the water without contact with it.*
>
> *Marine waters in the Port Curtis area are not included in schedule 1 of the EPP (Water), therefore environmental values and water quality objectives need to be derived in accordance with the Queensland Water Quality Guidelines (QWQG) (2006).*

In accordance with the QWQG (2006), the aquatic ecosystem condition is assessed as a Level 2 - Slightly to moderately disturbed ecosystem where the ecosystem has previously been "…adversely affected to a relatively small but measurable degree by human activity" and is "…immediately adjacent to metropolitan areas". Water quality trigger values are therefore, those that are defined for Level 2 waters.

2.1.2 State Coastal Management Plan

The State Coastal Management Plan — Queensland's Coastal Policy describes management requirements for the Queensland coastal zone and has statutory effect under the *Coastal Protection and Management Act 1995* (Coastal Act 1995). The Coastal Act defines 'Coastal Zone' in section 15 as:

> *(a) coastal waters; or*
>
> *(b) all areas to the landward side of coastal waters in which there are physical features, ecological or natural processes or human activities that affect, or potentially affect, the coast or coastal resources.*

Major values and pressures for Queensland's coastal resources are tabulated in the State Coastal Plan and these 'values' could also be categorised as 'environmental values' in accordance with the definition provided in the *Environmental Protection Act 1994*, section 9(a), as they have "a quality or physical characteristic of the environment that is conducive to ecological health, public amenity or safety". Consequently, 'values' potentially relevant to this project have been extracted from the State Coastal Plan for a range of coastal resources such as for coastal wetlands, soft-bottom (benthic) systems, mid-water column (pelagic) systems, coastal and estuarine waters, indigenous traditional owner cultural resources, and cultural sites.

2.1.3 Curtis Coast Regional Coastal Management Plan

Like the State Coastal Plan, the Curtis Coastal Plan is also a statutory instrument under the Coastal Act 1995. The Curtis Coastal Plan identifies the coastal management district for the Curtis Coast region, addresses matters of international, national, state or regional importance within the region, and provides direction on future development and land management decisions in the coastal zone.

As previously stated for the State Coastal Plan, the values tabulated in the Curtis Coastal Plan can be considered environmental values as defined in the *Environmental Protection Act 1994*. Environmental values associated with water quality, extracted from the Curtis Coastal Plan, are also provided in Table 2-1 for coastal resources such as coastal wetlands, mid-water column (pelagic) systems, coastal and estuarine waters, indigenous traditional owner cultural resources, and cultural sites. The coastal resource 'soft-bottom (benthic) systems' is not included in the Curtis Coastal Plan, however, there are potential impacts on benthic marine biota that may occur as a result of the project and as such, consideration is given to this environmental value.

2.2 Summary of Environmental Values

A summary of environmental values, as determined from information contained in the QWQG (2006), State Coastal Plan, Curtis Coastal Plan and from existing data, are presented in Table 2-1. The QWQG (2006) recommends default guidelines for use when no Queensland guidelines are available for a range of environmental values. Where the levels of water quality indicators differ for the protection of the different environmental values, the most stringent indicator should be applied to protect identified environmental values.

Table 2-1 Environmental Values and Applicable Water Quality Guidelines for Coastal Waters within the Project Area

Environmental Values	Information Source	Management Goal	Applicable Water Quality Guidelines
Modified aquatic ecosystem	EPP (Water)	Maintain biological integrity of system where the water quality is not pristine (EPP(Water)) and it is a Level 2-slightly to moderately disturbed ecosystem (QWQG 2006).	QWQG (2006)[a] ANZECC (2000)[b], Ch 3 – Aquatic ecosystems Toxicants in water, sediment and biota as per ANZECC (2000) (QWQG 2006) Release of sewage from vessels to be controlled in accordance with requirements of the *Transport Operations (Marine Pollution) Act and Regulations 1995* (QWQG 2006) Comply with Code of Practice for Antifouling and in-water Hull Cleaning and Maintenance, ANZECC (2000) (QWQG 2006)
Recreational uses Also as scenic and recreational amenity in coastal plans	EPP (Water) State Coastal Plan Curtis Coastal Plan	Meet guideline values for primary contact, secondary contact and visual use recreational activities	Guidelines for Managing Risks in Recreational Water (2008)[c] ANZECC (2000), Ch 5 – Guidelines for recreational water quality and aesthetics
Industrial uses	EPP (Water)	Water quality requirements for industry vary and the ANZECC (2000) do not provide guidelines to protect industrial water use and these are assessed on a case-by-case basis. In any case, the industrial use of marine water shall not compromise marine environment water quality such that existing aquatic ecosystem EVs shall be protected.	Code of Practice for antifouling and In-water Hull Cleaning and maintenance *Transport Operations (Marine Pollution) Act and Regulations 1995*

Environmental Values	Information Source	Management Goal	Applicable Water Quality Guidelines
Human consumer	Local knowledge	Food grown and or caught in the environment meets human consumption guidelines as provided in the FDFA Guidelines.	ANZECC (2000)[d] Guidelines as per ANZECC (2000) and Food Standards Code, Australia New Zealand Food Authority 1996 and updates (QWQG 2006)
Wetland[e]	Directory of Important Wetlands	Meet guidelines where possible or not lead to a deterioration of water quality values.	ANZECC (2000), Protection of slightly disturbed aquatic ecosystems. TVs for physical and chemical stressors, salinity and turbidity in Tropical Australia (Table 3.3.4 and 3.3.5 in ANZECC)
Indigenous traditional owner cultural resources and values[f]	State Coastal Plan Curtis Coastal Plan	Protect or restore Indigenous and non-Indigenous cultural heritage consistent with relevant policies and plans (QWQG 2006).	
Habitat for native and migratory animals	State Coastal Plan Curtis Coastal Plan	Protect habitat for native and migratory animals. Meet guidelines were possible or not lead to a deterioration of water quality values.	ANZECC (2000), Protection of slightly disturbed aquatic ecosystems.
Habitat for native plants	State Coastal Plan Curtis Coastal Plan	Protect habitat for native plants. Meet guidelines were possible or not lead to a deterioration of water quality values.	ANZECC (2000), Protection of slightly disturbed aquatic ecosystems.
Nursery habitat	State Coastal Plan Curtis Coastal Plan	Protect habitat for fish nursery purposes. Meet guidelines were possible or not lead to a deterioration of water quality values.	ANZECC (2000), Protection of slightly disturbed aquatic ecosystems.
Fishing	State Coastal Plan Curtis Coastal Plan	Protect environment for fishing purposes. Meet guidelines were possible or not lead to a deterioration of water quality values.	ANZECC (2000), Protection of slightly disturbed aquatic ecosystems.

Environmental Values	Information Source	Management Goal	Applicable Water Quality Guidelines
Localities for maritime infrastructure	State Coastal Plan Curtis Coastal Plan	Localities be utilised for maritime infrastructure requirements as and where appropriate.	No applicable guidelines

a. Queensland Water Quality Guidelines (2006) prepared by the Environmental Protection Agency, Queensland Government.

b. Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2000) prepared by the Australian and New Zealand Environmental and Conservation Council (ANZECC) and the Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ).

c. Guidelines for Managing Risks in Recreational Water (2008) prepared by NHMRC, Australian Government.

d. Australia New Zealand Food Standards Code (2000).

e. The Port Curtis Wetland (QLD019) is listed on the Directory of Important Wetlands and includes all tidal areas in the vicinity of Gladstone, from a line between Laird Point and Friend Point (southern end of The Narrows), to a line between Gatcombe Head and Canoe Point, including the seaward side of facing Island and Sable Chief Rocks, and southern Curtis Island west of a line between North Point an Connor Bluff (DEWHA 2008)

f. Indigenous traditional owner cultural resource values - (significant animals, fishing practices, spiritual significance, cultural significance, economic significance, self determination, knowledge systems)

3. Water Quality Guidelines

An overview of the applicable water quality guidelines in QWQG (2006) and ANZECC (2000) for the protection of identified environmental values is provided in this chapter.

The QWQG (2006) provides information on guideline development with the concept of an acceptable departure from a natural or reference condition. With this approach, criteria from a reference site are used as indicators of physico-chemical, biological and habitat characteristics. However, this monitoring method is unsuitable for this project because adjacent sites for which there is data available do not comply with reference site criteria, namely:

- No significant point-source wastewater discharge within the estuary or within 20 km upstream; and
- No major urban area (>5000 population) within 20 km upstream.

The QWQG (2006) regional guideline values for physico-chemical indicators in the Central Coast region and water types identified in the project area are summarised in Table 3-1.

The ANZECC (2000) guidelines are also provided in Table 3-1 where the QWQG (2006) indicate that they must be followed. The ANZECC (2000) guidelines do not have specific values for Central Queensland, but rather present guidelines for south east Australia and tropical Australia. Central Queensland is geographically positioned between these two regions, but for the purposes of this EIS the Tropical Australian guidelines are adopted because of the sub-tropical (versus temperate) character of the coastal waters. Where the ANZECC (2000) guidelines are used, they are referenced with the system of guideline ‘trigger values’. Trigger values are defined in ANZECC (2000) as:

“…concentrations that if exceeded, would indicate a potential environmental problem, and so ‘trigger’ a management response, e.g. further investigation and subsequent refinement of the guidelines according to local conditions”.

Trigger values are default guideline values to provide an appropriate level of low-risk protection against chronic exposures. As these data are not based on objective biological criteria or specificity, *“…default trigger values should only be used until site or ecosystem-specific values can be generated”* (ANZECC 2000).

Trigger values for metals and metalloids in marine water for slightly-moderately disturbed systems are provided in Table 3-2 for the recommended level of protection for aquatic ecosystems, in accordance with requirements set out in Table 3.4.1 of ANZECC (2000). For metals and metalloids that have the potential to bioaccumulate or where 95% protection levels provide inadequate protection, a 99% protection level is recommended in ANZECC (2000). For some metals and metalloids, there are insufficient data available for a trigger value to be derived. No trigger values are available for Aluminium, Antimony, Arsenic, Beryllium or Iron.

Indigenous traditional owner cultural resources and cultural sites were identified as environmental values in the State and Curtis Coastal Plans, however there are no water quality guidelines for the protection of these values. Instead, Indigenous interests are recognised and managed through native title and cultural heritage legislation.

Table 3-1 Guidelines for Physico-Chemical Indicators in Central Queensland Waters

Central Region Water Type	Enclosed coastal (QWQG 2006)	Marine Inshore Waters (Tropical Australia) (ANZECC 2000)
pH	8.0 – 8.4	8.0 – 8.4
Turbidity (NTU)	6	1 – 20
Secchi depth (m)	1.5	-
Suspended Solids (SS) (mg/L)	15	-
Dissolved Oxygen (DO) (% sat)	90 – 100	90 – nd*
Ammonia as N (μg N/L)	8	1 – 10
Oxidised Nitrogen as N (μg N/L)	3	-
Organic Nitrogen (μg N/L)	180	-
Total Nitrogen as N (μg N/L)	200	100
Filterable Reactive Phosphate as P (μg P/L)	8	5
Total Phosphorus as P (μg P/L)	25	15
Chlorophyll-a (μg/L)	4	0.7 – 1.4

*nd – no data

Table 3-2 Trigger Values for Metals and Metalloids in Marine Water for Slightly to Moderately Disturbed Systems (ANZECC 2000)

Metals and Metalloids	TV for Marine Water (μg/L)	Level of Protection (% species)
Ammonia	910	95
Cadmium	0.7	99
Chromium (Cr III)	27.4	95
Chromium (Cr VI)	4.4	95
Cobalt	1	95
Copper	1.3	95
Lead	4.4	95
Mercury (inorganic)	0.1	99
Nickel	7	99
Silver	1.4	95
Tributyltin (as Sn)	0.006	95
Vanadium	100	95
Zinc	15	95

4. Baseline Water Quality Methods

4.1 Overview

A baseline water quality monitoring program was undertaken in Gladstone Harbour as part of the Project investigations. The program will involve six months of data collection (of which four months of monitoring have been undertaken at the time of writing) from the following two sources with coordinates (Table 4-1) and spatial locations (Figure 4-1) also provided:

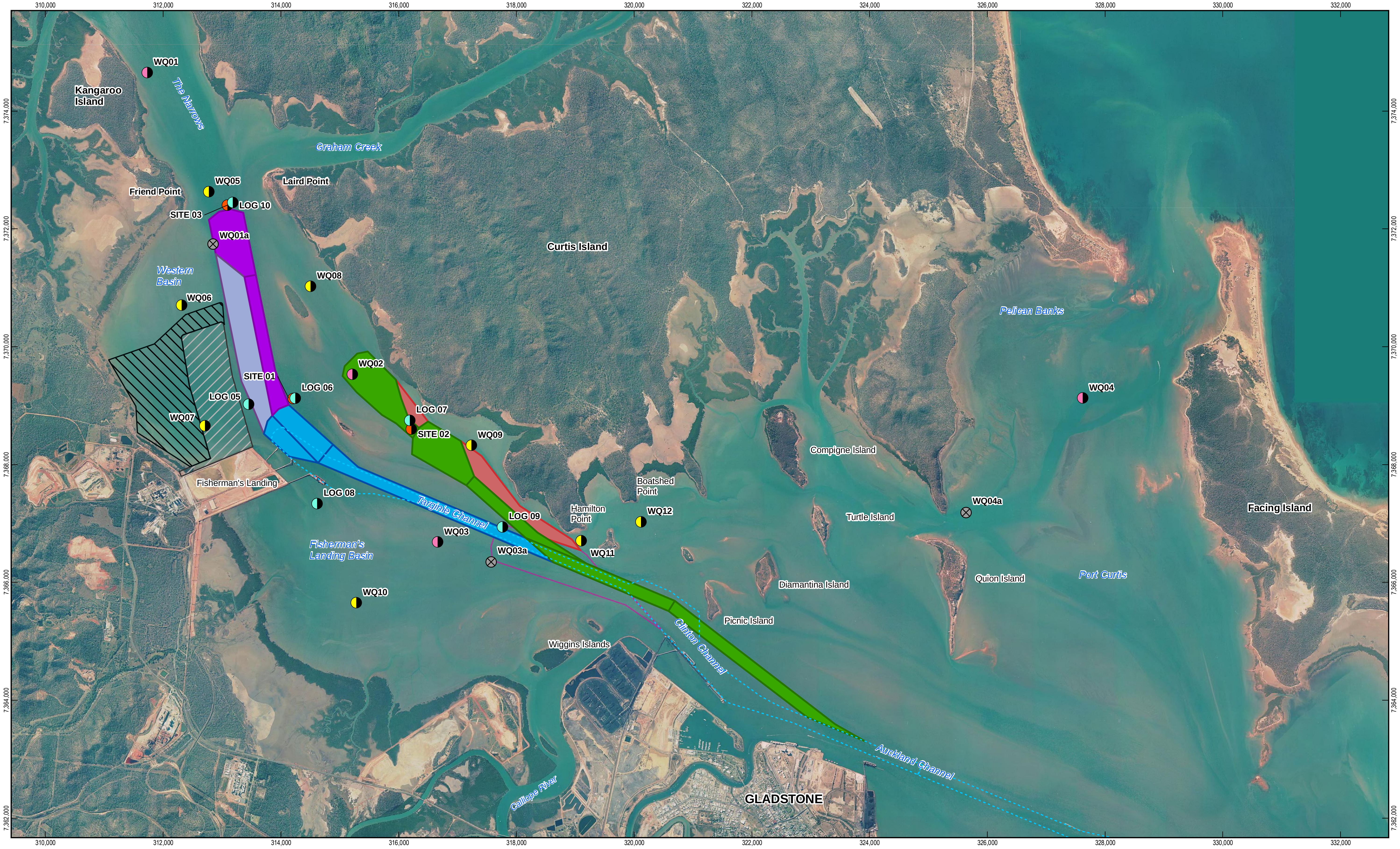
- Fixed water quality loggers provided by James Cook University (JCU); and
- Monthly vessel-based monitoring of *in situ* water quality measurements and collection of samples for laboratory analysis of water quality parameters.

The monitoring program also included a survey of elutriate water quality in the proposed water quality sampling areas collected by QGC and provided by GPC for use in this EIS in raw excel format. In the next section the methodology for the baseline water quality monitoring program is described.

Table 4-1 Location of Water Quality Survey Sites and Method of Data Collection

Survey Site	**Purpose**	**Survey Location**	**Easting (GDA 94, Zone 56K)**	**Northing (GDA 94, zone 56K)**
WQ01	Water Quality (Chemical and JCU Logger)	The Narrows, north of Graham Creek	311728	7374656
WQ02	Water Quality (Chemical and JCU Logger)	Between North and South Passage Island	315212	7369532
WQ03	Water Quality (Chemical and JCU Logger)	Adjacent to Wiggins Island Seagrass bed, halfway between Wiggins Island and Fisherman's Landing	316663	7366685
WQ04	Water Quality (Chemical and JCU Logger)	Pelican Banks seagrass bed	327623	7369129
WQ05	Water Quality (Chemical Only)	Entrance to The Narrows, between Friend and Laird Points	312776	7372634
WQ06	Water Quality (Chemical Only)	North of existing Fisherman's Landing, outside proposed Reclamation Area	312313	7370704
WQ07	Water Quality (Chemical Only)	North of existing Fisherman's Landing, within proposed reclamation area	312707	7368656
WQ08	Water Quality (Chemical Only)	Inside of North Passage	314505	7371026

Survey Site	Purpose	Survey Location	Easting (GDA 94, Zone 56K)	Northing (GDA 94, zone 56K)
WQ09	Water Quality (Chemical Only)	China Bay, southern side of Curtis Island	317236	7368326
WQ10	Water Quality (Chemical Only)	Wiggins Island seagrass beds, halfway between Wiggins Island and Fisherman's Landing	315280	7365653
WQ11	Water Quality (Chemical Only)	Hamilton Point	319099	7366705
WQ12	Water Quality (Chemical Only)	Boatshed Point	320117	7367026
Logger 05	JCU Logger	Fisherman's Landing west	313451	7369022
Logger 06	JCU Logger	Fisherman's Landing east	314242	7369125
Logger 07	JCU Logger	China Bay	316192	7368750
Logger 08	JCU Logger	South west of Berth 1, Fisherman's Landing	314615	7367336
Logger 09	JCU Logger	Targinie Channel	317765	7366941
Logger 10	JCU Logger	Entrance to The Narrows	313184	7372450



1:60,000 (at A3)

0 0.5 1 1.5 2

Kilometres

N

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 56

LEGEND

- ● ADCP Site
- ● Sample Location
- ● WQ Logger and Sample Location
- ● WQ Logger
- ⊗ WQ Logger - Temp Site
- ▨ Western Basin Reclamation Area
- ▨ Fisherman's Landing Northern Expansion
- ☐ Existing Channels, Swing Basins and Berths
- ☐ Wiggins Island Coal Terminal (Approved)
- 🟩 Stage 1A - North China Bay LNG
- 🟦 Stage 1B - Fisherman's Landing LNG
- 🟪 Stage 2 - Laird Point LNG
- 🟪 Stage 3 - Fisherman's Landing
- 🟥 Stage 4 - Hamilton Point

Port of Gladstone
Western Basin Dredging and Disposal Project

ADCP Sites, Water Quality Monitoring Locations and Logger Stations

Job Number	42-15386
Revision	A
Date	30 Aug 2009

Figure 4-1

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4.2 Water Quality Loggers

4.2.1 Locations

At the onset of the monitoring program, fixed *in situ* water quality loggers were deployed on the seabed at four locations as shown in Figure 4-1 and listed in Table 4-1 (i.e. sites WQ01 to WQ04). Vessel-based water quality monitoring with a multi-parameter probe and water sample collection for subsequent laboratory analysis was carried out at twelve locations (i.e. sites WQ01 to WQ12) of which the first four corresponded with the fixed logger deployments (Figure 4-1 and Table 4-1).

Six additional water quality loggers (i.e. locations Logger05 to Logger10) and three ADCPs were deployed for approximately 2 months to aid in calibration of the hydrodynamic model. Further, monitoring of the turbidity plume generated by dredging from the Wombat cutter suction dredge was also carried out over this EIS data collection period by WBM (WBM 2009) and GHD (2009e). Turbidity data from both these monitoring programs has been incorporated into the current EIS.

4.2.2 Water Logger Parameters

The JCU Mk10 sediment deposition and turbidity sensor is a 68HC11 based data logger that can simultaneously measure the deposition of sediment on a flat plate, the turbidity of the water from which the settling is occurring, photosynthetic available radiation (PAR), water pressure, and wave height. The method of recording each of the sedentary water logger parameters is provided in Table 4-2.

Table 4-2 Summary of Fixed Water Quality Logger Parameters

Parameter	Method of Measurement
Accumulated Suspended Solids Deposition (ASSD)	ASSD was measured using an upward pointing fibre optic bundle to measure the backscatter of light produced by fallen sediment. Periodically, a mechanical wiper is activated removing the deposited sediment from the plate. The difference in reading before and after the wipe provides a measure of sediment mass per unit area deposited on the plate.
Turbidity	Turbidity was measured using a backscatter probe; cleaned using a mechanical wiper. This was done to allow long deployment periods where bio-fouling would otherwise seriously affect readings. Bio-fouling of the logger was controlled by anti-foul paint externally and a mechanical wiper on the sensor. The sediment samples required to enable the conversion of data from Total Suspended Solids (TSS) to NTU were taken at the time of initial deployment of each logger. These samples were taken from the same sites where the loggers were deployed. Samples of sediment were suspended in saltwater in a large container and simultaneous measurements of NTU were taken in situ with a hand held water quality logger. The water sample was then analysed by a NATA accredited laboratory to determine the TSS concentration. Approximately 6 different TSS/NTU pairs per site were used to provide the calibration of the nephelometer. Note that the backscatter probe does not measure turbidity according to the standard method associated with the Nephelometric Turbidity Unit (NTU) which requires a 90 degree scatter angle. The instruments used employ a 180 degree scatter angle. The probe is calibrated to produce reading comparable with NTU, and are reported in NTU units.
Photosynthetically Available Radiation (PAR)	PAR provides a good indicative measure for potential impacts of reduced light on seagrass habitat.

Parameter	Method of Measurement
Water Pressure	It is known that waves are the key drivers of sediment re-suspension in environments similar to those found at the Port of Townsville (Dr Peter Ridd, pers. comm.). It is therefore important to be able to estimate the wave climate when interpreting turbidity readings. For example, water pressure which is influenced in a known manner by waves and tides was measured once a second for ten seconds at ten minute intervals. By recording the water pressure at this interval, a measure of the pressure fluctuation caused by the waves (RMS) water depth is calculated as outlined in Equation 1, where WD1 to WD10 are the ten samples taken. This value shows the variation in water depth and is therefore an indication of wave height and, hence, the wave climate at the Port of Townsville. Equation 1: $RMS\_WaterDepth = \left((WD1 - MeanWD)^2 + \ldots + (WD10 - MeanWD)^2 \middle/ 10 \right)^{1/2}$

4.2.3 Calibration

Calibration of turbidity sensors were checked in the field against standard grey PVC blocks placed at a precise distance in front of the optical aperture prior to and after deployments to allow for correction if required. Instrument calibration in the laboratory was carried out with sediments at the location of each logger's deployment to estimate both sediment deposition thickness and TSS concentration. The calibrated reading of the turbidity sensor against the standard grey PVC blocks was also carried out in the lab prior to deployment. All pressure sensors were calibrated against a pressure gauge and the pressure converted into depth in metres (m).

4.2.4 Logger Deployment

Loggers were deployed in April 2009 and serviced on a monthly basis. Each parameter (turbidity, PAR, water pressure and ASSD) was measured and recorded by the logger every 10 minutes. Logging units were attached to solid metal stands (30 – 40 kg), submerged and marked with a weighted rope to aid in relocating the loggers during the monthly download and maintenance events (Figure 4-2). The submerged logger setup was utilised to minimise the likelihood of vessel fouling and/or tampering as the loggers were deployed in locations with heavy commercial and recreational vessel activity.

Figure 4-2 Fixed Water Quality Logger Prior to Deployment

4.2.5 Data Download and Logger Maintenance

During the sampling period the logger(s) underwent a monthly retrieval for data download and maintenance. This monthly period of deployment and maintenance has been shown through previous studies to provide the maximum level of confidence in data. This consisted of the loggers being thoroughly cleaned of biofouling during each maintenance event before redeployment.

4.2.6 Data Analysis

Data from the loggers was provided to GHD by JCU in excel format and analysed (and plotted) with the MATLAB package.

4.3 Vessel-Based Water Quality Monitoring

4.3.1 Overview, Dates and Locations

Vessel-based monitoring and water sample collection was conducted to coincide with the maintenance and data download regime for the fixed loggers. Two forms of data were collected during vessel-based monitoring, namely *in situ* physico-chemical parameters and water samples for laboratory analysis. Samples were collected from the twelve water quality monitoring sites throughout the Project Area (Figure 4-1 and Table 4-1). On the first sampling date (20 April 2009) only four stations were sampled, but subsequent monthly sampling required two days to complete the monitoring program of twelve stations (

Table 4-3 and Figure 4-1).

Table 4-3 Vessel-Based Water Quality Monitoring Dates and Site Locations (Figure 4-1)

Sampling Event	Date	Sampling Locations
1	20 April 2009	WQ01, WQ02, WQ03, WQ04
2	21 May 2009	WQ01, WQ04, WQ05, WQ08, WQ10, WQ11, WQ12
3	26 May 2009	WQ02, WQ03, WQ06, WQ07, WQ09
4	23 June 2009	WQ02, WQ03, WQ04, WQ08, WQ10, WQ11, WQ12
5	24 June 2009	WQ01, WQ05, WQ06, WQ07, WQ09
6	27 July 2009	WQ02, WQ03, WQ04, WQ08, WQ10, WQ11, WQ12
7	28 July 2009	WQ01, WQ05, WQ06, WQ07, WQ09
8	17 August 2009	WQ0,1 WQ02, WQ05, WQ08, WQ09, WQ10, WQ11, WQ12
9	18 August 2009	WQ04, WQ06, WQ07
10	19 August 2009	WQ03

4.3.2 Water Quality Grab Samples

Water quality sampling was undertaken in accordance with the following guidelines and standards:

- Queensland EPA Water Quality Sampling Manual (1999);
- ANZECC and Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) October 2000 Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Volume 1, The Guidelines (Chapters 1-7) (ANZECC 2000);
- ANZECC/ARMCANZ October 2000 Australian Guidelines for Water Quality Monitoring and Reporting (2000), Chapters 1-7 (ANZECC 2000);
- Australian Standard Number 5667.1.1998 – Water Quality – Sampling – Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples;
- Australian Standard Number 5667.9:1998 – Water Quality – Sampling – Guidance on sampling of marine waters; and
- *Environmental Protection (Water) Policy 1997.*

Water samples were collected in laboratory supplied containers at each monitoring station and two sites were randomly sampled to provide quality assurance samples. Water samples were collected from approximately 0.2 m below the water surface.

The following water quality parameters were recorded on a monthly basis:

- Dissolved metals and metalloids (Aluminium, Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Cobalt, Copper, Iron, Lead, Manganese, Mercury, Nickel, Silver, and Vanadium);
- Nutrients (Ammonia, Nitrate, Nitrite, Total Oxidised Nitrogen, Total Kjeldahl Nitrogen, Total Nitrogen, Reactive Phosphorus, Total Phosphorus);
- Total Dissolved Solids (TDS);
- Chlorophyll-*a*;
- Total Suspended Solids (TSS);
- pH; and
- Electrical Conductivity.

The following water quality parameters were monitored during the initial round of sampling, and on an ongoing basis if concentrations were found to be above the limits of reporting:

- BTEX(Benzene, Toluene, Ethylbenzene, and Xylenes (3));
- Fungicide (one species);
- Herbicides (nine species);
- Organochlorine pesticides (twenty-six species);
- Organophosphorus pesticides (twenty species);
- Tributyltin,
- Polycyclic aromatic hydrocarbons (PAHs) and Phenols (twenty-nine species);
- Phenoxy acid herbicides (fourteen species);

- Phenoxyacetic acid herbicides (two species);
- Cyanide;
- Total petroleum hydrocarbons (TPHs) (five species); and
- Volatile organic compounds (VOCs) (three species).

Water samples were stored on ice and couriered overnight to the NATA accredited ALS Laboratory Group for analysis under Chain of Custody documentation as recorded in Appendix B.

4.3.3 *In Situ* Physico-Chemical Profiling

The *in situ* physico-chemical water quality parameters were collected with a hand-held electronic multi-parameter water quality meter with logging capability for turbidity, DO, pH, salinity, ORP and temperature. The data was stored on the logger and downloaded at the end of each field day. The *in situ* physico-chemical water quality values for each of the twelve locations had ten replicates recorded at three depths (surface, middle and bottom). *In situ* physico-chemical water quality data have been presented as medians for each of the three depths.

4.4 Elutriate Water Quality Monitoring

When dredge material is released into the natural environment, pollutants present in the pore water can be released into the water column. Elutriate water quality testing is used to estimate the water quality impacts of the release of dredged material. The elutriate water quality testing was undertaken by QGC, with a full description of the methodology described in the Queensland Curtis Pre-Dredging Assessment Plan (Sampling and Analysis Plan) (2009).

Samples were analysed for the following categories of water quality:

- Ammonia;
- Seventeen metals and metalloids;
- Hexachlorobenzene;
- Organochlorine pesticides (twenty-five species);
- Organophosphorus pesticides (nineteen species);
- PAHs and Phenols (eighteen species);
- Polychlorinated Biphenyls (eight species); and
- Semi-VOCs (6 species).

4.5 Reporting

Medians of measurements taken at the surface, mid-depth and near-bottom of the *in situ* physicochemical multi-probe parameters are presented to identify temporal and spatial trends.

Water quality of the vessel-based grab samples and elutriate data were compared to relevant guidelines including:

- QWQG (2006) for enclosed coastal waters; and
- ANZECC (2000) for marine inshore waters of tropical Australia; and

- ANZECC (2000) trigger values for metals and metalloids in marine waters for slightly to moderately disturbed systems.

Again these guidelines and trigger values have been summarised beforehand in Table 3-1 and Table 3-2.

5. Baseline Water Quality Results

5.1 Rainfall

Figure 5-1 shows the rainfall recorded at Gladstone Airport during 2009. Little rainfall was recorded during the baseline data collection period though 74.4 mm was recorded on the 5 April approximately two weeks prior to the initial field sampling event and deployment of loggers. The mean monthly rainfall (based on 15 years of records) and 2009 rainfall is summarised in Table 5-1.

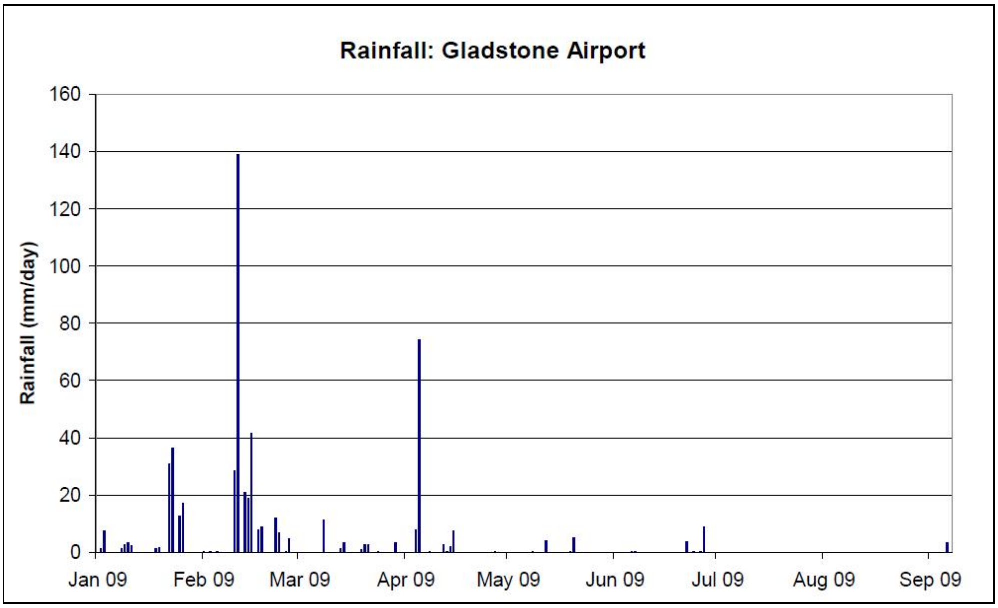


Figure 5-1 Rainfall recorded at Gladstone Airport in 2009

Table 5-1 Mean Monthly and 2009 Rainfall at Gladstone Airport

	Mean Monthly Rainfall (mm)	2009 Rainfall
Jan	114	118.6
Feb	178.8	291
Mar	48.3	26
Apr	39.7	95.2
May	36	9.6
Jun	45.3	13.8
Jul	22.4	0
Aug	32.5	0
Sep	29.6	Incomplete
Oct	65	Incomplete
Nov	59.8	Incomplete
Dec	104.4	Incomplete

5.2 In Situ Physico-Chemical Profiling

The following six water quality parameters were measured at water quality sampling station WQ01 to WQ12 with a Yeokal water quality profiling instrument:

- Water temperature;
- DO;
- Electrical conductivity;
- pH;
- Turbidity; and
- ORP.

Measurements were made near the surface, at mid-depth and near the bottom at each location at approximately a monthly frequency (see

Table 4-3). At each depth, several measurements were logged so that simple statistics could be computed. Figure 5-2 to Figure 5-7 show the monthly medians of these physico-chemical measurements at the three depths over the four sampling dates.

The following sections provide an overview of the spatial and temporal trends of *in situ* physico-chemical water quality recorded as part of the monthly vessel-based water quality monitoring program.

5.2.1 Temperature

There are no applicable temperature guidelines in QWQG (2006) or ANZECC (2000). Median values of multiple measurements at each of three depths (near-surface, mid-depth, near-bottom) at each of the twelve sampling sites over the four (WQ05-WQ12) to five (WQ01-WQ04) months are shown in Figure 5-2.

The monthly median *in situ* temperatures at all of the stations had the following patterns over the four to five months:

- Temperatures were almost always homogeneous through the water column at each station. There were several exceptions, where for example, during May 2009 at WQ01 and WQ05 the bottom waters were 0.2-0.5˚C cooler than the mid- and near surface waters; and
- Generally, temperatures were cooling over the 4 months from 26˚C in April to 19-20˚C in July, with the initiation of heating of water in September.

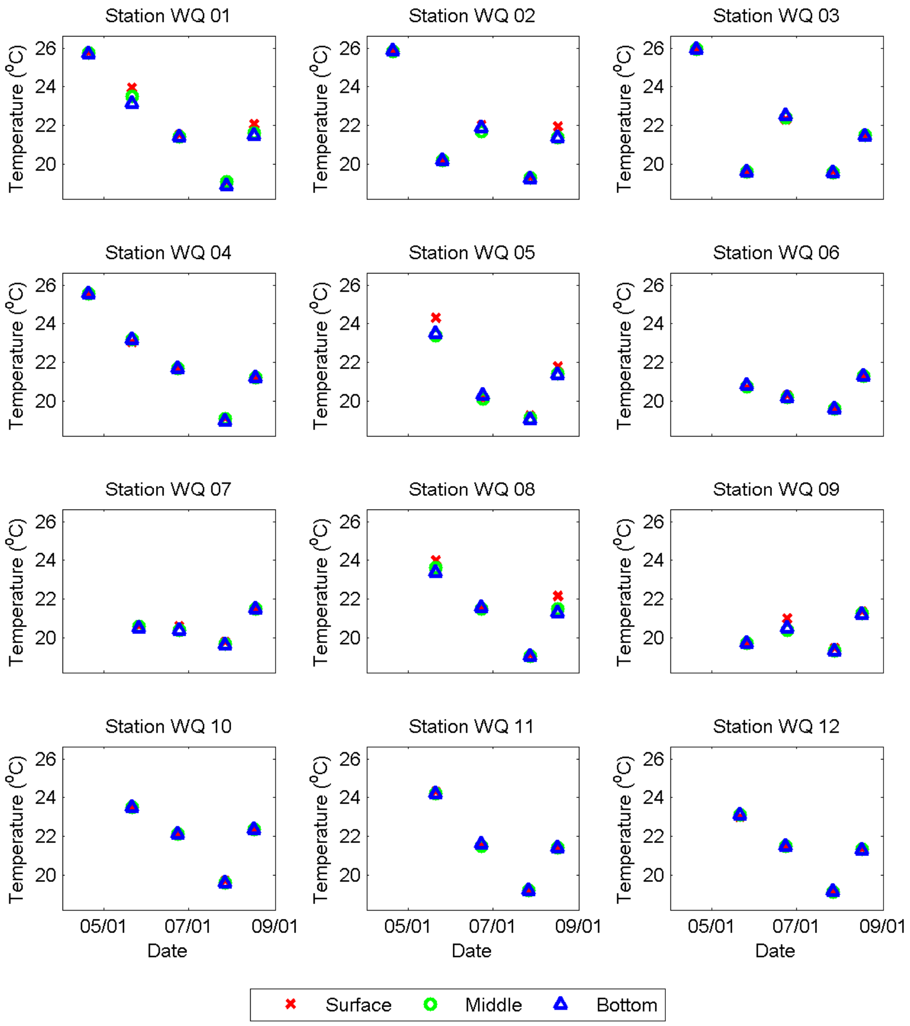


Figure 5-2 Temperature Data Recorded I*n Situ*

5.2.2 Electrical Conductivity

There are no applicable electrical conductivity (or salinity) guidelines in the QWQG (2006) or ANZECC (2000). Medians at three depths (near-surface, mid-depth, near-bottom) at each of the twelve sampling sites over the four (WQ05-WQ12) to five (WQ01-WQ04) months are shown in Figure 5-3.

The monthly median *in situ* electrical conductivity at all of the stations had the following patterns over the four to five months:

- Electrical conductivity was almost always homogeneous through the water column at each station. There are several exceptions, where for example. during May 2009 at WQ01 and WQ03 the bottom waters were 1 mS/cm more saline than the mid- and/or near surface waters; and
- Generally, electrical conductivity increased across the Western Basin over the 4 months from 53-54 mS/cm in May to 55-56 mS/cm in August. Presumably, this is simply a function of reduced freshwater

inputs relative to the wet season, thereby nearing typical ocean values as well regional evapo-concentration over the course of the dry season.

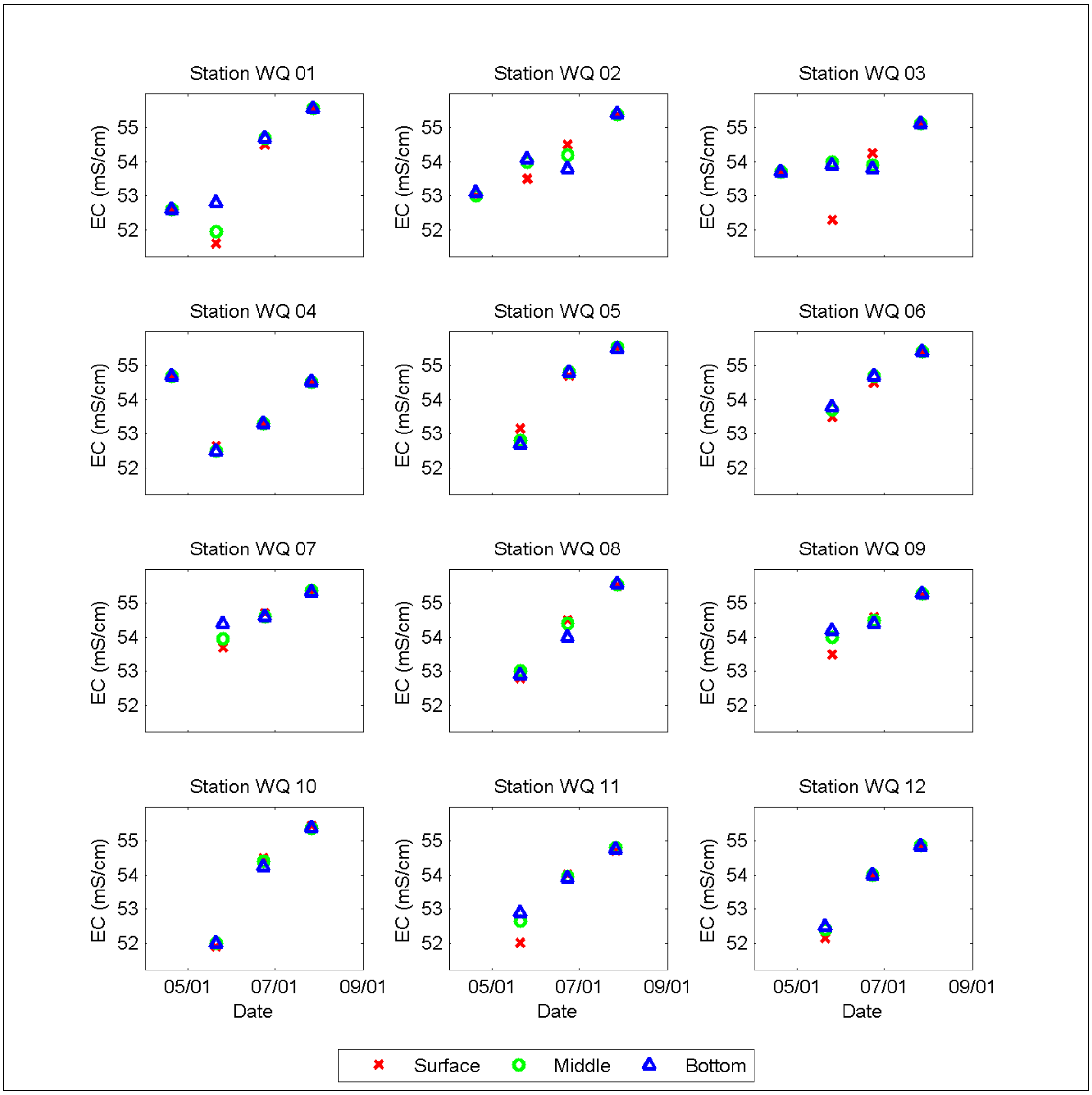


Figure 5-3 Electrical conductivity (EC) Data Recorded I*n Situ*

5.2.3 pH

The QWQG (2006) guideline for pH in a Central Coast Region for an enclosed coastal area has a lower limit of 8.0 and an upper limit of 8.4. Medians at three depths (near-surface, mid-depth, near-bottom) at each of the twelve sampling sites over the four (WQ05-WQ12) to five (WQ01-WQ04) months are shown in Figure 5-4. The following are noted about the pH data:

- For the most part, pH was homogeneous through the water column at each station. There are several exceptions, where for example, during May 2009 at WQ03 and WQ04 where the pH of the near-bottom measurements were lower than at the surface;
- Generally, pH followed similar temporal patterns across all of the stations with elevated pH during May and August and lower pH during June and July; and
- Over the four sampling events, only during the August sampling event were all sites and depths within the lower and upper guidelines. The four stations sampled during the May event were nearly within the guidelines, but the June and July events were well below the lower guideline value of 8.0 (ca. <7.5).

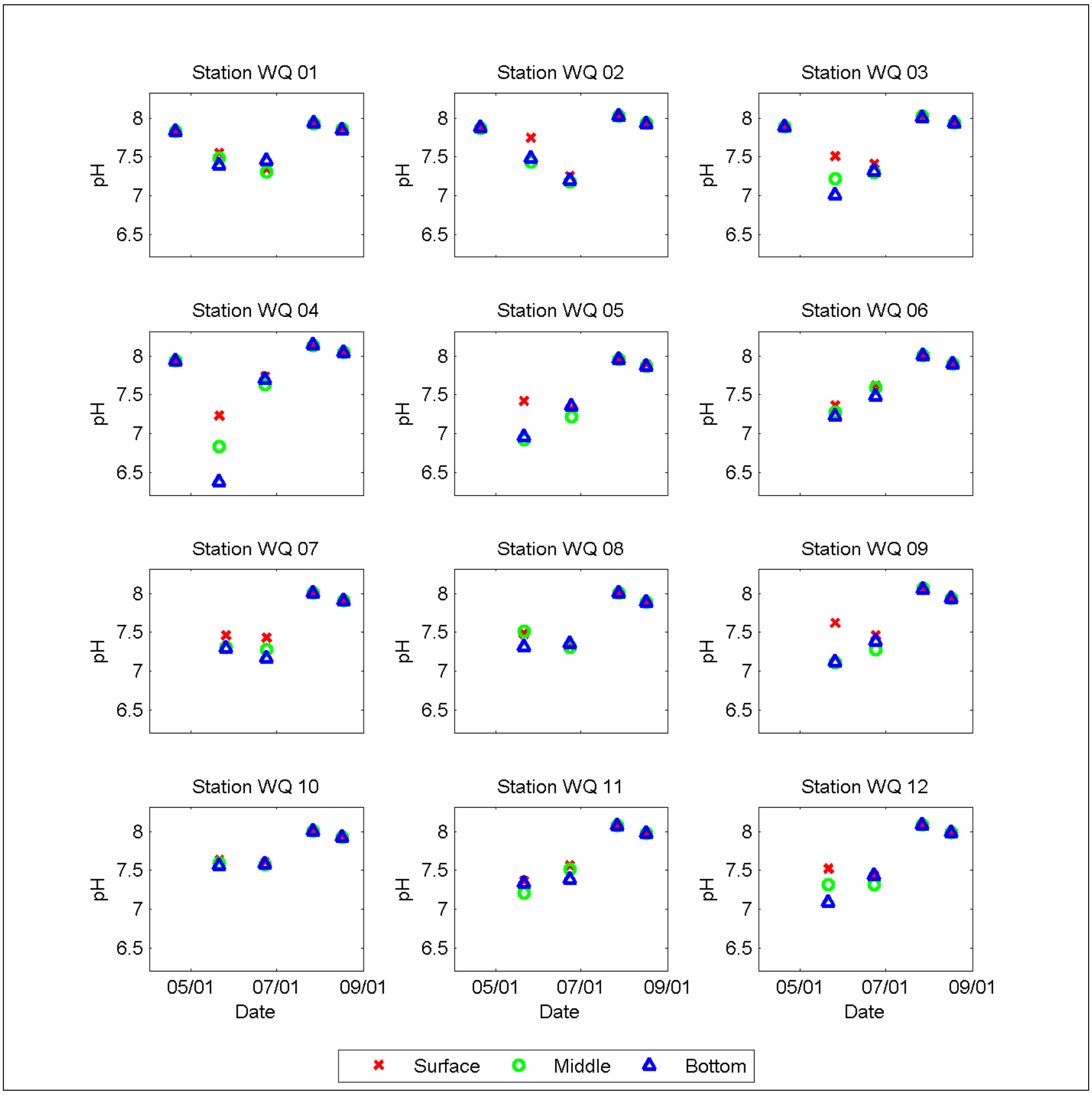


Figure 5-4 pH Data Recorded In Situ

5.2.4 Dissolved Oxygen

The QWQG (2006) guideline range for DO saturation consists of upper and lower guideline values of 90% and 100%, respectively. Medians of multiple measurements at three depths (near-surface, mid-depth, near-bottom) at each of the twelve sampling stations over the four (WQ05-WQ12) to five (WQ01-WQ04) months are shown in Figure 5-5. Results are summarised as follows:

- DO saturation was generally in the range of 80 – 100%, and generally highest at the surface;
- Deviations below and above the 90%–100% guideline were common, but generally in 75-110% range; and
- Where differences were observed in DO saturation levels between the surface, middle and bottom of the water column, measurements at the surface were generally higher than middle, which was in turn greater than the bottom.

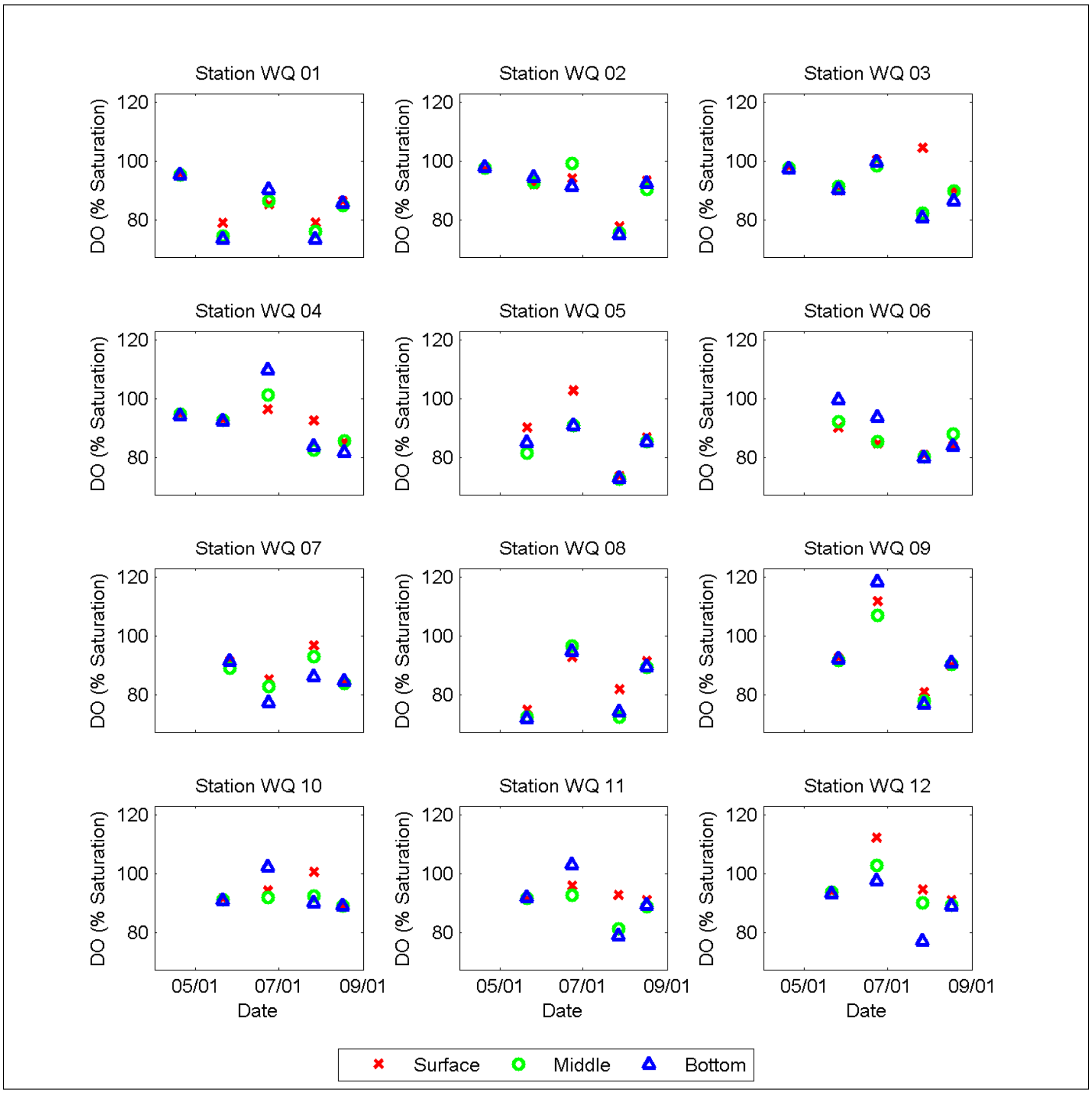


Figure 5-5 DO Saturation Data Recorded In Situ

5.2.5 Turbidity

The QWQG (2006) turbidity guideline for an enclosed coastal area of the Central Coast Region is 6 NTU, while the ANZECC (2000) turbidity guideline range for tropical Australian estuarine and marine waters is 1–20 NTU. The in situ vessel-based turbidity data are presented in Figure 5-6. Results are summarised as follows:

- The *in situ* dry season turbidity measurements ranged approximately up to 30 NTU. Generally, turbidity at the surface was lower or near to levels at the bottom of the water column;
- It is not possible to make conclusions about the temporal turbidity dynamics of the area with this dataset because turbidity varies over short time-scales, and this data has a monthly frequency;
- No significant rainfall events occurred within several weeks of these monthly turbidity measurements;

- With the exception of station WQ04, turbidity generally exceeded the QWQG (2006) guideline level of 6 NTU. WQ04 is a suitable reference site some distance from the Project Area near the confluence with the coastal ocean, and as such, generally had considerably lower turbidity; and
- The records across the sites were generally below the upper ANZECC (2000) guideline level of 20 NTU, except at WQ02 and WQO3, which exceeded this upper limit in May 2009.

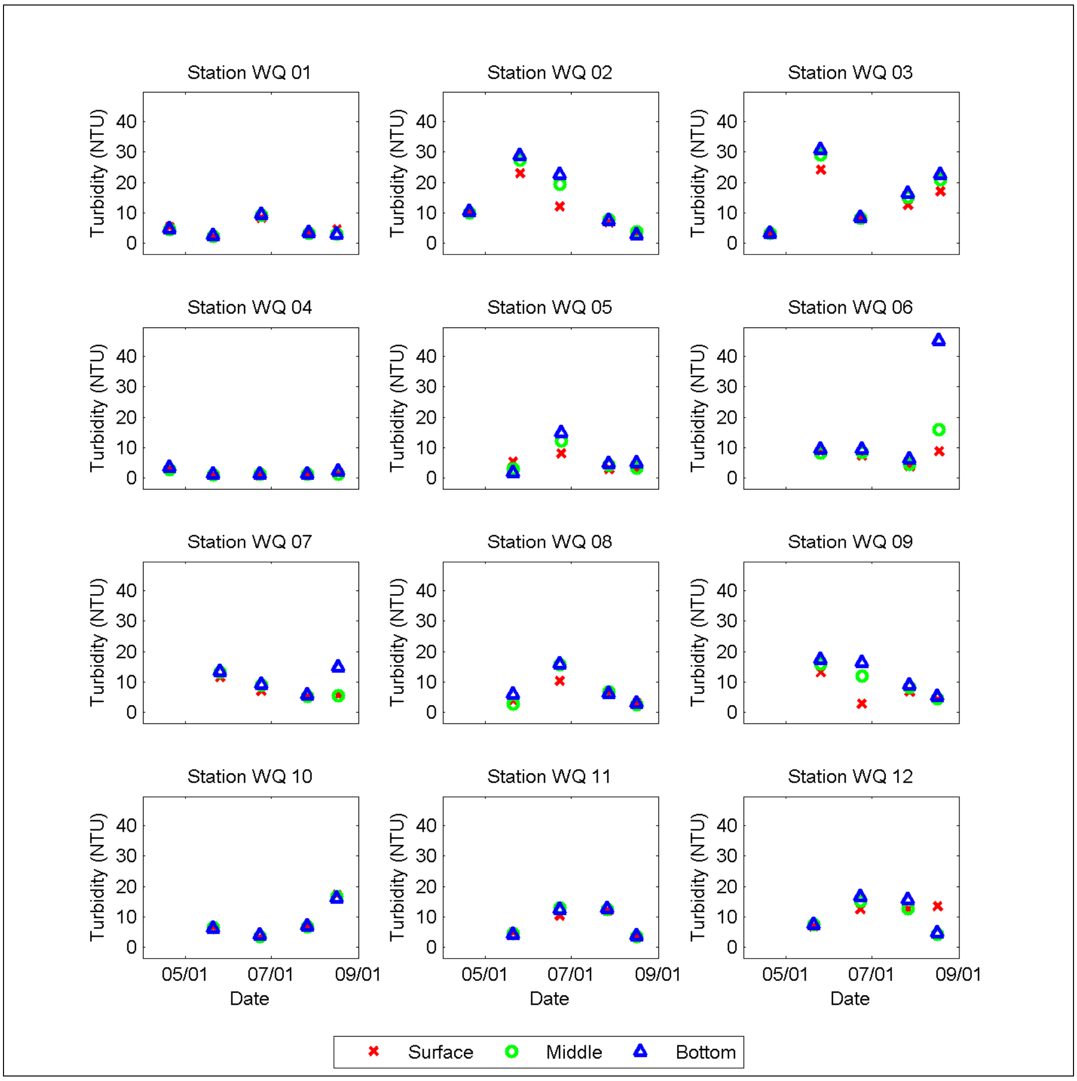


Figure 5-6 Turbidity Data Recorded In Situ

5.2.6 Oxidation-Reduction Potential

ORP at each site and monitoring date was nearly equivalent throughout the water column. Positive values at all sites and dates throughout the water column were consistent with a generally well oxygenated water column.

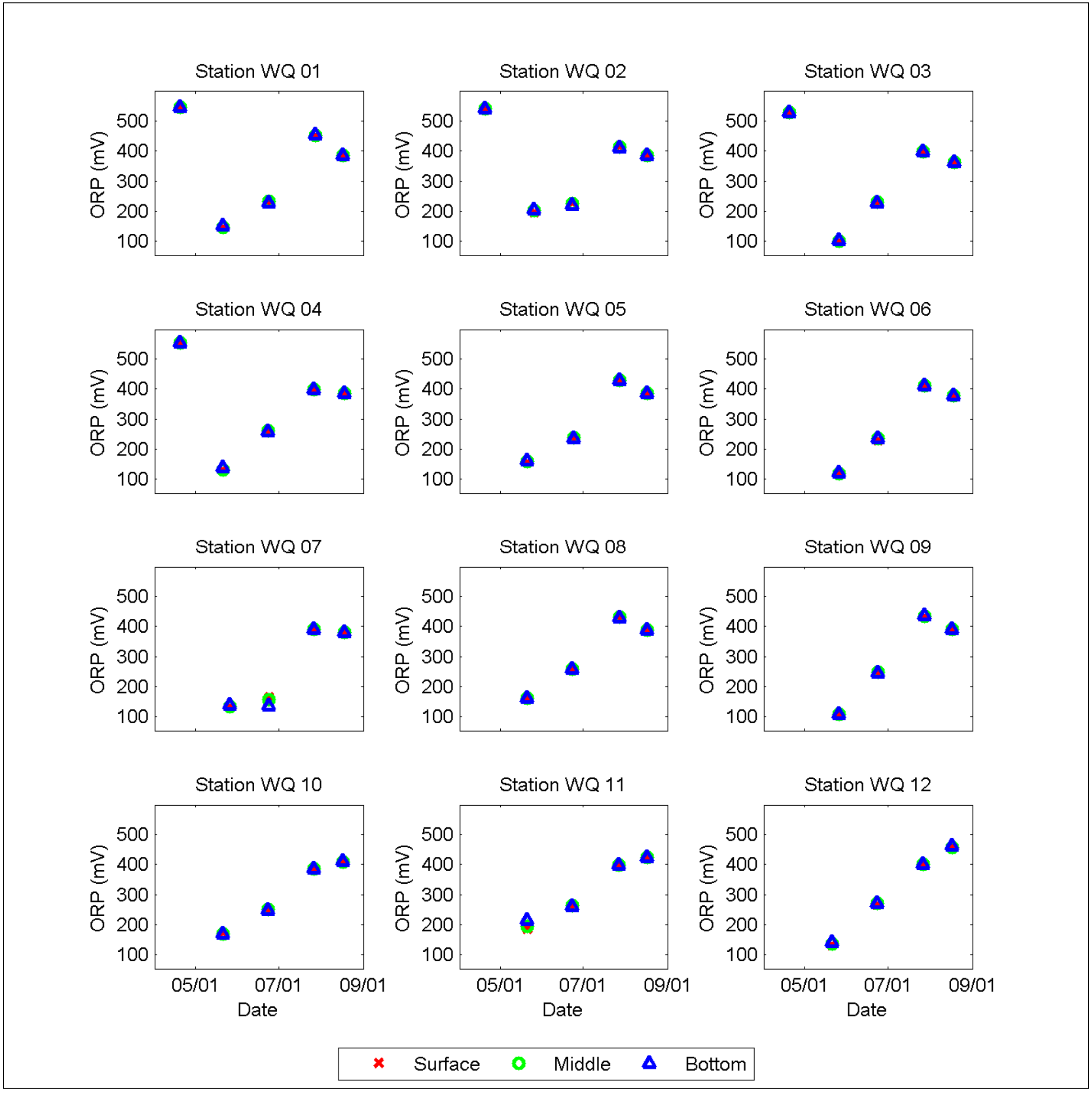


Figure 5-7 ORP data recorded *in situ*

5.2.7 Summary of Field Multi-probe Measurements

In summary, the *in situ* physico-chemical profiles indicate the following:

- Generally, all measured parameters (temperature, electrical conductivity, pH, DO, turbidity, ORP) were homogeneously distributed throughout the water column, indicative of vertically well-mixed conditions;
- Seasonal signals included decreasing water temperatures, increasing electrical conductivity, increasing ORP, increasing pH and decreasing turbidity, all of which are indicative of less influence of freshwater inputs and reduced primary productivity from lower winter insolation; and
- pH tended to be lower than the CQWQ (2006) guideline range, as did turbidity. However, turbidity tended to be near the upper limit of the ANZECC (2000) guideline range. DO saturation tended to be within the CQWQ (2006) guideline range of 90-100%, with occasional measurements above or below this range.

5.3 Vessel-Based Water Quality

Water samples collected from stations WQ01 to WQ12 were analysed for a broad range of chemical and physical properties, which are summarised in this section. Laboratory analysis and quality control certificates are provided in Appendix B and a summary of field quality control samples are provided in Appendix C.

Overall, the results of the Quality Control programs adopted by the laboratory and by GHD, indicate that the results of the following chemical analyses are of sufficient quality to be confidently used to determine the concentrations of substances of the waters within the Project Area, for comparison with the nominated guidelines. Appendix B (Laboratory Analysis and Interpretive Quality Control Certificates for Water Quality Monitoring), and Appendix D (Quality Assurance and Quality Control), provide the details of this overall assessment.

5.3.1 Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX)

One sample taken at each of the 12 water quality monitoring stations was analysed for the chemical species described in Table 5-2. Stations WQ01, WQ04, WQ05, WQ08 WQ10, WQ11 and WQ12 were sampled on the 21 May 2009 while stations WQ02, WQ03, WQ06, WQ07, and WQ09 were sampled on the 26 May 2009.

Table 5-2 BTEX Chemical Species and Limits of Reporting

Chemical Species	Limit of Reporting
Benzene	1 µg/L
Ethylbenzene	2 µg/L
Toluene	2 µg/L
Xylene (*meta*- and *para*-)	2 µg/L
Xylene (*ortho*-)	2 µg/L
Total Xylene	4 µg/L

No samples exceeded the limits of reporting, so these measurements were not included as part of the suite of measurements during subsequent field monitoring dates.

5.3.2 Fungicide

One water sample at each of the 12 water quality monitoring stations (i.e. WQ01-WQ12) was analysed for Propiconazole, a triazole fungicide. Stations WQ01, WQ04, WQ05, WQ08 WQ10, WQ11 and WQ12 were sampled on the 21 May 2009 while stations WQ02, WQ03, WQ06, WQ07, and WQ09 were sampled on the 26 May 2009.

No samples were above the limit of reporting of 0.01 (µg/L), so Propiconazole was not included as part of the suite of measurements during subsequent field monitoring dates

5.3.3 Herbicides

Samples from the 12 water quality monitoring stations were analysed for the 9 herbicide species summarised in Table 5-3. Samples in May, June and August 2009 were analysed for some of the herbicide species, while others were analysed for May the sampling event only. With the exception of metolachlor (i.e. a chloroacetanilide herbicide), all samples were below the limit of reporting. The recorded concentrations for metolachlor are shown in Table 5-4.

Table 5-3 Herbicide Species and Limits or Reporting

Herbicide Species	Limit of Reporting	Samples Taken
Atrazine	0.005 µg/L	May and June
Diuron	0.005 µg/L	May and June
Hexazinone	0.01 µg/L	May
Metolachlor	0.005 µg/L	May and June
Molinate	0.005 µg/L	May and June
Simazine	0.005 µg/L	May and June
Tebuthiuron	0.01 µg/L	May
Thiobencarb	0.005 µg/L	May and June
Trifluralin	0.005 µg/L	May and June

Table 5-4 Metolachlor Water Quality Monitoring Results

Date	Station	Metolachlor (ug/L)
21/05/2009	WQ01	<0.005
24/06/2009	WQ01	0.013
17/08/2009	WQ01	<0.005
26/05/2009	WQ02	<0.005

Date	Station	Metolachlor (ug/L)
23/06/2009	WQ02	0.009
17/08/2009	WQ02	<0.005
26/05/2009	WQ03	<0.005
23/06/2009	WQ03	<0.005
19/08/2009	WQ03	<0.005
21/05/2009	WQ04	<0.005
23/06/2009	WQ04	<0.005
18/08/2009	WQ04	<0.005
21/05/2009	WQ05	<0.005
24/06/2009	WQ05	<0.005
17/08/2009	WQ05	<0.005
26/05/2009	WQ06	<0.005
24/06/2009	WQ06	0.099
18/08/2009	WQ06	<0.005
26/05/2009	WQ07	<0.005
24/06/2009	WQ07	0.03
18/08/2009	WQ07	<0.005
21/05/2009	WQ08	<0.005
23/06/2009	WQ08	0.273
17/08/2009	WQ08	<0.005
26/05/2009	WQ09	<0.005
24/06/2009	WQ09	0.027
17/08/2009	WQ09	<0.005
21/05/2009	WQ10	<0.005
23/06/2009	WQ10	<0.005
17/08/2009	WQ10	<0.005
21/05/2009	WQ11	<0.005
23/06/2009	WQ11	<0.005
17/08/2009	WQ11	<0.005
21/05/2009	WQ12	<0.005

Date	Station	Metolachlor (ug/L)
23/06/2009	WQ12	0.075
17/08/2009	WQ12	<0.005

5.3.4 Metals and Metalloids

Samples at each of the 12 water quality monitoring stations were analysed for the 16 metal and metalloid species summarised in Table 5-5 each month. Samples were filtered prior to analysis. Four sets of samples were collected in May, June, July and August 2009. All results for antimony, beryllium, cobalt, lead and mercury were below the limits of reporting. The results for the remaining species are shown in Table 5-6. This table also includes a comparison of data to the trigger values included in the ANZECC (2000) guidelines.

Except for cadmium, all metals species with trigger values listed in the ANZECC (2000) were below the relevant trigger values. Cadmium exceeded its trigger value during the May sampling event at stations WQ06 and WQ09.

Table 5-5 Monitored Metals and Metalloids Species and Limits of Reporting

Metal Species	Limit of Reporting
Aluminium	10 µg/L
Antimony	0.5 µg/L
Arsenic	0.5 µg/L
Barium	1 µg/L
Beryllium	0.1 µg/L
Cadmium	0.2 µg/L
Chromium(III+VI)	0.5 µg/L
Cobalt	0.2 µg/L
Copper	1 µg/L
Iron	5 µg/L
Lead	0.2 µg/L
Manganese	0.5 µg/L
Mercury	0.1 µg/L
Nickel	0.5 µg/L
Silver	0.1 µg/L
Vanadium	0.5 µg/L

Table 5-6 Metals and Metalloids above Limits of Reporting

Date	Station	Aluminium (µg/L)	Arsenic (µg/L)	Barium (µg/L)	Cadmium (µg/L)	Chromium (III+VI) (µg/L)	Copper (µg/L)	Iron (µg/L)	Manganese (µg/L)	Nickel (µg/L)	Silver (µg/L)	Vanadium (µg/L)
21/05/2009	WQ01	<10	1	13	<0.2	<0.5	<1	6	11	0.6	<0.1	1.9
24/06/2009	WQ01	<10	0.6	7	<0.2	<0.5	<1	<5	1.2	<0.5	<0.1	1.1
28/07/2009	WQ01	<10	1	9	<0.2	<0.5	<1	<5	3	<0.5	<0.1	0.9
17/08/2009	WQ01	30	0.8	8	<0.2	<0.5	<1	<5	4.5	0.5	<0.1	<0.5
26/05/2009	WQ02	<10	1.4	9	<0.2	<0.5	1	<5	<0.5	0.5	<0.1	1.4
23/06/2009	WQ02	<10	0.6	7	<0.2	<0.5	<1	<5	0.8	<0.5	<0.1	1.1
28/07/2009	WQ02	<10	1	8	<0.2	<0.5	<1	<5	1	<0.5	<0.1	1.1
17/08/2009	WQ02	50	0.9	8	<0.2	<0.5	<1	<5	2	<0.5	<0.1	<0.5
26/05/2009	WQ03	<10	1.3	10	<0.2	<0.5	<1	<5	<0.5	0.6	<0.1	1.4
23/06/2009	WQ03	<10	0.8	7	<0.2	<0.5	<1	<5	2.3	<0.5	<0.1	1.1
27/07/2009	WQ03	<10	1.2	8	<0.2	<0.5	<1	<5	0.7	<0.5	<0.1	1.2
19/08/2009	WQ03	30	1.6	7	<0.2	<0.5	<1	6	1.7	<0.5	<0.1	3.6
21/05/2009	WQ04	<10	1.7	8	<0.2	<0.5	1	6	3.4	<0.5	<0.1	1.8
23/06/2009	WQ04	<10	0.6	3	<0.2	<0.5	<1	<5	<0.5	<0.5	<0.1	0.9
27/07/2009	WQ04	<10	1.3	6	<0.2	<0.5	<1	<5	1.4	<0.5	<0.1	1.1
18/08/2009	WQ04	60	1.5	5	<0.2	<0.5	<1	<5	1.5	0.8	<0.1	2.4
21/05/2009	WQ05	<10	1.5	12	<0.2	<0.5	1	6	8.5	0.7	<0.1	2.3
24/06/2009	WQ05	<10	0.7	7	<0.2	<0.5	<1	<5	0.6	<0.5	<0.1	1.3
28/07/2009	WQ05	<10	1.1	10	<0.2	<0.5	<1	<5	2.1	<0.5	<0.1	1.1
17/08/2009	WQ05	<10	0.8	8	<0.2	<0.5	<1	12	3	0.7	<0.1	<0.5
26/05/2009	WQ06	<10	1.2	10	2.7	<0.5	1	<5	0.8	1.2	<0.1	1.5
24/06/2009	WQ06	<10	0.7	8	<0.2	2.9	<1	<5	1.6	0.7	<0.1	1.5
28/07/2009	WQ06	<10	1	8	<0.2	<0.5	<1	<5	1.8	<0.5	<0.1	1.1
18/08/2009	WQ06	70	1.2	8	<0.2	<0.5	<1	<5	2.1	0.6	<0.1	1
26/05/2009	WQ07	<10	1.3	10	<0.2	<0.5	<1	<5	0.8	0.9	<0.1	1.5
24/06/2009	WQ07	<10	0.7	8	<0.2	<0.5	<1	<5	0.7	<0.5	<0.1	1.1
27/07/2009	WQ07	<10	1.2	9	<0.2	<0.5	<1	<5	2.2	<0.5	<0.1	1
18/08/2009	WQ07	210	1	8	<0.2	<0.5	<1	<5	2.9	<0.5	<0.1	0.8
21/05/2009	WQ08	<10	1.6	12	<0.2	<0.5	1	<5	7.5	0.7	<0.1	2.2
23/06/2009	WQ08	<10	0.6	7	<0.2	<0.5	<1	<5	1.1	0.5	<0.1	1.3
28/07/2009	WQ08	<10	1	9	<0.2	<0.5	<1	<5	1	<0.5	<0.1	0.9
17/08/2009	WQ08	<10	0.8	8	0.4	<0.5	<1	<5	3	<0.5	<0.1	<0.5
26/05/2009	WQ09	<10	1.2	8	1.7	<0.5	<1	<5	<0.5	0.8	<0.1	1.4
24/06/2009	WQ09	<10	0.6	6	<0.2	<0.5	<1	<5	<0.5	<0.5	<0.1	1.3
28/07/2009	WQ09	<10	1.3	8	<0.2	<0.5	<1	<5	0.8	0.9	<0.1	1
17/08/2009	WQ09	140	0.8	8	<0.2	<0.5	<1	<5	2.9	<0.5	<0.1	0.6
21/05/2009	WQ10	<10	1.7	12	<0.2	<0.5	1	<5	6.8	0.6	<0.1	2.7
23/06/2009	WQ10	<10	0.8	8	<0.2	<0.5	<1	<5	1.5	0.5	<0.1	1.3
27/07/2009	WQ10	<10	1	8	<0.2	<0.5	<1	<5	2.8	<0.5	<0.1	1.1
17/08/2009	WQ10	<10	1.1	8	<0.2	<0.5	<1	<5	8.2	<0.5	<0.1	0.6
21/05/2009	WQ11	<10	1.8	10	<0.2	<0.5	1	5	3	0.5	<0.1	2.9
23/06/2009	WQ11	<10	0.9	6	<0.2	<0.5	<1	<5	<0.5	<0.5	<0.1	1.4
27/07/2009	WQ11	<10	1.3	7	<0.2	<0.5	<1	<5	0.7	<0.5	<0.1	0.8
17/08/2009	WQ11	10	0.9	7	<0.2	<0.5	<1	<5	1.7	<0.5	<0.1	0.8

Date	Station	Aluminium (µg/L)	Arsenic (µg/L)	Barium (µg/L)	Cadmium (µg/L)	Chromium (III+VI) (µg/L)	Copper (µg/L)	Iron (µg/L)	Manganese (µg/L)	Nickel (µg/L)	Silver (µg/L)	Vanadium (µg/L)
21/05/2009	WQ12	<10	1.9	10	<0.2	<0.5	<1	6	2.2	<0.5	<0.1	2.3
23/06/2009	WQ12	<10	0.8	6	<0.2	<0.5	<1	<5	<0.5	<0.5	0.1	1.5
27/07/2009	WQ12	<10	1.4	8	<0.2	<0.5	<1	<5	0.7	<0.5	<0.1	1.3
17/08/2009	WQ12	80	0.8	7	<0.2	<0.5	<1	<5	1.5	<0.5	<0.1	1
Total Number of Samples		48	48	48	48	48	48	48	48	48	48	48
Number Above LoR		9	48	48	3	1	7	7	41	18	1	44
Maximum Value		210	1.9	13	2.7	2.9	1	12	11	1.2	0.1	3.6
Median Value (inc. results < LoR)		<10	1	8	<0.2	<0.5	<1	<5	2.15	<0.5	<0.1	1.3
ANZECC (2000) Guideline Level		-	-	-	0.7	27.4 / 4.4 *	1.3	-	-	7	1.4	100
Number Above ANZECC Guideline		-	-	-	2	0	0	-	-	0	0	0

* Trigger values for Chromium (III) and Chromium (IV) respectively.

5.3.5 Nutrients

Nutrient species were measured at all 12 water quality monitoring locations each month (May, June, July, and August 2009) as shown in Table 5-7.

Ammonia concentrations exceeded the QWQG (2006) guideline level 10 times, and the ANZECC (2000) guideline level six times. Total oxidised nitrogen exceeded the QWQG (2006) guideline level 26 times out of a total of 48 measurements with the median value (0.004 mg/L) greater than the guideline level (0.003 mg/L). Total kjeldahl nitrogen exceeded the QWQG (2006) level twice from 48 samples.

Reactive phosphorus did not exceed the QWQG (2006) guideline level, however it did exceed the ANZECC (2000) guideline level on 6 occasions. Total phosphorus did not exceed the QWQG (2006) guideline level or the ANZECC (2000) guideline level during the monitoring period.

Table 5-7 Nutrient Data Measured During Vessel Based Water Quality Sampling

Date	Station	Ammonia (mg/L)	Nitrate (as N) (mg/L)	Nitrite (as N) (mg/L)	Nitrogen (Total Oxidised) (mg/L)	TKN (as N) (mg/L)	Nitrogen (Total) (mg/L)	Reactive Phosphorus as P (mg/L)	Total Phosphorus (mg/L)
21/05/2009	WQ01	0.006	0.004	<0.002	0.004	0.15	0.15	0.002	<0.005
24/06/2009	WQ01	0.005	0.005	<0.002	0.005	0.14	0.15	0.002	0.009
28/07/2009	WQ01	0.007	0.004	<0.002	0.004	0.17	0.17	0.005	<0.005
17/08/2009	WQ01	<0.005	<0.002	<0.002	<0.002	0.06	0.06	<0.001	0.01
26/05/2009	WQ02	<0.005	<0.002	<0.002	-	0.14	0.14	0.003	<0.005
23/06/2009	WQ02	<0.005	0.006	<0.002	0.006	0.15	0.16	0.002	<0.005
28/07/2009	WQ02	0.009	0.006	<0.002	0.006	0.17	0.17	0.005	<0.005
17/08/2009	WQ02	0.014	0.003	<0.002	0.003	0.06	0.06	<0.001	0.008
26/05/2009	WQ03	<0.005	0.005	<0.002	-	0.12	0.13	0.004	<0.005
23/06/2009	WQ03	0.006	0.014	<0.002	0.014	0.16	0.17	0.002	0.007
27/07/2009	WQ03	0.011	0.008	0.002	0.01	0.14	0.14	0.006	<0.005
21/05/2009	WQ04	<0.005	0.003	<0.002	0.003	0.12	0.12	<0.001	<0.005
23/06/2009	WQ04	<0.005	0.003	<0.002	0.003	0.08	0.08	<0.001	<0.005
27/07/2009	WQ04	0.007	0.006	<0.002	0.006	0.15	0.15	0.004	<0.005
18/08/2009	WQ04	<0.005	<0.002	<0.002	<0.002	0.09	0.09	0.002	<0.005
21/05/2009	WQ05	<0.005	0.003	<0.002	0.003	0.13	0.13	0.002	<0.005
24/06/2009	WQ05	0.006	0.006	<0.002	0.006	0.11	0.12	0.002	0.006
28/07/2009	WQ05	0.008	0.004	<0.002	0.004	0.14	0.14	0.006	<0.005
17/08/2009	WQ05	<0.005	0.003	<0.002	0.003	0.09	0.09	0.001	0.01
26/05/2009	WQ06	0.007	0.003	<0.002	-	0.15	0.15	0.004	0.011
24/06/2009	WQ06	0.006	0.006	<0.002	0.006	0.14	0.15	0.002	0.006
28/07/2009	WQ06	0.007	0.005	<0.002	0.005	0.14	0.15	0.005	<0.005
18/08/2009	WQ06	0.019	<0.002	<0.002	<0.002	0.14	0.14	0.008	0.005
26/05/2009	WQ07	<0.005	0.002	<0.002	-	0.13	0.13	0.003	<0.005
24/06/2009	WQ07	0.006	0.009	<0.002	0.009	0.11	0.12	0.002	<0.005
27/07/2009	WQ07	0.01	0.004	<0.002	0.004	0.18	0.19	0.005	<0.005
18/08/2009	WQ07	0.013	<0.002	<0.002	<0.002	0.13	0.13	0.006	0.006
21/05/2009	WQ08	0.006	0.005	<0.002	0.005	0.14	0.14	0.002	0.006
23/06/2009	WQ08	0.005	0.004	<0.002	0.004	0.16	0.16	0.002	0.007
28/07/2009	WQ08	0.011	0.005	<0.002	0.005	0.14	0.15	0.006	<0.005
17/08/2009	WQ08	<0.005	<0.002	<0.002	<0.002	<0.05	<0.05	<0.001	0.01
19/08/2009	WQ08	<0.005	0.002	<0.002	0.002	0.11	0.12	0.007	0.006
26/05/2009	WQ09	0.006	0.004	<0.002	-	1.88	1.88	0.004	<0.005
24/06/2009	WQ09	<0.005	0.007	<0.002	0.007	0.11	0.12	0.001	<0.005
28/07/2009	WQ09	0.009	0.006	<0.002	0.006	0.14	0.15	0.005	<0.005
17/08/2009	WQ09	<0.005	0.003	<0.002	0.003	<0.05	<0.05	<0.001	0.01
21/05/2009	WQ10	<0.005	0.003	<0.002	0.003	0.12	0.12	<0.001	<0.005
23/06/2009	WQ10	<0.005	0.004	<0.002	0.004	0.12	0.12	0.002	<0.005
27/07/2009	WQ10	0.008	0.004	<0.002	0.004	0.15	0.15	0.005	<0.005
17/08/2009	WQ10	<0.005	<0.002	<0.002	<0.002	0.05	0.05	<0.001	0.014
21/05/2009	WQ11	0.006	0.006	<0.002	0.006	0.1	0.11	0.002	<0.005
23/06/2009	WQ11	0.006	0.004	<0.002	0.004	0.1	0.1	<0.001	<0.005

Date	Station	Ammonia (mg/L)	Nitrate (as N) (mg/L)	Nitrite (as N) (mg/L)	Nitrogen (Total Oxidised) (mg/L)	TKN (as N) (mg/L)	Nitrogen (Total) (mg/L)	Reactive Phosphorus as P (mg/L)	Total Phosphorus (mg/L)
27/07/2009	WQ11	0.01	0.005	<0.002	0.005	0.13	0.14	0.005	<0.005
17/08/2009	WQ11	<0.005	0.005	<0.002	0.005	<0.05	<0.05	<0.001	0.009
21/05/2009	WQ12	0.006	0.007	<0.002	0.007	0.24	0.25	0.002	<0.005
23/06/2009	WQ12	0.008	0.004	<0.002	0.004	0.11	0.11	0.002	<0.005
27/07/2009	WQ12	0.012	0.005	<0.002	0.005	0.13	0.14	0.004	<0.005
17/08/2009	WQ12	<0.005	<0.002	<0.002	<0.002	<0.05	<0.05	<0.001	0.01
Total Number of Samples		48	48	48	43	48	48	48	48
Number Above LoR		29	40	1	36	44	44	37	18
Maximum Value		0.019	0.014	0.002	0.014	1.88	1.88	0.008	0.014
Median Value (inc. results < LoR)		0.006	0.004	<0.002	0.004	0.13	0.135	0.002	<0.005
QWQG (2006) Guideline Level		0.008	-	-	0.003	0.18	0.2	0.008	0.025
Number Above QWQG		10	-	-	28	2	2	0	0
ANZECC (2000) Guideline Level		0.01	-	-	-	-	0.1	0.005	0.015
Number Above ANZECC Guideline		6	-	-	-	-	37	6	0

5.3.6 Organochlorine Pesticides

One sample at each of the 12 water quality monitoring stations (i.e. WQ01-WQ12) was analysed for a suite of 26 organochlorine pesticides. Stations WQ01, WQ04, WQ05, WQ08 WQ10, WQ11 and WQ12 were sampled on the 21 May 2009 while stations WQ02, WQ03, WQ06, WQ07, and WQ09 were sampled on the 26 May 2009. The species tested and the limits of reporting are shown in Table 5-8.

Table 5-8 Organochlorine Species and Limits or Reporting

Species	Limit of Reporting	Species	Limit of Reporting
4,4-DDE	0.01 µg/L	Endosulfan	0.01 µg/L
a-BHC	0.01 µg/L	Endosulfan I	0.01 µg/L
Aldrin	0.01 µg/L	Endosulfan II	0.01 µg/L
Aldrin + Dieldrin	0.02 µg/L	Endosulfan sulphate	0.01 µg/L
b-BHC	0.01 µg/L	Endrin	0.01 µg/L
chlordane	0.01 µg/L	Endrin aldehyde	0.01 µg/L
Chlordane (cis)	0.01 µg/L	Endrin ketone	0.01 µg/L
Chlordane (trans)	0.01 µg/L	g-BHC (Lindane)	0.01 µg/L
d-BHC	0.01 µg/L	g-BHC (Lindane)	0.01 µg/L
DDD	0.01 µg/L	Heptachlor (including its epoxide)	0.02 µg/L
DDT	0.01 µg/L	Hexachlorobenzene	0.01 µg/L
DDT+DDE+DDD	0.02 µg/L	Methoxychlor	0.01 µg/L
Dieldrin	0.01 µg/L		

None of the samples collected across the twelve sites exceeded the limits of reporting for any of the species tested. As such, they were not tested for in subsequent water quality tests.

5.3.7 Organophosphorus Pesticides

One sample taken at each of the 12 water quality monitoring stations (i.e. WQ01-WQ12) during the May monthly monitoring event and analysed for a suite of 20 organophosphorus pesticides. Stations WQ01, WQ04, WQ05, WQ08 WQ10, WQ11 and WQ12 were sampled on the 21 May 2009 while stations WQ02, WQ03, WQ06, WQ07, and WQ09 were sampled on the 26 May 2009. The organophosphorus pesticide species tested and the limits of reporting are shown in Table 5-9.

With the exception of chlorpyrifos, all species tested were below the limit of reporting. Chlorpyrifos was detected at several locations, and was measured again during the June monthly monitoring, along with diazinon and malathion. Diazinon and malathion measurements did not exceed the limits of reporting on during either occasion at any site. The results for chlorpyrifos are summarised in Table 5-10.

Table 5-9 Organophosphorus Species and Limits or Reporting

Species	Limit of Reporting	Species	Limit of Reporting
Azinophos methyl	0.1 µg/L	Ethion	0.1 µg/L
Bromophos	0.1 µg/L	Fenamiphos	0.1 µg/L
Carbophenothion	0.1 µg/L	Fenthion	0.1 µg/L
Chlorfenvinphos Z	0.1 µg/L	Malathion	0.002 µg/L
Chlorpyrifos	0.005 µg/L	Methyl parathion	0.1 µg/L
Chlorpyrifos-methyl	0.1 µg/L	Monocrotophos	0.1 µg/L
Demeton-S-methyl	0.1 µg/L	Parathion	0.1 µg/L
Diazinon	0.005 µg/L	Pirimphos-ethyl	0.1 µg/L
Dichlorvos	0.1 µg/L	Prothiofos	0.1 µg/L
Dimethoate	0.1 µg/L	Temephos	0.01 µg/L

Table 5-10 All Recorded Chlorpyrifos Data

Date	Station	Chlorpyrifos
21/05/2009	WQ01	0.012
24/06/2009	WQ01	0.024
17/08/2009	WQ01	<0.005
26/05/2009	WQ02	<0.005
23/06/2009	WQ02	<0.005
17/08/2009	WQ02	<0.005
26/05/2009	WQ03	<0.005
23/06/2009	WQ03	<0.005
19/08/2009	WQ03	<0.005
21/05/2009	WQ04	0.008
23/06/2009	WQ04	<0.005
18/08/2009	WQ04	<0.005
21/05/2009	WQ05	0.012
24/06/2009	WQ05	<0.005
17/08/2009	WQ05	<0.005
26/05/2009	WQ06	<0.005
24/06/2009	WQ06	<0.005
18/08/2009	WQ06	<0.005
26/05/2009	WQ07	<0.005

Date	Station	Chlorpyrifos
24/06/2009	WQ07	<0.005
18/08/2009	WQ07	<0.005
21/05/2009	WQ08	0.016
23/06/2009	WQ08	<0.005
17/08/2009	WQ08	<0.005
26/05/2009	WQ09	<0.005
24/06/2009	WQ09	<0.005
17/08/2009	WQ09	<0.005
21/05/2009	WQ10	0.02
23/06/2009	WQ10	<0.005
17/08/2009	WQ10	<0.005
21/05/2009	WQ11	<0.005
23/06/2009	WQ11	<0.005
17/08/2009	WQ11	<0.005
21/05/2009	WQ12	<0.005
23/06/2009	WQ12	<0.005
17/08/2009	WQ12	<0.005

5.3.8 Tributyltin

One sample at each of the 12 sites was analysed for tributyltin. Stations WQ01, WQ04, WQ05, WQ08 WQ10, WQ11 and WQ12 were sampled on the 21 May 2009 while stations WQ02, WQ03, WQ06, WQ07, and WQ09 were sampled on the 26 May 2009.

None of the tributyltin samples analysed exceeded the limit of reporting of 2 ng(Sn)/L.

5.3.9 Polycyclic Aromatic Hydrocarbons (PAHs) and Phenols

One sample taken at each of the 12 water quality monitoring stations (i.e. WQ01-WQ12) during the May monthly monitoring event was analysed for a suite of twenty-seven PAHs and phenols. Stations WQ01, WQ04, WQ05, WQ08 WQ10, WQ11 and WQ12 were sampled on the 21 May 2009 while stations WQ02, WQ03, WQ06, WQ07, and WQ09 were sampled on the 26 May 2009. The species tested, and the limits of reporting, are shown in Table 5-11.

Table 5-11 PAHs and Phenols Species and Limits or Reporting

Species	Limit of Reporting	Species	Limit of Reporting
2-nitrophenol	1 µg/L	Chrysene	1 µg/L
3-&4-methylphenol	2 µg/L	Dibenz(a,h)anthracene	1 µg/L
4-chloro-3-methylphenol	1 µg/L	Fluoranthene	1 µg/L
Acenaphthene	1 µg/L	Fluorene	1 µg/L
Acenaphthylene	1 µg/L	Indeno(1,2,3-c,d)pyrene	1 µg/L
Anthracene	1 µg/L	Naphthalene	1 µg/L
Benz(a)anthracene	1 µg/L	Pentachlorophenol	4 µg/L
Benzo(a) pyrene	0.5 µg/L	Phenanthrene	1 µg/L
Benzo(b)fluoranthene	1 µg/L	Phenol	1 µg/L
Benzo(g,h,i)perylene	1 µg/L	Pyrene	1 µg/L
Benzo(k)fluoranthene	1 µg/L		

None of the species measured exceeded the limits of reporting. These species were not investigated on subsequent monthly water quality monitoring samples.

5.3.10 Phenoxy Acid Herbicides

One sample at each of the 12 water quality monitoring stations (i.e. WQ01-WQ12) during the May 2009 monthly monitoring event was analysed for a suite of 14 phenoxy acid herbicides. Stations WQ01, WQ04, WQ05, WQ08 WQ10, WQ11 and WQ12 were sampled on the 21 May 2009 while stations WQ02, WQ03, WQ06, WQ07, and WQ09 were sampled on the 26 May 2009. The phenoxy acid herbicide species tested, and the limits of reporting, are shown in Table 5-12.

None of the phenoxy acid herbicide species measured exceeded the limits of reporting. These phenoxy acid herbicide species were not investigated on subsequent monthly water quality monitoring samples.

Table 5-12 Phenoxy Acid Herbicide Species and Limits of Reporting

Species	Limit of Reporting	Species	Limit of Reporting
2,4,5 trichlorophenoxyacetic acid	0.01 µg/L	Dicamba	0.01 µg/L
2-(2,4,5-trichlorophenoxy)propionic acid (Silvex)	0.01 µg/L	Fluroxypyr	0.01 µg/L
2,4-dichlorophenoxyacetic acid	0.01 µg/L	2-methyl-4-chlorophenoxyacetic acid	0.01 µg/L
4-(2,4-dichlorophenoxy)butyric acid	0.01 µg/L	4-(4-chloro-o-tolyloxy)butyric acid	0.01 µg/L

Species	Limit of Reporting	Species	Limit of Reporting
2,4-dichlorophenoxy-acetic acid	0.01 µg/L	Mecoprop	0.01 µg/L
4-chlorophenoxy acetic acid	0.01 µg/L	Picloram	0.05 µg/L
Clopyralid	0.05 µg/L	Triclopyr	0.01 µg/L

5.3.11 Phenoxyacetic Acid Herbicides

One sample at each of the 12 water quality monitoring stations (i.e. WQ01-WQ12) during the May 2009 monthly monitoring event was analysed for 2 species of phenoxyacetic acid herbicides.

Stations WQ01, WQ04, WQ05, WQ08 WQ10, WQ11 and WQ12 were sampled on the 21 May 2009 while stations WQ02, WQ03, WQ06, WQ07, and WQ09 were sampled on the 26 May 2009. The species tested, and the limits of reporting, are shown in Table 5-12.

All measurements of 2,4,6-trichlorophenol and Dichlorprop were below their limit of reporting values (0.1 µg/L and 0.01 µg/L respectively) across all sites.

5.3.12 TPHs

One sample at each of the 12 water quality monitoring stations (i.e. WQ01-WQ12) during the May 2009monthly monitoring event was analysed for a suite of 5 species of TPHs. Stations WQ01, WQ04, WQ05, WQ08 WQ10, WQ11 and WQ12 were sampled on the 21st of May 2009 while stations WQ02, WQ03, WQ06, WQ07, and WQ09 were sampled on the 26th of May 2009. The TPH species tested and the limits of reporting are shown in Table 5-13.

None of the TPH species measured exceeded the limits of reporting. These TPH species were not investigated on subsequent monthly water quality monitoring samples.

Table 5-13 TPH Species and Limits of Reporting

Species	Limit of Reporting
TPH C 6 - C 9 Fraction	20 µg/L
TPH C10 - C14 Fraction	50 µg/L
TPH C15 - C28 Fraction	100 µg/L
TPH C29-C36 Fraction	50 µg/L
TPH+C10 - C36 (Sum of total)	200 µg/L

5.3.13 Volatile Organic Compounds (VOC)

One sample at each of the 12 water quality monitoring stations (i.e. WQ01-WQ12) during the May 2009 monthly monitoring event was analysed for a suite of 3 species of VOCs. Stations WQ01, WQ04, WQ05, WQ08 WQ10, WQ11 and WQ12 were sampled on the 21 May 2009 while stations WQ02, WQ03, WQ06, WQ07, and WQ09 were sampled on the 26 May 2009. The VOC species tested and the limits of reporting are shown in Table 5-14.

None of the VOC species measured exceeded the limits of reporting. These VOC species were not investigated on subsequent monthly water quality monitoring samples.

Table 5-14 VOC Species and Limits of Reporting

Species	Limit of Reporting
1,1,1-trichloroethane	1 µg/L
1,1,2-trichloroethane	5 µg/L
1,2,4-trichlorobenzene	0.5 µg/L

5.3.14 Other Laboratory Measurements of Physico-Chemical and Chemical Species

A number of additional measurements of physico-chemical and chemical properties were carried out in the laboratory on water samples from the 12 stations on a monthly basis including:

- Cyanide;
- Chlorophyll a
- pH;
- Electrical Conductivity;
- TDS; and
- TSS.

Cyanide was measured during the May 2009 monthly sampling event. Stations WQ01, WQ04, WQ05, WQ08 WQ10, WQ11 and WQ12 were sampled on the 21 May 2009 while stations WQ02, WQ03, WQ06, WQ07, and WQ09 were sampled on the 26 May 2009. No cyanide samples exceeded the limit of reporting for this species (4 µg/L).

The remaining measurements had numerous values above the limit or reporting as reported in Table 5-15.

Chlorophyll *a* exceeded the limits or reporting on several occasions, reaching a maximum of 5 µg/L. The QWQG guideline for Chlorophyll *a* is 2.0 µg/L or mg/m^3.

The QWQG (2006) guideline for pH in an enclosed coastal area of the Central Coast Region has a lower limit of 8.0 and an upper limit of 8.4. Laboratory pH was generally at the lower end of this range, or below the lower limit of 8.0, in agreement with the *in situ* measurements.

Some variability in electrical conductivity and TDS was observed as expected from mixing between different water types in the Project Area (e.g. mixing between fresh water inputs and sea water) and because of evapo-concentration over the monitoring period that coincided with the dry season.

The majority of the TSS measurements exceeded the QWQG (2006) guideline for an enclosed coastal area of the Central Coast Region (15 mg/L) with only one measurement below the limit of reporting (5 mg/L).

Table 5-15 Other Laboratory Physico-Chemical and Chemical Data

Date	Station	Chlorophyll *a*	Electrical Conductivity (us/cm)	pH	TDS (mg/L)	TSS (mg/L)
21/05/2009	WQ01	5	47600	7.81	47000	94
24/06/2009	WQ01	<1	68200	7.64	37100	21
28/07/2009	WQ01	3	50400	8.06	43000	17
17/08/2009	WQ01	1	50000	7.93	39700	6
26/05/2009	WQ02	1	55700	8.03	38500	53
23/06/2009	WQ02	<1	72000	8	38800	18
28/07/2009	WQ02	1	52100	8.17	42700	10
17/08/2009	WQ02	<1	50000	8	40100	16
26/05/2009	WQ03	<1	54900	8.05	47600	52
23/06/2009	WQ03	<1	72100	8.01	40000	20
27/07/2009	WQ03	1	48700	8.16	43700	14
19/08/2009	WQ03	<1	51000	7.94	38300	53
21/05/2009	WQ04	5	51100	8.1	44800	90
23/06/2009	WQ04	<1	69600	8.17	39600	10
27/07/2009	WQ04	<1	49200	8.27	42200	16
18/08/2009	WQ04	<1	51000	7.95	42600	65
21/05/2009	WQ05	5	48900	8.05	44600	44
24/06/2009	WQ05	<1	67200	7.71	39200	21
28/07/2009	WQ05	<1	51200	8.11	44200	14
17/08/2009	WQ05	<1	50100	8.01	42800	8
26/05/2009	WQ06	6	55100	8.04	48600	27
24/06/2009	WQ06	2	63900	7.77	38800	17
28/07/2009	WQ06	<1	51100	8.16	42300	5
18/08/2009	WQ06	1	51800	7.89	41900	37
26/05/2009	WQ07	<1	56000	8.04	49400	29
24/06/2009	WQ07	<1	59500	7.77	39600	15
27/07/2009	WQ07	2	50500	8.17	43600	<5
18/08/2009	WQ07	<1	51500	7.88	43100	47
21/05/2009	WQ08	5	49100	8	45700	110
23/06/2009	WQ08	<1	72100	7.97	40400	20
28/07/2009	WQ08	<1	50000	8.15	43700	7
17/08/2009	WQ08	<1	50400	8	38700	7
26/05/2009	WQ09	<1	54700	8.11	49000	25
24/06/2009	WQ09	<1	58600	7.88	40200	12
28/07/2009	WQ09	1	50100	8.21	42100	12
17/08/2009	WQ09	2	50000	8.04	40800	6
21/05/2009	WQ10	5	49000	8.05	44600	104
23/06/2009	WQ10	<1	72400	8.02	40600	12
27/07/2009	WQ10	5	50800	8.18	46200	8
17/08/2009	WQ10	1	51000	8.08	38600	32
21/05/2009	WQ11	3	49400	8.08	45400	75
23/06/2009	WQ11	1	71900	8.09	40000	18
27/07/2009	WQ11	<1	50500	8.04	42800	12
17/08/2009	WQ11	1	50400	8.13	39000	7
21/05/2009	WQ12	5	50500	8.09	43200	94
23/06/2009	WQ12	<1	70300	8.1	40300	28
27/07/2009	WQ12	1	49400	8.2	44100	10

Date	Station	Chlorophyll *a*	Electrical Conductivity (us/cm)	pH	TDS (mg/L)	TSS (mg/L)
17/08/2009	WQ12	<1	50000	8.15	40000	8

Total Number of Samples	48	48	48	48	48
Number Above LoR	23	48	48	48	47
Maximum Value	6	72400	8.27	49400	110
Median Value (inc. results < LoR)	<1	51000	8.045	42250	18
QWQG (2006) Guideline Level	4	-	8.0 8.4	-	15
Number Above QWQG	8	-	12	-	28
ANZECC (2000) Guideline Level	1.4	-	8.0-8.4	-	-
Number Above ANZECC Guideline	13	-	12	-	-

5.3.15 Summary of Grab Water Quality Measurements

The majority of species analysed from the water quality grab samples were below the limit of reporting across all sites, which included:

- All five of the BTEX species (benzene, toluene, ethylbenzene, and xylenes);
- The single fungicide species (propiconazole);
- All 9 herbicides except metolachlor;
- All 26 organochlorine pesticides species;
- All 20 organophosphorus pesticides except chlorpyrifos;
- Tributyltin;
- All 29 PAHs and phenols;
- All 14 phenoxy acid herbicides;
- Both of the phenoxyacetic acid herbicides;
- Cyanide;
- All 5 TPHs; and
- All 3 VOCs.

Chlorpyrifos, an organophosphorus pesticide, and metolachlor, an herbicide, exceeded the limit of reporting on six out of thirty-six recordings.

In regards to dissolved metals, all measurements of antimony, beryllium, cobalt, lead and mercury were below the limits of reporting throughout the monitoring period. The remaining metals species of aluminium, arsenic, barium, cadmium, chromium (III+VI), copper, iron, manganese, nickel, silver and vanadium included measurements above their respective limit or recording. Of these, only cadmium exceeded the ANZECC (2000) trigger value on two occasions during the period of monitoring.

All nitrogen nutrient species exceeded the QWQG (2006) and/or ANZECC (2000) guidelines on at least one occasion over the monitoring period. The most regularly exceeded guideline levels were:

- Total oxidised nitrogen with a median of 0.004 mg/L above the QWQG (2006) guideline level of 0.003 mg/L; and
- Total nitrogen with a median of 0.135 mg/L exceeded the ANZECC (2000) guideline level of 0.1 mg/L on 37 occasions.
- Both reactive and total phosphorus were always lower than the QWQG (2006) guideline levels. Reactive phosphorus exceeded the ANZECC (2000) guideline level of 0.005 mg/L on 6 occasions.

Chlorophyll *a* exceeded both the QWQG (2006) and ANZECC (2000) guideline levels on 8 and 13 occasions, respectively, out of a total of 48 samples over the monitoring period.

Generally, pH was below the lower guideline limit of both QWQG (2006) and ANZECC (2000).

TSS exceeded the QWQG (2006) guideline level of 15 mg/L on 28 occasions out of the 48 measurements with a median TSS of 18 mg/L.

In summary, the water quality of the Project Area generally met the relevant adopted guidelines.

5.4 Elutriate Water Quality

In this section elutriate monitoring results are presented. Of the 121 elutriate samples across the 4 proposed dredge areas, most water quality parameters were analysed for a subset of 100 of these samples. Filtered arsenic was measured on a subset of 10 samples, while ammonia was analysed for a subset of 71 samples. Samples were collected across the following proposed dredge areas:

- **Area 1A:** 32 samples;
- **Area 1B:** 22 samples;
- **Area 2:** 24 samples.
- **Area 3:** 14 samples; and
- **Area 4:** 8 samples.

Figure 6-1 illustrates the various dredge areas.

5.4.1 Hexachlorobenzene

One hundred of the one hundred and twenty-one elutriate samples were analysed for hexachlorobenzene. None of the samples in any of the areas exceeded the detection limit of 0.01 µg/L.

5.4.2 Ammonia

Ammonia elutriate measurements at 33 sites had a median of 783 ug/L, well in excess of the QWQG (2006) guideline level of 8 ug/L and the ANZECC (2000) guideline upper limit of 10 ug/L, but compliant to the ANZECC (2000) toxicant guideline of 910 ug/L. The largest ammonia concentration recorded was 8,680 ug/L.

5.4.3 Metals

One hundred of the 121 elutriate samples were analysed for the metal and metalloid species shown in Table 5-16, except for filtered arsenic, which had only ten samples analysed. Levels of lead and mercury were below the limit of reporting in all samples.

Table 5-17 summarises all of the metals elutriate measurements that exceeded the limits of reporting. Cobalt and copper exceeded the ANZECC (2000) marine environment trigger values on several occasions. These same results are broken down based on the different proposed dredging areas in Table 5-18.

Table 5-16 Elutriate Metal and Metalloid Species and Limits of Reporting

Metal Species	Limit of Reporting
Aluminium	10 µg/L
Antimony	0.5 µg/L
Arsenic	0.5 µg/L
Cadmium	0.2 µg/L
Chromium(III+VI)	0.5 µg/L

Cobalt	0.2 µg/L
Copper	1 µg/L
Iron	5 µg/L
Lead	0.2 µg/L
Manganese	0.5 µg/L
Mercury	0.1 µg/L
Nickel	0.5 µg/L
Selenium	2 µg/L
Silver	0.1 µg/L
Vanadium	0.5 µg/L
Zinc	5 µg/L

Table 5-17 Overall Statistical Summary of Elutriate Metals and Metalloids

Species	Number of Samples	Number of Samples Above LoR	Median Value (ug/L)	95th Percentile Value (ug/L)	Maximum Value (ug/L)	ANZECC (2000) Guideline (ug/L)	Number of Samples over ANZECC Guideline
Aluminium	100	12	<10	30	190	-	-
Antimony	100	69	4.2	10.2	12.2	-	-
Arsenic	100	99	4.85	18.9	29.6	-	-
Cadmium	100	3	<0.2	<0.2	0.4	0.7	0
Chromium (III+VI)	100	5	<0.5	<0.5	1.7	27.4 / 4.4	0
Cobalt	100	49	<0.2	4	22.9	1	22
Copper	100	11	<1	2	2	1.3	6
Iron	100	69	8	140	201	-	-
Manganese	100	99	399	984	3030	-	-
Nickel	100	80	0.9	3	6.7	7	0
Selenium	100	1	<2	<2	5	-	-
Silver	100	5	<0.1	<0.1	0.8	1.4	0
Vanadium	100	99	8.45	34.1	89.8	100	0
Zinc	100	21	<5	9	12	15	0

Table 5-18 Statistical Summary by Dredge Area of Elutriate Metals and Metalloids

	Site 1A (n = 32)			Site 1B (n = 22)			Site 2 (n = 24)			Site 3 (n = 14)			Site 4 (n = 8)		
	Min (ug/L)	Median (ug/L)	Max (ug/L)	Min (ug/L)	Median (ug/L)	Max (ug/L)	Min (ug/L)	Median (ug/L)	Max (ug/L)	Min (ug/L)	Median (ug/L)	Max (ug/L)	Min (ug/L)	Median (ug/L)	Max (ug/L)
Aluminium	<10	<10	10	<10	<10	10	<10	<10	190	<10	<10	<10	<10	<10	<10
Antimony	<0.5	1.4	9.4	<0.5	<0.5	8.4	<0.5	6.6	10.7	3.2	6.3	11.7	<0.5	2.05	12.2
Arsenic	1.2	3.05	19.2	0.6	1.75	20.2	1.4	9.45	18.9	3.6	7.65	19.5	1	3.2	29.6
Cadmium	<0.2	<0.2	0.4	<0.2	<0.2	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Chromium (III+VI)	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	<0.5	0.7	<0.5	<0.5	1.7	<0.5	<0.5	1.3
Cobalt	<0.2	<0.2	8	<0.2	0.6	22.9	<0.2	0.3	5	<0.2	<0.2	1.2	<0.2	<0.2	0.3
Copper	<1	<1	2	<1	<1	2	<1	<1	1	<1	<1	<1	<1	<1	2
Iron	<5	5.5	148	<5	6.5	201	<5	8.5	110	8	64	161	<5	5.5	26
Manganese	1.1	302.5	1790	7.8	445	3030	18.8	367	757	268	490	862	0.7	143.25	960
Nickel	<0.5	0.85	3.9	0.5	1.8	<0.5	<0.5	0.85	4.1	<0.5	0.7	1.4	<0.5	1.15	2
Selenium	<2	<2	<2	<2	<2	<2	<2	<2	5	<2	<2	<2	<2	<2	<2
Silver	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.3	<0.1	<0.1	0.8	<0.1	<0.1	<0.1
Vanadium	1.4	8	89.8	0.5	2.75	16.2	0.7	16.5	63.3	2	5.8	80.2	1.4	7.7	31.8
Zinc	<5	<5	12	<5	<5	11	<5	<5	9	<5	<5	5	<5	<5	9

A comparison between median elutriate metal and metalloid concentrations with median water column concentrations is presented in Table 5-19. The median water column values are based on 4 months of monthly sampling conducted between May and August 2009. Not all species were recorded in both sets of data (NR indicates that a species was not recorded). Results from the elutriate testing are higher than those measured in the water column, or below the limit of reporting.

Table 5-19 Comparison of Metals and Metalloids in Elutriate and the Water Column

	Median Water Column Concentration (ug/L)	Median Elutriate Concentration (ug/L)
Aluminium	<10	<10
Antimony	<0.5	4.2
Arsenic	1	4.85
Barium	8	NR
Cadmium	<0.2	<0.2
Chromium (III+VI)	<0.5	<0.5
Cobalt	<0.2	<0.2
Copper	<1	<1
Iron	<5	8
Manganese	2.15	399
Nickel	<0.5	0.9
Selenium	NR	<2
Silver	<0.1	<0.1
Vanadium	1.3	8.45
Zinc	NR	<5

5.4.4 Organochlorine Pesticides

One hundred of the 121 elutriate samples were analysed for the organochlorine pesticides species shown in Table 5-20. None of these samples exceeded their respective limits of reporting.

Table 5-20 Organochlorine Species and Limits or Reporting

Species	Limit of Reporting	Species	Limit of Reporting
4,4-DDE	0.01 µg/L	Endosulfan	0.01 µg/L
a-BHC	0.01 µg/L	Endosulfan I	0.01 µg/L
Aldrin	0.01 µg/L	Endosulfan II	0.01 µg/L
Aldrin + Dieldrin	0.02 µg/L	Endosulfan sulphate	0.01 µg/L
b-BHC	0.01 µg/L	Endrin	0.01 µg/L
Chlordane	0.01 µg/L	Endrin aldehyde	0.01 µg/L
Chlordane (cis)	0.01 µg/L	Endrin ketone	0.01 µg/L
Chlordane (trans)	0.01 µg/L	g-BHC (Lindane)	0.01 µg/L
d-BHC	0.01 µg/L	g-BHC (Lindane)	0.01 µg/L
DDD	0.01 µg/L	Heptachlor	0.05 µg/L
DDT	0.01 µg/L	Heptachlor epoxide	0.01 µg/L
DDT+DDE+DDD	0.03 µg/L	Methoxychlor	0.01 µg/L
Dieldrin	0.01 µg/L		

5.4.5 Organophosphorus Pesticides

One hundred of the 121 elutriate samples were analysed for the organochlorine pesticides species shown in Table 5-21. None of these samples exceeded their respective limits of reporting.

Table 5-21 Organophosphorus Pesticide Species and Limits or Reporting

Species	Limit of Reporting	Species	Limit of Reporting
Azinophos methyl	0.1 µg/L	Ethion	0.1 µg/L
Bromophos	0.1 µg/L	Fenamiphos	0.1 µg/L
Carbophenothion	0.1 µg/L	Fenthion	0.1 µg/L
Chlorfenvinphos Z	0.1 µg/L	Malathion	0.1 µg/L
Chlorpyrifos	0.05 µg/L	Methyl parathion	0.1 µg/L
Chlorpyrifos-methyl	0.1 µg/L	Monocrotophos	0.1 µg/L
Demeton-S-methyl	0.1 µg/L	Parathion	0.1 µg/L
Diazinon	0.1 µg/L	Pirimphos-ethyl	0.1 µg/L
Dichlorvos	0.1 µg/L	Prothiofos	0.1 µg/L
Dimethoate	0.1 µg/L		

5.4.6 Polycyclic Aromatic Hydrocarbons (PAHs) and Phenols

One hundred of the 121 elutriate samples were analysed for the organochlorine pesticides species in Table 5-21. None of these samples exceeded their respective limits of reporting, apart from at Site 1A-063 in dredge area 1A. Table 5-23 summarises the data recorded at Site 1A-063 which were above the limits of reporting.

Table 5-22 PAHs and Phenol Species and Limits or Reporting

Species	Limit of Reporting	Species	Limit of Reporting
3-methylcholanthrene	0.1 µg/L	Chrysene	0.1 µg/L
Acenaphthene	0.1 µg/L	Dibenz(a,h)anthracene	0.1 µg/L
Acenaphthylene	0.1 µg/L	Fluoranthene	0.1 µg/L
Anthracene	0.1 µg/L	Fluorene	0.1 µg/L
Benz(a)anthracene	0.1 µg/L	Indeno(1,2,3-c,d)pyrene	0.1 µg/L
Benzo(a) pyrene	0.05 µg/L	Naphthalene	0.1 µg/L
Benzo(b)fluoranthene	0.1 µg/L	Pentachlorophenol	0.1 µg/L
Benzo(g,h,i)perylene	0.1 µg/L	Phenanthrene	0.1 µg/L
Benzo(k)fluoranthene	0.1 µg/L	Pyrene	0.1 µg/L

Table 5-23 PAHs and Phenols at Site 1A-063

Species	Concentration (µg/L)
Acenaphthene	0.1
Acenaphthylene	0.1
Anthracene	0.1
Benz(a)anthracene	0.1
Chrysene	0.1
Fluoranthene	0.1
Fluorene	0.1
Naphthalene	0.2
Phenanthrene	0.1
Pyrene	0.1

5.4.7 Polychlorinated Biphenyls (PCBs)

One hundred of the 121 elutriate samples were analysed for polychlorinated biphenyls (PCBs) shown in Table 5-24. None of these samples exceeded their respective limits of reporting.

Table 5-24 PCBs Limits of Reporting

Species	Limit of Reporting
Arochlor 1016	0.1 µg/L
Arochlor 1221	0.1 µg/L
Arochlor 1232	0.1 µg/L
Arochlor 1242	0.1 µg/L
Arochlor 1248	0.1 µg/L
Arochlor 1254	0.1 µg/L
Arochlor 1260	0.1 µg/L
Total PCBs	0.1 µg/L

5.4.8 Semi-Volatile Organic Compounds

One hundred of the 121 elutriate samples were analysed for the semi-VOCs species in Table 5-25. All measurements were below their respective limits or reporting apart from Site 1A-063 at which 7,12-dimethylbenz(a) anthracene was measured at 0.2 µg/L.

Table 5-25 Semi-VOCs Limits of Reporting

Species	Limit of Reporting
2-(acetylamino) fluorene	0.1 µg/L
2-methylnaphthalene	0.1 µg/L
7,12-dimethylbenz(a)anthracene	0.1 µg/L
Benzo(e)pyrene	0.1 µg/L
Coronene	0.1 µg/L
Perylene	0.1 µg/L

5.4.9 Summary of Elutriate Water Quality Measurements

Concentrations of organochlorine pesticides, organophosphorus pesticides, PAHs, phenols, PCBs and semi-VOCs were below the limits or reporting apart for one site in dredge area 1A that had some PAHs and phenols above the limit or reporting.

Concentrations of metals, metalloids and ammonia were generally much higher that those levels recorded in the water column, with ammonia compliant to the ANZECC (2000) toxicant guideline, but exceeding the QWQG (2006).

5.5 Water Quality Loggers

The water quality loggers deployed in this study measured turbidity, light intensity, sediment accumulation, water depth and wave height. However, not all parameters were recorded at every station during every deployment (Table 5-26). The process of redeploying the instruments took several days and as such, the deployment dates overlap on occasion. The dates specified in the table cover the time from when the first logger was activated, to when the last logger was retrieved.

Table 5-26 Logger Configuration for Deployments

	Deployment 1	Deployment 2	Deployment 3	Deployment 4
Deployment Dates	20 Apr – 19 May	19 May – 25 Jun	23 Jun – 28 Jul	27 Jul – 19 Aug
Logger 1	T, L, A			T, L, A, D, W
Logger 2	T, L, A, D, W		T, L, A, D, W	T, L, A, D, W
Logger 3	T, A	T, L, A	T, L, A, D, W	T, L, A, D, W
Logger 4	T, L, A, D, W	T, L, A, D, W	T, L, A	T, L, A, D, W
Logger 5		T	T	
Logger 6			T	
Logger 7		T	T	
Logger 8		T	T, L	
Logger 9		T	T, L, A, D, W	
Logger 10			T	

T = Turbidity, L = Light, A = Aggregated Suspended Solids Deposition, D = Depth, W = Wave Height

5.5.1 Turbidity Logger Data

The logger turbidity data over the first four deployments is summarised with simple statistics in Table 5-27 and plotted in Figure 5-8 to Figure 5-16. Whilst all loggers were located in relatively deep water (depth greater than 4m), a comparison of the median turbidity indicates differences between sites still exist. Higher values were seen in those channel areas that were slightly deeper (i.e. loggers 2, 3, 6 and 9). However, according to the equipment supplier, the turbidity data collected with Logger 5 showed indications of bio-fouling and has been excluded from this analysis.

Separation of turbidity measurements during neap and spring tide conditions shows a strong relationship between tidal conditions and turbidity (Table 5-27). At all locations, median turbidity under spring tide conditions is substantially greater than during neap tide conditions. Across all of the logger locations, the turbidity exceeded the QWQG (2006) guideline level of 6 NTU around 20 – 50% of the time. In general, turbidity levels were below the ANZECC (2000) upper guideline of 20 NTU limit for 80 – 99% of the time.

Table 5-27 Summary of Logger Turbidity Data (Units NTU)

Logger (or subset of logger data)	Season (Wet or Dry)	Tidal Conditions	Number of Samples	20th Percentile Turbidity	50th Percentile Turbidity	80h Percentile Turbidity	95th Percentile Turbidity	99th Percentile Turbidity
Logger 01	Dry	Neap and Spring	6625	1.53	3.04	5.93	11.39	33.64
Spring Tide Subset	Dry	Spring	3185	2.85	4.41	7.12	12.87	25.56
Neap Tide Subset	Dry	Neap	3440	1.12	1.88	3.69	9.67	43.51
Logger 02	Dry	Neap and Spring	10755	1.57	5.26	12.91	27.98	70.19
Spring Tide Subset	Dry	Spring	4749	4.67	9.1	16.74	30.32	54.31
Neap Tide Subset	Dry	Neap	6006	1	3.01	7.23	23.49	86.58
Logger 03	Dry	Neap and Spring	16925	2.65	5.02	9.32	15.77	19.7
Spring Tide Subset	Dry	Spring	8504	4.64	7.17	12.62	17.54	21.38
Neap Tide Subset	Dry	Neap	8421	1.99	3.16	5.7	9.69	13.63
Logger 04	Dry	Neap and Spring	17196	1.84	3.22	5.86	11.31	20.44
Spring Tide Subset	Dry	Spring	8489	2.3	3.9	6.78	12.43	20.26
Neap Tide Subset	Dry	Neap	8707	1.38	2.61	4.7	9.83	20.76
Logger 06	Dry	Neap and Spring	4426	1.75	4.54	11.74	25.41	96.49
Spring Tide Subset	Dry	Spring	2274	3.66	8.07	15.56	30.11	146.03
Neap Tide Subset	Dry	Neap	2152	1.16	2.48	5.86	15.17	76.93
Logger 07	Dry	Neap and Spring	8900	1.08	2.9	6.37	13.81	21.06
Spring Tide Subset	Dry	Spring	4709	2.65	4.76	9.21	16.54	24.35
Neap Tide Subset	Dry	Neap	4191	0.52	1.41	3.03	4.9	7.97
Logger 08	Dry	Neap and Spring	8911	1.98	4.06	8.47	20.17	107.54
Spring Tide Subset	Dry	Spring	4714	2.95	5.52	10.8	27.13	120.07
Neap Tide Subset	Dry	Neap	4197	1.44	2.7	5.52	13.63	75.97
Logger 09	Dry	Neap and Spring	9830	3.11	8.63	16.42	27.85	38.26
Spring Tide Subset	Dry	Spring	5235	6.64	12.01	21	31.73	42.86
Neap Tide Subset	Dry	Neap	4595	1.69	3.92	10.91	17.22	26.36
Logger 10	Dry	Neap and Spring	1007	1.35	3.07	8.23	16.08	27.58
Spring Tide Subset	Dry	Spring	109	4.98	9.21	15.27	22.52	29.84
Neap Tide Subset	Dry	Neap	898	1.23	2.7	6.83	14.12	26.41

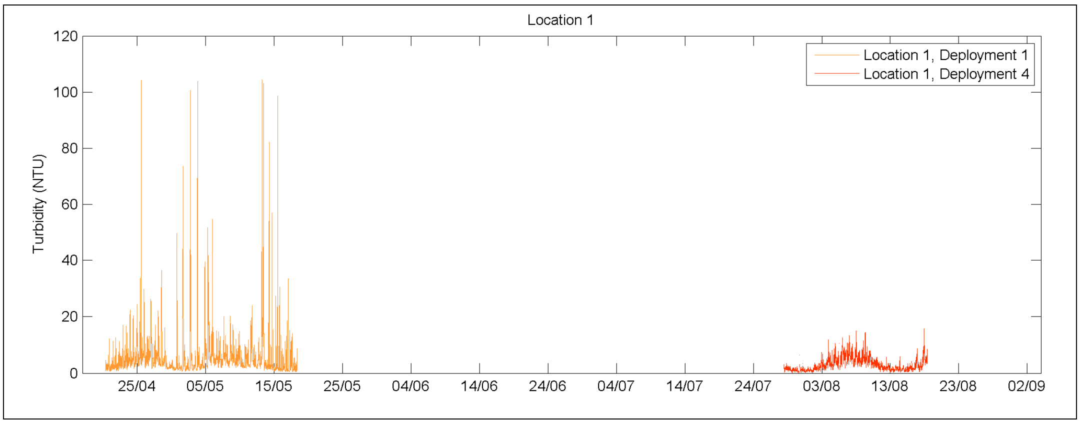


Figure 5-8 Turbidity Logger Data at Location 1

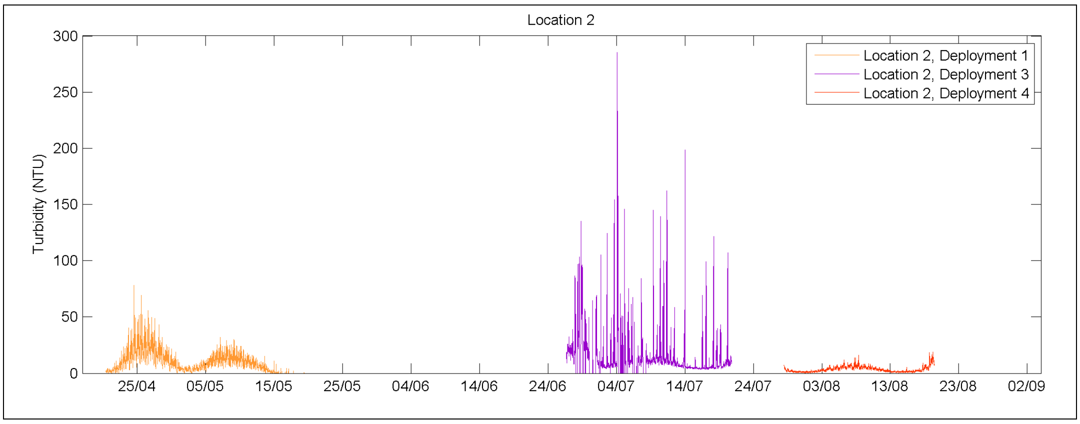


Figure 5-9 Turbidity Logger Data at Location 2

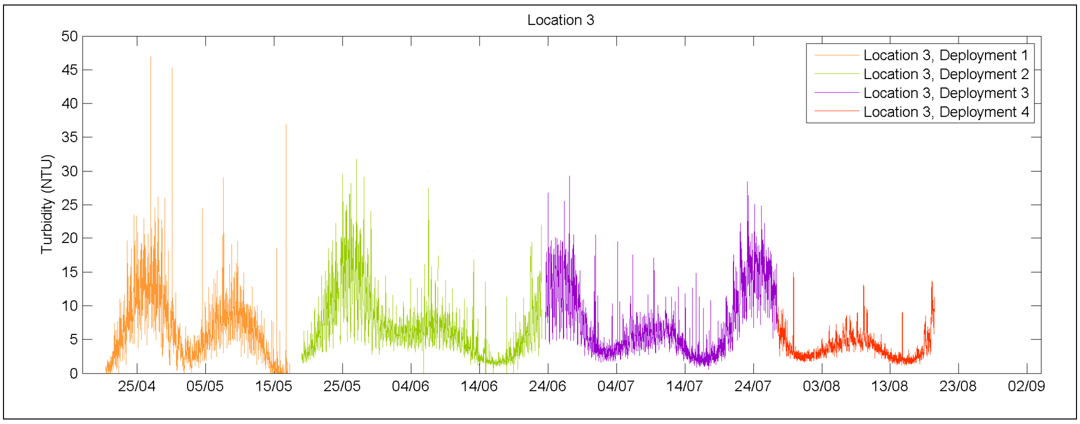


Figure 5-10 Turbidity Logger Data at Location 3

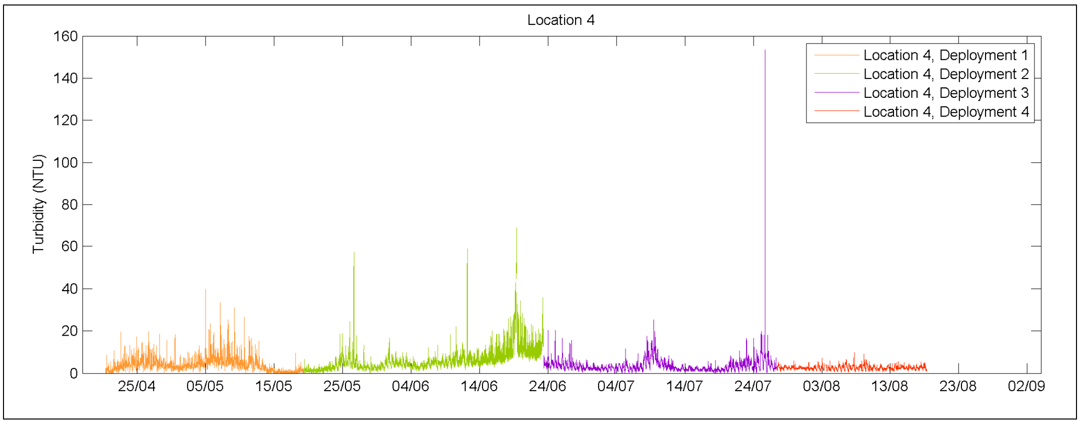


Figure 5-11 Turbidity Logger Data at Location 4

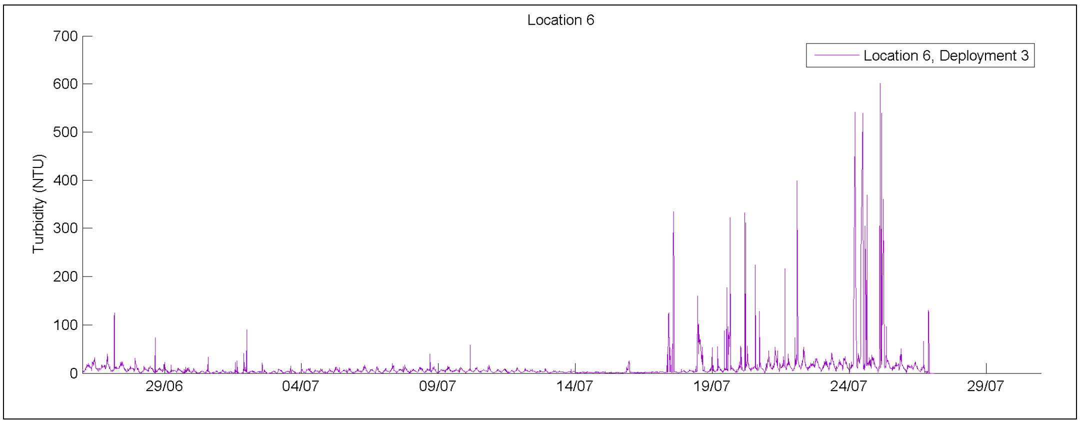


Figure 5-12 Turbidity Logger Data at Location 6

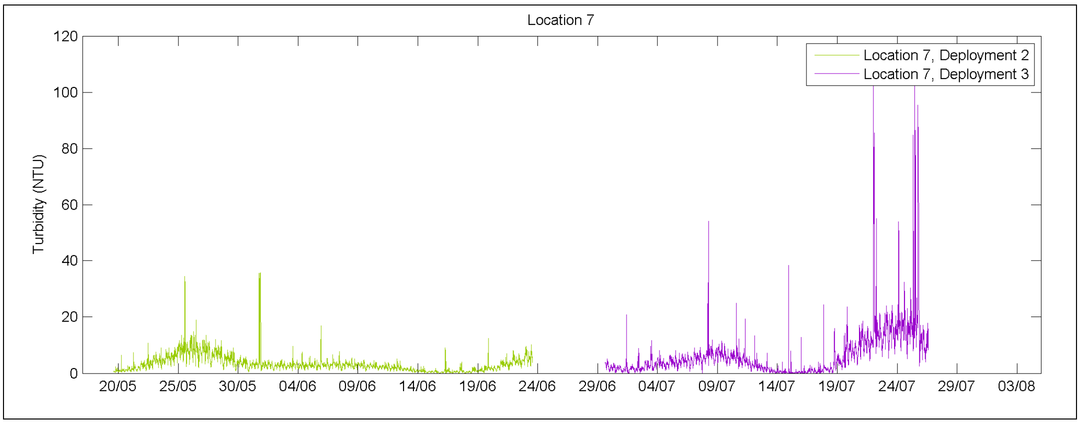


Figure 5-13 Turbidity Logger Data at Location 7

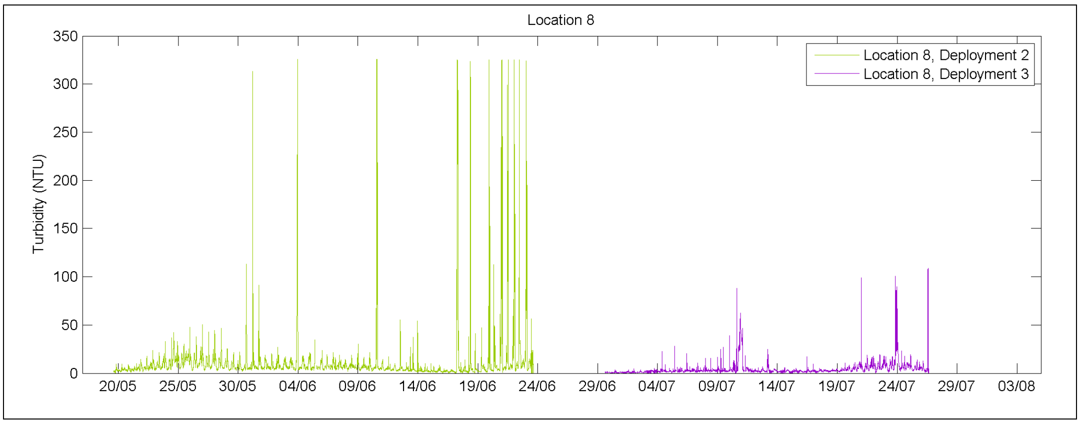


Figure 5-14 Turbidity Logger Data at Location 8

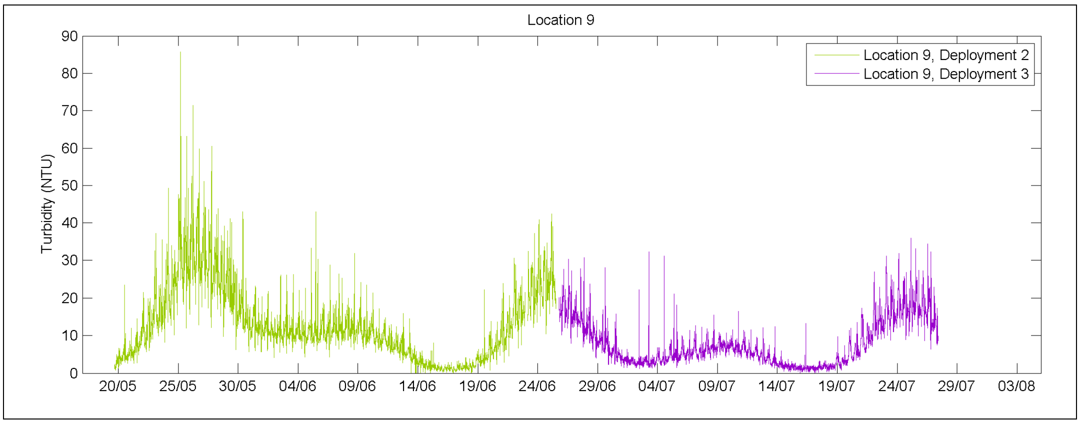


Figure 5-15 Turbidity logger data at location 9

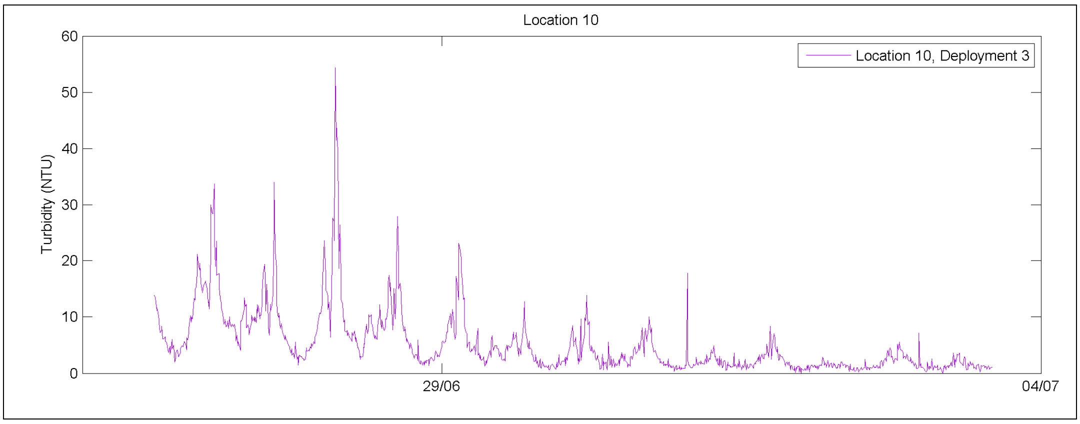


Figure 5-16 Turbidity Logger Data at Location 10

5.5.2 Incorporation of Other Recent Turbidity Data

With the primary impact on water quality from the Project likely to be attributable to the effects of the capital dredging and reclamation decant effluent on turbidity within the Project Area, recent *in situ* turbidity logger and profiling data have been incorporated into the analysis. This section therefore provides a complete data set from which to determine appropriate interim turbidity trigger values for this Project.

Turbidity as an Indicator of Water Quality

Turbidity is an optical property of water. As light passes through water, it can be scattered by particles suspended in the water. Turbidity is a measure of the degree to which light is scattered as it passes through water. It is a measurement that can be made *in situ* or in the laboratory. Spot measurements of turbidity can be made *in situ* with a handheld device. Alternatively measurements can be made continuously at one location with a turbidity logger.

Turbidity is commonly reported in Formazin Nephelometric Units (FTU) or Nephelometric Turbidity Units (NTU). NTU is a special case of the FTU standard.

Turbidity is used as an indirect indicator of the amount of suspended material in suspension. Different sediment types have different light scattering properties and as such, the relationship between turbidity and suspended solid concentration is site specific.

Variability in Turbidity in the Project Area

Measurements of turbidity in the Project Area during 2009 were collected as part of the baseline data, which indicates that turbidity varies considerably between sites as well as between neap and spring tide conditions (Section 5.5.1). The measurements made also indicate that turbidity can vary considerably over short time periods.

All continuous turbidity measurements made to date for the Project as part of the baseline data set have been collected during the dry season with minimal influence from rainfall events and associated catchment inputs. It is expected, on the basis of previous experience, that turbidity will vary between wet and dry seasons owing to sediment laden catchment inputs into the Project Area.

Sources of Turbidity Data

Measurements of turbidity in the Project Area can be divided into two classes – continuous measurements and spot measurements. High temporal resolution data (i.e. 10 minute frequency) recorded for this EIS's baseline data indicates turbidity can vary substantially over a short period of time (i.e. less than one day) during the dry season as demonstrated in Figure 5-8 to Figure 5-16.

Given this established pattern of variability, spot measurements of turbidity taken infrequently (e.g. weekly, monthly) cannot identify trends. Indeed, spot measurements taken on a regular basis (e.g. monthly) have significant potential for bias because of the dependency of turbidity on tidal (i.e. current) conditions. As such, only continuous measurements of turbidity are considered in this analysis to characterise the turbidity climate of the Project Area.

Sources of continuous turbidity data relevant to the Project Area are summarised in Table 5-28. Some of the continuous turbidity data from past studies coincided with the wet season, which has not yet been covered by the monitoring program for this Project. Therefore, data from other sources was made available for this project to allow estimates of characteristic turbidity ranges during the wet season.

Table 5-28 Sources of Continuous Turbidity Data

Date	Reference
Feb – Apr 2005 *(Wet Season)*	*Capital Dredging of the Fourth Berth at RG Tanna Coal Terminal, Protection of the Marine Environment During Dredging and Dewatering. (GHD Gladstone 2005)*
2008-2009 *(Wet and Dry Seasons)*	*Port Curtis Seagrass Water Quality* (Wilson *et al.* 2008)
2008 *(Dry Season)*	*WBM Turbidity Data from Fisherman's Landing)(WBM 2008)*
2009	*Fisherman's Landing Baseline Turbidity Report* (Wilson and Andersen 2009)
2009 *(Dry Season)*	*GHD Baseline Study for the Western Basin EIS.*

Much of the data previously collected has been made available as raw data. Hence, all data presented here have been analysed in a similar manner as summarised in the following section.

Summary Turbidity Statistics

Turbidity data in the natural environment often displays a skewed frequency distribution. In the case of turbidity, the data often contains many relatively low turbidity readings and a few very high measurements. Hence, application of conventional averaging techniques to turbidity data sets can produce misleading results, as these infrequent, high level turbidity events can skew the computed average.

The preferred method for presenting statistical summaries of turbidity data sets is the application of 'percentage exceedance' or 'percentile' calculations. This allows the data to be summarised in terms of ambient (or background) behaviour with the median (50th percentile) and extreme behaviour with a higher percentile value (e.g. 95th percentile).

Table 5-29 presents a statistical summary of the all available recent logger data that has been collated in the Project Area. From the combined data sets, the following conclusions can be drawn:

- Median dry season turbidity in deep water logger deployment locations (GHD logger deployments for this EIS, Berth 5 Fisherman's Landing June-October 2008) varies from around 3 to 9 NTU with the 95th percentile ranging from 11-35 NTU;
- Median dry season turbidity in shallow logger deployment locations of 9 NTU and a 95th percentile range from 30-90 NTU; (refer Fisherman's Landing shallow water samples from August-September 2008, Seagrass bed 8 north of Fisherman's Landing May to November 2008, and seagrass bed 5 west of Wiggins Island May to November 2008)
- Median wet season turbidity in shallow logger deployment locations (Fisherman's Landing shallow water January-April 2008 and December 2008-April 2009, Bed 8 north of Fisherman's Landing January-April 2008 and December 2008-April 2009) of 10 and 23 NTU, and the 95th percentile of 127 and 176 NTU; and

- During the dry season the turbidity during spring tide conditions is 2-4 times those in neap tide conditions.

Though the available data indicates that the turbidity is substantially higher during the wet season, less data has been collected over this period relative to the dry season (approximately 15% of all data). As such, it is likely that the wet season statistics are heavily biased towards individual events during the wet season as the record is not sufficiently long to ascertain otherwise. However, it could reasonably be expected that turbidity will be higher in the wet season due to impacts from higher catchment runoff.

Table 5-29 Summary of all Available Recent Continuous Turbidity Data

Location	Season	Tide	n Samples	80th percentile	50th percentile	20th percentile	5th percentile	1st percentile
Clinton Wharf, Feb 2004 – Apr 2005	Wet and Dry	Neap and Spring	Not Reported	Not Reported	5	17	38	52
Targinie Channel, Jun 2008 (4 days)	Dry	Spring	Not Reported	Not Reported	Not Reported	Not Reported	Not Reported	Not Reported
Berth 5 Fisherman's Landing, Jun - Oct 2008	Dry	Neap and Spring	14493	4	9	17	35	81
Spring Tide Subset	Dry	Spring	7769	6	12	20	35	83.32
Neap Tide Subset	Dry	Neap	6724	3	6	12	33	77
Fisherman's Landing, Deep Water, Aug - Sept 2008	Dry	Neap and Spring	Not Reported	Not Reported	Not Reported	Not Reported	Not Reported	Not Reported
Spring Tide Subset								
Neap Tide Subset								
Fisherman's Landing, Shallow Water, Aug - Sept 2008	Dry	Neap and Spring	4920		9.14	16.87	30.53	73.46
Spring Tide Subset	Dry	Spring	2995		12.38	20.42	34.94	82.08
Neap Tide Subset	Dry	Neap	1925		5.13	8.69	16.8	50.76
Bed 8, North of Fisherman's Landing, Jan 2008 - Apr 2009	Wet and Dry	Neap and Spring	23796	4.92	14.14	43.32	95.29	207.94
Spring Tide Subset (Wet and Dry Seasons)	Wet and Dry	Spring	12824	6.2	16.96	43.32	89.92	174.14
Neap Tide Subset (Wet and Dry Seasons)	Wet and Dry	Neap	10972	4.16	10.81	43.32	104.25	234.56
Wet Season (Neap and Spring Tides) Subset	Wet	Neap and Spring	12273	7.23	23.36	62.17	126.78	259.99
Wet Season, Spring Tide Subset	Wet	Spring	6441	8.51	26.17	64.32	111.93	233.53
Wet Season, Neap Tide Subset	Wet	Neap	5832	6.72	18.75	59.71	146.47	284.99
Dry Season (Neap and Spring Tides) Subset	Dry	Neap and Spring	11523	3.39	9.28	23.87	54.84	109.15
Dry Season, Spring Tide Subset	Dry	Spring	6383	4.67	12.09	26.17	53.82	97.18
Dry Season, Neap Tide Subset	Dry	Neap	5140	2.62	6.72	18.24	57.66	115.06
Bed 5, West of Wiggins Island, Jan 2008 - Apr 2009	Wet and Dry	Neap and Spring	14114	3.33	9.47	29.96	161.73	201.03
Spring Tide Subset (Wet and Dry Seasons)	Wet and Dry	Spring	8989	3.33	8.97	24.12	75.76	200.54
Neap Tide Subset (Wet and Dry Seasons)	Wet and Dry	Neap	5125	3.41	10.56	66.89	197.94	201.63
Wet Season (Neap and Spring Tides) Subset	Wet	Neap and Spring	10512	3.33	9.57	32.14	175.99	201.13
Wet Season, Spring Tide Subset	Wet	Spring	6323	3.43	9.57	25.6	95.52	200.83
Wet Season, Neap Tide Subset	Wet	Neap	4189	3.23	9.76	71.01	199.94	201.72
Dry Season (Neap and Spring Tides) Subset	Dry	Neap and Spring	3602	3.33	9.07	24.91	90.84	196.68
Dry Season, Spring Tide Subset	Dry	Spring	2666	3.03	7.78	18.28	63.13	176.49
Dry Season, Neap Tide Subset	Dry	Neap	936	4.32	15.65	45.11	163.11	197.14
GHD WQ Station 01	Dry	Neap and Spring	6625	1.53	3.04	5.93	11.39	33.64
Spring Tide Subset	Dry	Spring	3185	2.85	4.41	7.12	12.87	25.56
Neap Tide Subset	Dry	Neap	3440	1.12	1.88	3.69	9.67	43.51
GHD WQ Station 02	Dry	Neap and Spring	10755	1.57	5.26	12.91	27.98	70.19
Spring Tide Subset	Dry	Spring	4749	4.67	9.1	16.74	30.32	54.31
Neap Tide Subset	Dry	Neap	6006	1	3.01	7.23	23.49	86.58
GHD WQ Station 03	Dry	Neap and Spring	16925	2.65	5.02	9.32	15.77	19.7
Spring Tide Subset	Dry	Spring	8504	4.64	7.17	12.62	17.54	21.38
Neap Tide Subset	Dry	Neap	8421	1.99	3.16	5.7	9.69	13.63
GHD WQ Station 04	Dry	Neap and Spring	17196	1.84	3.22	5.86	11.31	20.44
Spring Tide Subset	Dry	Spring	8489	2.3	3.9	6.78	12.43	20.26
Neap Tide Subset	Dry	Neap	8707	1.38	2.61	4.7	9.83	20.76
GHD WQ Station 06	Dry	Neap and Spring	4426	1.75	4.54	11.74	25.41	96.49
Spring Tide Subset	Dry	Spring	2274	3.66	8.07	15.56	30.11	146.03

Location	Season	Tide	n Samples	80th percentile	50th percentile	20th percentile	5th percentile	1st percentile
Neap Tide Subset	Dry	Neap	2152	1.16	2.48	5.86	15.17	76.93
GHD WQ Station 07	Dry	Neap and Spring	8900	1.08	2.9	6.37	13.81	21.06
Spring Tide Subset	Dry	Spring	4709	2.65	4.76	9.21	16.54	24.35
Neap Tide Subset	Dry	Neap	4191	0.52	1.41	3.03	4.9	7.97
GHD WQ Station 08	Dry	Neap and Spring	8911	1.98	4.06	8.47	20.17	107.54
Spring Tide Subset	Dry	Spring	4714	2.95	5.52	10.8	27.13	120.07
Neap Tide Subset	Dry	Neap	4197	1.44	2.7	5.52	13.63	75.97
GHD WQ Station 09	Dry	Neap and Spring	9830	3.11	8.63	16.42	27.85	38.26
Spring Tide Subset	Dry	Spring	5235	6.64	12.01	21	31.73	42.86
Neap Tide Subset	Dry	Neap	4595	1.69	3.92	10.91	17.22	26.36
GHD WQ Station 10	Dry	Neap and Spring	1007	1.35	3.07	8.23	16.08	27.58
Spring Tide Subset	Dry	Spring	109	4.98	9.21	15.27	22.52	29.84
Neap Tide Subset	Dry	Neap	898	1.23	2.7	6.83	14.12	26.41

Relation of TSS versus Turbidity

As previously discussed, turbidity is an optical property and can only be considered an indicator of the TSS concentration. The relationship between turbidity and TSS is site specific and must be determined on a case by case basis with simultaneous measurements of turbidity and TSS.

Several turbidity and TSS datasets are available (Table 5-30). These include data collected under normal conditions, periods of dredging and data collected through the process of calibrating nephelometer sensors. In order to establish a common relation between turbidity and suspended solids, these datasets have been combined and a simple relation derived for application in this EIS.

Table 5-30 Summary Available Turbidity and TSS Datasets

Dataset Title	Recorded By	Comments
Non-dredging Data	WBM	Past measurements by WBM under non-dredging conditions over the Project Area.
Dredge Monitoring Data	WBM	Data collected by WBM during dredging operations, Fisherman's Landing Berth 1, June/July 2009.
Dredge Monitoring Data, Round 1	GHD	Data collected by GHD during dredging operations, Fisherman's Landing Berth 1, June/July 2009.
Dredge Monitoring Data, Round 2	GHD	Data collected by GHD during dredging operations, Fisherman's Landing Berth 1, June/July 2009.
Baseline Data	GHD	Data collected during the baseline monitoring for this EIS across the Project Area.

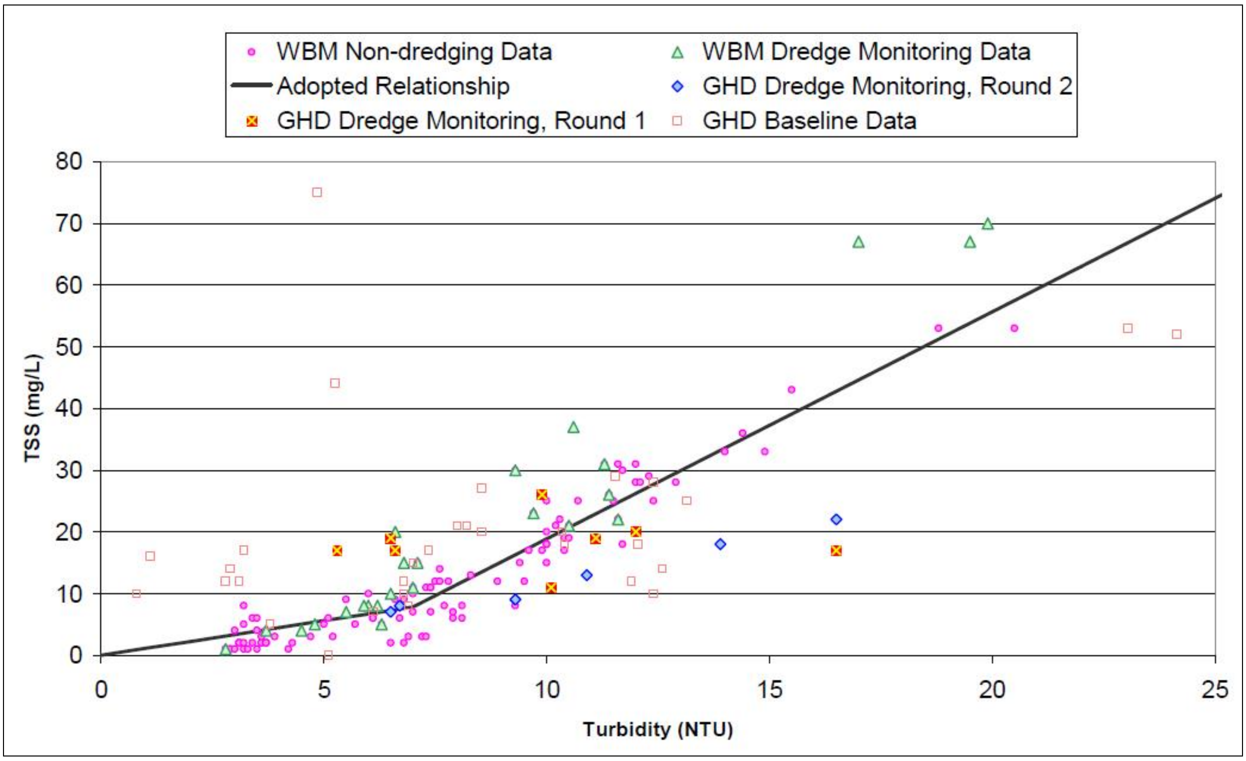


Figure 5-17 Relation of TSS versus turbidity

The adopted relation between turbidity and TSS in Figure 5-17 is a piece-wise linear function, based on the largest and most consistent dataset available (WBM Non-dredging Data), and is defined as follows:

- TSS = 1.12 x [turbidity] where [turbidity] is between 0 and 7 NTU; and
- TSS = 3.68 x [turbidity] – 17.92 where [turbidity] is greater than 7 NTU.

The relation reflects the current data-set and may therefore change to some degree as additional data is collected. There is considerable scatter above and below the adopted relation. This is not unexpected as naturally occurring resuspended material, suspended material bought into the estuary by freshwater inputs, and suspended material generated by dredging are likely to have different physical and optical characteristics.

Given the degree of scatter, it is suggested that turbidity be used rather than TSS, as the primary indicator and point of comparison of water clarity, as it is a direct measure.

5.5.3 Photosynthetically Available Radiation

Photosynthetically available radiation (PAR) is used to measure the amount of visible light available for photosynthetic processes for the benthic primary producer communities (e.g. seagrass communities). Plots of the light intensity time series data at logger locations with a PAR sensor are presented in Figure 5-18 to Figure 5-23. PAR measurements (not shown) exhibit a strong diurnal fluctuation associated with the natural variability between day and night, as well as variation from day to day. Variation from day to day can be caused by:

- Changes in incoming light intensity (due to atmospheric conditions);

- Seasonal changes in the Sun's angle;
- Changes in water depth during the light portion of the day caused by tides; and
- Attenuation through the water column as a function of particles and phytoplankton.

Differences in peak daily light intensity between sites are primarily a function of deployment depth. The closer the sensor is to the surface, the more PAR will reach the sensor and the higher the recorded measurement. A typical daylight light intensity at the surface is approximately 1,800 uE/m^{2}s^{-1}. Differences in light intensity between deployments are likely to be caused by small changes in deployment depth (Figure 5-29 to Figure 5-33) and removal of bio-fouling from the light sensor.

Because of the large range of the depth of deployments of the PAR sensors, the primary influence on the underwater light intensity data was water depth with turbidity (or TSS) levels a secondary influence.

In the case of logger 9 (Figure 5-23), the light is very heavily attenuated and does not increase to more that 2 uE/m^{2}s^{-1} under normal conditions. Because the resolution of this instrument is 1 uE/m^{2}s^{-1}, the graph has an unusual appearance, with the intensity jumping between 0, 1, 2 uE/m^{2}s^{-1} over time. As this logger is deployed in relatively deep water (approximately 15 m) and has relatively high turbidity, the attenuation of PAR through the water column is high.

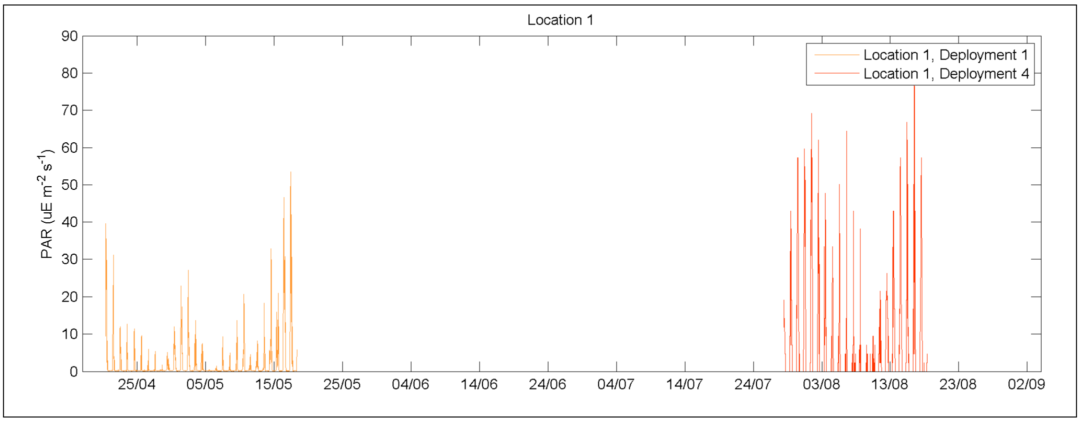


Figure 5-18 PAR at Location 1 with Water Level Range of 4-7 m

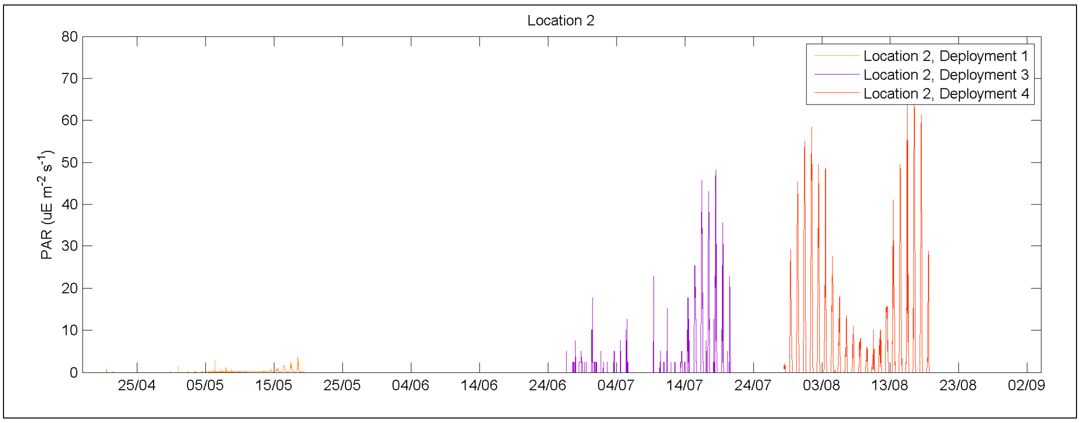


Figure 5-19 PAR at Location 2 of with Water Level Range of 4-9 m

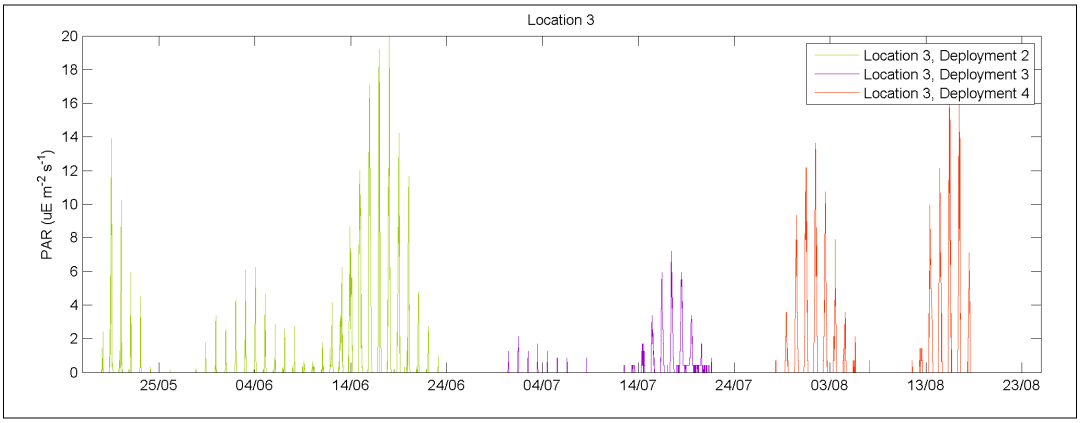


Figure 5-20 PAR at Location 3 with Water Level Range of 7.5-12 m

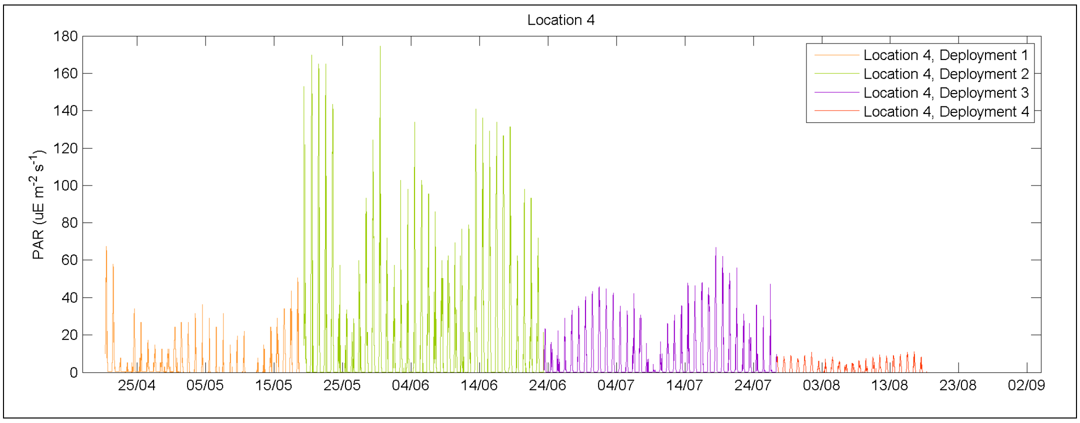


Figure 5-21 PAR at Location 4 with Water Level Range of 2.5-6 m

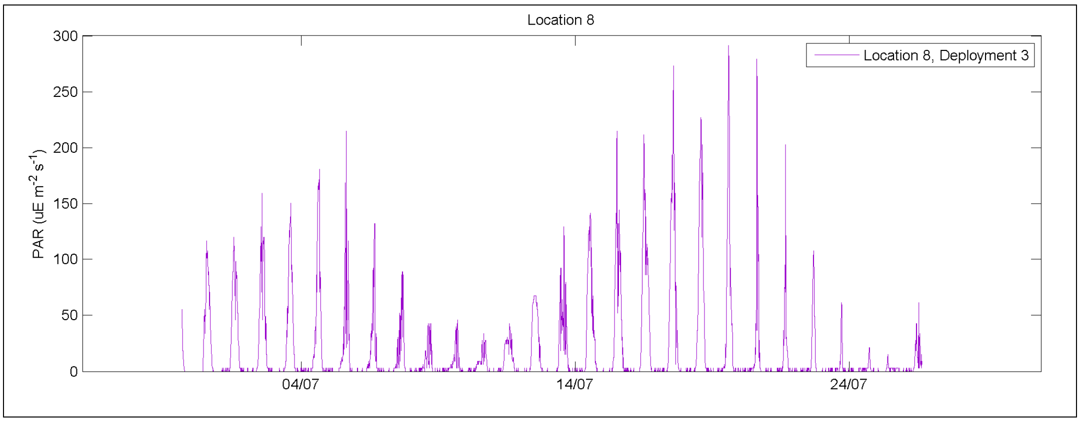


Figure 5-22 PAR at Location 8 where Water Level Range Not Recorded

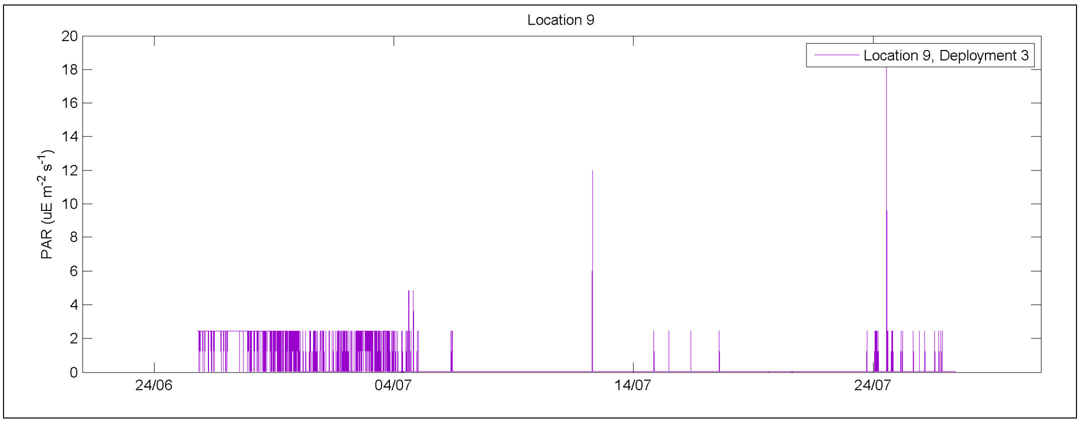


Figure 5-23 PAR at Location 9 with Water Level Range of 13-17 m

5.5.4 Accumulated Suspended Solids Deposition

Both the 10-minute record values and the cumulative value over each deployment of the accumulated suspended sediment deposition (ASSD) recorded over the four deployments is plotted in Figure 5-24 to Figure 5-28. As no sediment traps were deployed to correlate with this indirect measure of sedimentation, and owing to the high variability between and within deployments, ASSD is not considered quantitatively reliable; rather a qualitative measure of when high deposition events occur. For example, based on the net sedimentation measurements the duration to accumulate 30 cm of sediment ranges from 2 (i.e. Location 4, Period 3) to 70 (Location 3, Period 2) years.

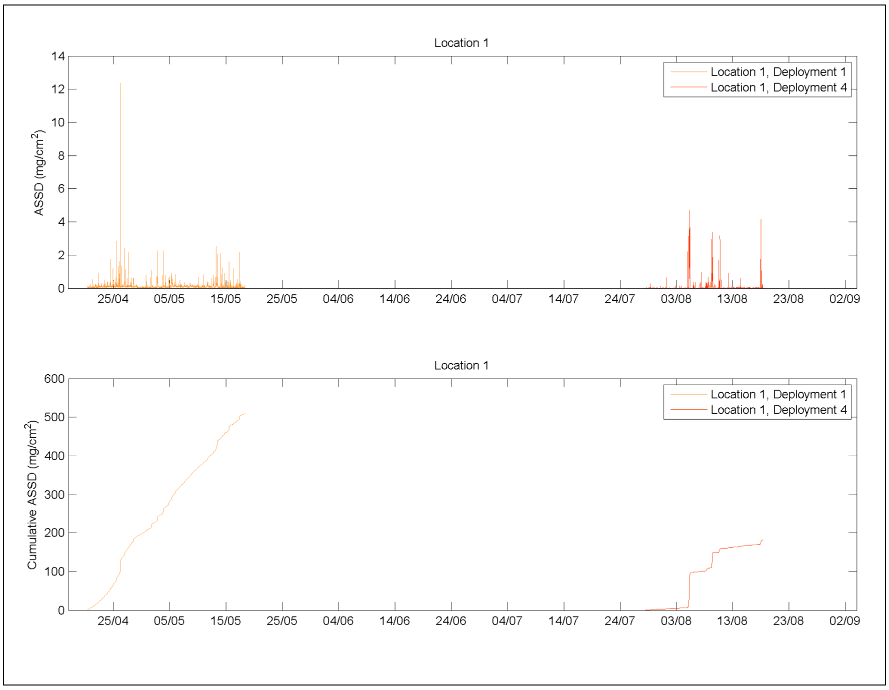


Figure 5-24 Time Series of ASSD over 10 Minute Intervals and Cumulative ASSD over each Deployment at Location 1

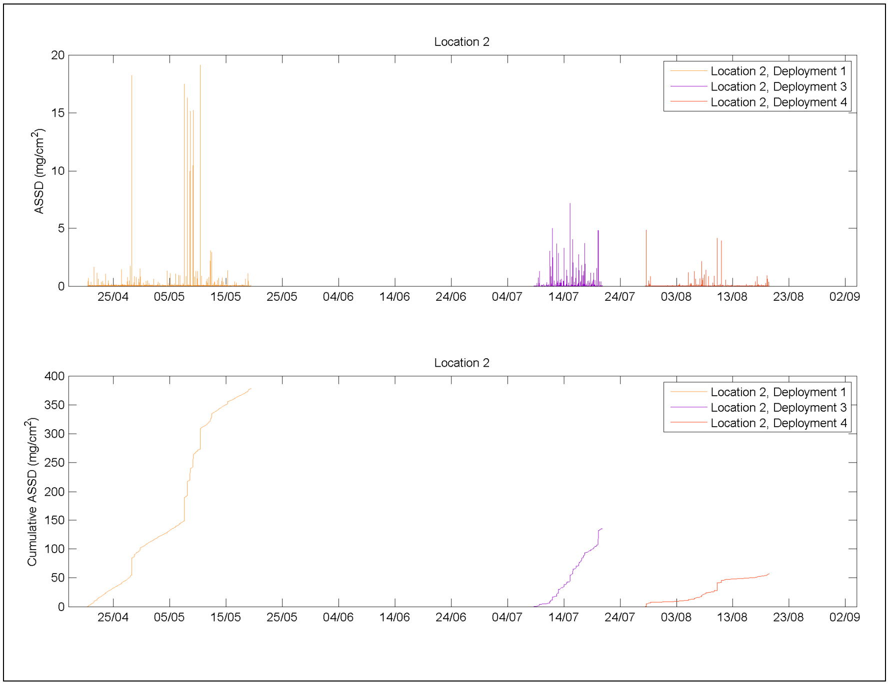


Figure 5-25 Time Series of ASSD over 10 Minute Intervals and Cumulative ASSD Over Each Deployment at Location 2

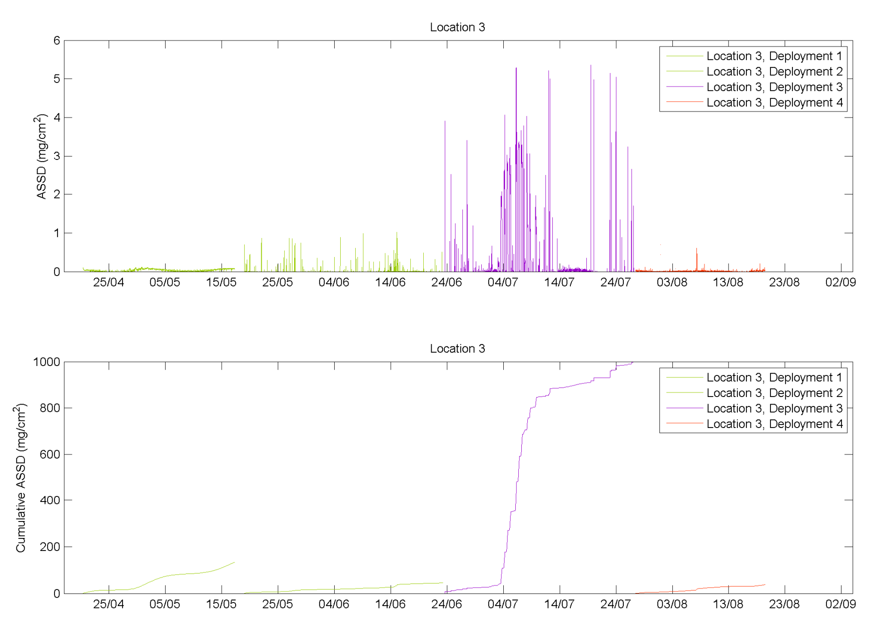


Figure 5-26 Time Series of ASSD Over 10 Minute Intervals and Cumulative ASSD Over Each Deployment at Location 3

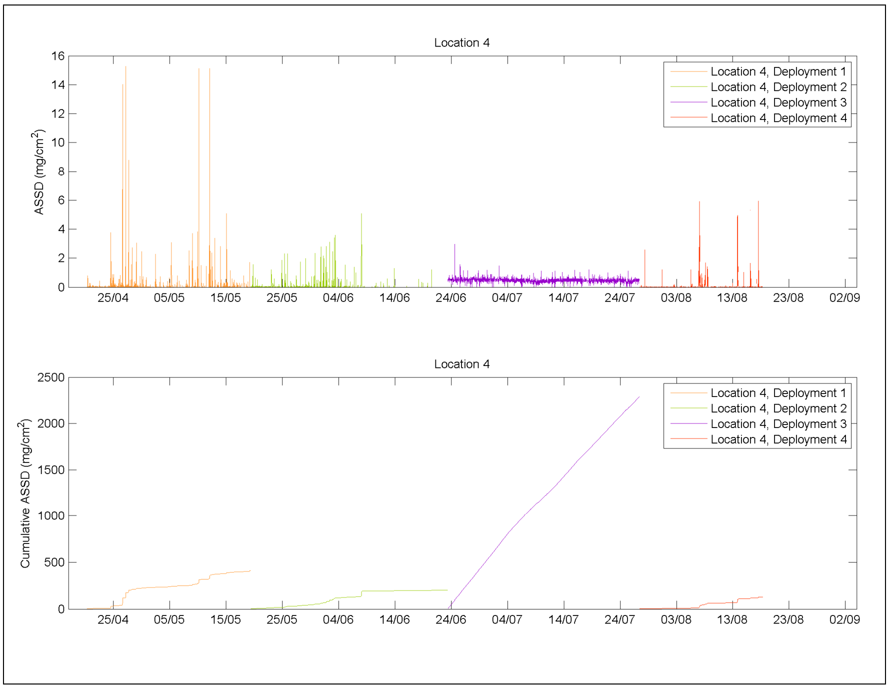


Figure 5-27 Time Series of ASSD Over 10 Minute Intervals and Cumulative ASSD Over Each Deployment at Location 4

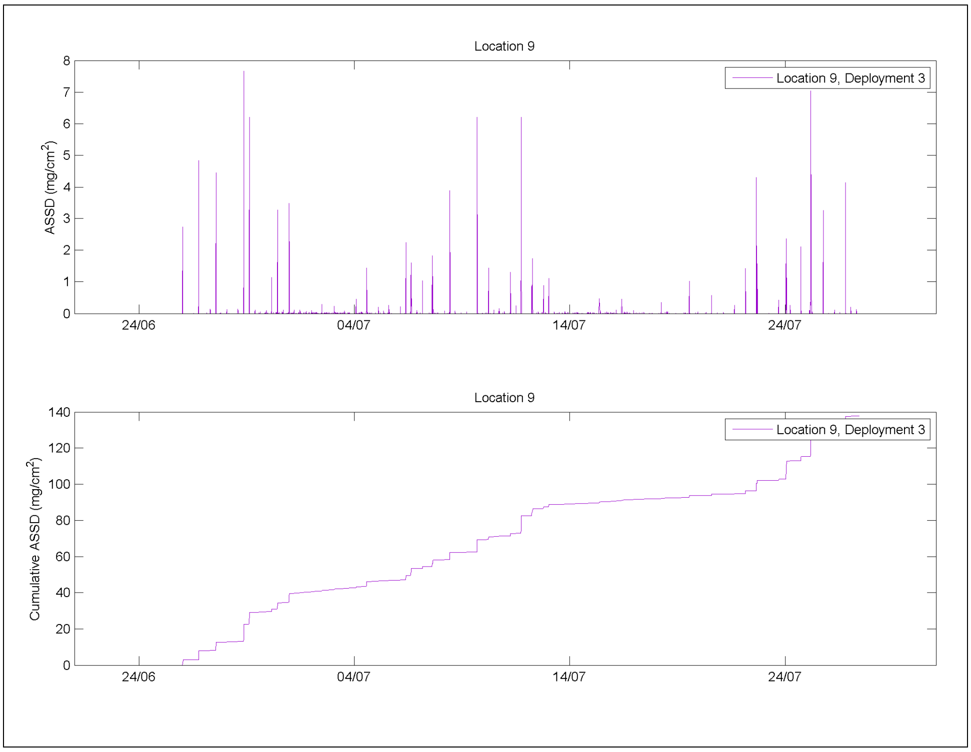


Figure 5-28 Time Series of ASSD Over 10 Minute Intervals and Cumulative ASSD Over Each Deployment at Location 9

5.5.5 Water Depth

Variations in water depth recorded over the four deployments are plotted in Figure 5-29 to Figure 5-33 at locations that were equipped with a depth sensor. Changes in depth between deployments are evident, as the instruments were bought to the surface and redeployed at slightly different locations.

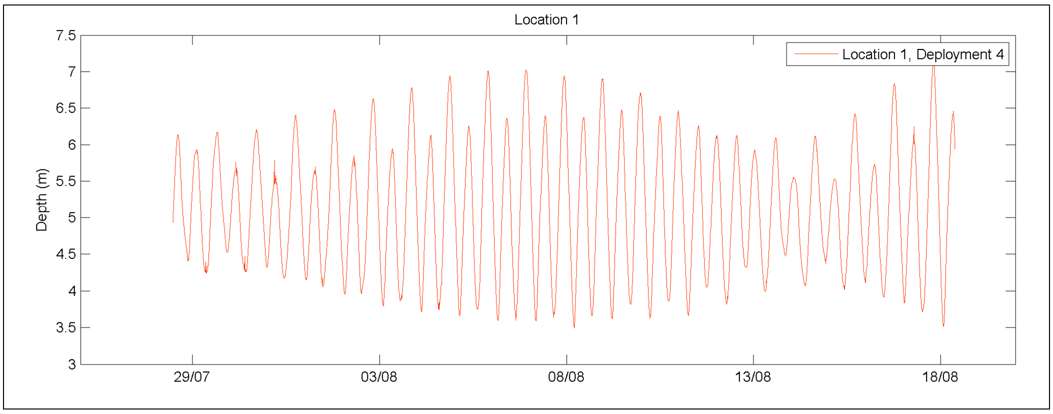


Figure 5-29 Water Depth at Location 1

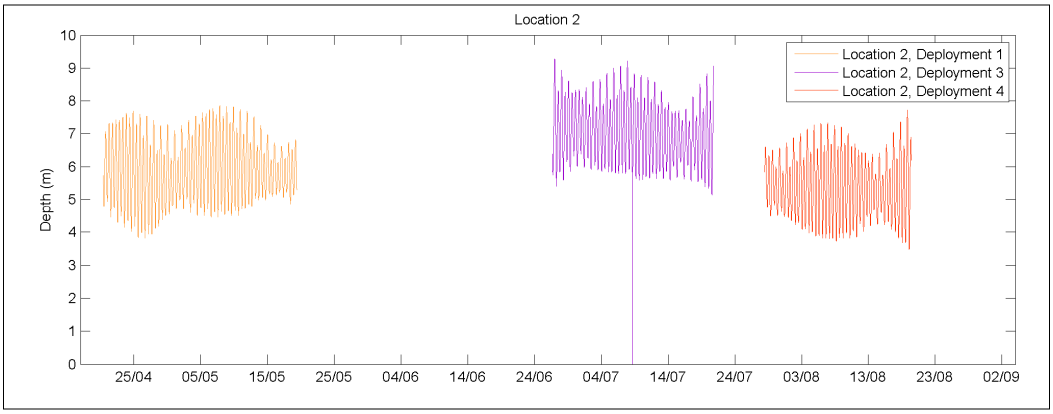


Figure 5-30 Water Depth at Location 2

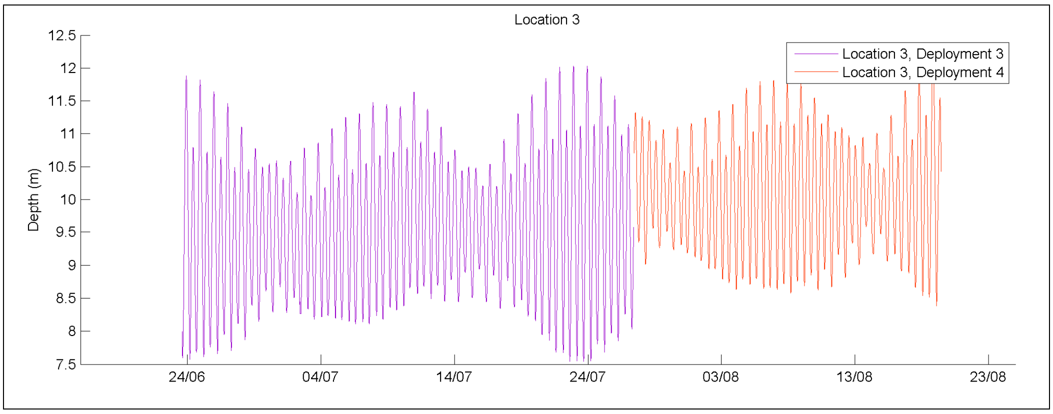


Figure 5-31 Water Depth at Location 3

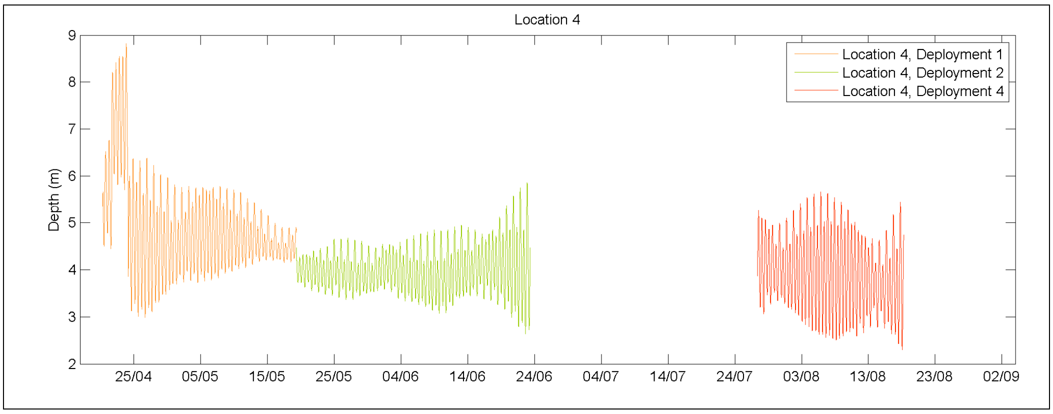


Figure 5-32 Water Depth at Location 4

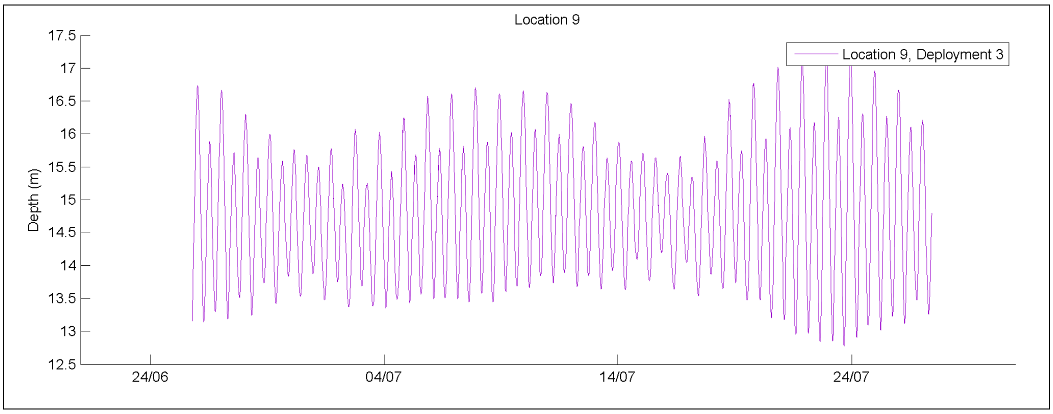


Figure 5-33 Water Depth at Location 9

5.5.6 Wave Height

Wave height data (extracted from variation in the pressure signal) is plotted in Figure 5-34 to Figure 5-38. Changes in depth between deployments are evident, as the instruments were bought to the surface and redeployed at slightly different locations. Firstly wave height measurements are extremely low. Secondly, because of the depth of most deployments (ca. >5 m), waves are not likely to influence resuspension.

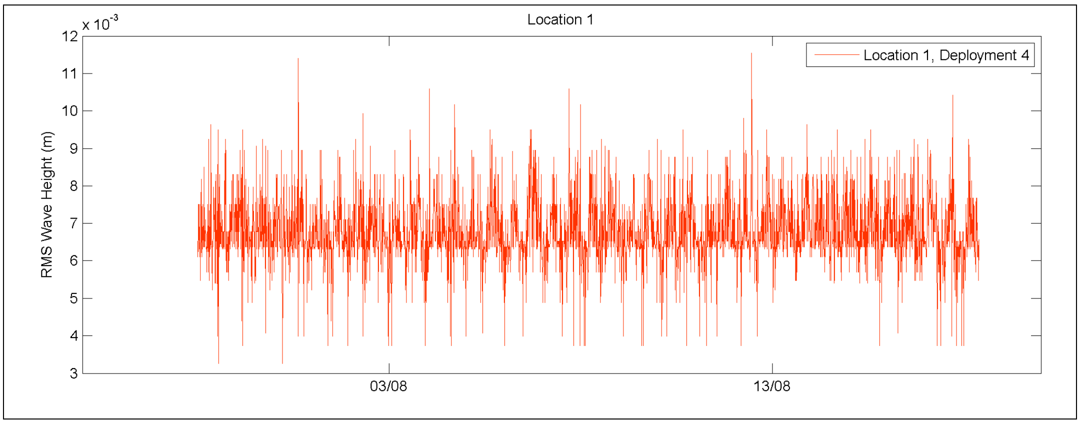


Figure 5-34 Wave Height at Location 1

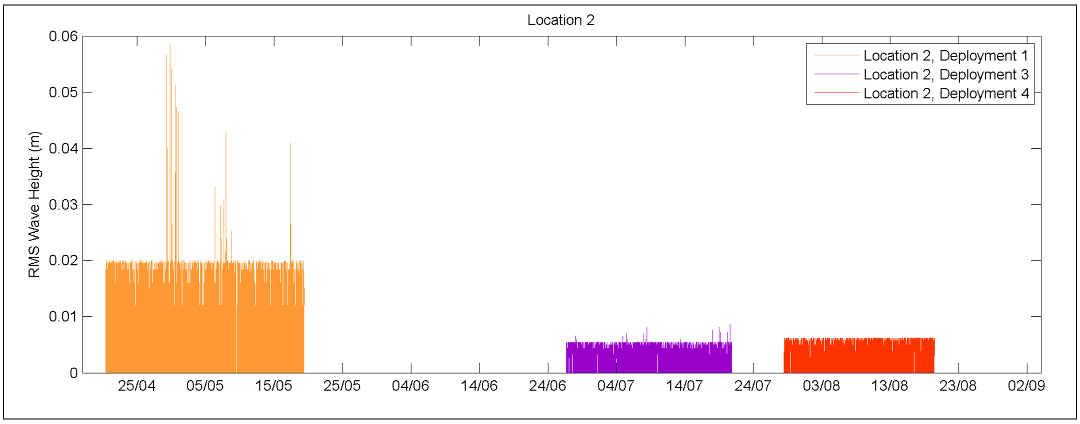


Figure 5-35 Wave Height at Location 2

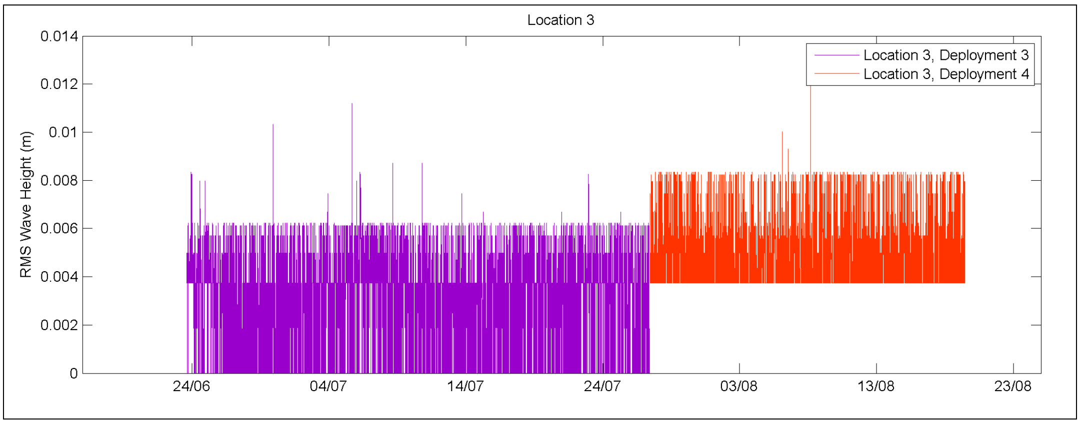


Figure 5-36 Wave Height at Location 3

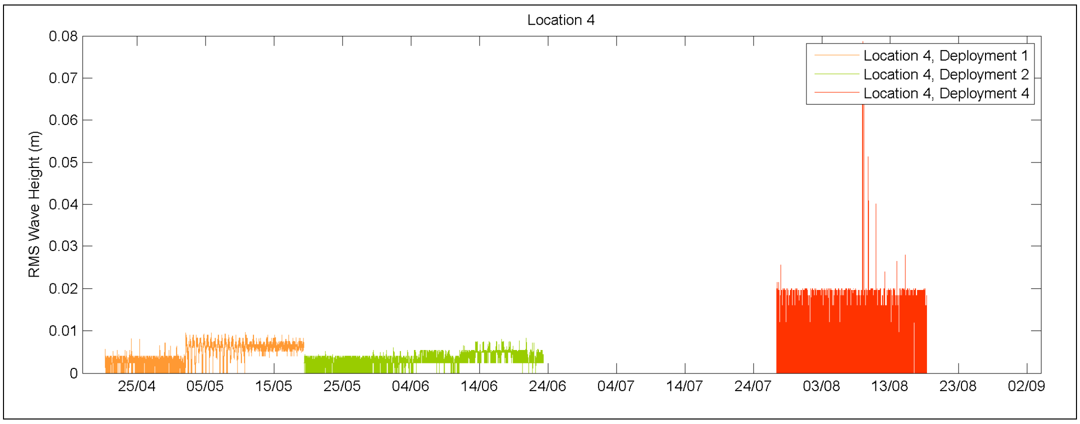


Figure 5-37 Wave Height at Location 4

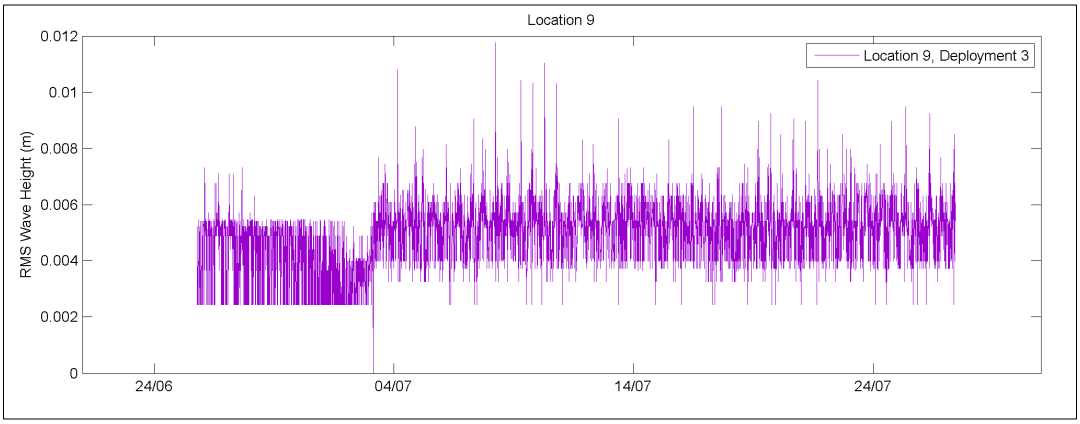


Figure 5-38 Wave Height at Location 9

5.6 Summary of Baseline Water Quality in the Project Area

This section provides a summary of the water quality data that is based on the baseline monitoring data collected for this EIS and other available recent turbidity logger data within the Project Area.

5.6.1 Turbidity

Results for turbidity (monthly and continuous data) and suspended solids indicate that the Project Area is a naturally turbid system. The continuous logger data indicates that turbidity is regularly elevated above the QWQG (2006) and ANZECC (2000) guidelines. Turbidity logger data indicates the following characterisation of the Project Area:

- The median and 95th percentile turbidity ranges during the dry season in deep waters (approximately >2 m LAT) of the Project Area are 3-9 NTU and 11-35 NTU, respectively;
- The median and 95th percentile turbidity ranges during the dry season in shallow waters (approximately <2 m LAT) of the Project Area are 9 NTU and 30-90 NTU, respectively;
- The median and 95th percentile turbidity ranges during the wet season in shallow waters of the Project Area are 10-23 NTU and 127-176 NTU, respectively; and
- During the dry season the turbidity during spring tide conditions is 2-4 times those in neap tide conditions.

Though the data available indicates that the turbidity is substantially higher during the wet season, much less data has been collected over this period relative to the dry season (approximately 15% of all data). As such, it is possible that the wet season statistics may be heavily biased towards individual events during the wet season as the record is not sufficiently long to ascertain otherwise.

Nonetheless, two environmental variables appear to influence sediment concentrations in the water column in the Project Area; tidal state current speeds that induce resuspension of bottom sediments and wet season inflows from the catchment, both of which are natural events.

Monthly turbidity profiles (surface, mid-depth, bottom) for this EIS support the dry season deep water characterisation with a range of 5-30 NTU over four monthly field events.

The adopted relation between turbidity and TSS in Figure 5-17 is a piece-wise linear function, based on the largest and most consistent dataset available and is defined as follows:

- TSS = 1.12 x [turbidity] where [turbidity] is between 0 and 7 NTU; and
- TSS = 3.68 x [turbidity] – 17.92 where [turbidity] is greater than 7 NTU.

5.6.2 Water Quality

The majority of water quality parameters analysed from the vessel-based monitoring program were below the limit of reporting except for:

- One herbicide, metolachlor, exceeded the limit of reporting on six out of thirty-six recordings;
- One organophosphorus pesticide, chlorpyrifos, exceeded the limit of reporting on six out of thirty-six recordings;

- Of the dissolved metals, aluminium, arsenic, barium, cadmium, chromium (III+VI), copper, iron, manganese, nickel, silver and vanadium had some measurements above their respective limit or recording. Only cadmium exceeded the ANZECC (2000) trigger value on two occasions;
- All nitrogen nutrient species exceeded the QWQG (2006) and/or ANZECC (2000) guidelines on at least one occasion over the monitoring period. The most regularly exceeded guideline levels were:
  - Total oxidised nitrogen with a median of 0.004 mg/L above the QWQG (2006) guideline level of 0.003 mg/L;
  - Total nitrogen with a median of 0.135 mg/L exceeded the ANZECC (2000) guideline level of 0.1 mg/L on 37 occasions;
- Both reactive and total phosphorus were always lower than the QWQG (2006) guideline levels. Reactive phosphorus exceeded the ANZECC (2000) guideline level of 0.005 mg/L on 6 occasions;
- Chlorophyll *a* exceeded both the QWQG (2006) and ANZECC (2000) guideline levels on 8 and 13 occasions, respectively, out of a total of 48 samples over the monitoring period;
- Laboratory and *in situ* pH tended to be below the lower limit specified in both the QWQG (2006) and ANZECC (2000) guidelines, but not above the upper limit;
- TSS exceeded the QWQG (2006) guideline level of 15 mg/L on 28 occasions out of the forty-eight measurements with a median TSS of 18 mg/L;
- *In situ* turbidity tended to be near the upper limit of the ANZECC (2000) guideline range of 20 NTU and above the CWQG (2006) guideline of 6 NTU; and
- *In situ* DO saturation tended to be within the CQWQ (2006) guideline range of 90-100% with occasional measurements above or below this range.

The results indicate that anthropogenic contaminant inputs are minor (one herbicide, one pesticide, one metal) and that nitrogen regularly exceeds the adopted guidelines. This may indicate anthropogenic input of nitrogen from urban and agricultural sources (e.g. sewage effluent and fertilisers), but this may also result from naturally high levels in the Project Area.

5.6.3 Elutriate Water Quality

Concentrations of metals, metalloids and ammonia were generally much higher that those levels recorded in the water column or the relevant ecosystem water quality guidelines, so mobilisation of these water quality parameters need to be assessed with regards to potential impacts during dredging works on the Project Area.

6. Potential Impacts and Mitigation Measures

6.1 Project Activities

The Western Basin Dredging and Disposal Project is expected to require the following construction works:

- Construction of a rock revetment bund;
- Reclamation of land;
- Dredging to deepen and widen existing channels;
- Dredging of new channels, swing basins, berth pockets; and
- Rehandling of dredge materials into the reclamation.

To facilitate construction of the reclamation a rock revetment bund will be established. This bund, it is understood, will be lined with geofabric material to reduce the potential for leaching of fine sediments back into the marine environment through the bund wall during reclamation and dewatering works. Rehandling of some dredged material, that collected by a trailer suction hopper dredger, is expected to be required. Dredged material will be deposited adjacent to the eastern face of the revetment before being rehandled into the reclamation area.

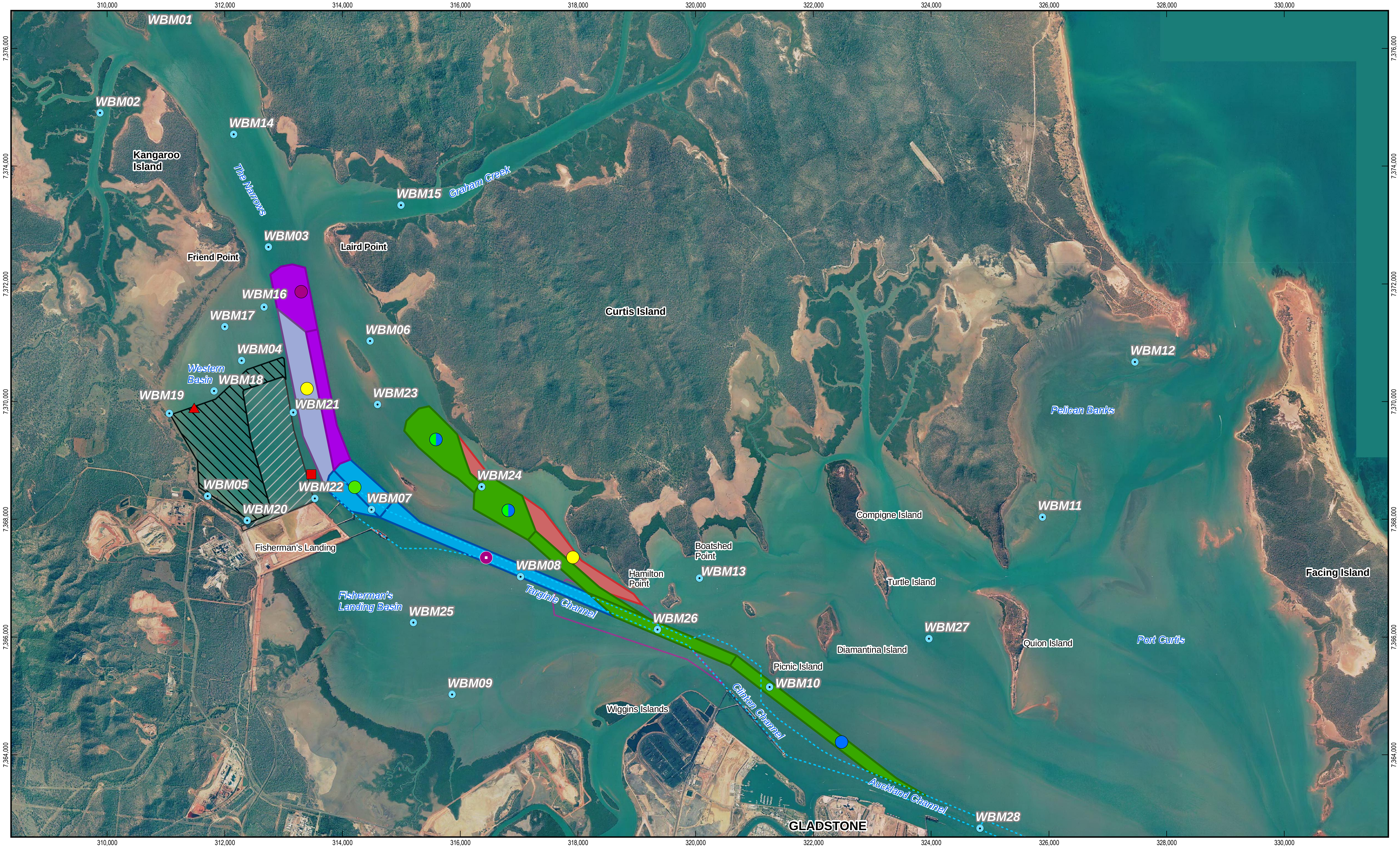
The positioning of the reclamation works will create a tidally influenced channel on the western side of the reclamation works adjacent to the existing soft sediment, mangrove fringed, shoreline. The channel is proposed to be 40 m in width from the edge of the mangroves to the revetment.

Dredging activities for the channels are expected to occur in three phases. These are identified on Figure 6-1. Stages 1A and part of stage 1B (Stage 1) are expected to be dredged from 2010 to 2011 (over a period of two years). The remainder of Stage 1B and Stage 2 are expected to commence in 2012 and require a period of 12 months to complete. Stages 3 and 4 could commence in 2013, as required and will be undertaken to meet market demand. It is expected that large cutter suction dredges (CSD) will be used for the majority of works with a large trailer suction hopper dredger (TSHD) required for some works in Stage 1A in the Clinton Bypass Channel area and Stage 1B.

For the purposes of this water quality impact assessment, the following activities were considered to fall within the construction phase of the proposed development:

- Construction of the bund wall;
- Dredging, rehandling and placement of material within the bund; and
- Decant of tailwaters from placement of dredged material within the bund.

The exact nature of the import and export industries that will develop on the Western Basin site once the reclamation process is complete are not currently defined. As such, this EIS does not specifically address the potential impacts of these future developments.



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Kilometres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 56

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LEGEND

▲ Decant Outfall	◐ CSD Scenario 1a, 1b	🟩 Stage 1A - North China Bay LNG	▨ Western Basin Reclamation Area
🟥 TSHD Dumping/ CSD Rehandling	● CSD Scenario 2	🟦 Stage 1B - Fisherman's Landing LNG	▨ Fisherman's Landing Northern Expansion
● TSHD Scenario 1a	⊙ TSHD Scenario 2	🟪 Stage 2 - Laird Point LNG	▭ Existing Channels, Swing Basins and Berths
● CSD Scenario 1b	● CSD Scenario 3	🟪 Stage 3 - Fisherman's Landing	▭ Wiggins Island Coal Terminal (Approved)
	⊙ Model Output Location	🟥 Stage 4 - Hamilton Point	

GHD

Port of Gladstone
Western Basin Dredging and Disposal Project
Project Area with outlines of each Stage of Dredging Works, the Developed Reclamation and the Locations of Model Output Time Series

Job Number	42-15386
Revision	A
Date	30 Aug 2009

Figure 6-1

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6.2 Modelling Overview

As described later in this chapter, limited offsite water quality impacts are expected from CSD operation. However, the TSHD will likely produce more extensive plumes, which will, depending on the tide, extend up to The Narrows and out past Barney Point. This report summarises the water quality impacts associated with the construction of the developed reclamation and dredging channels. In addition to the water quality data described in Chapter 5, this chapter relies on the Numerical Modelling Studies Report (WBM 2009, Appendix J of main EIS) for this EIS to predict the Project's impacts on hydrodynamics, flushing, turbidity climate and sedimentation that may potentially be experienced in Port Curtis under the proposed reclamation and dredging operations associated with the Project.

6.2.1 Methodology for Hydrodynamic and Flushing Simulations

The predicted changes to hydrodynamics and flushing efficiency from the Project, which in turn can impact water quality, were assessed with a numerical hydrodynamic model (WBM 2009). Four scenarios were simulated, namely:

- Base case – Existing conditions including approved dredge works in the Wiggins Island area (already approved);
- Scenario 1 – Base case with Western Basin bund and Stage 1A and Stage 1B (Stage 1) dredging;
- Scenario 2 – As for Scenario 1 along with Stage 1B (Full) and Stage 2 dredging; and
- Scenario 3 – As for Scenario 2 along with Stages 3 and 4.

These simulated hydrodynamic/flushing scenarios are described in Table 6-1. Each hydrodynamic modelling scenario was simulated assuming the existence of the fully developed reclamation and completion of dredging works. This allows impact assessment of the hydrodynamics/flushing after the completion of dredging scheduled for each scenario.

Table 6-1 Overview of the Four Hydrodynamic Modelling Scenarios

Scenario	Stages	Details
Base		**Existing Reclamation** - Existing Fisherman's Landing reclamation **Dredging** - Existing Channels - Present Fisherman's Landing Berth 1 - Ultimate Wiggins Island Coal Terminal

Scenario	Stages	Details
Scenario 1	**Reclamation** Western Basin reclamation fully constructed **Dredging** Stage 1A Stage 1B (Stage 1)	**Developed Reclamation** - Area to north of existing Fisherman's Landing reclamation - Setback buffer from shoreline 40m **Stage 1A** - Clinton Bypass channel 200m wide at -13m LAT - Spur channel to China Bay 200m wide at -13m LAT - China Bay Swing Basins (2) 600m wide at -13m LAT **Stage 1B (Stage 1)** - Targinie Channel 180m wide at -10.6m LAT - Fisherman's Landing Bulk Liquids Wharf Swing Basin 550m wide at -10.6m LAT - Fisherman's Landing Bulk Liquids Wharf Swing Berth to 430m long at -12.5m LAT
Scenario 2	Scenario 1 completed **Dredging** Stage 1B (fully developed) Stage 2	**Stage 1B (Fully Developed)** - Targinie Channel 180m wide at -13.0m LAT - Fisherman's Landing Swing Basin 650m wide at -13.0m LAT - Fisherman's Landing Bulk Liquids Wharf Swing Berth to 430m long at -13.0m LAT **Stage 2 Dredging** - Channel extension to Laird Point 200m wide at -13m LAT - Laird Point Swing Basin approx 650m wide at -13m LAT
Scenario 3	Scenario 1 completed Scenario 2 completed **Dredging** Stage 3 Stage 4	**Stage 3 Dredging** - Berth and Swing Basins to Laird Point 450m wide (total 650m) at -13m LAT **Stage 4 Dredging** - China Bay and Hamilton Point additional Swing Basins and Departure Areas at -13m LAT

Modelling assessments indicate that the effects on the hydrodynamics within the Project Area are not consistent across sites or tides and will include:

- Changes in water velocity;
- Changes in water levels;
- Changes in bed shear stresses; and
- Changes in tidal flows.

These are described in detail the complementary Numerical Modelling Studies Report (Appendix J of main EIS).

The various construction and operation activities for the Project are expected to result in a range of impacts on the water quality within the Project Area, including reduced flushing of dissolved constituents and increased turbidity levels from dredging, which are described in the following sections.

6.2.2 Methodology for Dredge Plume Simulations

Turbidity (or TSS) plumes generated from the dredging operations were assumed to occur from:

- Dredge head TSS source during dredging by Trailer Suction Hopper Dredge (TSHD) and Cutter Suction Dredge (CSD);
- TSHD hopper overflowing during dredging;
- TSHD hopper dumping at a rehandling site in vicinity of Fisherman's Landing berth and swing basin; and
- Decant discharge from the reclamation.

Simulations only modelled the "dredge plume", which is the TSS in the water generated from dredging above natural background levels after settling of coarser material (i.e. cobbles, gravel, large sand particles, clay clumps). The increased TSS/turbidity from the dredge plume and the additional sediment deposition are two of the primary potential environmental impacts arising from the Project. Details of the derivation of loadings, plume settling parameters and relations, and dredge plume and decant particle sizes are given in the Numerical Modelling Studies Report (Appendix J of main EIS).

Dredging is proposed to occur progressively over a number of stages with combinations of:

- Large CSDs with dredge slurry pumped to the reclamation and eventually discharging via the decant outlet (after sufficient residence time to allow substantive TSS settling);
- A large TSHD at locations not practical for the CSD pumped slurry operation; and
- A medium CSD for rehandling of at the TSHD rehandling location.

These stages have been grouped into four dredge plume scenarios as outlined in Table 6-2. Definition of the TSS loading from each source to generate dredge plumes are also summarised in Table 6-2. All dredge plume loads were simulated as stationary sources with TSS inputs into a single model "cell", which assumed:

- Continuous operation for the CSDs and decant sources; and
- A continuous TSHD cycle of 3 hours with 1 hour of hopper filling (and overflow) during dredging and a 10 minute period of dumping.

These are deemed to be conservative plume modelling assumptions as not all dredgers can maintain continuous operations. Further, all plume modelling assumed the bathymetry for each scenario was at the initiation of dredging, which may be considered as a conservative measure as less volumetric dilution is simulated.

Table 6-2 Overview of the Four Dredge Plume Scenarios and Associated TSS Loadings

Scenario	Stage	Description	Loading
1a	1A	Western Basin Middle with Large CSD	4 kg/s continuous
		Western Basin North with Large CSD	4 kg/s continuous
		Decant from Piped Slurry from Western Basin Middle & North Direct to Reclamation	100 mg/L TSS @ 5 m^3/s
		Clinton Wedge & Bypass, Western Basin South with Large TSHD	75 kg/s for 1 hour every 3 hours
		Dumping at Fisherman's Landing Dumping Ground with Large TSHD	340 kg/s for 10 min every 3 hours
		Rehandle at Fisherman's Landing with Medium CSD	4 kg/s continuous
		Decant from Piped Slurry from Fisherman's Landing Rehandling Site Direct to Reclamation	100 mg/L TSS @ 1.25 m^3/s
1b	1A	Western Basin Middle with Large CSD	4 kg/s continuous
		Western Basin North with Large CSD	4 kg/s continuous
		Decant from Piped Slurry from Western Basin Middle & North Direct to Reclamation	100 mg/L TSS @ 5 m^3/s
	1B Stage 1	Fisherman's Landing Swing Basin with Large TSHD	75 kg/s for 1 hour every 3 hours
		Dumping at Fisherman's Landing Dumping Ground with Large TSHD	340 kg/s for 10 min every 3 hours
		Rehandle at Fisherman's Landing with Medium CSD	4 kg/s continuous
		Decant from Piped Slurry from Fisherman's Landing Rehandling Site Direct to Reclamation	100 mg/L TSS @ 1.25 m^3/s

Scenario	Stage	Description	Loading
2	2	Laird Point with Large CSD	4 kg/s continuous
		Decant from Piped Slurry from Laird Point to Reclamation	100 mg/L TSS @ 2.5 m^3/s
	1B Full	Targinie Channel with Large TSHD	75 kg/s for 1 hour every 3 hours
		Dumping at Fisherman's Landing Rehandling Site with Large TSHD	340 kg/s for 10 min every 3 hours
		Rehandle at Fisherman's Landing with Medium CSD	4 kg/s continuous
		Decant from Piped Slurry from Fisherman's Landing Rehandling Site Direct to Reclamation	100 mg/L TSS @ 1.25 m^3/s
3	3	Fisherman's Landing North with Large CSD	4 kg/s continuous
	4	Hamilton Point with Large CSD	4 kg/s continuous
	3 & 4	Decant from Piped Slurry from Fisherman's Landing North and Hamilton Point Direct to Reclamation	100 mg/L TSS @ 5 m^3/s

6.3 Impacts of Construction of the Reclamation on Water Quality

This section outlines the potential water quality impacts associated with:

- Construction of the bund; and
- Filling of the bund

6.3.1 Construction of Bund Wall

Potential Impacts

Construction of the bund will involve placement of core material and rock armour by trucks. It is not proposed to remove the soft surface sediments before placement of the rock as this is not necessary to achieve the agreed design criteria for geotechnical stability of the bund wall. Therefore, as the rock is placed onto the seabed during the construction of the bund wall, soft sediments will be mobilised into the water column and will also be pushed out the front and sides of the bund wall. This is likely to result in the generation of a small yet visible turbid plume. While a turbid plume will reduce light penetration over nearby seagrass beds, these meadows experience elevated turbidity on a regular basis through natural tidal resuspension of the soft seabed sediments. It is likely that any sediments disturbed by the construction of the bund wall that deposit over the seagrass beds will be remobilised and transported away from the tidal flats again during tidal movements and elevated wave conditions.

The disturbance of the soft seabed sediments will be limited to the first layer of rocks, after which any additional rock for that section will be placed on rock and not the soft seabed sediments. Therefore, the generation of plumes through the placement of rock is likely to be transient. Also, migration of turbid plumes will be somewhat minimised by the presence of the rock on the seabed, which will act to reduce water movement in the immediate vicinity of the bund construction as the height of the rock increases.

There will be an increased risk of remobilisation of the mud wave during elevated wind and wave conditions, or during spring tides. The potential for waves to erode core material during storm (cyclone) conditions may arise over the course of construction, although armouring of the core should be close behind the rate of core construction.

There is the potential for spillage (either minor, through drips or major through a leak/accident) of oils and fuels from construction equipment to impact on marine water quality.

Mitigation

Generation of turbid plumes by the placement of rock during bund construction can be limited through control of the material being used. The fine material (<20 mm) will be scalped from the core material for the bund wall, removing this potential source of turbid plume generation during construction. The erosion of core material by waves during potential storm conditions will be managed by placement of armour material to the exposed face of the core material closely behind the core work face. A small stockpile of armour material will be held at the quarry, sufficient to cover any exposed core if a cyclone were to approach. Contingency planning for a storm may require the placement of the stockpiled armour material to cover exposed faces of the core material. A maximum unarmoured length of 50 m will be maintained during construction.

Monitoring and management of any material that is displaced above LAT or its current elevation will be undertaken in accordance with an Acid Sulphate Soil Management Plan (ASSMP).

No refuelling or maintenance of construction equipment will occur on the site, nor will equipment be parked at the site for a significant time, reducing the potential for significant spills of oils and fuels to occur. All construction equipment will undergo regular maintenance and pre-start inspections will be undertaken on a daily basis to identify any leaks. Spill kits for land and water based spills will be kept at the site and personnel trained in their use. Emergency response procedures will be established.

6.3.2 Filling of the Bund

Potential Impacts

The bund design includes the placement of geotextile fabric on the inner face of the bund before commencement of filling operations. This will act to minimise the migration of fines through the bund wall and into the surrounding waters from the differential pressures created on either side of the wall by the rise and fall of the tide. Once a significant amount of dredged material is beached against the inner wall, this will also act as a filter layer to assist in preventing the migration of fine material through the bund wall into the receiving environment. Therefore, minimal direct impacts to water quality are expected from the filling of the bund with dredged material. The potential impacts of decant waters are discussed in Section 6.5.

Mitigation Measures

No further mitigation measures are recommended for construction of the reclamation as minimal impacts to water quality are expected.

6.4 Impacts of the Reclamation and Dredging on Hydrodynamics and Flushing

This section outlines the potential impacts of the developed reclamation and dredging channels on the hydrodynamics and flushing efficiency of the Project Area. Changes to hydrodynamics (water level and current speed) can affect turbidity via re-suspension. Changes to the flushing efficiency can modify the water quality because of differences with coastal oceanic exchange. Hence, impacts to hydrodynamics and flushing are needed to assess impacts to water quality.

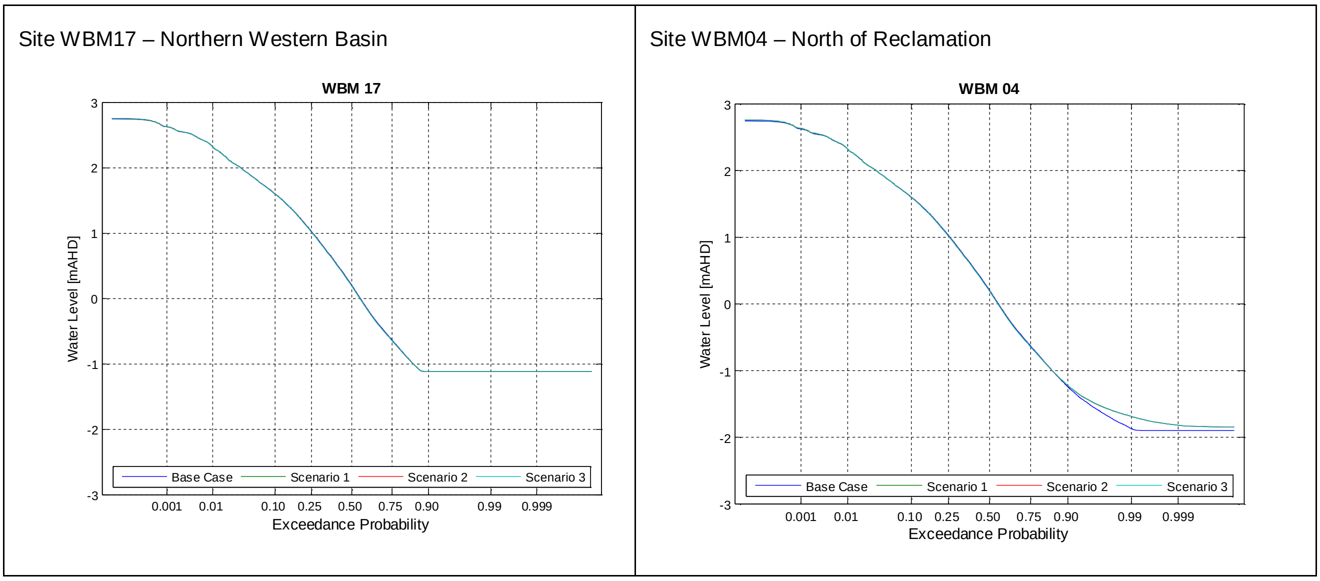
6.4.1 Hydrodynamics

Potential Impacts Affecting Turbidity

Changes to hydrodynamics (water level and current speed) can affect turbidity via the process of re-suspension. Predicted impacts on water levels at two shallow locations in the northern Western Basin inter-tidal area (refer WBM04 and WBM17 sites in Figure 6-1) are considered here owing to their proximity to the developed Reclamation Area and seagrass beds. Results are presented in the form of exceedance plots in Figure 6-2. These show no change at WBM17, and only a minor change at WBM04.

Water level differences (time of low tide) are predicted to be more substantive in the 40 m tidal channel (refer sites WBM20 and WBM05) and the immediate vicinity of the northern perimeter of the reclamation wall (refer sites WBM19 and WBM18).

Water level variations in other regions of the Project Area are more subtle as detailed in the Numerical Modelling Studies Report (Appendix J of main EIS).

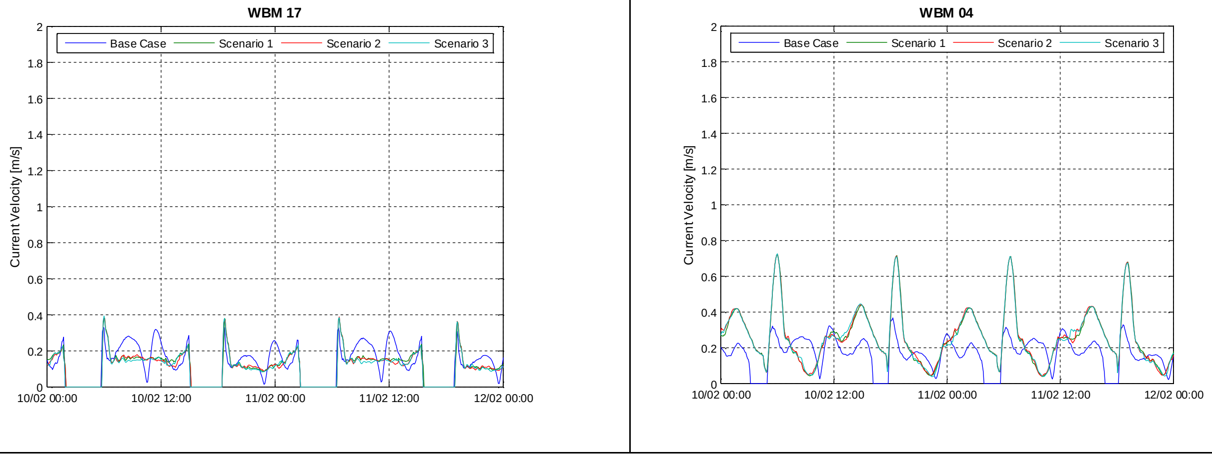


Site WBM17 – Northern Western Basin

Site WBM04 – North of Reclamation

Figure 6-2 Probability Exceedance Plots of Water Level at Two Locations in the Western Basin Intertidal Area

Predicted current velocity impacts during spring tides (10-12 February 2009) at the same two locations (WBM17 and WBM04) again illustrate that the effect of the reclamation (difference between Base Case and Scenario 1) is greater than expansion of dredged areas (differences between Scenarios 1, 2 and 3) (Figure 6-3). At WBM04. as with other locations around the perimeter of the developed reclamation, current velocities are generally predicted to increase. In contrast, at the northern Western Basin location at WBM17, current velocities are predicted to become more consistent. In short, the impacts to current speeds in the inter-tidal and sub-tidal areas decreases with distance north from the reclamation and proximity to the deeper channels.

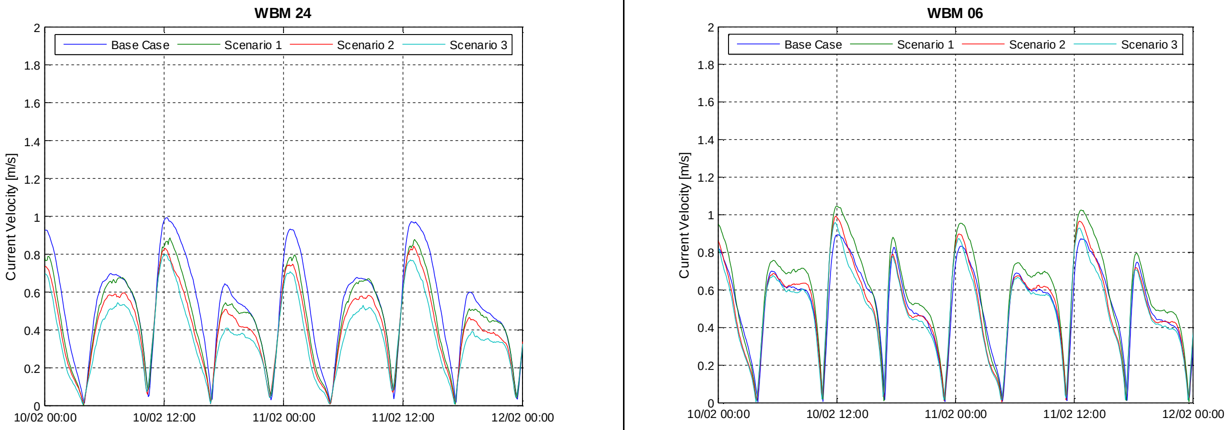


Site WBM17 – Northern Western Basin

Site WBM04 – North of Reclamation

Figure 6-3 Time Series of Spring tide Current Speeds at Two Locations in the Western Basin Inter-tidal Area

Predicted current velocity impacts at two locations within a newly dredged area (WBM24) and upstream of a newly dredged channel (WBM06) are illustrated in Figure 6-3. The impact on spring tide current speeds at WBM24 is a decrease with each successive scenario that deepens the channel. In contrast, the impact on spring tide current speeds at the upstream location (WBM 06) are smaller in scale.



Site WBM24 – China Bay Swing Basin

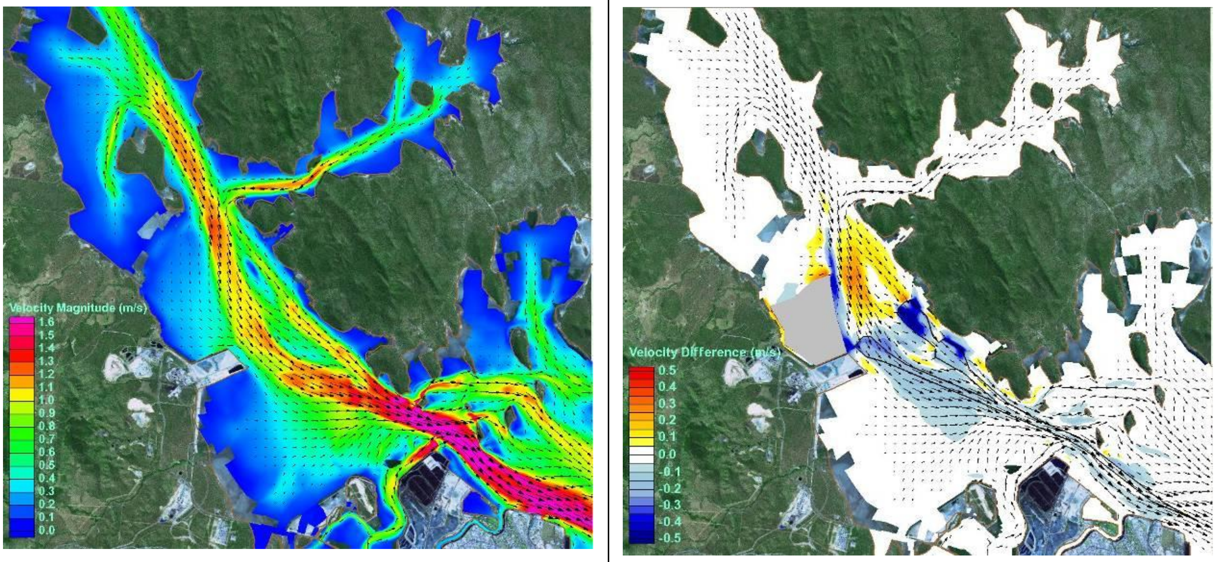
Site WBM06 – Curtis Channel

Figure 6-4 Time Series of Spring Tide Current Speeds at Two Locations in or Near Newly Dredged Areas

Predicted spatial water velocity impacts between the base case and the three scenarios during spring ebb tides (simulation date and time: 10 February 2009 at 12:30) generally exhibit lower peak velocities in dredged areas and higher peak velocities in the upstream regions of completed dredging channels during each stage (Figure 6-5). For the reclamation the increased velocities at the north-eastern corner is expected as this is a topographic constraint during ebb tides. This snap shot (results at a given instant) indicates the model predicts increased velocities upstream of dredged areas, at the north-eastern corner of the reclamation and in the narrow tidal channel bounded by the reclamation and shoreline. Decreased velocities are predicted in the dredged areas as well as along the eastern margin of the reclamation. Similar patterns occur during flood tide cycles, though the high velocities along the north-eastern corner are not predicted.

Base Case Ebb Spring Tide

Scenario 1 – Base Case (Ebb Spring Tide)



Scenario 2 – Base Case (Ebb Spring Tide)

Scenario 3 – Base Case (Ebb Spring Tide)

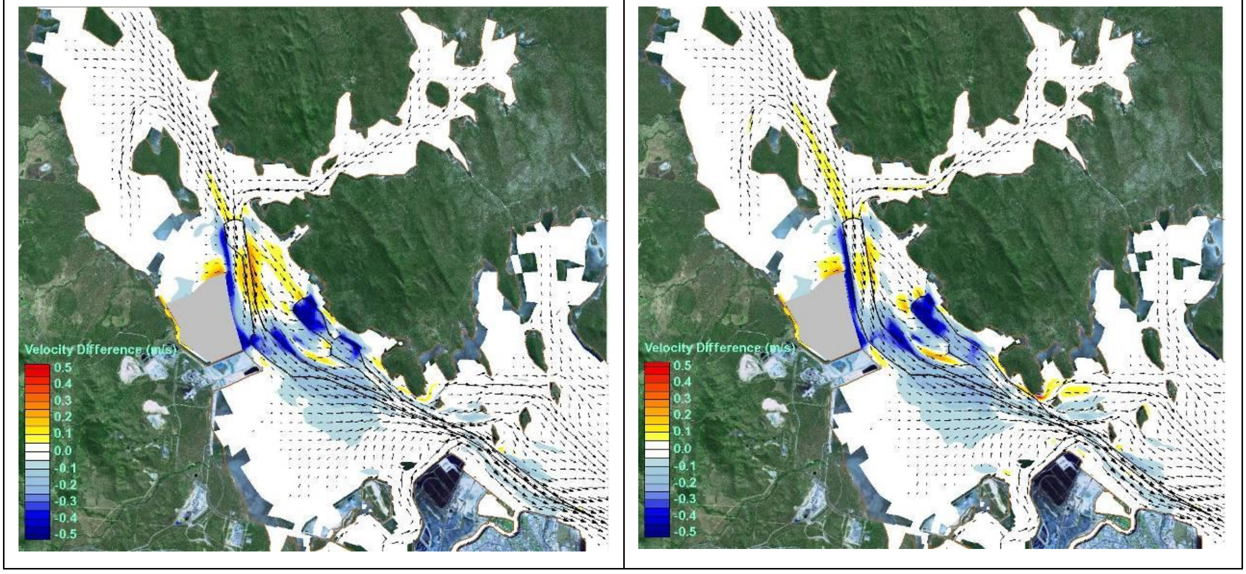


Figure 6-5 Peak Spring Ebb Tide Current Speeds for Base Case and Velocity Impacts of each Scenario

The Numerical Modelling report (Appendix J of main EIS) has identified the following hydrodynamic impacts arising from the proposed reclamation and dredging works:

- The proposed reclamation reduces the inter-tidal storage area of the Western Basin region sufficiently to subtly alter the tidal propagation dynamics (i.e. water levels and currents) generally.
- Predicted water levels indicate that the Reclamation Area works have negligible impact (<1 cm) on high tide levels in the Project Area, but can increase low tide levels by 1-5 cm with some tidal slight phase changes.
- The relative impact of the Reclamation Area and associated loss of inter-tidal storage on the Project Area hydrodynamics is greater than the dredging works.
- Generally, current velocities tend to decrease in dredged areas as well as those laterally adjacent. Increased velocity typically occurs to adjacent areas upstream and downstream of the newly dredged areas.
- Tide flows are expected to increase between Mud Island and Hamilton Point, not change at The Narrows, and to decrease at Targinie Channel. This is predicted presumably, as a consequence of the loss of tidal storage volume from the reclamation.

Mitigation Measures

There are no mitigation measures proposed in response to the minor predicted changes in hydrodynamics arising from the construction of the Western Basin Reclamation Area and dredging works.

6.4.2 Flushing

Potential Impacts

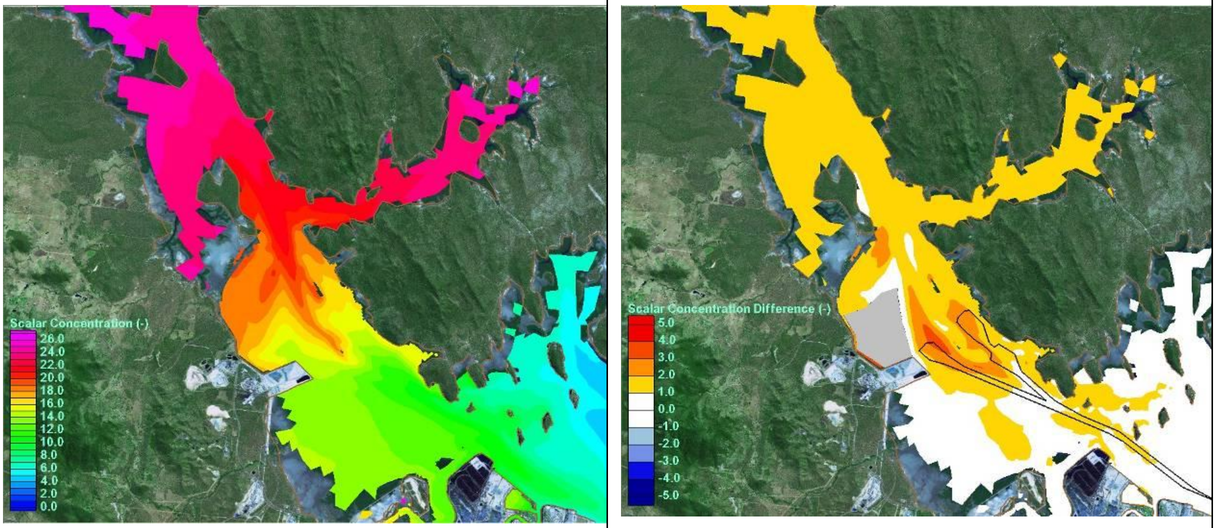
Changes to flushing efficiency can modify water quality because of differences with coastal oceanic exchange. Spatial impacts on flushing efficiency were assessed by tracking a uniform initial conservative tracer concentration of 100 units throughout the model domain and determining the e-folding time for each grid cell in the domain for each scenario, where e-folding time denotes the time for the tracer to reduce from 100 units to l/e (i.e. 36.8% or 36.8 units). Details of the methodology are provided in the Numerical Modelling Studies Report (Appendix J of main EIS).

A comparison of tracer results between the Base Case and the three scenarios (during slack water at high tide near the end of the 2 month simulations) show higher tracer in response to the developed Reclamation Area and dredging works (Figure 6-6). Generally, the tracer levels increase with each successive scenario except for Scenario 2. This indicates that the effect of the dredging works on broad scale circulation patterns also influences flushing. After the 2 month simulation duration there is an approximate increase of 1-2% of tracer for the scenarios in the model domain relative to the Base Case.

Impacts to flushing were characterised with spatial representations of e-folding times between the Base Case and three Scenarios (Figure 6-7). Generally, a 1-2 day increase in the e-folding flushing time was predicted in response to the Project. The remnant 40 m tidal waterway bounded by the developed reclamation and shoreline has the greatest reduction in flushing efficiency of up to 7 days, though model predictions in this region are not considered robust because of coarse grid resolution of this tidal channel.

Base Case

Scenario 1 – Base Case



Scenario 2 – Base Case

Scenario 3 – Base Case

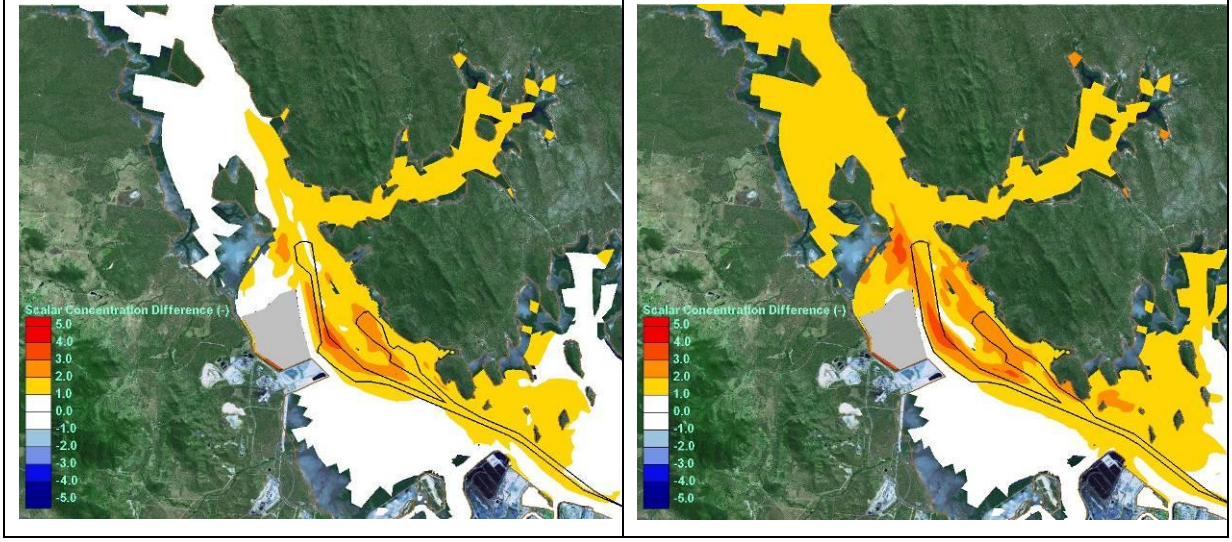


Figure 6-6 Tracer Distribution during Spring Tide for the Base Case and impact (difference) associated with each Scenario

The base case e-folding time is approximately 30-40 days, so a reduction of 1-2 days yields a 3-5% reduction in terms of impacts to flushing. There will also be slight reductions in flushing efficiency of areas surrounding the Passage Islands and the western shoreline of Curtis Island.

The base case e-folding time is approximately 30-40 days, so a reduction of 1-2 days yields a 3-5% reduction in terms of impacts to flushing. There will also be slight reductions in flushing efficiency of areas surrounding the Passage Islands and the western shoreline of Curtis Island.

Further to the above, flushing has the potential to affect the fate of various pollutants within the water column. This relates to nitrogen species (TKN, TN, NH_X, TON, FRP[1]), chlorophyll[2], pH, the organo-

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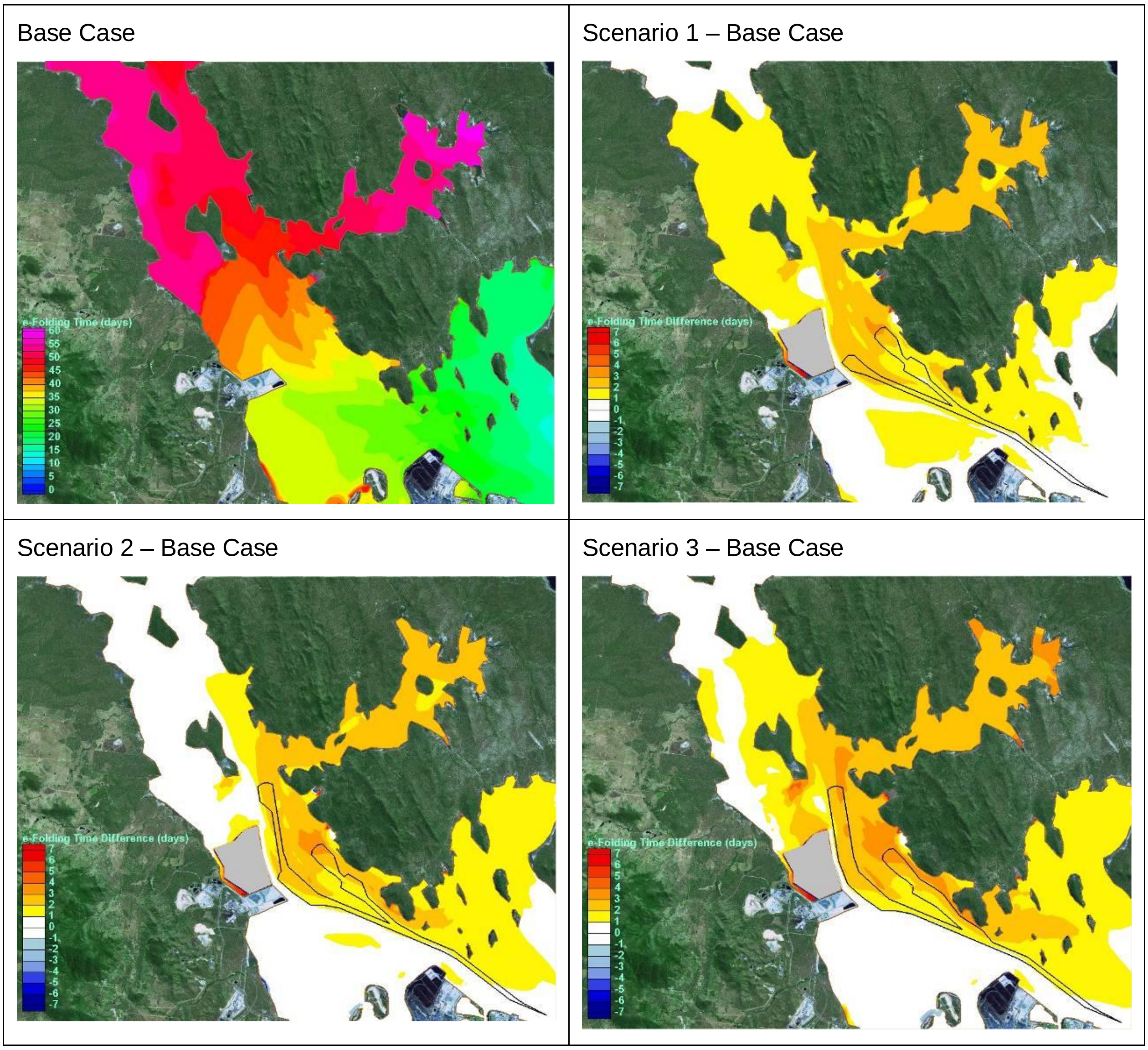
[1] Regularly above ANZECC (2000) only, but not QWQG (2006).

phosphorus pesticide chlorpyrifos, the herbicide metolachlor and cadmium, all of which were indicated at levels above or nearing guideline values (Chapter 5). Hence, any potential increases from reduced flushing to the levels of these constituents may need to be captured in monitoring programs of the Project Area.


Base Case

Scenario 1 – Base Case

Scenario 2 – Base Case

Scenario 3 – Base Case

Figure 6-7 Spatial Estimates of Fitted e-folding times during Spring Tide for Base Case and Changes (Differences) for each Scenario

At most a 3-5% increase in these levels would be expected if they behaved in a conservative manner (i.e. the predicted decrease in flushing from the Project). However, all of these substances are likely to undergo a variety of natural processes (e.g. decomposition, mineralisation, adsorption to particles and burial) so that any increases from flushing will be substantially lower. Hence, it is unlikely that changes to concentrations of these substances from reduced flushing will be detected.

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[2] Regularly above ANZECC (2000) and QWQG (2006).

Mitigation Measures

There are no practical mitigation measures to address the minor predicted changes in flushing regime as a result of the construction of the Western Basin Reclamation Area and dredging works.

6.5 Potential Impacts of the Dredging and Decant on Turbidity and Light Climate

This section summarises the potential impacts of turbid plumes generated by dredging and decant activities on the turbidity of the project area. The impact on sensitive habitats in the project area, namely seagrass and mangrove communities, is evaluated in the Marine Ecology Report (GHD 2009d).

The four dredge and decant plume scenarios were those summarised in Table 6-2.

Additionally, as the plume simulations utilise TSS as the model state variable where the following relation between TSS and turbidity is used from Section 5.5.2:

TSS = Turbidity * 1.12 for Turbidity between 0 and 7 NTU; and

TSS = 3.68 * Turbidity - 17.92 for turbidity greater than 7 NTU.

As spatial representations from the plume simulations are in units of TSS (mg/L), this relation is used to convert TSS simulation output to turbidity when needed. Turbidity has been adopted as the basis for monitoring because hand-held instruments can be used for *in situ* instantaneous monitoring.

6.5.1 Development of Site Specific Turbidity Objectives and Simulation Thresholds

The ANZECC (2000) guidelines favour the development of site specific water quality objectives, based on natural conditions and known tolerances of key sensitive species and habitats. Background turbidity in the Project Area regularly exceeds the QWGQ (2006) and ANZECC (2000) guidelines. Therefore, it is appropriate to develop site specific guideline values for turbidity.

In this section, site specific turbidity objectives were developed for the decant discharge, decant receiving environment, shallow water Berth 5 Fisherman’s Landing, northern Western Basin seagrass bed (Bed 8), west Wiggins Island seagrass bed (Bed 5) and deeper waters potentially impacted by the Project from recent continuous turbidity measurements. The development of these turbidity objectives are based on sections 5.5.1 and 5.5.2, and Table 5-29.

McArthur *et al.* (2004) indicate that the 95th percentile turbidity represents a suitable tolerance threshold for a marine community in the absence of direct physiological response data because of adaptation to frequent intensities and durations of elevated turbidity and accompanying regimes of light attenuation and sediment deposition.

The methodology used here in the development of site specific turbidity objectives was to:

- Utilise the dry season turbidity data to establish the water quality objectives. Available recent continuous turbidity data is heavily biased towards dry season measurements. Elevated turbidity during the wet season from catchment loads is highly variable depending on frequency and intensity of rainfall events. An adaptive water quality objective for the wet season that is dependent on interannual variability of wet season turbidity may be appropriate;
- Utilise median turbidity to represent the background concentration levels; and
- Utilise the 95th percentile turbidity to represent the site specific water quality objectives.

For this EIS, turbidity loggers were deployed over the 'dry' season in numerous 'deep' water locations (>3 m LAT). The purpose of these deployments was to develop turbidity objectives in regions throughout the Project Area in which dredging and/or decant potential impacts may occur. A summary of medians and 95th percentiles at each of the deep water logger locations is summarised in Table 6-3. An average of these values was adopted as the turbidity objective for the dry season, namely 5 NTU for the median and 20 NTU for 95th percentile, representative of background and impact threshold levels.

Table 6-3 Summary of Median and 95th Percentile Turbidity for Dry Season Deployments in Deep Waters throughout the Project Area for this EIS

Logger	Median (NTU)	95th Percentile (NTU)
1	3	11.4
2	5.3	28
3	5	15.8
4[3]	3.2	11.3
6	4.5	25.4
7	2.9	13.8
8	4.1	20.2
9	8.6	27.9
10	3.1	16.1
FL Berth	9	35
Average	**4.9**	**20.5**

Table 6-4 summarises site (i.e. 3 shallow and 1 deep water objectives) specific turbidity objectives (i.e. the 95th percentile values), the background levels (i.e. medians), conversion to TSS with the adopted relation from turbidity (Section 5.5.2), and the simulation TSS threshold (i.e. 95th percentile minus median) for analysis of plume simulations. To reiterate, the plume simulations only model the dredge plume material, and not the ambient TSS levels. Hence, the simulation TSS threshold was used to evaluate the modelled plume scenarios.

Justification for each of these site specific turbidity objectives includes:

- Decant receiving environment:
  - Median turbidity of 9 NTU was the same at all shallow water locations and higher than the deep water locations, presumably because of greater resuspension (i.e. shallower depths) and greater proportion of fine particles relative to deeper waters with higher tidal current speeds;

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[3] Not used to derive turbidity objective because of proximity to coastal ocean. Logger location 5 was not used because of unreliable data.

  - The 95th percentile of 30 NTU was the lowest of all shallow water locations because it was not in proximity to either extensive salt pans (source of turbidity) or any rivers (another source of turbidity);
  - Monitoring of the decant plume from previous dredging and reclamation projects indicates that it generally cannot be seen or measured approximately 20 – 50 m from the outfall (GHD 2009f). However, the decant discharge from this Project is expected to be substantially greater than those in the past, so the decant plume is likely to extend over a greater area; and
  - As outlined in the Review of Previous Water and Sediment Quality (Appendix A), GPC has previously undertaken a number of capital and maintenance dredging programs in accordance with approved Dredge Management Plans. GPC successfully complied with the requirements of the Dredge Management Plans, however, the water quality guidelines applied to turbidity at the final reclamation cell in the Development Approvals for both the RG Tanna Coal Terminal Berth 4 and Fisherman's Landing Berth 1 dredging projects were quite low in comparison to the turbidity objectives determined here. These previous water quality guidelines were 20 NTU in winter (May – September) and 40 NTU in summer (October – April).
- Northern Western Basin seagrass beds:
  - The median turbidity of 9 NTU is in agreement with all of the other dry season values in shallow waters; and
  - The elevated 95th percentile turbidity of 55 NTU relative to 30 NTU near the existing Fisherman's Landing reclamation is likely from a combination of shallower depths and proximity to the salt pan to the north. Nonetheless, it is indicative of adaptation to substantially greater turbidity levels by the seagrass meadows in this region.
- Wiggins Island and South Fisherman's Landing seagrass beds:
  - The median turbidity of 9 NTU is in agreement with all of the other dry season values; and
  - The elevated 95th percentile turbidity of 91 NTU relative to 55 NTU for the northern Western Basin seagrass beds is likely from the combined effect of the salt pans to the west as well as the Calliope River (i.e. two sources of turbidity in addition to resuspension of fine material). This is indicative of adaptation to substantially greater turbidity levels by the seagrass meadows in this region.
- Deep channel waters:
  - The median turbidity of 4.5 NTU for the deeper channel waters is approximately half of the dry season levels for the shallow sites because of a range of factors such as greater dilution, less resuspension and larger particle size classes; and
  - The 95th percentile value of 20 NTU is substantially lower than the dry season levels for the shallow sites (33-91 NTU) as expected for the same range of factors as the lower median values at deeper sites.

Table 6-4 Summary of Median and 95th Percentile Turbidity, TSS and Modelled Plume for Dry Season for Shallow Water and Deep Water Deployments in Western Basin Area

		Turbidity (NTU)		TSS (mg/L)		Dredge Plume TSS (mg/L)
Data Source	**Applicability**	**Median**	**95th Percentile**	**Median**	**95th Percentile**	**Threshold**
FL Shallow Water (Aug-Sep 2008) WBM	Decant receiving environment	9	30	15	92	77
Bed 8, North of FL (May-Nov 2008)	Western Basin seagrass beds	9	55	15	184	169
Bed 5, West of Wiggins Island (May-Nov 2008)	Wiggins Island, South FL seagrass beds	9	91	15	317	302
GHD May-Aug 2009 at 8 sites	Deep channel waters	4.5	20	5	56	51

6.5.2 Impacts of Decant Outfall on Turbidity

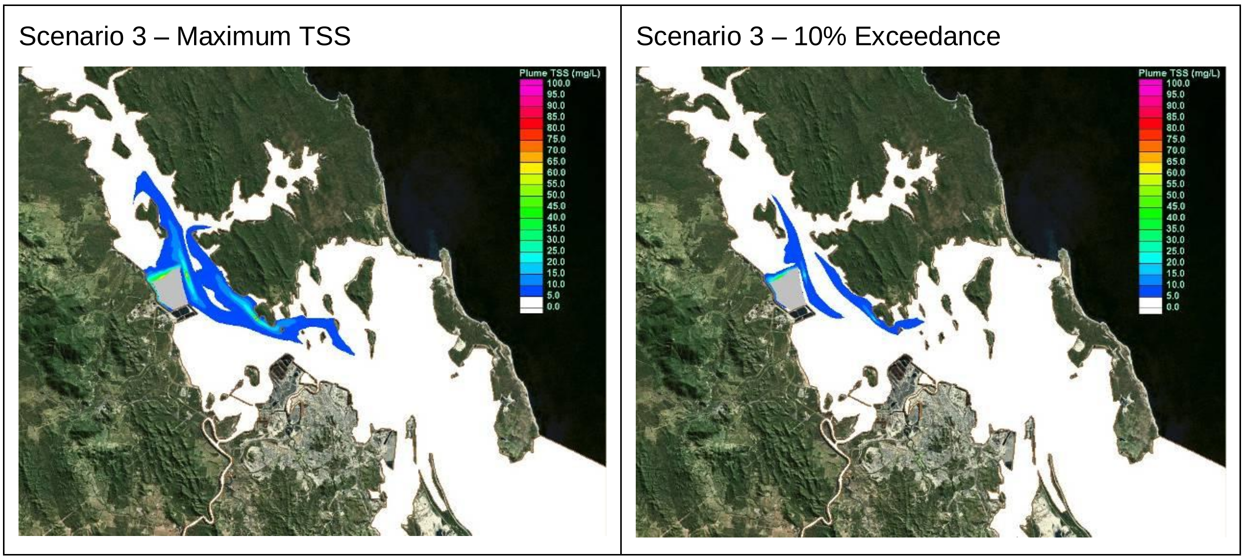
Potential Impacts

This section summarises the potential impacts of plumes generated from the developed reclamation's decant outfall on the turbidity of the Western Basin region. The recommended turbidity objectives for the decant outfall are:

- 100 NTU in the final reclamation cell prior to discharge into the receiving environment, which is equivalent to 350 mg/L TSS; and
- 30 NTU in the receiving environment adjacent to the decant outfall, which is equivalent to 92 mg/L TSS. With the indicative background TSS value at this location of 15 mg/L TSS, the corresponding threshold to compare with the plume simulations is 77 mg/L (i.e. 92 mg/L minus 15 mg/L) (Table 6-4).

In order to assess the potential impact and extent of the decant plume, reference is made to the results of Scenario 3. Scenario 3 involves the simultaneous operations of two CSDs that pump dredge material slurry to the reclamation with decant discharge from the north-eastern corner after sufficient residence time to meet the turbidity objective of 100 NTU (350 mg/L TSS). These CSDs do not generate a large dredge plume (refer to Table 6-2 for loading rates used). Hence, Scenario 3 was used to evaluate the likely plume impacts from the decant discharge on the Western Basin inter-tidal and sub-tidal TSS (or turbidity) climate.

Spatial TSS representations of the maximum level and 10% exceedance levels for Scenario 3 over the two month simulations are illustrated in Figure 6-8. The simulations show that the decant discharge into the receiving environment does not reach the adopted decant plume TSS objective of 77 mg/L.

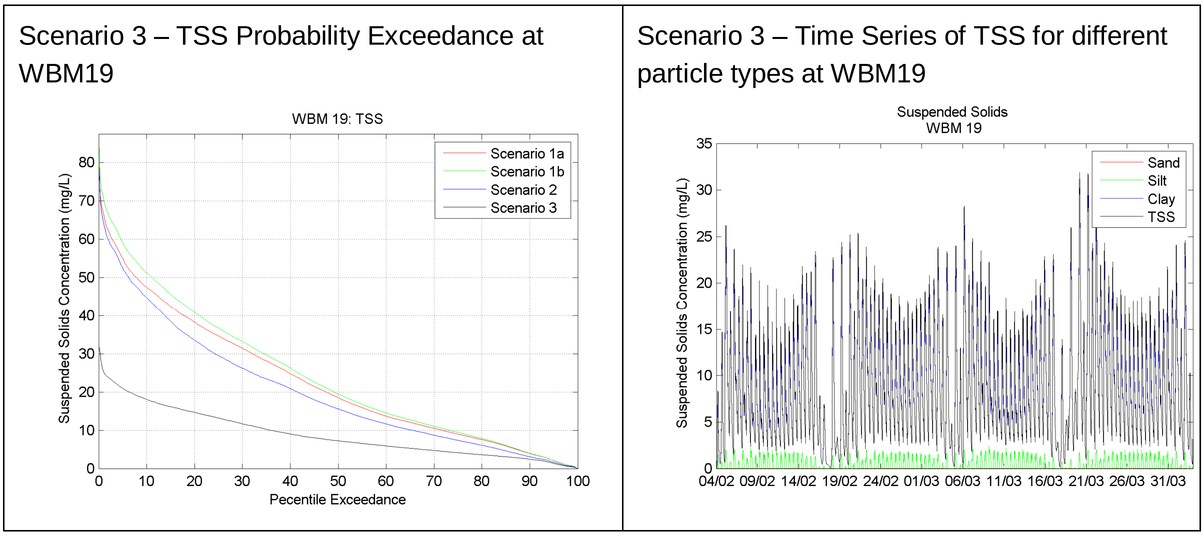


Scenario 3 – Maximum TSS

Scenario 3 – 10% Exceedance

Figure 6-8 Spatial Representation of Simulated Maximum and 10% Exceedance TSS for Scenario 3

Inspection of the time series location at WBM19, adjacent to the decant discharge, illustrates that the decant TSS objective of 77 mg/L is not exceeded for Scenario 3 (Figure 6-9), with the 95th percentile being of the order of only 20 mg/L TSS. In the simulations the decant discharge was input as 100 mg/L TSS.



Scenario 3 – TSS Probability Exceedance at WBM19

Scenario 3 – Time Series of TSS for different particle types at WBM19

Figure 6-9 Total Suspended Solids at the Decant Discharge Location (WBM19)

The conclusions from analysis of the plume modelling of Scenario 3 with respect to the decant are:

- The predicted increase in TSS (and turbidity) is within the natural range and variability that has been measured within the Western Basin inter-tidal and sub-tidal regions of the Project Area;
- The spatial extent of TSS introduced by the reclamation decant outfall cannot be clearly separated because Scenario 3 also modelled two CSDs that generated a modest dredge plume that interacted

with the decant plume. Nonetheless, the combined areal extent of the decant outfall and the two CSDs was predicted to have elevated TSS levels restricted to the northern boundary of the Reclamation Area; and

- Therefore, impacts from the decant on seagrass beds are expected to be focused along the northern boundary of the developed Reclamation Area.

Mitigation Measures

To achieve water quality objectives, multiple cells will be established within the reclamation to allow the finer materials to settle out of suspension. These cells will be connected via weir boxes with adjustable gates, allowing water to be retained for longer periods when more time is required for fine materials to settle out of suspension. The final weir box at the outfall will be able to be completely closed to allow retention of decant waters should the water quality objective value in the receiving environment be exceeded. Floating booms will also be available on site and will be deployed into the reclamation cells should wind conditions result in waves stirring up deposited sediments within the reclamation cells.

Detailed calculations will be undertaken prior to each dredging program once the dredger, volume, production rate and time frame of the particular program is known, to ensure that the nominated turbidity objective can be maintained over the course of the decant. These calculations will also allow design of the number of reclamation cells and the area required to achieve the water quality objectives.

A Dredge Management Plan will be developed employing a similar monitoring program as undertaken for the recent Berth 1 dredging at Fisherman’s Landing, including daily monitoring of sites adjacent to the dredge, within the final reclamation cell, at the outfall and at the northern Western Basin seagrass bed. Monitoring will commence a minimum of two weeks prior to dredging and will continue during decant discharge. The control measures will be re-assessed if the turbidity exceeds 100 NTU in the final reclamation cell or 30 NTU in the receiving environment adjacent to the outfall or if the visible plume extends beyond the spatial extent predicted by the modelling.

6.5.3 Impacts on Turbidity and Light Climate

Potential Impacts

This section presents a discussion of the potential impacts with respect to turbidity and the light climate at representative seagrass locations. It supports the assessment of impact on sensitive habitats in the Project Area, namely seagrass communities, which is evaluated in the Marine Ecology Report (GHD 2009d).

Potential Spatial Impacts from Cutter Suction Dredgers on Turbidity

Previous dredging programs have indicated that the spatial extent of the visible plume from a cutter suction dredger is typically not large, most recently evidenced with the recent Wombat CSD capital dredging at Fisherman’s Landing Berth 1 (GHD 2009e and Appendix J of main EIS). Monitoring of this campaign indicated that elevated turbidity levels near the dredger were less than 45 NTU during daily measurements.

Hence, the effect of the CSD dredge plumes from capital dredging operations at the North and Middle Western Basin, Laird Point, Fisherman’s Landing North and Hamilton Point are likely to be localised to a relatively small area surrounding the dredger with a visible plume likely to extend along the channel in the direction of tidal current flow. Model predictions of the generation of dredge plumes by CSD supports the suggestion that limited impact on the turbidity climate will result, as illustrated in Figure 6-8.

Potential Spatial Impacts from Trailer Suction Hopper Dredges on Turbidity

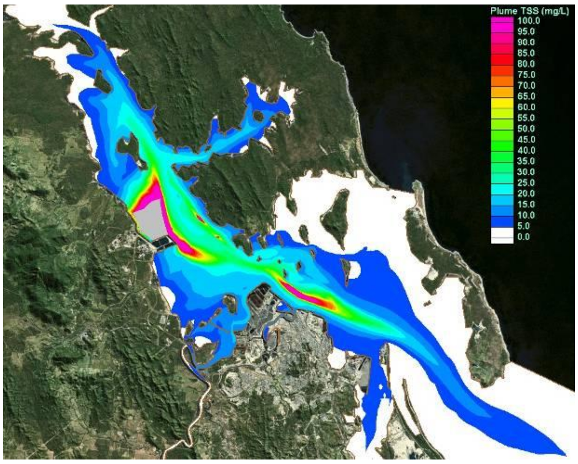
In contrast to CSDs, TSHDs will have a greater impact on the turbidity environment of the Project Area. This is clearly evident through inspection of Table 6-2 where large TSS source rates have been estimated during overflow while dredging (i.e. 75 kg/s for 1 hour because of overflow) and rapid release of the dredged material at the dumping ground (i.e. 340 kg/s for 10 minutes).

Spatial representations of plumes for Scenarios 1a, 1b and 2 are plotted as 10% exceedance TSS levels over the 2 month simulations. These are utilised in a comparative analysis in order to provide a more robust measure of elevated turbidity levels that sensitive habitats are likely to experience (Figure 6-10).

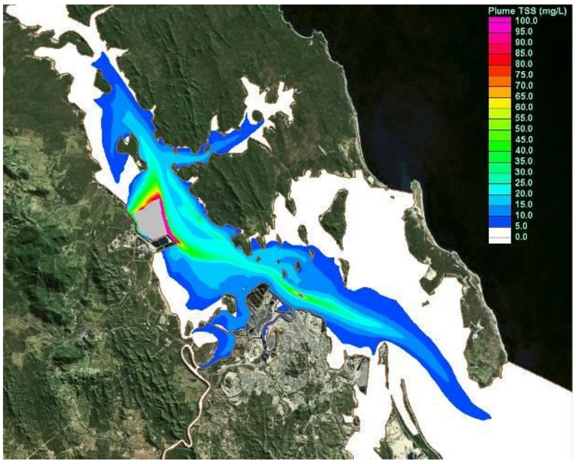
For Scenarios (1a, 1b, 2) where combinations of CSD and TSHD dredges operating simultaneously have been simulated, several key insights into spatial dredge plume patterns are obtained. These can then be used to inform potential impacts to sensitive environments and potential operational mitigation measures. The following patterns are described with respect to the adopted deep water (channel) TSS objective of 50 mg/L (Table 6-4):

- All three Scenarios included one large TSHD dredger dumping in the vicinity of the north-eastern corner of the current Fisherman’s Landing reclamation. Inspection of animations of the simulated dredge plume clearly show that when TSHD dumping occurs coincidentally with a flood tide, much of the dredged material is transported into the shallow waters of the northern part of the Western Basin, with a strong tendency to accumulate along the northern margin of the developed Reclamation Area. Similarly, the dumping of dredged material during flood tides will lead to higher TSS concentrations in The Narrows and Graham Creek;
- In contrast, TSHD dumping during ebb tides offers a reduced impact on the seagrass beds in the shallow waters between Fisherman’s Landing and Wiggins Island as the majority of the dredge plume material is transported along and within the adjacent dredged channels. This difference between flood and ebb tides provides a potential operational measure to reduce impacts to the northern Western Basin and The Narrows seagrass beds on the basis of the programming of TSHD dumping events;
- TSHD operations locales were predicted to experience elevated TSS levels in response to hopper overflows of 1 hour duration. Hence, the proximity of the TSHD dredging location to the dumping location has a substantive effect on the areal extent of plume. For example, for Scenario 1a with TSHD dredging of the Clinton Channel, distinct elevations of TSS are predicted at the dredge and dumping locations. However, for Scenario 1b with the TSHD operating in close proximity to the dumping ground, the areal extent that exceeds the TSS objective of 50 mg/L increases dramatically. The areal extent of dredge plume exceedance for Scenario 2 is somewhat reduced relative to Scenario 1b, because of the greater separation distance between the overflow and dumping dredge plume sources.

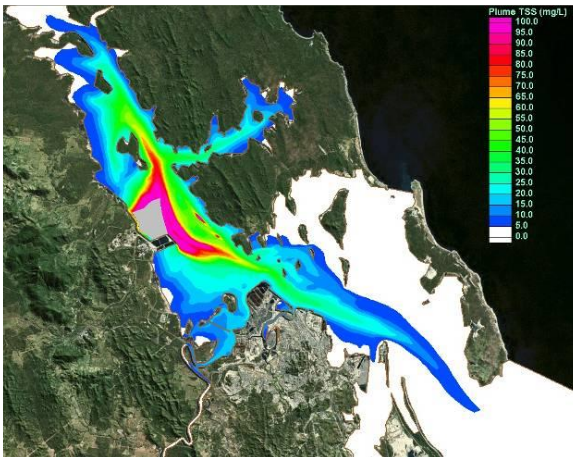
Scenario 1a – Maximum TSS



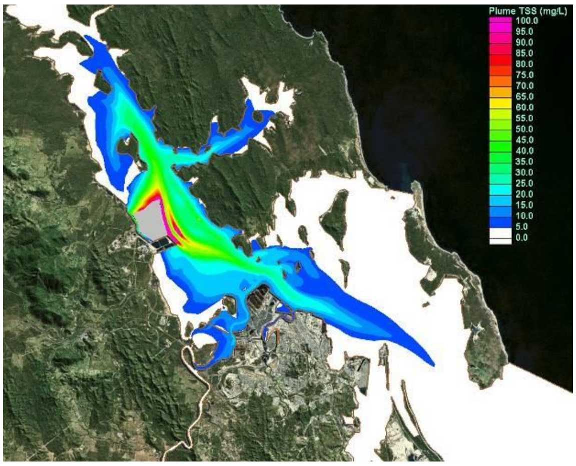
Scenario 1a– 10% Exceedance



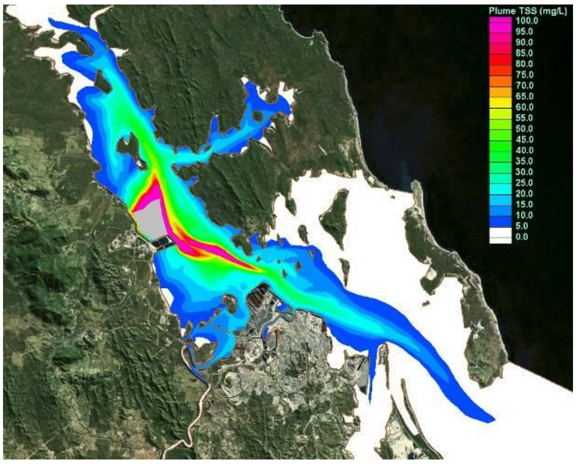
Scenario 1b – Maximum TSS



Scenario 1b– 10% Exceedance



Scenario 2 – Maximum TSS



Scenario 2– 10% Exceedance

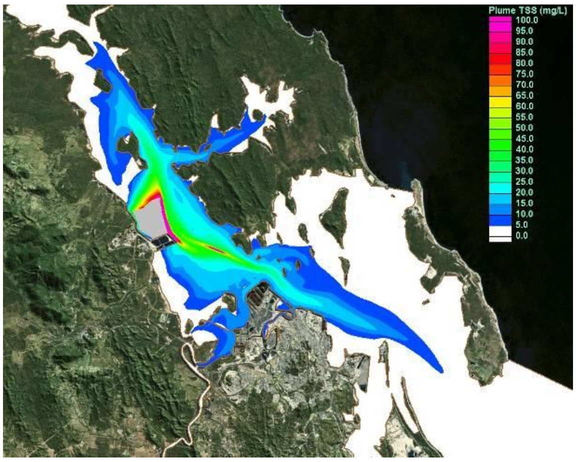


Figure 6-10 Spatial Representation of 10% TSS Exceedance for all Scenarios

Potential Impacts of Dredge Plumes to TSS Climate of Seagrass Beds

Potential light climate impacts from the predicted dredge plumes for the four scenarios have been evaluated at representative locations of environmental sensitivity (i.e. seagrass beds). These include the following model time series points, the locations of which were illustrated in Figure 6-1:

- WBM17 - Northern Western Basin seagrass beds;
- WBM04 - Middle Western Basin seagrass beds;
- WBM02 - Narrows seagrass beds; and
- WBM09 - Wiggins Island seagrass beds.

Probability exceedance plots of TSS at each of these locations are provided in Figure 6-11 and can be summarise as:

- Scenario 3 with dredging only by CSDs has substantially lower dredge plume TSS concentrations than the other three scenarios;
- The middle Western Basin (WBM04) dredge plume TSS levels are substantially greater for Scenarios 1a, 1b and 2 by a factor of two over the northern Western Basin (WBM17) with impacts to The Narrows (WBM02) and Wiggins Island (WBM09) seagrass beds substantially lower; and
- Scenario 1a has lower dredge plume TSS concentrations than the other two TSHD scenarios and Scenario 1b has the highest TSS concentrations.

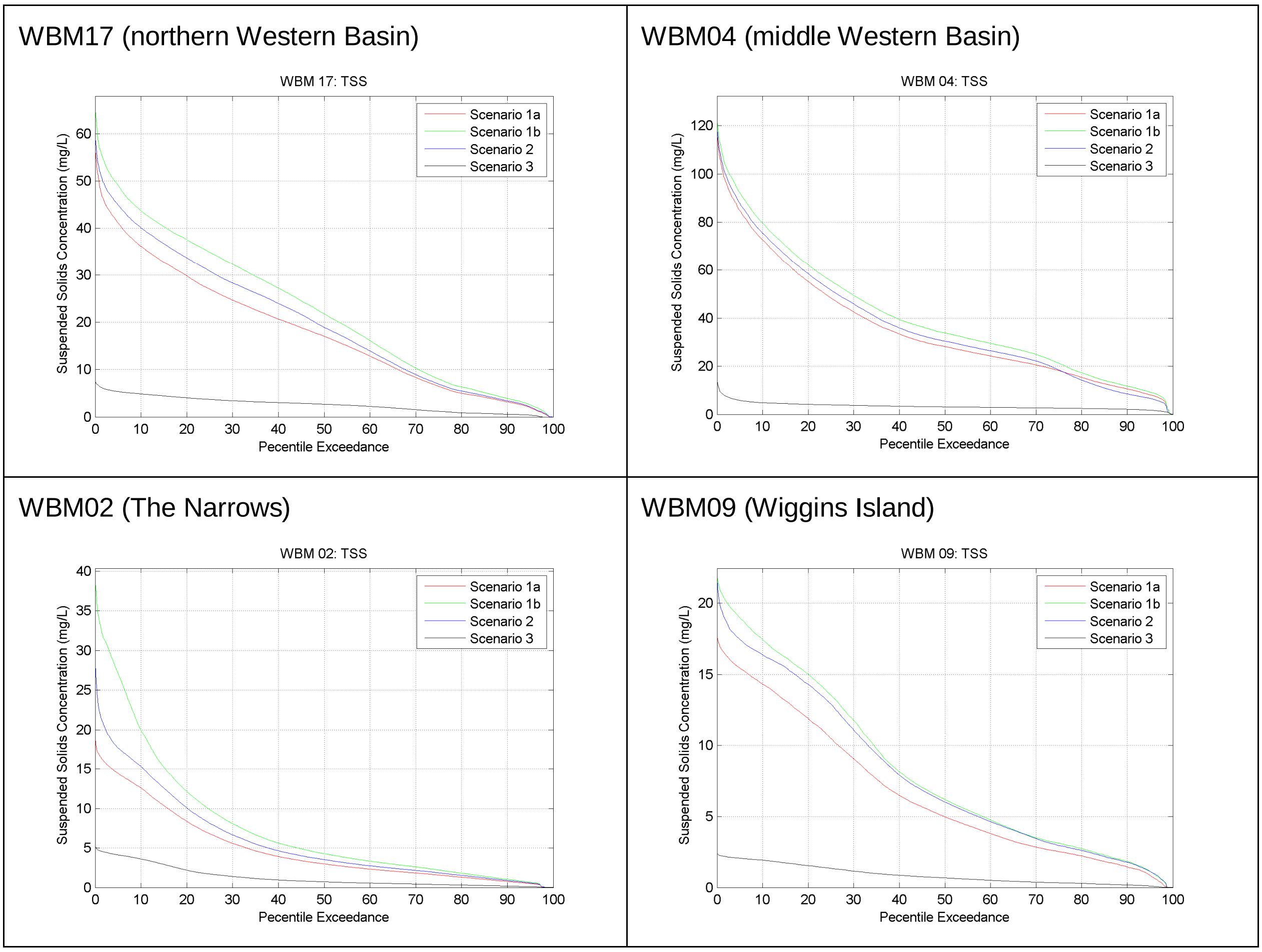


Figure 6-11 Probability Exceedance Plots of TSS at four key Seagrass Bed Locations

A tabular comparison of the 50th, 20th, 10th and 5th probability exceedance TSS concentrations at four representative locations relative to the turbidity/TSS objectives is summarised in Table 6-5. Of these, Scenario 3 experiences dredge plume TSS concentrations at all locations well below the TSS objective. Concentrations are higher for Scenarios 1a, 1b and 2, with the following conclusions offered:

- Seagrass beds at Wiggins Island (WBM09) are predicted to be subjected to turbidity levels well below a TSS objective based on either the 95th or 80th percentile of data;
- Seagrass beds at The Narrows (WBM02) and the northern Western Basin (WBM17) are predicted to be subjected to turbidity levels below a TSS objective based on the 95th percentile of data, and would still meet the objective if an 80th percentile criteria was adopted; and
- Seagrass beds in the middle Western Basin (WBM04) are predicted to be impacted, including a strong influence from elevated dredge plumes generated by TSHD dumping at the rehandling site coincident with flood tides.
- All results need to be considered in terms of the duration for which they occur, and must recognise the significant natural variability that occurs in these waters.

Table 6-5 Comparison of 50th, 20th, 10th and 5th Probability Exceedance of Simulated TSS Versus the Dredge Plume TSS Objective

Scenario	Data Derived		Simulations			
Scenario	**TSS Objective (95th Percentile)**	**Alternate TSS Objective (80th Percentile)**	**Median**	**20th%ile**	**10th%ile**	**5%ile**
Location: WBM04 (Middle Western Basin)						
Scenario 1a	77	29	28	55	73	85
Scenario 1b	77	29	33	63	80	93
Scenario 2	77	29	30	58	76	89
Scenario 3	77	29	4	4.5	5	6
Location: WBM17 (North Western Basin)						
Scenario 1a	169	55	17	30	36	41
Scenario 1b	169	55	22	37	44	49
Scenario 2	169	55	19	34	40	45
Scenario 3	169	55	3	4	5	6
Location: WBM02 (The Narrows - Objective as WBM04)						
Scenario 1a	77	29	3	8	12	14
Scenario 1b	77	29	4	12	20	27
Scenario 2	77	29	3.5	10	15	18
Scenario 3	77	29	1	2	3	4
Location: WBM09 (Wiggins Island)						
Scenario 1a	302	59	5	12	14	16
Scenario 1b	302	59	6.5	15	17.5	18.5
Scenario 2	302	59	6	14	16.5	17.5
Scenario 3	302	59	1	2	2.5	2.5

Note: Grey shading denotes where suggested trigger value is exceeded (e.g. 5% exceedance is higher than 95% occurrence). Trigger value based on difference between median and nominated threshold.

Potential Impacts of Dredge Plumes to Light Climate of Seagrass Beds

The specific attenuation coefficient of TSS was estimated through comparisons with measured PAR near the seabed by the loggers at locations 1, 2 and 4 with a background turbidity of 5 NTU (5.6 mg TSS L^{-1}). These values yield a specific attenuation coefficient of roughly 0.15 m^{-1} (mg TSS $L^{-1})^{-1}$ over the range of water levels in Figure 6-12. Estimates here also assumed a median chlorophyll a level of 1 ug chla L^{-1} (Table 5-15) with a specific attenuation coefficient of 0.02 m^{-1} (mg chla L^{-1}).

The relative percentage of incident PAR at the seabed was calculated with Beer's Law assuming seagrass beds were located -1, -1.5 and -2 m relative to mean sea level. A base case turbidity of 9 NTU (15.6 mg TSS L^{-1}) was used to estimate the current background PAR climate for each of the shallow water depths considered. An average of the median TSS for Scenarios 1a, 1b and 2 (Table 6-5) was added to the background TSS to assess light climate impacts at each of the four locations with the following values:

- Wiggins Island seagrass beds: 5.8 mg L^{-1} above background TSS;
- Narrows seagrass beds: 3.5 mg L^{-1} above background TSS;

- North Western Basin seagrass beds: 19.3 mg L^{-1} above background TSS; and
- Middle Western Basin seagrass beds: 30.3 mg L^{-1} above background TSS.

An example of the relative percentage of incident PAR at the seabed for the representative 95th percentile tidal cycle (i.e. spring tide) is illustrated in Figure 6-13. The highest percentage occurs at tidal cycle hour 6 when the water level is at a minimum (i.e. 10 cm, Figure 6-12). The impact of the dredge plume at Wiggins Island (WBM09) and upper Narrows (WBM02) is minimal, but substantially greater at the two Western Basin locations (WBM17 and WBM04), in terms of both light intensity and the duration of light exposure on the seabed.

Figure 6-14 shows that a large neap tide (25th percentile tidal range) results in a substantial decrease for all cases of the relative percentage of incident PAR. This is attributable to the greater minimum water during the tidal cycle. Further, the relative impacts are also much greater because of the non-linear relation between light absorption through the turbid water column and depth. A decrease in the seabed depth to 1.0 m below mean sea level yields substantial exposure of seagrass to incident light for the 50th percentile tidal range with periods of 100% light exposure at the seabed (Figure 6-15).

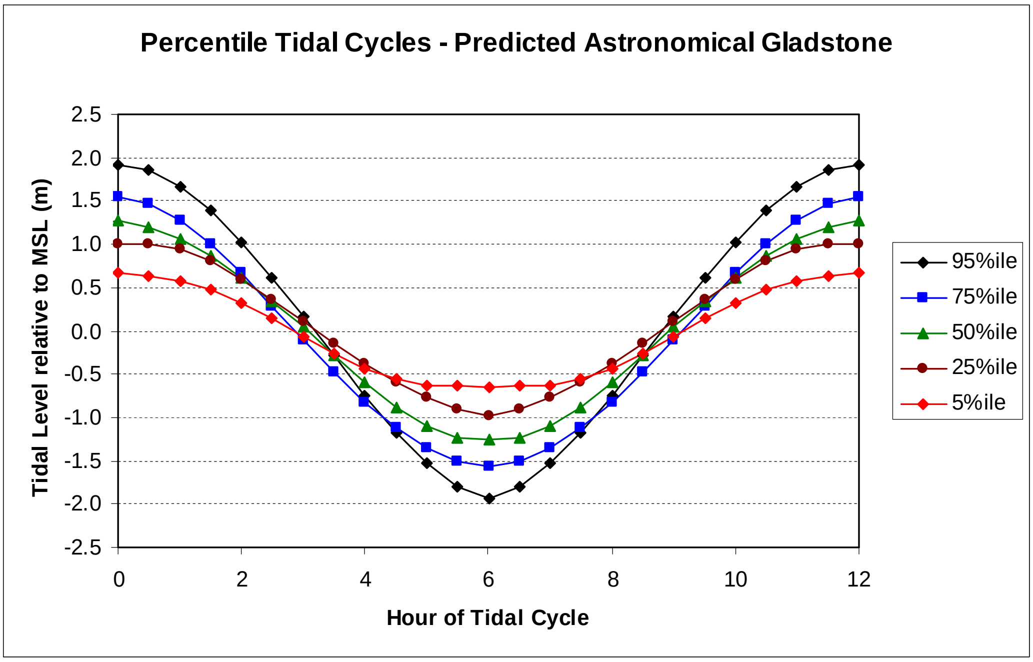


Figure 6-12 Percentile (95th, 75th, 50th, 25th and 5th) Predicted Astronomical Semi-diurnal Tides

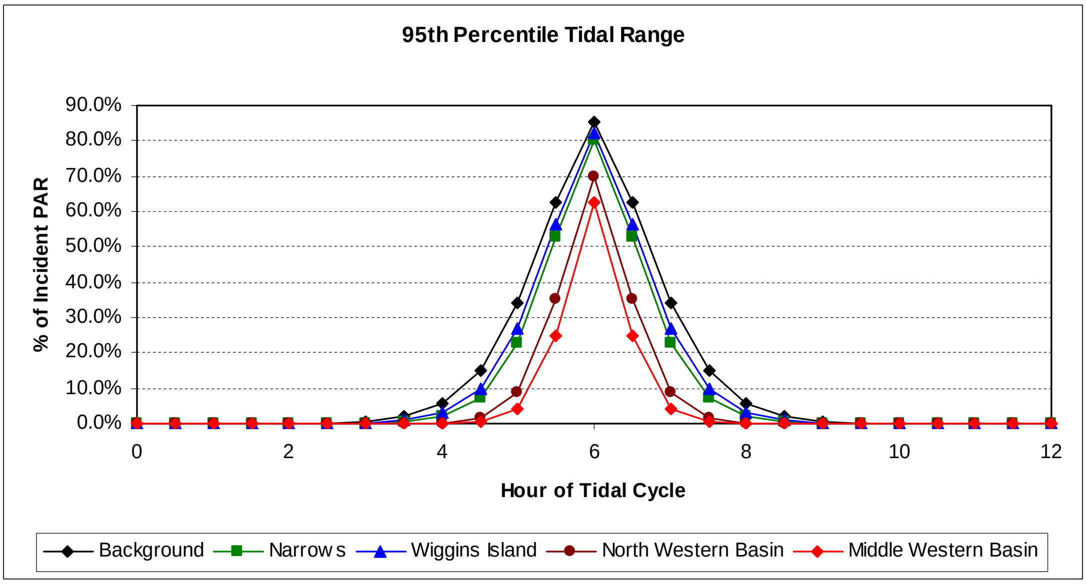


Figure 6-13 Percent of Incident PAR at the Seabed for 95th Percentile Tidal Range (Spring Tide) in 2 m of Depth Relative to MSL for Background and Dredge Plume Scenarios

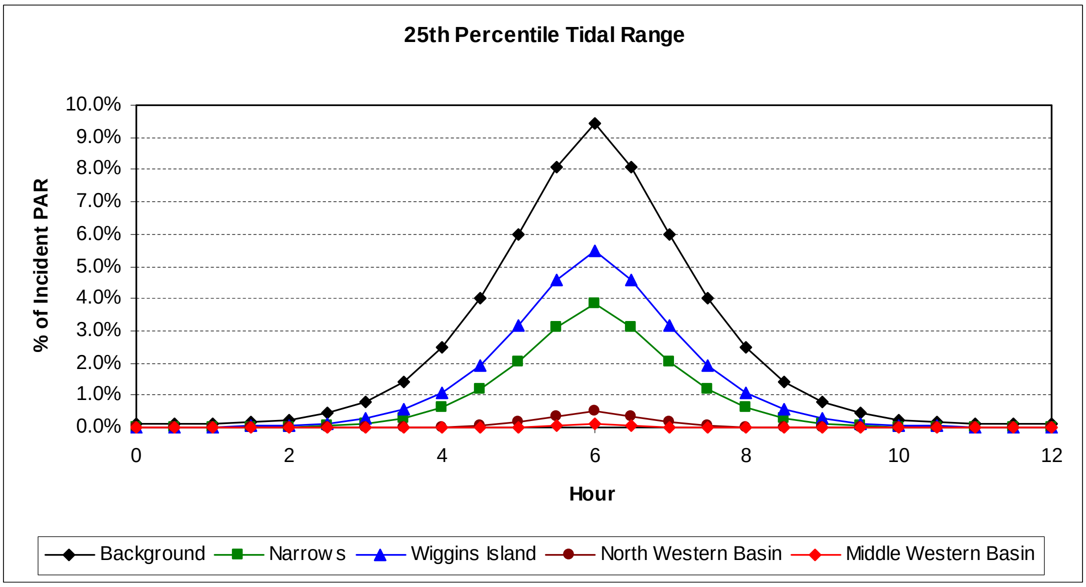


Figure 6-14 Percent of Incident PAR at the Seabed for 25th Percentile Tidal Range (Large Neap Tide) in 2 m of Depth Relative to MSL for Background and Dredge Plume Scenarios

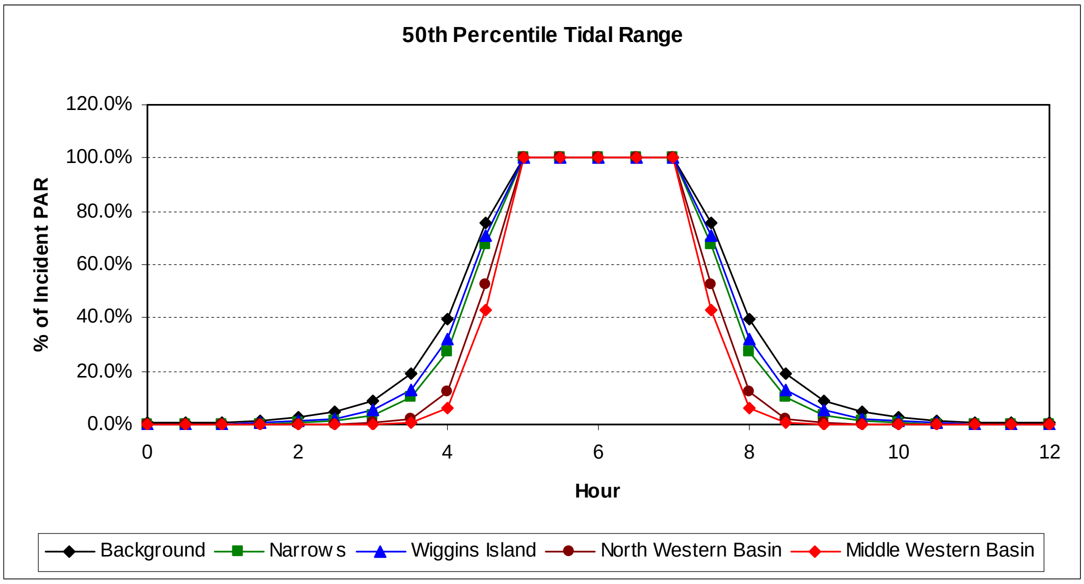


Figure 6-15 Percent of Incident PAR at the Seabed for 50th Percentile Tidal Range (transition tide) in 1.0 m of Depth Relative to MSL for Background and Dredge Plume Scenarios

With the dredging period expected to occur over several years, the following assumptions were made in order to provide an integrated light climate impact assessment over this time scale:

- The range of tidal cycles and water depths are evenly distributed across dredging years in terms of high insolation periods (e.g. several hours either side on solar noon);
- No account made for any differences in variable background TSS between spring and neap tides;
- Assume that the median dredge plume TSS is a reasonable representation of the long-term particle climate that is added to the background levels for impact assessment over yearly time scales.

Allowing for these assumptions, an integrated measure of light climate impacts can be derived through a coarse integration of the representative tidal ranges for each combination of the four locations and three depths as shown in Table 6-6.

Table 6-6 Weightings for Integrated Light Climate Assessment for Each Tidal Range Percentile

Approximation Percentile	Upper Representative Percentile	Lower Representative Percentile	Percentile Weighting (w_p)
95	100.0	90.0	0.10
75	90.0	62.5	0.28
50	62.6	37.5	0.25
25	37.5	10.0	0.28
5	10.0	0.0	0.10

For each location, an approximation of the overall relative percentage PAR over all tidal cycles over 30 minute intervals at 3 depths was estimated as:

$$L_t = \sum_{p=1}^{5} w_p I_{tp}$$

where t is each 30 minute interval across the approximate tidal cycle, p is the percentile tidal cycle that has been approximated (i.e. 5th, 25th, 50th, 75th, 95th), w_p is the tidal cycle weighting (Table 6-6) and I_{tp} is the relative incident PAR at time t and tical cycle p. This approximation of the relative incident PAR percentage at the seabed highlights that the impact of the dredge plume is substantially greater for water depths of 2 m than 1 m (Figure 6-16, Figure 6-17, Figure 6-18).

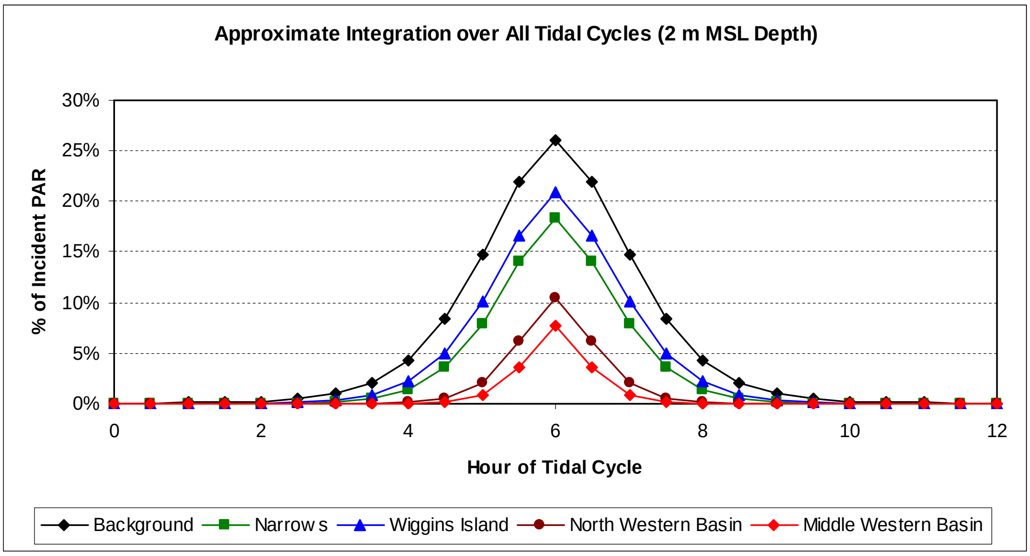


Figure 6-16 Percent of Incident PAR Estimate at the Seabed Across All Tidal Cycles for 2.0 m Depth Relative to MSL for Background and Dredge Plume Scenarios

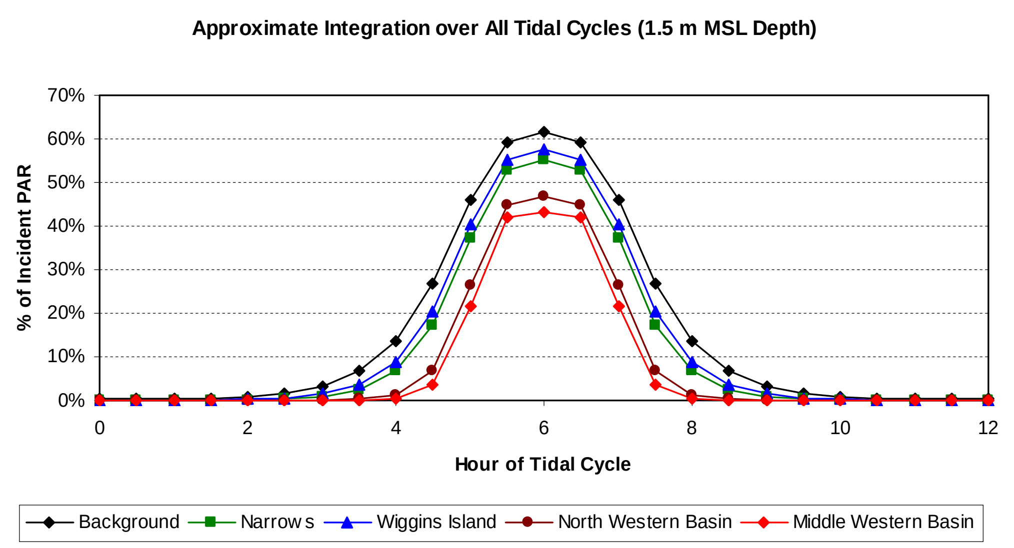


Figure 6-17 Percent of Iincident PAR Estimate at the Seabed Across All Tidal Cycles for 1.5 m Depth Relative to MSL for Background and Dredge Plume Scenarios

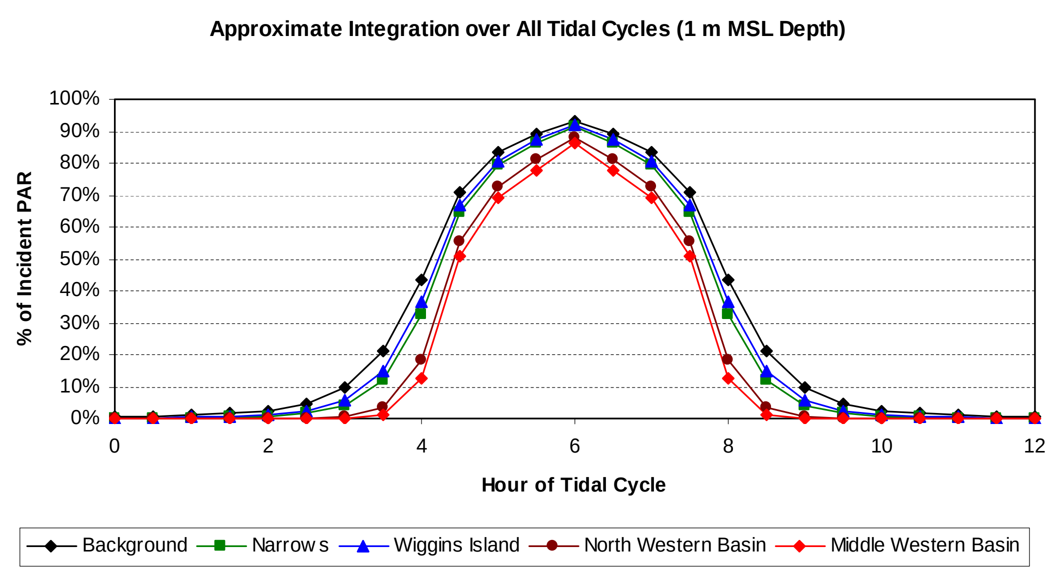


Figure 6-18 Percent of Incident PAR Eestimate at the Seabed Across All Tidal Cycles for 1.0 m Depth Relative to MSL for Background and Dredge Plume Scenarios

A measure of the potential impact to the light climate is to integrate the following equation was used to calculate the overall light climate percentage over each 30 minute interval:

$$L = \frac{\sum_{t=0}^{12} \sum_{p=1}^{5} w_p I_{tp}}{n_t}$$

Where t is each 30 minute interval across a tidal cycle, p is the percentile tidal cycle that has been approximated, w_p is the tidal cycle weighting (Table 6-6) and I_{tp} is the relative incident PAR at t and p for a particular location.

An annual light climate impact assessment on the basis of representative astronomical tides, high incident PAR of 1800 uE/m^2/s and mean water depths of 1, 1.5 and 2 m (Table 6-7), can be summarised as:

- For a 1 m water depth, relative percentage of incident PAR ranges from 20% (Western Basin) to 30% (Background). The relative decrease in PAR is approximately 10% at Wiggins Island and the Narrows and 30% at the Western Basin site;
- For a 1.5 m water depth, relative percentage of incident PAR ranges from 7% (Western Basin) to 15% (Background). The relative decrease in PAR is approximately 20% at Wiggins Island and the Narrows and 50% in Western Basin; and
- For a 2 m water depth, relative percentage of incident PAR ranges from 1% (Western Basin) to 5% (Background). The relative decrease in PAR is approximately 30-40% at Wiggins Island and the Narrows and 80-90% in Western Basin.

Table 6-7 Light Climate Impact Assessment

Depth (m)	Background	Narrows	Wiggins Island	North Western Basin	Middle Western Basin
% of Incident PAR at Seabed					
1	**30.0%**	**26.2%**	**27.5%**	**22.1%**	**20.4%**
1.5	**15.2%**	**11.7%**	**12.8%**	**8.3%**	**7.1%**
2	**5.3%**	**2.9%**	**3.7%**	**1.1%**	**0.7%**
% Change of Incident PAR relative to Background					
1		**13%**	**9%**	**27%**	**32%**
1.5		**23%**	**16%**	**46%**	**53%**
2		**45%**	**31%**	**79%**	**88%**

Mitigation Measures

A Dredge Management Plan will be developed for the Western Basin capital dredging, employing a similar monitoring program to that undertaken for the recent Berth 1 dredging at Fisherman's Landing, including daily monitoring of sites adjacent to the dredger, within the final reclamation cell, at the outfall and at the Fisherman's Landing and Wiggins Island seagrass beds.

Several operational considerations for the period of capital dredging have been identified as a means to potentially reduce dredge plume impacts to sensitive habitats. It is noted that:

- The effect on the Narrows and northern portion of the Western Basin is greater during the flood phase of large spring tides as tidal transport of dredge material to this region is predicted to be substantial. Hence, TSHD dumping during daytime flood tides should be minimised through programming wherever possible (with emphasis on periods of large spring tides); and

- The same constraints are not present during ebb tides as most of the dumped dredge material is predicted to be constrained to the deeper channels and does not greatly elevate TSS levels at the Wiggins Island seagrass beds.

Operationally, utilisation of the option to pump from TSHDs directly into the reclamation during the periods identified above should be considered. As TSHD bottom dumping events are predicted to produce elevated TSS levels for relatively short durations, this approach may also provide benefit to the seagrass beds during dredging works.

Improved characterisation of the light environment of the seagrass beds is also recommended, as the light climate is not well characterised to date. Deployment of a PAR logger array in the Wiggins Island and Northern Western Basin seagrass beds is recommended for consideration to achieve this outcome.

As specified previously, the turbidity objectives derived for this EIS are based predominately on dry season continuous logger measurements. With wet season turbidity likely to exhibit strong inter-annual variability as a function of rainfall and resultant catchment loadings, it is recommended that wet season logger deployments in both deep and shallow waters be implemented to allow for the further development of wet season turbidity objectives.

Dredging programs will need to be undertaken in accordance with Dredge Management Plans approved under the *Coastal Management and Protection Act 1995* and *Environmental Protection Act 1994*.

6.6 Potential Impacts of Dredging and Decant on Sedimentation

Potential Impacts

Potential Impacts of Sand-Sized and Fine Material Dredge Plume Sedimentation on Deeper Waters

Potential impacts to bed shear stresses, and sand-sized and silt-sized sedimentation in the deeper waters (>2 m LAT) are reported in the Numerical Modelling Studies Report (Appendix J of main EIS). The purpose of this assessment was to provide sedimentation estimates to inform maintenance dredging frequency, which indicates the following:

- Bed shear stresses during spring tides in channels are large enough so that fine sediments will not be stable deposits in the long term, which is consistent with observations of limited fine material in the main channel. The shallower areas with lower velocities have smaller bed shear stresses that is consistent with the natural deposition of fine material in these areas. The predicted Project impact is a reduction in bed shear stresses in the dredged areas where depths are greater and velocities lower as well as laterally adjacent areas where velocities are reduced;
- Additional sand-sized sedimentation is predicted to occur in the Project Area for all of the scenarios relative to the base case because of the expanded dredge footprint. It is noted that sand-sized sedimentation for areas less than -2 m LAT were not estimated because of likely over-prediction due to lack of incorporation of resuspension dynamics that are likely an important mobilisation process; and
- The substantial (17-fold) increase in fine material siltation of dredged areas is due to the much larger dredged area footprint in the developed cases, this dredge footprint occurs largely in a region of

lower tidal flow energy than the existing port channels, and the further decrease in tidal velocities due to the dredging associated with the developed cases. Sedimentation rates of up to 0.08 m/year occur at siltation hotspots within the dredged areas. Therefore, a 0.3 m over-dredging allowance should accommodate 3+ years of sedimentation between maintenance dredging campaigns.

These sedimentation predictions focused on the dredged areas to determine maintenance dredging requirements and utilised currents and bed shear stresses from the hydrodynamic/flushing simulations.

Predicted Spatial Impacts from Plume Sedimentation

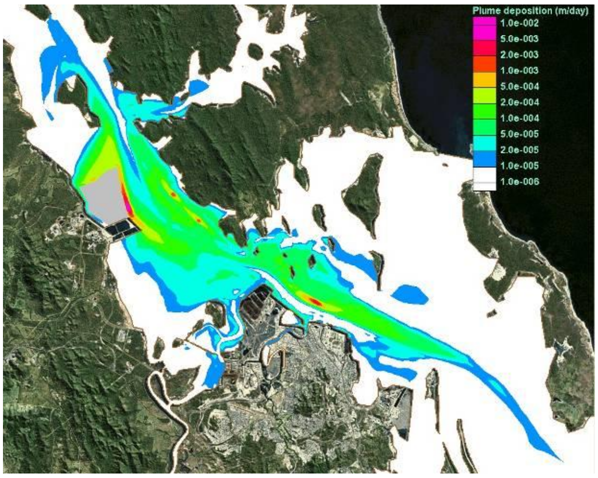
An output from the dredge plume simulations was the average sedimentation rate of the dredge plume material over the 2 month simulations (Figure 6-19). The assumptions in the modelling included:

- No provision for re-suspension of already deposited plume material as it will generally become mixed with and hence, indistinguishable from the re-suspension of the natural bed material; and
- Settling will occur in areas when currents and waves (and hence bed shear stresses) are sufficiently low; and
- Resuspension is dependent on prevailing conditions and the nature of the material rather than the origin of the material.

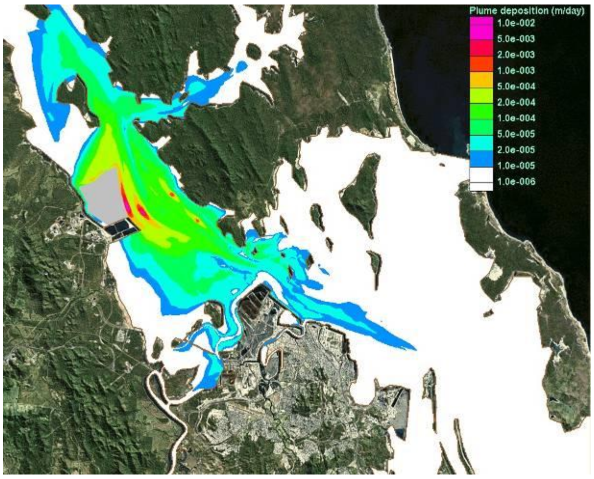
Given these assumptions, spatial representations of the sedimentation predictions are shown in Figure 6-19, which have the following patterns:

- Elevated sedimentation rates are predicted to occur at locations of dredging operations (CSD, TSHD overflow, TSHD dumping) and the decant outfall. Those at the actual dredging location are, of course, artificial estimates, in that they will continue to be removed as part of the dredging process until design depth is achieved;
- Scenario 3 has a relatively small dredge plume sedimentation footprint in comparison with the other scenarios confined primarily to the operating locales of the two CSDs and the decant outfall. Clearly, there is an interaction between the CSD operating in Fisherman's Landing North and the decant outfall that enlarges the sedimentation footprint;
- The other three scenarios (1a, 1b, and 2) all have similarly sized plume deposition patterns with differences in sedimentation hot spots coincident with CSD and TSHD overflow locations. The deposition footprint of Scenario 1a extends further south owing to TSHD operations in the Clinton Channel. In contrast, the deposition footprint extends further up The Narrows for Scenario 1b as a consequence of TSHD operations in the Fisherman's Landing swing basin, the northern most extent of simulated TSHD operations; and
- Sedimentation in the Western Basin inter-tidal and sub-tidal areas is predicted to be substantially greater for those scenarios inclusive of TSHD dumping.

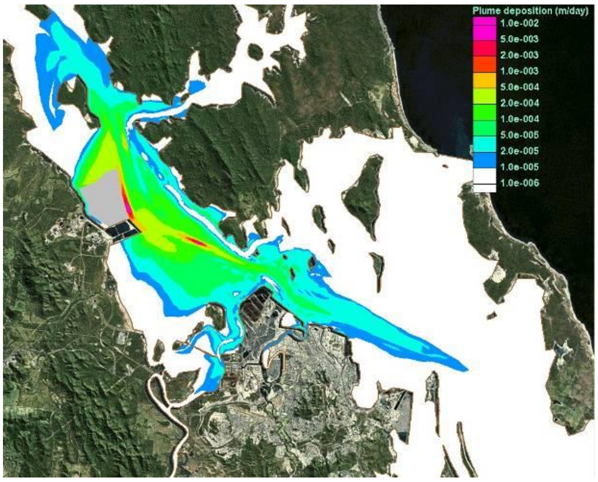
Scenario 1a



Scenario 1b



Scenario 2



Scenario 3

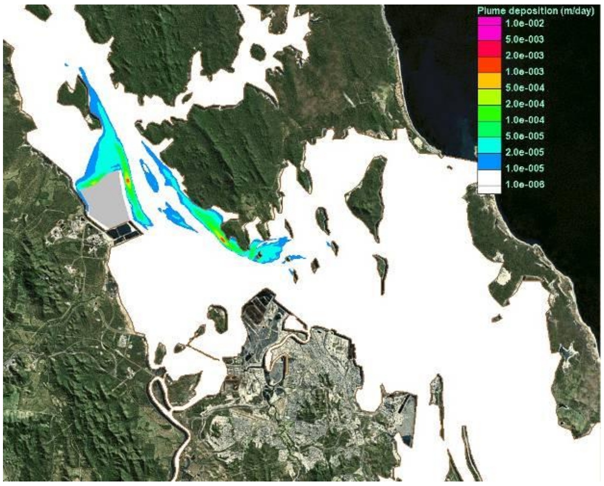


Figure 6-19 Spatial Representation of TSS Plume Deposition

Potential Impacts of Dredge Plume Sedimentation at Representative Seagrass Bed Locations

Potential sedimentation impacts to seagrass beds may result from smothering of existing substrates by settling of dredge plume material during the dredging operations. Smothering of seagrass can weigh down leaves, restrict light penetration and cause stress on the plants. The seagrass communities in the vicinity of the Project Area may experience an increase in sedimentation because of the Project. Potential sedimentation impacts from the predicted dredge plumes are assessed at the same representative locations of environmental sensitivity (i.e. seagrass beds) as for the prior light climate impact analysis, namely (Figure 6-1):

- WBM17 - Northern Western Basin seagrass beds;
- WBM04 - Middle Western Basin seagrass beds;
- WBM02 - Narrows seagrass beds; and
- WBM09 - Wiggins Island seagrass beds.

Daily sedimentation rates of dredge plume material at these four locations are summarised in Table 6-8.

Table 6-8 Daily Sedimentation Rates of Dredge Plume Material (mm/day)

Scenario	Narrows	Wiggins Island	North Western Basin	Middle Western Basin
1a	0.008	0.033	0.167	0.367
1b	0.022	0.047	0.217	0.400
2	0.012	0.043	0.192	0.383
3	0.003	0.003	0.025	0.033

Daily sedimentation rates at the Western Basin seagrass beds are clearly much greater than The Narrows and Wiggins Island sites, particularly for Scenarios 1a, 1b and 2. These estimates should be viewed as qualitative comparisons as the resuspension of natural bed material has not been modelled. Hence, these estimates are more representative of calm and low current conditions when wave and current induced resuspension is minimal.

Mitigation Measures

Operationally, addition of the option to pump directly from TSHDs into the Reclamation Area during the flood phase of large spring tides coincident with daytime could be considered. TSHD bottom dumping events are predicted to produce elevated rates of TSS sedimentation over the Western Basin seagrass beds at these times.

Mitigation measures to reduce turbidity from the decant are also applicable for reduction of sedimentation rates.

6.7 Potential Impacts on Water Quality of Sediment Quality and Elutriate Release during Dredging

Potential Impacts

Potential Impacts from Dredged Sediments

The Project will encompass a wide range of sediment types with a range of physical (i.e. cobble, gravel, sand, silt and clay relative composition) and quality properties. Nonetheless, the analysis of QGC sediment quality data in the Sediment Quality Report (GHD 2009a) indicates that sediments are 'clean' with the following overall characteristics:

- The analysis of a large number of sediment samples from each of the dredge stages for an extensive suite of potential contaminants has revealed that the overall quality of the sediments in the Project Area are compliant to the NAGD (2009) and the EPA Draft Guidelines for the Assessment and Management of Contaminated Land in Queensland (1998) – Environmental Investigation Levels; and
- The only exception to the compliance of the sediment quality with the adopted guideline values is the elevated manganese concentrations observed within the Stage 1B area.

Due comprehensive nature of the sediment sampling and analysis program, the findings are considered representative of the sediments to be dredged for the Project. The results of the sediment chemical characteristics are also consistent with a number of other recent capital and maintenance dredging sampling programs within Port Curtis. It is therefore considered that the sediments proposed to be dredged are suitable for placement within the proposed Western Basin Reclamation.

Potential Impacts from Elutriate on Water Quality during Dredging and Rehandling

Median elutriate concentrations of ammonia (783 ug N L^{-1}) and manganese (399 ug Mn L^{-1}) were substantially greater than median values in the water column (NH_4=6 ug N L^{-1}, Mn=2.2 ug Mn L^{-1}) (Section 5.4). The QWQG (2006) guideline for indirect effects (i.e. eutrophication) of ammonia/ammonium is 8 ug N L^{-1} and no guideline exists for manganese in marine waters.

The NAGD (2009) defaults to the ANZECC (2000) 95th percentile level of protection for direct toxicity effects from elutriate after 'initial dilution' estimates. Hence, for ammonia elutriate the relevant guideline is 910 ug N L^{-1}, so the median elutriate ammonia level is below the relevant NAGD (2009) guideline for direct toxic effects on the ambient waters of the Project Area during overflow and rehandling operations.

Because of the potential indirect (i.e. eutrophication) impacts from ammonia elutriate during TSHD overflow and rehandling operations, estimates of the near-field (i.e. in close proximity to the TSHD) concentrations of the receiving estuarine waters were derived with the following assumptions:

- TSHD filling discharge rate is 16.7 m^3 s^{-1} (i.e. 10,000 m^3 hopper capacity filling in 10 minutes);
- TSHD overflows for 50 minutes of 60 minutes (10 minutes to fill);
- Concentrations of ammonia elutriate of 783 ug L^{-1} and receiving waters 6 ug L^{-1} ;
- 7.83 kg of ammonia elutriate dredged per 3 hour cycle of TSHD;
- 75% of the ammonia elutriate released during 50 minutes of overflow and remaining 25% during 10 minute dump, which assumes the majority of the ammonia elutriate is discharged during released overflow operations;
- Assumed overflow and rehandling TSS plumes have a cross-current length scale of 100 m (characteristic length scale);
- Assumed a completely mixed water column of 10 m depth (characteristic depth scale); and
- Assumed conservative behaviour (i.e. no oxidation to NO_X, no particle adsorption, no transfers across air-water interface).

These assumptions were used to calculate the near-field ammonia concentrations for representative current speeds of 0.1 m/s (slack), 0.5 m/s (neap) and 1 m/s (spring) as shown in Table 6-9.

Table 6-9 Overall Ammonia Elutriate Impact Assessment for Indirect Impacts

Current (m/s)	Time (s)	Dilution Volume (m^3)	Median NH_X (g/m^3)	Overflow Volume (m^3)	NH_X Elutriate Mass (g)	NH_X Hopper Elutriate (mg/L)	NH_X (mg/L) Near-Field	Ratio Relative to Guideline
Overflow								
0.1	3000	300,000	0.006	50000	5873	0.117	0.022	2.7
0.5	3000	1,500,000	0.006	50000	5873	0.117	0.010	1.2
1	3000	3,000,000	0.006	50000	5873	0.117	0.008	1.0

Current (m/s)	Time (s)	Dilution Volume (m^3)	Median NH_X (g/m^3)	Overflow Volume (m^3)	NH_X Elutriate Mass (g)	NH_X Hopper Elutriate (mg/L)	NH_X (mg/L) Near-Field	Ratio Relative to Guideline
Rehandling								
0.1	600	60,000	0.006	10000	1958	0.196	0.033	4.1
0.5	600	300,000	0.006	10000	1958	0.196	0.012	1.5
1	600	600,000	0.006	10000	1958	0.196	0.009	1.1

This conservative approach indicates that the QWQG (2006) guideline will be exceeded during rehandling and overflow activities except during elevated currents (i.e. 1 m/s) for both overflow and rehandling operations. In contrast, because of the much smaller dilution volume during low slack tide currents, ammonia levels of 3 – 4 fold over the guideline values are estimated in this situation.

This analysis does not take into account far-field dispersion processes nor non-conservative processes (i.e. adsorption to particles and settling, volatilisation across the air-water interface, oxidation to oxidised inorganic nitrogen or uptake by photosynthetic organisms) and as such should be interpreted as a very conservative measure of potential indirect impacts from increased levels of nitrogen availability to primary producers.

Application of the NAGD (2009) guidelines to estimate ‘initial dilution’ over a 4 hour period will substantially reduce these estimates as dispersion of the elutriate will be much greater than the conservative approach used here (i.e. elutriate dilution in water volume that moves past during overflow and rehandling activities). Generally, the most likely indirect impact under these circumstances is the stimulation of phytoplankton growth or blooms, which is highly unlikely as the ammonia plume is coincident with a turbid plume, which greatly reduces light availability.

It is noted that the concentration of metals and ammonia in the decant waters from the reclamation were not considered in this analysis as the majority of the pore water fraction would be fluxed out of the sediments during dredging, overflow and rehandling.

Mitigation Measures

There are no mitigation measures proposed for the predicted changes in water quality associated with elutriate inputs or sediment mobilised into the water column as a result of the dredging operations other than to monitor ammonia and manganese periodically in the locale of dredging operations.

6.8 Maintenance Dredging

Maintenance dredging will be required on occasion to maintain the channels, swing basins and berths to their declared depths and to maintain shipping safety. Based on current maintenance dredging for Port Curtis, it is likely that dredging will continue to be required annually. The impacts of maintenance dredging will be much reduced relative to those of capital dredging because the duration will be considerably less than the capital dredging programs. Sediment quality will be analysed prior to any dredging and appropriate disposal locations identified based on the physical and chemical properties of the material to be dredged. GPC will obtain all required permits for maintenance dredging and will implement mitigation measures and monitoring programs to minimise impacts on the receiving environment, in particular water quality.

6.9 Overview of Potential Impacts and Mitigation Measures

Potential impacts and mitigation measures for water quality are summarised in Table 6-10.

Table 6-10 Overview of Potential Impacts of the Project on Water Quality

Construction Aspect	Construction Process	Potential Impacts	Potential Mitigation Measures
Construction of Bund Wall	Construction of the bund will involve placement of core material and rock armour into the harbour by trucks.	The disturbance of soft seabed sediments will be limited to the first layer of rocks, after which subsequent any additional rock for that section will be dumped on rock and not the soft seabed sediments. There will be an increased risk of remobilisation of the mud wave during elevated wind and wave conditions, or during spring tides. There will also be the potential for waves to erode core material during storm (cyclone) conditions that may arise over the course of construction. There is the potential for spillage (either minor through drips or major through a leak/accident) of oils and fuels from construction equipment to impact on marine water quality. Small reduction in flushing because of loss of inter-tidal storage and small changes to currents, water levels and tide phases.	Generation of turbid plumes during rock placement to be visually monitored and photographed daily during initial construction stages. Difficult to mitigate this plume as the large tidal range and strong tidal currents limit the practicality of silt curtains in this environment. A stockpile of armour material will be held at the quarry, sufficient to cover any exposed core if a cyclone were to approach. Contingency planning for a storm will require the placement of the stockpiled armour material to cover exposed faces of the core material. No refuelling or maintenance of construction equipment will occur on the site, nor will equipment be parked at the site for a significant time, reducing the potential for significant spills of oils and fuels to occur. Spill kits for land and water based spills will be kept at the site and personnel trained in their use. Emergency response procedures will be established. No mitigation measures for flushing and hydrodynamic changes.

Construction Aspect	Construction Process	Potential Impacts	Potential Mitigation Measures
Filling of Bund Wall and Reclamation Decant	Dredged plume material will either be pumped from CSD locations or dumped by a TSHD adjacent to the reclamation and rehandled by a medium-sized CSD into the reclamation.	Placement of geotextile fabric will act to minimise the migration of fines through the bund wall and surrounding waters. Once a significant amount of dredged material is beached against the inner wall, this will also act as a filter layer to assist in preventing the migration of fine material through the bund wall into the receiving environment. TSS (and turbidity) from the decant is within the natural range and variability that has been measured within the Western Basin intertidal and subtidal regions of the Project Area with elevated levels primarily along the northern boundary of the reclamation, which is likely to the region of impacts to seagrass beds.	No mitigation required for migration of dredge plume material through the bund. To achieve water quality objectives multiple cells within the reclamation will allow finer materials to settle out of suspension via weir boxes with adjustable gates so that water can be retained for longer periods if needed, and the final weir box at the outfall can be completely closed if water quality objective is exceeded. Floating booms will also be available on site and will be deployed into the reclamation cells should wind conditions result in waves stirring up deposited sediments within the reclamation cells. Prior to each dredging program, once the dredger, volume, production rate and time frame of the particular program is known, calculations will allow design of the number of reclamation cells and the area required to achieve the water quality objectives. Development of a Dredge Management Plan including daily monitoring of sites within the final reclamation cell, at the outfall and at the northern Western Basin seagrass bed that commences two weeks prior to dredging, and continues during decant discharge.

Construction Aspect	Construction Process	Potential Impacts	Potential Mitigation Measures
Channel Dredging	Material removed from seafloor by pumped CSD or TSHD rehandling with placement in reclamation	Increased turbidity in vicinity of CSD, TSHD overflow and TSHD dumping. Development of large turbid plumes that impact seagrass beds in Western Basin (primarily during flood tides because of TSHD dumping), but less so for those in The Narrows and Wiggins Island. Decrease in the light climate experienced by seagrass beds in shallow waters. Slight reductions in net circulation patterns and flushing.	Monitoring of water quality during dredging and comparison of results to site specific water quality objectives for turbidity. Sediment sampling undertaken for the EIS determined dredged material is suitable for reclamation material, therefore the risk of contaminants being mobilised into the water column is considered low. Where possible, reduce occurrence of TSHD dumping during selected periods (such as flood phase of large spring tides) through programming, as this is when much of the dredge plume material will be transported into the Western Basin seagrass beds, and to a lesser extent, beyond these beds. No mitigation for changes to circulation patterns and flushing.

7. Risk Assessment

To assess the risk posed to the marine environment by activities undertaken as part of the proposed project a risk assessment has been undertaken. This risk assessment addresses the construction and operational aspects of the Western Basin Dredging and Disposal Project and, therefore, takes into consideration potential compounded impacts from multiple dredging programs. The assessment identifies aspects of the works that pose an environmental risk, and classes these risked into one of four categories (High, Medium, Low and Very Low). The classification then allows priorities to be set for addressing and mitigating these risks.

7.1.1 The Risk Assessment Process

No international standard exists for risk management and as a result the risk assessment methodology employed here is based on the Australian Standard AS/NZS 4360: 1999 *Risk Management* (the Standard), HB 203: 2000 *Environmental Risk Management – Principles and Process* (the Guidelines), and the GPC Environment Procedure for Risk Assessment. The Standard and Guidelines set out a generic framework for establishing the context, identifying, analysing, evaluating, treating, monitoring and communicating risks. The Best Practice Environmental Management in Mining, Environmental Risk Assessment (EA, 1999) also adopts this standard though different definitions have been adopted by EA. The GPC Environment Procedure for Risk Assessment provides a whole of business risk matrix to assist in calculating the level of consequence and likelihood for identified risks.

Risk Assessment Methodology

The objective of a risk assessment is to filter the minor acceptable risks from the major non-acceptable risks. It involves consideration of the sources of risk, the consequences and the likelihood that those consequences may occur.

Risk analysis may be undertaken to various degrees of refinement depending upon the risk information and data available. Analysis techniques include:

- Qualitative assessment;
- Semi-Quantitative assessment; and
- Quantitative assessment.

In practice, a qualitative analysis is often used to first obtain a general indication of the level of risk and then a more quantitative analysis is applied to refine the risk.

A quantitative risk assessment can be undertaken based on statistical analysis for various consequences and probabilities. In the absence of statistical data, an estimate may be made of the degree of the consequence and frequency (refer to Section 4.3 of the Standard).

The risk assessment methodology for this EIS uses a semi-quantitative process for determining risk. The semi-quantitative process estimates the degree of the consequence and probability and assigns a score to each. The assigned scores for consequence and probability are not linearly related to each other or to the level of environmental impact but are weighted descriptors (refer to Section 4.3.4 of the Standard). The risk and impact assessment process used here to assess and weight potential project risks was undertaken using an Environmental Risk and Likely Impact ("ERLI") approach. For each possible impact aspect, two key areas were addressed:

Environmental Risk

This essentially considers the risk of irreversible change to natural ecological processes and community interaction. Assessment addresses:

- Conservation significance of environmental, social and cultural values and regional context of these values;
- Current level of integrity of natural ecosystem processes;
- Known sensitivity of ecosystem processes/natural values to human induced change;
- Natural change and resilience of relevant ecosystem processes/natural values;
- Potential for cumulative social and environmental impacts; and
- Level of scientific certainty of the above factors.

Likely Impact

This considered the likely impact of the project, as modified and undertaken in accordance with mitigation strategies (including any environmental management plans or conditions from licensing/approval agencies) and includes:

- Geographic extent of the activities;
- Duration of the activities;
- Magnitude of potential environmental change;
- Confidence in prediction of impact;
- Confidence in mitigation strategies to minimise ecological and social risks; and
- Ability to monitor the impacts and detect change before irreversible change to system processes occurs.

The approach considered direct and indirect impacts, short and long term, cumulative, temporary and irreversible, and adverse and beneficial impacts.

The relative importance of each impact was examined to provide context and an ability to justifiably determine the impact's significance. In particular, the duration of the impact (temporary vs. permanent) and reversibility were considered. The ability of natural systems (including population, communities and ecosystems) to accept or assimilate impacts was also considered.

The above approach is used to provide the essential information that is used in the formal Risk Assessment as based on the Australian/New Zealand Standard 4360:2004. This methodology is outlined below.

Stage 1: Identification of Risk

This included identification of all relevant risks, addresses all known activities and related environmental aspects of the Project.

Stage 2: Risk Analysis

An important feature is recognition of the fact that an event's consequence extends beyond the immediate impact. This methodology ensures that the full consequences of events are visible to risk owners and managers and that the effects on the Project are all understood and treated. Each class of consequence is rated a score of 1 - 5, where "1" is minor consequence to "5" is critical.

An analysis of each risk is undertaken to determine an environmental event's likelihood of occurrence and its consequences. A five-level qualitative description of the likelihood and consequences for each risk enables a semi-quantitative method to be used to calculate a 'score' for each risk.

Definitions and scales for Consequences that are in accordance with the GPC Environment Procedure for Risk Assessment are shown in Table 7-1 and definitions and scales for Likelihood are shown in Table 7-2.

Stage 3: Calculation of Risk Level

Two levels of risk are used:

The **Primary Risk Level (PRL)** is a conservative measure of risk, based on the most severe consequences across all the relevant criteria. PRL is calculated according to the equation:

Primary Risk Level (PRL) = Likelihood Rating X Maximum Consequence Rating

The **Secondary Risk Level (SRL)** is a less conservative measure of risk, which incorporates all relevant criteria, not just the most severe ones. SRL is calculated according to the equation:

Secondary Risk Level (SRL) = Likelihood Rating X Average Consequence Rating

In most circumstances PRL should be the preferred measure, as it is more conservative. Risk scores are banded into risk levels, which provides a "plain English" view of the risk. Scores will always be visible to enable prioritisation within bands.

Table 7-3 and Table 7-4 show the bands, their threshold values and indicative management action.

Stage 4: Determination of Options for Treatment of Risks

Following the analysis of a risk it is necessary to investigate the options available for risk treatment and then determine the option or options that provide the greatest cost benefit.

Risks may be treated in one or a combination of ways[4]:

- Avoiding a risk by preventing the activity that leads to the risk eventuating;
- Reducing the likelihood of the risk eventuating;
- Reducing the consequences if the risk does eventuate;
- Transfer the risk; and
- Retaining the risk.

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[4] After AS/NZS 4360:2004

Table 7-1 GPC Threat Criteria and Consequence Scales

Category	Workplace Health & Safety	Environment	Financial Impact on Earnings before Interest and Tax	Community or Customer Reputation	Legal	Process Interruption
1 Minor	Near miss/no injury	On site release of pollutant contained without external assistance	Losses less than $100,000	Isolated complaint	Court action with small fine – less than $10,000	Less than 1 hour
2 Moderate	First Aid Treatment	On site release of pollutants contained with external assistance	Losses of $100,000 to $1 million	Multiple community or customer complaints	Court action with moderate fine - $10,000 to $75,000	1 hour to 1 shift
3 Significant	Medical treatment	Significant on or off site release and detrimental impacts	Losses of $1 million to $2.5 million	Community action with possible delays to project	Court action with significant fine - $75,000 to $250,000	1 shift to 1 day
4 Major	Serious injury/lost time injury	Major offsite release and detrimental impacts	Losses of $2.5 million to $5 million	Community action severely delays project	Court action with major fine - Greater than $250,000	1 day to 1 week
5 Critical	Major extensive injury (permanent disablement) or fatality	EPA ordered shutdown of major part of process	Losses of greater than $5 million	Community or customer outrage prevents projects or results in severe damage to Corporate image which limits future options	Court action with jail sentence	More than 1 week

Table 7-2 GPC Likelihood Rating

Likelihood	Rating	Likelihood Calculator
Rare	1	The risk may occur only in exceptional circumstances (The risk is not likely to occur in the next 25 years)
Unlikely	2	The risk could occur at some time (The risk is likely to occur once in the next 5-25 years)
Possible	3	The risk might occur at some time (This risk is likely to occur in the next 2-5 years)

Likelihood	Rating	Likelihood Calculator
Likely	4	The risk will probably occur in most circumstances (The risk is likely to occur in 1-2 years)
Almost Certain	5	The risk is expected to occur in most circumstances (The risk is likely to occur within the next 12 months)

Table 7-3 GPC Risk Assessment Matrix

	Consequence				
Likelihood	Critical (5)	Major (4)	Significant (3)	Moderate (2)	Minor (1)
Almost Certain (5)	High	High	High	Medium	Medium
Likely (4)	High	High	Medium	Medium	Low
Possible (3)	High	Medium	Medium	Low	Low
Unlikely (2)	Medium	Medium	Low	Low	Very Low
Rare (1)	Medium	Low	Low	Very Low	Very Low

Table 7-4 Risk Levels and Management Action (Example)

Risk Level (PRL or SRL)	Descriptor	Indicative Management Action
1-4	Low	Manage by routine procedures, unlikely to need specific application of resources
5-10	Medium	Manage by specific monitoring or response procedures, develop more detailed actions as resources allow
10-16	High	Senior management attention needed and management responsibilities specified for further action
17-25	Extreme	Immediate action required, senior management will be involved

Limitations

As with any model, the relevance and applicability of the risk model revolves around a number of basic assumptions and limitations. The application of the risk model has been based on subjective ranges of consequences and probabilities.

Limitations of the application of the risk methodology for this study include:

- The assessment is based on the professional judgement of a limited number of experienced GHD staff and does not incorporate the collective experience of all parties involved with the Project. The full range of risks and the most appropriate consequence and likelihood rating would be best completed in a workshop involving key stakeholders;
- The assessment has been limited to a selected number of primary risks and the assessment of cumulative risk to the environment from multiple pollution sources or sources of environmental

degradation has not been addressed. Cumulative risks are approached for this study in a qualitatively manner only.

Although a semi-quantitative methodology was used to conduct the risk assessment, the resultant risk estimation is purely relative. The risk estimations do not imply an absolute scale of risk that can be applied to any other situation or assessment.

7.1.2 Applying the Process to Expected Impacts

Table 7-5 adopts the process described above to provide an assessment of water quality risks for the Project.

Table 7-5 Water Quality Risk Assessment

Activity Description	Potential Impacts and their Consequences	Preliminary Risk Assessment (C, L) Score	Additional Control Strategy	Residual Risk with Additional Control Strategies Adopted (C, L) Score
Construction Phase				
Construction of Bund	Impact upon hydrodynamic regime and slightly reduced flushing of the Project Area with potential for small increases to background water quality levels.	(1,5) Medium	No ability to control impact.	(1,5) Medium
	Impact upon turbidity of the Western Basin inter-tidal and sub-tidal area from the disturbance of soft seabed sediments will be limited to the first layer of rocks after which any additional rock will be dumped on rock and not the soft seabed sediments.	(1, 5) Medium	Little ability to control impact. Silt curtains inappropriate given high flow environment. Minimal impacts expected.	(1, 5) Medium
	Increased risk of remobilisation of disturbed sediments during elevated wind and wave conditions, or during spring tides. There will also be the potential for waves to erode core material during storm (cyclone) conditions that may arise over the course of construction.	(2, 3) Low	Small stockpile of armour material held at the quarry sufficient to cover any exposed core if a cyclone approaches. Construction technique likely to have armour layer only 20 to 30m behind core. Minimise exposed core to 50m.	(2, 2) Low

Activity Description	Potential Impacts and their Consequences	Preliminary Risk Assessment (C, L) Score	Additional Control Strategy	Residual Risk with Additional Control Strategies Adopted (C, L) Score
	There is the potential for spillage (either minor through drips or major through a leak/accident) of oils and fuels from construction equipment to impact on marine water quality.	(3, 5) High	No refuelling or maintenance of construction equipment to occur on site, nor equipment to be parked at the site for a significant time. Readily available spill kits for land and water to be kept on site with trained personnel. Emergency response procedures will be established. Adherence to waste management controls identified in the EMP for this Project.	(1, 5) Medium
Filling of the Bund and Dredge Decant	Placement of geotextile fabric will minimise migration of fines through bund wall into surrounding waters. Once substantial amount of dredged material is beached against the inner wall this will act as an additional filter layer to prevent fine material migration through the bund wall into the receiving environment.	(3,4) Medium	No additional mitigation required.	(3,4) Medium
	Predicted TSS (and turbidity) from the decant results primarily in elevated levels along the northern boundary of the reclamation, which is the likely region of impacts to seagrass beds.	(3,5) High	Appropriate design and construction of bund, including lining with geotextile fabric and installing internal bunding, to reduce potential for fines to be moved back into marine environment through the bund wall or via the decant waters. Monitor tailwater decant to meet conditions/objectives within pond and/or within approved mixing zone. Provision to modify internal bund structure or discharge weir arrangement if required.	(3,4) Medium

Activity Description	Potential Impacts and their Consequences	Preliminary Risk Assessment (C, L) Score	Additional Control Strategy	Residual Risk with Additional Control Strategies Adopted (C, L) Score
Remnant Channel to West of Reclaimed Area	Reduction in net circulation and flushing	(1, 3) Low	Limited ability to control impact.	(1, 3) Low
CSD Dredging	Increased turbidity in vicinity of CSD	(1, 5) Medium	Limited impact in comparison to TSHD, with DMP to be adopted. No additional measure proposed.	(1, 5) Medium
	Metals concentrations exceed trigger level due to CSD operation including release of sediment due to the activity of the cutter	(1, 5) Medium	No ability to control impact, but likely extent and persistence minimal.	(1, 5) Medium
TSHD Dredging	Increased turbidity in vicinity of TSHD overflow. Primary impact will be on seagrass bed areas in the Western Basin.	(4,4) High	Monitoring and control of dredge regime to be in accordance with dredge management plan (DMP). Monitor turbidity levels against site specific objective within relevant sensitive ecosystem receptors and adjacent habitats and respond as required by DMP. Activity alteration may include reducing duration of dredging at particular locations during spring tide, relocating dredge to different areas in accordance with dredge program, planned increase in period between dredging activity at any one location. Use of a CSD has been nominated for areas closest to The Narrows and Graham Creek.	(4,3) Medium

Activity Description	Potential Impacts and their Consequences	Preliminary Risk Assessment (C, L) Score	Additional Control Strategy	Residual Risk with Additional Control Strategies Adopted (C, L) Score
	Increased turbidity and decreased light on seagrass beds in Western Basin owing to TSHD dumping, with reduced impact on areas such as The Narrows and Grahams Creek.	(4, 5) High	Program dredge activity to avoid, where practicable, use of TSHD in dump mode in northern extents of Western Basin during flood phase of large spring tides. Implement offset program in accordance with conditions.	(3, 5) High
	Increased turbidity and decreased light on seagrass beds other than the Western Basin because of TSHD dumping	(2, 4) Medium	Dumping and rehandling primarily affect remnant part of Western Basin immediately to north of reclamation. Recommendations as above.	(2, 3) Low
	Metals concentrations exceed trigger level due to TSHD operation including release of sediment due to the activity of the cutter	(2, 5) Medium	No ability to control impact, but perhaps relatively large extent and moderate persistence.	(2, 5) Medium
	Potential release of waste materials or pollutants associated with the dredger into the marine environment resulting in reduction in biodiversity.	(4, 3) Medium	Adherence to waste management controls for vessel operations.	(4, 2) Medium
Operational Phase				
Water Quality Impacts	Impacts to marine water quality from alteration of stormwater input, including increased erosion or storm water run-off to adjacent marine environment during storm / flooding events. Potential to mobilise contaminants into the marine environment and reduce biodiversity.	(2, 3) Low	Implement appropriate topside waste and stormwater management system. Design stormwater drainage systems to avoid increased scouring potential at release points in adjacent marine environment or concentration of freshwater inputs at outflow points to reduce impacts at point of introduction.	(2, 2) Low

Activity Description	Potential Impacts and their Consequences	Preliminary Risk Assessment (C, L) Score	Additional Control Strategy	Residual Risk with Additional Control Strategies Adopted (C, L) Score
Maintenance Dredging	Maintenance dredge program will increase in keeping with extended network of channels. Turbidity will be generated accordingly, subject to the type of dredge used. Similar practices to those currently employed for maintenance dredging likely to be employed.	(2, 5) Medium	Sediment quality will be analysed prior to any dredging and appropriate disposal locations identified based on the physical and chemical properties of the material to be dredged. GPC will obtain all required permits for maintenance dredging and will implement mitigation measures and monitoring programs to minimise impacts on the receiving environment, in particular water quality. Review and update DMP for maintenance dredging.	(2, 5) Medium

8. Cumulative Impacts and Mitigation Strategies

8.1 Background

Any proposed development has the potential to impact upon the environmental, social or economic values of a region as a result of its development. It also has the potential to produce a cumulative impact upon those values when the proposed activity is conducted in combination with other developments. The typical effect is a compounded impact resulting from the interaction of multiple stressors from different projects. To have complete understanding of the full impact potential of a proposed development, it is necessary to assess the potential cumulative impacts that may result from the Project in combination with other projects. In addition, assessing the direct and indirect impacts attributable only to the project of interest must be carried out.

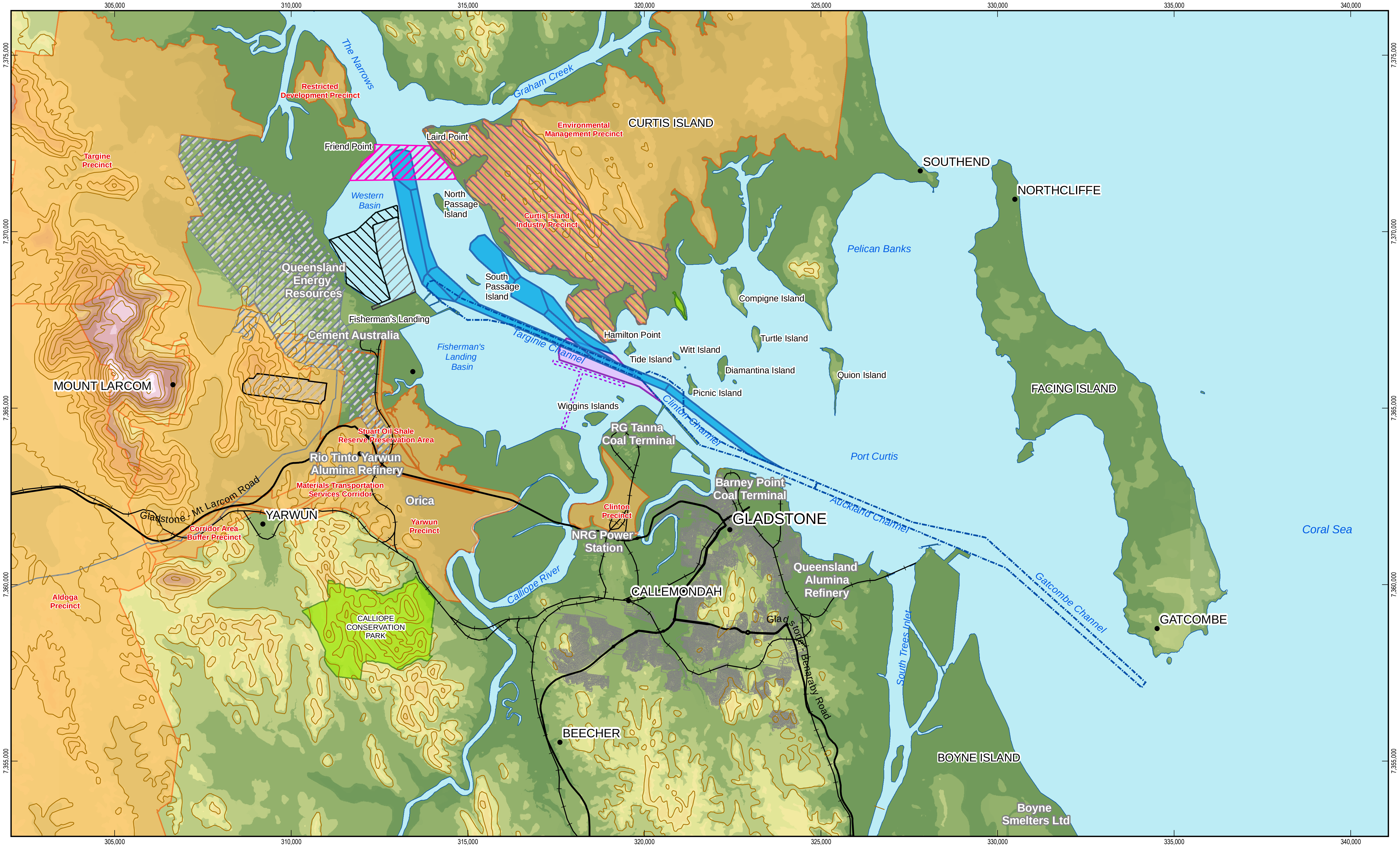
An assessment of cumulative environmental impacts considers the potential impact of a proposed development in the context of:

- Previous developments to provide context to environmental resilience;
- Existing developments to understand direct potential confounding impacts; and
- Future developments to consider all potential and indirect environmental impacts.

The assessment enables all potential impacts of a project to be understood in relative context and not in isolation from other projects. Assessment of previous developments should be conducted in context of the current baseline conditions of the environment. In this regard the existing environment has been characterised through studies conducted to complete the EIS and is reported in the main body of the EIS. Economic and social impacts from the Project are also presented in the body of the EIS, and, in accordance with the ToR, the cumulative impacts of relevance to these sections are noted here and detailed in the following sections.

A number of coastal developments are being undertaken in the Gladstone region concurrently (Figure 8-1). These include:

- Annual maintenance dredging of the shipping channels, swing basins and berth pockets of various Port of Gladstone facilities by the '*Brisbane'* trailer hopper suction dredger;
- Development of the Wiggins Island Coal Terminal (approved);
- LNG Ltd Stage 1 dredging at the existing Fisherman's Landing reclamation Bulk Liquids Wharf;
- Fisherman's Landing Northern Expansion (draft EIS on public display); and
- Construction of marine offload facilities, including associated dredging, on the western coast of Curtis Island to facilitate the import of materials for LNG plant construction (Curtis Island industry precinct).



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Kilometres

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Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 56

LEGEND

- ● Town and Locality
- Contour (50m interval)
- Railway
- Major Road
- Built Up Area
- 🟩 Conservation Estate
- ▨ Western Basin Reclamation
- ▨ Fisherman's Landing Northern Expansion
- ▨ Mining Lease
- ▨ Quarry Lot Boundary
- 🟧 Gladstone State Development Area
- 🟦 Proposed Dredging
- ▨ Bridge & Road Marine Investigation Area
- ▨ LNG Facility Investigation Area
- Proposed Wiggin's Island Wharf
- Existing Channels, Swing Basins and Berths
- Wiggins Island Coal Terminal (Approved)

GHD

GPC

Port of Gladstone
Western Basin Dredging and Disposal Project

Job Number	42-15386
Revision	A
Date	30 Aug 2009

Existing and Proposed Industries

Figure 8-1

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The Western Basin Dredging and Disposal Project, which will be developed in parallel with the above projects, is required by GPC to provide additional capacity for land based disposal of material from capital and maintenance dredging works in the Port of Gladstone. A comparative assessment of opportunities for disposal of the dredged material in other locations has been undertaken as part of this EIS and determined that placement of material within the Western Basin footprint provides the least impact approach. This assessment is detailed under Chapter 1 of the main EIS document.

If one or more other projects proceed in parallel with this project, there is potential for cumulative environmental impacts to the region resulting from concurrent or successive developments, particularly with regard to compounding impacts from multiple dredging activities.

Impacts from future developments are not able to be quantified and, accordingly, it is appropriate to examine cumulative impacts across all developments from a qualitative perspective. In this regard the methodological approach to assessment of cumulative impacts for the proposed Western Basin Dredging and Disposal Project has been to:

- Describe the existing baseline conditions of relevance to the Project Area;
- Ascertain potential direct and indirect impacts from the Western Basin Dredging and Disposal Project;
- Identify mitigation and management measures for each identified impact;
- Ascertain which of the identified impacts may be compounded by concurrent or successive other developments within the local region;
- Qualitatively describe how identified impacts are compounded; and
- Identify mitigation and management measures against the compounded impact potential.

In accordance with the ToR, the following describes identified cumulative impacts and mitigation measures for the water quality considerations of the Western Basin Dredging and Disposal Project. This section focuses on the impacts identified in Section 6 that may be compounded by other projects occurring concurrently or in succession.

8.2 Cumulative Impacts

8.2.1 Project Context

The Port of Gladstone has experienced ongoing development since the beginning of the twentieth century. Surveys in recent years and those for this EIS have identified good water quality in the Project Area under existing port operational conditions. However, as dredging and reclamation have both direct and indirect impacts on water quality, it follows that the implementation of additional dredging and reclamation projects will have a cumulative impact.

The proposed dredging activities intend to utilise the Western Basin reclamation site for dredged material disposal. An ability to better assess the potential cumulative impacts that could occur from the multiple dredging programs that are proposed for the Gladstone region has been achieved by including and simulating a large number of potential future dredging works under the impact assessment for this EIS. Works proposed for Fisherman’s Landing, LNG Limited and Wiggins Island Coal Terminal have not been included in the impact assessment for this project. Wiggins Island Coal Terminal has already achieved approval and the dredging works to be undertaken for Fisherman’s Landing and LNG Limited are being assessed under separate EIS processes.

Construction and operational cumulative impacts beyond dredging works have not, however, been addressed under this project. Accordingly, in conjunction with the assessment of impacts from all dredging activities, it is appropriate to also explore potential cumulative impacts that may result from concurrent water based construction projects within the Project Area as these could compound and amplify the impacts identified by this project. With respect to turbidity, these changes are likely to be limited to piling, and construction of marine off-loading facilities (MOFs) (dredging of MOFs is included in this EIS, but MOF construction activities may also generate turbidity).

8.2.2 Approaches to Reduce Cumulative Impact Potential within Gladstone

By locating the Western Basin Dredging and Disposal Project adjacent to the Fisherman's Landing Northern Expansion, the potential impacts of these projects are amalgamated in one area. This amalgamation of impact areas has allowed for the avoidance of multiple regions of degraded water quality in the port.

8.2.3 Expected Cumulative Impacts in Addition to Dredging Activities

Hydrodynamic modelling as well as water and sediment quality studies undertaken to support this EIS have been used to inform what potential impacts may occur as a direct or indirect result of all (cumulative) reclamation and dredging works. This includes scenarios with multiple dredgers operating. A full quantitative assessment of potential impacts from all concurrent projects would require detailed understanding of construction requirements and approaches, which is beyond the scope of this study currently. However, the risk assessment for this project also identified a range of in-water construction impacts, which are likely applicable across all projects and have been considered here for the qualitative assessment.

On this basis, potential cumulative impacts from concurrent projects in the Project Area are expected to result in some degradation of water quality and have been identified to include:

- Declines in water and sediment quality (including increased pollution) associated with construction events such as bund construction, bund filling and capital dredging works (as simulated in the modelling process);
- The flow on effects to benthic habitats and communities, particularly with respect to increased turbidity; and
- Declines in water and sediment quality associated with longer maintenance dredging requirements relative to those currently employed.

8.2.4 Expected Effects on Water Quality from Identified Cumulative Impact Activities

Mitigation strategies against each impact for the Proposed Western Basin Dredging and Disposal Project were identified in the Section 7.1.2 under Table 7-5. These took into consideration the potential impacts from multiple dredging projects occurring concurrently. These are considered to be the biggest concern with regard to cumulative impact potential relating to the multiple project development that may occur within the Project Area. Degradation of water quality is only expected to be temporary, coincident with active dredging operations as the flushing time scale is approximately 30-40 days. Accordingly, impacted areas are not expected to be permanently impacted from declines in water quality or altered hydrodynamic regimes, as assessed by this Project.

8.2.5 Offsets and Mitigation of Potential Cumulative Impacts

The major cumulative impact of approved and proposed projects on water quality is likely to lead to reductions to the extent of seagrass beds and suitable habitat for other marine communities in the Project Area. This is addressed further under the Marine Ecology Report (GHD 2009d), which should be referred to for a discussion of all potential cumulative impacts to marine ecology.

9. Conclusion

Water quality monitoring for this EIS and past data of the Project Area has characterised the locality as a turbid environment with relatively good water quality. Most of the physico-chemical and chemical parameters were within adopted guidelines.

As the Project involves reclamation of approximately 235 ha of seabed, there is a minor impact on tidal currents, water levels and flushing efficiency with diminishing effects with distance from the Reclamation Area. The hydrodynamic and flushing impacts of the proposed capital dredging areas are less than those associated with the loss of the tidal volume from the Reclamation Area.

The main potential construction impacts, including potential cumulative impacts, which may result during the reclamation and channel dredging works are, therefore:

- Decant discharge during filling of the Reclamation Area is predicted to generate elevated turbidity in the region of the outfall and particularly along the northern bund wall. However, the effects of the decant discharge on the northern Western Basin inter-tidal and sub-tidal regions are greatly diminished relative to the northern bund wall area. Representative locations of sensitive seagrass beds (i.e. Wiggins Island and the Narrows) are not significantly impacted by elevating the decant discharge;
- CSD plants are predicted to have a low impact on turbidity and water quality, as most of the dredged material will be pumped directly to the Reclamation Area;
- TSHD plants are predicted to have greater impacts in terms of areal extent during dredging works. Regions of persistent elevated turbidity are predicted as a consequence of overflows during active dredging and emptying of the hopper adjacent to the eastern bund wall with subsequent rehandling by a dedicated CSD plant with dredge material pumped into the Reclamation Area. In particular, hopper dumping coincident with flood tides will have an impact on the turbidity climate of the Western Basin and to a lesser degree on the Narrows. Increased turbidity reduces the light intensity at the seabed, thereby impacting seagrass beds. Seagrass beds in the vicinity of Wiggins Island are not greatly impacted during ebb tides as the dredge material plumes are primarily confined to the deep water channels with elevated velocities; and
- The sediments of the Project Area are predominately of good quality, hence other than increases in turbidity, persistent degradation to other physico-chemical and chemical parameters is not anticipated. However, elutriate analyses indicate manganese and ammonia that can be readily released from the sediments and/or are contained within the pore waters, however ammonia concentrations are compliant to the ANZECC (2000) toxicant guidelines. For TSHD overflow and rehandling activities, elevated levels of ammonia were conservatively estimated to range from a 3-4 fold increase over QWQG (2006) guidelines during low slack tide. However, the impact is likely to be substantially less when a number of physical, chemical and biological processes that would decrease ammonia values in the water column are taken into account and the NAGD (2009) initial dilution over a 4 hour period is applied.

All of these potential impacts on water quality are temporary, and water quality should therefore return to levels similar to the current status in between various capital dredging works stages and at the end of the project. Small changes to the overall water quality may occur because of minor changes to flushing efficiency of certain regions in the Project Area.

In addressing the potential risks to the marine system from the Project proposed mitigation measures were examined, where opportunities to mitigate impacts are available. These were detailed above and, in brief, include:

- Development and implementation of a reactive dredge management plan to mitigate against impacts on water quality from dredging activities;
- Implementation of waste management plans;
- Appropriate design of the Reclamation Area facility to reduce water quality impacts from leaching of material through the bund wall, decant waters and storm-water run-off; and
- Practicable scheduling of TSHD hopper dumps to not occur during some flood tide periods to reduce turbidity and light climate impacts to Western Basin shallow waters.

A number of direct impacts are not able to be mitigated such as modifications to hydrodynamics and flushing efficiency.

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Appendix A

Review of Previous Water and Sediment Quality Studies

GHD (2009)

CLIENTS | PEOPLE | PERFORMANCE

Gladstone Ports Corporation

Report for Fisherman's Landing Northern Expansion Environmental Impact Statement

Review of Previous Water and Sediment Quality Studies

May 2009

Contents

Table Index

Figure Index

1. Introduction

Numerous studies relating to water and sediment quality in Port Curtis have been undertaken since the 1990's. These studies have been reviewed and are presented in this report to provide baseline information on water and sediment quality in Port Curtis, which will assist in the determination of the potential impacts of the proposed Fisherman's Landing Northern Expansion.

Studies reviewed include the following:

- Baseline water quality data collection during periods where no dredging or reclamation was occurring;
- Data collected on the quality of sediments to be dredged (capital and maintenance);
- Water quality data collected during dredging and reclamation projects, with a focus on inner harbour dredging and onshore disposal; and
- Research projects undertaken by the Cooperative Research Centre for Coastal Zone, Estuary and Waterway Management and Central Queensland University, which include biological as well as physicochemical indicators.

2. Existing Information on Water Quality in Port Curtis

2.1 Introduction

Water quality studies previously undertaken either in the vicinity of the proposed Fisherman's Landing Northern Expansion or for similar dredging and reclamation projects between 1995 and 2009 are summarised in Table 3 with further details of these studies after this summary table. The sampling sites for each study are shown in Figure 1. Results of studies are compared against the relevant guidelines as determined in Chapter 8 of the main EIS document. These are provided in Table 1 and Table 2.

Table 1 Guidelines for Physicochemical Indicators in Central Queensland Waters

Central Region Water Type	Enclosed coastal (QWQG 2006)	Marine (Tropical Australia - Inshore) (ANZECC 2000)
pH	8.0 – 8.4	8.0 – 8.4
Turbidity (NTU)	6	1 – 20
Secchi depth (m)	1.5	-
Suspended Solids (SS) (mg/L)	15	-
Dissolved Oxygen (% sat)	90 – 100	90
Ammonia as N (mg/L)	8	1 – 10
Oxidised Nitrogen as N (mg/L)	3	-
Organic Nitrogen (mg/L)	180	-
Total Nitrogen (mg/L)	200	100
Filterable Reactive Phosphate (mg/L)	8	5
Total Phosphorus (mg/L)	25	15
Chlorophyll-a (mg/L)	4	0.7 – 1.4

Table 2 Trigger Values for Metals and Metalloids in Marine Water for Slightly-Moderately Disturbed Systems (ANZECC 2000)

Metals and Metalloids	TV for Marine Water (µg/L)	Level of Protection (% species)
Cadmium	0.7	99
Chromium (Cr III)	27.4	95
Chromium (Cr VI)	4.4	95
Cobalt	1	95

Metals and Metalloids	TV for Marine Water (µg/L)	Level of Protection (% species)
Copper	1.3	95
Lead	4.4	95
Mercury (inorganic)	0.1	99
Nickel	7	99
Silver	1.4	95
Tributyltin (as Sn)	0.006	95
Vanadium	100	95
Zinc	15	95

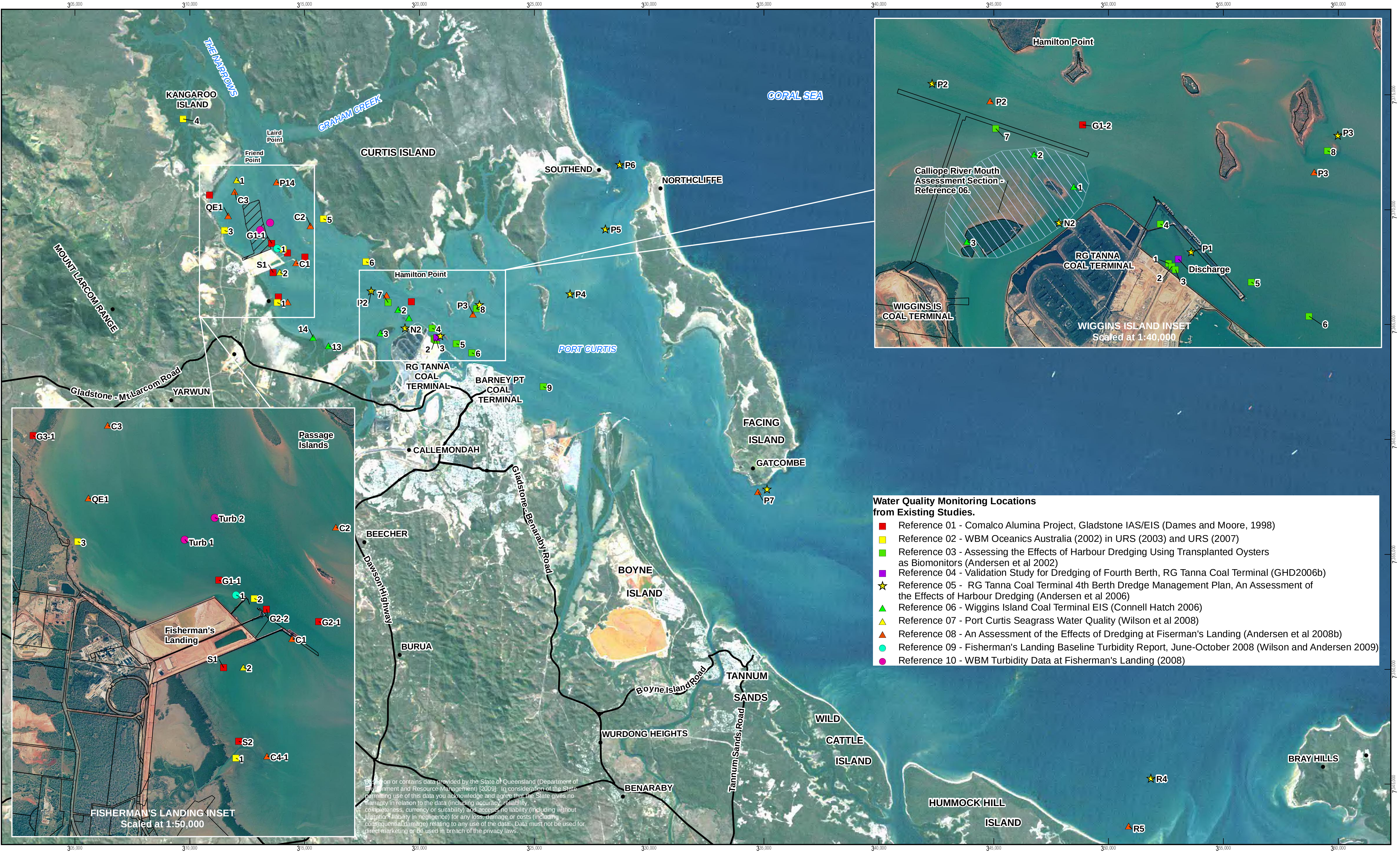
Table 3 Water Quality Studies Undertaken in the Vicinity of the Proposed Project Area

Study/Purpose	Sampling Locations	Sampling Date/s	Parameters Measured
Comalco Alumina Project Gladstone: Impact Assessment Study, Environmental Impact Statement, Vol 1. (Dames and Moore 1998)	1995 Shipping channels near Tide Island and South Passage Island Fisherman's Landing (NE edge of ship turning circle at Fisherman's Wharf) and south of Friend Pt) Targinie Creek (middle reaches and mouth of tributary) 1997 Lower intertidal mud bank 200 m and 800 m from Fisherman's Landing Wharf Boat Creek, Flying Fox Creek, Nutmeg Creek, Calliope River	September 1995 November 1997	Various combinations of the following at different sites: ◗ Total Suspended Solids (TSS) ◗ Total Dissolved Solids (TDS) ◗ Total Organic Carbon (TOC) ◗ Total Nitrogen (TN) ◗ Total Phosphorus (TP) ◗ pH ◗ Metals (Fe, Al, Mn, As, Cd, Co, Cr, Cu, Hg, Mo, Ni, Pb, Se, Sn) ◗ Turbidity
Baseline and background survey undertaken by WBM Oceanics Australia [2002] in URS (2007; 2003). *Gladstone Nickel Project Environmental Impact Statement, Vol 1.* (URS 2007). *Chlor Alkali/Ethylene Dichloride Plant Gladstone, Environmental Impact Statement, Vol.1*. (URS 2003).	Boat Creek Fisherman's Landing Fisherman's Landing Embayment Targinie Creek Curtis Island	1998 – 2001	◗ *In situ* parameters (temperature, conductivity, salinity, pH, redox potential, dissolved oxygen (DO), turbidity, Secchi depth). ◗ Trace elements (Al, As, Ba, B, Cd, Cr, Cu, Fe, Pb, Mn, Hg, Ni, Zn, F, Cn) ◗ Nutrients (TN, Total Kjeldahl Nitrogen (TKN), organic-N, ammonia, nitrite, nitrate, TP and Filterable Reactive Phosphate (FRP)) ◗ SS

Study/Purpose	Sampling Locations	Sampling Date/s	Parameters Measured
Cooperative Research Centre (CRC) for Coastal Zone, Estuary and Waterway Management – Technical Report 25: Contaminants in Port Curtis: screening level risk assessment (Apte *et al.* 2005)	50 sites throughout Port	August – October 2001 (dry season) and February 2002 (wet season)	◗ Metals (Al, As, Cd, Cr, Cu, Fe, Hg, Ni, Pb, Se, Zn) ◗ Tributyltin (TBT)
Assessing the Effects of Harbour Dredging using Transplanted Oysters as Biomonitors. (Andersen *et al.* 2002)	Monitoring undertaken at RG Tanna reclamation decant point	3-4 January 2002 5-6 February 2002 11-15 March 2002 16 April 2002	◗ Composite samples of 5 whole oyster soft tissues were analysed for metals (Cd, Cr, Ni, Pb Ag, Al, Cu, Fe, Zn, As and Se) ◗ Seagrass (*Zostera capricorni*) were analysed for metals (Cd, Cr, Ni, Pb, Ag, Al, Cu, Fe, Zn, As and Se)
Capital Dredging of the Fourth Berth at RG Tanna Coal Terminal, Protection of the Marine Environment During Dredging and Dewatering. GHD (2005).	RG Tanna Coal Terminal	February 2004 to April 2005	Turbidity (prior to works commencing)
Validation Study for Dredging of Fourth Berth, RG Tanna Coal Terminal (GHD 2006a)	Cell 4 (final reclamation pond) Discharge Point Gladstone Harbour (receiving waters)	21 – 28 November 2005	Turbidity
RG Tanna Coal Terminal 4th Berth Dredge Management Plan, An Assessment of the Effects of Harbour Dredging (Andersen *et al.* 2006)	In vicinity of discharged reclamation water, middle and outer harbour sites within Port Curtis and reference sites outside the predicted range for sediment transport from Port Curtis	July/August 2005 (pre-dredge monitoring) 23 November 2005 – 6 January 2006 (dewatering of the reclamation cells)	◗ Physicochemical water parameters (pH, temperature, dissolved oxygen, turbidity and conductivity) ◗ Biomonitors (transplanted oysters and DGTs) to assess water metal concentrations (Cu, Zn, Al, Cd, Fe, Ag and Hg)

Study/Purpose	**Sampling Locations**	**Sampling Date/s**	**Parameters Measured**
Wiggins Island Coal Terminal Environmental Impact Statement, Revision 3. Connell Hatch (2006).	Intertidal, marine areas adjacent to Wiggins Island and Mud Island Flying Fox Creek Sandfly Creek	14 – 15 May 2006 and September 2006	Wet and dry season data: ◗ Turbidity ◗ Chlorophyll-a ◗ DO (%sat) ◗ pH ◗ TSS
Port Curtis Integrated Monitoring Program (PCIMP), Port Curtis Ecosystem Health Report Card (Storey *et al.* 2007)	Zone 2 Inner Harbour Fisherman's (includes Fisherman's landing Wharf)	2006-2007 data	◗ Water chemistry, water contaminants, mangrove health, sediment contaminants, and seagrass biomass
Port Curtis Seagrass Water Quality (Wilson *et al.* 2008)	15 – 20 cm above sediment surface from three seagrass beds in Port Curtis	24 January to 18 April 2008	◗ Temperature, turbidity and light
PCIMP Biomonitoring 2007, North Harbour Zones (Andersen *et al.* 2008a)	Estuarine, inner harbour and outer harbour areas of Port Curtis	July and September 2007	◗ Water quality, including temperature, conductivity, dissolved oxygen, pH and turbidity ◗ Metal concentrations in oysters and DGTs
An Assessment of the Effects of Dredging at Fisherman's Landing (Andersen *et al.* 2008b)	Fisherman's Landing: ◗ adjacent to the dredge head ◗ northern seagrass meadow ◗ reclamation cell ◗ discharge point ◗ eight sites in the harbour	Before dredging (18 Feb to 3 Mar 08) During dredging (4 to 10 Mar 08) During dewatering (11 Mar to 8 Apr 08)	◗ *In situ* parameters (temperature, conductivity, TDS, DO, pH, turbidity, redox, light attenuation) ◗ Metals (total and dissolved)
WBM Turbidity Data from Fisherman's Landing 2008	Two sites: one at Fisherman's Landing tidal flats and one adjacent to tidal flats in deeper water	15 August to 9 September 2008	Turbidity, conductivity, temperature

Study/Purpose	Sampling Locations	Sampling Date/s	Parameters Measured
Fisherman’s Landing Baseline Turbidity Report (Wilson and Andersen 2009)	Fisherman’s Landing Berth 5	Between June and October 2008	Temperature and turbidity



Water Quality Monitoring Locations from Existing Studies.

- 🟥 Reference 01 - Comalco Alumina Project, Gladstone IAS/EIS (Dames and Moore, 1998)
- 🟨 Reference 02 - WBM Oceanics Australia (2002) in URS (2003) and URS (2007)
- 🟩 Reference 03 - Assessing the Effects of Harbour Dredging Using Transplanted Oysters as Biomonitors (Andersen et al 2002)
- 🟪 Reference 04 - Validation Study for Dredging of Fourth Berth, RG Tanna Coal Terminal (GHD2006b)
- ☆ Reference 05 - RG Tanna Coal Terminal 4th Berth Dredge Management Plan, An Assessment of the Effects of Harbour Dredging (Andersen et al 2006)
- ▲ Reference 06 - Wiggins Island Coal Terminal EIS (Connell Hatch 2006)
- △ Reference 07 - Port Curtis Seagrass Water Quality (Wilson et al 2008)
- ▲ Reference 08 - An Assessment of the Effects of Dredging at Fiserman's Landing (Andersen et al 2008b)
- ● Reference 09 - Fisherman's Landing Baseline Turbidity Report, June-October 2008 (Wilson and Andersen 2009)
- ● Reference 10 - WBM Turbidity Data at Fisherman's Landing (2008)

Based on or contains data provided by the State of Queensland (Department of Environment and Resource Management) [2009]. In consideration of the State permitting use of this data you acknowledge and agree that the State gives no warranty in relation to the data (including accuracy, reliability, completeness, currency or suitability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of the data. Data must not be used for direct marketing or be used in breach of the privacy laws.

1:150,000

0 1 2 3 4 5

Kilometres (at A3)

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid of Australia, Zone 56

N

LEGEND

- Major Road
- ☐ Cadastre
- ▨ Proposed Fisherman's Landing Northern Expansion

NOTE:
Water quality sample locations are intended to be as accurate as possible however, the locations were obtained from scanned copies of reports, not from actual GPS data.
Refer to referenced report from further information.

GHD GPC

Fisherman's Landing Northern Expansion EIS

Job Number	42-15386
Revision	A
Date	28 May 2009

Location of Water Quality Sampling Sites from Previous Studies in Port Curtis

Figure 1a

2 / 100 Goondoon Street Gladstone QLD 4680 Australia T 61 7 4972 6377 F 61 7 4972 6236 E gltmail@ghd.com.au W www.ghd.com.au

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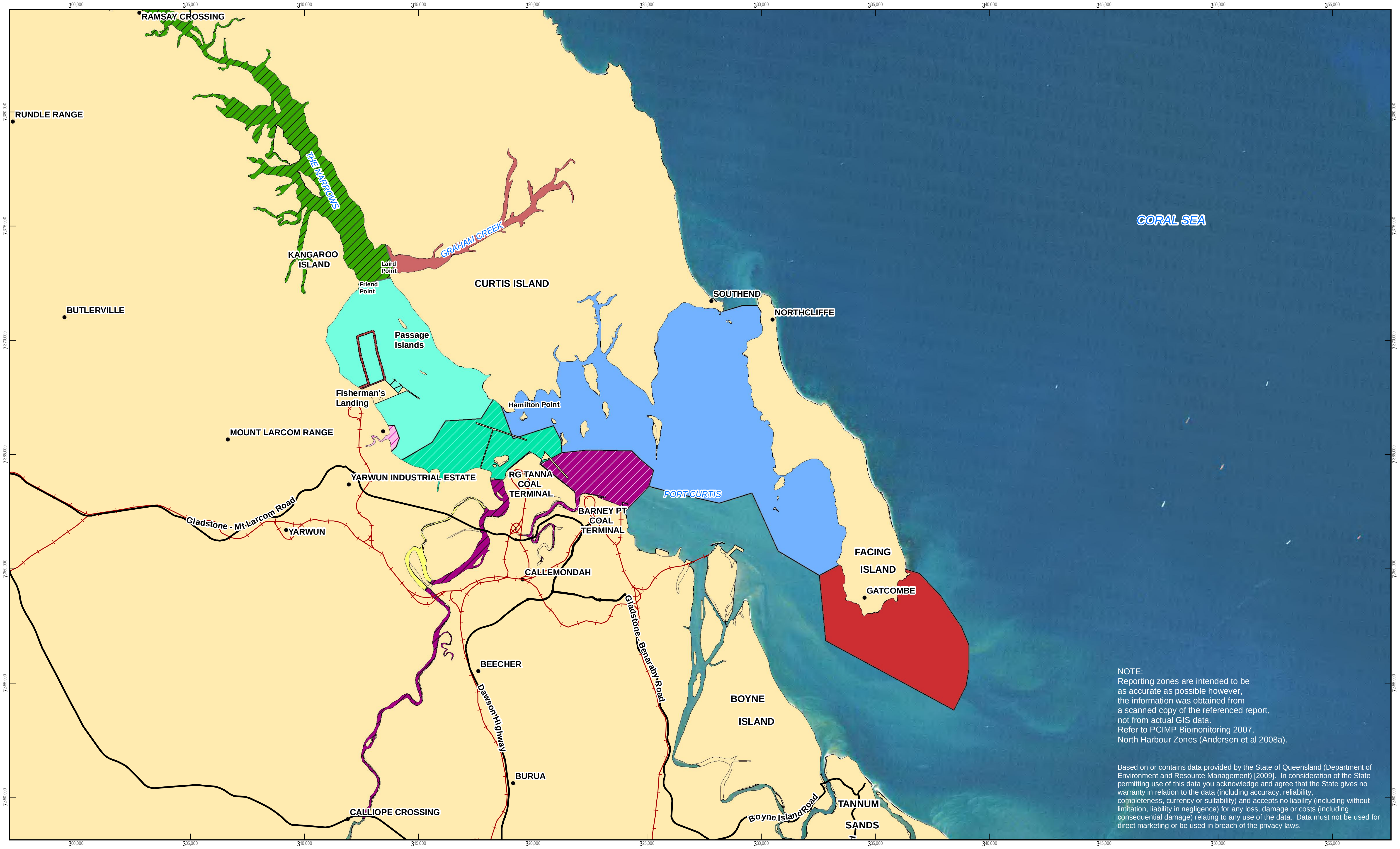
Data Sources: Reclamation area (2009) - ©The State of QLD (Gladstone Ports Corporation); Landsat (2007), Aerial imagery (2007) ©The State of QLD (Department of Environment and Resource Management); 250K Topo Data (2006) - ©Commonwealth of Aust (Geoscience Australia). Created by: TH.



NOTE:
Reporting zones are intended to be
as accurate as possible however,
the information was obtained from
a scanned copy of the referenced report,
not from actual GIS data.
Refer to PCIMP Biomonitoring 2007,
North Harbour Zones (Andersen et al 2008a).

Based on or contains data provided by the State of Queensland (Department of Environment and Resource Management) [2009]. In consideration of the State permitting use of this data you acknowledge and agree that the State gives no warranty in relation to the data (including accuracy, reliability, completeness, currency or suitability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of the data. Data must not be used for direct marketing or be used in breach of the privacy laws.

1:150,000

0 1 2 3 4 5

Kilometres (at A3)

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid of Australia, Zone 56

N

LEGEND

—	Major Road
┼	Rail line

PCIMP Biomonitoring Zones 2007

▨	Narrows
🟥	Graham Creek
🟩	Fisherman's Landing
▨	Wiggins Island
🟨	Calliope Annabranch
▨	Calliope River
▨	Auckland Creek
🟦	Mid Harbour
🟥	Outer Harbour
☐	Proposed Fisherman's Landing Northern Expansion

Fisherman's Landing Northern Expansion EIS

Job Number	42-15386
Revision	A
Date	28 May 2009

Location of Water Quality Sampling Sites from Previous Studies in Port Curtis

Figure 1b

2 / 100 Goondoon Street Gladstone QLD 4680 Australia T 61 7 4972 6377 F 61 7 4972 6236 E gltmail@ghd.com.au W www.ghd.com.au

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2.2 Comalco Alumina Project, Gladstone IAS \ EIS (Dames and Moore, 1998)

As part of the Comalco Alumina Project EIS (Dames and Moore, 1998), sampling was undertaken at a number of sites in September 1995 and November 1997 to establish baseline data (Figure 1). All water samples were grab samples taken 0.2 m below the water surface. Sites of relevance to the current project were:

- G1.1 – Shipping channel near Tide Island;
- G1.2 – Shipping channel near South Passage Island;
- G2.1 – Fisherman's Landing – NE edge of ship turning circle at Fisherman's Wharf;
- G2.2 – Fisherman's Landing – Corner of the large lower intertidal bank south of Friend Point; and
- G3.1 – Mouth of Targinie Creek tributary – 2.5 km north of Fisherman's Landing.

Samples were collected and analysed for solids, carbon and nutrient levels (Table 4) as well as a range of metals (Table 5). The laboratory limits of reporting (LOR) are greater than the trigger values (TV) for cadmium, chromium, copper, mercury, nickel and lead. Concentrations of nickel exceeded the TVs at G1.2, G2.1 and G3.1 (cells shaded grey) and were equal to the TVs for cobalt at all sites.

Table 4 Physicochemical Results for Water Samples Collected in September 1995

Parameter	G1.1	G1.2	G2.1	G2.3	G3.1
TSS (mg/L)	12	12	13	23	23
TDS (g/L)	40.0	40.6	40.8	40.8	43.5
TOC (mg/L)	1.0	1.5	1.2	3.4	10
TN (mg/L)	<0.2	0.6	0.3	0.3	0.2
TP (mg/L)	0.02	0.01	0.02	0.05	0.02
pH (laboratory)	8.0	8.0	8.1	8.2	7.9

Table 5 Metal Concentrations (µg/L) for Water Samples Collected in September 1995

Parameter	ANZECC (2000) Trigger Values (µg/L)	G1.1	G1.2	G2.1	G2.3	G3.1
Iron		20	40	30	140	60
Aluminium		60	30	50	260	110
Manganese		<10	<10	<10	<10	<10
Arsenic		3	3	3	3	2
Cadmium	0.7	<2	<2	<2	<2	<2

Parameter	ANZECC (2000) Trigger Values (µg/L)	G1.1	G1.2	G2.1	G2.3	G3.1
Cobalt	1	1	1	1	1	1
Chromium	4.4	<10	<10	<10	<10	<10
Copper	1.3	<5	<5	<5	<5	<5
Mercury	0.1	<0.5	<0.5	<0.5	<0.5	<0.5
Molybdenum		15	15	15	15	15
Nickel	7	<10	10	10	<10	10
Lead	4.4	<5	<5	<5	<5	<5
Selenium		<10	<10	<10	<10	<10
Tin		<10	<10	<10	<10	<10

The water quality sampling program undertaken in 1997 included additional parameters and sites, however, the only data of relevance to the current project was pH and turbidity from two sites near Fisherman's Landing Wharf (Table 6). Samples collected from the Fisherman's Landing Wharf sites were not analysed for metals. The sites were located at:

- S1 – Lower intertidal mud bank 200 – 400 m due south of Fisherman's Landing Wharf
- S2 – Lower intertidal mud bank 800 m south east of Fisherman's Landing Wharf

Table 6 pH and Turbidity Levels in Water Samples Collected in November 1997

Parameter	S1[a]	S2[b]
pH	7.8	7.8
Turbidity (NTU)	10	15

(a) Depth of measurement 0.2 m
(b) Depth of measurement 0.5 m

2.3 WBM Oceanics Australia [2002] in URS (2003) and URS (2007)

WBM Oceanics Australia collected water quality data in Port Curtis between December 1998 and November 2001. The original data were included as Appendix H Modelling of Discharges by URS (2003) as part of the Chlor Alkali/Ethylene Dichloride Plant EIS. This same data was also used by URS (2007) to provide baseline water quality data for the marine environment surrounding the proposed Fisherman's Landing reclamation area in Section 8 of the Gladstone Pacific Nickel Project EIS.

There were six sampling locations in the study that included Boat Creek, Fisherman's Landing, Fisherman's Landing embayment (called 'Gully C' in the URS (2007) report), Targinie Creek and two sites near Curtis Island (Figure 1).

URS (2003; 2007) reported that all samples were collected under high water conditions. Data presented by URS (2007) are percentiles (20th, 50th and 80th percentiles). *In situ* measurements included temperature, conductivity, salinity, pH, redox, DO, turbidity and Secchi depth. Samples were also analysed for metals, cyanide, nutrients and suspended solids.

pH levels complied with the QWQG (2006) enclosed coastal guidelines (pH 8.0 – 8.4) and turbidity levels frequently exceed the adopted guidelines (1 – 20 NTU) (Table 7). URS (2003) reported that the tidal range caused large variations in water quality for Port Curtis and that "near low water, the shallow water along the muddy foreshores is often highly turbid from the entrainment of fine bed sediments by wave action". As these data were collected during high water conditions, the expectation is for increased turbidity during low water in shallow areas.

Trace element concentrations of chromium, lead, mercury and zinc in water samples collected were less than the TVs for all percentile values (Table 8). Copper concentrations exceeded the TVs at Fisherman's Landing and the Curtis Island 1 sampling sites at the 80th percentile only. The LOR for cadmium is greater than the ANZECC (2000) TV and therefore a conclusion cannot be drawn on this element.

Table 7 pH and Turbidity for WBM Oceanics (2002) Sampling Sites

Sampling Location	**pH**			**Turbidity (NTU)**		
	Percentiles			**Percentiles**		
	20th	**50th**	**80th**	**20th**	**50th**	**80th**
Boat Creek	8.0	8.1	8.1	6.9	14.7	15.2
Fisherman's Landing	8.0	8.1	8.2	10.9	19.3	32.9
Fisherman's Landing Embayment (Gully C)	8.0	8.1	8.2	6.2	9.4	27.2
Targinie Creek	7.8	7.9	8.0	9.3	13.5	30.8
Curtis Island 1	8.1	8.1	8.0	12.5	24.3	36.7
Curtis Island 2	8.0	8.1	8.2	11.2	22.9	35.8

Table 8 Concentrations of Metals (μg/L) in Water Samples Collected by WBM Oceanics (2002) in URS (2007)

Metal	ANZECC (2000) Trigger Values (μg/L)	Boat Creek			Fisherman's Landing			Fisherman's Landing Embayment (Gully C)			Targinie Creek			Curtis Island 1			Curtis Island 2		
		Percentiles			Percentiles			Percentiles			Percentiles			Percentiles			Percentiles		
		20th	50th	80th	20th	50th	80th	20th	50th	80th	20th	50th	80th	20th	50th	80th	20th	50th	80th
Aluminium		29	47	71	34	87	210	30	70	120	37	66	120	48	80	140	48	63	100
Arsenic		All sites < 1 μg/L																	
Barium		9	12	14	8	9	12	9	11	15	9	12	14	7	10	12	7	8	11
Boron		4200	4500	5000	4200	4540	5100	4100	4600	5000	4100	4500	5100	4100	5000	5000	4200	4500	5100
Cadmium	0.7	All sites < 1 μg/L																	
Chromium	4.4	All sites < 1 μg/L																	
Copper	1.3	< 1 μg/L			<1	<1	1.4	< 1 μg/L			<1	<1	1.2	<1	<1	1.4	< 1 μg/L		
Iron		22	46	100	24	76	320	27	51	180	35	87	170	43	110	270	20	67	140
Lead	4.4	All sites < 1 μg/L																	
Manganese		4	8	11	4	8	17	4	8	13	7	11	18	3	7	17	3	6	15
Mercury	0.1	All sites < 0.1 μg/L																	
Nickel	7	<1	<1	1.3	<1	<1	2	<1	<1	1.4	<1	<1	2	<1	<1	3	<1	<1	2
Zinc	15	<1	<1	3	<1	1.4	6	<1	<1	3	<1	<1	3	<1	1.1	3	<1	<1	4

2.4 CRC Coastal Zone, Estuary and Waterway Management (Apte *et al.* 2005)

The CRC undertook a screening level risk assessment of water and sediment quality in Port Curtis in 2001/2002. The aim of this study was to identify contaminants of concern in Port Curtis. Selected monitoring parameters were based on the likelihood of inputs from industry and port activities, which included metals, PAHs, cyanide, fluoride and tributyltin (TBT). Surface water samples were collected at 50 sites spread in a grid pattern around Port Curtis from the Narrows to seaward of Facing Island with subsequent analysis for metals and TBT. Results for sediments are reported in Section 3.3.

The concentrations of metals in water samples were below the ANZECC (2000) water quality guidelines for marine waters (Apte *et al.* 2005). Some areas within the harbour showed higher concentrations of metals than others. In particular, the inner harbour had higher concentrations of some metals than the outer, more open waters. Concentrations of copper and nickel were elevated compared to other coastal sites in Australia (Apte *et al.* 2005). TBT was detected at 5 out of 7 samples analysed and exceeded ANZECC (2000) guidelines.

2.5 Assessing the Effects of Harbour Dredging Using Transplanted Oysters as Biomonitors (Andersen *et al.* 2002)

Andersen *et al.* (2002) assessed the effects of dredging with transplanted oysters (*Saccostrea glomerata*) as biomonitors in Port Curtis. Most of the sites monitored were in the vicinity of RG Tanna Coal Terminal where dredging was taking place and two control sites were also included (Figure 1). The site closest to the reclamation discharge point was located approximately 80 m from the outfall. Water quality was also monitored at each oyster site on each sampling occasion and seagrass was monitored at two sites near Wiggins Island and South End.

Oysters in this monitoring program were sourced from a known uncontaminated site in Moreton Bay and deployed one month prior to dredging activity. Oysters were sampled and analysed prior to deployment to determine baseline metal concentrations. After commencement of dredging the study was expanded to include resident oysters from the pylons at RG Tanna Coal Terminal with a comparison of these findings with previous oyster data at the same site from the CRC contaminants project in August 2001. At each site a composite oyster tissue sample of five oysters were analysed for a range of metals including cadmium, chromium, nickel, lead, silver, aluminium, copper, iron, zinc, arsenic and selenium. The transplanted oysters were sampled and analysed before dredging commenced (one month after deployment) as well as one and two months after dredging had commenced (Dredge 1 and Dredge 2 results, respectively). The resident oysters were collected and analysed approximately 3.5 months after dredging had commenced.

Three factors were incorporated into the experimental design:

- Time (before dredging, Dredge 1, Dredge 2);
- Direction from the source (north, east and south); and
- Spatial distance from the source (array) (inner, middle and outer).

The study assumed that oysters were still equilibrating to ambient concentrations when sampling was undertaken four weeks after dredging commenced, so increases may not have resulted from dredging. However, concentrations at two months of dredging were assumed to reflect the effects of dredging activities. Results are provided in Table 9.

Table 9 Effects of Harbour Dredging with Transplanted Oysters as Biomonitors

Study Objectives	Summarised Results
Comparison of baseline to control sites over time	No significant changes in Pb, Fe or Al concentrations for all sampling periods, however significant changes were found for As, Se, Cu, Zn, Cd, Cr, Ni and Ag. Cr and Ni were variable and lacked consistency over time. Ag declined over time. Cd, As, Se, Cu and Zn increased at control locations over time suggesting oysters were still equilibrating to ambient background concentrations. Fe, Pb, Al, Cr and Ni concentrations did not demonstrate an obvious increasing concentration trend over time.
Comparison between control sites (South End to Settlement Pt) over time	The only metal to demonstrate a significant spatial difference was As (South End greater than Settlement Pt), however significant temporal differences in seven out of the 11 metals were detected. No consistent change in Ag, Al, Fe, Cr, Pb or Ni over time. Metal concentrations that increased over time included Cd, As, Cu and Se.
Comparison of individual metals at all sites over time	**Al** – significant effects for time, direction and array. Al concentration increased over time, concentrations were higher in the east and north than in the south and higher near the dredging activity than in the control locations. **Ag** – similar to Al but no difference detected between direction treatments. **As** – significant array, time and direction effects. Concentrations decreased over time, southern sites higher than northern and eastern sites and control sites higher concentrations than sites around dredging activity. **Cd** – significant array, time and direction effects with time being the major factor in the observed effect of increasing concentrations. No difference in concentrations from control or other sites near dredging activity, therefore it was assumed that oysters were still acclimatising to ambient levels. **Cr** – significant array and direction effects but not affected by time. Concentration increased in oysters in the east over the north and south directions. **Cu** – significant array and time effects and non-significant direction effect. **Fe** – significant array, time and direction effects and all interaction terms except time x direction interaction. That is, higher Fe concentration in oysters after dredging compared with before dredging, but Dredge 1 and Dredge 2 not significantly different. Inner, middle and outer arrays comparable but higher than control sites. East and north of outfall similar Fe concentrations but higher than those to the south. **Ni** – significant array and direction effects but non-significant time effect.

Study Objectives	Summarised Results
	That is, no change in Ni concentrations over time. Ni concentration increased in oysters in the east more than in the north and south directions. Higher concentration in the oysters from the outer array compared with other arrays and control sites. **Pb** – no significant main effect or interaction terms in concentration in oysters over time. Majority of Pb concentrations were below limits of reporting. **Se** – significant array, time and direction effects and all interaction terms. Lower concentration of Se in oysters in Dredge 1 samples compared with before or Dredge 2 samples. Highest concentrations in control locations and lowest at sites closest to dredging activity. However, concentrations at the control sites did not change with time. **Zn** – significant array and time effects and non-significant direction effect. Highest concentrations closest to dredging activity. Concentrations increased over time.
Comparison of resident oysters (Clinton Coal Wharf) to CRC oysters	Al, As and Fe concentrations were higher in the CRC study oysters (August 2001) compared to the April 2002 study oysters and there were little differences in the other metals investigated.

It was concluded that increased metal concentrations in oysters at the site closest to the dredging activity were likely from dredging. Not all metals will be taken up or accumulated at the same rates and some metals such as Cu and Zn may have antagonised the uptake of As (Andersen *et al.* 2002).

Seagrass samples were collected at the same time as the oysters and analysed for metal concentrations. Changes to metal concentrations in the seagrasses from Wiggins Island and South End sites are provided in Table 10.

Table 10 Metal Concentrations in Seagrass

Study Objectives	Summarised Results
Comparison of individual metals at both sites over time	**Al** – not significantly different from each other but an increasing trend in concentration over time. **As** – Wiggins Island significantly higher than South End and Dredge 2 significantly higher than Dredge 1 but pre-dredging sample had intermediate concentrations. **Cd** – Wiggins Island seagrass concentrations higher than South End at all sample times. Dredge 2 and Dredge 1 samples were higher than pre-dredging sample but not different to each other. **Cr** – not significantly different from each other. **Cu** – Wiggins Island seagrass concentrations higher than South End. Dredge 1 was greater than Dredge 2 and pre-dredging sample but not different from each other. **Fe** - Wiggins Island seagrass concentrations higher than South End and temporal trends were inconsistent. **Ni** – not significantly different between the two sample sites and

Study Objectives	Summarised Results
	temporal trends were inconsistent. **Pb** - not significantly different between the two sample sites and temporal trends were inconsistent. **Se** – concentrations from Wiggins Island were significantly higher than at South End but not significantly different over time. **Zn** – concentrations from Wiggins Island were higher than at South End but not significantly different over time.
Wiggins Island seagrass compared with CRC data	Significant differences for all metals. Trend for highest mean concentrations in Dredge 2 and pre-dredging samples, and lowest mean values in Dredge 1 and CRC data demonstrating inconsistent trends. Dredge 1 samples were lower than pre-dredging samples with the exceptions of Cd, Cu and Zn which increased from before to Dredge 1 and then stabilised for Cd and Cu and decreased for Zn. There was no difference for Al, As, Cd, Fe and Pb concentrations between CRC data and the pre-dredging 2002 study samples. However, Zn had higher and Cr, Cu, Ni and Se had lower concentrations in the CRC data than pre-dredging samples.

Concentrations of all metals in seagrass were higher at Wiggins Island than at South End in pre-dredged samples, which indicated that the inner harbour site had naturally higher ambient metal concentrations (Andersen et al. 2002). However, this trend was inconsistent over time with decreased concentrations for Al, As, Cr, Fe, Ni, Pb and Se at the Wiggins Island site for Dredge 1 sampling. Reasons for these inconsistencies were unknown and were potentially attributed to seasonal differences and small rainfall events.

With respect to water quality results, pH, salinity and dissolved oxygen were relatively stable for all sites over the three sampling events except for temperature, which was slightly lower at all sites on the Dredge 2 sampling event. Metal concentrations in the water samples collected were variable. For Ag, As, Cd, Cu, Ni, Pb and Se, no changes were observed in total metal concentrations over the sampling period, but Zn, Cr, Al and Fe levels increased for the Dredge 2 sampling event at some sites. Zn concentrations increased at sites 1 to 6 with the highest level of 0.32 mg/L at Site 1. Cr increased at all sites with a maximum of 0.11 mg/L at Site 1 and Site 6. Al increased at sites 1 to 9 with the highest concentrations of 2.86 and 2.91 mg/L at Site 6 and Site 7, respectively. Fe increased at all sites except Site 10, which decreased.

In summarising the effects of dredging on oysters, seagrass and water quality in the Port Curtis Harbour, Andersen et al. (2002) make the following points:

- Dredging results in the exposure of anoxic sediments to oxygen enabling metals to be released and to enter the dissolved phase or bound to particulate organic matter, thereby remobilising into the water column and becoming bioavailable to aquatic life;
- A decreasing gradient from inner to outer harbour sites for copper and zinc and other metals existed prior to dredging and consequently, oysters in closer proximity to anthropogenic inputs will have naturally elevated metal concentrations;

- Samples collected nearer the reclamation outfall had greater concentrations of aluminium, copper, iron, silver and zinc than other sites, suggesting that the reclamation outfall was a point source for these metals;
- Oysters did not accumulate all metals in the same temporal and spatial patterns. Trends for As and Se contrasted to other metals analysed;
- The concentrations of metals in seagrass were inconsistent and inconclusive; and
- Plumes created by many dredging studies are small, temporary and intermittent and turbidity increases experienced have been similar to that caused by natural runoff events.

2.6 Capital Dredging of the Fourth Berth at RG Tanna Coal Terminal (GHD 2005)

GHD (2005) conducted a review of baseline water quality data in the vicinity of the Clinton Coal Wharf prior to the fourth berth dredging and dewatering program at RG Tanna Coal Terminal at the Port of Gladstone (approximately 9 km south-east of Fisherman's Landing). At Clinton Wharf, natural variation in turbidity was evidenced with the time series data recorded by Gladstone Ports Corporation (GPC) from February 2004 to April 2005 (Figure 2). Though summary statistics indicate most values ranged between 0 – 20 NTU, there were regular elevations between 20 and 40 NTU during February/March 2004 and 2005 and peaks of up to 125 NTU for short periods (Table 11). These peaks were likely from natural resuspension of sediments by tidal currents.

Based on this background data, GHD (2005) proposed during the dredging and reclamation works that the TV for turbidity of the receiving environment be set at 40 NTU and that a validation study be undertaken to allow the relationship between turbidity in the receiving environment and turbidity at the overflow site to be determined.

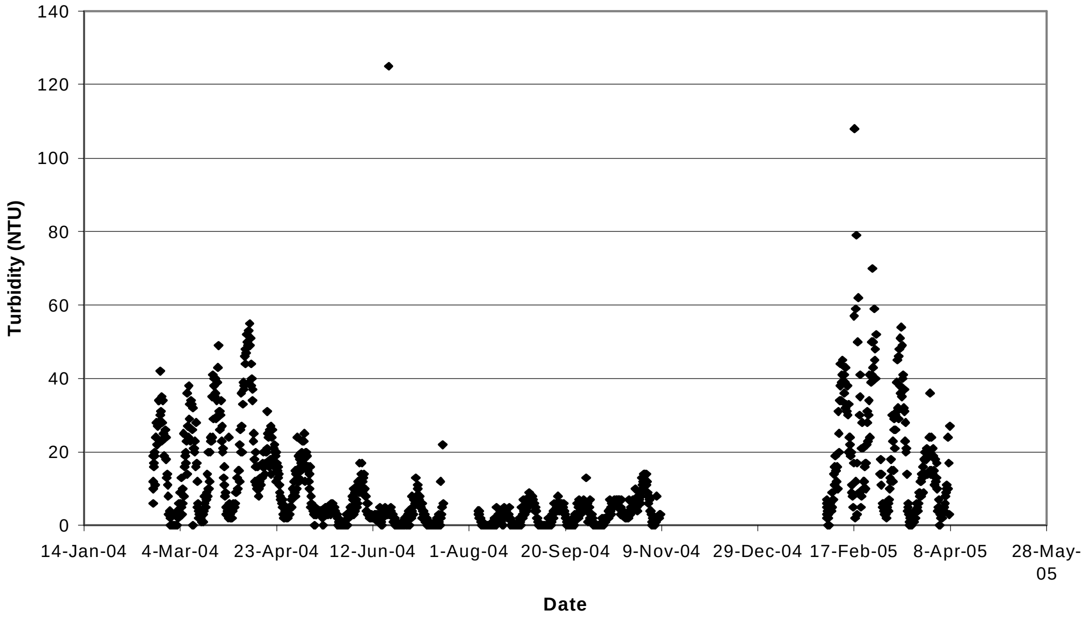


Figure 2 Time Series Turbidity Data recorded at RG Tanna Coal Terminal from February 2004 to April 2005

Table 11 Summary Statistics for Water Quality Data collected by GPC at the Clinton Coal Wharf between February 2004 and April 2005

Statistic	Turbidity (NTU)
Minimum	0.0
Mean	10.3
Median	5.0
80th percentile	17.0
95th percentile	38.0
99th percentile	52.0
Maximum	125.0

2.7 Validation Study for Dredging of Fourth Berth, RG Tanna Coal Terminal (GHD 2006a)

GHD (2006b) undertook a validation study for the water quality objectives adopted for the reclamation area decant point during dredging of the fourth berth at the RG Tanna Coal Terminal. The study was undertaken over a week in November 2005 with monitoring undertaken on flooding and ebbing tides each day at a number of locations (Figure 1).

Turbidity measurements within the study area showed no evidence of any migration of the discharge plume more than 50 m away from the discharge point. Summary statistics show that Cell 4 (the final reclamation pond) had turbidity ranging from 5.9 – 28.5 NTU, while at the licensed discharge point and receiving waters respectively, turbidity ranged from 5.6 – 43.5 NTU and 3.6 – 40.7 NTU (Table 12). Turbidity in reclamation Cell 4 was less variable in comparison to the discharge point, due to wave and tidal action in the receiving environment as well as scouring of sediments from the decant drain by the discharge waters.

Table 12 Summary Statistics for Water Quality Data at the RG Tanna Coal Terminal Dredging and Reclamation Site November 2005

Location	Turbidity (NTU)		
	Minimum	Maximum	Mean
Cell 4[a]	5.9	28.5	11.8 ± 5.5
Discharge Point	5.6	43.5	17.3 ± 5.9
Gladstone Harbour	3.6	40.7	10.6 ± 4.9

a. The last reclamation pond before decanted water was discharged into the harbour

2.8 RG Tanna Coal Terminal 4th Berth Dredge Management Plan, An Assessment of the Effects of Harbour Dredging (Andersen *et al.* 2006)

The effects of harbour dredging were investigated by Andersen *et al.* (2006) during dredging and land reclamation activities for the Fourth Berth at RG Tanna Coal Terminal in 2005. Physicochemical water parameters were measured (pH, temperature, dissolved oxygen, turbidity and conductivity) along with transplanted oysters (*Saccostrea glomerata*) and Diffuse Gradients in Thin Films (DGT) passive sampling devices to assess metal concentrations in water. The DGT technique provides a time-averaged speciation measurement of reactive metals in waters over the period of deployment where soluble metal species diffuse through a known thickness of thin film and irreversibly bind to a layer in a concentration gradient for layer analysis. Monitoring was undertaken prior to dredging (July/August 2005) and during dewatering of the reclamation cells (23 November 2005 to 6 January 2006). Monitoring sites are shown in Figure 1.

Results from this study included:

- There were no changes in water conductivity, dissolved oxygen, pH or total suspended solids between the pre-dredge and dewatering surveys. Water temperature increased between the periods, which was attributed to seasonal differences;

- GPC's licence conditions were not exceeded during the dewatering phases although turbidity increased at inner harbour sites. However, measurements were not significantly different to middle harbour sites at this time;
- No changes in DGT metal concentrations were found at the harbour monitoring sites between the two monitoring periods;
- Some oyster metal concentrations were higher during the pre-dredge monitoring period than during dewatering phase. This was suggested to be a consequence of seasonal variation in oyster growth. A gradient of deceasing metal levels were demonstrated for some metals in oysters from inner to outer harbour sites, which may relate to the increasing distance from potential anthropogenic inputs. This trend was observed prior to dredging commencing. This indicates that dredging was unlikely to be the cause for the elevation of accumulated metals in oysters in the inner harbour area; and
- Turbidity was more closely monitored and controlled during this dredging event in 2005 compared with the 2002 dredging activity (see Section 2.4), and hence there appeared to be little or no impact to harbour monitoring sites from the 2005 dredging. The major differences between the two events to which the reductions in impacts were attributable were increased retention times and controls in place for the release of reclamation discharge waters. Turbidity was closely monitored in each of the reclamation cells and when turbidity increased, the outfalls were sealed to prevent dewatering until turbidity concentrations again decreased.

2.9 Wiggins Island Coal Terminal EIS (Connell Hatch 2006)

The Wiggins Island Coal Terminal EIS contains water quality data from 14 – 15 May 2006 and September 2006 represented wet and dry seasons, respectively (Connell Hatch 2006). It has been assumed that these data consist of single surface grab samples at each site. Connell Hatch (2006) combined different monitoring locations into 'sections' and presented data as medians for each 'section'. Monitoring locations are provided in Figure 1.

Parameters measured included:

- A median value for each of the parameters measured (turbidity, chlorophyll-a, dissolved oxygen, pH and total suspended solids) for 'Section 1' which comprised the monitoring locations identified as the "…intertidal, marine areas adjacent to Wiggins Island and Mud Island". These near shore waters are primarily intertidal, "…with large tracts of exposed substrate during low tides"; and
- Data for Flying Fox Creek and Sandfly Creek which discharge into Port Curtis.

pH was marginally lower than the QWQG (2006) range during the wet and dry seasons in the areas around Wiggins Island and Mud Island (Table 13). However, SS and turbidity levels were elevated around Wiggins Island and Mud Island. Connell Hatch (2006) established that turbidity levels measured during the monitoring program exceeded the water quality objectives set for the Wiggins Island Project and attributed this to natural tidal resuspension of seabed sediments. Data from the sites at Flying Fox Creek and Sandfly Creek demonstrate that these two sites had elevated SS and turbidity levels while pH was marginally lower than the QWQG (2006) range.

Table 13 pH and Turbidity Levels for Water Quality in Vicinity of the Fisherman's Landing Reclamation Project (Connell Hatch 2006)

Site Location	Suspended Solids (mg/L)	pH	Turbidity (NTU)
QWQG (2006)	15	8.0 – 8.4	6
Intertidal, marine areas adjacent to Wiggins Island and Mud Island[a]	30.5 (wet season) 55 (dry season)	6.58 (wet season) 7.77 (dry season)	7.7 (wet season) 17 (dry season)
Flying Fox Creek[b]	57 (Season 2)	7.87 (average of three readings (Season 2)	12 (Season 2)
Sandfly Creek[c]	44 (Season 2)	7.87 ± 0.02 (duplicate readings) (Season 2)	15 (Season 2)

a. Section 1 in Wiggins Island EIS (Connell Hatch 2006), which is a median value of three sampling sites

b. Site 14 data from the Connell Hatch Appendix I3

c. Site 13 data from the Connell Hatch Appendix I3

2.10 Port Curtis Integrated Monitoring Program (PCIMP) Ecosystem Health Report Card (Storey *et al.* 2007)

The PCIMP is a consortium of 15 members from bodies representing industry, government and other stakeholders that developed a collaborative integrated monitoring program for addressing the ecological health of Port Curtis.

Ecosystem health is a measure of the resilience of the ecosystem in the presence of stress. For the Ecosystem Health Report, indicator data are compared against guideline levels to produce a Standardised Score, which represents a departure from the desired ecological health. Indicators are then allocated into *"…Performance Categories and an average score for each Performance Category in each zone is calculated". "The combined average score for all Performance Categories in each zone is determined and converted to the final health rating, a grade from A (equivalent to reference) to F (complete fail).*" (Storey *et al.* 2007).

Most of the data utilised in this report was collected during 2005 and 2006. Indicators in the monitoring program included water chemistry, water contaminants, mangrove health, sediment contaminants, and seagrass biomass. The area was sub-divided into nine zones with information on Zone 2, Inner Harbour Fisherman's, presented in this review. Zone 2 encompasses the harbour from the entrance to the Narrows between Fisherman's Landing Wharf and Curtis Island and south to the small estuary of Boat Creek. Industries within the adjacent catchment area include Rio Tinto Aluminium – Yarwun, Cement Australia, Orica, Queensland Energy Resource Ltd. and Transpacific Ltd. The licensed discharge points identified in the report include Rio Tinto Aluminium – Yarwun and the Gladstone Regional Council Trade Waste Outfall. A summary of the findings for Zone 2 include:

- Zone 2 was provided with a B+ rating, which was influenced by some low scores in several performance categories; however the average score for each category was A and the lowest score in each category was a B;
- The only other zone within the Harbour to record a B+ rating was Inner Harbour, South Trees (Zone 6), with all other areas within the Harbour being rated as A-, through to A+. Therefore, Fisherman's Landing experiences some existing reduction in ecosystem health, but did not score substantially lower than other areas within the Harbour;
- Low scores were mainly attributed to Boat Creek because of low pH, high turbidity and low dissolved oxygen (DO). This was noted to be similar to other mangrove lined estuaries and it was also noted that Boat Creek does not receive point source discharges;
- Elevated total phosphorus was recorded;
- High levels of aluminium, copper, cobalt and manganese recorded were attributed to Boat Creek conditions, with metals being more bioavailable due to low pH and low DO conditions;
- Copper, nickel and zinc uptake in oysters was noted;
- Cobalt, copper and cadmium were elevated compared to background estuarine reference zone although still below recommended guidelines; and
- Sediment PAHs were of a low concentration and scored well.

2.11 PCIMP Biomonitoring 2007, North Harbour Zones (Andersen *et al.* 2008a)

Andersen *et al.* (2008a) investigated the spatial variability of nutrient and metal concentrations in the estuarine, inner harbour and outer harbour areas of Port Curtis with transplanted oysters (*Saccostrea glomerata*) as biomonitors and DGTs as the tools for the environmental assessment. Transplanted oysters were also used the 2002 and 2005 studies by Andersen *et al.* (2002) as described in Sections 2.4 and 2.8.

There were numerous sites investigated and these were allocated into 20 zones based on disturbance level, previous sampling results, hydrodynamic flows and local knowledge. Reference locations were included for oceanic and estuarine zones.

Physicochemical parameters for water quality, including temperature, conductivity, dissolved oxygen, pH and turbidity, were recorded just below the water surface at the following times:

- During deployment of oysters and DGT (11 to 15 July 2007);
- During retrieval of the DGT devices (17 to 20 July 2007); and
- During retrieval of the oysters (10 to 13 September 2007).

Light attenuation was also measured at biomonitoring sites at 0.25 m or 0.5 m intervals throughout the water column to obtain a minimum of five measurements. Water samples were collected for analysis of nutrients and other parameters of interest at approximately 0.5 m depth when the DGT devices were retrieved (17 to 20 July 2007). Oysters obtained from a commercial lease in Moreton Bay were deployed at approximately 1 m depth for a period of eight weeks (deployed 11 to 15 July and retrieved 10 to 13 September 2007). Composite samples of soft tissue from the oyster shells from each site were analysed for various metal concentrations. Metals data was presented as accumulation rates that were calculated by subtracting the baseline metal concentration from the final metal concentration and then dividing by the number of days deployed. This method assumes that uptake rates are linear. The DGT devices were deployed at the same time as the oysters (11 to 15 July 2007), however these were retrieved only after six days (retrieved 17 to 20 July 2007).

Results from this study included:

- There were seasonal differences in the physicochemical characteristics of water between the July and September sampling periods with September having higher temperatures, lower conductivity, higher dissolved oxygen and lower pH;
- Euphotic depth was lower in September compared to July (less depth penetration by light);
- Lower pH and higher turbidity in estuarine versus oceanic zones;
- Despite the presence of a licensed discharge point for aluminium at Fisherman's Landing, this site did not contain the highest concentrations of aluminium;
- Total phosphorus ranged from 40 to 60 µg/L for all impact zones and was two to three times above the ANZECC (2000) guidelines;
- Total nitrogen exceeded the ANZECC (2000) guidelines in Boat Creek and Calliope Anabranch at 250 and 260 µg/L respectively;
- Boat Creek consistently exhibited elevated concentrations of manganese and cobalt in DGTs compared to other sites. This site does not receive a licensed discharge and the report concludes that the intrusion of groundwater (resulting in the observed cooler waters and higher conductivity) and low pH may be the cause of these metal concentrations. Inputs from metallic refuse located adjacent to the Boat Creek boat ramp may also influence metal concentrations; and
- The only metal concentration in DGTs that exceeded the ANZECC (2000) guidelines was cobalt where the concentrations ranged from 0.01 to 0.39 µg/L and exceeded the reported 99% species protection guidelines.

2.12 Port Curtis Seagrass Water Quality (Wilson *et al*. 2008)

A project to assess water quality impacts on seagrass was undertaken as part of a collaborative project between the former Department of Primary Industries and Fisheries (DPI&F) Marine Ecology Group and the Centre for Environmental Management (CEM) as part of the Port Curtis Integrated Monitoring Program (PCIMP) (Wilson *et al.* 2008). Continuous recordings of temperature, turbidity and light at selected seagrass beds in Port Curtis were collected. For the purposes of this EIS, only turbidity and light data at two seagrass beds, identified by Wilson *et al.* (2008) as sites No.5 and 8, are of interest (Figure 1). Descriptions of the seagrass bed locations and sampling sites are provided in Table 14.

Data were collected from these sites from 24 January to 18 April 2008. Loggers were placed on intertidal seagrass beds and became exposed at low spring tides for up to four hours. Data during these exposed periods were omitted from turbidity data analysis. Wilson *et al.* (2008) did not indicate whether these data were excluded for light analysis and stated that *"…values greater than 500 micro Einsteins (µE) recorded for up to four hours at these times".*

Table 14 Descriptions of Seagrass Beds in the Vicinity of Fisherman’s Landing from Wilson *et al.* (2008)

Site ID	Seagrass Bed Location	Sampling Site	Seagrass Community Type	Meadow Cover
5	West of Wiggins Island	Northern side of bed	Light *Z. capricorni* with H. *ovalis*	Aggregated patches
8	Along shoreline from Fisherman’s Landing wharves extending northward to Friend Point	Near Friend Point (north of Fisherman’s Landing)	Light *Z. capricorni* with mixed *Halophila* species	Aggregated patches

Turbidity and light measurements and were logged by JCU Mk9 Nephelometers with data recorded every 10 minutes and the sensor cleaned by wipers every two hours. Both parameters were calculated with calibration constants and plotted for the sites with turbidity units of Nephelometric Turbidity Units (NTU) and for light data as Photosynthetically Active Radiation (PAR) in µE. Wilson *et al.* (2008) reported that nephelometers were set up 15 – 20 cm above the sediment surface.

Monitoring data for turbidity and light are presented for the Fisherman’s Landing site in Table 15. These data demonstrate that the site north of Fisherman’s Landing had a large range of turbidity and light levels over the monitoring period. Turbidity was consistently higher at the Fisherman’s Landing site versus the other sites (Fisherman’s Landing mean = 99 NTU; West Wiggins Island mean = 28 NTU). High turbidity levels at the Fisherman’s Landing seagrass beds were attributed to the natural occurrence of sediment runoff during tidal changes, heavy rainfall (February to March) and a series of large flood plumes observed flowing through The Narrows into Port Curtis, possibly from the Fitzroy River system. Light measurements were similar to that of turbidity, with reduced PAR readings following heavy rainfall. Wilson *et al.* (2008) indicate that *“Light and turbidity data corresponded to each other indicating the latter is a strong influencing factor on the former”*. Other factors affecting light included day and night periods and reduced radiance from cloud cover.

Table 15 Summary Statistics for Turbidity and PAR at Fisherman’s Landing Seagrass Bed (24 January – 16 April 2008)

Parameter	Turbidity (NTU)	PAR (µE)
Mean (95% confidence interval)	99.01 (±2.18)	40.37 (±2.22)
Range	2.36 – 539.71	0.06 – 623.34
Median	47.93	3.00
99th Percentile	505.40	621.24
95th Percentile	356.67	228.54
80th Percentile	174.91	17.28
20th Percentile	16.70	2.16
Number of samples	10788	11812

2.13 An Assessment of the Effects of Dredging at Fisherman’s Landing (Andersen *et al.* 2008b)

A water quality monitoring program was conducted by CEM to assess water quality impacts from dredging Berth 1 and decant from the reclamation at Fisherman’s Landing (Andersen *et al.* 2008b). Results were compared with relevant guidelines and previous dredging assessments in Port Curtis. Physicochemical parameters and metal concentrations were assessed with different techniques including a before-after-control-impact (BACI) design and by examining *“…potentially highly impacted, less impacted and reference sites both before and during the dredge event…”* (Andersen *et al.* 2008b).

Physicochemical parameters measured *in situ* included temperature, conductivity, TDS, DO, pH, turbidity and oxidation reduction potential (ORP). Values provided are the mean of three readings. PAR (400 – 700 nm) was measured at 0.5 m depth intervals and at 0.25 m intervals in shallower areas to yield at least 5 samples so that light attenuation could be calculated. Turbidity measurements were measured concurrently with PAR. PAR measurements were plotted versus depth and regression analysis was carried out to estimate vertical attenuation coefficients, and subsequently the euphotic depth in metres.

There were a number of monitoring locations reported by Andersen *et al.* (2008b), including two harbour sites (C1 adjacent to the dredge head and QE1 on the northern seagrass meadow), the reclamation cell (Cell 2), the reclamation cell discharge point plume (the Outfall) and eight additional sites in the harbour (Figure 1). Of particular relevance to this project are the two harbour sites C1 and QE1 as well as Cell 2 and the Outfall. Data for pH, turbidity and euphotic depth at these four sites are presented in Table 7, for different stages of the project (pre-dredging, dredging and dewatering). These data demonstrate that pH values were generally within the QWQG (2006) range. Turbidity exceeded the QWGQ (2006) even prior to commencement of dredging works with no substantial increase at C1 even during dredging. The variable turbidity results were attributed to tidal movement and the shallowness of the area. There are no guidelines to assess euphotic depth, but estimates were variable throughout the different stages of the project.

Table 16 pH, Turbidity and Euphotic Depth Ranges at Pre-Dredging, Dredging and Dewatering at Fisherman’s Landing, 2008

	pH				Turbidity (NTU)				Euphotic Depth (m)			
QWGQ 2006	**8.0 – 8.4**				**6**							
Sites	**C1**	**QE1**	**C2**	**Outfall**	**C1**	**QE1**	**C2**	**Outfall**	**C1**	**QE1**	**C2**	**Outfall**
Pre-dredging (18 February – 3 March 2008)	7.7 – 8.2	7.6 – 8.1	n/a	n/a	5.7 – 20.7	2.5 – 14.6	n/a	n/a	1.5 – 4.4	2.2 – 3.9	n/a	n/a
During dredging (4 – 10 March 2008)	8.1 – 8.2	8.0 – 8.1	n/a	n/a	8.7 – 17.9	8.2 – 19.5	n/a	n/a	1.8 – 3.8	2.1 – 3.6	n/a	n/a
During dewatering (11 March – 8 April 2008)	8.0 – 8.1	8.0 – 8.1	7.9 – 8.2	8.0 – 8.2	4.1 – 39.0	4.8 – 19.4	16.0 – 44.9	6.9 – 35.2	1.1 – 5.6	1.9 – 5.8	n/a	n/a

Surface water samples were analysed for total and dissolved metal concentrations and report that only *"…aluminium, iron, manganese, molybdenum and zinc were regularly above the laboratory limits of detection"* (Andersen *et al.* 2008b). For C1 and QE1 sites, values for zinc did not exceed the 95% ANZECC values. A comparison of metals concentrations from pre-dredge, dredge and post-dredging revealed few differences. Turbidity recordings in the outfall plume exceeded the ANZECC (2000) guideline of 20 NTU for five of the nineteen days a measurement was recorded. The report noted that dewatering was not occurring during the elevated period.

2.14 Fisherman's Landing Baseline Turbidity Report, June – October 2008 (Wilson and Andersen 2009)

Turbidity monitoring was undertaken at Fisherman's Landing outside of the wet season during a period when dredging was not occurring. Turbidity monitoring was undertaken at Berth 5 (Bulk Liquids Wharf) over a period of five months between 2 June and 29 October 2008 with a Greenspan TS3000 turbidity sensor data logger. Temperature and turbidity data were logged every ten minutes and wipers cleaned the sensors every two hours. Data are plotted in Figure 3. Erroneous data due to sensor fouling were removed from the data set (18 July to 18 August and 18 September to 10 October). Other anomalous values, such as those outside of the instrument range and during periods of extreme low tides when logger was not submerged, were also removed from the data set.

Mean turbidity concentrations for each month demonstrate a seasonal pattern with a general declining trend through to August and then increasing to October (Table 17) (Wilson and Andersen 2009).

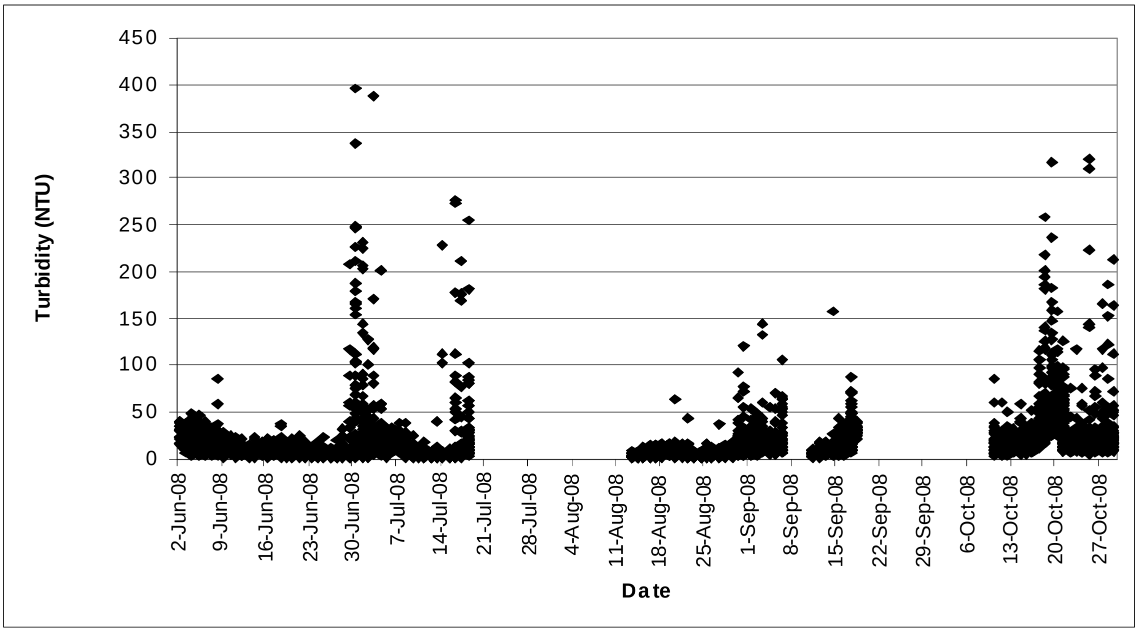


Figure 3 Turbidity Data for Fisherman's Landing, June to October 2008

Table 17 Turbidity Statistics (NTU) for Fisherman's Landing Berth 5, June – October 2008

Parameter	Overall	June	July	August	September	October
Mean (95% confidence interval)	13.60 (±0.30)	11.24 (±0.47)	12.63 (±0.82)	6.89 (±0.22)	14.13 (±0.52)	24.04 (±0.93)
Range	1 - 397	1- 397	1 - 388	1 - 121	2 - 158	3 - 321
Median	9	8	8	5	11	16
99th Percentile	83	41	101	24	56	134
95th Percentile	36	29	29	15	32	64
80th Percentile	18	15	17	10	19	31
20th Percentile	5	6	6	4	8	11
No. of Samples	13769	4043	2530	2661	1767	2768

Overall, Wilson and Andersen (2009) indicated that 80% of the samples were below the ANZECC (2000) guideline of 20 NTU for Tropical Australia - Inshore Marine Waters and that higher turbidity levels recorded (maximums approaching 400 NTU) were mainly attributed to resuspension of sediments by wind induced waves and tidal currents, with the tidal phase (neap and spring) also having an impact. It is also noted that only approximately 20% of the samples were below the QWQG (2006) of 6 NTU.

Turbidity trends reported by Wilson and Andersen (2009), with respect to factors investigated, are as follows:

- Rainfall events: Turbidly levels were not related to rainfall events where there were four periods of moderate rainfall (30-50 mm in 24 h) during the sampling period. It is anticipated that during the wet season, rainfall would be a greater contributing factor in turbidity elevations.
- Tidal influences: Trends in turbidity levels were associated with spring and neap tides with higher means occurring around spring tides (16.0 NTU) compared to neap tides (8.5 NTU). This was attributed to greater bed sediment movements with stronger tidal actions during spring tides.
- Wind direction and speed: Peaks in turbidity were related to prevailing and strong winds in the NE to ESE direction, although *"…not all winds from this direction caused elevated turbidity"*. The rise in turbidly between August and October was attributed to the predominance of easterly wind patterns as well as the wind speed increasing from 16 to 23 km/h (monthly mean) during that time.
- Shipping movements: Were not consistently related to elevations in turbidity readings as high turbidity values (greater than the monthly average) were recorded only during one vessel departure.

2.15 WBM Turbidity Data at Fisherman's Landing (2008)

As part of an ongoing process of calibrating the hydrodynamic model for Port Curtis, WBM undertook turbidity monitoring on the tidal flats at the proposed Fisherman's Landing Northern Reclamation site. Monitoring was undertaken at two sites for approximately 1 month from 15 August to 9 September 2008, covering both neap and spring tidal states. Site 1 was located in the shallow tidal flats and Site 2 was located in deeper waters adjacent to the tidal flats Figure 1.

Data is presented in Figure 4, with tide level shown in Figure 5. Data was collected with an Analite Turbidity Probe with a data range of 0 – 100 NTU. The data show a distinct tidal influence on turbidity, with peaks during flooding and ebbing tides. Turbidity was higher at both sites during spring tides, when there is greater movement of water between high and low tide. Turbidity was higher on the tidal flats than in the adjacent deeper waters during all stages of the tide, with higher and more frequent peaks in turbidity being observed on the tidal flats also. Turbidity is the result of the resuspension of fine sediments from the seabed by tidal currents.

Turbidity regularly exceeded the ANZECC (2000) guideline of 20 NTU and the QWQG (2006) of 6 NTU, and on the tidal flats consistently exceeded these guidelines for substantial periods. This data indicates that the tidal flats and adjacent deeper waters regularly experience elevated turbidity and that the marine flora and fauna present are adapted to these conditions.

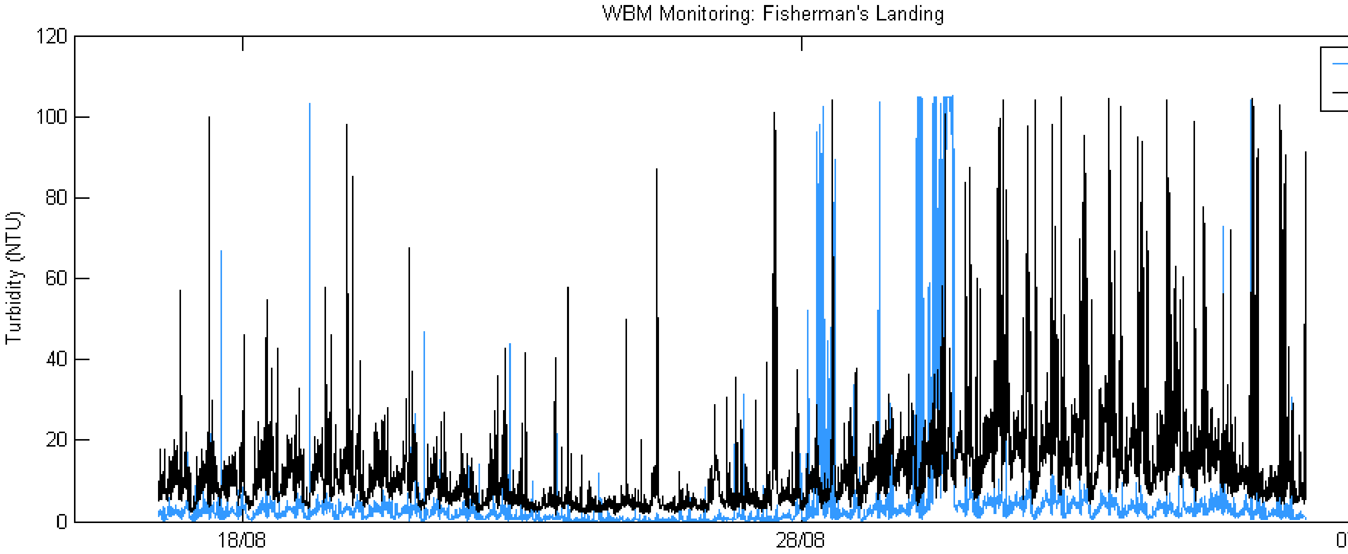


Figure 4 Turbidity at Fisherman's Landing Tidal Flats, 17 August to 6 September 2008. Site 1: 93072; Site 2: 93071 (WBM 2008)

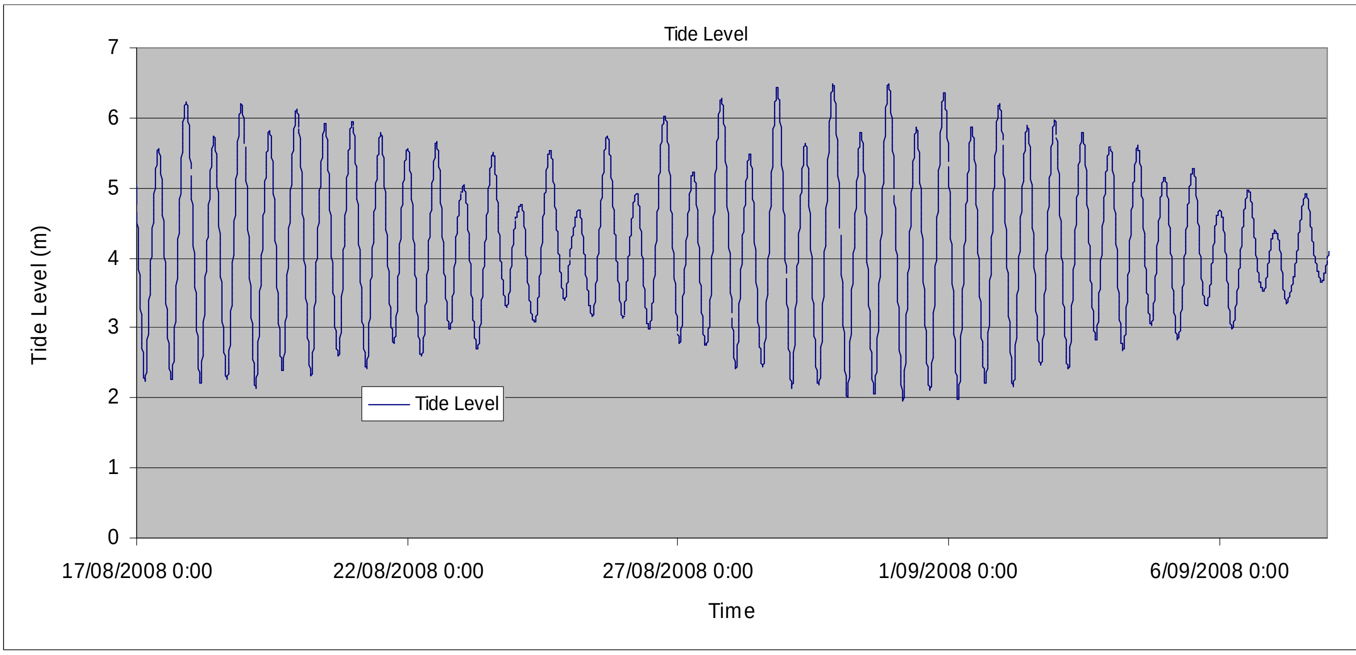


Figure 5 Tide Level at Fisherman's Landing from 17 August to 6 September 2008 (WBM 2008)

3. Existing Information on Sediment Quality

3.1 Introduction

Sediment quality studies previously undertaken in the project area have been reviewed and are provided in Table 19. Further details relating to these studies are presented following the summary table. The sampling sites for each study are shown in Figure 6. Previous studies were undertaken with the sediment quality guidelines specified in the National Ocean Disposal Guidelines for Dredged Material (NODGDM 2002). An update of these guidelines was released in 2009, therefore, these National Assessment Guidelines for Dredging supersede of 2009 the NODGDM (2002). As the sediment quality guidelines do not differ substantially, the results of previous studies have not been checked against the NAGD (2009) and their conclusions are reported against the NODGDM (2002). A summary of the guidelines applied to this EIS as outlined in Chapter 8 of the main document are provided in Table 18.

Table 18 Sediment Quality Guidelines Adopted for Fisherman's Landing

Parameter	Draft Contaminated Land Qld (1998) – EIL	NODGDM (2002) – Screening Level	NAGD (2009) – Screening Level	NAGD (2009) – SQG-high
Metals (mg/kg)				
Arsenic	20	20	20	70
Antimony	20	20	2	25
Cadmium	3	1.5	1.5	10
Chromium (III +IV)		80	80	370
Copper	60	65	65	270
Lead	300	50	50	220
Manganese	500			
Mercury	1	0.15	0.15	1
Nickel	60	21	21	52
Silver		1	1	3.7
Zinc	200	200	200	410
Total Petroleum Hydrocarbons (mg/kg)				
C 6 – C9 Fraction	100			
C 10 – C14 Fraction	100			
C 15 – C28 Fraction	1000			
C 29 – C36 Fraction	1000			
Total TPHs			550	
Polycyclic Aromatic Hydrocarbons (µg/kg)				

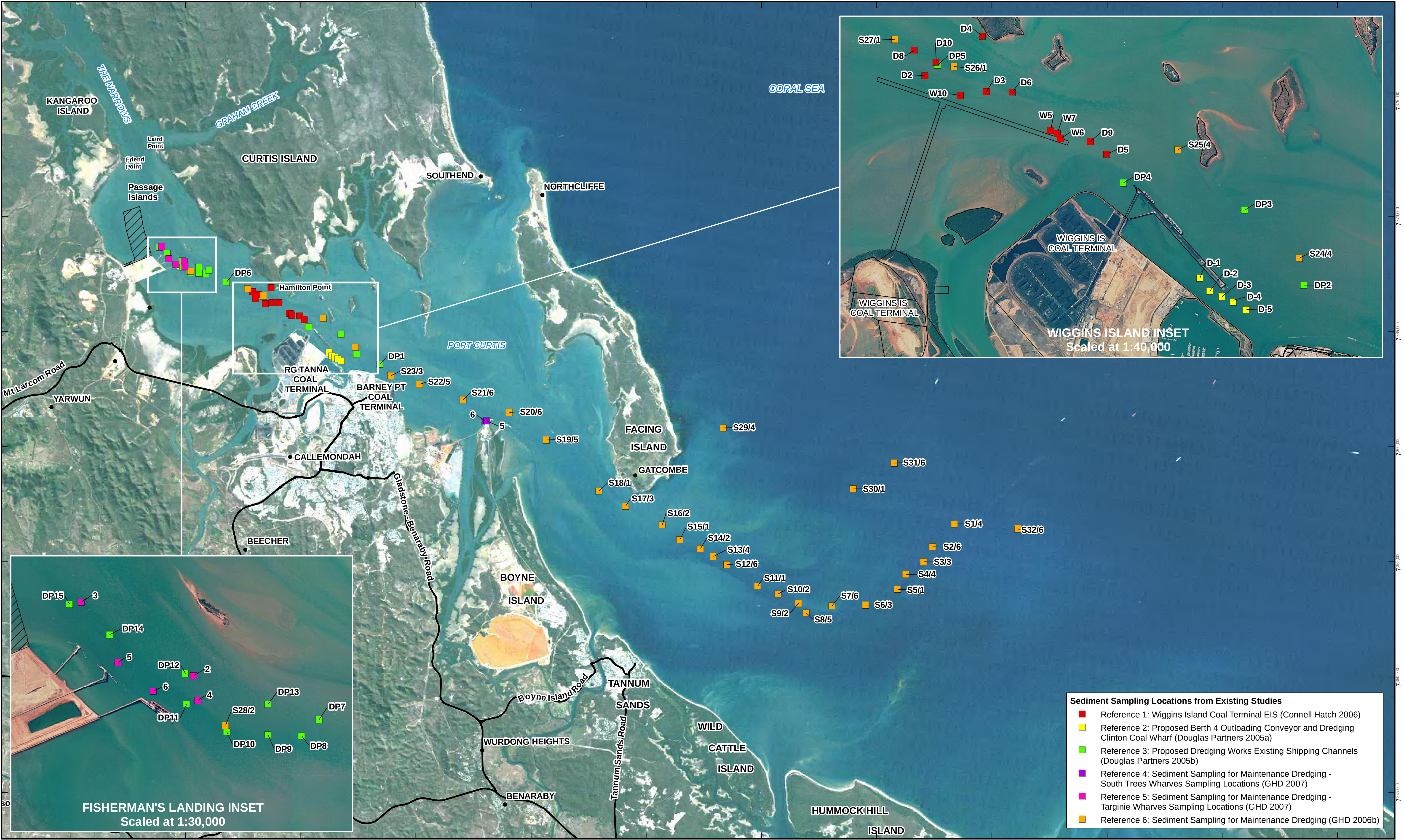
Parameter	Draft Contaminated Land Qld (1998) – EIL	NODGDM (2002) – Screening Level	NAGD (2009) – Screening Level	NAGD (2009) – SQG-high
Benz(a)pyrene				
PAHs (Sum of total)		4,000	10,000	50,000
Polychlorinated Biphenyls (µg/kg)				
PCBs (sum of total)	1,000	23	23	
Organochlorine Pesticides (µg/kg)				
4,4-DDE		2.2	2.2	27
Aldrin + Dieldrin	200			
Chlordane		0.5	0.5	6.0
DDD		2.0	2.0	20
DDT		1.6	1.6	46
DDT+DDE+DDD	200			
Dieldrin		0.02	280	270 / 620
Endrin		0.02	10	120 / 220
g-BHC (Lindane)		0.32	0.32	1.0
Organotins (µg Sn/kg)				
Tributyltin		5 µg Sn/kg	9 µg Sn/kg	70 µg Sn/kg

Table 19 Sediment Quality Studies Undertaken in the Vicinity of the Proposed Project Area

Study	Purpose	Parameters	Sample Locations	Sampling Time Period
Comalco Alumina Project (Dames and Moore, 1998)	Environmental Impact Statement	◗ Metals (Fe, Al, Mn, As, Cd, Co, Cr, Cu, Hg, Mo, Ni, Pb, Se, Sn) ◗ Total Petroleum Hydrocarbons (TPH)	Fisherman's Landing	September 1995
Cooperative Research Centre (CRC) for Coastal Zone, Estuary and Waterway Management (2005, 2006)	Three CRC Research Projects	Technical Report 25: ◗ Metals (Al, As, Cd, Cr, Cu, Fe, Hg, Ni, Pb, Se, Zn) ◗ Polyaromatic Hydrocarbons (PAH) ◗ Fluoride ◗ Cyanide ◗ Tributyltin (TBT) Contaminants reduced in Technical Report 73 and 83	Throughout Port Curtis	Technical Report 25: August – October 2001 (dry season) and February 2002 (wet season) Technical Report 73: December 2003 and December 2004 Technical Report 83: December 2003 and December 2004
Douglas Partners (2005a)	Proposed dredging of Berth 4, RG Tanna Coal Terminal	◗ Metals (As, Sb, Cd, Cr, Cu, Pb, Hg, Ni, Ag, Zn) ◗ PAHs ◗ TBT ◗ PCBs ◗ Pesticides ◗ Organic carbon ◗ Acid sulfate soils (ASS)	5 environmental bore holes located in Fourth Berth, RG Tanna Coal Terminal	March and April 2005

Study	Purpose	Parameters	Sample Locations	Sampling Time Period
Douglas Partners (2005b)	Proposed dredging at Fisherman's Landing, Targinie Channel and adjacent to RG Tanna Coal Terminal	◗ Metals (As, Sb, Cd, Cr, Cu, Pb, Hg, Ni, Ag, Zn) ◗ PAHs ◗ TBT ◗ PCBs ◗ Pesticides ◗ Organic carbon ◗ Acid sulfate soils (ASS)	15 bore holes located around existing shipping channels, Fisherman's Landing wharves and RG Tanna Coal Terminal	March and April 2005
Wiggins Island Coal Terminal EIS (Connell Hatch 2006)	Dredging and wharf construction at proposed at Wiggins Island Coal Terminal	◗ Metals (As, Sb, Cd, Cr, Cu, Pb, Hg, Ni, Ag, Zn) ◗ PAHs ◗ pesticides ◗ PCBs ◗ Organic carbon ◗ TBT ◗ ASS	Wiggins Island Coal Terminal dredging and wharf footprint	2006
Sediment Sampling for Maintenance Dredging 1992, 1996 and 2000	1992, 1996 and 2000 permits for sea disposal of maintenance dredging material	Various	Main shipping channel	

Study	Purpose	Parameters	Sample Locations	Sampling Time Period
GHD (2006b, 2007)	2006 application for long term sea disposal permit for maintenance dredging material	◗ Total Organic Carbon ◗ Particle Size ◗ Metals (As, Cd, Cr, Cu, Pb, Hg, Ni, Zn, Ag) ◗ Cyanide, Ammonia ◗ PAHs ◗ Organotins ◗ BTEX and TPHs	28 sites along shipping channel in inner and outer harbour Additional sampling at 5 sites at Fisherman's Landing berths and swing basin and 2 sites at South Trees wharf berths	July 2006 and June 2007



Sediment Sampling Locations from Existing Studies

- 🟥 Reference 1: Wiggins Island Coal Terminal EIS (Connell Hatch 2006)
- 🟨 Reference 2: Proposed Berth 4 Outloading Conveyor and Dredging Clinton Coal Wharf (Douglas Partners 2005a)
- 🟩 Reference 3: Proposed Dredging Works Existing Shipping Channels (Douglas Partners 2005b)
- 🟪 Reference 4: Sediment Sampling for Maintenance Dredging - South Trees Wharves Sampling Locations (GHD 2007)
- 🟪 Reference 5: Sediment Sampling for Maintenance Dredging - Targinie Wharves Sampling Locations (GHD 2007)
- 🟧 Reference 6: Sediment Sampling for Maintenance Dredging (GHD 2006b)

1:150,000 (at A3)

0 1 2 3 4 5

Kilometres (at A3)

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid of Australia, Zone 56

N

LEGEND

- Major Road
- Cadastre
- ▨ Proposed Fisherman's Landing Northern Expansion

NOTE:
Sediment sample locations are intended
to be as accurate as possible however,
the locations were obtained from scanned copies
of reports, not from actual GPS data.
Refer to referenced report from further information.

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Fisherman's Landing Northern Expansion EIS

Job Number	42-15386
Revision	A
Date	1 JUNE 2009

Location of Sediment Sampling Sites from Previous Studies in Port Curtis

Figure 6

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250K Topo Data (2006) - ©Commonwealth of Aust (Geoscience Australia), Sediment Samples - GHD Pty Lt (2006-2007); Sediment Samples - Douglas Partners (2005). Sediment Samples - Connell Hatch (2006). Created by: KD

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3.2 Comalco Alumina Project, Gladstone IAS \ EIS (Dames and Moore, 1998)

Dames and Moore (1998) conducted baseline sediment quality monitoring for the Port Curtis area for the Comalco Alumina IAS/EIS during 1995. Data for the site adjacent to Fisherman's Landing is presented in Table 20. All parameters examined were compliant with the NODGDM (2000).

Table 20 Sediment Quality Results for Fisherman's Landing (Dames and Moore 1998)

Parameter	Concentration (mg/kg)	NODGDM (2000) ISQG (low)
Iron	21700	
Aluminium	9200	
Manganese	400	
Arsenic	13	20
Cadmium	<0.1	1.5
Chromium	9	80
Cobalt	10	
Copper	52	65
Lead	42	50
Mercury	<0.2	0.15
Molybdenum	1.0	
Nickel	5	21
Selenium	0.1	
Tin	3.0	
Total Petroleum Hydrocarbons	<0.2	

3.3 CRC Coastal Zone, Estuary and Waterway Management (2005, 2006)

The Cooperative Research Centre (CRC) for Coastal Zone, Estuary and Waterway Management has undertaken a series of research projects into contaminants in sediments and contaminant pathways in Port Curtis. These studies are published in three Technical Reports:

- Technical Report 25: Contaminants in Port Curtis: screening level risk assessment (Apte *et al.* 2005);
- Technical Report 73: Contaminant pathways in Port Curtis (Apte *et al.* 2006); and
- Technical Report 83: Metal and polycyclic aromatic hydrocarbon contaminants in benthic sediments in Port Curtis (Vincente-Beckett *et al.* 2006).

3.3.1 Technical Report 25

The CRC undertook a screening level risk assessment of water and sediment quality in Port Curtis in 2001/2002 (water quality is reported in Section 2.4). The aim of this study was to identify contaminants of concern in Port Curtis. Parameters to be monitored were chosen based on likely inputs from industry and port activities and included metals, PAHs, cyanide, fluoride and tributyltin (TBT). Surface sediment grabs were collected at 50 sites throughout the harbour (Figure 7). Seagrass, oysters, mud whelks and crabs were also collected and analysed for contaminant concentrations to determine if bioaccumulation of contaminants was an issue in Port Curtis. Fish were also collected for human health risk assessment. Only metals and TBT were analysed on biota samples.

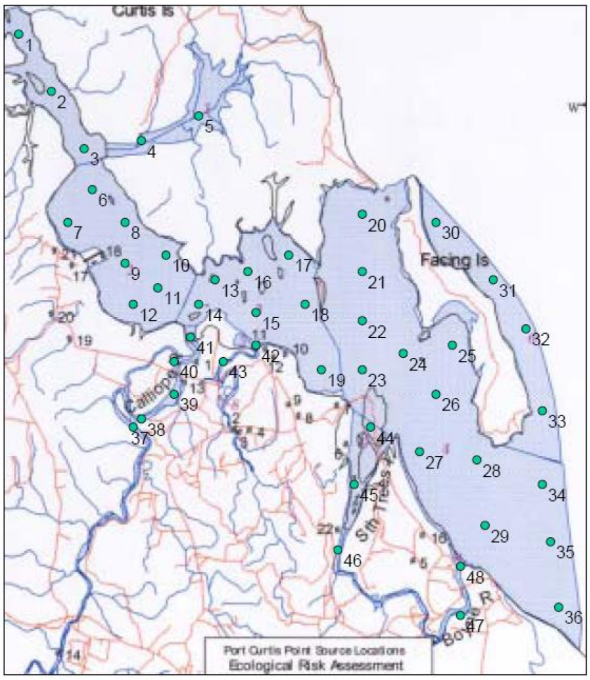

Figure 7 Location of Sediment Samples from CRC Study (Apte *et al.* 2005)

Results of sediment sampling are summarised in table 5 of Apte *et al.* (2005) (see below). The following conclusions were drawn from the study:

- Concentrations of arsenic, chromium, nickel and TBT exceeded the ISQG-low guidelines in a number of samples;
- The concentrations of chromium and nickel in the harbour were comparable to control site concentrations, indicating naturally elevated levels of these metals in Port Curtis;
- The concentrations of arsenic were above background;
- The concentrations of PAHs were below limits of reporting, but the LORs were too high to compare to sediment quality guidelines. A previous WBM (2000) study had indicated measurable concentrations of PAHs such as napthalene, pyrene and fluoranthene in sediments in Port Curtis;

- The concentrations of a number of metals were enriched in biota samples within Port Curtis relative to reference sites, however, the study noted that this did not necessarily result in deleterious effects; and
- The concentrations of mercury in fish were of potential concern, but this was noted to be a typical public health concern throughout Australia (Apte *et al.* 2005).

The study concluded that contaminants of concern in Port Curtis sediments were arsenic, TBT and napthalene.

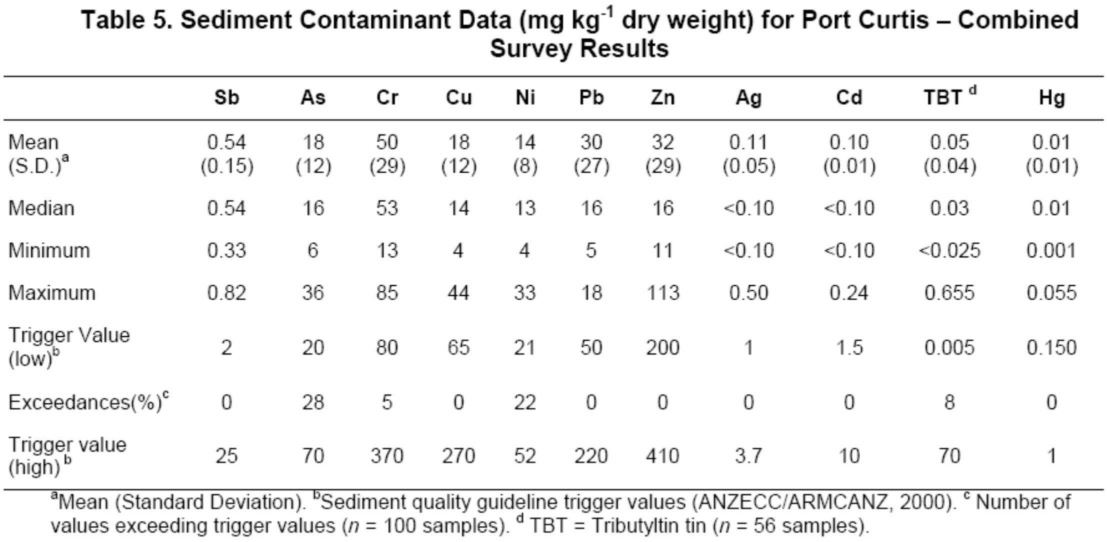

Table 5. Sediment Contaminant Data (mg kg^{-1} dry weight) for Port Curtis – Combined Survey Results

	Sb	As	Cr	Cu	Ni	Pb	Zn	Ag	Cd	TBT [d]	Hg
Mean (S.D.)[a]	0.54 (0.15)	18 (12)	50 (29)	18 (12)	14 (8)	30 (27)	32 (29)	0.11 (0.05)	0.10 (0.01)	0.05 (0.04)	0.01 (0.01)
Median	0.54	16	53	14	13	16	16	<0.10	<0.10	0.03	0.01
Minimum	0.33	6	13	4	4	5	11	<0.10	<0.10	<0.025	0.001
Maximum	0.82	36	85	44	33	18	113	0.50	0.24	0.655	0.055
Trigger Value (low)[b]	2	20	80	65	21	50	200	1	1.5	0.005	0.150
Exceedances(%)[c]	0	28	5	0	22	0	0	0	0	8	0
Trigger value (high) [b]	25	70	370	270	52	220	410	3.7	10	70	1

[a]Mean (Standard Deviation). [b]Sediment quality guideline trigger values (ANZECC/ARMCANZ, 2000). [c] Number of values exceeding trigger values (*n* = 100 samples). [d] TBT = Tributyltin tin (*n* = 56 samples).

3.3.2 Technical Report 73

The CRC undertook a study to attempt to determine the sources of the contaminants of concern in Port Curtis that were identified in the Apte *et al.* (2005) study. The study focused on metals, PAHs and TBT. The following conclusions were made:

- Elevated concentrations of dissolved metals were identified in the waters of Port Curtis. Likely sources of metals were industrial and anthropogenic discharges, unidentified sources in The Narrows and the Fitzroy River plume;
- Elevated concentrations of arsenic, chromium and nickel in Port Curtis sediments were identified as being from natural geology, not anthropogenic sources;
- PAHs were identified around industrial areas of the Port, but concentrations were below ANZECC (2000) guidelines;
- The top 28 cm of sediments were determined to have been deposited since 1958, which marks the beginning of industrialisation in Gladstone; and
- Imposex was identified in mud whelks in the Port, indicating a biological response to TBT exposure.

3.3.3 Technical Study 83

This study contained a more detailed review of the studies relating to sediment metal and PAHs concentrations that were reported in Technical Study 73.

3.4 Proposed Berth 4 Outloading Conveyor and Dredging Clinton Coal Wharf (Douglas Partners 2005a)

Sixteen boreholes were drilled within the proposed capital dredging and wharf construction area for the Fourth Berth at RG Tanna Coal Terminal (Douglas Partners 2005a). Environmental analyses were undertaken on 5 boreholes, with samples collected and analysed at the surface, within the top 6m below seabed and between 6 and 12 m below seabed (Figure 6). Samples from the surface were analysed for a full range of contaminants (metals, PAHs, TBT, PCBs, pesticides, organic carbon, chromium suite for ASS) and the two deeper samples from each core were analysed for metals, napthalene, total PAHs, chromium suite for ASS and organic carbon.

The results were as follows:

- 80% of the material to be dredged comprised sands and clayey sands, with minor proportions of gravel and the remaining 20% of material comprised clays, silty clays and sandy clays, also with minor gravel content;
- The concentrations of PCBs, pesticides, PAHs and TBT were below laboratory limits of reporting, with the exception of TBT in one sample. The concentration of TBT that was above laboratory LORs was below the ISQG-low and EILs;
- The concentrations of all metals were below the ISQG-low and EILs;
- The field pH screening tests that indicate the presence of actual acid sulfate soils (AASS) and potential acid sulfate soils (PASS) did not indicate the presence of either of these in the sediments to be dredged; and
- The action criteria from the chromium suite tests for ASS was not exceeded for any samples, indicating that the risk of oxidation of PASS during dredging and reclamation was below the criteria that require action and management.

3.5 Proposed Dredging Works Existing Shipping Channels (Douglas Partners 2005b)

Sediment sampling was undertaken as part of an investigation into the proposed dredging of shipping channels and swing basins in the Port of Gladstone, along Targinie Channel and adjacent to Fisherman's Landing wharves (Douglas Partners 2005b) (Figure 6). Fifteen boreholes were drilled to derive geotechnical and geochemical characteristics of sediments in existing shipping channels and swing basins in March and April 2005. Samples from the surface were analysed for a full range of contaminants (metals, PAHs, TBT, PCBs, pesticides, organic carbon, chromium suite for ASS) and the one deeper sample from site DP15 was analysed for metals, napthalene, total PAHs, chromium suite for ASS and organic carbon. Most cores were drilled to 4 – 5 m, which is well below the proposed depth of dredging in these areas. DP15 was drilled to 10 m.

The results of the study were:

- The top 2 m of material in the Targinie Channel consisted of ~95% silt and clay and ~5% sand with minor gravel and the top 2 m of material in the Targinie Swing Basin (adjacent to existing Fisherman's Landing reclamation) consisted of ~75% silt and clay and ~25% sand with minor gravel;

- The concentrations of metals, PCBs, PAHs, pesticides and TBT were below the ISQG-low, with the exception of arsenic in two samples. The 95% upper confidence limit of the mean for arsenic in all samples was below the ISQG-low; and
- None of the field screening tests indicated the presence of AASS or PASS in the material to be dredged and the action criterion was not exceeded for any of the 16 samples that underwent chromium suite analysis, indicating that the risk of oxidation of PASS during dredging and reclamation was below the criteria that require action and management.

3.6 Wiggins Island Coal Terminal EIS (Connell Hatch 2006)

Environmental and ASS analysis was undertaken on 13 boreholes from the footprint of the proposed Wiggins Island Coal Terminal (WICT) wharf, berths and swing basin (Connell Hatch 2006) (Figure 6). Surface samples (0 – 0.45 and 0.5 – 0.95 m) were analysed for the range of contaminants outlined in the NODGDM (2000). Samples were collected at 1 m intervals below 0.95 m and analysed for a reduced suite, including metals and ASS field screening. The results of the sampling and analysis indicated the following:

- The material to be dredged comprised mostly sands (Table 21);
- The concentrations of PAHs, pesticides, PCBs and TBT were below the NODGDM (2000) ISQG-low screening levels after normalisation to 1% total organic carbon;
- Concentrations of 6 metals exceeded the ISQG-low or EIL in individual samples, however, the 95% upper confidence limit of the mean for each metal was compliant to the guidelines, with the exception of silver, which exceeded the ISQG-high trigger value. The depth of the samples led to the conclusion that these concentrations were natural and not of concern for land based disposal; and
- No acid sulfate soils were identified in the material to be dredged (Connell Hatch 2006).

Table 21 Summary of Sediment Types in Material to be Dredged for WICT Project (Connell Hatch 2006)

Area to be Dredged	Sediment Type
Berth Pockets	◗ sands, clayey sands and minor gravelly sands 66% ◗ sandy clays, silty clays and minor gravelly clays 31% ◗ dense gravels 3%
Departure/Arrival Channel	◗ sands, clayey sands and minor gravelly sands 60% ◗ sandy clays, silty clays and minor gravelly clays 37% ◗ dense gravels 3%
Swing Basin	◗ sands 65% ◗ clayey sands 30% ◗ gravelly sand and silty clay 5%

3.7 Sediment Sampling for Maintenance Dredging (1992, 1996, 2000)

GPC provided a summary of previous sediment sampling programs for maintenance dredging in the Port of Gladstone in their Long Term Management Plan for Sea Disposal of Maintenance Dredging Material (GPC 2006), referencing a WBM (2001) report. This summary is provided in this section.

3.7.1 1992 Study Results

None of the sediments sampled were found to contain any trace metal contaminants at concentrations above the then London Dumping Convention criteria. All organic compounds such as organochlorine pesticides, organophosphorus pesticides or petroleum hydrocarbons were found to be at levels equal or less than the limits of detection. The total oils and grease concentrations were also low. Radioactivity levels of all sediments sampled were below the level of detection. The oxygen demand of the channel sediments, particularly those from the outer channel were determined as being relatively high, based upon their high biota concentrations. It was considered that any oxygen demand in the waters within the placement site would be minimal and transient because of the mixing afforded by tidal currents and wave action. Based upon these results, all sediments to be dredged were considered uncontaminated and therefore suitable for placement at sea (WBM, 2001).

3.7.2 1996 Study Results

None of the 1996 sediments sampled were found to contain any trace metal contaminants at concentrations above the respective ANZECC screening level criteria. No organic compounds such as organochlorine pesticides, PCB's or petroleum hydrocarbons were present in any of the sediments at levels exceeding the limits of detection. The organic matter concentration of sediment samples from the outer channel was generally low, whilst those for the inner channel were very low. Based upon this investigation, all sediments to be dredged were considered uncontaminated and therefore suitable for relocation and placement at sea (WBM, 2001).

3.7.3 2000 Study Results

With the exception of slightly elevated concentrations of arsenic at three sampling locations (2 outer channel, 1 inner channel), sediments sampled in 2000 were not found to contain any trace element contaminants at concentrations above the ANZECC screening level criteria. However, all trace elements, including arsenic, were at acceptable levels when the means for the inner and outer channel areas were calculated as prescribed in the ANZECC Interim Ocean Disposal Guidelines. The slight elevation of arsenic was considered a naturally occurring feature of the harbour geology. The incidence of elevated levels of arsenic on the east coast of Australia is noted in the ANZECC guidelines. No organic compounds including organochlorine pesticides, PCB's or PAH's were found at levels exceeding the ANZECC screening level criteria. Based upon these results, all sediments to be dredged were considered uncontaminated and therefore suitable for dredging and placement at sea (WBM, 2001).

3.8 Sediment Sampling for Maintenance Dredging (GHD 2006b)

Sediment sampling within the main shipping channel of the Port of Gladstone was undertaken in accordance with the NODGDM (2002) in support of an application for a new long term maintenance dredging permit (GHD 2006a). Surface samples were collected from 28 sites within the shipping channel in July 2006 (Figure 6). Samples were analysed for organic carbon, particle size, metals (As, Cd, Cr, Cu, Pg, Hg, Ni, Zn, Ag), cyanide, ammonia, PAHs, organotins, BTEX, TPHs.

The sediments to be dredged were dominated by the sand fraction, which is typical of maintenance dredging material in the Port. The results of the initial sampling identified concentrations of arsenic, PAHs and TBT that required further analysis and risk assessment, including sampling in closer proximity to wharf centres (Figure 6). It was noted that arsenic and PAHs were identified by the previous CRC studies as being of natural origin in Port Curtis. Further sampling and analysis and risk assessment, including further review of background concentrations and previous studies, resulted in the sediments from the shipping channel being assessed as suitable for unconfined ocean disposal (GHD 2007).

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Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	J Lee	J Romero		J Lee		19/6/09

Appendix B

Laboratory Analysis and Interpretive Quality Control Certificates for Water Quality Monitoring

Chain of Custody & Analysis Request

Page __1__ of _1__

Chain of Custody Number: :

GHD

PROJECT ID:	4215386 41	QUOTE:	
PROJECT:	Western Basin EIS WQ Monitoring		
CLIENT:	GHD		
POSTAL ADDRESS:	PO Box 373, Gladstone 4680		
CONTACT:	Adrian White		
PHONE:	412035667	FAX:	07) 49726236
EMAIL:	Jason.K.Fowler@ghd.com.au, Adrian.A.White@ghd.com.au		
INVOICE:	Jason.K.Fowler@ghd.com.au, Adrian.A.White@ghd.com.au		
DATA NEEDED BY:			
REPORT FORMAT:			
EMAIL FORMAT:	ESDAT, EXCEL & PDF		

LABORATORY BATCH NO.:

FOR LAB USE ONLY

COOLER SEAL: Yes ✓ No Broken Intact ✓

COOLER TEMP: 1.4 deg C

DESPATCHED TO: ALS Laboratories
32 SHAND STREET STAFFORD QLD 4053
3243-7222

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

Water samples from a **marine** environment (Background sampling)

(EMAIL ADDRESSES PROVIDED ABOVE)

ANALYSIS REQUIRED

SAMPLE ID		MATRIX	DATE	DETECTION LIMIT	PRESERVATION	TSS (EA025)	Chlorophyll a (EP008)	pH (EA005)	TDS (EA015)	BTEX	TBT (Lowest LOR)	VOC (1,2,4-Trichlorobenzene, 1,1,2-Trichloroethane (EP074LL)	Cyanide	Electro Conductivity	Multi Residue Pesticides –EP-215LL (lowest DL)	Ultra Trace Phenoxy Acid Herbicides – EP-202LL	Mulit Residue Pesticide – EP-209LL (lowest DL)	Tebuthiuron (DL 10ug/L) - SGS Coburg	Ultratrace OC/OP Pesticides (EP130A/EP131A)	PAH/Phenols & TPH (S-14A / EP080)	Note: If not enough sample to undertake BTEX and VOC analysis forfeit the BTEX analysis. Please store samples for Sydney analysis over weekend then forward on Monday. Outsourced Tebuthiuron analysis is approved. Please forward. **SAMPLES LABELED QA04 are QA01**
G-WQ-01	1.	Water	21/05/2009	LOR	As Required	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
G-WQ-04	2.	Water	21/05/2009	LOR	As Required	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
G-WQ-05	3.	Water	21/05/2009	LOR	As Required	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
G-WQ-08	4.	Water	21/05/2009	LOR	As Required	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
G-WQ-10	5.	Water	21/05/2009	LOR	As Required	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
G-WQ-11	6.	Water	21/05/2009	LOR	As Required	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
G-WQ-12	7.	Water	21/05/2009	LOR	As Required	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
QA1 (some are labeled QA4)	8	Water	21/05/2009	LOR	As Required	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	

Environmental Division
Brisbane
Work Order
EB0908160
Telephone : +61-7-3243 7222

RELINQUISHED BY:				RECEIVED BY:			
NAME :	A White	DATE:	21/05/2009	NAME :	Maggie Kalvi	DATE:	22-5-09
OF:	GHD Gladstone	TIME:	1530	OF:	ALS	TIME:	8:20

PLEASE EMAIL COMPLETED ANALYSIS REQUEST TO: Jason.K.Fowler@ghd.com.au, Adrian.A.White@ghd.com.au

*Container Type and Preservative Codes: P = Neutral Plastic; N = Nitric Acid Preserved; C = Sodium Hydroxide Preserved; J = Solvent Washed Acid Rinced Jar; S = Solvent Washed Acid Rinced Glass Bottle; VC = Hydrochloric Acid Preserved Vial; VS = Sulfuric Acid Preserved Vial; BS = Sulfuric Acid Preserved Glass Bottle; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; O = Other.

SAMPLE RECEIPT NOTIFICATION (SRN)

Comprehensive Report

Work Order : **EB0908160**

Client	: **GHD SERVICES PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR ADRIAN WHITE	Contact	: Tim Kilmister
Address	: P O BOX 373 GLADSTONE QLD, AUSTRALIA 4680	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: adrian.a.white@ghd.com.au	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 07 49731611	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 4972 6236	Facsimile	: +61-7-3243 7218
Project	: 4215386 41 Western Basin EIS WQ Monitoring	Page	: 1 of 3
Order number	: ----		
C-O-C number	: ----	Quote number	: EM2009GHDSER0392 (EN/005/09)
Site	: ----		
Sampler	: ----	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Dates

Date Samples Received	: 22-MAY-2009	Issue Date	: 22-MAY-2009 15:54
Client Requested Due Date	: 05-JUN-2009	Scheduled Reporting Date	: **05-JUN-2009**

Delivery Details

Mode of Delivery	: Carrier	Temperature	: 0.6,2.6,0.4,0.8C - Ice present
No. of coolers/boxes	: 4 LARGE, 3 MEDIUM	No. of samples received	: 8
Sercurity Seal	: Intact.	No. of samples analysed	: 8

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Requested Deliverables
- **Samples received in appropriately pretreated and preserved containers.**
- **Sample(s) have been received within recommended holding times.**
- **Sample(s) requiring volatile organic compound analysis received in airtight containers (ZHE).**
- **Tebuthiuron analysis has been subcontracted to SGS (Multilab).**
- Please direct any turn around / technical queries to the laboratory contact designated above.
- Please direct any queries related to sample condition / numbering / breakages to Maggie Kahi.
- Analytical work for this work order will be conducted at ALS Brisbane.
- Sample Disposal - Aqueous (14 days), Solid (90 days) from date of completion of work order.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exist.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process neccessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

When date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for processing purposes. If the sampling time is displayed as 0:00 the information was not provided by client.

Matrix: **WATER**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	WATER - EA005: pH pH	WATER - EA010P Conductivity (PC)	WATER - EA015 Total Dissolved Solids	WATER - EA025 Suspended Solids	WATER - EK026G Total Cyanide by Discrete Analyser	WATER - EP008 Chlorophyll a	WATER - EP074-LL Ultra-Trace Volatiles by P&T GCMS(SIM)	WATER - EP090S Organotins
EB0908160-001	21-MAY-2009 15:00	G-WQ-01	✓	✓	✓	✓	✓	✓	✓	✓
EB0908160-002	21-MAY-2009 15:00	G-WQ-04	✓	✓	✓	✓	✓	✓	✓	✓
EB0908160-003	21-MAY-2009 15:00	G-WQ-05	✓	✓	✓	✓	✓	✓	✓	✓
EB0908160-004	21-MAY-2009 15:00	G-WQ-08	✓	✓	✓	✓	✓	✓	✓	✓
EB0908160-005	21-MAY-2009 15:00	G-WQ-10	✓	✓	✓	✓	✓	✓	✓	✓
EB0908160-006	21-MAY-2009 15:00	G-WQ-11	✓	✓	✓	✓	✓	✓	✓	✓
EB0908160-007	21-MAY-2009 15:00	G-WQ-12	✓	✓	✓	✓	✓	✓	✓	✓
EB0908160-008	21-MAY-2009 15:00	QA1 some labelled Q...	✓	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	WATER - EP202LL Phenoxyacetic acids - low level	WATER - EP209LL Multiresidue Pesticide Screen (Suite 1) - Low Level	WATER - EP215LL Multiresidue Pesticide Screen (Suite 2) - Low Level	WATER - MSC-WAT (Subcontracted) Miscelleneous Subcontracting	WATER - UTO-1W Ultratrace OC / OP Pesticides	WATER - W-04 TPH/BTEX	WATER - W-14A PAH/Phenols (SIM)
EB0908160-001	21-MAY-2009 15:00	G-WQ-01	✓	✓	✓	✓	✓	✓	✓
EB0908160-002	21-MAY-2009 15:00	G-WQ-04	✓	✓	✓	✓	✓	✓	✓
EB0908160-003	21-MAY-2009 15:00	G-WQ-05	✓	✓	✓	✓	✓	✓	✓
EB0908160-004	21-MAY-2009 15:00	G-WQ-08	✓	✓	✓	✓	✓	✓	✓
EB0908160-005	21-MAY-2009 15:00	G-WQ-10	✓	✓	✓	✓	✓	✓	✓
EB0908160-006	21-MAY-2009 15:00	G-WQ-11	✓	✓	✓	✓	✓	✓	✓
EB0908160-007	21-MAY-2009 15:00	G-WQ-12	✓	✓	✓	✓	✓	✓	✓
EB0908160-008	21-MAY-2009 15:00	QA1 some labelled Q...	✓	✓	✓	✓	✓	✓	✓

Requested Deliverables

MR ADRIAN WHITE

*AU Certificate of Analysis - NATA (COA)	Email	adrian.a.white@ghd.com.au
*AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	adrian.a.white@ghd.com.au
*AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	adrian.a.white@ghd.com.au
A4 - AU Sample Receipt Notification - Environmental (SRN)	Email	adrian.a.white@ghd.com.au
A4 - AU Tax Invoice (INV)	Email	adrian.a.white@ghd.com.au
Default - Chain of Custody (COC)	Email	adrian.a.white@ghd.com.au
EDI Format - ENMRG (ENMRG)	Email	adrian.a.white@ghd.com.au
EDI Format - ESDAT (ESDAT)	Email	adrian.a.white@ghd.com.au
Trigger - Subcontract Report (SUBCO)	Email	adrian.a.white@ghd.com.au

MR JASON FOWLER

*AU Certificate of Analysis - NATA (COA)	Email	jason.k.fowler@ghd.com.au
*AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	jason.k.fowler@ghd.com.au
*AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	jason.k.fowler@ghd.com.au
A4 - AU Sample Receipt Notification - Environmental (SRN)	Email	jason.k.fowler@ghd.com.au
A4 - AU Tax Invoice (INV)	Email	jason.k.fowler@ghd.com.au
Default - Chain of Custody (COC)	Email	jason.k.fowler@ghd.com.au
EDI Format - ENMRG (ENMRG)	Email	jason.k.fowler@ghd.com.au
EDI Format - ESDAT (ESDAT)	Email	jason.k.fowler@ghd.com.au
Trigger - Subcontract Report (SUBCO)	Email	jason.k.fowler@ghd.com.au

CERTIFICATE OF ANALYSIS

Work Order	: **EB0908160**	Page	: 1 of 14
Client	: **GHD SERVICES PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR ADRIAN WHITE	Contact	: Tim Kilmister
Address	: P O BOX 373 GLADSTONE QLD, AUSTRALIA 4680	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: adrian.a.white@ghd.com.au	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 07 49731611	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 4972 6236	Facsimile	: +61-7-3243 7218
Project	: 4215386 41 Western Basin EIS WQ Monitoring	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 22-MAY-2009
Sampler	: ----	Issue Date	: 05-JUN-2009
Site	: ----		
		No. of samples received	: 8
Quote number	: EN/005/09	No. of samples analysed	: 8

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

NATA Accredited Laboratory 825

This document is issued in accordance with NATA accreditation requirements.

Accredited for compliance with ISO/IEC 17025.

WORLD RECOGNISED ACCREDITATION

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
		Organics
Alex Rossi	Organic Chemist	Organics
Kim McCabe	Senior Inorganic Chemist	Inorganics
Lana Nguyen	Organic Chemist	Organics
Matthew Goodwin	Senior Organic Chemist	Organics
Sarah Ashworth	Organic Chemist	Organics
Stephen Hislop	Senior Inorganic Chemist	Inorganics

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insuffient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for processing purposes. If the sampling time is displayed as 0:00 the information was not provided by client.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting

- **EP215: Insufficient sample has been provided for QC analysis.**
- **TDS by method EA-015 may bias high due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.**
- **Ultra-Trace analysis (bar VOC-LL) conducted by ALS Sydney, NATA accreditation no. 825, site no 10911**

Analytical Results

Sub-Matrix: **MARINE WATER**			*Client sample ID*	**G-WQ-01**	**G-WQ-04**	**G-WQ-05**	**G-WQ-08**	**G-WQ-10**
			Client sampling date / time	21-MAY-2009 15:00	21-MAY-2009 15:00	21-MAY-2009 15:00	21-MAY-2009 15:00	21-MAY-2009 15:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB0908160-001**	**EB0908160-002**	**EB0908160-003**	**EB0908160-004**	**EB0908160-005**
EA005: pH								
pH Value	----	0.01	pH Unit	**7.81**	**8.10**	**8.05**	**8.00**	**8.05**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**47600**	**51100**	**48900**	**49100**	**49000**
EA015: Total Dissolved Solids								
^ Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	**47000**	**44800**	**44600**	**45700**	**44600**
EA025: Suspended Solids								
^ Suspended Solids (SS)	----	1	mg/L	**94**	**90**	**44**	**110**	**104**
EK026G: Total Cyanide By Discrete Analyser								
Total Cyanide	57-12-5	0.004	mg/L	<0.004	<0.004	<0.004	<0.004	<0.004
EP008: Chlorophyll a								
Chlorophyll a	----	1	mg/m3	**5**	**5**	**5**	**5**	**5**
EP074E: Halogenated Aliphatic Compounds								
1.1.1-Trichloroethane	71-55-6	1	µg/L	<1	<1	<1	<1	<1
1.1.2-Trichloroethane	79-00-5	5	µg/L	<5	<5	<5	<5	<5
EP074F: Halogenated Aromatic Compounds								
1.2.4-Trichlorobenzene	120-82-1	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
EP075(SIM)A: Phenolic Compounds								
Phenol	108-95-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
2-Chlorophenol	95-57-8	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
2-Methylphenol	95-48-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
3- & 4-Methylphenol	1319-77-3	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0
2-Nitrophenol	88-75-5	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
2.4-Dimethylphenol	105-67-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
2.4-Dichlorophenol	120-83-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
2.6-Dichlorophenol	87-65-0	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
4-Chloro-3-Methylphenol	59-50-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
2.4.6-Trichlorophenol	88-06-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
2.4.5-Trichlorophenol	95-95-4	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Pentachlorophenol	87-86-5	4.0	µg/L	<4.0	<4.0	<4.0	<4.0	<4.0
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Acenaphthylene	208-96-8	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Acenaphthene	83-32-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Fluorene	86-73-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Phenanthrene	85-01-8	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Anthracene	120-12-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Fluoranthene	206-44-0	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0

Analytical Results

Sub-Matrix: **MARINE WATER**			*Client sample ID*	**G-WQ-01**	**G-WQ-04**	**G-WQ-05**	**G-WQ-08**	**G-WQ-10**
			Client sampling date / time	21-MAY-2009 15:00	21-MAY-2009 15:00	21-MAY-2009 15:00	21-MAY-2009 15:00	21-MAY-2009 15:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB0908160-001**	**EB0908160-002**	**EB0908160-003**	**EB0908160-004**	**EB0908160-005**
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Pyrene	129-00-0	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Chrysene	218-01-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(b)fluoranthene	205-99-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
EP080: BTEX								
Benzene	71-43-2	1	µg/L	<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L	<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	<2	<2
EP090: Organotin Compounds (Soluble)								
Tributyltin	56573-85-4	2	ngSn/L	<2	<2	<2	<2	<2
EP130A: Organophosphorus Pesticides (Ultra-trace)								
Bromophos-ethyl	4824-78-6	0.10	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10
Carbophenothion	786-19-6	0.10	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10
Chlorfenvinphos (Z)	470-90-8	0.10	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10
Chlorpyrifos	2921-88-2	0.050	µg/L	<0.050	<0.050	<0.050	<0.050	<0.050
Chlorpyrifos-methyl	5598-13-0	0.10	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10
Demeton-S-methyl	919-86-8	0.10	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10
Diazinon	333-41-5	0.10	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10
Dichlorvos	62-73-7	0.10	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10
Dimethoate	60-51-5	0.10	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10
Ethion	563-12-2	0.10	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10
Fenamiphos	22224-92-6	0.10	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10
Fenthion	55-38-9	0.10	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10
Malathion	121-75-5	0.10	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10
Azinphos Methyl	86-50-0	0.10	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10
Monocrotophos	6923-22-4	0.10	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10

Analytical Results

Sub-Matrix: **MARINE WATER**

			Client sample ID	**G-WQ-01**	**G-WQ-04**	**G-WQ-05**	**G-WQ-08**	**G-WQ-10**
			Client sampling date / time	21-MAY-2009 15:00	21-MAY-2009 15:00	21-MAY-2009 15:00	21-MAY-2009 15:00	21-MAY-2009 15:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB0908160-001**	**EB0908160-002**	**EB0908160-003**	**EB0908160-004**	**EB0908160-005**
EP130A: Organophosphorus Pesticides (Ultra-trace) - Continued								
Parathion	56-38-2	0.10	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10
Parathion-methyl	298-00-0	0.10	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10
Pirimphos-ethyl	23505-41-1	0.10	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10
Prothiofos	34643-46-4	0.10	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10
EP131A: Organochlorine Pesticides								
Aldrin	309-00-2	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010
alpha-BHC	319-84-6	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010
beta-BHC	319-85-7	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010
delta-BHC	319-86-8	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010
4.4`-DDD	72-54-8	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010
4.4`-DDE	72-55-9	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010
4.4`-DDT	50-29-3	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010
^ DDT (total)	----	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010
Dieldrin	60-57-1	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010
alpha-Endosulfan	959-98-8	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010
beta-Endosulfan	33213-65-9	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010
Endosulfan sulfate	1031-07-8	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010
Endosulfan (sum)	115-29-7	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010
Endrin	72-20-8	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010
Endrin aldehyde	7421-93-4	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010
Endrin ketone	53494-70-5	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010
Heptachlor	76-44-8	0.005	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Heptachlor epoxide	1024-57-3	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010
Hexachlorobenzene (HCB)	118-74-1	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010
gamma-BHC	58-89-9	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010
Methoxychlor	72-43-5	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010
cis-Chlordane	5103-71-9	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010
trans-Chlordane	5103-74-2	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010
Total Chlordane (sum)	----	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010
EP202A: Phenoxyacetic Acid Herbicides by LCMS								
4-Chlorophenoxy acetic acid	122-88-3	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
2.4-DB	94-82-6	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Dicamba	1918-00-9	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Mecoprop	93-65-2	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
MCPA	94-74-6	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
2.4-DP	120-36-5	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
2.4-D	94-75-7	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Triclopyr	55335-06-3	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01

Analytical Results

Sub-Matrix: **MARINE WATER**			*Client sample ID*	**G-WQ-01**	**G-WQ-04**	**G-WQ-05**	**G-WQ-08**	**G-WQ-10**
			Client sampling date / time	21-MAY-2009 15:00	21-MAY-2009 15:00	21-MAY-2009 15:00	21-MAY-2009 15:00	21-MAY-2009 15:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB0908160-001**	**EB0908160-002**	**EB0908160-003**	**EB0908160-004**	**EB0908160-005**
EP202A: Phenoxyacetic Acid Herbicides by LCMS - Continued								
2.4.5-TP (Silvex)	93-72-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
2.4.5-T	93-76-5	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
MCPB	94-81-5	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Picloram	1918-02-1	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Clopyralid	1702-17-6	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Fluroxypyr	69377-81-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
2.6-D	575-90-6	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
2.4.6-T	575-89-3	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
EP209: Multiresidue Pesticide Residue Screen (Suite 1)								
Atrazine	1912-24-9	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010
Chlorpyrifos	2921-88-2	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010
Hexazinone	51235-04-2	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010
Molinate	2212-67-1	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010
Propiconazole	60207-90-1	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010
Temephos	3383-96-8	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010
EP215: Multiresidue Pesticide Residue Screen (Suite 2)								
Simazine	122-34-9	0.005	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Diuron	330-54-1	0.005	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Atrazine	1912-24-9	0.005	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Molinate	2212-67-1	0.005	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Metolachlor	51218-45-2	0.005	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Malathion	121-75-5	0.002	µg/L	<0.002	<0.002	<0.002	<0.002	<0.002
Diazinon	333-41-5	0.005	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Thiobencarb	28249-77-6	0.005	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorpyrifos	2921-88-2	0.005	µg/L	**0.012**	**0.008**	**0.012**	**0.016**	**0.020**
Trifluralin	1582-09-8	0.005	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005
EP074S: VOC Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.1	%	**95.3**	**100**	**99.3**	**97.9**	**105**
1.2-Dichloroethane-D4	17060-07-0	0.1	%	**118**	**114**	**109**	**111**	**110**
Toluene-D8	2037-26-5	0.1	%	**96.1**	**100**	**98.4**	**99.6**	**97.3**
Toluene-D8	2037-26-5	0.1	%	**101**	**98.0**	**92.5**	**94.8**	**97.8**
4-Bromofluorobenzene	460-00-4	0.1	%	**98.1**	**103**	**102**	**101**	**99.9**
4-Bromofluorobenzene	460-00-4	0.1	%	**102**	**99.6**	**96.1**	**95.0**	**97.1**
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.1	%	**34.6**	**35.6**	**35.8**	**35.5**	**33.1**
2-Chlorophenol-D4	93951-73-6	0.1	%	**75.0**	**74.2**	**77.9**	**77.7**	**72.8**
2.4.6-Tribromophenol	118-79-6	0.1	%	**76.7**	**78.4**	**80.9**	**79.5**	**74.3**

Analytical Results

Sub-Matrix: **MARINE WATER**			*Client sample ID*	**G-WQ-01**	**G-WQ-04**	**G-WQ-05**	**G-WQ-08**	**G-WQ-10**
			Client sampling date / time	21-MAY-2009 15:00	21-MAY-2009 15:00	21-MAY-2009 15:00	21-MAY-2009 15:00	21-MAY-2009 15:00
Compound	*CAS Number*	*LOR*	*Unit*	**EB0908160-001**	**EB0908160-002**	**EB0908160-003**	**EB0908160-004**	**EB0908160-005**
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.1	%	**80.5**	**83.4**	**83.6**	**83.3**	**78.4**
Anthracene-d10	1719-06-8	0.1	%	**88.8**	**91.1**	**92.6**	**91.7**	**85.6**
4-Terphenyl-d14	1718-51-0	0.1	%	**97.2**	**101**	**102**	**99.2**	**94.6**
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.1	%	**101**	**107**	**107**	**117**	**117**
Toluene-D8	2037-26-5	0.1	%	**97.2**	**99.5**	**97.0**	**95.3**	**96.4**
4-Bromofluorobenzene	460-00-4	0.1	%	**91.1**	**92.6**	**94.4**	**95.6**	**93.7**
EP090S: Organotin Surrogate								
Tripropyltin	----	0.1	%	**88.7**	**93.6**	**90.7**	**91.4**	**70.8**
EP130S: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.1	%	**77.0**	**79.4**	**92.5**	**68.9**	**72.8**
EP131S: OC Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.1	%	**75.5**	**79.2**	**81.8**	**63.3**	**70.7**
EP202S: Phenoxyacetic Acid Herbicide Surrogate								
2.4-Dichlorophenyl Acetic Acid	19719-28-9	0.1	%	**92.2**	**123**	**121**	**119**	**125**

Analytical Results

Sub-Matrix: **MARINE WATER**			*Client sample ID*	**G-WQ-11**	**G-WQ-12**	**QA1** **some labelled QA4**	----	----
			Client sampling date / time	21-MAY-2009 15:00	21-MAY-2009 15:00	21-MAY-2009 15:00	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EB0908160-006**	**EB0908160-007**	**EB0908160-008**	**----**	**----**
EA005: pH								
pH Value	----	0.01	pH Unit	**8.08**	**8.09**	**8.14**	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**49400**	**50500**	**50600**	----	----
EA015: Total Dissolved Solids								
^ Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	**45400**	**43200**	**45300**	----	----
EA025: Suspended Solids								
^ Suspended Solids (SS)	----	1	mg/L	**75**	**94**	**78**	----	----
EK026G: Total Cyanide By Discrete Analyser								
Total Cyanide	57-12-5	0.004	mg/L	<0.004	<0.004	<0.004	----	----
EP008: Chlorophyll a								
Chlorophyll a	----	1	mg/m3	**3**	**5**	**4**	----	----
EP074E: Halogenated Aliphatic Compounds								
1.1.1-Trichloroethane	71-55-6	1	µg/L	<1	<1	<1	----	----
1.1.2-Trichloroethane	79-00-5	5	µg/L	<5	<5	<5	----	----
EP074F: Halogenated Aromatic Compounds								
1.2.4-Trichlorobenzene	120-82-1	0.5	µg/L	<0.5	<0.5	<0.5	----	----
EP075(SIM)A: Phenolic Compounds								
Phenol	108-95-2	1.0	µg/L	<1.0	<1.0	<1.0	----	----
2-Chlorophenol	95-57-8	1.0	µg/L	<1.0	<1.0	<1.0	----	----
2-Methylphenol	95-48-7	1.0	µg/L	<1.0	<1.0	<1.0	----	----
3- & 4-Methylphenol	1319-77-3	2.0	µg/L	<2.0	<2.0	<2.0	----	----
2-Nitrophenol	88-75-5	1.0	µg/L	<1.0	<1.0	<1.0	----	----
2.4-Dimethylphenol	105-67-9	1.0	µg/L	<1.0	<1.0	<1.0	----	----
2.4-Dichlorophenol	120-83-2	1.0	µg/L	<1.0	<1.0	<1.0	----	----
2.6-Dichlorophenol	87-65-0	1.0	µg/L	<1.0	<1.0	<1.0	----	----
4-Chloro-3-Methylphenol	59-50-7	1.0	µg/L	<1.0	<1.0	<1.0	----	----
2.4.6-Trichlorophenol	88-06-2	1.0	µg/L	<1.0	<1.0	<1.0	----	----
2.4.5-Trichlorophenol	95-95-4	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Pentachlorophenol	87-86-5	4.0	µg/L	<4.0	<4.0	<4.0	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Acenaphthylene	208-96-8	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Acenaphthene	83-32-9	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Fluorene	86-73-7	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Phenanthrene	85-01-8	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Anthracene	120-12-7	1.0	µg/L	<1.0	<1.0	<1.0	----	----

Analytical Results

Sub-Matrix: **MARINE WATER**	*Client sample ID*			**G-WQ-11**	**G-WQ-12**	**QA1 some labelled QA4**	----	----
	Client sampling date / time			21-MAY-2009 15:00	21-MAY-2009 15:00	21-MAY-2009 15:00	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EB0908160-006**	**EB0908160-007**	**EB0908160-008**	**----**	**----**
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Fluoranthene	206-44-0	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Pyrene	129-00-0	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Chrysene	218-01-9	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Benzo(b)fluoranthene	205-99-2	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	<0.5	<0.5	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L	<1.0	<1.0	<1.0	----	----
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L	<1.0	<1.0	<1.0	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	----	----
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	----	----
C15 - C28 Fraction	----	100	µg/L	<100	<100	<100	----	----
C29 - C36 Fraction	----	50	µg/L	<50	<50	<50	----	----
EP080: BTEX								
Benzene	71-43-2	1	µg/L	<1	<1	<1	----	----
Toluene	108-88-3	2	µg/L	<2	<2	<2	----	----
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	----	----
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	----	----
EP090: Organotin Compounds (Soluble)								
Tributyltin	56573-85-4	2	ngSn/L	<2	<2	<2	----	----
EP130A: Organophosphorus Pesticides (Ultra-trace)								
Bromophos-ethyl	4824-78-6	0.10	µg/L	<0.10	<0.10	<0.10	----	----
Carbophenothion	786-19-6	0.10	µg/L	<0.10	<0.10	<0.10	----	----
Chlorfenvinphos (Z)	470-90-8	0.10	µg/L	<0.10	<0.10	<0.10	----	----
Chlorpyrifos	2921-88-2	0.050	µg/L	<0.050	<0.050	<0.050	----	----
Chlorpyrifos-methyl	5598-13-0	0.10	µg/L	<0.10	<0.10	<0.10	----	----
Demeton-S-methyl	919-86-8	0.10	µg/L	<0.10	<0.10	<0.10	----	----
Diazinon	333-41-5	0.10	µg/L	<0.10	<0.10	<0.10	----	----
Dichlorvos	62-73-7	0.10	µg/L	<0.10	<0.10	<0.10	----	----
Dimethoate	60-51-5	0.10	µg/L	<0.10	<0.10	<0.10	----	----
Ethion	563-12-2	0.10	µg/L	<0.10	<0.10	<0.10	----	----
Fenamiphos	22224-92-6	0.10	µg/L	<0.10	<0.10	<0.10	----	----
Fenthion	55-38-9	0.10	µg/L	<0.10	<0.10	<0.10	----	----
Malathion	121-75-5	0.10	µg/L	<0.10	<0.10	<0.10	----	----

Analytical Results

Sub-Matrix: **MARINE WATER**	*Client sample ID*			**G-WQ-11**	**G-WQ-12**	**QA1** **some labelled QA4**	----	----
	Client sampling date / time			21-MAY-2009 15:00	21-MAY-2009 15:00	21-MAY-2009 15:00	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EB0908160-006**	**EB0908160-007**	**EB0908160-008**	**----**	**----**
EP130A: Organophosphorus Pesticides (Ultra-trace) - Continued								
Azinphos Methyl	86-50-0	0.10	µg/L	<0.10	<0.10	<0.10	----	----
Monocrotophos	6923-22-4	0.10	µg/L	<0.10	<0.10	<0.10	----	----
Parathion	56-38-2	0.10	µg/L	<0.10	<0.10	<0.10	----	----
Parathion-methyl	298-00-0	0.10	µg/L	<0.10	<0.10	<0.10	----	----
Pirimphos-ethyl	23505-41-1	0.10	µg/L	<0.10	<0.10	<0.10	----	----
Prothiofos	34643-46-4	0.10	µg/L	<0.10	<0.10	<0.10	----	----
EP131A: Organochlorine Pesticides								
Aldrin	309-00-2	0.010	µg/L	<0.010	<0.010	<0.010	----	----
alpha-BHC	319-84-6	0.010	µg/L	<0.010	<0.010	<0.010	----	----
beta-BHC	319-85-7	0.010	µg/L	<0.010	<0.010	<0.010	----	----
delta-BHC	319-86-8	0.010	µg/L	<0.010	<0.010	<0.010	----	----
4.4`-DDD	72-54-8	0.010	µg/L	<0.010	<0.010	<0.010	----	----
4.4`-DDE	72-55-9	0.010	µg/L	<0.010	<0.010	<0.010	----	----
4.4`-DDT	50-29-3	0.010	µg/L	<0.010	<0.010	<0.010	----	----
^ DDT (total)	----	0.010	µg/L	<0.010	<0.010	<0.010	----	----
Dieldrin	60-57-1	0.010	µg/L	<0.010	<0.010	<0.010	----	----
alpha-Endosulfan	959-98-8	0.010	µg/L	<0.010	<0.010	<0.010	----	----
beta-Endosulfan	33213-65-9	0.010	µg/L	<0.010	<0.010	<0.010	----	----
Endosulfan sulfate	1031-07-8	0.010	µg/L	<0.010	<0.010	<0.010	----	----
Endosulfan (sum)	115-29-7	0.010	µg/L	<0.010	<0.010	<0.010	----	----
Endrin	72-20-8	0.010	µg/L	<0.010	<0.010	<0.010	----	----
Endrin aldehyde	7421-93-4	0.010	µg/L	<0.010	<0.010	<0.010	----	----
Endrin ketone	53494-70-5	0.010	µg/L	<0.010	<0.010	<0.010	----	----
Heptachlor	76-44-8	0.005	µg/L	<0.005	<0.005	<0.005	----	----
Heptachlor epoxide	1024-57-3	0.010	µg/L	<0.010	<0.010	<0.010	----	----
Hexachlorobenzene (HCB)	118-74-1	0.010	µg/L	<0.010	<0.010	<0.010	----	----
gamma-BHC	58-89-9	0.010	µg/L	<0.010	<0.010	<0.010	----	----
Methoxychlor	72-43-5	0.010	µg/L	<0.010	<0.010	<0.010	----	----
cis-Chlordane	5103-71-9	0.010	µg/L	<0.010	<0.010	<0.010	----	----
trans-Chlordane	5103-74-2	0.010	µg/L	<0.010	<0.010	<0.010	----	----
Total Chlordane (sum)	----	0.010	µg/L	<0.010	<0.010	<0.010	----	----
EP202A: Phenoxyacetic Acid Herbicides by LCMS								
4-Chlorophenoxy acetic acid	122-88-3	0.01	µg/L	<0.01	<0.01	<0.01	----	----
2.4-DB	94-82-6	0.01	µg/L	<0.01	<0.01	<0.01	----	----
Dicamba	1918-00-9	0.01	µg/L	<0.01	<0.01	<0.01	----	----
Mecoprop	93-65-2	0.01	µg/L	<0.01	<0.01	<0.01	----	----
MCPA	94-74-6	0.01	µg/L	<0.01	<0.01	<0.01	----	----

Analytical Results

Sub-Matrix: **MARINE WATER**

			Client sample ID	**G-WQ-11**	**G-WQ-12**	**QA1** **some labelled QA4**	----	----
			Client sampling date / time	21-MAY-2009 15:00	21-MAY-2009 15:00	21-MAY-2009 15:00	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EB0908160-006**	**EB0908160-007**	**EB0908160-008**	**----**	**----**
EP202A: Phenoxyacetic Acid Herbicides by LCMS - Continued								
2.4-DP	120-36-5	0.01	µg/L	<0.01	<0.01	<0.01	----	----
2.4-D	94-75-7	0.01	µg/L	<0.01	<0.01	<0.01	----	----
Triclopyr	55335-06-3	0.01	µg/L	<0.01	<0.01	<0.01	----	----
2.4.5-TP (Silvex)	93-72-1	0.01	µg/L	<0.01	<0.01	<0.01	----	----
2.4.5-T	93-76-5	0.01	µg/L	<0.01	<0.01	<0.01	----	----
MCPB	94-81-5	0.01	µg/L	<0.01	<0.01	<0.01	----	----
Picloram	1918-02-1	0.05	µg/L	<0.05	<0.05	<0.05	----	----
Clopyralid	1702-17-6	0.05	µg/L	<0.05	<0.05	<0.05	----	----
Fluroxypyr	69377-81-7	0.05	µg/L	<0.05	<0.05	<0.05	----	----
2.6-D	575-90-6	0.1	µg/L	<0.1	<0.1	<0.1	----	----
2.4.6-T	575-89-3	0.1	µg/L	<0.1	<0.1	<0.1	----	----
EP209: Multiresidue Pesticide Residue Screen (Suite 1)								
Atrazine	1912-24-9	0.010	µg/L	<0.010	<0.010	<0.010	----	----
Chlorpyrifos	2921-88-2	0.010	µg/L	<0.010	<0.010	<0.010	----	----
Hexazinone	51235-04-2	0.010	µg/L	<0.010	<0.010	<0.010	----	----
Molinate	2212-67-1	0.010	µg/L	<0.010	<0.010	<0.010	----	----
Propiconazole	60207-90-1	0.010	µg/L	<0.010	<0.010	<0.010	----	----
Temephos	3383-96-8	0.010	µg/L	<0.010	<0.010	<0.010	----	----
EP215: Multiresidue Pesticide Residue Screen (Suite 2)								
Simazine	122-34-9	0.005	µg/L	<0.005	<0.005	<0.005	----	----
Diuron	330-54-1	0.005	µg/L	<0.005	<0.005	<0.005	----	----
Atrazine	1912-24-9	0.005	µg/L	<0.005	<0.005	<0.005	----	----
Molinate	2212-67-1	0.005	µg/L	<0.005	<0.005	<0.005	----	----
Metolachlor	51218-45-2	0.005	µg/L	<0.005	<0.005	<0.005	----	----
Malathion	121-75-5	0.002	µg/L	<0.002	<0.002	<0.002	----	----
Diazinon	333-41-5	0.005	µg/L	<0.005	<0.005	<0.005	----	----
Thiobencarb	28249-77-6	0.005	µg/L	<0.005	<0.005	<0.005	----	----
Chlorpyrifos	2921-88-2	0.005	µg/L	<0.005	<0.005	**0.015**	----	----
Trifluralin	1582-09-8	0.005	µg/L	<0.005	<0.005	<0.005	----	----
EP074S: VOC Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.1	%	**108**	**98.3**	**107**	----	----
1.2-Dichloroethane-D4	17060-07-0	0.1	%	**119**	**105**	**115**	----	----
Toluene-D8	2037-26-5	0.1	%	**97.5**	**97.0**	**97.4**	----	----
Toluene-D8	2037-26-5	0.1	%	**103**	**94.9**	**98.1**	----	----
4-Bromofluorobenzene	460-00-4	0.1	%	**101**	**99.6**	**100**	----	----
4-Bromofluorobenzene	460-00-4	0.1	%	**104**	**93.4**	**99.7**	----	----
EP075(SIM)S: Phenolic Compound Surrogates								

Analytical Results

Sub-Matrix: **MARINE WATER**			Client sample ID	**G-WQ-11**	**G-WQ-12**	**QA1** **some labelled QA4**	----	----
			Client sampling date / time	21-MAY-2009 15:00	21-MAY-2009 15:00	21-MAY-2009 15:00	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EB0908160-006**	**EB0908160-007**	**EB0908160-008**	**----**	**----**
EP075(SIM)S: Phenolic Compound Surrogates - Continued								
Phenol-d6	13127-88-3	0.1	%	**33.3**	**36.8**	**34.9**	----	----
2-Chlorophenol-D4	93951-73-6	0.1	%	**73.3**	**79.2**	**74.8**	----	----
2.4.6-Tribromophenol	118-79-6	0.1	%	**74.0**	**83.3**	**79.3**	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.1	%	**76.8**	**83.7**	**77.2**	----	----
Anthracene-d10	1719-06-8	0.1	%	**89.4**	**92.9**	**88.0**	----	----
4-Terphenyl-d14	1718-51-0	0.1	%	**93.1**	**102**	**96.2**	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.1	%	**99.4**	**98.4**	**101**	----	----
Toluene-D8	2037-26-5	0.1	%	**99.8**	**99.2**	**97.7**	----	----
4-Bromofluorobenzene	460-00-4	0.1	%	**94.3**	**93.6**	**92.6**	----	----
EP090S: Organotin Surrogate								
Tripropyltin	----	0.1	%	**67.0**	**88.1**	**87.9**	----	----
EP130S: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.1	%	**95.1**	**86.9**	**93.6**	----	----
EP131S: OC Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.1	%	**78.3**	**78.3**	**81.6**	----	----
EP202S: Phenoxyacetic Acid Herbicide Surrogate								
2.4-Dichlorophenyl Acetic Acid	19719-28-9	0.1	%	**124**	**123**	**90.7**	----	----

Surrogate Control Limits

Sub-Matrix: **MARINE WATER**

Compound	CAS Number	Recovery Limits (%) Low	Recovery Limits (%) High
EP074S: VOC Surrogates			
1.2-Dichloroethane-D4	17060-07-0	80	120
Toluene-D8	2037-26-5	88	110
4-Bromofluorobenzene	460-00-4	86	115
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	10	94
2-Chlorophenol-D4	93951-73-6	23	134
2.4.6-Tribromophenol	118-79-6	10	123
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	43	116
Anthracene-d10	1719-06-8	27	133
4-Terphenyl-d14	1718-51-0	33	141
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	80	120
Toluene-D8	2037-26-5	88	110
4-Bromofluorobenzene	460-00-4	86	115
EP090S: Organotin Surrogate			
Tripropyltin	----	10	108
EP130S: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	32	136.4
EP131S: OC Pesticide Surrogate			
Dibromo-DDE	21655-73-2	10	136
EP202S: Phenoxyacetic Acid Herbicide Surrogate			
2.4-Dichlorophenyl Acetic Acid	19719-28-9	37.8	142

CERTIFICATE OF ANALYSIS

4 June 2009

ALS QLD
32 Shand St
Stafford
QLD 4053

Attention: Tim Kilmister

Your Reference: EB0908160
Report Number: ME100781

SAMPLE TYPE:	8 water samples
SAMPLES RECEIVED:	26/05/2009
PRELIMINARY REPORT EMAILED:	Not Issued

These samples were analysed in accordance with your written instructions.
A copy of the instructions is attached with the analytical report.

For and on Behalf of:
SGS AUSTRALIA PTY LTD

Client Services:	Alexandra Stenta	Alexandra.Stenta@sgs.com
Site Manager:	Dr Aaron D. Stott	Aaron.Stott@sgs.com

This report has been authorised by the undersigned:

Anthony Pellegrini
LC Team Leader

Tebuthiuron Our Reference: Your Reference Container Type Sample Type Date Sampled	LOR --------- ---------	UNITS ----------- -----------	ME100781-1 G-WQ-01 500mL amber glass bottle Water 21/05/2009	ME100781-2 G-WQ-04 500mL amber glass bottle Water 21/05/2009	ME100781-3 G-WQ-05 500mL amber glass bottle Water 21/05/2009	ME100781-4 G-WQ-08 500mL amber glass bottle Water 21/05/2009	ME100781-5 G-WQ-10 500mL amber glass bottle Water 21/05/2009
Date Extracted			3/06/2009	3/06/2009	3/06/2009	3/06/2009	3/06/2009
Date Analysed			3/06/2009	3/06/2009	3/06/2009	3/06/2009	3/06/2009
Tebuthiuron*	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01

Tebuthiuron Our Reference: Your Reference Container Type Sample Type Date Sampled	LOR --------- ---------	UNITS ----------- -----------	ME100781-6 G-WQ-11 500mL amber glass bottle Water 21/05/2009	ME100781-7 G-WQ-12 500mL amber glass bottle Water 21/05/2009	ME100781-8 QA1 (same are labelled QA4) 500mL amber glass bottle Water 21/05/2009
Date Extracted			3/06/2009	3/06/2009	3/06/2009
Date Analysed			3/06/2009	3/06/2009	3/06/2009
Tebuthiuron*	0.01	mg/L	<0.01	<0.01	<0.01

Method ID	Methodology Summary
SGSMC258	An in-house method for the determination of Organochlorines, Organophosphates and Synthetic Pyrethoids in Water by dual analysis using Gas Chromatography with Mass Spectrometry and Flame Photometric Detection (GC/MS/FPD) and LC/MS/MS.

Result Codes

[INS]	:	Insufficient Sample for this test	[RPD]	:	Relative Percentage Difference
[NR]	:	Not Requested	*	:	Not part of NATA Accreditation
[NT]	:	Not tested	[N/A]	:	Not Applicable

Report Comments

NATA Corporate Accreditation No. 2562, Site No 2076

Note: Test results are not corrected for recovery (excluding Dioxins/Furans* and PAH in XAD and PUF).
This document is issued, on the Client's behalf, by the Company under its General Conditions of Service available on request and accessible at http://www.sgs.com/terms_and_conditions.htm. The Client's attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

Any other holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents.

Quality Control Protocol

Method Blank: An analyte free matrix to which all reagents are added in the same volume or proportions as used in sample processing. The method blank should be carried through the complete sample preparation and analytical procedure. A method blank is prepared every 20 samples.
Duplicate: A separate portion of a sample being analysed that is treated the same as the other samples in the batch. One duplicate is processed at least every 10 samples.
Surrogate Spike: An organic compound which is similar to the target analyte(s) in chemical composition and behavior in the analytical process, but which is not normally found in environmental samples. Surrogates are added to samples before extraction to monitor extraction efficiency and percent recovery in each sample.
Internal Standard: Added to all samples requiring analysis for organics (where relevant) or metals by ICP after the extraction/digestion process; the compounds/elements serve to give a standard of retention time and/or response, which is invariant from run-to-run with the instruments.
Laboratory Control Sample: A known matrix spiked with compound(s) representative of the target analytes. It is used to document laboratory performance. When the results of the matrix spike analysis indicates a potential problem due to the sample matrix itself, the LCS results are used to verify that the laboratory can perform the analysis in a clean matrix.
Matrix Spike: An aliquot of sample spiked with a known concentration of target analyte(s). The spiking occurs prior to sample preparation and analysis. A matrix spike is used to document the bias of a method in a given sample matrix.

Quality Acceptance Criteria

Unless otherwise specified in the test method, the following general acceptance criteria apply:

Method Blanks:	<LOR
Duplicates:	<5 x LOR: No RPD criteria applied.
	>5 x LOR: 0-30% RPD is accepted.
LCS's:	Determined by Control Charts.
	Where control charts have not been developed, the Matrix Spikes criteria apply.
Matrix Spikes:	70-130% recovery is accepted for metals / inorganics.
	60-140% is accepted for organics.
Surrogates:	60-130% recovery is accepted for BTEX.
	70-130% recovery is accepted for other organics.

QUALITY CONTROL REPORT

Work Order	: **EB0908160**	Page	: 1 of 13
Client	: **GHD SERVICES PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR ADRIAN WHITE	Contact	: Tim Kilmister
Address	: P O BOX 373 GLADSTONE QLD, AUSTRALIA 4680	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: adrian.a.white@ghd.com.au	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 07 49731611	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 4972 6236	Facsimile	: +61-7-3243 7218
Project	: 4215386 41 Western Basin EIS WQ Monitoring	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 22-MAY-2009
Sampler	: ----	Issue Date	: 05-JUN-2009
Order number	: ----		
		No. of samples received	: 8
Quote number	: EN/005/09	No. of samples analysed	: 8

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

NATA
WORLD RECOGNISED ACCREDITATION

NATA Accredited Laboratory 825

This document is issued in accordance with NATA accreditation requirements.

Accredited for compliance with ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
		Organics
Alex Rossi	Organic Chemist	Organics
Kim McCabe	Senior Inorganic Chemist	Inorganics
Lana Nguyen	Organic Chemist	Organics
Matthew Goodwin	Senior Organic Chemist	Organics
Sarah Ashworth	Organic Chemist	Organics
Stephen Hislop	Senior Inorganic Chemist	Inorganics

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insuffient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR:- No Limit; Result between 10 and 20 times LOR:- 0% - 50%; Result > 20 times LOR:- 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA005: pH (QC Lot: 987011)									
EB0908140-001	Anonymous	EA005: pH Value	----	0.01	pH Unit	6.86	6.86	0.0	0% - 20%
EB0908160-002	G-WQ-04	EA005: pH Value	----	0.01	pH Unit	8.10	8.10	0.0	0% - 20%
EA010P: Conductivity by PC Titrator (QC Lot: 987537)									
EB0908072-001	Anonymous	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	294	302	2.7	0% - 20%
EB0908160-008	QA1 some labelled QA4	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	50600	50000	1.2	0% - 20%
EA015: Total Dissolved Solids (QC Lot: 988960)									
EB0908000-003	Anonymous	EA015: Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	8980	8820	1.8	0% - 20%
EB0908160-004	G-WQ-08	EA015: Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	45700	46200	1.0	0% - 20%
EA025: Suspended Solids (QC Lot: 991166)									
EB0908099-002	Anonymous	EA025: Suspended Solids (SS)	----	1	mg/L	8	8	0.0	No Limit
EB0908143-005	Anonymous	EA025: Suspended Solids (SS)	----	1	mg/L	59	60	1.7	0% - 20%
EA025: Suspended Solids (QC Lot: 991172)									
EB0908121-001	Anonymous	EA025: Suspended Solids (SS)	----	1	mg/L	13	12	8.0	0% - 50%
EB0908190-002	Anonymous	EA025: Suspended Solids (SS)	----	1	mg/L	176	170	3.5	0% - 20%
EK026G: Total Cyanide By Discrete Analyser (QC Lot: 994867)									
EB0908160-001	G-WQ-01	EK026G: Total Cyanide	57-12-5	0.004	mg/L	<0.004	<0.004	0.0	No Limit
EP008: Chlorophyll a (QC Lot: 986693)									
EB0908160-001	G-WQ-01	EP008: Chlorophyll a	----	1	mg/m3	5	4	40.1	No Limit
EP074E: Halogenated Aliphatic Compounds (QC Lot: 989356)									
EB0908160-001	G-WQ-01	EP074-LL: 1.1.1-Trichloroethane	71-55-6	1	µg/L	<1	<1	0.0	No Limit
EM0904622-005	Anonymous	EP074-LL: 1.1.1-Trichloroethane	71-55-6	1	µg/L	<1	<1	0.0	No Limit
EP074E: Halogenated Aliphatic Compounds (QC Lot: 992081)									
EB0908063-001	Anonymous	EP074: 1.1.2-Trichloroethane	79-00-5	5	µg/L	<5	<5	0.0	No Limit
EB0908160-007	G-WQ-12	EP074: 1.1.2-Trichloroethane	79-00-5	5	µg/L	<5	<5	0.0	No Limit
EP074F: Halogenated Aromatic Compounds (QC Lot: 989356)									
EB0908160-001	G-WQ-01	EP074-LL: 1.2.4-Trichlorobenzene	120-82-1	0.5	µg/L	<0.5	<0.5	0.0	No Limit
EM0904622-005	Anonymous	EP074-LL: 1.2.4-Trichlorobenzene	120-82-1	0.5	µg/L	<0.5	<0.5	0.0	No Limit
EP075(SIM)A: Phenolic Compounds (QC Lot: 987140)									
EB0908139-001	Anonymous	EP075(SIM): Phenol	108-95-2	1.0	µg/L	6.6	8.3	24.1	No Limit
		EP075(SIM): 2-Chlorophenol	95-57-8	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): 2-Methylphenol	95-48-7	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): 2-Nitrophenol	88-75-5	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): 2.4-Dimethylphenol	105-67-9	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): 2.4-Dichlorophenol	120-83-2	1.0	µg/L	<1.0	<1.0	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP075(SIM)A: Phenolic Compounds (QC Lot: 987140) - continued									
EB0908139-001	Anonymous	EP075(SIM): 2.6-Dichlorophenol	87-65-0	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): 4-Chloro-3-Methylphenol	59-50-7	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): 2.4.6-Trichlorophenol	88-06-2	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): 2.4.5-Trichlorophenol	95-95-4	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): 3- & 4-Methylphenol	1319-77-3	2.0	µg/L	<2.0	<2.0	0.0	No Limit
		EP075(SIM): Pentachlorophenol	87-86-5	2.0	µg/L	<2.0	<2.0	0.0	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 987140)									
EB0908139-001	Anonymous	EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Naphthalene	91-20-3	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Acenaphthene	83-32-9	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Fluorene	86-73-7	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Phenanthrene	85-01-8	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Anthracene	120-12-7	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Fluoranthene	206-44-0	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Pyrene	129-00-0	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Chrysene	218-01-9	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Benzo(b)fluoranthene	205-99-2	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	1.0	µg/L	<1.0	<1.0	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 987141)									
EB0908139-001	Anonymous	EP071: C15 - C28 Fraction	----	100	µg/L	100	100	0.0	No Limit
		EP071: C10 - C14 Fraction	----	50	µg/L	70	90	31.7	No Limit
		EP071: C29 - C36 Fraction	----	50	µg/L	<50	<50	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 987565)									
EB0908139-001	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
EB0908160-001	G-WQ-01	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 987671)									
EB0908160-006	G-WQ-11	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
EP080: BTEX (QC Lot: 987565)									
EB0908139-001	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP080: BTEX (QC Lot: 987565) - continued									
EB0908160-001	G-WQ-01	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
EP080: BTEX (QC Lot: 987671)									
EB0908160-006	G-WQ-11	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
EP090: Organotin Compounds (Soluble) (QC Lot: 987660)									
EB0907895-001	Anonymous	EP090S: Tributyltin	56573-85-4	2	ngSn/L	<2	<2	0.0	No Limit
EB0908160-005	G-WQ-10	EP090S: Tributyltin	56573-85-4	2	ngSn/L	<2	<2	0.0	No Limit
EP202A: Phenoxyacetic Acid Herbicides by LCMS (QC Lot: 990327)									
ES0907538-001	Anonymous	EP202-LL: 4-Chlorophenoxy acetic acid	122-88-3	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP202-LL: 2.4-DB	94-82-6	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP202-LL: Dicamba	1918-00-9	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP202-LL: Mecoprop	93-65-2	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP202-LL: MCPA	94-74-6	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP202-LL: 2.4-DP	120-36-5	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP202-LL: 2.4-D	94-75-7	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP202-LL: Triclopyr	55335-06-3	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP202-LL: 2.4.5-TP (Silvex)	93-72-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP202-LL: 2.4.5-T	93-76-5	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP202-LL: MCPB	94-81-5	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP202-LL: Picloram	1918-02-1	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP202-LL: Clopyralid	1702-17-6	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP202-LL: Fluroxypyr	69377-81-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP202-LL: 2.6-D	575-90-6	0.1	µg/L	<0.1	<0.1	0.0	No Limit
		EP202-LL: 2.4.6-T	575-89-3	0.1	µg/L	<0.1	<0.1	0.0	No Limit
ES0907545-002	Anonymous	EP202-LL: 4-Chlorophenoxy acetic acid	122-88-3	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP202-LL: 2.4-DB	94-82-6	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP202-LL: Dicamba	1918-00-9	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP202-LL: Mecoprop	93-65-2	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP202-LL: MCPA	94-74-6	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP202-LL: 2.4-DP	120-36-5	0.01	µg/L	<0.01	<0.01	0.0	No Limit

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP202A: Phenoxyacetic Acid Herbicides by LCMS (QC Lot: 990327) - continued									
ES0907545-002	Anonymous	EP202-LL: 2.4-D	94-75-7	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP202-LL: Triclopyr	55335-06-3	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP202-LL: 2.4.5-TP (Silvex)	93-72-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP202-LL: 2.4.5-T	93-76-5	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP202-LL: MCPB	94-81-5	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP202-LL: Picloram	1918-02-1	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP202-LL: Clopyralid	1702-17-6	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP202-LL: Fluroxypyr	69377-81-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP202-LL: 2.6-D	575-90-6	0.1	µg/L	<0.1	<0.1	0.0	No Limit
		EP202-LL: 2.4.6-T	575-89-3	0.1	µg/L	<0.1	<0.1	0.0	No Limit
EP209: Multiresidue Pesticide Residue Screen (Suite 1) (QC Lot: 990326)									
ES0907538-001	Anonymous	EP209-LL: Atrazine	1912-24-9	0.010	µg/L	<0.010	<0.010	0.0	No Limit
		EP209-LL: Hexazinone	51235-04-2	0.010	µg/L	<0.010	<0.010	0.0	No Limit
		EP209-LL: Molinate	2212-67-1	0.010	µg/L	<0.010	<0.010	0.0	No Limit
		EP209-LL: Propiconazole	60207-90-1	0.010	µg/L	<0.010	<0.010	0.0	No Limit
		EP209-LL: Chlorpyrifos	2921-88-2	0.050	µg/L	<0.050	<0.050	0.0	No Limit
		EP209-LL: Temephos	3383-96-8	0.050	µg/L	<0.050	<0.050	0.0	No Limit
ES0907545-002	Anonymous	EP209-LL: Atrazine	1912-24-9	0.010	µg/L	<0.010	<0.010	0.0	No Limit
		EP209-LL: Hexazinone	51235-04-2	0.010	µg/L	<0.010	<0.010	0.0	No Limit
		EP209-LL: Molinate	2212-67-1	0.010	µg/L	<0.010	<0.010	0.0	No Limit
		EP209-LL: Propiconazole	60207-90-1	0.010	µg/L	<0.010	<0.010	0.0	No Limit
		EP209-LL: Chlorpyrifos	2921-88-2	0.050	µg/L	<0.050	<0.050	0.0	No Limit
		EP209-LL: Temephos	3383-96-8	0.050	µg/L	<0.050	<0.050	0.0	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	*Laboratory Control Spike (LCS) Report*			
					Spike	*Spike Recovery (%)*	*Recovery Limits (%)*	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EA005: pH (QCLot: 987011)								
EA005: pH Value	----	0.01	pH Unit	----	7.00 pH Unit	100	82	118
EA010P: Conductivity by PC Titrator (QCLot: 987537)								
EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	1412 µS/cm	100	90.3	108
EA015: Total Dissolved Solids (QCLot: 988960)								
EA015: Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	<1	2000 mg/L	99.0	86	106
EA025: Suspended Solids (QCLot: 991166)								
EA025: Suspended Solids (SS)	----	1	mg/L	<1	150 mg/L	107	86	108
EA025: Suspended Solids (QCLot: 991172)								
EA025: Suspended Solids (SS)	----	1	mg/L	<1	150 mg/L	107	86	108
EK026G: Total Cyanide By Discrete Analyser (QCLot: 994867)								
EK026G: Total Cyanide	57-12-5	0.004	mg/L	<0.004	0.5 mg/L	96.0	70	130
EP008: Chlorophyll a (QCLot: 986693)								
EP008: Chlorophyll a	----	5	mg/m3	<5	2000 mg/m3	94.8	70.7	119
EP074E: Halogenated Aliphatic Compounds (QCLot: 989356)								
EP074-LL: 1.1.1-Trichloroethane	71-55-6	1	µg/L	<1	1 µg/L	101	68.4	135
EP074E: Halogenated Aliphatic Compounds (QCLot: 992081)								
EP074: 1.1.2-Trichloroethane	79-00-5	5	µg/L	<5	10 µg/L	103	69.2	133
EP074F: Halogenated Aromatic Compounds (QCLot: 989356)								
EP074-LL: 1.2.4-Trichlorobenzene	120-82-1	0.5	µg/L	<0.5	1 µg/L	103	68.3	128
EP075(SIM)A: Phenolic Compounds (QCLot: 987140)								
EP075(SIM): Phenol	108-95-2	1	µg/L	<1.0	5 µg/L	25.6	24	70
EP075(SIM): 2-Chlorophenol	95-57-8	1	µg/L	<1.0	5 µg/L	64.0	57	105
EP075(SIM): 2-Methylphenol	95-48-7	1	µg/L	<1.0	5 µg/L	60.4	51	96
EP075(SIM): 3- & 4-Methylphenol	1319-77-3	2	µg/L	<2.0	10 µg/L	53.2	45	94
EP075(SIM): 2-Nitrophenol	88-75-5	1	µg/L	<1.0	5 µg/L	69.2	48	132
EP075(SIM): 2.4-Dimethylphenol	105-67-9	1	µg/L	<1.0	5 µg/L	60.4	44	112
EP075(SIM): 2.4-Dichlorophenol	120-83-2	1	µg/L	<1.0	5 µg/L	86.0	60	114
EP075(SIM): 2.6-Dichlorophenol	87-65-0	1	µg/L	<1.0	5 µg/L	59.6	59	115
EP075(SIM): 4-Chloro-3-Methylphenol	59-50-7	1	µg/L	<1.0	5 µg/L	66.8	60	117
EP075(SIM): 2.4.6-Trichlorophenol	88-06-2	1	µg/L	<1.0	5 µg/L	67.9	59	123
EP075(SIM): 2.4.5-Trichlorophenol	95-95-4	1	µg/L	<1.0	5 µg/L	63.6	59	123
EP075(SIM): Pentachlorophenol	87-86-5	2	µg/L	<2.0	10 µg/L	# 138	22.1	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 987140)								

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	**CAS Number**	**LOR**	**Unit**	**Result**	**Concentration**	**LCS**	**Low**	**High**
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 987140) - continued								
EP075(SIM): Naphthalene	91-20-3	1	µg/L	<1.0	5 µg/L	68.6	46	111
EP075(SIM): Acenaphthylene	208-96-8	1	µg/L	<1.0	5 µg/L	66.4	51	114
EP075(SIM): Acenaphthene	83-32-9	1	µg/L	<1.0	5 µg/L	69.2	50	114
EP075(SIM): Fluorene	86-73-7	1	µg/L	<1.0	5 µg/L	66.1	55	118
EP075(SIM): Phenanthrene	85-01-8	1	µg/L	<1.0	5 µg/L	82.9	54	110
EP075(SIM): Anthracene	120-12-7	1	µg/L	<1.0	5 µg/L	80.1	49	117
EP075(SIM): Fluoranthene	206-44-0	1	µg/L	<1.0	5 µg/L	79.2	51	117
EP075(SIM): Pyrene	129-00-0	1	µg/L	<1.0	5 µg/L	78.2	51	117
EP075(SIM): Benz(a)anthracene	56-55-3	1	µg/L	<1.0	5 µg/L	81.9	53	120
EP075(SIM): Chrysene	218-01-9	1	µg/L	<1.0	5 µg/L	67.9	48	114
EP075(SIM): Benzo(b)fluoranthene	205-99-2	1	µg/L	<1.0	5 µg/L	78.2	48	130
EP075(SIM): Benzo(k)fluoranthene	207-08-9	1	µg/L	<1.0	5 µg/L	64.8	43	126
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	5 µg/L	62.9	44	120
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	1	µg/L	<1.0	5 µg/L	55.2	45	129
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	1	µg/L	<1.0	5 µg/L	59.8	47	131
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	1	µg/L	<1.0	5 µg/L	60.5	42	126
EP080/071: Total Petroleum Hydrocarbons (QCLot: 987141)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	600 µg/L	88.8	49	110
EP071: C15 - C28 Fraction	----	100	µg/L	<100	1020 µg/L	92.1	58	130
EP071: C29 - C36 Fraction	----	50	µg/L	<50	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons (QCLot: 987565)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	160 µg/L	104	73	135
EP080/071: Total Petroleum Hydrocarbons (QCLot: 987671)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	160 µg/L	96.2	73	135
EP080: BTEX (QCLot: 987565)								
EP080: Benzene	71-43-2	1	µg/L	<1	10 µg/L	104	77.6	122
EP080: Toluene	108-88-3	2	µg/L	<2	10 µg/L	102	74	122
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	10 µg/L	102	73	126
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	20 µg/L	101	70.4	129
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	10 µg/L	101	74.3	126
EP080: BTEX (QCLot: 987671)								
EP080: Benzene	71-43-2	1	µg/L	<1	10 µg/L	101	77.6	122
EP080: Toluene	108-88-3	2	µg/L	<2	10 µg/L	99.2	74	122
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	10 µg/L	99.4	73	126
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	20 µg/L	98.7	70.4	129
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	10 µg/L	101	74.3	126

Sub-Matrix: **WATER**

				Method Blank (MB) Report	*Laboratory Control Spike (LCS) Report*			
					Spike	*Spike Recovery (%)*	*Recovery Limits (%)*	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EP090: Organotin Compounds (Soluble) (QCLot: 987660)								
EP090S: Tributyltin	56573-85-4	2	ngSn/L	----	1470 ngSn/L	43.4	29	100
				<2	----	----	----	----
EP130A: Organophosphorus Pesticides (Ultra-trace) (QCLot: 991052)								
EP130: Bromophos-ethyl	4824-78-6	0.10	µg/L	<0.10	1.0 µg/L	108	35.4	143
EP130: Carbophenothion	786-19-6	0.10	µg/L	<0.10	1.0 µg/L	72.8	5.13	171
EP130: Chlorfenvinphos (Z)	470-90-8	0.10	µg/L	<0.10	1.0 µg/L	99.7	44.6	155
EP130: Chlorpyrifos	2921-88-2	0.05	µg/L	<0.050	1.0 µg/L	90.8	38.5	145
EP130: Chlorpyrifos-methyl	5598-13-0	0.10	µg/L	<0.10	1.0 µg/L	87.8	40.3	135
EP130: Demeton-S-methyl	919-86-8	0.10	µg/L	<0.10	1.0 µg/L	105	20.7	178
EP130: Diazinon	333-41-5	0.10	µg/L	<0.10	1.0 µg/L	88.5	38.7	146
EP130: Dichlorvos	62-73-7	0.10	µg/L	<0.10	1.0 µg/L	87.6	18.4	151
EP130: Dimethoate	60-51-5	0.10	µg/L	<0.10	1.0 µg/L	94.2	27.4	131
EP130: Ethion	563-12-2	0.10	µg/L	<0.10	1.0 µg/L	128	36.1	147
EP130: Fenamiphos	22224-92-6	0.10	µg/L	<0.10	1.0 µg/L	97.2	4.43	168
EP130: Fenthion	55-38-9	0.10	µg/L	<0.10	1.0 µg/L	104	23.2	145
EP130: Malathion	121-75-5	0.10	µg/L	<0.10	1.0 µg/L	114	40.7	136
EP130: Azinphos Methyl	86-50-0	0.10	µg/L	<0.10	1.0 µg/L	128	1.35	163
EP130: Monocrotophos	6923-22-4	0.10	µg/L	<0.10	1.0 µg/L	46.5	10	86.3
EP130: Parathion	56-38-2	0.10	µg/L	<0.10	1.0 µg/L	104	35.5	141
EP130: Parathion-methyl	298-00-0	0.10	µg/L	<0.10	1.0 µg/L	114	31.1	144
EP130: Pirimphos-ethyl	23505-41-1	0.10	µg/L	<0.10	1.0 µg/L	91.5	38.9	142
EP130: Prothiofos	34643-46-4	0.10	µg/L	<0.10	1.0 µg/L	122	40	138
EP131A: Organochlorine Pesticides (QCLot: 991051)								
EP131A: Aldrin	309-00-2	0.001	µg/L	----	0.1 µg/L	63.8	35.8	139
		0.01	µg/L	<0.010	----	----	----	----
EP131A: alpha-BHC	319-84-6	0.001	µg/L	----	0.1 µg/L	47.3	19.7	153
		0.01	µg/L	<0.010	----	----	----	----
EP131A: beta-BHC	319-85-7	0.001	µg/L	----	0.1 µg/L	66.2	43.8	136
		0.01	µg/L	<0.010	----	----	----	----
EP131A: delta-BHC	319-86-8	0.001	µg/L	----	0.1 µg/L	72.1	37.4	144
		0.01	µg/L	<0.010	----	----	----	----
EP131A: 4.4`-DDD	72-54-8	0.001	µg/L	----	0.1 µg/L	87.2	37.5	145
		0.01	µg/L	<0.010	----	----	----	----
EP131A: 4.4`-DDE	72-55-9	0.001	µg/L	----	0.1 µg/L	78.5	30.5	146
		0.01	µg/L	<0.010	----	----	----	----
EP131A: 4.4`-DDT	50-29-3	0.001	µg/L	----	0.1 µg/L	92.4	31	151
		0.01	µg/L	<0.010	----	----	----	----
EP131A: DDT (total)	----	0.01	µg/L	<0.010	----	----	----	----

Sub-Matrix: **WATER**

				Method Blank (MB) Report	*Laboratory Control Spike (LCS) Report*			
					Spike	*Spike Recovery (%)*	*Recovery Limits (%)*	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EP131A: Organochlorine Pesticides (QCLot: 991051) - continued								
EP131A: Dieldrin	60-57-1	0.001	µg/L	----	0.1 µg/L	84.4	34.4	145
		0.01	µg/L	<0.010	----	----	----	----
EP131A: alpha-Endosulfan	959-98-8	0.001	µg/L	----	0.1 µg/L	73.2	30.2	141
		0.01	µg/L	<0.010	----	----	----	----
EP131A: beta-Endosulfan	33213-65-9	0.001	µg/L	----	0.1 µg/L	89.6	30.3	148
		0.01	µg/L	<0.010	----	----	----	----
EP131A: Endosulfan sulfate	1031-07-8	0.001	µg/L	----	0.1 µg/L	88.6	19.1	150
		0.01	µg/L	<0.010	----	----	----	----
EP131A: Endosulfan (sum)	115-29-7	0.01	µg/L	<0.010	----	----	----	----
EP131A: Endrin	72-20-8	0.001	µg/L	----	0.1 µg/L	111	13	165
		0.01	µg/L	<0.010	----	----	----	----
EP131A: Endrin aldehyde	7421-93-4	0.001	µg/L	----	0.1 µg/L	53.2	28.3	134
		0.01	µg/L	<0.010	----	----	----	----
EP131A: Endrin ketone	53494-70-5	0.001	µg/L	----	0.1 µg/L	84.3	15.1	146
		0.01	µg/L	<0.010	----	----	----	----
EP131A: Heptachlor	76-44-8	0.001	µg/L	----	0.1 µg/L	72.1	33.2	148
		0.005	µg/L	<0.005	----	----	----	----
EP131A: Heptachlor epoxide	1024-57-3	0.001	µg/L	----	0.1 µg/L	72.2	36	143
		0.01	µg/L	<0.010	----	----	----	----
EP131A: Hexachlorobenzene (HCB)	118-74-1	0.001	µg/L	----	0.1 µg/L	44.0	14	146
		0.01	µg/L	<0.010	----	----	----	----
EP131A: gamma-BHC	58-89-9	0.001	µg/L	----	0.1 µg/L	53.6	27.2	147
		0.01	µg/L	<0.010	----	----	----	----
EP131A: Methoxychlor	72-43-5	0.001	µg/L	----	0.1 µg/L	105	34.4	150
		0.01	µg/L	<0.010	----	----	----	----
EP131A: cis-Chlordane	5103-71-9	0.001	µg/L	----	0.1 µg/L	77.5	15.4	152
		0.01	µg/L	<0.010	----	----	----	----
EP131A: trans-Chlordane	5103-74-2	0.001	µg/L	----	0.1 µg/L	60.4	45.1	140
		0.01	µg/L	<0.010	----	----	----	----
EP131A: Total Chlordane (sum)	----	0.01	µg/L	<0.010	----	----	----	----
EP202A: Phenoxyacetic Acid Herbicides by LCMS (QCLot: 990327)								
EP202-LL: 4-Chlorophenoxy acetic acid	122-88-3	0.01	µg/L	<0.01	0.1 µg/L	92.6	20.1	106
EP202-LL: 2.4-DB	94-82-6	0.01	µg/L	<0.01	0.1 µg/L	123	24	142
EP202-LL: Dicamba	1918-00-9	0.01	µg/L	<0.01	0.1 µg/L	81.5	21	139
EP202-LL: Mecoprop	93-65-2	0.01	µg/L	<0.01	0.1 µg/L	128	42.6	147
EP202-LL: MCPA	94-74-6	0.01	µg/L	<0.01	0.1 µg/L	122	33.9	144
EP202-LL: 2.4-DP	120-36-5	0.01	µg/L	<0.01	0.1 µg/L	125	39.2	144
EP202-LL: 2.4-D	94-75-7	0.01	µg/L	<0.01	0.1 µg/L	102	39.3	149
EP202-LL: Triclopyr	55335-06-3	0.01	µg/L	<0.01	0.1 µg/L	118	34.5	145
EP202-LL: 2.4.5-TP (Silvex)	93-72-1	0.01	µg/L	<0.01	0.1 µg/L	125	34.3	144

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP202A: Phenoxyacetic Acid Herbicides by LCMS (QCLot: 990327) - continued								
EP202-LL: 2.4.5-T	93-76-5	0.01	µg/L	<0.01	0.1 µg/L	125	26.3	146
EP202-LL: MCPB	94-81-5	0.01	µg/L	<0.01	0.1 µg/L	120	24.3	141
EP202-LL: Picloram	1918-02-1	0.05	µg/L	<0.05	0.1 µg/L	62.1	21.3	142
EP202-LL: Clopyralid	1702-17-6	0.05	µg/L	<0.05	0.1 µg/L	67.2	7.18	150
EP202-LL: Fluroxypyr	69377-81-7	0.05	µg/L	<0.05	0.1 µg/L	108	25.1	136
EP202-LL: 2.6-D	575-90-6	0.1	µg/L	<0.1	0.1 µg/L	118	37.3	140
EP202-LL: 2.4.6-T	575-89-3	0.1	µg/L	<0.1	0.1 µg/L	123	39	134
EP209: Multiresidue Pesticide Residue Screen (Suite 1) (QCLot: 990326)								
EP209-LL: Atrazine	1912-24-9	0.01	µg/L	<0.010	0.05 µg/L	79.0	68.1	142
EP209-LL: Chlorpyrifos	2921-88-2	0.01	µg/L	<0.010	0.05 µg/L	96.3	58	134
EP209-LL: Hexazinone	51235-04-2	0.01	µg/L	<0.010	0.05 µg/L	94.9	75.5	142
EP209-LL: Molinate	2212-67-1	0.01	µg/L	<0.010	0.05 µg/L	70.4	54	138
EP209-LL: Propiconazole	60207-90-1	0.01	µg/L	<0.010	0.05 µg/L	80.2	64	130
EP209-LL: Temephos	3383-96-8	0.01	µg/L	<0.010	0.05 µg/L	70.5	59	129
EP215: Multiresidue Pesticide Residue Screen (Suite 2) (QCLot: 990329)								
EP215-LL: Simazine	122-34-9	0.005	µg/L	<0.005	0.025 µg/L	100	65	130
EP215-LL: Diuron	330-54-1	0.005	µg/L	<0.005	0.025 µg/L	104	65	130
EP215-LL: Atrazine	1912-24-9	0.005	µg/L	<0.005	0.025 µg/L	93.8	65	130
EP215-LL: Molinate	2212-67-1	0.005	µg/L	<0.005	0.025 µg/L	66.4	65	130
EP215-LL: Metolachlor	51218-45-2	0.005	µg/L	<0.005	0.025 µg/L	79.5	65	130
EP215-LL: Malathion	121-75-5	0.002	µg/L	<0.002	0.025 µg/L	93.0	65	130
EP215-LL: Diazinon	333-41-5	0.005	µg/L	<0.005	0.025 µg/L	78.0	65	130
EP215-LL: Thiobencarb	28249-77-6	0.005	µg/L	<0.005	0.025 µg/L	80.0	65	130
EP215-LL: Chlorpyrifos	2921-88-2	0.005	µg/L	<0.005	0.025 µg/L	94.2	65	130
EP215-LL: Trifluralin	1582-09-8	0.005	µg/L	<0.005	0.025 µg/L	79.0	65	130

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	Spike Recovery (%)	Recovery Limits (%)	
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EK026G: Total Cyanide By Discrete Analyser (QCLot: 994867)							
EB0908160-002	G-WQ-04	EK026G: Total Cyanide	57-12-5	0.2 mg/L	104	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 987141)							
EB0908139-002	Anonymous	EP071: C10 - C14 Fraction	----	600 µg/L	101	70	130
		EP071: C15 - C28 Fraction	----	1020 µg/L	127	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 987565)							
EB0908139-002	Anonymous	EP080: C6 - C9 Fraction	----	140 µg/L	82.0	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 987671)							
EB0908160-007	G-WQ-12	EP080: C6 - C9 Fraction	----	140 µg/L	70.8	70	130
EP080: BTEX (QCLot: 987565)							
EB0908139-002	Anonymous	EP080: Benzene	71-43-2	10 µg/L	98.7	70	130
		EP080: Toluene	108-88-3	10 µg/L	93.9	70	130
EP080: BTEX (QCLot: 987671)							
EB0908160-007	G-WQ-12	EP080: Benzene	71-43-2	10 µg/L	91.3	70	130
		EP080: Toluene	108-88-3	10 µg/L	85.0	70	130
EP090: Organotin Compounds (Soluble) (QCLot: 987660)							
EB0907895-002	Anonymous	EP090S: Tributyltin	56573-85-4	1470 ngSn/L	61.0	20	130
EP202A: Phenoxyacetic Acid Herbicides by LCMS (QCLot: 990327)							
ES0907545-001	Anonymous	EP202-LL: 4-Chlorophenoxy acetic acid	122-88-3	0.1 µg/L	89.3	33.8	106
		EP202-LL: 2.4-DB	94-82-6	0.1 µg/L	85.8	22.5	142
		EP202-LL: Dicamba	1918-00-9	0.1 µg/L	96.8	20.3	138
		EP202-LL: Mecoprop	93-65-2	0.1 µg/L	115	44.6	137
		EP202-LL: MCPA	94-74-6	0.1 µg/L	121	36.4	142
		EP202-LL: 2.4-DP	120-36-5	0.1 µg/L	124	39.0	146
		EP202-LL: 2.4-D	94-75-7	0.1 µg/L	122	41.8	138
		EP202-LL: Triclopyr	55335-06-3	0.1 µg/L	127	41.4	139
		EP202-LL: 2.4.5-TP (Silvex)	93-72-1	0.1 µg/L	123	37.0	126
		EP202-LL: 2.4.5-T	93-76-5	0.1 µg/L	118	31.1	135
		EP202-LL: MCPB	94-81-5	0.1 µg/L	89.9	22.8	136
		EP202-LL: Picloram	1918-02-1	0.1 µg/L	71.9	20.6	124
		EP202-LL: Clopyralid	1702-17-6	0.1 µg/L	80.3	15.3	118
		EP202-LL: Fluroxypyr	69377-81-7	0.1 µg/L	89.7	37.3	115
		EP202-LL: 2.6-D	575-90-6	0.1 µg/L	102	34.4	146
		EP202-LL: 2.4.6-T	575-89-3	0.1 µg/L	# 124	43.2	123

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	Spike Recovery (%)	Recovery Limits (%)	
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EP209: Multiresidue Pesticide Residue Screen (Suite 1) (QCLot: 990326)							
ES0907545-001	Anonymous	EP209-LL: Atrazine	1912-24-9	0.05 µg/L	80.5	70	130
		EP209-LL: Chlorpyrifos	2921-88-2	0.05 µg/L	91.9	70	130
		EP209-LL: Hexazinone	51235-04-2	0.05 µg/L	94.9	70	130
		EP209-LL: Molinate	2212-67-1	0.05 µg/L	85.0	70	130
		EP209-LL: Propiconazole	60207-90-1	0.05 µg/L	80.9	70	130
		EP209-LL: Temephos	3383-96-8	0.05 µg/L	94.8	70	130

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: **EB0908160**	Page	: 1 of 11
Client	: GHD SERVICES PTY LTD	Laboratory	: Environmental Division Brisbane
Contact	: MR ADRIAN WHITE	Contact	: Tim Kilmister
Address	: P O BOX 373 GLADSTONE QLD, AUSTRALIA 4680	Address	: 32 Shand Street Stafford QLD Australia 4053
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Facsimile	: +61 07 4972 6236	Facsimile	: +61-7-3243 7218
Project	: 4215386 41 Western Basin EIS WQ Monitoring	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 22-MAY-2009
Sampler	: ----	Issue Date	: 05-JUN-2009
Order number	: ----		
		No. of samples received	: 8
Quote number	: EN/005/09	No. of samples analysed	: 8

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Interpretive Quality Control Report contains the following information:

- Analysis Holding Time Compliance
- Quality Control Parameter Frequency Compliance
- Brief Method Summaries
- Summary of Outliers

Analysis Holding Time Compliance

The following report summarises extraction / preparation and analysis times and compares with recommended holding times. Dates reported represent first date of extraction or analysis and precludes subsequent dilutions and reruns. Information is also provided re the sample container (preservative) from which the analysis aliquot was taken. Elapsed period to analysis represents number of days from sampling where no extraction / digestion is involved or period from extraction / digestion where this is present. For composite samples, sampling date is assumed to be that of the oldest sample contributing to the composite. Sample date for laboratory produced leachates is assumed as the completion date of the leaching process. Outliers for holding time are based on USEPA SW 846, APHA, AS and NEPM (1999). A listing of breaches is provided in the Summary of Outliers.

Holding times for leachate methods (excluding elutriates) vary according to the analytes being determined on the resulting solution. For non -volatile analytes, the holding time compliance assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These soil holding times are: Organics (14 days); Mercury (28 days) & other metals (180 days). A recorded breach therefore does not guarantee a breach for all non-volatile parameters.

Matrix: **WATER**

Evaluation: ✗ = Holding time breach ; ✓ = Within holding time.

Method	*Sample Date*	*Extraction / Preparation*			*Analysis*		
Container / Client Sample ID(s)		*Date extracted*	*Due for extraction*	*Evaluation*	*Date analysed*	*Due for analysis*	*Evaluation*
EA005: pH							
Clear Plastic Bottle - Natural G-WQ-01, G-WQ-04, G-WQ-05, G-WQ-08, G-WQ-10, G-WQ-11, G-WQ-12, QA1 - some labelled QA4	**21-MAY-2009**	**----**	----	----	**22-MAY-2009**	21-MAY-2009	✗
EA010P: Conductivity by PC Titrator							
Clear Plastic Bottle - Natural G-WQ-01, G-WQ-04, G-WQ-05, G-WQ-08, G-WQ-10, G-WQ-11, G-WQ-12, QA1 - some labelled QA4	**21-MAY-2009**	**---**	---	----	**25-MAY-2009**	18-JUN-2009	✓
EA015: Total Dissolved Solids							
Clear Plastic Bottle - Natural G-WQ-01, G-WQ-04, G-WQ-05, G-WQ-08, G-WQ-10, G-WQ-11, G-WQ-12, QA1 - some labelled QA4	**21-MAY-2009**	**----**	----	----	**26-MAY-2009**	28-MAY-2009	✓
EA025: Suspended Solids							
Clear Plastic Bottle - Natural G-WQ-01, G-WQ-04, G-WQ-05, G-WQ-08, G-WQ-10, G-WQ-11, G-WQ-12, QA1 - some labelled QA4	**21-MAY-2009**	**----**	----	----	**27-MAY-2009**	28-MAY-2009	✓
EK026G: Total Cyanide By Discrete Analyser							
White Plastic Bottle - NaOH/Cadmium Nitrate G-WQ-01, G-WQ-04, G-WQ-05, G-WQ-08, G-WQ-10, G-WQ-11, G-WQ-12, QA1 - some labelled QA4	**21-MAY-2009**	**01-JUN-2009**	04-JUN-2009	✓	**01-JUN-2009**	04-JUN-2009	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method ***Container** / Client Sample ID(s)*	***Sample Date***	*Extraction / Preparation*			*Analysis*		
		Date extracted	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*
EP008: Chlorophyll a							
White Plastic Bottle - Unpreserved G-WQ-01, G-WQ-04, G-WQ-05, G-WQ-08, G-WQ-10, G-WQ-11, G-WQ-12, QA1 - some labelled QA4	**21-MAY-2009**	**----**	----	----	**22-MAY-2009**	23-MAY-2009	✓
EP074E: Halogenated Aliphatic Compounds							
Amber VOC Vial - HCl or NaHSO4 G-WQ-01, G-WQ-04, G-WQ-05, G-WQ-08, G-WQ-10, G-WQ-11, G-WQ-12, QA1 - some labelled QA4	**21-MAY-2009**	**---**	---	----	**28-MAY-2009**	04-JUN-2009	✓
Amber VOC Vial - HCl or NaHSO4 G-WQ-01, G-WQ-04, G-WQ-05, G-WQ-08, G-WQ-10, G-WQ-11, G-WQ-12, QA1 - some labelled QA4	**21-MAY-2009**	**----**	----	----	**26-MAY-2009**	04-JUN-2009	✓
EP074F: Halogenated Aromatic Compounds							
Amber VOC Vial - HCl or NaHSO4 G-WQ-01, G-WQ-04, G-WQ-05, G-WQ-08, G-WQ-10, G-WQ-11, G-WQ-12, QA1 - some labelled QA4	**21-MAY-2009**	**----**	----	----	**26-MAY-2009**	04-JUN-2009	✓
EP075(SIM)A: Phenolic Compounds							
Amber Glass Bottle - Unpreserved G-WQ-01, G-WQ-04, G-WQ-05, G-WQ-08, G-WQ-10, G-WQ-11, G-WQ-12, QA1 - some labelled QA4	**21-MAY-2009**	**25-MAY-2009**	28-MAY-2009	✓	**26-MAY-2009**	04-JUL-2009	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Amber Glass Bottle - Unpreserved G-WQ-01, G-WQ-04, G-WQ-05, G-WQ-08, G-WQ-10, G-WQ-11, G-WQ-12, QA1 - some labelled QA4	**21-MAY-2009**	**25-MAY-2009**	28-MAY-2009	✓	**26-MAY-2009**	04-JUL-2009	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method ***Container** / Client Sample ID(s)*	***Sample Date***	*Extraction / Preparation* ***Date extracted***	 *Due for extraction*	 *Evaluation*	*Analysis* ***Date analysed***	 *Due for analysis*	 *Evaluation*
EP080/071: Total Petroleum Hydrocarbons							
Amber Glass Bottle - Unpreserved G-WQ-01, G-WQ-04, G-WQ-05, G-WQ-08, G-WQ-10, G-WQ-11, G-WQ-12, QA1 - some labelled QA4	**21-MAY-2009**	**25-MAY-2009**	28-MAY-2009	✓	**26-MAY-2009**	04-JUL-2009	✓
Amber VOC Vial - HCl or NaHSO4 G-WQ-01, G-WQ-04, G-WQ-05, G-WQ-08, G-WQ-10, G-WQ-11, G-WQ-12, QA1 - some labelled QA4	**21-MAY-2009**	**---**	---	----	**25-MAY-2009**	04-JUN-2009	✓
EP080: BTEX							
Amber VOC Vial - HCl or NaHSO4 G-WQ-01, G-WQ-04, G-WQ-05, G-WQ-08, G-WQ-10, G-WQ-11, G-WQ-12, QA1 - some labelled QA4	**21-MAY-2009**	**---**	---	----	**25-MAY-2009**	04-JUN-2009	✓
EP090: Organotin Compounds (Soluble)							
Amber Glass Bottle - Unpreserved G-WQ-01, G-WQ-04, G-WQ-05, G-WQ-08, G-WQ-10, G-WQ-11, G-WQ-12, QA1 - some labelled QA4	**21-MAY-2009**	**25-MAY-2009**	28-MAY-2009	✓	**26-MAY-2009**	04-JUL-2009	✓
EP130A: Organophosphorus Pesticides (Ultra-trace)							
Amber Glass Bottle - Unpreserved G-WQ-01, G-WQ-04, G-WQ-05, G-WQ-08, G-WQ-10, G-WQ-11, G-WQ-12, QA1 - some labelled QA4	**21-MAY-2009**	**27-MAY-2009**	28-MAY-2009	✓	**29-MAY-2009**	06-JUL-2009	✓
EP131A: Organochlorine Pesticides							
Amber Glass Bottle - Unpreserved G-WQ-01, G-WQ-04, G-WQ-05, G-WQ-08, G-WQ-10, G-WQ-11, G-WQ-12, QA1 - some labelled QA4	**21-MAY-2009**	**27-MAY-2009**	28-MAY-2009	✓	**29-MAY-2009**	06-JUL-2009	✓
EP202A: Phenoxyacetic Acid Herbicides by LCMS							
Amber Glass Bottle - Unpreserved G-WQ-01, G-WQ-04, G-WQ-05, G-WQ-08, G-WQ-10, G-WQ-11, G-WQ-12, QA1 - some labelled QA4	**21-MAY-2009**	**----**	----	----	**28-MAY-2009**	28-MAY-2009	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method *Container / Client Sample ID(s)*		*Sample Date*	*Extraction / Preparation*			*Analysis*		
			Date extracted	*Due for extraction*	*Evaluation*	*Date analysed*	*Due for analysis*	*Evaluation*
EP209: Multiresidue Pesticide Residue Screen (Suite 1)								
Amber Glass Bottle - Unpreserved								
G-WQ-01,	G-WQ-04,	**21-MAY-2009**	**----**	----	----	**28-MAY-2009**	28-MAY-2009	✓
G-WQ-05,	G-WQ-08,							
G-WQ-10,	G-WQ-11,							
G-WQ-12,	QA1 - some labelled QA4							
EP215: Multiresidue Pesticide Residue Screen (Suite 2)								
Amber Glass Bottle - Unpreserved								
G-WQ-01,	G-WQ-04,	**21-MAY-2009**	**27-MAY-2009**	28-MAY-2009	✓	**02-JUN-2009**	12-JUL-2009	✓
G-WQ-05,	G-WQ-08,							
G-WQ-10,	G-WQ-11,							
G-WQ-12,	QA1 - some labelled QA4							

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(where) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: ✗ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		*Count*		*Rate (%)*			*Quality Control Specification*
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Chlorophyll a	EP008	1	8	**12.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Conductivity by PC Titrator	EA010-P	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Multiresidue Pesticide Screen (N0. 1) - Low Level	EP209-LL	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Organotin Compounds (Soluble)	EP090S	2	14	**14.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	14	**7.1**	**10.0**	✗	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
pH	EA005	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Phenoxyacetic Acid Herbicides (LCMS - Low DL)	EP202-LL	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Suspended Solids	EA025	4	40	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Cyanide By Discrete Analyser	EK026G	1	10	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids	EA015	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071	1	16	**6.3**	**10.0**	✗	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	3	29	**10.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Ultra-trace Volatile Organic Compounds	EP074-LL	2	17	**11.8**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Volatile Organic Compounds	EP074	2	12	**16.7**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
Chlorophyll a	EP008	1	8	**12.5**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Conductivity by PC Titrator	EA010-P	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Multiresidue Pesticide Screen (N0. 1) - Low Level	EP209-LL	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Multiresidue Pesticide Screen (No. 2)	EP215-LL	1	11	**9.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Organochlorine Pesticides (Ultra-trace)	EP131A	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Organophosphorus Pesticides (Ultra-trace)	EP130	1	10	**10.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Organotin Compounds (Soluble)	EP090S	1	14	**7.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	14	**7.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
pH	EA005	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Phenoxyacetic Acid Herbicides (LCMS - Low DL)	EP202-LL	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Suspended Solids	EA025	2	40	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Cyanide By Discrete Analyser	EK026G	1	10	**10.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids	EA015	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071	1	16	**6.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	2	29	**6.9**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Ultra-trace Volatile Organic Compounds	EP074-LL	1	17	**5.9**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Volatile Organic Compounds	EP074	1	12	**8.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
Chlorophyll a	EP008	1	8	**12.5**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Conductivity by PC Titrator	EA010-P	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Matrix: **WATER**

Evaluation: ✗ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Method Blanks (MB) - Continued							
Multiresidue Pesticide Screen (N0. 1) - Low Level	EP209-LL	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Multiresidue Pesticide Screen (No. 2)	EP215-LL	1	11	**9.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Organochlorine Pesticides (Ultra-trace)	EP131A	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Organophosphorus Pesticides (Ultra-trace)	EP130	1	10	**10.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Organotin Compounds (Soluble)	EP090S	1	14	**7.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	14	**7.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Phenoxyacetic Acid Herbicides (LCMS - Low DL)	EP202-LL	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Suspended Solids	EA025	2	40	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Cyanide By Discrete Analyser	EK026G	1	10	**10.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids	EA015	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071	1	16	**6.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	2	29	**6.9**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Ultra-trace Volatile Organic Compounds	EP074-LL	1	17	**5.9**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Volatile Organic Compounds	EP074	1	12	**8.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							
Multiresidue Pesticide Screen (N0. 1) - Low Level	EP209-LL	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement
Organotin Compounds (Soluble)	EP090S	1	14	**7.1**	**5.0**	✓	ALS QCS3 requirement
Phenoxyacetic Acid Herbicides (LCMS - Low DL)	EP202-LL	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement
Total Cyanide By Discrete Analyser	EK026G	1	10	**10.0**	**5.0**	✓	ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071	1	16	**6.3**	**5.0**	✓	ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	2	29	**6.9**	**5.0**	✓	ALS QCS3 requirement
Ultra-trace Volatile Organic Compounds	EP074-LL	1	17	**5.9**	**5.0**	✓	ALS QCS3 requirement
Volatile Organic Compounds	EP074	1	12	**8.3**	**5.0**	✓	ALS QCS3 requirement

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
pH	EA005	WATER	APHA 21st ed. 4500 H+ B. pH of water samples is determined by ISE either manually or by automated pH meter. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Conductivity by PC Titrator	EA010-P	WATER	APHA 21st ed., 2510 B This procedure determines conductivity by automated ISE. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Dissolved Solids	EA015	WATER	APHA 21st ed., 2540C A gravimetric procedure that determines the amount of `filterable` residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+5C. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Suspended Solids	EA025	WATER	APHA 21st ed., 2540D A gravimetric procedure employed to determine the amount of `non-filterable` residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Cyanide By Discrete Analyser	EK026G	WATER	APHA 21st ed., 4500-CN-C & N Total Cyanide is determined from aqueous solutions after distillation with sulphuric acid. The resultant distillate is then captured in a caustic absorber solution followed by Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Chlorophyll a	EP008	WATER	In-house (APHA 21st ed., 10200 H mod.) The pigments are extracted into aqueous acetone. The optical density of the extract before and after acidification at both 664 nm and 665 nm is determined spectrometrically.
TPH - Semivolatile Fraction	EP071	WATER	USEPA SW 846 - 8015A The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Volatile Organic Compounds	EP074	WATER	USEPA SW 846 - 8260B Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Ultra-trace Volatile Organic Compounds	EP074-LL	WATER	(USEPA SW 846 - 8260B, ALS QWI-ORG/EP074) Water samples are directly purged (ALSQWI-ORG/16) prior to analysis by Capillary GC/MS in Selected Ion Monitoring mode. Quantitation is achieved using internal standardisation against a multi-point calibration curve.
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	WATER	USEPA SW 846 - 8270D Sample extracts are analysed by Capillary GC/MS in SIM Mode and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
TPH Volatiles/BTEX	EP080	WATER	USEPA SW 846 - 8260B Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Organotin Compounds (Soluble)	EP090S	WATER	USEPA SW 846 - 8270D Sample extracts are analysed by GC/MS coupled with high volume injection and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Organophosphorus Pesticides (Ultra-trace)	EP130	WATER	USEPA Method 3640 (GPC cleanup), 8141 (GC/FPD - Capillary Column) This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
Organochlorine Pesticides (Ultra-trace)	EP131A	WATER	USEPA Method 3640 (GPC cleanup),3620 (Florisil), 8081/8082 (GC/uECD/uECD). This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Phenoxyacetic Acid Herbicides (LCMS - Low DL)	EP202-LL	WATER	In-House, LCMS (Electrospray). Residues of acid herbicides in water samples are extracted with dichloromethane under acidic conditions. The organic phase is evaporated to dryness and made up the HPLC mobile phase for MS determination.
Multiresidue Pesticide Screen (N0. 1) - Low Level	EP209-LL	WATER	In-house, LCMS (APCI in positive mode). The compounds are extracted from water samples using dichloromethane. The organic phase is evaporated to dryness and reconstituted in a mixture of methanol and water for reverse phase HPLC analysis.
Multiresidue Pesticide Screen (No. 2)	EP215-LL	WATER	In-house, LCMS (APCI in positive mode). The compounds are extracted from water samples using dichloromethane. The organic phase is evaporated to dryness and reconstituted in a mixture of acetonitrile and water for reverse phase HPLC analysis.

Preparation Methods	*Method*	*Matrix*	*Method Descriptions*
Total Cyanide	EK026-PR	WATER	APHA 21st ed., 4500 CN- C&N. The sample is distilled with H2SO4 releasing all bound cyanides as HCN. The CN is trapped in a caustic solution, and quanitified by colourimetry on FIA. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Separatory funnel extraction for LCMS herbicides.	* EP215-PR	WATER	In-house. A 1 L sample is extracted three times with 60 mL of methylene chloride, reduced to dryness and made up in HPLC mobile phase.
Separatory Funnel Extraction of Liquids	ORG14	WATER	USEPA SW 846 - 3510B 500 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using 60mL DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2). ALS default excludes sediment which may be resident in the container.
Sep. Funnel Extraction of Liquids (Ultra-trace pesticides.)	ORG14-UTP	WATER	USEPA 3510 Samples are extracted into dichloromethane, concentrated and exchanged into an apporpriate solvent for GPC and florisil cleanup as required. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2). ALS default excludes sediment which may be resident in the container.
Organotin Sample Preparation	ORG34	WATER	In-house. A specified volume of sample is spiked with surrogate, acidified and vacuum filtered. Reagents and solvent are added and the mixture tumbled. The butyltin compounds is derivitisated, extracted and the subtitution reaction completed. The extract is transferred to a separatory funnel and further extracted two times with petroleum ether. The resultant extracts are combined and concentrated for analysis.

Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged in the Quality Control (QC) Report. Surrogate recovery limits are static and based on USEPA SW846 or ALS-QWI/EN/38 (in the absence of specific USEPA limits). This report displays QC Outliers (breaches) only.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	**Analyte**	CAS Number	Data	Limits	**Comment**
Laboratory Control Spike (LCS) Recoveries							
EP075(SIM)A: Phenolic Compounds	1131007-002	----	**Pentachlorophenol**	87-86-5	138 %	22.1-130%	**Recovery greater than upper control limit**
Matrix Spike (MS) Recoveries							
EP202A: Phenoxyacetic Acid Herbicides by LCMS	ES0907545-001	Anonymous	**2.4.6-T**	575-89-3	124 %	43.2-123%	**Recovery greater than upper control limit**

- **For all matrices, no Method Blank value outliers occur.**
- **For all matrices, no Duplicate outliers occur.**

Regular Sample Surrogates

- **For all regular sample matrices, no surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

This report displays Holding Time breaches only. Only the respective Extraction / Preparation and/or Analysis component is/are displayed.

Matrix: **WATER**

Method	*Extraction / Preparation*			*Analysis*		
Container / Client Sample ID(s)	*Date extracted*	*Due for extraction*	***Days overdue***	*Date analysed*	*Due for analysis*	***Days overdue***
EA005: pH						
Clear Plastic Bottle - Natural G-WQ-01, G-WQ-04, G-WQ-05, G-WQ-08, G-WQ-10, G-WQ-11, G-WQ-12, QA1 - some labelled QA4	----	----	----	22-MAY-2009	21-MAY-2009	**1**

Outliers : Frequency of Quality Control Samples

The following report highlights breaches in the Frequency of Quality Control Samples.

Matrix: **WATER**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
PAH/Phenols (GC/MS - SIM)	1	14	7.1	10.0	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fraction	1	16	6.3	10.0	NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Matrix: **WATER**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	

Chain of Custody & Analysis Request

Page _1_ of _1_

Chain of Custody Number:

GHD

PROJECT ID:	4215386 41	**QUOTE:**	
PROJECT:	**Western Basin EIS WQ Monitoring**		
CLIENT:	GHD		
POSTAL ADDRESS:	PO Box 373, Gladstone 4680		
CONTACT:	Adrian White		
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INVOICE:	Jason.K.Fowler@ghd.com.au, Adrian.A.White@ghd.com.au		
DATA NEEDED BY:			
REPORT FORMAT:			
EMAIL FORMAT:	ESDAT, EXCEL & PDF		

LABORATORY BATCH NO.:

FOR LAB USE ONLY

COOLER SEAL:
Yes No ......
Broken Intact ......

COOLER TEMP:
..... deg.C

DESPATCHED TO: ALS Laboratories
32 SHAND STREET STAFFORD QLD 4053
3243-7222

Environmental Division
Brisbane
Work Order
EB0908368

Telephone : +61-7-3243 7222

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

Water samples from a **marine** environment (Background sampling)

(EMAIL ADDRESSES PROVIDED ABOVE)

ANALYSIS REQUIRED

	SAMPLE ID	**MATRIX**	**DATE**	**DETECTION LIMIT**	**PRESERVATION**	**TSS (EA025)**	**Chlorophyll a (EP008)**	**pH (EA005)**	**TDS (EA015)**	**BTEX**	**TBT (Lowest LOR)**	**VOC (1,2,4-Trichlorobenzene, 1,1,2-Trichloroethane (EP074LL)**	**Cyanide**	**Electro Conductivity**	**Multi Residue Pesticides –EP-215LL (lowest DL)**	**Ultra Trace Phenoxy Acid Herbicides – EP-202LL**	**Mulit Residue Pesticide – EP-209LL (lowest DL)**	**Tebuthiuron (DL 10ug/L)**	**Ultratrace OC/OP Pesiticides (EP130A/EP131A)**	**PAH/Phenols & TPH (S-14A / EP080)**	Note: Outsourced Tebuthiuron analysis is approved. Please forward ultratrace to Sydney Lab
1	G-WQ-02	Water	**26/05/2009**	LOR	As Required	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
2	G-WQ-03	Water	**26/05/2009**	LOR	As Required	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
3	G-WQ-06	Water	**26/05/2009**	LOR	As Required	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
4	G-WQ-07	Water	**26/05/2009**	LOR	As Required	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
5	G-WQ-09	Water	**26/05/2009**	LOR	As Required	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
6	QA2	Water	**26/05/2009**	LOR	As Required	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	

RELINQUISHED BY:
NAME : A White — DATE: 26/05/2009
OF: GHD Gladstone — TIME: 1530

RECEIVED BY:
NAME :
DATE: 27/05/09
OF: ALS
TIME: 845

PLEASE EMAIL COMPLETED ANALYSIS REQUEST TO: Jason.K.Fowler@ghd.com.au, Adrian.A.White@ghd.com.au

*Container Type and Preservative Codes: P = Neutral Plastic; N = Nitric Acid Preserved; C = Sodium Hydroxide Preserved; J = Solvent Washed Acid Rinced Jar; S = Solvent Washed Acid Rinced Glass Bottle; VC = Hydrochloric Acid Preserved Vial; VS = Sulfuric Acid Preserved Vial; BS = Sulfuric Acid Preserved Glass Bottle; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; O = Other.

SAMPLE RECEIPT NOTIFICATION (SRN)

Comprehensive Report

Work Order : **EB0908368**

Client	: **GHD SERVICES PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR ADRIAN WHITE	Contact	: Tim Kilmister
Address	: P O BOX 373 GLADSTONE QLD, AUSTRALIA 4680	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: adrian.a.white@ghd.com.au	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 07 49731611	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 4972 6236	Facsimile	: +61-7-3243 7218
Project	: 421538641 Western Basin EIS WQ Monitoring	Page	: 1 of 3
Order number	: ----		
C-O-C number	: ----	Quote number	: EM2009GHDSER0392 (EN/005/09)
Site	: ----		
Sampler	: ----	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Dates

Date Samples Received	: 27-MAY-2009	Issue Date	: 27-MAY-2009 14:26
Client Requested Due Date	: 03-JUN-2009	Scheduled Reporting Date	: **10-JUN-2009**

Delivery Details

Mode of Delivery	: Carrier	Temperature	: 0.6,2.8,1.4,4.2,9.2, - Ice present
No. of coolers/boxes	: 6x Medium	No. of samples received	: 6
Sercurity Seal	: Intact.	No. of samples analysed	: 6

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Requested Deliverables
- **Samples received in appropriately pretreated and preserved containers.**
- **Sample(s) have been received within recommended holding times.**
- **Tebuthiuron analysis has been subcontracted to SGS (Multilab).**
- Please direct any turn around / technical queries to the laboratory contact designated above.
- Please direct any queries related to sample condition / numbering / breakages to Maggie Kahi.
- Analytical work for this work order will be conducted at ALS Brisbane.
- Sample Disposal - Aqueous (14 days), Solid (90 days) from date of completion of work order.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exist.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process neccessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

When date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for processing purposes. If the sampling time is displayed as 0:00 the information was not provided by client.

Matrix: **WATER**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	WATER - EA005: pH pH	WATER - EA010P Conductivity (PC)	WATER - EA015 Total Dissolved Solids	WATER - EA025 Suspended Solids	WATER - EK026G Total Cyanide by Discrete Analyser	WATER - EP008 Chlorophyll a	WATER - EP074-LL Ultra-Trace Volatiles by P&T GCMS(SIM)	WATER - EP090S Organotins
EB0908368-001	26-MAY-2009 15:30	G-WQ-02	✓	✓	✓	✓	✓	✓	✓	✓
EB0908368-002	26-MAY-2009 15:30	G-WQ-03	✓	✓	✓	✓	✓	✓	✓	✓
EB0908368-003	26-MAY-2009 15:30	G-WQ-06	✓	✓	✓	✓	✓	✓	✓	✓
EB0908368-004	26-MAY-2009 15:30	G-WQ-07	✓	✓	✓	✓	✓	✓	✓	✓
EB0908368-005	26-MAY-2009 15:30	G-WQ-09	✓	✓	✓	✓	✓	✓	✓	✓
EB0908368-006	26-MAY-2009 15:30	QA2	✓	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	WATER - EP202LL Phenoxyacetic acids - low level	WATER - EP209LL Multiresidue Pesticide Screen (Suite 1) - Low Level	WATER - EP215LL Multiresidue Pesticide Screen (Suite 2) - Low Level	WATER - MSC-WAT (Subcontracted) Miscelleneous Subcontracting	WATER - UTO-1W Ultratrace OC / OP Pesticides	WATER - W-04 TPH/BTEX	WATER - W-14A PAH/Phenols (SIM)
EB0908368-001	26-MAY-2009 15:30	G-WQ-02	✓	✓	✓	✓	✓	✓	✓
EB0908368-002	26-MAY-2009 15:30	G-WQ-03	✓	✓	✓	✓	✓	✓	✓
EB0908368-003	26-MAY-2009 15:30	G-WQ-06	✓	✓	✓	✓	✓	✓	✓
EB0908368-004	26-MAY-2009 15:30	G-WQ-07	✓	✓	✓	✓	✓	✓	✓
EB0908368-005	26-MAY-2009 15:30	G-WQ-09	✓	✓	✓	✓	✓	✓	✓
EB0908368-006	26-MAY-2009 15:30	QA2	✓	✓	✓	✓	✓	✓	✓

Requested Deliverables

MR ADRIAN WHITE

- *AU Certificate of Analysis - NATA (COA)	Email	adrian.a.white@ghd.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	adrian.a.white@ghd.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	adrian.a.white@ghd.com.au
- A4 - AU Sample Receipt Notification - Environmental (SRN)	Email	adrian.a.white@ghd.com.au
- A4 - AU Tax Invoice (INV)	Email	adrian.a.white@ghd.com.au
- Default - Chain of Custody (COC)	Email	adrian.a.white@ghd.com.au
- EDI Format - ENMRG (ENMRG)	Email	adrian.a.white@ghd.com.au
- EDI Format - ESDAT (ESDAT)	Email	adrian.a.white@ghd.com.au
- Trigger - Subcontract Report (SUBCO)	Email	adrian.a.white@ghd.com.au

MR JASON FOWLER

- *AU Certificate of Analysis - NATA (COA)	Email	jason.k.fowler@ghd.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	jason.k.fowler@ghd.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	jason.k.fowler@ghd.com.au
- A4 - AU Sample Receipt Notification - Environmental (SRN)	Email	jason.k.fowler@ghd.com.au
- A4 - AU Tax Invoice (INV)	Email	jason.k.fowler@ghd.com.au
- Default - Chain of Custody (COC)	Email	jason.k.fowler@ghd.com.au
- EDI Format - ENMRG (ENMRG)	Email	jason.k.fowler@ghd.com.au
- EDI Format - ESDAT (ESDAT)	Email	jason.k.fowler@ghd.com.au
- Trigger - Subcontract Report (SUBCO)	Email	jason.k.fowler@ghd.com.au

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: **EB0908368**	Page	: 1 of 14
Client	: **GHD SERVICES PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR ADRIAN WHITE	Contact	: Tim Kilmister
Address	: P O BOX 373 GLADSTONE QLD, AUSTRALIA 4680	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: adrian.a.white@ghd.com.au	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 07 49731611	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 4972 6236	Facsimile	: +61-7-3243 7218
Project	: 421538641 Western Basin EIS WQ Monitoring	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 27-MAY-2009
Sampler	: ----	Issue Date	: 10-JUN-2009
Site	: ----		
		No. of samples received	: 6
Quote number	: EN/005/09	No. of samples analysed	: 6

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

NATA Accredited Laboratory 825

This document is issued in accordance with NATA accreditation requirements.

Accredited for compliance with ISO/IEC 17025.

WORLD RECOGNISED ACCREDITATION

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Alex Rossi	Organic Chemist	Organics
Kim McCabe	Senior Inorganic Chemist	Inorganics
Lana Nguyen	Organic Chemist	Organics
Matthew Goodwin	Senior Organic Chemist	Organics
Sarah Ashworth	Organic Chemist	Organics
Stephen Hislop	Senior Inorganic Chemist	Inorganics

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insuffient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for processing purposes. If the sampling time is displayed as 0:00 the information was not provided by client.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting

- **TBT: High failing LCS deemed acceptable as all associated analyte results are less than LOR.**

Analytical Results

Sub-Matrix: **WATER**			*Client sample ID*	**G-WQ-02**	**G-WQ-03**	**G-WQ-06**	**G-WQ-07**	**G-WQ-09**
			Client sampling date / time	26-MAY-2009 15:30	26-MAY-2009 15:30	26-MAY-2009 15:30	26-MAY-2009 15:30	26-MAY-2009 15:30
Compound	*CAS Number*	*LOR*	*Unit*	**EB0908368-001**	**EB0908368-002**	**EB0908368-003**	**EB0908368-004**	**EB0908368-005**
EA005: pH								
pH Value	----	0.01	pH Unit	**8.03**	**8.05**	**8.04**	**8.04**	**8.11**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**55700**	**54900**	**55100**	**56000**	**54700**
EA015: Total Dissolved Solids								
^ Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	**38500**	**47600**	**48600**	**49400**	**49000**
EA025: Suspended Solids								
^ Suspended Solids (SS)	----	1	mg/L	**53**	**52**	**27**	**29**	**25**
EK026G: Total Cyanide By Discrete Analyser								
Total Cyanide	57-12-5	0.004	mg/L	<0.004	<0.004	<0.004	<0.004	<0.004
EP008: Chlorophyll a								
Chlorophyll a	----	1	mg/m3	**1**	<1	**6**	<1	<1
EP074E: Halogenated Aliphatic Compounds								
1.1.2-Trichloroethane	79-00-5	5	µg/L	<5	<5	<5	<5	<5
EP074F: Halogenated Aromatic Compounds								
1.2.4-Trichlorobenzene	120-82-1	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
EP075(SIM)A: Phenolic Compounds								
Phenol	108-95-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
2-Chlorophenol	95-57-8	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
2-Methylphenol	95-48-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
3- & 4-Methylphenol	1319-77-3	2.0	µg/L	<2.0	<2.0	<2.0	<2.0	<2.0
2-Nitrophenol	88-75-5	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
2.4-Dimethylphenol	105-67-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
2.4-Dichlorophenol	120-83-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
2.6-Dichlorophenol	87-65-0	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
4-Chloro-3-Methylphenol	59-50-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
2.4.6-Trichlorophenol	88-06-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
2.4.5-Trichlorophenol	95-95-4	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Pentachlorophenol	87-86-5	4.0	µg/L	<4.0	<4.0	<4.0	<4.0	<4.0
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Acenaphthylene	208-96-8	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Acenaphthene	83-32-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Fluorene	86-73-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Phenanthrene	85-01-8	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Anthracene	120-12-7	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Fluoranthene	206-44-0	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Pyrene	129-00-0	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0

Analytical Results

Sub-Matrix: **WATER**			*Client sample ID*	**G-WQ-02**	**G-WQ-03**	**G-WQ-06**	**G-WQ-07**	**G-WQ-09**
			Client sampling date / time	26-MAY-2009 15:30	26-MAY-2009 15:30	26-MAY-2009 15:30	26-MAY-2009 15:30	26-MAY-2009 15:30
Compound	*CAS Number*	*LOR*	*Unit*	**EB0908368-001**	**EB0908368-002**	**EB0908368-003**	**EB0908368-004**	**EB0908368-005**
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Chrysene	218-01-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(b)fluoranthene	205-99-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
EP080: BTEX								
Benzene	71-43-2	1	µg/L	<1	<1	<1	<1	<1
Toluene	108-88-3	2	µg/L	<2	<2	<2	<2	<2
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	<2	<2
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	<2	<2
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	<2	<2
EP090: Organotin Compounds (Soluble)								
Tributyltin	56573-85-4	2	ngSn/L	<2	<2	<2	<2	<2
EP130A: Organophosphorus Pesticides (Ultra-trace)								
Bromophos-ethyl	4824-78-6	0.10	µg/L	<0.12	<0.12	<0.12	<0.12	<0.12
Carbophenothion	786-19-6	0.10	µg/L	<0.12	<0.12	<0.12	<0.12	<0.12
Chlorfenvinphos (Z)	470-90-8	0.10	µg/L	<0.12	<0.12	<0.12	<0.12	<0.12
Chlorpyrifos	2921-88-2	0.050	µg/L	<0.050	<0.050	<0.050	<0.050	<0.050
Chlorpyrifos-methyl	5598-13-0	0.10	µg/L	<0.12	<0.12	<0.12	<0.12	<0.12
Demeton-S-methyl	919-86-8	0.10	µg/L	<0.12	<0.12	<0.12	<0.12	<0.12
Diazinon	333-41-5	0.10	µg/L	<0.12	<0.12	<0.12	<0.12	<0.12
Dichlorvos	62-73-7	0.10	µg/L	<0.12	<0.12	<0.12	<0.12	<0.12
Dimethoate	60-51-5	0.10	µg/L	<0.12	<0.12	<0.12	<0.12	<0.12
Ethion	563-12-2	0.10	µg/L	<0.12	<0.12	<0.12	<0.12	<0.12
Fenamiphos	22224-92-6	0.10	µg/L	<0.12	<0.12	<0.12	<0.12	<0.12
Fenthion	55-38-9	0.10	µg/L	<0.12	<0.12	<0.12	<0.12	<0.12
Malathion	121-75-5	0.10	µg/L	<0.12	<0.12	<0.12	<0.12	<0.12
Azinphos Methyl	86-50-0	0.10	µg/L	<0.12	<0.12	<0.12	<0.12	<0.12
Monocrotophos	6923-22-4	0.10	µg/L	<0.12	<0.12	<0.12	<0.12	<0.12
Parathion	56-38-2	0.10	µg/L	<0.12	<0.12	<0.12	<0.12	<0.12

Analytical Results

Sub-Matrix: **WATER**			Client sample ID	**G-WQ-02**	**G-WQ-03**	**G-WQ-06**	**G-WQ-07**	**G-WQ-09**
			Client sampling date / time	26-MAY-2009 15:30	26-MAY-2009 15:30	26-MAY-2009 15:30	26-MAY-2009 15:30	26-MAY-2009 15:30
Compound	*CAS Number*	*LOR*	*Unit*	**EB0908368-001**	**EB0908368-002**	**EB0908368-003**	**EB0908368-004**	**EB0908368-005**
EP130A: Organophosphorus Pesticides (Ultra-trace) - Continued								
Parathion-methyl	298-00-0	0.10	µg/L	<0.12	<0.12	<0.12	<0.12	<0.12
Pirimphos-ethyl	23505-41-1	0.10	µg/L	<0.12	<0.12	<0.12	<0.12	<0.12
Prothiofos	34643-46-4	0.10	µg/L	<0.12	<0.12	<0.12	<0.12	<0.12
EP131A: Organochlorine Pesticides								
Aldrin	309-00-2	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010
alpha-BHC	319-84-6	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010
beta-BHC	319-85-7	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010
delta-BHC	319-86-8	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010
4.4`-DDD	72-54-8	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010
4.4`-DDE	72-55-9	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010
4.4`-DDT	50-29-3	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010
^ DDT (total)	----	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010
Dieldrin	60-57-1	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010
alpha-Endosulfan	959-98-8	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010
beta-Endosulfan	33213-65-9	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010
Endosulfan sulfate	1031-07-8	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010
Endosulfan (sum)	115-29-7	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010
Endrin	72-20-8	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010
Endrin aldehyde	7421-93-4	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010
Endrin ketone	53494-70-5	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010
Heptachlor	76-44-8	0.005	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Heptachlor epoxide	1024-57-3	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010
Hexachlorobenzene (HCB)	118-74-1	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010
gamma-BHC	58-89-9	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010
Methoxychlor	72-43-5	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010
cis-Chlordane	5103-71-9	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010
trans-Chlordane	5103-74-2	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010
Total Chlordane (sum)	----	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010
EP202A: Phenoxyacetic Acid Herbicides by LCMS								
4-Chlorophenoxy acetic acid	122-88-3	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
2.4-DB	94-82-6	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Dicamba	1918-00-9	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Mecoprop	93-65-2	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
MCPA	94-74-6	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
2.4-DP	120-36-5	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
2.4-D	94-75-7	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Triclopyr	55335-06-3	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
2.4.5-TP (Silvex)	93-72-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01

Analytical Results

Sub-Matrix: **WATER**			*Client sample ID*	**G-WQ-02**	**G-WQ-03**	**G-WQ-06**	**G-WQ-07**	**G-WQ-09**
			Client sampling date / time	26-MAY-2009 15:30	26-MAY-2009 15:30	26-MAY-2009 15:30	26-MAY-2009 15:30	26-MAY-2009 15:30
Compound	*CAS Number*	*LOR*	*Unit*	**EB0908368-001**	**EB0908368-002**	**EB0908368-003**	**EB0908368-004**	**EB0908368-005**
EP202A: Phenoxyacetic Acid Herbicides by LCMS - Continued								
2.4.5-T	93-76-5	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
MCPB	94-81-5	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Picloram	1918-02-1	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Clopyralid	1702-17-6	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Fluroxypyr	69377-81-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
2.6-D	575-90-6	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
2.4.6-T	575-89-3	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
EP209: Multiresidue Pesticide Residue Screen (Suite 1)								
Atrazine	1912-24-9	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010
Chlorpyrifos	2921-88-2	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010
Hexazinone	51235-04-2	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010
Molinate	2212-67-1	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010
Propiconazole	60207-90-1	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010
Temephos	3383-96-8	0.010	µg/L	<0.010	<0.010	<0.010	<0.010	<0.010
EP215: Multiresidue Pesticide Residue Screen (Suite 2)								
Simazine	122-34-9	0.005	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Diuron	330-54-1	0.005	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Atrazine	1912-24-9	0.005	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Molinate	2212-67-1	0.005	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Metolachlor	51218-45-2	0.005	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Malathion	121-75-5	0.002	µg/L	<0.002	<0.002	<0.002	<0.002	<0.002
Diazinon	333-41-5	0.005	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Thiobencarb	28249-77-6	0.005	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorpyrifos	2921-88-2	0.005	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Trifluralin	1582-09-8	0.005	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005
EP074S: VOC Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.1	%	**105**	**99.9**	**103**	**105**	**108**
1.2-Dichloroethane-D4	17060-07-0	0.1	%	**108**	**105**	**107**	**111**	**116**
Toluene-D8	2037-26-5	0.1	%	**99.0**	**100**	**96.6**	**99.2**	**99.9**
Toluene-D8	2037-26-5	0.1	%	**96.4**	**94.8**	**93.5**	**94.8**	**99.1**
4-Bromofluorobenzene	460-00-4	0.1	%	**104**	**106**	**99.2**	**104**	**105**
4-Bromofluorobenzene	460-00-4	0.1	%	**94.9**	**92.4**	**92.0**	**93.3**	**98.6**
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.1	%	**29.2**	**37.8**	**27.0**	**31.9**	**34.8**
2-Chlorophenol-D4	93951-73-6	0.1	%	**61.1**	**80.1**	**60.9**	**66.9**	**73.9**
2.4.6-Tribromophenol	118-79-6	0.1	%	**62.2**	**81.8**	**62.8**	**69.1**	**77.0**
EP075(SIM)T: PAH Surrogates								

Analytical Results

Sub-Matrix: **WATER**			*Client sample ID*	**G-WQ-02**	**G-WQ-03**	**G-WQ-06**	**G-WQ-07**	**G-WQ-09**
			Client sampling date / time	26-MAY-2009 15:30	26-MAY-2009 15:30	26-MAY-2009 15:30	26-MAY-2009 15:30	26-MAY-2009 15:30
Compound	*CAS Number*	*LOR*	*Unit*	**EB0908368-001**	**EB0908368-002**	**EB0908368-003**	**EB0908368-004**	**EB0908368-005**
EP075(SIM)T: PAH Surrogates - Continued								
2-Fluorobiphenyl	321-60-8	0.1	%	**74.0**	**90.9**	**71.4**	**77.8**	**86.6**
Anthracene-d10	1719-06-8	0.1	%	**72.2**	**108**	**74.8**	**79.3**	**85.3**
4-Terphenyl-d14	1718-51-0	0.1	%	**83.0**	**96.4**	**78.2**	**83.1**	**94.1**
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.1	%	**109**	**105**	**107**	**112**	**118**
Toluene-D8	2037-26-5	0.1	%	**95.7**	**94.5**	**92.1**	**93.6**	**98.1**
4-Bromofluorobenzene	460-00-4	0.1	%	**96.1**	**94.4**	**93.1**	**94.5**	**99.8**
EP090S: Organotin Surrogate								
Tripropyltin	----	0.1	%	**91.8**	**94.2**	**110**	**93.8**	**69.0**
EP130S: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.1	%	**67.9**	**66.6**	**63.8**	**60.3**	**60.0**
EP131S: OC Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.1	%	**96.4**	**97.2**	**78.7**	**73.7**	**83.2**
EP202S: Phenoxyacetic Acid Herbicide Surrogate								
2.4-Dichlorophenyl Acetic Acid	19719-28-9	0.1	%	**129**	**129**	**106**	**117**	**109**

Analytical Results

Sub-Matrix: **WATER**			*Client sample ID*	**QA2**	----	----	----	----
			Client sampling date / time	26-MAY-2009 15:30	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EB0908368-006**	**----**	**----**	**----**	**----**
EA005: pH								
pH Value	----	0.01	pH Unit	**8.07**	----	----	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**54500**	----	----	----	----
EA015: Total Dissolved Solids								
^ Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	**49700**	----	----	----	----
EA025: Suspended Solids								
^ Suspended Solids (SS)	----	1	mg/L	**44**	----	----	----	----
EK026G: Total Cyanide By Discrete Analyser								
Total Cyanide	57-12-5	0.004	mg/L	<0.004	----	----	----	----
EP008: Chlorophyll a								
Chlorophyll a	----	1	mg/m3	**2**	----	----	----	----
EP074E: Halogenated Aliphatic Compounds								
1.1.2-Trichloroethane	79-00-5	5	µg/L	<5	----	----	----	----
EP074F: Halogenated Aromatic Compounds								
1.2.4-Trichlorobenzene	120-82-1	0.5	µg/L	<0.5	----	----	----	----
EP075(SIM)A: Phenolic Compounds								
Phenol	108-95-2	1.0	µg/L	<1.0	----	----	----	----
2-Chlorophenol	95-57-8	1.0	µg/L	<1.0	----	----	----	----
2-Methylphenol	95-48-7	1.0	µg/L	<1.0	----	----	----	----
3- & 4-Methylphenol	1319-77-3	2.0	µg/L	<2.0	----	----	----	----
2-Nitrophenol	88-75-5	1.0	µg/L	<1.0	----	----	----	----
2.4-Dimethylphenol	105-67-9	1.0	µg/L	<1.0	----	----	----	----
2.4-Dichlorophenol	120-83-2	1.0	µg/L	<1.0	----	----	----	----
2.6-Dichlorophenol	87-65-0	1.0	µg/L	<1.0	----	----	----	----
4-Chloro-3-Methylphenol	59-50-7	1.0	µg/L	<1.0	----	----	----	----
2.4.6-Trichlorophenol	88-06-2	1.0	µg/L	<1.0	----	----	----	----
2.4.5-Trichlorophenol	95-95-4	1.0	µg/L	<1.0	----	----	----	----
Pentachlorophenol	87-86-5	4.0	µg/L	<4.0	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	1.0	µg/L	<1.0	----	----	----	----
Acenaphthylene	208-96-8	1.0	µg/L	<1.0	----	----	----	----
Acenaphthene	83-32-9	1.0	µg/L	<1.0	----	----	----	----
Fluorene	86-73-7	1.0	µg/L	<1.0	----	----	----	----
Phenanthrene	85-01-8	1.0	µg/L	<1.0	----	----	----	----
Anthracene	120-12-7	1.0	µg/L	<1.0	----	----	----	----
Fluoranthene	206-44-0	1.0	µg/L	<1.0	----	----	----	----
Pyrene	129-00-0	1.0	µg/L	<1.0	----	----	----	----

Analytical Results

Sub-Matrix: **WATER**

			Client sample ID	**QA2**	----	----	----	----
			Client sampling date / time	26-MAY-2009 15:30	----	----	----	----
Compound	CAS Number	LOR	Unit	**EB0908368-006**	**----**	**----**	**----**	**----**
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	----	----	----	----
Chrysene	218-01-9	1.0	µg/L	<1.0	----	----	----	----
Benzo(b)fluoranthene	205-99-2	1.0	µg/L	<1.0	----	----	----	----
Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0	----	----	----	----
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	----	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	<1.0	----	----	----	----
Dibenz(a.h)anthracene	53-70-3	1.0	µg/L	<1.0	----	----	----	----
Benzo(g.h.i)perylene	191-24-2	1.0	µg/L	<1.0	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	----	----	----	----
C10 - C14 Fraction	----	50	µg/L	<50	----	----	----	----
C15 - C28 Fraction	----	100	µg/L	<100	----	----	----	----
C29 - C36 Fraction	----	50	µg/L	<50	----	----	----	----
EP080: BTEX								
Benzene	71-43-2	1	µg/L	<1	----	----	----	----
Toluene	108-88-3	2	µg/L	<2	----	----	----	----
Ethylbenzene	100-41-4	2	µg/L	<2	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	----	----	----	----
ortho-Xylene	95-47-6	2	µg/L	<2	----	----	----	----
EP090: Organotin Compounds (Soluble)								
Tributyltin	56573-85-4	2	ngSn/L	<2	----	----	----	----
EP130A: Organophosphorus Pesticides (Ultra-trace)								
Bromophos-ethyl	4824-78-6	0.10	µg/L	<0.12	----	----	----	----
Carbophenothion	786-19-6	0.10	µg/L	<0.12	----	----	----	----
Chlorfenvinphos (Z)	470-90-8	0.10	µg/L	<0.12	----	----	----	----
Chlorpyrifos	2921-88-2	0.050	µg/L	<0.050	----	----	----	----
Chlorpyrifos-methyl	5598-13-0	0.10	µg/L	<0.12	----	----	----	----
Demeton-S-methyl	919-86-8	0.10	µg/L	<0.12	----	----	----	----
Diazinon	333-41-5	0.10	µg/L	<0.12	----	----	----	----
Dichlorvos	62-73-7	0.10	µg/L	<0.12	----	----	----	----
Dimethoate	60-51-5	0.10	µg/L	<0.12	----	----	----	----
Ethion	563-12-2	0.10	µg/L	<0.12	----	----	----	----
Fenamiphos	22224-92-6	0.10	µg/L	<0.12	----	----	----	----
Fenthion	55-38-9	0.10	µg/L	<0.12	----	----	----	----
Malathion	121-75-5	0.10	µg/L	<0.12	----	----	----	----
Azinphos Methyl	86-50-0	0.10	µg/L	<0.12	----	----	----	----
Monocrotophos	6923-22-4	0.10	µg/L	<0.12	----	----	----	----
Parathion	56-38-2	0.10	µg/L	<0.12	----	----	----	----

Analytical Results

Sub-Matrix: **WATER**			*Client sample ID*	**QA2**	----	----	----	----
			Client sampling date / time	26-MAY-2009 15:30	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EB0908368-006**	**----**	**----**	**----**	**----**
EP130A: Organophosphorus Pesticides (Ultra-trace) - Continued								
Parathion-methyl	298-00-0	0.10	µg/L	<0.12	----	----	----	----
Pirimphos-ethyl	23505-41-1	0.10	µg/L	<0.12	----	----	----	----
Prothiofos	34643-46-4	0.10	µg/L	<0.12	----	----	----	----
EP131A: Organochlorine Pesticides								
Aldrin	309-00-2	0.010	µg/L	<0.010	----	----	----	----
alpha-BHC	319-84-6	0.010	µg/L	<0.010	----	----	----	----
beta-BHC	319-85-7	0.010	µg/L	<0.010	----	----	----	----
delta-BHC	319-86-8	0.010	µg/L	<0.010	----	----	----	----
4.4`-DDD	72-54-8	0.010	µg/L	<0.010	----	----	----	----
4.4`-DDE	72-55-9	0.010	µg/L	<0.010	----	----	----	----
4.4`-DDT	50-29-3	0.010	µg/L	<0.010	----	----	----	----
^ DDT (total)	----	0.010	µg/L	<0.010	----	----	----	----
Dieldrin	60-57-1	0.010	µg/L	<0.010	----	----	----	----
alpha-Endosulfan	959-98-8	0.010	µg/L	<0.010	----	----	----	----
beta-Endosulfan	33213-65-9	0.010	µg/L	<0.010	----	----	----	----
Endosulfan sulfate	1031-07-8	0.010	µg/L	<0.010	----	----	----	----
Endosulfan (sum)	115-29-7	0.010	µg/L	<0.010	----	----	----	----
Endrin	72-20-8	0.010	µg/L	<0.010	----	----	----	----
Endrin aldehyde	7421-93-4	0.010	µg/L	<0.010	----	----	----	----
Endrin ketone	53494-70-5	0.010	µg/L	<0.010	----	----	----	----
Heptachlor	76-44-8	0.005	µg/L	<0.005	----	----	----	----
Heptachlor epoxide	1024-57-3	0.010	µg/L	<0.010	----	----	----	----
Hexachlorobenzene (HCB)	118-74-1	0.010	µg/L	<0.010	----	----	----	----
gamma-BHC	58-89-9	0.010	µg/L	<0.010	----	----	----	----
Methoxychlor	72-43-5	0.010	µg/L	<0.010	----	----	----	----
cis-Chlordane	5103-71-9	0.010	µg/L	<0.010	----	----	----	----
trans-Chlordane	5103-74-2	0.010	µg/L	<0.010	----	----	----	----
Total Chlordane (sum)	----	0.010	µg/L	<0.010	----	----	----	----
EP202A: Phenoxyacetic Acid Herbicides by LCMS								
4-Chlorophenoxy acetic acid	122-88-3	0.01	µg/L	<0.01	----	----	----	----
2.4-DB	94-82-6	0.01	µg/L	<0.01	----	----	----	----
Dicamba	1918-00-9	0.01	µg/L	<0.01	----	----	----	----
Mecoprop	93-65-2	0.01	µg/L	<0.01	----	----	----	----
MCPA	94-74-6	0.01	µg/L	<0.01	----	----	----	----
2.4-DP	120-36-5	0.01	µg/L	<0.01	----	----	----	----
2.4-D	94-75-7	0.01	µg/L	<0.01	----	----	----	----
Triclopyr	55335-06-3	0.01	µg/L	<0.01	----	----	----	----
2.4.5-TP (Silvex)	93-72-1	0.01	µg/L	<0.01	----	----	----	----

Analytical Results

Sub-Matrix: **WATER**			Client sample ID	**QA2**	----	----	----	----
			Client sampling date / time	26-MAY-2009 15:30	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EB0908368-006**	**----**	**----**	**----**	**----**
EP202A: Phenoxyacetic Acid Herbicides by LCMS - Continued								
2.4.5-T	93-76-5	0.01	µg/L	<0.01	----	----	----	----
MCPB	94-81-5	0.01	µg/L	<0.01	----	----	----	----
Picloram	1918-02-1	0.05	µg/L	<0.05	----	----	----	----
Clopyralid	1702-17-6	0.05	µg/L	<0.05	----	----	----	----
Fluroxypyr	69377-81-7	0.05	µg/L	<0.05	----	----	----	----
2.6-D	575-90-6	0.1	µg/L	<0.1	----	----	----	----
2.4.6-T	575-89-3	0.1	µg/L	<0.1	----	----	----	----
EP209: Multiresidue Pesticide Residue Screen (Suite 1)								
Atrazine	1912-24-9	0.010	µg/L	<0.010	----	----	----	----
Chlorpyrifos	2921-88-2	0.010	µg/L	<0.010	----	----	----	----
Hexazinone	51235-04-2	0.010	µg/L	<0.010	----	----	----	----
Molinate	2212-67-1	0.010	µg/L	<0.010	----	----	----	----
Propiconazole	60207-90-1	0.010	µg/L	<0.010	----	----	----	----
Temephos	3383-96-8	0.010	µg/L	<0.010	----	----	----	----
EP215: Multiresidue Pesticide Residue Screen (Suite 2)								
Simazine	122-34-9	0.005	µg/L	<0.005	----	----	----	----
Diuron	330-54-1	0.005	µg/L	<0.005	----	----	----	----
Atrazine	1912-24-9	0.005	µg/L	<0.005	----	----	----	----
Molinate	2212-67-1	0.005	µg/L	<0.005	----	----	----	----
Metolachlor	51218-45-2	0.005	µg/L	<0.005	----	----	----	----
Malathion	121-75-5	0.002	µg/L	<0.002	----	----	----	----
Diazinon	333-41-5	0.005	µg/L	<0.005	----	----	----	----
Thiobencarb	28249-77-6	0.005	µg/L	<0.005	----	----	----	----
Chlorpyrifos	2921-88-2	0.005	µg/L	<0.005	----	----	----	----
Trifluralin	1582-09-8	0.005	µg/L	<0.005	----	----	----	----
EP074S: VOC Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.1	%	**106**	----	----	----	----
1.2-Dichloroethane-D4	17060-07-0	0.1	%	**112**	----	----	----	----
Toluene-D8	2037-26-5	0.1	%	**97.9**	----	----	----	----
Toluene-D8	2037-26-5	0.1	%	**95.0**	----	----	----	----
4-Bromofluorobenzene	460-00-4	0.1	%	**103**	----	----	----	----
4-Bromofluorobenzene	460-00-4	0.1	%	**94.4**	----	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.1	%	**33.9**	----	----	----	----
2-Chlorophenol-D4	93951-73-6	0.1	%	**72.5**	----	----	----	----
2.4.6-Tribromophenol	118-79-6	0.1	%	**74.1**	----	----	----	----
EP075(SIM)T: PAH Surrogates								

Analytical Results

Sub-Matrix: **WATER**			Client sample ID	**QA2**	----	----	----	----
			Client sampling date / time	26-MAY-2009 15:30	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EB0908368-006**	**----**	**----**	**----**	**----**
EP075(SIM)T: PAH Surrogates - Continued								
2-Fluorobiphenyl	321-60-8	0.1	%	**79.1**	----	----	----	----
Anthracene-d10	1719-06-8	0.1	%	**83.9**	----	----	----	----
4-Terphenyl-d14	1718-51-0	0.1	%	**91.6**	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.1	%	**112**	----	----	----	----
Toluene-D8	2037-26-5	0.1	%	**94.0**	----	----	----	----
4-Bromofluorobenzene	460-00-4	0.1	%	**95.6**	----	----	----	----
EP090S: Organotin Surrogate								
Tripropyltin	----	0.1	%	**89.2**	----	----	----	----
EP130S: Organophosphorus Pesticide Surrogate								
DEF	78-48-8	0.1	%	**67.3**	----	----	----	----
EP131S: OC Pesticide Surrogate								
Dibromo-DDE	21655-73-2	0.1	%	**98.5**	----	----	----	----
EP202S: Phenoxyacetic Acid Herbicide Surrogate								
2.4-Dichlorophenyl Acetic Acid	19719-28-9	0.1	%	**117**	----	----	----	----

Surrogate Control Limits

Sub-Matrix: **WATER**

Compound	*CAS Number*	*Recovery Limits (%)* Low	High
EP074S: VOC Surrogates			
1.2-Dichloroethane-D4	17060-07-0	80	120
Toluene-D8	2037-26-5	88	110
4-Bromofluorobenzene	460-00-4	86	115
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	10	94
2-Chlorophenol-D4	93951-73-6	23	134
2.4.6-Tribromophenol	118-79-6	10	123
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	43	116
Anthracene-d10	1719-06-8	27	133
4-Terphenyl-d14	1718-51-0	33	141
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	80	120
Toluene-D8	2037-26-5	88	110
4-Bromofluorobenzene	460-00-4	86	115
EP090S: Organotin Surrogate			
Tripropyltin	----	10	108
EP130S: Organophosphorus Pesticide Surrogate			
DEF	78-48-8	32	136.4
EP131S: OC Pesticide Surrogate			
Dibromo-DDE	21655-73-2	10	136
EP202S: Phenoxyacetic Acid Herbicide Surrogate			
2.4-Dichlorophenyl Acetic Acid	19719-28-9	37.8	142

CERTIFICATE OF ANALYSIS

4 June 2009

ALS Brisbane
32 Shand St
STAFFORD
QLD 4053

Attention: Tim Kilmister

Your Reference: EB0908368.001 to .006
Report Number: ME100796

SAMPLE TYPE:	6x 500 mL Amber Glass Bottles- Water
SAMPLES RECEIVED:	28/05/2009
PRELIMINARY REPORT EMAILED:	Not Issued

These samples were analysed in accordance with your written instructions.
A copy of the instructions is attached with the analytical report.

For and on Behalf of:
SGS AUSTRALIA PTY LTD

Client Services:	Alexandra Stenta	Alexandra.Stenta@sgs.com
Site Manager:	Dr Aaron D. Stott	Aaron.Stott@sgs.com

This report has been authorised by the undersigned:

Anthony Pellegrini
LC Team Leader

Sample Analysis Our Reference:	LOR	UNITS	ME100796-1	ME100796-2	ME100796-3	ME100796-4	ME100796-5
Your Reference	---------	-----------	G-WQ-02	G-WQ-03	G-WQ-06	G-WQ-07	G-WQ-09
Container Type	---------	-----------	500mL Amber Glass Bottle	500mL Amber Glass Bottle	500mL Amber Glass Bottle	500mL Amber Glass Bottle	500mL Amber Glass Bottle
Sample Type			Water	Water	Water	Water	Water
Date Sampled			26/05/2009	26/05/2009	26/05/2009	26/05/2009	26/05/2009
Date Extracted			3/06/2009	3/06/2009	3/06/2009	3/06/2009	3/06/2009
Date Analysed			3/06/2009	3/06/2009	3/06/2009	3/06/2009	3/06/2009
Tebuthiuron*	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01

Sample Analysis Our Reference:	LOR	UNITS	ME100796-6
Your Reference	---------	-----------	QA2
Container Type	---------	-----------	500mL Amber Glass Bottle
Sample Type			Water
Date Sampled			26/05/2009
Date Extracted			3/06/2009
Date Analysed			3/06/2009
Tebuthiuron*	0.01	mg/L	<0.01

Method ID	Methodology Summary
SGSMC258	An in-house method for the determination of Organochlorines, Organophosphates and Synthetic Pyrethoids in Water by dual analysis using Gas Chromatography with Mass Spectrometry and Flame Photometric Detection (GC/MS/FPD) and LC/MS/MS.

Result Codes

[INS]	:	Insufficient Sample for this test	[RPD]	:	Relative Percentage Difference
[NR]	:	Not Requested	*	:	Not part of NATA Accreditation
[NT]	:	Not tested	[N/A]	:	Not Applicable

Report Comments

NATA Corporate Accreditation No. 2562, Site No 2076

Note: Test results are not corrected for recovery (excluding Dioxins/Furans* and PAH in XAD and PUF).
This document is issued, on the Client's behalf, by the Company under its General Conditions of Service available on request and accessible at http://www.sgs.com/terms_and_conditions.htm. The Client's attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

Any other holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents.

Quality Control Protocol

Method Blank: An analyte free matrix to which all reagents are added in the same volume or proportions as used in sample processing. The method blank should be carried through the complete sample preparation and analytical procedure. A method blank is prepared every 20 samples.

Duplicate: A separate portion of a sample being analysed that is treated the same as the other samples in the batch. One duplicate is processed at least every 10 samples.

Surrogate Spike: An organic compound which is similar to the target analyte(s) in chemical composition and behavior in the analytical process, but which is not normally found in environmental samples. Surrogates are added to samples before extraction to monitor extraction efficiency and percent recovery in each sample.

Internal Standard: Added to all samples requiring analysis for organics (where relevant) or metals by ICP after the extraction/digestion process; the compounds/elements serve to give a standard of retention time and/or response, which is invariant from run-to-run with the instruments.

Laboratory Control Sample: A known matrix spiked with compound(s) representative of the target analytes. It is used to document laboratory performance. When the results of the matrix spike analysis indicates a potential problem due to the sample matrix itself, the LCS results are used to verify that the laboratory can perform the analysis in a clean matrix.

Matrix Spike: An aliquot of sample spiked with a known concentration of target analyte(s). The spiking occurs prior to sample preparation and analysis. A matrix spike is used to document the bias of a method in a given sample matrix.

Quality Acceptance Criteria

Unless otherwise specified in the test method, the following general acceptance criteria apply:

Method Blanks:	<LOR
Duplicates:	<5 x LOR: No RPD criteria applied. >5 x LOR: 0-30% RPD is accepted.
LCS's:	Determined by Control Charts. Where control charts have not been developed, the Matrix Spikes criteria apply.
Matrix Spikes:	70-130% recovery is accepted for metals / inorganics. 60-140% is accepted for organics.
Surrogates:	60-130% recovery is accepted for BTEX. 70-130% recovery is accepted for other organics.

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

QUALITY CONTROL REPORT

Work Order	: **EB0908368**	Page	: 1 of 15
Client	: **GHD SERVICES PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR ADRIAN WHITE	Contact	: Tim Kilmister
Address	: P O BOX 373 GLADSTONE QLD, AUSTRALIA 4680	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: adrian.a.white@ghd.com.au	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 07 49731611	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 4972 6236	Facsimile	: +61-7-3243 7218
Project	: 421538641 Western Basin EIS WQ Monitoring	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 27-MAY-2009
Sampler	: ----	Issue Date	: 10-JUN-2009
Order number	: ----		
		No. of samples received	: 6
Quote number	: EN/005/09	No. of samples analysed	: 6

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

NATA
WORLD RECOGNISED
ACCREDITATION

NATA Accredited Laboratory 825

This document is issued in
accordance with NATA
accreditation requirements.

Accredited for compliance with
ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Alex Rossi	Organic Chemist	Organics
Kim McCabe	Senior Inorganic Chemist	Inorganics
Lana Nguyen	Organic Chemist	Organics
Matthew Goodwin	Senior Organic Chemist	Organics
Sarah Ashworth	Organic Chemist	Organics
Stephen Hislop	Senior Inorganic Chemist	Inorganics

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insuffient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key :
Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR:- No Limit; Result between 10 and 20 times LOR:- 0% - 50%; Result > 20 times LOR:- 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA005: pH (QC Lot: 991611)									
EB0908355-001	Anonymous	EA005: pH Value	----	0.01	pH Unit	7.86	7.86	0.0	0% - 20%
EB0908368-005	G-WQ-09	EA005: pH Value	----	0.01	pH Unit	8.11	8.10	0.1	0% - 20%
EA010P: Conductivity by PC Titrator (QC Lot: 991841)									
EB0908368-001	G-WQ-02	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	55700	56100	0.7	0% - 20%
EB0908379-004	Anonymous	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	33500	33400	0.3	0% - 20%
EA015: Total Dissolved Solids (QC Lot: 992565)									
EB0908279-002	Anonymous	EA015: Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	132	116	12.9	0% - 20%
EB0908400-005	Anonymous	EA015: Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	990	988	0.2	0% - 20%
EA025: Suspended Solids (QC Lot: 992575)									
EB0908279-002	Anonymous	EA025: Suspended Solids (SS)	----	1	mg/L	4	4	0.0	No Limit
EB0908368-005	G-WQ-09	EA025: Suspended Solids (SS)	----	1	mg/L	25	25	0.0	0% - 20%
EK026G: Total Cyanide By Discrete Analyser (QC Lot: 998730)									
EB0908368-001	G-WQ-02	EK026G: Total Cyanide	57-12-5	0.004	mg/L	<0.004	<0.004	0.0	No Limit
EB0908718-007	Anonymous	EK026G: Total Cyanide	57-12-5	0.004	mg/L	<0.004	<0.004	0.0	No Limit
EP008: Chlorophyll a (QC Lot: 991910)									
EB0908368-001	G-WQ-02	EP008: Chlorophyll a	----	1	mg/m3	1	1	0.0	No Limit
EB0908371-006	Anonymous	EP008: Chlorophyll a	----	1	mg/m3	1	<1	0.0	No Limit
EP074E: Halogenated Aliphatic Compounds (QC Lot: 991825)									
EB0908355-001	Anonymous	EP074: 1.1.2-Trichloroethane	79-00-5	5	µg/L	<5	<5	0.0	No Limit
EP074F: Halogenated Aromatic Compounds (QC Lot: 993406)									
EB0908279-001	Anonymous	EP074-LL: 1.2.4-Trichlorobenzene	120-82-1	0.5	µg/L	<0.5	<0.5	0.0	No Limit
EM0904717-002	Anonymous	EP074-LL: 1.2.4-Trichlorobenzene	120-82-1	0.5	µg/L	<0.5	<0.5	0.0	No Limit
EP075(SIM)A: Phenolic Compounds (QC Lot: 992273)									
EB0908450-001	Anonymous	EP075(SIM): Phenol	108-95-2	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): 2-Chlorophenol	95-57-8	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): 2-Methylphenol	95-48-7	1.0	µg/L	1.1	<1.0	13.2	No Limit
		EP075(SIM): 2-Nitrophenol	88-75-5	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): 2.4-Dimethylphenol	105-67-9	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): 2.4-Dichlorophenol	120-83-2	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): 2.6-Dichlorophenol	87-65-0	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): 4-Chloro-3-Methylphenol	59-50-7	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): 2.4.6-Trichlorophenol	88-06-2	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): 2.4.5-Trichlorophenol	95-95-4	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): 3- & 4-Methylphenol	1319-77-3	2.0	µg/L	<2.0	<2.0	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP075(SIM)A: Phenolic Compounds (QC Lot: 992273) - continued									
EB0908450-001	Anonymous	EP075(SIM): Pentachlorophenol	87-86-5	2.0	µg/L	<2.0	<2.0	0.0	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 992273)									
EB0908450-001	Anonymous	EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Naphthalene	91-20-3	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Acenaphthene	83-32-9	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Fluorene	86-73-7	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Phenanthrene	85-01-8	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Anthracene	120-12-7	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Fluoranthene	206-44-0	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Pyrene	129-00-0	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Chrysene	218-01-9	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Benzo(b)fluoranthene	205-99-2	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	1.0	µg/L	<1.0	<1.0	0.0	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	1.0	µg/L	<1.0	<1.0	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 991826)									
EB0908355-001	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
EB0908407-004	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 992272)									
EB0908450-001	Anonymous	EP071: C15 - C28 Fraction	----	100	µg/L	<100	<100	0.0	No Limit
		EP071: C10 - C14 Fraction	----	50	µg/L	<50	<50	0.0	No Limit
		EP071: C29 - C36 Fraction	----	50	µg/L	<50	<50	0.0	No Limit
EP080: BTEX (QC Lot: 991826)									
EB0908355-001	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
EB0908407-004	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
EP130A: Organophosphorus Pesticides (Ultra-trace) (QC Lot: 993051)									

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP130A: Organophosphorus Pesticides (Ultra-trace) (QC Lot: 993051) - continued									
EB0908368-006	QA2	EP130: Chlorpyrifos	2921-88-2	0.050	µg/L	<0.050	<0.050	0.0	No Limit
		EP130: Bromophos-ethyl	4824-78-6	0.10	µg/L	<0.12	<0.12	0.0	No Limit
		EP130: Carbophenothion	786-19-6	0.10	µg/L	<0.12	<0.12	0.0	No Limit
		EP130: Chlorfenvinphos (Z)	470-90-8	0.10	µg/L	<0.12	<0.12	0.0	No Limit
		EP130: Chlorpyrifos-methyl	5598-13-0	0.10	µg/L	<0.12	<0.12	0.0	No Limit
		EP130: Demeton-S-methyl	919-86-8	0.10	µg/L	<0.12	<0.12	0.0	No Limit
		EP130: Diazinon	333-41-5	0.10	µg/L	<0.12	<0.12	0.0	No Limit
		EP130: Dichlorvos	62-73-7	0.10	µg/L	<0.12	<0.12	0.0	No Limit
		EP130: Dimethoate	60-51-5	0.10	µg/L	<0.12	<0.12	0.0	No Limit
		EP130: Ethion	563-12-2	0.10	µg/L	<0.12	<0.12	0.0	No Limit
		EP130: Fenamiphos	22224-92-6	0.10	µg/L	<0.12	<0.12	0.0	No Limit
		EP130: Fenthion	55-38-9	0.10	µg/L	<0.12	<0.12	0.0	No Limit
		EP130: Malathion	121-75-5	0.10	µg/L	<0.12	<0.12	0.0	No Limit
		EP130: Azinphos Methyl	86-50-0	0.10	µg/L	<0.12	<0.12	0.0	No Limit
		EP130: Monocrotophos	6923-22-4	0.10	µg/L	<0.12	<0.12	0.0	No Limit
		EP130: Parathion	56-38-2	0.10	µg/L	<0.12	<0.12	0.0	No Limit
		EP130: Parathion-methyl	298-00-0	0.10	µg/L	<0.12	<0.12	0.0	No Limit
		EP130: Pirimphos-ethyl	23505-41-1	0.10	µg/L	<0.12	<0.12	0.0	No Limit
		EP130: Prothiofos	34643-46-4	0.10	µg/L	<0.12	<0.12	0.0	No Limit
EP131A: Organochlorine Pesticides (QC Lot: 993050)									
EB0908368-006	QA2	EP131A: Heptachlor	76-44-8	0.005	µg/L	<0.005	<0.005	0.0	No Limit
		EP131A: Aldrin	309-00-2	0.010	µg/L	<0.010	<0.010	0.0	No Limit
		EP131A: alpha-BHC	319-84-6	0.010	µg/L	<0.010	<0.010	0.0	No Limit
		EP131A: beta-BHC	319-85-7	0.010	µg/L	<0.010	<0.010	0.0	No Limit
		EP131A: delta-BHC	319-86-8	0.010	µg/L	<0.010	<0.010	0.0	No Limit
		EP131A: 4.4`-DDD	72-54-8	0.010	µg/L	<0.010	<0.010	0.0	No Limit
		EP131A: 4.4`-DDE	72-55-9	0.010	µg/L	<0.010	<0.010	0.0	No Limit
		EP131A: 4.4`-DDT	50-29-3	0.010	µg/L	<0.010	<0.010	0.0	No Limit
		EP131A: DDT (total)	----	0.010	µg/L	<0.010	<0.010	0.0	No Limit
		EP131A: Dieldrin	60-57-1	0.010	µg/L	<0.010	<0.010	0.0	No Limit
		EP131A: alpha-Endosulfan	959-98-8	0.010	µg/L	<0.010	<0.010	0.0	No Limit
		EP131A: beta-Endosulfan	33213-65-9	0.010	µg/L	<0.010	<0.010	0.0	No Limit
		EP131A: Endosulfan sulfate	1031-07-8	0.010	µg/L	<0.010	<0.010	0.0	No Limit
		EP131A: Endosulfan (sum)	115-29-7	0.010	µg/L	<0.010	<0.010	0.0	No Limit
		EP131A: Endrin	72-20-8	0.010	µg/L	<0.010	<0.010	0.0	No Limit
		EP131A: Endrin aldehyde	7421-93-4	0.010	µg/L	<0.010	<0.010	0.0	No Limit
		EP131A: Endrin ketone	53494-70-5	0.010	µg/L	<0.010	<0.010	0.0	No Limit
		EP131A: Heptachlor epoxide	1024-57-3	0.010	µg/L	<0.010	<0.010	0.0	No Limit
		EP131A: Hexachlorobenzene (HCB)	118-74-1	0.010	µg/L	<0.010	<0.010	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP131A: Organochlorine Pesticides (QC Lot: 993050) - continued									
EB0908368-006	QA2	EP131A: gamma-BHC	58-89-9	0.010	µg/L	<0.010	<0.010	0.0	No Limit
		EP131A: Methoxychlor	72-43-5	0.010	µg/L	<0.010	<0.010	0.0	No Limit
		EP131A: cis-Chlordane	5103-71-9	0.010	µg/L	<0.010	<0.010	0.0	No Limit
		EP131A: trans-Chlordane	5103-74-2	0.010	µg/L	<0.010	<0.010	0.0	No Limit
		EP131A: Total Chlordane (sum)	----	0.010	µg/L	<0.010	<0.010	0.0	No Limit
EP202A: Phenoxyacetic Acid Herbicides by LCMS (QC Lot: 990327)									
ES0907538-001	Anonymous	EP202-LL: 4-Chlorophenoxy acetic acid	122-88-3	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP202-LL: 2.4-DB	94-82-6	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP202-LL: Dicamba	1918-00-9	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP202-LL: Mecoprop	93-65-2	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP202-LL: MCPA	94-74-6	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP202-LL: 2.4-DP	120-36-5	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP202-LL: 2.4-D	94-75-7	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP202-LL: Triclopyr	55335-06-3	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP202-LL: 2.4.5-TP (Silvex)	93-72-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP202-LL: 2.4.5-T	93-76-5	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP202-LL: MCPB	94-81-5	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP202-LL: Picloram	1918-02-1	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP202-LL: Clopyralid	1702-17-6	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP202-LL: Fluroxypyr	69377-81-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP202-LL: 2.6-D	575-90-6	0.1	µg/L	<0.1	<0.1	0.0	No Limit
		EP202-LL: 2.4.6-T	575-89-3	0.1	µg/L	<0.1	<0.1	0.0	No Limit
ES0907545-002	Anonymous	EP202-LL: 4-Chlorophenoxy acetic acid	122-88-3	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP202-LL: 2.4-DB	94-82-6	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP202-LL: Dicamba	1918-00-9	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP202-LL: Mecoprop	93-65-2	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP202-LL: MCPA	94-74-6	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP202-LL: 2.4-DP	120-36-5	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP202-LL: 2.4-D	94-75-7	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP202-LL: Triclopyr	55335-06-3	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP202-LL: 2.4.5-TP (Silvex)	93-72-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP202-LL: 2.4.5-T	93-76-5	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP202-LL: MCPB	94-81-5	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP202-LL: Picloram	1918-02-1	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP202-LL: Clopyralid	1702-17-6	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP202-LL: Fluroxypyr	69377-81-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP202-LL: 2.6-D	575-90-6	0.1	µg/L	<0.1	<0.1	0.0	No Limit
		EP202-LL: 2.4.6-T	575-89-3	0.1	µg/L	<0.1	<0.1	0.0	No Limit
EP202A: Phenoxyacetic Acid Herbicides by LCMS (QC Lot: 993089)									

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	***Client sample ID***	***Method: Compound***	***CAS Number***	***LOR***	***Unit***	***Original Result***	***Duplicate Result***	***RPD (%)***	***Recovery Limits (%)***
EP202A: Phenoxyacetic Acid Herbicides by LCMS (QC Lot: 993089) - continued									
ES0907726-001	Anonymous	EP202-LL: 4-Chlorophenoxy acetic acid	122-88-3	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP202-LL: 2.4-DB	94-82-6	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP202-LL: Dicamba	1918-00-9	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP202-LL: Mecoprop	93-65-2	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP202-LL: MCPA	94-74-6	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP202-LL: 2.4-DP	120-36-5	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP202-LL: 2.4-D	94-75-7	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP202-LL: Triclopyr	55335-06-3	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP202-LL: 2.4.5-TP (Silvex)	93-72-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP202-LL: 2.4.5-T	93-76-5	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP202-LL: MCPB	94-81-5	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP202-LL: Picloram	1918-02-1	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP202-LL: Clopyralid	1702-17-6	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP202-LL: Fluroxypyr	69377-81-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP202-LL: 2.6-D	575-90-6	0.1	µg/L	<0.1	<0.1	0.0	No Limit
		EP202-LL: 2.4.6-T	575-89-3	0.1	µg/L	<0.1	<0.1	0.0	No Limit
EP209: Multiresidue Pesticide Residue Screen (Suite 1) (QC Lot: 990326)									
ES0907538-001	Anonymous	EP209-LL: Atrazine	1912-24-9	0.010	µg/L	<0.010	<0.010	0.0	No Limit
		EP209-LL: Hexazinone	51235-04-2	0.010	µg/L	<0.010	<0.010	0.0	No Limit
		EP209-LL: Molinate	2212-67-1	0.010	µg/L	<0.010	<0.010	0.0	No Limit
		EP209-LL: Propiconazole	60207-90-1	0.010	µg/L	<0.010	<0.010	0.0	No Limit
		EP209-LL: Chlorpyrifos	2921-88-2	0.050	µg/L	<0.050	<0.050	0.0	No Limit
		EP209-LL: Temephos	3383-96-8	0.050	µg/L	<0.050	<0.050	0.0	No Limit
ES0907545-002	Anonymous	EP209-LL: Atrazine	1912-24-9	0.010	µg/L	<0.010	<0.010	0.0	No Limit
		EP209-LL: Hexazinone	51235-04-2	0.010	µg/L	<0.010	<0.010	0.0	No Limit
		EP209-LL: Molinate	2212-67-1	0.010	µg/L	<0.010	<0.010	0.0	No Limit
		EP209-LL: Propiconazole	60207-90-1	0.010	µg/L	<0.010	<0.010	0.0	No Limit
		EP209-LL: Chlorpyrifos	2921-88-2	0.050	µg/L	<0.050	<0.050	0.0	No Limit
		EP209-LL: Temephos	3383-96-8	0.050	µg/L	<0.050	<0.050	0.0	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	*Laboratory Control Spike (LCS) Report*			
					Spike	*Spike Recovery (%)*	*Recovery Limits (%)*	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EA005: pH (QCLot: 991611)								
EA005: pH Value	----	0.01	pH Unit	----	7.00 pH Unit	100	82	118
EA010P: Conductivity by PC Titrator (QCLot: 991841)								
EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	1412 µS/cm	100	90.3	108
EA015: Total Dissolved Solids (QCLot: 992565)								
EA015: Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	<1	2000 mg/L	94.8	86	106
EA025: Suspended Solids (QCLot: 992575)								
EA025: Suspended Solids (SS)	----	1	mg/L	<1	150 mg/L	93.3	86	108
EK026G: Total Cyanide By Discrete Analyser (QCLot: 998730)								
EK026G: Total Cyanide	57-12-5	0.004	mg/L	<0.004	0.5 mg/L	97.4	70	130
EP008: Chlorophyll a (QCLot: 991910)								
EP008: Chlorophyll a	----	5	mg/m3	<5	2000 mg/m3	76.0	70.7	119
EP074E: Halogenated Aliphatic Compounds (QCLot: 991825)								
EP074: 1.1.2-Trichloroethane	79-00-5	5	µg/L	<5	10 µg/L	91.7	69.2	133
EP074F: Halogenated Aromatic Compounds (QCLot: 993406)								
EP074-LL: 1.2.4-Trichlorobenzene	120-82-1	0.5	µg/L	<0.5	1 µg/L	115	68.3	128
EP075(SIM)A: Phenolic Compounds (QCLot: 992273)								
EP075(SIM): Phenol	108-95-2	1	µg/L	<1.0	5 µg/L	25.5	24	70
EP075(SIM): 2-Chlorophenol	95-57-8	1	µg/L	<1.0	5 µg/L	64.4	57	105
EP075(SIM): 2-Methylphenol	95-48-7	1	µg/L	<1.0	5 µg/L	62.3	51	96
EP075(SIM): 3- & 4-Methylphenol	1319-77-3	2	µg/L	<2.0	10 µg/L	52.0	45	94
EP075(SIM): 2-Nitrophenol	88-75-5	1	µg/L	<1.0	5 µg/L	74.5	48	132
EP075(SIM): 2.4-Dimethylphenol	105-67-9	1	µg/L	<1.0	5 µg/L	70.0	44	112
EP075(SIM): 2.4-Dichlorophenol	120-83-2	1	µg/L	<1.0	5 µg/L	91.0	60	114
EP075(SIM): 2.6-Dichlorophenol	87-65-0	1	µg/L	<1.0	5 µg/L	66.4	59	115
EP075(SIM): 4-Chloro-3-Methylphenol	59-50-7	1	µg/L	<1.0	5 µg/L	79.6	60	117
EP075(SIM): 2.4.6-Trichlorophenol	88-06-2	1	µg/L	<1.0	5 µg/L	86.9	59	123
EP075(SIM): 2.4.5-Trichlorophenol	95-95-4	1	µg/L	<1.0	5 µg/L	78.2	59	123
EP075(SIM): Pentachlorophenol	87-86-5	2	µg/L	<2.0	10 µg/L	49.4	22.1	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 992273)								
EP075(SIM): Naphthalene	91-20-3	1	µg/L	<1.0	5 µg/L	65.7	46	111
EP075(SIM): Acenaphthylene	208-96-8	1	µg/L	<1.0	5 µg/L	89.3	51	114
EP075(SIM): Acenaphthene	83-32-9	1	µg/L	<1.0	5 µg/L	64.6	50	114
EP075(SIM): Fluorene	86-73-7	1	µg/L	<1.0	5 µg/L	70.2	55	118

Sub-Matrix: **WATER**

				Method Blank (MB) Report	*Laboratory Control Spike (LCS) Report*			
					Spike	*Spike Recovery (%)*	*Recovery Limits (%)*	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 992273) - continued								
EP075(SIM): Phenanthrene	85-01-8	1	µg/L	<1.0	5 µg/L	67.7	54	110
EP075(SIM): Anthracene	120-12-7	1	µg/L	<1.0	5 µg/L	66.4	49	117
EP075(SIM): Fluoranthene	206-44-0	1	µg/L	<1.0	5 µg/L	72.1	51	117
EP075(SIM): Pyrene	129-00-0	1	µg/L	<1.0	5 µg/L	69.8	51	117
EP075(SIM): Benz(a)anthracene	56-55-3	1	µg/L	<1.0	5 µg/L	70.4	53	120
EP075(SIM): Chrysene	218-01-9	1	µg/L	<1.0	5 µg/L	65.0	48	114
EP075(SIM): Benzo(b)fluoranthene	205-99-2	1	µg/L	<1.0	5 µg/L	65.7	48	130
EP075(SIM): Benzo(k)fluoranthene	207-08-9	1	µg/L	<1.0	5 µg/L	66.8	43	126
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	5 µg/L	64.6	44	120
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	1	µg/L	<1.0	5 µg/L	74.1	45	129
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	1	µg/L	<1.0	5 µg/L	74.9	47	131
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	1	µg/L	<1.0	5 µg/L	70.2	42	126
EP080/071: Total Petroleum Hydrocarbons (QCLot: 991826)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	160 µg/L	98.2	73	135
EP080/071: Total Petroleum Hydrocarbons (QCLot: 992272)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	600 µg/L	68.5	49	110
EP071: C15 - C28 Fraction	----	100	µg/L	<100	1020 µg/L	75.0	58	130
EP071: C29 - C36 Fraction	----	50	µg/L	<50	----	----	----	----
EP080: BTEX (QCLot: 991826)								
EP080: Benzene	71-43-2	1	µg/L	<1	10 µg/L	97.2	77.6	122
EP080: Toluene	108-88-3	2	µg/L	<2	10 µg/L	102	74	122
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	10 µg/L	98.9	73	126
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	20 µg/L	96.8	70.4	129
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	10 µg/L	100	74.3	126
EP090: Organotin Compounds (Soluble) (QCLot: 993117)								
EP090S: Tributyltin	56573-85-4	2	ngSn/L	<2	1470 ngSn/L	# 122	29	100
EP130A: Organophosphorus Pesticides (Ultra-trace) (QCLot: 993051)								
EP130: Bromophos-ethyl	4824-78-6	0.10	µg/L	<0.12	1.0 µg/L	114	35.4	143
EP130: Carbophenothion	786-19-6	0.10	µg/L	<0.12	1.0 µg/L	102	5.13	171
EP130: Chlorfenvinphos (Z)	470-90-8	0.10	µg/L	<0.12	1.0 µg/L	110	44.6	155
EP130: Chlorpyrifos	2921-88-2	0.05	µg/L	<0.050	1.0 µg/L	110	38.5	145
EP130: Chlorpyrifos-methyl	5598-13-0	0.10	µg/L	<0.12	1.0 µg/L	104	40.3	135
EP130: Demeton-S-methyl	919-86-8	0.10	µg/L	<0.12	1.0 µg/L	116	20.7	178
EP130: Diazinon	333-41-5	0.10	µg/L	<0.12	1.0 µg/L	103	38.7	146
EP130: Dichlorvos	62-73-7	0.10	µg/L	<0.12	1.0 µg/L	76.0	18.4	151
EP130: Dimethoate	60-51-5	0.10	µg/L	<0.12	1.0 µg/L	103	27.4	131
EP130: Ethion	563-12-2	0.10	µg/L	<0.12	1.0 µg/L	116	36.1	147

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EP130A: Organophosphorus Pesticides (Ultra-trace) (QCLot: 993051) - continued								
EP130: Fenamiphos	22224-92-6	0.10	µg/L	<0.12	1.0 µg/L	126	4.43	168
EP130: Fenthion	55-38-9	0.10	µg/L	<0.12	1.0 µg/L	101	23.2	145
EP130: Malathion	121-75-5	0.10	µg/L	<0.12	1.0 µg/L	107	40.7	136
EP130: Azinphos Methyl	86-50-0	0.10	µg/L	<0.12	1.0 µg/L	20.5	1.35	163
EP130: Monocrotophos	6923-22-4	0.10	µg/L	<0.12	1.0 µg/L	38.6	10	86.3
EP130: Parathion	56-38-2	0.10	µg/L	<0.12	1.0 µg/L	115	35.5	141
EP130: Parathion-methyl	298-00-0	0.10	µg/L	<0.12	1.0 µg/L	106	31.1	144
EP130: Pirimphos-ethyl	23505-41-1	0.10	µg/L	<0.12	1.0 µg/L	108	38.9	142
EP130: Prothiofos	34643-46-4	0.10	µg/L	<0.12	1.0 µg/L	116	40	138
EP131A: Organochlorine Pesticides (QCLot: 993050)								
EP131A: Aldrin	309-00-2	0.001	µg/L	----	0.1 µg/L	53.4	35.8	139
		0.01	µg/L	<0.010	----	----	----	----
EP131A: alpha-BHC	319-84-6	0.001	µg/L	----	0.1 µg/L	32.3	19.7	153
		0.01	µg/L	<0.010	----	----	----	----
EP131A: beta-BHC	319-85-7	0.001	µg/L	----	0.1 µg/L	69.8	43.8	136
		0.01	µg/L	<0.010	----	----	----	----
EP131A: delta-BHC	319-86-8	0.001	µg/L	----	0.1 µg/L	76.1	37.4	144
		0.01	µg/L	<0.010	----	----	----	----
EP131A: 4.4`-DDD	72-54-8	0.001	µg/L	----	0.1 µg/L	107	37.5	145
		0.01	µg/L	<0.010	----	----	----	----
EP131A: 4.4`-DDE	72-55-9	0.001	µg/L	----	0.1 µg/L	70.0	30.5	146
		0.01	µg/L	<0.010	----	----	----	----
EP131A: 4.4`-DDT	50-29-3	0.001	µg/L	----	0.1 µg/L	113	31	151
		0.01	µg/L	<0.010	----	----	----	----
EP131A: DDT (total)	----	0.01	µg/L	<0.010	----	----	----	----
EP131A: Dieldrin	60-57-1	0.001	µg/L	----	0.1 µg/L	105	34.4	145
		0.01	µg/L	<0.010	----	----	----	----
EP131A: alpha-Endosulfan	959-98-8	0.001	µg/L	----	0.1 µg/L	87.6	30.2	141
		0.01	µg/L	<0.010	----	----	----	----
EP131A: beta-Endosulfan	33213-65-9	0.001	µg/L	----	0.1 µg/L	105	30.3	148
		0.01	µg/L	<0.010	----	----	----	----
EP131A: Endosulfan sulfate	1031-07-8	0.001	µg/L	----	0.1 µg/L	109	19.1	150
		0.01	µg/L	<0.010	----	----	----	----
EP131A: Endosulfan (sum)	115-29-7	0.01	µg/L	<0.010	----	----	----	----
EP131A: Endrin	72-20-8	0.001	µg/L	----	0.1 µg/L	99.5	13	165
		0.01	µg/L	<0.010	----	----	----	----
EP131A: Endrin aldehyde	7421-93-4	0.001	µg/L	----	0.1 µg/L	80.4	28.3	134
		0.01	µg/L	<0.010	----	----	----	----
EP131A: Endrin ketone	53494-70-5	0.001	µg/L	----	0.1 µg/L	101	15.1	146
		0.01	µg/L	<0.010	----	----	----	----

Sub-Matrix: **WATER**

				Method Blank (MB) Report	*Laboratory Control Spike (LCS) Report*			
					Spike	*Spike Recovery (%)*	*Recovery Limits (%)*	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EP131A: Organochlorine Pesticides (QCLot: 993050) - continued								
EP131A: Heptachlor	76-44-8	0.001	µg/L	----	0.1 µg/L	44.3	33.2	148
		0.005	µg/L	<0.005	----	----	----	----
EP131A: Heptachlor epoxide	1024-57-3	0.001	µg/L	----	0.1 µg/L	78.6	36	143
		0.01	µg/L	<0.010	----	----	----	----
EP131A: Hexachlorobenzene (HCB)	118-74-1	0.001	µg/L	----	0.1 µg/L	39.2	14	146
		0.01	µg/L	<0.010	----	----	----	----
EP131A: gamma-BHC	58-89-9	0.001	µg/L	----	0.1 µg/L	37.2	27.2	147
		0.01	µg/L	<0.010	----	----	----	----
EP131A: Methoxychlor	72-43-5	0.001	µg/L	----	0.1 µg/L	103	34.4	150
		0.01	µg/L	<0.010	----	----	----	----
EP131A: cis-Chlordane	5103-71-9	0.001	µg/L	----	0.1 µg/L	91.6	15.4	152
		0.01	µg/L	<0.010	----	----	----	----
EP131A: trans-Chlordane	5103-74-2	0.001	µg/L	----	0.1 µg/L	79.9	45.1	140
		0.01	µg/L	<0.010	----	----	----	----
EP131A: Total Chlordane (sum)	----	0.01	µg/L	<0.010	----	----	----	----
EP202A: Phenoxyacetic Acid Herbicides by LCMS (QCLot: 990327)								
EP202-LL: 4-Chlorophenoxy acetic acid	122-88-3	0.01	µg/L	<0.01	0.1 µg/L	92.6	20.1	106
EP202-LL: 2.4-DB	94-82-6	0.01	µg/L	<0.01	0.1 µg/L	123	24	142
EP202-LL: Dicamba	1918-00-9	0.01	µg/L	<0.01	0.1 µg/L	81.5	21	139
EP202-LL: Mecoprop	93-65-2	0.01	µg/L	<0.01	0.1 µg/L	128	42.6	147
EP202-LL: MCPA	94-74-6	0.01	µg/L	<0.01	0.1 µg/L	122	33.9	144
EP202-LL: 2.4-DP	120-36-5	0.01	µg/L	<0.01	0.1 µg/L	125	39.2	144
EP202-LL: 2.4-D	94-75-7	0.01	µg/L	<0.01	0.1 µg/L	102	39.3	149
EP202-LL: Triclopyr	55335-06-3	0.01	µg/L	<0.01	0.1 µg/L	118	34.5	145
EP202-LL: 2.4.5-TP (Silvex)	93-72-1	0.01	µg/L	<0.01	0.1 µg/L	125	34.3	144
EP202-LL: 2.4.5-T	93-76-5	0.01	µg/L	<0.01	0.1 µg/L	125	26.3	146
EP202-LL: MCPB	94-81-5	0.01	µg/L	<0.01	0.1 µg/L	120	24.3	141
EP202-LL: Picloram	1918-02-1	0.05	µg/L	<0.05	0.1 µg/L	62.1	21.3	142
EP202-LL: Clopyralid	1702-17-6	0.05	µg/L	<0.05	0.1 µg/L	67.2	7.18	150
EP202-LL: Fluroxypyr	69377-81-7	0.05	µg/L	<0.05	0.1 µg/L	108	25.1	136
EP202-LL: 2.6-D	575-90-6	0.1	µg/L	<0.1	0.1 µg/L	118	37.3	140
EP202-LL: 2.4.6-T	575-89-3	0.1	µg/L	<0.1	0.1 µg/L	123	39	134
EP202A: Phenoxyacetic Acid Herbicides by LCMS (QCLot: 993089)								
EP202-LL: 4-Chlorophenoxy acetic acid	122-88-3	0.01	µg/L	<0.01	0.1 µg/L	95.6	20.1	106
EP202-LL: 2.4-DB	94-82-6	0.01	µg/L	<0.01	0.1 µg/L	120	24	142
EP202-LL: Dicamba	1918-00-9	0.01	µg/L	<0.01	0.1 µg/L	75.4	21	139
EP202-LL: Mecoprop	93-65-2	0.01	µg/L	<0.01	0.1 µg/L	115	42.6	147
EP202-LL: MCPA	94-74-6	0.01	µg/L	<0.01	0.1 µg/L	118	33.9	144
EP202-LL: 2.4-DP	120-36-5	0.01	µg/L	<0.01	0.1 µg/L	116	39.2	144

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EP202A: Phenoxyacetic Acid Herbicides by LCMS (QCLot: 993089) - continued								
EP202-LL: 2.4-D	94-75-7	0.01	µg/L	<0.01	0.1 µg/L	103	39.3	149
EP202-LL: Triclopyr	55335-06-3	0.01	µg/L	<0.01	0.1 µg/L	124	34.5	145
EP202-LL: 2.4.5-TP (Silvex)	93-72-1	0.01	µg/L	<0.01	0.1 µg/L	123	34.3	144
EP202-LL: 2.4.5-T	93-76-5	0.01	µg/L	<0.01	0.1 µg/L	118	26.3	146
EP202-LL: MCPB	94-81-5	0.01	µg/L	<0.01	0.1 µg/L	119	24.3	141
EP202-LL: Picloram	1918-02-1	0.05	µg/L	<0.05	0.1 µg/L	46.4	21.3	142
EP202-LL: Clopyralid	1702-17-6	0.05	µg/L	<0.05	0.1 µg/L	76.3	7.18	150
EP202-LL: Fluroxypyr	69377-81-7	0.05	µg/L	<0.05	0.1 µg/L	90.7	25.1	136
EP202-LL: 2.6-D	575-90-6	0.1	µg/L	<0.1	0.1 µg/L	116	37.3	140
EP202-LL: 2.4.6-T	575-89-3	0.1	µg/L	<0.1	0.1 µg/L	123	39	134
EP209: Multiresidue Pesticide Residue Screen (Suite 1) (QCLot: 990326)								
EP209-LL: Atrazine	1912-24-9	0.01	µg/L	<0.010	0.05 µg/L	79.0	68.1	142
EP209-LL: Chlorpyrifos	2921-88-2	0.01	µg/L	<0.010	0.05 µg/L	96.3	58	134
EP209-LL: Hexazinone	51235-04-2	0.01	µg/L	<0.010	0.05 µg/L	94.9	75.5	142
EP209-LL: Molinate	2212-67-1	0.01	µg/L	<0.010	0.05 µg/L	70.4	54	138
EP209-LL: Propiconazole	60207-90-1	0.01	µg/L	<0.010	0.05 µg/L	80.2	64	130
EP209-LL: Temephos	3383-96-8	0.01	µg/L	<0.010	0.05 µg/L	70.5	59	129
EP215: Multiresidue Pesticide Residue Screen (Suite 2) (QCLot: 994750)								
EP215-LL: Simazine	122-34-9	0.005	µg/L	<0.005	0.0125 µg/L	75.4	65	130
EP215-LL: Diuron	330-54-1	0.005	µg/L	<0.005	0.0125 µg/L	93.0	65	130
EP215-LL: Atrazine	1912-24-9	0.005	µg/L	<0.005	0.0125 µg/L	76.8	65	130
EP215-LL: Molinate	2212-67-1	0.005	µg/L	<0.005	0.0125 µg/L	72.4	65	130
EP215-LL: Metolachlor	51218-45-2	0.005	µg/L	<0.005	0.0125 µg/L	97.3	65	130
EP215-LL: Malathion	121-75-5	0.002	µg/L	<0.002	0.0125 µg/L	106	65	130
EP215-LL: Diazinon	333-41-5	0.005	µg/L	<0.005	0.0125 µg/L	70.1	65	130
EP215-LL: Thiobencarb	28249-77-6	0.005	µg/L	<0.005	0.0125 µg/L	68.9	65	130
EP215-LL: Chlorpyrifos	2921-88-2	0.005	µg/L	<0.005	0.0125 µg/L	78.6	65	130
EP215-LL: Trifluralin	1582-09-8	0.005	µg/L	<0.005	0.0125 µg/L	65.2	65	130

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	Spike Recovery (%)	Recovery Limits (%)	
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EK026G: Total Cyanide By Discrete Analyser (QCLot: 998730)							
EB0908368-002	G-WQ-03	EK026G: Total Cyanide	57-12-5	0.2 mg/L	85.5	70	130
EP075(SIM)A: Phenolic Compounds (QCLot: 992273)							
EB0908450-003	Anonymous	EP075(SIM): Phenol	108-95-2	5.0 µg/L	# Not Determined	20	130
		EP075(SIM): 2-Chlorophenol	95-57-8	5.0 µg/L	79.8	70	130
		EP075(SIM): 2-Nitrophenol	88-75-5	5.0 µg/L	98.2	70	130
		EP075(SIM): 4-Chloro-3-Methylphenol	59-50-7	5.0 µg/L	84.2	70	130
		EP075(SIM): Pentachlorophenol	87-86-5	5.0 µg/L	96.5	70	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 992273)							
EB0908450-003	Anonymous	EP075(SIM): Acenaphthene	83-32-9	5.0 µg/L	84.2	70	130
		EP075(SIM): Pyrene	129-00-0	5.0 µg/L	84.0	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 991826)							
EB0908368-001	G-WQ-02	EP080: C6 - C9 Fraction	----	140 µg/L	77.9	70	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 992272)							
EB0908450-002	Anonymous	EP071: C10 - C14 Fraction	----	600 µg/L	82.9	70	130
		EP071: C15 - C28 Fraction	----	1020 µg/L	80.0	70	130
EP080: BTEX (QCLot: 991826)							
EB0908368-001	G-WQ-02	EP080: Benzene	71-43-2	10 µg/L	94.8	70	130
		EP080: Toluene	108-88-3	10 µg/L	88.6	70	130
EP130A: Organophosphorus Pesticides (Ultra-trace) (QCLot: 993051)							
EB0908368-006	QA2	EP130: Bromophos-ethyl	4824-78-6	1.0 µg/L	76.2	35.4	143
		EP130: Carbophenothion	786-19-6	1.0 µg/L	67.8	5.13	171
		EP130: Chlorfenvinphos (Z)	470-90-8	1.0 µg/L	73.0	44.6	155
		EP130: Chlorpyrifos	2921-88-2	1.0 µg/L	71.0	38.5	145
		EP130: Chlorpyrifos-methyl	5598-13-0	1.0 µg/L	64.7	40.3	135
		EP130: Demeton-S-methyl	919-86-8	1.0 µg/L	70.6	20.7	178
		EP130: Diazinon	333-41-5	1.0 µg/L	64.0	38.7	146
		EP130: Dichlorvos	62-73-7	1.0 µg/L	41.5	18.4	151
		EP130: Dimethoate	60-51-5	1.0 µg/L	67.8	27.4	131
		EP130: Ethion	563-12-2	1.0 µg/L	75.4	36.1	147
		EP130: Fenamiphos	22224-92-6	1.0 µg/L	83.9	4.43	168
		EP130: Fenthion	55-38-9	1.0 µg/L	70.1	23.2	145
		EP130: Malathion	121-75-5	1.0 µg/L	70.3	40.7	136
		EP130: Azinphos Methyl	86-50-0	1.0 µg/L	15.2	1.35	163
		EP130: Monocrotophos	6923-22-4	1.0 µg/L	39.3	10	86.3

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	Spike Recovery (%)	Recovery Limits (%)	
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EP130A: Organophosphorus Pesticides (Ultra-trace) (QCLot: 993051) - continued							
EB0908368-006	QA2	EP130: Parathion	56-38-2	1.0 µg/L	74.7	35.5	141
		EP130: Parathion-methyl	298-00-0	1.0 µg/L	68.5	31.1	144
		EP130: Pirimphos-ethyl	23505-41-1	1.0 µg/L	73.6	38.9	142
		EP130: Prothiofos	34643-46-4	1.0 µg/L	75.7	40	138
EP131A: Organochlorine Pesticides (QCLot: 993050)							
EB0908368-006	QA2	EP131A: Aldrin	309-00-2	0.1 µg/L	39.4	35.8	139
		EP131A: alpha-BHC	319-84-6	0.1 µg/L	23.8	19.7	153
		EP131A: beta-BHC	319-85-7	0.1 µg/L	# 34.8	43.8	136
		EP131A: delta-BHC	319-86-8	0.1 µg/L	49.9	37.4	144
		EP131A: 4.4`-DDD	72-54-8	0.1 µg/L	83.9	37.5	145
		EP131A: 4.4`-DDE	72-55-9	0.1 µg/L	56.8	30.5	146
		EP131A: 4.4`-DDT	50-29-3	0.1 µg/L	82.4	31	151
		EP131A: Dieldrin	60-57-1	0.1 µg/L	78.7	34.4	145
		EP131A: alpha-Endosulfan	959-98-8	0.1 µg/L	66.9	30.2	141
		EP131A: beta-Endosulfan	33213-65-9	0.1 µg/L	83.8	30.3	148
		EP131A: Endosulfan sulfate	1031-07-8	0.1 µg/L	81.8	19.1	150
		EP131A: Endrin	72-20-8	0.1 µg/L	89.5	13	165
		EP131A: Endrin aldehyde	7421-93-4	0.1 µg/L	63.6	28.3	134
		EP131A: Endrin ketone	53494-70-5	0.1 µg/L	77.4	15.1	146
		EP131A: Heptachlor	76-44-8	0.1 µg/L	# 30.3	33.2	148
		EP131A: Heptachlor epoxide	1024-57-3	0.1 µg/L	55.0	36	143
		EP131A: Hexachlorobenzene (HCB)	118-74-1	0.1 µg/L	27.6	14	146
		EP131A: gamma-BHC	58-89-9	0.1 µg/L	# 26.1	27.2	147
		EP131A: Methoxychlor	72-43-5	0.1 µg/L	85.3	34.4	150
		EP131A: cis-Chlordane	5103-71-9	0.1 µg/L	68.1	15.4	152
		EP131A: trans-Chlordane	5103-74-2	0.1 µg/L	59.0	45.1	140
EP202A: Phenoxyacetic Acid Herbicides by LCMS (QCLot: 990327)							
ES0907545-001	Anonymous	EP202-LL: 4-Chlorophenoxy acetic acid	122-88-3	0.1 µg/L	89.3	33.8	106
		EP202-LL: 2.4-DB	94-82-6	0.1 µg/L	85.8	22.5	142
		EP202-LL: Dicamba	1918-00-9	0.1 µg/L	96.8	20.3	138
		EP202-LL: Mecoprop	93-65-2	0.1 µg/L	115	44.6	137
		EP202-LL: MCPA	94-74-6	0.1 µg/L	121	36.4	142
		EP202-LL: 2.4-DP	120-36-5	0.1 µg/L	124	39.0	146
		EP202-LL: 2.4-D	94-75-7	0.1 µg/L	122	41.8	138
		EP202-LL: Triclopyr	55335-06-3	0.1 µg/L	127	41.4	139
		EP202-LL: 2.4.5-TP (Silvex)	93-72-1	0.1 µg/L	123	37.0	126
		EP202-LL: 2.4.5-T	93-76-5	0.1 µg/L	118	31.1	135
		EP202-LL: MCPB	94-81-5	0.1 µg/L	89.9	22.8	136

Sub-Matrix: **WATER**

Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*Matrix Spike (MS) Report*			
				Spike Concentration	*Spike Recovery (%)*	*Recovery Limits (%)*	
					MS	*Low*	*High*
EP202A: Phenoxyacetic Acid Herbicides by LCMS (QCLot: 990327) - continued							
ES0907545-001	Anonymous	EP202-LL: Picloram	1918-02-1	0.1 µg/L	71.9	20.6	124
		EP202-LL: Clopyralid	1702-17-6	0.1 µg/L	80.3	15.3	118
		EP202-LL: Fluroxypyr	69377-81-7	0.1 µg/L	89.7	37.3	115
		EP202-LL: 2.6-D	575-90-6	0.1 µg/L	102	34.4	146
		EP202-LL: 2.4.6-T	575-89-3	0.1 µg/L	# 124	43.2	123
EP202A: Phenoxyacetic Acid Herbicides by LCMS (QCLot: 993089)							
ES0907726-002	Anonymous	EP202-LL: 4-Chlorophenoxy acetic acid	122-88-3	0.1 µg/L	94.8	33.8	106
		EP202-LL: 2.4-DB	94-82-6	0.1 µg/L	81.0	22.5	142
		EP202-LL: Dicamba	1918-00-9	0.1 µg/L	116	20.3	138
		EP202-LL: Mecoprop	93-65-2	0.1 µg/L	123	44.6	137
		EP202-LL: MCPA	94-74-6	0.1 µg/L	110	36.4	142
		EP202-LL: 2.4-DP	120-36-5	0.1 µg/L	123	39.0	146
		EP202-LL: 2.4-D	94-75-7	0.1 µg/L	110	41.8	138
		EP202-LL: Triclopyr	55335-06-3	0.1 µg/L	115	41.4	139
		EP202-LL: 2.4.5-TP (Silvex)	93-72-1	0.1 µg/L	118	37.0	126
		EP202-LL: 2.4.5-T	93-76-5	0.1 µg/L	117	31.1	135
		EP202-LL: MCPB	94-81-5	0.1 µg/L	83.9	22.8	136
		EP202-LL: Picloram	1918-02-1	0.1 µg/L	68.8	20.6	124
		EP202-LL: Clopyralid	1702-17-6	0.1 µg/L	89.3	15.3	118
		EP202-LL: Fluroxypyr	69377-81-7	0.1 µg/L	98.4	37.3	115
		EP202-LL: 2.6-D	575-90-6	0.1 µg/L	96.6	34.4	146
		EP202-LL: 2.4.6-T	575-89-3	0.1 µg/L	116	43.2	123
EP209: Multiresidue Pesticide Residue Screen (Suite 1) (QCLot: 990326)							
ES0907545-001	Anonymous	EP209-LL: Atrazine	1912-24-9	0.05 µg/L	80.5	70	130
		EP209-LL: Chlorpyrifos	2921-88-2	0.05 µg/L	91.9	70	130
		EP209-LL: Hexazinone	51235-04-2	0.05 µg/L	94.9	70	130
		EP209-LL: Molinate	2212-67-1	0.05 µg/L	85.0	70	130
		EP209-LL: Propiconazole	60207-90-1	0.05 µg/L	80.9	70	130
		EP209-LL: Temephos	3383-96-8	0.05 µg/L	94.8	70	130

Environmental Division

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: **EB0908368**	Page	: 1 of 10
Client	: GHD SERVICES PTY LTD	Laboratory	: Environmental Division Brisbane
Contact	: MR ADRIAN WHITE	Contact	: Tim Kilmister
Address	: P O BOX 373 GLADSTONE QLD, AUSTRALIA 4680	Address	: 32 Shand Street Stafford QLD Australia 4053
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Facsimile	: +61 07 4972 6236	Facsimile	: +61-7-3243 7218
Project	: 421538641 Western Basin EIS WQ Monitoring	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 27-MAY-2009
Sampler	: ----	Issue Date	: 10-JUN-2009
Order number	: ----		
		No. of samples received	: 6
Quote number	: EN/005/09	No. of samples analysed	: 6

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Interpretive Quality Control Report contains the following information:

- Analysis Holding Time Compliance
- Quality Control Parameter Frequency Compliance
- Brief Method Summaries
- Summary of Outliers

Analysis Holding Time Compliance

The following report summarises extraction / preparation and analysis times and compares with recommended holding times. Dates reported represent first date of extraction or analysis and precludes subsequent dilutions and reruns. Information is also provided re the sample container (preservative) from which the analysis aliquot was taken. Elapsed period to analysis represents number of days from sampling where no extraction / digestion is involved or period from extraction / digestion where this is present. For composite samples, sampling date is assumed to be that of the oldest sample contributing to the composite. Sample date for laboratory produced leachates is assumed as the completion date of the leaching process. Outliers for holding time are based on USEPA SW 846, APHA, AS and NEPM (1999). A listing of breaches is provided in the Summary of Outliers.

Holding times for leachate methods (excluding elutriates) vary according to the analytes being determined on the resulting solution. For non -volatile analytes, the holding time compliance assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These soil holding times are: Organics (14 days); Mercury (28 days) & other metals (180 days). A recorded breach therefore does not guarantee a breach for all non-volatile parameters.

Matrix: **WATER**

Evaluation: ✗ = Holding time breach ; ✓ = Within holding time.

Method	*Sample Date*	*Extraction / Preparation*			*Analysis*		
Container / Client Sample ID(s)		*Date extracted*	*Due for extraction*	*Evaluation*	*Date analysed*	*Due for analysis*	*Evaluation*
EA005: pH							
Clear Plastic Bottle - Natural G-WQ-02, G-WQ-03, G-WQ-06, G-WQ-07, G-WQ-09, QA2	**26-MAY-2009**	**----**	----	----	**27-MAY-2009**	26-MAY-2009	✗
EA010P: Conductivity by PC Titrator							
Clear Plastic Bottle - Natural G-WQ-02, G-WQ-03, G-WQ-06, G-WQ-07, G-WQ-09, QA2	**26-MAY-2009**	**---**	---	----	**28-MAY-2009**	23-JUN-2009	✓
EA015: Total Dissolved Solids							
Clear Plastic Bottle - Natural G-WQ-02, G-WQ-03, G-WQ-06, G-WQ-07, G-WQ-09, QA2	**26-MAY-2009**	**----**	----	----	**28-MAY-2009**	02-JUN-2009	✓
EA025: Suspended Solids							
Clear Plastic Bottle - Natural G-WQ-02, G-WQ-03, G-WQ-06, G-WQ-07, G-WQ-09, QA2	**26-MAY-2009**	**----**	----	----	**28-MAY-2009**	02-JUN-2009	✓
EK026G: Total Cyanide By Discrete Analyser							
White Plastic Bottle - NaOH/Cadmium Nitrate G-WQ-02, G-WQ-03, G-WQ-06, G-WQ-07, G-WQ-09, QA2	**26-MAY-2009**	**04-JUN-2009**	09-JUN-2009	✓	**04-JUN-2009**	09-JUN-2009	✓
EP008: Chlorophyll a							
White Plastic Bottle - Unpreserved G-WQ-02, G-WQ-03, G-WQ-06, G-WQ-07, G-WQ-09, QA2	**26-MAY-2009**	**----**	----	----	**28-MAY-2009**	28-MAY-2009	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method	*Sample Date*	*Extraction / Preparation*			*Analysis*		
Container / Client Sample ID(s)		*Date extracted*	*Due for extraction*	*Evaluation*	*Date analysed*	*Due for analysis*	*Evaluation*
EP074E: Halogenated Aliphatic Compounds							
Amber VOC Vial - HCl or NaHSO4 G-WQ-02, G-WQ-03, G-WQ-06, G-WQ-07, G-WQ-09, QA2	**26-MAY-2009**	**---**	---	----	**28-MAY-2009**	09-JUN-2009	✓
EP074F: Halogenated Aromatic Compounds							
Amber VOC Vial - HCl or NaHSO4 G-WQ-02, G-WQ-03, G-WQ-06, G-WQ-07, G-WQ-09, QA2	**26-MAY-2009**	**----**	----	----	**29-MAY-2009**	09-JUN-2009	✓
EP075(SIM)A: Phenolic Compounds							
Amber Glass Bottle - Unpreserved G-WQ-02, G-WQ-03, G-WQ-06, G-WQ-07, G-WQ-09, QA2	**26-MAY-2009**	**29-MAY-2009**	02-JUN-2009	✓	**29-MAY-2009**	08-JUL-2009	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Amber Glass Bottle - Unpreserved G-WQ-02, G-WQ-03, G-WQ-06, G-WQ-07, G-WQ-09, QA2	**26-MAY-2009**	**29-MAY-2009**	02-JUN-2009	✓	**29-MAY-2009**	08-JUL-2009	✓
EP080/071: Total Petroleum Hydrocarbons							
Amber Glass Bottle - Unpreserved G-WQ-02, G-WQ-03, G-WQ-06, G-WQ-07, G-WQ-09, QA2	**26-MAY-2009**	**29-MAY-2009**	02-JUN-2009	✓	**29-MAY-2009**	08-JUL-2009	✓
Amber VOC Vial - HCl or NaHSO4 G-WQ-02, G-WQ-03, G-WQ-06, G-WQ-07, G-WQ-09, QA2	**26-MAY-2009**	**---**	---	----	**28-MAY-2009**	09-JUN-2009	✓
EP080: BTEX							
Amber VOC Vial - HCl or NaHSO4 G-WQ-02, G-WQ-03, G-WQ-06, G-WQ-07, G-WQ-09, QA2	**26-MAY-2009**	**---**	---	----	**28-MAY-2009**	09-JUN-2009	✓
EP090: Organotin Compounds (Soluble)							
Amber Glass Bottle - Unpreserved G-WQ-02, G-WQ-03, G-WQ-06, G-WQ-07, G-WQ-09, QA2	**26-MAY-2009**	**01-JUN-2009**	02-JUN-2009	✓	**01-JUN-2009**	11-JUL-2009	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method	***Sample Date***	*Extraction / Preparation*			*Analysis*		
***Container** / Client Sample ID(s)*		***Date extracted***	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*
EP130A: Organophosphorus Pesticides (Ultra-trace)							
Amber Glass Bottle - Unpreserved G-WQ-02, G-WQ-03, G-WQ-06, G-WQ-07, G-WQ-09, QA2	**26-MAY-2009**	**29-MAY-2009**	02-JUN-2009	✓	**02-JUN-2009**	08-JUL-2009	✓
EP131A: Organochlorine Pesticides							
Amber Glass Bottle - Unpreserved G-WQ-02, G-WQ-03, G-WQ-06, G-WQ-07, G-WQ-09, QA2	**26-MAY-2009**	**29-MAY-2009**	02-JUN-2009	✓	**02-JUN-2009**	08-JUL-2009	✓
EP202A: Phenoxyacetic Acid Herbicides by LCMS							
Amber Glass Bottle - Unpreserved G-WQ-02, G-WQ-03, G-WQ-06, G-WQ-07, G-WQ-09, QA2	**26-MAY-2009**	**----**	----	----	**01-JUN-2009**	02-JUN-2009	✓
EP209: Multiresidue Pesticide Residue Screen (Suite 1)							
Amber Glass Bottle - Unpreserved G-WQ-02, G-WQ-03, G-WQ-06, G-WQ-07, G-WQ-09, QA2	**26-MAY-2009**	**----**	----	----	**02-JUN-2009**	02-JUN-2009	✓
EP215: Multiresidue Pesticide Residue Screen (Suite 2)							
Amber Glass Bottle - Unpreserved G-WQ-02, G-WQ-03, G-WQ-06, G-WQ-07, G-WQ-09, QA2	**26-MAY-2009**	**01-JUN-2009**	02-JUN-2009	✓	**04-JUN-2009**	11-JUL-2009	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(where) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: ✗ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Chlorophyll a	EP008	2	18	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Conductivity by PC Titrator	EA010-P	2	11	**18.2**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Multiresidue Pesticide Screen (N0. 1) - Low Level	EP209-LL	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Organochlorine Pesticides (Ultra-trace)	EP131A	1	6	**16.7**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Organophosphorus Pesticides (Ultra-trace)	EP130	1	6	**16.7**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	9	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
pH	EA005	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Phenoxyacetic Acid Herbicides (LCMS - Low DL)	EP202-LL	3	26	**11.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Suspended Solids	EA025	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Cyanide By Discrete Analyser	EK026G	2	15	**13.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids	EA015	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071	1	17	**5.9**	**10.0**	✗	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	2	13	**15.4**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Ultra-trace Volatile Organic Compounds	EP074-LL	2	11	**18.2**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Volatile Organic Compounds	EP074	1	7	**14.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
Chlorophyll a	EP008	1	18	**5.6**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Conductivity by PC Titrator	EA010-P	1	11	**9.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Multiresidue Pesticide Screen (N0. 1) - Low Level	EP209-LL	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Multiresidue Pesticide Screen (No. 2)	EP215-LL	1	6	**16.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Organochlorine Pesticides (Ultra-trace)	EP131A	1	6	**16.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Organophosphorus Pesticides (Ultra-trace)	EP130	1	6	**16.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Organotin Compounds (Soluble)	EP090S	1	7	**14.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
pH	EA005	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Phenoxyacetic Acid Herbicides (LCMS - Low DL)	EP202-LL	2	26	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Suspended Solids	EA025	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Cyanide By Discrete Analyser	EK026G	1	15	**6.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids	EA015	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071	1	17	**5.9**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	1	13	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Ultra-trace Volatile Organic Compounds	EP074-LL	1	11	**9.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Volatile Organic Compounds	EP074	1	7	**14.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
Chlorophyll a	EP008	1	18	**5.6**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Method Blanks (MB) - Continued							
Conductivity by PC Titrator	EA010-P	1	11	**9.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Multiresidue Pesticide Screen (N0. 1) - Low Level	EP209-LL	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Multiresidue Pesticide Screen (No. 2)	EP215-LL	1	6	**16.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Organochlorine Pesticides (Ultra-trace)	EP131A	1	6	**16.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Organophosphorus Pesticides (Ultra-trace)	EP130	1	6	**16.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Organotin Compounds (Soluble)	EP090S	1	7	**14.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Phenoxyacetic Acid Herbicides (LCMS - Low DL)	EP202-LL	2	26	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Suspended Solids	EA025	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Cyanide By Discrete Analyser	EK026G	1	15	**6.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids	EA015	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071	1	17	**5.9**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	1	13	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Ultra-trace Volatile Organic Compounds	EP074-LL	1	11	**9.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Volatile Organic Compounds	EP074	1	7	**14.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							
Multiresidue Pesticide Screen (N0. 1) - Low Level	EP209-LL	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement
Organochlorine Pesticides (Ultra-trace)	EP131A	1	6	**16.7**	**5.0**	✓	ALS QCS3 requirement
Organophosphorus Pesticides (Ultra-trace)	EP130	1	6	**16.7**	**5.0**	✓	ALS QCS3 requirement
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	9	**11.1**	**5.0**	✓	ALS QCS3 requirement
Phenoxyacetic Acid Herbicides (LCMS - Low DL)	EP202-LL	2	26	**7.7**	**5.0**	✓	ALS QCS3 requirement
Total Cyanide By Discrete Analyser	EK026G	1	15	**6.7**	**5.0**	✓	ALS QCS3 requirement
TPH - Semivolatile Fraction	EP071	1	17	**5.9**	**5.0**	✓	ALS QCS3 requirement
TPH Volatiles/BTEX	EP080	1	13	**7.7**	**5.0**	✓	ALS QCS3 requirement
Ultra-trace Volatile Organic Compounds	EP074-LL	1	11	**9.1**	**5.0**	✓	ALS QCS3 requirement
Volatile Organic Compounds	EP074	1	7	**14.3**	**5.0**	✓	ALS QCS3 requirement

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
pH	EA005	WATER	APHA 21st ed. 4500 H+ B. pH of water samples is determined by ISE either manually or by automated pH meter. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Conductivity by PC Titrator	EA010-P	WATER	APHA 21st ed., 2510 B This procedure determines conductivity by automated ISE. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Dissolved Solids	EA015	WATER	APHA 21st ed., 2540C A gravimetric procedure that determines the amount of `filterable` residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+5C. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Suspended Solids	EA025	WATER	APHA 21st ed., 2540D A gravimetric procedure employed to determine the amount of `non-filterable` residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Cyanide By Discrete Analyser	EK026G	WATER	APHA 21st ed., 4500-CN-C & N Total Cyanide is determined from aqueous solutions after distillation with sulphuric acid. The resultant distillate is then captured in a caustic absorber solution followed by Discrete Analyser. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Chlorophyll a	EP008	WATER	In-house (APHA 21st ed., 10200 H mod.) The pigments are extracted into aqueous acetone. The optical density of the extract before and after acidification at both 664 nm and 665 nm is determined spectrometrically.
TPH - Semivolatile Fraction	EP071	WATER	USEPA SW 846 - 8015A The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Volatile Organic Compounds	EP074	WATER	USEPA SW 846 - 8260B Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Ultra-trace Volatile Organic Compounds	EP074-LL	WATER	(USEPA SW 846 - 8260B, ALS QWI-ORG/EP074) Water samples are directly purged (ALSQWI-ORG/16) prior to analysis by Capillary GC/MS in Selected Ion Monitoring mode. Quantitation is achieved using internal standardisation against a multi-point calibration curve.
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	WATER	USEPA SW 846 - 8270D Sample extracts are analysed by Capillary GC/MS in SIM Mode and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
TPH Volatiles/BTEX	EP080	WATER	USEPA SW 846 - 8260B Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Organotin Compounds (Soluble)	EP090S	WATER	USEPA SW 846 - 8270D Sample extracts are analysed by GC/MS coupled with high volume injection and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Organophosphorus Pesticides (Ultra-trace)	EP130	WATER	USEPA Method 3640 (GPC cleanup), 8141 (GC/FPD - Capillary Column) This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
Organochlorine Pesticides (Ultra-trace)	EP131A	WATER	USEPA Method 3640 (GPC cleanup),3620 (Florisil), 8081/8082 (GC/uECD/uECD). This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Phenoxyacetic Acid Herbicides (LCMS - Low DL)	EP202-LL	WATER	In-House, LCMS (Electrospray). Residues of acid herbicides in water samples are extracted with dichloromethane under acidic conditions. The organic phase is evaporated to dryness and made up the HPLC mobile phase for MS determination.
Multiresidue Pesticide Screen (N0. 1) - Low Level	EP209-LL	WATER	In-house, LCMS (APCI in positive mode). The compounds are extracted from water samples using dichloromethane. The organic phase is evaporated to dryness and reconstituted in a mixture of methanol and water for reverse phase HPLC analysis.
Multiresidue Pesticide Screen (No. 2)	EP215-LL	WATER	In-house, LCMS (APCI in positive mode). The compounds are extracted from water samples using dichloromethane. The organic phase is evaporated to dryness and reconstituted in a mixture of acetonitrile and water for reverse phase HPLC analysis.

Preparation Methods	*Method*	*Matrix*	*Method Descriptions*
Total Cyanide	EK026-PR	WATER	APHA 21st ed., 4500 CN- C&N. The sample is distilled with H2SO4 releasing all bound cyanides as HCN. The CN is trapped in a caustic solution, and quanitified by colourimetry on FIA. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Separatory funnel extraction for LCMS herbicides.	* EP215-PR	WATER	In-house. A 1 L sample is extracted three times with 60 mL of methylene chloride, reduced to dryness and made up in HPLC mobile phase.
Separatory Funnel Extraction of Liquids	ORG14	WATER	USEPA SW 846 - 3510B 500 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using 60mL DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2). ALS default excludes sediment which may be resident in the container.
Sep. Funnel Extraction of Liquids (Ultra-trace pesticides.)	ORG14-UTP	WATER	USEPA 3510 Samples are extracted into dichloromethane, concentrated and exchanged into an apporpriate solvent for GPC and florisil cleanup as required. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2). ALS default excludes sediment which may be resident in the container.
Organotin Sample Preparation	ORG34	WATER	In-house. A specified volume of sample is spiked with surrogate, acidified and vacuum filtered. Reagents and solvent are added and the mixture tumbled. The butyltin compounds is derivitisated, extracted and the subtitution reaction completed. The extract is transferred to a separatory funnel and further extracted two times with petroleum ether. The resultant extracts are combined and concentrated for analysis.

Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged in the Quality Control (QC) Report. Surrogate recovery limits are static and based on USEPA SW846 or ALS-QWI/EN/38 (in the absence of specific USEPA limits). This report displays QC Outliers (breaches) only.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	**Analyte**	CAS Number	Data	Limits	**Comment**
Laboratory Control Spike (LCS) Recoveries							
EP090: Organotin Compounds (Soluble)	1138115-002	----	**Tributyltin**	56573-85-4	122 %	29-100%	**Recovery greater than upper control limit**
Matrix Spike (MS) Recoveries							
EP075(SIM)A: Phenolic Compounds	EB0908450-003	Anonymous	**Phenol**	108-95-2	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EP131A: Organochlorine Pesticides	EB0908368-006	QA2	**beta-BHC**	319-85-7	34.8 %	43.8-136%	**Recovery less than lower data quality objective**
EP131A: Organochlorine Pesticides	EB0908368-006	QA2	**Heptachlor**	76-44-8	30.3 %	33.2-148%	**Recovery less than lower data quality objective**
EP131A: Organochlorine Pesticides	EB0908368-006	QA2	**gamma-BHC**	58-89-9	26.1 %	27.2-147%	**Recovery less than lower data quality objective**
EP202A: Phenoxyacetic Acid Herbicides by LCMS	ES0907545-001	Anonymous	**2.4.6-T**	575-89-3	124 %	43.2-123%	**Recovery greater than upper control limit**

- **For all matrices, no Method Blank value outliers occur.**
- **For all matrices, no Duplicate outliers occur.**

Regular Sample Surrogates

Sub-Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	**Analyte**	CAS Number	Data	Limits	**Comment**
Samples Submitted							
EP090S: Organotin Surrogate	EB0908368-003	G-WQ-06	**Tripropyltin**	----	110 %	10-108 %	**Recovery greater than upper data quality objective**

Outliers : Analysis Holding Time Compliance

This report displays Holding Time breaches only. Only the respective Extraction / Preparation and/or Analysis component is/are displayed.

Matrix: **WATER**

Method	*Extraction / Preparation*			*Analysis*		
Container / Client Sample ID(s)	*Date extracted*	*Due for extraction*	***Days overdue***	*Date analysed*	*Due for analysis*	***Days overdue***
EA005: pH						

Matrix: **WATER**

Method	*Extraction / Preparation*			*Analysis*		
Container / Client Sample ID(s)	*Date extracted*	*Due for extraction*	***Days overdue***	*Date analysed*	*Due for analysis*	***Days overdue***
EA005: pH - Analysis Holding Time Compliance						
Clear Plastic Bottle - Natural						
G-WQ-02, G-WQ-03, G-WQ-06, G-WQ-07, G-WQ-09, QA2	----	----	----	27-MAY-2009	26-MAY-2009	**1**

Outliers : Frequency of Quality Control Samples

The following report highlights breaches in the Frequency of Quality Control Samples.

Matrix: **WATER**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
TPH - Semivolatile Fraction	1	17	5.9	10.0	NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Chain of Custody & Analysis Request

Page _1_ of _1_

Chain of Custody Number:

GHD

PROJECT ID:	4215386 41	QUOTE:	
PROJECT:	**Western Basin EIS WQ Monitoring**		
CLIENT:	GHD		
POSTAL ADDRESS:	PO Box 373, Gladstone 4680		
CONTACT:	Adrian White		
PHONE:	412035667	FAX:	07) 49726236
EMAIL:	Jason.K.Fowler@ghd.com.au, Adrian.A.White@ghd.com.au		
INVOICE:	Jason.K.Fowler@ghd.com.au, Adrian.A.White@ghd.com.au		

LABORATORY BATCH NO.:	
FOR LAB USE ONLY	
COOLER SEAL: Yes No Broken Intact	COOLER TEMP. deg C

DESPATCHED TO: ALS Laboratories
32 SHAND STREET STAFFORD QLD 4053
3243-7222

DATA NEEDED BY:	
REPORT FORMAT:	
EMAIL FORMAT:	ESDAT, EXCEL & PDF

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

Water samples from a **marine** environment (Background sampling)

(EMAIL ADDRESSES PROVIDED ABOVE)

Environmental Division
Brisbane
Work Order
EB0909974
Telephone : +61-7-3243 7222

ANALYSIS REQUIRED

	SAMPLE ID	MATRIX	DATE	DETECTION LIMIT	PRESERVATION	TSS (EA025)	Chlorophyll a (EP008)	pH (EA005)	TDS (EA015)	Electrical Conductivity (EA010)	PSD on WATER	
1	G-WQ-02	Water	6/23/2009	LOR	As Required	X	X	X	X	X	X	
2	G-WQ-03	Water	6/23/2009	LOR	As Required	X	X	X	X	X	X	
3	G-WQ-04	Water	6/23/2009	LOR	As Required	X	X	X	X	X	X	ONLY do PSD testing if there is enough volume
4	G-WQ-08	Water	6/23/2009	LOR	As Required	X	X	X	X	X	X	
5	G-WQ-10	Water	6/23/2009	LOR	As Required	X	X	X	X	X	X	
6	G-WQ-11	Water	6/23/2009	LOR	As Required	X	X	X	X	X	X	ONLY do PSD testing if there is enough volume
7	G-WQ-12	Water	6/23/2009	LOR	As Required	X	X	X	X	X	X	ONLY do PSD testing if there is enough volume
8	QA-03	Water	6/23/2009	LOR	As Required	X	X	X	X	X	X	

RELINQUISHED BY:		RECEIVED BY:	
NAME : J Fowler	DATE: 23/06/2009	NAME : Maggie Kahi	DATE: 24.6.09
OF: GHD Gladstone	TIME: 1530	OF: ALS	TIME: 11.30

PLEASE EMAIL COMPLETED ANALYSIS REQUEST TO: Jason.K.Fowler@ghd.com.au, Adrian.A.White@ghd.com.au

*Container Type and Preservative Codes: P = Neutral Plastic; N = Nitric Acid Preserved; C = Sodium Hydroxide Preserved; J = Solvent Washed Acid Rinced Jar; S = Solvent Washed Acid Rinced Glass Bottle;
VC = Hydrochloric Acid Preserved Vial; VS = Sulfuric Acid Preserved Vial; BS = Sulfuric Acid Preserved Glass Bottle; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle;
O = Other.

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

SAMPLE RECEIPT NOTIFICATION (SRN)

Comprehensive Report

Work Order : **EB0909974**

Client	: **GHD SERVICES PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR ADRIAN WHITE	Contact	: Tim Kilmister
Address	: P O BOX 373 GLADSTONE QLD, AUSTRALIA 4680	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: adrian.a.white@ghd.com.au	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 07 49731611	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 4972 6236	Facsimile	: +61-7-3243 7218
Project	: 421538641 Western Basin EIS WQ Monitoring	Page	: 1 of 2
Order number	: ----		
C-O-C number	: ----	Quote number	: EM2009GHDSER0392 (EN/005/09)
Site	: ----		
Sampler	: ----	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Dates

Date Samples Received	: 24-JUN-2009	Issue Date	: 25-JUN-2009 08:28
Client Requested Due Date	: 02-JUL-2009	Scheduled Reporting Date	: **02-JUL-2009**

Delivery Details

Mode of Delivery	: Carrier	Temperature	: -0.6 C -1.4 C - Ice present
No. of coolers/boxes	: 1 LARGE, 1 MEDIUM	No. of samples received	: 8
Sercurity Seal	: Intact.	No. of samples analysed	: 8

General Comments

- This report contains the following information:
    - Sample Container(s)/Preservation Non-Compliances
    - Summary of Sample(s) and Requested Analysis
    - Requested Deliverables
- **Samples received in appropriately pretreated and preserved containers.**
- **Breaches in recommended extraction / analysis holding times may occur.**
- **pH holding time is six hours after sampling.**
- **Particle Sizing by laser light scattering has been subcontracted to "Microns to Measure".**
- Please direct any turn around / technical queries to the laboratory contact designated above.
- Please direct any queries related to sample condition / numbering / breakages to Maggie Kahi.
- Analytical work for this work order will be conducted at ALS Brisbane.
- Sample Disposal - Aqueous (14 days), Solid (90 days) from date of completion of work order.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exist.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process neccessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

When date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for processing purposes. If the sampling time is displayed as 0:00 the information was not provided by client.

Matrix: **WATER**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	WATER - EA005: pH pH	WATER - EA010P Conductivity (PC)	WATER - EA015 Total Dissolved Solids	WATER - EA025 Suspended Solids	WATER - EP008 Chlorophyll a	WATER - PSA-WAT (Subcontracted) Particle Size Analysis (Water)
EB0909974-001	23-JUN-2009 15:30	G-WQ-02	✓	✓	✓	✓	✓	✓
EB0909974-002	23-JUN-2009 15:30	G-WQ-03	✓	✓	✓	✓	✓	✓
EB0909974-003	23-JUN-2009 15:30	G-WQ-04	✓	✓	✓	✓	✓	✓
EB0909974-004	23-JUN-2009 15:30	G-WQ-08	✓	✓	✓	✓	✓	✓
EB0909974-005	23-JUN-2009 15:30	G-WQ-10	✓	✓	✓	✓	✓	✓
EB0909974-006	23-JUN-2009 15:30	G-WQ-11	✓	✓	✓	✓	✓	✓
EB0909974-007	23-JUN-2009 15:30	G-WQ-12	✓	✓	✓	✓	✓	✓
EB0909974-008	23-JUN-2009 15:30	QA-03	✓	✓	✓	✓	✓	✓

Requested Deliverables

MR ADRIAN WHITE

- *AU Certificate of Analysis - NATA (COA)	Email	adrian.a.white@ghd.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	adrian.a.white@ghd.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	adrian.a.white@ghd.com.au
- A4 - AU Sample Receipt Notification - Environmental (SRN)	Email	adrian.a.white@ghd.com.au
- A4 - AU Tax Invoice (INV)	Email	adrian.a.white@ghd.com.au
- Default - Chain of Custody (COC)	Email	adrian.a.white@ghd.com.au
- EDI Format - ENMRG (ENMRG)	Email	adrian.a.white@ghd.com.au
- EDI Format - ESDAT (ESDAT)	Email	adrian.a.white@ghd.com.au
- EDI Format - XTab (XTAB)	Email	adrian.a.white@ghd.com.au
- Trigger - Subcontract Report (SUBCO)	Email	adrian.a.white@ghd.com.au

MR JASON FOWLER

- *AU Certificate of Analysis - NATA (COA)	Email	jason.k.fowler@ghd.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	jason.k.fowler@ghd.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	jason.k.fowler@ghd.com.au
- A4 - AU Sample Receipt Notification - Environmental (SRN)	Email	jason.k.fowler@ghd.com.au
- A4 - AU Tax Invoice (INV)	Email	jason.k.fowler@ghd.com.au
- Default - Chain of Custody (COC)	Email	jason.k.fowler@ghd.com.au
- EDI Format - ENMRG (ENMRG)	Email	jason.k.fowler@ghd.com.au
- EDI Format - ESDAT (ESDAT)	Email	jason.k.fowler@ghd.com.au
- EDI Format - XTab (XTAB)	Email	jason.k.fowler@ghd.com.au
- Trigger - Subcontract Report (SUBCO)	Email	jason.k.fowler@ghd.com.au

Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: **EB0909974**	Page	: 1 of 4
Client	: **GHD SERVICES PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR ADRIAN WHITE	Contact	: Tim Kilmister
Address	: P O BOX 373 GLADSTONE QLD, AUSTRALIA 4680	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: adrian.a.white@ghd.com.au	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 07 49731611	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 4972 6236	Facsimile	: +61-7-3243 7218
Project	: 421538641 Western Basin EIS WQ Monitoring	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 24-JUN-2009
Sampler	: ----	Issue Date	: 02-JUL-2009
Site	: ----		
		No. of samples received	: 8
Quote number	: EN/005/09	No. of samples analysed	: 8

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

NATA Accredited Laboratory 825

This document is issued in accordance with NATA accreditation requirements.

Accredited for compliance with ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Kim McCabe	Senior Inorganic Chemist	Inorganics

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insuffient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for processing purposes. If the sampling time is displayed as 0:00 the information was not provided by client.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting

Analytical Results

Sub-Matrix: **MARINE WATER**			*Client sample ID*	**G-WQ-02**	**G-WQ-03**	**G-WQ-04**	**G-WQ-08**	**G-WQ-10**
			Client sampling date / time	23-JUN-2009 15:30	23-JUN-2009 15:30	23-JUN-2009 15:30	23-JUN-2009 15:30	23-JUN-2009 15:30
Compound	*CAS Number*	*LOR*	*Unit*	**EB0909974-001**	**EB0909974-002**	**EB0909974-003**	**EB0909974-004**	**EB0909974-005**
EA005: pH								
pH Value	----	0.01	pH Unit	**8.00**	**8.01**	**8.17**	**7.97**	**8.02**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**72000**	**72100**	**69600**	**72100**	**72400**
EA015: Total Dissolved Solids								
^ Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	**38800**	**40000**	**39600**	**40400**	**40600**
EA025: Suspended Solids								
^ Suspended Solids (SS)	----	1	mg/L	**18**	**20**	**10**	**20**	**12**
EP008: Chlorophyll a								
Chlorophyll a	----	1	mg/m3	<1	<1	<1	<1	<1

Analytical Results

Sub-Matrix: **MARINE WATER**			*Client sample ID*	**G-WQ-11**	**G-WQ-12**	**QA-03**	----	----
			Client sampling date / time	23-JUN-2009 15:30	23-JUN-2009 15:30	23-JUN-2009 15:30	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EB0909974-006**	**EB0909974-007**	**EB0909974-008**	**----**	**----**
EA005: pH								
pH Value	----	0.01	pH Unit	**8.09**	**8.10**	**8.02**	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**71900**	**70300**	**72200**	----	----
EA015: Total Dissolved Solids								
^ Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	**40000**	**40300**	**42200**	----	----
EA025: Suspended Solids								
^ Suspended Solids (SS)	----	1	mg/L	**18**	**28**	**26**	----	----
EP008: Chlorophyll a								
Chlorophyll a	----	1	mg/m3	**1**	<1	**1**	----	----

MICRONS TO MEASURE

42 Ramsden Street, Clifton Hill
Post: PO Box 335 Clifton Hill, Victoria 3068, Australia
Phone & Fax: 03-9481 3451 **E-mail: pcresswe@bigpond.net.au**
International: +61-3-9481 3451 **www.micronstomeasure.com.au**
Mobile: 0419 396 049
(PEARSON CRESSWELL & ASSOCIATES P/L ABN 70 057 197 047)

ANALYSIS REPORT

Report No: 1177 Job No: B167

ALS Environmental
32 Shand Street
STAFFORD QLD 4053

Report Date: 6 July 2009
Samples Submitted: 25 June 2009

Sample ID: EB0909974

Report:

Our ID	Your ID	Mean microns	Median microns	Maxima approx
B167-1	001: G-WQ-02	5.6	3.5	0.3, 5
B167-2	002: G-WQ-03	7.3	3.5	0.3, 5
B167-3	003: G-WQ-04#	Insufficient Sample		
B167-4	004: G-WQ-08	7.8	3.8	0.3, 5
B167-5	005: G-WQ-10	5.6	3.6	0.3, 5
B167-6	006: G-WQ-11#	Insufficient Sample		
B167-7	007: G-WQ-12#	Insufficient Sample		
B167-8	008: QA-03	4.6	3.3	0.3, 5

These samples contained insufficient particulates to dertermine a distribution (all were 500ml volume only).

The results for all samples are very similar. The variation is attributable to differences in the concentration of particulates in the samples; large particles are present in small numbers and are more likely to be detected when the concentration of particulates is higher. Detailed reports for each sample are attached.

PCresswell

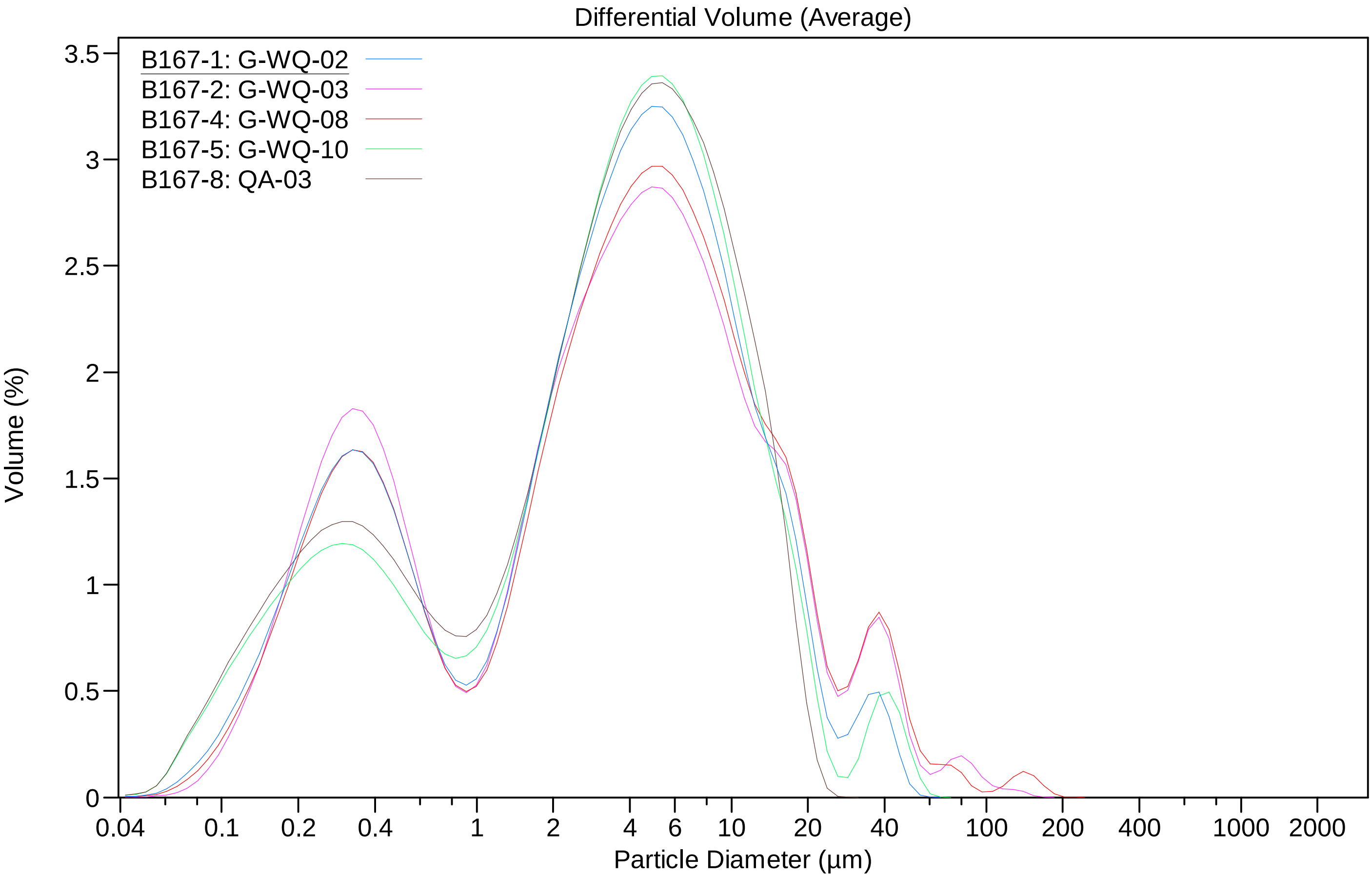
Dr Pearson Cresswell

Notes: The measurements were made using a Coulter LS230 instrument. The sample was dispersed in water using sonication to aid dispersion. The distribution was calculated using a Mie Theory optical model (RI 1.55/0.1).

LS Particle Size Analyzer

6 Jul 2009

by Microns to Measure



BECKMAN COULTER™

LS Particle Size Analyzer

6 Jul 2009

by Microns to Measure

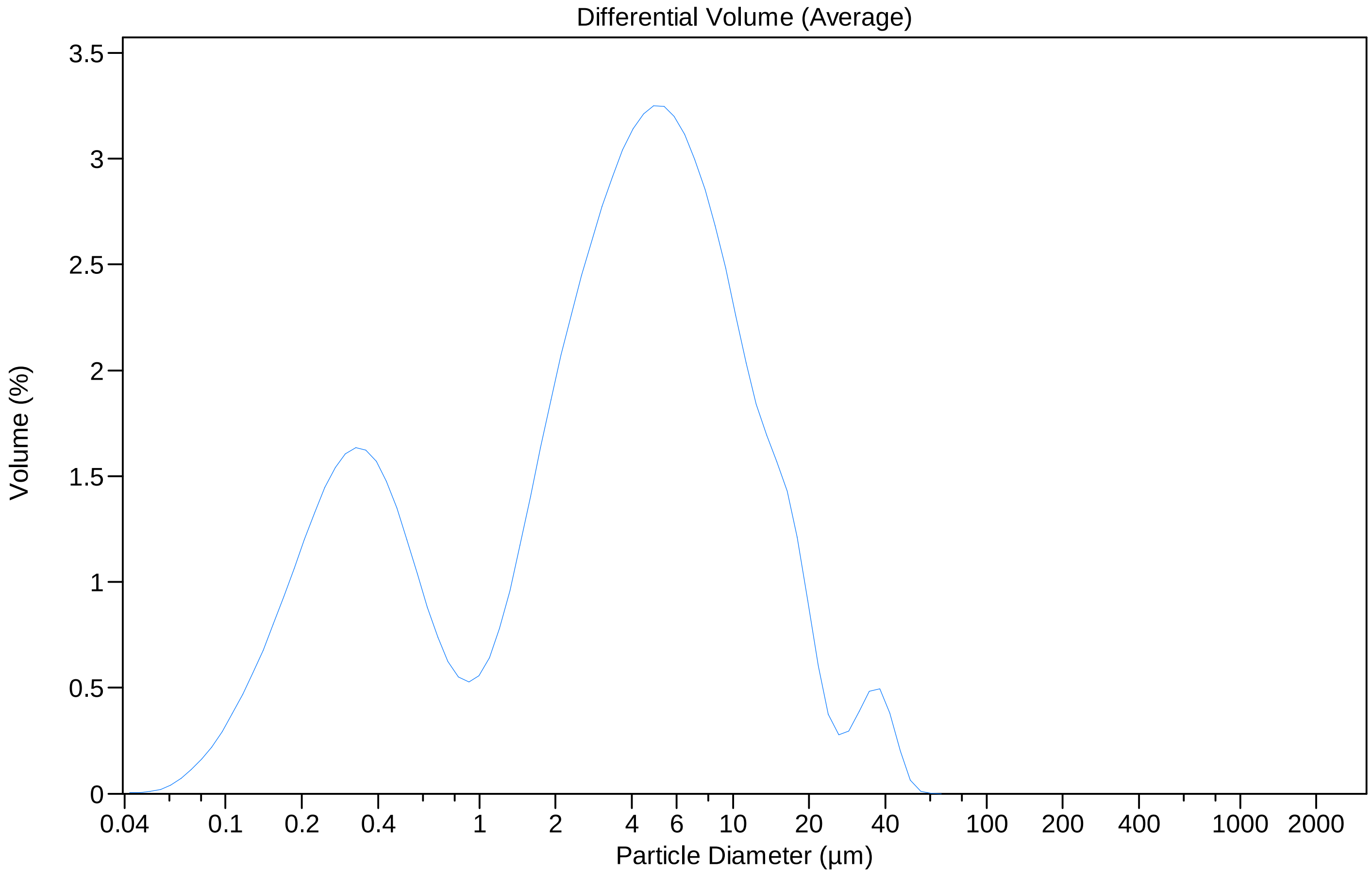
File name: B167-1.$04
Sample ID: ALS EB09099974-001
Operator: pjc
Comments: G-WQ-02
Optical model: Soil2.rfd PIDS included
LS 230 Small Volume Module

Group ID: B167-1

Run length: 89 seconds

Fluid: Water
Software: 3.01
Firmware: 2.02 0

Average of 2 Files:
B167-1.$02 B167-1.$03



Volume Statistics (Arithmetic) B167-1.$04

Calculations from 0.0400 µm to 2,000 µm

Volume: 100%
Mean: 5.576 µm
S.D.: 6.924 µm
Median: 3.492 µm
C.V.: 124%
D(3,2): 0.828 µm
Mode: 4.877 µm

% <	10	25	50	75	90
µm	0.262	0.782	3.492	7.321	13.28

B167-1.$04

Channel Diameter (Lower) µm	Diff. Volume %	Cum. < Volume %
0.040	0.0031	0
0.044	0.0050	0.0031
0.048	0.0094	0.0081
0.053	0.020	0.018
0.058	0.040	0.037
0.064	0.073	0.078
0.070	0.11	0.15
0.077	0.16	0.26
0.084	0.22	0.42
0.093	0.29	0.64
0.102	0.38	0.94
0.112	0.47	1.31
0.122	0.57	1.78
0.134	0.68	2.35
0.148	0.80	3.03
0.162	0.93	3.83
0.178	1.07	4.76
0.195	1.20	5.82
0.214	1.33	7.02
0.235	1.45	8.35
0.258	1.54	9.80
0.284	1.61	11.3
0.311	1.63	12.9
0.342	1.62	14.6
0.375	1.57	16.2
0.412	1.48	17.8
0.452	1.35	19.2
0.496	1.20	20.6
0.545	1.04	21.8
0.598	0.88	22.8
0.656	0.74	23.7
0.721	0.62	24.5
0.791	0.55	25.1
0.868	0.53	25.6
0.953	0.56	26.2
1.047	0.64	26.7
1.149	0.78	27.4
1.261	0.96	28.1
1.384	1.17	29.1
1.520	1.40	30.3
1.668	1.64	31.7
1.832	1.86	33.3
2.011	2.07	35.2
2.207	2.27	37.2
2.423	2.45	39.5
2.660	2.62	41.9
2.920	2.77	44.6
3.205	2.92	47.3
3.519	3.04	50.3
3.863	3.14	53.3
4.240	3.21	56.4
4.655	3.25	59.6
5.110	3.25	62.9
5.610	3.20	66.1
6.158	3.12	69.3
6.760	3.00	72.5
7.421	2.85	75.5
8.147	2.68	78.3
8.943	2.48	81.0
9.818	2.26	83.5
10.78	2.03	85.7
11.83	1.84	87.8
12.99	1.69	89.6
14.26	1.57	91.3
15.65	1.43	92.9
17.18	1.21	94.3
18.86	0.91	95.5
20.71	0.60	96.4
22.73	0.38	97.0
24.95	0.28	97.4
27.39	0.30	97.7
30.07	0.39	98.0
33.01	0.48	98.4
36.24	0.49	98.9
39.78	0.38	99.3
43.67	0.20	99.7
47.94	0.063	99.9
52.62	0.0095	99.99
57.77	0.00037	100
63.41	0	100
69.61	0	100
76.42	0	100
83.89	0	100
92.09	0	100
101.1	0	100
111.0	0	100
121.8	0	100
133.7	0	100
146.8	0	100
161.2	0	100
176.9	0	100
194.2	0	100
213.2	0	100
234.0	0	100
256.9	0	100
282.1	0	100
309.6	0	100
339.9	0	100
373.1	0	100
409.6	0	100
449.7	0	100
493.6	0	100
541.9	0	100
594.8	0	100
653.0	0	100
716.8	0	100
786.9	0	100
863.9	0	100
948.3	0	100
1,041	0	100
1,143	0	100
1,255	0	100
1,377	0	100
1,512	0	100
1,660	0	100
1,822	0	100
2,000		100

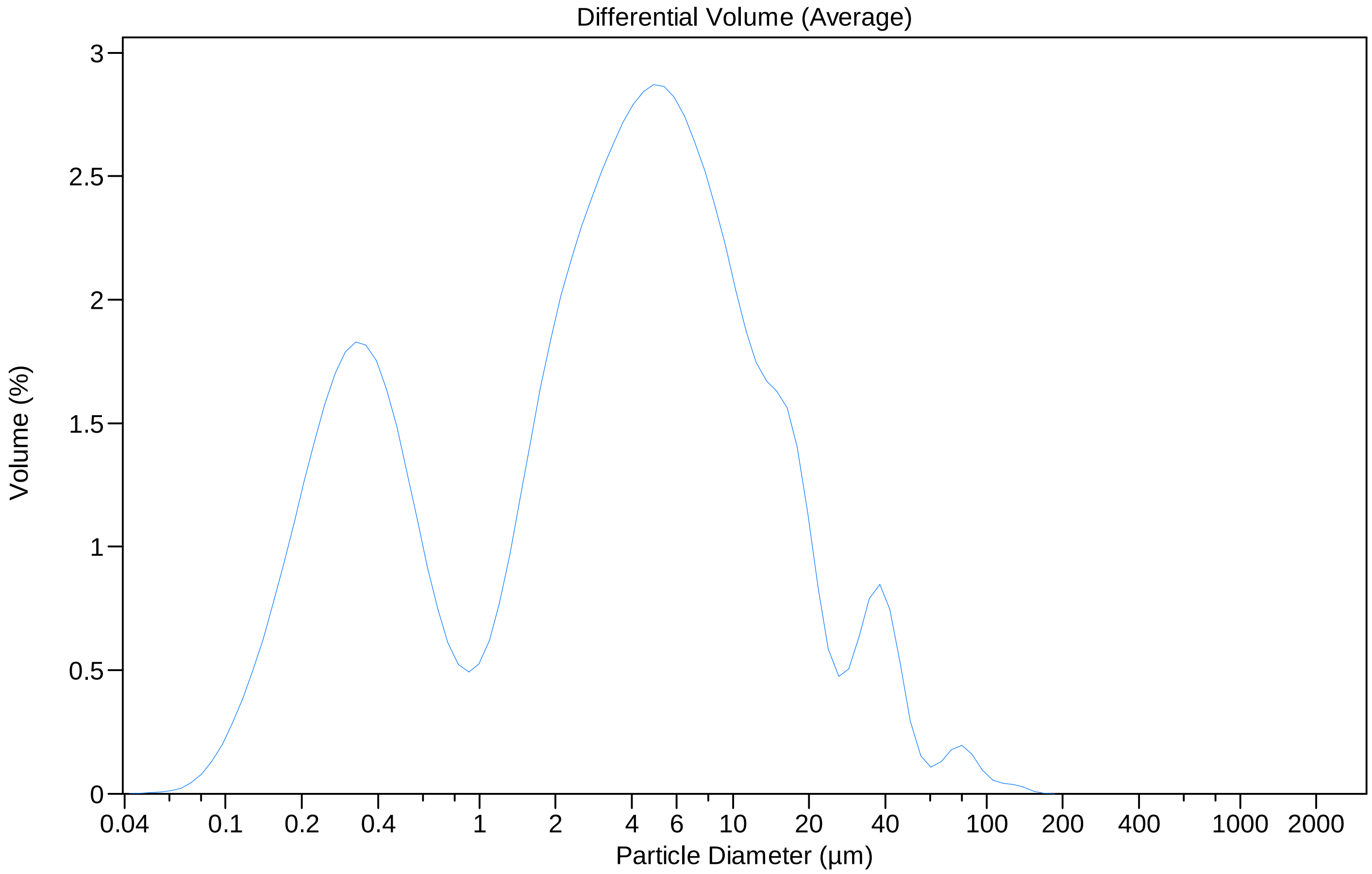
LS Particle Size Analyzer

6 Jul 2009

by Microns to Measure

File name:	B167-2.$04	Group ID:	B167-2
Sample ID:	ALS EB09099974-002		
Operator:	pjc		
Comments:	G-WQ-03		
Optical model:	Soil2.rfd PIDS included		
LS 230	Small Volume Module		
		Run length:	90 seconds
Fluid:	Water		
Software:	3.01	Firmware:	2.02 0

Average of 2 Files:
B167-2.$02 B167-2.$03



Volume Statistics (Arithmetic) B167-2.$04

Calculations from 0.0400 µm to 2,000 µm

Volume:	100%		
Mean:	7.270 µm	S.D.:	11.99 µm
Median:	3.504 µm	C.V.:	165%
D(3,2):	0.857 µm		
Mode:	4.877 µm		

% <	10	25	50	75	90
µm	0.268	0.682	3.504	8.171	17.14

B167-2.$04

Channel Diameter (Lower) µm	Diff. Volume %	Cum. < Volume %
0.040	0.00036	0
0.044	0.0011	0.00036
0.048	0.0029	0.0014
0.053	0.0061	0.0043
0.058	0.012	0.010
0.064	0.022	0.022
0.070	0.043	0.044
0.077	0.079	0.087
0.084	0.13	0.17
0.093	0.20	0.30
0.102	0.28	0.49
0.112	0.39	0.78
0.122	0.50	1.16
0.134	0.63	1.66
0.148	0.77	2.29
0.162	0.93	3.06
0.178	1.10	3.99
0.195	1.27	5.09
0.214	1.43	6.35
0.235	1.58	7.78
0.258	1.70	9.36
0.284	1.79	11.1
0.311	1.83	12.9
0.342	1.82	14.7
0.375	1.75	16.5
0.412	1.64	18.2
0.452	1.49	19.9
0.496	1.30	21.4
0.545	1.11	22.7
0.598	0.92	23.8
0.656	0.75	24.7
0.721	0.61	25.5
0.791	0.52	26.1
0.868	0.49	26.6
0.953	0.53	27.1
1.047	0.62	27.6
1.149	0.77	28.2
1.261	0.97	29.0
1.384	1.19	30.0
1.520	1.42	31.2
1.668	1.65	32.6
1.832	1.85	34.2
2.011	2.02	36.1
2.207	2.17	38.1
2.423	2.30	40.3
2.660	2.41	42.6
2.920	2.52	45.0
3.205	2.62	47.5
3.519	2.71	50.1
3.863	2.79	52.8
4.240	2.84	55.6
4.655	2.87	58.5
5.110	2.86	61.3
5.610	2.82	64.2
6.158	2.74	67.0
6.760	2.64	69.8
7.421	2.52	72.4
8.147	2.38	74.9
8.943	2.22	77.3
9.818	2.04	79.5
10.78	1.87	81.6
11.83	1.74	83.4
12.99	1.67	85.2
14.26	1.63	86.9
15.65	1.56	88.5
17.18	1.40	90.0
18.86	1.14	91.4
20.71	0.83	92.6
22.73	0.59	93.4
24.95	0.48	94.0
27.39	0.50	94.5
30.07	0.64	95.0
33.01	0.79	95.6
36.24	0.85	96.4
39.78	0.75	97.3
43.67	0.52	98.0
47.94	0.29	98.5
52.62	0.15	98.8
57.77	0.11	99.0
63.41	0.13	99.1
69.61	0.18	99.2
76.42	0.20	99.4
83.89	0.16	99.6
92.09	0.095	99.7
101.1	0.055	99.8
111.0	0.041	99.9
121.8	0.037	99.9
133.7	0.027	99.96
146.8	0.0087	99.99
161.2	0.0012	99.999
176.9	0	100
194.2	0	100
213.2	0	100
234.0	0	100
256.9	0	100
282.1	0	100
309.6	0	100
339.9	0	100
373.1	0	100
409.6	0	100
449.7	0	100
493.6	0	100
541.9	0	100
594.8	0	100
653.0	0	100
716.8	0	100
786.9	0	100
863.9	0	100
948.3	0	100
1,041	0	100
1,143	0	100
1,255	0	100
1,377	0	100
1,512	0	100
1,660	0	100
1,822	0	100
2,000		100

LS Particle Size Analyzer

6 Jul 2009

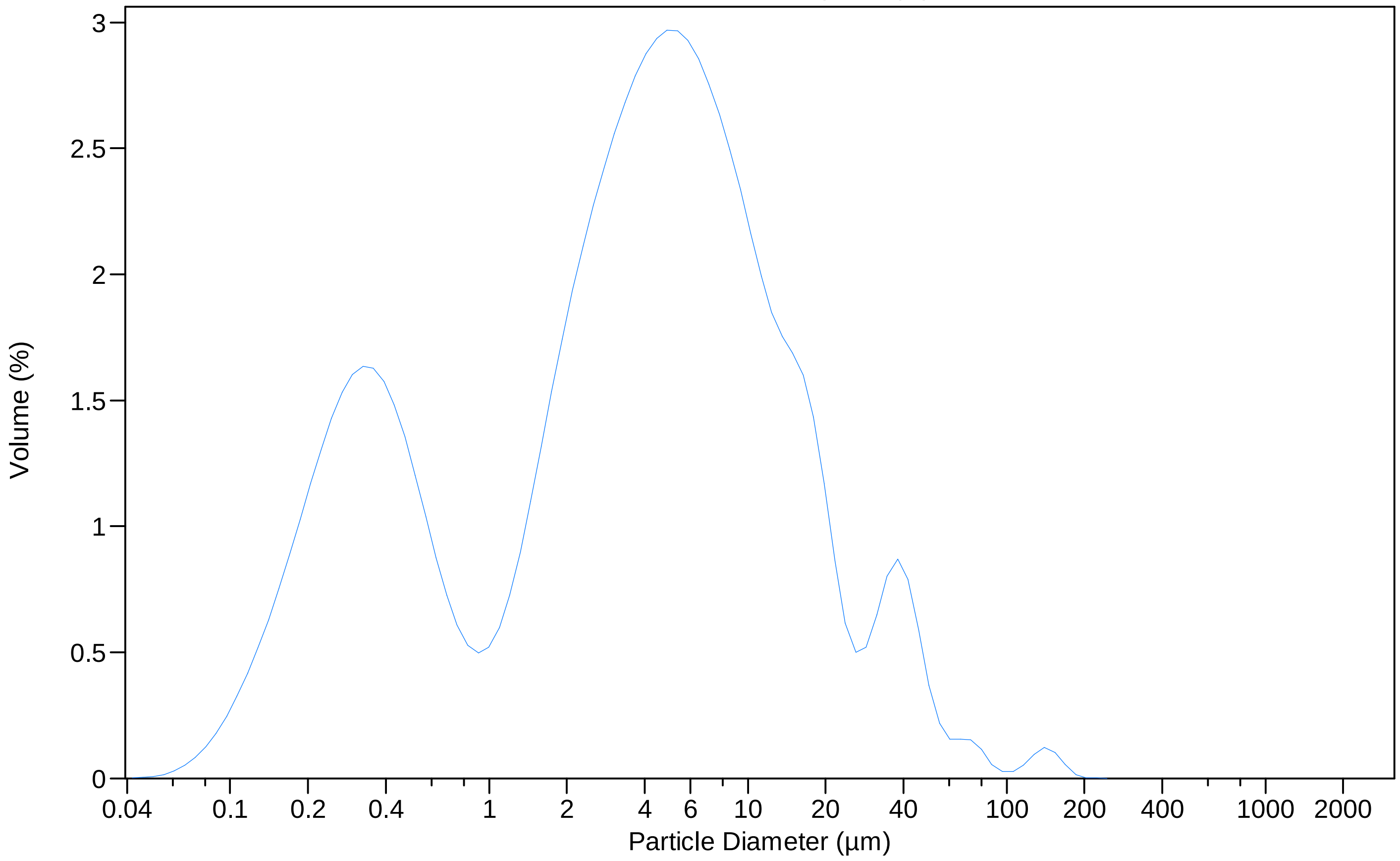
by Microns to Measure

File name:	B167-4.$07	Group ID:	B167-4
Sample ID:	ALS EB09099974-004		
Operator:	pjc		
Comments:	G-WQ-8		
Optical model:	Soil2.rfd PIDS included		
LS 230	Small Volume Module		
Fluid:	Water		
Software:	3.01	Firmware:	2.02 0

Average of 4 Files:

B167-4.$02 B167-4.$03 B167-4.$05 B167-4.$06

Differential Volume (Average)



Volume Statistics (Arithmetic) B167-4.$07

Calculations from 0.0400 µm to 2,000 µm

Volume:	100%		
Mean:	7.829 µm	S.D.:	13.99 µm
Median:	3.778 µm	C.V.:	179%
D(3,2):	0.876 µm		
Mode:	4.877 µm		

% <	10	25	50	75	90
µm	0.272	0.873	3.778	8.591	17.78

B167-4.$07

Channel Diameter (Lower) µm	Diff. Volume %	Cum. < Volume %
0.040	0.0021	0
0.044	0.0034	0.0021
0.048	0.0066	0.0055
0.053	0.014	0.012
0.058	0.028	0.026
0.064	0.051	0.055
0.070	0.083	0.11
0.077	0.12	0.19
0.084	0.18	0.31
0.093	0.24	0.49
0.102	0.33	0.73
0.112	0.42	1.06
0.122	0.52	1.48
0.134	0.63	1.99
0.148	0.75	2.62
0.162	0.89	3.37
0.178	1.03	4.26
0.195	1.17	5.29
0.214	1.30	6.46
0.235	1.43	7.76
0.258	1.53	9.19
0.284	1.60	10.7
0.311	1.64	12.3
0.342	1.63	14.0
0.375	1.58	15.6
0.412	1.48	17.2
0.452	1.35	18.6
0.496	1.20	20.0
0.545	1.04	21.2
0.598	0.87	22.2
0.656	0.73	23.1
0.721	0.61	23.8
0.791	0.53	24.4
0.868	0.50	25.0
0.953	0.52	25.5
1.047	0.60	26.0
1.149	0.73	26.6
1.261	0.90	27.3
1.384	1.10	28.2
1.520	1.32	29.3
1.668	1.54	30.6
1.832	1.74	32.2
2.011	1.94	33.9
2.207	2.11	35.8
2.423	2.27	38.0
2.660	2.42	40.2
2.920	2.56	42.7
3.205	2.68	45.2
3.519	2.79	47.9
3.863	2.88	50.7
4.240	2.94	53.6
4.655	2.97	56.5
5.110	2.97	59.5
5.610	2.93	62.4
6.158	2.86	65.4
6.760	2.76	68.2
7.421	2.64	71.0
8.147	2.50	73.6
8.943	2.34	76.1
9.818	2.16	78.4
10.78	1.99	80.6
11.83	1.85	82.6
12.99	1.75	84.4
14.26	1.69	86.2
15.65	1.60	87.9
17.18	1.43	89.5
18.86	1.17	90.9
20.71	0.86	92.1
22.73	0.62	93.0
24.95	0.50	93.6
27.39	0.52	94.1
30.07	0.65	94.6
33.01	0.80	95.2
36.24	0.87	96.0
39.78	0.79	96.9
43.67	0.59	97.7
47.94	0.37	98.3
52.62	0.22	98.7
57.77	0.16	98.9
63.41	0.15	99.0
69.61	0.15	99.2
76.42	0.12	99.3
83.89	0.054	99.4
92.09	0.026	99.5
101.1	0.027	99.5
111.0	0.053	99.6
121.8	0.095	99.6
133.7	0.12	99.7
146.8	0.10	99.8
161.2	0.054	99.9
176.9	0.015	99.98
194.2	0.0019	99.998
213.2	0.000037	100
234.0	0	100
256.9	0	100
282.1	0	100
309.6	0	100
339.9	0	100
373.1	0	100
409.6	0	100
449.7	0	100
493.6	0	100
541.9	0	100
594.8	0	100
653.0	0	100
716.8	0	100
786.9	0	100
863.9	0	100
948.3	0	100
1,041	0	100
1,143	0	100
1,255	0	100
1,377	0	100
1,512	0	100
1,660	0	100
1,822	0	100
2,000		100

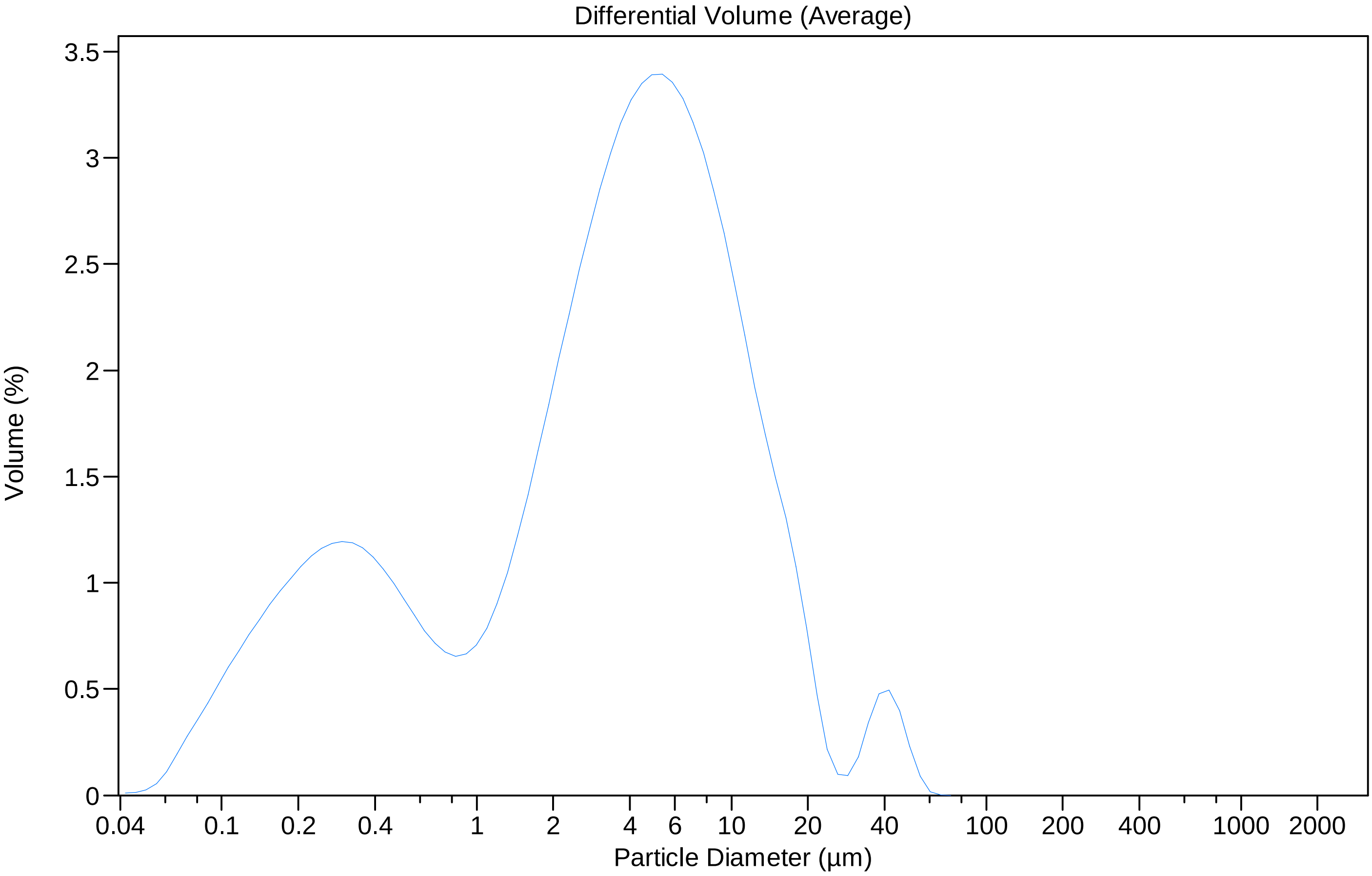
LS Particle Size Analyzer

6 Jul 2009

by Microns to Measure

File name:	B167-5.$04	Group ID:	B167-5
Sample ID:	ALS EB09099974-005		
Operator:	pjc		
Comments:	G-WQ-10		
Optical model:	Soil2.rfd PIDS included		
LS 230	Small Volume Module		
		Run length:	89 seconds
Fluid:	Water		
Software:	3.01	Firmware:	2.02 0

Average of 2 Files:
B167-5.$02   B167-5.$03



Volume Statistics (Arithmetic)   B167-5.$04

Calculations from 0.0400 µm to 2,000 µm

Volume:	100%		
Mean:	5.626 µm	S.D.:	7.216 µm
Median:	3.611 µm	C.V.:	128%
D(3,2):	0.765 µm		
Mode:	5.354 µm		

% <	10	25	50	75	90
µm	0.236	1.049	3.611	7.313	12.66

BECKMAN
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LS Particle Size Analyzer

6 Jul 2009

by Microns to Measure

B167-5.$04

Channel Diameter (Lower) µm	Diff. Volume %	Cum. < Volume %
0.040	0.010	0
0.044	0.015	0.010
0.048	0.025	0.025
0.053	0.053	0.050
0.058	0.11	0.10
0.064	0.19	0.21
0.070	0.28	0.41
0.077	0.36	0.68
0.084	0.43	1.04
0.093	0.52	1.47
0.102	0.60	1.99
0.112	0.68	2.60
0.122	0.75	3.28
0.134	0.83	4.04
0.148	0.90	4.86
0.162	0.96	5.76
0.178	1.02	6.72
0.195	1.08	7.74
0.214	1.13	8.82
0.235	1.16	9.94
0.258	1.19	11.1
0.284	1.20	12.3
0.311	1.19	13.5
0.342	1.16	14.7
0.375	1.12	15.8
0.412	1.06	17.0
0.452	1.00	18.0
0.496	0.92	19.0
0.545	0.85	19.9
0.598	0.77	20.8
0.656	0.72	21.6
0.721	0.67	22.3
0.791	0.65	23.0
0.868	0.66	23.6
0.953	0.71	24.3
1.047	0.79	25.0
1.149	0.90	25.8
1.261	1.05	26.7
1.384	1.22	27.7
1.520	1.41	28.9
1.668	1.62	30.3
1.832	1.84	32.0
2.011	2.05	33.8
2.207	2.27	35.9
2.423	2.47	38.1
2.660	2.67	40.6
2.920	2.85	43.3
3.205	3.02	46.1
3.519	3.16	49.1
3.863	3.27	52.3
4.240	3.35	55.6
4.655	3.39	58.9
5.110	3.39	62.3
5.610	3.36	65.7
6.158	3.28	69.1
6.760	3.17	72.4
7.421	3.02	75.5
8.147	2.85	78.5
8.943	2.65	81.4
9.818	2.42	84.0
10.78	2.17	86.5
11.83	1.92	88.6
12.99	1.69	90.5
14.26	1.50	92.2
15.65	1.30	93.7
17.18	1.08	95.0
18.86	0.79	96.1
20.71	0.47	96.9
22.73	0.22	97.4
24.95	0.098	97.6
27.39	0.091	97.7
30.07	0.18	97.8
33.01	0.34	98.0
36.24	0.48	98.3
39.78	0.50	98.8
43.67	0.40	99.3
47.94	0.23	99.7
52.62	0.088	99.9
57.77	0.017	99.98
63.41	0.0012	99.999
69.61	0	100
76.42	0	100
83.89	0	100
92.09	0	100
101.1	0	100
111.0	0	100
121.8	0	100
133.7	0	100
146.8	0	100
161.2	0	100
176.9	0	100
194.2	0	100
213.2	0	100
234.0	0	100
256.9	0	100
282.1	0	100
309.6	0	100
339.9	0	100
373.1	0	100
409.6	0	100
449.7	0	100
493.6	0	100
541.9	0	100
594.8	0	100
653.0	0	100
716.8	0	100
786.9	0	100
863.9	0	100
948.3	0	100
1,041	0	100
1,143	0	100
1,255	0	100
1,377	0	100
1,512	0	100
1,660	0	100
1,822	0	100
2,000		100

LS Particle Size Analyzer

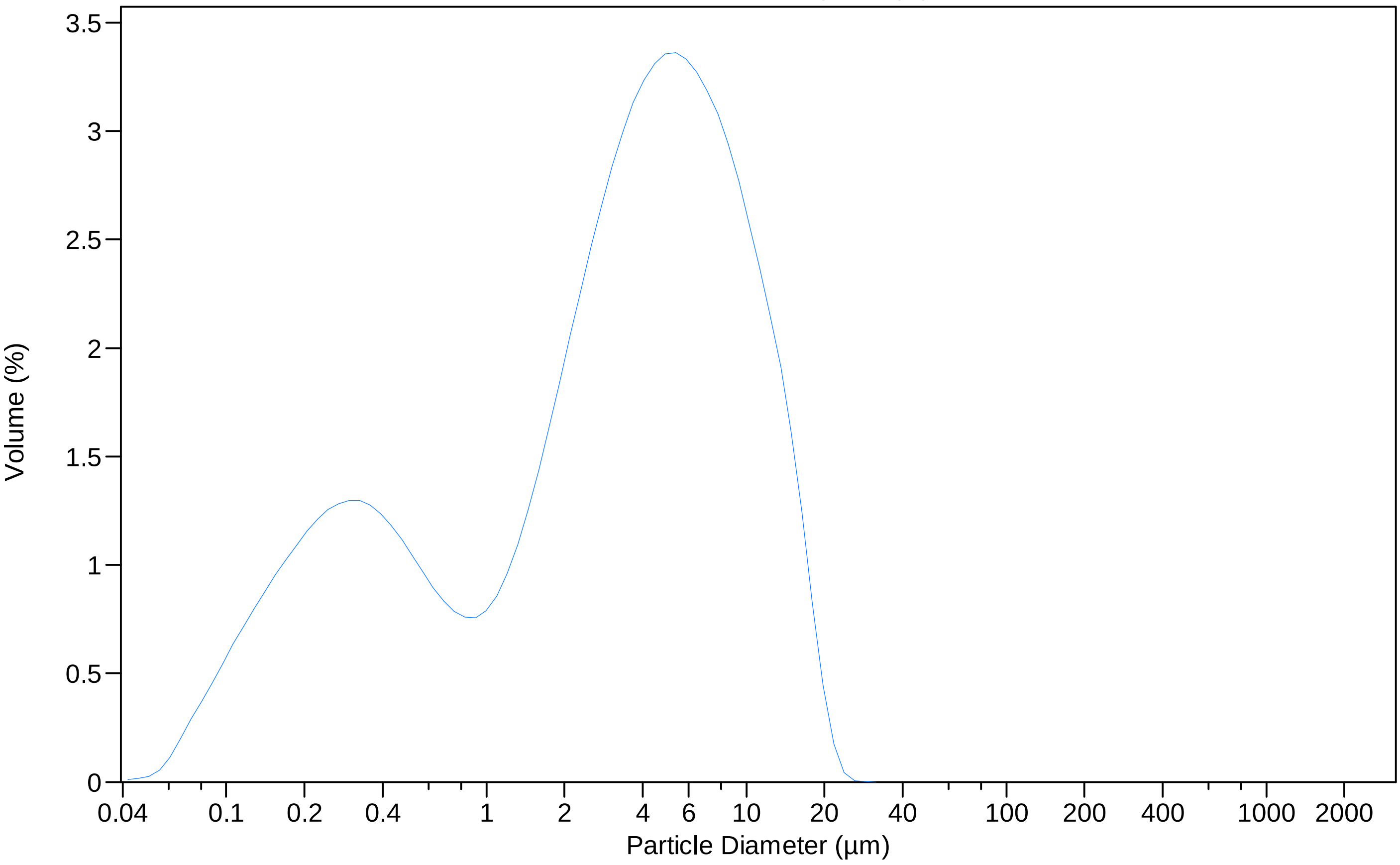
6 Jul 2009

by Microns to Measure

File name:	B167-8.$04	Group ID:	B167-8
Sample ID:	ALS EB09099974-008		
Operator:	pjc		
Comments:	QA-03		
Optical model:	Soil2.rfd PIDS included		
LS 230	Small Volume Module		
Fluid:	Water		
Software:	3.01	Firmware:	2.02 0

Average of 2 Files:
B167-8.$02 B167-8.$03

Differential Volume (Average)



Volume Statistics (Arithmetic) B167-8.$04

Calculations from 0.0400 µm to 2,000 µm

Volume:	100%		
Mean:	4.567 µm	S.D.:	4.419 µm
Median:	3.342 µm	C.V.:	96.8%
D(3,2):	0.720 µm		
Mode:	5.354 µm		

% <	10	25	50	75	90
µm	0.226	0.790	3.342	6.825	11.12

B167-8.$04

Channel Diameter (Lower) µm	Diff. Volume %	Cum. < Volume %
0.040	0.011	0
0.044	0.015	0.011
0.048	0.026	0.026
0.053	0.055	0.052
0.058	0.11	0.11
0.064	0.20	0.22
0.070	0.29	0.42
0.077	0.37	0.71
0.084	0.45	1.09
0.093	0.55	1.54
0.102	0.64	2.08
0.112	0.72	2.72
0.122	0.80	3.44
0.134	0.88	4.24
0.148	0.95	5.11
0.162	1.02	6.06
0.178	1.09	7.09
0.195	1.16	8.18
0.214	1.21	9.33
0.235	1.25	10.5
0.258	1.28	11.8
0.284	1.30	13.1
0.311	1.30	14.4
0.342	1.28	15.7
0.375	1.24	17.0
0.412	1.18	18.2
0.452	1.12	19.4
0.496	1.05	20.5
0.545	0.97	21.5
0.598	0.89	22.5
0.656	0.83	23.4
0.721	0.78	24.2
0.791	0.76	25.0
0.868	0.76	25.8
0.953	0.79	26.5
1.047	0.86	27.3
1.149	0.96	28.2
1.261	1.09	29.1
1.384	1.25	30.2
1.520	1.44	31.5
1.668	1.64	32.9
1.832	1.84	34.6
2.011	2.06	36.4
2.207	2.27	38.5
2.423	2.47	40.7
2.660	2.66	43.2
2.920	2.84	45.9
3.205	3.00	48.7
3.519	3.13	51.7
3.863	3.24	54.8
4.240	3.31	58.1
4.655	3.35	61.4
5.110	3.36	64.7
5.610	3.33	68.1
6.158	3.27	71.4
6.760	3.19	74.7
7.421	3.08	77.9
8.147	2.94	81.0
8.943	2.77	83.9
9.818	2.57	86.7
10.78	2.36	89.2
11.83	2.15	91.6
12.99	1.91	93.7
14.26	1.61	95.7
15.65	1.24	97.3
17.18	0.83	98.5
18.86	0.44	99.3
20.71	0.17	99.8
22.73	0.043	99.95
24.95	0.0054	99.99
27.39	0.00024	100
30.07	0	100
33.01	0	100
36.24	0	100
39.78	0	100
43.67	0	100
47.94	0	100
52.62	0	100
57.77	0	100
63.41	0	100
69.61	0	100
76.42	0	100
83.89	0	100
92.09	0	100
101.1	0	100
111.0	0	100
121.8	0	100
133.7	0	100
146.8	0	100
161.2	0	100
176.9	0	100
194.2	0	100
213.2	0	100
234.0	0	100
256.9	0	100
282.1	0	100
309.6	0	100
339.9	0	100
373.1	0	100
409.6	0	100
449.7	0	100
493.6	0	100
541.9	0	100
594.8	0	100
653.0	0	100
716.8	0	100
786.9	0	100
863.9	0	100
948.3	0	100
1,041	0	100
1,143	0	100
1,255	0	100
1,377	0	100
1,512	0	100
1,660	0	100
1,822	0	100
2,000		100

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

QUALITY CONTROL REPORT

Work Order : **EB0909974**

Client : **GHD SERVICES PTY LTD**
Contact : MR ADRIAN WHITE
Address : P O BOX 373
GLADSTONE QLD, AUSTRALIA 4680

E-mail : adrian.a.white@ghd.com.au
Telephone : +61 07 49731611
Facsimile : +61 07 4972 6236

Project : 421538641 Western Basin EIS WQ Monitoring
Site : ----
C-O-C number : ----
Sampler : ----
Order number : ----

Quote number : EN/005/09

Page : 1 of 5

Laboratory : Environmental Division Brisbane
Contact : Tim Kilmister
Address : 32 Shand Street Stafford QLD Australia 4053

E-mail : Services.Brisbane@alsenviro.com
Telephone : +61-7-3243 7222
Facsimile : +61-7-3243 7218

QC Level : NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Date Samples Received : 24-JUN-2009
Issue Date : 02-JUL-2009

No. of samples received : 8
No. of samples analysed : 8

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

NATA
WORLD RECOGNISED
ACCREDITATION

NATA Accredited Laboratory 825

This document is issued in
accordance with NATA
accreditation requirements.

Accredited for compliance with
ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Kim McCabe	Senior Inorganic Chemist	Inorganics

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insuffient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key :
Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR:- No Limit; Result between 10 and 20 times LOR:- 0% - 50%; Result > 20 times LOR:- 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA005: pH (QC Lot: 1020679)									
EB0909974-001	G-WQ-02	EA005: pH Value	----	0.01	pH Unit	8.00	8.00	0.0	0% - 20%
EA010P: Conductivity by PC Titrator (QC Lot: 1020941)									
EB0909851-001	Anonymous	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	175	175	0.0	0% - 20%
EB0909974-003	G-WQ-04	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	69600	70000	0.6	0% - 20%
EA015: Total Dissolved Solids (QC Lot: 1024578)									
EB0909903-001	Anonymous	EA015: Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	679	695	2.3	0% - 20%
EB0910003-001	Anonymous	EA015: Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	320	332	3.7	0% - 20%
EA025: Suspended Solids (QC Lot: 1024583)									
EB0909934-007	Anonymous	EA025: Suspended Solids (SS)	----	1	mg/L	1280	1220	4.8	0% - 20%
EB0909968-002	Anonymous	EA025: Suspended Solids (SS)	----	1	mg/L	236	248	5.0	0% - 20%
EP008: Chlorophyll a (QC Lot: 1021829)									
EB0909974-001	G-WQ-02	EP008: Chlorophyll a	----	1	mg/m3	<1	<1	0.0	No Limit
EB0909996-004	Anonymous	EP008: Chlorophyll a	----	1	mg/m3	<1	<1	0.0	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA005: pH (QCLot: 1020679)								
EA005: pH Value	----	0.01	pH Unit	----	7.00 pH Unit	100	85	115
EA010P: Conductivity by PC Titrator (QCLot: 1020941)								
EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	1412 µS/cm	99.3	97	103
EA015: Total Dissolved Solids (QCLot: 1024578)								
EA015: Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	<1	2000 mg/L	94.2	85	109
EA025: Suspended Solids (QCLot: 1024583)								
EA025: Suspended Solids (SS)	----	1	mg/L	<1	150 mg/L	101	82	120
EP008: Chlorophyll a (QCLot: 1021829)								
EP008: Chlorophyll a	----	5	mg/m3	<5	2000 mg/m3	86.0	70.7	118

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

- **No Matrix Spike (MS) Results are required to be reported.**

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: **EB0909974**	Page	: 1 of 5
Client	: GHD SERVICES PTY LTD	Laboratory	: Environmental Division Brisbane
Contact	: MR ADRIAN WHITE	Contact	: Tim Kilmister
Address	: P O BOX 373 GLADSTONE QLD, AUSTRALIA 4680	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: adrian.a.white@ghd.com.au	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 07 49731611	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 4972 6236	Facsimile	: +61-7-3243 7218
Project	: 421538641 Western Basin EIS WQ Monitoring	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 24-JUN-2009
Sampler	: ----	Issue Date	: 02-JUL-2009
Order number	: ----		
		No. of samples received	: 8
Quote number	: EN/005/09	No. of samples analysed	: 8

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Interpretive Quality Control Report contains the following information:

- Analysis Holding Time Compliance
- Quality Control Parameter Frequency Compliance
- Brief Method Summaries
- Summary of Outliers

Analysis Holding Time Compliance

The following report summarises extraction / preparation and analysis times and compares with recommended holding times. Dates reported represent first date of extraction or analysis and precludes subsequent dilutions and reruns. Information is also provided re the sample container (preservative) from which the analysis aliquot was taken. Elapsed period to analysis represents number of days from sampling where no extraction / digestion is involved or period from extraction / digestion where this is present. For composite samples, sampling date is assumed to be that of the oldest sample contributing to the composite. Sample date for laboratory produced leachates is assumed as the completion date of the leaching process. Outliers for holding time are based on USEPA SW 846, APHA, AS and NEPM (1999). A listing of breaches is provided in the Summary of Outliers.

Holding times for leachate methods (excluding elutriates) vary according to the analytes being determined on the resulting solution. For non -volatile analytes, the holding time compliance assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These soil holding times are: Organics (14 days); Mercury (28 days) & other metals (180 days). A recorded breach therefore does not guarantee a breach for all non-volatile parameters.

Matrix: **WATER**

Evaluation: ✗ = Holding time breach ; ✓ = Within holding time.

Method		***Sample Date***	*Extraction / Preparation*			*Analysis*		
***Container** / Client Sample ID(s)*			***Date extracted***	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*
EA005: pH								
Clear Plastic Bottle - Natural								
G-WQ-02,	G-WQ-03,	**23-JUN-2009**	**----**	----	----	**24-JUN-2009**	23-JUN-2009	✗
G-WQ-04,	G-WQ-08,							
G-WQ-10,	G-WQ-11,							
G-WQ-12,	QA-03							
EA010P: Conductivity by PC Titrator								
Clear Plastic Bottle - Natural								
G-WQ-02,	G-WQ-03,	**23-JUN-2009**	**---**	---	----	**25-JUN-2009**	21-JUL-2009	✓
G-WQ-04,	G-WQ-08,							
G-WQ-10,	G-WQ-11,							
G-WQ-12,	QA-03							
EA015: Total Dissolved Solids								
Clear Plastic Bottle - Natural								
G-WQ-02,	G-WQ-03,	**23-JUN-2009**	**----**	----	----	**30-JUN-2009**	30-JUN-2009	✓
G-WQ-04,	G-WQ-08,							
G-WQ-10,	G-WQ-11,							
G-WQ-12,	QA-03							
EA025: Suspended Solids								
Clear Plastic Bottle - Natural								
G-WQ-02,	G-WQ-03,	**23-JUN-2009**	**----**	----	----	**30-JUN-2009**	30-JUN-2009	✓
G-WQ-04,	G-WQ-08,							
G-WQ-10,	G-WQ-11,							
G-WQ-12,	QA-03							
EP008: Chlorophyll a								
White Plastic Bottle - Unpreserved								
G-WQ-02,	G-WQ-03,	**23-JUN-2009**	**----**	----	----	**25-JUN-2009**	25-JUN-2009	✓
G-WQ-04,	G-WQ-08,							
G-WQ-10,	G-WQ-11,							
G-WQ-12,	QA-03							

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(where) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Chlorophyll a	EP008	2	15	**13.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Conductivity by PC Titrator	EA010-P	2	16	**12.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
pH	EA005	1	8	**12.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Suspended Solids	EA025	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids	EA015	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
Chlorophyll a	EP008	1	15	**6.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Conductivity by PC Titrator	EA010-P	1	16	**6.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
pH	EA005	2	8	**25.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Suspended Solids	EA025	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids	EA015	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
Chlorophyll a	EP008	1	15	**6.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Conductivity by PC Titrator	EA010-P	1	16	**6.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Suspended Solids	EA025	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids	EA015	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
pH	EA005	WATER	APHA 21st ed. 4500 H+ B. pH of water samples is determined by ISE either manually or by automated pH meter. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Conductivity by PC Titrator	EA010-P	WATER	APHA 21st ed., 2510 B This procedure determines conductivity by automated ISE. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Dissolved Solids	EA015	WATER	APHA 21st ed., 2540C A gravimetric procedure that determines the amount of \`filterable\` residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+5C. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Suspended Solids	EA025	WATER	APHA 21st ed., 2540D A gravimetric procedure employed to determine the amount of \`non-filterable\` residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Chlorophyll a	EP008	WATER	In-house (APHA 21st ed., 10200 H mod.) The pigments are extracted into aqueous acetone. The optical density of the extract before and after acidification at both 664 nm and 665 nm is determined spectrometrically.
Particle Size Analysis (Water)	PSA-WAT	WATER	Particle Size Analysis of water matrices conducted by Subcontracting Laboratory

Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged in the Quality Control (QC) Report. Surrogate recovery limits are static and based on USEPA SW846 or ALS-QWI/EN/38 (in the absence of specific USEPA limits). This report displays QC Outliers (breaches) only.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

- **For all matrices, no Method Blank value outliers occur.**
- **For all matrices, no Duplicate outliers occur.**
- **For all matrices, no Laboratory Control outliers occur.**
- **For all matrices, no Matrix Spike outliers occur.**

Regular Sample Surrogates

- **For all regular sample matrices, no surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

This report displays Holding Time breaches only. Only the respective Extraction / Preparation and/or Analysis component is/are displayed.

Matrix: **WATER**

Method		*Extraction / Preparation*			*Analysis*		
Container / Client Sample ID(s)		*Date extracted*	*Due for extraction*	***Days overdue***	*Date analysed*	*Due for analysis*	***Days overdue***
EA005: pH							
Clear Plastic Bottle - Natural							
G-WQ-02,	G-WQ-03,	----	----	----	24-JUN-2009	23-JUN-2009	**1**
G-WQ-04,	G-WQ-08,						
G-WQ-10,	G-WQ-11,						
G-WQ-12,	QA-03						

Outliers : Frequency of Quality Control Samples

The following report highlights breaches in the Frequency of Quality Control Samples.

- **No Quality Control Sample Frequency Outliers exist.**

Chain of Custody & Analysis Request

Page _1_ of _1_

Chain of Custody Number:

GHD

PROJECT ID:	4215386 41	QUOTE:	
PROJECT:	**Western Basin EIS WQ Monitoring**		
CLIENT:	GHD		
POSTAL ADDRESS:	PO Box 373, Gladstone 4680		
CONTACT:	Adrian White		
PHONE:	412035667	FAX:	07) 49726236
EMAIL:	Jason.K.Fowler@ghd.com.au, Adrian.A.White@ghd.com.au		
INVOICE:	Jason.K.Fowler@ghd.com.au, Adrian.A.White@ghd.com.au		
DATA NEEDED BY:			
REPORT FORMAT:			
EMAIL FORMAT:	ESDAT, EXCEL & PDF		

LABORATORY BATCH NO.:

FOR LAB USE ONLY

COOLER SEAL:
Yes No
Broken Intact

COOLER TEMP:
deg C

DESPATCHED TO: ALS Laboratories
32 SHAND STREET STAFFORD QLD 4053
3243-7222

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

Water samples from a **marine** environment (Background sampling)

(EMAIL ADDRESSES PROVIDED ABOVE)

ANALYSIS REQUIRED

SAMPLE ID	MATRIX	DATE	DETECTION LIMIT	PRESERVATION	TSS (EA025)	Chlorophyll a (EP008)	pH (EA005)	TDS (EA015)	Electrical Conductivity (EA010)	PSD on WATER
G-WQ-01	Water	**24/06/2009**	LOR	As Required	X	X	X	X	X	X
G-WQ-05	Water	**24/06/2009**	LOR	As Required	X	X	X	X	X	X
G-WQ-06	Water	**24/06/2009**	LOR	As Required	X	X	X	X	X	X
G-WQ-07	Water	**24/06/2009**	LOR	As Required	X	X	X	X	X	X
G-WQ-09	Water	**24/06/2009**	LOR	As Required	X	X	X	X	X	X
QA-04	Water	**24/06/2009**	LOR	As Required	X	X	X	X	X	X

Environmental Division
Brisbane
Work Order
EB0909996

Telephone : +61-7-3243 7222

RELINQUISHED BY:
NAME : J Fowler DATE: 24/06/2009
OF: GHD Gladstone TIME: 1530

RECEIVED BY:
NAME : DATE:
OF: TIME:

PLEASE EMAIL COMPLETED ANALYSIS REQUEST TO: Jason.K.Fowler@ghd.com.au, Adrian.A.White@ghd.com.au

*Container Type and Preservative Codes: P = Neutral Plastic; N = Nitric Acid Preserved; C = Sodium Hydroxide Preserved; J = Solvent Washed Acid Rinced Jar; S = Solvent Washed Acid Rinced Glass Bottle; VC = Hydrochloric Acid Preserved Vial; VS = Sulfuric Acid Preserved Vial; BS = Sulfuric Acid Preserved Glass Bottle; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; O = Other.

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

SAMPLE RECEIPT NOTIFICATION (SRN)

Comprehensive Report

Work Order	: **EB0909996**		
Client	: **GHD SERVICES PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR ADRIAN WHITE	Contact	: Tim Kilmister
Address	: P O BOX 373 GLADSTONE QLD, AUSTRALIA 4680	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: adrian.a.white@ghd.com.au	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 07 49731611	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 4972 6236	Facsimile	: +61-7-3243 7218
Project	: 421538641 Western Basin EIS WQ Monitoring	Page	: 1 of 2
Order number	: ----		
C-O-C number	: ----	Quote number	: EM2009GHDSER0392 (EN/005/09)
Site	: ----		
Sampler	: ----	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Dates

Date Samples Received	: 25-JUN-2009	Issue Date	: 25-JUN-2009 16:58
Client Requested Due Date	: 02-JUL-2009	Scheduled Reporting Date	: **02-JUL-2009**

Delivery Details

Mode of Delivery	: Carrier	Temperature	: ----
No. of coolers/boxes	: ----	No. of samples received	: 6
Sercurity Seal	: Intact.	No. of samples analysed	: 6

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Requested Deliverables
- **Samples received in appropriately pretreated and preserved containers.**
- **Breaches in recommended extraction / analysis holding times may occur.**
- **pH holding time is six hours after sampling.**
- **Particle Sizing by laser light scattering has been subcontracted to "Microns to Measure".**
- **Please be advised tha sample G-WQ-A9 was labelled as G-WQ-09.**
- Please direct any turn around / technical queries to the laboratory contact designated above.
- Please direct any queries related to sample condition / numbering / breakages to Maggie Kahi.
- Analytical work for this work order will be conducted at ALS Brisbane.
- Sample Disposal - Aqueous (14 days), Solid (90 days) from date of completion of work order.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exist.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process neccessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
When date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for processing purposes. If the sampling time is displayed as 0:00 the information was not provided by client.

Matrix: **WATER**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	WATER - EA005: pH pH	WATER - EA010P Conductivity (PC)	WATER - EA015 Total Dissolved Solids	WATER - EA025 Suspended Solids	WATER - EP008 Chlorophyll a	WATER - PSA-WAT (Subcontracted) Particle Size Analysis (Water)
EB0909996-001	[24-JUN-2009]	G-WQ-01	✓	✓	✓	✓	✓	✓
EB0909996-002	[24-JUN-2009]	G-WQ-05	✓	✓	✓	✓	✓	✓
EB0909996-003	[24-JUN-2009]	G-WQ-06	✓	✓	✓	✓	✓	✓
EB0909996-004	[24-JUN-2009]	G-WQ-07	✓	✓	✓	✓	✓	✓
EB0909996-005	[24-JUN-2009]	G-WQ-19	✓	✓	✓	✓	✓	✓
EB0909996-006	[24-JUN-2009]	QA-04	✓	✓	✓	✓	✓	✓

Requested Deliverables

MR ADRIAN WHITE

- *AU Certificate of Analysis - NATA (COA)	Email	adrian.a.white@ghd.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	adrian.a.white@ghd.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	adrian.a.white@ghd.com.au
- A4 - AU Sample Receipt Notification - Environmental (SRN)	Email	adrian.a.white@ghd.com.au
- A4 - AU Tax Invoice (INV)	Email	adrian.a.white@ghd.com.au
- Default - Chain of Custody (COC)	Email	adrian.a.white@ghd.com.au
- EDI Format - ENMRG (ENMRG)	Email	adrian.a.white@ghd.com.au
- EDI Format - ESDAT (ESDAT)	Email	adrian.a.white@ghd.com.au
- Trigger - Subcontract Report (SUBCO)	Email	adrian.a.white@ghd.com.au

MR JASON FOWLER

- *AU Certificate of Analysis - NATA (COA)	Email	jason.k.fowler@ghd.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	jason.k.fowler@ghd.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	jason.k.fowler@ghd.com.au
- A4 - AU Sample Receipt Notification - Environmental (SRN)	Email	jason.k.fowler@ghd.com.au
- Default - Chain of Custody (COC)	Email	jason.k.fowler@ghd.com.au
- EDI Format - ENMRG (ENMRG)	Email	jason.k.fowler@ghd.com.au
- EDI Format - ESDAT (ESDAT)	Email	jason.k.fowler@ghd.com.au
- Trigger - Subcontract Report (SUBCO)	Email	jason.k.fowler@ghd.com.au

MICRONS TO MEASURE

42 Ramsden Street, Clifton Hill
Post: PO Box 335 Clifton Hill, Victoria 3068, Australia
Phone & Fax: 03-9481 3451 **E-mail: pcresswe@bigpond.net.au**
International: +61-3-9481 3451 **www.micronstomeasure.com.au**
Mobile: 0419 396 049
(PEARSON CRESSWELL & ASSOCIATES P/L ABN 70 057 197 047)

ANALYSIS REPORT

Report No: 1178 Job No: B168

ALS Environmental
32 Shand Street
STAFFORD QLD 4053

Report Date: 6 July 2009
Samples Submitted: 26 June 2009

Sample ID: EB0909996

Report:

Our ID	Your ID	Mean microns	Median microns	Maxima approx
B168-1	001: G-WQ-01	6.8	3.7	0.3, 5
B168-2	002: G-WQ-05	6.5	3.9	0.3, 5
B168-3	003: G-WQ-06	6.0	3.9	0.3, 5
B168-4	004: G-WQ-07	4.9	3.6	0.3, 5
B168-5	005: G-WQ-09	6.4	4.2	0.3, 5
B168-6	008: QA-04	6.6	4.3	0.3, 5

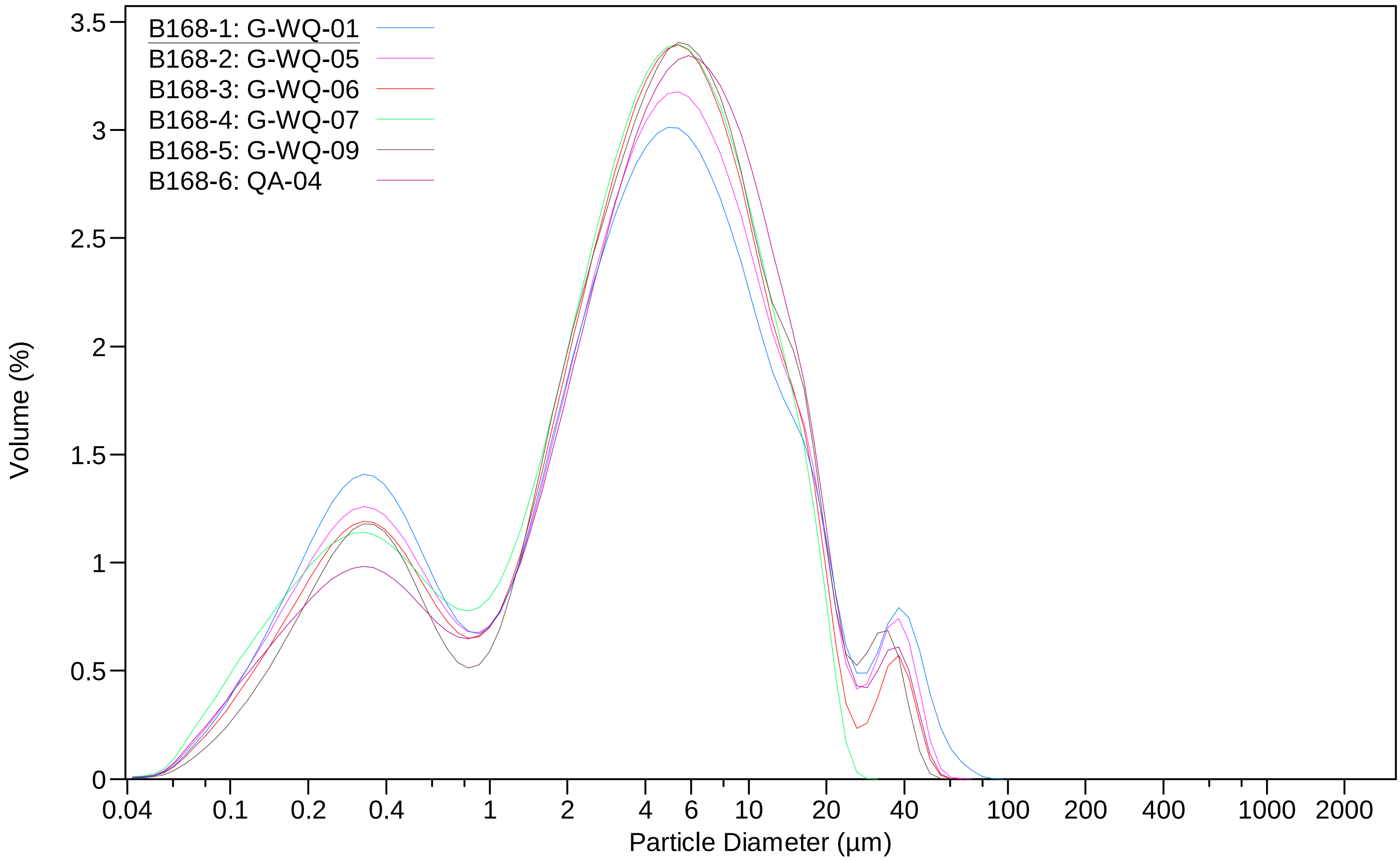
The results for all samples are very similar. The variation is attributable to differences in the concentration of particulates in the samples; large particles are present in small numbers and are more likely to be detected when the concentration of particulates is higher. Detailed reports for each sample are attached.

PCresswell

Dr Pearson Cresswell

Notes: The measurements were made using a Coulter LS230 instrument. The sample was dispersed in water using sonication to aid dispersion. The distribution was calculated using a Mie Theory optical model (RI 1.55/0.1).

Differential Volume (Average)



LS Particle Size Analyzer

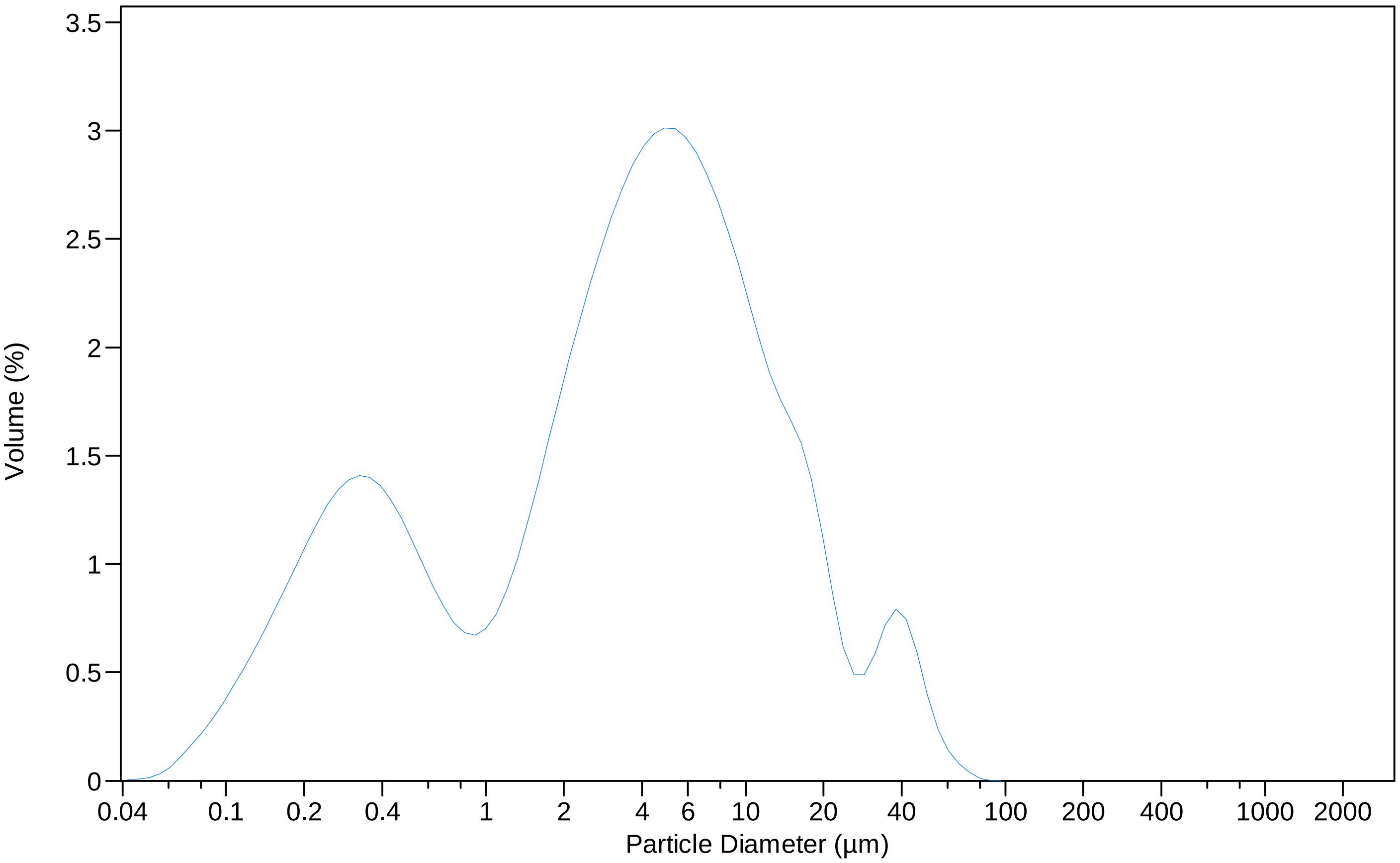
6 Jul 2009

by Microns to Measure

File name:	B168-1.$04	Group ID:	B168-1
Sample ID:	ALS EB0909996-001		
Operator:	pjc		
Comments:	G-WQ-01		
Optical model:	Soil2.rfd PIDS included		
LS 230	Small Volume Module		
		Run length:	89 seconds
Fluid:	Water		
Software:	3.01	Firmware:	2.02 0

Average of 2 Files:
B168-1.$02 B168-1.$03

Differential Volume (Average)



Volume Statistics (Arithmetic) B168-1.$04

Calculations from 0.0400 µm to 2,000 µm

Volume:	100%		
Mean:	6.824 µm	S.D.:	9.467 µm
Median:	3.700 µm	C.V.:	139%
D(3,2):	0.836 µm		
Mode:	4.877 µm		

% <	10	25	50	75	90
µm	0.263	0.948	3.700	8.263	16.51

B168-1.$04

Channel Diameter (Lower) µm	Diff. Volume %	Cum. < Volume %	Channel Diameter (Lower) µm	Diff. Volume %	Cum. < Volume %
0.040	0.0053	0	11.83	1.88	83.8
0.044	0.0080	0.0053	12.99	1.76	85.7
0.048	0.014	0.013	14.26	1.67	87.5
0.053	0.030	0.028	15.65	1.56	89.1
0.058	0.062	0.058	17.18	1.39	90.7
0.064	0.11	0.12	18.86	1.14	92.1
0.070	0.16	0.23	20.71	0.85	93.2
0.077	0.22	0.39	22.73	0.61	94.1
0.084	0.28	0.61	24.95	0.49	94.7
0.093	0.35	0.89	27.39	0.49	95.2
0.102	0.43	1.25	30.07	0.59	95.7
0.112	0.52	1.68	33.01	0.72	96.3
0.122	0.60	2.20	36.24	0.79	97.0
0.134	0.69	2.80	39.78	0.74	97.8
0.148	0.79	3.49	43.67	0.59	98.5
0.162	0.89	4.28	47.94	0.40	99.1
0.178	0.99	5.18	52.62	0.24	99.5
0.195	1.09	6.17	57.77	0.14	99.7
0.214	1.19	7.27	63.41	0.078	99.9
0.235	1.27	8.46	69.61	0.039	99.9
0.258	1.34	9.73	76.42	0.0099	99.99
0.284	1.39	11.1	83.89	0.0012	99.999
0.311	1.41	12.5	92.09	0	100
0.342	1.40	13.9	101.1	0	100
0.375	1.36	15.3	111.0	0	100
0.412	1.30	16.6	121.8	0	100
0.452	1.21	17.9	133.7	0	100
0.496	1.11	19.1	146.8	0	100
0.545	1.00	20.3	161.2	0	100
0.598	0.90	21.3	176.9	0	100
0.656	0.81	22.2	194.2	0	100
0.721	0.73	23.0	213.2	0	100
0.791	0.68	23.7	234.0	0	100
0.868	0.67	24.4	256.9	0	100
0.953	0.70	25.0	282.1	0	100
1.047	0.77	25.7	309.6	0	100
1.149	0.88	26.5	339.9	0	100
1.261	1.02	27.4	373.1	0	100
1.384	1.19	28.4	409.6	0	100
1.520	1.38	29.6	449.7	0	100
1.668	1.57	31.0	493.6	0	100
1.832	1.77	32.6	541.9	0	100
2.011	1.95	34.3	594.8	0	100
2.207	2.13	36.3	653.0	0	100
2.423	2.30	38.4	716.8	0	100
2.660	2.46	40.7	786.9	0	100
2.920	2.60	43.2	863.9	0	100
3.205	2.73	45.8	948.3	0	100
3.519	2.84	48.5	1,041	0	100
3.863	2.93	51.3	1,143	0	100
4.240	2.98	54.3	1,255	0	100
4.655	3.01	57.3	1,377	0	100
5.110	3.01	60.3	1,512	0	100
5.610	2.97	63.3	1,660	0	100
6.158	2.90	66.2	1,822	0	100
6.760	2.80	69.1	2,000		100
7.421	2.68	71.9			
8.147	2.54	74.6			
8.943	2.39	77.2			
9.818	2.22	79.6			
10.78	2.04	81.8			

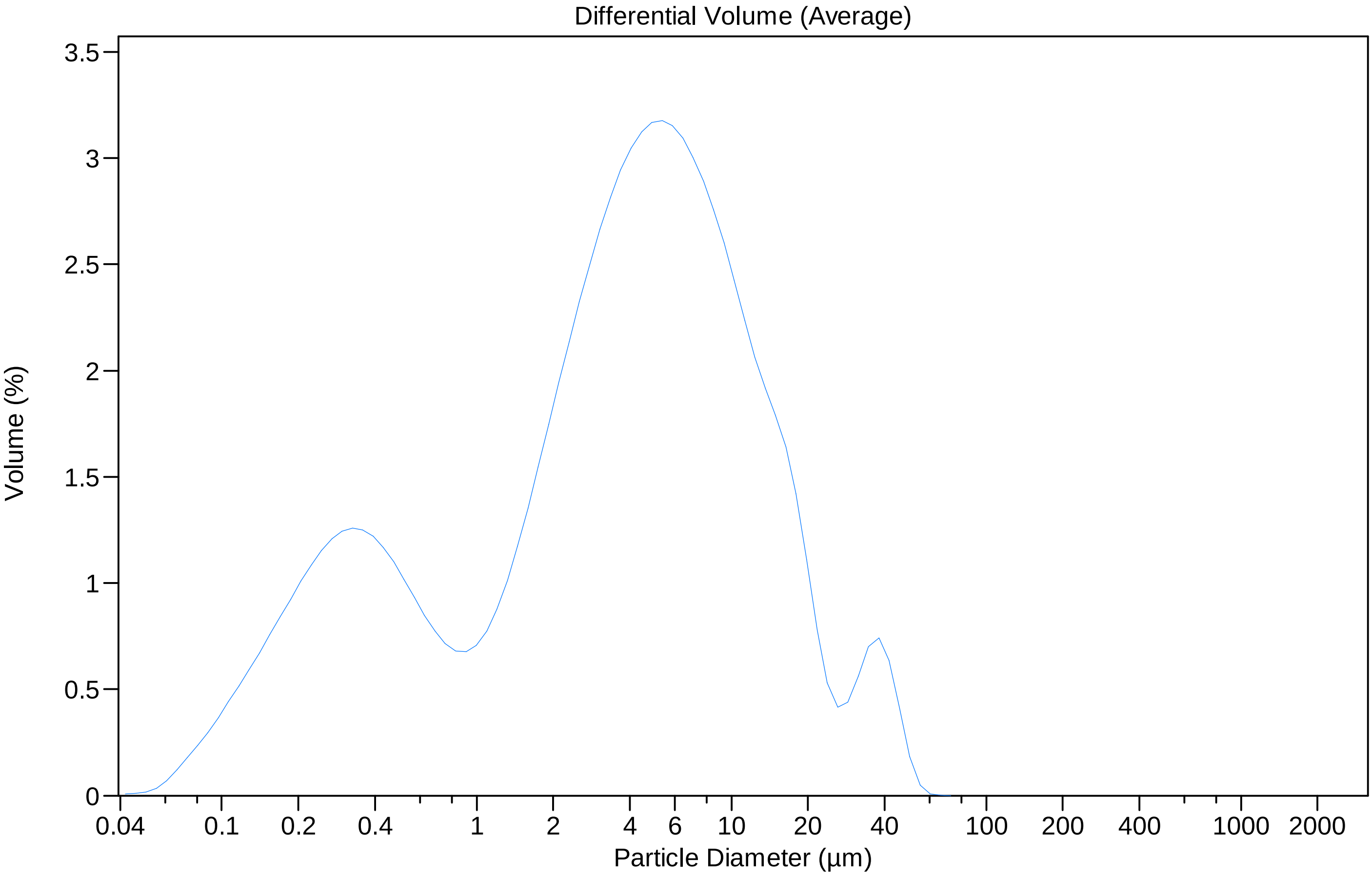
LS Particle Size Analyzer

6 Jul 2009

by Microns to Measure

File name:	B168-2.$04	Group ID:	B168-2
Sample ID:	ALS EB0909996-002		
Operator:	pjc		
Comments:	G-WQ-05		
Optical model:	Soil2.rfd PIDS included		
LS 230	Small Volume Module		
Fluid:	Water		
Software:	3.01	Firmware:	2.02 0

Average of 2 Files:
B168-2.$02 B168-2.$03



Volume Statistics (Arithmetic) B168-2.$04

Calculations from 0.0400 µm to 2,000 µm

Volume:	100%		
Mean:	6.451 µm	S.D.:	8.127 µm
Median:	3.872 µm	C.V.:	126%
D(3,2):	0.866 µm		
Mode:	5.354 µm		

% <	10	25	50	75	90
µm	0.272	1.163	3.872	8.267	15.36

BECKMAN COULTER™

LS Particle Size Analyzer

6 Jul 2009

by Microns to Measure

B168-2.$04

Channel Diameter (Lower) µm	Diff. Volume %	Cum. < Volume %	Channel Diameter (Lower) µm	Diff. Volume %	Cum. < Volume %
0.040	0.0061	0	11.83	2.06	84.6
0.044	0.0089	0.0061	12.99	1.92	86.7
0.048	0.016	0.015	14.26	1.79	88.6
0.053	0.033	0.031	15.65	1.64	90.4
0.058	0.068	0.064	17.18	1.42	92.0
0.064	0.12	0.13	18.86	1.11	93.4
0.070	0.18	0.25	20.71	0.78	94.5
0.077	0.24	0.43	22.73	0.53	95.3
0.084	0.30	0.67	24.95	0.41	95.9
0.093	0.37	0.96	27.39	0.44	96.3
0.102	0.44	1.33	30.07	0.56	96.7
0.112	0.52	1.77	33.01	0.70	97.3
0.122	0.59	2.29	36.24	0.74	98.0
0.134	0.67	2.88	39.78	0.63	98.7
0.148	0.76	3.55	43.67	0.41	99.4
0.162	0.84	4.31	47.94	0.18	99.8
0.178	0.93	5.15	52.62	0.047	99.9
0.195	1.01	6.08	57.77	0.0060	99.99
0.214	1.09	7.08	63.41	0.00021	100
0.235	1.15	8.17	69.61	0	100
0.258	1.21	9.32	76.42	0	100
0.284	1.24	10.5	83.89	0	100
0.311	1.26	11.8	92.09	0	100
0.342	1.25	13.0	101.1	0	100
0.375	1.22	14.3	111.0	0	100
0.412	1.17	15.5	121.8	0	100
0.452	1.10	16.7	133.7	0	100
0.496	1.02	17.8	146.8	0	100
0.545	0.93	18.8	161.2	0	100
0.598	0.85	19.7	176.9	0	100
0.656	0.77	20.6	194.2	0	100
0.721	0.72	21.3	213.2	0	100
0.791	0.68	22.1	234.0	0	100
0.868	0.68	22.7	256.9	0	100
0.953	0.71	23.4	282.1	0	100
1.047	0.77	24.1	309.6	0	100
1.149	0.88	24.9	339.9	0	100
1.261	1.01	25.8	373.1	0	100
1.384	1.17	26.8	409.6	0	100
1.520	1.35	28.0	449.7	0	100
1.668	1.55	29.3	493.6	0	100
1.832	1.75	30.9	541.9	0	100
2.011	1.94	32.6	594.8	0	100
2.207	2.14	34.5	653.0	0	100
2.423	2.32	36.7	716.8	0	100
2.660	2.50	39.0	786.9	0	100
2.920	2.67	41.5	863.9	0	100
3.205	2.82	44.2	948.3	0	100
3.519	2.94	47.0	1,041	0	100
3.863	3.05	49.9	1,143	0	100
4.240	3.12	53.0	1,255	0	100
4.655	3.17	56.1	1,377	0	100
5.110	3.18	59.3	1,512	0	100
5.610	3.15	62.4	1,660	0	100
6.158	3.09	65.6	1,822	0	100
6.760	3.00	68.7	2,000		100
7.421	2.89	71.7			
8.147	2.76	74.6			
8.943	2.60	77.3			
9.818	2.42	79.9			
10.78	2.24	82.4			

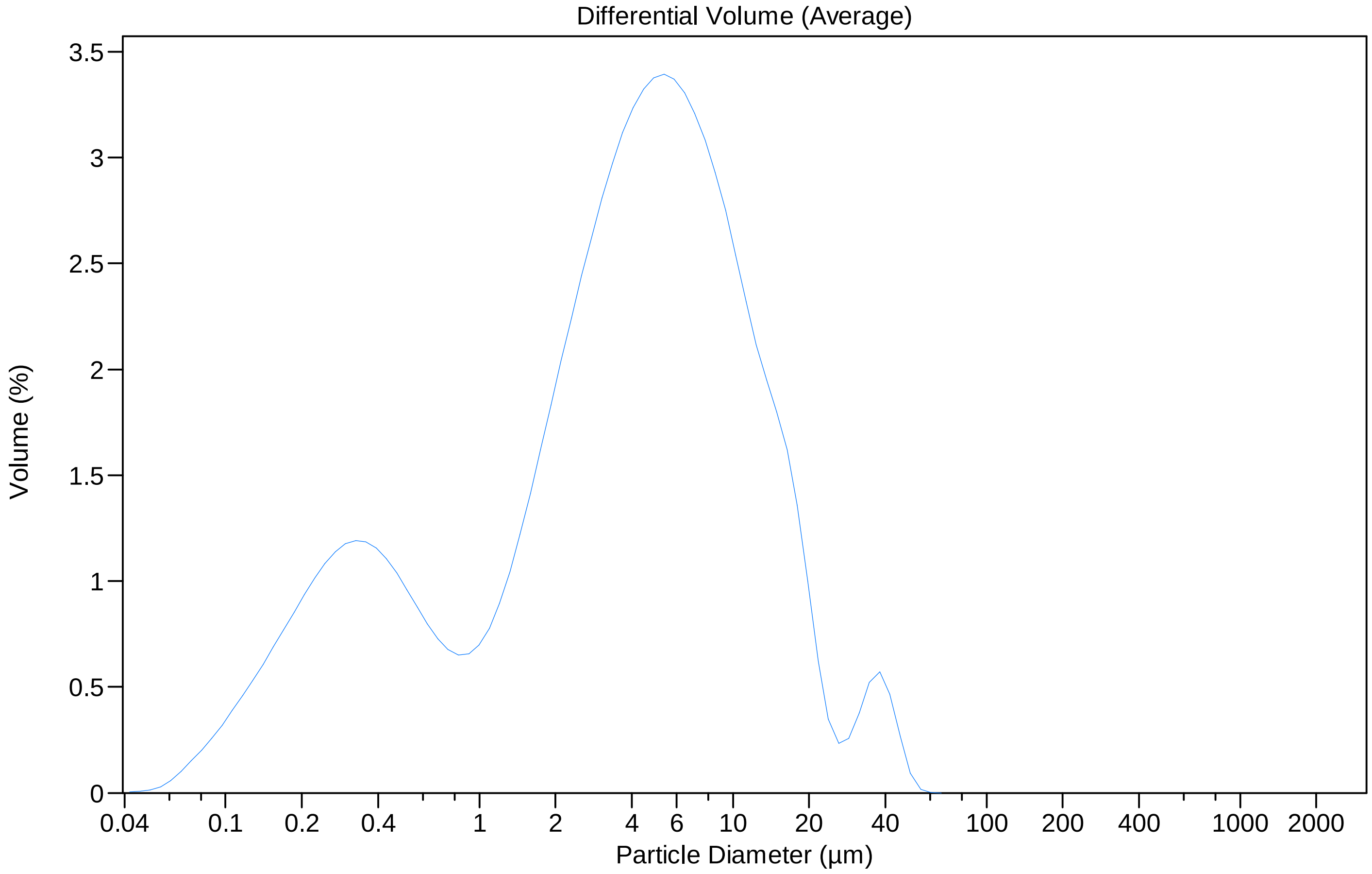
BECKMAN COULTER™

LS Particle Size Analyzer

6 Jul 2009

by Microns to Measure

File name: B168-3.$04 Group ID: B168-3
Sample ID: ALS EB0909996-003
Operator: pjc
Comments: G-WQ-06
Optical model: Soil2.rfd PIDS included
LS 230 Small Volume Module
Fluid: Water
Software: 3.01 Firmware: 2.02 0
Average of 2 Files:
B168-3.$02 B168-3.$03



Volume Statistics (Arithmetic) B168-3.$04

Calculations from 0.0400 µm to 2,000 µm

Volume: 100%
Mean: 6.032 µm S.D.: 7.177 µm
Median: 3.915 µm C.V.: 119%
D(3,2): 0.926 µm
Mode: 5.354 µm

% <	10	25	50	75	90
µm	0.293	1.359	3.915	7.947	13.96

B168-3.$04

Channel Diameter (Lower) µm	Diff. Volume %	Cum. < Volume %
0.040	0.0051	0
0.044	0.0075	0.0051
0.048	0.013	0.013
0.053	0.028	0.026
0.058	0.058	0.054
0.064	0.10	0.11
0.070	0.15	0.21
0.077	0.20	0.37
0.084	0.26	0.57
0.093	0.32	0.82
0.102	0.39	1.14
0.112	0.46	1.53
0.122	0.53	1.99
0.134	0.61	2.52
0.148	0.69	3.13
0.162	0.77	3.82
0.178	0.85	4.59
0.195	0.94	5.44
0.214	1.01	6.38
0.235	1.08	7.39
0.258	1.14	8.47
0.284	1.17	9.61
0.311	1.19	10.8
0.342	1.19	12.0
0.375	1.16	13.2
0.412	1.11	14.3
0.452	1.04	15.4
0.496	0.96	16.5
0.545	0.88	17.4
0.598	0.80	18.3
0.656	0.73	19.1
0.721	0.68	19.8
0.791	0.65	20.5
0.868	0.66	21.2
0.953	0.70	21.8
1.047	0.78	22.5
1.149	0.89	23.3
1.261	1.04	24.2
1.384	1.22	25.2
1.520	1.41	26.4
1.668	1.62	27.9
1.832	1.83	29.5
2.011	2.04	31.3
2.207	2.24	33.3
2.423	2.44	35.6
2.660	2.63	38.0
2.920	2.81	40.7
3.205	2.97	43.5
3.519	3.12	46.4
3.863	3.23	49.6
4.240	3.32	52.8
4.655	3.38	56.1
5.110	3.39	59.5
5.610	3.37	62.9
6.158	3.31	66.3
6.760	3.21	69.6
7.421	3.08	72.8
8.147	2.93	75.8
8.943	2.75	78.8
9.818	2.54	81.5
10.78	2.32	84.1
11.83	2.12	86.4
12.99	1.95	88.5
14.26	1.80	90.5
15.65	1.62	92.3
17.18	1.36	93.9
18.86	1.00	95.2
20.71	0.62	96.2
22.73	0.35	96.9
24.95	0.23	97.2
27.39	0.26	97.4
30.07	0.38	97.7
33.01	0.52	98.1
36.24	0.57	98.6
39.78	0.47	99.2
43.67	0.27	99.6
47.94	0.093	99.9
52.62	0.016	99.98
57.77	0.00090	99.999
63.41	0	100
69.61	0	100
76.42	0	100
83.89	0	100
92.09	0	100
101.1	0	100
111.0	0	100
121.8	0	100
133.7	0	100
146.8	0	100
161.2	0	100
176.9	0	100
194.2	0	100
213.2	0	100
234.0	0	100
256.9	0	100
282.1	0	100
309.6	0	100
339.9	0	100
373.1	0	100
409.6	0	100
449.7	0	100
493.6	0	100
541.9	0	100
594.8	0	100
653.0	0	100
716.8	0	100
786.9	0	100
863.9	0	100
948.3	0	100
1,041	0	100
1,143	0	100
1,255	0	100
1,377	0	100
1,512	0	100
1,660	0	100
1,822	0	100
2,000		100

LS Particle Size Analyzer

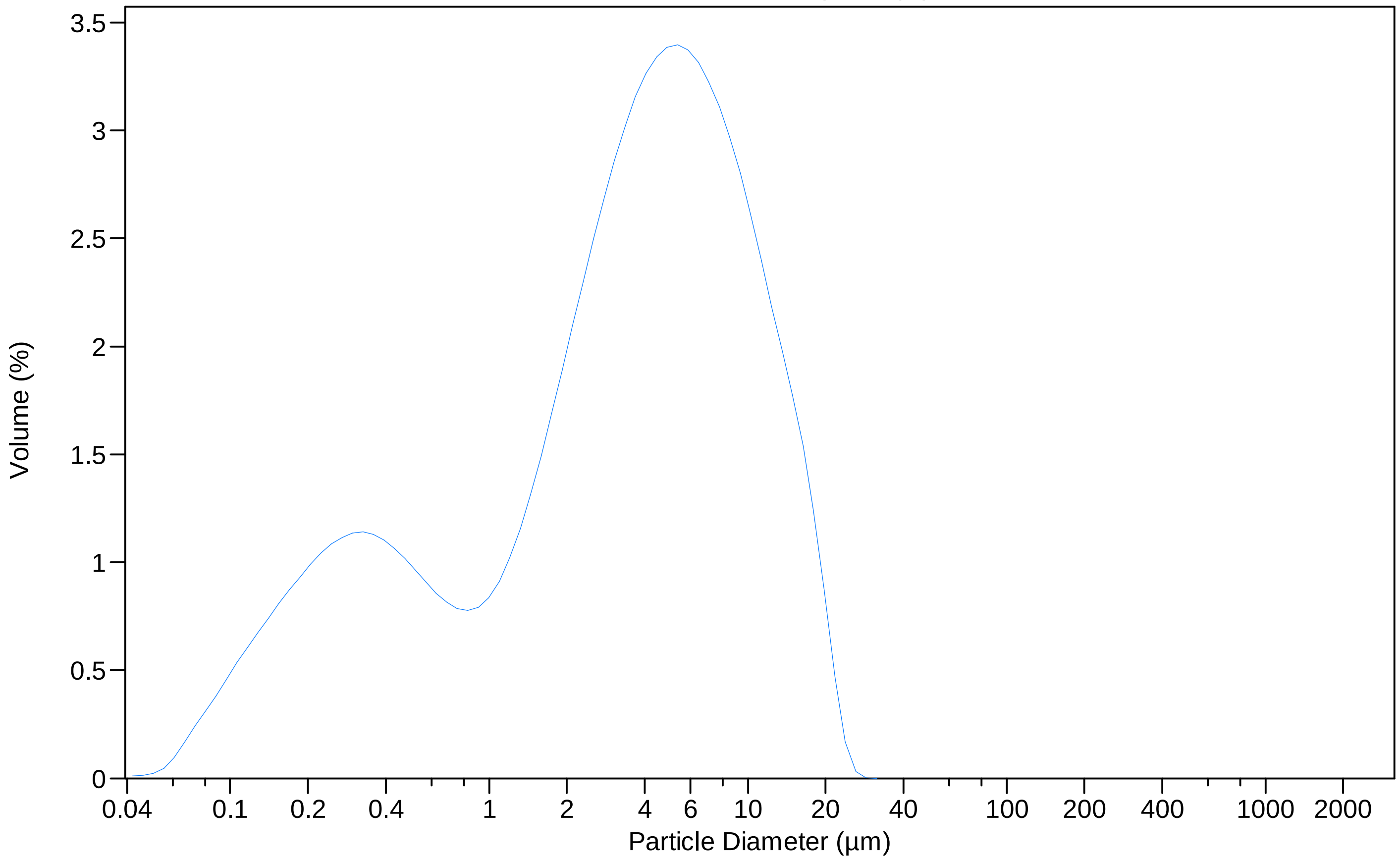
6 Jul 2009

by Microns to Measure

File name:	B168-4.$04	Group ID:	B168-4
Sample ID:	ALS EB0909996-004		
Operator:	pjc		
Comments:	G-WQ-07		
Optical model:	Soil2.rfd PIDS included		
LS 230	Small Volume Module		
Fluid:	Water		
Software:	3.01	Firmware:	2.02 0

Average of 2 Files:
B168-4.$02 B168-4.$03

Differential Volume (Average)



Volume Statistics (Arithmetic) B168-4.$04

Calculations from 0.0400 µm to 2,000 µm

Volume:	100%		
Mean:	4.947 µm	S.D.:	4.775 µm
Median:	3.583 µm	C.V.:	96.5%
D(3,2):	0.811 µm		
Mode:	5.354 µm		

% <	10	25	50	75	90
µm	0.257	1.105	3.583	7.245	11.96

B168-4.$04

Channel Diameter (Lower) µm	Diff. Volume %	Cum. < Volume %
0.040	0.0089	0
0.044	0.013	0.0089
0.048	0.022	0.021
0.053	0.046	0.043
0.058	0.095	0.090
0.064	0.17	0.18
0.070	0.24	0.35
0.077	0.31	0.60
0.084	0.38	0.91
0.093	0.46	1.29
0.102	0.53	1.75
0.112	0.61	2.28
0.122	0.67	2.89
0.134	0.74	3.56
0.148	0.81	4.30
0.162	0.87	5.11
0.178	0.93	5.99
0.195	0.99	6.92
0.214	1.04	7.91
0.235	1.09	8.95
0.258	1.12	10.0
0.284	1.13	11.2
0.311	1.14	12.3
0.342	1.13	13.4
0.375	1.10	14.6
0.412	1.07	15.7
0.452	1.02	16.7
0.496	0.96	17.7
0.545	0.91	18.7
0.598	0.86	19.6
0.656	0.81	20.5
0.721	0.79	21.3
0.791	0.78	22.1
0.868	0.79	22.9
0.953	0.84	23.6
1.047	0.91	24.5
1.149	1.02	25.4
1.261	1.16	26.4
1.384	1.32	27.6
1.520	1.49	28.9
1.668	1.69	30.4
1.832	1.89	32.1
2.011	2.09	34.0
2.207	2.30	36.1
2.423	2.50	38.3
2.660	2.68	40.8
2.920	2.86	43.5
3.205	3.02	46.4
3.519	3.15	49.4
3.863	3.26	52.6
4.240	3.34	55.8
4.655	3.39	59.2
5.110	3.40	62.6
5.610	3.37	66.0
6.158	3.31	69.3
6.760	3.22	72.6
7.421	3.11	75.9
8.147	2.97	79.0
8.943	2.80	81.9
9.818	2.61	84.7
10.78	2.40	87.3
11.83	2.18	89.7
12.99	1.98	91.9
14.26	1.77	93.9
15.65	1.54	95.7
17.18	1.24	97.2
18.86	0.87	98.5
20.71	0.47	99.3
22.73	0.17	99.8
24.95	0.031	99.97
27.39	0.0022	99.998
30.07	0	100
33.01	0	100
36.24	0	100
39.78	0	100
43.67	0	100
47.94	0	100
52.62	0	100
57.77	0	100
63.41	0	100
69.61	0	100
76.42	0	100
83.89	0	100
92.09	0	100
101.1	0	100
111.0	0	100
121.8	0	100
133.7	0	100
146.8	0	100
161.2	0	100
176.9	0	100
194.2	0	100
213.2	0	100
234.0	0	100
256.9	0	100
282.1	0	100
309.6	0	100
339.9	0	100
373.1	0	100
409.6	0	100
449.7	0	100
493.6	0	100
541.9	0	100
594.8	0	100
653.0	0	100
716.8	0	100
786.9	0	100
863.9	0	100
948.3	0	100
1,041	0	100
1,143	0	100
1,255	0	100
1,377	0	100
1,512	0	100
1,660	0	100
1,822	0	100
2,000		100

LS Particle Size Analyzer

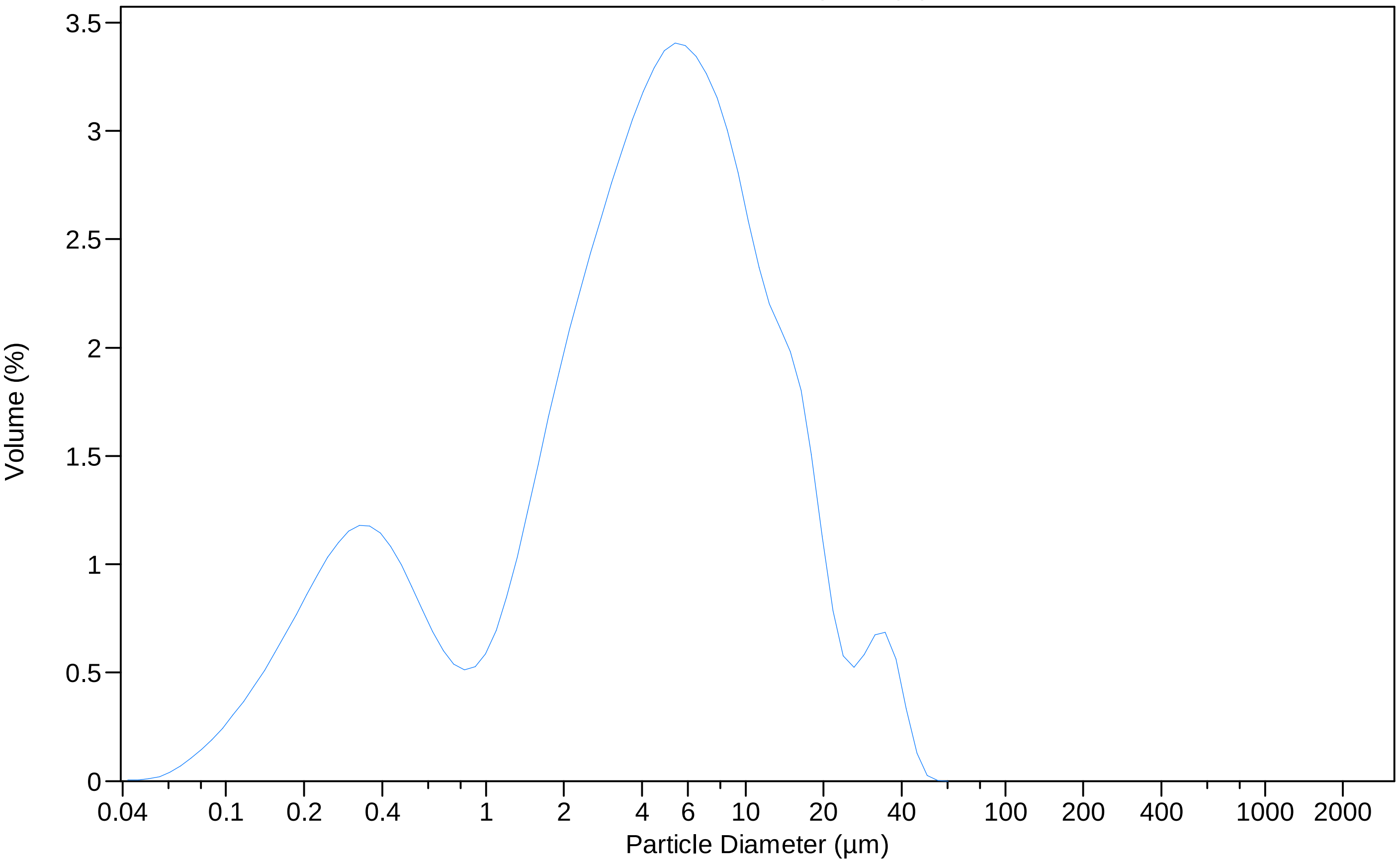
6 Jul 2009

by Microns to Measure

File name:	B168-5.$04	Group ID:	B168-5
Sample ID:	ALS EB0909996-005		
Operator:	pjc		
Comments:	G-WQ-09		
Optical model:	Soil2.rfd PIDS included		
LS 230	Small Volume Module		
Fluid:	Water		
Software:	3.01	Firmware:	2.02 0

Average of 2 Files:
B168-5.$02 B168-5.$03

Differential Volume (Average)



Volume Statistics (Arithmetic) B168-5.$04

Calculations from 0.0400 µm to 2,000 µm

Volume:	100%		
Mean:	6.435 µm	S.D.:	7.291 µm
Median:	4.189 µm	C.V.:	113%
D(3,2):	1.032 µm		
Mode:	5.354 µm		

% <	10	25	50	75	90
µm	0.322	1.611	4.189	8.504	15.17

B168-5.$04

Channel Diameter (Lower) µm	Diff. Volume %	Cum. < Volume %	Channel Diameter (Lower) µm	Diff. Volume %	Cum. < Volume %
0.040	0.0033	0	11.83	2.20	84.4
0.044	0.0050	0.0033	12.99	2.09	86.6
0.048	0.0090	0.0083	14.26	1.98	88.7
0.053	0.019	0.017	15.65	1.80	90.7
0.058	0.039	0.037	17.18	1.50	92.5
0.064	0.070	0.076	18.86	1.13	94.0
0.070	0.11	0.15	20.71	0.79	95.1
0.077	0.14	0.25	22.73	0.58	95.9
0.084	0.19	0.40	24.95	0.52	96.5
0.093	0.24	0.58	27.39	0.58	97.0
0.102	0.30	0.83	30.07	0.67	97.6
0.112	0.37	1.13	33.01	0.69	98.3
0.122	0.44	1.50	36.24	0.56	99.0
0.134	0.51	1.93	39.78	0.33	99.5
0.148	0.59	2.44	43.67	0.13	99.8
0.162	0.68	3.03	47.94	0.024	99.97
0.178	0.77	3.71	52.62	0.0017	99.998
0.195	0.86	4.48	57.77	0	100
0.214	0.95	5.34	63.41	0	100
0.235	1.03	6.29	69.61	0	100
0.258	1.10	7.32	76.42	0	100
0.284	1.15	8.42	83.89	0	100
0.311	1.18	9.57	92.09	0	100
0.342	1.18	10.8	101.1	0	100
0.375	1.14	11.9	111.0	0	100
0.412	1.08	13.1	121.8	0	100
0.452	1.00	14.2	133.7	0	100
0.496	0.90	15.2	146.8	0	100
0.545	0.79	16.0	161.2	0	100
0.598	0.69	16.8	176.9	0	100
0.656	0.60	17.5	194.2	0	100
0.721	0.54	18.1	213.2	0	100
0.791	0.51	18.7	234.0	0	100
0.868	0.53	19.2	256.9	0	100
0.953	0.59	19.7	282.1	0	100
1.047	0.70	20.3	309.6	0	100
1.149	0.85	21.0	339.9	0	100
1.261	1.03	21.8	373.1	0	100
1.384	1.24	22.9	409.6	0	100
1.520	1.46	24.1	449.7	0	100
1.668	1.68	25.6	493.6	0	100
1.832	1.89	27.2	541.9	0	100
2.011	2.08	29.1	594.8	0	100
2.207	2.27	31.2	653.0	0	100
2.423	2.44	33.5	716.8	0	100
2.660	2.60	35.9	786.9	0	100
2.920	2.76	38.5	863.9	0	100
3.205	2.91	41.3	948.3	0	100
3.519	3.05	44.2	1,041	0	100
3.863	3.18	47.2	1,143	0	100
4.240	3.29	50.4	1,255	0	100
4.655	3.37	53.7	1,377	0	100
5.110	3.40	57.1	1,512	0	100
5.610	3.39	60.5	1,660	0	100
6.158	3.35	63.9	1,822	0	100
6.760	3.26	67.2	2,000		100
7.421	3.15	70.5			
8.147	3.00	73.7			
8.943	2.81	76.7			
9.818	2.58	79.5			
10.78	2.37	82.0			

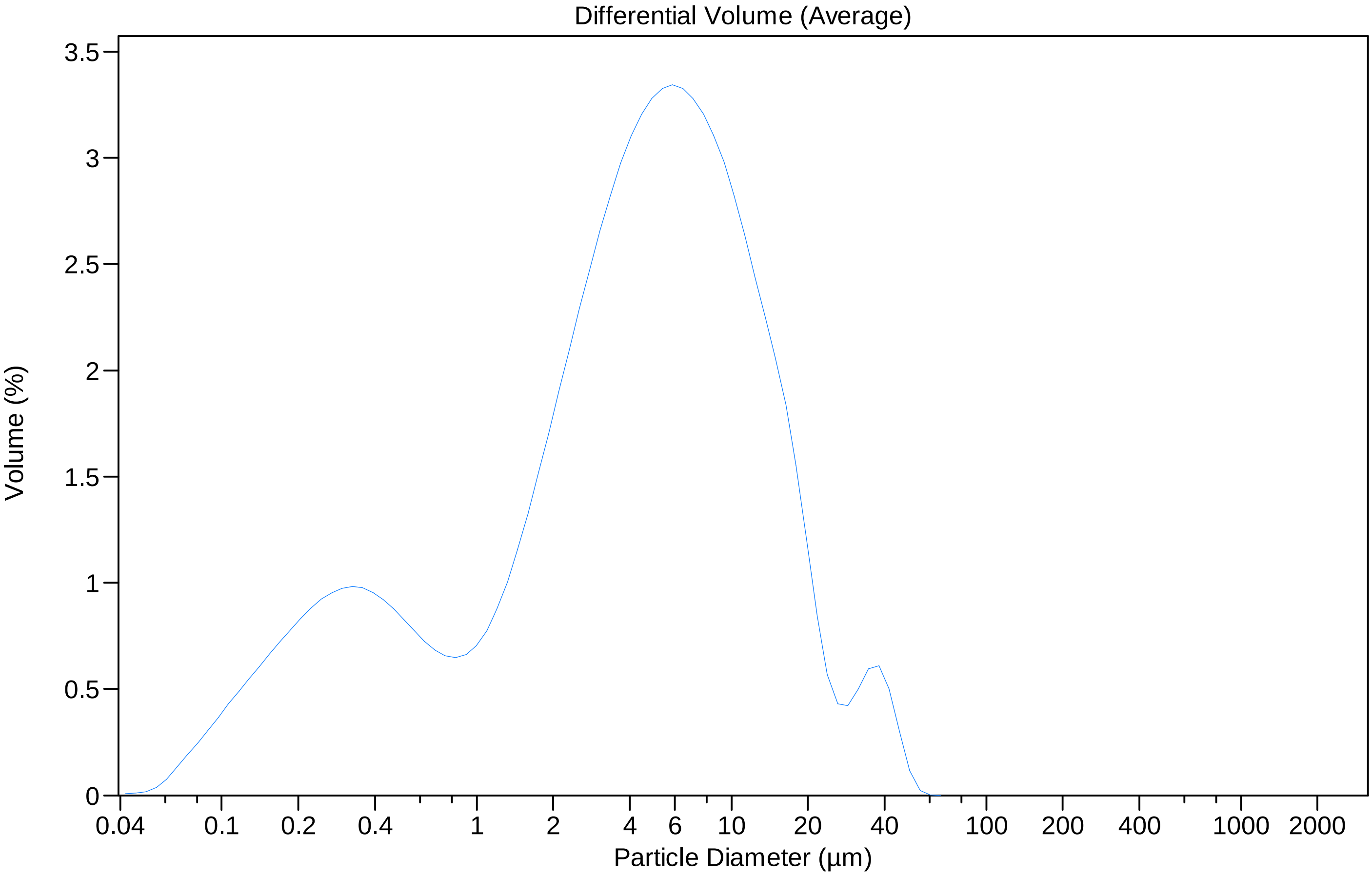
LS Particle Size Analyzer

6 Jul 2009

by Microns to Measure

File name:	B168-6.$04	Group ID:	B168-6
Sample ID:	ALS EB0909996-006		
Operator:	pjc		
Comments:	QA-04		
Optical model:	Soil2.rfd PIDS included		
LS 230	Small Volume Module		
		Run length:	90 seconds
Fluid:	Water		
Software:	3.01	Firmware:	2.02 0

Average of 2 Files:
B168-6.$02 B168-6.$03



Volume Statistics (Arithmetic) B168-6.$04

Calculations from 0.0400 µm to 2,000 µm

Volume:	100%		
Mean:	6.639 µm	S.D.:	7.628 µm
Median:	4.339 µm	C.V.:	115%
D(3,2):	0.958 µm		
Mode:	5.878 µm		

% <	10	25	50	75	90
µm	0.306	1.589	4.339	8.864	15.31

B168-6.$04

Channel Diameter (Lower) µm	Diff. Volume %	Cum. < Volume %
0.040	0.0069	0
0.044	0.0099	0.0069
0.048	0.017	0.017
0.053	0.036	0.034
0.058	0.075	0.070
0.064	0.13	0.14
0.070	0.19	0.28
0.077	0.25	0.47
0.084	0.30	0.71
0.093	0.37	1.02
0.102	0.43	1.38
0.112	0.49	1.81
0.122	0.55	2.30
0.134	0.61	2.85
0.148	0.67	3.46
0.162	0.72	4.13
0.178	0.78	4.85
0.195	0.83	5.63
0.214	0.88	6.46
0.235	0.92	7.34
0.258	0.95	8.26
0.284	0.97	9.22
0.311	0.98	10.2
0.342	0.98	11.2
0.375	0.95	12.1
0.412	0.92	13.1
0.452	0.88	14.0
0.496	0.83	14.9
0.545	0.77	15.7
0.598	0.72	16.5
0.656	0.68	17.2
0.721	0.66	17.9
0.791	0.65	18.6
0.868	0.66	19.2
0.953	0.70	19.9
1.047	0.77	20.6
1.149	0.88	21.3
1.261	1.00	22.2
1.384	1.16	23.2
1.520	1.33	24.4
1.668	1.51	25.7
1.832	1.70	27.2
2.011	1.90	28.9
2.207	2.10	30.8
2.423	2.29	32.9
2.660	2.48	35.2
2.920	2.66	37.7
3.205	2.82	40.3
3.519	2.97	43.2
3.863	3.10	46.1
4.240	3.20	49.2
4.655	3.28	52.4
5.110	3.33	55.7
5.610	3.34	59.0
6.158	3.33	62.4
6.760	3.28	65.7
7.421	3.21	69.0
8.147	3.11	72.2
8.943	2.98	75.3
9.818	2.82	78.3
10.78	2.64	81.1
11.83	2.44	83.7
12.99	2.25	86.2
14.26	2.06	88.4
15.65	1.84	90.5
17.18	1.55	92.3
18.86	1.20	93.9
20.71	0.85	95.1
22.73	0.57	95.9
24.95	0.43	96.5
27.39	0.42	96.9
30.07	0.50	97.4
33.01	0.60	97.9
36.24	0.61	98.5
39.78	0.50	99.1
43.67	0.30	99.6
47.94	0.12	99.9
52.62	0.022	99.98
57.77	0.0016	99.998
63.41	0	100
69.61	0	100
76.42	0	100
83.89	0	100
92.09	0	100
101.1	0	100
111.0	0	100
121.8	0	100
133.7	0	100
146.8	0	100
161.2	0	100
176.9	0	100
194.2	0	100
213.2	0	100
234.0	0	100
256.9	0	100
282.1	0	100
309.6	0	100
339.9	0	100
373.1	0	100
409.6	0	100
449.7	0	100
493.6	0	100
541.9	0	100
594.8	0	100
653.0	0	100
716.8	0	100
786.9	0	100
863.9	0	100
948.3	0	100
1,041	0	100
1,143	0	100
1,255	0	100
1,377	0	100
1,512	0	100
1,660	0	100
1,822	0	100
2,000		100

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

CERTIFICATE OF ANALYSIS

Work Order : **EB0909996**

Client : **GHD SERVICES PTY LTD**
Contact : MR ADRIAN WHITE
Address : P O BOX 373
GLADSTONE QLD, AUSTRALIA 4680

E-mail : adrian.a.white@ghd.com.au
Telephone : +61 07 49731611
Facsimile : +61 07 4972 6236

Project : 421538641 Western Basin EIS WQ Monitoring
Order number : ----
C-O-C number : ----
Sampler : ----
Site : ----

Quote number : EN/005/09

Page : 1 of 4

Laboratory : Environmental Division Brisbane
Contact : Tim Kilmister
Address : 32 Shand Street Stafford QLD Australia 4053

E-mail : Services.Brisbane@alsenviro.com
Telephone : +61-7-3243 7222
Facsimile : +61-7-3243 7218

QC Level : NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Date Samples Received : 25-JUN-2009
Issue Date : 02-JUL-2009

No. of samples received : 6
No. of samples analysed : 6

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

NATA Accredited Laboratory 825

This document is issued in accordance with NATA accreditation requirements.

Accredited for compliance with ISO/IEC 17025.

WORLD RECOGNISED
ACCREDITATION

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Kim McCabe	Senior Inorganic Chemist	Inorganics

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insuffient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for processing purposes. If the sampling time is displayed as 0:00 the information was not provided by client.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting

Analytical Results

Sub-Matrix: **WATER**			Client sample ID	**G-WQ-01**	**G-WQ-05**	**G-WQ-06**	**G-WQ-07**	**G-WQ-09**
			Client sampling date / time	[24-JUN-2009]	[24-JUN-2009]	[24-JUN-2009]	[24-JUN-2009]	[24-JUN-2009]
Compound	*CAS Number*	*LOR*	*Unit*	**EB0909996-001**	**EB0909996-002**	**EB0909996-003**	**EB0909996-004**	**EB0909996-005**
EA005: pH								
pH Value	----	0.01	pH Unit	**7.64**	**7.71**	**7.77**	**7.77**	**7.88**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**68200**	**67200**	**63900**	**59500**	**58600**
EA015: Total Dissolved Solids								
^ Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	**37100**	**39200**	**38800**	**39600**	**40200**
EA025: Suspended Solids								
^ Suspended Solids (SS)	----	1	mg/L	**21**	**21**	**17**	**15**	**12**
EP008: Chlorophyll a								
Chlorophyll a	----	1	mg/m3	<1	<1	**2**	<1	<1

Analytical Results

Sub-Matrix: **WATER**			Client sample ID	**QA-04**	----	----	----	----
			Client sampling date / time	[24-JUN-2009]	----	----	----	----
Compound	CAS Number	LOR	Unit	**EB0909996-006**	**----**	**----**	**----**	**----**
EA005: pH								
pH Value	----	0.01	pH Unit	**7.76**	----	----	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**61900**	----	----	----	----
EA015: Total Dissolved Solids								
^ Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	**37600**	----	----	----	----
EA025: Suspended Solids								
^ Suspended Solids (SS)	----	1	mg/L	**40**	----	----	----	----
EP008: Chlorophyll a								
Chlorophyll a	----	1	mg/m3	**1**	----	----	----	----

QUALITY CONTROL REPORT

Work Order	: **EB0909996**	Page	: 1 of 5
Client	: **GHD SERVICES PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR ADRIAN WHITE	Contact	: Tim Kilmister
Address	: P O BOX 373 GLADSTONE QLD, AUSTRALIA 4680	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: adrian.a.white@ghd.com.au	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 07 49731611	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 4972 6236	Facsimile	: +61-7-3243 7218
Project	: 421538641 Western Basin EIS WQ Monitoring	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 25-JUN-2009
Sampler	: ----	Issue Date	: 02-JUL-2009
Order number	: ----		
		No. of samples received	: 6
Quote number	: EN/005/09	No. of samples analysed	: 6

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

NATA
WORLD RECOGNISED ACCREDITATION

NATA Accredited Laboratory 825

This document is issued in accordance with NATA accreditation requirements.

Accredited for compliance with ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Kim McCabe	Senior Inorganic Chemist	Inorganics

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insuffient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key :
Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR:- No Limit; Result between 10 and 20 times LOR:- 0% - 50%; Result > 20 times LOR:- 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA005: pH (QC Lot: 1021577)									
EB0909996-001	G-WQ-01	EA005: pH Value	----	0.01	pH Unit	7.64	7.64	0.0	0% - 20%
EB0910033-001	Anonymous	EA005: pH Value	----	0.01	pH Unit	7.27	7.30	0.4	0% - 20%
EA010P: Conductivity by PC Titrator (QC Lot: 1021885)									
EB0909993-001	Anonymous	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	249	253	1.6	0% - 20%
EB0910027-001	Anonymous	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	2560	2520	1.6	0% - 20%
EA015: Total Dissolved Solids (QC Lot: 1026743)									
EB0909996-001	G-WQ-01	EA015: Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	37100	38400	3.3	0% - 20%
EB0910092-003	Anonymous	EA015: Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	740	770	4.0	0% - 20%
EA025: Suspended Solids (QC Lot: 1026044)									
EB0909897-006	Anonymous	EA025: Suspended Solids (SS)	----	1	mg/L	80	88	10.1	0% - 20%
EB0910026-005	Anonymous	EA025: Suspended Solids (SS)	----	1	mg/L	22	19	14.6	0% - 50%
EP008: Chlorophyll a (QC Lot: 1021829)									
EB0909974-001	Anonymous	EP008: Chlorophyll a	----	1	mg/m3	<1	<1	0.0	No Limit
EB0909996-004	G-WQ-07	EP008: Chlorophyll a	----	1	mg/m3	<1	<1	0.0	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA005: pH (QCLot: 1021577)								
EA005: pH Value	----	0.01	pH Unit	----	7.00 pH Unit	100	85	115
EA010P: Conductivity by PC Titrator (QCLot: 1021885)								
EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	1412 µS/cm	100	97	103
EA015: Total Dissolved Solids (QCLot: 1026743)								
EA015: Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	<1	2000 mg/L	91.2	85	109
EA025: Suspended Solids (QCLot: 1026044)								
EA025: Suspended Solids (SS)	----	1	mg/L	<1	150 mg/L	93.3	82	120
EP008: Chlorophyll a (QCLot: 1021829)								
EP008: Chlorophyll a	----	5	mg/m3	<5	2000 mg/m3	86.0	70.7	118

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

- **No Matrix Spike (MS) Results are required to be reported.**

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: **EB0909996**	Page	: 1 of 5
Client	: GHD SERVICES PTY LTD	Laboratory	: Environmental Division Brisbane
Contact	: MR ADRIAN WHITE	Contact	: Tim Kilmister
Address	: P O BOX 373 GLADSTONE QLD, AUSTRALIA 4680	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: adrian.a.white@ghd.com.au	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 07 49731611	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 4972 6236	Facsimile	: +61-7-3243 7218
Project	: 421538641 Western Basin EIS WQ Monitoring	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 25-JUN-2009
Sampler	: ----	Issue Date	: 02-JUL-2009
Order number	: ----		
		No. of samples received	: 6
Quote number	: EN/005/09	No. of samples analysed	: 6

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Interpretive Quality Control Report contains the following information:

- Analysis Holding Time Compliance
- Quality Control Parameter Frequency Compliance
- Brief Method Summaries
- Summary of Outliers

Analysis Holding Time Compliance

The following report summarises extraction / preparation and analysis times and compares with recommended holding times. Dates reported represent first date of extraction or analysis and precludes subsequent dilutions and reruns. Information is also provided re the sample container (preservative) from which the analysis aliquot was taken. Elapsed period to analysis represents number of days from sampling where no extraction / digestion is involved or period from extraction / digestion where this is present. For composite samples, sampling date is assumed to be that of the oldest sample contributing to the composite. Sample date for laboratory produced leachates is assumed as the completion date of the leaching process. Outliers for holding time are based on USEPA SW 846, APHA, AS and NEPM (1999). A listing of breaches is provided in the Summary of Outliers.

Holding times for leachate methods (excluding elutriates) vary according to the analytes being determined on the resulting solution. For non-volatile analytes, the holding time compliance assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These soil holding times are: Organics (14 days); Mercury (28 days) & other metals (180 days). A recorded breach therefore does not guarantee a breach for all non-volatile parameters.

Matrix: **WATER**

Evaluation: ✗ = Holding time breach ; ✓ = Within holding time.

Method	*Sample Date*	*Extraction / Preparation*			*Analysis*		
Container / Client Sample ID(s)		*Date extracted*	*Due for extraction*	*Evaluation*	*Date analysed*	*Due for analysis*	*Evaluation*
EA005: pH							
Clear Plastic Bottle - Natural G-WQ-01, G-WQ-05, G-WQ-06, G-WQ-07, G-WQ-09, QA-04	**24-JUN-2009**	**----**	----	----	**25-JUN-2009**	24-JUN-2009	✗
EA010P: Conductivity by PC Titrator							
Clear Plastic Bottle - Natural G-WQ-01, G-WQ-05, G-WQ-06, G-WQ-07, G-WQ-09, QA-04	**24-JUN-2009**	**---**	---	----	**26-JUN-2009**	22-JUL-2009	✓
EA015: Total Dissolved Solids							
Clear Plastic Bottle - Natural G-WQ-01, G-WQ-05, G-WQ-06, G-WQ-07, G-WQ-09, QA-04	**24-JUN-2009**	**----**	----	----	**01-JUL-2009**	01-JUL-2009	✓
EA025: Suspended Solids							
Clear Plastic Bottle - Natural G-WQ-01, G-WQ-05, G-WQ-06, G-WQ-07, G-WQ-09, QA-04	**24-JUN-2009**	**----**	----	----	**01-JUL-2009**	01-JUL-2009	✓
EP008: Chlorophyll a							
White Plastic Bottle - Unpreserved G-WQ-01, G-WQ-05, G-WQ-06, G-WQ-07, G-WQ-09, QA-04	**24-JUN-2009**	**----**	----	----	**26-JUN-2009**	26-JUN-2009	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(where) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Chlorophyll a	EP008	2	15	**13.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Conductivity by PC Titrator	EA010-P	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
pH	EA005	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Suspended Solids	EA025	2	18	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids	EA015	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
Chlorophyll a	EP008	1	15	**6.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Conductivity by PC Titrator	EA010-P	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
pH	EA005	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Suspended Solids	EA025	1	18	**5.6**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids	EA015	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
Chlorophyll a	EP008	1	15	**6.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Conductivity by PC Titrator	EA010-P	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Suspended Solids	EA025	1	18	**5.6**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids	EA015	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
pH	EA005	WATER	APHA 21st ed. 4500 H+ B. pH of water samples is determined by ISE either manually or by automated pH meter. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Conductivity by PC Titrator	EA010-P	WATER	APHA 21st ed., 2510 B This procedure determines conductivity by automated ISE. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Dissolved Solids	EA015	WATER	APHA 21st ed., 2540C A gravimetric procedure that determines the amount of `filterable` residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+5C. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Suspended Solids	EA025	WATER	APHA 21st ed., 2540D A gravimetric procedure employed to determine the amount of `non-filterable` residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Chlorophyll a	EP008	WATER	In-house (APHA 21st ed., 10200 H mod.) The pigments are extracted into aqueous acetone. The optical density of the extract before and after acidification at both 664 nm and 665 nm is determined spectrometrically.
Particle Size Analysis (Water)	PSA-WAT	WATER	Particle Size Analysis of water matrices conducted by Subcontracting Laboratory

Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged in the Quality Control (QC) Report. Surrogate recovery limits are static and based on USEPA SW846 or ALS-QWI/EN/38 (in the absence of specific USEPA limits). This report displays QC Outliers (breaches) only.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

- **For all matrices, no Method Blank value outliers occur.**
- **For all matrices, no Duplicate outliers occur.**
- **For all matrices, no Laboratory Control outliers occur.**
- **For all matrices, no Matrix Spike outliers occur.**

Regular Sample Surrogates

- **For all regular sample matrices, no surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

This report displays Holding Time breaches only. Only the respective Extraction / Preparation and/or Analysis component is/are displayed.

Matrix: **WATER**

Method		*Extraction / Preparation*			*Analysis*		
Container / Client Sample ID(s)		*Date extracted*	*Due for extraction*	***Days overdue***	*Date analysed*	*Due for analysis*	***Days overdue***
EA005: pH							
Clear Plastic Bottle - Natural							
G-WQ-01,	G-WQ-05,	----	----	----	25-JUN-2009	24-JUN-2009	**1**
G-WQ-06,	G-WQ-07,						
G-WQ-09,	QA-04						

Outliers : Frequency of Quality Control Samples

The following report highlights breaches in the Frequency of Quality Control Samples.

- **No Quality Control Sample Frequency Outliers exist.**

Chain of Custody & Analysis Request

Page __1__ of _1__

Chain of Custody Number:

GHD

PROJECT ID: 4215386 41 **QUOTE:**
PROJECT: Western Basin EIS WQ Monitoring
CLIENT: GHD
POSTAL ADDRESS: PO Box 373, Gladstone 4680
CONTACT: Adrian White
PHONE: 412035667 **FAX:** 07) 49726236
EMAIL: Jason.K.Fowler@ghd.com.au, Adrian.A.White@ghd.com.au
INVOICE: Jason.K.Fowler@ghd.com.au, Adrian.A.White@ghd.com.au

LABORATORY BATCH NO.:
FOR LAB USE ONLY
COOLER SEAL: Yes No ...... Broken Intact ......
COOLER TEMP: ..... deg.C

DESPATCHED TO: ALS Environmental
277-289 Woodpark Road
Smithfield NSW 2164
02 8784 8555

DATA NEEDED BY:
REPORT FORMAT:
EMAIL FORMAT: ESDAT, EXCEL & PDF

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

Water samples from a marine environment (Background sampling)

QA04 = QA01

(EMAIL ADDRESSES PROVIDED ABOVE)

ANALYSIS REQUIRED

Sample ID QA4 is QA01. Please change

SAMPLE ID	MATRIX	DATE	DETECTION LIMIT	PRESERVATION	Ultra trace ORC - dissolved metals (EG093F) (Sb, As, Ba, Be, Cd, Co, Cr, Cu, Mn, Ni, Pb, V, Hg, Fe, Al, Ag)	Ultra trace nutrients (UTN - 04) (TP, RP, NH3, NO2, NO3, TKN, TN)
● G-WQ-01 ①	Water	21/05/2009	LOR	As Required	X	X
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	X	X
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	X	X
● G-WQ-04 ②	Water	21/05/2009	LOR	As Required	X	X
● G-WQ-05 ③	Water	21/05/2009	LOR	As Required	X	X
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	X	X
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	X	X
● G-WQ-08 ④	Water	21/05/2009	LOR	As Required	X	X
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	X	X
● G-WQ-10 ⑤	Water	21/05/2009	LOR	As Required	X	X
● G-WQ-11 ⑥	Water	21/05/2009	LOR	As Required	X	X
● G-WQ-12 ⑦	Water	21/05/2009	LOR	As Required	X	X
QA1 ⑧	Water	21/05/2009	LOR	As Required	X	X
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	X	X

Environmental Division
Sydney
Work Order
ES0907382
Telephone : + 61-2-8784 8555

RELINQUISHED BY:
NAME : A White DATE: 21/05/2009
OF: GHD Gladstone TIME: 1530

RECEIVED BY:
NAME : Be DATE: 22/5
OF: TIME: 830

PLEASE EMAIL COMPLETED ANALYSIS REQUEST TO: Jason.K.Fowler@ghd.com.au, Adrian.A.White@ghd.com.au

*Container Type and Preservative Codes: P = Neutral Plastic; N = Nitric Acid Preserved; C = Sodium Hydroxide Preserved; J = Solvent Washed Acid Rinced Jar; S = Solvent Washed Acid Rinced Glass Bottle; VC = Hydrochloric Acid Preserved Vial; VS = Sulfuric Acid Preserved Vial; BS = Sulfuric Acid Preserved Glass Bottle; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; O = Other.

SAMPLE RECEIPT NOTIFICATION (SRN)

Comprehensive Report

Work Order : **ES0907382**

Client	: **GHD SERVICES PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR ADRIAN WHITE	Contact	: Charlie Pierce
Address	: P O BOX 373 GLADSTONE QLD, AUSTRALIA 4680	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: adrian.a.white@ghd.com.au	E-mail	: charlie.pierce@alsenviro.com
Telephone	: +61 07 49731611	Telephone	: +61-2-8784 8555
Facsimile	: +61 07 4972 6236	Facsimile	: +61-2-8784 8500
Project	: 421538641-WATER BASIN EIS WQ MONITORING	Page	: 1 of 3
Order number	: ----		
C-O-C number	: ----	Quote number	: EM2009GHDSER0392 (EN/005/09)
Site	: ----		
Sampler	: ----	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Dates

Date Samples Received	: 22-MAY-2009	Issue Date	: 22-MAY-2009 12:15
Client Requested Due Date	: 29-MAY-2009	Scheduled Reporting Date	: **29-MAY-2009**

Delivery Details

Mode of Delivery	: Carrier	Temperature	: 3.4'C - Ice present
No. of coolers/boxes	: 1 HARD	No. of samples received	: 8
Sercurity Seal	: Intact.	No. of samples analysed	: 8

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Requested Deliverables
- **Sample containers do not comply to pretreatment / preservation standards (AS, APHA, USEPA). Please refer to the Sample Container(s)/Preservation Non-Compliance Log at the end of this report for details.**
- **Sample(s) have been received within recommended holding times.**
- Please direct any turn around / technical queries to the laboratory contact designated above.
- Please direct any queries related to sample condition / numbering / breakages to Nanthini Coilparampil
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (14 days), Solid (90 days) from date of completion of work order.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

Method *Client sample ID*	**Sample Container Received**	**Preferred Sample Container for Analysis**
EG093A-F : Dissolved Metals in Saline Water -Suite A by ORC-ICPMS		
G-WQ-01	- Clear Plastic Bottle - Filtered; Lab-acidified	- Clear Plastic Bottle - UHP Nitric Acid Pres./Filt
G-WQ-04	- Clear Plastic Bottle - Filtered; Lab-acidified	- Clear Plastic Bottle - UHP Nitric Acid Pres./Filt
G-WQ-05	- Clear Plastic Bottle - Filtered; Lab-acidified	- Clear Plastic Bottle - UHP Nitric Acid Pres./Filt
G-WQ-08	- Clear Plastic Bottle - Filtered; Lab-acidified	- Clear Plastic Bottle - UHP Nitric Acid Pres./Filt
G-WQ-10	- Clear Plastic Bottle - Filtered; Lab-acidified	- Clear Plastic Bottle - UHP Nitric Acid Pres./Filt
G-WQ-11	- Clear Plastic Bottle - Filtered; Lab-acidified	- Clear Plastic Bottle - UHP Nitric Acid Pres./Filt
G-WQ-12	- Clear Plastic Bottle - Filtered; Lab-acidified	- Clear Plastic Bottle - UHP Nitric Acid Pres./Filt
QA1	- Clear Plastic Bottle - Filtered; Lab-acidified	- Clear Plastic Bottle - UHP Nitric Acid Pres./Filt
EG093B-F : Dissolved Metals in Saline Water -Suite B by ORC-ICPMS		
G-WQ-01	- Clear Plastic Bottle - Filtered; Lab-acidified	- Clear Plastic Bottle - UHP Nitric Acid Pres./Filt
G-WQ-04	- Clear Plastic Bottle - Filtered; Lab-acidified	- Clear Plastic Bottle - UHP Nitric Acid Pres./Filt
G-WQ-05	- Clear Plastic Bottle - Filtered; Lab-acidified	- Clear Plastic Bottle - UHP Nitric Acid Pres./Filt
G-WQ-08	- Clear Plastic Bottle - Filtered; Lab-acidified	- Clear Plastic Bottle - UHP Nitric Acid Pres./Filt
G-WQ-10	- Clear Plastic Bottle - Filtered; Lab-acidified	- Clear Plastic Bottle - UHP Nitric Acid Pres./Filt
G-WQ-11	- Clear Plastic Bottle - Filtered; Lab-acidified	- Clear Plastic Bottle - UHP Nitric Acid Pres./Filt
G-WQ-12	- Clear Plastic Bottle - Filtered; Lab-acidified	- Clear Plastic Bottle - UHP Nitric Acid Pres./Filt
QA1	- Clear Plastic Bottle - Filtered; Lab-acidified	- Clear Plastic Bottle - UHP Nitric Acid Pres./Filt

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process neccessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

When date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for processing purposes. If the sampling time is displayed as 0:00 the information was not provided by client.

Matrix: **WATER**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	WATER - EG035F Dissolved Mercury by FIMS	WATER - EG093A-F Dissolved metals in saline water by ORC-ICPMS	WATER - EG093B-F Dissolved Metals in Saline Water Suite B by ORC-ICPMS	WATER - EK255A-SW Ammonia as N (Ultra-trace in Saline Waters by Flow Injection Analysis)	WATER - EK257A-SW Nitrite as N (Ultra-trace in Saline Waters by Flow Injection Analysis)	WATER - EK258A-SW Nitrate as N by difference between NOx and NO2 (Ultra-trace in Saline Waters by	WATER - EK261PA-SW TKN by calculated difference between Total N and NOx. (Ultra-trace in Saline	WATER - EK262PA-SW Total Nitrogen by Persulfate Digestion (Ultra-trace in Saline Waters by Flow
ES0907382-001	21-MAY-2009 15:00	G-WQ-01	✓	✓	✓	✓	✓	✓	✓	✓
ES0907382-002	21-MAY-2009 15:00	G-WQ-04	✓	✓	✓	✓	✓	✓	✓	✓
ES0907382-003	21-MAY-2009 15:00	G-WQ-05	✓	✓	✓	✓	✓	✓	✓	✓
ES0907382-004	21-MAY-2009 15:00	G-WQ-08	✓	✓	✓	✓	✓	✓	✓	✓
ES0907382-005	21-MAY-2009 15:00	G-WQ-10	✓	✓	✓	✓	✓	✓	✓	✓
ES0907382-006	21-MAY-2009 15:00	G-WQ-11	✓	✓	✓	✓	✓	✓	✓	✓
ES0907382-007	21-MAY-2009 15:00	G-WQ-12	✓	✓	✓	✓	✓	✓	✓	✓
ES0907382-008	21-MAY-2009 15:00	QA1	✓	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	WATER - EK267PA-SW Total Phosphorus by Persulfate Digestion (Ultra-trace in Saline Waters by Flow	WATER - EK271A-SW Reactive Phosphorus (Ultra-trace in Saline Waters by Flow Injection
ES0907382-001	21-MAY-2009 15:00	G-WQ-01	✓	✓
ES0907382-002	21-MAY-2009 15:00	G-WQ-04	✓	✓
ES0907382-003	21-MAY-2009 15:00	G-WQ-05	✓	✓
ES0907382-004	21-MAY-2009 15:00	G-WQ-08	✓	✓
ES0907382-005	21-MAY-2009 15:00	G-WQ-10	✓	✓
ES0907382-006	21-MAY-2009 15:00	G-WQ-11	✓	✓
ES0907382-007	21-MAY-2009 15:00	G-WQ-12	✓	✓
ES0907382-008	21-MAY-2009 15:00	QA1	✓	✓

Requested Deliverables

MR ADRIAN WHITE

- *AU Certificate of Analysis - NATA (COA)	Email	adrian.a.white@ghd.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	adrian.a.white@ghd.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	adrian.a.white@ghd.com.au
- A4 - AU Sample Receipt Notification - Environmental (SRN)	Email	adrian.a.white@ghd.com.au
- A4 - AU Tax Invoice (INV)	Email	adrian.a.white@ghd.com.au
- Default - Chain of Custody (COC)	Email	adrian.a.white@ghd.com.au
- EDI Format - ENMRG (ENMRG)	Email	adrian.a.white@ghd.com.au
- EDI Format - ESDAT (ESDAT)	Email	adrian.a.white@ghd.com.au

MR JASON FOWLER

- *AU Certificate of Analysis - NATA (COA)	Email	jason.k.fowler@ghd.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	jason.k.fowler@ghd.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	jason.k.fowler@ghd.com.au
- A4 - AU Sample Receipt Notification - Environmental (SRN)	Email	jason.k.fowler@ghd.com.au
- A4 - AU Tax Invoice (INV)	Email	jason.k.fowler@ghd.com.au
- Default - Chain of Custody (COC)	Email	jason.k.fowler@ghd.com.au
- EDI Format - ENMRG (ENMRG)	Email	jason.k.fowler@ghd.com.au
- EDI Format - ESDAT (ESDAT)	Email	jason.k.fowler@ghd.com.au

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: **ES0907382**	Page	: 1 of 4
Client	: **GHD SERVICES PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR ADRIAN WHITE	Contact	: Charlie Pierce
Address	: P O BOX 373 GLADSTONE QLD, AUSTRALIA 4680	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: adrian.a.white@ghd.com.au	E-mail	: charlie.pierce@alsenviro.com
Telephone	: +61 07 49731611	Telephone	: +61-2-8784 8555
Facsimile	: +61 07 4972 6236	Facsimile	: +61-2-8784 8500
Project	: 421538641-WATER BASIN EIS WQ MONITORING	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 22-MAY-2009
Sampler	: ----	Issue Date	: 29-MAY-2009
Site	: ----		
		No. of samples received	: 8
Quote number	: EN/005/09	No. of samples analysed	: 8

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

NATA Accredited Laboratory 825

This document is issued in accordance with NATA accreditation requirements.

Accredited for compliance with ISO/IEC 17025.

WORLD RECOGNISED
ACCREDITATION

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Celine Conceicao	Spectroscopist	Inorganics
Hoa Nguyen	Inorganic Chemist	Inorganics
Sarah Millington	Senior Inorganic Chemist	Inorganics
Wisam Abou-Maraseh	Spectroscopist	Inorganics

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insuffient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for processing purposes. If the sampling time is displayed as 0:00 the information was not provided by client.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting

- **EG093F: LCS recovery for various elements falls outside ALS Dynamic Control Limit. However, it is within the acceptance criteria based on ALS DQO. No further action is required.**

Analytical Results

Sub-Matrix: **WATER**			*Client sample ID*	**G-WQ-01**	**G-WQ-04**	**G-WQ-05**	**G-WQ-08**	**G-WQ-10**
			Client sampling date / time	21-MAY-2009 15:00	21-MAY-2009 15:00	21-MAY-2009 15:00	21-MAY-2009 15:00	21-MAY-2009 15:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES0907382-001**	**ES0907382-002**	**ES0907382-003**	**ES0907382-004**	**ES0907382-005**
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS								
Aluminium	7429-90-5	10	µg/L	<10	<10	<10	<10	<10
Antimony	7440-36-0	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Iron	7439-89-6	5	µg/L	**6**	**6**	**6**	<5	<5
Arsenic	7440-38-2	0.5	µg/L	**1.0**	**1.7**	**1.5**	**1.6**	**1.7**
Barium	7440-39-3	1	µg/L	**13**	**8**	**12**	**12**	**12**
Beryllium	7440-41-7	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Cadmium	7440-43-9	0.2	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Chromium	7440-47-3	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Cobalt	7440-48-4	0.2	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Copper	7440-50-8	1	µg/L	<1	**1**	**1**	**1**	**1**
Lead	7439-92-1	0.2	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Manganese	7439-96-5	0.5	µg/L	**11.0**	**3.4**	**8.5**	**7.5**	**6.8**
Nickel	7440-02-0	0.5	µg/L	**0.6**	<0.5	**0.7**	**0.7**	**0.6**
Silver	7440-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Vanadium	7440-62-2	0.5	µg/L	**1.9**	**1.8**	**2.3**	**2.2**	**2.7**
Ultra-Trace Nutrients								
Ammonia as N	7664-41-7	0.005	mg/L	**0.006**	<0.005	<0.005	**0.006**	<0.005
Nitrite as N	----	0.002	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002
Nitrate as N	14797-55-8	0.002	mg/L	**0.004**	**0.003**	**0.003**	**0.005**	**0.003**
Nitrite + Nitrate as N	----	0.002	mg/L	**0.004**	**0.003**	**0.003**	**0.005**	**0.003**
Total Kjeldahl Nitrogen as N	----	0.05	mg/L	**0.15**	**0.12**	**0.13**	**0.14**	**0.12**
Total Nitrogen as N	----	0.05	mg/L	**0.15**	**0.12**	**0.13**	**0.14**	**0.12**
Reactive Phosphorus as P	----	0.001	mg/L	**0.002**	<0.001	**0.002**	**0.002**	<0.001
Total Phosphorus as P	----	0.005	mg/L	<0.005	<0.005	<0.005	**0.006**	<0.005

Analytical Results

Sub-Matrix: **WATER**			*Client sample ID*	**G-WQ-11**	**G-WQ-12**	**QA1**	----	----
			Client sampling date / time	21-MAY-2009 15:00	21-MAY-2009 15:00	21-MAY-2009 15:00	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**ES0907382-006**	**ES0907382-007**	**ES0907382-008**	**----**	**----**
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	----	----
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS								
Aluminium	7429-90-5	10	µg/L	<10	<10	<10	----	----
Antimony	7440-36-0	0.5	µg/L	<0.5	<0.5	<0.5	----	----
Iron	7439-89-6	5	µg/L	**5**	**6**	**6**	----	----
Arsenic	7440-38-2	0.5	µg/L	**1.8**	**1.9**	**2.0**	----	----
Barium	7440-39-3	1	µg/L	**10**	**10**	**8**	----	----
Beryllium	7440-41-7	0.1	µg/L	<0.1	<0.1	<0.1	----	----
Cadmium	7440-43-9	0.2	µg/L	<0.2	<0.2	<0.2	----	----
Chromium	7440-47-3	0.5	µg/L	<0.5	<0.5	<0.5	----	----
Cobalt	7440-48-4	0.2	µg/L	<0.2	<0.2	<0.2	----	----
Copper	7440-50-8	1	µg/L	**1**	<1	**1**	----	----
Lead	7439-92-1	0.2	µg/L	<0.2	<0.2	<0.2	----	----
Manganese	7439-96-5	0.5	µg/L	**3.0**	**2.2**	**3.3**	----	----
Nickel	7440-02-0	0.5	µg/L	**0.5**	<0.5	<0.5	----	----
Silver	7440-22-4	0.1	µg/L	<0.1	<0.1	<0.1	----	----
Vanadium	7440-62-2	0.5	µg/L	**2.9**	**2.3**	**2.2**	----	----
Ultra-Trace Nutrients								
Ammonia as N	7664-41-7	0.005	mg/L	**0.006**	**0.006**	<0.005	----	----
Nitrite as N	----	0.002	mg/L	<0.002	<0.002	<0.002	----	----
Nitrate as N	14797-55-8	0.002	mg/L	**0.006**	**0.007**	**0.003**	----	----
Nitrite + Nitrate as N	----	0.002	mg/L	**0.006**	**0.007**	**0.003**	----	----
Total Kjeldahl Nitrogen as N	----	0.05	mg/L	**0.10**	**0.24**	**0.12**	----	----
Total Nitrogen as N	----	0.05	mg/L	**0.11**	**0.25**	**0.12**	----	----
Reactive Phosphorus as P	----	0.001	mg/L	**0.002**	**0.002**	<0.001	----	----
Total Phosphorus as P	----	0.005	mg/L	<0.005	<0.005	<0.005	----	----

QUALITY CONTROL REPORT

Work Order	: **ES0907382**	Page	: 1 of 5
Client	: **GHD SERVICES PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR ADRIAN WHITE	Contact	: Charlie Pierce
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E-mail	: adrian.a.white@ghd.com.au	E-mail	: charlie.pierce@alsenviro.com
Telephone	: +61 07 49731611	Telephone	: +61-2-8784 8555
Facsimile	: +61 07 4972 6236	Facsimile	: +61-2-8784 8500
Project	: 421538641-WATER BASIN EIS WQ MONITORING	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 22-MAY-2009
Sampler	: ----	Issue Date	: 29-MAY-2009
Order number	: ----		
		No. of samples received	: 8
Quote number	: EN/005/09	No. of samples analysed	: 8

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

NATA
WORLD RECOGNISED
ACCREDITATION

NATA Accredited Laboratory 825

This document is issued in
accordance with NATA
accreditation requirements.

Accredited for compliance with
ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Celine Conceicao	Spectroscopist	Inorganics
Hoa Nguyen	Inorganic Chemist	Inorganics
Sarah Millington	Senior Inorganic Chemist	Inorganics
Wisam Abou-Maraseh	Spectroscopist	Inorganics

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insuffient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key :
Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR:- No Limit; Result between 10 and 20 times LOR:- 0% - 50%; Result > 20 times LOR:- 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EG035F: Dissolved Mercury by FIMS (QC Lot: 986832)									
ES0907327-001	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
ES0907382-006	G-WQ-11	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS (QC Lot: 992229)									
ES0907382-001	G-WQ-01	EG093A-F: Beryllium	7440-41-7	0.1	µg/L	<0.1	<0.1	0.0	No Limit
		EG093A-F: Silver	7440-22-4	0.1	µg/L	<0.1	<0.1	0.0	No Limit
		EG093A-F: Cadmium	7440-43-9	0.2	µg/L	<0.2	<0.2	0.0	No Limit
		EG093A-F: Cobalt	7440-48-4	0.2	µg/L	<0.2	<0.2	0.0	No Limit
		EG093A-F: Lead	7439-92-1	0.2	µg/L	<0.2	<0.2	0.0	No Limit
		EG093A-F: Antimony	7440-36-0	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EG093A-F: Arsenic	7440-38-2	0.5	µg/L	1.0	1.3	21.3	No Limit
		EG093A-F: Chromium	7440-47-3	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EG093A-F: Manganese	7439-96-5	0.5	µg/L	11.0	11.2	1.7	0% - 20%
		EG093A-F: Nickel	7440-02-0	0.5	µg/L	0.6	0.9	34.3	No Limit
		EG093A-F: Vanadium	7440-62-2	0.5	µg/L	1.9	2.2	15.6	No Limit
		EG093A-F: Barium	7440-39-3	1	µg/L	13	13	0.0	0% - 50%
		EG093A-F: Copper	7440-50-8	1	µg/L	<1	<1	0.0	No Limit
		EG093A-F: Aluminium	7429-90-5	10	µg/L	<10	<10	0.0	No Limit
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS (QC Lot: 992230)									
ES0907382-001	G-WQ-01	EG093B-F: Iron	7439-89-6	5	µg/L	6	6	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 986705)									
ES0907382-001	G-WQ-01	EK257A-SW: Nitrite as N	----	0.002	mg/L	<0.002	<0.002	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 986706)									
ES0907382-001	G-WQ-01	EK255A-SW: Ammonia as N	7664-41-7	0.005	mg/L	0.006	0.005	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 986707)									
ES0907382-001	G-WQ-01	EK271A-SW: Reactive Phosphorus as P	----	0.001	mg/L	0.002	0.002	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 986989)									
ES0907382-001	G-WQ-01	EK262PA-SW: Total Nitrogen as N	----	0.05	mg/L	0.15	0.16	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 986990)									
ES0907382-001	G-WQ-01	EK267PA-SW: Total Phosphorus as P	----	0.005	mg/L	<0.005	<0.005	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 988516)									
ES0907327-001	Anonymous	EK259A-SW: Nitrite + Nitrate as N	----	0.002	mg/L	0.058	0.060	2.2	0% - 20%
ES0907382-001	G-WQ-01	EK259A-SW: Nitrite + Nitrate as N	----	0.002	mg/L	0.004	0.004	0.0	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EG035F: Dissolved Mercury by FIMS (QCLot: 986832)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.010 mg/L	113	86	116
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS (QCLot: 992229)								
EG093A-F: Aluminium	7429-90-5	10	µg/L	<10	50 µg/L	125	80	128
EG093A-F: Antimony	7440-36-0	0.5	µg/L	<0.5	----	----	----	----
EG093A-F: Arsenic	7440-38-2	0.5	µg/L	<0.5	10 µg/L	124	85	125
EG093A-F: Barium	7440-39-3	1	µg/L	<1	10 µg/L	115	81	129
EG093A-F: Beryllium	7440-41-7	0.1	µg/L	<0.1	10 µg/L	120	80	122
EG093A-F: Cadmium	7440-43-9	0.2	µg/L	<0.2	10 µg/L	114	78	116
EG093A-F: Chromium	7440-47-3	0.5	µg/L	<0.5	10 µg/L	121	86	128
EG093A-F: Cobalt	7440-48-4	0.2	µg/L	<0.2	10 µg/L	121	87	127
EG093A-F: Copper	7440-50-8	1	µg/L	<1	10 µg/L	# 129	86	124
EG093A-F: Lead	7439-92-1	0.2	µg/L	<0.2	10 µg/L	118	87	123
EG093A-F: Manganese	7439-96-5	0.5	µg/L	<0.5	10 µg/L	121	90	122
EG093A-F: Nickel	7440-02-0	0.5	µg/L	<0.5	10 µg/L	122	84	124
EG093A-F: Silver	7440-22-4	0.1	µg/L	<0.1	----	----	----	----
EG093A-F: Vanadium	7440-62-2	0.5	µg/L	<0.5	10 µg/L	121	85	123
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS (QCLot: 992230)								
EG093B-F: Iron	7439-89-6	5	µg/L	<5	50 µg/L	# 126	89	119
Ultra-Trace Nutrients (QCLot: 986705)								
EK257A-SW: Nitrite as N	----	0.002	mg/L	<0.002	1.0 mg/L	98.5	70	130
Ultra-Trace Nutrients (QCLot: 986706)								
EK255A-SW: Ammonia as N	7664-41-7	0.005	mg/L	<0.005	0.1 mg/L	98.3	70	130
Ultra-Trace Nutrients (QCLot: 986707)								
EK271A-SW: Reactive Phosphorus as P	----	0.001	mg/L	<0.001	0.1 mg/L	88.8	70	130
Ultra-Trace Nutrients (QCLot: 986989)								
EK262PA-SW: Total Nitrogen as N	----	0.05	mg/L	<0.05	1.0 mg/L	97.5	70	130
Ultra-Trace Nutrients (QCLot: 986990)								
EK267PA-SW: Total Phosphorus as P	----	0.005	mg/L	<0.005	0.44 mg/L	95.4	70	130
Ultra-Trace Nutrients (QCLot: 988516)								
EK259A-SW: Nitrite + Nitrate as N	----	0.002	mg/L	<0.002	0.1 mg/L	108	70	130

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	*Spike Recovery (%)*	*Recovery Limits (%)*	
Laboratory sample ID	***Client sample ID***	***Method: Compound***	***CAS Number***	***Concentration***	***MS***	***Low***	***High***
EG035F: Dissolved Mercury by FIMS (QCLot: 986832)							
ES0907327-001	Anonymous	EG035F: Mercury	7439-97-6	0.0100 mg/L	85.4	70	130
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS (QCLot: 992229)							
ES0907382-001	G-WQ-01	EG093A-F: Arsenic	7440-38-2	50 µg/L	74.7	70	130
		EG093A-F: Barium	7440-39-3	50 µg/L	75.7	70	130
		EG093A-F: Beryllium	7440-41-7	50 µg/L	70.2	70	130
		EG093A-F: Cadmium	7440-43-9	12.5 µg/L	72.6	70	130
		EG093A-F: Chromium	7440-47-3	50 µg/L	73.7	70	130
		EG093A-F: Cobalt	7440-48-4	50 µg/L	78.2	70	130
		EG093A-F: Copper	7440-50-8	50 µg/L	76.4	70	130
		EG093A-F: Lead	7439-92-1	50 µg/L	77.2	70	130
		EG093A-F: Manganese	7439-96-5	50 µg/L	71.2	70	130
		EG093A-F: Nickel	7440-02-0	50 µg/L	74.5	70	130
		EG093A-F: Vanadium	7440-62-2	50 µg/L	74.9	70	130
Ultra-Trace Nutrients (QCLot: 986705)							
ES0907382-002	G-WQ-04	EK257A-SW: Nitrite as N	----	0.1 mg/L	71.9	70	130
Ultra-Trace Nutrients (QCLot: 986706)							
ES0907382-002	G-WQ-04	EK255A-SW: Ammonia as N	7664-41-7	0.1 mg/L	102	70.	130
Ultra-Trace Nutrients (QCLot: 986707)							
ES0907382-002	G-WQ-04	EK271A-SW: Reactive Phosphorus as P	----	0.1 mg/L	123	70	130
Ultra-Trace Nutrients (QCLot: 986989)							
ES0907382-001	G-WQ-01	EK262PA-SW: Total Nitrogen as N	----	0.5 mg/L	97.7	70	130
Ultra-Trace Nutrients (QCLot: 986990)							
ES0907382-001	G-WQ-01	EK267PA-SW: Total Phosphorus as P	----	0.5 mg/L	111	70	130
Ultra-Trace Nutrients (QCLot: 988516)							
ES0907327-001	Anonymous	EK259A-SW: Nitrite + Nitrate as N	----	0.1 mg/L	74.6	70	130

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: **ES0907382**	Page	: 1 of 7
Client	: GHD SERVICES PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: MR ADRIAN WHITE	Contact	: Charlie Pierce
Address	: P O BOX 373 GLADSTONE QLD, AUSTRALIA 4680	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
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Telephone	: +61 07 49731611	Telephone	: +61-2-8784 8555
Facsimile	: +61 07 4972 6236	Facsimile	: +61-2-8784 8500
Project	: 421538641-WATER BASIN EIS WQ MONITORING	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 22-MAY-2009
Sampler	: ----	Issue Date	: 29-MAY-2009
Order number	: ----		
		No. of samples received	: 8
Quote number	: EN/005/09	No. of samples analysed	: 8

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Interpretive Quality Control Report contains the following information:

- Analysis Holding Time Compliance
- Quality Control Parameter Frequency Compliance
- Brief Method Summaries
- Summary of Outliers

Analysis Holding Time Compliance

The following report summarises extraction / preparation and analysis times and compares with recommended holding times. Dates reported represent first date of extraction or analysis and precludes subsequent dilutions and reruns. Information is also provided re the sample container (preservative) from which the analysis aliquot was taken. Elapsed period to analysis represents number of days from sampling where no extraction / digestion is involved or period from extraction / digestion where this is present. For composite samples, sampling date is assumed to be that of the oldest sample contributing to the composite. Sample date for laboratory produced leachates is assumed as the completion date of the leaching process. Outliers for holding time are based on USEPA SW 846, APHA, AS and NEPM (1999). A listing of breaches is provided in the Summary of Outliers.

Holding times for leachate methods (excluding elutriates) vary according to the analytes being determined on the resulting solution. For non -volatile analytes, the holding time compliance assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These soil holding times are: Organics (14 days); Mercury (28 days) & other metals (180 days). A recorded breach therefore does not guarantee a breach for all non-volatile parameters.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method		*Sample Date*	*Extraction / Preparation*			*Analysis*		
Container / Client Sample ID(s)			*Date extracted*	*Due for extraction*	*Evaluation*	*Date analysed*	*Due for analysis*	*Evaluation*
EG035F: Dissolved Mercury by FIMS								
Clear HDPE (U-T ORC) - Filtered; Lab-acidified								
G-WQ-01, G-WQ-05, G-WQ-10, G-WQ-12,	G-WQ-04, G-WQ-08, G-WQ-11, QA1	**21-MAY-2009**	**---**	---	----	**25-MAY-2009**	18-JUN-2009	✓
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS								
Clear HDPE (U-T ORC) - Filtered; Lab-acidified								
G-WQ-01, G-WQ-05, G-WQ-10, G-WQ-12,	G-WQ-04, G-WQ-08, G-WQ-11, QA1	**21-MAY-2009**	**28-MAY-2009**	17-NOV-2009	✓	**28-MAY-2009**	17-NOV-2009	✓
Ultra-Trace Nutrients								
Clear Plastic Bottle - Filtered (AS)								
G-WQ-01, G-WQ-05, G-WQ-10, G-WQ-12,	G-WQ-04, G-WQ-08, G-WQ-11, QA1	**21-MAY-2009**	**---**	---	----	**22-MAY-2009**	22-MAY-2009	✓
Clear Plastic Bottle - Natural (AS)								
G-WQ-01, G-WQ-05, G-WQ-10, G-WQ-12,	G-WQ-04, G-WQ-08, G-WQ-11, QA1	**21-MAY-2009**	**22-MAY-2009**	22-MAY-2009	✓	**22-MAY-2009**	22-MAY-2009	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(where) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Ammonia as N - Ultra-Trace in Saline Waters	EK255A-SW	1	8	**12.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	2	13	**15.4**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals in Saline Water -Suite A by ORC-ICPMS	EG093A-F	1	8	**12.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals in Saline Water -Suite B by ORC-ICPMS	EG093B-F	1	8	**12.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N - Ultra-Trace in Saline Waters	EK259A-SW	2	12	**16.7**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N - Ultra-Trace in Saline Waters	EK257A-SW	1	8	**12.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P - Ultra-Trace in Saline Water	EK271A-SW	1	8	**12.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Nitrogen/Persulfate Digestion/Ultra-Trace/Saline	EK262PA-SW	1	8	**12.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus/Persulfate Digestion/ Ultra Trace /Saline	EK267PA-SW	1	8	**12.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
Ammonia as N - Ultra-Trace in Saline Waters	EK255A-SW	1	8	**12.5**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	1	13	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals in Saline Water -Suite A by ORC-ICPMS	EG093A-F	1	8	**12.5**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals in Saline Water -Suite B by ORC-ICPMS	EG093B-F	1	8	**12.5**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N - Ultra-Trace in Saline Waters	EK259A-SW	1	12	**8.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N - Ultra-Trace in Saline Waters	EK257A-SW	1	8	**12.5**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P - Ultra-Trace in Saline Water	EK271A-SW	1	8	**12.5**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Nitrogen/Persulfate Digestion/Ultra-Trace/Saline	EK262PA-SW	1	8	**12.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus/Persulfate Digestion/ Ultra Trace /Saline	EK267PA-SW	1	8	**12.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
Ammonia as N - Ultra-Trace in Saline Waters	EK255A-SW	1	8	**12.5**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	1	13	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals in Saline Water -Suite A by ORC-ICPMS	EG093A-F	1	8	**12.5**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals in Saline Water -Suite B by ORC-ICPMS	EG093B-F	1	8	**12.5**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N - Ultra-Trace in Saline Waters	EK259A-SW	1	12	**8.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N - Ultra-Trace in Saline Waters	EK257A-SW	1	8	**12.5**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P - Ultra-Trace in Saline Water	EK271A-SW	1	8	**12.5**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Nitrogen/Persulfate Digestion/Ultra-Trace/Saline	EK262PA-SW	1	8	**12.5**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus/Persulfate Digestion/ Ultra Trace /Saline	EK267PA-SW	1	8	**12.5**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							
Ammonia as N - Ultra-Trace in Saline Waters	EK255A-SW	1	8	**12.5**	**5.0**	✓	ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	1	13	**7.7**	**5.0**	✓	ALS QCS3 requirement
Dissolved Metals in Saline Water -Suite A by ORC-ICPMS	EG093A-F	1	8	**12.5**	**5.0**	✓	ALS QCS3 requirement
Nitrite and Nitrate as N - Ultra-Trace in Saline Waters	EK259A-SW	1	12	**8.3**	**5.0**	✓	ALS QCS3 requirement
Nitrite as N - Ultra-Trace in Saline Waters	EK257A-SW	1	8	**12.5**	**5.0**	✓	ALS QCS3 requirement

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Matrix Spikes (MS) - Continued							
Reactive Phosphorus as P - Ultra-Trace in Saline Water	EK271A-SW	1	8	**12.5**	**5.0**	✓	ALS QCS3 requirement
Total Nitrogen/Persulfate Digestion/Ultra-Trace/Saline	EK262PA-SW	1	8	**12.5**	**5.0**	✓	ALS QCS3 requirement
Total Phosphorus/Persulfate Digestion/ Ultra Trace /Saline	EK267PA-SW	1	8	**12.5**	**5.0**	✓	ALS QCS3 requirement

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
Dissolved Mercury by FIMS	EG035F	WATER	AS 3550, APHA 21st ed. 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Dissolved Metals in Saline Water -Suite A by ORC-ICPMS	EG093A-F	WATER	APHA 21st ed., 3125; USEPA SW846 - 6020 Samples are 0.45 um filtered prior to analysis. The ORC-ICPMS technique removes interfering species through a series of chemical reactions prior to ion detection. Ions are passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to measurement by a discrete dynode ion detector. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Dissolved Metals in Saline Water -Suite B by ORC-ICPMS	EG093B-F	WATER	APHA 21st ed., 3125; USEPA SW846 - 6020 Samples are 0.45 um filtered prior to analysis. The ORC-ICPMS technique removes interfering species through a series of chemical reactions prior to ion detection. Ions are passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to measurement by a discrete dynode ion detector. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Ammonia as N - Ultra-Trace in Saline Waters	EK255A-SW	WATER	APHA 21st ed., 4500-NH3 H Ammonia is determined by direct colorimetry by FIA. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Nitrite as N - Ultra-Trace in Saline Waters	EK257A-SW	WATER	APHA 21st ed., 4500-NO2- B. Nitrite is determined by direct colourimetry by FIA.
Nitrate as N - Ultra-Trace in Saline Waters	EK258A-SW	WATER	APHA 21st ed., 4500-NO3- I Nitrate is reduced to nitrite by way of a cadmium reduction column followed by quantification by FIA. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results.
Nitrite and Nitrate as N - Ultra-Trace in Saline Waters	EK259A-SW	WATER	APHA 21st ed., 4500-NO3- I. Combined oxidised Nitrogen (NO2+NO3) is determined by Cadmium Reduction and direct colourimetry by FIA.
TKN (Total N - NOx-N). (FIA - UT) in Saline Waters	EK261PA-SW	WATER	APHA 21st ed., 4500-P J. & 4500-NO3- I. Calculated by difference from total Nitrogen and NOx. Contributing method parameters are determined by FIA. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Nitrogen/Persulfate Digestion/Ultra-Trace/Saline	EK262PA-SW	WATER	APHA 21st ed., 4500-P J. Persulfate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus. As sample is digested with persulfate under alkaline conditions yielding orthophosphate and nitrate. Following digestion, analytes are determined by flow injection analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Phosphorus/Persulfate Digestion/ Ultra Trace /Saline	EK267PA-SW	WATER	APHA 21st ed., 4500-P J. Persulfate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus. As sample is digested with persulfate under alkaline conditions yielding orthophosphate and nitrate. Following digestion, analytes are determined by flow injection analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
Reactive Phosphorus as P - Ultra-Trace in Saline Water	EK271A-SW	WATER	APHA 21st ed., 4500-P E Ammonium molybdate and potassium antimonyl tartrate reacts in acid medium with othophosphate to form a heteropoly acid -phosphomolybdic acid - which is reduced to intensely coloured molybdenum blue by ascorbic acid. Quantification is by FIA. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)

Preparation Methods	*Method*	*Matrix*	*Method Descriptions*
Persulfate Digestion for UT TN and TP for FIA/Saline	EK262/267PA-SW	WATER	APHA 21st ed., 4500 P - J. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)

Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged in the Quality Control (QC) Report. Surrogate recovery limits are static and based on USEPA SW846 or ALS-QWI/EN/38 (in the absence of specific USEPA limits). This report displays QC Outliers (breaches) only.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	**Analyte**	CAS Number	Data	Limits	**Comment**
Laboratory Control Spike (LCS) Recoveries							
EG093F: Dissolved Metals in Saline Water by ORC-ICP	1137045-003	----	**Copper**	7440-50-8	129 %	86-124%	**Recovery greater than upper control limit**
EG093F: Dissolved Metals in Saline Water by ORC-ICP	1137045-003	----	**Iron**	7439-89-6	126 %	89-119%	**Recovery greater than upper control limit**

- **For all matrices, no Method Blank value outliers occur.**
- **For all matrices, no Duplicate outliers occur.**
- **For all matrices, no Matrix Spike outliers occur.**

Regular Sample Surrogates

- **For all regular sample matrices, no surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

This report displays Holding Time breaches only. Only the respective Extraction / Preparation and/or Analysis component is/are displayed.

- **No Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

The following report highlights breaches in the Frequency of Quality Control Samples.

- **No Quality Control Sample Frequency Outliers exist.**

Chain of Custody & Analysis Request

Page _1_ of _1_

Chain of Custody Number:

GHD

PROJECT ID:	4215386 41	**QUOTE:**	
PROJECT:	**Western Basin EIS WQ Monitoring**		
CLIENT:	GHD		
POSTAL ADDRESS:	PO Box 373, Gladstone 4680		
CONTACT:	Adrian White		
PHONE:	412035667	**FAX:**	07) 49726236
EMAIL:	Jason.K.Fowler@ghd.com.au, Adrian.A.White@ghd.com.au		
INVOICE:	Jason.K.Fowler@ghd.com.au, Adrian.A.White@ghd.com.au		
DATA NEEDED BY:			
REPORT FORMAT:			
EMAIL FORMAT:	ESDAT, EXCEL & PDF		

LABORATORY BATCH NO.:

FOR LAB USE ONLY

COOLER SEAL:
Yes No ......
Broken Intact ......

COOLER TEMP:
..... deg.C

DESPATCHED TO:
ALS Environmental
277-289 Woodpark Road
Smithfield NSW 2164
02 8784 8555

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

Water samples from a marine environment (Background sampling)

(EMAIL ADDRESSES PROVIDED ABOVE)

Environmental Division
Sydney
Work Order
ES0907660

Telephone : + 61-2-8784 8555

ANALYSIS REQUIRED

SAMPLE ID	MATRIX	DATE	DETECTION LIMIT	PRESERVATION	Ultra trace ORC - dissolved metals (EG093F) (Sb, As, Ba, Be, Cd, Co, Cr, Cu, Mn, Ni, Pb, V, Hg, Fe, Al, Ag)	Ultra trace nutrients (UTN - 04) (TP, RP, NH3, NO2, NO3, TKN, TN)
G-WQ-02 1	Water	26/05/2009	LOR	As Required	X	X
G-WQ-03 2	Water	26/05/2009	LOR	As Required	X	X
G-WQ-06 3	Water	26/05/2009	LOR	As Required	X	X
G-WQ-07 4	Water	26/05/2009	LOR	As Required	X	X
G-WQ-09 5	Water	26/05/2009	LOR	As Required	X	X
QA2 6	Water	26/05/2009	LOR	As Required	X	X

RELINQUISHED BY:
NAME : A White DATE: 26/05/2009
OF: GHD Gladstone TIME: 1530

RECEIVED BY:
NAME : [illegible] DATE: 27/5/9 18.8°
OF: Als. TIME: 12:45

PLEASE EMAIL COMPLETED ANALYSIS REQUEST TO: Jason.K.Fowler@ghd.com.au, Adrian.A.White@ghd.com.au

*Container Type and Preservative Codes: P = Neutral Plastic; N = Nitric Acid Preserved; C = Sodium Hydroxide Preserved; J = Solvent Washed Acid Rinced Jar; S = Solvent Washed Acid Rinced Glass Bottle; VC = Hydrochloric Acid Preserved Vial; VS = Sulfuric Acid Preserved Vial; BS = Sulfuric Acid Preserved Glass Bottle; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; O = Other.

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

SAMPLE RECEIPT NOTIFICATION (SRN)

Comprehensive Report

Work Order : **ES0907660**

Client	: **GHD SERVICES PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR ADRIAN WHITE	Contact	: Charlie Pierce
Address	: P O BOX 373 GLADSTONE QLD, AUSTRALIA 4680	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: adrian.a.white@ghd.com.au	E-mail	: charlie.pierce@alsenviro.com
Telephone	: +61 07 49731611	Telephone	: +61-2-8784 8555
Facsimile	: +61 07 4972 6236	Facsimile	: +61-2-8784 8500
Project	: WESTERN BASIN EIS WQ MONITORING 4215386 41	Page	: 1 of 3
Order number	: ----		
C-O-C number	: ----	Quote number	: ----
Site	: ----		
Sampler	: ----	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Dates

Date Samples Received	: 27-MAY-2009	Issue Date	: 27-MAY-2009 15:26
Client Requested Due Date	: 03-JUN-2009	Scheduled Reporting Date	: **03-JUN-2009**

Delivery Details

Mode of Delivery	: Carrier	Temperature	: 1.8'C - Ice present
No. of coolers/boxes	: 1 HARD	No. of samples received	: 6
Sercurity Seal	: Intact.	No. of samples analysed	: 6

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Requested Deliverables
- **Samples received in appropriately pretreated and preserved containers.**
- **Sample(s) have been received within recommended holding times.**
- Please direct any turn around / technical queries to the laboratory contact designated above.
- Please direct any queries related to sample condition / numbering / breakages to Nanthini Coilparampil
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (14 days), Solid (90 days) from date of completion of work order.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exist.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process neccessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

When date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for processing purposes. If the sampling time is displayed as 0:00 the information was not provided by client.

Matrix: **WATER**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	WATER - EG035F Dissolved Mercury by FIMS	WATER - EG093A-F Dissolved metals in saline water by ORC-ICPMS	WATER - EG093B-F Dissolved Metals in Saline Water Suite B by ORC-ICPMS	WATER - EK255A-SW Ammonia as N (Ultra-trace in Saline Waters by Flow Injection Analysis)	WATER - EK257A-SW Nitrite as N (Ultra-trace in Saline Waters by Flow Injection Analysis)	WATER - EK258A-SW Nitrate as N by difference between NOx and NO2 (Ultra-trace in Saline Waters by	WATER - EK261PA-SW TKN by calculated difference between Total N and NOx. (Ultra-trace in Saline	WATER - EK262PA-SW Total Nitrogen by Persulfate Digestion (Ultra-trace in Saline Waters by Flow
ES0907660-001	26-MAY-2009 15:00	G-WQ-02	✓	✓	✓	✓	✓	✓	✓	✓
ES0907660-002	26-MAY-2009 15:00	G-WQ-03	✓	✓	✓	✓	✓	✓	✓	✓
ES0907660-003	26-MAY-2009 15:00	G-WQ-06	✓	✓	✓	✓	✓	✓	✓	✓
ES0907660-004	26-MAY-2009 15:00	G-WQ-07	✓	✓	✓	✓	✓	✓	✓	✓
ES0907660-005	26-MAY-2009 15:00	G-WQ-09	✓	✓	✓	✓	✓	✓	✓	✓
ES0907660-006	26-MAY-2009 15:00	QA2	✓	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	WATER - EK267PA-SW Total Phosphorus by Persulfate Digestion (Ultra-trace in Saline Waters by Flow	WATER - EK271A-SW Reactive Phosphorus (Ultra-trace in Saline Waters by Flow Injection
ES0907660-001	26-MAY-2009 15:00	G-WQ-02	✓	✓
ES0907660-002	26-MAY-2009 15:00	G-WQ-03	✓	✓
ES0907660-003	26-MAY-2009 15:00	G-WQ-06	✓	✓
ES0907660-004	26-MAY-2009 15:00	G-WQ-07	✓	✓
ES0907660-005	26-MAY-2009 15:00	G-WQ-09	✓	✓
ES0907660-006	26-MAY-2009 15:00	QA2	✓	✓

Requested Deliverables

MR ADRIAN WHITE

- *AU Certificate of Analysis - NATA (COA)	Email	adrian.a.white@ghd.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	adrian.a.white@ghd.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	adrian.a.white@ghd.com.au
- A4 - AU Sample Receipt Notification - Environmental (SRN)	Email	adrian.a.white@ghd.com.au
- A4 - AU Tax Invoice (INV)	Email	adrian.a.white@ghd.com.au
- Default - Chain of Custody (COC)	Email	adrian.a.white@ghd.com.au
- EDI Format - ENMRG (ENMRG)	Email	adrian.a.white@ghd.com.au
- EDI Format - ESDAT (ESDAT)	Email	adrian.a.white@ghd.com.au

MR JASON FOWLER

- *AU Certificate of Analysis - NATA (COA)	Email	jason.k.fowler@ghd.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	jason.k.fowler@ghd.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	jason.k.fowler@ghd.com.au
- A4 - AU Sample Receipt Notification - Environmental (SRN)	Email	jason.k.fowler@ghd.com.au
- A4 - AU Tax Invoice (INV)	Email	jason.k.fowler@ghd.com.au
- Default - Chain of Custody (COC)	Email	jason.k.fowler@ghd.com.au
- EDI Format - ENMRG (ENMRG)	Email	jason.k.fowler@ghd.com.au
- EDI Format - ESDAT (ESDAT)	Email	jason.k.fowler@ghd.com.au

CERTIFICATE OF ANALYSIS

Work Order	: **ES0907660**	Page	: 1 of 4
Client	: **GHD SERVICES PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR ADRIAN WHITE	Contact	: Charlie Pierce
Address	: P O BOX 373 GLADSTONE QLD, AUSTRALIA 4680	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: adrian.a.white@ghd.com.au	E-mail	: charlie.pierce@alsenviro.com
Telephone	: +61 07 49731611	Telephone	: +61-2-8784 8555
Facsimile	: +61 07 4972 6236	Facsimile	: +61-2-8784 8500
Project	: WESTERN BASIN EIS WQ MONITORING 4215386 41	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 27-MAY-2009
Sampler	: ----	Issue Date	: 03-JUN-2009
Site	: ----		
		No. of samples received	: 6
Quote number	: EN/005/09	No. of samples analysed	: 6

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

NATA Accredited Laboratory 825

This document is issued in accordance with NATA accreditation requirements.

Accredited for compliance with ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Hoa Nguyen	Inorganic Chemist	Inorganics
Wisam Abou-Maraseh	Spectroscopist	Inorganics

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insuffient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for processing purposes. If the sampling time is displayed as 0:00 the information was not provided by client.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting

- **EG093:LCS recovery for various elemets falls outside ALS Dynamic Control Limit. However, it is within the acceptance criteria based on ALS DQO. No further action is required.**
- **EK262PA: The TN/TKN result for sample ID' G-WQ-09' has been confirmed by re-analysis.**

Analytical Results

Sub-Matrix: **WATER**			*Client sample ID*	**G-WQ-02**	**G-WQ-03**	**G-WQ-06**	**G-WQ-07**	**G-WQ-09**
			Client sampling date / time	26-MAY-2009 15:00	26-MAY-2009 15:00	26-MAY-2009 15:00	26-MAY-2009 15:00	26-MAY-2009 15:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES0907660-001**	**ES0907660-002**	**ES0907660-003**	**ES0907660-004**	**ES0907660-005**
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS								
Aluminium	7429-90-5	10	µg/L	<10	<10	<10	<10	<10
Antimony	7440-36-0	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Iron	7439-89-6	5	µg/L	<5	<5	<5	<5	<5
Arsenic	7440-38-2	0.5	µg/L	**1.4**	**1.3**	**1.2**	**1.3**	**1.2**
Barium	7440-39-3	1	µg/L	**9**	**10**	**10**	**10**	**8**
Beryllium	7440-41-7	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Cadmium	7440-43-9	0.2	µg/L	<0.2	<0.2	**2.7**	<0.2	**1.7**
Chromium	7440-47-3	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Cobalt	7440-48-4	0.2	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Copper	7440-50-8	1	µg/L	**1**	<1	**1**	<1	<1
Lead	7439-92-1	0.2	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Manganese	7439-96-5	0.5	µg/L	<0.5	<0.5	**0.8**	**0.8**	<0.5
Nickel	7440-02-0	0.5	µg/L	**0.5**	**0.6**	**1.2**	**0.9**	**0.8**
Silver	7440-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Vanadium	7440-62-2	0.5	µg/L	**1.4**	**1.4**	**1.5**	**1.5**	**1.4**
Ultra-Trace Nutrients								
Ammonia as N	7664-41-7	0.005	mg/L	<0.005	<0.005	**0.007**	<0.005	**0.006**
Nitrite as N	----	0.002	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002
^ Nitrate as N	14797-55-8	0.002	mg/L	<0.002	**0.005**	**0.003**	**0.002**	**0.004**
Total Kjeldahl Nitrogen as N	----	0.05	mg/L	**0.14**	**0.12**	**0.15**	**0.13**	**1.88**
Total Nitrogen as N	----	0.05	mg/L	**0.14**	**0.13**	**0.15**	**0.13**	**1.88**
Reactive Phosphorus as P	----	0.001	mg/L	**0.003**	**0.004**	**0.004**	**0.003**	**0.004**
Total Phosphorus as P	----	0.005	mg/L	<0.005	<0.005	**0.011**	<0.005	<0.005

Analytical Results

Sub-Matrix: **WATER**			*Client sample ID*	**QA2**	----	----	----	----
			Client sampling date / time	26-MAY-2009 15:00	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**ES0907660-006**	**----**	**----**	**----**	**----**
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	----	----	----	----
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS								
Aluminium	7429-90-5	10	µg/L	<10	----	----	----	----
Antimony	7440-36-0	0.5	µg/L	<0.5	----	----	----	----
Iron	7439-89-6	5	µg/L	<5	----	----	----	----
Arsenic	7440-38-2	0.5	µg/L	**1.2**	----	----	----	----
Barium	7440-39-3	1	µg/L	**9**	----	----	----	----
Beryllium	7440-41-7	0.1	µg/L	<0.1	----	----	----	----
Cadmium	7440-43-9	0.2	µg/L	<0.2	----	----	----	----
Chromium	7440-47-3	0.5	µg/L	<0.5	----	----	----	----
Cobalt	7440-48-4	0.2	µg/L	<0.2	----	----	----	----
Copper	7440-50-8	1	µg/L	<1	----	----	----	----
Lead	7439-92-1	0.2	µg/L	<0.2	----	----	----	----
Manganese	7439-96-5	0.5	µg/L	<0.5	----	----	----	----
Nickel	7440-02-0	0.5	µg/L	**0.5**	----	----	----	----
Silver	7440-22-4	0.1	µg/L	<0.1	----	----	----	----
Vanadium	7440-62-2	0.5	µg/L	**1.5**	----	----	----	----
Ultra-Trace Nutrients								
Ammonia as N	7664-41-7	0.005	mg/L	<0.005	----	----	----	----
Nitrite as N	----	0.002	mg/L	<0.002	----	----	----	----
^ Nitrate as N	14797-55-8	0.002	mg/L	**0.003**	----	----	----	----
Total Kjeldahl Nitrogen as N	----	0.05	mg/L	**0.11**	----	----	----	----
Total Nitrogen as N	----	0.05	mg/L	**0.11**	----	----	----	----
Reactive Phosphorus as P	----	0.001	mg/L	**0.004**	----	----	----	----
Total Phosphorus as P	----	0.005	mg/L	<0.005	----	----	----	----

QUALITY CONTROL REPORT

Work Order	: **ES0907660**	Page	: 1 of 5
Client	: **GHD SERVICES PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR ADRIAN WHITE	Contact	: Charlie Pierce
Address	: P O BOX 373 GLADSTONE QLD, AUSTRALIA 4680	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: adrian.a.white@ghd.com.au	E-mail	: charlie.pierce@alsenviro.com
Telephone	: +61 07 49731611	Telephone	: +61-2-8784 8555
Facsimile	: +61 07 4972 6236	Facsimile	: +61-2-8784 8500
Project	: WESTERN BASIN EIS WQ MONITORING 4215386 41	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 27-MAY-2009
Sampler	: ----	Issue Date	: 03-JUN-2009
Order number	: ----		
		No. of samples received	: 6
Quote number	: EN/005/09	No. of samples analysed	: 6

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

NATA
WORLD RECOGNISED ACCREDITATION

NATA Accredited Laboratory 825

This document is issued in accordance with NATA accreditation requirements.

Accredited for compliance with ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Hoa Nguyen	Inorganic Chemist	Inorganics
Wisam Abou-Maraseh	Spectroscopist	Inorganics

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insuffient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key :
Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR:- No Limit; Result between 10 and 20 times LOR:- 0% - 50%; Result > 20 times LOR:- 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EG035F: Dissolved Mercury by FIMS (QC Lot: 991122)									
ES0907660-001	G-WQ-02	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS (QC Lot: 995006)									
EM0904803-001	Anonymous	EG093A-F: Beryllium	7440-41-7	0.1	µg/L	<0.1	<0.1	0.0	No Limit
		EG093A-F: Silver	7440-22-4	0.1	µg/L	0.1	<0.1	0.0	No Limit
		EG093A-F: Cadmium	7440-43-9	0.2	µg/L	<0.2	<0.2	0.0	No Limit
		EG093A-F: Cobalt	7440-48-4	0.2	µg/L	<0.2	<0.2	0.0	No Limit
		EG093A-F: Lead	7439-92-1	0.2	µg/L	<0.2	<0.2	0.0	No Limit
		EG093A-F: Antimony	7440-36-0	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EG093A-F: Arsenic	7440-38-2	0.5	µg/L	2.1	1.7	16.6	No Limit
		EG093A-F: Chromium	7440-47-3	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EG093A-F: Manganese	7439-96-5	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EG093A-F: Nickel	7440-02-0	0.5	µg/L	0.5	<0.5	0.0	No Limit
		EG093A-F: Vanadium	7440-62-2	0.5	µg/L	1.6	1.6	0.0	No Limit
		EG093A-F: Barium	7440-39-3	1	µg/L	6	6	0.0	No Limit
		EG093A-F: Copper	7440-50-8	1	µg/L	<1	<1	0.0	No Limit
		EG093A-F: Aluminium	7429-90-5	10	µg/L	<10	<10	0.0	No Limit
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS (QC Lot: 995007)									
EM0904803-001	Anonymous	EG093B-F: Iron	7439-89-6	5	µg/L	<5	<5	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 991316)									
ES0907660-001	G-WQ-02	EK257A-SW: Nitrite as N	----	0.002	mg/L	<0.002	<0.002	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 991317)									
ES0907660-001	G-WQ-02	EK255A-SW: Ammonia as N	7664-41-7	0.005	mg/L	<0.005	<0.005	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 991319)									
ES0907660-001	G-WQ-02	EK271A-SW: Reactive Phosphorus as P	----	0.001	mg/L	0.003	0.004	31.6	No Limit
Ultra-Trace Nutrients (QC Lot: 991321)									
ES0907660-001	G-WQ-02	EK262PA-SW: Total Nitrogen as N	----	0.05	mg/L	0.14	0.13	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 991322)									
ES0907660-001	G-WQ-02	EK267PA-SW: Total Phosphorus as P	----	0.005	mg/L	<0.005	<0.005	0.0	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	*Laboratory Control Spike (LCS) Report*			
					Spike	*Spike Recovery (%)*	*Recovery Limits (%)*	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EG035F: Dissolved Mercury by FIMS (QCLot: 991122)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.010 mg/L	107	86	116
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS (QCLot: 995006)								
EG093A-F: Aluminium	7429-90-5	10	µg/L	<10	50 µg/L	92.2	80	128
EG093A-F: Antimony	7440-36-0	0.5	µg/L	<0.5	----	----	----	----
EG093A-F: Arsenic	7440-38-2	0.5	µg/L	<0.5	10 µg/L	99.8	85	125
EG093A-F: Barium	7440-39-3	1	µg/L	<1	10 µg/L	110	81	129
EG093A-F: Beryllium	7440-41-7	0.1	µg/L	<0.1	10 µg/L	90.6	80	122
EG093A-F: Cadmium	7440-43-9	0.2	µg/L	<0.2	10 µg/L	113	78	116
EG093A-F: Chromium	7440-47-3	0.5	µg/L	<0.5	10 µg/L	102	86	128
EG093A-F: Cobalt	7440-48-4	0.2	µg/L	<0.2	10 µg/L	109	87	127
EG093A-F: Copper	7440-50-8	1	µg/L	<1	10 µg/L	108	86	124
EG093A-F: Lead	7439-92-1	0.2	µg/L	<0.2	10 µg/L	98.4	87	123
EG093A-F: Manganese	7439-96-5	0.5	µg/L	<0.5	10 µg/L	112	90	122
EG093A-F: Nickel	7440-02-0	0.5	µg/L	<0.5	10 µg/L	101	84	124
EG093A-F: Silver	7440-22-4	0.1	µg/L	<0.1	----	----	----	----
EG093A-F: Vanadium	7440-62-2	0.5	µg/L	<0.5	10 µg/L	96.7	85	123
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS (QCLot: 995007)								
EG093B-F: Iron	7439-89-6	5	µg/L	<5	50 µg/L	101	89	119
Ultra-Trace Nutrients (QCLot: 991316)								
EK257A-SW: Nitrite as N	----	0.002	mg/L	<0.002	0.1 mg/L	102	70	130
Ultra-Trace Nutrients (QCLot: 991317)								
EK255A-SW: Ammonia as N	7664-41-7	0.005	mg/L	<0.005	0.1 mg/L	101	70	130
Ultra-Trace Nutrients (QCLot: 991319)								
EK271A-SW: Reactive Phosphorus as P	----	0.001	mg/L	<0.001	0.1 mg/L	101	70	130
Ultra-Trace Nutrients (QCLot: 991321)								
EK262PA-SW: Total Nitrogen as N	----	0.05	mg/L	<0.05	1.0 mg/L	89.8	70	130
Ultra-Trace Nutrients (QCLot: 991322)								
EK267PA-SW: Total Phosphorus as P	----	0.005	mg/L	<0.005	0.44 mg/L	85.2	70	130

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	*Spike Recovery (%)*	*Recovery Limits (%)*	
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EG035F: Dissolved Mercury by FIMS (QCLot: 991122)							
ES0907660-001	G-WQ-02	EG035F: Mercury	7439-97-6	0.0100 mg/L	81.6	70	130
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS (QCLot: 995006)							
EB0908379-002	Anonymous	EG093A-F: Arsenic	7440-38-2	50 µg/L	70.2	70	130
		EG093A-F: Barium	7440-39-3	50 µg/L	72.0	70	130
		EG093A-F: Beryllium	7440-41-7	50 µg/L	78.3	70	130
		EG093A-F: Cadmium	7440-43-9	12.5 µg/L	71.0	70	130
		EG093A-F: Chromium	7440-47-3	50 µg/L	76.6	70	130
		EG093A-F: Cobalt	7440-48-4	50 µg/L	76.1	70	130
		EG093A-F: Copper	7440-50-8	50 µg/L	85.9	70	130
		EG093A-F: Lead	7439-92-1	50 µg/L	73.5	70	130
		EG093A-F: Manganese	7439-96-5	50 µg/L	97.0	70	130
		EG093A-F: Nickel	7440-02-0	50 µg/L	70.6	70	130
		EG093A-F: Vanadium	7440-62-2	50 µg/L	77.7	70	130
Ultra-Trace Nutrients (QCLot: 991316)							
ES0907660-001	G-WQ-02	EK257A-SW: Nitrite as N	----	0.1 mg/L	121	70	130
Ultra-Trace Nutrients (QCLot: 991317)							
ES0907660-001	G-WQ-02	EK255A-SW: Ammonia as N	7664-41-7	0.1 mg/L	94.1	70.	130
Ultra-Trace Nutrients (QCLot: 991319)							
ES0907660-001	G-WQ-02	EK271A-SW: Reactive Phosphorus as P	----	0.1 mg/L	77.5	70	130
Ultra-Trace Nutrients (QCLot: 991321)							
ES0907660-001	G-WQ-02	EK262PA-SW: Total Nitrogen as N	----	0.5 mg/L	73.7	70	130
Ultra-Trace Nutrients (QCLot: 991322)							
ES0907660-001	G-WQ-02	EK267PA-SW: Total Phosphorus as P	----	0.5 mg/L	80.7	70	130

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: **ES0907660**	Page	: 1 of 6
Client	: GHD SERVICES PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: MR ADRIAN WHITE	Contact	: Charlie Pierce
Address	: P O BOX 373 GLADSTONE QLD, AUSTRALIA 4680	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: adrian.a.white@ghd.com.au	E-mail	: charlie.pierce@alsenviro.com
Telephone	: +61 07 49731611	Telephone	: +61-2-8784 8555
Facsimile	: +61 07 4972 6236	Facsimile	: +61-2-8784 8500
Project	: WESTERN BASIN EIS WQ MONITORING 4215386 41	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 27-MAY-2009
Sampler	: ----	Issue Date	: 03-JUN-2009
Order number	: ----		
		No. of samples received	: 6
Quote number	: EN/005/09	No. of samples analysed	: 6

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Interpretive Quality Control Report contains the following information:

- Analysis Holding Time Compliance
- Quality Control Parameter Frequency Compliance
- Brief Method Summaries
- Summary of Outliers

Analysis Holding Time Compliance

The following report summarises extraction / preparation and analysis times and compares with recommended holding times. Dates reported represent first date of extraction or analysis and precludes subsequent dilutions and reruns. Information is also provided re the sample container (preservative) from which the analysis aliquot was taken. Elapsed period to analysis represents number of days from sampling where no extraction / digestion is involved or period from extraction / digestion where this is present. For composite samples, sampling date is assumed to be that of the oldest sample contributing to the composite. Sample date for laboratory produced leachates is assumed as the completion date of the leaching process. Outliers for holding time are based on USEPA SW 846, APHA, AS and NEPM (1999). A listing of breaches is provided in the Summary of Outliers.

Holding times for leachate methods (excluding elutriates) vary according to the analytes being determined on the resulting solution. For non -volatile analytes, the holding time compliance assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These soil holding times are: Organics (14 days); Mercury (28 days) & other metals (180 days). A recorded breach therefore does not guarantee a breach for all non-volatile parameters.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method	***Sample Date***	*Extraction / Preparation*			*Analysis*		
Container */ Client Sample ID(s)*		***Date extracted***	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*
EG035F: Dissolved Mercury by FIMS							
Clear HDPE (U-T ORC) - Filtered; Lab-acidified G-WQ-02, G-WQ-03, G-WQ-06, G-WQ-07, G-WQ-09, QA2	**26-MAY-2009**	**---**	---	----	**29-MAY-2009**	23-JUN-2009	✓
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS							
Clear HDPE (U-T ORC) - Filtered; Lab-acidified G-WQ-02, G-WQ-03, G-WQ-06, G-WQ-07, G-WQ-09, QA2	**26-MAY-2009**	**01-JUN-2009**	---	----	**01-JUN-2009**	22-NOV-2009	✓
Ultra-Trace Nutrients							
Clear Plastic Bottle - Filtered (AS) G-WQ-02, G-WQ-03, G-WQ-06, G-WQ-07, G-WQ-09, QA2	**26-MAY-2009**	**---**	---	----	**27-MAY-2009**	27-MAY-2009	✓
Clear Plastic Bottle - Natural G-WQ-02, G-WQ-03, G-WQ-06, G-WQ-07, G-WQ-09, QA2	**26-MAY-2009**	**27-MAY-2009**	27-MAY-2009	✓	**27-MAY-2009**	27-MAY-2009	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(where) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		*Count*		*Rate (%)*			*Quality Control Specification*
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Ammonia as N - Ultra-Trace in Saline Waters	EK255A-SW	1	6	**16.7**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	1	6	**16.7**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals in Saline Water -Suite A by ORC-ICPMS	EG093A-F	1	9	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals in Saline Water -Suite B by ORC-ICPMS	EG093B-F	1	7	**14.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N - Ultra-Trace in Saline Waters	EK257A-SW	1	6	**16.7**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P - Ultra-Trace in Saline Water	EK271A-SW	1	6	**16.7**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Nitrogen/Persulfate Digestion/Ultra-Trace/Saline	EK262PA-SW	1	6	**16.7**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus/Persulfate Digestion/ Ultra Trace /Saline	EK267PA-SW	1	6	**16.7**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
Ammonia as N - Ultra-Trace in Saline Waters	EK255A-SW	1	6	**16.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	1	6	**16.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals in Saline Water -Suite A by ORC-ICPMS	EG093A-F	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals in Saline Water -Suite B by ORC-ICPMS	EG093B-F	1	7	**14.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N - Ultra-Trace in Saline Waters	EK257A-SW	1	6	**16.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P - Ultra-Trace in Saline Water	EK271A-SW	1	6	**16.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Nitrogen/Persulfate Digestion/Ultra-Trace/Saline	EK262PA-SW	1	6	**16.7**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus/Persulfate Digestion/ Ultra Trace /Saline	EK267PA-SW	1	6	**16.7**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
Ammonia as N - Ultra-Trace in Saline Waters	EK255A-SW	1	6	**16.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	1	6	**16.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals in Saline Water -Suite A by ORC-ICPMS	EG093A-F	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals in Saline Water -Suite B by ORC-ICPMS	EG093B-F	1	7	**14.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N - Ultra-Trace in Saline Waters	EK257A-SW	1	6	**16.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P - Ultra-Trace in Saline Water	EK271A-SW	1	6	**16.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Nitrogen/Persulfate Digestion/Ultra-Trace/Saline	EK262PA-SW	1	6	**16.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus/Persulfate Digestion/ Ultra Trace /Saline	EK267PA-SW	1	6	**16.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							
Ammonia as N - Ultra-Trace in Saline Waters	EK255A-SW	1	6	**16.7**	**5.0**	✓	ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	1	6	**16.7**	**5.0**	✓	ALS QCS3 requirement
Dissolved Metals in Saline Water -Suite A by ORC-ICPMS	EG093A-F	1	9	**11.1**	**5.0**	✓	ALS QCS3 requirement
Nitrite as N - Ultra-Trace in Saline Waters	EK257A-SW	1	6	**16.7**	**5.0**	✓	ALS QCS3 requirement
Reactive Phosphorus as P - Ultra-Trace in Saline Water	EK271A-SW	1	6	**16.7**	**5.0**	✓	ALS QCS3 requirement
Total Nitrogen/Persulfate Digestion/Ultra-Trace/Saline	EK262PA-SW	1	6	**16.7**	**5.0**	✓	ALS QCS3 requirement
Total Phosphorus/Persulfate Digestion/ Ultra Trace /Saline	EK267PA-SW	1	6	**16.7**	**5.0**	✓	ALS QCS3 requirement

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
Dissolved Mercury by FIMS	EG035F	WATER	AS 3550, APHA 21st ed. 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Dissolved Metals in Saline Water -Suite A by ORC-ICPMS	EG093A-F	WATER	APHA 21st ed., 3125; USEPA SW846 - 6020 Samples are 0.45 um filtered prior to analysis. The ORC-ICPMS technique removes interfering species through a series of chemical reactions prior to ion detection. Ions are passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to measurement by a discrete dynode ion detector. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Dissolved Metals in Saline Water -Suite B by ORC-ICPMS	EG093B-F	WATER	APHA 21st ed., 3125; USEPA SW846 - 6020 Samples are 0.45 um filtered prior to analysis. The ORC-ICPMS technique removes interfering species through a series of chemical reactions prior to ion detection. Ions are passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to measurement by a discrete dynode ion detector. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Ammonia as N - Ultra-Trace in Saline Waters	EK255A-SW	WATER	APHA 21st ed., 4500-NH3 H Ammonia is determined by direct colorimetry by FIA. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Nitrite as N - Ultra-Trace in Saline Waters	EK257A-SW	WATER	APHA 21st ed., 4500-NO2- B. Nitrite is determined by direct colourimetry by FIA.
Nitrate as N - Ultra-Trace in Saline Waters	EK258A-SW	WATER	APHA 21st ed., 4500-NO3- I Nitrate is reduced to nitrite by way of a cadmium reduction column followed by quantification by FIA. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results.
Nitrite and Nitrate as N - Ultra-Trace in Saline Waters	EK259A-SW	WATER	APHA 21st ed., 4500-NO3- I. Combined oxidised Nitrogen (NO2+NO3) is determined by Cadmium Reduction and direct colourimetry by FIA.
TKN (Total N - NOx-N). (FIA - UT) in Saline Waters	EK261PA-SW	WATER	APHA 21st ed., 4500-P J. & 4500-NO3- I. Calculated by difference from total Nitrogen and NOx. Contributing method parameters are determined by FIA. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Nitrogen/Persulfate Digestion/Ultra-Trace/Saline	EK262PA-SW	WATER	APHA 21st ed., 4500-P J. Persulfate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus. As sample is digested with persulfate under alkaline conditions yielding orthophosphate and nitrate. Following digestion, analytes are determined by flow injection analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Phosphorus/Persulfate Digestion/ Ultra Trace /Saline	EK267PA-SW	WATER	APHA 21st ed., 4500-P J. Persulfate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus. As sample is digested with persulfate under alkaline conditions yielding orthophosphate and nitrate. Following digestion, analytes are determined by flow injection analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
Reactive Phosphorus as P - Ultra-Trace in Saline Water	EK271A-SW	WATER	APHA 21st ed., 4500-P E Ammonium molybdate and potassium antimonyl tartrate reacts in acid medium with othophosphate to form a heteropoly acid -phosphomolybdic acid - which is reduced to intensely coloured molybdenum blue by ascorbic acid. Quantification is by FIA. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)

Preparation Methods	*Method*	*Matrix*	*Method Descriptions*
Persulfate Digestion for UT TN and TP for FIA/Saline	EK262/267PA-SW	WATER	APHA 21st ed., 4500 P - J. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)

Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged in the Quality Control (QC) Report. Surrogate recovery limits are static and based on USEPA SW846 or ALS-QWI/EN/38 (in the absence of specific USEPA limits). This report displays QC Outliers (breaches) only.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

- **For all matrices, no Method Blank value outliers occur.**
- **For all matrices, no Duplicate outliers occur.**
- **For all matrices, no Laboratory Control outliers occur.**
- **For all matrices, no Matrix Spike outliers occur.**

Regular Sample Surrogates

- **For all regular sample matrices, no surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

This report displays Holding Time breaches only. Only the respective Extraction / Preparation and/or Analysis component is/are displayed.

- **No Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

The following report highlights breaches in the Frequency of Quality Control Samples.

- **No Quality Control Sample Frequency Outliers exist.**

Chain of Custody & Analysis Request

Page __1__ of _1__

Chain of Custody Number:

GHD

PROJECT ID:	4215386 41	**QUOTE:**	
PROJECT:	**Western Basin EIS WQ Monitoring**		
CLIENT:	GHD		
POSTAL ADDRESS:	PO Box 373, Gladstone 4680		
CONTACT:	Adrian White		
PHONE:	412035667	**FAX:**	07) 49726236
EMAIL:	Jason.K.Fowler@ghd.com.au, Adrian.A.White@ghd.com.au		
INVOICE:	Jason.K.Fowler@ghd.com.au, Adrian.A.White@ghd.com.au		
DATA NEEDED BY:			
REPORT FORMAT:			
EMAIL FORMAT:	ESDAT, EXCEL & PDF		

LABORATORY BATCH NO.:

FOR LAB USE ONLY

COOLER SEAL:

Yes No ......

Broken Intact ......

COOLER TEMP:

..... deg.C

DESPATCHED TO:

ALS Environmental
277-289 Woodpark Road
Smithfield NSW 2164
02 8784 8555

Environmental Division
Sydney
Work Order
ES0909216
Telephone : + 61-2-8784 8555

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

Water samples from a marine environment (Background sampling)

(EMAIL ADDRESSES PROVIDED ABOVE)

ANALYSIS REQUIRED

SAMPLE ID	**MATRIX**	**DATE**	**DETECTION LIMIT**	**PRESERVATION**	**Ultra trace ORC - dissolved metals (EG093F) (Sb, As, Ba, Be, Cd, Co, Cr, Cu, Mn, Ni, Pb, V, Hg, Fe, Al, Ag)**	**Ultra trace nutrients (UTN - 04) (TP, RP, NH3, NO2, NO3, TKN, TN)**	**Multi Residue Pesticides –EP-215LL (lowest DL)**					
G-WQ-01 1	Water	**24/06/2009**	LOR	As Required	**X**	**X**	**X**					
G-WQ-05 2	Water	**24/06/2009**	LOR	As Required	**X**	**X**	**X**					
G-WQ-06 3	Water	**24/06/2009**	LOR	As Required	**X**	**X**	**X**					
G-WQ-07 4	Water	**24/06/2009**	LOR	As Required	**X**	**X**	**X**					
G-WQ-09 5	Water	**24/06/2009**	LOR	As Required	**X**	**X**	**X**					
QA-04 6	Water	**24/06/2009**	LOR	As Required	**X**	**X**	**X**					

Ultra trace nutrient bottles frozen in The field, using dry ice.

RELINQUISHED BY:

NAME : J Fowler DATE: 24/06/2009

OF: GHD Gladstone TIME: 1530

RECEIVED BY:

NAME : Frank DATE: 25-6-9

OF: ALS TIME: 9.30am

PLEASE EMAIL COMPLETED ANALYSIS REQUEST TO: Jason.K.Fowler@ghd.com.au, Adrian.A.White@ghd.com.au

*Container Type and Preservative Codes: P = Neutral Plastic; N = Nitric Acid Preserved; C = Sodium Hydroxide Preserved; J = Solvent Washed Acid Rinced Jar; S = Solvent Washed Acid Rinced Glass Bottle; VC = Hydrochloric Acid Preserved Vial; VS = Sulfuric Acid Preserved Vial; BS = Sulfuric Acid Preserved Glass Bottle; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; O = Other.

SAMPLE RECEIPT NOTIFICATION (SRN)

Comprehensive Report

Work Order : **ES0909216**

Client	: **GHD SERVICES PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR ADRIAN WHITE	Contact	: Charlie Pierce
Address	: P O BOX 373 GLADSTONE QLD, AUSTRALIA 4680	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: adrian.a.white@ghd.com.au	E-mail	: charlie.pierce@alsenviro.com
Telephone	: +61 07 49731611	Telephone	: +61-2-8784 8555
Facsimile	: +61 07 4972 6236	Facsimile	: +61-2-8784 8500
Project	: 421538641 WESTERN BASIN EIS WQ MONITORING	Page	: 1 of 2
Order number	: ----		
C-O-C number	: ----	Quote number	: EM2009GHDSER0392 (EN/005/09)
Site	: ----		
Sampler	: ----	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Dates

Date Samples Received	: 25-JUN-2009	Issue Date	: 25-JUN-2009 13:50
Client Requested Due Date	: 06-JUL-2009	Scheduled Reporting Date	: **06-JUL-2009**

Delivery Details

Mode of Delivery	: Carrier	Temperature	: 14.8'C - Ice present
No. of coolers/boxes	: 2 HARD	No. of samples received	: 6
Sercurity Seal	: Intact.	No. of samples analysed	: 6

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Requested Deliverables
- **Samples received in appropriately pretreated and preserved containers.**
- **Sample(s) have been received within recommended holding times.**
- Please direct any turn around / technical queries to the laboratory contact designated above.
- Please direct any queries related to sample condition / numbering / breakages to Nanthini Coilparampil
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (14 days), Solid (90 days) from date of completion of work order.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exist.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process neccessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

When date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for processing purposes. If the sampling time is displayed as 0:00 the information was not provided by client.

Matrix: **WATER**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	WATER - EG035F Dissolved Mercury by FIMS	WATER - EG093A-F Dissolved metals in saline water by ORC-ICPMS	WATER - EG093B-F Dissolved Metals in Saline Water Suite B by ORC-ICPMS	WATER - EP215LL Multiresidue Pesticide Screen (Suite 2) - Low Level	WATER - UTN-4 Ultratrace NO2, NO3, NH3, Nitrogen, Phosphorus, TKN, Reactive Phosphorus
ES0909216-001	24-JUN-2009 15:00	G-WQ-01	✓	✓	✓	✓	✓
ES0909216-002	24-JUN-2009 15:00	G-WQ-05	✓	✓	✓	✓	✓
ES0909216-003	24-JUN-2009 15:00	G-WQ-06	✓	✓	✓	✓	✓
ES0909216-004	24-JUN-2009 15:00	G-WQ-07	✓	✓	✓	✓	✓
ES0909216-005	24-JUN-2009 15:00	G-WQ-09	✓	✓	✓	✓	✓
ES0909216-006	24-JUN-2009 15:00	QA-04	✓	✓	✓	✓	✓

Requested Deliverables

MR ADRIAN WHITE

- *AU Certificate of Analysis - NATA (COA)	Email	adrian.a.white@ghd.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	adrian.a.white@ghd.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	adrian.a.white@ghd.com.au
- A4 - AU Sample Receipt Notification - Environmental (SRN)	Email	adrian.a.white@ghd.com.au
- A4 - AU Tax Invoice (INV)	Email	adrian.a.white@ghd.com.au
- Default - Chain of Custody (COC)	Email	adrian.a.white@ghd.com.au
- EDI Format - ENMRG (ENMRG)	Email	adrian.a.white@ghd.com.au
- EDI Format - ESDAT (ESDAT)	Email	adrian.a.white@ghd.com.au

MR JASON FOWLER

- *AU Certificate of Analysis - NATA (COA)	Email	jason.k.fowler@ghd.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	jason.k.fowler@ghd.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	jason.k.fowler@ghd.com.au
- A4 - AU Sample Receipt Notification - Environmental (SRN)	Email	jason.k.fowler@ghd.com.au
- A4 - AU Tax Invoice (INV)	Email	jason.k.fowler@ghd.com.au
- Default - Chain of Custody (COC)	Email	jason.k.fowler@ghd.com.au
- EDI Format - ENMRG (ENMRG)	Email	jason.k.fowler@ghd.com.au
- EDI Format - ESDAT (ESDAT)	Email	jason.k.fowler@ghd.com.au

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: **ES0909216**	Page	: 1 of 4
Client	: **GHD SERVICES PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR ADRIAN WHITE	Contact	: Charlie Pierce
Address	: P O BOX 373 GLADSTONE QLD, AUSTRALIA 4680	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: adrian.a.white@ghd.com.au	E-mail	: charlie.pierce@alsenviro.com
Telephone	: +61 07 49731611	Telephone	: +61-2-8784 8555
Facsimile	: +61 07 4972 6236	Facsimile	: +61-2-8784 8500
Project	: 421538641 WESTERN BASIN EIS WQ MONITORING	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 25-JUN-2009
Sampler	: ----	Issue Date	: 07-JUL-2009
Site	: ----		
		No. of samples received	: 6
Quote number	: BN/314/09	No. of samples analysed	: 6

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

NATA Accredited Laboratory 825

This document is issued in accordance with NATA accreditation requirements.

Accredited for compliance with ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Celine Conceicao	Spectroscopist	Inorganics
Hoa Nguyen	Inorganic Chemist	Inorganics
Lana Nguyen	LCMS Chemist	Organics

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insuffient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for processing purposes. If the sampling time is displayed as 0:00 the information was not provided by client.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting

- **EG093: LCS recovery for various elements falls outside ALS Dynamic Control Limit. However, it is within the acceptance criteria based on ALS DQO. No further action is required.**
- **EK271A & EK255A: Spike failed for Reactive Phosphorus and Ammonia due to matrix interference (confirmed by re-analysis).**

Analytical Results

Sub-Matrix: **WATER**			*Client sample ID*	**G-WQ-01**	**G-WQ-05**	**G-WQ-06**	**G-WQ-07**	**G-WQ-09**
			Client sampling date / time	24-JUN-2009 15:00	24-JUN-2009 15:00	24-JUN-2009 15:00	24-JUN-2009 15:00	24-JUN-2009 15:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES0909216-001**	**ES0909216-002**	**ES0909216-003**	**ES0909216-004**	**ES0909216-005**
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS								
Aluminium	7429-90-5	10	µg/L	<10	<10	<10	<10	<10
Antimony	7440-36-0	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Iron	7439-89-6	5	µg/L	<5	<5	<5	<5	<5
Arsenic	7440-38-2	0.5	µg/L	**0.6**	**0.7**	**0.7**	**0.7**	**0.6**
Barium	7440-39-3	1	µg/L	**7**	**7**	**8**	**8**	**6**
Beryllium	7440-41-7	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Cadmium	7440-43-9	0.2	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Chromium	7440-47-3	0.5	µg/L	<0.5	<0.5	**2.9**	<0.5	<0.5
Cobalt	7440-48-4	0.2	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Copper	7440-50-8	1	µg/L	<1	<1	<1	<1	<1
Lead	7439-92-1	0.2	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Manganese	7439-96-5	0.5	µg/L	**1.2**	**0.6**	**1.6**	**0.7**	<0.5
Nickel	7440-02-0	0.5	µg/L	<0.5	<0.5	**0.7**	<0.5	<0.5
Silver	7440-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Vanadium	7440-62-2	0.5	µg/L	**1.1**	**1.3**	**1.5**	**1.1**	**1.3**
EP215: Multiresidue Pesticide Residue Screen (Suite 2)								
Simazine	122-34-9	0.005	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Diuron	330-54-1	0.005	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Atrazine	1912-24-9	0.005	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Molinate	2212-67-1	0.005	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Metolachlor	51218-45-2	0.005	µg/L	**0.013**	<0.005	**0.099**	**0.030**	**0.027**
Malathion	121-75-5	0.002	µg/L	<0.002	<0.002	<0.002	<0.002	<0.002
Diazinon	333-41-5	0.005	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Thiobencarb	28249-77-6	0.005	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorpyrifos	2921-88-2	0.005	µg/L	**0.024**	<0.005	<0.005	<0.005	<0.005
Trifluralin	1582-09-8	0.005	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Ultra-Trace Nutrients								
Ammonia as N	7664-41-7	0.005	mg/L	**0.005**	**0.006**	**0.006**	**0.006**	<0.005
Nitrite as N	----	0.002	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002
^ Nitrate as N	14797-55-8	0.002	mg/L	**0.005**	**0.006**	**0.006**	**0.009**	**0.007**
Nitrite + Nitrate as N	----	0.002	mg/L	**0.005**	**0.006**	**0.006**	**0.009**	**0.007**
Total Kjeldahl Nitrogen as N	----	0.05	mg/L	**0.14**	**0.11**	**0.14**	**0.11**	**0.11**
Total Nitrogen as N	----	0.05	mg/L	**0.15**	**0.12**	**0.15**	**0.12**	**0.12**
Reactive Phosphorus as P	----	0.001	mg/L	**0.002**	**0.002**	**0.002**	**0.002**	**0.001**
Total Phosphorus as P	----	0.005	mg/L	**0.009**	**0.006**	**0.006**	<0.005	<0.005

Analytical Results

Sub-Matrix: **WATER**			*Client sample ID*	**QA-04**	----	----	----	----
			Client sampling date / time	24-JUN-2009 15:00	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**ES0909216-006**	**----**	**----**	**----**	**----**
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	----	----	----	----
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS								
Aluminium	7429-90-5	10	µg/L	<10	----	----	----	----
Antimony	7440-36-0	0.5	µg/L	<0.5	----	----	----	----
Iron	7439-89-6	5	µg/L	<5	----	----	----	----
Arsenic	7440-38-2	0.5	µg/L	**0.6**	----	----	----	----
Barium	7440-39-3	1	µg/L	**8**	----	----	----	----
Beryllium	7440-41-7	0.1	µg/L	<0.1	----	----	----	----
Cadmium	7440-43-9	0.2	µg/L	<0.2	----	----	----	----
Chromium	7440-47-3	0.5	µg/L	<0.5	----	----	----	----
Cobalt	7440-48-4	0.2	µg/L	<0.2	----	----	----	----
Copper	7440-50-8	1	µg/L	<1	----	----	----	----
Lead	7439-92-1	0.2	µg/L	<0.2	----	----	----	----
Manganese	7439-96-5	0.5	µg/L	**0.8**	----	----	----	----
Nickel	7440-02-0	0.5	µg/L	<0.5	----	----	----	----
Silver	7440-22-4	0.1	µg/L	<0.1	----	----	----	----
Vanadium	7440-62-2	0.5	µg/L	**1.4**	----	----	----	----
EP215: Multiresidue Pesticide Residue Screen (Suite 2)								
Simazine	122-34-9	0.005	µg/L	<0.005	----	----	----	----
Diuron	330-54-1	0.005	µg/L	<0.005	----	----	----	----
Atrazine	1912-24-9	0.005	µg/L	<0.005	----	----	----	----
Molinate	2212-67-1	0.005	µg/L	<0.005	----	----	----	----
Metolachlor	51218-45-2	0.005	µg/L	<0.005	----	----	----	----
Malathion	121-75-5	0.002	µg/L	<0.002	----	----	----	----
Diazinon	333-41-5	0.005	µg/L	<0.005	----	----	----	----
Thiobencarb	28249-77-6	0.005	µg/L	<0.005	----	----	----	----
Chlorpyrifos	2921-88-2	0.005	µg/L	<0.005	----	----	----	----
Trifluralin	1582-09-8	0.005	µg/L	<0.005	----	----	----	----
Ultra-Trace Nutrients								
Ammonia as N	7664-41-7	0.005	mg/L	**0.007**	----	----	----	----
Nitrite as N	----	0.002	mg/L	<0.002	----	----	----	----
^ Nitrate as N	14797-55-8	0.002	mg/L	**0.008**	----	----	----	----
Nitrite + Nitrate as N	----	0.002	mg/L	**0.008**	----	----	----	----
Total Kjeldahl Nitrogen as N	----	0.05	mg/L	**0.11**	----	----	----	----
Total Nitrogen as N	----	0.05	mg/L	**0.12**	----	----	----	----
Reactive Phosphorus as P	----	0.001	mg/L	**0.002**	----	----	----	----
Total Phosphorus as P	----	0.005	mg/L	<0.005	----	----	----	----

Environmental Division

QUALITY CONTROL REPORT

Work Order	: **ES0909216**	Page	: 1 of 7
Client	: **GHD SERVICES PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR ADRIAN WHITE	Contact	: Charlie Pierce
Address	: P O BOX 373 GLADSTONE QLD, AUSTRALIA 4680	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: adrian.a.white@ghd.com.au	E-mail	: charlie.pierce@alsenviro.com
Telephone	: +61 07 49731611	Telephone	: +61-2-8784 8555
Facsimile	: +61 07 4972 6236	Facsimile	: +61-2-8784 8500
Project	: 421538641 WESTERN BASIN EIS WQ MONITORING	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 25-JUN-2009
Sampler	: ----	Issue Date	: 07-JUL-2009
Order number	: ----		
		No. of samples received	: 6
Quote number	: BN/314/09	No. of samples analysed	: 6

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

NATA
WORLD RECOGNISED ACCREDITATION

NATA Accredited Laboratory 825

This document is issued in
accordance with NATA
accreditation requirements.

Accredited for compliance with
ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Celine Conceicao	Spectroscopist	Inorganics
Hoa Nguyen	Inorganic Chemist	Inorganics
Lana Nguyen	LCMS Chemist	Organics

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insuffient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR:- No Limit; Result between 10 and 20 times LOR:- 0% - 50%; Result > 20 times LOR:- 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EG035F: Dissolved Mercury by FIMS (QC Lot: 1026556)									
ES0909216-001	G-WQ-01	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
ES0909220-005	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS (QC Lot: 1025314)									
EB0909527-002	Anonymous	EG093A-F: Beryllium	7440-41-7	0.1	µg/L	<0.1	<0.1	0.0	No Limit
		EG093A-F: Silver	7440-22-4	0.1	µg/L	<0.1	<0.1	0.0	No Limit
		EG093A-F: Cadmium	7440-43-9	0.2	µg/L	<0.2	<0.2	0.0	No Limit
		EG093A-F: Cobalt	7440-48-4	0.2	µg/L	<0.2	<0.2	0.0	No Limit
		EG093A-F: Lead	7439-92-1	0.2	µg/L	2.0	1.9	0.0	No Limit
		EG093A-F: Antimony	7440-36-0	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EG093A-F: Arsenic	7440-38-2	0.5	µg/L	0.7	0.9	24.5	No Limit
		EG093A-F: Chromium	7440-47-3	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EG093A-F: Manganese	7439-96-5	0.5	µg/L	17.7	17.3	2.2	0% - 20%
		EG093A-F: Nickel	7440-02-0	0.5	µg/L	<0.5	0.6	0.0	No Limit
		EG093A-F: Vanadium	7440-62-2	0.5	µg/L	1.6	1.8	11.5	No Limit
		EG093A-F: Barium	7440-39-3	1	µg/L	21	20	0.0	0% - 20%
		EG093A-F: Copper	7440-50-8	1	µg/L	<1	<1	0.0	No Limit
		EG093A-F: Aluminium	7429-90-5	10	µg/L	<10	<10	0.0	No Limit
ES0909073-001	Anonymous	EG093A-F: Beryllium	7440-41-7	0.1	µg/L	<0.1	<0.1	0.0	No Limit
		EG093A-F: Silver	7440-22-4	0.1	µg/L	<0.1	<0.1	0.0	No Limit
		EG093A-F: Cadmium	7440-43-9	0.2	µg/L	<0.2	<0.2	0.0	No Limit
		EG093A-F: Cobalt	7440-48-4	0.2	µg/L	<0.2	<0.2	0.0	No Limit
		EG093A-F: Lead	7439-92-1	0.2	µg/L	<0.2	<0.2	0.0	No Limit
		EG093A-F: Antimony	7440-36-0	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EG093A-F: Arsenic	7440-38-2	0.5	µg/L	0.8	0.7	0.0	No Limit
		EG093A-F: Chromium	7440-47-3	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EG093A-F: Manganese	7439-96-5	0.5	µg/L	0.6	0.5	0.0	No Limit
		EG093A-F: Nickel	7440-02-0	0.5	µg/L	0.7	<0.5	32.6	No Limit
		EG093A-F: Vanadium	7440-62-2	0.5	µg/L	1.2	1.2	0.0	No Limit
		EG093A-F: Barium	7440-39-3	1	µg/L	9	8	0.0	No Limit
		EG093A-F: Copper	7440-50-8	1	µg/L	<1	<1	0.0	No Limit
		EG093A-F: Aluminium	7429-90-5	10	µg/L	<10	<10	0.0	No Limit
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS (QC Lot: 1025315)									
ES0909073-001	Anonymous	EG093B-F: Iron	7439-89-6	5	µg/L	<5	<5	0.0	No Limit
ES0909220-001	Anonymous	EG093B-F: Iron	7439-89-6	5	µg/L	<5	<5	0.0	No Limit
EP215: Multiresidue Pesticide Residue Screen (Suite 2) (QC Lot: 1019161)									

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP215: Multiresidue Pesticide Residue Screen (Suite 2) (QC Lot: 1019161) - continued									
ES0909216-005	G-WQ-09	EP215-LL: Malathion	121-75-5	0.002	µg/L	<0.002	<0.002	0.0	No Limit
		EP215-LL: Simazine	122-34-9	0.005	µg/L	<0.005	<0.005	0.0	No Limit
		EP215-LL: Diuron	330-54-1	0.005	µg/L	<0.005	<0.005	0.0	No Limit
		EP215-LL: Atrazine	1912-24-9	0.005	µg/L	<0.005	<0.005	0.0	No Limit
		EP215-LL: Molinate	2212-67-1	0.005	µg/L	<0.005	<0.005	0.0	No Limit
		EP215-LL: Metolachlor	51218-45-2	0.005	µg/L	0.027	0.028	3.6	No Limit
		EP215-LL: Diazinon	333-41-5	0.005	µg/L	<0.005	<0.005	0.0	No Limit
		EP215-LL: Thiobencarb	28249-77-6	0.005	µg/L	<0.005	<0.005	0.0	No Limit
		EP215-LL: Chlorpyrifos	2921-88-2	0.005	µg/L	<0.005	<0.005	0.0	No Limit
		EP215-LL: Trifluralin	1582-09-8	0.005	µg/L	<0.005	<0.005	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 1030874)									
ES0909216-001	G-WQ-01	EK257A-SW: Nitrite as N	----	0.002	mg/L	<0.002	<0.002	0.0	No Limit
ES0909220-004	Anonymous	EK257A-SW: Nitrite as N	----	0.002	mg/L	<0.002	<0.002	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 1030875)									
ES0909216-001	G-WQ-01	EK255A-SW: Ammonia as N	7664-41-7	0.005	mg/L	0.005	0.008	44.3	No Limit
ES0909220-004	Anonymous	EK255A-SW: Ammonia as N	7664-41-7	0.005	mg/L	0.005	<0.005	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 1030876)									
ES0909216-001	G-WQ-01	EK259A-SW: Nitrite + Nitrate as N	----	0.002	mg/L	0.005	0.005	0.0	No Limit
ES0909220-004	Anonymous	EK259A-SW: Nitrite + Nitrate as N	----	0.002	mg/L	0.004	0.004	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 1030877)									
ES0909216-001	G-WQ-01	EK271A-SW: Reactive Phosphorus as P	----	0.001	mg/L	0.002	0.002	0.0	No Limit
ES0909220-004	Anonymous	EK271A-SW: Reactive Phosphorus as P	----	0.001	mg/L	0.002	0.002	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 1030886)									
ES0909216-001	G-WQ-01	EK262PA-SW: Total Nitrogen as N	----	0.05	mg/L	0.15	0.14	0.0	No Limit
ES0909220-005	Anonymous	EK262PA-SW: Total Nitrogen as N	----	0.05	mg/L	0.12	0.12	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 1030887)									
ES0909216-001	G-WQ-01	EK267PA-SW: Total Phosphorus as P	----	0.005	mg/L	0.009	0.008	16.5	No Limit
ES0909220-005	Anonymous	EK267PA-SW: Total Phosphorus as P	----	0.005	mg/L	<0.005	<0.005	0.0	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	*Laboratory Control Spike (LCS) Report*			
					Spike	*Spike Recovery (%)*	*Recovery Limits (%)*	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EG035F: Dissolved Mercury by FIMS (QCLot: 1026556)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.010 mg/L	108	86	116
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS (QCLot: 1025314)								
EG093A-F: Aluminium	7429-90-5	10	µg/L	<10	50 µg/L	80.8	80	128
EG093A-F: Antimony	7440-36-0	0.5	µg/L	<0.5	----	----	----	----
EG093A-F: Arsenic	7440-38-2	0.5	µg/L	<0.5	10 µg/L	# 79.1	85	125
EG093A-F: Barium	7440-39-3	1	µg/L	<1	10 µg/L	87.1	81	129
EG093A-F: Beryllium	7440-41-7	0.1	µg/L	<0.1	10 µg/L	82.8	80	122
EG093A-F: Cadmium	7440-43-9	0.2	µg/L	<0.2	10 µg/L	104	78	116
EG093A-F: Chromium	7440-47-3	0.5	µg/L	<0.5	10 µg/L	91.1	86	128
EG093A-F: Cobalt	7440-48-4	0.2	µg/L	<0.2	10 µg/L	# 80.3	87	127
EG093A-F: Copper	7440-50-8	1	µg/L	<1	10 µg/L	# 76.8	86	124
EG093A-F: Lead	7439-92-1	0.2	µg/L	<0.2	10 µg/L	87.3	87	123
EG093A-F: Manganese	7439-96-5	0.5	µg/L	<0.5	10 µg/L	# 88.9	90	122
EG093A-F: Nickel	7440-02-0	0.5	µg/L	<0.5	10 µg/L	# 82.2	84	124
EG093A-F: Silver	7440-22-4	0.1	µg/L	<0.1	1 µg/L	70.3	70	130
EG093A-F: Vanadium	7440-62-2	0.5	µg/L	<0.5	10 µg/L	# 82.5	85	123
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS (QCLot: 1025315)								
EG093B-F: Iron	7439-89-6	5	µg/L	<5	50 µg/L	94.6	89	119
EP215: Multiresidue Pesticide Residue Screen (Suite 2) (QCLot: 1019161)								
EP215-LL: Simazine	122-34-9	0.005	µg/L	<0.005	0.025 µg/L	112	65	130
EP215-LL: Diuron	330-54-1	0.005	µg/L	<0.005	0.025 µg/L	114	65	130
EP215-LL: Atrazine	1912-24-9	0.005	µg/L	<0.005	0.025 µg/L	104	65	130
EP215-LL: Molinate	2212-67-1	0.005	µg/L	<0.005	0.025 µg/L	88.6	65	130
EP215-LL: Metolachlor	51218-45-2	0.005	µg/L	<0.005	0.025 µg/L	104	65	130
EP215-LL: Malathion	121-75-5	0.002	µg/L	<0.002	0.025 µg/L	95.0	65	130
EP215-LL: Diazinon	333-41-5	0.005	µg/L	<0.005	0.025 µg/L	86.5	65	130
EP215-LL: Thiobencarb	28249-77-6	0.005	µg/L	<0.005	0.025 µg/L	67.4	65	130
EP215-LL: Chlorpyrifos	2921-88-2	0.005	µg/L	<0.005	0.025 µg/L	92.7	65	130
EP215-LL: Trifluralin	1582-09-8	0.005	µg/L	<0.005	0.1 µg/L	86.8	65	130
Ultra-Trace Nutrients (QCLot: 1030874)								
EK257A-SW: Nitrite as N	----	0.002	mg/L	<0.002	1.0 mg/L	105	70	130
Ultra-Trace Nutrients (QCLot: 1030875)								
EK255A-SW: Ammonia as N	7664-41-7	0.005	mg/L	<0.005	0.1 mg/L	91.8	70	130
Ultra-Trace Nutrients (QCLot: 1030876)								

Sub-Matrix: **WATER**

				Method Blank (MB) Report	*Laboratory Control Spike (LCS) Report*			
					Spike	*Spike Recovery (%)*	*Recovery Limits (%)*	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
Ultra-Trace Nutrients (QCLot: 1030876) - continued								
EK259A-SW: Nitrite + Nitrate as N	----	0.002	mg/L	<0.002	0.1 mg/L	107	70	130
Ultra-Trace Nutrients (QCLot: 1030877)								
EK271A-SW: Reactive Phosphorus as P	----	0.001	mg/L	<0.001	0.1 mg/L	102	70	130
Ultra-Trace Nutrients (QCLot: 1030886)								
EK262PA-SW: Total Nitrogen as N	----	0.05	mg/L	<0.05	1.0 mg/L	91.0	70	130
Ultra-Trace Nutrients (QCLot: 1030887)								
EK267PA-SW: Total Phosphorus as P	----	0.005	mg/L	<0.005	0.44 mg/L	73.2	70	130

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix**: WATER**

				Matrix Spike (MS) Report			
				Spike	*Spike Recovery (%)*	*Recovery Limits (%)*	
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EG035F: Dissolved Mercury by FIMS (QCLot: 1026556)							
ES0909216-001	G-WQ-01	EG035F: Mercury	7439-97-6	0.0100 mg/L	93.7	70	130
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS (QCLot: 1025314)							
EB0909527-002	Anonymous	EG093A-F: Arsenic	7440-38-2	50 µg/L	94.4	70	130
		EG093A-F: Barium	7440-39-3	50 µg/L	93.1	70	130
		EG093A-F: Beryllium	7440-41-7	50 µg/L	91.9	70	130
		EG093A-F: Cadmium	7440-43-9	12.5 µg/L	111	70	130
		EG093A-F: Chromium	7440-47-3	50 µg/L	112	70	130
		EG093A-F: Cobalt	7440-48-4	50 µg/L	97.8	70	130
		EG093A-F: Copper	7440-50-8	50 µg/L	93.0	70	130
		EG093A-F: Lead	7439-92-1	50 µg/L	90.8	70	130
		EG093A-F: Manganese	7439-96-5	50 µg/L	111	70	130
		EG093A-F: Nickel	7440-02-0	50 µg/L	98.4	70	130
		EG093A-F: Vanadium	7440-62-2	50 µg/L	97.2	70	130
Ultra-Trace Nutrients (QCLot: 1030874)							
ES0909216-001	G-WQ-01	EK257A-SW: Nitrite as N	----	0.1 mg/L	120	70	130
Ultra-Trace Nutrients (QCLot: 1030875)							
ES0909216-001	G-WQ-01	EK255A-SW: Ammonia as N	7664-41-7	0.1 mg/L	# 57.4	70.	130
Ultra-Trace Nutrients (QCLot: 1030876)							
ES0909216-001	G-WQ-01	EK259A-SW: Nitrite + Nitrate as N	----	0.1 mg/L	102	70	130
Ultra-Trace Nutrients (QCLot: 1030877)							
ES0909216-001	G-WQ-01	EK271A-SW: Reactive Phosphorus as P	----	0.1 mg/L	# 48.6	70	130
Ultra-Trace Nutrients (QCLot: 1030886)							
ES0909216-001	G-WQ-01	EK262PA-SW: Total Nitrogen as N	----	0.5 mg/L	91.0	70	130
Ultra-Trace Nutrients (QCLot: 1030887)							
ES0909216-001	G-WQ-01	EK267PA-SW: Total Phosphorus as P	----	0.5 mg/L	81.0	70	130

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: **ES0909216**	Page	: 1 of 7
Client	: GHD SERVICES PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: MR ADRIAN WHITE	Contact	: Charlie Pierce
Address	: P O BOX 373 GLADSTONE QLD, AUSTRALIA 4680	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: adrian.a.white@ghd.com.au	E-mail	: charlie.pierce@alsenviro.com
Telephone	: +61 07 49731611	Telephone	: +61-2-8784 8555
Facsimile	: +61 07 4972 6236	Facsimile	: +61-2-8784 8500
Project	: 421538641 WESTERN BASIN EIS WQ MONITORING	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 25-JUN-2009
Sampler	: ----	Issue Date	: 07-JUL-2009
Order number	: ----		
		No. of samples received	: 6
Quote number	: BN/314/09	No. of samples analysed	: 6

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Interpretive Quality Control Report contains the following information:

- Analysis Holding Time Compliance
- Quality Control Parameter Frequency Compliance
- Brief Method Summaries
- Summary of Outliers

Analysis Holding Time Compliance

The following report summarises extraction / preparation and analysis times and compares with recommended holding times. Dates reported represent first date of extraction or analysis and precludes subsequent dilutions and reruns. Information is also provided re the sample container (preservative) from which the analysis aliquot was taken. Elapsed period to analysis represents number of days from sampling where no extraction / digestion is involved or period from extraction / digestion where this is present. For composite samples, sampling date is assumed to be that of the oldest sample contributing to the composite. Sample date for laboratory produced leachates is assumed as the completion date of the leaching process. Outliers for holding time are based on USEPA SW 846, APHA, AS and NEPM (1999). A listing of breaches is provided in the Summary of Outliers.

Holding times for leachate methods (excluding elutriates) vary according to the analytes being determined on the resulting solution. For non -volatile analytes, the holding time compliance assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These soil holding times are: Organics (14 days); Mercury (28 days) & other metals (180 days). A recorded breach therefore does not guarantee a breach for all non-volatile parameters.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method	*Sample Date*	*Extraction / Preparation*			*Analysis*		
Container / Client Sample ID(s)		*Date extracted*	*Due for extraction*	*Evaluation*	*Date analysed*	*Due for analysis*	*Evaluation*
EG035F: Dissolved Mercury by FIMS							
Clear HDPE (U-T ORC) - UHP Nitric Acid; Filtered G-WQ-01, G-WQ-05, G-WQ-06, G-WQ-07, G-WQ-09, QA-04	**24-JUN-2009**	**---**	---	----	**02-JUL-2009**	22-JUL-2009	✓
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS							
Clear HDPE (U-T ORC) - UHP Nitric Acid; Filtered G-WQ-01, G-WQ-05, G-WQ-06, G-WQ-07, G-WQ-09, QA-04	**24-JUN-2009**	**01-JUL-2009**	21-DEC-2009	✓	**01-JUL-2009**	21-DEC-2009	✓
EP215: Multiresidue Pesticide Residue Screen (Suite 2)							
Amber Glass Bottle - Unpresered G-WQ-01, G-WQ-05, G-WQ-06, G-WQ-07, G-WQ-09, QA-04	**24-JUN-2009**	**26-JUN-2009**	01-JUL-2009	✓	**26-JUN-2009**	05-AUG-2009	✓
Ultra-Trace Nutrients							
Clear Plastic Bottle - Filtered and Frozen (AS) G-WQ-01, G-WQ-05, G-WQ-06, G-WQ-07, G-WQ-09, QA-04	**24-JUN-2009**	**---**	---	----	**25-JUN-2009**	26-JUN-2009	✓
Clear Plastic Bottle - Frozen (AS) G-WQ-01, G-WQ-05, G-WQ-06, G-WQ-07, G-WQ-09, QA-04	**24-JUN-2009**	**25-JUN-2009**	22-JUL-2009	✓	**25-JUN-2009**	22-JUL-2009	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(where) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Ammonia as N - Ultra-Trace in Saline Waters	EK255A-SW	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Ammonia as N - Ultra-Trace for Catchment Monitoring	EK255A-CM	2	6	**33.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	2	15	**13.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals in Saline Water -Suite A by ORC-ICPMS	EG093A-F	2	19	**10.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals in Saline Water -Suite B by ORC-ICPMS	EG093B-F	2	18	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Multiresidue Pesticide Screen (No. 2)	EP215-LL	1	20	**5.0**	**10.0**	×	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N - Ultra-Trace in Saline Waters	EK259A-SW	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) - Ultra-Trace for Catchment M	EK259A-CM	2	6	**33.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N - Ultra-Trace in Saline Waters	EK257A-SW	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P - Ultra-Trace for Catchment M	EK271A-CM	2	6	**33.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P - Ultra-Trace in Saline Water	EK271A-SW	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Nitrogen as N (Persulfate digestion)-Ultra-Trace - CM	EK262PA-CM	2	6	**33.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Nitrogen/Persulfate Digestion/Ultra-Trace/Saline	EK262PA-SW	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus(Persulfate Digestion) - Ultra-Trace for CM	EK267PA-CM	2	6	**33.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus/Persulfate Digestion/ Ultra Trace /Saline	EK267PA-SW	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
Ammonia as N - Ultra-Trace in Saline Waters	EK255A-SW	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Ammonia as N - Ultra-Trace for Catchment Monitoring	EK255A-CM	1	6	**16.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	1	15	**6.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals in Saline Water -Suite A by ORC-ICPMS	EG093A-F	1	19	**5.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals in Saline Water -Suite B by ORC-ICPMS	EG093B-F	1	18	**5.6**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Multiresidue Pesticide Screen (No. 2)	EP215-LL	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N - Ultra-Trace in Saline Waters	EK259A-SW	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) - Ultra-Trace for Catchment M	EK259A-CM	1	6	**16.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N - Ultra-Trace in Saline Waters	EK257A-SW	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P - Ultra-Trace for Catchment M	EK271A-CM	1	6	**16.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P - Ultra-Trace in Saline Water	EK271A-SW	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Nitrogen as N (Persulfate digestion)-Ultra-Trace - CM	EK262PA-CM	1	6	**16.7**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Nitrogen/Persulfate Digestion/Ultra-Trace/Saline	EK262PA-SW	1	20	**5.0**	**10.0**	×	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus(Persulfate Digestion) - Ultra-Trace for CM	EK267PA-CM	1	6	**16.7**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus/Persulfate Digestion/ Ultra Trace /Saline	EK267PA-SW	1	20	**5.0**	**10.0**	×	NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Method Blanks (MB)							
Ammonia as N - Ultra-Trace in Saline Waters	EK255A-SW	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Ammonia as N - Ultra-Trace for Catchment Monitoring	EK255A-CM	1	6	**16.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	1	15	**6.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals in Saline Water -Suite A by ORC-ICPMS	EG093A-F	1	19	**5.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals in Saline Water -Suite B by ORC-ICPMS	EG093B-F	1	18	**5.6**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Multiresidue Pesticide Screen (No. 2)	EP215-LL	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N - Ultra-Trace in Saline Waters	EK259A-SW	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) - Ultra-Trace for Catchment M	EK259A-CM	1	6	**16.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N - Ultra-Trace in Saline Waters	EK257A-SW	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P - Ultra-Trace for Catchment M	EK271A-CM	1	6	**16.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P - Ultra-Trace in Saline Water	EK271A-SW	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Nitrogen as N (Persulfate digestion)-Ultra-Trace - CM	EK262PA-CM	1	6	**16.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Nitrogen/Persulfate Digestion/Ultra-Trace/Saline	EK262PA-SW	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus(Persulfate Digestion) - Ultra-Trace for CM	EK267PA-CM	1	6	**16.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus/Persulfate Digestion/ Ultra Trace /Saline	EK267PA-SW	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							
Ammonia as N - Ultra-Trace in Saline Waters	EK255A-SW	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement
Ammonia as N - Ultra-Trace for Catchment Monitoring	EK255A-CM	1	6	**16.7**	**5.0**	✓	ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	1	15	**6.7**	**5.0**	✓	ALS QCS3 requirement
Dissolved Metals in Saline Water -Suite A by ORC-ICPMS	EG093A-F	1	19	**5.3**	**5.0**	✓	ALS QCS3 requirement
Nitrite and Nitrate as N - Ultra-Trace in Saline Waters	EK259A-SW	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) - Ultra-Trace for Catchment M	EK259A-CM	1	6	**16.7**	**5.0**	✓	ALS QCS3 requirement
Nitrite as N - Ultra-Trace in Saline Waters	EK257A-SW	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement
Reactive Phosphorus as P - Ultra-Trace for Catchment M	EK271A-CM	1	6	**16.7**	**5.0**	✓	ALS QCS3 requirement
Reactive Phosphorus as P - Ultra-Trace in Saline Water	EK271A-SW	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement
Total Nitrogen as N (Persulfate digestion)-Ultra-Trace - CM	EK262PA-CM	1	6	**16.7**	**5.0**	✓	ALS QCS3 requirement
Total Nitrogen/Persulfate Digestion/Ultra-Trace/Saline	EK262PA-SW	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement
Total Phosphorus(Persulfate Digestion) - Ultra-Trace for CM	EK267PA-CM	1	6	**16.7**	**5.0**	✓	ALS QCS3 requirement
Total Phosphorus/Persulfate Digestion/ Ultra Trace /Saline	EK267PA-SW	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
Dissolved Mercury by FIMS	EG035F	WATER	AS 3550, APHA 21st ed. 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Dissolved Metals in Saline Water -Suite A by ORC-ICPMS	EG093A-F	WATER	APHA 21st ed., 3125; USEPA SW846 - 6020 Samples are 0.45 um filtered prior to analysis. The ORC-ICPMS technique removes interfering species through a series of chemical reactions prior to ion detection. Ions are passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to measurement by a discrete dynode ion detector. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Dissolved Metals in Saline Water -Suite B by ORC-ICPMS	EG093B-F	WATER	APHA 21st ed., 3125; USEPA SW846 - 6020 Samples are 0.45 um filtered prior to analysis. The ORC-ICPMS technique removes interfering species through a series of chemical reactions prior to ion detection. Ions are passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to measurement by a discrete dynode ion detector. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Ammonia as N - Ultra-Trace for Catchment Monitoring	EK255A-CM	WATER	APHA 21st ed., 4500-NH3 H Ammonia is determined by direct colorimetry by FIA. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Ammonia as N - Ultra-Trace in Saline Waters	EK255A-SW	WATER	APHA 21st ed., 4500-NH3 H Ammonia is determined by direct colorimetry by FIA. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Nitrite as N - Ultra-Trace for Catchment Monitoring	EK257A-CM	WATER	APHA 21st ed., 4500-NO2- B. Nitrite is determined by direct colourimetry by FIA.
Nitrite as N - Ultra-Trace in Saline Waters	EK257A-SW	WATER	APHA 21st ed., 4500-NO2- B. Nitrite is determined by direct colourimetry by FIA.
Nitrate as N - Ultra-Trace for Catchment Monitoring	EK258A-CM	WATER	APHA 21st ed., 4500-NO3- I Nitrate is reduced to nitrite by way of a cadmium reduction column followed by quantification by FIA. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results.
Nitrate as N - Ultra-Trace in Saline Waters	EK258A-SW	WATER	APHA 21st ed., 4500-NO3- I Nitrate is reduced to nitrite by way of a cadmium reduction column followed by quantification by FIA. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results.
Nitrite and Nitrate as N (NOx) - Ultra-Trace for Catchment M	EK259A-CM	WATER	APHA 21st ed., 4500-NO3- I. Combined oxidised Nitrogen (NO2+NO3) is determined by Cadmium Reduction and direct colourimetry by FIA.
Nitrite and Nitrate as N - Ultra-Trace in Saline Waters	EK259A-SW	WATER	APHA 21st ed., 4500-NO3- I. Combined oxidised Nitrogen (NO2+NO3) is determined by Cadmium Reduction and direct colourimetry by FIA.
TKN (Total N - NOx-N). (FIA - UT) for Catchment Monitoring	EK261PA-CM	WATER	APHA 21st ed., 4500-P J. & 4500-NO3- I . Calculated by difference from total Nitrogen and NOx. Contributing method parameters are determined by FIA. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
TKN (Total N - NOx-N). (FIA - UT) in Saline Waters	EK261PA-SW	WATER	APHA 21st ed., 4500-P J. & 4500-NO3- I. Calculated by difference from total Nitrogen and NOx. Contributing method parameters are determined by FIA. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Nitrogen as N (Persulfate digestion)-Ultra-Trace - CM	EK262PA-CM	WATER	APHA 21st ed., 4500-P J. Persulfate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus. As sample is digested with persulfate under alkaline conditions yielding orthophosphate and nitrate. Following digestion, analytes are determined by flow injection analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Nitrogen/Persulfate Digestion/Ultra-Trace/Saline	EK262PA-SW	WATER	APHA 21st ed., 4500-P J. Persulfate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus. As sample is digested with persulfate under alkaline conditions yielding orthophosphate and nitrate. Following digestion, analytes are determined by flow injection analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Phosphorus(Persulfate Digestion) - Ultra-Trace for CM	EK267PA-CM	WATER	APHA 21st ed., 4500-P J. Persulfate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus. As sample is digested with persulfate under alkaline conditions yielding orthophosphate and nitrate. Following digestion, analytes are determined by flow injection analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Phosphorus/Persulfate Digestion/ Ultra Trace /Saline	EK267PA-SW	WATER	APHA 21st ed., 4500-P J. Persulfate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus. As sample is digested with persulfate under alkaline conditions yielding orthophosphate and nitrate. Following digestion, analytes are determined by flow injection analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Reactive Phosphorus as P - Ultra-Trace for Catchment M	EK271A-CM	WATER	APHA 21st ed., 4500-P E Ammonium molybdate and potassium antimonyl tartrate reacts in acid medium with othophosphate to form a heteropoly acid -phosphomolybdic acid - which is reduced to intensely coloured molybdenum blue by ascorbic acid. Quantification is by FIA. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Reactive Phosphorus as P - Ultra-Trace in Saline Water	EK271A-SW	WATER	APHA 21st ed., 4500-P E Ammonium molybdate and potassium antimonyl tartrate reacts in acid medium with othophosphate to form a heteropoly acid -phosphomolybdic acid - which is reduced to intensely coloured molybdenum blue by ascorbic acid. Quantification is by FIA. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Multiresidue Pesticide Screen (No. 2)	EP215-LL	WATER	In-house, LCMS (APCI in positive mode). The compounds are extracted from water samples using dichloromethane. The organic phase is evaporated to dryness and reconstituted in a mixture of acetonitrile and water for reverse phase HPLC analysis.

Preparation Methods	*Method*	*Matrix*	*Method Descriptions*
Persulfate Digestion for UT TN and TP for FIA finish.	EK262/267-PA	WATER	APHA 21st ed., 4500 P - J. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Persulfate Digestion for UT TN and TP for FIA/Saline	EK262/267PA-SW	WATER	APHA 21st ed., 4500 P - J. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Separatory funnel extraction for LCMS herbicides.	* EP215-PR	WATER	In-house. A 1 L sample is extracted three times with 60 mL of methylene chloride, reduced to dryness and made up in HPLC mobile phase.

Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged in the Quality Control (QC) Report. Surrogate recovery limits are static and based on USEPA SW846 or ALS-QWI/EN/38 (in the absence of specific USEPA limits). This report displays QC Outliers (breaches) only.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Laboratory Control Spike (LCS) Recoveries							
EG093F: Dissolved Metals in Saline Water by ORC-ICP	1176715-003	----	**Arsenic**	7440-38-2	79.1 %	85-125%	**Recovery less than lower control limit**
EG093F: Dissolved Metals in Saline Water by ORC-ICP	1176715-003	----	**Cobalt**	7440-48-4	80.3 %	87-127%	**Recovery less than lower control limit**
EG093F: Dissolved Metals in Saline Water by ORC-ICP	1176715-003	----	**Copper**	7440-50-8	76.8 %	86-124%	**Recovery less than lower control limit**
EG093F: Dissolved Metals in Saline Water by ORC-ICP	1176715-003	----	**Manganese**	7439-96-5	88.9 %	90-122%	**Recovery less than lower control limit**
EG093F: Dissolved Metals in Saline Water by ORC-ICP	1176715-003	----	**Nickel**	7440-02-0	82.2 %	84-124%	**Recovery less than lower control limit**
EG093F: Dissolved Metals in Saline Water by ORC-ICP	1176715-003	----	**Vanadium**	7440-62-2	82.5 %	85-123%	**Recovery less than lower control limit**
Matrix Spike (MS) Recoveries							
Ultra-Trace Nutrients	ES0909216-001	G-WQ-01	**Ammonia as N**	7664-41-7	57.4 %	70.-130%	**Recovery less than lower data quality objective**
Ultra-Trace Nutrients	ES0909216-001	G-WQ-01	**Reactive Phosphorus as P**	----	48.6 %	70-130%	**Recovery less than lower data quality objective**

- **For all matrices, no Method Blank value outliers occur.**
- **For all matrices, no Duplicate outliers occur.**

Regular Sample Surrogates

- **For all regular sample matrices, no surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

This report displays Holding Time breaches only. Only the respective Extraction / Preparation and/or Analysis component is/are displayed.

- **No Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

The following report highlights breaches in the Frequency of Quality Control Samples.

Matrix: **WATER**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
Multiresidue Pesticide Screen (No. 2)	1	20	5.0	10.0	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)					
Total Nitrogen/Persulfate Digestion/Ultra-Trace/Saline	1	20	5.0	10.0	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus/Persulfate Digestion/ Ultra Trace /Saline	1	20	5.0	10.0	NEPM 1999 Schedule B(3) and ALS QCS3 requirement

GHD

Chain of Custody & Analysis Request

Page _1_ of _1_

Chain of Custody Number:

GHD

PROJECT ID:	4215386 41	**QUOTE:**	
PROJECT:	**Western Basin EIS WQ Monitoring**		
CLIENT:	GHD		
POSTAL ADDRESS:	PO Box 373, Gladstone 4680		
CONTACT:	Adrian White		
PHONE:	412035667	**FAX:**	07) 49726236
EMAIL:	Jason.K.Fowler@ghd.com.au, Adrian.A.White@ghd.com.au		
INVOICE:	Jason.K.Fowler@ghd.com.au, Adrian.A.White@ghd.com.au		
DATA NEEDED BY:			
REPORT FORMAT:			
EMAIL FORMAT:	ESDAT, EXCEL & PDF		

LABORATORY BATCH NO.:

FOR LAB USE ONLY

COOLER SEAL: Yes No Broken Intact

COOLER TEMP: deg C

DESPATCHED TO:
ALS Environmental
277-289 Woodpark Road
Smithfield NSW 2164
02 8784 8555

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

Water samples from a marine environment (Background sampling)

(EMAIL ADDRESSES PROVIDED ABOVE)

ANALYSIS REQUIRED

	SAMPLE ID	**MATRIX**	**DATE**	**DETECTION LIMIT**	**PRESERVATION**	**Ultra trace ORC - dissolved metals (EG093F) (Sb, As, Ba, Be, Cd, Co, Cr, Cu, Mn, Ni, Pb, V, Hg, Fe, Al, Ag)**	**Ultra trace nutrients (UTN - 04) (TP, RP, NH3, NO2, NO3, TKN, TN)**	**Multi Residue Pesticides –EP-215LL (lowest DL)**					
1	G-WQ-02	Water	**23/06/2009**	LOR	As Required	X	X	X					
2	G-WQ-03	Water	**23/06/2009**	LOR	As Required	X	X	X					
3	G-WQ-04	Water	**23/06/2009**	LOR	As Required	X	X	X					
4	G-WQ-08	Water	**23/06/2009**	LOR	As Required	X	X	X					
5	G-WQ-10	Water	**23/06/2009**	LOR	As Required	X	X	X					
6	G-WQ-11	Water	**23/06/2009**	LOR	As Required	X	X	X					
7	G-WQ-12	Water	**23/06/2009**	LOR	As Required	X	X	X					
8	QA-03	Water	**23/06/2009**	LOR	As Required	X	X	X					

Environmental Division
Sydney
Work Order
ES0909220

Telephone : + 61-2-8784 8555

RELINQUISHED BY:		**RECEIVED BY:**	
NAME : J Fowler	DATE: 23/06/2009	NAME : Frank	DATE: 25-6-9
OF: GHD Gladstone	TIME: 1530	OF: ALS	TIME: 9:30am

PLEASE EMAIL COMPLETED ANALYSIS REQUEST TO: Jason.K.Fowler@ghd.com.au, Adrian.A.White@ghd.com.au

*Container Type and Preservative Codes: P = Neutral Plastic; N = Nitric Acid Preserved; C = Sodium Hydroxide Preserved; J = Solvent Washed Acid Rinced Jar; S = Solvent Washed Acid Rinced Glass Bottle; VC = Hydrochloric Acid Preserved Vial; VS = Sulfuric Acid Preserved Vial; BS = Sulfuric Acid Preserved Glass Bottle; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; O = Other.

SAMPLE RECEIPT NOTIFICATION (SRN)

Comprehensive Report

Work Order	: **ES0909220**		
Client	: **GHD SERVICES PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR ADRIAN WHITE	Contact	: Charlie Pierce
Address	: P O BOX 373 GLADSTONE QLD, AUSTRALIA 4680	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: adrian.a.white@ghd.com.au	E-mail	: charlie.pierce@alsenviro.com
Telephone	: +61 07 49731611	Telephone	: +61-2-8784 8555
Facsimile	: +61 07 4972 6236	Facsimile	: +61-2-8784 8500
Project	: 421538641	Page	: 1 of 2
Order number	: ----		
C-O-C number	: ----	Quote number	: EM2009GHDSER0392 (EN/005/09)
Site	: ----		
Sampler	: ----	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Dates

Date Samples Received	: 25-JUN-2009	Issue Date	: 25-JUN-2009 13:38
Client Requested Due Date	: 06-JUL-2009	Scheduled Reporting Date	: **06-JUL-2009**

Delivery Details

Mode of Delivery	: Carrier	Temperature	: 2.4'C - Ice present
No. of coolers/boxes	: 2 HARD	No. of samples received	: 8
Sercurity Seal	: Intact.	No. of samples analysed	: 8

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Requested Deliverables
- **Samples received in appropriately pretreated and preserved containers.**
- **Sample(s) have been received within recommended holding times.**
- Please direct any turn around / technical queries to the laboratory contact designated above.
- Please direct any queries related to sample condition / numbering / breakages to Nanthini Coilparampil
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (14 days), Solid (90 days) from date of completion of work order.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exist.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process neccessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

When date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for processing purposes. If the sampling time is displayed as 0:00 the information was not provided by client.

Matrix: **WATER**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	WATER - EG035F Dissolved Mercury by FIMS	WATER - EG093A-F Dissolved metals in saline water by ORC-ICPMS	WATER - EG093B-F Dissolved Metals in Saline Water Suite B by ORC-ICPMS	WATER - EP215LL Multiresidue Pesticide Screen (Suite 2) - Low Level	WATER - UTN-4 Ultratrace NO2, NO3, NH3, Nitrogen, Phosphorus, TKN, Reactive Phosphorus
ES0909220-001	23-JUN-2009 15:00	G-WQ-02	✓	✓	✓	✓	✓
ES0909220-002	23-JUN-2009 15:00	G-WQ-03	✓	✓	✓	✓	✓
ES0909220-003	23-JUN-2009 15:00	G-WQ-04	✓	✓	✓	✓	✓
ES0909220-004	23-JUN-2009 15:00	G-WQ-08	✓	✓	✓	✓	✓
ES0909220-005	23-JUN-2009 15:00	G-WQ-10	✓	✓	✓	✓	✓
ES0909220-006	23-JUN-2009 15:00	G-WQ-11	✓	✓	✓	✓	✓
ES0909220-007	23-JUN-2009 15:00	G-WQ-12	✓	✓	✓	✓	✓
ES0909220-008	23-JUN-2009 15:00	QA-03	✓	✓	✓	✓	✓

Requested Deliverables

MR ADRIAN WHITE

- *AU Certificate of Analysis - NATA (COA)	Email	adrian.a.white@ghd.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	adrian.a.white@ghd.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	adrian.a.white@ghd.com.au
- A4 - AU Sample Receipt Notification - Environmental (SRN)	Email	adrian.a.white@ghd.com.au
- A4 - AU Tax Invoice (INV)	Email	adrian.a.white@ghd.com.au
- Default - Chain of Custody (COC)	Email	adrian.a.white@ghd.com.au
- EDI Format - ENMRG (ENMRG)	Email	adrian.a.white@ghd.com.au
- EDI Format - ESDAT (ESDAT)	Email	adrian.a.white@ghd.com.au

MR JASON FOWLER

- *AU Certificate of Analysis - NATA (COA)	Email	jason.k.fowler@ghd.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	jason.k.fowler@ghd.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	jason.k.fowler@ghd.com.au
- A4 - AU Sample Receipt Notification - Environmental (SRN)	Email	jason.k.fowler@ghd.com.au
- A4 - AU Tax Invoice (INV)	Email	jason.k.fowler@ghd.com.au
- Default - Chain of Custody (COC)	Email	jason.k.fowler@ghd.com.au
- EDI Format - ENMRG (ENMRG)	Email	jason.k.fowler@ghd.com.au
- EDI Format - ESDAT (ESDAT)	Email	jason.k.fowler@ghd.com.au

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

CERTIFICATE OF ANALYSIS

Work Order : **ES0909220**

Client : **GHD SERVICES PTY LTD**
Contact : MR ADRIAN WHITE
Address : P O BOX 373
GLADSTONE QLD, AUSTRALIA 4680

E-mail : adrian.a.white@ghd.com.au
Telephone : +61 07 49731611
Facsimile : +61 07 4972 6236

Project : 421538641
Order number : ----
C-O-C number : ----
Sampler : ----
Site : ----

Quote number : EN/005/09

Page : 1 of 4

Laboratory : Environmental Division Sydney
Contact : Charlie Pierce
Address : 277-289 Woodpark Road Smithfield NSW Australia 2164

E-mail : charlie.pierce@alsenviro.com
Telephone : +61-2-8784 8555
Facsimile : +61-2-8784 8500

QC Level : NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Date Samples Received : 25-JUN-2009
Issue Date : 07-JUL-2009

No. of samples received : 8
No. of samples analysed : 8

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

NATA Accredited Laboratory 825

This document is issued in accordance with NATA accreditation requirements.

Accredited for compliance with ISO/IEC 17025.

WORLD RECOGNISED
ACCREDITATION

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Celine Conceicao	Spectroscopist	Inorganics
Hoa Nguyen	Inorganic Chemist	Inorganics
Lana Nguyen	LCMS Chemist	Organics

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insuffient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for processing purposes. If the sampling time is displayed as 0:00 the information was not provided by client.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting

- **EG093: LCS recovery for various elements falls outside ALS Dynamic Control Limit. However, it is within the acceptance criteria based on ALS DQO. No further action is required.**
- **EK271A & EK255A: Spike failed for Reactive Phosphorus and Ammonia due to matrix interference (confirmed by re-analysis).**

Analytical Results

Sub-Matrix: **WATER**	*Client sample ID*			**G-WQ-02**	**G-WQ-03**	**G-WQ-04**	**G-WQ-08**	**G-WQ-10**
	Client sampling date / time			23-JUN-2009 15:00	23-JUN-2009 15:00	23-JUN-2009 15:00	23-JUN-2009 15:00	23-JUN-2009 15:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES0909220-001**	**ES0909220-002**	**ES0909220-003**	**ES0909220-004**	**ES0909220-005**
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS								
Aluminium	7429-90-5	10	µg/L	<10	<10	<10	<10	<10
Antimony	7440-36-0	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Iron	7439-89-6	5	µg/L	<5	<5	<5	<5	<5
Arsenic	7440-38-2	0.5	µg/L	**0.6**	**0.8**	**0.6**	**0.6**	**0.8**
Barium	7440-39-3	1	µg/L	**7**	**7**	**3**	**7**	**8**
Beryllium	7440-41-7	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Cadmium	7440-43-9	0.2	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Chromium	7440-47-3	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Cobalt	7440-48-4	0.2	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Copper	7440-50-8	1	µg/L	<1	<1	<1	<1	<1
Lead	7439-92-1	0.2	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Manganese	7439-96-5	0.5	µg/L	**0.8**	**2.3**	<0.5	**1.1**	**1.5**
Nickel	7440-02-0	0.5	µg/L	<0.5	<0.5	<0.5	**0.5**	**0.5**
Silver	7440-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Vanadium	7440-62-2	0.5	µg/L	**1.1**	**1.1**	**0.9**	**1.3**	**1.3**
EP215: Multiresidue Pesticide Residue Screen (Suite 2)								
Simazine	122-34-9	0.005	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Diuron	330-54-1	0.005	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Atrazine	1912-24-9	0.005	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Molinate	2212-67-1	0.005	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Metolachlor	51218-45-2	0.005	µg/L	**0.009**	<0.005	<0.005	**0.273**	<0.005
Malathion	121-75-5	0.002	µg/L	<0.002	<0.002	<0.002	<0.002	<0.002
Diazinon	333-41-5	0.005	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Thiobencarb	28249-77-6	0.005	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorpyrifos	2921-88-2	0.005	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Trifluralin	1582-09-8	0.005	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Ultra-Trace Nutrients								
Ammonia as N	7664-41-7	0.005	mg/L	<0.005	**0.006**	<0.005	**0.005**	<0.005
Nitrite as N	----	0.002	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002
^ Nitrate as N	14797-55-8	0.002	mg/L	**0.006**	**0.014**	**0.003**	**0.004**	**0.004**
Nitrite + Nitrate as N	----	0.002	mg/L	**0.006**	**0.014**	**0.003**	**0.004**	**0.004**
Total Kjeldahl Nitrogen as N	----	0.05	mg/L	**0.15**	**0.16**	**0.08**	**0.16**	**0.12**
Total Nitrogen as N	----	0.05	mg/L	**0.16**	**0.17**	**0.08**	**0.16**	**0.12**
Reactive Phosphorus as P	----	0.001	mg/L	**0.002**	**0.002**	<0.001	**0.002**	**0.002**
Total Phosphorus as P	----	0.005	mg/L	<0.005	**0.007**	<0.005	**0.007**	<0.005

Analytical Results

Sub-Matrix: **WATER**			*Client sample ID*	**G-WQ-11**	**G-WQ-12**	**QA-03**	----	----
			Client sampling date / time	23-JUN-2009 15:00	23-JUN-2009 15:00	23-JUN-2009 15:00	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**ES0909220-006**	**ES0909220-007**	**ES0909220-008**	**----**	**----**
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	----	----
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS								
Aluminium	7429-90-5	10	µg/L	<10	<10	<10	----	----
Antimony	7440-36-0	0.5	µg/L	<0.5	<0.5	<0.5	----	----
Iron	7439-89-6	5	µg/L	<5	<5	<5	----	----
Arsenic	7440-38-2	0.5	µg/L	**0.9**	**0.8**	**0.7**	----	----
Barium	7440-39-3	1	µg/L	**6**	**6**	**6**	----	----
Beryllium	7440-41-7	0.1	µg/L	<0.1	<0.1	<0.1	----	----
Cadmium	7440-43-9	0.2	µg/L	<0.2	<0.2	<0.2	----	----
Chromium	7440-47-3	0.5	µg/L	<0.5	<0.5	<0.5	----	----
Cobalt	7440-48-4	0.2	µg/L	<0.2	<0.2	<0.2	----	----
Copper	7440-50-8	1	µg/L	<1	<1	<1	----	----
Lead	7439-92-1	0.2	µg/L	<0.2	<0.2	<0.2	----	----
Manganese	7439-96-5	0.5	µg/L	<0.5	<0.5	**1.0**	----	----
Nickel	7440-02-0	0.5	µg/L	<0.5	<0.5	<0.5	----	----
Silver	7440-22-4	0.1	µg/L	<0.1	**0.1**	<0.1	----	----
Vanadium	7440-62-2	0.5	µg/L	**1.4**	**1.5**	**1.2**	----	----
EP215: Multiresidue Pesticide Residue Screen (Suite 2)								
Simazine	122-34-9	0.005	µg/L	<0.005	<0.005	<0.005	----	----
Diuron	330-54-1	0.005	µg/L	<0.005	<0.005	<0.005	----	----
Atrazine	1912-24-9	0.005	µg/L	<0.005	<0.005	<0.005	----	----
Molinate	2212-67-1	0.005	µg/L	<0.005	<0.005	<0.005	----	----
Metolachlor	51218-45-2	0.005	µg/L	<0.005	**0.075**	<0.005	----	----
Malathion	121-75-5	0.002	µg/L	<0.002	<0.002	<0.002	----	----
Diazinon	333-41-5	0.005	µg/L	<0.005	<0.005	<0.005	----	----
Thiobencarb	28249-77-6	0.005	µg/L	<0.005	<0.005	<0.005	----	----
Chlorpyrifos	2921-88-2	0.005	µg/L	<0.005	<0.005	<0.005	----	----
Trifluralin	1582-09-8	0.005	µg/L	<0.005	<0.005	<0.005	----	----
Ultra-Trace Nutrients								
Ammonia as N	7664-41-7	0.005	mg/L	**0.006**	**0.008**	<0.005	----	----
Nitrite as N	----	0.002	mg/L	<0.002	<0.002	<0.002	----	----
^ Nitrate as N	14797-55-8	0.002	mg/L	**0.004**	**0.004**	**0.006**	----	----
Nitrite + Nitrate as N	----	0.002	mg/L	**0.004**	**0.004**	**0.006**	----	----
Total Kjeldahl Nitrogen as N	----	0.05	mg/L	**0.10**	**0.11**	**0.12**	----	----
Total Nitrogen as N	----	0.05	mg/L	**0.10**	**0.11**	**0.13**	----	----
Reactive Phosphorus as P	----	0.001	mg/L	<0.001	**0.002**	**0.002**	----	----
Total Phosphorus as P	----	0.005	mg/L	<0.005	<0.005	**0.007**	----	----

QUALITY CONTROL REPORT

Work Order	: **ES0909220**	Page	: 1 of 9
Client	: **GHD SERVICES PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR ADRIAN WHITE	Contact	: Charlie Pierce
Address	: P O BOX 373 GLADSTONE QLD, AUSTRALIA 4680	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: adrian.a.white@ghd.com.au	E-mail	: charlie.pierce@alsenviro.com
Telephone	: +61 07 49731611	Telephone	: +61-2-8784 8555
Facsimile	: +61 07 4972 6236	Facsimile	: +61-2-8784 8500
Project	: 421538641	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 25-JUN-2009
Sampler	: ----	Issue Date	: 07-JUL-2009
Order number	: ----		
		No. of samples received	: 8
Quote number	: EN/005/09	No. of samples analysed	: 8

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

NATA
WORLD RECOGNISED ACCREDITATION

NATA Accredited Laboratory 825

This document is issued in accordance with NATA accreditation requirements.

Accredited for compliance with ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Celine Conceicao	Spectroscopist	Inorganics
Hoa Nguyen	Inorganic Chemist	Inorganics
Lana Nguyen	LCMS Chemist	Organics

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insuffient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key :
Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR:- No Limit; Result between 10 and 20 times LOR:- 0% - 50%; Result > 20 times LOR:- 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EG035F: Dissolved Mercury by FIMS (QC Lot: 1026556)									
ES0909216-001	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
ES0909220-005	G-WQ-10	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS (QC Lot: 1025314)									
EB0909527-002	Anonymous	EG093A-F: Beryllium	7440-41-7	0.1	µg/L	<0.1	<0.1	0.0	No Limit
		EG093A-F: Silver	7440-22-4	0.1	µg/L	<0.1	<0.1	0.0	No Limit
		EG093A-F: Cadmium	7440-43-9	0.2	µg/L	<0.2	<0.2	0.0	No Limit
		EG093A-F: Cobalt	7440-48-4	0.2	µg/L	<0.2	<0.2	0.0	No Limit
		EG093A-F: Lead	7439-92-1	0.2	µg/L	2.0	1.9	0.0	No Limit
		EG093A-F: Antimony	7440-36-0	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EG093A-F: Arsenic	7440-38-2	0.5	µg/L	0.7	0.9	24.5	No Limit
		EG093A-F: Chromium	7440-47-3	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EG093A-F: Manganese	7439-96-5	0.5	µg/L	17.7	17.3	2.2	0% - 20%
		EG093A-F: Nickel	7440-02-0	0.5	µg/L	<0.5	0.6	0.0	No Limit
		EG093A-F: Vanadium	7440-62-2	0.5	µg/L	1.6	1.8	11.5	No Limit
		EG093A-F: Barium	7440-39-3	1	µg/L	21	20	0.0	0% - 20%
		EG093A-F: Copper	7440-50-8	1	µg/L	<1	<1	0.0	No Limit
		EG093A-F: Aluminium	7429-90-5	10	µg/L	<10	<10	0.0	No Limit
ES0909073-001	Anonymous	EG093A-F: Beryllium	7440-41-7	0.1	µg/L	<0.1	<0.1	0.0	No Limit
		EG093A-F: Silver	7440-22-4	0.1	µg/L	<0.1	<0.1	0.0	No Limit
		EG093A-F: Cadmium	7440-43-9	0.2	µg/L	<0.2	<0.2	0.0	No Limit
		EG093A-F: Cobalt	7440-48-4	0.2	µg/L	<0.2	<0.2	0.0	No Limit
		EG093A-F: Lead	7439-92-1	0.2	µg/L	<0.2	<0.2	0.0	No Limit
		EG093A-F: Antimony	7440-36-0	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EG093A-F: Arsenic	7440-38-2	0.5	µg/L	0.8	0.7	0.0	No Limit
		EG093A-F: Chromium	7440-47-3	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EG093A-F: Manganese	7439-96-5	0.5	µg/L	0.6	0.5	0.0	No Limit
		EG093A-F: Nickel	7440-02-0	0.5	µg/L	0.7	<0.5	32.6	No Limit
		EG093A-F: Vanadium	7440-62-2	0.5	µg/L	1.2	1.2	0.0	No Limit
		EG093A-F: Barium	7440-39-3	1	µg/L	9	8	0.0	No Limit
		EG093A-F: Copper	7440-50-8	1	µg/L	<1	<1	0.0	No Limit
		EG093A-F: Aluminium	7429-90-5	10	µg/L	<10	<10	0.0	No Limit
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS (QC Lot: 1025315)									
ES0909073-001	Anonymous	EG093B-F: Iron	7439-89-6	5	µg/L	<5	<5	0.0	No Limit
ES0909220-001	G-WQ-02	EG093B-F: Iron	7439-89-6	5	µg/L	<5	<5	0.0	No Limit
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS (QC Lot: 1025316)									

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS (QC Lot: 1025316) - continued									
ES0909220-007	G-WQ-12	EG093A-F: Beryllium	7440-41-7	0.1	µg/L	<0.1	<0.1	0.0	No Limit
		EG093A-F: Silver	7440-22-4	0.1	µg/L	0.1	<0.1	0.0	No Limit
		EG093A-F: Cadmium	7440-43-9	0.2	µg/L	<0.2	<0.2	0.0	No Limit
		EG093A-F: Cobalt	7440-48-4	0.2	µg/L	<0.2	<0.2	0.0	No Limit
		EG093A-F: Lead	7439-92-1	0.2	µg/L	<0.2	<0.2	0.0	No Limit
		EG093A-F: Antimony	7440-36-0	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EG093A-F: Arsenic	7440-38-2	0.5	µg/L	0.8	0.8	0.0	No Limit
		EG093A-F: Chromium	7440-47-3	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EG093A-F: Manganese	7439-96-5	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EG093A-F: Nickel	7440-02-0	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EG093A-F: Vanadium	7440-62-2	0.5	µg/L	1.5	0.9	47.9	No Limit
		EG093A-F: Barium	7440-39-3	1	µg/L	6	5	0.0	No Limit
		EG093A-F: Copper	7440-50-8	1	µg/L	<1	<1	0.0	No Limit
		EG093A-F: Aluminium	7429-90-5	10	µg/L	<10	<10	0.0	No Limit
EP215: Multiresidue Pesticide Residue Screen (Suite 2) (QC Lot: 1019161)									
ES0909216-005	Anonymous	EP215-LL: Malathion	121-75-5	0.002	µg/L	<0.002	<0.002	0.0	No Limit
		EP215-LL: Simazine	122-34-9	0.005	µg/L	<0.005	<0.005	0.0	No Limit
		EP215-LL: Diuron	330-54-1	0.005	µg/L	<0.005	<0.005	0.0	No Limit
		EP215-LL: Atrazine	1912-24-9	0.005	µg/L	<0.005	<0.005	0.0	No Limit
		EP215-LL: Molinate	2212-67-1	0.005	µg/L	<0.005	<0.005	0.0	No Limit
		EP215-LL: Metolachlor	51218-45-2	0.005	µg/L	0.027	0.028	3.6	No Limit
		EP215-LL: Diazinon	333-41-5	0.005	µg/L	<0.005	<0.005	0.0	No Limit
		EP215-LL: Thiobencarb	28249-77-6	0.005	µg/L	<0.005	<0.005	0.0	No Limit
		EP215-LL: Chlorpyrifos	2921-88-2	0.005	µg/L	<0.005	<0.005	0.0	No Limit
		EP215-LL: Trifluralin	1582-09-8	0.005	µg/L	<0.005	<0.005	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 1030874)									
ES0909216-001	Anonymous	EK257A-SW: Nitrite as N	----	0.002	mg/L	<0.002	<0.002	0.0	No Limit
ES0909220-004	G-WQ-08	EK257A-SW: Nitrite as N	----	0.002	mg/L	<0.002	<0.002	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 1030875)									
ES0909216-001	Anonymous	EK255A-SW: Ammonia as N	7664-41-7	0.005	mg/L	0.005	0.008	44.3	No Limit
ES0909220-004	G-WQ-08	EK255A-SW: Ammonia as N	7664-41-7	0.005	mg/L	0.005	<0.005	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 1030876)									
ES0909216-001	Anonymous	EK259A-SW: Nitrite + Nitrate as N	----	0.002	mg/L	0.005	0.005	0.0	No Limit
ES0909220-004	G-WQ-08	EK259A-SW: Nitrite + Nitrate as N	----	0.002	mg/L	0.004	0.004	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 1030877)									
ES0909216-001	Anonymous	EK271A-SW: Reactive Phosphorus as P	----	0.001	mg/L	0.002	0.002	0.0	No Limit
ES0909220-004	G-WQ-08	EK271A-SW: Reactive Phosphorus as P	----	0.001	mg/L	0.002	0.002	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 1030886)									
ES0909216-001	Anonymous	EK262PA-SW: Total Nitrogen as N	----	0.05	mg/L	0.15	0.14	0.0	No Limit

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
Ultra-Trace Nutrients (QC Lot: 1030886) - continued									
ES0909220-005	G-WQ-10	EK262PA-SW: Total Nitrogen as N	----	0.05	mg/L	0.12	0.12	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 1030887)									
ES0909216-001	Anonymous	EK267PA-SW: Total Phosphorus as P	----	0.005	mg/L	0.009	0.008	16.5	No Limit
ES0909220-005	G-WQ-10	EK267PA-SW: Total Phosphorus as P	----	0.005	mg/L	<0.005	<0.005	0.0	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	*Laboratory Control Spike (LCS) Report*			
					Spike	*Spike Recovery (%)*	*Recovery Limits (%)*	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EG035F: Dissolved Mercury by FIMS (QCLot: 1026556)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.010 mg/L	108	86	116
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS (QCLot: 1025314)								
EG093A-F: Aluminium	7429-90-5	10	µg/L	<10	50 µg/L	80.8	80	128
EG093A-F: Antimony	7440-36-0	0.5	µg/L	<0.5	----	----	----	----
EG093A-F: Arsenic	7440-38-2	0.5	µg/L	<0.5	10 µg/L	# 79.1	85	125
EG093A-F: Barium	7440-39-3	1	µg/L	<1	10 µg/L	87.1	81	129
EG093A-F: Beryllium	7440-41-7	0.1	µg/L	<0.1	10 µg/L	82.8	80	122
EG093A-F: Cadmium	7440-43-9	0.2	µg/L	<0.2	10 µg/L	104	78	116
EG093A-F: Chromium	7440-47-3	0.5	µg/L	<0.5	10 µg/L	91.1	86	128
EG093A-F: Cobalt	7440-48-4	0.2	µg/L	<0.2	10 µg/L	# 80.3	87	127
EG093A-F: Copper	7440-50-8	1	µg/L	<1	10 µg/L	# 76.8	86	124
EG093A-F: Lead	7439-92-1	0.2	µg/L	<0.2	10 µg/L	87.3	87	123
EG093A-F: Manganese	7439-96-5	0.5	µg/L	<0.5	10 µg/L	# 88.9	90	122
EG093A-F: Nickel	7440-02-0	0.5	µg/L	<0.5	10 µg/L	# 82.2	84	124
EG093A-F: Silver	7440-22-4	0.1	µg/L	<0.1	1 µg/L	70.3	70	130
EG093A-F: Vanadium	7440-62-2	0.5	µg/L	<0.5	10 µg/L	# 82.5	85	123
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS (QCLot: 1025315)								
EG093B-F: Iron	7439-89-6	5	µg/L	<5	50 µg/L	94.6	89	119
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS (QCLot: 1025316)								
EG093A-F: Aluminium	7429-90-5	10	µg/L	<10	50 µg/L	102	80	128
EG093A-F: Antimony	7440-36-0	0.5	µg/L	<0.5	----	----	----	----
EG093A-F: Arsenic	7440-38-2	0.5	µg/L	<0.5	10 µg/L	# 82.6	85	125
EG093A-F: Barium	7440-39-3	1	µg/L	<1	10 µg/L	85.0	81	129
EG093A-F: Beryllium	7440-41-7	0.1	µg/L	<0.1	10 µg/L	84.8	80	122
EG093A-F: Cadmium	7440-43-9	0.2	µg/L	<0.2	10 µg/L	106	78	116
EG093A-F: Chromium	7440-47-3	0.5	µg/L	<0.5	10 µg/L	94.3	86	128
EG093A-F: Cobalt	7440-48-4	0.2	µg/L	<0.2	10 µg/L	# 83.4	87	127
EG093A-F: Copper	7440-50-8	1	µg/L	<1	10 µg/L	# 83.2	86	124
EG093A-F: Lead	7439-92-1	0.2	µg/L	<0.2	10 µg/L	# 85.6	87	123
EG093A-F: Manganese	7439-96-5	0.5	µg/L	<0.5	10 µg/L	95.2	90	122
EG093A-F: Nickel	7440-02-0	0.5	µg/L	<0.5	10 µg/L	# 78.5	84	124
EG093A-F: Silver	7440-22-4	0.1	µg/L	<0.1	1 µg/L	82.0	70	130
EG093A-F: Vanadium	7440-62-2	0.5	µg/L	<0.5	10 µg/L	# 81.2	85	123
EP215: Multiresidue Pesticide Residue Screen (Suite 2) (QCLot: 1019161)								

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	**CAS Number**	**LOR**	**Unit**	**Result**	**Concentration**	**LCS**	**Low**	**High**
EP215: Multiresidue Pesticide Residue Screen (Suite 2) (QCLot: 1019161) - continued								
EP215-LL: Simazine	122-34-9	0.005	µg/L	<0.005	0.025 µg/L	112	65	130
EP215-LL: Diuron	330-54-1	0.005	µg/L	<0.005	0.025 µg/L	114	65	130
EP215-LL: Atrazine	1912-24-9	0.005	µg/L	<0.005	0.025 µg/L	104	65	130
EP215-LL: Molinate	2212-67-1	0.005	µg/L	<0.005	0.025 µg/L	88.6	65	130
EP215-LL: Metolachlor	51218-45-2	0.005	µg/L	<0.005	0.025 µg/L	104	65	130
EP215-LL: Malathion	121-75-5	0.002	µg/L	<0.002	0.025 µg/L	95.0	65	130
EP215-LL: Diazinon	333-41-5	0.005	µg/L	<0.005	0.025 µg/L	86.5	65	130
EP215-LL: Thiobencarb	28249-77-6	0.005	µg/L	<0.005	0.025 µg/L	67.4	65	130
EP215-LL: Chlorpyrifos	2921-88-2	0.005	µg/L	<0.005	0.025 µg/L	92.7	65	130
EP215-LL: Trifluralin	1582-09-8	0.005	µg/L	<0.005	0.1 µg/L	86.8	65	130
Ultra-Trace Nutrients (QCLot: 1030874)								
EK257A-SW: Nitrite as N	----	0.002	mg/L	<0.002	1.0 mg/L	105	70	130
Ultra-Trace Nutrients (QCLot: 1030875)								
EK255A-SW: Ammonia as N	7664-41-7	0.005	mg/L	<0.005	0.1 mg/L	91.8	70	130
Ultra-Trace Nutrients (QCLot: 1030876)								
EK259A-SW: Nitrite + Nitrate as N	----	0.002	mg/L	<0.002	0.1 mg/L	107	70	130
Ultra-Trace Nutrients (QCLot: 1030877)								
EK271A-SW: Reactive Phosphorus as P	----	0.001	mg/L	<0.001	0.1 mg/L	102	70	130
Ultra-Trace Nutrients (QCLot: 1030886)								
EK262PA-SW: Total Nitrogen as N	----	0.05	mg/L	<0.05	1.0 mg/L	91.0	70	130
Ultra-Trace Nutrients (QCLot: 1030887)								
EK267PA-SW: Total Phosphorus as P	----	0.005	mg/L	<0.005	0.44 mg/L	73.2	70	130

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	Spike Recovery (%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG035F: Dissolved Mercury by FIMS (QCLot: 1026556)							
ES0909216-001	Anonymous	EG035F: Mercury	7439-97-6	0.0100 mg/L	93.7	70	130
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS (QCLot: 1025314)							
EB0909527-002	Anonymous	EG093A-F: Arsenic	7440-38-2	50 µg/L	94.4	70	130
		EG093A-F: Barium	7440-39-3	50 µg/L	93.1	70	130
		EG093A-F: Beryllium	7440-41-7	50 µg/L	91.9	70	130
		EG093A-F: Cadmium	7440-43-9	12.5 µg/L	111	70	130
		EG093A-F: Chromium	7440-47-3	50 µg/L	112	70	130
		EG093A-F: Cobalt	7440-48-4	50 µg/L	97.8	70	130
		EG093A-F: Copper	7440-50-8	50 µg/L	93.0	70	130
		EG093A-F: Lead	7439-92-1	50 µg/L	90.8	70	130
		EG093A-F: Manganese	7439-96-5	50 µg/L	111	70	130
		EG093A-F: Nickel	7440-02-0	50 µg/L	98.4	70	130
		EG093A-F: Vanadium	7440-62-2	50 µg/L	97.2	70	130
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS (QCLot: 1025316)							
ES0909220-007	G-WQ-12	EG093A-F: Arsenic	7440-38-2	50 µg/L	99.0	70	130
		EG093A-F: Barium	7440-39-3	50 µg/L	96.2	70	130
		EG093A-F: Beryllium	7440-41-7	50 µg/L	90.8	70	130
		EG093A-F: Cadmium	7440-43-9	12.5 µg/L	114	70	130
		EG093A-F: Chromium	7440-47-3	50 µg/L	112	70	130
		EG093A-F: Cobalt	7440-48-4	50 µg/L	99.3	70	130
		EG093A-F: Copper	7440-50-8	50 µg/L	94.4	70	130
		EG093A-F: Lead	7439-92-1	50 µg/L	89.6	70	130
		EG093A-F: Manganese	7439-96-5	50 µg/L	110	70	130
		EG093A-F: Nickel	7440-02-0	50 µg/L	98.9	70	130
		EG093A-F: Vanadium	7440-62-2	50 µg/L	97.0	70	130
Ultra-Trace Nutrients (QCLot: 1030874)							
ES0909216-001	Anonymous	EK257A-SW: Nitrite as N	----	0.1 mg/L	120	70	130
Ultra-Trace Nutrients (QCLot: 1030875)							
ES0909216-001	Anonymous	EK255A-SW: Ammonia as N	7664-41-7	0.1 mg/L	# 57.4	70.	130
Ultra-Trace Nutrients (QCLot: 1030876)							
ES0909216-001	Anonymous	EK259A-SW: Nitrite + Nitrate as N	----	0.1 mg/L	102	70	130
Ultra-Trace Nutrients (QCLot: 1030877)							
ES0909216-001	Anonymous	EK271A-SW: Reactive Phosphorus as P	----	0.1 mg/L	# 48.6	70	130
Ultra-Trace Nutrients (QCLot: 1030886)							

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report			
				Spike	Spike Recovery (%)	Recovery Limits (%)	
				Concentration	MS	Low	High
Ultra-Trace Nutrients (QCLot: 1030886) - continued							
ES0909216-001	Anonymous	EK262PA-SW: Total Nitrogen as N	----	0.5 mg/L	91.0	70	130
Ultra-Trace Nutrients (QCLot: 1030887)							
ES0909216-001	Anonymous	EK267PA-SW: Total Phosphorus as P	----	0.5 mg/L	81.0	70	130

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: **ES0909220**	Page	: 1 of 8
Client	: GHD SERVICES PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: MR ADRIAN WHITE	Contact	: Charlie Pierce
Address	: P O BOX 373 GLADSTONE QLD, AUSTRALIA 4680	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: adrian.a.white@ghd.com.au	E-mail	: charlie.pierce@alsenviro.com
Telephone	: +61 07 49731611	Telephone	: +61-2-8784 8555
Facsimile	: +61 07 4972 6236	Facsimile	: +61-2-8784 8500
Project	: 421538641	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 25-JUN-2009
Sampler	: ----	Issue Date	: 07-JUL-2009
Order number	: ----		
		No. of samples received	: 8
Quote number	: EN/005/09	No. of samples analysed	: 8

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Interpretive Quality Control Report contains the following information:

- Analysis Holding Time Compliance
- Quality Control Parameter Frequency Compliance
- Brief Method Summaries
- Summary of Outliers

Analysis Holding Time Compliance

The following report summarises extraction / preparation and analysis times and compares with recommended holding times. Dates reported represent first date of extraction or analysis and precludes subsequent dilutions and reruns. Information is also provided re the sample container (preservative) from which the analysis aliquot was taken. Elapsed period to analysis represents number of days from sampling where no extraction / digestion is involved or period from extraction / digestion where this is present. For composite samples, sampling date is assumed to be that of the oldest sample contributing to the composite. Sample date for laboratory produced leachates is assumed as the completion date of the leaching process. Outliers for holding time are based on USEPA SW 846, APHA, AS and NEPM (1999). A listing of breaches is provided in the Summary of Outliers.

Holding times for leachate methods (excluding elutriates) vary according to the analytes being determined on the resulting solution. For non -volatile analytes, the holding time compliance assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These soil holding times are: Organics (14 days); Mercury (28 days) & other metals (180 days). A recorded breach therefore does not guarantee a breach for all non-volatile parameters.

Matrix: **WATER**

Evaluation: ✗ = Holding time breach ; ✓ = Within holding time.

Method ***Container** / Client Sample ID(s)*	***Sample Date***	*Extraction / Preparation*			*Analysis*		
		Date extracted	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*
EG035F: Dissolved Mercury by FIMS							
Clear HDPE (U-T ORC) - UHP Nitric Acid; Filtered G-WQ-02, G-WQ-03, G-WQ-04, G-WQ-08, G-WQ-10, G-WQ-11, G-WQ-12, QA-03	**23-JUN-2009**	**---**	---	----	**02-JUL-2009**	21-JUL-2009	✓
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS							
Clear HDPE (U-T ORC) - UHP Nitric Acid; Filtered G-WQ-02, G-WQ-03, G-WQ-04, G-WQ-08, G-WQ-10, G-WQ-11, G-WQ-12, QA-03	**23-JUN-2009**	**01-JUL-2009**	20-DEC-2009	✓	**01-JUL-2009**	20-DEC-2009	✓
EP215: Multiresidue Pesticide Residue Screen (Suite 2)							
Amber Glass Bottle - Unpreserved G-WQ-02, G-WQ-03, G-WQ-04, G-WQ-08, G-WQ-10, G-WQ-11, G-WQ-12, QA-03	**23-JUN-2009**	**26-JUN-2009**	30-JUN-2009	✓	**26-JUN-2009**	05-AUG-2009	✓
Ultra-Trace Nutrients							
Clear Plastic Bottle - Filtered (AS) G-WQ-02, G-WQ-03, G-WQ-04, G-WQ-08, G-WQ-10, G-WQ-11, G-WQ-12, QA-03	**23-JUN-2009**	**---**	---	----	**25-JUN-2009**	24-JUN-2009	✗
Clear Plastic Bottle - Natural (AS) G-WQ-02, G-WQ-03, G-WQ-04, G-WQ-08, G-WQ-10, G-WQ-11, G-WQ-12, QA-03	**23-JUN-2009**	**25-JUN-2009**	---	----	**25-JUN-2009**	24-JUN-2009	✗

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(where) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: ✗ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		*Count*		*Rate (%)*			*Quality Control Specification*
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Ammonia as N - Ultra-Trace in Saline Waters	EK255A-SW	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Ammonia as N - Ultra-Trace for Catchment Monitoring	EK255A-CM	2	6	**33.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	2	15	**13.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals in Saline Water -Suite A by ORC-ICPMS	EG093A-F	3	21	**14.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals in Saline Water -Suite B by ORC-ICPMS	EG093B-F	2	18	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Multiresidue Pesticide Screen (No. 2)	EP215-LL	1	20	**5.0**	**10.0**	✗	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N - Ultra-Trace in Saline Waters	EK259A-SW	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) - Ultra-Trace for Catchment M	EK259A-CM	2	6	**33.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N - Ultra-Trace in Saline Waters	EK257A-SW	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P - Ultra-Trace for Catchment M	EK271A-CM	2	6	**33.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P - Ultra-Trace in Saline Water	EK271A-SW	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Nitrogen as N (Persulfate digestion)-Ultra-Trace - CM	EK262PA-CM	2	6	**33.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Nitrogen/Persulfate Digestion/Ultra-Trace/Saline	EK262PA-SW	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus(Persulfate Digestion) - Ultra-Trace for CM	EK267PA-CM	2	6	**33.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus/Persulfate Digestion/ Ultra Trace /Saline	EK267PA-SW	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
Ammonia as N - Ultra-Trace in Saline Waters	EK255A-SW	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Ammonia as N - Ultra-Trace for Catchment Monitoring	EK255A-CM	1	6	**16.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	1	15	**6.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals in Saline Water -Suite A by ORC-ICPMS	EG093A-F	2	21	**9.5**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals in Saline Water -Suite B by ORC-ICPMS	EG093B-F	1	18	**5.6**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Multiresidue Pesticide Screen (No. 2)	EP215-LL	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N - Ultra-Trace in Saline Waters	EK259A-SW	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) - Ultra-Trace for Catchment M	EK259A-CM	1	6	**16.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N - Ultra-Trace in Saline Waters	EK257A-SW	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P - Ultra-Trace for Catchment M	EK271A-CM	1	6	**16.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P - Ultra-Trace in Saline Water	EK271A-SW	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Nitrogen as N (Persulfate digestion)-Ultra-Trace - CM	EK262PA-CM	1	6	**16.7**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Nitrogen/Persulfate Digestion/Ultra-Trace/Saline	EK262PA-SW	1	20	**5.0**	**10.0**	✗	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus(Persulfate Digestion) - Ultra-Trace for CM	EK267PA-CM	1	6	**16.7**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus/Persulfate Digestion/ Ultra Trace /Saline	EK267PA-SW	1	20	**5.0**	**10.0**	✗	NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Method Blanks (MB)							
Ammonia as N - Ultra-Trace in Saline Waters	EK255A-SW	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Ammonia as N - Ultra-Trace for Catchment Monitoring	EK255A-CM	1	6	**16.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	1	15	**6.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals in Saline Water -Suite A by ORC-ICPMS	EG093A-F	2	21	**9.5**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals in Saline Water -Suite B by ORC-ICPMS	EG093B-F	1	18	**5.6**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Multiresidue Pesticide Screen (No. 2)	EP215-LL	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N - Ultra-Trace in Saline Waters	EK259A-SW	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) - Ultra-Trace for Catchment M	EK259A-CM	1	6	**16.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N - Ultra-Trace in Saline Waters	EK257A-SW	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P - Ultra-Trace for Catchment M	EK271A-CM	1	6	**16.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P - Ultra-Trace in Saline Water	EK271A-SW	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Nitrogen as N (Persulfate digestion)-Ultra-Trace - CM	EK262PA-CM	1	6	**16.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Nitrogen/Persulfate Digestion/Ultra-Trace/Saline	EK262PA-SW	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus(Persulfate Digestion) - Ultra-Trace for CM	EK267PA-CM	1	6	**16.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus/Persulfate Digestion/ Ultra Trace /Saline	EK267PA-SW	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							
Ammonia as N - Ultra-Trace in Saline Waters	EK255A-SW	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement
Ammonia as N - Ultra-Trace for Catchment Monitoring	EK255A-CM	1	6	**16.7**	**5.0**	✓	ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	1	15	**6.7**	**5.0**	✓	ALS QCS3 requirement
Dissolved Metals in Saline Water -Suite A by ORC-ICPMS	EG093A-F	2	21	**9.5**	**5.0**	✓	ALS QCS3 requirement
Nitrite and Nitrate as N - Ultra-Trace in Saline Waters	EK259A-SW	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) - Ultra-Trace for Catchment M	EK259A-CM	1	6	**16.7**	**5.0**	✓	ALS QCS3 requirement
Nitrite as N - Ultra-Trace in Saline Waters	EK257A-SW	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement
Reactive Phosphorus as P - Ultra-Trace for Catchment M	EK271A-CM	1	6	**16.7**	**5.0**	✓	ALS QCS3 requirement
Reactive Phosphorus as P - Ultra-Trace in Saline Water	EK271A-SW	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement
Total Nitrogen as N (Persulfate digestion)-Ultra-Trace - CM	EK262PA-CM	1	6	**16.7**	**5.0**	✓	ALS QCS3 requirement
Total Nitrogen/Persulfate Digestion/Ultra-Trace/Saline	EK262PA-SW	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement
Total Phosphorus(Persulfate Digestion) - Ultra-Trace for CM	EK267PA-CM	1	6	**16.7**	**5.0**	✓	ALS QCS3 requirement
Total Phosphorus/Persulfate Digestion/ Ultra Trace /Saline	EK267PA-SW	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
Dissolved Mercury by FIMS	EG035F	WATER	AS 3550, APHA 21st ed. 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Dissolved Metals in Saline Water -Suite A by ORC-ICPMS	EG093A-F	WATER	APHA 21st ed., 3125; USEPA SW846 - 6020 Samples are 0.45 um filtered prior to analysis. The ORC-ICPMS technique removes interfering species through a series of chemical reactions prior to ion detection. Ions are passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to measurement by a discrete dynode ion detector. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Dissolved Metals in Saline Water -Suite B by ORC-ICPMS	EG093B-F	WATER	APHA 21st ed., 3125; USEPA SW846 - 6020 Samples are 0.45 um filtered prior to analysis. The ORC-ICPMS technique removes interfering species through a series of chemical reactions prior to ion detection. Ions are passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to measurement by a discrete dynode ion detector. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Ammonia as N - Ultra-Trace for Catchment Monitoring	EK255A-CM	WATER	APHA 21st ed., 4500-NH3 H Ammonia is determined by direct colorimetry by FIA. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Ammonia as N - Ultra-Trace in Saline Waters	EK255A-SW	WATER	APHA 21st ed., 4500-NH3 H Ammonia is determined by direct colorimetry by FIA. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Nitrite as N - Ultra-Trace for Catchment Monitoring	EK257A-CM	WATER	APHA 21st ed., 4500-NO2- B. Nitrite is determined by direct colourimetry by FIA.
Nitrite as N - Ultra-Trace in Saline Waters	EK257A-SW	WATER	APHA 21st ed., 4500-NO2- B. Nitrite is determined by direct colourimetry by FIA.
Nitrate as N - Ultra-Trace for Catchment Monitoring	EK258A-CM	WATER	APHA 21st ed., 4500-NO3- I Nitrate is reduced to nitrite by way of a cadmium reduction column followed by quantification by FIA. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results.
Nitrate as N - Ultra-Trace in Saline Waters	EK258A-SW	WATER	APHA 21st ed., 4500-NO3- I Nitrate is reduced to nitrite by way of a cadmium reduction column followed by quantification by FIA. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results.
Nitrite and Nitrate as N (NOx) - Ultra-Trace for Catchment M	EK259A-CM	WATER	APHA 21st ed., 4500-NO3- I. Combined oxidised Nitrogen (NO2+NO3) is determined by Cadmium Reduction and direct colourimetry by FIA.
Nitrite and Nitrate as N - Ultra-Trace in Saline Waters	EK259A-SW	WATER	APHA 21st ed., 4500-NO3- I. Combined oxidised Nitrogen (NO2+NO3) is determined by Cadmium Reduction and direct colourimetry by FIA.
TKN (Total N - NOx-N). (FIA - UT) for Catchment Monitoring	EK261PA-CM	WATER	APHA 21st ed., 4500-P J. & 4500-NO3- I . Calculated by difference from total Nitrogen and NOx. Contributing method parameters are determined by FIA. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
TKN (Total N - NOx-N). (FIA - UT) in Saline Waters	EK261PA-SW	WATER	APHA 21st ed., 4500-P J. & 4500-NO3- I. Calculated by difference from total Nitrogen and NOx. Contributing method parameters are determined by FIA. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Nitrogen as N (Persulfate digestion)-Ultra-Trace - CM	EK262PA-CM	WATER	APHA 21st ed., 4500-P J. Persulfate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus. As sample is digested with persulfate under alkaline conditions yielding orthophosphate and nitrate. Following digestion, analytes are determined by flow injection analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Nitrogen/Persulfate Digestion/Ultra-Trace/Saline	EK262PA-SW	WATER	APHA 21st ed., 4500-P J. Persulfate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus. As sample is digested with persulfate under alkaline conditions yielding orthophosphate and nitrate. Following digestion, analytes are determined by flow injection analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Phosphorus(Persulfate Digestion) - Ultra-Trace for CM	EK267PA-CM	WATER	APHA 21st ed., 4500-P J. Persulfate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus. As sample is digested with persulfate under alkaline conditions yielding orthophosphate and nitrate. Following digestion, analytes are determined by flow injection analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Phosphorus/Persulfate Digestion/ Ultra Trace /Saline	EK267PA-SW	WATER	APHA 21st ed., 4500-P J. Persulfate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus. As sample is digested with persulfate under alkaline conditions yielding orthophosphate and nitrate. Following digestion, analytes are determined by flow injection analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Reactive Phosphorus as P - Ultra-Trace for Catchment M	EK271A-CM	WATER	APHA 21st ed., 4500-P E Ammonium molybdate and potassium antimonyl tartrate reacts in acid medium with othophosphate to form a heteropoly acid -phosphomolybdic acid - which is reduced to intensely coloured molybdenum blue by ascorbic acid. Quantification is by FIA. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Reactive Phosphorus as P - Ultra-Trace in Saline Water	EK271A-SW	WATER	APHA 21st ed., 4500-P E Ammonium molybdate and potassium antimonyl tartrate reacts in acid medium with othophosphate to form a heteropoly acid -phosphomolybdic acid - which is reduced to intensely coloured molybdenum blue by ascorbic acid. Quantification is by FIA. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Multiresidue Pesticide Screen (No. 2)	EP215-LL	WATER	In-house, LCMS (APCI in positive mode). The compounds are extracted from water samples using dichloromethane. The organic phase is evaporated to dryness and reconstituted in a mixture of acetonitrile and water for reverse phase HPLC analysis.

Preparation Methods	*Method*	*Matrix*	*Method Descriptions*
Persulfate Digestion for UT TN and TP for FIA finish.	EK262/267-PA	WATER	APHA 21st ed., 4500 P - J. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Persulfate Digestion for UT TN and TP for FIA/Saline	EK262/267PA-SW	WATER	APHA 21st ed., 4500 P - J. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Separatory funnel extraction for LCMS herbicides.	* EP215-PR	WATER	In-house. A 1 L sample is extracted three times with 60 mL of methylene chloride, reduced to dryness and made up in HPLC mobile phase.

Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged in the Quality Control (QC) Report. Surrogate recovery limits are static and based on USEPA SW846 or ALS-QWI/EN/38 (in the absence of specific USEPA limits). This report displays QC Outliers (breaches) only.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	**Analyte**	CAS Number	Data	Limits	**Comment**
Laboratory Control Spike (LCS) Recoveries							
EG093F: Dissolved Metals in Saline Water by ORC-ICP	1176715-037	----	**Arsenic**	7440-38-2	82.6 %	85-125%	**Recovery less than lower control limit**
EG093F: Dissolved Metals in Saline Water by ORC-ICP	1176715-003	----	**Arsenic**	7440-38-2	79.1 %	85-125%	**Recovery less than lower control limit**
EG093F: Dissolved Metals in Saline Water by ORC-ICP	1176715-003	----	**Cobalt**	7440-48-4	80.3 %	87-127%	**Recovery less than lower control limit**
EG093F: Dissolved Metals in Saline Water by ORC-ICP	1176715-037	----	**Cobalt**	7440-48-4	83.4 %	87-127%	**Recovery less than lower control limit**
EG093F: Dissolved Metals in Saline Water by ORC-ICP	1176715-003	----	**Copper**	7440-50-8	76.8 %	86-124%	**Recovery less than lower control limit**
EG093F: Dissolved Metals in Saline Water by ORC-ICP	1176715-037	----	**Copper**	7440-50-8	83.2 %	86-124%	**Recovery less than lower control limit**
EG093F: Dissolved Metals in Saline Water by ORC-ICP	1176715-037	----	**Lead**	7439-92-1	85.6 %	87-123%	**Recovery less than lower control limit**
EG093F: Dissolved Metals in Saline Water by ORC-ICP	1176715-003	----	**Manganese**	7439-96-5	88.9 %	90-122%	**Recovery less than lower control limit**
EG093F: Dissolved Metals in Saline Water by ORC-ICP	1176715-003	----	**Nickel**	7440-02-0	82.2 %	84-124%	**Recovery less than lower control limit**
EG093F: Dissolved Metals in Saline Water by ORC-ICP	1176715-037	----	**Nickel**	7440-02-0	78.5 %	84-124%	**Recovery less than lower control limit**
EG093F: Dissolved Metals in Saline Water by ORC-ICP	1176715-037	----	**Vanadium**	7440-62-2	81.2 %	85-123%	**Recovery less than lower control limit**
EG093F: Dissolved Metals in Saline Water by ORC-ICP	1176715-003	----	**Vanadium**	7440-62-2	82.5 %	85-123%	**Recovery less than lower control limit**
Matrix Spike (MS) Recoveries							
Ultra-Trace Nutrients	ES0909216-001	Anonymous	**Ammonia as N**	7664-41-7	57.4 %	70.-130%	**Recovery less than lower data quality objective**
Ultra-Trace Nutrients	ES0909216-001	Anonymous	**Reactive Phosphorus as P**	----	48.6 %	70-130%	**Recovery less than lower data quality objective**

- **For all matrices, no Method Blank value outliers occur.**
- **For all matrices, no Duplicate outliers occur.**

Regular Sample Surrogates

- **For all regular sample matrices, no surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

This report displays Holding Time breaches only. Only the respective Extraction / Preparation and/or Analysis component is/are displayed.

Matrix: **WATER**

Method	*Extraction / Preparation*			*Analysis*		
Container / Client Sample ID(s)	*Date extracted*	*Due for extraction*	***Days overdue***	*Date analysed*	*Due for analysis*	***Days overdue***
Ultra-Trace Nutrients						

Matrix: **WATER**

Method Container / Client Sample ID(s)		Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
Ultra-Trace Nutrients - Analysis Holding Time Compliance							
Clear Plastic Bottle - Filtered (AS)							
G-WQ-02, G-WQ-04, G-WQ-10, G-WQ-12,	G-WQ-03, G-WQ-08, G-WQ-11, QA-03	----	----	----	25-JUN-2009	24-JUN-2009	**1**
Clear Plastic Bottle - Natural (AS)							
G-WQ-02, G-WQ-04, G-WQ-10, G-WQ-12,	G-WQ-03, G-WQ-08, G-WQ-11, QA-03	----	----	----	25-JUN-2009	24-JUN-2009	**1**

Outliers : Frequency of Quality Control Samples

The following report highlights breaches in the Frequency of Quality Control Samples.

Matrix: **WATER**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
Multiresidue Pesticide Screen (No. 2)	1	20	5.0	10.0	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)					
Total Nitrogen/Persulfate Digestion/Ultra-Trace/Saline	1	20	5.0	10.0	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus/Persulfate Digestion/ Ultra Trace /Saline	1	20	5.0	10.0	NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Chain of Custody & Analysis Request

Page _1_ of _1_

Chain of Custody Number:

GHD

PROJECT ID:	4215386 41	**QUOTE:**	
PROJECT:	**Western Basin EIS WQ Monitoring**		
CLIENT:	GHD		
POSTAL ADDRESS:	PO Box 373, Gladstone 4680		
CONTACT:	Adrian White		
PHONE:	412035667	**FAX:**	07) 49726236
EMAIL:	Jason.K.Fowler@ghd.com.au, Adrian.A.White@ghd.com.au		
INVOICE:	Jason.K.Fowler@ghd.com.au, Adrian.A.White@ghd.com.au		
DATA NEEDED BY:			
REPORT FORMAT:			
EMAIL FORMAT:	ESDAT, EXCEL & PDF		

LABORATORY BATCH NO.:

FOR LAB USE ONLY

COOLER SEAL:
Yes No ……
Broken Intact ……

COOLER TEMP:
…… deg.C

DESPATCHED TO:
ALS Environmental
277-289 Woodpark Road
Smithfield NSW 2164
02 8784 8555

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

Water samples from a marine environment (Background sampling)

(EMAIL ADDRESSES PROVIDED ABOVE)

ANALYSIS REQUIRED

SAMPLE ID	MATRIX	DATE	DETECTION LIMIT	PRESERVATION	Ultra trace ORC - dissolved metals (EG093F) (Sb, As, Ba, Be, Cd, Co, Cr, Cu, Mn, Ni, Pb, V, Hg, Fe, Al, Ag)	Ultra trace nutrients (UTN - 04) (TP, RP, NH3, NO2, NO3, TKN, TN)	TSS (EA025)	Chlorophyll a (EP008)	pH (EA005)	TDS (EA015)	Electro Conductivity	[redacted]
[redacted]												[redacted]
[redacted]												[redacted]
1 ✓ G-WQ-03	Water		LOR	As Required	X	X	X	X	X	X	X	[redacted]
2 ✓ G-WQ-04	Water		LOR	As Required	X	X	X	X	X	X	X	[redacted]
[redacted]												[redacted]
[redacted]												[redacted]
3 ✓ G-WQ-07	Water		LOR	As Required	X	X	X	X	X	X	X	[redacted]
[redacted]												[redacted]
[redacted]												[redacted]
4 ✓ G-WQ-10	Water		LOR	As Required	X	X	X	X	X	X	X	[redacted]
5 ✓ G-WQ-11	Water		LOR	As Required	X	X	X	X	X	X	X	[redacted]
6 ✓ G-WQ-12	Water		LOR	As Required	X	X	X	X	X	X	X	[redacted]
[redacted]												[redacted]

SAMPLES FROM MARINE ENVIRONMENT

Environmental Division
Sydney
Work Order
ES0911097
Telephone : +61-2-8784 8555

RELINQUISHED BY:
NAME : A White
DATE: 27/7
OF: GHD Gladstone
TIME: 15:30

RECEIVED BY:
NAME :
DATE: 29/07
OF:
TIME: 8:30

PLEASE EMAIL COMPLETED ANALYSIS REQUEST TO: Jason.K.Fowler@ghd.com.au, Adrian.A.White@ghd.com.au

*Container Type and Preservative Codes: P = Neutral Plastic; N = Nitric Acid Preserved; C = Sodium Hydroxide Preserved; J = Solvent Washed Acid Rinced Jar; S = Solvent Washed Acid Rinced Glass Bottle; VC = Hydrochloric Acid Preserved Vial; VS = Sulfuric Acid Preserved Vial; BS = Sulfuric Acid Preserved Glass Bottle; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; O = Other.

SAMPLE RECEIPT NOTIFICATION (SRN)

Comprehensive Report

Work Order : **ES0911097**

Client	: **GHD SERVICES PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR ADRIAN WHITE	Contact	: Charlie Pierce
Address	: P O BOX 373 GLADSTONE QLD, AUSTRALIA 4680	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: adrian.a.white@ghd.com.au	E-mail	: charlie.pierce@alsenviro.com
Telephone	: +61 07 49731611	Telephone	: +61-2-8784 8555
Facsimile	: +61 07 4972 6236	Facsimile	: +61-2-8784 8500
Project	: 4215386 41 WASTERN BASIN EIS WQ MONITORING	Page	: 1 of 3
Order number	: ----		
C-O-C number	: ----	Quote number	: EB2009GHDSER0401 (BN/314/09)
Site	: ----		
Sampler	: AW	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Dates

Date Samples Received	: 29-JUL-2009	Issue Date	: 29-JUL-2009 13:17
Client Requested Due Date	: 05-AUG-2009	Scheduled Reporting Date	: **05-AUG-2009**

Delivery Details

Mode of Delivery	: Carrier	Temperature	: 7.8'C - Ice present
No. of coolers/boxes	: 1 HARD	No. of samples received	: 6
Sercurity Seal	: Intact.	No. of samples analysed	: 6

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Requested Deliverables
- **Samples received in appropriately pretreated and preserved containers.**
- **Breaches in recommended extraction / analysis holding times may occur. Please contact ALS for further information (Nanthini Coilparampil).**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please direct any turn around / technical queries to the laboratory contact designated above.
- Please direct any queries related to sample condition / numbering / breakages to Nanthini Coilparampil
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (14 days), Solid (90 days) from date of completion of work order.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exist.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process neccessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

When date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for processing purposes. If the sampling time is displayed as 0:00 the information was not provided by client.

Matrix: **WATER**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	WATER - EA005: pH pH	WATER - EA010P Conductivity (PC)	WATER - EA015 Total Dissolved Solids	WATER - EA025H Suspended Solids (High Level)	WATER - EG035F Dissolved Mercury by FIMS	WATER - EG093A-F Dissolved metals in saline water by ORC-ICPMS	WATER - EG093B-F Dissolved Metals in Saline Water Suite B by ORC-ICPMS	WATER - EP008 Chlorophyll a
ES0911097-001	27-JUL-2009 15:00	GQ-WQ-03	✓	✓	✓	✓	✓	✓	✓	✓
ES0911097-002	27-JUL-2009 15:00	GQ-WQ-04	✓	✓	✓	✓	✓	✓	✓	✓
ES0911097-003	27-JUL-2009 15:00	GQ-WQ-07	✓	✓	✓	✓	✓	✓	✓	✓
ES0911097-004	27-JUL-2009 15:00	GQ-WQ-10	✓	✓	✓	✓	✓	✓	✓	✓
ES0911097-005	27-JUL-2009 15:00	GQ-WQ-11	✓	✓	✓	✓	✓	✓	✓	✓
ES0911097-006	27-JUL-2009 15:00	GQ-WQ-12	✓	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	WATER - UTN-4 SW Ultratrace NO2, NO3, NH3, Nitrogen, Phosphorus, TKN, Reactive Phosphorus
ES0911097-001	27-JUL-2009 15:00	GQ-WQ-03	✓
ES0911097-002	27-JUL-2009 15:00	GQ-WQ-04	✓
ES0911097-003	27-JUL-2009 15:00	GQ-WQ-07	✓
ES0911097-004	27-JUL-2009 15:00	GQ-WQ-10	✓
ES0911097-005	27-JUL-2009 15:00	GQ-WQ-11	✓
ES0911097-006	27-JUL-2009 15:00	GQ-WQ-12	✓

Requested Deliverables

MR ADRIAN WHITE

- *AU Certificate of Analysis - NATA (COA)	Email	adrian.a.white@ghd.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	adrian.a.white@ghd.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	adrian.a.white@ghd.com.au
- A4 - AU Sample Receipt Notification - Environmental (SRN)	Email	adrian.a.white@ghd.com.au
- A4 - AU Tax Invoice (INV)	Email	adrian.a.white@ghd.com.au
- Default - Chain of Custody (COC)	Email	adrian.a.white@ghd.com.au
- EDI Format - ENMRG (ENMRG)	Email	adrian.a.white@ghd.com.au
- EDI Format - ESDAT (ESDAT)	Email	adrian.a.white@ghd.com.au

MR JASON FOWLER

- *AU Certificate of Analysis - NATA (COA)	Email	jason.k.fowler@ghd.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	jason.k.fowler@ghd.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	jason.k.fowler@ghd.com.au
- A4 - AU Sample Receipt Notification - Environmental (SRN)	Email	jason.k.fowler@ghd.com.au
- A4 - AU Tax Invoice (INV)	Email	jason.k.fowler@ghd.com.au
- Default - Chain of Custody (COC)	Email	jason.k.fowler@ghd.com.au
- EDI Format - ENMRG (ENMRG)	Email	jason.k.fowler@ghd.com.au
- EDI Format - ESDAT (ESDAT)	Email	jason.k.fowler@ghd.com.au

CERTIFICATE OF ANALYSIS

Work Order	: **ES0911097**	Page	: 1 of 6
Client	: **GHD SERVICES PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR ADRIAN WHITE	Contact	: Charlie Pierce
Address	: P O BOX 373 GLADSTONE QLD, AUSTRALIA 4680	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: adrian.a.white@ghd.com.au	E-mail	: charlie.pierce@alsenviro.com
Telephone	: +61 07 49731611	Telephone	: +61-2-8784 8555
Facsimile	: +61 07 4972 6236	Facsimile	: +61-2-8784 8500
Project	: 4215386 41 WASTERN BASIN EIS WQ MONITORING	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 29-JUL-2009
Sampler	: AW	Issue Date	: 03-AUG-2009
Site	: ----		
		No. of samples received	: 6
Quote number	: BN/314/09	No. of samples analysed	: 6

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

NATA Accredited Laboratory 825

This document is issued in accordance with NATA accreditation requirements.

Accredited for compliance with ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Hoa Nguyen	Inorganic Chemist	Inorganics
Wisam Abou-Maraseh	Spectroscopist	Inorganics

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insuffient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for processing purposes. If the sampling time is displayed as 0:00 the information was not provided by client.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting

Analytical Results

Sub-Matrix: **MARINE WATER**			Client sample ID	**GQ-WQ-03**	**GQ-WQ-04**	**GQ-WQ-07**	**GQ-WQ-10**	**GQ-WQ-11**
			Client sampling date / time	27-JUL-2009 15:00	27-JUL-2009 15:00	27-JUL-2009 15:00	27-JUL-2009 15:00	27-JUL-2009 15:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES0911097-001**	**ES0911097-002**	**ES0911097-003**	**ES0911097-004**	**ES0911097-005**
EA005: pH								
pH Value	----	0.01	pH Unit	**8.16**	**8.27**	**8.17**	**8.18**	**8.04**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**48700**	**49200**	**50500**	**50800**	**50500**
EA015: Total Dissolved Solids								
^ Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	**43700**	**42200**	**43600**	**46200**	**42800**
EA025: Suspended Solids								
^ Suspended Solids (SS)	----	5	mg/L	**14**	**16**	<5	**8**	**12**
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS								
Aluminium	7429-90-5	10	µg/L	<10	<10	<10	<10	<10
Antimony	7440-36-0	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Iron	7439-89-6	5	µg/L	<5	<5	<5	<5	<5
Arsenic	7440-38-2	0.5	µg/L	**1.2**	**1.3**	**1.2**	**1.0**	**1.3**
Barium	7440-39-3	1	µg/L	**8**	**6**	**9**	**8**	**7**
Beryllium	7440-41-7	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Cadmium	7440-43-9	0.2	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Chromium	7440-47-3	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Cobalt	7440-48-4	0.2	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Copper	7440-50-8	1	µg/L	<1	<1	<1	<1	<1
Lead	7439-92-1	0.2	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Manganese	7439-96-5	0.5	µg/L	**0.7**	**1.4**	**2.2**	**2.8**	**0.7**
Nickel	7440-02-0	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Silver	7440-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Vanadium	7440-62-2	0.5	µg/L	**1.2**	**1.1**	**1.0**	**1.1**	**0.8**
EP008: Chlorophyll a								
Chlorophyll a	----	1	mg/m3	**1**	<1	**2**	**5**	<1
Volume	----	0.01	L	**1**	**1**	**1**	**1**	**1**
Volume Extract	----	0.01	mL	**10**	**10**	**10**	**10**	**10**
Ultra-Trace Nutrients								
Ammonia as N	7664-41-7	0.005	mg/L	**0.011**	**0.007**	**0.010**	**0.008**	**0.010**
Nitrite as N	----	0.002	mg/L	**0.002**	<0.002	<0.002	<0.002	<0.002
^ Nitrate as N	14797-55-8	0.002	mg/L	**0.008**	**0.006**	**0.004**	**0.004**	**0.005**
Nitrite + Nitrate as N	----	0.002	mg/L	**0.010**	**0.006**	**0.004**	**0.004**	**0.005**
^ Total Kjeldahl Nitrogen as N	----	0.05	mg/L	**0.14**	**0.15**	**0.18**	**0.15**	**0.13**
Total Nitrogen as N	----	0.05	mg/L	**0.14**	**0.15**	**0.19**	**0.15**	**0.14**
Reactive Phosphorus as P	----	0.001	mg/L	**0.006**	**0.004**	**0.005**	**0.005**	**0.005**

Analytical Results

Sub-Matrix: **MARINE WATER**			Client sample ID	**GQ-WQ-03**	**GQ-WQ-04**	**GQ-WQ-07**	**GQ-WQ-10**	**GQ-WQ-11**
			Client sampling date / time	27-JUL-2009 15:00	27-JUL-2009 15:00	27-JUL-2009 15:00	27-JUL-2009 15:00	27-JUL-2009 15:00
Compound	CAS Number	LOR	Unit	**ES0911097-001**	**ES0911097-002**	**ES0911097-003**	**ES0911097-004**	**ES0911097-005**
Ultra-Trace Nutrients - Continued								
Total Phosphorus as P	----	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005

Analytical Results

Sub-Matrix: **MARINE WATER**			*Client sample ID*	**GQ-WQ-12**	----	----	----	----
			Client sampling date / time	27-JUL-2009 15:00	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**ES0911097-006**	**----**	**----**	**----**	**----**
EA005: pH								
pH Value	----	0.01	pH Unit	**8.20**	----	----	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**49400**	----	----	----	----
EA015: Total Dissolved Solids								
^ Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	**44100**	----	----	----	----
EA025: Suspended Solids								
^ Suspended Solids (SS)	----	5	mg/L	**10**	----	----	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	----	----	----	----
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS								
Aluminium	7429-90-5	10	µg/L	<10	----	----	----	----
Antimony	7440-36-0	0.5	µg/L	<0.5	----	----	----	----
Iron	7439-89-6	5	µg/L	<5	----	----	----	----
Arsenic	7440-38-2	0.5	µg/L	**1.4**	----	----	----	----
Barium	7440-39-3	1	µg/L	**8**	----	----	----	----
Beryllium	7440-41-7	0.1	µg/L	<0.1	----	----	----	----
Cadmium	7440-43-9	0.2	µg/L	<0.2	----	----	----	----
Chromium	7440-47-3	0.5	µg/L	<0.5	----	----	----	----
Cobalt	7440-48-4	0.2	µg/L	<0.2	----	----	----	----
Copper	7440-50-8	1	µg/L	<1	----	----	----	----
Lead	7439-92-1	0.2	µg/L	<0.2	----	----	----	----
Manganese	7439-96-5	0.5	µg/L	**0.7**	----	----	----	----
Nickel	7440-02-0	0.5	µg/L	<0.5	----	----	----	----
Silver	7440-22-4	0.1	µg/L	<0.1	----	----	----	----
Vanadium	7440-62-2	0.5	µg/L	**1.3**	----	----	----	----
EP008: Chlorophyll a								
Chlorophyll a	----	1	mg/m3	**1**	----	----	----	----
Volume	----	0.01	L	**1**	----	----	----	----
Volume Extract	----	0.01	mL	**10**	----	----	----	----
Ultra-Trace Nutrients								
Ammonia as N	7664-41-7	0.005	mg/L	**0.012**	----	----	----	----
Nitrite as N	----	0.002	mg/L	<0.002	----	----	----	----
^ Nitrate as N	14797-55-8	0.002	mg/L	**0.005**	----	----	----	----
Nitrite + Nitrate as N	----	0.002	mg/L	**0.005**	----	----	----	----
^ Total Kjeldahl Nitrogen as N	----	0.05	mg/L	**0.13**	----	----	----	----
Total Nitrogen as N	----	0.05	mg/L	**0.14**	----	----	----	----
Reactive Phosphorus as P	----	0.001	mg/L	**0.004**	----	----	----	----

Analytical Results

Sub-Matrix: **MARINE WATER**			Client sample ID	**GQ-WQ-12**	----	----	----	----
			Client sampling date / time	27-JUL-2009 15:00	----	----	----	----
Compound	CAS Number	LOR	Unit	**ES0911097-006**	**----**	**----**	**----**	**----**
Ultra-Trace Nutrients - Continued								
Total Phosphorus as P	----	0.005	mg/L	<0.005	----	----	----	----

QUALITY CONTROL REPORT

Work Order	: **ES0911097**	Page	: 1 of 7
Client	: **GHD SERVICES PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR ADRIAN WHITE	Contact	: Charlie Pierce
Address	: P O BOX 373 GLADSTONE QLD, AUSTRALIA 4680	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: adrian.a.white@ghd.com.au	E-mail	: charlie.pierce@alsenviro.com
Telephone	: +61 07 49731611	Telephone	: +61-2-8784 8555
Facsimile	: +61 07 4972 6236	Facsimile	: +61-2-8784 8500
Project	: 4215386 41 WASTERN BASIN EIS WQ MONITORING	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 29-JUL-2009
Sampler	: AW	Issue Date	: 03-AUG-2009
Order number	: ----		
		No. of samples received	: 6
Quote number	: BN/314/09	No. of samples analysed	: 6

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

NATA
WORLD RECOGNISED ACCREDITATION

NATA Accredited Laboratory 825

This document is issued in accordance with NATA accreditation requirements.

Accredited for compliance with ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Hoa Nguyen	Inorganic Chemist	Inorganics
Wisam Abou-Maraseh	Spectroscopist	Inorganics

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insuffient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key :
Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR:- No Limit; Result between 10 and 20 times LOR:- 0% - 50%; Result > 20 times LOR:- 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA005: pH (QC Lot: 1053599)									
ES0911039-001	Anonymous	EA005: pH Value	----	0.01	pH Unit	9.08	9.10	0.2	0% - 20%
ES0911097-005	GQ-WQ-11	EA005: pH Value	----	0.01	pH Unit	8.04	8.06	0.2	0% - 20%
EA010P: Conductivity by PC Titrator (QC Lot: 1053615)									
ES0911085-002	Anonymous	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	691	694	0.4	0% - 20%
ES0911097-002	GQ-WQ-04	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	49200	49300	0.2	0% - 20%
EA010P: Conductivity by PC Titrator (QC Lot: 1054445)									
ES0911097-003	GQ-WQ-07	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	50500	50700	0.4	0% - 20%
ES0911109-003	Anonymous	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	51200	51300	0.2	0% - 20%
EA015: Total Dissolved Solids (QC Lot: 1053601)									
ES0911029-003	Anonymous	EA015: Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	42800	45600	6.4	0% - 20%
ES0911062-001	Anonymous	EA015: Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	45	50	10.5	0% - 20%
EA025: Suspended Solids (QC Lot: 1054989)									
ES0910906-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	296	304	2.7	0% - 20%
EG035F: Dissolved Mercury by FIMS (QC Lot: 1054513)									
ES0911043-032	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
ES0911109-004	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS (QC Lot: 1055711)									
ES0911097-001	GQ-WQ-03	EG093A-F: Beryllium	7440-41-7	0.1	µg/L	<0.1	<0.1	0.0	No Limit
		EG093A-F: Silver	7440-22-4	0.1	µg/L	<0.1	<0.1	0.0	No Limit
		EG093A-F: Cadmium	7440-43-9	0.2	µg/L	<0.2	<0.2	0.0	No Limit
		EG093A-F: Cobalt	7440-48-4	0.2	µg/L	<0.2	<0.2	0.0	No Limit
		EG093A-F: Lead	7439-92-1	0.2	µg/L	<0.2	<0.2	0.0	No Limit
		EG093A-F: Antimony	7440-36-0	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EG093A-F: Arsenic	7440-38-2	0.5	µg/L	1.2	1.1	9.1	No Limit
		EG093A-F: Chromium	7440-47-3	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EG093A-F: Manganese	7439-96-5	0.5	µg/L	0.7	0.6	15.0	No Limit
		EG093A-F: Nickel	7440-02-0	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EG093A-F: Vanadium	7440-62-2	0.5	µg/L	1.2	0.8	31.7	No Limit
		EG093A-F: Barium	7440-39-3	1	µg/L	8	8	0.0	No Limit
		EG093A-F: Copper	7440-50-8	1	µg/L	<1	<1	0.0	No Limit
		EG093A-F: Aluminium	7429-90-5	10	µg/L	<10	<10	0.0	No Limit
ES0911109-005	Anonymous	EG093A-F: Beryllium	7440-41-7	0.1	µg/L	<0.1	<0.1	0.0	No Limit
		EG093A-F: Silver	7440-22-4	0.1	µg/L	<0.1	<0.1	0.0	No Limit
		EG093A-F: Cadmium	7440-43-9	0.2	µg/L	<0.2	<0.2	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS (QC Lot: 1055711) - continued									
ES0911109-005	Anonymous	EG093A-F: Cobalt	7440-48-4	0.2	µg/L	<0.2	<0.2	0.0	No Limit
		EG093A-F: Lead	7439-92-1	0.2	µg/L	<0.2	<0.2	0.0	No Limit
		EG093A-F: Antimony	7440-36-0	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EG093A-F: Arsenic	7440-38-2	0.5	µg/L	1.0	1.0	0.0	No Limit
		EG093A-F: Chromium	7440-47-3	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EG093A-F: Manganese	7439-96-5	0.5	µg/L	1.0	1.1	11.0	No Limit
		EG093A-F: Nickel	7440-02-0	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EG093A-F: Vanadium	7440-62-2	0.5	µg/L	0.9	1.0	0.0	No Limit
		EG093A-F: Barium	7440-39-3	1	µg/L	9	8	0.0	No Limit
		EG093A-F: Copper	7440-50-8	1	µg/L	<1	<1	0.0	No Limit
		EG093A-F: Aluminium	7429-90-5	10	µg/L	<10	<10	0.0	No Limit
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS (QC Lot: 1055712)									
ES0911097-001	GQ-WQ-03	EG093B-F: Iron	7439-89-6	5	µg/L	<5	<5	0.0	No Limit
ES0911109-005	Anonymous	EG093B-F: Iron	7439-89-6	5	µg/L	<5	<5	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 1054041)									
ES0911097-001	GQ-WQ-03	EK257A-SW: Nitrite as N	----	0.002	mg/L	0.002	0.002	0.0	No Limit
ES0911109-005	Anonymous	EK257A-SW: Nitrite as N	----	0.002	mg/L	<0.002	<0.002	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 1054042)									
ES0911097-001	GQ-WQ-03	EK255A-SW: Ammonia as N	7664-41-7	0.005	mg/L	0.011	0.012	13.2	No Limit
ES0911109-005	Anonymous	EK255A-SW: Ammonia as N	7664-41-7	0.005	mg/L	0.011	0.007	41.8	No Limit
Ultra-Trace Nutrients (QC Lot: 1054043)									
ES0911097-001	GQ-WQ-03	EK259A-SW: Nitrite + Nitrate as N	----	0.002	mg/L	0.010	0.010	0.0	No Limit
ES0911109-005	Anonymous	EK259A-SW: Nitrite + Nitrate as N	----	0.002	mg/L	0.005	0.005	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 1054044)									
ES0911097-001	GQ-WQ-03	EK271A-SW: Reactive Phosphorus as P	----	0.001	mg/L	0.006	0.006	0.0	No Limit
ES0911109-005	Anonymous	EK271A-SW: Reactive Phosphorus as P	----	0.001	mg/L	0.006	0.006	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 1054092)									
ES0911097-001	GQ-WQ-03	EK262PA-SW: Total Nitrogen as N	----	0.05	mg/L	0.14	0.16	8.2	No Limit
ES0911109-005	Anonymous	EK262PA-SW: Total Nitrogen as N	----	0.05	mg/L	0.15	0.14	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 1054093)									
ES0911097-001	GQ-WQ-03	EK267PA-SW: Total Phosphorus as P	----	0.005	mg/L	<0.005	<0.005	0.0	No Limit
ES0911109-005	Anonymous	EK267PA-SW: Total Phosphorus as P	----	0.005	mg/L	<0.005	<0.005	0.0	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	*Laboratory Control Spike (LCS) Report*			
					Spike	*Spike Recovery (%)*	*Recovery Limits (%)*	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EA010P: Conductivity by PC Titrator (QCLot: 1053615)								
EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	2000 µS/cm	100	86.3	112
EA010P: Conductivity by PC Titrator (QCLot: 1054445)								
EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	2000 µS/cm	100	86.3	112
EA015: Total Dissolved Solids (QCLot: 1053601)								
EA015: Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	<1	293 mg/L	100	77.9	122
EA025: Suspended Solids (QCLot: 1054989)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	104	30	150
EG035F: Dissolved Mercury by FIMS (QCLot: 1054513)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.010 mg/L	102	86	116
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS (QCLot: 1055711)								
EG093A-F: Aluminium	7429-90-5	10	µg/L	<10	50 µg/L	97.8	80	128
EG093A-F: Antimony	7440-36-0	0.5	µg/L	<0.5	----	----	----	----
EG093A-F: Arsenic	7440-38-2	0.5	µg/L	<0.5	10 µg/L	100	85	125
EG093A-F: Barium	7440-39-3	1	µg/L	<1	10 µg/L	106	81	129
EG093A-F: Beryllium	7440-41-7	0.1	µg/L	<0.1	10 µg/L	104	80	122
EG093A-F: Cadmium	7440-43-9	0.2	µg/L	<0.2	10 µg/L	95.9	78	116
EG093A-F: Chromium	7440-47-3	0.5	µg/L	<0.5	10 µg/L	104	86	128
EG093A-F: Cobalt	7440-48-4	0.2	µg/L	<0.2	10 µg/L	105	87	127
EG093A-F: Copper	7440-50-8	1	µg/L	<1	10 µg/L	103	86	124
EG093A-F: Lead	7439-92-1	0.2	µg/L	<0.2	10 µg/L	102	87	123
EG093A-F: Manganese	7439-96-5	0.5	µg/L	<0.5	10 µg/L	102	90	122
EG093A-F: Nickel	7440-02-0	0.5	µg/L	<0.5	10 µg/L	102	84	124
EG093A-F: Silver	7440-22-4	0.1	µg/L	<0.1	1 µg/L	78.1	70	130
EG093A-F: Vanadium	7440-62-2	0.5	µg/L	<0.5	10 µg/L	104	85	123
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS (QCLot: 1055712)								
EG093B-F: Iron	7439-89-6	5	µg/L	<5	50 µg/L	101	89	119
EP008: Chlorophyll a (QCLot: 1053883)								
EP008: Chlorophyll a	----	1	mg/m3	----	20 mg/m3	95.0	60.3	134
		1	mg/m³	<1	----	----	----	----
EP008: Volume	----	0.01	L	0	----	1	----	----
EP008: Volume Extract	----	0.01	mL	0	----	10	----	----
Ultra-Trace Nutrients (QCLot: 1054041)								
EK257A-SW: Nitrite as N	----	0.002	mg/L	<0.002	1.0 mg/L	87.0	70	130

Sub-Matrix**: WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
Ultra-Trace Nutrients (QCLot: 1054042)								
EK255A-SW: Ammonia as N	7664-41-7	0.005	mg/L	<0.005	0.1 mg/L	104	70	130
Ultra-Trace Nutrients (QCLot: 1054043)								
EK259A-SW: Nitrite + Nitrate as N	----	0.002	mg/L	<0.002	0.1 mg/L	112	70	130
Ultra-Trace Nutrients (QCLot: 1054044)								
EK271A-SW: Reactive Phosphorus as P	----	0.001	mg/L	<0.001	0.1 mg/L	103	70	130
Ultra-Trace Nutrients (QCLot: 1054092)								
EK262PA-SW: Total Nitrogen as N	----	0.05	mg/L	<0.05	1.0 mg/L	94.9	70	130
Ultra-Trace Nutrients (QCLot: 1054093)								
EK267PA-SW: Total Phosphorus as P	----	0.005	mg/L	<0.005	0.44 mg/L	87.3	70	130

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix**: WATER**

				Matrix Spike (MS) Report			
				Spike	*Spike Recovery (%)*	*Recovery Limits (%)*	
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EG035F: Dissolved Mercury by FIMS (QCLot: 1054513)							
ES0911043-032	Anonymous	EG035F: Mercury	7439-97-6	0.0100 mg/L	108	70	130
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS (QCLot: 1055711)							
ES0911097-001	GQ-WQ-03	EG093A-F: Arsenic	7440-38-2	50 µg/L	119	70	130
		EG093A-F: Barium	7440-39-3	50 µg/L	118	70	130
		EG093A-F: Beryllium	7440-41-7	50 µg/L	110	70	130
		EG093A-F: Cadmium	7440-43-9	12.5 µg/L	107	70	130
		EG093A-F: Chromium	7440-47-3	50 µg/L	120	70	130
		EG093A-F: Cobalt	7440-48-4	50 µg/L	121	70	130
		EG093A-F: Copper	7440-50-8	50 µg/L	121	70	130
		EG093A-F: Lead	7439-92-1	50 µg/L	109	70	130
		EG093A-F: Manganese	7439-96-5	50 µg/L	116	70	130
		EG093A-F: Nickel	7440-02-0	50 µg/L	121	70	130
		EG093A-F: Vanadium	7440-62-2	50 µg/L	118	70	130
Ultra-Trace Nutrients (QCLot: 1054041)							
ES0911097-001	GQ-WQ-03	EK257A-SW: Nitrite as N	----	0.1 mg/L	72.7	70	130
Ultra-Trace Nutrients (QCLot: 1054042)							
ES0911097-001	GQ-WQ-03	EK255A-SW: Ammonia as N	7664-41-7	0.1 mg/L	71.3	70.	130
Ultra-Trace Nutrients (QCLot: 1054043)							
ES0911097-001	GQ-WQ-03	EK259A-SW: Nitrite + Nitrate as N	----	0.1 mg/L	71.6	70	130
Ultra-Trace Nutrients (QCLot: 1054044)							
ES0911097-001	GQ-WQ-03	EK271A-SW: Reactive Phosphorus as P	----	0.1 mg/L	73.4	70	130
Ultra-Trace Nutrients (QCLot: 1054092)							
ES0911097-001	GQ-WQ-03	EK262PA-SW: Total Nitrogen as N	----	0.5 mg/L	101	70	130
Ultra-Trace Nutrients (QCLot: 1054093)							
ES0911097-001	GQ-WQ-03	EK267PA-SW: Total Phosphorus as P	----	0.5 mg/L	90.1	70	130

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: **ES0911097**	Page	: 1 of 9
Client	: GHD SERVICES PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: MR ADRIAN WHITE	Contact	: Charlie Pierce
Address	: P O BOX 373 GLADSTONE QLD, AUSTRALIA 4680	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
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Project	: 4215386 41 WASTERN BASIN EIS WQ MONITORING	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 29-JUL-2009
Sampler	: AW	Issue Date	: 03-AUG-2009
Order number	: ----		
		No. of samples received	: 6
Quote number	: BN/314/09	No. of samples analysed	: 6

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Interpretive Quality Control Report contains the following information:

- Analysis Holding Time Compliance
- Quality Control Parameter Frequency Compliance
- Brief Method Summaries
- Summary of Outliers

Analysis Holding Time Compliance

The following report summarises extraction / preparation and analysis times and compares with recommended holding times. Dates reported represent first date of extraction or analysis and precludes subsequent dilutions and reruns. Information is also provided re the sample container (preservative) from which the analysis aliquot was taken. Elapsed period to analysis represents number of days from sampling where no extraction / digestion is involved or period from extraction / digestion where this is present. For composite samples, sampling date is assumed to be that of the oldest sample contributing to the composite. Sample date for laboratory produced leachates is assumed as the completion date of the leaching process. Outliers for holding time are based on USEPA SW 846, APHA, AS and NEPM (1999). A listing of breaches is provided in the Summary of Outliers.

Holding times for leachate methods (excluding elutriates) vary according to the analytes being determined on the resulting solution. For non -volatile analytes, the holding time compliance assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These soil holding times are: Organics (14 days); Mercury (28 days) & other metals (180 days). A recorded breach therefore does not guarantee a breach for all non-volatile parameters.

Matrix: **WATER** Evaluation: ✗ = Holding time breach ; ✓ = Within holding time.

Method	***Sample Date***	*Extraction / Preparation*			*Analysis*		
***Container** / Client Sample ID(s)*		***Date extracted***	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*
EA005: pH							
Clear Plastic Bottle - Natural GQ-WQ-03, GQ-WQ-04, GQ-WQ-07, GQ-WQ-10, GQ-WQ-11, GQ-WQ-12	**27-JUL-2009**	**----**	----	----	**29-JUL-2009**	27-JUL-2009	✗
EA010P: Conductivity by PC Titrator							
Clear Plastic Bottle - Natural GQ-WQ-03, GQ-WQ-04	**27-JUL-2009**	**---**	---	----	**29-JUL-2009**	24-AUG-2009	✓
Clear Plastic Bottle - Natural GQ-WQ-07, GQ-WQ-10, GQ-WQ-11, GQ-WQ-12	**27-JUL-2009**	**---**	---	----	**30-JUL-2009**	24-AUG-2009	✓
EA015: Total Dissolved Solids							
Clear Plastic Bottle - Natural GQ-WQ-03, GQ-WQ-04, GQ-WQ-07, GQ-WQ-10, GQ-WQ-11, GQ-WQ-12	**27-JUL-2009**	**----**	----	----	**29-JUL-2009**	03-AUG-2009	✓
EA025: Suspended Solids							
Clear Plastic Bottle - Natural GQ-WQ-03, GQ-WQ-04, GQ-WQ-07, GQ-WQ-10, GQ-WQ-11, GQ-WQ-12	**27-JUL-2009**	**----**	----	----	**30-JUL-2009**	03-AUG-2009	✓
EG035F: Dissolved Mercury by FIMS							
Clear HDPE (U-T ORC) - Filtered; Lab-acidified GQ-WQ-03, GQ-WQ-04, GQ-WQ-07, GQ-WQ-10, GQ-WQ-11, GQ-WQ-12	**27-JUL-2009**	**---**	---	----	**31-JUL-2009**	24-AUG-2009	✓
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS							
Clear HDPE (U-T ORC) - Filtered; Lab-acidified GQ-WQ-03, GQ-WQ-04, GQ-WQ-07, GQ-WQ-10, GQ-WQ-11, GQ-WQ-12	**27-JUL-2009**	**31-JUL-2009**	23-JAN-2010	✓	**31-JUL-2009**	23-JAN-2010	✓

Matrix: **WATER**

Evaluation: ✘ = Holding time breach ; ✓ = Within holding time.

Method	***Sample Date***	*Extraction / Preparation*			*Analysis*		
***Container** / Client Sample ID(s)*		***Date extracted***	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*
EP008: Chlorophyll a							
White Plastic Bottle - Unpreserved							
GQ-WQ-03, GQ-WQ-04, GQ-WQ-07, GQ-WQ-10, GQ-WQ-11, GQ-WQ-12	**27-JUL-2009**	**----**	----	----	**29-JUL-2009**	29-JUL-2009	✓
Ultra-Trace Nutrients							
Clear Plastic Bottle - Filtered (AS)							
GQ-WQ-03, GQ-WQ-04, GQ-WQ-07, GQ-WQ-10, GQ-WQ-11, GQ-WQ-12	**27-JUL-2009**	**---**	---	----	**29-JUL-2009**	28-JUL-2009	✘
Clear Plastic Bottle - Natural (AS)							
GQ-WQ-03, GQ-WQ-04, GQ-WQ-07, GQ-WQ-10, GQ-WQ-11, GQ-WQ-12	**27-JUL-2009**	**29-JUL-2009**	28-JUL-2009	✘	**29-JUL-2009**	28-JUL-2009	✘

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(where) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: ✗ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type *Analytical Methods*	*Method*	*Count* *QC*	 *Regular*	*Rate (%)* ***Actual***	 ***Expected***	 *Evaluation*	*Quality Control Specification*
Laboratory Duplicates (DUP)							
Ammonia as N - Ultra-Trace in Saline Waters	EK255A-SW	2	13	**15.4**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Conductivity by PC Titrator	EA010-P	4	24	**16.7**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	2	14	**14.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals in Saline Water -Suite A by ORC-ICPMS	EG093A-F	2	13	**15.4**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals in Saline Water -Suite B by ORC-ICPMS	EG093B-F	2	13	**15.4**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N - Ultra-Trace in Saline Waters	EK259A-SW	2	13	**15.4**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N - Ultra-Trace in Saline Waters	EK257A-SW	2	13	**15.4**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
pH	EA005	2	13	**15.4**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P - Ultra-Trace in Saline Water	EK271A-SW	2	13	**15.4**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Suspended Solids (High Level)	EA025H	1	10	**10.0**	**9.5**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids	EA015	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Nitrogen/Persulfate Digestion/Ultra-Trace/Saline	EK262PA-SW	2	13	**15.4**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus/Persulfate Digestion/ Ultra Trace /Saline	EK267PA-SW	2	13	**15.4**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
Ammonia as N - Ultra-Trace in Saline Waters	EK255A-SW	1	13	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chlorophyll a	EP008	1	13	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Conductivity by PC Titrator	EA010-P	2	24	**8.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	1	14	**7.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals in Saline Water -Suite A by ORC-ICPMS	EG093A-F	1	13	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals in Saline Water -Suite B by ORC-ICPMS	EG093B-F	1	13	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N - Ultra-Trace in Saline Waters	EK259A-SW	1	13	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N - Ultra-Trace in Saline Waters	EK257A-SW	1	13	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P - Ultra-Trace in Saline Water	EK271A-SW	1	13	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Suspended Solids (High Level)	EA025H	1	10	**10.0**	**4.8**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids	EA015	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Nitrogen/Persulfate Digestion/Ultra-Trace/Saline	EK262PA-SW	1	13	**7.7**	**10.0**	✗	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus/Persulfate Digestion/ Ultra Trace /Saline	EK267PA-SW	1	13	**7.7**	**10.0**	✗	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
Ammonia as N - Ultra-Trace in Saline Waters	EK255A-SW	1	13	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chlorophyll a	EP008	1	13	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Conductivity by PC Titrator	EA010-P	2	24	**8.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	1	14	**7.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals in Saline Water -Suite A by ORC-ICPMS	EG093A-F	1	13	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals in Saline Water -Suite B by ORC-ICPMS	EG093B-F	1	13	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N - Ultra-Trace in Saline Waters	EK259A-SW	1	13	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Method Blanks (MB) - Continued							
Nitrite as N - Ultra-Trace in Saline Waters	EK257A-SW	1	13	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P - Ultra-Trace in Saline Water	EK271A-SW	1	13	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Suspended Solids (High Level)	EA025H	1	10	**10.0**	**4.8**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids	EA015	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Nitrogen/Persulfate Digestion/Ultra-Trace/Saline	EK262PA-SW	1	13	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus/Persulfate Digestion/ Ultra Trace /Saline	EK267PA-SW	1	13	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							
Ammonia as N - Ultra-Trace in Saline Waters	EK255A-SW	1	13	**7.7**	**5.0**	✓	ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	1	14	**7.1**	**5.0**	✓	ALS QCS3 requirement
Dissolved Metals in Saline Water -Suite A by ORC-ICPMS	EG093A-F	1	13	**7.7**	**5.0**	✓	ALS QCS3 requirement
Nitrite and Nitrate as N - Ultra-Trace in Saline Waters	EK259A-SW	1	13	**7.7**	**5.0**	✓	ALS QCS3 requirement
Nitrite as N - Ultra-Trace in Saline Waters	EK257A-SW	1	13	**7.7**	**5.0**	✓	ALS QCS3 requirement
Reactive Phosphorus as P - Ultra-Trace in Saline Water	EK271A-SW	1	13	**7.7**	**5.0**	✓	ALS QCS3 requirement
Total Nitrogen/Persulfate Digestion/Ultra-Trace/Saline	EK262PA-SW	1	13	**7.7**	**5.0**	✓	ALS QCS3 requirement
Total Phosphorus/Persulfate Digestion/ Ultra Trace /Saline	EK267PA-SW	1	13	**7.7**	**5.0**	✓	ALS QCS3 requirement

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH	EA005	WATER	APHA 21st ed. 4500 H+ B. pH of water samples is determined by ISE either manually or by automated pH meter. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Conductivity by PC Titrator	EA010-P	WATER	APHA 21st ed., 2510 B This procedure determines conductivity by automated ISE. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Dissolved Solids	EA015	WATER	APHA 21st ed., 2540C A gravimetric procedure that determines the amount of `filterable` residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Suspended Solids (High Level)	EA025H	WATER	APHA 21st ed., 2540D A gravimetric procedure employed to determine the amount of `non-filterable` residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Dissolved Mercury by FIMS	EG035F	WATER	AS 3550, APHA 21st ed. 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Dissolved Metals in Saline Water -Suite A by ORC-ICPMS	EG093A-F	WATER	APHA 21st ed., 3125; USEPA SW846 - 6020 Samples are 0.45 um filtered prior to analysis. The ORC-ICPMS technique removes interfering species through a series of chemical reactions prior to ion detection. Ions are passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to measurement by a discrete dynode ion detector. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Dissolved Metals in Saline Water -Suite B by ORC-ICPMS	EG093B-F	WATER	APHA 21st ed., 3125; USEPA SW846 - 6020 Samples are 0.45 um filtered prior to analysis. The ORC-ICPMS technique removes interfering species through a series of chemical reactions prior to ion detection. Ions are passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to measurement by a discrete dynode ion detector. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Ammonia as N - Ultra-Trace in Saline Waters	EK255A-SW	WATER	APHA 21st ed., 4500-NH3 H Ammonia is determined by direct colorimetry by FIA. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Nitrite as N - Ultra-Trace in Saline Waters	EK257A-SW	WATER	APHA 21st ed., 4500-NO2- B. Nitrite is determined by direct colourimetry by FIA.
Nitrate as N - Ultra-Trace in Saline Waters	EK258A-SW	WATER	APHA 21st ed., 4500-NO3- I Nitrate is reduced to nitrite by way of a cadmium reduction column followed by quantification by FIA. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results.
Nitrite and Nitrate as N - Ultra-Trace in Saline Waters	EK259A-SW	WATER	APHA 21st ed., 4500-NO3- I. Combined oxidised Nitrogen (NO2+NO3) is determined by Cadmium Reduction and direct colourimetry by FIA.

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
TKN (Total N - NOx-N). (FIA - UT) in Saline Waters	EK261PA-SW	WATER	APHA 21st ed., 4500-P J. & 4500-NO3- I. Calculated by difference from total Nitrogen and NOx. Contributing method parameters are determined by FIA. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Nitrogen/Persulfate Digestion/Ultra-Trace/Saline	EK262PA-SW	WATER	APHA 21st ed., 4500-P J. Persulfate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus. As sample is digested with persulfate under alkaline conditions yielding orthophosphate and nitrate. Following digestion, analytes are determined by flow injection analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Phosphorus/Persulfate Digestion/ Ultra Trace /Saline	EK267PA-SW	WATER	APHA 21st ed., 4500-P J. Persulfate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus. As sample is digested with persulfate under alkaline conditions yielding orthophosphate and nitrate. Following digestion, analytes are determined by flow injection analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Reactive Phosphorus as P - Ultra-Trace in Saline Water	EK271A-SW	WATER	APHA 21st ed., 4500-P E Ammonium molybdate and potassium antimonyl tartrate reacts in acid medium with othophosphate to form a heteropoly acid -phosphomolybdic acid - which is reduced to intensely coloured molybdenum blue by ascorbic acid. Quantification is by FIA. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Chlorophyll a	EP008	WATER	In-house (APHA 21st ed., 10200 H mod.) The pigments are extracted into aqueous acetone. The optical density of the extract before and after acidification at both 664 nm and 665 nm is determined spectrometrically.

Preparation Methods	*Method*	*Matrix*	*Method Descriptions*
Persulfate Digestion for UT TN and TP for FIA/Saline	EK262/267PA-SW	WATER	APHA 21st ed., 4500 P - J. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)

Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged in the Quality Control (QC) Report. Surrogate recovery limits are static and based on USEPA SW846 or ALS-QWI/EN/38 (in the absence of specific USEPA limits). This report displays QC Outliers (breaches) only.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

- **For all matrices, no Method Blank value outliers occur.**
- **For all matrices, no Duplicate outliers occur.**
- **For all matrices, no Laboratory Control outliers occur.**
- **For all matrices, no Matrix Spike outliers occur.**

Regular Sample Surrogates

- **For all regular sample matrices, no surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

This report displays Holding Time breaches only. Only the respective Extraction / Preparation and/or Analysis component is/are displayed.

Matrix: **WATER**

Method	*Extraction / Preparation*			*Analysis*		
Container / Client Sample ID(s)	*Date extracted*	*Due for extraction*	***Days overdue***	*Date analysed*	*Due for analysis*	***Days overdue***
EA005: pH						
Clear Plastic Bottle - Natural						
GQ-WQ-03, GQ-WQ-04, GQ-WQ-07, GQ-WQ-10, GQ-WQ-11, GQ-WQ-12	----	----	----	29-JUL-2009	27-JUL-2009	**2**
Ultra-Trace Nutrients						
Clear Plastic Bottle - Filtered (AS)						
GQ-WQ-03, GQ-WQ-04, GQ-WQ-07, GQ-WQ-10, GQ-WQ-11, GQ-WQ-12	----	----	----	29-JUL-2009	28-JUL-2009	**1**
Clear Plastic Bottle - Natural (AS)						
GQ-WQ-03, GQ-WQ-04, GQ-WQ-07, GQ-WQ-10, GQ-WQ-11, GQ-WQ-12	29-JUL-2009	28-JUL-2009	**1**	29-JUL-2009	28-JUL-2009	**1**

Outliers : Frequency of Quality Control Samples

The following report highlights breaches in the Frequency of Quality Control Samples.

Matrix: **WATER**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Laboratory Control Samples (LCS)					

Matrix: **WATER**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Laboratory Control Samples (LCS) - Continued					
Total Nitrogen/Persulfate Digestion/Ultra-Trace/Saline	1	13	7.7	10.0	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus/Persulfate Digestion/ Ultra Trace /Saline	1	13	7.7	10.0	NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Page _1_ of _1_

Chain of Custody & Analysis Request

Chain of Custody Number:

GHD

PROJECT ID:	4215386 41	QUOTE:	
PROJECT:	Western Basin EIS WQ Monitoring		
CLIENT:	GHD		
POSTAL ADDRESS:	PO Box 373, Gladstone 4680		
CONTACT:	Adrian White		
PHONE:	412035667	FAX:	07) 49726236
EMAIL:	Jason.K.Fowler@ghd.com.au, Adrian.A.White@ghd.com.au		
INVOICE:	Jason.K.Fowler@ghd.com.au, Adrian.A.White@ghd.com.au		
DATA NEEDED BY:			
REPORT FORMAT:			
EMAIL FORMAT:	ESDAT, EXCEL & PDF		

LABORATORY BATCH NO.:

FOR LAB USE ONLY

COOLER SEAL:
Yes ...... No ......
Broken ...... Intact ......

COOLER TEMP:
...... deg.C

DESPATCHED TO:
ALS Environmental
277-289 Woodpark Road
Smithfield NSW 2164
02 8784 8555

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

Water samples from a marine environment (Background sampling)

(EMAIL ADDRESSES PROVIDED ABOVE)

ANALYSIS REQUIRED

	SAMPLE ID	MATRIX	DATE	DETECTION LIMIT	PRESERVATION	Ultra trace ORC - dissolved metals (EG093F) (Sb, As, Ba, Be, Cd, Co, Cr, Cu, Mn, Ni, Pb, V, Hg, Fe, Al, Ag)	Ultra trace nutrients (UTN - 04) (TP, RP, NH3, NO2, NO3, TKN, TN)	TSS (EA025)	Chlorophyll a (EP008)	pH (EA005)	TDS (EA015)	Electro Conductivity
1	G-WQ-01	✓ Water	28/7	LOR	As Required	X	X	X	X	X	X	X
	G-WQ-02	✓ Water		LOR	As Required	X	X	X	X	X	X	X
	[redacted]	[redacted]		[redacted]		[redacted]						
	[redacted]	[redacted]		[redacted]		[redacted]						
3	G-WQ-05	✓ Water		LOR	As Required	X	X	X	X	X	X	X
	[redacted]	[redacted]		[redacted]		[redacted]						
4	G-WQ-07	✓ Water		LOR	As Required	X	X	X	X	X	X	X
5	G-WQ-08	✓ Water		LOR	As Required	X	X	X	X	X	X	X
6	G-WQ-09	✓ Water		LOR	As Required	X	X	X	X	X	X	X
	[redacted]	[redacted]		[redacted]		[redacted]						
	[redacted]	[redacted]		[redacted]		[redacted]						
	[redacted]	[redacted]		[redacted]		[redacted]						
7	QA01	Water	↓	LOR	As Required	X	X	X	X	X	X	X

SAMPLES FROM MARINE ENVIRONMENT

Environmental Division
Sydney
Work Order
ES0911109
Telephone : + 61-2-8784 8555

RELINQUISHED BY:
NAME : A.White
OF: GHD Gladstone
DATE: 28/7/09
TIME: 13:00

RECEIVED BY:
NAME : Felix
OF: als
DATE: 29/07/09
TIME: 8:30

PLEASE EMAIL COMPLETED ANALYSIS REQUEST TO: Jason.K.Fowler@ghd.com.au, Adrian.A.White@ghd.com.au

*Container Type and Preservative Codes: P = Neutral Plastic; N = Nitric Acid Preserved; C = Sodium Hydroxide Preserved; J = Solvent Washed Acid Rinced Jar; S = Solvent Washed Acid Rinced Glass Bottle; VC = Hydrochloric Acid Preserved Vial; VS = Sulfuric Acid Preserved Vial; BS = Sulfuric Acid Preserved Glass Bottle; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; O = Other.

SAMPLE RECEIPT NOTIFICATION (SRN)

Comprehensive Report

Work Order : **ES0911109**

Client	: **GHD SERVICES PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR ADRIAN WHITE	Contact	: Charlie Pierce
Address	: P O BOX 373 GLADSTONE QLD, AUSTRALIA 4680	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: adrian.a.white@ghd.com.au	E-mail	: charlie.pierce@alsenviro.com
Telephone	: +61 07 49731611	Telephone	: +61-2-8784 8555
Facsimile	: +61 07 4972 6236	Facsimile	: +61-2-8784 8500
Project	: 4215386 41 WESTERN BASIN EIS WQ MONITORING	Page	: 1 of 3
Order number	: ----		
C-O-C number	: ----	Quote number	: EM2009GHDSER0392 (EN/005/09)
Site	: ----		
Sampler	: AW	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Dates

Date Samples Received	: 29-JUL-2009	Issue Date	: 29-JUL-2009 13:58
Client Requested Due Date	: 05-AUG-2009	Scheduled Reporting Date	: **05-AUG-2009**

Delivery Details

Mode of Delivery	: Carrier	Temperature	: 7.2'C - Ice present
No. of coolers/boxes	: 1 HARD	No. of samples received	: 7
Sercurity Seal	: Intact.	No. of samples analysed	: 7

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Requested Deliverables
- **Samples received in appropriately pretreated and preserved containers.**
- **Breaches in recommended extraction / analysis holding times may occur. Please contact ALS for further information (Nanthini Coilparampil).**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please direct any turn around / technical queries to the laboratory contact designated above.
- Please direct any queries related to sample condition / numbering / breakages to Nanthini Coilparampil
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (14 days), Solid (90 days) from date of completion of work order.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exist.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process neccessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
When date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for processing purposes. If the sampling time is displayed as 0:00 the information was not provided by client.

Matrix: **WATER**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	WATER - EA005: pH pH	WATER - EA010P Conductivity (PC)	WATER - EA015 Total Dissolved Solids	WATER - EA025H Suspended Solids (High Level)	WATER - EG035F Dissolved Mercury by FIMS	WATER - EG093A-F Dissolved metals in saline water by ORC-ICPMS	WATER - EG093B-F Dissolved Metals in Saline Water Suite B by ORC-ICPMS	WATER - EP008 Chlorophyll a
ES0911109-001	28-JUL-2009 13:00	G-WQ-01	✓	✓	✓	✓	✓	✓	✓	✓
ES0911109-002	28-JUL-2009 13:00	G-WQ-02	✓	✓	✓	✓	✓	✓	✓	✓
ES0911109-003	28-JUL-2009 13:00	G-WQ-05	✓	✓	✓	✓	✓	✓	✓	✓
ES0911109-004	28-JUL-2009 13:00	G-WQ-06	✓	✓	✓	✓	✓	✓	✓	✓
ES0911109-005	28-JUL-2009 13:00	G-WQ-08	✓	✓	✓	✓	✓	✓	✓	✓
ES0911109-006	28-JUL-2009 13:00	G-WQ-09	✓	✓	✓	✓	✓	✓	✓	✓
ES0911109-007	28-JUL-2009 13:00	QA01	✓	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	WATER - UTN-4 SW Ultratrace NO2, NO3, NH3, Nitrogen, Phosphorus, TKN, Reactive Phosphorus
ES0911109-001	28-JUL-2009 13:00	G-WQ-01	✓
ES0911109-002	28-JUL-2009 13:00	G-WQ-02	✓
ES0911109-003	28-JUL-2009 13:00	G-WQ-05	✓
ES0911109-004	28-JUL-2009 13:00	G-WQ-06	✓
ES0911109-005	28-JUL-2009 13:00	G-WQ-08	✓
ES0911109-006	28-JUL-2009 13:00	G-WQ-09	✓
ES0911109-007	28-JUL-2009 13:00	QA01	✓

Requested Deliverables

MR ADRIAN WHITE		
- *AU Certificate of Analysis - NATA (COA)	Email	adrian.a.white@ghd.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	adrian.a.white@ghd.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	adrian.a.white@ghd.com.au
- A4 - AU Sample Receipt Notification - Environmental (SRN)	Email	adrian.a.white@ghd.com.au
- A4 - AU Tax Invoice (INV)	Email	adrian.a.white@ghd.com.au
- Default - Chain of Custody (COC)	Email	adrian.a.white@ghd.com.au
- EDI Format - ENMRG (ENMRG)	Email	adrian.a.white@ghd.com.au
- EDI Format - ESDAT (ESDAT)	Email	adrian.a.white@ghd.com.au
MR JASON FOWLER		
- *AU Certificate of Analysis - NATA (COA)	Email	jason.k.fowler@ghd.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	jason.k.fowler@ghd.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	jason.k.fowler@ghd.com.au
- A4 - AU Sample Receipt Notification - Environmental (SRN)	Email	jason.k.fowler@ghd.com.au
- A4 - AU Tax Invoice (INV)	Email	jason.k.fowler@ghd.com.au
- Default - Chain of Custody (COC)	Email	jason.k.fowler@ghd.com.au
- EDI Format - ENMRG (ENMRG)	Email	jason.k.fowler@ghd.com.au
- EDI Format - ESDAT (ESDAT)	Email	jason.k.fowler@ghd.com.au

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: **ES0911109**	Page	: 1 of 6
Client	: **GHD SERVICES PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR ADRIAN WHITE	Contact	: Charlie Pierce
Address	: P O BOX 373 GLADSTONE QLD, AUSTRALIA 4680	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: adrian.a.white@ghd.com.au	E-mail	: charlie.pierce@alsenviro.com
Telephone	: +61 07 49731611	Telephone	: +61-2-8784 8555
Facsimile	: +61 07 4972 6236	Facsimile	: +61-2-8784 8500
Project	: 4215386 41 WESTERN BASIN EIS WQ MONITORING	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 29-JUL-2009
Sampler	: AW	Issue Date	: 05-AUG-2009
Site	: ----		
		No. of samples received	: 7
Quote number	: BN/314/09	No. of samples analysed	: 7

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

NATA
WORLD RECOGNISED ACCREDITATION

NATA Accredited Laboratory 825

This document is issued in accordance with NATA accreditation requirements.

Accredited for compliance with ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Celine Conceicao	Spectroscopist	Inorganics
Hoa Nguyen	Inorganic Chemist	Inorganics
Nanthini Coilparampil	Senior Inorganic Chemist	Inorganics
Wisam Abou-Maraseh	Spectroscopist	Inorganics

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insuffient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for processing purposes. If the sampling time is displayed as 0:00 the information was not provided by client.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting

- **EK267PA-SW, It has been noted that RP is greater than TP for various samples , however this difference is within the limits of experimental variation.**

Analytical Results

Sub-Matrix: **MARINE WATER**			*Client sample ID*	**G-WQ-01**	**G-WQ-02**	**G-WQ-05**	**G-WQ-06**	**G-WQ-08**
			Client sampling date / time	28-JUL-2009 13:00	28-JUL-2009 13:00	28-JUL-2009 13:00	28-JUL-2009 13:00	28-JUL-2009 13:00
Compound	*CAS Number*	*LOR*	*Unit*	**ES0911109-001**	**ES0911109-002**	**ES0911109-003**	**ES0911109-004**	**ES0911109-005**
EA005: pH								
pH Value	----	0.01	pH Unit	**8.06**	**8.17**	**8.11**	**8.16**	**8.15**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**50400**	**52100**	**51200**	**51100**	**50000**
EA015: Total Dissolved Solids								
^ Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	**43000**	**42700**	**44200**	**42300**	**43700**
EA025: Suspended Solids								
^ Suspended Solids (SS)	----	5	mg/L	**17**	**10**	**14**	**5**	**7**
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS								
Aluminium	7429-90-5	10	µg/L	<10	<10	<10	<10	<10
Antimony	7440-36-0	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Iron	7439-89-6	5	µg/L	<5	<5	<5	<5	<5
Arsenic	7440-38-2	0.5	µg/L	**1.0**	**1.0**	**1.1**	**1.0**	**1.0**
Barium	7440-39-3	1	µg/L	**9**	**8**	**10**	**8**	**9**
Beryllium	7440-41-7	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Cadmium	7440-43-9	0.2	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Chromium	7440-47-3	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Cobalt	7440-48-4	0.2	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Copper	7440-50-8	1	µg/L	<1	<1	<1	<1	<1
Lead	7439-92-1	0.2	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Manganese	7439-96-5	0.5	µg/L	**3.0**	**1.0**	**2.1**	**1.8**	**1.0**
Nickel	7440-02-0	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Silver	7440-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Vanadium	7440-62-2	0.5	µg/L	**0.9**	**1.1**	**1.1**	**1.1**	**0.9**
EP008: Chlorophyll a								
Chlorophyll a	----	1	mg/m3	**3**	**1**	<1	<1	<1
Volume	----	0.01	L	**1**	**1**	**1**	**1**	**1**
Volume Extract	----	0.01	mL	**10**	**10**	**10**	**10**	**10**
Ultra-Trace Nutrients								
Ammonia as N	7664-41-7	0.005	mg/L	**0.007**	**0.009**	**0.008**	**0.007**	**0.011**
Nitrite as N	----	0.002	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002
^ Nitrate as N	14797-55-8	0.002	mg/L	**0.004**	**0.006**	**0.004**	**0.005**	**0.005**
Nitrite + Nitrate as N	----	0.002	mg/L	**0.004**	**0.006**	**0.004**	**0.005**	**0.005**
^ Total Kjeldahl Nitrogen as N	----	0.05	mg/L	**0.17**	**0.17**	**0.14**	**0.14**	**0.14**
Total Nitrogen as N	----	0.05	mg/L	**0.17**	**0.17**	**0.14**	**0.15**	**0.15**
Reactive Phosphorus as P	----	0.001	mg/L	**0.005**	**0.005**	**0.006**	**0.005**	**0.006**

Analytical Results

Sub-Matrix: **MARINE WATER**			Client sample ID	**G-WQ-01**	**G-WQ-02**	**G-WQ-05**	**G-WQ-06**	**G-WQ-08**
			Client sampling date / time	28-JUL-2009 13:00	28-JUL-2009 13:00	28-JUL-2009 13:00	28-JUL-2009 13:00	28-JUL-2009 13:00
Compound	CAS Number	LOR	Unit	**ES0911109-001**	**ES0911109-002**	**ES0911109-003**	**ES0911109-004**	**ES0911109-005**
Ultra-Trace Nutrients - Continued								
Total Phosphorus as P	----	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005

Analytical Results

Sub-Matrix: **MARINE WATER**			*Client sample ID*	**G-WQ-09**	**QA01**	----	----	----
			Client sampling date / time	28-JUL-2009 13:00	28-JUL-2009 13:00	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**ES0911109-006**	**ES0911109-007**	**----**	**----**	**----**
EA005: pH								
pH Value	----	0.01	pH Unit	**8.21**	**8.18**	----	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**50100**	**50900**	----	----	----
EA015: Total Dissolved Solids								
^ Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	**42100**	**42400**	----	----	----
EA025: Suspended Solids								
^ Suspended Solids (SS)	----	5	mg/L	**12**	**7**	----	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	----	----	----
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS								
Aluminium	7429-90-5	10	µg/L	<10	<10	----	----	----
Antimony	7440-36-0	0.5	µg/L	<0.5	<0.5	----	----	----
Iron	7439-89-6	5	µg/L	<5	<5	----	----	----
Arsenic	7440-38-2	0.5	µg/L	**1.3**	**1.1**	----	----	----
Barium	7440-39-3	1	µg/L	**8**	**8**	----	----	----
Beryllium	7440-41-7	0.1	µg/L	<0.1	<0.1	----	----	----
Cadmium	7440-43-9	0.2	µg/L	<0.2	<0.2	----	----	----
Chromium	7440-47-3	0.5	µg/L	<0.5	<0.5	----	----	----
Cobalt	7440-48-4	0.2	µg/L	<0.2	<0.2	----	----	----
Copper	7440-50-8	1	µg/L	<1	<1	----	----	----
Lead	7439-92-1	0.2	µg/L	<0.2	<0.2	----	----	----
Manganese	7439-96-5	0.5	µg/L	**0.8**	**1.1**	----	----	----
Nickel	7440-02-0	0.5	µg/L	**0.9**	**1.0**	----	----	----
Silver	7440-22-4	0.1	µg/L	<0.1	<0.1	----	----	----
Vanadium	7440-62-2	0.5	µg/L	**1.0**	**1.1**	----	----	----
EP008: Chlorophyll a								
Chlorophyll a	----	1	mg/m3	**1**	<1	----	----	----
Volume	----	0.01	L	**1**	**1**	----	----	----
Volume Extract	----	0.01	mL	**10**	**10**	----	----	----
Ultra-Trace Nutrients								
Ammonia as N	7664-41-7	0.005	mg/L	**0.009**	**0.009**	----	----	----
Nitrite as N	----	0.002	mg/L	<0.002	<0.002	----	----	----
^ Nitrate as N	14797-55-8	0.002	mg/L	**0.006**	**0.006**	----	----	----
Nitrite + Nitrate as N	----	0.002	mg/L	**0.006**	**0.006**	----	----	----
^ Total Kjeldahl Nitrogen as N	----	0.05	mg/L	**0.14**	**0.17**	----	----	----
Total Nitrogen as N	----	0.05	mg/L	**0.15**	**0.18**	----	----	----
Reactive Phosphorus as P	----	0.001	mg/L	**0.005**	**0.006**	----	----	----

Analytical Results

Sub-Matrix: **MARINE WATER**			Client sample ID	**G-WQ-09**	**QA01**	----	----	----
			Client sampling date / time	28-JUL-2009 13:00	28-JUL-2009 13:00	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**ES0911109-006**	**ES0911109-007**	**----**	**----**	**----**
Ultra-Trace Nutrients - Continued								
Total Phosphorus as P	----	0.005	mg/L	<0.005	<0.005	----	----	----

QUALITY CONTROL REPORT

Work Order	: **ES0911109**	Page	: 1 of 7
Client	: **GHD SERVICES PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR ADRIAN WHITE	Contact	: Charlie Pierce
Address	: P O BOX 373 GLADSTONE QLD, AUSTRALIA 4680	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: adrian.a.white@ghd.com.au	E-mail	: charlie.pierce@alsenviro.com
Telephone	: +61 07 49731611	Telephone	: +61-2-8784 8555
Facsimile	: +61 07 4972 6236	Facsimile	: +61-2-8784 8500
Project	: 4215386 41 WESTERN BASIN EIS WQ MONITORING	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 29-JUL-2009
Sampler	: AW	Issue Date	: 05-AUG-2009
Order number	: ----		
		No. of samples received	: 7
Quote number	: BN/314/09	No. of samples analysed	: 7

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

NATA
WORLD RECOGNISED ACCREDITATION

NATA Accredited Laboratory 825

This document is issued in accordance with NATA accreditation requirements.

Accredited for compliance with ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Celine Conceicao	Spectroscopist	Inorganics
Hoa Nguyen	Inorganic Chemist	Inorganics
Nanthini Coilparampil	Senior Inorganic Chemist	Inorganics
Wisam Abou-Maraseh	Spectroscopist	Inorganics

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insuffient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key :
Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR:- No Limit; Result between 10 and 20 times LOR:- 0% - 50%; Result > 20 times LOR:- 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA005: pH (QC Lot: 1053674)									
ES0911109-001	G-WQ-01	EA005: pH Value	----	0.01	pH Unit	8.06	8.07	0.1	0% - 20%
ES0911113-001	Anonymous	EA005: pH Value	----	0.01	pH Unit	12.9	13.0	0.2	0% - 20%
EA010P: Conductivity by PC Titrator (QC Lot: 1054445)									
ES0911097-003	Anonymous	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	50500	50700	0.4	0% - 20%
ES0911109-003	G-WQ-05	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	51200	51300	0.2	0% - 20%
EA015: Total Dissolved Solids (QC Lot: 1054826)									
ES0911085-001	Anonymous	EA015: Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	372	316	16.3	0% - 20%
ES0911109-004	G-WQ-06	EA015: Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	42300	43200	2.2	0% - 20%
EA025: Suspended Solids (QC Lot: 1057260)									
ES0911049-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	280	280	0.0	0% - 20%
ES0911132-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	372	360	3.3	0% - 20%
EG035F: Dissolved Mercury by FIMS (QC Lot: 1054513)									
ES0911043-032	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
ES0911109-004	G-WQ-06	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS (QC Lot: 1055711)									
ES0911097-001	Anonymous	EG093A-F: Beryllium	7440-41-7	0.1	µg/L	<0.1	<0.1	0.0	No Limit
		EG093A-F: Silver	7440-22-4	0.1	µg/L	<0.1	<0.1	0.0	No Limit
		EG093A-F: Cadmium	7440-43-9	0.2	µg/L	<0.2	<0.2	0.0	No Limit
		EG093A-F: Cobalt	7440-48-4	0.2	µg/L	<0.2	<0.2	0.0	No Limit
		EG093A-F: Lead	7439-92-1	0.2	µg/L	<0.2	<0.2	0.0	No Limit
		EG093A-F: Antimony	7440-36-0	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EG093A-F: Arsenic	7440-38-2	0.5	µg/L	1.2	1.1	9.1	No Limit
		EG093A-F: Chromium	7440-47-3	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EG093A-F: Manganese	7439-96-5	0.5	µg/L	0.7	0.6	15.0	No Limit
		EG093A-F: Nickel	7440-02-0	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EG093A-F: Vanadium	7440-62-2	0.5	µg/L	1.2	0.8	31.7	No Limit
		EG093A-F: Barium	7440-39-3	1	µg/L	8	8	0.0	No Limit
		EG093A-F: Copper	7440-50-8	1	µg/L	<1	<1	0.0	No Limit
		EG093A-F: Aluminium	7429-90-5	10	µg/L	<10	<10	0.0	No Limit
ES0911109-005	G-WQ-08	EG093A-F: Beryllium	7440-41-7	0.1	µg/L	<0.1	<0.1	0.0	No Limit
		EG093A-F: Silver	7440-22-4	0.1	µg/L	<0.1	<0.1	0.0	No Limit
		EG093A-F: Cadmium	7440-43-9	0.2	µg/L	<0.2	<0.2	0.0	No Limit
		EG093A-F: Cobalt	7440-48-4	0.2	µg/L	<0.2	<0.2	0.0	No Limit
		EG093A-F: Lead	7439-92-1	0.2	µg/L	<0.2	<0.2	0.0	No Limit
		EG093A-F: Antimony	7440-36-0	0.5	µg/L	<0.5	<0.5	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS (QC Lot: 1055711) - continued									
ES0911109-005	G-WQ-08	EG093A-F: Arsenic	7440-38-2	0.5	µg/L	1.0	1.0	0.0	No Limit
		EG093A-F: Chromium	7440-47-3	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EG093A-F: Manganese	7439-96-5	0.5	µg/L	1.0	1.1	11.0	No Limit
		EG093A-F: Nickel	7440-02-0	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EG093A-F: Vanadium	7440-62-2	0.5	µg/L	0.9	1.0	0.0	No Limit
		EG093A-F: Barium	7440-39-3	1	µg/L	9	8	0.0	No Limit
		EG093A-F: Copper	7440-50-8	1	µg/L	<1	<1	0.0	No Limit
		EG093A-F: Aluminium	7429-90-5	10	µg/L	<10	<10	0.0	No Limit
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS (QC Lot: 1055712)									
ES0911097-001	Anonymous	EG093B-F: Iron	7439-89-6	5	µg/L	<5	<5	0.0	No Limit
ES0911109-005	G-WQ-08	EG093B-F: Iron	7439-89-6	5	µg/L	<5	<5	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 1054041)									
ES0911097-001	Anonymous	EK257A-SW: Nitrite as N	----	0.002	mg/L	0.002	0.002	0.0	No Limit
ES0911109-005	G-WQ-08	EK257A-SW: Nitrite as N	----	0.002	mg/L	<0.002	<0.002	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 1054042)									
ES0911097-001	Anonymous	EK255A-SW: Ammonia as N	7664-41-7	0.005	mg/L	0.011	0.012	13.2	No Limit
ES0911109-005	G-WQ-08	EK255A-SW: Ammonia as N	7664-41-7	0.005	mg/L	0.011	0.007	41.8	No Limit
Ultra-Trace Nutrients (QC Lot: 1054043)									
ES0911097-001	Anonymous	EK259A-SW: Nitrite + Nitrate as N	----	0.002	mg/L	0.010	0.010	0.0	No Limit
ES0911109-005	G-WQ-08	EK259A-SW: Nitrite + Nitrate as N	----	0.002	mg/L	0.005	0.005	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 1054044)									
ES0911097-001	Anonymous	EK271A-SW: Reactive Phosphorus as P	----	0.001	mg/L	0.006	0.006	0.0	No Limit
ES0911109-005	G-WQ-08	EK271A-SW: Reactive Phosphorus as P	----	0.001	mg/L	0.006	0.006	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 1054092)									
ES0911097-001	Anonymous	EK262PA-SW: Total Nitrogen as N	----	0.05	mg/L	0.14	0.16	8.2	No Limit
ES0911109-005	G-WQ-08	EK262PA-SW: Total Nitrogen as N	----	0.05	mg/L	0.15	0.14	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 1054093)									
ES0911097-001	Anonymous	EK267PA-SW: Total Phosphorus as P	----	0.005	mg/L	<0.005	<0.005	0.0	No Limit
ES0911109-005	G-WQ-08	EK267PA-SW: Total Phosphorus as P	----	0.005	mg/L	<0.005	<0.005	0.0	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	*Laboratory Control Spike (LCS) Report*			
					Spike	*Spike Recovery (%)*	*Recovery Limits (%)*	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EA010P: Conductivity by PC Titrator (QCLot: 1054445)								
EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	2000 µS/cm	100	86.3	112
EA015: Total Dissolved Solids (QCLot: 1054826)								
EA015: Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	<1	293 mg/L	99.6	77.9	122
EA025: Suspended Solids (QCLot: 1057260)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	104	30	150
EG035F: Dissolved Mercury by FIMS (QCLot: 1054513)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.010 mg/L	102	86	116
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS (QCLot: 1055711)								
EG093A-F: Aluminium	7429-90-5	10	µg/L	<10	50 µg/L	97.8	80	128
EG093A-F: Antimony	7440-36-0	0.5	µg/L	<0.5	----	----	----	----
EG093A-F: Arsenic	7440-38-2	0.5	µg/L	<0.5	10 µg/L	100	85	125
EG093A-F: Barium	7440-39-3	1	µg/L	<1	10 µg/L	106	81	129
EG093A-F: Beryllium	7440-41-7	0.1	µg/L	<0.1	10 µg/L	104	80	122
EG093A-F: Cadmium	7440-43-9	0.2	µg/L	<0.2	10 µg/L	95.9	78	116
EG093A-F: Chromium	7440-47-3	0.5	µg/L	<0.5	10 µg/L	104	86	128
EG093A-F: Cobalt	7440-48-4	0.2	µg/L	<0.2	10 µg/L	105	87	127
EG093A-F: Copper	7440-50-8	1	µg/L	<1	10 µg/L	103	86	124
EG093A-F: Lead	7439-92-1	0.2	µg/L	<0.2	10 µg/L	102	87	123
EG093A-F: Manganese	7439-96-5	0.5	µg/L	<0.5	10 µg/L	102	90	122
EG093A-F: Nickel	7440-02-0	0.5	µg/L	<0.5	10 µg/L	102	84	124
EG093A-F: Silver	7440-22-4	0.1	µg/L	<0.1	1 µg/L	78.1	70	130
EG093A-F: Vanadium	7440-62-2	0.5	µg/L	<0.5	10 µg/L	104	85	123
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS (QCLot: 1055712)								
EG093B-F: Iron	7439-89-6	5	µg/L	<5	50 µg/L	101	89	119
EP008: Chlorophyll a (QCLot: 1053883)								
EP008: Chlorophyll a	----	1	mg/m3	----	20 mg/m3	95.0	60.3	134
		1	mg/m^3	<1	----	----	----	----
EP008: Volume	----	0.01	L	0	----	1	----	----
EP008: Volume Extract	----	0.01	mL	0	----	10	----	----
Ultra-Trace Nutrients (QCLot: 1054041)								
EK257A-SW: Nitrite as N	----	0.002	mg/L	<0.002	1.0 mg/L	87.0	70	130
Ultra-Trace Nutrients (QCLot: 1054042)								
EK255A-SW: Ammonia as N	7664-41-7	0.005	mg/L	<0.005	0.1 mg/L	104	70	130

Sub-Matrix: **WATER**

				Method Blank (MB) Report	*Laboratory Control Spike (LCS) Report*			
					Spike	*Spike Recovery (%)*	*Recovery Limits (%)*	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
Ultra-Trace Nutrients (QCLot: 1054043)								
EK259A-SW: Nitrite + Nitrate as N	----	0.002	mg/L	<0.002	0.1 mg/L	112	70	130
Ultra-Trace Nutrients (QCLot: 1054044)								
EK271A-SW: Reactive Phosphorus as P	----	0.001	mg/L	<0.001	0.1 mg/L	103	70	130
Ultra-Trace Nutrients (QCLot: 1054092)								
EK262PA-SW: Total Nitrogen as N	----	0.05	mg/L	<0.05	1.0 mg/L	94.9	70	130
Ultra-Trace Nutrients (QCLot: 1054093)								
EK267PA-SW: Total Phosphorus as P	----	0.005	mg/L	<0.005	0.44 mg/L	87.3	70	130

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	*Spike Recovery (%)*	*Recovery Limits (%)*	
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EG035F: Dissolved Mercury by FIMS (QCLot: 1054513)							
ES0911043-032	Anonymous	EG035F: Mercury	7439-97-6	0.0100 mg/L	108	70	130
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS (QCLot: 1055711)							
ES0911097-001	Anonymous	EG093A-F: Arsenic	7440-38-2	50 µg/L	119	70	130
		EG093A-F: Barium	7440-39-3	50 µg/L	118	70	130
		EG093A-F: Beryllium	7440-41-7	50 µg/L	110	70	130
		EG093A-F: Cadmium	7440-43-9	12.5 µg/L	107	70	130
		EG093A-F: Chromium	7440-47-3	50 µg/L	120	70	130
		EG093A-F: Cobalt	7440-48-4	50 µg/L	121	70	130
		EG093A-F: Copper	7440-50-8	50 µg/L	121	70	130
		EG093A-F: Lead	7439-92-1	50 µg/L	109	70	130
		EG093A-F: Manganese	7439-96-5	50 µg/L	116	70	130
		EG093A-F: Nickel	7440-02-0	50 µg/L	121	70	130
		EG093A-F: Vanadium	7440-62-2	50 µg/L	118	70	130
Ultra-Trace Nutrients (QCLot: 1054041)							
ES0911097-001	Anonymous	EK257A-SW: Nitrite as N	----	0.1 mg/L	72.7	70	130
Ultra-Trace Nutrients (QCLot: 1054042)							
ES0911097-001	Anonymous	EK255A-SW: Ammonia as N	7664-41-7	0.1 mg/L	71.3	70.	130
Ultra-Trace Nutrients (QCLot: 1054043)							
ES0911097-001	Anonymous	EK259A-SW: Nitrite + Nitrate as N	----	0.1 mg/L	71.6	70	130
Ultra-Trace Nutrients (QCLot: 1054044)							
ES0911097-001	Anonymous	EK271A-SW: Reactive Phosphorus as P	----	0.1 mg/L	73.4	70	130
Ultra-Trace Nutrients (QCLot: 1054092)							
ES0911097-001	Anonymous	EK262PA-SW: Total Nitrogen as N	----	0.5 mg/L	101	70	130
Ultra-Trace Nutrients (QCLot: 1054093)							
ES0911097-001	Anonymous	EK267PA-SW: Total Phosphorus as P	----	0.5 mg/L	90.1	70	130

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: **ES0911109**	Page	: 1 of 8
Client	: GHD SERVICES PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: MR ADRIAN WHITE	Contact	: Charlie Pierce
Address	: P O BOX 373 GLADSTONE QLD, AUSTRALIA 4680	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: adrian.a.white@ghd.com.au	E-mail	: charlie.pierce@alsenviro.com
Telephone	: +61 07 49731611	Telephone	: +61-2-8784 8555
Facsimile	: +61 07 4972 6236	Facsimile	: +61-2-8784 8500
Project	: 4215386 41 WESTERN BASIN EIS WQ MONITORING	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 29-JUL-2009
Sampler	: AW	Issue Date	: 05-AUG-2009
Order number	: ----		
		No. of samples received	: 7
Quote number	: BN/314/09	No. of samples analysed	: 7

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Interpretive Quality Control Report contains the following information:

- Analysis Holding Time Compliance
- Quality Control Parameter Frequency Compliance
- Brief Method Summaries
- Summary of Outliers

Analysis Holding Time Compliance

The following report summarises extraction / preparation and analysis times and compares with recommended holding times. Dates reported represent first date of extraction or analysis and precludes subsequent dilutions and reruns. Information is also provided re the sample container (preservative) from which the analysis aliquot was taken. Elapsed period to analysis represents number of days from sampling where no extraction / digestion is involved or period from extraction / digestion where this is present. For composite samples, sampling date is assumed to be that of the oldest sample contributing to the composite. Sample date for laboratory produced leachates is assumed as the completion date of the leaching process. Outliers for holding time are based on USEPA SW 846, APHA, AS and NEPM (1999). A listing of breaches is provided in the Summary of Outliers.

Holding times for leachate methods (excluding elutriates) vary according to the analytes being determined on the resulting solution. For non -volatile analytes, the holding time compliance assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These soil holding times are: Organics (14 days); Mercury (28 days) & other metals (180 days). A recorded breach therefore does not guarantee a breach for all non-volatile parameters.

Matrix: **WATER**

Evaluation: ✘ = Holding time breach ; ✓ = Within holding time.

Method	*Sample Date*	*Extraction / Preparation*			*Analysis*		
Container / Client Sample ID(s)		*Date extracted*	*Due for extraction*	*Evaluation*	*Date analysed*	*Due for analysis*	*Evaluation*
EA005: pH							
Clear Plastic Bottle - Natural G-WQ-01, G-WQ-02, G-WQ-05, G-WQ-06, G-WQ-08, G-WQ-09, QA01	**28-JUL-2009**	**----**	----	----	**29-JUL-2009**	28-JUL-2009	✘
EA010P: Conductivity by PC Titrator							
Clear Plastic Bottle - Natural G-WQ-01, G-WQ-02, G-WQ-05, G-WQ-06, G-WQ-08, G-WQ-09, QA01	**28-JUL-2009**	**---**	---	----	**30-JUL-2009**	25-AUG-2009	✓
EA015: Total Dissolved Solids							
Clear Plastic Bottle - Natural G-WQ-01, G-WQ-02, G-WQ-05, G-WQ-06, G-WQ-08, G-WQ-09, QA01	**28-JUL-2009**	**----**	----	----	**30-JUL-2009**	04-AUG-2009	✓
EA025: Suspended Solids							
Clear Plastic Bottle - Natural G-WQ-01, G-WQ-02, G-WQ-05, G-WQ-06, G-WQ-08, G-WQ-09, QA01	**28-JUL-2009**	**----**	----	----	**03-AUG-2009**	04-AUG-2009	✓
EG035F: Dissolved Mercury by FIMS							
Clear HDPE (U-T ORC) - Filtered; Lab-acidified G-WQ-01, G-WQ-02, G-WQ-05, G-WQ-06, G-WQ-08, G-WQ-09, QA01	**28-JUL-2009**	**---**	---	----	**31-JUL-2009**	25-AUG-2009	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method	***Sample Date***	*Extraction / Preparation*			*Analysis*		
***Container** / Client Sample ID(s)*		***Date extracted***	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS							
Clear HDPE (U-T ORC) - Filtered; Lab-acidified G-WQ-01, G-WQ-02, G-WQ-05, G-WQ-06, G-WQ-08, G-WQ-09, QA01	**28-JUL-2009**	**31-JUL-2009**	24-JAN-2010	✓	**31-JUL-2009**	24-JAN-2010	✓
EP008: Chlorophyll a							
White Plastic Bottle - Unpreserved G-WQ-01, G-WQ-02, G-WQ-05, G-WQ-06, G-WQ-08, G-WQ-09, QA01	**28-JUL-2009**	**----**	----	----	**29-JUL-2009**	30-JUL-2009	✓
Ultra-Trace Nutrients							
Clear Plastic Bottle - Filtered (AS) G-WQ-01, G-WQ-02, G-WQ-05, G-WQ-06, G-WQ-08, G-WQ-09, QA01	**28-JUL-2009**	**---**	---	----	**29-JUL-2009**	29-JUL-2009	✓
Clear Plastic Bottle - Natural (AS) G-WQ-01, G-WQ-02, G-WQ-05, G-WQ-06, G-WQ-08, G-WQ-09, QA01	**28-JUL-2009**	**29-JUL-2009**	29-JUL-2009	✓	**29-JUL-2009**	29-JUL-2009	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(where) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: ✗ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Ammonia as N - Ultra-Trace in Saline Waters	EK255A-SW	2	13	**15.4**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Conductivity by PC Titrator	EA010-P	2	15	**13.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	2	14	**14.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals in Saline Water -Suite A by ORC-ICPMS	EG093A-F	2	13	**15.4**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals in Saline Water -Suite B by ORC-ICPMS	EG093B-F	2	13	**15.4**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N - Ultra-Trace in Saline Waters	EK259A-SW	2	13	**15.4**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N - Ultra-Trace in Saline Waters	EK257A-SW	2	13	**15.4**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
pH	EA005	2	14	**14.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P - Ultra-Trace in Saline Water	EK271A-SW	2	13	**15.4**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Suspended Solids (High Level)	EA025H	2	17	**11.8**	**9.5**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids	EA015	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Nitrogen/Persulfate Digestion/Ultra-Trace/Saline	EK262PA-SW	2	13	**15.4**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus/Persulfate Digestion/ Ultra Trace /Saline	EK267PA-SW	2	13	**15.4**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
Ammonia as N - Ultra-Trace in Saline Waters	EK255A-SW	1	13	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chlorophyll a	EP008	1	13	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Conductivity by PC Titrator	EA010-P	1	15	**6.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	1	14	**7.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals in Saline Water -Suite A by ORC-ICPMS	EG093A-F	1	13	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals in Saline Water -Suite B by ORC-ICPMS	EG093B-F	1	13	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N - Ultra-Trace in Saline Waters	EK259A-SW	1	13	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N - Ultra-Trace in Saline Waters	EK257A-SW	1	13	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P - Ultra-Trace in Saline Water	EK271A-SW	1	13	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Suspended Solids (High Level)	EA025H	1	17	**5.9**	**4.8**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids	EA015	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Nitrogen/Persulfate Digestion/Ultra-Trace/Saline	EK262PA-SW	1	13	**7.7**	**10.0**	✗	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus/Persulfate Digestion/ Ultra Trace /Saline	EK267PA-SW	1	13	**7.7**	**10.0**	✗	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
Ammonia as N - Ultra-Trace in Saline Waters	EK255A-SW	1	13	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chlorophyll a	EP008	1	13	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Conductivity by PC Titrator	EA010-P	1	15	**6.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	1	14	**7.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals in Saline Water -Suite A by ORC-ICPMS	EG093A-F	1	13	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals in Saline Water -Suite B by ORC-ICPMS	EG093B-F	1	13	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N - Ultra-Trace in Saline Waters	EK259A-SW	1	13	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Method Blanks (MB) - Continued							
Nitrite as N - Ultra-Trace in Saline Waters	EK257A-SW	1	13	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P - Ultra-Trace in Saline Water	EK271A-SW	1	13	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Suspended Solids (High Level)	EA025H	1	17	**5.9**	**4.8**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids	EA015	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Nitrogen/Persulfate Digestion/Ultra-Trace/Saline	EK262PA-SW	1	13	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus/Persulfate Digestion/ Ultra Trace /Saline	EK267PA-SW	1	13	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							
Ammonia as N - Ultra-Trace in Saline Waters	EK255A-SW	1	13	**7.7**	**5.0**	✓	ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	1	14	**7.1**	**5.0**	✓	ALS QCS3 requirement
Dissolved Metals in Saline Water -Suite A by ORC-ICPMS	EG093A-F	1	13	**7.7**	**5.0**	✓	ALS QCS3 requirement
Nitrite and Nitrate as N - Ultra-Trace in Saline Waters	EK259A-SW	1	13	**7.7**	**5.0**	✓	ALS QCS3 requirement
Nitrite as N - Ultra-Trace in Saline Waters	EK257A-SW	1	13	**7.7**	**5.0**	✓	ALS QCS3 requirement
Reactive Phosphorus as P - Ultra-Trace in Saline Water	EK271A-SW	1	13	**7.7**	**5.0**	✓	ALS QCS3 requirement
Total Nitrogen/Persulfate Digestion/Ultra-Trace/Saline	EK262PA-SW	1	13	**7.7**	**5.0**	✓	ALS QCS3 requirement
Total Phosphorus/Persulfate Digestion/ Ultra Trace /Saline	EK267PA-SW	1	13	**7.7**	**5.0**	✓	ALS QCS3 requirement

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
pH	EA005	WATER	APHA 21st ed. 4500 H+ B. pH of water samples is determined by ISE either manually or by automated pH meter. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Conductivity by PC Titrator	EA010-P	WATER	APHA 21st ed., 2510 B This procedure determines conductivity by automated ISE. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Dissolved Solids	EA015	WATER	APHA 21st ed., 2540C A gravimetric procedure that determines the amount of \`filterable\` residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Suspended Solids (High Level)	EA025H	WATER	APHA 21st ed., 2540D A gravimetric procedure employed to determine the amount of \`non-filterable\` residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Dissolved Mercury by FIMS	EG035F	WATER	AS 3550, APHA 21st ed. 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Dissolved Metals in Saline Water -Suite A by ORC-ICPMS	EG093A-F	WATER	APHA 21st ed., 3125; USEPA SW846 - 6020 Samples are 0.45 um filtered prior to analysis. The ORC-ICPMS technique removes interfering species through a series of chemical reactions prior to ion detection. Ions are passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to measurement by a discrete dynode ion detector. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Dissolved Metals in Saline Water -Suite B by ORC-ICPMS	EG093B-F	WATER	APHA 21st ed., 3125; USEPA SW846 - 6020 Samples are 0.45 um filtered prior to analysis. The ORC-ICPMS technique removes interfering species through a series of chemical reactions prior to ion detection. Ions are passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to measurement by a discrete dynode ion detector. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Ammonia as N - Ultra-Trace in Saline Waters	EK255A-SW	WATER	APHA 21st ed., 4500-NH3 H Ammonia is determined by direct colorimetry by FIA. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Nitrite as N - Ultra-Trace in Saline Waters	EK257A-SW	WATER	APHA 21st ed., 4500-NO2- B. Nitrite is determined by direct colourimetry by FIA.
Nitrate as N - Ultra-Trace in Saline Waters	EK258A-SW	WATER	APHA 21st ed., 4500-NO3- I Nitrate is reduced to nitrite by way of a cadmium reduction column followed by quantification by FIA. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results.
Nitrite and Nitrate as N - Ultra-Trace in Saline Waters	EK259A-SW	WATER	APHA 21st ed., 4500-NO3- I. Combined oxidised Nitrogen (NO2+NO3) is determined by Cadmium Reduction and direct colourimetry by FIA.

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
TKN (Total N - NOx-N). (FIA - UT) in Saline Waters	EK261PA-SW	WATER	APHA 21st ed., 4500-P J. & 4500-NO3- I. Calculated by difference from total Nitrogen and NOx. Contributing method parameters are determined by FIA. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Nitrogen/Persulfate Digestion/Ultra-Trace/Saline	EK262PA-SW	WATER	APHA 21st ed., 4500-P J. Persulfate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus. As sample is digested with persulfate under alkaline conditions yielding orthophosphate and nitrate. Following digestion, analytes are determined by flow injection analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Phosphorus/Persulfate Digestion/ Ultra Trace /Saline	EK267PA-SW	WATER	APHA 21st ed., 4500-P J. Persulfate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus. As sample is digested with persulfate under alkaline conditions yielding orthophosphate and nitrate. Following digestion, analytes are determined by flow injection analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Reactive Phosphorus as P - Ultra-Trace in Saline Water	EK271A-SW	WATER	APHA 21st ed., 4500-P E Ammonium molybdate and potassium antimonyl tartrate reacts in acid medium with othophosphate to form a heteropoly acid -phosphomolybdic acid - which is reduced to intensely coloured molybdenum blue by ascorbic acid. Quantification is by FIA. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Chlorophyll a	EP008	WATER	In-house (APHA 21st ed., 10200 H mod.) The pigments are extracted into aqueous acetone. The optical density of the extract before and after acidification at both 664 nm and 665 nm is determined spectrometrically.

Preparation Methods	*Method*	*Matrix*	*Method Descriptions*
Persulfate Digestion for UT TN and TP for FIA/Saline	EK262/267PA-SW	WATER	APHA 21st ed., 4500 P - J. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)

Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged in the Quality Control (QC) Report. Surrogate recovery limits are static and based on USEPA SW846 or ALS-QWI/EN/38 (in the absence of specific USEPA limits). This report displays QC Outliers (breaches) only.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

- **For all matrices, no Method Blank value outliers occur.**
- **For all matrices, no Duplicate outliers occur.**
- **For all matrices, no Laboratory Control outliers occur.**
- **For all matrices, no Matrix Spike outliers occur.**

Regular Sample Surrogates

- **For all regular sample matrices, no surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

This report displays Holding Time breaches only. Only the respective Extraction / Preparation and/or Analysis component is/are displayed.

Matrix: **WATER**

Method	*Extraction / Preparation*			*Analysis*		
Container / Client Sample ID(s)	*Date extracted*	*Due for extraction*	***Days overdue***	*Date analysed*	*Due for analysis*	***Days overdue***
EA005: pH						
Clear Plastic Bottle - Natural						
G-WQ-01, G-WQ-02, G-WQ-05, G-WQ-06, G-WQ-08, G-WQ-09, QA01	----	----	----	29-JUL-2009	28-JUL-2009	**1**

Outliers : Frequency of Quality Control Samples

The following report highlights breaches in the Frequency of Quality Control Samples.

Matrix: **WATER**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Laboratory Control Samples (LCS)					
Total Nitrogen/Persulfate Digestion/Ultra-Trace/Saline	1	13	7.7	10.0	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus/Persulfate Digestion/ Ultra Trace /Saline	1	13	7.7	10.0	NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Chain of Custody & Analysis Request

Page _1_ of _1_

Chain of Custody Number:

GHD

PROJECT ID:	4215386 41	**QUOTE:**	
PROJECT:	**Western Basin EIS WQ Monitoring**		
CLIENT:	GHD		
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INVOICE:	Jason.K.Fowler@ghd.com.au, Adrian.A.White@ghd.com.au		
DATA NEEDED BY:			
REPORT FORMAT:			
EMAIL FORMAT:	ESDAT, EXCEL & PDF		

LABORATORY BATCH NO.:

FOR LAB USE ONLY

COOLER SEAL:
Yes No ......
Broken Intact ......

COOLER TEMP:
..... deg.C

DESPATCHED TO:
ALS Environmental
277-289 Woodpark Road
Smithfield NSW 2164
02 8784 8555

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

Water samples from a marine environment (Background sampling)

(EMAIL ADDRESSES PROVIDED ABOVE)

ANALYSIS REQUIRED

SAMPLES FROM MARINE ENVIRONMENT

	SAMPLE ID	MATRIX	DATE	DETECTION LIMIT	PRESERVATION	Ultra trace ORC - dissolved metals (EG093F) (Sb, As, Ba, Be, Cd, Co, Cr, Cu, Mn, Ni, Pb, V, Hg, Fe, Al, Ag)	Ultra trace nutrients (UTN - 04) (TP, RP, NH3, NO2, NO3, TKN, TN)	TSS (EA025)	Chlorophyll a (EP008)	pH (EA005)	TDS (EA015)	Electro Conductivity	Multi Residue Pesticides –EP-215LL (lowest DL)	
1	G-WQ-01	Water	17/08/2009	LOR	As Required	X	X	X	X	X	X	X	X	**NOTE: Two glass amber bottle collected at G-WQ-05, for lab QA.**
2	G-WQ-02	Water	17/08/2009	LOR	As Required	X	X	X	X	X	X	X	X	[redacted]
3	G-WQ-05	Water	17/08/2009	LOR	As Required	X	X	X	X	X	X	X	X	
4	G-WQ-08	Water	17/08/2009	LOR	As Required	X	X	X	X	X	X	X	X	
5	G-WQ-09	Water	17/08/2009	LOR	As Required	X	X	X	X	X	X	X	X	
6	G-WQ-10	Water	17/08/2009	LOR	As Required	X	X	X	X	X	X	X	X	
7	G-WQ-11	Water	17/08/2009	LOR	As Required	X	X	X	X	X	X	X	X	
8	G-WQ-12	Water	17/08/2009	LOR	As Required	X	X	X	X	X	X	X	X	
9	QA 01	Water	17/08/2009	LOR	As Required	X	X	X	X	X	X	X	X	

Environmental Division
Sydney
Work Order
ES0912210

Telephone : + 61-2-8784 8555

RELINQUISHED BY:
NAME : J Fowler DATE: 17/08/2009
OF: GHD Gladstone TIME:

RECEIVED BY:
NAME : Frank DATE: 18/08/09
OF: ALS TIME: 9:30am

PLEASE EMAIL COMPLETED ANALYSIS REQUEST TO: Jason.K.Fowler@ghd.com.au, Adrian.A.White@ghd.com.au

*Container Type and Preservative Codes: P = Neutral Plastic; N = Nitric Acid Preserved; C = Sodium Hydroxide Preserved; J = Solvent Washed Acid Rinced Jar; S = Solvent Washed Acid Rinced Glass Bottle; VC = Hydrochloric Acid Preserved Vial; VS = Sulfuric Acid Preserved Vial; BS = Sulfuric Acid Preserved Glass Bottle; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; O = Other.

SAMPLE RECEIPT NOTIFICATION (SRN)

Comprehensive Report

Work Order	: **ES0912210**		
Client	: **GHD SERVICES PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR ADRIAN WHITE	Contact	: Charlie Pierce
Address	: G P O BOX 668 BRISBANE QLD, AUSTRALIA 4001	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: adrian.a.white@ghd.com.au	E-mail	: charlie.pierce@alsenviro.com
Telephone	: +61 07 3316 3000	Telephone	: +61-2-8784 8555
Facsimile	: +61 07 3316 3333	Facsimile	: +61-2-8784 8500
Project	: 4215386 41 WESTERN BASIN EIS WQ MONITORING	Page	: 1 of 3
Order number	: ----		
C-O-C number	: ----	Quote number	: EB2009GHDSER0401 (BN/314/09)
Site	: ----		
Sampler	: ----	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Dates

Date Samples Received	: 18-AUG-2009	Issue Date	: 25-AUG-2009 08:33
Client Requested Due Date	: 01-SEP-2009	Scheduled Reporting Date	: **31-AUG-2009**

Delivery Details

Mode of Delivery	: Carrier	Temperature	: 2.4'c - Ice present
No. of coolers/boxes	: 2 HARD	No. of samples received	: 9
Sercurity Seal	: Intact.	No. of samples analysed	: 9

General Comments

- This report contains the following information:
    - Sample Container(s)/Preservation Non-Compliances
    - Summary of Sample(s) and Requested Analysis
    - Requested Deliverables
- **Samples received in appropriately pretreated and preserved containers.**
- **Breaches in recommended extraction / analysis holding times may occur. Please contact ALS for further information (Nanthini Coilparampil).**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please direct any turn around / technical queries to the laboratory contact designated above.
- Please direct any queries related to sample condition / numbering / breakages to Nanthini Coilparampil
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (14 days), Solid (90 days) from date of completion of work order.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exist.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process neccessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
When date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for processing purposes. If the sampling time is displayed as 0:00 the information was not provided by client.

Matrix: **WATER**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	WATER - EA005: pH pH	WATER - EA010P Conductivity (PC)	WATER - EA015 Total Dissolved Solids	WATER - EA025H Suspended Solids (High Level)	WATER - EG035F Dissolved Mercury by FIMS	WATER - EG093A-F Dissolved metals in saline water by ORC-ICPMS	WATER - EG093B-F Dissolved Metals in Saline Water Suite B by ORC-ICPMS	WATER - EP008 Chlorophyll a
ES0912210-001	[17-AUG-2009]	G-WQ-01	✓	✓	✓	✓	✓	✓	✓	✓
ES0912210-002	[17-AUG-2009]	G-WQ-02	✓	✓	✓	✓	✓	✓	✓	✓
ES0912210-003	[17-AUG-2009]	G-WQ-05	✓	✓	✓	✓	✓	✓	✓	✓
ES0912210-004	[17-AUG-2009]	G-WQ-08	✓	✓	✓	✓	✓	✓	✓	✓
ES0912210-005	[17-AUG-2009]	G-WQ-09	✓	✓	✓	✓	✓	✓	✓	✓
ES0912210-006	[17-AUG-2009]	G-WQ-10	✓	✓	✓	✓	✓	✓	✓	✓
ES0912210-007	[17-AUG-2009]	G-WQ-11	✓	✓	✓	✓	✓	✓	✓	✓
ES0912210-008	[17-AUG-2009]	G-WQ-12	✓	✓	✓	✓	✓	✓	✓	✓
ES0912210-009	[17-AUG-2009]	QA01	✓	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	WATER - EP215LL Multiresidue Pesticide Screen (Suite 2) - Low Level	WATER - UTN-4 SW Ultratrace NO2, NO3, NH3, Nitrogen, Phosphorus, TKN, Reactive Phosphorus
ES0912210-001	[17-AUG-2009]	G-WQ-01	✓	✓
ES0912210-002	[17-AUG-2009]	G-WQ-02	✓	✓
ES0912210-003	[17-AUG-2009]	G-WQ-05	✓	✓
ES0912210-004	[17-AUG-2009]	G-WQ-08	✓	✓
ES0912210-005	[17-AUG-2009]	G-WQ-09	✓	✓
ES0912210-006	[17-AUG-2009]	G-WQ-10	✓	✓
ES0912210-007	[17-AUG-2009]	G-WQ-11	✓	✓
ES0912210-008	[17-AUG-2009]	G-WQ-12	✓	✓
ES0912210-009	[17-AUG-2009]	QA01	✓	✓

Requested Deliverables

MR ADRIAN WHITE

- *AU Certificate of Analysis - NATA (COA)	Email	adrian.a.white@ghd.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	adrian.a.white@ghd.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	adrian.a.white@ghd.com.au
- A4 - AU Sample Receipt Notification - Environmental (SRN)	Email	adrian.a.white@ghd.com.au
- A4 - AU Tax Invoice (INV)	Email	adrian.a.white@ghd.com.au
- Default - Chain of Custody (COC)	Email	adrian.a.white@ghd.com.au
- EDI Format - ENMRG (ENMRG)	Email	adrian.a.white@ghd.com.au
- EDI Format - ESDAT (ESDAT)	Email	adrian.a.white@ghd.com.au

MR JASON FOWLER

- *AU Certificate of Analysis - NATA (COA)	Email	jason.k.fowler@ghd.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	jason.k.fowler@ghd.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	jason.k.fowler@ghd.com.au
- A4 - AU Sample Receipt Notification - Environmental (SRN)	Email	jason.k.fowler@ghd.com.au
- A4 - AU Tax Invoice (INV)	Email	jason.k.fowler@ghd.com.au
- Default - Chain of Custody (COC)	Email	jason.k.fowler@ghd.com.au
- EDI Format - ENMRG (ENMRG)	Email	jason.k.fowler@ghd.com.au
- EDI Format - ESDAT (ESDAT)	Email	jason.k.fowler@ghd.com.au

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

CERTIFICATE OF ANALYSIS

Work Order : **ES0912210**

Client : **GHD SERVICES PTY LTD**
Contact : MR ADRIAN WHITE
Address : P O BOX 373
GLADSTONE QLD, AUSTRALIA 4680

E-mail : adrian.a.white@ghd.com.au
Telephone : +61 07 4972 6377
Facsimile : +61 07 4972 6236

Project : 4215386 41 WESTERN BASIN EIS WQ MONITORING
Order number : ----
C-O-C number : ----
Sampler : ----
Site : ----

Quote number : BN/314/09

Page : 1 of 6

Laboratory : Environmental Division Sydney
Contact : Charlie Pierce
Address : 277-289 Woodpark Road Smithfield NSW Australia 2164

E-mail : charlie.pierce@alsenviro.com
Telephone : +61-2-8784 8555
Facsimile : +61-2-8784 8500

QC Level : NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Date Samples Received : 18-AUG-2009
Issue Date : 27-AUG-2009

No. of samples received : 9
No. of samples analysed : 9

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

NATA Accredited Laboratory 825

This document is issued in
accordance with NATA
accreditation requirements.

Accredited for compliance with
ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Celine Conceicao	Spectroscopist	Inorganics
Hoa Nguyen	Inorganic Chemist	Inorganics
Lana Nguyen	LCMS Chemist	Organics
Nanthini Coilparampil	Senior Inorganic Chemist	Inorganics

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insuffient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for processing purposes. If the sampling time is displayed as 0:00 the information was not provided by client.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting

- **EG093: LCS recovery for various elements falls outside ALS Dynamic Control Limit. However, it is within the acceptance criteria based on ALS DQO. No further action is required.**
- **EK255A: Spike failed for Ammonia due to matrix interference. Confirmed by re-analysis.**

Analytical Results

Sub-Matrix: **WATER**			*Client sample ID*	**G-WQ-01**	**G-WQ-02**	**G-WQ-05**	**G-WQ-08**	**G-WQ-09**
			Client sampling date / time	[17-AUG-2009]	[17-AUG-2009]	[17-AUG-2009]	[17-AUG-2009]	[17-AUG-2009]
Compound	*CAS Number*	*LOR*	*Unit*	**ES0912210-001**	**ES0912210-002**	**ES0912210-003**	**ES0912210-004**	**ES0912210-005**
EA005: pH								
pH Value	----	0.01	pH Unit	**7.93**	**8.00**	**8.01**	**8.00**	**8.04**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**50000**	**50000**	**50100**	**50400**	**50000**
EA015: Total Dissolved Solids								
^ Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	**39700**	**40100**	**42800**	**38700**	**40800**
EA025: Suspended Solids								
^ Suspended Solids (SS)	----	5	mg/L	**6**	**16**	**8**	**7**	**6**
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS								
Aluminium	7429-90-5	10	µg/L	**30**	**50**	<10	<10	**140**
Antimony	7440-36-0	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Iron	7439-89-6	5	µg/L	<5	<5	**12**	<5	<5
Arsenic	7440-38-2	0.5	µg/L	**0.8**	**0.9**	**0.8**	**0.8**	**0.8**
Barium	7440-39-3	1	µg/L	**8**	**8**	**8**	**8**	**8**
Beryllium	7440-41-7	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Cadmium	7440-43-9	0.2	µg/L	<0.2	<0.2	<0.2	**0.4**	<0.2
Chromium	7440-47-3	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Cobalt	7440-48-4	0.2	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Copper	7440-50-8	1	µg/L	<1	<1	<1	<1	<1
Lead	7439-92-1	0.2	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Manganese	7439-96-5	0.5	µg/L	**4.5**	**2.0**	**3.0**	**3.0**	**2.9**
Nickel	7440-02-0	0.5	µg/L	**0.5**	<0.5	**0.7**	<0.5	<0.5
Silver	7440-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Vanadium	7440-62-2	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	**0.6**
EP008: Chlorophyll a								
Chlorophyll a	----	1	mg/m3	**1**	<1	<1	<1	**2**
EP215: Multiresidue Pesticide Residue Screen (Suite 2)								
Simazine	122-34-9	0.005	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Diuron	330-54-1	0.005	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Atrazine	1912-24-9	0.005	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Molinate	2212-67-1	0.005	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Metolachlor	51218-45-2	0.005	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Malathion	121-75-5	0.002	µg/L	<0.002	<0.002	<0.002	<0.002	<0.002
Diazinon	333-41-5	0.005	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Thiobencarb	28249-77-6	0.005	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorpyrifos	2921-88-2	0.005	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005

Analytical Results

Sub-Matrix: **WATER**

			Client sample ID	**G-WQ-01**	**G-WQ-02**	**G-WQ-05**	**G-WQ-08**	**G-WQ-09**
			Client sampling date / time	[17-AUG-2009]	[17-AUG-2009]	[17-AUG-2009]	[17-AUG-2009]	[17-AUG-2009]
Compound	*CAS Number*	*LOR*	*Unit*	**ES0912210-001**	**ES0912210-002**	**ES0912210-003**	**ES0912210-004**	**ES0912210-005**
EP215: Multiresidue Pesticide Residue Screen (Suite 2) - Continued								
Trifluralin	1582-09-8	0.005	µg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Ultra-Trace Nutrients								
Ammonia as N	7664-41-7	0.005	mg/L	<0.005	**0.014**	<0.005	<0.005	<0.005
Nitrite as N	----	0.002	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002
^ Nitrate as N	14797-55-8	0.002	mg/L	<0.002	**0.003**	**0.003**	<0.002	**0.003**
Nitrite + Nitrate as N	----	0.002	mg/L	<0.002	**0.003**	**0.003**	<0.002	**0.003**
^ Total Kjeldahl Nitrogen as N	----	0.05	mg/L	**0.06**	**0.06**	**0.09**	<0.05	<0.05
Total Nitrogen as N	----	0.05	mg/L	**0.06**	**0.06**	**0.09**	<0.05	<0.05
Reactive Phosphorus as P	----	0.001	mg/L	<0.001	<0.001	**0.001**	<0.001	<0.001
Total Phosphorus as P	----	0.005	mg/L	**0.010**	**0.008**	**0.010**	**0.010**	**0.010**

Analytical Results

Sub-Matrix: **WATER**			*Client sample ID*	**G-WQ-10**	**G-WQ-11**	**G-WQ-12**	**QA01**	----
			Client sampling date / time	[17-AUG-2009]	[17-AUG-2009]	[17-AUG-2009]	[17-AUG-2009]	----
Compound	*CAS Number*	*LOR*	*Unit*	**ES0912210-006**	**ES0912210-007**	**ES0912210-008**	**ES0912210-009**	**----**
EA005: pH								
pH Value	----	0.01	pH Unit	**8.08**	**8.13**	**8.15**	**8.07**	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**51000**	**50400**	**50000**	**50900**	----
EA015: Total Dissolved Solids								
^ Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	**38600**	**39000**	**40000**	**39500**	----
EA025: Suspended Solids								
^ Suspended Solids (SS)	----	5	mg/L	**32**	**7**	**8**	**14**	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	----
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS								
Aluminium	7429-90-5	10	µg/L	<10	**10**	**80**	**70**	----
Antimony	7440-36-0	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Iron	7439-89-6	5	µg/L	<5	<5	<5	<5	----
Arsenic	7440-38-2	0.5	µg/L	**1.1**	**0.9**	**0.8**	**0.9**	----
Barium	7440-39-3	1	µg/L	**8**	**7**	**7**	**9**	----
Beryllium	7440-41-7	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	----
Cadmium	7440-43-9	0.2	µg/L	<0.2	<0.2	<0.2	<0.2	----
Chromium	7440-47-3	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	----
Cobalt	7440-48-4	0.2	µg/L	<0.2	<0.2	<0.2	<0.2	----
Copper	7440-50-8	1	µg/L	<1	<1	<1	<1	----
Lead	7439-92-1	0.2	µg/L	<0.2	<0.2	<0.2	<0.2	----
Manganese	7439-96-5	0.5	µg/L	**8.2**	**1.7**	**1.5**	**4.6**	----
Nickel	7440-02-0	0.5	µg/L	<0.5	<0.5	<0.5	**0.5**	----
Silver	7440-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	----
Vanadium	7440-62-2	0.5	µg/L	**0.6**	**0.8**	**1.0**	**0.6**	----
EP008: Chlorophyll a								
Chlorophyll a	----	1	mg/m3	**1**	**1**	<1	**2**	----
EP215: Multiresidue Pesticide Residue Screen (Suite 2)								
Simazine	122-34-9	0.005	µg/L	<0.005	<0.005	<0.005	<0.005	----
Diuron	330-54-1	0.005	µg/L	<0.005	<0.005	<0.005	<0.005	----
Atrazine	1912-24-9	0.005	µg/L	<0.005	<0.005	<0.005	<0.005	----
Molinate	2212-67-1	0.005	µg/L	<0.005	<0.005	<0.005	<0.005	----
Metolachlor	51218-45-2	0.005	µg/L	<0.005	<0.005	<0.005	<0.005	----
Malathion	121-75-5	0.002	µg/L	<0.002	<0.002	<0.002	<0.002	----
Diazinon	333-41-5	0.005	µg/L	<0.005	<0.005	<0.005	<0.005	----
Thiobencarb	28249-77-6	0.005	µg/L	<0.005	<0.005	<0.005	<0.005	----
Chlorpyrifos	2921-88-2	0.005	µg/L	<0.005	<0.005	<0.005	<0.005	----

Analytical Results

Sub-Matrix: **WATER**			*Client sample ID*	**G-WQ-10**	**G-WQ-11**	**G-WQ-12**	**QA01**	----
			Client sampling date / time	[17-AUG-2009]	[17-AUG-2009]	[17-AUG-2009]	[17-AUG-2009]	----
Compound	*CAS Number*	*LOR*	*Unit*	**ES0912210-006**	**ES0912210-007**	**ES0912210-008**	**ES0912210-009**	**----**
EP215: Multiresidue Pesticide Residue Screen (Suite 2) - Continued								
Trifluralin	1582-09-8	0.005	µg/L	<0.005	<0.005	<0.005	<0.005	----
Ultra-Trace Nutrients								
Ammonia as N	7664-41-7	0.005	mg/L	<0.005	<0.005	<0.005	**0.009**	----
Nitrite as N	----	0.002	mg/L	<0.002	<0.002	<0.002	<0.002	----
^ Nitrate as N	14797-55-8	0.002	mg/L	<0.002	**0.005**	<0.002	<0.002	----
Nitrite + Nitrate as N	----	0.002	mg/L	<0.002	**0.005**	<0.002	<0.002	----
^ Total Kjeldahl Nitrogen as N	----	0.05	mg/L	**0.05**	<0.05	<0.05	**0.05**	----
Total Nitrogen as N	----	0.05	mg/L	**0.05**	<0.05	<0.05	**0.05**	----
Reactive Phosphorus as P	----	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Total Phosphorus as P	----	0.005	mg/L	**0.014**	**0.009**	**0.010**	**0.012**	----

Environmental Division

QUALITY CONTROL REPORT

Work Order	: **ES0912210**	Page	: 1 of 8
Client	: **GHD SERVICES PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR ADRIAN WHITE	Contact	: Charlie Pierce
Address	: P O BOX 373 GLADSTONE QLD, AUSTRALIA 4680	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: adrian.a.white@ghd.com.au	E-mail	: charlie.pierce@alsenviro.com
Telephone	: +61 07 4972 6377	Telephone	: +61-2-8784 8555
Facsimile	: +61 07 4972 6236	Facsimile	: +61-2-8784 8500
Project	: 4215386 41 WESTERN BASIN EIS WQ MONITORING	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 18-AUG-2009
Sampler	: ----	Issue Date	: 27-AUG-2009
Order number	: ----		
		No. of samples received	: 9
Quote number	: BN/314/09	No. of samples analysed	: 9

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

NATA
WORLD RECOGNISED
ACCREDITATION

NATA Accredited Laboratory 825

This document is issued in accordance with NATA accreditation requirements.

Accredited for compliance with ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Celine Conceicao	Spectroscopist	Inorganics
Hoa Nguyen	Inorganic Chemist	Inorganics
Lana Nguyen	LCMS Chemist	Organics
Nanthini Coilparampil	Senior Inorganic Chemist	Inorganics

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insuffient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key :
Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR:- No Limit; Result between 10 and 20 times LOR:- 0% - 50%; Result > 20 times LOR:- 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA005: pH (QC Lot: 1072214)									
ES0912210-001	G-WQ-01	EA005: pH Value	----	0.01	pH Unit	7.93	7.92	0.1	0% - 20%
ES0912222-001	Anonymous	EA005: pH Value	----	0.01	pH Unit	8.46	8.47	0.1	0% - 20%
EA010P: Conductivity by PC Titrator (QC Lot: 1073141)									
ES0912069-001	Anonymous	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	4780	4790	0.2	0% - 20%
ES0912210-005	G-WQ-09	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	50000	50000	0.02	0% - 20%
EA015: Total Dissolved Solids (QC Lot: 1075531)									
ES0912210-001	G-WQ-01	EA015: Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	39700	39800	0.1	0% - 20%
ES0912215-001	Anonymous	EA015: Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	1790	1750	2.3	0% - 20%
EA025: Suspended Solids (QC Lot: 1073707)									
ES0912031-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	480	468	2.5	0% - 20%
ES0912210-002	G-WQ-02	EA025H: Suspended Solids (SS)	----	5	mg/L	16	<5	102	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 1072146)									
ES0912210-003	G-WQ-05	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS (QC Lot: 1077326)									
EM0907702-001	Anonymous	EG093A-F: Beryllium	7440-41-7	0.1	µg/L	<0.1	<0.1	0.0	No Limit
		EG093A-F: Silver	7440-22-4	0.1	µg/L	<0.1	<0.1	0.0	No Limit
		EG093A-F: Cadmium	7440-43-9	0.2	µg/L	1.0	1.0	0.0	No Limit
		EG093A-F: Cobalt	7440-48-4	0.2	µg/L	<0.2	<0.2	0.0	No Limit
		EG093A-F: Lead	7439-92-1	0.2	µg/L	<0.2	<0.2	0.0	No Limit
		EG093A-F: Antimony	7440-36-0	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EG093A-F: Arsenic	7440-38-2	0.5	µg/L	1.3	1.3	0.0	No Limit
		EG093A-F: Chromium	7440-47-3	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EG093A-F: Manganese	7439-96-5	0.5	µg/L	1.4	1.5	0.0	No Limit
		EG093A-F: Nickel	7440-02-0	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EG093A-F: Vanadium	7440-62-2	0.5	µg/L	1.3	0.8	50.6	No Limit
		EG093A-F: Barium	7440-39-3	1	µg/L	11	11	0.0	0% - 50%
		EG093A-F: Copper	7440-50-8	1	µg/L	<1	<1	0.0	No Limit
		EG093A-F: Aluminium	7429-90-5	10	µg/L	30	30	0.0	No Limit
ES0912210-006	G-WQ-10	EG093A-F: Beryllium	7440-41-7	0.1	µg/L	<0.1	<0.1	0.0	No Limit
		EG093A-F: Silver	7440-22-4	0.1	µg/L	<0.1	<0.1	0.0	No Limit
		EG093A-F: Cadmium	7440-43-9	0.2	µg/L	<0.2	<0.2	0.0	No Limit
		EG093A-F: Cobalt	7440-48-4	0.2	µg/L	<0.2	<0.2	0.0	No Limit
		EG093A-F: Lead	7439-92-1	0.2	µg/L	<0.2	<0.2	0.0	No Limit
		EG093A-F: Antimony	7440-36-0	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EG093A-F: Arsenic	7440-38-2	0.5	µg/L	1.1	0.9	17.8	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS (QC Lot: 1077326) - continued									
ES0912210-006	G-WQ-10	EG093A-F: Chromium	7440-47-3	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EG093A-F: Manganese	7439-96-5	0.5	µg/L	8.2	8.3	2.1	0% - 50%
		EG093A-F: Nickel	7440-02-0	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EG093A-F: Vanadium	7440-62-2	0.5	µg/L	0.6	0.6	0.0	No Limit
		EG093A-F: Barium	7440-39-3	1	µg/L	8	8	0.0	No Limit
		EG093A-F: Copper	7440-50-8	1	µg/L	<1	<1	0.0	No Limit
		EG093A-F: Aluminium	7429-90-5	10	µg/L	<10	<10	0.0	No Limit
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS (QC Lot: 1077327)									
EM0907702-001	Anonymous	EG093B-F: Iron	7439-89-6	5	µg/L	<5	<5	0.0	No Limit
ES0912210-006	G-WQ-10	EG093B-F: Iron	7439-89-6	5	µg/L	<5	<5	0.0	No Limit
EP215: Multiresidue Pesticide Residue Screen (Suite 2) (QC Lot: 1077505)									
ES0912396-002	Anonymous	EP215-LL: Malathion	121-75-5	0.002	µg/L	<0.002	<0.002	0.0	No Limit
		EP215-LL: Simazine	122-34-9	0.005	µg/L	<0.005	<0.005	0.0	No Limit
		EP215-LL: Diuron	330-54-1	0.005	µg/L	<0.005	<0.005	0.0	No Limit
		EP215-LL: Atrazine	1912-24-9	0.005	µg/L	<0.005	<0.005	0.0	No Limit
		EP215-LL: Molinate	2212-67-1	0.005	µg/L	<0.005	<0.005	0.0	No Limit
		EP215-LL: Metolachlor	51218-45-2	0.005	µg/L	<0.005	<0.005	0.0	No Limit
		EP215-LL: Diazinon	333-41-5	0.005	µg/L	<0.005	<0.005	0.0	No Limit
		EP215-LL: Thiobencarb	28249-77-6	0.005	µg/L	<0.005	<0.005	0.0	No Limit
		EP215-LL: Chlorpyrifos	2921-88-2	0.005	µg/L	<0.005	<0.005	0.0	No Limit
		EP215-LL: Trifluralin	1582-09-8	0.005	µg/L	<0.005	<0.005	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 1072152)									
ES0912210-005	G-WQ-09	EK257A-SW: Nitrite as N	----	0.002	mg/L	<0.002	<0.002	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 1072153)									
ES0912210-005	G-WQ-09	EK255A-SW: Ammonia as N	7664-41-7	0.005	mg/L	<0.005	<0.005	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 1072154)									
ES0912210-005	G-WQ-09	EK259A-SW: Nitrite + Nitrate as N	----	0.002	mg/L	0.003	0.003	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 1072155)									
ES0912210-005	G-WQ-09	EK271A-SW: Reactive Phosphorus as P	----	0.001	mg/L	<0.001	<0.001	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 1072694)									
ES0912210-001	G-WQ-01	EK262PA-SW: Total Nitrogen as N	----	0.05	mg/L	0.06	<0.05	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 1072695)									
ES0912210-001	G-WQ-01	EK267PA-SW: Total Phosphorus as P	----	0.005	mg/L	0.010	0.010	0.0	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*		*LCS*	*Low*	*High*
EA010P: Conductivity by PC Titrator (QCLot: 1073141)								
EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	2000 µS/cm	99.7	86.3	112
EA015: Total Dissolved Solids (QCLot: 1075531)								
EA015: Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	<1	293 mg/L	101	77.9	122
EA025: Suspended Solids (QCLot: 1073707)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	103	30	150
EG035F: Dissolved Mercury by FIMS (QCLot: 1072146)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.010 mg/L	105	86	116
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS (QCLot: 1077326)								
EG093A-F: Aluminium	7429-90-5	10	µg/L	<10	50 µg/L	116	80	128
EG093A-F: Antimony	7440-36-0	0.5	µg/L	<0.5	----	----	----	----
EG093A-F: Arsenic	7440-38-2	0.5	µg/L	<0.5	10 µg/L	86.0	85	125
EG093A-F: Barium	7440-39-3	1	µg/L	<1	10 µg/L	86.3	81	129
EG093A-F: Beryllium	7440-41-7	0.1	µg/L	<0.1	10 µg/L	84.0	80	122
EG093A-F: Cadmium	7440-43-9	0.2	µg/L	<0.2	10 µg/L	79.4	78	116
EG093A-F: Chromium	7440-47-3	0.5	µg/L	<0.5	10 µg/L	# 85.9	86	128
EG093A-F: Cobalt	7440-48-4	0.2	µg/L	<0.2	10 µg/L	# 84.4	87	127
EG093A-F: Copper	7440-50-8	1	µg/L	<1	10 µg/L	# 83.4	86	124
EG093A-F: Lead	7439-92-1	0.2	µg/L	<0.2	10 µg/L	# 82.7	87	123
EG093A-F: Manganese	7439-96-5	0.5	µg/L	<0.5	10 µg/L	# 87.6	90	122
EG093A-F: Nickel	7440-02-0	0.5	µg/L	<0.5	10 µg/L	# 82.4	84	124
EG093A-F: Silver	7440-22-4	0.1	µg/L	<0.1	----	----	----	----
EG093A-F: Vanadium	7440-62-2	0.5	µg/L	<0.5	10 µg/L	# 81.3	85	123
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS (QCLot: 1077327)								
EG093B-F: Iron	7439-89-6	5	µg/L	<5	50 µg/L	# 79.5	89	119
EP008: Chlorophyll a (QCLot: 1072297)								
EP008: Chlorophyll a	----	1	mg/m3	----	20 mg/m3	100	60.3	134
		1	mg/m³	<1	----	----	----	----
EP215: Multiresidue Pesticide Residue Screen (Suite 2) (QCLot: 1077505)								
EP215-LL: Simazine	122-34-9	0.005	µg/L	<0.005	0.0125 µg/L	92.4	65	130
EP215-LL: Diuron	330-54-1	0.005	µg/L	<0.005	0.0125 µg/L	91.8	65	130
EP215-LL: Atrazine	1912-24-9	0.005	µg/L	<0.005	0.0125 µg/L	87.2	65	130
EP215-LL: Molinate	2212-67-1	0.005	µg/L	<0.005	0.0125 µg/L	76.7	65	130
EP215-LL: Metolachlor	51218-45-2	0.005	µg/L	<0.005	0.0125 µg/L	75.2	65	130

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EP215: Multiresidue Pesticide Residue Screen (Suite 2) (QCLot: 1077505) - continued								
EP215-LL: Malathion	121-75-5	0.002	µg/L	<0.002	0.0125 µg/L	73.9	65	130
EP215-LL: Diazinon	333-41-5	0.005	µg/L	<0.005	0.0125 µg/L	72.2	65	130
EP215-LL: Thiobencarb	28249-77-6	0.005	µg/L	<0.005	0.0125 µg/L	86.5	65	130
EP215-LL: Chlorpyrifos	2921-88-2	0.005	µg/L	<0.005	0.0125 µg/L	75.1	65	130
EP215-LL: Trifluralin	1582-09-8	0.005	µg/L	<0.005	0.0125 µg/L	82.9	65	130
Ultra-Trace Nutrients (QCLot: 1072152)								
EK257A-SW: Nitrite as N	----	0.002	mg/L	<0.002	1.0 mg/L	94.3	70	130
Ultra-Trace Nutrients (QCLot: 1072153)								
EK255A-SW: Ammonia as N	7664-41-7	0.005	mg/L	<0.005	0.1 mg/L	104	74	118
Ultra-Trace Nutrients (QCLot: 1072154)								
EK259A-SW: Nitrite + Nitrate as N	----	0.002	mg/L	<0.002	0.1 mg/L	113	76	130
Ultra-Trace Nutrients (QCLot: 1072155)								
EK271A-SW: Reactive Phosphorus as P	----	0.001	mg/L	<0.001	0.1 mg/L	99.2	70	121
Ultra-Trace Nutrients (QCLot: 1072694)								
EK262PA-SW: Total Nitrogen as N	----	0.05	mg/L	<0.05	1.0 mg/L	89.1	70	110
Ultra-Trace Nutrients (QCLot: 1072695)								
EK267PA-SW: Total Phosphorus as P	----	0.005	mg/L	<0.005	0.44 mg/L	106	72	122

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	Spike Recovery (%)	Recovery Limits (%)	
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	Concentration	MS	Low	High
EG035F: Dissolved Mercury by FIMS (QCLot: 1072146)							
ES0912210-001	G-WQ-01	EG035F: Mercury	7439-97-6	0.0100 mg/L	92.4	70	130
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS (QCLot: 1077326)							
EB0912789-002	Anonymous	EG093A-F: Arsenic	7440-38-2	50 µg/L	93.9	70	130
		EG093A-F: Barium	7440-39-3	50 µg/L	77.4	70	130
		EG093A-F: Beryllium	7440-41-7	50 µg/L	91.8	70	130
		EG093A-F: Cadmium	7440-43-9	12.5 µg/L	92.8	70	130
		EG093A-F: Chromium	7440-47-3	50 µg/L	98.6	70	130
		EG093A-F: Cobalt	7440-48-4	50 µg/L	98.0	70	130
		EG093A-F: Copper	7440-50-8	50 µg/L	92.9	70	130
		EG093A-F: Lead	7439-92-1	50 µg/L	92.1	70	130
		EG093A-F: Manganese	7439-96-5	50 µg/L	# Not Determined	70	130
		EG093A-F: Nickel	7440-02-0	50 µg/L	98.8	70	130
		EG093A-F: Vanadium	7440-62-2	50 µg/L	93.6	70	130
EP215: Multiresidue Pesticide Residue Screen (Suite 2) (QCLot: 1077505)							
ES0912210-003	G-WQ-05	EP215-LL: Simazine	122-34-9	0.0125 µg/L	83.9	65	130
		EP215-LL: Diuron	330-54-1	0.0125 µg/L	108	65	130
		EP215-LL: Atrazine	1912-24-9	0.0125 µg/L	93.7	65	130
		EP215-LL: Molinate	2212-67-1	0.0125 µg/L	75.8	65	130
		EP215-LL: Metolachlor	51218-45-2	0.0125 µg/L	108	65	130
		EP215-LL: Malathion	121-75-5	0.0125 µg/L	78.9	65	130
		EP215-LL: Diazinon	333-41-5	0.0125 µg/L	87.3	65	130
		EP215-LL: Thiobencarb	28249-77-6	0.0125 µg/L	72.7	65	130
		EP215-LL: Chlorpyrifos	2921-88-2	0.0125 µg/L	90.6	65	130
		EP215-LL: Trifluralin	1582-09-8	0.0125 µg/L	72.9	65	130
Ultra-Trace Nutrients (QCLot: 1072152)							
ES0912210-005	G-WQ-09	EK257A-SW: Nitrite as N	----	0.1 mg/L	77.3	70	130
Ultra-Trace Nutrients (QCLot: 1072153)							
ES0912210-005	G-WQ-09	EK255A-SW: Ammonia as N	7664-41-7	0.1 mg/L	# 65.8	70.	130
Ultra-Trace Nutrients (QCLot: 1072154)							
ES0912210-005	G-WQ-09	EK259A-SW: Nitrite + Nitrate as N	----	0.1 mg/L	73.5	70	130
Ultra-Trace Nutrients (QCLot: 1072155)							
ES0912210-005	G-WQ-09	EK271A-SW: Reactive Phosphorus as P	----	0.1 mg/L	70.7	70	130
Ultra-Trace Nutrients (QCLot: 1072694)							
ES0912210-001	G-WQ-01	EK262PA-SW: Total Nitrogen as N	----	0.5 mg/L	88.4	70	130

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	Spike Recovery (%)	Recovery Limits (%)	
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	Concentration	MS	Low	High
Ultra-Trace Nutrients (QCLot: 1072695)							
ES0912210-001	G-WQ-01	EK267PA-SW: Total Phosphorus as P	----	0.5 mg/L	102	70	130

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: **ES0912210**	Page	: 1 of 9
Client	: GHD SERVICES PTY LTD	Laboratory	: Environmental Division Sydney
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Project	: 4215386 41 WESTERN BASIN EIS WQ MONITORING	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 18-AUG-2009
Sampler	: ----	Issue Date	: 27-AUG-2009
Order number	: ----		
		No. of samples received	: 9
Quote number	: BN/314/09	No. of samples analysed	: 9

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Interpretive Quality Control Report contains the following information:

- Analysis Holding Time Compliance
- Quality Control Parameter Frequency Compliance
- Brief Method Summaries
- Summary of Outliers

Analysis Holding Time Compliance

The following report summarises extraction / preparation and analysis times and compares with recommended holding times. Dates reported represent first date of extraction or analysis and precludes subsequent dilutions and reruns. Information is also provided re the sample container (preservative) from which the analysis aliquot was taken. Elapsed period to analysis represents number of days from sampling where no extraction / digestion is involved or period from extraction / digestion where this is present. For composite samples, sampling date is assumed to be that of the oldest sample contributing to the composite. Sample date for laboratory produced leachates is assumed as the completion date of the leaching process. Outliers for holding time are based on USEPA SW 846, APHA, AS and NEPM (1999). A listing of breaches is provided in the Summary of Outliers.

Holding times for leachate methods (excluding elutriates) vary according to the analytes being determined on the resulting solution. For non-volatile analytes, the holding time compliance assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These soil holding times are: Organics (14 days); Mercury (28 days) & other metals (180 days). A recorded breach therefore does not guarantee a breach for all non-volatile parameters.

Matrix: **WATER**

Evaluation: ✗ = Holding time breach ; ✓ = Within holding time.

Method	***Sample Date***	*Extraction / Preparation*			*Analysis*		
***Container** / Client Sample ID(s)*		***Date extracted***	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*
EA005: pH							
Clear Plastic Bottle - Natural G-WQ-01, G-WQ-02, G-WQ-05, G-WQ-08, G-WQ-09, G-WQ-10, G-WQ-11, G-WQ-12, QA01	**17-AUG-2009**	**----**	----	----	**18-AUG-2009**	17-AUG-2009	✗
EA010P: Conductivity by PC Titrator							
Clear Plastic Bottle - Natural G-WQ-01, G-WQ-02, G-WQ-05, G-WQ-08, G-WQ-09, G-WQ-10, G-WQ-11, G-WQ-12, QA01	**17-AUG-2009**	**---**	---	----	**19-AUG-2009**	14-SEP-2009	✓
EA015: Total Dissolved Solids							
Clear Plastic Bottle - Natural G-WQ-01, G-WQ-02, G-WQ-05, G-WQ-08, G-WQ-09, G-WQ-10, G-WQ-11, G-WQ-12, QA01	**17-AUG-2009**	**----**	----	----	**21-AUG-2009**	24-AUG-2009	✓
EA025: Suspended Solids							
Clear Plastic Bottle - Natural G-WQ-01, G-WQ-02, G-WQ-05, G-WQ-08, G-WQ-09, G-WQ-10, G-WQ-11, G-WQ-12, QA01	**17-AUG-2009**	**----**	----	----	**19-AUG-2009**	24-AUG-2009	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method ***Container*** / *Client Sample ID(s)*	***Sample Date***	*Extraction / Preparation*			*Analysis*		
		Date extracted	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*
EG035F: Dissolved Mercury by FIMS							
Clear HDPE (U-T ORC) - UHP Nitric Acid; Filtered G-WQ-01, G-WQ-02, G-WQ-05, G-WQ-08, G-WQ-09, G-WQ-10, G-WQ-11, G-WQ-12, QA01	**17-AUG-2009**	**---**	---	----	**19-AUG-2009**	14-SEP-2009	✓
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS							
Clear HDPE (U-T ORC) - UHP Nitric Acid; Filtered G-WQ-01, G-WQ-02, G-WQ-05, G-WQ-08, G-WQ-09, G-WQ-10, G-WQ-11, G-WQ-12, QA01	**17-AUG-2009**	**24-AUG-2009**	13-FEB-2010	✓	**24-AUG-2009**	13-FEB-2010	✓
EP008: Chlorophyll a							
White Plastic Bottle - Unpreserved G-WQ-01, G-WQ-02, G-WQ-05, G-WQ-08, G-WQ-09, G-WQ-10, G-WQ-11, G-WQ-12, QA01	**17-AUG-2009**	**----**	----	----	**18-AUG-2009**	19-AUG-2009	✓
EP215: Multiresidue Pesticide Residue Screen (Suite 2)							
Amber Glass Bottle - Unpreserved G-WQ-01, G-WQ-02, G-WQ-05, G-WQ-08, G-WQ-09, G-WQ-10, G-WQ-11, G-WQ-12, QA01	**17-AUG-2009**	**19-AUG-2009**	24-AUG-2009	✓	**19-AUG-2009**	28-SEP-2009	✓
Ultra-Trace Nutrients							
Clear Plastic - Natural - for UT Nut. G-WQ-01, G-WQ-02, G-WQ-05, G-WQ-08, G-WQ-09, G-WQ-10, G-WQ-11, G-WQ-12, QA01	**17-AUG-2009**	**---**	---	----	**18-AUG-2009**	18-AUG-2009	✓
Clear Plastic Bottle - Natural G-WQ-01, G-WQ-02, G-WQ-05, G-WQ-08, G-WQ-09, G-WQ-10, G-WQ-11, G-WQ-12, QA01	**17-AUG-2009**	**18-AUG-2009**	18-AUG-2009	✓	**18-AUG-2009**	18-AUG-2009	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(where) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Ammonia as N - Ultra-Trace in Saline Waters	EK255A-SW	1	9	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Conductivity by PC Titrator	EA010-P	2	15	**13.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	1	9	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals in Saline Water -Suite A by ORC-ICPMS	EG093A-F	2	14	**14.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals in Saline Water -Suite B by ORC-ICPMS	EG093B-F	2	12	**16.7**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Multiresidue Pesticide Screen (No. 2)	EP215-LL	1	20	**5.0**	**10.0**	×	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N - Ultra-Trace in Saline Waters	EK259A-SW	1	9	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N - Ultra-Trace in Saline Waters	EK257A-SW	1	9	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
pH	EA005	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P - Ultra-Trace in Saline Water	EK271A-SW	1	9	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Suspended Solids (High Level)	EA025H	2	21	**9.5**	**9.5**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids	EA015	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Nitrogen/Persulfate Digestion/Ultra-Trace/Saline	EK262PA-SW	1	9	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus/Persulfate Digestion/ Ultra Trace /Saline	EK267PA-SW	1	9	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
Ammonia as N - Ultra-Trace in Saline Waters	EK255A-SW	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chlorophyll a	EP008	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Conductivity by PC Titrator	EA010-P	1	15	**6.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals in Saline Water -Suite A by ORC-ICPMS	EG093A-F	1	14	**7.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals in Saline Water -Suite B by ORC-ICPMS	EG093B-F	1	12	**8.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Multiresidue Pesticide Screen (No. 2)	EP215-LL	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N - Ultra-Trace in Saline Waters	EK259A-SW	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N - Ultra-Trace in Saline Waters	EK257A-SW	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P - Ultra-Trace in Saline Water	EK271A-SW	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Suspended Solids (High Level)	EA025H	1	21	**4.8**	**4.8**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids	EA015	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Nitrogen/Persulfate Digestion/Ultra-Trace/Saline	EK262PA-SW	1	9	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus/Persulfate Digestion/ Ultra Trace /Saline	EK267PA-SW	1	9	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
Ammonia as N - Ultra-Trace in Saline Waters	EK255A-SW	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chlorophyll a	EP008	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Conductivity by PC Titrator	EA010-P	1	15	**6.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals in Saline Water -Suite A by ORC-ICPMS	EG093A-F	1	14	**7.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type *Analytical Methods*	*Method*	*Count* *QC*	 *Regular*	*Rate (%)* ***Actual***	 ***Expected***	 *Evaluation*	*Quality Control Specification*
Method Blanks (MB) - Continued							
Dissolved Metals in Saline Water -Suite B by ORC-ICPMS	EG093B-F	1	12	**8.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Multiresidue Pesticide Screen (No. 2)	EP215-LL	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N - Ultra-Trace in Saline Waters	EK259A-SW	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N - Ultra-Trace in Saline Waters	EK257A-SW	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P - Ultra-Trace in Saline Water	EK271A-SW	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Suspended Solids (High Level)	EA025H	1	21	**4.8**	**4.8**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids	EA015	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Nitrogen/Persulfate Digestion/Ultra-Trace/Saline	EK262PA-SW	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus/Persulfate Digestion/ Ultra Trace /Saline	EK267PA-SW	1	9	**11.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							
Ammonia as N - Ultra-Trace in Saline Waters	EK255A-SW	1	9	**11.1**	**5.0**	✓	ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	1	9	**11.1**	**5.0**	✓	ALS QCS3 requirement
Dissolved Metals in Saline Water -Suite A by ORC-ICPMS	EG093A-F	1	14	**7.1**	**5.0**	✓	ALS QCS3 requirement
Multiresidue Pesticide Screen (No. 2)	EP215-LL	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement
Nitrite and Nitrate as N - Ultra-Trace in Saline Waters	EK259A-SW	1	9	**11.1**	**5.0**	✓	ALS QCS3 requirement
Nitrite as N - Ultra-Trace in Saline Waters	EK257A-SW	1	9	**11.1**	**5.0**	✓	ALS QCS3 requirement
Reactive Phosphorus as P - Ultra-Trace in Saline Water	EK271A-SW	1	9	**11.1**	**5.0**	✓	ALS QCS3 requirement
Total Nitrogen/Persulfate Digestion/Ultra-Trace/Saline	EK262PA-SW	1	9	**11.1**	**5.0**	✓	ALS QCS3 requirement
Total Phosphorus/Persulfate Digestion/ Ultra Trace /Saline	EK267PA-SW	1	9	**11.1**	**5.0**	✓	ALS QCS3 requirement

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
pH	EA005	WATER	APHA 21st ed. 4500 H+ B. pH of water samples is determined by ISE either manually or by automated pH meter. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Conductivity by PC Titrator	EA010-P	WATER	APHA 21st ed., 2510 B This procedure determines conductivity by automated ISE. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Dissolved Solids	EA015	WATER	APHA 21st ed., 2540C A gravimetric procedure that determines the amount of `filterable` residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Suspended Solids (High Level)	EA025H	WATER	APHA 21st ed., 2540D A gravimetric procedure employed to determine the amount of `non-filterable` residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Dissolved Mercury by FIMS	EG035F	WATER	AS 3550, APHA 21st ed. 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) Samples are 0.45 um filtered prior to analysis. FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Dissolved Metals in Saline Water -Suite A by ORC-ICPMS	EG093A-F	WATER	APHA 21st ed., 3125; USEPA SW846 - 6020 Samples are 0.45 um filtered prior to analysis. The ORC-ICPMS technique removes interfering species through a series of chemical reactions prior to ion detection. Ions are passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to measurement by a discrete dynode ion detector. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Dissolved Metals in Saline Water -Suite B by ORC-ICPMS	EG093B-F	WATER	APHA 21st ed., 3125; USEPA SW846 - 6020 Samples are 0.45 um filtered prior to analysis. The ORC-ICPMS technique removes interfering species through a series of chemical reactions prior to ion detection. Ions are passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to measurement by a discrete dynode ion detector. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Ammonia as N - Ultra-Trace in Saline Waters	EK255A-SW	WATER	APHA 21st ed., 4500-NH3 H Ammonia is determined by direct colorimetry by FIA. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Nitrite as N - Ultra-Trace in Saline Waters	EK257A-SW	WATER	APHA 21st ed., 4500-NO2- B. Nitrite is determined by direct colourimetry by FIA.
Nitrate as N - Ultra-Trace in Saline Waters	EK258A-SW	WATER	APHA 21st ed., 4500-NO3- I Nitrate is reduced to nitrite by way of a cadmium reduction column followed by quantification by FIA. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results.
Nitrite and Nitrate as N - Ultra-Trace in Saline Waters	EK259A-SW	WATER	APHA 21st ed., 4500-NO3- I. Combined oxidised Nitrogen (NO2+NO3) is determined by Cadmium Reduction and direct colourimetry by FIA.

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
TKN (Total N - NOx-N). (FIA - UT) in Saline Waters	EK261PA-SW	WATER	APHA 21st ed., 4500-P J. & 4500-NO3- I. Calculated by difference from total Nitrogen and NOx. Contributing method parameters are determined by FIA. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Nitrogen/Persulfate Digestion/Ultra-Trace/Saline	EK262PA-SW	WATER	APHA 21st ed., 4500-P J. Persulfate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus. As sample is digested with persulfate under alkaline conditions yielding orthophosphate and nitrate. Following digestion, analytes are determined by flow injection analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Phosphorus/Persulfate Digestion/ Ultra Trace /Saline	EK267PA-SW	WATER	APHA 21st ed., 4500-P J. Persulfate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus. As sample is digested with persulfate under alkaline conditions yielding orthophosphate and nitrate. Following digestion, analytes are determined by flow injection analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Reactive Phosphorus as P - Ultra-Trace in Saline Water	EK271A-SW	WATER	APHA 21st ed., 4500-P E Ammonium molybdate and potassium antimonyl tartrate reacts in acid medium with othophosphate to form a heteropoly acid -phosphomolybdic acid - which is reduced to intensely coloured molybdenum blue by ascorbic acid. Quantification is by FIA. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Chlorophyll a	EP008	WATER	In-house (APHA 21st ed., 10200 H mod.) The pigments are extracted into aqueous acetone. The optical density of the extract before and after acidification at both 664 nm and 665 nm is determined spectrometrically.
Multiresidue Pesticide Screen (No. 2)	EP215-LL	WATER	In-house, LCMS (APCI in positive mode). The compounds are extracted from water samples using dichloromethane. The organic phase is evaporated to dryness and reconstituted in a mixture of acetonitrile and water for reverse phase HPLC analysis.

Preparation Methods	*Method*	*Matrix*	*Method Descriptions*
Persulfate Digestion for UT TN and TP for FIA/Saline	EK262/267PA-SW	WATER	APHA 21st ed., 4500 P - J. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Separatory funnel extraction for LCMS herbicides.	* EP215-PR	WATER	In-house. A 1 L sample is extracted three times with 60 mL of methylene chloride, reduced to dryness and made up in HPLC mobile phase.

Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged in the Quality Control (QC) Report. Surrogate recovery limits are static and based on USEPA SW846 or ALS-QWI/EN/38 (in the absence of specific USEPA limits). This report displays QC Outliers (breaches) only.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	**Analyte**	CAS Number	Data	Limits	**Comment**
Laboratory Control Spike (LCS) Recoveries							
EG093F: Dissolved Metals in Saline Water by ORC-ICP	1239602-003	----	**Chromium**	7440-47-3	85.9 %	86-128%	**Recovery less than lower control limit**
EG093F: Dissolved Metals in Saline Water by ORC-ICP	1239602-003	----	**Cobalt**	7440-48-4	84.4 %	87-127%	**Recovery less than lower control limit**
EG093F: Dissolved Metals in Saline Water by ORC-ICP	1239602-003	----	**Copper**	7440-50-8	83.4 %	86-124%	**Recovery less than lower control limit**
EG093F: Dissolved Metals in Saline Water by ORC-ICP	1239602-003	----	**Lead**	7439-92-1	82.7 %	87-123%	**Recovery less than lower control limit**
EG093F: Dissolved Metals in Saline Water by ORC-ICP	1239602-003	----	**Manganese**	7439-96-5	87.6 %	90-122%	**Recovery less than lower control limit**
EG093F: Dissolved Metals in Saline Water by ORC-ICP	1239602-003	----	**Nickel**	7440-02-0	82.4 %	84-124%	**Recovery less than lower control limit**
EG093F: Dissolved Metals in Saline Water by ORC-ICP	1239602-003	----	**Vanadium**	7440-62-2	81.3 %	85-123%	**Recovery less than lower control limit**
EG093F: Dissolved Metals in Saline Water by ORC-ICP	1239602-003	----	**Iron**	7439-89-6	79.5 %	89-119%	**Recovery less than lower control limit**
Matrix Spike (MS) Recoveries							
EG093F: Dissolved Metals in Saline Water by ORC-ICP	EB0912789-002	Anonymous	**Manganese**	7439-96-5	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
Ultra-Trace Nutrients	ES0912210-005	G-WQ-09	**Ammonia as N**	7664-41-7	65.8 %	70.-130%	**Recovery less than lower data quality objective**

- **For all matrices, no Method Blank value outliers occur.**
- **For all matrices, no Duplicate outliers occur.**

Regular Sample Surrogates

- **For all regular sample matrices, no surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

This report displays Holding Time breaches only. Only the respective Extraction / Preparation and/or Analysis component is/are displayed.

Matrix: **WATER**

Method	*Extraction / Preparation*			*Analysis*		
Container / Client Sample ID(s)	*Date extracted*	*Due for extraction*	***Days overdue***	*Date analysed*	*Due for analysis*	***Days overdue***
EA005: pH						

Matrix: **WATER**

Method **Container** / Client Sample ID(s)	*Extraction / Preparation*			*Analysis*		
	Date extracted	*Due for extraction*	***Days overdue***	*Date analysed*	*Due for analysis*	***Days overdue***
EA005: pH - Analysis Holding Time Compliance						
Clear Plastic Bottle - Natural						
G-WQ-01, G-WQ-02, G-WQ-05, G-WQ-08, G-WQ-09, G-WQ-10, G-WQ-11, G-WQ-12, QA01	----	----	----	18-AUG-2009	17-AUG-2009	**1**

Outliers : Frequency of Quality Control Samples

The following report highlights breaches in the Frequency of Quality Control Samples.

Matrix: **WATER**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
Multiresidue Pesticide Screen (No. 2)	1	20	5.0	10.0	NEPM 1999 Schedule B(3) and ALS QCS3 requirement

GHD

Chain of Custody & Analysis Request

Page _1_ of _1_

Chain of Custody Number:

GHD

PROJECT ID:	4215386 41	**QUOTE:**	
PROJECT:	**Western Basin EIS WQ Monitoring**		
CLIENT:	GHD		
POSTAL ADDRESS:	PO Box 373, Gladstone 4680		
CONTACT:	Adrian White or Jason Fowler		
PHONE:	0412035667 or 0404357072	**FAX:**	07) 49726236
EMAIL:	Jason.K.Fowler@ghd.com.au, Adrian.A.White@ghd.com.au		
INVOICE:	Jason.K.Fowler@ghd.com.au, Adrian.A.White@ghd.com.au		
DATA NEEDED BY:			
REPORT FORMAT:			
EMAIL FORMAT:	ESDAT, EXCEL & PDF		

LABORATORY BATCH NO.:

FOR LAB USE ONLY

COOLER SEAL: Yes ...... No ...... Broken ...... Intact ......

COOLER TEMP: ...... deg.C

DESPATCHED TO:
ALS Environmental
277-289 Woodpark Road
Smithfield NSW 2164
02 8784 8555

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

Water samples from a marine environment (Background sampling)

(EMAIL ADDRESSES PROVIDED ABOVE)

ANALYSIS REQUIRED

SAMPLE ID	**MATRIX**	**DATE**	**DETECTION LIMIT**	**PRESERVATION**	**Ultra trace ORC - dissolved metals (EG093F) (Sb, As, Ba, Be, Cd, Co, Cr, Cu, Mn, Ni, Pb, V, Hg, Fe, Al, Ag)**	**Ultra trace nutrients (UTN - 04) (TP, RP, NH3, NO2, NO3, TKN, TN)**	**TSS (EA025)**	**Chlorophyll a (EP008)**	**pH (EA005)**	**TDS (EA015)**	**Electro Conductivity**	**Multi Residue Pesticides –EP-215LL (lowest DL)**	**SAMPLES FROM MARINE ENVIRONMENT**
G-WQ-04	Water	**18/08/2009**	LOR	As Required	X	X	X	X	X	X	X	X	**NOTE: Two glass amber bottle collected at G-WQ-07, for lab QA.**
G-WQ-06	Water	**18/08/2009**	LOR	As Required	X	X	X	X	X	X	X	X	[redacted]
G-WQ-07	Water	**18/08/2009**	LOR	As Required	X	X	X	X	X	X	X	X	

RELINQUISHED BY:
NAME : J Fowler DATE: 18/08/2009
OF: GHD Gladstone TIME: 1530

RECEIVED BY:
NAME : Frank DATE: 19/8/9
OF: ALS TIME: 9am

PLEASE EMAIL COMPLETED ANALYSIS REQUEST TO: Jason.K.Fowler@ghd.com.au, Adrian.A.White@ghd.com.au

*Container Type and Preservative Codes: P = Neutral Plastic; N = Nitric Acid Preserved; C = Sodium Hydroxide Preserved; J = Solvent Washed Acid Rinced Jar; S = Solvent Washed Acid Rinced Glass Bottle; VC = Hydrochloric Acid Preserved Vial; VS = Sulfuric Acid Preserved Vial; BS = Sulfuric Acid Preserved Glass Bottle; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; O = Other.

Environmental Division
Sydney
Work Order
ES0912327

Telephone : + 61-2-8784 8555

SAMPLE RECEIPT NOTIFICATION (SRN)

Comprehensive Report

Work Order : **ES0912327**

Client	: **GHD SERVICES PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR ADRIAN WHITE	Contact	: Charlie Pierce
Address	: G P O BOX 668 BRISBANE QLD, AUSTRALIA 4001	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: adrian.a.white@ghd.com.au	E-mail	: charlie.pierce@alsenviro.com
Telephone	: +61 07 3316 3000	Telephone	: +61-2-8784 8555
Facsimile	: +61 07 3316 3333	Facsimile	: +61-2-8784 8500
Project	: 4215386 41 ESTERN BASIN EIS WQ MONITORING	Page	: 1 of 3
Order number	: ----		
C-O-C number	: ----	Quote number	: EB2009GHDSER0401 (BN/314/09)
Site	: ----		
Sampler	: JF	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Dates

Date Samples Received	: 19-AUG-2009	Issue Date	: 21-AUG-2009 20:27
Client Requested Due Date	: 02-SEP-2009	Scheduled Reporting Date	: **02-SEP-2009**

Delivery Details

Mode of Delivery	: Carrier	Temperature	: 1.6'C - Ice present
No. of coolers/boxes	: 1 HARD	No. of samples received	: 3
Sercurity Seal	: Intact.	No. of samples analysed	: 3

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Requested Deliverables
- **Samples received in appropriately pretreated and preserved containers.**
- **Breaches in recommended extraction / analysis holding times may occur. Please contact ALS for further information (Nanthini Coilparampil).**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please direct any turn around / technical queries to the laboratory contact designated above.
- Please direct any queries related to sample condition / numbering / breakages to Nanthini Coilparampil
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (14 days), Solid (90 days) from date of completion of work order.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exist.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process neccessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
When date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for processing purposes. If the sampling time is displayed as 0:00 the information was not provided by client.

Matrix: **WATER**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	WATER - EA005: pH pH	WATER - EA010P Conductivity (PC)	WATER - EA015 Total Dissolved Solids	WATER - EA025H Suspended Solids (High Level)	WATER - EG035F Dissolved Mercury by FIMS	WATER - EG093A-F Dissolved metals in saline water by ORC-ICPMS	WATER - EG093B-F Dissolved Metals in Saline Water Suite B by ORC-ICPMS	WATER - EP008 Chlorophyll a
ES0912327-001	18-AUG-2009 15:00	G-WQ-04	✓	✓	✓	✓	✓	✓	✓	✓
ES0912327-002	18-AUG-2009 15:00	G-WQ-06	✓	✓	✓	✓	✓	✓	✓	✓
ES0912327-003	18-AUG-2009 15:00	G-WQ-07	✓	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	WATER - EP215LL Multiresidue Pesticide Screen (Suite 2) - Low Level	WATER - UTN-4 SW Ultratrace NO2, NO3, NH3, Nitrogen, Phosphorus, TKN, Reactive Phosphorus
ES0912327-001	18-AUG-2009 15:00	G-WQ-04	✓	✓
ES0912327-002	18-AUG-2009 15:00	G-WQ-06	✓	✓
ES0912327-003	18-AUG-2009 15:00	G-WQ-07	✓	✓

Requested Deliverables

MR ADRIAN WHITE

- *AU Certificate of Analysis - NATA (COA)	Email	adrian.a.white@ghd.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	adrian.a.white@ghd.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	adrian.a.white@ghd.com.au
- A4 - AU Sample Receipt Notification - Environmental (SRN)	Email	adrian.a.white@ghd.com.au
- A4 - AU Tax Invoice (INV)	Email	adrian.a.white@ghd.com.au
- Default - Chain of Custody (COC)	Email	adrian.a.white@ghd.com.au
- EDI Format - ENMRG (ENMRG)	Email	adrian.a.white@ghd.com.au
- EDI Format - ESDAT (ESDAT)	Email	adrian.a.white@ghd.com.au

MR JASON FOWLER

- *AU Certificate of Analysis - NATA (COA)	Email	jason.k.fowler@ghd.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	jason.k.fowler@ghd.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	jason.k.fowler@ghd.com.au
- A4 - AU Sample Receipt Notification - Environmental (SRN)	Email	jason.k.fowler@ghd.com.au
- A4 - AU Tax Invoice (INV)	Email	jason.k.fowler@ghd.com.au
- Default - Chain of Custody (COC)	Email	jason.k.fowler@ghd.com.au
- EDI Format - ENMRG (ENMRG)	Email	jason.k.fowler@ghd.com.au
- EDI Format - ESDAT (ESDAT)	Email	jason.k.fowler@ghd.com.au

CERTIFICATE OF ANALYSIS

Work Order	: **ES0912327**	Page	: 1 of 4
Client	: **GHD SERVICES PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR ADRIAN WHITE	Contact	: Charlie Pierce
Address	: P O BOX 373 GLADSTONE QLD, AUSTRALIA 4680	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: adrian.a.white@ghd.com.au	E-mail	: charlie.pierce@alsenviro.com
Telephone	: +61 07 4972 6377	Telephone	: +61-2-8784 8555
Facsimile	: +61 07 4972 6236	Facsimile	: +61-2-8784 8500
Project	: 4215386 41 WESTERN BASIN EIS WQ MONITORING	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 19-AUG-2009
Sampler	: JF	Issue Date	: 31-AUG-2009
Site	: ----		
		No. of samples received	: 3
Quote number	: BN/314/09	No. of samples analysed	: 3

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

NATA Accredited Laboratory 825

This document is issued in accordance with NATA accreditation requirements.

Accredited for compliance with ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Hoa Nguyen	Inorganic Chemist	Inorganics
Lana Nguyen	LCMS Chemist	Organics
Wisam Abou-Maraseh	Spectroscopist	Inorganics

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insuffient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for processing purposes. If the sampling time is displayed as 0:00 the information was not provided by client.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting

- **EK267PA- It has been noted that RP is greater than TP , however this difference is within the limits of experimental variation.**

Analytical Results

Sub-Matrix: **MARINE WATER**

			Client sample ID	**G-WQ-04**	**G-WQ-06**	**G-WQ-07**	----	----
			Client sampling date / time	18-AUG-2009 15:00	18-AUG-2009 15:00	18-AUG-2009 15:00	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**ES0912327-001**	**ES0912327-002**	**ES0912327-003**	**----**	**----**
EA005: pH								
pH Value	----	0.01	pH Unit	**7.95**	**7.89**	**7.88**	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**51000**	**51800**	**51500**	----	----
EA015: Total Dissolved Solids								
^ Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	**42600**	**41900**	**43100**	----	----
EA025: Suspended Solids								
^ Suspended Solids (SS)	----	5	mg/L	**65**	**37**	**47**	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	----	----
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS								
Aluminium	7429-90-5	10	µg/L	**60**	**70**	**210**	----	----
Antimony	7440-36-0	0.5	µg/L	<0.5	<0.5	<0.5	----	----
Iron	7439-89-6	5	µg/L	<5	<5	<5	----	----
Arsenic	7440-38-2	0.5	µg/L	**1.5**	**1.2**	**1.0**	----	----
Barium	7440-39-3	1	µg/L	**5**	**8**	**8**	----	----
Beryllium	7440-41-7	0.1	µg/L	<0.1	<0.1	<0.1	----	----
Cadmium	7440-43-9	0.2	µg/L	<0.2	<0.2	<0.2	----	----
Chromium	7440-47-3	0.5	µg/L	<0.5	<0.5	<0.5	----	----
Cobalt	7440-48-4	0.2	µg/L	<0.2	<0.2	<0.2	----	----
Copper	7440-50-8	1	µg/L	<1	<1	<1	----	----
Lead	7439-92-1	0.2	µg/L	<0.2	<0.2	<0.2	----	----
Manganese	7439-96-5	0.5	µg/L	**1.5**	**2.1**	**2.9**	----	----
Nickel	7440-02-0	0.5	µg/L	**0.8**	**0.6**	<0.5	----	----
Silver	7440-22-4	0.1	µg/L	<0.1	<0.1	<0.1	----	----
Vanadium	7440-62-2	0.5	µg/L	**2.4**	**1.0**	**0.8**	----	----
EP008: Chlorophyll a								
Chlorophyll a	----	1	mg/m3	<1	**1**	<1	----	----
EP215: Multiresidue Pesticide Residue Screen (Suite 2)								
Simazine	122-34-9	0.005	µg/L	<0.005	<0.005	<0.005	----	----
Diuron	330-54-1	0.005	µg/L	<0.005	<0.005	<0.005	----	----
Atrazine	1912-24-9	0.005	µg/L	<0.005	<0.005	<0.005	----	----
Molinate	2212-67-1	0.005	µg/L	<0.005	<0.005	<0.005	----	----
Metolachlor	51218-45-2	0.005	µg/L	<0.005	<0.005	<0.005	----	----
Malathion	121-75-5	0.002	µg/L	<0.002	<0.002	<0.002	----	----
Diazinon	333-41-5	0.005	µg/L	<0.005	<0.005	<0.005	----	----
Thiobencarb	28249-77-6	0.005	µg/L	<0.005	<0.005	<0.005	----	----
Chlorpyrifos	2921-88-2	0.005	µg/L	<0.005	<0.005	<0.005	----	----

Analytical Results

Sub-Matrix: **MARINE WATER**			Client sample ID	**G-WQ-04**	**G-WQ-06**	**G-WQ-07**	----	----
			Client sampling date / time	18-AUG-2009 15:00	18-AUG-2009 15:00	18-AUG-2009 15:00	----	----
Compound	CAS Number	LOR	Unit	**ES0912327-001**	**ES0912327-002**	**ES0912327-003**	**----**	**----**
EP215: Multiresidue Pesticide Residue Screen (Suite 2) - Continued								
Trifluralin	1582-09-8	0.005	µg/L	<0.005	<0.005	<0.005	----	----
Ultra-Trace Nutrients								
Ammonia as N	7664-41-7	0.005	mg/L	<0.005	**0.019**	**0.013**	----	----
Nitrite as N	----	0.002	mg/L	<0.002	<0.002	<0.002	----	----
^ Nitrate as N	14797-55-8	0.002	mg/L	<0.002	<0.002	<0.002	----	----
Nitrite + Nitrate as N	----	0.002	mg/L	<0.002	<0.002	<0.002	----	----
^ Total Kjeldahl Nitrogen as N	----	0.05	mg/L	**0.09**	**0.14**	**0.13**	----	----
Total Nitrogen as N	----	0.05	mg/L	**0.09**	**0.14**	**0.13**	----	----
Reactive Phosphorus as P	----	0.001	mg/L	**0.002**	**0.008**	**0.006**	----	----
Total Phosphorus as P	----	0.005	mg/L	<0.005	**0.005**	**0.006**	----	----

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

QUALITY CONTROL REPORT

Work Order	: **ES0912327**	Page	: 1 of 9
Client	: **GHD SERVICES PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR ADRIAN WHITE	Contact	: Charlie Pierce
Address	: P O BOX 373 GLADSTONE QLD, AUSTRALIA 4680	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: adrian.a.white@ghd.com.au	E-mail	: charlie.pierce@alsenviro.com
Telephone	: +61 07 4972 6377	Telephone	: +61-2-8784 8555
Facsimile	: +61 07 4972 6236	Facsimile	: +61-2-8784 8500
Project	: 4215386 41 WESTERN BASIN EIS WQ MONITORING	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 19-AUG-2009
Sampler	: JF	Issue Date	: 31-AUG-2009
Order number	: ----		
		No. of samples received	: 3
Quote number	: BN/314/09	No. of samples analysed	: 3

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

NATA
WORLD RECOGNISED
ACCREDITATION

NATA Accredited Laboratory 825

This document is issued in accordance with NATA accreditation requirements.

Accredited for compliance with ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Hoa Nguyen	Inorganic Chemist	Inorganics
Lana Nguyen	LCMS Chemist	Organics
Wisam Abou-Maraseh	Spectroscopist	Inorganics

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insuffient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key :
Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR:- No Limit; Result between 10 and 20 times LOR:- 0% - 50%; Result > 20 times LOR:- 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA005: pH (QC Lot: 1076637)									
ES0912327-001	G-WQ-04	EA005: pH Value	----	0.01	pH Unit	7.95	7.96	0.1	0% - 20%
ES0912552-001	Anonymous	EA005: pH Value	----	0.01	pH Unit	7.83	7.84	0.1	0% - 20%
EA010P: Conductivity by PC Titrator (QC Lot: 1078424)									
ES0912327-001	G-WQ-04	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	51000	51100	0.2	0% - 20%
ES0912366-012	Anonymous	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	1320	1320	0.3	0% - 20%
EA015: Total Dissolved Solids (QC Lot: 1077349)									
ES0912184-001	Anonymous	EA015: Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	2260	2250	0.5	0% - 20%
ES0912327-002	G-WQ-06	EA015: Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	41900	45400	7.9	0% - 20%
EA025: Suspended Solids (QC Lot: 1079091)									
ES0912327-001	G-WQ-04	EA025H: Suspended Solids (SS)	----	5	mg/L	65	64	1.6	0% - 50%
ES0912397-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	53	61	14.0	0% - 50%
EG035F: Dissolved Mercury by FIMS (QC Lot: 1080533)									
ES0912327-003	G-WQ-07	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
ES0912525-001	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS (QC Lot: 1080208)									
ES0912327-001	G-WQ-04	EG093A-F: Beryllium	7440-41-7	0.1	µg/L	<0.1	<0.1	0.0	No Limit
		EG093A-F: Silver	7440-22-4	0.1	µg/L	<0.1	<0.1	0.0	No Limit
		EG093A-F: Cadmium	7440-43-9	0.2	µg/L	<0.2	<0.2	0.0	No Limit
		EG093A-F: Cobalt	7440-48-4	0.2	µg/L	<0.2	<0.2	0.0	No Limit
		EG093A-F: Lead	7439-92-1	0.2	µg/L	<0.2	<0.2	0.0	No Limit
		EG093A-F: Antimony	7440-36-0	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EG093A-F: Arsenic	7440-38-2	0.5	µg/L	1.5	1.3	17.2	No Limit
		EG093A-F: Chromium	7440-47-3	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EG093A-F: Manganese	7439-96-5	0.5	µg/L	1.5	1.4	7.2	No Limit
		EG093A-F: Nickel	7440-02-0	0.5	µg/L	0.8	<0.5	44.6	No Limit
		EG093A-F: Vanadium	7440-62-2	0.5	µg/L	2.4	1.3	56.8	No Limit
		EG093A-F: Barium	7440-39-3	1	µg/L	5	5	0.0	No Limit
		EG093A-F: Copper	7440-50-8	1	µg/L	<1	<1	0.0	No Limit
		EG093A-F: Aluminium	7429-90-5	10	µg/L	60	70	0.0	No Limit
ES0912340-008	Anonymous	EG093A-F: Beryllium	7440-41-7	0.1	µg/L	<0.1	<0.1	0.0	No Limit
		EG093A-F: Silver	7440-22-4	0.1	µg/L	<0.1	0.1	0.0	No Limit
		EG093A-F: Cadmium	7440-43-9	0.2	µg/L	<0.2	0.2	0.0	No Limit
		EG093A-F: Cobalt	7440-48-4	0.2	µg/L	7.0	7.6	8.7	0% - 20%
		EG093A-F: Lead	7439-92-1	0.2	µg/L	<0.2	<0.2	0.0	No Limit
		EG093A-F: Antimony	7440-36-0	0.5	µg/L	4.8	5.0	3.7	0% - 50%

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS (QC Lot: 1080208) - continued									
ES0912340-008	Anonymous	EG093A-F: Arsenic	7440-38-2	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EG093A-F: Chromium	7440-47-3	0.5	µg/L	0.8	0.8	0.0	No Limit
		EG093A-F: Manganese	7439-96-5	0.5	µg/L	309	322	4.1	0% - 20%
		EG093A-F: Nickel	7440-02-0	0.5	µg/L	23.4	24.5	4.8	0% - 20%
		EG093A-F: Vanadium	7440-62-2	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EG093A-F: Barium	7440-39-3	1	µg/L	271	291	7.1	0% - 20%
		EG093A-F: Copper	7440-50-8	1	µg/L	17	18	0.0	0% - 50%
		EG093A-F: Aluminium	7429-90-5	10	µg/L	20	20	0.0	No Limit
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS (QC Lot: 1080209)									
ES0912327-001	G-WQ-04	EG093B-F: Iron	7439-89-6	5	µg/L	<5	5	0.0	No Limit
EP215: Multiresidue Pesticide Residue Screen (Suite 2) (QC Lot: 1077505)									
ES0912396-002	Anonymous	EP215-LL: Malathion	121-75-5	0.002	µg/L	<0.002	<0.002	0.0	No Limit
		EP215-LL: Simazine	122-34-9	0.005	µg/L	<0.005	<0.005	0.0	No Limit
		EP215-LL: Diuron	330-54-1	0.005	µg/L	<0.005	<0.005	0.0	No Limit
		EP215-LL: Atrazine	1912-24-9	0.005	µg/L	<0.005	<0.005	0.0	No Limit
		EP215-LL: Molinate	2212-67-1	0.005	µg/L	<0.005	<0.005	0.0	No Limit
		EP215-LL: Metolachlor	51218-45-2	0.005	µg/L	<0.005	<0.005	0.0	No Limit
		EP215-LL: Diazinon	333-41-5	0.005	µg/L	<0.005	<0.005	0.0	No Limit
		EP215-LL: Thiobencarb	28249-77-6	0.005	µg/L	<0.005	<0.005	0.0	No Limit
		EP215-LL: Chlorpyrifos	2921-88-2	0.005	µg/L	<0.005	<0.005	0.0	No Limit
		EP215-LL: Trifluralin	1582-09-8	0.005	µg/L	<0.005	<0.005	0.0	No Limit
EP215: Multiresidue Pesticide Residue Screen (Suite 2) (QC Lot: 1077549)									
ES0912327-003	G-WQ-07	EP215-LL: Malathion	121-75-5	0.002	µg/L	<0.002	<0.002	0.0	No Limit
		EP215-LL: Simazine	122-34-9	0.005	µg/L	<0.005	<0.005	0.0	No Limit
		EP215-LL: Diuron	330-54-1	0.005	µg/L	<0.005	<0.005	0.0	No Limit
		EP215-LL: Atrazine	1912-24-9	0.005	µg/L	<0.005	<0.005	0.0	No Limit
		EP215-LL: Molinate	2212-67-1	0.005	µg/L	<0.005	<0.005	0.0	No Limit
		EP215-LL: Metolachlor	51218-45-2	0.005	µg/L	<0.005	<0.005	0.0	No Limit
		EP215-LL: Diazinon	333-41-5	0.005	µg/L	<0.005	<0.005	0.0	No Limit
		EP215-LL: Thiobencarb	28249-77-6	0.005	µg/L	<0.005	<0.005	0.0	No Limit
		EP215-LL: Chlorpyrifos	2921-88-2	0.005	µg/L	<0.005	<0.005	0.0	No Limit
		EP215-LL: Trifluralin	1582-09-8	0.005	µg/L	<0.005	<0.005	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 1076579)									
ES0912327-001	G-WQ-04	EK257A-SW: Nitrite as N	----	0.002	mg/L	<0.002	<0.002	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 1076580)									
ES0912327-001	G-WQ-04	EK255A-SW: Ammonia as N	7664-41-7	0.005	mg/L	<0.005	0.009	58.2	No Limit
Ultra-Trace Nutrients (QC Lot: 1076581)									
ES0912327-001	G-WQ-04	EK259A-SW: Nitrite + Nitrate as N	----	0.002	mg/L	<0.002	<0.002	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 1076582)									

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
Ultra-Trace Nutrients (QC Lot: 1076582) - continued									
ES0912327-001	G-WQ-04	EK271A-SW: Reactive Phosphorus as P	----	0.001	mg/L	0.002	0.002	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 1076644)									
ES0912327-001	G-WQ-04	EK262PA-SW: Total Nitrogen as N	----	0.05	mg/L	0.09	0.07	27.8	No Limit
Ultra-Trace Nutrients (QC Lot: 1076645)									
ES0912327-001	G-WQ-04	EK267PA-SW: Total Phosphorus as P	----	0.005	mg/L	<0.005	<0.005	0.0	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EA010P: Conductivity by PC Titrator (QCLot: 1078424)								
EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	2000 µS/cm	99.6	86.3	112
EA015: Total Dissolved Solids (QCLot: 1077349)								
EA015: Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	<1	293 mg/L	102	77.9	122
EA025: Suspended Solids (QCLot: 1079091)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	104	30	150
EG035F: Dissolved Mercury by FIMS (QCLot: 1080533)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.010 mg/L	99.9	86	116
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS (QCLot: 1080208)								
EG093A-F: Aluminium	7429-90-5	10	µg/L	<10	50 µg/L	128	80	128
EG093A-F: Antimony	7440-36-0	0.5	µg/L	<0.5	----	----	----	----
EG093A-F: Arsenic	7440-38-2	0.5	µg/L	<0.5	10 µg/L	95.9	85	125
EG093A-F: Barium	7440-39-3	1	µg/L	<1	10 µg/L	88.8	81	129
EG093A-F: Beryllium	7440-41-7	0.1	µg/L	<0.1	10 µg/L	89.0	80	122
EG093A-F: Cadmium	7440-43-9	0.2	µg/L	<0.2	10 µg/L	83.7	78	116
EG093A-F: Chromium	7440-47-3	0.5	µg/L	<0.5	10 µg/L	93.2	86	128
EG093A-F: Cobalt	7440-48-4	0.2	µg/L	<0.2	10 µg/L	96.0	87	127
EG093A-F: Copper	7440-50-8	1	µg/L	<1	10 µg/L	101	86	124
EG093A-F: Lead	7439-92-1	0.2	µg/L	<0.2	10 µg/L	93.6	87	123
EG093A-F: Manganese	7439-96-5	0.5	µg/L	<0.5	10 µg/L	90.6	90	122
EG093A-F: Nickel	7440-02-0	0.5	µg/L	<0.5	10 µg/L	91.3	84	124
EG093A-F: Silver	7440-22-4	0.1	µg/L	<0.1	----	----	----	----
EG093A-F: Vanadium	7440-62-2	0.5	µg/L	<0.5	10 µg/L	98.5	85	123
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS (QCLot: 1080209)								
EG093B-F: Iron	7439-89-6	5	µg/L	<5	50 µg/L	93.0	89	119
EP008: Chlorophyll a (QCLot: 1076632)								
EP008: Chlorophyll a	----	1	mg/m3	----	20 mg/m3	100	60.3	134
		1	mg/m³	<1	----	----	----	----
EP215: Multiresidue Pesticide Residue Screen (Suite 2) (QCLot: 1077505)								
EP215-LL: Simazine	122-34-9	0.005	µg/L	<0.005	0.0125 µg/L	92.4	65	130
EP215-LL: Diuron	330-54-1	0.005	µg/L	<0.005	0.0125 µg/L	91.8	65	130
EP215-LL: Atrazine	1912-24-9	0.005	µg/L	<0.005	0.0125 µg/L	87.2	65	130
EP215-LL: Molinate	2212-67-1	0.005	µg/L	<0.005	0.0125 µg/L	76.7	65	130
EP215-LL: Metolachlor	51218-45-2	0.005	µg/L	<0.005	0.0125 µg/L	75.2	65	130

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EP215: Multiresidue Pesticide Residue Screen (Suite 2) (QCLot: 1077505) - continued								
EP215-LL: Malathion	121-75-5	0.002	µg/L	<0.002	0.0125 µg/L	73.9	65	130
EP215-LL: Diazinon	333-41-5	0.005	µg/L	<0.005	0.0125 µg/L	72.2	65	130
EP215-LL: Thiobencarb	28249-77-6	0.005	µg/L	<0.005	0.0125 µg/L	86.5	65	130
EP215-LL: Chlorpyrifos	2921-88-2	0.005	µg/L	<0.005	0.0125 µg/L	75.1	65	130
EP215-LL: Trifluralin	1582-09-8	0.005	µg/L	<0.005	0.0125 µg/L	82.9	65	130
EP215: Multiresidue Pesticide Residue Screen (Suite 2) (QCLot: 1077549)								
EP215-LL: Simazine	122-34-9	0.005	µg/L	<0.005	0.0125 µg/L	122	65	130
EP215-LL: Diuron	330-54-1	0.005	µg/L	<0.005	0.0125 µg/L	73.3	65	130
EP215-LL: Atrazine	1912-24-9	0.005	µg/L	<0.005	0.0125 µg/L	80.3	65	130
EP215-LL: Molinate	2212-67-1	0.005	µg/L	<0.005	0.0125 µg/L	113	65	130
EP215-LL: Metolachlor	51218-45-2	0.005	µg/L	<0.005	0.0125 µg/L	75.3	65	130
EP215-LL: Malathion	121-75-5	0.002	µg/L	<0.002	0.0125 µg/L	88.5	65	130
EP215-LL: Diazinon	333-41-5	0.005	µg/L	<0.005	0.0125 µg/L	100	65	130
EP215-LL: Thiobencarb	28249-77-6	0.005	µg/L	<0.005	0.0125 µg/L	89.5	65	130
EP215-LL: Chlorpyrifos	2921-88-2	0.005	µg/L	<0.005	0.0125 µg/L	82.2	65	130
EP215-LL: Trifluralin	1582-09-8	0.005	µg/L	<0.005	0.0125 µg/L	73.0	65	130
Ultra-Trace Nutrients (QCLot: 1076579)								
EK257A-SW: Nitrite as N	----	0.002	mg/L	<0.002	1.0 mg/L	103	70	130
Ultra-Trace Nutrients (QCLot: 1076580)								
EK255A-SW: Ammonia as N	7664-41-7	0.005	mg/L	<0.005	0.1 mg/L	87.3	74	118
Ultra-Trace Nutrients (QCLot: 1076581)								
EK259A-SW: Nitrite + Nitrate as N	----	0.002	mg/L	<0.002	0.1 mg/L	105	76	130
Ultra-Trace Nutrients (QCLot: 1076582)								
EK271A-SW: Reactive Phosphorus as P	----	0.001	mg/L	<0.001	0.1 mg/L	114	70	121
Ultra-Trace Nutrients (QCLot: 1076644)								
EK262PA-SW: Total Nitrogen as N	----	0.05	mg/L	<0.05	1.0 mg/L	104	70	110
Ultra-Trace Nutrients (QCLot: 1076645)								
EK267PA-SW: Total Phosphorus as P	----	0.005	mg/L	<0.005	0.44 mg/L	101	72	122

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix**: WATER**

				Matrix Spike (MS) Report			
				Spike	*Spike Recovery (%)*	*Recovery Limits (%)*	
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EG035F: Dissolved Mercury by FIMS (QCLot: 1080533)							
ES0912327-003	G-WQ-07	EG035F: Mercury	7439-97-6	0.0100 mg/L	84.2	70	130
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS (QCLot: 1080208)							
ES0912327-001	G-WQ-04	EG093A-F: Arsenic	7440-38-2	50 µg/L	97.6	70	130
		EG093A-F: Barium	7440-39-3	50 µg/L	95.6	70	130
		EG093A-F: Beryllium	7440-41-7	50 µg/L	88.1	70	130
		EG093A-F: Cadmium	7440-43-9	12.5 µg/L	92.1	70	130
		EG093A-F: Chromium	7440-47-3	50 µg/L	105	70	130
		EG093A-F: Cobalt	7440-48-4	50 µg/L	102	70	130
		EG093A-F: Copper	7440-50-8	50 µg/L	114	70	130
		EG093A-F: Lead	7439-92-1	50 µg/L	88.3	70	130
		EG093A-F: Manganese	7439-96-5	50 µg/L	95.6	70	130
		EG093A-F: Nickel	7440-02-0	50 µg/L	90.2	70	130
		EG093A-F: Vanadium	7440-62-2	50 µg/L	101	70	130
EP215: Multiresidue Pesticide Residue Screen (Suite 2) (QCLot: 1077505)							
ES0912210-003	Anonymous	EP215-LL: Simazine	122-34-9	0.0125 µg/L	83.9	65	130
		EP215-LL: Diuron	330-54-1	0.0125 µg/L	108	65	130
		EP215-LL: Atrazine	1912-24-9	0.0125 µg/L	93.7	65	130
		EP215-LL: Molinate	2212-67-1	0.0125 µg/L	75.8	65	130
		EP215-LL: Metolachlor	51218-45-2	0.0125 µg/L	108	65	130
		EP215-LL: Malathion	121-75-5	0.0125 µg/L	78.9	65	130
		EP215-LL: Diazinon	333-41-5	0.0125 µg/L	87.3	65	130
		EP215-LL: Thiobencarb	28249-77-6	0.0125 µg/L	72.7	65	130
		EP215-LL: Chlorpyrifos	2921-88-2	0.0125 µg/L	90.6	65	130
		EP215-LL: Trifluralin	1582-09-8	0.0125 µg/L	72.9	65	130
Ultra-Trace Nutrients (QCLot: 1076579)							
ES0912327-001	G-WQ-04	EK257A-SW: Nitrite as N	----	0.1 mg/L	75.2	70	130
Ultra-Trace Nutrients (QCLot: 1076580)							
ES0912327-001	G-WQ-04	EK255A-SW: Ammonia as N	7664-41-7	0.1 mg/L	84.7	70.	130
Ultra-Trace Nutrients (QCLot: 1076581)							
ES0912327-001	G-WQ-04	EK259A-SW: Nitrite + Nitrate as N	----	0.1 mg/L	86.9	70	130
Ultra-Trace Nutrients (QCLot: 1076582)							
ES0912327-001	G-WQ-04	EK271A-SW: Reactive Phosphorus as P	----	0.1 mg/L	91.6	70	130
Ultra-Trace Nutrients (QCLot: 1076644)							
ES0912327-001	G-WQ-04	EK262PA-SW: Total Nitrogen as N	----	0.5 mg/L	101	70	130

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	Spike Recovery (%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
Ultra-Trace Nutrients (QCLot: 1076645)							
ES0912327-001	G-WQ-04	EK267PA-SW: Total Phosphorus as P	----	0.5 mg/L	89.4	70	130

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: **ES0912327**	Page	: 1 of 9
Client	: GHD SERVICES PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: MR ADRIAN WHITE	Contact	: Charlie Pierce
Address	: P O BOX 373 GLADSTONE QLD, AUSTRALIA 4680	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: adrian.a.white@ghd.com.au	E-mail	: charlie.pierce@alsenviro.com
Telephone	: +61 07 4972 6377	Telephone	: +61-2-8784 8555
Facsimile	: +61 07 4972 6236	Facsimile	: +61-2-8784 8500
Project	: 4215386 41 WESTERN BASIN EIS WQ MONITORING	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 19-AUG-2009
Sampler	: JF	Issue Date	: 31-AUG-2009
Order number	: ----		
		No. of samples received	: 3
Quote number	: BN/314/09	No. of samples analysed	: 3

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Interpretive Quality Control Report contains the following information:

- Analysis Holding Time Compliance
- Quality Control Parameter Frequency Compliance
- Brief Method Summaries
- Summary of Outliers

Analysis Holding Time Compliance

The following report summarises extraction / preparation and analysis times and compares with recommended holding times. Dates reported represent first date of extraction or analysis and precludes subsequent dilutions and reruns. Information is also provided re the sample container (preservative) from which the analysis aliquot was taken. Elapsed period to analysis represents number of days from sampling where no extraction / digestion is involved or period from extraction / digestion where this is present. For composite samples, sampling date is assumed to be that of the oldest sample contributing to the composite. Sample date for laboratory produced leachates is assumed as the completion date of the leaching process. Outliers for holding time are based on USEPA SW 846, APHA, AS and NEPM (1999). A listing of breaches is provided in the Summary of Outliers.

Holding times for leachate methods (excluding elutriates) vary according to the analytes being determined on the resulting solution. For non -volatile analytes, the holding time compliance assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These soil holding times are: Organics (14 days); Mercury (28 days) & other metals (180 days). A recorded breach therefore does not guarantee a breach for all non-volatile parameters.

Matrix: **WATER**

Evaluation: ✗ = Holding time breach ; ✓ = Within holding time.

Method	*Sample Date*	*Extraction / Preparation*			*Analysis*		
Container / Client Sample ID(s)		*Date extracted*	*Due for extraction*	*Evaluation*	*Date analysed*	*Due for analysis*	*Evaluation*
EA005: pH							
Clear Plastic Bottle - Natural G-WQ-04, G-WQ-06, G-WQ-07	**18-AUG-2009**	**----**	----	----	**21-AUG-2009**	18-AUG-2009	✗
EA010P: Conductivity by PC Titrator							
Clear Plastic Bottle - Natural G-WQ-04, G-WQ-06, G-WQ-07	**18-AUG-2009**	**---**	---	----	**25-AUG-2009**	15-SEP-2009	✓
EA015: Total Dissolved Solids							
Clear Plastic Bottle - Natural G-WQ-04, G-WQ-06, G-WQ-07	**18-AUG-2009**	**----**	----	----	**24-AUG-2009**	25-AUG-2009	✓
EA025: Suspended Solids							
Clear Plastic Bottle - Natural G-WQ-04, G-WQ-06, G-WQ-07	**18-AUG-2009**	**----**	----	----	**25-AUG-2009**	25-AUG-2009	✓
EG035F: Dissolved Mercury by FIMS							
Clear HDPE (U-T ORC) - Filtered; Lab-acidified G-WQ-04, G-WQ-06, G-WQ-07	**18-AUG-2009**	**---**	---	----	**27-AUG-2009**	15-SEP-2009	✓
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS							
Clear HDPE (U-T ORC) - Filtered; Lab-acidified G-WQ-04, G-WQ-06, G-WQ-07	**18-AUG-2009**	**26-AUG-2009**	14-FEB-2010	✓	**26-AUG-2009**	14-FEB-2010	✓
EP008: Chlorophyll a							
White Plastic Bottle - Unpreserved G-WQ-04, G-WQ-06, G-WQ-07	**18-AUG-2009**	**----**	----	----	**21-AUG-2009**	20-AUG-2009	✗

Matrix: **WATER**

Evaluation: ✗ = Holding time breach ; ✓ = Within holding time.

Method **Container** / Client Sample ID(s)		**Sample Date**	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	**Date analysed**	Due for analysis	Evaluation
EP215: Multiresidue Pesticide Residue Screen (Suite 2)								
Amber Glass Bottle - Unpreserved								
G-WQ-04, G-WQ-07	G-WQ-06,	**18-AUG-2009**	**24-AUG-2009**	25-AUG-2009	✓	**24-AUG-2009**	03-OCT-2009	✓
Ultra-Trace Nutrients								
Clear Plastic - Filtered (AS) - for UT Nut.								
G-WQ-04, G-WQ-07	G-WQ-06,	**18-AUG-2009**	**---**	---	----	**21-AUG-2009**	19-AUG-2009	✗
Clear Plastic Bottle - Natural (AS)								
G-WQ-04, G-WQ-07	G-WQ-06,	**18-AUG-2009**	**21-AUG-2009**	19-AUG-2009	✗	**21-AUG-2009**	19-AUG-2009	✗

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(where) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: ✗ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		*Count*		*Rate (%)*			*Quality Control Specification*
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Ammonia as N - Ultra-Trace in Saline Waters	EK255A-SW	1	3	**33.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Conductivity by PC Titrator	EA010-P	2	18	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	2	14	**14.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals in Saline Water -Suite A by ORC-ICPMS	EG093A-F	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals in Saline Water -Suite B by ORC-ICPMS	EG093B-F	1	3	**33.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Multiresidue Pesticide Screen (No. 2)	EP215-LL	2	22	**9.1**	**10.0**	✗	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N - Ultra-Trace in Saline Waters	EK259A-SW	1	3	**33.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N - Ultra-Trace in Saline Waters	EK257A-SW	1	3	**33.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
pH	EA005	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P - Ultra-Trace in Saline Water	EK271A-SW	1	3	**33.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Suspended Solids (High Level)	EA025H	2	19	**10.5**	**9.5**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids	EA015	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Nitrogen/Persulfate Digestion/Ultra-Trace/Saline	EK262PA-SW	1	3	**33.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus/Persulfate Digestion/ Ultra Trace /Saline	EK267PA-SW	1	3	**33.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
Ammonia as N - Ultra-Trace in Saline Waters	EK255A-SW	1	3	**33.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chlorophyll a	EP008	1	3	**33.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Conductivity by PC Titrator	EA010-P	1	18	**5.6**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	1	14	**7.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals in Saline Water -Suite A by ORC-ICPMS	EG093A-F	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals in Saline Water -Suite B by ORC-ICPMS	EG093B-F	1	3	**33.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Multiresidue Pesticide Screen (No. 2)	EP215-LL	2	22	**9.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N - Ultra-Trace in Saline Waters	EK259A-SW	1	3	**33.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N - Ultra-Trace in Saline Waters	EK257A-SW	1	3	**33.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P - Ultra-Trace in Saline Water	EK271A-SW	1	3	**33.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Suspended Solids (High Level)	EA025H	1	19	**5.3**	**4.8**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids	EA015	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Nitrogen/Persulfate Digestion/Ultra-Trace/Saline	EK262PA-SW	1	3	**33.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus/Persulfate Digestion/ Ultra Trace /Saline	EK267PA-SW	1	3	**33.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
Ammonia as N - Ultra-Trace in Saline Waters	EK255A-SW	1	3	**33.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chlorophyll a	EP008	1	3	**33.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Conductivity by PC Titrator	EA010-P	1	18	**5.6**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	1	14	**7.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals in Saline Water -Suite A by ORC-ICPMS	EG093A-F	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Method Blanks (MB) - Continued							
Dissolved Metals in Saline Water -Suite B by ORC-ICPMS	EG093B-F	1	3	**33.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Multiresidue Pesticide Screen (No. 2)	EP215-LL	2	22	**9.1**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N - Ultra-Trace in Saline Waters	EK259A-SW	1	3	**33.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N - Ultra-Trace in Saline Waters	EK257A-SW	1	3	**33.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P - Ultra-Trace in Saline Water	EK271A-SW	1	3	**33.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Suspended Solids (High Level)	EA025H	1	19	**5.3**	**4.8**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids	EA015	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Nitrogen/Persulfate Digestion/Ultra-Trace/Saline	EK262PA-SW	1	3	**33.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus/Persulfate Digestion/ Ultra Trace /Saline	EK267PA-SW	1	3	**33.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							
Ammonia as N - Ultra-Trace in Saline Waters	EK255A-SW	1	3	**33.3**	**5.0**	✓	ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	1	14	**7.1**	**5.0**	✓	ALS QCS3 requirement
Dissolved Metals in Saline Water -Suite A by ORC-ICPMS	EG093A-F	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement
Multiresidue Pesticide Screen (No. 2)	EP215-LL	1	20	**5.0**	**5.0**	✓	ALS QCS3 requirement
Nitrite and Nitrate as N - Ultra-Trace in Saline Waters	EK259A-SW	1	3	**33.3**	**5.0**	✓	ALS QCS3 requirement
Nitrite as N - Ultra-Trace in Saline Waters	EK257A-SW	1	3	**33.3**	**5.0**	✓	ALS QCS3 requirement
Reactive Phosphorus as P - Ultra-Trace in Saline Water	EK271A-SW	1	3	**33.3**	**5.0**	✓	ALS QCS3 requirement
Total Nitrogen/Persulfate Digestion/Ultra-Trace/Saline	EK262PA-SW	1	3	**33.3**	**5.0**	✓	ALS QCS3 requirement
Total Phosphorus/Persulfate Digestion/ Ultra Trace /Saline	EK267PA-SW	1	3	**33.3**	**5.0**	✓	ALS QCS3 requirement

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
pH	EA005	WATER	APHA 21st ed. 4500 H+ B. pH of water samples is determined by ISE either manually or by automated pH meter. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Conductivity by PC Titrator	EA010-P	WATER	APHA 21st ed., 2510 B This procedure determines conductivity by automated ISE. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Dissolved Solids	EA015	WATER	APHA 21st ed., 2540C A gravimetric procedure that determines the amount of \`filterable\` residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Suspended Solids (High Level)	EA025H	WATER	APHA 21st ed., 2540D A gravimetric procedure employed to determine the amount of \`non-filterable\` residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Dissolved Mercury by FIMS	EG035F	WATER	AS 3550, APHA 21st ed. 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) Samples are 0.45 um filtered prior to analysis. FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Dissolved Metals in Saline Water -Suite A by ORC-ICPMS	EG093A-F	WATER	APHA 21st ed., 3125; USEPA SW846 - 6020 Samples are 0.45 um filtered prior to analysis. The ORC-ICPMS technique removes interfering species through a series of chemical reactions prior to ion detection. Ions are passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to measurement by a discrete dynode ion detector. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Dissolved Metals in Saline Water -Suite B by ORC-ICPMS	EG093B-F	WATER	APHA 21st ed., 3125; USEPA SW846 - 6020 Samples are 0.45 um filtered prior to analysis. The ORC-ICPMS technique removes interfering species through a series of chemical reactions prior to ion detection. Ions are passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to measurement by a discrete dynode ion detector. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Ammonia as N - Ultra-Trace in Saline Waters	EK255A-SW	WATER	APHA 21st ed., 4500-NH3 H Ammonia is determined by direct colorimetry by FIA. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Nitrite as N - Ultra-Trace in Saline Waters	EK257A-SW	WATER	APHA 21st ed., 4500-NO2- B. Nitrite is determined by direct colourimetry by FIA.
Nitrate as N - Ultra-Trace in Saline Waters	EK258A-SW	WATER	APHA 21st ed., 4500-NO3- I Nitrate is reduced to nitrite by way of a cadmium reduction column followed by quantification by FIA. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results.
Nitrite and Nitrate as N - Ultra-Trace in Saline Waters	EK259A-SW	WATER	APHA 21st ed., 4500-NO3- I. Combined oxidised Nitrogen (NO2+NO3) is determined by Cadmium Reduction and direct colourimetry by FIA.

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
TKN (Total N - NOx-N). (FIA - UT) in Saline Waters	EK261PA-SW	WATER	APHA 21st ed., 4500-P J. & 4500-NO3- I. Calculated by difference from total Nitrogen and NOx. Contributing method parameters are determined by FIA. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Nitrogen/Persulfate Digestion/Ultra-Trace/Saline	EK262PA-SW	WATER	APHA 21st ed., 4500-P J. Persulfate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus. As sample is digested with persulfate under alkaline conditions yielding orthophosphate and nitrate. Following digestion, analytes are determined by flow injection analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Phosphorus/Persulfate Digestion/ Ultra Trace /Saline	EK267PA-SW	WATER	APHA 21st ed., 4500-P J. Persulfate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus. As sample is digested with persulfate under alkaline conditions yielding orthophosphate and nitrate. Following digestion, analytes are determined by flow injection analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Reactive Phosphorus as P - Ultra-Trace in Saline Water	EK271A-SW	WATER	APHA 21st ed., 4500-P E Ammonium molybdate and potassium antimonyl tartrate reacts in acid medium with othophosphate to form a heteropoly acid -phosphomolybdic acid - which is reduced to intensely coloured molybdenum blue by ascorbic acid. Quantification is by FIA. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Chlorophyll a	EP008	WATER	In-house (APHA 21st ed., 10200 H mod.) The pigments are extracted into aqueous acetone. The optical density of the extract before and after acidification at both 664 nm and 665 nm is determined spectrometrically.
Multiresidue Pesticide Screen (No. 2)	EP215-LL	WATER	In-house, LCMS (APCI in positive mode). The compounds are extracted from water samples using dichloromethane. The organic phase is evaporated to dryness and reconstituted in a mixture of acetonitrile and water for reverse phase HPLC analysis.

Preparation Methods	*Method*	*Matrix*	*Method Descriptions*
Persulfate Digestion for UT TN and TP for FIA/Saline	EK262/267PA-SW	WATER	APHA 21st ed., 4500 P - J. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Separatory funnel extraction for LCMS herbicides.	* EP215-PR	WATER	In-house. A 1 L sample is extracted three times with 60 mL of methylene chloride, reduced to dryness and made up in HPLC mobile phase.

Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged in the Quality Control (QC) Report. Surrogate recovery limits are static and based on USEPA SW846 or ALS-QWI/EN/38 (in the absence of specific USEPA limits). This report displays QC Outliers (breaches) only.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

- **For all matrices, no Method Blank value outliers occur.**
- **For all matrices, no Duplicate outliers occur.**
- **For all matrices, no Laboratory Control outliers occur.**
- **For all matrices, no Matrix Spike outliers occur.**

Regular Sample Surrogates

- **For all regular sample matrices, no surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

This report displays Holding Time breaches only. Only the respective Extraction / Preparation and/or Analysis component is/are displayed.

Matrix: **WATER**

Method		*Extraction / Preparation*			*Analysis*		
Container / Client Sample ID(s)		*Date extracted*	*Due for extraction*	***Days overdue***	*Date analysed*	*Due for analysis*	***Days overdue***
EA005: pH							
Clear Plastic Bottle - Natural G-WQ-04, G-WQ-07	G-WQ-06,	----	----	----	21-AUG-2009	18-AUG-2009	**3**
EP008: Chlorophyll a							
White Plastic Bottle - Unpreserved G-WQ-04, G-WQ-07	G-WQ-06,	----	----	----	21-AUG-2009	20-AUG-2009	**1**
Ultra-Trace Nutrients							
Clear Plastic - Filtered (AS) - for UT Nut. G-WQ-04, G-WQ-07	G-WQ-06,	----	----	----	21-AUG-2009	19-AUG-2009	**2**
Clear Plastic Bottle - Natural (AS) G-WQ-04, G-WQ-07	G-WQ-06,	21-AUG-2009	19-AUG-2009	**2**	21-AUG-2009	19-AUG-2009	**2**

Outliers : Frequency of Quality Control Samples

The following report highlights breaches in the Frequency of Quality Control Samples.

Matrix: **WATER**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	

Matrix: **WATER**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
Multiresidue Pesticide Screen (No. 2)	2	22	9.1	10.0	NEPM 1999 Schedule B(3) and ALS QCS3 requirement

03
~~02~~908

GHD

Chain of Custody & Analysis Request

Page __1__ of _1__

Chain of Custody Number:

GHD

PROJECT ID:	4215386 41	**QUOTE:**	
PROJECT:	**Western Basin EIS WQ Monitoring**		
CLIENT:	GHD		
POSTAL ADDRESS:	PO Box 373, Gladstone 4680		
CONTACT:	Adrian White or Jason Fowler		
PHONE:	0412035667 or 0404357072	**FAX:**	07) 49726236
EMAIL:	Jason.K.Fowler@ghd.com.au, Adrian.A.White@ghd.com.au		
INVOICE:	Jason.K.Fowler@ghd.com.au, Adrian.A.White@ghd.com.au		
DATA NEEDED BY:			
REPORT FORMAT:			
EMAIL FORMAT:	ESDAT, EXCEL & PDF		

LABORATORY BATCH NO.:

FOR LAB USE ONLY

COOLER SEAL:
Yes No ......
Broken Intact ......

COOLER TEMP:
..... deg.C

DESPATCHED TO: ALS Environmental
277-289 Woodpark Road
Smithfield NSW 2164
02 8784 8555

Environmental Division
Sydney
Work Order
ES0912397

Telephone : + 61-2-8784 8555

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

Water samples from a marine environment (Background sampling)

(EMAIL ADDRESSES PROVIDED ABOVE)

SAMPLES FROM MARINE ENVIRONMENT

ANALYSIS REQUIRED

SAMPLE ID	MATRIX	DATE	DETECTION LIMIT	PRESERVATION	Ultra trace ORC - dissolved metals (EG093F) (Sb, As, Ba, Be, Cd, Co, Cr, Cu, Mn, Ni, Pb, V, Hg, Fe, Al, Ag)	Ultra trace nutrients (UTN - 04) (TP, RP, NH3, NO2, NO3, TKN, TN)	TSS (EA025)	Chlorophyll a (EP008)	pH (EA005)	TDS (EA015)	Electro Conductivity	Multi Residue Pesticides –EP-215LL (lowest DL)
G-WQ-03	Water	19/08/2009	LOR	As Required	X	X	X	X	X	X	X	X

RELINQUISHED BY:		**RECEIVED BY:**	
NAME : J Fowler	DATE: 19/08/2009	NAME : Frank	DATE: 20/08/09
OF: GHD Gladstone	TIME: 1530	OF: ALS	TIME: 9am

PLEASE EMAIL COMPLETED ANALYSIS REQUEST TO: Jason.K.Fowler@ghd.com.au, Adrian.A.White@ghd.com.au

*Container Type and Preservative Codes: P = Neutral Plastic; N = Nitric Acid Preserved; C = Sodium Hydroxide Preserved; J = Solvent Washed Acid Rinced Jar; S = Solvent Washed Acid Rinced Glass Bottle; VC = Hydrochloric Acid Preserved Vial; VS = Sulfuric Acid Preserved Vial; BS = Sulfuric Acid Preserved Glass Bottle; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; O = Other.

SAMPLE RECEIPT NOTIFICATION (SRN)

Comprehensive Report

Work Order : **ES0912397**

Client	: **GHD SERVICES PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR ADRIAN WHITE	Contact	: Charlie Pierce
Address	: G P O BOX 668 BRISBANE QLD, AUSTRALIA 4001	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: adrian.a.white@ghd.com.au	E-mail	: charlie.pierce@alsenviro.com
Telephone	: +61 07 3316 3000	Telephone	: +61-2-8784 8555
Facsimile	: +61 07 3316 3333	Facsimile	: +61-2-8784 8500
Project	: 421538641 WESTERN BASIN EIS WQ MONITORING	Page	: 1 of 3
Order number	: ----		
C-O-C number	: ----	Quote number	: EB2009GHDSER0401 (BN/314/09)
Site	: ----		
Sampler	: ----	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Dates

Date Samples Received	: 20-AUG-2009	Issue Date	: 20-AUG-2009 18:43
Client Requested Due Date	: 03-SEP-2009	Scheduled Reporting Date	: **03-SEP-2009**

Delivery Details

Mode of Delivery	: Carrier	Temperature	: 1.0'c - Ice present
No. of coolers/boxes	: 1 HARD	No. of samples received	: 1
Sercurity Seal	: Intact.	No. of samples analysed	: 1

General Comments

- This report contains the following information:
    - Sample Container(s)/Preservation Non-Compliances
    - Summary of Sample(s) and Requested Analysis
    - Requested Deliverables
- **Samples received in appropriately pretreated and preserved containers.**
- **Breaches in recommended extraction / analysis holding times may occur. Please contact ALS for further information (Jacob Waugh).**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please direct any turn around / technical queries to the laboratory contact designated above.
- Please direct any queries related to sample condition / numbering / breakages to Jacob Waugh
- Analytical work for this work order will be conducted at ALS Sydney.
- Sample Disposal - Aqueous (14 days), Solid (90 days) from date of completion of work order.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exist.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process neccessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
When date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for processing purposes. If the sampling time is displayed as 0:00 the information was not provided by client.

Matrix: **WATER**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	WATER - EA005: pH pH	WATER - EA010P Conductivity (PC)	WATER - EA015 Total Dissolved Solids	WATER - EA025H Suspended Solids (High Level)	WATER - EG035F Dissolved Mercury by FIMS	WATER - EG093A-F Dissolved metals in saline water by ORC-ICPMS	WATER - EG093B-F Dissolved Metals in Saline Water Suite B by ORC-ICPMS	WATER - EP008 Chlorophyll a
ES0912397-001	19-AUG-2009 15:00	G-WQ-03	✓	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	WATER - EP215LL Multiresidue Pesticide Screen (Suite 2) - Low Level	WATER - UTN-4 SW Ultratrace NO2, NO3, NH3, Nitrogen, Phosphorus, TKN, Reactive Phosphorus
ES0912397-001	19-AUG-2009 15:00	G-WQ-03	✓	✓

Requested Deliverables

MR ADRIAN WHITE

- *AU Certificate of Analysis - NATA (COA)	Email	adrian.a.white@ghd.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	adrian.a.white@ghd.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	adrian.a.white@ghd.com.au
- A4 - AU Sample Receipt Notification - Environmental (SRN)	Email	adrian.a.white@ghd.com.au
- A4 - AU Tax Invoice (INV)	Email	adrian.a.white@ghd.com.au
- Default - Chain of Custody (COC)	Email	adrian.a.white@ghd.com.au
- EDI Format - ENMRG (ENMRG)	Email	adrian.a.white@ghd.com.au
- EDI Format - ESDAT (ESDAT)	Email	adrian.a.white@ghd.com.au

MR JASON FOWLER

- *AU Certificate of Analysis - NATA (COA)	Email	jason.k.fowler@ghd.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	jason.k.fowler@ghd.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	jason.k.fowler@ghd.com.au
- A4 - AU Sample Receipt Notification - Environmental (SRN)	Email	jason.k.fowler@ghd.com.au
- A4 - AU Tax Invoice (INV)	Email	jason.k.fowler@ghd.com.au
- Default - Chain of Custody (COC)	Email	jason.k.fowler@ghd.com.au
- EDI Format - ENMRG (ENMRG)	Email	jason.k.fowler@ghd.com.au
- EDI Format - ESDAT (ESDAT)	Email	jason.k.fowler@ghd.com.au

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

CERTIFICATE OF ANALYSIS

Work Order : **ES0912397**

Client : **GHD SERVICES PTY LTD**
Contact : MR ADRIAN WHITE
Address : P O BOX 373
GLADSTONE QLD, AUSTRALIA 4680

E-mail : adrian.a.white@ghd.com.au
Telephone : +61 07 4972 6377
Facsimile : +61 07 4972 6236

Project : 421538641 WESTERN BASIN EIS WQ MONITORING
Order number : ----
C-O-C number : ----
Sampler : ----
Site : ----

Quote number : BN/314/09

Page : 1 of 4

Laboratory : Environmental Division Sydney
Contact : Charlie Pierce
Address : 277-289 Woodpark Road Smithfield NSW Australia 2164

E-mail : charlie.pierce@alsenviro.com
Telephone : +61-2-8784 8555
Facsimile : +61-2-8784 8500

QC Level : NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Date Samples Received : 20-AUG-2009
Issue Date : 31-AUG-2009

No. of samples received : 1
No. of samples analysed : 1

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

NATA

WORLD RECOGNISED
ACCREDITATION

NATA Accredited Laboratory 825

This document is issued in accordance with NATA accreditation requirements.

Accredited for compliance with ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Hoa Nguyen	Inorganic Chemist	Inorganics
Lana Nguyen	LCMS Chemist	Organics
Wisam Abou-Maraseh	Spectroscopist	Inorganics

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insuffient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for processing purposes. If the sampling time is displayed as 0:00 the information was not provided by client.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting

- **EG093: LCS recovery for Fe falls outside ALS Dynamic Control Limit. However, it is within the acceptance criteria based on ALS DQO. No further action is required.**
- **EK267PA, It has been noted that RP is greater than TP , however this difference is within the limits of experimental variation.**

Analytical Results

Sub-Matrix: **WATER**			*Client sample ID*	**G-WQ-03**	----	----	----	----
			Client sampling date / time	19-AUG-2009 15:00	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**ES0912397-001**	**----**	**----**	**----**	**----**
EA005: pH								
pH Value	----	0.01	pH Unit	**7.94**	----	----	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**51000**	----	----	----	----
EA015: Total Dissolved Solids								
^ Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	**38300**	----	----	----	----
EA025: Suspended Solids								
^ Suspended Solids (SS)	----	5	mg/L	**53**	----	----	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	----	----	----	----
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS								
Aluminium	7429-90-5	10	µg/L	**30**	----	----	----	----
Antimony	7440-36-0	0.5	µg/L	<0.5	----	----	----	----
Iron	7439-89-6	5	µg/L	**6**	----	----	----	----
Arsenic	7440-38-2	0.5	µg/L	**1.6**	----	----	----	----
Barium	7440-39-3	1	µg/L	**7**	----	----	----	----
Beryllium	7440-41-7	0.1	µg/L	<0.1	----	----	----	----
Cadmium	7440-43-9	0.2	µg/L	<0.2	----	----	----	----
Chromium	7440-47-3	0.5	µg/L	<0.5	----	----	----	----
Cobalt	7440-48-4	0.2	µg/L	<0.2	----	----	----	----
Copper	7440-50-8	1	µg/L	<1	----	----	----	----
Lead	7439-92-1	0.2	µg/L	<0.2	----	----	----	----
Manganese	7439-96-5	0.5	µg/L	**1.7**	----	----	----	----
Nickel	7440-02-0	0.5	µg/L	<0.5	----	----	----	----
Silver	7440-22-4	0.1	µg/L	<0.1	----	----	----	----
Vanadium	7440-62-2	0.5	µg/L	**3.6**	----	----	----	----
EP008: Chlorophyll a								
Chlorophyll a	----	1	mg/m3	<1	----	----	----	----
EP215: Multiresidue Pesticide Residue Screen (Suite 2)								
Simazine	122-34-9	0.005	µg/L	<0.005	----	----	----	----
Diuron	330-54-1	0.005	µg/L	<0.005	----	----	----	----
Atrazine	1912-24-9	0.005	µg/L	<0.005	----	----	----	----
Molinate	2212-67-1	0.005	µg/L	<0.005	----	----	----	----
Metolachlor	51218-45-2	0.005	µg/L	<0.005	----	----	----	----
Malathion	121-75-5	0.002	µg/L	<0.002	----	----	----	----
Diazinon	333-41-5	0.005	µg/L	<0.005	----	----	----	----
Thiobencarb	28249-77-6	0.005	µg/L	<0.005	----	----	----	----
Chlorpyrifos	2921-88-2	0.005	µg/L	<0.005	----	----	----	----

Analytical Results

Sub-Matrix: **WATER**			Client sample ID	**G-WQ-03**	----	----	----	----
			Client sampling date / time	19-AUG-2009 15:00	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**ES0912397-001**	**----**	**----**	**----**	**----**
EP215: Multiresidue Pesticide Residue Screen (Suite 2) - Continued								
Trifluralin	1582-09-8	0.005	µg/L	<0.005	----	----	----	----
Ultra-Trace Nutrients								
Ammonia as N	7664-41-7	0.005	mg/L	<0.005	----	----	----	----
Nitrite as N	----	0.002	mg/L	<0.002	----	----	----	----
^ Nitrate as N	14797-55-8	0.002	mg/L	**0.002**	----	----	----	----
Nitrite + Nitrate as N	----	0.002	mg/L	**0.002**	----	----	----	----
^ Total Kjeldahl Nitrogen as N	----	0.05	mg/L	**0.11**	----	----	----	----
Total Nitrogen as N	----	0.05	mg/L	**0.12**	----	----	----	----
Reactive Phosphorus as P	----	0.001	mg/L	**0.007**	----	----	----	----
Total Phosphorus as P	----	0.005	mg/L	**0.006**	----	----	----	----

QUALITY CONTROL REPORT

Work Order	: **ES0912397**	Page	: 1 of 7
Client	: **GHD SERVICES PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: MR ADRIAN WHITE	Contact	: Charlie Pierce
Address	: P O BOX 373 GLADSTONE QLD, AUSTRALIA 4680	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: adrian.a.white@ghd.com.au	E-mail	: charlie.pierce@alsenviro.com
Telephone	: +61 07 4972 6377	Telephone	: +61-2-8784 8555
Facsimile	: +61 07 4972 6236	Facsimile	: +61-2-8784 8500
Project	: 421538641 WESTERN BASIN EIS WQ MONITORING	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 20-AUG-2009
Sampler	: ----	Issue Date	: 31-AUG-2009
Order number	: ----		
		No. of samples received	: 1
Quote number	: BN/314/09	No. of samples analysed	: 1

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

NATA
WORLD RECOGNISED
ACCREDITATION

NATA Accredited Laboratory 825

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Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Hoa Nguyen	Inorganic Chemist	Inorganics
Lana Nguyen	LCMS Chemist	Organics
Wisam Abou-Maraseh	Spectroscopist	Inorganics

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insuffient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key :
Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR:- No Limit; Result between 10 and 20 times LOR:- 0% - 50%; Result > 20 times LOR:- 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA005: pH (QC Lot: 1075294)									
ES0912396-001	Anonymous	EA005: pH Value	----	0.01	pH Unit	8.11	8.12	0.1	0% - 20%
EA010P: Conductivity by PC Titrator (QC Lot: 1075578)									
ES0912397-001	G-WQ-03	EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	51000	51000	0.0	0% - 20%
EA015: Total Dissolved Solids (QC Lot: 1079805)									
ES0912396-004	Anonymous	EA015: Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	37100	37400	0.8	0% - 20%
ES0912425-008	Anonymous	EA015: Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	326	332	1.8	0% - 20%
EA025: Suspended Solids (QC Lot: 1079091)									
ES0912327-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	65	64	1.6	0% - 50%
ES0912397-001	G-WQ-03	EA025H: Suspended Solids (SS)	----	5	mg/L	53	61	14.0	0% - 50%
EG035F: Dissolved Mercury by FIMS (QC Lot: 1075689)									
ES0912321-006	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
ES0912397-001	G-WQ-03	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS (QC Lot: 1081878)									
EB0913196-001	Anonymous	EG093A-F: Beryllium	7440-41-7	0.1	µg/L	<0.1	<0.1	0.0	No Limit
		EG093A-F: Silver	7440-22-4	0.1	µg/L	<0.1	<0.1	0.0	No Limit
		EG093A-F: Cadmium	7440-43-9	0.2	µg/L	<0.2	<0.2	0.0	No Limit
		EG093A-F: Cobalt	7440-48-4	0.2	µg/L	<0.2	<0.2	0.0	No Limit
		EG093A-F: Lead	7439-92-1	0.2	µg/L	<0.2	<0.2	0.0	No Limit
		EG093A-F: Antimony	7440-36-0	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EG093A-F: Arsenic	7440-38-2	0.5	µg/L	1.4	1.3	8.7	No Limit
		EG093A-F: Chromium	7440-47-3	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EG093A-F: Manganese	7439-96-5	0.5	µg/L	7.6	7.2	5.3	0% - 50%
		EG093A-F: Nickel	7440-02-0	0.5	µg/L	1.3	1.2	8.5	No Limit
		EG093A-F: Vanadium	7440-62-2	0.5	µg/L	2.3	2.8	19.6	No Limit
		EG093A-F: Barium	7440-39-3	1	µg/L	10	10	0.0	0% - 50%
		EG093A-F: Copper	7440-50-8	1	µg/L	2	1	68.2	No Limit
		EG093A-F: Aluminium	7429-90-5	10	µg/L	260	300	13.3	0% - 20%
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS (QC Lot: 1081879)									
EB0913196-001	Anonymous	EG093B-F: Iron	7439-89-6	5	µg/L	6	6	0.0	No Limit
EP215: Multiresidue Pesticide Residue Screen (Suite 2) (QC Lot: 1077549)									
ES0912327-003	Anonymous	EP215-LL: Malathion	121-75-5	0.002	µg/L	<0.002	<0.002	0.0	No Limit
		EP215-LL: Simazine	122-34-9	0.005	µg/L	<0.005	<0.005	0.0	No Limit
		EP215-LL: Diuron	330-54-1	0.005	µg/L	<0.005	<0.005	0.0	No Limit
		EP215-LL: Atrazine	1912-24-9	0.005	µg/L	<0.005	<0.005	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP215: Multiresidue Pesticide Residue Screen (Suite 2) (QC Lot: 1077549) - continued									
ES0912327-003	Anonymous	EP215-LL: Molinate	2212-67-1	0.005	µg/L	<0.005	<0.005	0.0	No Limit
		EP215-LL: Metolachlor	51218-45-2	0.005	µg/L	<0.005	<0.005	0.0	No Limit
		EP215-LL: Diazinon	333-41-5	0.005	µg/L	<0.005	<0.005	0.0	No Limit
		EP215-LL: Thiobencarb	28249-77-6	0.005	µg/L	<0.005	<0.005	0.0	No Limit
		EP215-LL: Chlorpyrifos	2921-88-2	0.005	µg/L	<0.005	<0.005	0.0	No Limit
		EP215-LL: Trifluralin	1582-09-8	0.005	µg/L	<0.005	<0.005	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 1075117)									
ES0912396-001	Anonymous	EK262PA-SW: Total Nitrogen as N	----	0.05	mg/L	0.10	0.11	13.9	No Limit
Ultra-Trace Nutrients (QC Lot: 1075118)									
ES0912396-001	Anonymous	EK267PA-SW: Total Phosphorus as P	----	0.005	mg/L	0.042	0.034	19.7	No Limit
Ultra-Trace Nutrients (QC Lot: 1075280)									
ES0912396-002	Anonymous	EK255A-SW: Ammonia as N	7664-41-7	0.005	mg/L	<0.005	<0.005	0.0	No Limit
ES0912396-004	Anonymous	EK255A-SW: Ammonia as N	7664-41-7	0.005	mg/L	0.016	0.015	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 1075281)									
ES0912396-002	Anonymous	EK257A-SW: Nitrite as N	----	0.002	mg/L	0.004	0.003	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 1075282)									
ES0912396-002	Anonymous	EK259A-SW: Nitrite + Nitrate as N	----	0.002	mg/L	0.005	0.005	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 1075283)									
ES0912396-002	Anonymous	EK271A-SW: Reactive Phosphorus as P	----	0.001	mg/L	0.004	0.003	0.0	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EA010P: Conductivity by PC Titrator (QCLot: 1075578)								
EA010-P: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	2000 µS/cm	99.8	86.3	112
EA015: Total Dissolved Solids (QCLot: 1079805)								
EA015: Total Dissolved Solids @180°C	GIS-210-010	1	mg/L	<1	293 mg/L	100	77.9	122
EA025: Suspended Solids (QCLot: 1079091)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	104	30	150
EG035F: Dissolved Mercury by FIMS (QCLot: 1075689)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.010 mg/L	115	86	116
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS (QCLot: 1081878)								
EG093A-F: Aluminium	7429-90-5	10	µg/L	<10	50 µg/L	128	80	128
EG093A-F: Antimony	7440-36-0	0.5	µg/L	<0.5	----	----	----	----
EG093A-F: Arsenic	7440-38-2	0.5	µg/L	<0.5	10 µg/L	90.6	85	125
EG093A-F: Barium	7440-39-3	1	µg/L	<1	10 µg/L	95.3	81	129
EG093A-F: Beryllium	7440-41-7	0.1	µg/L	<0.1	10 µg/L	102	80	122
EG093A-F: Cadmium	7440-43-9	0.2	µg/L	<0.2	10 µg/L	89.1	78	116
EG093A-F: Chromium	7440-47-3	0.5	µg/L	<0.5	10 µg/L	87.9	86	128
EG093A-F: Cobalt	7440-48-4	0.2	µg/L	<0.2	10 µg/L	91.6	87	127
EG093A-F: Copper	7440-50-8	1	µg/L	<1	10 µg/L	92.4	86	124
EG093A-F: Lead	7439-92-1	0.2	µg/L	<0.2	10 µg/L	98.7	87	123
EG093A-F: Manganese	7439-96-5	0.5	µg/L	<0.5	10 µg/L	102	90	122
EG093A-F: Nickel	7440-02-0	0.5	µg/L	<0.5	10 µg/L	91.4	84	124
EG093A-F: Silver	7440-22-4	0.1	µg/L	<0.1	1 µg/L	104	70	130
EG093A-F: Vanadium	7440-62-2	0.5	µg/L	<0.5	10 µg/L	86.2	85	123
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS (QCLot: 1081879)								
EG093B-F: Iron	7439-89-6	5	µg/L	<5	50 µg/L	# 88.2	89	119
EP008: Chlorophyll a (QCLot: 1075297)								
EP008: Chlorophyll a	----	1	mg/m3	----	20 mg/m3	100	60.3	134
		1	mg/m^3	<1	----	----	----	----
EP215: Multiresidue Pesticide Residue Screen (Suite 2) (QCLot: 1077549)								
EP215-LL: Simazine	122-34-9	0.005	µg/L	<0.005	0.0125 µg/L	122	65	130
EP215-LL: Diuron	330-54-1	0.005	µg/L	<0.005	0.0125 µg/L	73.3	65	130
EP215-LL: Atrazine	1912-24-9	0.005	µg/L	<0.005	0.0125 µg/L	80.3	65	130
EP215-LL: Molinate	2212-67-1	0.005	µg/L	<0.005	0.0125 µg/L	113	65	130
EP215-LL: Metolachlor	51218-45-2	0.005	µg/L	<0.005	0.0125 µg/L	75.3	65	130

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EP215: Multiresidue Pesticide Residue Screen (Suite 2) (QCLot: 1077549) - continued								
EP215-LL: Malathion	121-75-5	0.002	µg/L	<0.002	0.0125 µg/L	88.5	65	130
EP215-LL: Diazinon	333-41-5	0.005	µg/L	<0.005	0.0125 µg/L	100	65	130
EP215-LL: Thiobencarb	28249-77-6	0.005	µg/L	<0.005	0.0125 µg/L	89.5	65	130
EP215-LL: Chlorpyrifos	2921-88-2	0.005	µg/L	<0.005	0.0125 µg/L	82.2	65	130
EP215-LL: Trifluralin	1582-09-8	0.005	µg/L	<0.005	0.0125 µg/L	73.0	65	130
Ultra-Trace Nutrients (QCLot: 1075117)								
EK262PA-SW: Total Nitrogen as N	----	0.05	mg/L	<0.05	1.0 mg/L	95.4	70	110
Ultra-Trace Nutrients (QCLot: 1075118)								
EK267PA-SW: Total Phosphorus as P	----	0.005	mg/L	<0.005	0.44 mg/L	101	72	122
Ultra-Trace Nutrients (QCLot: 1075280)								
EK255A-SW: Ammonia as N	7664-41-7	0.005	mg/L	<0.005	0.1 mg/L	94.8	74	118
Ultra-Trace Nutrients (QCLot: 1075281)								
EK257A-SW: Nitrite as N	----	0.002	mg/L	<0.002	1.0 mg/L	103	70	130
Ultra-Trace Nutrients (QCLot: 1075282)								
EK259A-SW: Nitrite + Nitrate as N	----	0.002	mg/L	<0.002	0.1 mg/L	104	76	130
Ultra-Trace Nutrients (QCLot: 1075283)								
EK271A-SW: Reactive Phosphorus as P	----	0.001	mg/L	<0.001	0.1 mg/L	105	70	121

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*Matrix Spike (MS) Report* Spike Concentration	Spike Recovery (%) MS	Recovery Limits (%) Low	Recovery Limits (%) High
EG035F: Dissolved Mercury by FIMS (QCLot: 1075689)							
ES0912321-001	Anonymous	EG035F: Mercury	7439-97-6	0.0100 mg/L	76.0	70	130
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS (QCLot: 1081878)							
EB0913196-001	Anonymous	EG093A-F: Arsenic	7440-38-2	50 µg/L	121	70	130
		EG093A-F: Barium	7440-39-3	50 µg/L	121	70	130
		EG093A-F: Beryllium	7440-41-7	50 µg/L	120	70	130
		EG093A-F: Cadmium	7440-43-9	12.5 µg/L	105	70	130
		EG093A-F: Chromium	7440-47-3	50 µg/L	119	70	130
		EG093A-F: Cobalt	7440-48-4	50 µg/L	118	70	130
		EG093A-F: Copper	7440-50-8	50 µg/L	117	70	130
		EG093A-F: Lead	7439-92-1	50 µg/L	114	70	130
		EG093A-F: Manganese	7439-96-5	50 µg/L	109	70	130
		EG093A-F: Nickel	7440-02-0	50 µg/L	119	70	130
		EG093A-F: Vanadium	7440-62-2	50 µg/L	112	70	130
Ultra-Trace Nutrients (QCLot: 1075117)							
ES0912396-001	Anonymous	EK262PA-SW: Total Nitrogen as N	----	0.5 mg/L	104	70	130
Ultra-Trace Nutrients (QCLot: 1075118)							
ES0912396-001	Anonymous	EK267PA-SW: Total Phosphorus as P	----	0.5 mg/L	84.3	70	130
Ultra-Trace Nutrients (QCLot: 1075280)							
ES0912396-002	Anonymous	EK255A-SW: Ammonia as N	7664-41-7	0.1 mg/L	102	70.	130
Ultra-Trace Nutrients (QCLot: 1075281)							
ES0912396-002	Anonymous	EK257A-SW: Nitrite as N	----	0.1 mg/L	96.6	70	130
Ultra-Trace Nutrients (QCLot: 1075282)							
ES0912396-002	Anonymous	EK259A-SW: Nitrite + Nitrate as N	----	0.1 mg/L	98.0	70	130
Ultra-Trace Nutrients (QCLot: 1075283)							
ES0912396-002	Anonymous	EK271A-SW: Reactive Phosphorus as P	----	0.1 mg/L	92.8	70	130

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: **ES0912397**	Page	: 1 of 7
Client	: GHD SERVICES PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: MR ADRIAN WHITE	Contact	: Charlie Pierce
Address	: P O BOX 373 GLADSTONE QLD, AUSTRALIA 4680	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: adrian.a.white@ghd.com.au	E-mail	: charlie.pierce@alsenviro.com
Telephone	: +61 07 4972 6377	Telephone	: +61-2-8784 8555
Facsimile	: +61 07 4972 6236	Facsimile	: +61-2-8784 8500
Project	: 421538641 WESTERN BASIN EIS WQ MONITORING	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: ----	Date Samples Received	: 20-AUG-2009
Sampler	: ----	Issue Date	: 31-AUG-2009
Order number	: ----		
		No. of samples received	: 1
Quote number	: BN/314/09	No. of samples analysed	: 1

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Interpretive Quality Control Report contains the following information:

- Analysis Holding Time Compliance
- Quality Control Parameter Frequency Compliance
- Brief Method Summaries
- Summary of Outliers

Analysis Holding Time Compliance

The following report summarises extraction / preparation and analysis times and compares with recommended holding times. Dates reported represent first date of extraction or analysis and precludes subsequent dilutions and reruns. Information is also provided re the sample container (preservative) from which the analysis aliquot was taken. Elapsed period to analysis represents number of days from sampling where no extraction / digestion is involved or period from extraction / digestion where this is present. For composite samples, sampling date is assumed to be that of the oldest sample contributing to the composite. Sample date for laboratory produced leachates is assumed as the completion date of the leaching process. Outliers for holding time are based on USEPA SW 846, APHA, AS and NEPM (1999). A listing of breaches is provided in the Summary of Outliers.

Holding times for leachate methods (excluding elutriates) vary according to the analytes being determined on the resulting solution. For non -volatile analytes, the holding time compliance assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These soil holding times are: Organics (14 days); Mercury (28 days) & other metals (180 days). A recorded breach therefore does not guarantee a breach for all non-volatile parameters.

Matrix: **WATER**

Evaluation: ✗ = Holding time breach ; ✓ = Within holding time.

Method	***Sample Date***	*Extraction / Preparation*			*Analysis*		
***Container** / Client Sample ID(s)*		***Date extracted***	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*
EA005: pH							
Clear Plastic Bottle - Natural G-WQ-03	**19-AUG-2009**	**----**	----	----	**20-AUG-2009**	19-AUG-2009	✗
EA010P: Conductivity by PC Titrator							
Clear Plastic Bottle - Natural G-WQ-03	**19-AUG-2009**	**---**	---	----	**21-AUG-2009**	16-SEP-2009	✓
EA015: Total Dissolved Solids							
Clear Plastic Bottle - Natural G-WQ-03	**19-AUG-2009**	**----**	----	----	**26-AUG-2009**	26-AUG-2009	✓
EA025: Suspended Solids							
Clear Plastic Bottle - Natural G-WQ-03	**19-AUG-2009**	**----**	----	----	**25-AUG-2009**	26-AUG-2009	✓
EG035F: Dissolved Mercury by FIMS							
Clear HDPE (U-T ORC) - Filtered; Lab-acidified G-WQ-03	**19-AUG-2009**	**---**	---	----	**21-AUG-2009**	16-SEP-2009	✓
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS							
Clear HDPE (U-T ORC) - Filtered; Lab-acidified G-WQ-03	**19-AUG-2009**	**27-AUG-2009**	15-FEB-2010	✓	**27-AUG-2009**	15-FEB-2010	✓
EP008: Chlorophyll a							
White Plastic Bottle - Unpreserved G-WQ-03	**19-AUG-2009**	**----**	----	----	**20-AUG-2009**	21-AUG-2009	✓
EP215: Multiresidue Pesticide Residue Screen (Suite 2)							
Amber Glass Bottle - Unpreserved G-WQ-03	**19-AUG-2009**	**21-AUG-2009**	26-AUG-2009	✓	**21-AUG-2009**	03-OCT-2009	✓
Ultra-Trace Nutrients							
Clear Plastic Bottle - Filtered (AS) G-WQ-03	**19-AUG-2009**	**---**	---	----	**20-AUG-2009**	20-AUG-2009	✓
Clear Plastic Bottle - Natural (AS) G-WQ-03	**19-AUG-2009**	**20-AUG-2009**	20-AUG-2009	✓	**20-AUG-2009**	20-AUG-2009	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(where) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		*Count*		*Rate (%)*			*Quality Control Specification*
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Ammonia as N - Ultra-Trace in Saline Waters	EK255A-SW	2	12	**16.7**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Conductivity by PC Titrator	EA010-P	1	2	**50.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	2	13	**15.4**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals in Saline Water -Suite A by ORC-ICPMS	EG093A-F	1	10	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals in Saline Water -Suite B by ORC-ICPMS	EG093B-F	1	10	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Multiresidue Pesticide Screen (No. 2)	EP215-LL	1	2	**50.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N - Ultra-Trace in Saline Waters	EK259A-SW	1	5	**20.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N - Ultra-Trace in Saline Waters	EK257A-SW	1	5	**20.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
pH	EA005	1	7	**14.3**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P - Ultra-Trace in Saline Water	EK271A-SW	1	5	**20.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Suspended Solids (High Level)	EA025H	2	19	**10.5**	**9.5**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids	EA015	2	20	**10.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Nitrogen/Persulfate Digestion/Ultra-Trace/Saline	EK262PA-SW	1	5	**20.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus/Persulfate Digestion/ Ultra Trace /Saline	EK267PA-SW	1	5	**20.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
Ammonia as N - Ultra-Trace in Saline Waters	EK255A-SW	1	12	**8.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chlorophyll a	EP008	1	19	**5.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Conductivity by PC Titrator	EA010-P	1	2	**50.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	1	13	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals in Saline Water -Suite A by ORC-ICPMS	EG093A-F	1	10	**10.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals in Saline Water -Suite B by ORC-ICPMS	EG093B-F	1	10	**10.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Multiresidue Pesticide Screen (No. 2)	EP215-LL	1	2	**50.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N - Ultra-Trace in Saline Waters	EK259A-SW	1	5	**20.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N - Ultra-Trace in Saline Waters	EK257A-SW	1	5	**20.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P - Ultra-Trace in Saline Water	EK271A-SW	1	5	**20.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Suspended Solids (High Level)	EA025H	1	19	**5.3**	**4.8**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids	EA015	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Nitrogen/Persulfate Digestion/Ultra-Trace/Saline	EK262PA-SW	1	5	**20.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus/Persulfate Digestion/ Ultra Trace /Saline	EK267PA-SW	1	5	**20.0**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
Ammonia as N - Ultra-Trace in Saline Waters	EK255A-SW	1	12	**8.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chlorophyll a	EP008	1	19	**5.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Conductivity by PC Titrator	EA010-P	1	2	**50.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	1	13	**7.7**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Metals in Saline Water -Suite A by ORC-ICPMS	EG093A-F	1	10	**10.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Method Blanks (MB) - Continued							
Dissolved Metals in Saline Water -Suite B by ORC-ICPMS	EG093B-F	1	10	**10.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Multiresidue Pesticide Screen (No. 2)	EP215-LL	1	2	**50.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N - Ultra-Trace in Saline Waters	EK259A-SW	1	5	**20.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N - Ultra-Trace in Saline Waters	EK257A-SW	1	5	**20.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P - Ultra-Trace in Saline Water	EK271A-SW	1	5	**20.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Suspended Solids (High Level)	EA025H	1	19	**5.3**	**4.8**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Dissolved Solids	EA015	1	20	**5.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Nitrogen/Persulfate Digestion/Ultra-Trace/Saline	EK262PA-SW	1	5	**20.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus/Persulfate Digestion/ Ultra Trace /Saline	EK267PA-SW	1	5	**20.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							
Ammonia as N - Ultra-Trace in Saline Waters	EK255A-SW	1	12	**8.3**	**5.0**	✓	ALS QCS3 requirement
Dissolved Mercury by FIMS	EG035F	1	13	**7.7**	**5.0**	✓	ALS QCS3 requirement
Dissolved Metals in Saline Water -Suite A by ORC-ICPMS	EG093A-F	1	10	**10.0**	**5.0**	✓	ALS QCS3 requirement
Nitrite and Nitrate as N - Ultra-Trace in Saline Waters	EK259A-SW	1	5	**20.0**	**5.0**	✓	ALS QCS3 requirement
Nitrite as N - Ultra-Trace in Saline Waters	EK257A-SW	1	5	**20.0**	**5.0**	✓	ALS QCS3 requirement
Reactive Phosphorus as P - Ultra-Trace in Saline Water	EK271A-SW	1	5	**20.0**	**5.0**	✓	ALS QCS3 requirement
Total Nitrogen/Persulfate Digestion/Ultra-Trace/Saline	EK262PA-SW	1	5	**20.0**	**5.0**	✓	ALS QCS3 requirement
Total Phosphorus/Persulfate Digestion/ Ultra Trace /Saline	EK267PA-SW	1	5	**20.0**	**5.0**	✓	ALS QCS3 requirement

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
pH	EA005	WATER	APHA 21st ed. 4500 H+ B. pH of water samples is determined by ISE either manually or by automated pH meter. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Conductivity by PC Titrator	EA010-P	WATER	APHA 21st ed., 2510 B This procedure determines conductivity by automated ISE. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Dissolved Solids	EA015	WATER	APHA 21st ed., 2540C A gravimetric procedure that determines the amount of `filterable` residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Suspended Solids (High Level)	EA025H	WATER	APHA 21st ed., 2540D A gravimetric procedure employed to determine the amount of `non-filterable` residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Dissolved Mercury by FIMS	EG035F	WATER	AS 3550, APHA 21st ed. 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) Samples are 0.45 um filtered prior to analysis. FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Dissolved Metals in Saline Water -Suite A by ORC-ICPMS	EG093A-F	WATER	APHA 21st ed., 3125; USEPA SW846 - 6020 Samples are 0.45 um filtered prior to analysis. The ORC-ICPMS technique removes interfering species through a series of chemical reactions prior to ion detection. Ions are passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to measurement by a discrete dynode ion detector. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Dissolved Metals in Saline Water -Suite B by ORC-ICPMS	EG093B-F	WATER	APHA 21st ed., 3125; USEPA SW846 - 6020 Samples are 0.45 um filtered prior to analysis. The ORC-ICPMS technique removes interfering species through a series of chemical reactions prior to ion detection. Ions are passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to measurement by a discrete dynode ion detector. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Ammonia as N - Ultra-Trace in Saline Waters	EK255A-SW	WATER	APHA 21st ed., 4500-NH3 H Ammonia is determined by direct colorimetry by FIA. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Nitrite as N - Ultra-Trace in Saline Waters	EK257A-SW	WATER	APHA 21st ed., 4500-NO2- B. Nitrite is determined by direct colourimetry by FIA.
Nitrate as N - Ultra-Trace in Saline Waters	EK258A-SW	WATER	APHA 21st ed., 4500-NO3- I Nitrate is reduced to nitrite by way of a cadmium reduction column followed by quantification by FIA. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results.
Nitrite and Nitrate as N - Ultra-Trace in Saline Waters	EK259A-SW	WATER	APHA 21st ed., 4500-NO3- I. Combined oxidised Nitrogen (NO2+NO3) is determined by Cadmium Reduction and direct colourimetry by FIA.

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
TKN (Total N - NOx-N). (FIA - UT) in Saline Waters	EK261PA-SW	WATER	APHA 21st ed., 4500-P J. & 4500-NO3- I. Calculated by difference from total Nitrogen and NOx. Contributing method parameters are determined by FIA. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Nitrogen/Persulfate Digestion/Ultra-Trace/Saline	EK262PA-SW	WATER	APHA 21st ed., 4500-P J. Persulfate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus. As sample is digested with persulfate under alkaline conditions yielding orthophosphate and nitrate. Following digestion, analytes are determined by flow injection analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Phosphorus/Persulfate Digestion/ Ultra Trace /Saline	EK267PA-SW	WATER	APHA 21st ed., 4500-P J. Persulfate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus. As sample is digested with persulfate under alkaline conditions yielding orthophosphate and nitrate. Following digestion, analytes are determined by flow injection analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Reactive Phosphorus as P - Ultra-Trace in Saline Water	EK271A-SW	WATER	APHA 21st ed., 4500-P E Ammonium molybdate and potassium antimonyl tartrate reacts in acid medium with othophosphate to form a heteropoly acid -phosphomolybdic acid - which is reduced to intensely coloured molybdenum blue by ascorbic acid. Quantification is by FIA. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Chlorophyll a	EP008	WATER	In-house (APHA 21st ed., 10200 H mod.) The pigments are extracted into aqueous acetone. The optical density of the extract before and after acidification at both 664 nm and 665 nm is determined spectrometrically.
Multiresidue Pesticide Screen (No. 2)	EP215-LL	WATER	In-house, LCMS (APCI in positive mode). The compounds are extracted from water samples using dichloromethane. The organic phase is evaporated to dryness and reconstituted in a mixture of acetonitrile and water for reverse phase HPLC analysis.

Preparation Methods	*Method*	*Matrix*	*Method Descriptions*
Persulfate Digestion for UT TN and TP for FIA/Saline	EK262/267PA-SW	WATER	APHA 21st ed., 4500 P - J. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Separatory funnel extraction for LCMS herbicides.	* EP215-PR	WATER	In-house. A 1 L sample is extracted three times with 60 mL of methylene chloride, reduced to dryness and made up in HPLC mobile phase.

Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged in the Quality Control (QC) Report. Surrogate recovery limits are static and based on USEPA SW846 or ALS-QWI/EN/38 (in the absence of specific USEPA limits). This report displays QC Outliers (breaches) only.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	**Analyte**	CAS Number	Data	Limits	**Comment**
Laboratory Control Spike (LCS) Recoveries							
EG093F: Dissolved Metals in Saline Water by ORC-ICP	1244751-003	----	**Iron**	7439-89-6	88.2 %	89-119%	**Recovery less than lower control limit**

- **For all matrices, no Method Blank value outliers occur.**
- **For all matrices, no Duplicate outliers occur.**
- **For all matrices, no Matrix Spike outliers occur.**

Regular Sample Surrogates

- **For all regular sample matrices, no surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

This report displays Holding Time breaches only. Only the respective Extraction / Preparation and/or Analysis component is/are displayed.

Matrix: **WATER**

Method	*Extraction / Preparation*			*Analysis*		
Container / Client Sample ID(s)	*Date extracted*	*Due for extraction*	***Days overdue***	*Date analysed*	*Due for analysis*	***Days overdue***
EA005: pH						
Clear Plastic Bottle - Natural						
G-WQ-03	----	----	----	20-AUG-2009	19-AUG-2009	**1**

Outliers : Frequency of Quality Control Samples

The following report highlights breaches in the Frequency of Quality Control Samples.

- **No Quality Control Sample Frequency Outliers exist.**

Appendix C

Field Quality Control and Quality Assurance Data

Field Duplicates (WATER)
Filter: ALL

			SDG	EB0908160	EB0908160		EB0908368	EB0908368		EB0909974	EB0909974		EB0909996	EB0909996		ES0907382	ES0907382		ES0907660	ES0907660		ES0909216	ES0909216		ES0909220	ES0909220		ES0911109	ES0911109		ES0912210	ES0912210	
			Field_ID	G-WQ-04	QA1	**RPD**	G-WQ-03	QA2	**RPD**	G-WQ-02	QA-03	**RPD**	G-WQ-07	QA-04	**RPD**	G-WQ-04	QA1	**RPD**	G-WQ-03	QA2	**RPD**	G-WQ-07	QA-04	**RPD**	G-WQ-02	QA-03	**RPD**	G-WQ-09	QA01	**RPD**	G-WQ-05	QA01	**RPD**
			Sampled_Date-Time	21/05/2009	21/05/2009		26/05/2009	26/05/2009		23/06/2009	23/06/2009		24/06/2009	24/06/2009		21/05/2009	21/05/2009		26/05/2009	26/05/2009		24/06/2009	24/06/2009		23/06/2009	23/06/2009		28/07/2009	28/07/2009		17/08/2009	17/08/2009	
Method_Type	**ChemName**	**Units**	**EQL**																														
(GC/MS/FPD) and LC/MS/MS.	Tebuthiuron	mg/l	0.01	<0.01	<0.01	0	<0.01	<0.01	0																								
Ammonia as N - Ultra-Trace in Saline Waters	Ammonia	mg/l	0.005													<0.005	<0.005	0	<0.005	<0.005	0	0.006	0.007	15	<0.005	<0.005	0	0.009	0.009	0	<0.005	0.009	57
Conductivity by PC Titrator	Electrical conductivity *(lab)	uS/cm	1	51100.0	50600.0	1	54900.0	54500.0	1	72000.0	72200.0	0	59500.0	61900.0	4													50100.0	50900.0	2	50100.0	50900.0	2
Dissolved Mercury by FIMS	Mercury (Filtered)	mg/l	0.0001													<0.0001	<0.0001	0	<0.0001	<0.0001	0	<0.0001	<0.0001	0	<0.0001	<0.0001	0	<0.0001	<0.0001	0	<0.0001	<0.0001	0
Dissolved Metals in Saline Water -Suite A by ORC-I	Aluminium (Filtered)	mg/l	0.01													<0.01	<0.01	0	<0.01	<0.01	0	<0.01	<0.01	0	<0.01	<0.01	0	<0.01	<0.01	0	**<0.01**	**0.07**	**150**
	Antimony (Filtered)	µg/L	0.5													<0.5	<0.5	0	<0.5	<0.5	0	<0.5	<0.5	0	<0.5	<0.5	0	<0.5	<0.5	0	<0.5	<0.5	0
	Arsenic (Filtered)	µg/L	0.5													1.7	2.0	16	1.3	1.2	8	0.7	0.6	15	0.6	0.7	15	1.3	1.1	17	0.8	0.9	12
	Barium (Filtered)	mg/l	0.001													0.008	0.008	0	0.01	0.009	11	0.008	0.008	0	0.007	0.006	15	0.008	0.008	0	0.008	0.009	12
	Beryllium (Filtered)	µg/L	0.1													<0.1	<0.1	0	<0.1	<0.1	0	<0.1	<0.1	0	<0.1	<0.1	0	<0.1	<0.1	0	<0.1	<0.1	0
	Cadmium (Filtered)	µg/L	0.2													<0.2	<0.2	0	<0.2	<0.2	0	<0.2	<0.2	0	<0.2	<0.2	0	<0.2	<0.2	0	<0.2	<0.2	0
	Chromium (III+VI) (Filtered)	µg/L	0.5													<0.5	<0.5	0	<0.5	<0.5	0	<0.5	<0.5	0	<0.5	<0.5	0	<0.5	<0.5	0	<0.5	<0.5	0
	Cobalt (Filtered)	µg/L	0.2													<0.2	<0.2	0	<0.2	<0.2	0	<0.2	<0.2	0	<0.2	<0.2	0	<0.2	<0.2	0	<0.2	<0.2	0
	Copper (Filtered)	mg/l	0.001													0.001	0.001	0	<0.001	<0.001	0	<0.001	<0.001	0	<0.001	<0.001	0	<0.001	<0.001	0	<0.001	<0.001	0
	Lead (Filtered)	µg/L	0.2													<0.2	<0.2	0	<0.2	<0.2	0	<0.2	<0.2	0	<0.2	<0.2	0	<0.2	<0.2	0	<0.2	<0.2	0
	Manganese (Filtered)	µg/L	0.5													3.4	3.3	3	<0.5	<0.5	0	0.7	0.8	13	0.8	1.0	22	0.8	1.1	32	3.0	4.6	42
	Nickel (Filtered)	µg/L	0.5													<0.5	<0.5	0	0.6	0.5	18	<0.5	<0.5	0	<0.5	<0.5	0	0.9	1.0	11	0.7	0.5	33
	Silver (Filtered)	µg/L	0.1													<0.1	<0.1	0	<0.1	<0.1	0	<0.1	<0.1	0	<0.1	<0.1	0	<0.1	<0.1	0	<0.1	<0.1	0
	Vanadium (Filtered)	µg/L	0.5													1.8	2.2	20	1.4	1.5	7	1.1	1.4	24	1.1	1.2	9	1.0	1.1	10	<0.5	0.6	18
Dissolved Metals in Saline Water -Suite B by ORC-I	Iron (Filtered)	mg/l	0.005													0.006	0.006	0	<0.005	<0.005	0	<0.005	<0.005	0	<0.005	<0.005	0	<0.005	<0.005	0	0.012	<0.005	82
Multiresidue Pesticide Screen (N0. 1) - Low Level	Atrazine	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0																								
	Hexazinone	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0																								
	Molinate	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0																								
	Propiconazole	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0																								
	Temephos	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0																								
Multiresidue Pesticide Screen (No. 2)	Atrazine	µg/L	0.005	<0.005	<0.005	0	<0.005	<0.005	0													<0.005	<0.005	0	<0.005	<0.005	0				<0.005	<0.005	0
	Chlorpyrifos	µg/L	0.005	0.008	0.015	61	<0.005	<0.005	0													<0.005	<0.005	0	<0.005	<0.005	0				<0.005	<0.005	0
	Diazinon	µg/L	0.005	<0.005	<0.005	0	<0.005	<0.005	0													<0.005	<0.005	0	<0.005	<0.005	0				<0.005	<0.005	0
	Diuron	µg/L	0.005	<0.005	<0.005	0	<0.005	<0.005	0													<0.005	<0.005	0	<0.005	<0.005	0				<0.005	<0.005	0
	Malathion	µg/L	0.002	<0.002	<0.002	0	<0.002	<0.002	0													<0.002	<0.002	0	<0.002	<0.002	0				<0.002	<0.002	0
	Metolachlor	µg/L	0.005	<0.005	<0.005	0	<0.005	<0.005	0													**0.03**	**<0.005**	**143**	0.009	<0.005	57				<0.005	<0.005	0
	Molinate	µg/L	0.005	<0.005	<0.005	0	<0.005	<0.005	0													<0.005	<0.005	0	<0.005	<0.005	0				<0.005	<0.005	0
	Simazine	µg/L	0.005	<0.005	<0.005	0	<0.005	<0.005	0													<0.005	<0.005	0	<0.005	<0.005	0				<0.005	<0.005	0
	Thiobencarb	µg/L	0.005	<0.005	<0.005	0	<0.005	<0.005	0													<0.005	<0.005	0	<0.005	<0.005	0				<0.005	<0.005	0
	Trifluralin	µg/L	0.005	<0.005	<0.005	0	<0.005	<0.005	0													<0.005	<0.005	0	<0.005	<0.005	0				<0.005	<0.005	0
Nitrate as N - Ultra-Trace in Saline Waters	Nitrate (as N)	mg/l	0.002													0.003	0.003	0	0.005	0.003	50	0.009	0.008	12	0.006	0.006	0	0.006	0.006	0	0.003	<0.002	40
Nitrite and Nitrate as N - Ultra-Trace in Saline W	Nitrogen (Total Oxidised)	mg/l	0.002													0.003	0.003	0				0.009	0.008	12	0.006	0.006	0	0.006	0.006	0	0.003	<0.002	40
Nitrite as N - Ultra-Trace in Saline Waters	Nitrite (as N)	mg/l	0.002													<0.002	<0.002	0	<0.002	<0.002	0	<0.002	<0.002	0	<0.002	<0.002	0	<0.002	<0.002	0	<0.002	<0.002	0
Organochlorine Pesticides (Ultra-trace)	4,4-DDE	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0																								
	a-BHC	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0																								
	Aldrin	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0																								
	b-BHC	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0																								
	chlordane	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0																								
	Chlordane (cis)	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0																								
	Chlordane (trans)	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0																								
	d-BHC	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0																								
	DDD	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0																								
	DDT	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0																								
	Dieldrin	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0																								
	Endosulfan	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0																								
	Endosulfan I	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0																								
	Endosulfan II	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0																								
	Endosulfan sulphate	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0																								
	Endrin	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0																								
	Endrin aldehyde	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0																								
	Endrin ketone	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0																								
	g-BHC (Lindane)	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0																								
	Heptachlor	µg/L	0.005	<0.005	<0.005	0	<0.005	<0.005	0																								
	Heptachlor epoxide	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0																								
	Hexachlorobenzene	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0																								
	Methoxychlor	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0																								
Organophosphorus Pesticides (Ultra-trace)	Azinophos methyl	µg/L	0.1	<0.1	<0.1	0	<0.12	<0.12	0																								
	Bromophos	µg/L	0.1	<0.1	<0.1	0	<0.12	<0.12	0																								
	Carbophenothion	µg/L	0.1	<0.1	<0.1	0	<0.12	<0.12	0																								
	Chlorfenvinphos Z	µg/L	0.1	<0.1	<0.1	0	<0.12	<0.12	0																								
	Chlorpyrifos-methyl	µg/L	0.1	<0.1	<0.1	0	<0.12	<0.12	0																								
	Demeton-S-methyl	µg/L	0.1	<0.1	<0.1	0	<0.12	<0.12	0																								
	Dichlorvos	µg/L	0.1	<0.1	<0.1	0	<0.12	<0.12	0																								
	Dimethoate	µg/L	0.1	<0.1	<0.1	0	<0.12	<0.12	0																								
	Ethion	µg/L	0.1	<0.1	<0.1	0	<0.12	<0.12	0																								
	Fenamiphos	µg/L	0.1	<0.1	<0.1	0	<0.12	<0.12	0																								
	Fenthion	µg/L	0.1	<0.1	<0.1	0	<0.12	<0.12	0																								
	Malathion	µg/L	0.1	<0.1	<0.1	0	<0.12	<0.12	0																								
	Methyl parathion	µg/L	0.1	<0.1	<0.1	0	<0.12	<0.12	0																								
	Monocrotophos	µg/L	0.1	<0.1	<0.1	0	<0.12	<0.12	0																								
	Parathion	µg/L	0.1	<0.1	<0.1	0	<0.12	<0.12	0																								
	Pirimphos-ethyl	µg/L	0.1	<0.1	<0.1	0	<0.12	<0.12	0																								
	Prothiofos	µg/L	0.1	<0.1	<0.1	0	<0.12	<0.12	0																								
Organotin Compounds (Soluble)	Tributyltin (as Sn)	ngSn/L	2	<2.0	<2.0	0	<2.0	<2.0	0																								
PAH/Phenols (GC/MS - SIM)	2,4,5-trichlorophenol	µg/L	1	<1.0	<1.0	0	<1.0	<1.0	0																								
	2,4,6-trichlorophenol	µg/L	1	<1.0	<1.0	0	<1.0	<1.0	0																								
	2,4-dichlorophenol	µg/L	1	<1.0	<1.0	0	<1.0	<1.0	0																								
	2,4-dimethylphenol	µg/L	1	<1.0	<1.0	0	<1.0	<1.0	0																								
	2,6-dichlorophenol	µg/L	1	<1.0	<1.0	0	<1.0	<1.0	0																								
	2-chlorophenol	µg/L	1	<1.0	<1.0	0	<1.0	<1.0	0																								
	2-methylphenol	µg/L	1	<1.0	<1.0	0	<1.0	<1.0	0																								
	2-nitrophenol	µg/L	1	<1.0	<1.0	0	<1.0	<1.0	0																								
	3-&4-methylphenol	µg/L	2	<2.0	<2.0	0	<2.0	<2.0	0																								
	4-chloro-3-methylphenol	µg/L	1	<1.0	<1.0	0	<1.0	<1.0	0																								
	Acenaphthene	µg/L	1	<1.0	<1.0	0	<1.0	<1.0	0																								
	Acenaphthylene	µg/L	1	<1.0	<1.0	0	<1.0	<1.0	0																								
	Anthracene	µg/L	1	<1.0	<1.0	0	<1.0	<1.0	0																								
	Benz(a)anthracene	µg/L	1	<1.0	<1.0	0	<1.0	<1.0	0																								
	Benzo(a) pyrene	µg/L	0.5	<0.5	<0.5	0	<0.5	<0.5	0																								
	Benzo(b)fluoranthene	µg/L	1	<1.0	<1.0	0	<1.0	<1.0	0																								
	Benzo(g,h,i)perylene	µg/L	1	<1.0	<1.0	0	<1.0	<1.0	0																								
	Benzo(k)fluoranthene	µg/L	1	<1.0	<1.0	0	<1.0	<1.0	0																								
	Chrysene	µg/L	1	<1.0	<1.0	0	<1.0	<1.0	0																								
	Dibenz(a,h)anthracene	µg/L	1	<1.0	<1.0	0	<1.0	<1.0	0																								
	Fluoranthene	µg/L	1	<1.0	<1.0	0	<1.0	<1.0	0																								
	Fluorene	µg/L	1	<1.0	<1.0	0	<1.0	<1.0	0																								
	Indeno(1,2,3-c,d)pyrene	µg/L	1	<1.0	<1.0	0	<1.0	<1.0	0																								
	Naphthalene	µg/L	1	<1.0	<1.0	0	<1.0	<1.0	0																								

Field Duplicates (WATER)
Filter: ALL

			SDG	EB0908160	EB0908160		EB0908368	EB0908368		EB0909974	EB0909974		EB0909996	EB0909996		ES0907382	ES0907382		ES0907660	ES0907660		ES0909216	ES0909216		ES0909220	ES0909220		ES0911109	ES0911109		ES0912210	ES0912210	
			Field_ID	G-WQ-04	QA1	**RPD**	G-WQ-03	QA2	**RPD**	G-WQ-02	QA-03	**RPD**	G-WQ-07	QA-04	**RPD**	G-WQ-04	QA1	**RPD**	G-WQ-03	QA2	**RPD**	G-WQ-07	QA-04	**RPD**	G-WQ-02	QA-03	**RPD**	G-WQ-09	QA01	**RPD**	G-WQ-05	QA01	**RPD**
			Sampled_Date-Time	21/05/2009	21/05/2009		26/05/2009	26/05/2009		23/06/2009	23/06/2009		24/06/2009	24/06/2009		21/05/2009	21/05/2009		26/05/2009	26/05/2009		24/06/2009	24/06/2009		23/06/2009	23/06/2009		28/07/2009	28/07/2009		17/08/2009	17/08/2009	
	Pentachlorophenol	µg/L	4	<4.0	<4.0	0	<4.0	<4.0	0																								
	Phenanthrene	µg/L	1	<1.0	<1.0	0	<1.0	<1.0	0																								
	Phenol	µg/L	1	<1.0	<1.0	0	<1.0	<1.0	0																								
	Pyrene	µg/L	1	<1.0	<1.0	0	<1.0	<1.0	0																								
pH	pH (Lab)	pH_Units	0.01	8.1	8.14	0	8.05	8.07	0	8.0	8.02	0	7.77	7.76	0													8.21	8.18	0	8.01	8.07	1
Phenoxyacetic Acid Herbicides (LCMS - Low DL)	2,4,5-T	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0																								
	2,4,5-TP (Silvex)	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0																								
	2,4,6-trichlorophenol	µg/L	0.1	<0.1	<0.1	0	<0.1	<0.1	0																								
	2,4-D	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0																								
	2,4-DB	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0																								
	2,4-DP	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0																								
	2,6-D	µg/L	0.1	<0.1	<0.1	0	<0.1	<0.1	0																								
	4-Chlorophenoxy acetic acid	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0																								
	Clopyralid	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0																								
	Dicamba	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0																								
	Fluroxypyr	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0																								
	MCPA	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0																								
	MCPB	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0																								
	Mecoprop	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0																								
	Picloram	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0																								
	Triclopyr	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0																								
Reactive Phosphorus as P - Ultra-Trace in Saline W	Reactive Phosphorus as P	mg/l	0.001													<0.001	<0.001	0	0.004	0.004	0	0.002	0.002	0	0.002	0.002	0	0.005	0.006	18	0.001	<0.001	0
Suspended Solids	TSS	mg/l	1	90.0	78.0	14	52.0	44.0	17	18.0	26.0	36	**15.0**	**40.0**	**91**																		
Suspended Solids (High Level)	TSS	mg/l	5																									12.0	7.0	53	8.0	14.0	55
TKN (Total N - NOx-N). (FIA - UT) in Saline Water	TKN (as N)	mg/l	0.05													0.12	0.12	0	0.12	0.11	9	0.11	0.11	0	0.15	0.12	22	0.14	0.17	19	0.09	0.05	57
Total Cyanide By Discrete Analyser	Cyanide Total	mg/l	0.004	<0.004	<0.004	0	<0.004	<0.004	0																								
Total Dissolved Solids	TDS	mg/l	1	44800.0	45300.0	1	47600.0	49700.0	4	38800.0	42200.0	8	39600.0	37600.0	5													42100.0	42400.0	1	42800.0	39500.0	8
Total Nitrogen/Persulfate Digestion/Ultra-Trace/Sa	Nitrogen (Total)	µg/l	50													120.0	120.0	0	130.0	110.0	17	120.0	120.0	0	160.0	130.0	21	150.0	180.0	18	90.0	50.0	57
Total Phosphorus/Persulfate Digestion/ Ultra Trace	Phosphorus	mg/l	0.005													<0.005	<0.005	0	<0.005	<0.005	0	<0.005	<0.005	0	<0.005	0.007	33	<0.005	<0.005	0	0.01	0.012	18
TPH - Semivolatile Fraction	TPH C10 - C14 Fraction	µg/L	50	<50.0	<50.0	0	<50.0	<50.0	0																								
	TPH C15 - C28 Fraction	µg/L	100	<100.0	<100.0	0	<100.0	<100.0	0																								
	TPH C29-C36 Fraction	µg/L	50	<50.0	<50.0	0	<50.0	<50.0	0																								
TPH Volatiles/BTEX	Benzene	µg/L	1	<1.0	<1.0	0	<1.0	<1.0	0																								
	Ethylbenzene	µg/L	2	<2.0	<2.0	0	<2.0	<2.0	0																								
	Toluene	µg/L	2	<2.0	<2.0	0	<2.0	<2.0	0																								
	TPH C 6 - C 9 Fraction	µg/L	20	<20.0	<20.0	0	<20.0	<20.0	0																								
	Xylene (m & p)	µg/L	2	<2.0	<2.0	0	<2.0	<2.0	0																								
	Xylene (o)	µg/L	2	<2.0	<2.0	0	<2.0	<2.0	0																								
Ultra-trace Volatile Organic Compounds	1,1,1-trichloroethane	µg/L	1	<1.0	<1.0	0																											
	1,2,4-trichlorobenzene	µg/L	0.5	<0.5	<0.5	0	<0.5	<0.5	0																								
Volatile Organic Compounds	1,1,2-trichloroethane	µg/L	5	<5.0	<5.0	0	<5.0	<5.0	0																								

*RPDs have only been considered where a concentration is greater than 5 times the EQL.

**High RPDs are in bold (Acceptable RPDs for each EQL multiplier range are: 50 (5-10 x EQL); 50 (10-30 x EQL); 50 (> 30 x EQL))

***Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in the primary laboratory

Appendix D

Summary of Quality Assurance and Quality Control Program

1. QUALITY ASSURANCE/QUALITY CONTROL PROCEDURES

GHD institutes a Quality Assurance (QA) / Quality Control (QC) program for all projects to ensure that as far as possible the data is valid, defensible and of known precision and accuracy. These data include data obtained both in the field and in the laboratory.

The Company has established a Quality Management System based on the requirements of AS 3901-1987, *Quality Systems for Design/Development, Production, Installation and Servicing* to manage quality throughout the Company's operations.

The Company Quality System is documented in:

- Quality Manual which documents Quality Policy, Organisation and Responsibilities, and outlines the quality system
- Systems Procedures Manual which documents the administrative and management procedures for each element in the quality system
- Technical Manual which details the specific operating procedures and work methods which employees must follow in carrying out activities or processes.

Provisions of the Quality System include:

- Guidelines/Procedures for most routine situations
- Information/Responses for non-standard situations.

Quality within the Company is managed by the Quality Committee, which undertakes periodic reviews of the effectiveness of the quality system.

2. FIELD QUALITY CONTROL PROCEDURES

The Company has in place Technical Procedures under which all field operations are conducted.

A specific sampling plan is prepared for each project. The sampling plan contains details of the method/s for collecting the samples, the number and type of containers per sampling location, any required sample preservation techniques, sample identification codes, frequency of any required QC samples and documentation procedures.

In addition, the Company has developed additional procedures for assessing sampling and analytical quality and has developed procedures for assessing sampling and analytical variance.

2.1 Soil Sample Collection

Samples for chemical or physical analysis were collected by qualified and experienced environmental scientists or environmental engineers employing the appropriate Technical Procedures, as specified in the Sampling Plan.

Generally for collection of the benthic sediment samples, a van veen grab sampler was used from boat, to collect samples. Samples for analysis of were placed as soon as possible into a secure cool box on ice.

The Chain of Custody documentation was then completed. Other data, such as OH&S monitoring, groundwater data, etc. were listed in the field note book.

2.2 Water Sample Collection

Samples for chemical or physical analysis were collected by qualified and experienced environmental scientists or environmental engineers employing the appropriate Technical Procedures, as specified in the Sampling Plan.

For the collection of water samples, laboratory supplied containers were used and water was collected from the surface (approximately 0.2m below the surface). Samples for analysis of were placed as soon as possible into a secure cool box on ice.

The Chain of Custody documentation was then completed. Other data, such as OH&S monitoring, groundwater data, etc. were listed in the field notebook.

2.3 Sample Documentation

All data collected in the field was recorded in the field notebook or on field data sheets.

Sample jars were labelled with the following:

- GHD Job number
- Unique sample number referring to a particular sample location and depth
- Sampler's identification
- Destination of the sample.

Labelling of sample containers was effected with permanent marking ink on the body of the container, not the lid.

Chain of custody documentation (CoC) was employed for all sampling events with copies of the CoCs retained by GHD.

2.4 Decontamination Procedures

As described above, standard GHD decontamination procedures were employed. These include for sampling equipment, the following:

- Wash and/or scrub in tap water
- Rinse or scrub in phosphate-free detergent
- Rinse in tap water
- Rinse in nitric acid in distilled water
- Rinse in methanol/distilled water (if organic compounds are to be analysed or if oily substances are noted in samples)
- Rinse twice in distilled water.

2.4 Field Analytical Equipment

Analytical equipment used in the field was appropriate to the required task, and was used under the appropriate Technical Procedure. Analysers were calibrated, as appropriate, and details of the calibration are recorded in the field note book or on the field data sheets.

3. QUALITY CONTROL ASSESSMENT OF LABORATORY RESULTS

GHD routinely carries out a number of procedures to ensure the results of laboratory chemical analyses could be relied upon to make valid conclusions concerning the presence or absence of contamination.

3.1 Laboratory Procedures

The first requirement of laboratories employed by GHD to analyse samples is that they are certified by the National Association of Testing Authorities Australia (NATA) as required by *Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites* (ANZECC/NHMRC, 1992) and the *Draft Guidelines for the Assessment and Management of Contaminated Land in Qld* (EPA, 1998). NATA certification applies to each analytical method (ie. for each substance) and ensures that the laboratory carried out certain prescribed procedures to ensure accuracy and precision of results for each analyte (the term analyte relates to the substance being analysed, which may be a compound such as DDT or an element such as lead). The methods for analyses are certified by NATA as being appropriate for each analyte.

The NATA certification provides for strict laboratory quality assurance procedures to be in place and to be carried out on an on-going basis in the laboratories. These include meticulous adherence to approved methods for carrying out the analytical procedures themselves, and a number of other QA procedures, which have been put into place to ensure reliable analytical results. These procedures include on receipt of samples at the laboratory logging-in of samples, checking chain-of-custody documentation, ensuring analyses are carried out within appropriate holding times, ensuring the appropriate samples preparation and extraction procedures are employed, tracking of samples and analytical results, calibration of analytical equipment, etc.

As part of the NATA requirements the laboratories carry out and report analyses a number of types of quality control samples, such as duplicate samples (the same sample analysed more than once), blanks (containing no levels of the analytes to be analysed), spiked samples (containing known additions of the analytes to appropriate matrices) and standard samples (samples containing known concentrations of the analytes - also known as reference standards).

The laboratories are also obliged under the terms of their NATA certification to carry out analyses of reagents (‘Reagent Blanks’) used in the analytical methods. These procedures are aimed at detecting impurities in reagents, which may give impact on the accuracy of the results.

The laboratories also employ other procedures, such as analysis of surrogate sample, which involve addition of substances with properties similar to the analytes being sought to samples, which are then analysed with the field samples. The concentrations determined by the laboratory are then compared with the concentrations of the surrogates added and are another method of evaluating the laboratory performance.

To avoid confusion, samples collected in the field and which are to be analysed to determine the concentrations of potential contaminants are referred to, below, as “field samples” or in the report, itself, where there is no likelihood of confusion, simply as “samples”.

3.2 Accuracy of Results - Spike and Certified Reference Samples and Reagent Blanks

3.2.1 Spike and Certified Reference Samples

The accuracy of analytical results relates to the actual or “true” concentration of each analyte in the sample. The accuracy of analytical results is measured by comparison of the results reported by the laboratory for spiked or standard samples.

Estimates of the accuracy of the laboratory results is given by analysis of the following samples:

- For analysis of organic substances, samples of similar types to the field samples are “spiked” with known concentrations of one or more of the analytes and then analysed with the field samples to determine the quantity of spike that is detected
- For analysis of inorganic substances, certified reference samples containing known concentrations of the analytes are analysed with the field samples and the quantity of substances detected is compared with the known or “true” value.

The data quality is evaluated by reference to the Relative Percentage Difference (RPD), which is generally expressed as a percentage and is defined as follows:

RPD = 100 (Result 1 - Result 2)/ (Mean Result)

The accuracy of analytical results is evaluated by reference to the “Percent Recovery” of known quantities of the analytes into a blank sample, which have been analysed in exactly the same manner as the field samples. Samples to which known quantities of the analytes have been added as known as “spiked samples” or “spikes”.

The Percent Recovery is calculated as follows:

$$\%\ \text{Recovery} = 100\ \frac{\text{(Result for spiked sample - background concentration in blank)}}{\text{Concentration of spike}}$$

If the analysis is 100% accurate then the Recovery is 100 %.

The % Recovery is generally reported only for organic analytes, for which reliable standards are generally unsatisfactory, due to their instability, availability at concentrations, which may not be appropriate for each job, and their high cost. Because of their stability, standard samples containing accurately known concentrations of substances such as heavy metals are readily available and are generally employed to evaluate accuracy of inorganic analyses, as noted above.

3.2.2 Reagent Blanks

Reagent blanks are samples, which consist of the reagents that are used during the preparation, extraction and digestion procedure and are analysed at the beginning of every sample batch analysis. These procedures are aimed at detecting impurities in reagents, which may give impact on the accuracy of the results.

3.3 Precision of Results - Duplicate Samples and Surrogate Spikes

3.3.1 Duplicate Samples

The term precision relates to the reproducibility of the results reported by the laboratory and is measured by comparison of results of repeat analyses of the same sample. Laboratories carry out repeat analyses of samples submitted from each job.

Also as a measure of precision, GHD may submit duplicate field samples, which have been collected for the same field location and as best we are able are carefully homogenised before splitting and placing one part of the sample in one container and the other part in another container, which is labelled so as to preserve the anonymity of the samples. The samples are submitted blind to the laboratory for analysis (ie. the laboratory does not know the samples are related).

Precision is not necessarily related in a simple manner to accuracy. It is possible for a laboratory to produce results having high precision (measured by similar results for repeat analyses) but because of some systems error for the results to have low accuracy (ie. to be not close to the “true” concentrations of the analyte in question).

The precision of the laboratory analyses, themselves, is evaluated by repeated analysis of known samples which have been carefully homogenised. It is, however, not always possible to homogenise field samples, due for example to the particulate nature of the contaminants or due to the presence of volatile compounds which would be lost during any attempt to homogenise the sample. Consequently, repeated analysis of field samples gives a measure of the combined sampling and analytical precision.

Any results reported for analysis of duplicate samples are influenced strongly by the homogeneity of the samples. Clearly, if the laboratories are analysing samples containing different quantities of the analytes the RPDs would be expected to be high. No matter how carefully samples containing particulate matter are homogenised in the field, identical duplicate samples will be very difficult to produce. In general, in the field it is easier to produce duplicate samples of sand soils, but it will be difficult to produce homogeneous duplicate samples from clay soils.

The precision of results is evaluated by reference to the RPD, as above.

3.3.2 Surrogate Spikes

Surrogate spikes are added to all samples requiring analyses for organics. The surrogate spikes are organic compounds, which are similar to the target analytes in chemical composition and behaviour in the analytical process, but which are not normally found in environmental samples.

The analyses of surrogate samples, involves the addition of the organic compounds, prior to extraction, which are then analysed with the field samples. The concentrations determined by the laboratory are then compared with the concentrations of the surrogates added.

Surrogate samples are to used to determine the extraction efficiency, ie a method of evaluating the laboratory performance. The precision of results is evaluated by reference to the laboratory acceptable recovery range (%).

3.4 Blank Sample

Samples known to contain only very low or nil levels of the analytes can be submitted anonymously (blind) to the laboratory for analysis together with the field samples.

3.5 Equipment Blanks

After cleaning sampling tools, streams of distilled deionised water are sprayed over the tools, collected and analysed to determine the extent, if any, of cross-contamination that may have been transferred from sample to sample.

3.6 Trip Blanks

For projects where the utmost reliability is required, and before going to the field, blank samples are placed in containers identical to those to be employed to collect the field samples. These containers are then carried out in the field where they are treated in an identical fashion to the field samples. Analysis of the trip blanks is employed to determine if any contaminants have been introduced to samples in the field and during subsequent storage and transport. Use of these blanks is important where low levels of volatile compounds are to be sought in either soil, water or air samples.

3.7 Background Samples

For projects where all the site is likely to contain elevated concentrations of the analytes, samples representative of local background levels can be collected from an adjacent site where no contamination will be present. However, for most projects not all locations on a site will be within contaminated zones and it is generally acceptable to rely on samples from these locations to provide an estimate of background levels of the analytes.

3.8 Interlaboratory Checking

For larger or especially sensitive projects, duplicates of field samples are sent to different laboratories for analysis of the same analytes and the results reported by each laboratory are evaluated by reference to the RPD, as above.

Differences are expected in the results from each of the laboratory and the results can be expected to be the same only if the same method of extraction or dissolution of the sample is employed by both laboratories and the method of analysis is exactly the same. Commonly, these procedures differ, from laboratory to laboratory. Evaluation of the results of the interlaboratory testing are made by reference to the RPD, as above.

The evaluation of interlaboratory checking will also be influenced by the homogeneity of field samples, as explained above.

3.9 Acceptability of Analytical Results

In evaluating the acceptability of analytical results reference is made to the RPD, as below.

Analysis	Upper Acceptable	RPD
Intralaboratory results	Inorganic analytes	30%
	Organic analytes	100%
Interlaboratory results	Inorganic analytes	50%
Organic analytes	100%	

The RPD cannot be used as a stand-alone measure of laboratory accuracy or precision. For example, in determining the acceptability of the laboratory duplicate analyses consideration is also given to the proximity of the results to the analytical detection limit. When the concentrations of the analytes are low, small differences in the analytical results can give rise to large RPDs which would not necessarily mean that the laboratory results are unreliable.

In addition, when the concentrations of the analytes are very high (exceeding, say for soils, 1000 mg/kg for certain analytes) the RPDs are often high, indicating that a second round of analyses may be required. Commonly, for preliminary assessments it is not required to accurately quantify extremely high levels of analytes, since it will be sufficient to know that the results can be relied on to indicate the presence of samples which greatly exceed the adopted site Environmental Investigation Levels (EILs) or Health Investigation Levels (HILs).

In determining the acceptability of analytical results employing RPDs, consideration is given to the likely distribution of contaminants within the field samples. If their distribution is heterogeneous, for example in fill, the use of RPDs to determine acceptability of the analytical results will be of little benefit. Similarly the use of RPDs will be of little benefit as an indicator of the acceptability of analytical results of volatile compounds, such as solvents or light fraction petroleum fuels.

4. QUALITY CONTROL PROGRAM FOR THE PRESENT ASSESSMENT

Because the substances detected at the site were relatively simple compounds for which standard methods for chemical analyses have been widely used, and the site criteria were well above laboratory detection limits, no difficulties were expected to be encountered in obtaining reliable analytical results. However, to ensure that the results of the laboratory analyses for samples collected as part of the present assessment can be relied on a number of quality control samples have been submitted anonymously (blind) to the laboratories. The results of the Quality Control Program undertaken for the preset assessment are presented below.

4.1 Laboratories Employed

Commercial laboratories used for the analysis of samples were as follows:

- Australian Laboratory Services (ALS)

Methods employed for the analyses of the above substances were in accordance with the respective NATA certification and are listed on the laboratory certificates of analysis.

4.2 Sample Holding and Extraction

The holding times prior to the date the analyses (extraction) of the samples commenced were within the stated holding times and are considered to be acceptable, for most of the samples with the exceptions of;

- WQ02, WQ03, WQ04, WQ08, WQ10, WQ11, WQ12 and QA3 for ultra-trace metals on 23 June 2009 by 1 day;
- WQ03, WQ04, WQ07, WQ10, WQ11 and WQ12 for ultra-trace metals on 27 July 2009 by 1 day; and
- WQ04 and WQ07 on 18 August 2009 for chlorophyll by 1 day and ultra-trace metals by 2 days.

Maximum sample holding times (days)

Analyte	Matrix	Maximum sample holding time prior to sample extraction (days)
Reactive Phosphourus, Nitrate, Nitrite, Chlorophyll a, Turbidity	Water	2
Oil & Grease, Ammonia, Nox, TKN, Total Phosphorus and Total Nitrogen	Water	28
Monoaromatic hydrocarbons (BTEX), petroleum hydrocarbons (TPH) (C6-C9),	Water	14
Polycyclic Aromatic Hydrocarbons (PAH), Phenols, PCBs, Chlorinated hydrocarbons, Semi volatile compounds (SVOC), Organo Chlorine/Organo Phosphorus Pesticides, Dioxins, Phenoxy Acid Herbicides, Organotins (TBT)	Water	7

Metals and metalloids other than mercury	Water/soils	180 (Mercury 28)

Note: Sample holding times published in Australian and New Zealand Environment Conservation Council (1996), *Guidelines for the Laboratory Analysis of Contaminated Soils - these holding times also appear within AS 4482.1-1997*

4.4 GHD Quality Control Program for the Present Assessment

4.4.1 Field Procedures

Samples were collected, stored and transported in accordance with the described quality assurance procedures.

4.4.2 Precision of Results

To ensure detection of errors in results reported by the laboratories, duplicates of field samples were submitted blind to the laboratories.

Six (6) Intra-laboratory duplicate surface water samples were sent to the primary laboratory (ALS) – this represented two samples from each of the six sampling events.

GHD Quality Control Samples

Date	Parent Sample	QA/QC Sample	Sample Matrix	Analysis	Laboratory
21/05/09	WQ04	QA1	Surface water	Heavy Metals, BTEX, Inorganics, Nutrients, OCP, Organic, OPP, PAH/Phenols, Pesticides, Multi-residue Pesticide Screen, Pheno Acid Herbicides, SVOC and TPH	ALS
26/05/09	WQ03	QA2	Surface water	Heavy Metals, BTEX, Inorganics, Nutrients, OCP, Organic, OPP, PAH/Phenols, Pesticides, Multi-residue Pesticide Screen, Pheno Acid Herbicides, SVOC and TPH	ALS
23/06/09	WQ02	QA3	Surface water	Heavy Metals, Inorganics, Nutrients, Multi-residue Pesticide Screen	ALS
24/06/09	WQ07	QA4	Surface water	Heavy Metals, Inorganics, Nutrients, Multi-residue Pesticide Screen	ALS
28/07/09	WQ09	QA5	Surface water	Heavy Metals, Inorganics, Nutrients, Multi-residue Pesticide Screen	ALS
17/08/09	WQ05	QA6	Surface water	Heavy Metals, Inorganics, Nutrients, Multi-residue Pesticide Screen	ALS

In order to check the precision of the analytical results, the Relative Percentage Differences (RPDs) were calculated for the water samples, as described above, for sets of duplicate samples.

The RPDs determined for the duplicates and the intra-laboratory samples analysed are summarised in Appendix C.

The RPDs that were outside the acceptable range in water:

May 2009

Station WQ04 (QA1)

- All parameters acceptable

Station WQ03 (QA2)

- Nitrate – 50%, however deemed acceptable as values near Limit of Reporting

June 2009

Station WQ02 (QA3)

- Total Suspended Solids – 36%, just above acceptable threshold
- Total Phosphorus – 33%, just above acceptable threshold

Station WQ03 (QA4)

- Metolachlor – 143%

July 2009

Station WQ09 (QA5)

- Filtered Manganese – 32%, however deemed acceptable as values near Limit of Reporting
- Total Suspended Solids – 53%

August 2009

Station WQ05 (QA6)

- Filtered Aluminium – 150%
- Filtered Manganese – 42%
- Filtered Nickel – 33%, just above acceptable threshold
- Nitrate – 40%
- Nitrite – 40%
- Total Suspended Solids – 55%
- TKN – 57%, near limit of reporting
- TN – 57%, near limit of reporting

In a number of cases, the concentrations in duplicate samples that had RPDs that were outside of the nominated limits were close to the limit of reporting, meaning small differences in concentration resulted in large differences in relative percent difference. This does not necessarily indicate a poor quality assurance, but rather heightened sensitivity of small differences in measurement (i.e. one duplicate at limit of reporting and other a small concentration just above the limit of reporting).

In other cases, such as TSS, natural variability exists in the marine environment due to the effect of wind and waves in resuspending sediments, therefore higher RPDs are expected.

4.4.3 Limits of Reporting

Throughout the monitoring program, the laboratory raised the LORs for metals, due to saline sample matrix interference. The LOR's therefore differ slightly between and within some monitoring events.

4.5 Laboratory Control Samples, Duplicates, Method Blanks, Matrix Spikes and Regular Sample Surrogates

4.5.1 Duplicates

For all matrices, there were no Duplicate outilers.

4.5.2 Method Blanks

For all matrices, there were no Method Blank value outiler..

4.5.3 Laboratory Quality Control Samples

For all matrices, there were no Laboratory Control Spike outliers with the following exceptions:

- Phenolic Compounds, 21 May 2009
- Dissolved Copper, 21 May 2009
- Dissolved Iron, 21 May 2009
- Organotin Compounds, 26 May 2009
- Following Dissolved Metals on 23 June 2009:
  - Arsenic
  - Cobalt
  - Copper
  - Lead
  - Manganese
  - Nickel
  - Vanadium
- Following Dissolved Metals on 24 June 2009:
  - Arsenic
  - Cobalt
  - Copper
  - Manganese
  - Nickel
  - Vanadium
- Following Dissolved Metals on 17 August 2009:
  - Chromium
  - Cobalt
  - Copper
  - Lead
  - Manganese
  - Nickel
  - Vanadium
  - Iron

- Dissolved Iron, 19 August 2009

4.5.4 Matrix Spikes

In general, there were no Matrix Spikes outliers, with the following exceptions:

- Phenoxyacetic Acid Herbidides, 21 May 2009
- QA2, 26 May 2009
  - Phenol
  - beta-BHC
  - Heptachlor
  - gamma-BHC
  - 2.4.6.-T
- QA3, 23 June 2009
  - Ammonia
  - Reactive Phosphorus
- QA4, 24 June 2009
  - Ammonia
  - Reactive Phosphorus
- QA6, 17 August 2009
  - Ammonia
  - Manganese

Spike recovery can be low or high as a result of matrix interference, particularly with organic compounds.

4.5.5 Regular Sample Surrogates

For most batches, there were no Regular sample surrogates outliners, with the following:

- Organotin, WQ06, 26 May 2009-10-12

5 Overall Assessment of the Quality Control

Overall, the results of the Quality Control programs adopted by the laboratory and by GHD indicate that the results of the following chemical analyses are of sufficient quality to be confidently used to determine the concentrations of substances of the waters within the Project Area for comparison with the nominated guidelines. Appendix B (Chain of Custory and Laboratory Analysis Reports), Appendix C (Summary of Duplicate Results) and Appendix D(Quality Control Methodology and Analysis, this appendix) provide the details of this overall assessment.

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