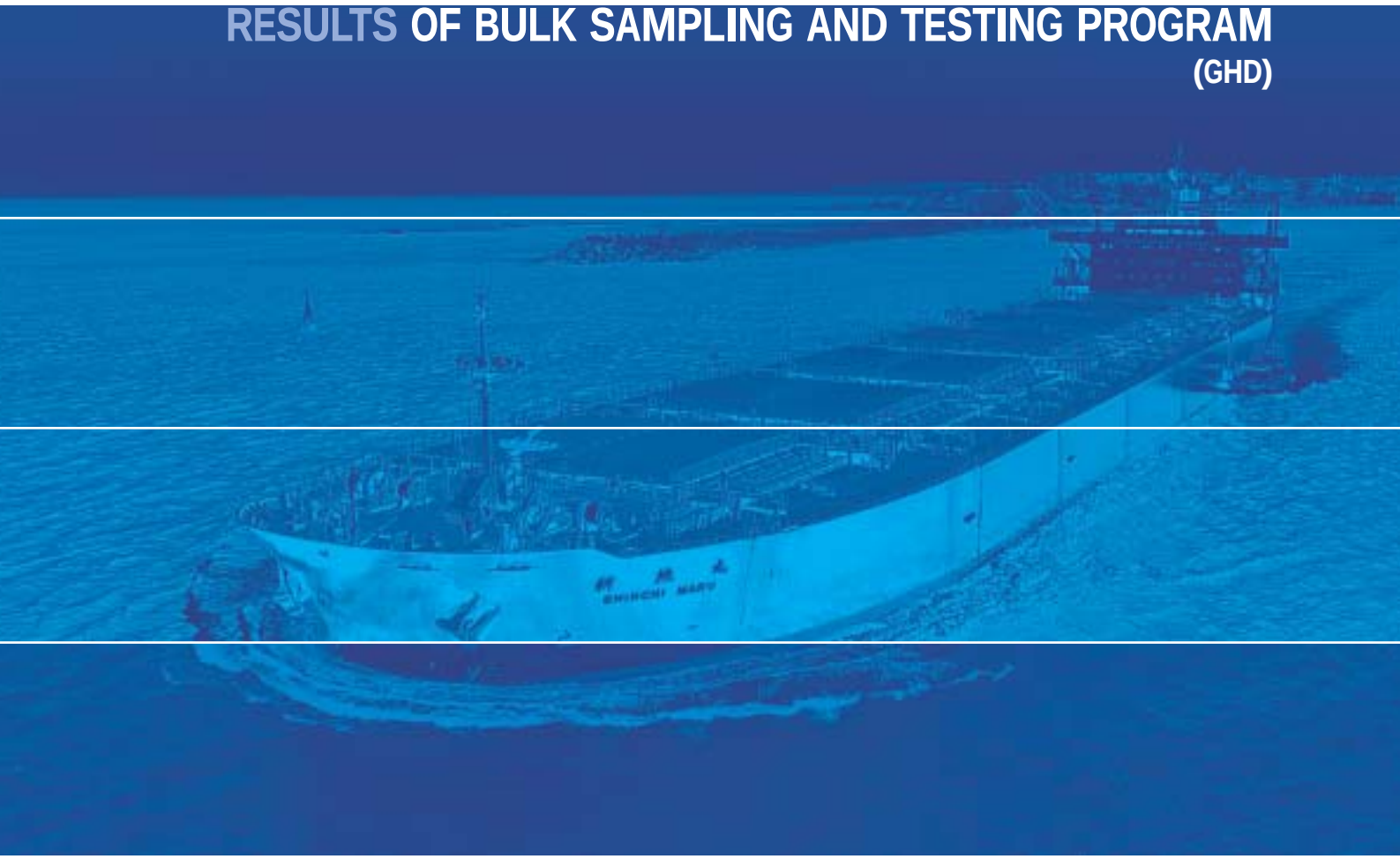
APPENDIX E

RESULTS OF BULK SAMPLING AND TESTING PROGRAM (GHD)



Newcastle Port Corporation

Proposed Extension of Shipping Channels EIS – Port of Newcastle

Options for Land Based Treatment of Sediments - Results of Bulk Sampling and Testing Programme

May 2003

CONTROLLED DOCUMENT NO. 1

BULK SAMPLING AND TESTING REPORT

for

NEWCASTLE PORT CORPORATION

at

HUNTER RIVER SOUTH ARM

for

PROPOSED EXTENSION OF SHIPPING CHANNELS EIS

REF: 2111563-10
DATE: 30 May 2003 Rev. 1

CONTROLLED DOCUMENT

DISTRIBUTION AND REVISION REGISTER

Distribution List

Copy No.	Custodian	Location
1	David Waddell	GHD, Sydney (Unbound)
2	Bob Batchelder	GHD-LongMac (Library)
3	Bob Batchelder	GHD-LongMac (Unbound Master)

Note: This register identifies the current custodians of controlled copies of the subject document.

© GHD Pty Ltd 2003

This document is and shall remain the property of GHD Pty Ltd. The document may only be used for the purposes for which it was commissioned and in accordance with the Terms of Engagement for the commission. Unauthorised use of this document in any form whatsoever is prohibited.

Document History

Revision No.	Revision Date	Description
0	28/03/03	Issued
1	30/05/03	General Revision

Issued by: .....

Date: 31/5/03

Contents

1. Introduction 1

2. Background 2

3. Bulk Sampling 3

   3.1 General 3

   3.2 Bulk Sediment Sampling 4

   3.3 Bulk Water Sampling 4

   3.4 Water Quality Testing at the Bulk Sampling Zones 5

   3.5 Unloading Bulk Samples from the Barge 5

4. Dewatering and Sediment Remediation Trials 6

   4.1 Sediment Mixing 6

   4.2 Sediment Classification Testing 7

   4.3 Geobag Testing 7

   4.4 Simulation Testing 8

   4.5 Cementitious Trials – Stabilisation 11

   4.6 Odour Trials 12

   4.7 *Water Quality Trials* 13

5. Results of Testing 15

   5.1 Sediment Classification 15

   5.2 Geobags 15

   5.3 Simulation Results 16

   5.4 Cementitious Trials 19

   5.5 Odour Tests 19

   5.6 Water Quality 19

6. Discussion and Conclusions 22

   6.1 Geobag Testing 22

   6.2 Odour Control 23

6.3 Simulation Modelling 24
6.4 Stabilisation 26

7. Assessment of Remediation Options 28

7.1 Dewatering Only 28
7.2 Geotubes – TTF 28
7.3 No Geotubes – CDF 29
7.4 Stabilisation 29
7.5 Thermal Desorption 30
7.6 Preferred Process 30

Standard Sheets

Photographs

Tables

Figures

Appendices

A - Laboratory Test Results

B – AMDEL Test Certificates

C - Haztec Cementitious Testing Report

D - CSIRO Toxicity Report

1. Introduction

This report presents the results of a Bulk Sampling and Testing (BST) programme conducted in order to assess the viability of various options for land-based treatment and remediation of contamination impacted sediments to be removed from the bed of the Hunter River South Arm. The work forms part of the EIS for the Proposed Extension of Shipping Channels (PESC) in the South Arm of the Hunter River, at the Port of Newcastle.

The purpose of the BST was to determine the constraints for a number of processes, and to establish a preferred option/s for remediation of those materials to be dredged that, due to elevated contaminant levels, are not able to be taken to offshore disposal.

This work has been conducted jointly with Patterson Britton Partners Pty Ltd (PBP). Sub-consultants have included: the University of NSW Odour Centre for odour trials; CSIRO for toxicity assessment; and Haztech Industries Pty Ltd for cementitious stabilisation.

In general, PBP conducted the bulk sampling, water quality/toxicity assessments, and arranged/reviewed the odour tests. GHD-LM set up the on-site testing apparatus for the Geobag and odour pen tests, conducted the Geobag testing and deposition/drying simulation tests for sediment dewatering purposes, arranged/reviewed the cementitious testing, and prepared a health and safety plan for the work. We note that there was a considerable amount of combined effort in many of the above work areas.

The work has been conducted in accordance with a Sampling and Analysis Plan (SAP), prepared by PBP and GHD-LM.

This report, which forms Appendix E of the PESC EIS, has been prepared by PBP and GHD-LM, and compiled by GHD-LM.

2. Background

The physical and geochemical characteristics of the materials to be removed as part of the proposed dredging of the South Arm are varied. Previous geotechnical investigations (refer to list in References) indicate that the sedimentary sequence underlying the South Arm channel (with increasing depth) may be summarised as follows:

- Very soft to soft marine silts/clays
- Poorly graded estuarine sand, some with higher fines content
- Firm to stiff alluvial clay present as lenses within the sand
- Stiff to very stiff alluvial clay grading into bedrock
- Sedimentary bedrock, generally comprising sandstones, siltstones shales and mudstones, grading typically from extremely weak to strong with depth.

The fine grained marine silts/clays are generally contaminated with heavy metals, polynuclear aromatic hydrocarbons (PAH) and total petroleum hydrocarbons (TPH). The highest concentration of contaminants is located in the area immediately adjacent to the former BHP Steelworks site. These sediments contain elevated concentrations of PAH and TPH at levels above the maximum guideline values given in the National Ocean Disposal Guidelines for Dredged Material (Environment Australia, 2002). An estimated 270,000 m^3 of this soft sediment has been identified to be unsuitable for unconfined sea disposal and must be remediated on land.

In addition to the elevated contaminant concentrations, the sediments emit odour when disturbed. This odour is principally associated with the PAH content, and in particular the speciated PAH Naphthalene.

3. Bulk Sampling

3.1 General

A bulk sampling and testing program was developed to provide data required for the evaluation of the most effective process for dredging and remediation of the contaminated sediments. The main tasks associated with the program and purpose of each task are summarised in Figure 1. The bulk sampling and testing program involved a series of scientific trials to simulate the operational performance of the following disposal options:

- Confined Disposal Facility (CDF) - temporary lined storage facility for sediment dewatering purposes.
- Temporary Treatment Facility (TTF) - temporary lined storage facility utilising large, porous, circa 2m diameter polypropylene tubes (Geotubes) filled with sediment for dewatering purposes.
- Stabilisation using cementitious additives.

In addition, testing was also conducted to assess odour issues associated with all three options and water quality both within the river at the dredge site and of any return water from the land-based disposal and treatment processes.

The following process details were assumed in structuring the sampling and testing program:

- The proposed dredging methodology would comprise either:
  - Removal by barge mounted excavator fitted with a clam-shell bucket which seals when closed. The excavated material would be placed into a tethered barge and pumped by positive displacement pump to shore for remediation. Alternatively, the excavated material would be transported by barge to a temporary wharf for unloading/transfer, which would support a similarly sized and configured excavator.
  - Removal by cutter-suction dredge and pump via pipeline to shore for remediation.
  - A combination of the above, using the excavator to remove the surficial layer which contains debris that might otherwise foul the cutter-suction dredge, then switching to the cutter-suction dredge to remove the underlying material.
- The proposed remediation options under consideration for treatment of contaminated material would include:
  - Dewatering only.
  - Stabilisation using cementitious based additives. Pre-treatment by dewatering to be conducted as necessary.
  - Thermal desorption, for which dewatering is expected to be necessary as a pre-treatment process.
- Dewatering options under consideration include:
  - The use of large geotextile bags (geotubes) placed in a TTF.
  - Placement into a 'tailings' type facility – CDF.
  - A combination of the above.

- The separation of the sand component from the clay/silt was also considered in order to reduce the TTF and/or the CDF sizing.

3.2 Bulk Sediment Sampling

Sediment from three zones of differing contamination (high, medium and low) was proposed for use in the various dewatering and sediment remediation trials. Existing sediment quality data for the contaminants of concern (PAHs and TPHs) were examined to define three zones of contamination (refer Figure 2). The level of contamination expected to be found in the sediment from each zone was as follows:

Contamination Zone	PAH (mg/kg)	TPH (mg/kg)
High	> 5000	>15000
Medium	1000-5000	5000-15000
Low	200-1000	500-5000

Collection of the bulk sediment samples from each zone was undertaken using a 30 tonne excavator with a customised clamshell device (0.05 m^3 capacity) mounted on a 35 m long and 8 m wide spudded barge (refer Photo 3.1).

An onboard Geographic Positioning System (GPS) was used to position the barge at the nominated sampling locations. The GPS was checked at the first location by a local land based surveyor (Monteath & Powys).

A turbidity curtain surrounded the area of sediment removal. The bulk sediment samples recovered by the excavator were deposited directly into 200 L barrels located on a fabricated steel platform (1.0 m wide by 1.5 m long) overhanging the end of the barge. The platform incorporated a mesh floor which allowed any excess or spillage of sediment to fall within the turbidity curtain (refer Photo 3.2). After sealing and hosing down each filled barrel, a specially fabricated steel sleeve was fastened around it and the excavator was used to lift the barrel from the platform to the deck of the barge (refer Photo 3.3).

Ten 200 litre samples were obtained from each contamination zone (giving a total of 30x200 litre barrels). Once each barrel was filled and placed on the barge deck, a sub sample was retrieved from each barrel by extracting a core sample approximately equal to the height of the barrel. A composite sample from this core was then collected and placed in a 250 ml jar and submitted for 24 hr laboratory analysis to confirm the PAH concentration of the sediment in the barrels as high, medium or low prior to use in the various trials (refer Photo 3.4) . Duplicate samples were taken at a rate of 1 in 10 samples. The barrels were then labelled and sealed (covered with 200 mm layer of water and lid sealed) until results of the 24 hr laboratory analysis were available.

3.3 Bulk Water Sampling

An on-board portable submersible pump was used to fill 200 litre barrels with "clean" Hunter River Water. These were required to mix with the sediment to achieve required moisture contents for the various dewatering and remediation trials.

In order to determine the background level of contaminants in the Hunter River, surface samples of "clean" Hunter River water were taken in triplicate for water quality testing. The samples were taken at a depth of

approximately 0.3 m below the water surface and were tested for a suite of analytes recommended by the EPA.

3.4 Water Quality Testing at the Bulk Sampling Zones

In order to assess the potential impact of the proposed South Arm dredging on Hunter River water quality, surface water samples were taken from the Hunter River for water quality testing at the three bulk sediment sampling zones. Samples were collected prior to, during and after the bulk sediment sampling from a location immediately outside the turbidity curtain (refer Photo 3.5). An additional surface water sample was taken inside the turbidity curtain during sediment removal by the excavator in order to assess the worst-case water quality conditions likely to be encountered during the proposed dredging. The surface samples were taken at a depth of approximately 0.3 m below the water surface. The water depths at each sampling site varied from 1 m to 3 m. The samples were tested for a suite of analytes recommended by the EPA. Duplicate samples were taken at a rate of 1 in 10 samples.

3.5 Unloading Bulk Samples from the Barge

The bulk sediment samples were unloaded from the barge using the same specially fabricated steel barrel lifting sleeve used for moving the barrels on board. The sleeve was placed around each barrel and the excavator used to lift the barrel from the deck of the barge to a timber pallet on the wharf. A forklift was then used to transport the pallet holding up to 3 barrels to the nominated Newcastle Port Corporation shed for use in the various dewatering and remediation trials (refer Photo 3.6).

4. Dewatering and Sediment Remediation Trials

4.1 Sediment Mixing

The results of the geochemical analysis of each barrel recovered during the bulk sampling exercise are shown in Table 4.1. Due to time constraints, preliminary total PAH results only (prior to any laboratory QA/QC checks) were used to select barrels from each range for use in the various dewatering and sediment remediation trials. For some samples, the preliminary result was significantly different from the final laboratory approved result. This was primarily due to detectors on the laboratory equipment not being able to handle the very high PAHs in the sediments. Some samples required dilution and repeat analysis to provide the accurate total PAH level. The preliminary total PAH results are shown in brackets after the final laboratory approved total PAH values. In order to provide sufficient volume of sediment for the trials, eight, 200L barrels were required for each contamination range. The barrels selected for use in the trials are noted in Table 4.1.

The resulting average total PAH and TPH concentrations for the eight barrels selected as high, medium and low contamination levels for use in the trials are shown below, together with the expected total PAH and TPH contamination ranges at the sampling location.

Barrels	Average total PAH (mg/kg)	Expected total PAH range (mg/kg)	Average TPH (mg/kg)	Expected TPH range (mg/kg)
8 High	4960	> 5000	12180	>15000
8 Medium	2180	1000-5000	5780	5000-15000
8 Low	490	200-1000	1440	500-5000

The average level of contamination found in the sediment of the eight barrels selected as medium and low was within the expected contamination ranges at the sampling locations. The average level of contamination found in the sediment of the eight barrels selected as high was just below the expected range at the sampling location. We note that it would have been within this range if barrel High 2 were utilised but the preliminary total PAH result was in error (i.e., a preliminary result of 216 mg/kg when the final result was 10,000 mg/kg).

Mixing of the sediment for the trials was conducted in 750 L bins using equal parts of each of the eight barrels (to achieve the average total PAH for each zone) to produce samples of 'low', 'medium' and 'high' total PAH and TPH concentrations (refer Photo 4.1). It was noted during this mixing process that the 'low' concentration was principally a 'dirty' sand and the 'medium' & 'high' were principally clays and high plasticity silts with varying amounts of sand.

The trials proposed testing and comparison of two dredging methods (mechanical and cutter suction dredging). In order to replicate the moisture content typical in sediment dredged using a cutter suction dredge, additional clean Hunter River water was added to the mixes of low, medium and high sediment to achieve approximately a 30% solids mix. No additional water was required to replicate mechanical dredging as the sediment had been collected by mechanical dredging (barge mounted excavator). All sediment mixes were tested in duplicate for a range of contaminants prior to use in the trials. The results of this testing are shown in Table 4.2.

4.2 Sediment Classification Testing

A suite of geotechnical laboratory classification tests were conducted on samples of the high, medium and low mixes for material classification purposes as follows:

- Particle size distribution – gradings plus hydrometer analysis.
- Soil reactivity - Atterberg limits and linear shrinkage.
- Particle density – specific gravity determinations.

4.3 Geobag Testing

Geotextile tubes are a relatively new sediment dewatering technology. The tubes are made of a geotextile fabric and can have typical cross-sectional dimensions of 2 m high by 10 m wide with variable length up to say 200m. The tubes are pumped full with dredged sediment. The pores provide sufficient permeability to allow water to drain out into an underlying drainage system yet contain the sediments.

The test geobags were provided by CRS Industrial Water Technologies Pty Ltd.

The geobag trial involved hanging eight geobags on scales/strain gauges supported from scaffolding over water collection trays. The test set up is shown on Photo 4.2.

The objective of the geobag trial was to assess the effectiveness of dewatering of the dredged sediment from the Hunter River using experimental-sized geobags. This included an assessment of the rate/quality of the filtrate water from the geobags, and also any potential benefits offered in terms of odour control.

The assessment of the quality of the filtrate water from the bags, including suspended solids/turbidity, chemical analysis and toxicity testing, is discussed in Section 4.7.

The tests comprised 5 samples representing mechanical dredging at 'as excavated' moisture (53% - 70% solids) and 3 samples slurried up with additional water to represent a cutter suction dredge process (35% solids). The geobags ranged in weight from approximately 150 kg to 270 kg, the lighter bags representing the lower density slurried samples. The relationships between moisture content, percent solids, dry density, slurry density and approximate particle density (G) for the three sediment types are shown on Table 4.3.

The eight bags (including two duplicates) that were used in the trials are as follows:

LE1 - Low contamination, removed by excavator
LE2 - Low contamination, removed by excavator (duplicate)
LS1 - Low contamination, cutter suction dredging
ME1 - Medium contamination, removed by excavator
ME2 - Medium contamination, removed by excavator (duplicate)
MS1 - Medium contamination, cutter suction dredging
HE1 - High contamination, removed by excavator
HS1 - High contamination, cutter suction dredging

The rate of water loss from the geobags was recorded by taking readings from the scales and from electronic read-out units attached to the strain gauges. The mixture of strain gauges and scales was necessitated by the limited availability of this equipment within the time frame of the testing.

Samples of the seepage water were regularly collected for water quality testing purposes by PBP.

On cessation of visible seepage, ongoing air-drying was accelerated using halogen floodlights to provide an assessment of the potential for further water loss through evaporation. Temperatures measured adjacent to the bags during the accelerated air drying were between 30 and 40 degrees Centigrade.

Achieving a nominated percent solids (slurry density) in the geobags was difficult, as mixing occurred within large pens where denser material may have accumulated in the base/corners of the pen, and samples for assessment of the slurry density were obtained from small (2L) sub-samples of the (potentially less dense) mixed material. Moreover, the mixed sediment was placed into the geobags subsequent to sampling for slurry density and some water was lost from seepage during the filling process and prior to commencement of recording of the geobag weights. In particular, significant water loss prior to recording of geobag weight was observed on the slurried 'low' sediment (dirty sand), which was more permeable than the the 'medium and 'high' (clay/high plasticity silt) sediments.

On completion of testing, an average moisture content was calculated for the geobag samples, based on analysis of moisture content samples taken at the top middle and base of the geobags. This average moisture content was then used to 'correct' the initial percent solids, to compensate for the abovementioned variances. The resultant 'start' concentration for the slurried samples was 35%.

4.4 Simulation Testing

4.4.1 Slurry Deposition Simulation Tests

These tests comprise column sedimentation, consolidation and permeability tests conducted on samples of slurry, stabilised and 'as excavated' material. The samples ranged from approximately 350 mm to 500 mm in initial layer thickness, and were contained within 190 mm diameter perspex tubes. The purpose of the tests was to model the depositional behaviour (supernatant/underdrainage production, settlement characteristics, consolidated densities, permeabilities and supernatant/leachate water quality).

The test apparatus (refer Photo 4.3) comprised an approximately 1m long vertically mounted 190mm perspex test cylinder with drainage layer and tap in the base. The drainage layer comprised fine to medium sand over geotextile, then fine gravel. The slurry samples were tested under undrained and drained conditions.

Tests on samples at slurried moisture content (approximately 30% solids) modelled the behaviour of the three concentrations of contaminated material when placed into a CDF facility, and also the affect of two different flocculants when mixed with the high concentration slurry.

The test samples included:

- LU - Low concentration 'undrained' (sand with approximately 10% - 20% silt and clay) with no drainage allowed during sedimentation (first stage), followed by opening of the underdrainage tap causing the sample to consolidate under a Hunter River water head equivalent to the original slurry height (second stage). This sample comprised two materials, the sand which settled out on placement and the silt/clay, which sedimented out on top of the sand layer. Stage 2 was not plotted due to the cohesionless nature of this material. The test was primarily run in order to obtain water quality samples.

- MU – Medium contaminant concentration (clay) with 'undrained' first stage and 'drained' second stage.
- HU – High contaminant concentration (highly plastic silt) with 'undrained' first stage and 'drained' second stage.
- LD – Low contaminant concentration 'drained', where drainage through the base was allowed during sedimentation (first stage), but no second stage was conducted due to the predominance of 'sand' in the sample. The test was run as a means of obtaining water quality data.
- MD - Medium contaminant concentration 'drained', where drainage through the base was allowed during sedimentation (first stage) followed by closing of the underdrainage tap allowing topping up of the tube with Hunter River water to a level above the original slurry height prior to re-opening the tap and allowing the sample to consolidate (second stage).
- HD – High contaminant concentration 'drained', as for MD.
- Ondeo Floc 83336 & Floc 83344 - Two high contaminant samples with flocculant additives, tested as 'undrained' sedimentation tests only. The flocculants were chosen on the basis of 'pilot' trials of 6 potential Ondeo flocculants, from which the two most effective were chosen.

4.4.2 Placement Simulation Tests

The test apparatus described in 4.4.1 above was also used to model permeabilities and leachate water quality for:

- Placement of the high contaminant sediment mixed with a 3.5% Dolocrete (by bulk mass) at 'as excavated' moisture content (Dolo). Dolocrete is a proprietary cementitious additive utilised in the cementitious trials by Haztec (refer to Section 4.5). The 3.5% addition rate was determined by sub-sampling from an odour pen test (refer Section 4.6), and provided a sample which retained 'soil-like' properties, thus enabling placement into the test apparatus.
- A mix of the three contaminant concentrations (as equal parts by bulk mass) at 'as excavated' moisture.

In these tests distilled water was used to replicate rainfall infiltration following curing of the Dolocrete sample (approximately 14 days), and at the normally consolidated density for the mix. If placed on site, these materials would be compacted after further drying to achieve a higher density and lower permeability than that tested herein.

The 'placement' samples tested were as follows:

- Dolo – this sample, obtained from the odour pen test some14 days after placement (firm to stiff consistency), was 'pressed' into the cylinder in order to form a watertight seal around the sample edges. A head of distilled water was placed over the sample, and permeability/leachate quality tests conducted following opening of the underdrainage tap.
- Mix – this sample, which was very soft, was placed into the test cylinder under a head of distilled water. Following opening of the underdrainage, settlement and permeability were measured, and water quality tests conducted. Note: that a suffix 'D' on the Mix sample refers to water passed through the filter, prior to placement of the sample, and a suffix 'L' refers to leachate collected.

4.4.3 Triaxial Permeability Tests

Triaxial permeability tests were conducted on the following cementitiuosly stabilised sediments in order to assess their potential for use as a low permeability capping materials, meeting the EIS consent conditions as approved for the Multi Purpose Terminal (MPT):

- General Purpose (GP) cement at 10% and 20% concentrations additive to the 'Mix' sediment (refer Section 4.4.2) and cured for 7 days prior to testing.
- Dolocrete at 3.5% added to the 'high' contaminant concentration sediment, and 10% added to the 'Mix' sediment, cured for 42 days and 7 days respectively.

The 3.5% Dolocrete remained in a 'soil-like' (remoudable) condition, and was thus compacted, but at a moisture content still some 8% wet of optimum moisture and at about 87% of Standard Density.

4.4.4 Air Drying Tests

The test comprised 0.5m long vertically mounted 230mm diameter uPVC pipe sections filled with sediment at 'excavated' moisture content placed to dry under lights (refer Photographs 4.4, 4.5) together with water containers for the estimation of evaporation from a free water surface (approximating 'Pan A' evaporation).

The temperature as measured near the drying surface fluctuated between 36 and 43 degrees Centigrade.

The purpose of these tests was to provide data on evaporation rates and strength gains in order to allow assessment of the achievability and time required for air-drying and strength gain to meet a particular target moisture content. The affect of a geobag cover was also investigated for comparison purposes with the efficiency of air drying through a geobag.

The test samples included:

- MENB - medium contamination, no geobag cover
- MEN – medium contamination, geobag cover
- HENB – high contamination, no geobag cover

Initial bulk (saturated) densities of the materials were recorded and these were correlated to dry densities as shown on Table 4.3. Final bulk and dry densities were measured by immersion of wax coated samples and by laboratory moisture content determinations.

4.4.5 Shear Strength and Moisture Content Measurements

Normally included as part of the CDF air drying testing, these tests also comprised regular readings of shear strength and moisture content of the clay/silt sediments as placed into the geobags and odour pens. The shear strengths were measured using a Pilcon 'hand held' shear vane pressed into the samples from the top surface.

Shear strengths and moisture contents were obtained as follows:

- Geobags – Shear strengths were taken at approximate 0.2m intervals, commencing at least 50mm below the top of the sample, over depths ranging from 0.5m to 1.5m below the top of the geobag. The final moisture content profile through the bags (top to base), together with final shear strengths, was obtained on completion of testing, following cutting down and opening of the bags.
- Odour Pens – Following cessation of the odour testing, shear strengths and moisture contents were twice recorded at approximately the mid-point of the layer depth within each of the medium and high sediment pens (excluding the GP sample which had set rigid). The tests were conducted at approximately 14 days and 42 days after placement.
- Air Drying Cylinders – Shear strengths and moisture contents were recorded at 2 time intervals over 3 depth increments within each of the cylinders, commencing a minimum of 50mm below the sample surface.

The purpose of the tests was to provide an approximate correlation between shear strengths as measured in the field and target moisture contents.

4.5 Cementitious Trials – Stabilisation

4.5.1 Strength and TCLP Tests

Haztec Industries Pty Ltd (Haztec) was supplied with samples of 'low', 'medium' and 'high' contaminant level sediments at three different moisture contents for testing of two additives at four different additive concentrations (72 test samples). The testing comprised strength and Toxicity Characteristic Leachate Procedure (TCLP) testing after a 14 day curing period.

The sediments 'as-excavated' also represent approximately the normally consolidated density of the material and the highest anticipated moisture content following dewatering of cutter suction dredged sediment placed into a TTF or CDF.

The moisture contents comprised 'wet', 'moderate' and 'low' as defined below:"

- The 'wet' moisture content sediment was 'as-excavated'.
- The 'moderate' moisture content sediments for the 'high' and 'medium' contamination concentration sediments (medium to high plasticity clay/silt) were pre-treated by drying at room temperature to approximately 20% lower moisture content than the 'as-excavated' condition, and to some 10% lower moisture content than the 'as-excavated' condition for the 'low' contamination concentration sediment (sand with silt and clay).
- The 'low' moisture content sediments for the 'high' and 'medium' contamination concentration sediments (medium to high plasticity clay/silt) were pre-treated by drying at room temperature to approximately 40% lower moisture content than the 'as-excavated' condition, and to some 20% lower moisture content than the 'as-excavated' condition for the 'low' contamination concentration sediment (sand with silt and clay).

The purpose of cementitious testing results was to assess treatability of the sediments with varying moisture content for remediation by stabilisation. 40% from the excavated condition for the20%

4.6 Odour Trials

4.6.1 General

In order to identify the composition and concentrations of gases that are likely to be emitted during the proposed dredging of the South Arm, an odour impact assessment was undertaken by the University of NSW Environmental Odour Laboratory. The assessment involved:

- Identification of odour emission sources and concentrations.
- Estimation of odour emission rates for each possible odour source.
- Odour dispersion modelling.
- Assessment of mitigation measures.

In order to collect meaningful and accurate data to determine potential odour impacts, field simulation exercises were undertaken which closely resembled the proposed dredging, transportation and sediment treatment operations. The field simulation exercises included:

- Mechanical dredging to simulate odour emission conditions from the dredge, the grab bucket and the water-air surface interface within the turbidity curtain.
- Storage of dredged sediment in pens to simulate odour emission conditions from sediment in the barge, the transfer trucks, the temporary storage facilities, the geobags and the cementation treatment facility.

4.6.2 Dredging Simulation

The bulk sediment sampling exercise using a barge-mounted excavator was undertaken to simulate the proposed mechanical dredging methodology and retrieve sediment required for the various dewatering and remediation trials. Odour samples were collected from the following locations during the bulk sediment sampling:

- The water-air surface interface within the turbidity curtain using a portable floating wind tunnel (refer Photo 4.6).
- The freshly dredged material following placement in the 200 litre barrels used to store the sediment using an isolation chamber (refer Photo 4.7).

4.6.3 Sediment Storage and Treatment Simulation

The onshore treatment and disposal test involved twelve odour pens approximately 1.1 m by 1.1 m square with 250mm to 300mm deep sedimented layers. Dredged sediment from each of the contamination zones (low, medium and high) was placed in the pens. The testing simulated moisture contents from sediment removal by mechanical (excavated) means and by cutter-suction (slurried) dredging methods for the range of contaminants, and for the use of geotubes (TTF) with all-round underdrainage and undrained uncovered (CDF) dewatering with supernatant removal (i.e., a total of 10 odour pens comprising: sediment with 3

levels of contamination; 2 moisture contents for the 'high' and 'medium' and 1 moisture (excavated only) for the 'low'; and the 2 dewatering technologies). An additional 2 odour pens were also used to investigate the odour reduction benefits of the addition of Dolocrete added to the excavated sediment at the dosage rate of 3.5 % by bulk weight, and GP cement added at the dosage rate of 20 % by bulk weight.

An isolation chamber was used to collect odour samples from all odour pens (refer Photo 4.8).

4.6.4 Odour Dispersion Modelling

The computer program Ausplume Atmospheric Dispersion Model was used to predict ground level odour concentrations at receptors located close to the proposed work sites using the odour emission results for all sources and meteorological data. To account for the various dredging methods, dredging locations within the dredging area and the temporary storage and proposed sediment treatment methodologies, eight different operation scenarios were modelled.

4.7 Water Quality Trials

4.7.1 Water Quality at the Bulk Sampling Zones

As discussed in Section 3.3, in order to assess the potential impact on Hunter River water quality of the proposed South Arm dredging, surface water quality samples were taken inside and outside the turbidity curtain surrounding each zone of sediment removal. In addition, samples of clean water were analysed to determine background levels of contaminants.

The ANZECC/ARMCANZ Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2000) present trigger values for physical and chemical stressors and toxicants. The trigger values are the concentrations (or loads) of indicators, below which there is a low risk that adverse biological effects will occur.

4.7.2 Return Water Quality - Geobags

The assessment of the quality of the filtrate water from the bags included chemical analysis and toxicity testing.

In order to recover the required volume of filtrate water from dewatering of the bags within the required timeframe, samples of the 'first flush' of the filtrate water from each bag were used for chemical testing and toxicity testing. Prior to any sampling, the first flush of filtrate water was allowed to stand for approximately 1 hour to allow the majority of suspended solids to settle out. The filtrate water was then sampled and tested for a suite of analytes recommended by the EPA. The suspended solids for each sample was also determined.

Due to the volume of water required for the toxicity work, a composite of filtrate from the 2 low (LE1 & LS1), 2 medium (ME1 & MS1) and 2 high (HE1 & HS1) contamination bags was provided for the toxicity testing. The composite samples comprised equal amounts of filtrate from each bag.

The toxicity testing was undertaken by CSIRO and Ecotox Services. The testing included:

- Growth inhibition test with algae (CSIRO).
- Microtoxicology test (CSIRO).
- Sea Urchin fertilisation and larval development (Ecotox Services).

In accordance with test procedure, unfiltered samples were tested for toxicity to sea urchins while filtrates were centrifuged for Microtox® and filtered through a 0.45 µm membrane filter for algal growth tests.

4.7.3 Relationship Between Key Contaminants and Suspended Solids in Return Water

Investigations into the contaminated sediments of the South Arm indicate that the sediments adjacent to the former BHP steelworks site are toxic to aquatic organisms. A series of sediment toxicity investigations undertaken by CSIRO have shown that PAHs and TPH are the most likely cause of toxicity in the sediment (refer PESC Appendix D, Sediment Quality Data). It was therefore considered likely that PAHs and TPH would be the contaminants of concern in return water from any dewatering of dredged sediment.

In order to establish a simple field method to screen return water prior to its release back into the Hunter River, a water quality investigation was undertaken to establish a relationship between PAH/TPH concentrations and suspended solids. As the relationship between suspended solids and turbidity can be readily established, turbidity is a water quality parameter that can then be simply and cheaply measured in the field to potentially screen return water prior to its release back into the Hunter River.

The water quality investigation to establish the relationship between PAH/TPH levels and suspended solids involved the addition of low, medium and high contamination sediment to Hunter River water to give visually cloudy, slightly cloudy and clear water samples. The water samples were then submitted for analysis of PAHs, TPH, suspended solids and turbidity.

5. Results of Testing

5.1 Sediment Classification

The results of this testing, as given in Appendix A1, indicate that for the samples tested:

- The 'low' contamination sediment was a poorly graded sand with clay and silt (SP-SM). 3% 'gravel' (which was mainly shells), 85% sand, 4% silt and 8% clay fractions were retained in the particle size analysis. This sediment was 'non-plastic'.
- The 'medium' contamination sediment was a medium to high plasticity sandy clay (CL/CH). 3% 'gravel' (which was mainly shells), 34% sand, 37% silt and 26% clay fractions were retained in the particle size analysis. This sediment was of medium plasticity, with liquid limit of 47%, plastic limit of 22% and linear shrinkage of 7.5%.
- The 'high' contamination sediment was a high plasticity silt with clay and sand (MH). 20% sand, 50% silt and 30% clay fractions were retained in the particle size analysis. This sediment was of high plasticity, with liquid limit of 52%, plastic limit of 23% and linear shrinkage of 10.5%.

The 'high' and 'medium' sediments represent ranges within a similar (cohesive) sediment type, whereas the 'low' was a different (cohesionless) sediment type.

The particle densities determined for each of the three contaminant categories were 2.33 (low), 2.21 (medium) and 2.48 (high).

5.2 Geobags

Plots of the weights of the geobags with time; rates of water loss and seepage production (normalised to litres per kg of dry sample); and total suspended solids(TSS)/turbidity with time are presented as laboratory report plots in in Appendix A. Laboratory test certificates for moisture contents are also given in Appendix A2.

The total seepage return was taken as the water loss until end of visible seepage. The total evaporative loss comprised the water loss after this point.

The initial and final dry densities, moisture contents, total seepage (return water) and water loss due to evaporation are shown below:

Geobag	+Initial Solids (%)	*Initial Dry Density (t/m^3)	^Final Av. Dry Density (t/m^3)	*Initial Moisture Content (%)	^ Final Av. Moisture Content (%)	^ Final Av. Shear Strength (kPa)	*Total Seepage Return (L/kg)	*Total Evaporation Loss (L/kg)	*Total Water Loss (L/kg)
LE1	67	1.08	1.25	49	11.7	-	0.20	0.14	0.34
LE2	70	1.17	-	43	8.0	-	0.14	0.13	0.26
LS1 (Sand)	35	0.44	-	186	5.7	-	1.20	0.17	1.37
LS1 (Fines)		-	1.27	-	37.0	-			
ME1	54	0.77	1.29	85	26.2	185	0.15	0.36	0.51

ME2	56	0.81	1.31	79	27.2	97	0.15	0.27	0.42
MS1	35	0.43	1.26	186	23.2	140	1.15	0.39	1.54
HE1	53	0.78	1.27	89	34.9	127	0.18	0.37	0.55
HS1	35	0.44	1.29	186	28.9	125	0.94	0.50	1.44

Notes: *Calculated based on initial % solids and measured initial weight/final weight
^Measured at end of test
+% solids corrected on the basis of final moisture contents

The test results, where appropriate, are plotted against time on Reports 11194-11197, 111206 & 111208 in Appendix A2.

Final moisture contents and dry densities are given on laboratory test certificates in Appendix A3.

5.3 Simulation Results

5.3.1 Slurry Deposition Simulation

The tests results on slurried samples were used for obtaining consolidation parameters, permeabilities, rates of production of supernatant and leachate, and quality of supernatant and leachate.

The geotechnical property results of these tests are summarised below:

Slurry Test No.	Initial Dry Density (t/m^3)	Final Dry Density (t/m^3)	Initial Moisture Content (%)	Final Moisture Content (%)	Total Super-natant (%)	Total Leachate (%)	m_v	k (m/s)	Cv (m^2/yr)
MU/1	0.40	0.59	203	122	32	-	-	-	-
HU/1	0.38	0.51	223	156	26	-	-	-	-
F83336	0.37	0.65	233	113	43	-	-	-	-
F83344	0.37	0.64	233	117	42	-	-	-	-
MU/2	0.59	0.71	122	96	-	-	0.025	$4.3x10^{-8}$	5.6
HU/2	0.51	0.63	156	117	-	-	0.083	$4.5x10^{-8}$	1.7
LD/1	0.39	0.74	213	92	31	16	-	$2.5x10^{-6}$	-
MD/1	0.40	0.76	203	85	23	26	-	$1x10^{-7}$	-
HD/1	0.40	0.75	213	92	19	27	-	$2.3x10^{-7}$	-
MD/2	0.76	0.79	85	82	-	-	0.040	$4.3x10^{-8}$	3.4
HD/2	0.75	0.78	92	89	-	-	0.018	$3.3x10^{-8}$	6.6

Notes: 1. The suffixes '1' and '2' in the test number refer to Stage I and Stage 2 of the tests.
2. Leachate and supernatant applicable to MU/1 and HU/1 only.
3. Stage 2 drained from base in all cases
4. MU/1 and HU/1 were terminated prior to completion of consolidation due to programme time constraints.

The use of flocullants greatly improved the settling time. As shown on laboratory Report No's 11216 and 11220, volume decrease of the 'high' sediment to about 75% was achieved at approximately 300 hours without the use of flocculants whereas with flocullants this time was reduced to between 10 and 35 hours.

5.3.2 Triaxial Permeabilities

Triaxial permeability testing results recorded on stabilised sediment samples are shown below:

Product	Additive Rate (%)	k (m/s)	Final Dry Density (t/m^3)	Final Moisture Content (%)	Void Ratio Calculated From Dry Density
Dolo/High	3.5	$1.8x10^{-10}$	1.23	34.7	1.02
*Dolo/Mix	10	$1.4x10^{-9}$	-	-	-
GP/Mix	10	$4x10^{-10}$	1.19	38.7	0.97
GP/Mix	10	$1.3x10^{-9}$	1.10	44.4	1.13
GP/Mix	20	$1.8x10^{-10}$	1.19	38.8	0.97

Note: *Coffey Geoscience Report

The results lie within the 'very low' to 'practically impermeable' ranges, as shown on laboratory Figure L5, 'Permeability vs Void Ratio'.

5.3.3 Placement Simulation

The modelling of the 'as excavated' materials represents placement of these materials on land above the water table, but beneath a standing head of distilled water to replicate rainfall infiltration. Except for the recording of supernatant, which was not applicable as the sediments were already at least normally consolidated, the test results were conducted in similar manner to the slurried samples.

The recorded permeabilities of Dolo and Mix respectively were$1.2x10^{-8}$ m/s and $3.x10^{-8}$ m/s i.e., very low as shown on Figure L5.

The consolidation parameters recorded for the Dolo sample, as shown on laboratory Table L5, are m_v = 0.016 and C_v = 2.4 m^2/yr.

5.3.4 Water Quality

Water quality results for key contaminants identified by PBP are presented on Table 5.1 Laboratory test certificates are provided in Appendix B.

The descriptors in Table 5.1 refer to samples as follows:

- LU, MU, HU – refers to low, medium and high slurry samples in the undrained test.
- LD, MD, HD - refers to low, medium and high slurry samples in the drained test.
- A suffix 'L' refers on the above labels refers to a leachate sample and a suffix 'S' to supernatant.
- MIX – refer Section 4.4.2.
- Dolo – refer Section 4.4.2.

Except for initial flush of the leachate from the undrained tests for low and high samples, the water quality results indicated that the contaminant levels (other than Ammonia) for the leachate and supernatant were below the site guidelines (ANZECC/ARMCANZ, 2000 - discussed in Section 4.7).

Ammonia was significantly elevated in both the supernatant and leachate.

PAH was significantly elevated in the supernatant and marginally elevated in the first flush of leachate from the high sample in the undrained test, and significantly elevated for the first flush of leachate from the low sample in the undrained test.

Geochemical test results for the sediment placed into the consolidation tubes are given in Table 5.2

5.3.5 Air Drying Tests

Evaporation losses are plotted on laboratory Report No's 11210, 11211, 11213 in Appendix A4. Final moisture contents and densities are also given in this appendix.

The average initial/final dry densities and moisture contents are shown below:

Air Drying Cylinder	Percent Solids (%)	<Initial Bulk Density (t/m^3)	*Average Initial Dry Density (t/m^3)	<Average Final Dry Density (t/m^3)	*Initial Av. Moisture Content (%)	<Final Av. Moisture Content (%)	Total Evaporation Loss (L/kg)
MENB	55	1.46	0.79	1.13	82	46.8	0.27
MEB	55	1.46	0.79	1.10	82	45.1	0.27
HENB	52	1.45	0.75	1.04	92	58.0	0.34

Notes; <Measured at start/end of test
*Calculated

Although the final dry densities and total evaporation losses are less than those recorded for the geobags, we note that the test was terminated due to time constraints while evaporation was still ongoing. We consider that similar final dry densities to the geobag tests would have been achieved with further air drying time.

The average pan evaporation from the free water surface, as shown on laboratory Report No11211, indicates that while initially the evaporation rates from the sediments are higher than pan evaporation rates, the rates drop to about 0.25 times the pan evaporation rate after approximately 900 hours.

The results also indicate that similar rates of evaporation are anticipated for sediment regardless of the presence of a geotextile cover, and that the 'high' sediment has a marginally greater rate of evaporation than the 'medium'.

5.3.6 Shear Strength and Moisture Content

The results of these tests as shown in Report No 11228 in Appendix A5, demonstrate that linear relationships exist between moisture content and the log of shear strength (Cu) for the different sediments tested. Thus, a target moisture content may be approximately related to a field measurement of shear strength.

The Dolocrete samples benefit from strength through moisture reduction early on, but for the low dosage rate applied, only marginally exceed the strengths achieved by the 'high' sediment when dried to a similar moisture content.

The 'high' sediment strengths were noticeably greater than those recorded for the 'medium' sediment.

5.4 Cementitious Trials

Haztec's conclusions, based on their test results, indicate that the sediments, once stabilised, meet the TCLP requirements for re-classification as Inert material.

We note that generally for the GP cement, the higher strengths were recorded on the samples prepared from the 'wet' condition (i.e., as-excavated). For the Dolocrete there was little difference in strength achieved over the preparation moisture content range ('low' to 'wet' condition).

Haztec's report is included as Appendix C.

5.5 Odour Tests

The results of the UNSW odour study are included in PESC Appendix L - Air Quality and Odour report. For convenience, the main findings of the odour sampling and analysis program are briefly summarised as follows:

- PAH compounds would cause the majority of odour.
- Odour measured at the water-air surface interface and in the barrels was found to increase from low to high which corresponds to each of the low, medium and high contamination sediment removal zones.
- Geotextile bags were found to provide only marginal benefit in odour reduction over exposed sediments.
- The odour generated in the pens was found to generally diminish with time.
- The odour emissions from the slurried sediment samples were greater than for those at 'excavated' moisture contents.
- The 3.5 % Dolocrete mix was found to perform marginally better at suppressing odour than the 20% GP cement mix.

In addition, the main findings of the Ausplume dispersion modelling are as follows:

- Odour generated by each of the dredging technologies proposed would be acceptable and the barges used to transfer the sediment would not need to be covered to meet the EPA requirements.
- Odour emission within the onshore dewatering facility whether using geotextile bags (TTF) for sediment de-watering or not (CDF) is dependent on the area of the facility. It has been established that the proposed area of 200 m by 400 m would be too large to meet NSW EPA requirements.

5.6 Water Quality

5.6.1 Bulk Sampling Exercise

The results of the water quality testing, together with relevant guideline values, are shown in Table 5.3. Comparison of the water quality results immediately outside of the turbidity curtain surrounding the excavator sampling positions, prior to, during and after bulk sediment sampling, indicate that all

contaminants except total zinc are below ANZECC/ARMCANZ high reliability trigger values. It should be noted that zinc levels in the "clean" Hunter

River water samples, taken to establish background levels, were close to the ANZECC/ARMCANZ high reliability trigger value.

Total zinc concentrations inside the turbidity curtain were particularly elevated corresponding to the elevated levels of suspended solids. However, the turbidity curtain significantly reduces the levels of zinc in the surrounding waters ie levels of zinc recorded inside the turbidity curtain were up to 16 times higher than outside the curtain.

The PAH concentration in the samples taken during the sampling are high in the samples taken inside the turbidity curtain. However, all naphthalene concentrations are below the high reliability trigger value. Other more toxic PAHs exceed low reliability guidelines inside the turbidity curtain. However, these low reliability guidelines may be overly-conservative and should only be used as an indicative interim working level (ANZECC/ARMCANZ, 2000).

The potential impact on Hunter River water quality of the proposed South Arm dredging is discussed further in Appendix G of the PESC EIS (Hydrology and Water Quality Impact Assessment Study).

5.6.2 Geobags

The results of the chemical testing of the filtrate from each bag are shown in Table 5.4. Comparison of the water quality results for the filtrate from the geo-bags to water quality criteria indicates that arsenic, zinc, lead, ammonia and cyanide concentrations all exceed ANZECC/ARMCANZ marine waters high reliability trigger values. The ANZECC/ARMCANZ marine waters high reliability trigger value for naphthalene is exceeded for bag LS1 and bag HE1. Other more toxic PAHs generally exceed low reliability guidelines. However, these low reliability guidelines may be overly-conservative and should only be used as an indicative interim working level (ANZECC/ARMCANZ, 2000).

The main findings of the toxicity testing as reported by CSIRO and Ecotox Services are summarised below. The CSIRO Toxicity Assessment report is provided in Appendix D.

Microtox Test

- The filtrates were of low acute toxicity to the bacteria (Microtox®), with EC50 concentrations i.e. the concentration of filtrate to cause a 50% reduction in bacterial light output after a 5 or 15 min exposure.
- The filtrate from the high PAH sediment was more toxic to the bacteria than the filtrates from the low and medium PAH sediments.
- Toxicity did not appear to correlate with any of the measured chemicals in the filtrates.
- The filtrate from the high PAH sediment would have to be diluted about 100 times to be below the "no effect" level for acute toxicity to the bacteria.

Microalgae

- The three filtrates were of low toxicity to micro-algal growth in the chronic tests, with IC50 values (i.e. the concentration of filtrate to inhibit algal growth rate by 50%), of 24-55% (where 100% is undiluted filtrate).
- The order of toxicity (based on IC50 values) was from most toxic to least toxic: low PAH > high PAH > medium PAH filtrate.
- The order of toxicity correlated with the concentrations of ammonia in the filtrates, released from the sediments during the dewatering procedure.
- Ammonia was the most likely cause of toxicity to algal growth, although this would need to be confirmed by further toxicity identification evaluation (TIE) phase III procedures.

Sea Urchin

- Toxicity of all filtrates to sea urchin larval development was similar, and was not correlated with any particular contaminant measured in the filtrates.
- The filtrates were more toxic to both sea urchin fertilisation and larval development than to algal growth and bacterial light output.
- It should be noted, however, that unfiltered samples were tested for toxicity to sea urchins while filtrates were centrifuged for Microtox® and filtered through a 0.45 µm membrane filter for algal growth tests.
- It is possible that toxicants associated with particulates may have contributed to the sensitivity of the sea urchin tests.

5.6.3 Key Contaminants and Suspended Solids Relationship

The results of the water quality analyses for key contaminants, as provided in Table 5.5, indicate that PAH and TPH levels in the water samples made using the 'low', 'medium' and 'high' contamination sediment, generally increase with increasing total suspended solids (TSS). This relationship was observed for TPH levels in all water samples made using the 'low', 'medium' and 'high' contamination sediment. Similarly, except for water samples made using the 'medium' contamination sediment, where the 'slightly cloudy' water sample recorded a significantly higher total PAH concentration than the 'clear' sample, PAH levels have followed this trend. We note that PAH subsample concentrations can be highly variable within samples of the sediment, which could account for the apparent anomaly in the water samples prepared using the medium sediment.

6. Discussion and Conclusions

6.1 Geobag Testing

6.1.1 Seepage and Evaporation

The test results indicate that:

- There is an initial flush of turbid water, after which the elutriate becomes clear for both the 'excavated' and 'slurried' samples, as the geotextile 'blankets off'
- Whilst the rate of production of elutriate is initially some five times greater for the 'slurried' samples than for the excavated samples, this rate rapidly reduces to that of the 'excavated' samples, within about 40 to 100 hours.
- The rates of supernatant production (as viewed within the geobags) exceeded the rates of seepage for the 'slurried' samples. Thus a 'controlled' rate of seepage should be possible, though additional bags may be required to handle the temporary supernatant storage within the bags.
- The sediment within the bags continues to air dry and 'overconsolidate' through evaporation after cessation of visible seepage.
- The total water loss (approximately 0.5L/kg dry mass of sample) for the 'high' and 'medium' excavated sediments were some 70% greater than for the 'low' (approximately 0.3L/kg dry mass of sample), due to the initially lower percent solids (higher moisture retention) in these cohesive materials.
- The total water losses in the slurried samples were similar (1.4 – 1.5L/kg dry mass of sample), but the evaporation losses were much greater (approximately 3 times) for the medium and high sediments than for the low (which lost most water through seepage rather than evaporation).
- The evaporation losses were dependent on material type i.e., lower for the 'low' sand and higher for the 'medium' and 'high' clays/high plasticity silts.
- A final dry density of approximately 1.3t/m^3 was attained for all samples. Although the samples continued to lose moisture, the depth of sediment for each sample below the top of the bag had stabilised, and hence the densities recorded at the end of the test are considered to represent maximum air dried densities for these sediments.
- The percent solids concentration of the slurried samples at the commencement of weight recording (35%) was higher than that measured during mixing (30%). Reasons for this include loss of water whilst filling the geobags, and the potential for a more fluid slurry sample recorded initially (at the stage of measurement of percent solids) that may exclude some unmixed portions at the corners/base of the mixing pens (which were subsequently placed into the geobags).

6.1.2 Suspended Solids and Turbidity with Time

We note that the suspended solids in the seepage from the geobags drop rapidly with time (Figures L1 to L4, Appendix A2) from over 6000 ppm to about 50 ppm within about 10 hours. Thus PAH and heavy metal contaminants, which are generally associated with TSS generally decreased accordingly. However, ammonia was still present at significantly elevated concentrations with respect to the ANZECC Marine Eco. Guidelines (2000), even at the lower solids concentrations.

6.1.3 Return Water Quality

The results of the toxicity testing show that the filtrate from the geo-bags could be toxic if returned to the Hunter River without treatment.

In particular, ammonia released from the dewatered sediments in the filtrates (refer Table 5.4) may be an issue if the water is returned to the river (CSIRO, 2003). The ammonia levels are well above the ANZECC trigger level and are not dissimilar to sewage effluents. Ammonia is not likely to adsorb to particles (CSIRO, 2003) in the physico-chemical environment of the Hunter River. Substantial dilution would be required (at least 1:100) as ammonia at low concentrations can also stimulate algal growth (CSIRO, 2003).

6.1.4 Relationship Between Toxicity and TSS/Turbidity

The aim of this investigation was to establish a simple field method to screen return water prior to its release back into the Hunter River. PAHs and TPH were thought to be the most likely contaminants of concern in return water from any dewatering of sediment following dredging. However, the return water toxicity trial which involved testing filtrate from geotextile bags using bacteria (Microtox®), microalgae and sea urchin could not identify PAHs or TPHs as the likely cause of observed toxicity. Toxicity to the bacteria and sea urchin did not appear to correlate with any of the measured chemicals in the filtrates while ammonia was the most likely cause of toxicity to algal growth. Further investigations would be required to identify the toxicity causing contaminants before a simple field method to screen return water prior to its release back into the Hunter River could be proposed.

6.2 Odour Control

We note that the remediation options under consideration are:

- Stabilisation using cement based additives
- A combination of dewatering (if necessary) and stabilisation.

It was concluded that for the abovementioned remediation options:

- The area of any dewatering facility (if required) may need to be restricted to less than 200m by 400m for odour control purposes.
- The proposed 50 m by 50 m on-shore cement stabilisation area is not expected to require a cover for odour reduction purposes.

Odour generated by the removal, transportation and onshore treatment of sediment can also be managed by the implementation of the following mitigative measures as necessary:

- Limiting the size of on-shore storage/remediation areas.
- Covering exposed areas of deposited dredged material on-shore.
- The addition of lime and cement to the dredged material during dredging and transportation.

6.3 Simulation Modelling

The purpose of the simulation modelling was to model the depositional and post-depositional (placement) behaviour (supernatant/underdrainage production, settlement characteristics, consolidated densities, permeabilities and supernatant/leachate water quality) of the three concentrations of contaminated sediments when placed into a CDF facility.

6.3.1 Slurry Consolidation

The results of the slurry consolidation tests indicate that similar sedimentation/consolidation characteristics are apparent for both the 'medium' and 'high' samples.

In the 'low' sample, a sand with silt and clay, the sand fraction settles out almost immediately and the finer particles then settle out over the sand layer. As shown on laboratory Report No. 11216 in Appendix 4, the volume of the complete sample decreased to some 75% of the initial volume, but this reflects the fines layer sedimenting out on top of the sand, which decreased to approximately 30% of the original volume above the top of the settled sand. The 'low' sample was included in the simulation testing primarily for assessment of permeability and water quality.

6.3.2 Permeability

The permeabilities, as shown in Appendix A7 on Figure L5, indicate that:

- The 'low' sediment after sedimentaion, is of low vertical permeability. However, this result is attributable to the silt and clay layer which sedimented onto the top of the sand layer. The expected horizontal permeability would be significantly higher due to the presence of the underlying 'clean' sand layer. In a CDF the sand would settle out near the deposition point, and the finer material would be carried further away to deposit in quiescent waters. In a TTF the sediment would be contained within the geotubes with only minor 'turbidity' losses in the period just after filling.
- The slurried 'low' and 'high' sediments were of low to very low permeability, but when consolidated in the second stage became very low in permeability. These second stage results are similar to the previous test results from the Kooragang Fines Detention Facility (FDF).
- 'Mix sample of excavated sediments ('high', 'medium' and 'low') also recorded a low permeability, indicating that the 'low' sand can be successfully mixed with the other sediments and still maintain a low permeability for the mix. We note that the sand appears to form only a small portion of the total sediment to be remediated.
- The Dolocrete stabilised sample placed at in situ moisture content after 14 days curing (Dolo) recorded a low to very low permeability, which may result from chemical fixation and/or the stabilised material being a 'high' sample (highly plastic silt) which is of inherently low

permeability. When the 10% Dolocrete result from the triaxial permeability testing is included, the cementitious stabilisation appears to have flattened the linear relationship between permeability and void ratio (as shown on laboratory Figure L5), resulting in much greater decrease in permeability for a given reduction in void ratio.

6.3.3 Water Quality

The simulation trials demonstrate a significant decrease in PAH and other key contaminants compared to the geobag results and a very significant decrease in comparison with TCLP test results. In particular, apart from the undrained slurry test results for 'medium' and 'high', the results appear to be below ANZECC 2000 Eco guidelines (excepting ammonia) in this material prior to any stabilisation. We note that cementitious stabilisation has apparently previously been successfully used to treat ammonia. We also note that the TCLP test does not simulate the deposition placement of the material, but is conducted for waste classification purposes.

The undrained test for 'low' and 'high', which produced significantly elevated levels of PAH in the low leachate and the high supernatant, does not simulate the placement of sediment, which would be above the groundwater level and not subject to ponding/seepage (by way of stormwater management).

Stabilisation of these materials adds strength/stiffness, chemically binds up contaminants and very significantly decreases the permeability, resulting in an inert material that could be used on the MPT site, subject to geotechnical testing to establish suitability for the purpose intended.

Mixing of the 'low' sediment with the 'medium' and 'high' sediments should be considered in order to avoid to minimise any potential requirements to handle this problematic sediment as a 'special case' due to its higher permeability.

6.3.4 Air Drying and Shear Strength

The air drying tests indicate that the materials can be dried in order to acheive significantly lower moisture contents and appreciable strength gains. This process can be approximately modelled using a log-linear relationship to correlate field measured values of shear strengths against target moisture content/s.

The tests also indicate that there is little difference in the evaporation rates between geobag covered and 'non-geobag' samples, and that considerable drying/strength gain within the surficial 0.5m depth is possible. Previous work (Kooragang Island, PWCS Coal Loader Expansions) with these materials has indicated a limiting depth of about 1m for significant strength gains from air drying.

We would expect that the limiting thickness for appreciable drying of cohesive sediment placed in a CDF facility would be about 1m and for geotubes about 2m (due to all around drainage i.e., equivalent approximately to 1m layer in a CDF).

Placement of a metre thickness of excavated 'medium' sediment into a CDF facility, at typically 0.84 t/m^3 dry density, would be expected to result in a final air dried deposit of approximately 0.75m thickness and 1.2 t/m^3 dry density for a loss of 0.25 m^3water/m^2 of deposited area. A similar result would be expected for a 'mixed' sediment.

We note that an average annual 'pan' evaporation of 1533mm has been recorded at the closest Bureau of Meteorology station to the Onesteel site (Maryville, Station No. 061223). Based on this evaporation potential, the period required to evaporate 0.25m, and thus to achieve approximately 1.2 t/m3 dry density using the adopted pan factor of 0.25, is approximately 8 months under average weather conditions.

6.4 Stabilisation

The stabilisation tests have established that the material can achieve a significant strength increase and is able to be treated at the mechanically excavated (approximate in situ) moisture content.

Moreover, modelling of untreated material has identified only ammonia as a potential problem for the placement proposed without chemical fixation. Stabilisation of these materials is expected to produce a very low permeability product that consequently does not leach.

6.4.1 Geochemical Performance – Waste Classification

The results of the TCLP testing, as reported by Haztec, indicate that the sediments, once stabilised, would meet the TCLP requirements for classification as an Inert material under the Waste Management Immobilisation Scheme.

6.4.2 Permeability – Use as Capping

The permeabilities recorded indicate that the cementitiously stabilised sediments meet the requirements for practically impermeable ($<1x10^{-9}$ m/s) capping and for very low permeability general capping ($<1x10^{-7}$ m/s).

From inspection of the permeability results as shown on Figure 3, the permeabilities of the sediments are shown to be sensitive to variation in the final density, and the cementitiously stabilised sediments appear to have a far greater response to density increase (decrease in void ratio) than the untreated sediment. Thus, cementitiously stabilised sediment with sufficient strength for engineered fill but remaining remouldable (enabling compaction) would be advantageous. Where higher strength is required, a higher additive rate of cementitious stabiliser could be adopted. For strength gain, GP cement appears to be more effective than Dolocrete.

We note that the Dolocrete/high sediment concentration tested (3.5%), when cured for three weeks and compacted to approximately 90% Standard density and wet of Optimum Moisture Content, satisfied the permeability criteria for capping of heavily contaminated areas ($<1x10^{-9}$ m/s). However, a non-compacted 10% Dolocrete/mix sediment was marginally too high in permeability, but met the general capping requirement ($<1x10^{-7}$ m/s). Examination of the trends shown in the permeability test results suggests that this is likely due to a lower achieved density in the 10% Dolocrete/mix.

Compaction of the stabilised sediment in order to minimise the permeability will require additives (or blending) for GP cement and may require specialised Dolocrete mixes, in order to allow sufficient time at a 'stiff' consistency to compact the stabilised product prior to setting. The Dolocrete appears to have a slower setting time, and thus depending on the percentage of Dolocrete added, may not require such additives.

6.4.3 Strength – As required for End Uses

The strength envisaged for remouldable capping would typically be 400 kPa to 600 kPa (e.g., a very stiff to hard cohesive material). Highly loaded areas, which require greater strength, would need to adopt a minimum of say 1Mpa (e.g., by the addition of 10% GP), which is unlikely to be remouldable.

7. Assessment of Remediation Options

We understand that remediation on the Onesteel site of the sediments taken from the bed of the Hunter River which are too high in contaminant concentrations to be disposed ofv at sea, is a requirement of the EPA. Within this constraint a number of potential options for remediation were investigated as described below.

7.1 Dewatering Only

The sediments would need to be dewatered in a TTF or CDF facility, prior to excavation and compaction at or near optimum moisture content into areas of the site where they could be isolated from the surface by at least 0.5m thickness of material meeting the Multi Purpose Terminal (MPT) consent conditions.

The dewatered sediments would have poor strength and settlement characteristics. Moreover, they would be susceptible to reactive movements on moisture content change, thus providing potentially significant engineering constraints in addition to any geochemical concerns.

Simulation tests have demonstrated that, apart from possibly ammonia, the materials when placed on a Hunter River sand bed, above the groundwater table, do not present a significant risk of harm to the groundwater. Ammonia was elevated with respect to ANZECC Eco. Guideline trigger levels. However, the dewatered sediments would still classify as industrial or hazardous waste, which is likely to require secure containment, and management of any potential leachate (for ammonia). The development of such a facility is unlikely to receive statutory approval.

For the above reasons, this option is not being further considered for on-site remediation.

7.2 Geotubes – TTF

The use of geotubes contained within shallow bunded, lined facilities (TTF) would likely be restricted to slurried sediments which produce large quantities of return supernatant/seepage water. For this application the geotubes provide a secure confinement and controlled rate of seepage for return water treatment purposes. A TTF would require only small water retaining embankments, with much reduced water management and flood routing requirements compared to a containment (CDF) facility.

There would appear to be little advantage in the use of geotubes for the treatment of sediments at the moisture contents resultant from mechanical excavation, as such material would produce only relatively small amounts of leachate which would likely be handled by evaporation processes or absorbed by the cementitious stabilisation process. Moreover, we note that there appears to be only marginal benefit from use of the geotubes in odour control.

If used with slurried sediments (cutter suction dredge), once dewatered, the sediments would need to be removed from the geotubes, the geotubes disposed of and the sediments either stabilised or thermally desorbed. We note that the size of such a facility for non-stabilised sediments may be limited by odour constraints. This would place a restriction on the amount of such sediments able to be stored at any one time without other odour management procedures being put in place (refer to Chapter 17 of the PESC EIS).

Moreover, the return water from the slurried sediments placed within the geobags, based on toxicity tests using the 'first flush' from the geotubes (refer Section 5.6.2) appears acutely toxic, requiring some 100 times mixing/dilution to drop below the 'no affect' level for acute toxicity. This may place a significant constraint on the a cutter suction dredge operation, as there would be some 1.3 m^3 to 2 m^3 of return water produced per bank m^3 of sediment removed by cutter suction dredge (at 25% to 30% solids), which would potentially require treatment. This figure excludes rainfall runoff.

7.3 No Geotubes – CDF

Use of cutter suction dredge techniques would have similar return-water quantity/quality constraints to the geobags. This process would also require careful water retaining dam embankment construction and water management/flood routing design.

The mechanically excavated material would likely be contained in a bunded, lined facility (CDF), similar to but deeper than a TTF, and the stockpile profiled by managed deposition practices to allow rainfall runoff to collect in a lower level sump for pumping to a holding tank, from where it could be used as make up water for cementitious stabilisation, treated or discharged (dependent on water quality). Such a facility is envisaged for temporary/contingency storage purposes associated with mechanically excavated sediments in the stabilisation process. It should be noted that the size of the facility would be subject to potential restrictions for odour control purposes similar to those for the geotubes.

7.4 Stabilisation

It must be noted that the end use of the stabilised sediment would depend on geotechnical as well as geochemical constraints. In particular, geotechnical testing would be required to assess appropriate strength, stiffness and durability for the proposed use where the materials are to be used as 'engineered fill'.

The Haztec results for tests using GP Cement (GP) and Dolocrete indicate that the material in-situ is suitable for stabilisation at the excavated moisture content, and that dewatering results in slightly lower strength products using GP stabilisation, but makes little diffference to the Dolocrete strength. This GP strength decrease may be due to increased mixing difficulties of the drier material. It should be noted that GP has significant time constraints for the completionof the work.

Treatment direct from the barge, or nearby 'temporary stockpile' staging point is proposed.

The water within the sediment is combined in the cementitious process to produce a stabilised 'dewatered' product that does not produce seepage and is of very low permeability to practically impermeable. The stabilised product meets the permeability requirements in the MPT consent for capping. This capping would be placed below an approximate 0.5m blanket of material meeting the MPT consent conditions for use as a separator/buffer.

The products from the two stabilisation agents proposed are as follows:

- Dolocrete at low concentration, to provide a very stiff/hard material, which is capable of being remoulded and compacted, similar to a very stiff to hard clay. Typical strengths 0.4MPa to

0.6MPa are targeted, with permeabilities less than $1x10^{-9}$ m/s (subject to moisture conditioning and compaction). This material also appears to emit less odour during the curing process than the GP.

- GP Cement, provides greater strength than Dolocrete at the same percentage addition, but is not generally remouldable and sets within about 3 hours (i.e., producing significant construction limitations). Although GP additive mixtures are difficult/not possible to compact due to their shorter setting time, the inclusion of 'workability' agents, such as PFA and Ground Granulated Blast Furnace Slag (GGBFS) may improve this performance. Typically a minimum 10% GP additive rate might be expected to achieve permeabilities less than $1x10^{-9}$ m/s (subject to moisture conditioning and compaction) for use as capping, dependent on the final density acheived. Strengths of over 1MPa are expected for the 10% additive rate tested.

Once treated and achieving a suitable Unconfined Compressive Strength (UCS), of nominally 0.4 MPa or greater, the materials meet the TCLP requirements for classification as inert waste.

7.5 Thermal Desorption

This is an accepted technology, used previously in similar projects. However, it requires dewatering/drying prior to treatment and is relatively expensive in comparison to the stabilisation techniques being considered herein. Moreover, without further stabilisation (eg cement additives) the end product could have significant limitations for use on site as engineered fill/capping.

On the basis of the above, this technology is not considered to be a preferred approach for remediation of the sediments.

7.6 Preferred Process

Based on the limited testing to date, we recommend that the preferred process adopted be a cementitiously stabilised mix that will remain workable for sufficient time for compaction and is able to be remoulded and compacted into position (equivalent hard/very stiff soil at UCS 400-600 kPa). The material could be placed into compacted stockpiles (to limit moisture ingress) and subsequently used as a compacted engineered fill when required (e.g., as a capping layer).

From extrapolation of the strength results, a 5%-8% Dolocrete additive at excavated moisture content appears feasible to achieve the above criteria, using a mixture of equal parts of 'high', 'medium' and 'low' sediment. This will need to be substantiated by further confirmatory testing at the appropriate rates of additive and compaction.

We note that the EPA encourages re-use of materials and that strength is seen as a requirement for use rather than a target in itself for which a use must be found. On this basis, we expect that a low percentage Dolocrete or special mix GP blend (to allow compaction to be achieved) might be utilised for the capping of the MPT site, and that a GP mix might be adopted in areas that require higher strength for engineering purposes (subject to confirmatory geotechnical suitability testing).

STANDARD SHEETS

General Notes

Laboratory Testing

GENERAL NOTES

CONSULTING GEOTECHNICAL ENGINEERS & GEOLOGISTS
36 Oxley Street, Crows Nest, N.S.W. 2065
Tel: (02) 9439 4033 Fax: (02) 9436 0606
Em: mail@longmac.com.au
GHD-LONGMAC

The report contains the results of a geotechnical investigation conducted for a specific purpose and client. The results should not be used by other parties, or for other purposes, as they may contain neither adequate nor appropriate information. In particular, the investigation does not cover contamination issues unless specifically required to do so by the client.

TEST HOLE LOGGING

The information on the test hole logs (boreholes, test pits, exposures etc.) is based on a visual and tactile assessment, except at the discrete locations where test information is available (field and/or laboratory results). The test hole logs include both factual data and inferred information. Reference should be made to the relevant sheets for the explanation of logging procedures (Soil and Rock Descriptions, Core Log Sheet Notes etc.).

GROUNDWATER

Unless otherwise indicated, the water levels presented on the test hole logs are the levels of free water or seepage in the test hole recorded at the given time of measuring. The actual groundwater level may differ from this recorded level depending on material permeabilities (i.e. depending on response time of the measuring instrument). Further, variations of this level could occur with time due to such effects as seasonal, environmental and tidal fluctuations or construction activities. Confirmation of groundwater levels, phreatic surfaces or piezometric pressures can only be made by appropriate instrumentation techniques and monitoring programmes.

INTERPRETATION OF RESULTS

The discussion or recommendations contained within this report normally are based on a site evaluation from discrete test hole data. Generalised, idealised or inferred subsurface conditions (including any geotechnical cross-sections) have been assumed or prepared by interpolation and/or extrapolation of these data. As such these conditions are an interpretation and must be considered as a guide only.

CHANGE IN CONDITIONS

Local variations or anomalies in the generalised ground conditions do occur in the natural environment, particularly between discrete test hole locations. Additionally, certain design or construction procedures may have been assumed in assessing the soil-structure interaction behaviour of the site. Furthermore, conditions may change at the site from those encountered at the time of the geotechnical investigation through construction activities and constantly changing natural forces.

Any change in design, in construction methods, or in ground conditions as noted during construction, from those assumed or reported should be referred to this firm for appropriate assessment and comment.

GEOTECHNICAL VERIFICATION

Verification of the geotechnical assumptions and/or model is an integral part of the design process - investigation, construction verification, and performance monitoring. Variability is a feature of the natural environment and, in many instances, verification of soil or rock quality, or foundation levels, is required. There may be a requirement to extend foundation depths, to modify a foundation system or to conduct monitoring as a result of this natural variability. Allowance for verification by geotechnical personnel accordingly should be recognised and programmed during construction.

FOUNDATIONS

Where referred to in the report, the soil or rock quality, or the recommended depth of any foundation (piles, caissons, footings etc.) is an engineering estimate. The estimate is influenced, and perhaps limited, by the fieldwork method and testing carried out in connection with the site investigation, and other pertinent information as has been made available. The material quality and/or foundation depth remains, however, an estimate and therefore liable to variation. Foundation drawings, designs and specifications should provide for variations in the final depth, depending upon the ground conditions at each point of support, and allow for geotechnical verification.

REPRODUCTION OF REPORTS

Where it is desired to reproduce the information contained in our geotechnical report, or other technical information, for the inclusion in contract documents or engineering specification of the subject development, such reproductions should include at least all of the relevant test hole and test data, together with the appropriate standard description sheets and remarks made in the written report of a factual or descriptive nature.

Reports are the subject of copyright and shall not be reproduced either totally or in part without the express permission of this firm.

WP Ref: C:\WPDOCS\ECP\PRACTICE\ENG\DS5.5.1 Issue 1.1 Date: 24 September 2002

LABORATORY TESTING

CONSULTING GEOTECHNICAL ENGINEERS & GEOLOGISTS
36 Oxley Street, Crows Nest, N.S.W. 2065
Tel: (02) 9439 4033 Fax: (02) 9436 0606
Em: mail@longmac.com.au
GHD-LONGMAC

GENERAL

Samples extracted during the fieldwork stage of a site investigation may be "disturbed" or "undisturbed" (as generally indicated on the trial hole logs) depending upon the nature and purpose of the sample as well as the method of extraction, transportation, extrusion and testing. This aspect should be taken into account when assessing test results, which must of necessity reflect the effects of such disturbance.

All soil properties (as measured by laboratory testing) exhibit inherent variability and thus a certain statistical number of tests is required in order to predict an average property with any degree of confidence. The site variability of soil strata, future changes in moisture and other conditions and the discrete sampling positions must also be considered when assessing the representative nature of the laboratory programme.

Certain laboratory test results provide interpreted soil properties as derived by conventional mathematical procedures. The applicability of such properties to engineering design must be assessed with due regard to the site, sample condition, procedure and project in hand.

WP Ref: C:\WPDOCS\EC\PRACTICE\ENG\DS5 5.2 Issue 1.1 Date: 24 September 2002

TESTING

Laboratory testing is normally carried out in accordance with Australian Standard AS 1289 as amended, or RTA Standards when specified. The routine Australian Standard tests are as follows:-

Moisture Content	Test 2.1.1	
Liquid Limit	Test 3.1.1	)
Plastic Limit	Test 3.2.1	) collectively known as Atterberg Limits
Plasticity Index	Test 3.3.1	)
Linear Shrinkage	Test 3.4.1	
Particle Density	Test 3.5.1	
Particle Size Distribution	Tests 3.6.1, 3.6.2 and 3.6.3	
Emerson Class Number	Test 3.8.1	)
Percent Dispersion	Test 3.8.2	) collectively, Dispersive Classification
Pinhole Dispersion Classification	Test 3.8.3	)
Organic Matter	Test 4.1.1	
Sulphate Content	Test 4.2.1	
pH Value	Test 4.3.1	
Resistivity	Test 4.4.1	
Standard Compaction	Test 5.1.1	
Modified Compaction	Test 5.2.1	
Dry Density Ratio	Test 5.4.1	
Minimum Density	Test 5.5.1	
Density Index	Test 5.6.1	
California Bearing Ratio	Tests 6.1.1 and 6.1.2	
Shear Box	Test 6.2.2	
Undrained Triaxial Shear	Test 6.4.1	
One Dimensional Consolidation	Test 6.6.1	
Constant Head Permeability	Akroyd	

Where tests are used which are not covered by appropriate standard procedures, details are given in the report.

LABORATORY

Our laboratory is a Registered Laboratory in the terms of registration with the National Association of Testing Authorities (NATA) for the listed tests.

The oedometer, triaxial and shear box equipment are fully automated for continuous operation using computer controlled data acquisition, processing and plotting systems.

PHOTOGRAPHS

Photo 3.1

Photo 3.2

Barge mounted excavator used to retrieve bulk sediment samples

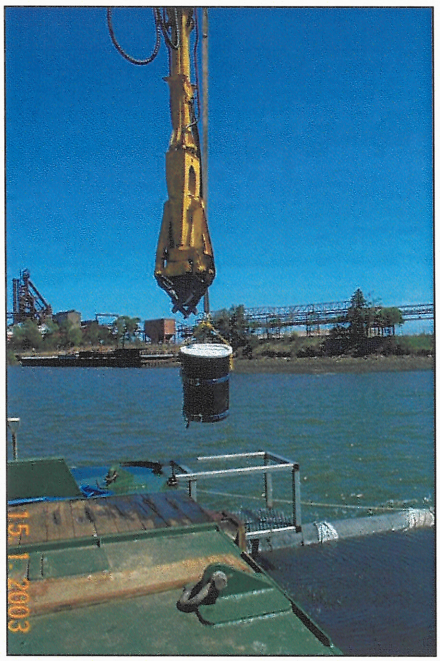


Photo 3.3
Lifting by the excavator

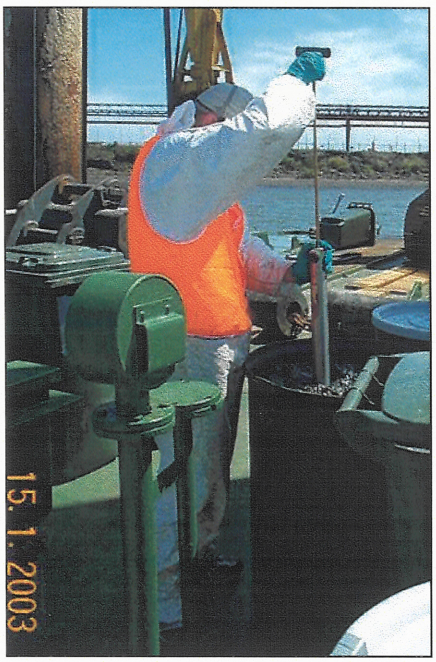


Photo 3.4(a), 3.4(b)
Sub sampling from the barrels

Photo 3.5 (a), 3.5(b)
Water Quality Sampling during Bulk Sediment Sampling

Ref: Data_ARB\2111563\EISChaps\Photos\Photos3.1-3.5

Photo 3.6(a), 3.6(b)
Unloading Bulk Samples from the barge

Photo 4.1 (a), 4.1(b)
Sediment mixing bins

Photo 4.2
Geobag Test Set Up

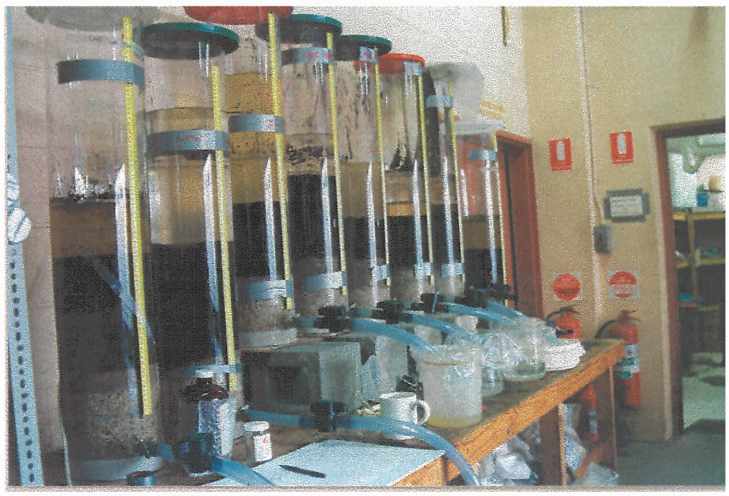


Photo 4.3
Deposition Simulation Test Apparatus

Ref: Data_ARB\2111563\EISChaps\Photos\Photos3.6-4.3

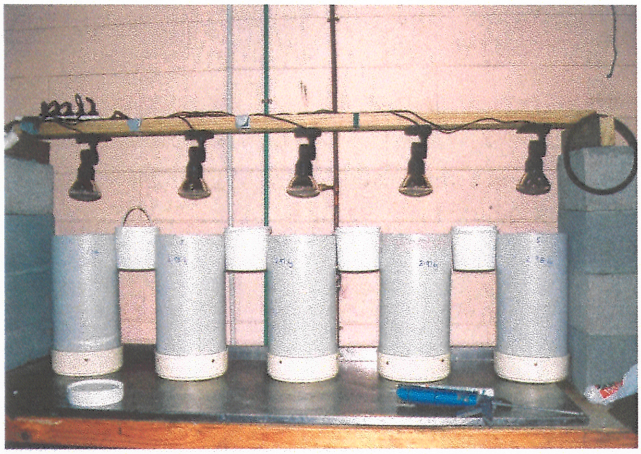


Photo 4.4
Air Drying Test Set Up

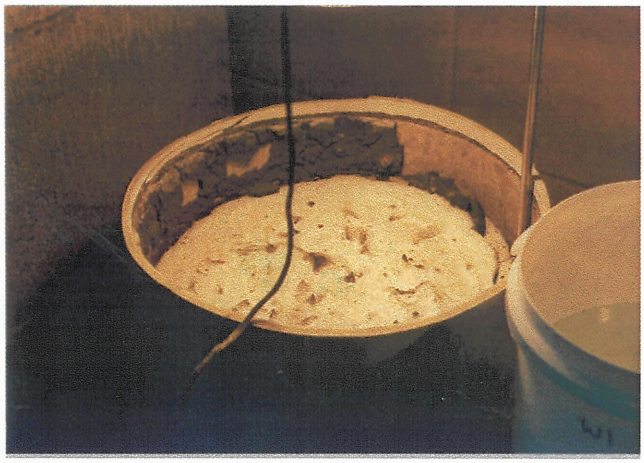


Photo 4.5
Medium Sample without Geobag Cover

Photo 4.6
Portable Floating Wind Tunnel

Photo 4.7
Isolation Chamber on Barrel

Photo 4.8
Isolation Chamber in Odour Pen

Ref: Data_ARB\2111563\EISChaps\Photos\Photos4.4-4.8

TABLES

Table 4.1	Results of Geochemical Analysis of Barrels
Table 4.2	Results of Geochemical Analysis of Sediment Mixes
Table 4.3	Slurry Density vs % Solids & Moisture Content
Table 5.1	CDF Trial – Water – Key Contaminants
Table 5.2	CDF Trial – Sediment – Key Contaminants
Table 5.3	Water Quality Results at Bulk Sampling Zones
Table 5.4	Water Quality Results for Filtrate from Geobags
Table 5.5	Water Quality Results for PAH/Turbidity Relationship

Table 4.1 Results of Geochemical Analysis of Barrels

Barrel	Total PAH (mg/kg)	TPH (mg/kg)	Selection of barrels for use in trials NB based on preliminary PAH results shown in brackets
Low 1	850 (845)	3180	Low
Low 2	1400 (1100)	7860	not selected as PAH contamination too high
Low 3	670 (670)	2120	Low
Low 4	620 (625)	1680	Low
Low 5	510 (500)	1340	Low
Low 6	190 (224)	290	Low
Low 7	300 (720)	1000	Low
Low 8	480 (result unavailable)	1360	not selected as preliminary PAH result unavailable at time of barrel selection
Low 9	420 (435)	980	Low
Low 10	380 (380)	890	Low
Medium 1	2700 (2407)	6810	Medium
Medium 2	2400 (2210)	6250	Medium
Medium 3	3600 (3135)	8350	Medium
Medium 4	1400 (>8800)	2120	High
Medium 5	4600 (4500)	9360	High
Medium 6	1200 (1155)	3300	Medium
Medium 7	3000 (3148)	6250	Medium
Medium 8	200 (205)	700	not selected as PAH contamination too low
Medium 9	1900 (1606)	4350	Medium
Medium 10	1400 (1380)	4450	Medium
High 1	4300 (4440)	12960	High
High 2	10000 (216)	26140	not selected as preliminary PAH result too low
High 3	11000 (5100)	21490	High
High 4	5300 (5617)	19190	High
High 5	2200 (2440)	9050	High
High 6	7500 (8032)	15410	High
High 7	1200 (1320)	6470	Medium
High 8	140 (148)	810	not selected as PAH contamination too low
High 9	3400 (3686)	7880	High
High 10	800 (840)	2080	not selected as PAH contamination too low

Table 4.2 Results of Geochemical Analysis of Sediment Mixes prepared for the trials

Sample Description	Mercury	Arsenic	Zinc	Lead	Ammonia as N	Total Cyanide	Total Phenolics	Naphthalene	Benzo(a)pyrene	Total PAHs	C6-C36
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	g/kg
ANZECC/ARMCANZ ISQG - Low	**0.15**	**20**	**200**	**50**	**--**	**--**	**--**	**0.16**	**0.43**	**4**	**--**
ANZECC/ARMCANZ ISQG-High	**1**	**70**	**410**	**220**	**--**	**--**	**--**	**2.1**	**1.6**	**45**	**--**
EPA Inert Non-Liquid Waste guideline*	**50***	**500***	**--**	**1500***	**--**	**5900***	**518***	**--**	**1***	**200***	**5650***
Low mix 1 (geobags) A	*0.03*	*2.5*	81	18	37	1	0.1	350	13	600	1803
Low mix 1 (geobags) B	0.06	*2.5*	93	19	39	0.7	*0.5*	360	13	600	1783
Low mix 2 (odour pens and immobilisation) A	0.06	*2.5*	92	18	49	1.2	0.2	450	17	750	1943
Low mix 2 (odour pens and immobilisation) B	*0.03*	*2.5*	94	21	41	1.6	0.1	420	15	710	1763
Medium mix 1 (geobags) A	*0.1*	10	920	140	*29*	71	*0.6*	*1000*	93	2500	7263
Medium mix 1 (geobags) B	0.09	9	840	130	33	68	0.8	960	33	1700	5343
Medium mix 2 (odour pens and immobilisation) A	0.1	7	670	100	41	53	0.2	380	15	660	2043
Medium mix 2 (odour pens and immobilisation) B	0.11	9	830	130	45	65	0.3	900	24	1400	4283
High mix 1 (geobags) A	0.18	10	1200	220	46	140	1	2500	71	4900	12717
High mix 1 (geobags) B	0.29	11	1400	240	53	170	1.2	2800	78	4900	11977
High mix 2 (odour pens and immobilisation) A	0.16	9	1100	190	61	150	1.8	2400	58	3900	10129
High mix 2 (odour pens and immobilisation) B	0.14	12	1500	260	57	160	1.2	3300	110	6000	14721

Notes
-- no guideline value available
italics - numbers in italics are those reported as Non Detected and are included as 1/2 PQL for statistical purposes
* maximum value for total concentration when used with leachable concentration

Ref: ARBComputer/Data_ARB/2111563/Tables/Table4.2

TABLE 4.3 Slurry Density vs % Solids & Moisture Content

SADM EIS			Job No. 2111563	
G=	2.48	High		
% Solids - C	Sat. Density (t/m3)	Dry Density (t/m3)	Wt Water (t/m3)	MContent (%)
20	1.14	0.23	0.91	400
25	1.18	0.29	0.88	300
30	1.22	0.37	0.85	233
35	1.26	0.44	0.82	186
40	1.31	0.53	0.79	150
45	1.37	0.62	0.75	122
50	1.43	0.71	0.71	100
55	1.49	0.82	0.67	82
60	1.56	0.93	0.62	67
65	1.63	1.06	0.57	54
70	1.72	1.20	0.52	43
75	1.81	1.36	0.45	33
80	1.91	1.53	0.38	25
85	2.03	1.73	0.30	18
90	2.16	1.94	0.22	11

G=	2.21	Medium		
% Solids - C	Sat. Density (t/m3)	Dry Density (t/m3)	Wt Water (t/m3)	MContent (%)
25	1.16	0.29	0.87	300
30	1.20	0.36	0.84	233
35	1.24	0.43	0.80	186
36	1.25	0.45	0.80	178
40	1.28	0.51	0.77	150
45	1.33	0.60	0.73	122
50	1.38	0.69	0.69	100
52	1.40	0.73	0.67	92.3
53	1.41	0.75	0.66	89
55	1.43	0.79	0.64	82
60	1.49	0.89	0.60	67
65	1.55	1.01	0.54	54
70	1.62	1.13	0.49	43
75	1.70	1.27	0.42	33
80	1.78	1.42	0.36	25
85	1.87	1.59	0.28	18
90	1.97	1.77	0.20	11

G=	2.33	Low		
% Solids - C	Sat. Density (t/m^3)	Dry Density (t/m^3)	Wt Water (t/m^3)	MContent (%)
20	1.13	0.23	0.90	400
25	1.17	0.29	0.87	300
30	1.21	0.36	0.84	233
35	1.25	0.44	0.81	186
40	1.30	0.52	0.78	150
45	1.35	0.61	0.74	122
50	1.40	0.70	0.70	100
55	1.46	0.80	0.66	82
60	1.52	0.91	0.61	67
65	1.59	1.03	0.56	54
70	1.67	1.17	0.50	43
75	1.75	1.31	0.44	33
80	1.84	1.47	0.37	25
85	1.94	1.65	0.29	18
90	2.06	1.85	0.21	11

Ref:ARB Drive\Data_ARB\2111563\Tables\Table4.3

TABLE 5.1 CDF TRIAL - WATER - KEY CONTAMINANTS

IDENT	Conductivity	Suspended	Turbidity	pH	Cyanide	Ammonia	Naphthalene	Phenanthrene	Anthracene	Fluoranthene	Benzo(a)pyrene	Total PAHs	C6-C36 Fraction
UNITS	uS/cm	mg/l	NTU		Total mg/L	mg/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Trigger Range - Estuarine & Marine (physical & chemical stressors)	--	--	0.5-10	--	--	--	--	--	--	--	--	--	--
Trigger Value - Estuaries (physical & chemical stressors)	--	--	--	--	--	15 (NH_4^+)	--	--	--	--	--	--	--
Trigger Value - Marine (physical & chemical stressors)	--	--	--	--	--	*20 (NH_4^+)*	--	--	--	--	--	--	--
Trigger Value for marine waters 95% protection (toxicants)	--	--	--	--	4	910	70	2*L	0.4*L	1.4*L	0.2*L	ID	ID
Trigger Value for freshwater 95% protection (toxicants)	--	--	--	--	7	900	16	2*L	0.4*L	1.4*L	0.2*L	ID	ID
Drained Test Leachate - First Flush													
REPORT: 3EO679													
DETECTION LIMIT	1	1	0.1	0.1	0.005	0.01	1	1	1	1	1	1	
LDL	--	7	1.2	--	0.056	36.1	nd	nd	nd	nd	nd	nd	--
MDL	--	8	1	--	0.098	8.6	nd	nd	nd	nd	nd	nd	--
HDL	--	17	4.4	--	0.046	11	nd	nd	nd	nd	nd	nd	--
Undrained Test Supernatant													
REPORT: 3EO702													
DETECTION LIMIT	1	1	0.1	0.1	0.005	0.01	1	1	1	1	1	1	
LUS	--	26	14	--	0.048	67.6	nd	nd	nd	nd	nd	nd	--
MUS	--	9	7	--	0.151	9	nd	nd	nd	nd	nd	nd	nd
HUS	--	140	27	--	0.072	18.4	1300	74	16	17	nd	1800	--
Undrained Test Leachate - Second Sampling													
REPORT: 3EO732													
DETECTION LIMIT							1	1	1	1	1	1	--
LUL	--	--	--	--	--	--	1400	3	nd	nd	nd	1500	--
HUL	--	--	--	--	--	--	230	nd	nd	nd	nd	240	--
Mix-Filter Material, Undrained Leachate-Third Sampling													
REPORT: 3EO752													
DETECTION LIMIT	1	1	0.1	0.1	0.005	0.01	1	1	1	1	1	1	
MIXD	360	20	3.4	8.2	--	--	2	nd	nd	nd	nd	nd	--
HUL	43000	7	1.2	8.2	--	--	nd	nd	nd	nd	nd	nd	--
MUL	44000	8	2.4	8.2	--	--	nd	nd	nd	nd	nd	nd	--
Mix-Leachate, First Flush													
REPORT: 3EO765													
DETECTION LIMIT	1	1	0.1	0.1	0.005	0.01	1	1	1	1	1	1	
MXL	3600	11	7.9	7.9	--	--	nd	nd	nd	nd	nd	nd	--
Drained Leachate 1stFlush, Undrained Leachate 4th Sample													
REPORT: 3EO799													
DETECTION LIMIT	1	1	0.1	0.1	0.005	0.01	1	1	1	1	1	1	
HDL	32000	nd	1.2	8.3	--	--	nd	nd	nd	nd	nd	nd	--
HUL	31000	1	0.6	8.1	--	--	2	nd	nd	nd	nd	2	--
Various as below													
REPORT: 3EO879													
DETECTION LIMIT	1	1	0.1	0.1	0.005	0.01	1	1	1	1	1	1	
DOLO - First Flush	7700	nd	2	7.6	--	--	nd	nd	nd	nd	nd	nd	--
MIXL - Leachate 2nd Sample	16000	4	0.6	8.2	--	--	nd	nd	nd	nd	nd	nd	--
HUL - Undrained Leachate 5th Sample	31000	24	1.4	8.2	--	--	nd	nd	nd	nd	nd	nd	--
HDL - Drained Leachate 2nd Sample	33000	1	1	8.3	--	--	nd	nd	nd	nd	nd	nd	nd
MUL - Undrained Leachate 4th Sample	33000	9	1.4	8.3	--	--	nd	nd	nd	nd	nd	nd	--
MDL - Drained Leachate 2nd Sample	--	--	--	--	0.164	5.21	--	--	--	--	--	--	nd
MDL/MUL - Combined 3rd Drained and 5th Undrained Samples	--	--	--	--	--	--	--	--	--	--	--	--	250
TSS vs PAH Sampling													
REPORT: 3EO1005A													
DETECTION LIMIT	1	1	0.1	0.1			1	1	1	1	1	1	
C+ T+	38000	2300	>1000	8	--	--	350	61	15	28	3	610	5807
C+ T0	37000	230	50	8	--	--	120	39	10	22	4	280	1227
C+ T-	36000	49	12	8	--	--	23	9	2	5	nd	57	120
C0 T+	35000	550	80	8	--	--	54	15	5	15	2	130	2159
C0 T0	35000	210	45	3	--	--	6	1	nd	1	nd	9	266
C0 T-	36000	46	6.6	8	--	--	37	10	4	10	2	91	nd
C- T+	38000	240	70	8.1	--	--	43	15	8	21	6	160	465
C- T0	37000	96	35	8.1	--	--	17	6	3	7	2	60	212
C- T-	36000	25	8.6	8.1	--	--	4	1	nd	1	nd	8	nd
C* T*	9500	4	1	6.7	--	--	nd	nd	nd	nd	nd	nd	nd

Ref: ARB Drive\Data_ARB\2111563\Tables\Table5.1

TABLE 5.2 CDF TRIAL - SEDIMENT - KEY CONTAMINANTS

IDENTIFICATION	C6-C36	TOC	Naphthalene	Benzo(a)	Total PAHs	Arsenic	Zinc	Lead	Mercury	Ammonia	Phenolics	Cyanide
UNITS	Fraction mg/kg	%	mg/kg	anthracene mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	total mg/kg	total mg/kg
ANZECC/ARMCANZ ISQG - Low	--	--	0.16	0.43	4	20	200	50	0.15	--	--	--
ANZECC/ARMCANZ ISQG-High	--	--	2.1	1.6	45	70	410	220	1	--	--	--
EPA Inert Non-Liquid Waste guideline*	5650*	--	--	1*	200*	500*	--	1500*	50*	--	5900*	518*
Consolidation Samples												
REPORT: 3EO636												
DETECTION LIMIT		0.1	0.05	0.05	0.05	5	5	5	0.05	0.1	0.1	0.5
LOW-CONSOL	2210	--	470	28	1100	5	90	18	0.09	21	0.2	0.7
MED-CONSOL	3420	--	700	41	1400	11	610	92	0.2	19	0.1	57
HIGH-CONSOL	9956	--	2500	50	4100	16	1200	200	0.26	23	0.2	120
Mix, Equal Parts High, Medium and Low												
REPORT: 3EO752												
DETECTION LIMIT		0.1	0.05	0.05	0.05	5	5	5	0.05			
MIX	4140	14	995	28.3	1740	--	--	--	--	--	--	--
REPORT: 3EO752a												
DETECTION LIMIT		0.1	0.05	0.05	0.05	5	5	5	0.05			
MIX	--	--	--	--	--	11	570	86	0.17	--	--	--
3.5% Dolocrete Stabilising 'High'												
REPORT: 3E0765												
DETECTION LIMIT		0.05	0.05	0.05	10	5	5	5	0.05			
DOLO	13507	16	4630	93.1	7040	11	1000	160	0.25	--	--	--
TSS vs PAH Relationship Tests												
REPORT: 3E1005A												
DETECTION LIMIT		0.05	0.05	0.05	10	5	5	5	0.05			
LOW	441	84.9	22.7	3.35	500	--	--	--	--	--	--	--
MED	925	120	29.7	5.04	1000	--	--	--	--	--	--	--
HIGH	3447	440	127	8.69	5500	--	--	--	--	--	--	--

Ref: ARB Drive\Data_ARB\2111563\Tables\Table5.2

Table 5.3 Water Quality Results at the Bulk Sampling Zones Inside & Outside Turbidity Curtain

Sample Description	Mercury	Arsenic	Zinc	Lead	Ammonia as N	Total Cyanide	Total Phenolics	Naphthalene	Anthracene	Phenanthrene	Fluoranthene	Benzo(a)pyrene	Total PAHs	C6-C36	Turbidity	Suspended Solids
	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	NTU	mg/l
Trigger Range - Estuarine & Marine (physical & chemical stressors)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	**0.5-10**	--
Trigger Value - Estuaries (physical & chemical stressors)	--	--	--	--	**15** (NH4+)	--	--	--	--	--	--	--	--	--	--	--
Trigger Value - Marine (physical & chemical stressors)	--	--	--	--	**20** (NH4+)	--	--	--	--	--	--	--	--	--	--	--
Trigger Value for marine waters 95% protection (toxicants)	**0.4**	**2.3*L**	**15**	**4.4**	**910**	**4**	**400**	**70**	**0.4*L**	**2*L**	**1.4*L**	**0.2*L**	ID	ID	--	--
Trigger Value for freshwater 95% protection (toxicants)	**0.6**	**24**	**8**	**3.4**	**900**	**7**	**320**	**16**	**0.4*L**	**2*L**	**1.4*L**	**0.2*L**	ID	ID	--	--
Hunter River Clean	*0.05*	*0.5*	12	*0.5*	20	*2.5*	*5*	1	*0.05*	*0.05*	*0.05*	*0.05*	1	150	3.4	17
Hunter River Clean	*0.05*	*0.5*	10	*0.5*	30	*2.5*	*5*	2.4	*0.05*	*0.05*	*0.05*	*0.05*	2.4	140	3	17
Hunter River Clean	*0.05*	*0.5*	11	*0.5*	20	*2.5*	*5*	2	*0.05*	*0.05*	*0.05*	*0.05*	2	150	3.6	19
Low zone, prior to sampling, outside turbidity curtain	*0.05*	*0.5*	15	*0.5*	70	*2.5*	*5*	*0.05*	*0.05*	*0.05*	*0.05*	*0.05*	*0.05*	*120*	1.6	8
Low zone, during sampling, inside turbidity curtain	*0.05*	1	30	2	20	*2.5*	*5*	2.2	1.2	1.4	1.8	0.3	12	*120*	6	38
Low zone, during sampling, outside turbidity curtain	*0.05*	*0.5*	15	*0.5*	40	*2.5*	*5*	5	0.3	0.4	0.4	*0.05*	6.4	*120*	2	16
Low zone, after sampling, outside turbidity curtain	*0.05*	*0.5*	18	*0.5*	40	*2.5*	*5*	0.2	*0.05*	0.1	*0.05*	*0.05*	0.3	*120*	1.4	16
Medium zone, prior to sampling, outside turbidity curtain	*0.05*	1	18	*0.5*	20	*2.5*	*5*	18	1.2	3.4	3	0.4	35	150	2.6	11
Medium zone, prior duplicate outside turbidity curtain	*0.05*	*0.5*	59	1	20	*2.5*	*5*	7.6	0.4	1.4	1.2	0.1	14	140	2.6	11
Medium zone, during sampling, inside turbidity curtain	*0.05*	2	270	24	100	30	10	55	6.4	18	21	3.6	170	966	58	280
Medium zone, during sampling, outside turbidity curtain	*0.05*	*0.5*	*16*	*0.5*	30	*2.5*	*5*	*6.4*	*0.5*	1.4	1.4	0.2	*14*	*120*	3	23
Medium zone, after sampling, outside turbidity curtain	*0.05*	*0.5*	21	*0.5*	30	*2.5*	*5*	1	*0.05*	0.2	0.2	*0.05*	1.6	*120*	4	17
High zone, prior to sampling, outside turbidity curtain	*0.05*	*0.5*	28	1	40	*2.5*	*5*	2.2	0.2	0.5	0.6	*0.05*	5.6	*120*	9.2	40
High zone, during sampling, inside turbidity curtain	*0.05*	2	260	25	10	19	*5*	65	4.2	11	15	2.4	140	200	14	79
High zone, during sampling, outside turbidity curtain	*0.05*	*0.5*	16	*0.5*	30	*2.5*	*5*	2.2	0.2	0.4	0.5	*0.05*	4.8	*120*	2.2	14
High zone, after sampling, outside turbidity curtain	*0.05*	*0.5*	44	2	30	*2.5*	*5*	5.2	0.6	1.4	1.4	0.2	15	*120*	2.8	34

Notes
ID - insufficient data to derive a reliable trigger value
*L - low reliability trigger value, should only be used as an indicative interim working level
-- no guideline available
italics - numbers in italics are those reported as Non Detected and are included as 1/2 PQL for statistical purposes

Ref:ARBDrive/Data_ARB/2111563/Tables/Table5.3

Table 5.4 Water Quality Results for Filtrate from Geo-bags

Sample Description	Mercury	Arsenic	Zinc	Lead	Ammonia as N	Total Cyanide	Total Phenolics	Naphthalene	Anthracene	Phenanthrene	Fluoranthene	Benzo(a)pyrene	Total PAHs	C6-C36	Turbidity	Suspended Solids
	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	mg/L	NTU	mg/l
Trigger Range - Estuarine & Marine (physical & chemical stressors)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.5-10	--
Trigger Value - Estuaries (physical & chemical stressors)	--	--	--	--	15 (NH4+)	--	--	--	--	--	--	--	--	--	--	--
Trigger Value - Marine (physical & chemical stressors)	--	--	--	--	20 (NH4+)	--	--	--	--	--	--	--	--	--	--	--
Trigger Value for marine waters 95% protection (toxicants)	0.4	2.3*L	15	4.4	910	4	400	70	0.4*L	2*L	1.4*L	0.2*L	ID	ID	--	--
Trigger Value for freshwater 95% protection (toxicants)	0.6	24	8	3.4	900	7	320	16	0.4	2	1.4	0.2	ID	ID	--	--
LE1	*0.05*	13	140	13	58200	84	90	6	2	4	8	1	41	420	100	250
LS1	*0.05*	7	58	8	29600	52	50	3300	16	92	14	*0.5*	3700	5411	20	43
ME1	*0.05*	21	58	6	15600	182	30	24	2	5	4	*0.5*	45	249	11	35
MS1	*0.05*	3	36	3	14200	180	40	6	*0.5*	2	2	*0.5*	16	40	11	11
HE1	*0.05*	26	160	21	18000	112	50	83	11	44	20	3	290	2830	69	170
HS1	*0.05*	4	160	20	18800	90	50	25	7	38	17	2	170	1440	26	50

Notes
ID - insufficient data to derive a reliable trigger value
*L - low reliability trigger value, should only be used as an indicative interim working level
-- No guideline available
italics - Numbers in italics are those reported as Non Detected and are included as 1/2 PQL for statistical purposes

Ref:ARBComputer/Data_ARB/2111563/Tables/Table5.4

Table 5.5 Water Quality Results for PAH/TPH and Turbidity Relationship Test

Sample Description	Naphthalene	Total PAHs	TPH C6-C36	Turbidity	Suspended Solids
	µg/L	µg/L	µg/L	NTU	mg/l
Trigger Range - Estuarine & Marine (physical & chemical stressors)	--	--	--	**0.5-10**	--
Trigger Value - Estuaries (physical & chemical stressors)	--	--	--	--	--
Trigger Value - Marine (physical & chemical stressors)	--	--	--	--	--
Trigger Value for marine waters 95% protection (toxicants)	**70**	**ID**	**ID**	--	--
Trigger Value for freshwater 95% protection (toxicants)	**16**	**ID**	**ID**	--	--
high contamination sediment, visually cloudy	350	610	5817	2300	>1000
high contamination sediment, slightly cloudy	120	280	1287	230	50
high contamination sediment, clear	23	57	230	49	12
medium contamination sediment, visually cloudy	54	130	2169	550	80
medium contamination sediment, slightly cloudy	6	9	326	210	45
medium contamination sediment, clear	37	91	*60*	46	6.6
low contamination sediment, visually cloudy	43	160	525	240	70
low contamination sediment, slightly cloudy	17	60	272	96	35
low contamination sediment, clear	4	8	*60*	25	8.6
blank	nd	nd	nd	4	1

Notes
ID - insufficient data to derive a reliable trigger value
-- No guideline available
italics - Numbers in italics are those reported as Non Detected and are included as 1/2 PQL for statistical purposes
nd not detected

Ref:ARBDrive/Data_ARB/2111563/Tables/Table5.5

APPENDICES

Appendix A	GHD_LongMac Laboratory Test Results
Appendix B	AMDEL Test Certificates
Appendix C	Haztec Cementitious Testing Report
Appendix D	CSIRO Toxicity Report

Appendix A

GHD-LongMac Laboratory Test Reports

A1 Soil Classification and Properties

A2 Geobag Plots

A3 Moisture Contents and Densities

A4 CDF Simulation Tests

A5 Moisture Content vs Shear Strength

A6 Triaxial Permeability Test Certificates

A7 Permeability vs Void Ratio

Appendix A1
Soil Classification and Properties

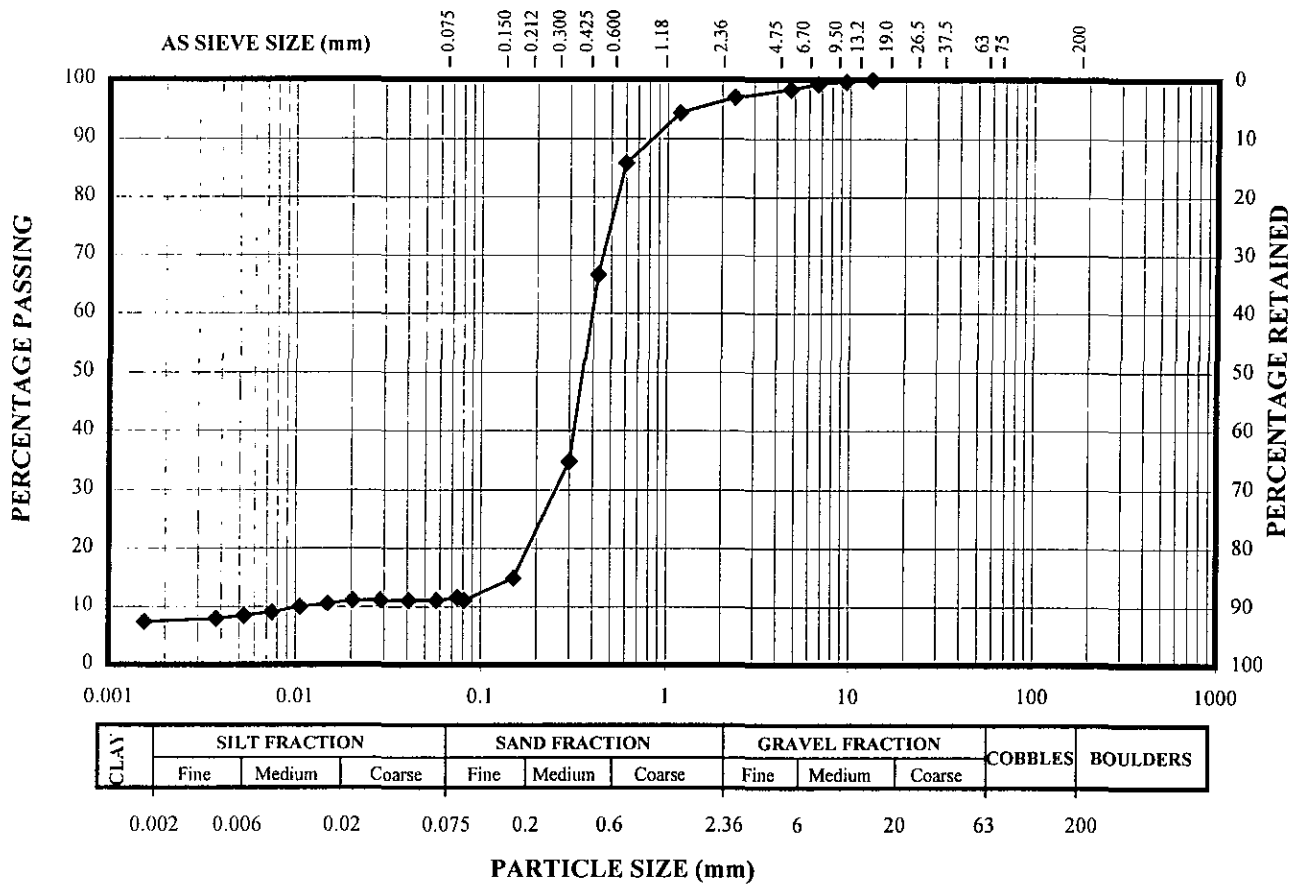
Report No's 11060 11061 11062 11103 11106

SOIL CLASSIFICATION REPORT

Trial Hole:	n/a.
Depth:	n/a.
Sample No:	3188/22

Client: Newcastle Port Corporation
Project: South Arm Dredging Master Plan
Location: Newcastle.

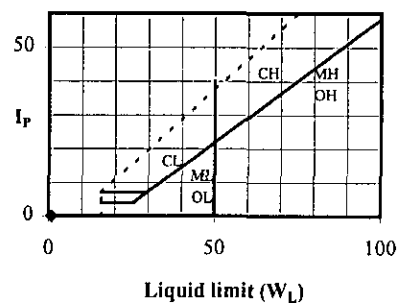
Client Sample No.: Low
Sample History: Sampled by GHD-LongMac Geotechnical



TEST METHODS
Classification AS1726 A2 Particle size AS1289.36.2

OTHER TESTS AS1289/2.1.1 AS1289.3.1.1
AS1289.3.2.1 AS1289.3.3.1 AS1289/3.4.1

GRADING
$C_u = D_{60} / D_{10} =$ 36.8
$C_c = D_{30} / (D_{10} \times D_{60}) =$ 16.1



PARTICLE DENSITY 2.33 (assumed)

PRE-TREATMENT HYDROMETER N/A

TEST CONDITION Dry

GROUP SYMBOL: SP-SM

SOIL NAME: Poorly graded sand with silt.

REMARKS:

INDEX PROPERTIES (%)
Liquid Limit = NP Plastic Limit = NP
Plasticity Index = NP Linear Shrinkage % Not determined

Atterberg Limits (preparation method) Dry

Liquid Limit (type of test) Standard

Linear Shrinkage (mould size)

Tested by:	GZ
Date tested:	19/02/03
Checked by:	
Date checked:	

GEOTECHNICAL TESTING SERVICES
36 Oxley Street, Crows Nest, N.S.W. 2065
Telephone (02) 9439 4033 Fax (02) 9436 0606 A.C.N. 003 666 966
GHD-LONGMAC PTY. LTD. Accreditation No: 679

Certified by:
D. Edgecliffe
31/3/03

This laboratory is accreditted by the National Association of Testing Authorities Australia
The test reported herein have been performed in accordance with its terms of accreditation

JOB No.	2111563/00
REPORT No.	11060

Ref: F:\SW\UTIL\LAB\STARTS\SIEVE

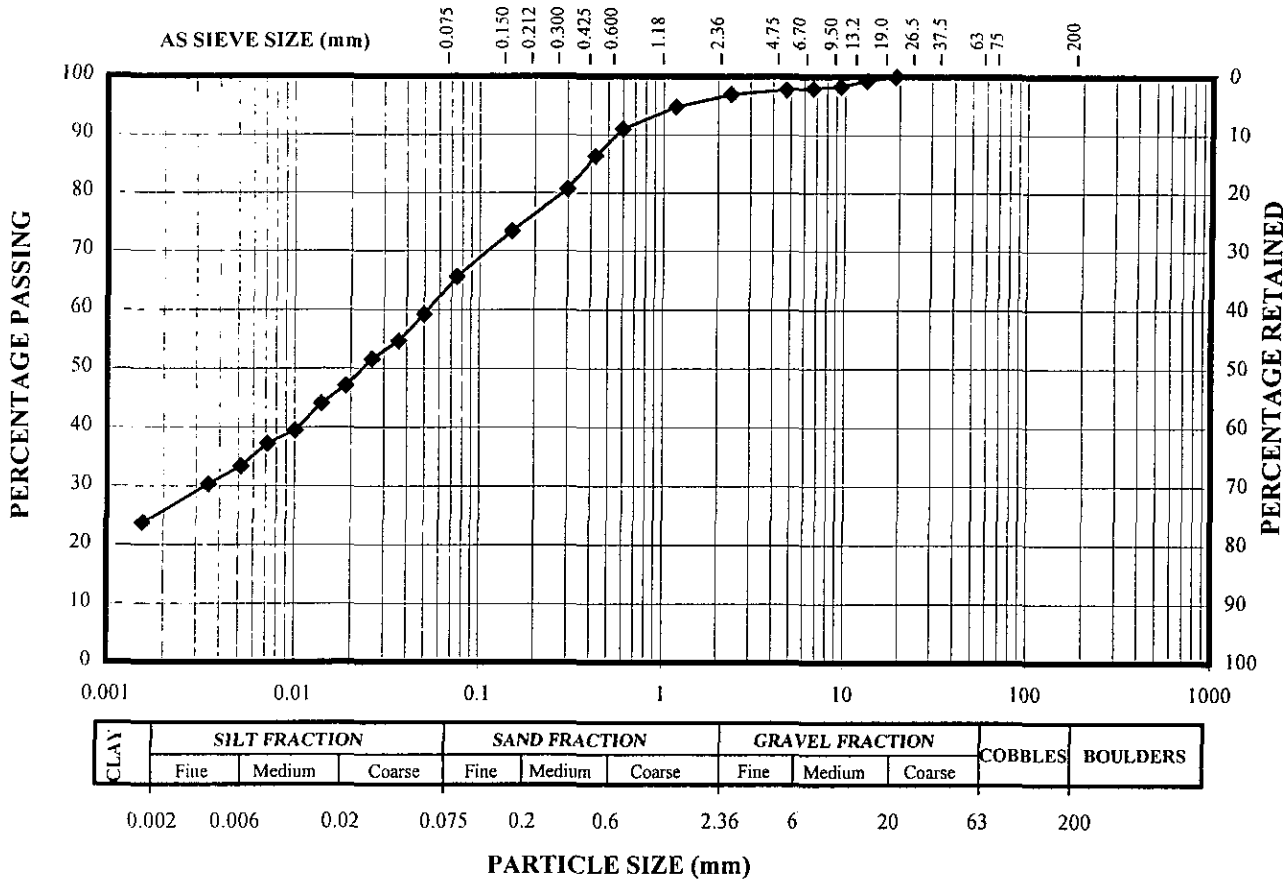
This laboratory Certificate may not be reproduced except in full unless permission for the publication of an approved extract has been obtained in writing from Longmac Associates Pty. Limited

SOIL CLASSIFICATION REPORT

Trial Hole:	n/a.
Depth:	n/a.
Sample No:	3188/23

Client: Newcastle Port Corporation
Project: South Arm Dredging Master Plan
Location: Newcastle

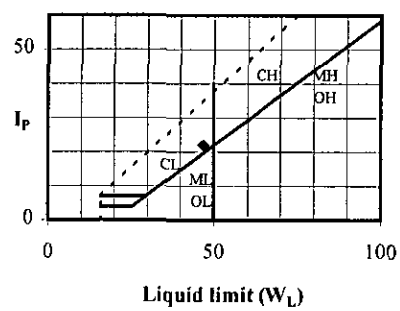
Client Sample No.: Medium
Sample History: Sampled by GHD-LongMac Geotechnical



TEST METHODS
Classification AS1726 A2 Particle size AS1289.36.2

OTHER TESTS AS1289/2.1.1 AS1289.3.1.1
AS1289.3.2.1 AS1289.3.3.1 AS1289/3.4.1

GRADING
$C_u = D_{60} / D_{10}$ = not determinable
$C_c = D_{30} / (D_{10} \times D_{60})$ = not determinable



PARTICLE DENSITY 2.21 (assumed)

PRE-TREATMENT HYDROMETER N/A

TEST CONDITION Dry

GROUP SYMBOL: CL

SOIL NAME: Sandy medium plasticity clay.

INDEX PROPERTIES (%)
Liquid Limit = 47 Plastic Limit = 25
Plasticity Index = 22 Linear Shrinkage % 7.5

Atterberg Limits (preparation method) Dry

Liquid Limit (type of test) Standard

Linear Shrinkage (mould size) 250 mm

REMARKS:

Tested by: GZ
Date tested: 19/02/03
Checked by:
Date checked:

GEOTECHNICAL TESTING SERVICES
36 Oxley Street, Crows Nest, N.S.W. 2065
Telephone (02) 9439 4033 Fax (02) 9436 0606 A.C.N. 003 666 966
GHD-LONGMAC PTY. LTD. Accreditation No: 679

Certified by:
D. Brooke
31/3/03

This laboratory is accreditted by the National Association of Testing Authorities Australia
The test reported herein have been performed in accordance with its terms of accreditation

JOB No.	2111563/00
REPORT No.	11061

Ref: FASWUTIL/LABSSTART/SIEVE

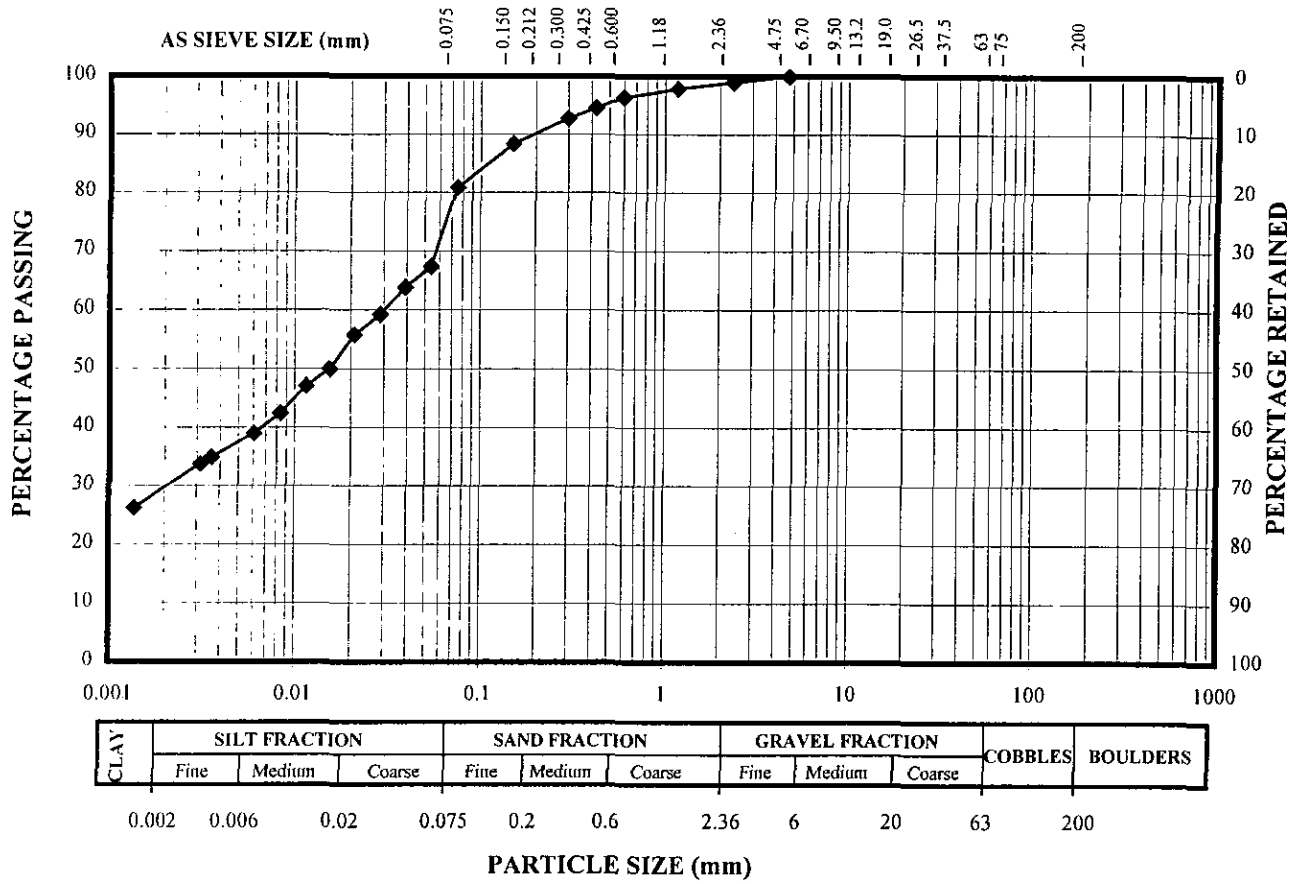
This laboratory Certificate may not be reproduced except in full unless permission for the publication of an approved extract has been obtained in writing from Longmac Associates Pty. Limited

SOIL CLASSIFICATION REPORT

Trial Hole:	n/a.
Depth:	n/a.
Sample No:	3188/24

Client: Newcastle Port Corporation
Project: South Arm Dredging Master Plan
Location: Newcastle

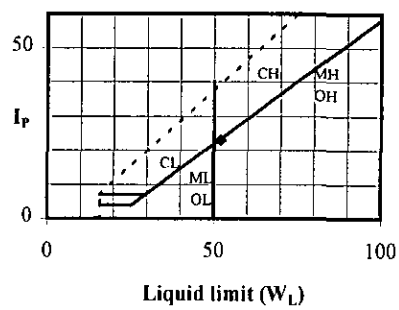
Client Sample No.: High
Sample History: Sampled by GHD-LongMac Geotechnical



TEST METHODS
Classification AS1726 A2 Particle size AS1289.36.2

OTHER TESTS AS1289/2.1.1 AS1289.3.1.1
AS1289.3.2.1 AS1289.3.3.1 AS1289/3.4.1

GRADING
$C_u = D_{60} / D_{10}$ = not determinable
$C_c = D_{30} / (D_{10} \times D_{60})$ = not determinable



PARTICLE DENSITY 2.48 (assumed)

PRE-TREATMENT HYDROMETER N/A

TEST CONDITION *Dry*

GROUP SYMBOL: MH

SOIL NAME: High plasticity silt with sand.

INDEX PROPERTIES (%)

Liquid Limit =	52	Plastic Limit =	29
Plasticity Index =	23	Linear Shrinkage %	10.5

Atterberg Limits *(preparation method)* Dry
Liquid Limit (type of test) Standard
Linear Shrinkage (mould size) 250 mm

REMARKS:

Tested by: GZ
Date tested: 19/02/03
Checked by:
Date checked:

GEOTECHNICAL TESTING SERVICES
36 Oxley Street, Crows Nest, N.S.W. 2065
Telephone (02) 9439 4033 Fax (02) 9436 0606 A.C.N. 003 666 966
GHD-LONGMAC PTY. LTD. Accreditation No: 679

Certified by:
D. BROOKS
31/3/03

This laboratory is accreditted by the National Association of Testing Authorities Australia
The test reported herein have been performed in accordance with its terms of accreditation

JOB No.	2111563/00
REPORT No.	11062

Ref: F:\SW\TITLE\LAB\SSTART\SIEVE

This laboratory Certificate may not be reproduced except in full unless permission for the publication of an approved extract has been obtained in writing from Longmac Associates Pty. Limited

Soil Particle Density - Report

Report No. 11103

Client:	Newcastle Port Authority
Project:	South Arm Dredging Master Plan
Location:	Newcastle
TEST METHOD :	AS1289.3.5.1

Job No.:	2111563/00
Sample No.:	as shown
Test Hole No.:	n/a
Depth (m) :	as shown
Client Sample ID :	as shown

SAMPLING HISTORY : Sampled by GHD-LONGMAC

Client Sample ID	Testhole Depth (m)	LM Sample Number	Average Apparent Particle Density -2.36 mm (Pf) (g/cm3)	Average Apparent Particle Density +2.36 mm (Pc) (g/cm3)	Soil Particle Density (Pst) (g/cm3)	Temp. (oC)
n/a	n/a	3188/16	n/a	n/a	**2.33**	23
SAMPLE DESCRIPTION :	C- M- low					
n/a	n/a	3188/17	n/a	n/a	**2.21**	23
SAMPLE DESCRIPTION :	Co M- Medium					
n/a	n/a	3188/18	n/a	n/a	**2.48**	23
SAMPLE DESCRIPTION :	C+ M- High					
SAMPLE DESCRIPTION :						
SAMPLE DESCRIPTION :						
SAMPLE DESCRIPTION :						
SAMPLE DESCRIPTION :						
SAMPLE DESCRIPTION :						

NOTES :

ABBREVATIONS :

n/a	not applicable
nt	not tested
n/av	not available

Tested by:	DB/GZ
Date tested:	29/01/03
Checked by:	
Authorised Signatory :	D. BROOKE
Date:	31/3/03

GHD - LONGMAC
36 Oxley Street, Crows Nest NSW 2065
Tel: (02) 9439 4033 Fax: (02) 9436 0606
GEOTECHNICAL TESTING SERVICES

This laboratory is accredited by the National Association of Testing Authorities, Australia. The tests reported herein have been performed in accordance with its terms of accreditation. NATA Accredited Laboratory Number 679

This laboratory certificate may not be reproduced except in full unless permission for the publication of an approved extracthas been obtained from GHD - LongMac.

Soil Index Properties - Report

Report No. 11106

Client: Newcastle Port Corporation

Job Number: 2111563/00

Project: South Arm Dredging Master Plan

Location: South Arm Hunter River, Newcastle

TEST METHODS :						
	Moisture Content	-	☒	AS1289.2.1.1	☐	RTA T120
	Liquid Limit (Four Point)	-	☒	AS1289.3.1.1	☐	RTA T102
	Liquid Limit (One Point)	-	☐	AS1289.3.1.2	☐	RTA T108
	Plastic Limit	-	☒	AS1289.3.2.1	☐	RTA T109
	Plasticity Index	-	☒	AS1289.3.3.1	☐	RTA T103
	Linear Shrinkage	-	☒	AS1289.3.4.1	☐	RTA T113

Sample History : Sampled by GHD-LONGMAC (Geotechnical)

LongMac Sample No.	Client Sample ID	Test Hole	Depth (m)	Description	NDD (t/m³)	FMC (%)	LL (%)	PL (%)	PI (%)	LS (%)
3188/22	n/a	n/a	n/a	Low	-	-	NO	NP	NP	0.0
3188/23	n/a	n/a	n/a	Medium	-	-	47	25	22	7.5
3188/24	n/a	n/a	n/a	High	-	-	52	29	23	10.5

Abbreviations :

LL	Liquid Limit
PL	Plastic Limit
PI	Plasticity Index
LS	Linear Shrinkage
FMC	Field Moisture Content
n/a	not applicable
nt	not tested
n/av	not available

Note :

Sample History ☐ Natural — Liquid Limit ☐ Air Dried ☒ Oven Dried

Preparation Method ☐ Wet — Liquid Limit ☒ Dry

Type of Test ☒ Four Point — Liquid Limit ☐ One Point

Type of Test ☐ 125mm — Linear Shrinkage - Mould Size ☐ 150mm ☒ 250mm

Tested by:	GZ
Date tested:	23/01/03
Checked by:	
Authorised Signatory :	D.Brooke
Date:	31/3/03

GHD - LONGMAC
36 Oxley Street, Crows Nest NSW 2065
Tel: (02) 9439 4033 Fax: (02) 9436 0606
GEOTECHNICAL TESTING SERVICES

This laboratory is accredited by the National Association of Testing Authorities,Australia.The tests reported herein have been performed in accordance with its terms of accreditation.
NATA Accredited Laboratory Number : 679

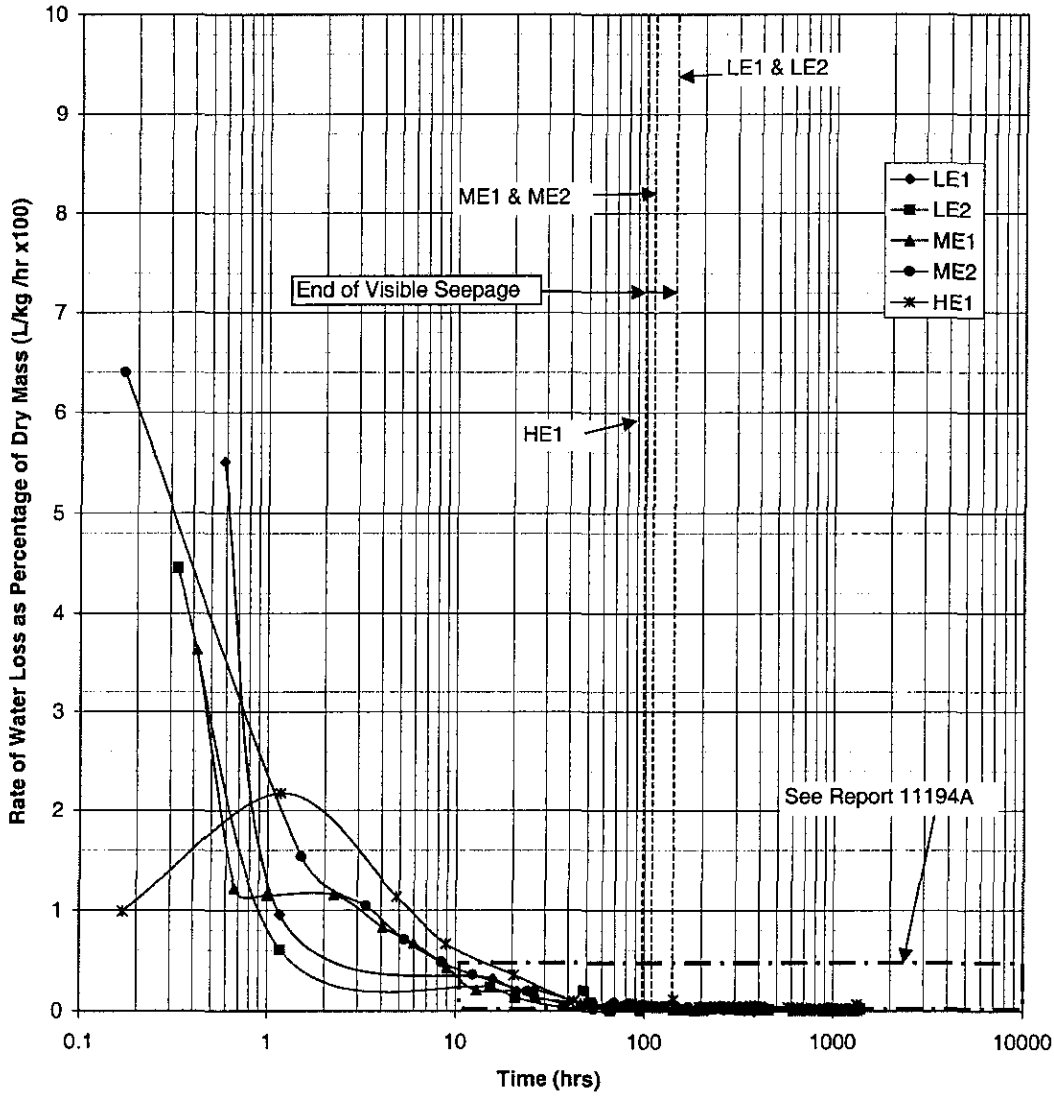
This laboratory certificate may not be reproduced except in full unless permission for the publication of an approved extract has been obtained from GHD - LongMac.

Appendix A2
Geobag Plots

Excavated Sediments	11194	11194A	11195	11208
Slurried Sediments	11196	11196A	11197	11206
TSS & turbidity vs Time	Laboratory Figures L1	L1A	L2	L3 L3A L4

Client:	Newcastle Port Corporation	Job No. :	21/11563/06
Project:	*SADM - EIS*		
Location:	Newcastle		
METHOD:	**LM Method**	**Client Sample ID:**	**Sediment**

GEOBAGS - EXCAVATED MATERIAL
RATE OF WATER LOSS WITH TIME



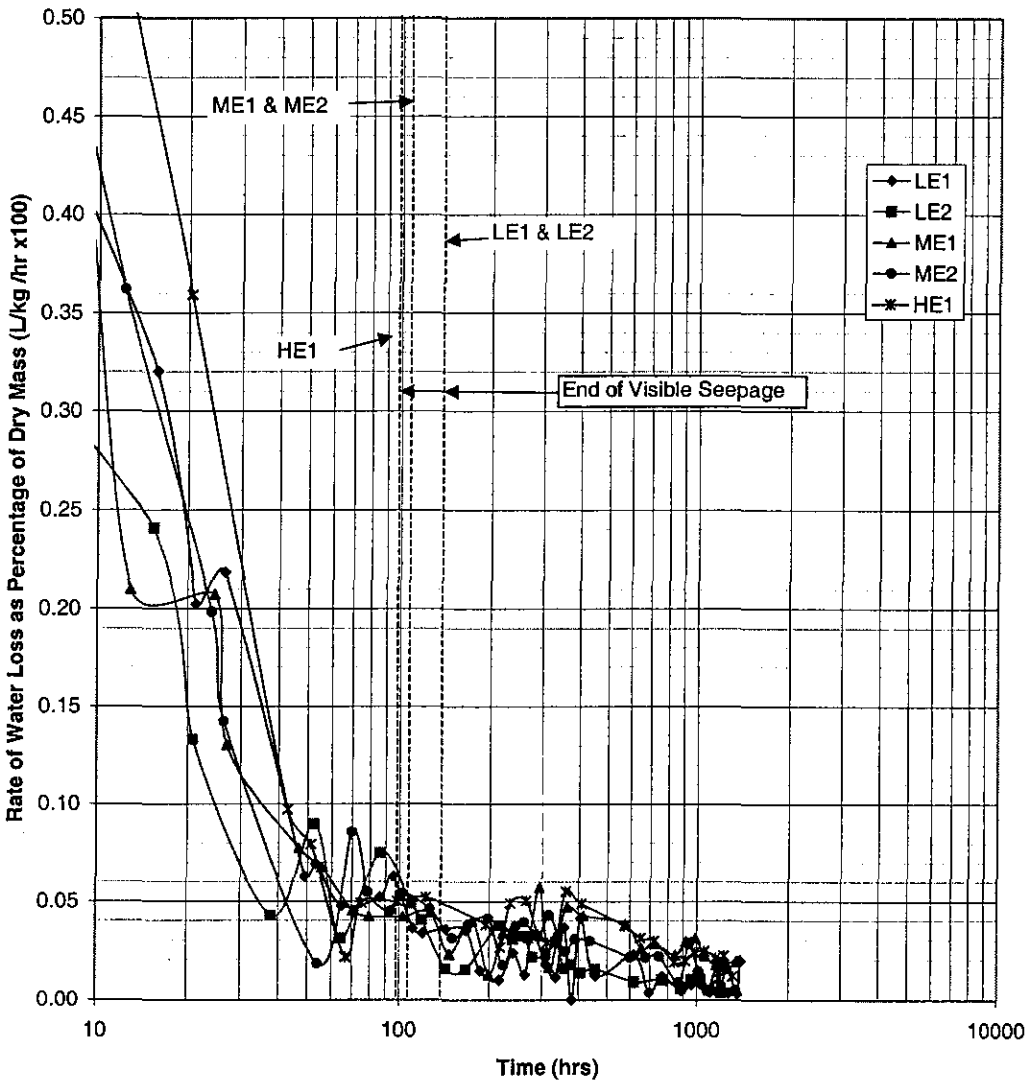
Note: No lights on ME2 for air drying

File Name:	Arb computer\arb drive\ Data_ARB\2111563\Geobags\ Hanging Bag (Exc) & Rate WL Fig.xls
Checked By:	
Date:	28/3/07

GHD-LONGMAC
36 Oxley Street, Crows Nest, N.S.W. 2065
Telephone: (02) 9439 4033 Fax: (02) 9436 0606
GEOTECHNICAL TESTING SERVICES

Client:	Newcastle Port Corporation	Job No. :	21/11563/06
Project:	SADM - EIS		
Location:	Newcastle		
METHOD:	**LM Method**	**Client Sample ID:**	**Sediment**

GEOBAGS - EXCAVATED MATERIAL
RATE OF WATER LOSS WITH TIME (A)



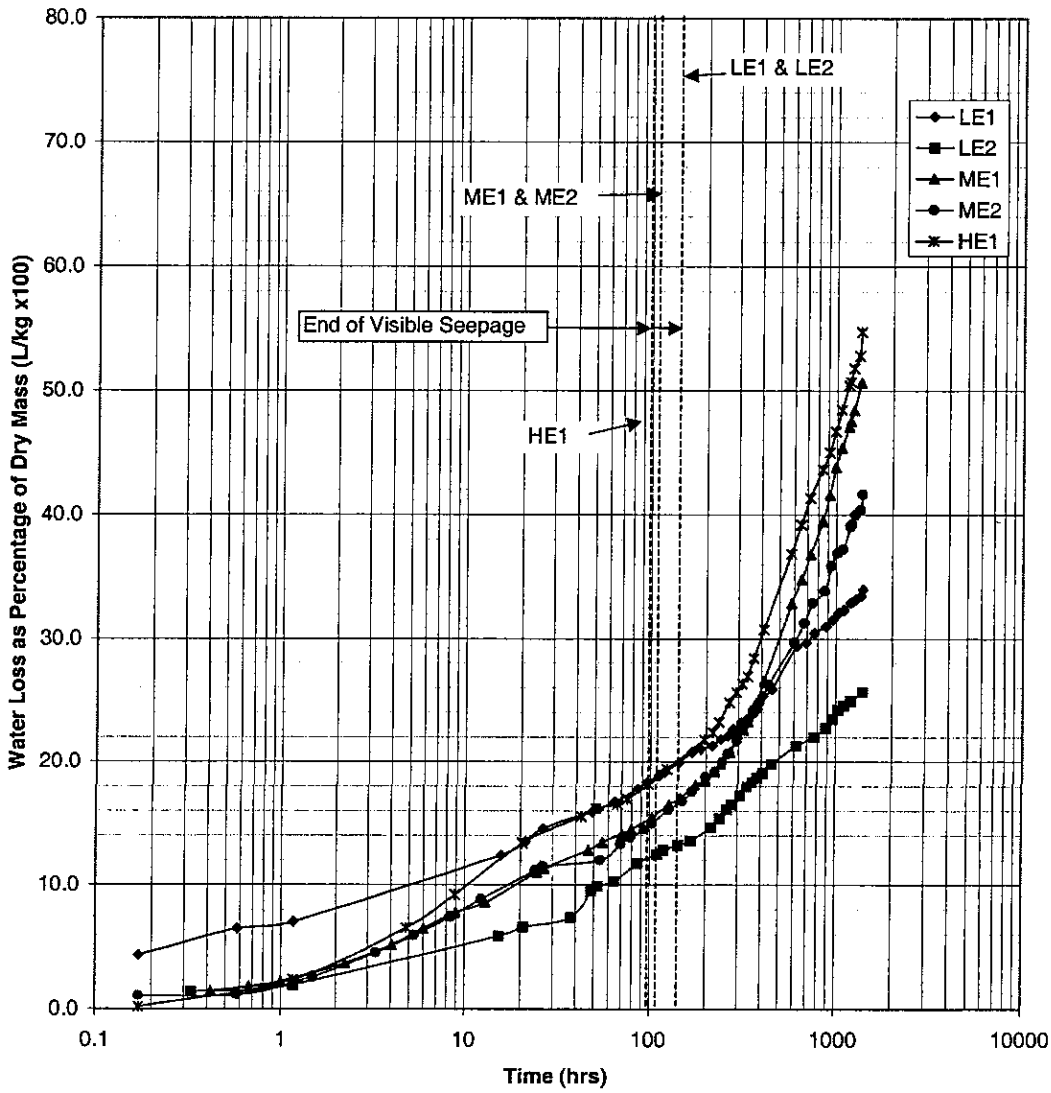
Note: No lights on ME2 for air drying

File Name:	Arb computer\arb drive\ Data_ARB\2111563\Geobags\ Hanging Bag (Exc) & Rate WL (A) Fig.xls
Checked By:	
Date:	28/4/03

GHD-LONGMAC
36 Oxley Street, Crows Nest, N.S.W. 2065
Telephone: (02) 9439 4033 Fax: (02) 9436 0606
GEOTECHNICAL TESTING SERVICES

Client:	Newcastle Port Corporation	Job No. :	21/11563/06
Project:	SADM - EIS		
Location:	Newcastle		
METHOD:	**LM Method**	**Client Sample ID:**	**Sediment**

GEOBAGS - EXCAVATED MATERIAL
CUMULATIVE WATER LOSS WITH TIME



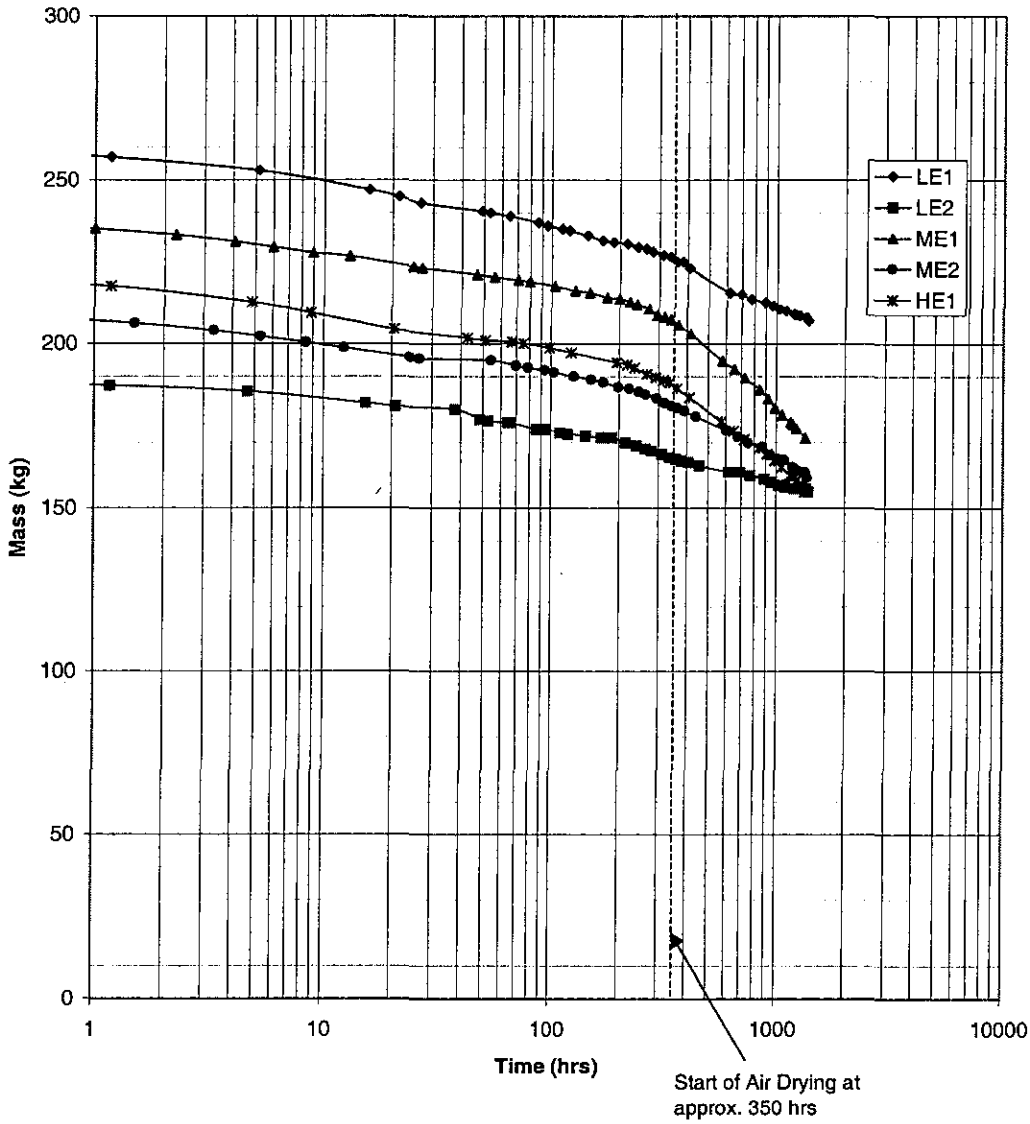
Note: No lights on ME2 for air drying

File Name:	Arb computer\arb drive\ Data_ARB\2111563\Geobags\ Hanging Bag (Exc) & Cum WL Fig.xls
Checked By:	
Date:	28/4/03

GHD-LONGMAC
36 Oxley Street, Crows Nest, N.S.W. 2065
Telephone: (02) 9439 4033 Fax: (02) 9436 0606
GEOTECHNICAL TESTING SERVICES

Client:	Newcastle Port Corporation	Job No. :	21/11563/06
Project:	SADM - EIS		
Location:	Newcastle		
METHOD:	**LM Method**	**Client Sample ID:**	**Sediment**

GEOBAGS - EXCAVATED MATERIAL
CHANGE IN MASS WITH TIME



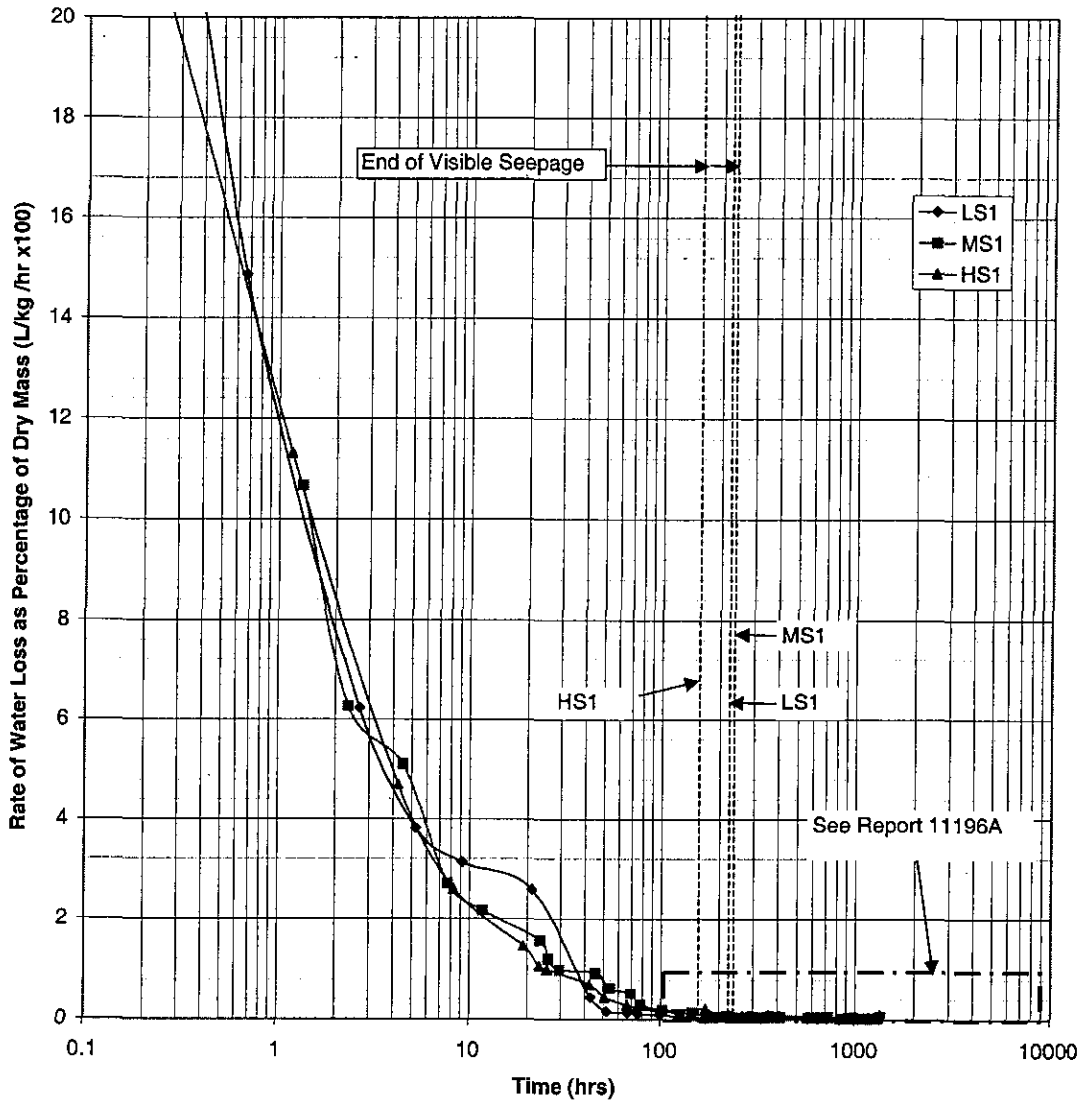
Note: No lights on ME2 for air drying

File Name:	Arb computer\arb drive\ Data_ARB\2111563\Geobags\ Hanging Bag (Exc) & Fig.xls
Checked By:	
Date:	24/4/03

GHD-LONGMAC
36 Oxley Street, Crows Nest, N.S.W. 2065
Telephone: (02) 9439 4033 Fax: (02) 9436 0606
GEOTECHNICAL TESTING SERVICES

Client:	Newcastle Port Corporation	Job No. :	21/11563/06
Project:	SADM - EIS		
Location:	Newcastle		
METHOD:	**LM Method**	**Client Sample ID:**	**Sediment**

GEOBAGS - SLURRY MATERIAL
RATE OF WATER LOSS WITH TIME



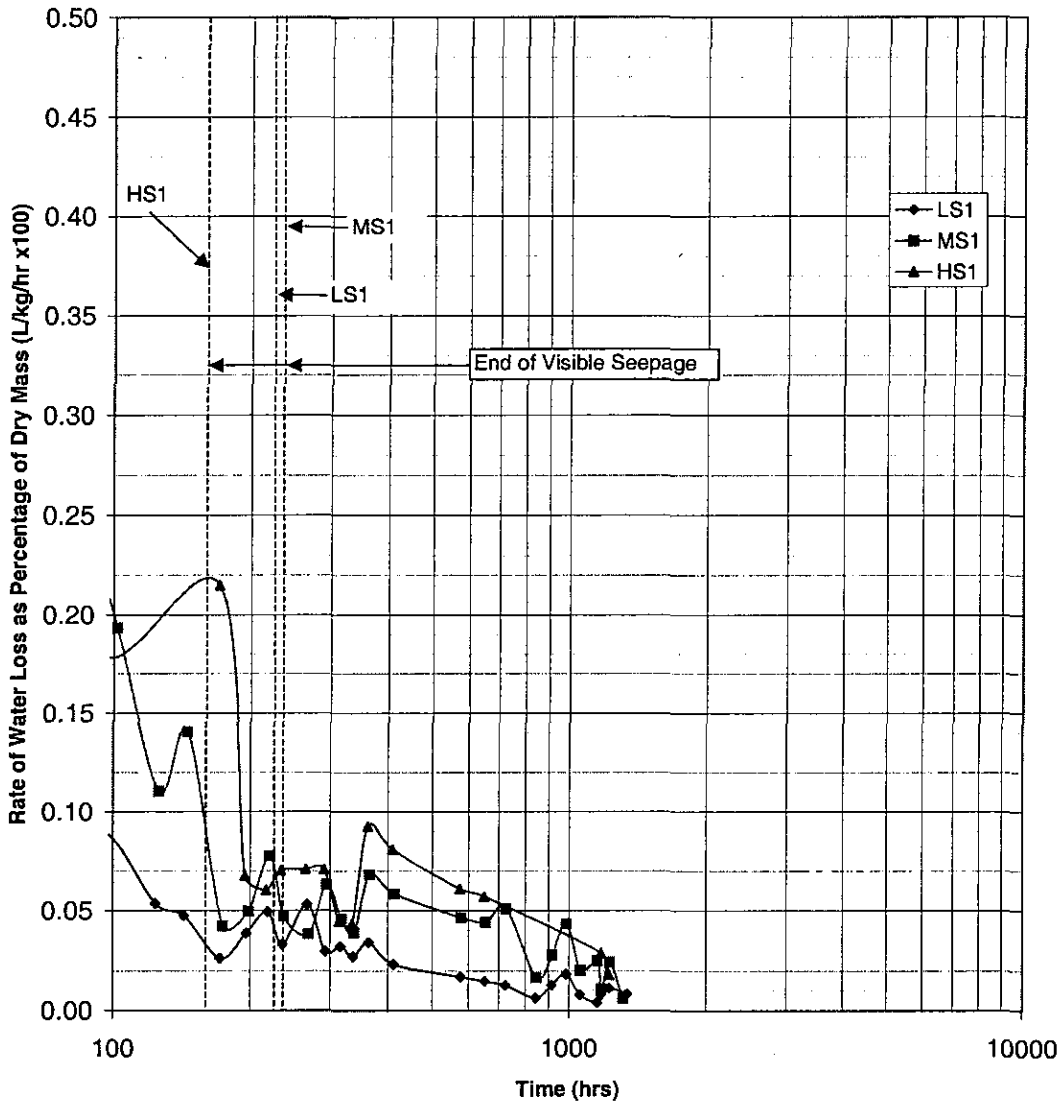
Note: No lights on LS1 for air drying

File Name:	Arb computer\arb drive\ Data_ARB\2111563\Geobags\ Hanging Bag (Slurry) & Rate WL Fig.xls
Checked By:	
Date:	28/4/08

GHD-LONGMAC
36 Oxley Street, Crows Nest, N.S.W. 2065
Telephone: (02) 9439 4033 Fax: (02) 9436 0606
GEOTECHNICAL TESTING SERVICES

Client:	Newcastle Port Corporation	Job No. :	21/11563/06
Project:	SADM - EIS		
Location:	Newcastle		
METHOD:	**LM Method**	**Client Sample ID:**	**Sediment**

GEOBAGS - SLURRY MATERIAL
RATE OF WATER LOSS WITH TIME (A)



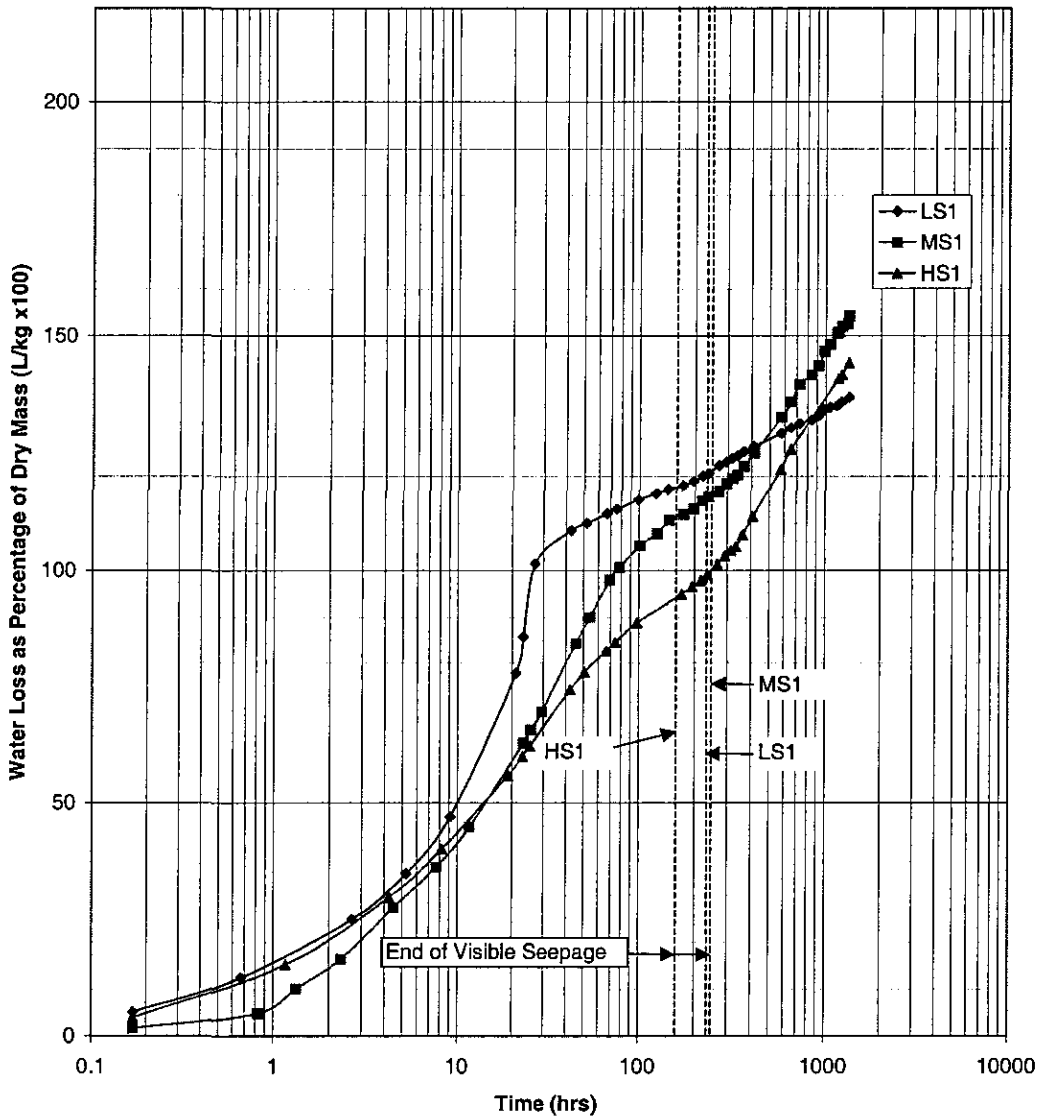
Note: No lights on LS1 for air drying

File Name:	Arb computer\arb drive\ Data_ARB\2111563\Geobags\ Hanging Bag (Slurry) & Rate WL (A) Fig.xls
Checked By:	
Date:	28/4/03

GHD-LONGMAC
36 Oxley Street, Crows Nest, N.S.W. 2065
Telephone: (02) 9439 4033 Fax: (02) 9436 0606
GEOTECHNICAL TESTING SERVICES

Client:	Newcastle Port Corporation	Job No. :	21/11563/06
Project:	SADM - EIS		
Location:	Newcastle		
METHOD:	**LM Method**	**Client Sample ID:**	**Sedimentt**

GEOBAGS - SLURRY MATERIAL
CUMULATIVE WATER LOSS WITH TIME



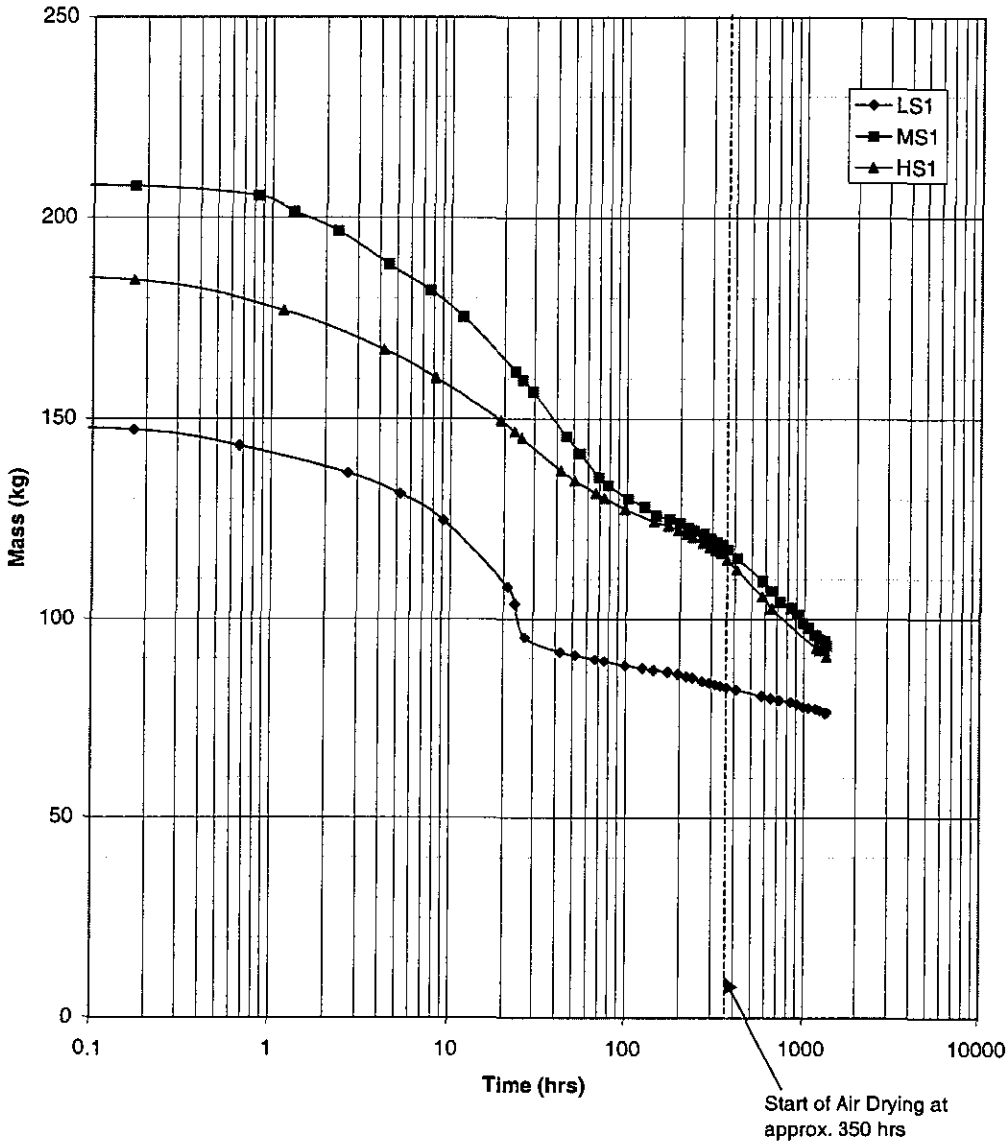
Note: No lights on LS1 for air drying

File Name:	Arb computer\arb drive\ Data_ARB\2111563\Geobags\ Hanging Bag (Slurry) & Cum WL Fig.xls
Checked By:	
Date:	29/4/03

GHD-LONGMAC
36 Oxley Street, Crows Nest, N.S.W. 2065
Telephone: (02) 9439 4033 Fax: (02) 9436 0606
GEOTECHNICAL TESTING SERVICES

Client:	Newcastle Port Corporation	Job No. :	21/11563/06
Project:	SADM - EIS		
Location:	Newcastle		
METHOD:	**LM Method**	**Client Sample ID:**	**Sediment**

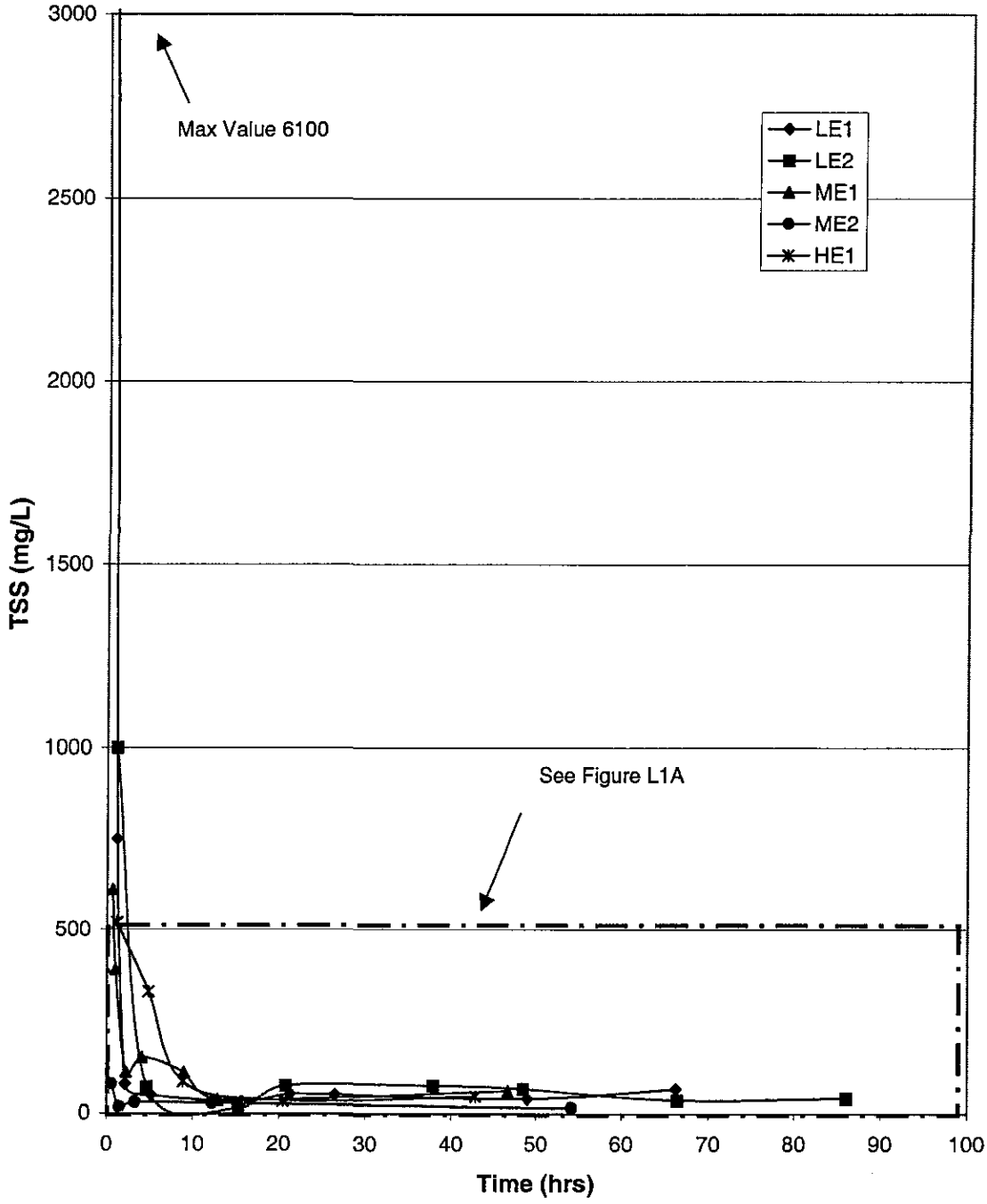
GEOBAGS - SLURRY MATERIAL
CHANGE IN MASS WITH TIME



Note: No lights on LS1 for air drying

File Name:	Arb computer\arb drive\ Data_ARB\2111563\Geobags\ Hanging Bag (Slurry) & Fig.xls
Checked By:	
Date:	28/4/05

GHD-LONGMAC
36 Oxley Street, Crows Nest, N.S.W. 2065
Telephone: (02) 9439 4033 Fax: (02) 9436 0606
GEOTECHNICAL TESTING SERVICES



Note: No lights on ME2 for air drying

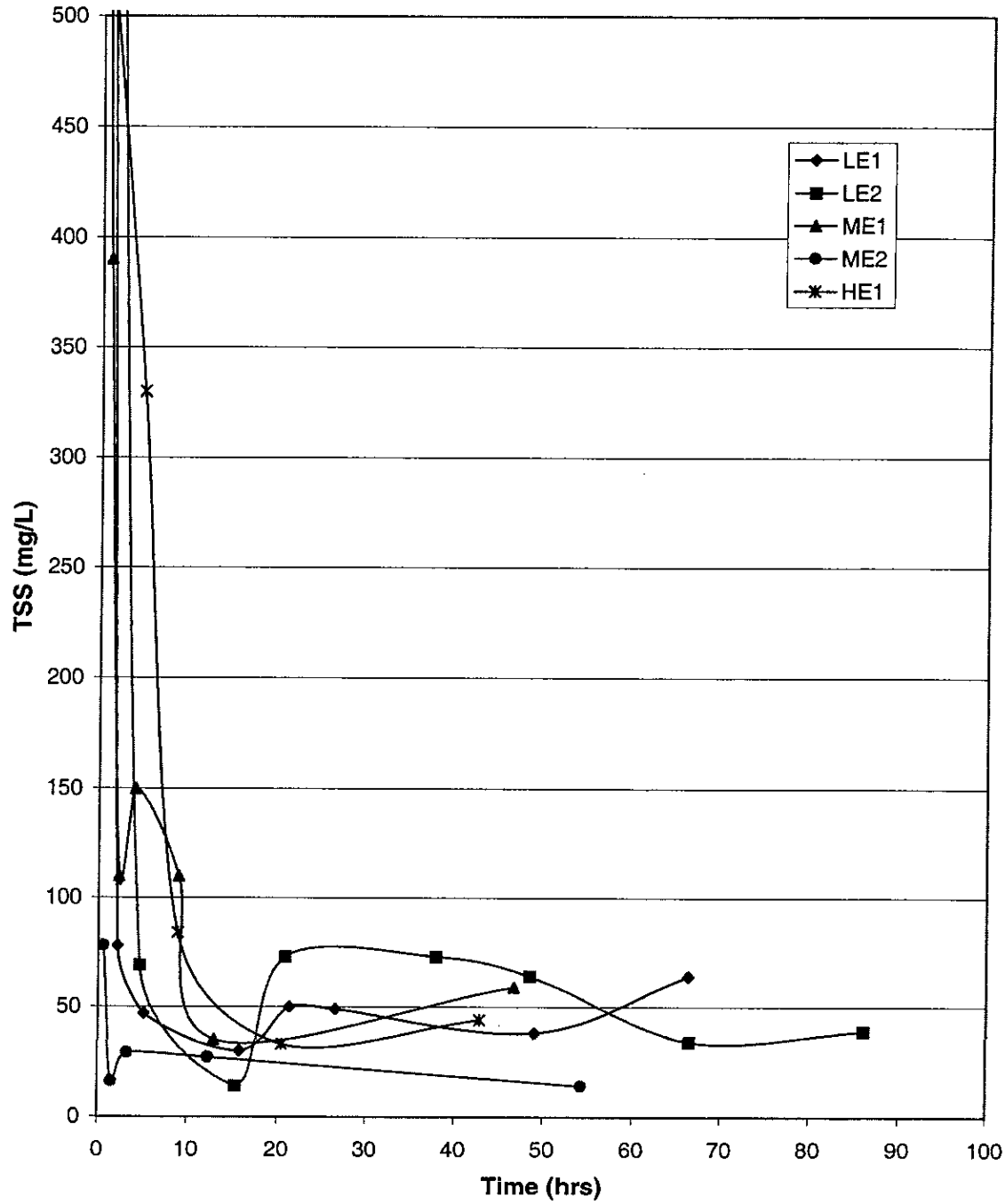
GHD-LONGMAC
36 Oxley Street,
Crows Nest, N.S.W. 2065
Tel: (02) 9439 4033
Fax: (02) 9436 0606

SADM EIS

CHANGE IN TSS WITH TIME
EXCAVATED MATERIAL

Designed	ARB
Drawn:	FdF
Checked	Date:
File name:	Exc - TSS A Fig.xls
Figure No:	L1
Job No:	21/11563
Scale:	—

FORM F.TP4.3.1

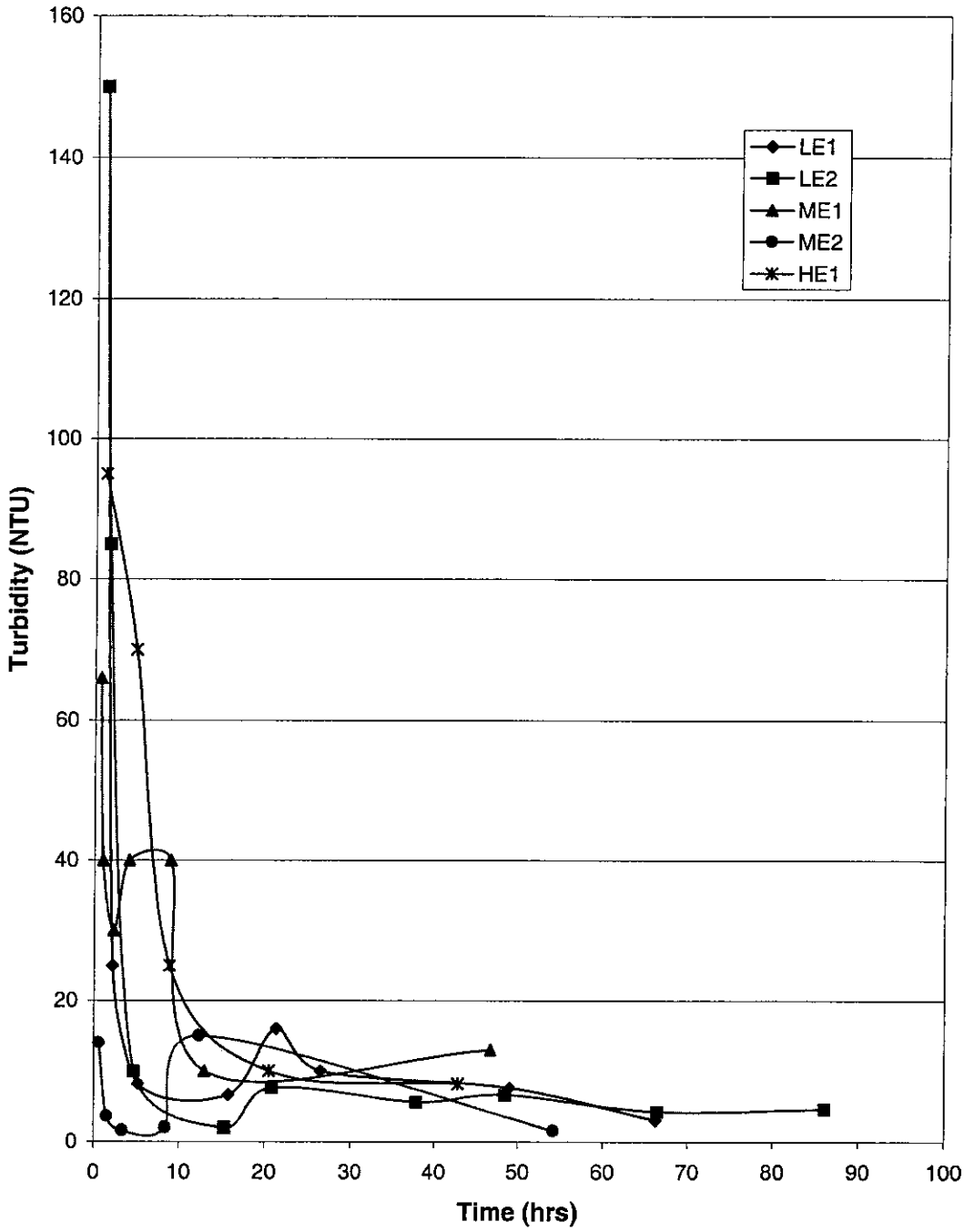


Note: No lights on ME2 for air drying

GHD-LONGMAC
36 Oxley Street,
Crows Nest, N.S.W. 2065
Tel: (02) 9439 4033
Fax: (02) 9436 0606

SADM EIS
CHANGE IN TSS WITH TIME
EXCAVATED MATERIAL

Designed	ARB
Drawn:	FdF
Checked	Date:
File name:	Exc - TSS B Fig.xls
Figure No:	L1A
Job No:	21/11563
Scale:	—



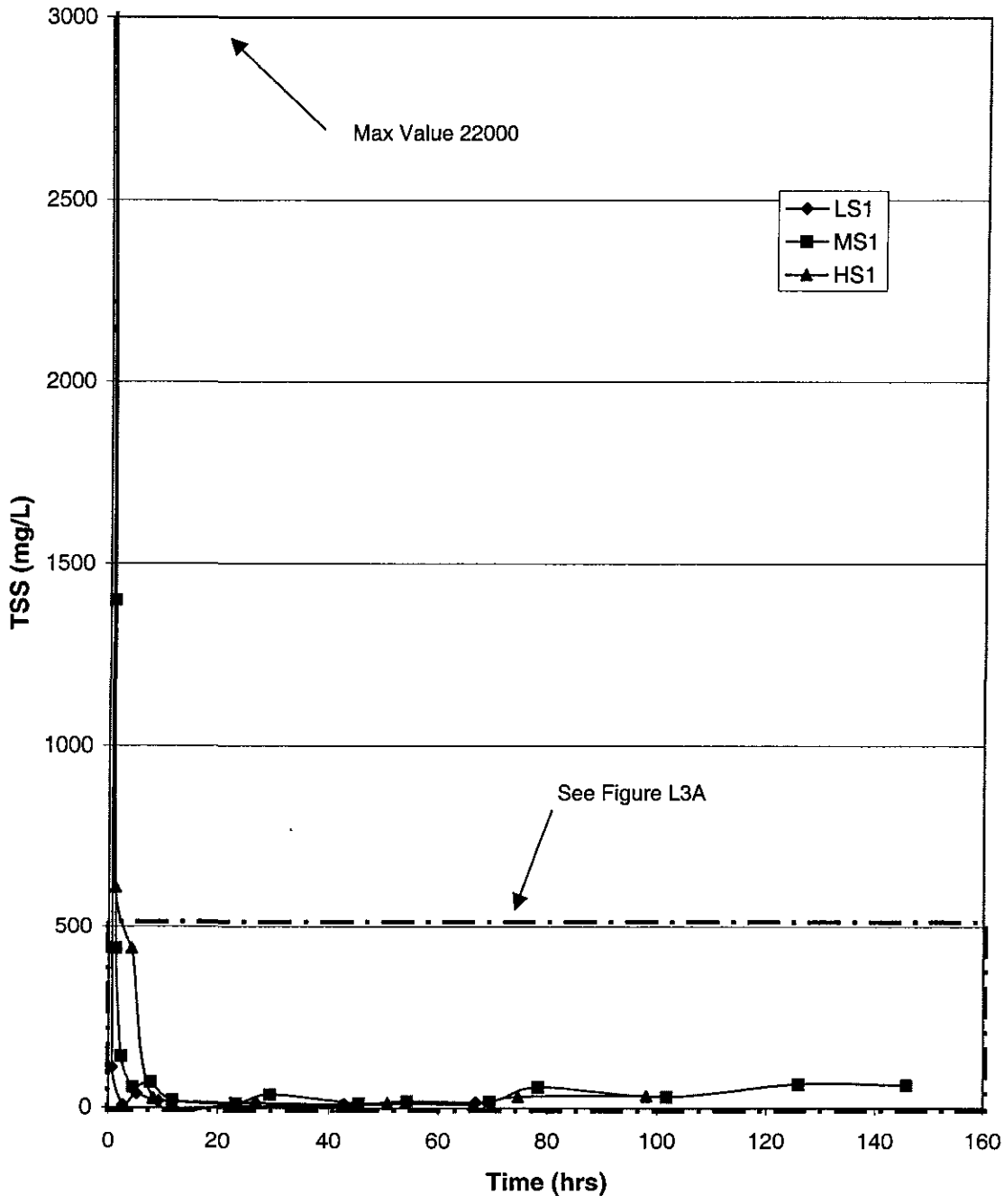
Note: No lights on ME2 for air drying

GHD-LONGMAC
36 Oxley Street,
Crows Nest, N.S.W. 2065
Tel: (02) 9439 4033
Fax: (02) 9436 0606

SADM EIS
CHANGE IN TURBIDITY WITH TIME
EXCAVATED MATERIAL

Designed	ARB
Drawn:	FdF
Checked	Date
File name:	Exc - turb Fig.xls
Figure No:	L2
Job No:	21/11563
Scale:	—

FORM F.TP4.3.1

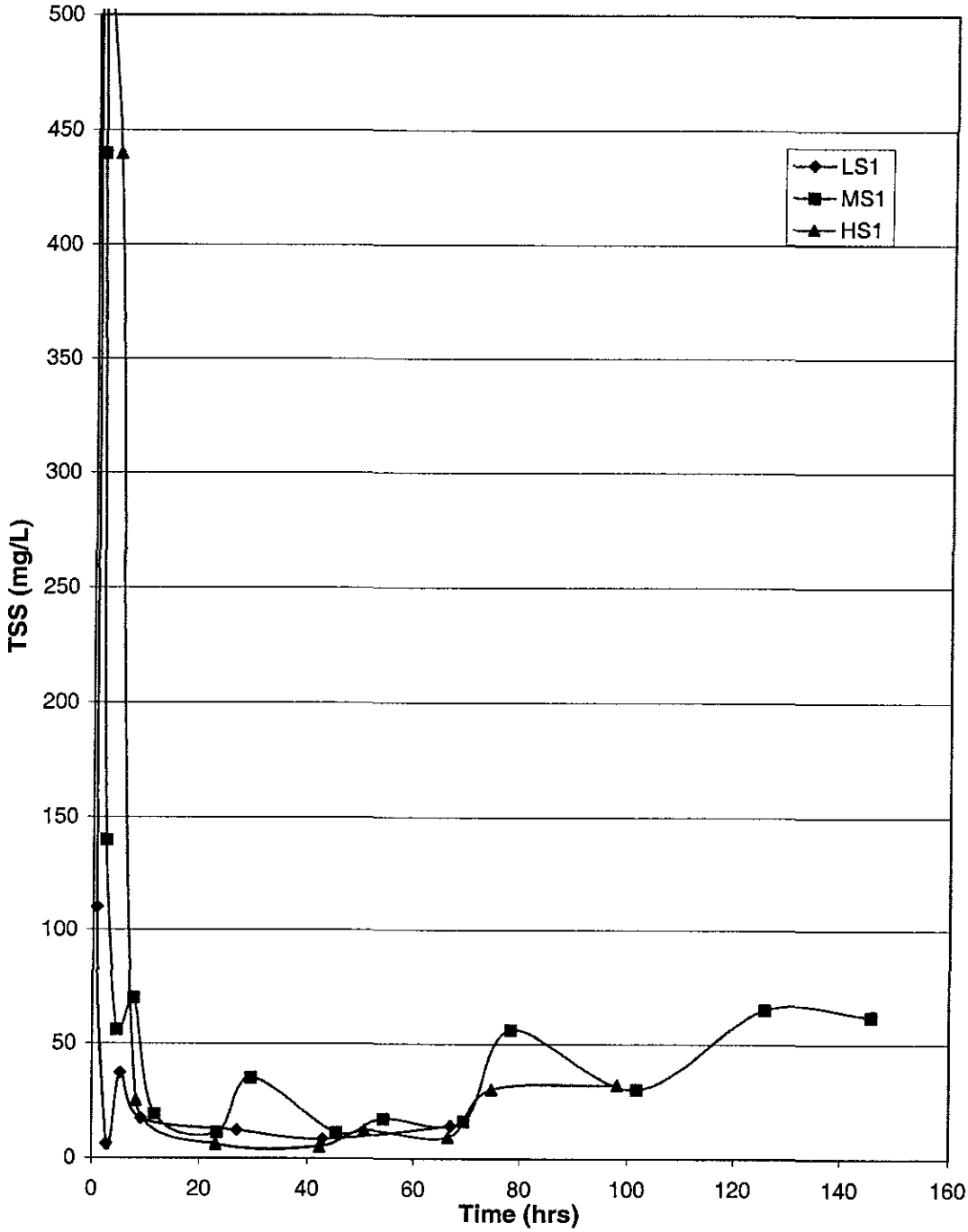


Note: No lights on LS1 for air drying

GHD-LONGMAC
36 Oxley Street,
Crows Nest, N.S.W. 2065
Tel: (02) 9439 4033
Fax: (02) 9436 0606

SADM EIS
CHANGE IN TSS WITH TIME
SLURRY MATERIAL

Designed	ARB
Drawn:	RdF
Checked	Date:
File name:	Slurry - TSS A Fig.xls
Figure No:	L3
Job No:	21/11563
Scale:	—

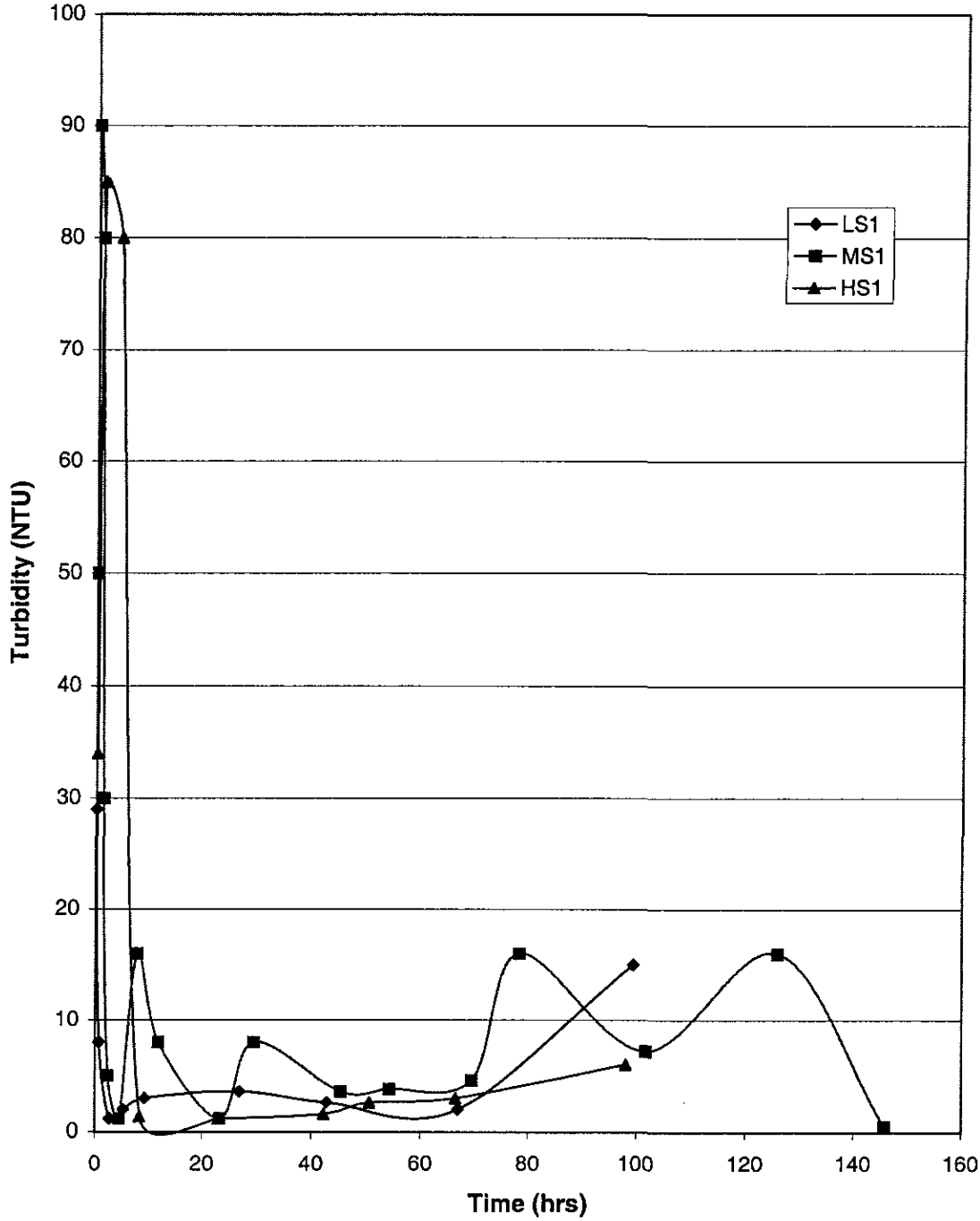


Note: No lights on LS1 for air drying

GHD-LONGMAC
36 Oxley Street,
Crows Nest, N.S.W. 2065
Tel: (02) 9439 4033
Fax: (02) 9436 0606

SADM EIS
CHANGE IN TSS WITH TIME
SLURRY MATERIAL

Designed	ARB
Drawn:	FdF
Checked	Date:
File name:	Slurry - TSS B Fig.xls
Figure No:	L3A
Job No:	21/11563
Scale:	—



Note: No lights on LS1 for air drying

GHD-LONGMAC
36 Oxley Street,
Crows Nest, N.S.W. 2065
Tel: (02) 9439 4033
Fax: (02) 9436 0606

SADM EIS

CHANGE IN TURBIDITY WITH TIME
SLURRY MATERIAL

Designed	ARB
Drawn:	FdE
Checked	Date:
File name:	Slurry - turb Fig.xls
Figure No:	L4
Job No:	21/11563
Scale:	

Appendix A3

Moisture Contents and Densities

Report No's	11104	11168	11169	11170	11171	11172
	11173	11176	11177	11178	11179	11182
	11183	11184	11225	11226		

Soil Index Properties - Report

Report No. 11104

Client: Newcastle Ports Corporation

Job Number: 2111563/00

Project: South Arm Dredging Master Plan

Location: South Arm Hunter River, Newcastle

TEST METHODS :					
	Moisture Content	-	☒ AS1289.2.1.1	☐	RTA T120
	Liquid Limit (Four Point)	-	☐ AS1289.3.1.1	☐	RTA T102
	Liquid Limit (One Point)	-	☐ AS1289.3.1.2	☐	RTA T108
	Plastic Limit	-	☐ AS1289.3.2.1	☐	RTA T109
	Plasticity Index	-	☐ AS1289.3.3.1	☐	RTA T103
	Linear Shrinkage	-	☐ AS1289.3.4.1	☐	RTA T113

Sample History : Sampled by GHD-LONGMAC (Geotechnical)

LongMac Sample No.	Client Sample ID	Test Hole	Depth (m)	Description	NWD (t/m³)	FMC (%)	LL (%)	PL (%)	PI (%)	LS (%)
3188/16	Before Drying	n/a	n/a	C- M- Low	1.737	26.7	-	-	-	-
3188/17	Before Drying	n/a	n/a	Co M- Med	1.471	66.9	-	-	-	-
3188/18	Before Drying	n/a	n/a	C+ M- High	1.465	90.3	-	-	-	-
3188/19	Before Drying	n/a	n/a	C+ Mo High	1.549	85.4	-	-	-	-
3188/20	Before Drying	n/a	n/a	Co Mo Medium	1.500	64.8	-	-	-	
3188/21	Before Drying	n/a	n/a	C- Mo Low	1.746	28.7	-	-	-	-

Abbreviations :

LL	Liquid Limit
PL	Plastic Limit
PI	Plasticity Index
LS	Linear Shrinkage
FMC	Field Moisture Content
n/a	not applicable
nt	not tested
n/av	not available

Note :

Sample History ☐ Natural — Liquid Limit ☐ Air Dried ☐ Oven Dried

Preparation Method ☐ Wet — Liquid Limit ☐ Dry

Type of Test ☐ Four Point — Liquid Limit ☐ One Point

Type of Test ☐ 125mm — Linear Shrinkage - Mould Size ☐ 150mm ☐ 250mm

Tested by:	GZ
Date tested:	23/01/03
Checked by:	
Authorised Signatory :	D. Brooke
Date:	28/2/03

GHD - LONGMAC
36 Oxley Street, Crows Nest NSW 2065
Tel: (02) 9439 4033 Fax: (02) 9436 0606
GEOTECHNICAL TESTING SERVICES

This laboratory is accredited by the National Association of Testing Authorities, Australia. The tests reported herein have been performed in accordance with its terms of accreditation.
NATA Accredited Laboratory Number : 679

This laboratory certificate may not be reproduced except in full unless permission for the publication of an approved extract has been obtained from GHD - LongMac.

Soil Index Properties - Report

Report No. 11168

Client: Newcastle Port Corporation

Project: South Arm Dredging Masterplan

Location: Newcastle

Job Number: 2111563/07

TEST METHODS :					
	Moisture Content	-	☒ AS1289.2.1.1	☐	RTA T120
	Liquid Limit (Four Point)	-	☐ AS1289.3.1.1	☐	RTA T102
	Liquid Limit (One Point)	-	☐ AS1289.3.1.2	☐	RTA T108
	Plastic Limit	-	☐ AS1289.3.2.1	☐	RTA T109
	Plasticity Index	-	☐ AS1289.3.3.1	☐	RTA T103
	Linear Shrinkage	-	☐ AS1289.3.4.1	☐	RTA T113

Sample History : Sampled by GHD-LONGMAC (Geotechnical)

LongMac Sample No.	Client Sample ID	Test Hole	Depth (m)	Description	NDD (t/m³)	FMC (%)	LL (%)	PL (%)	PI (%)	LS (%)
3215/37	MSB	-	-	Sampled 11/03/03	-	52.0	-	-	-	-
3215/38	MEB	-	-	Sampled 11/03/03	-	46.3	-	-	-	-
3215/39	MENB	-	-	Sampled 11/03/03	-	55.1	-	-	-	-
3215/40	HSNB	-	-	Sampled 11/03/03	-	87.1	-	-	-	-
3215/41	MSNB	-	-	Sampled 11/03/03	-	71.5	-	-	-	-
3215/42	HENB	-	-	Sampled 11/03/03	-	69.4	-	-	-	-
3215/43	HSB	-	-	Sampled 11/03/03	-	67.5	-	-	-	-
3215/44	DOLO	-	-	Sampled 11/03/03	-	48.4	-	-	-	-

Abbreviations :

LL	Liquid Limit
PL	Plastic Limit
PI	Plasticity Index
LS	Linear Shrinkage
FMC	Field Moisture Content
n/a	not applicable
nt	not tested
n/av	not available

Note :

Sample History ☐ Natural — Liquid Limit ☐ Air Dried ☐ Oven Dried

Preparation Method ☐ Wet — Liquid Limit ☐ Dry

Type of Test ☐ *Four Point* — Liquid Limit ☐ *One Point*

Type of Test ☐ 125mm — Linear Shrinkage - Mould Size ☐ 150mm ☐ 250mm

Tested by:	DB
Date tested:	14/03/03
Checked by:	
Authorised Signatory :	D BROOKE
Date:	20/3/03

GHD - LONGMAC
36 Oxley Street, Crows Nest NSW 2065
Tel: (02) 9439 4033 Fax: (02) 9436 0606
GEOTECHNICAL TESTING SERVICES

This laboratory is accredited by the National Association of Testing Authorities,Australia.The tests reported herein have been performed in accordance with its terms of accreditation.
NATA Accredited Laboratory Number : 679

This laboratory certificate may not be reproduced except in full unless permission for the publication of an approved extract has been obtained from GHD - LongMac.

Soil Index Properties - Report

Report No. 11169

Client: Newcastle Port Corporation

Job Number: 2111563/07

Project: South Arm Dredging Masterplan

Location: Newcastle

TEST METHODS :					
	Moisture Content	-	☒ AS1289.2.1.1	☐	RTA T120
	Liquid Limit (Four Point)	-	☐ AS1289.3.1.1	☐	RTA T102
	Liquid Limit (One Point)	-	☐ AS1289.3.1.2	☐	RTA T108
	Plastic Limit	-	☐ AS1289.3.2.1	☐	RTA T109
	Plasticity Index	-	☐ AS1289.3.3.1	☐	RTA T103
	Linear Shrinkage	-	☐ AS1289.3.4.1	☐	RTA T113

Sample History : Sampled by GHD-LONGMAC (Geotechnical)

LongMac Sample No.	Client Sample ID	Test Hole	Depth (m)	Description	NDD (t/m³)	FMC (%)	LL (%)	PL (%)	PI (%)	LS (%)
3215/45	HEB	-	-	Sampled 11/03/03	-	59.3	-	-	-	-
3215/48	MENB	-	-	Sampled 17/03/03	-	87.2	-	-	-	-
3215/49	HENB	-	-	Sampled 17/03/03	-	67.5	-	-	-	-
3215/50	MEB	-	-	Sampled 17/03/03	-	43.5	-	-	-	-
3215/51	HSD DOLO	-	-	Sampled 17/03/03	-	43.7	-	-	-	-
3215/52	HSNB	-	-	Sampled 17/03/03	-	80.6	-	-	-	-
3215/53	HSB	-	-	Sampled 17/03/03	-	72.9	-	-	-	-
3215/54	MSNB	-	-	Sampled 17/03/03	-	73.6	-	-	-	-

Abbreviations :

LL	Liquid Limit
PL	Plastic Limit
PI	Plasticity Index
LS	Linear Shrinkage
FMC	Field Moisture Content
n/a	not applicable
nt	not tested
n/av	not available

Note :

Sample History ☐ Natural — Liquid Limit ☐ Air Dried ☐ Oven Dried

Preparation Method ☐ Wet — Liquid Limit ☐ Dry

Type of Test ☐ Four Point — Liquid Limit ☐ One Point

Type of Test ☐ 125mm — Linear Shrinkage - Mould Size ☐ 150mm ☐ 250mm

Tested by:	DB
Date tested:	20/3/03
Checked by:	
Authorised Signatory :	
Date:	26/3/03

GHD - LONGMAC
36 Oxley Street, Crows Nest NSW 2065
Tel: (02) 9439 4033 Fax: (02) 9436 0606
GEOTECHNICAL TESTING SERVICES

This laboratory is accredited by the National Association of Testing Authorities,Australia.The tests reported herein have been performed in accordance with its terms of accreditation.
NATA Accredited Laboratory Number : 679

This laboratory certificate may not be reproduced except in full unless permission for the publication of an approved extract has been obtained from GHD - LongMac.

Soil Index Properties - Report

Report No. 11170

Client: Newcastle Port Corporation

Job Number: 2111563/07

Project: South Arm Dredging Masterplan

Location: Newcastle

TEST METHODS :						
	Moisture Content	-	☒	AS1289.2.1.1	☐	RTA T120
	Liquid Limit (Four Point)	-	☐	AS1289.3.1.1	☐	RTA T102
	Liquid Limit (One Point)	-	☐	AS1289.3.1.2	☐	RTA T108
	Plastic Limit	-	☐	AS1289.3.2.1	☐	RTA T109
	Plasticity Index	-	☐	AS1289.3.3.1	☐	RTA T103
	Linear Shrinkage	-	☐	AS1289.3.4.1	☐	RTA T113

Sample History : Sampled by GHD-LONGMAC (Geotechnical)

LongMac Sample No.	Client Sample ID	Test Hole	Depth (m)	Description	NDD (t/m³)	FMC (%)	LL (%)	PL (%)	PI (%)	LS (%)
3215/55	MSB	-	-	Sampled 17/03/03	-	53.2	-	-	-	-
3215/56	HEB	-	-	Sampled 17/03/03	-	55.9	-	-	-	-
3215/57	LS 1 Top	-	-	Sampled 17/03/03	-	5.6	-	-	-	-
3215/58	LS 1 Base	-	-	Sampled 17/03/03	-	5.8	-	-	-	-
3215/59	LE 2 Base	-	-	Sampled 17/03/03	-	9.3	-	-	-	-

Abbreviations :

LL	Liquid Limit
PL	Plastic Limit
PI	Plasticity Index
LS	Linear Shrinkage
FMC	Field Moisture Content
n/a	not applicable
nt	not tested
n/av	not available

Note :

Sample History ☐ Natural — Liquid Limit ☐ Air Dried ☐ Oven Dried

Preparation Method ☐ Wet — Liquid Limit ☐ Dry

Type of Test ☐ Four Point — Liquid Limit ☐ One Point

Type of Test ☐ 125mm — Linear Shrinkage - Mould Size ☐ 150mm ☐ 250mm

Tested by:	DB
Date tested:	20/3/03
Checked by:	
Authorised Signatory :	
Date:	26/3/03

GHD - LONGMAC
36 Oxley Street, Crows Nest NSW 2065
Tel: (02) 9439 4033 Fax: (02) 9436 0606
GEOTECHNICAL TESTING SERVICES

This laboratory is accredited by the National Association of Testing Authorities,Australia.The tests reported herein have been performed in accordance with its terms of accreditation.
NATA Accredited Laboratory Number : 679

This laboratory certificate may not be reproduced except in full unless permission for the publication of an approved extract has been obtained from GHD - LongMac.

Soil Index Properties - Report

Report No. 11171

Client: Newcastle Port Corporation

Job Number: 2111563/07

Project: South Arm Dredging Masterplan

Location: Newcastle

TEST METHODS :					
	Moisture Content	-	☒ AS1289.2.1.1	☐ RTA T120
	Liquid Limit (Four Point)	-	☐ AS1289.3.1.1	☐ RTA T102
	Liquid Limit (One Point)	-	☐ AS1289.3.1.2	☐ RTA T108
	Plastic Limit	-	☐ AS1289.3.2.1	☐ RTA T109
	Plasticity Index	-	☐ AS1289.3.3.1	☐ RTA T103
	Linear Shrinkage	-	☐ AS1289.3.4.1	☐ RTA T113

Sample History : Sampled by GHD-LONGMAC (Geotechnical)

LongMac Sample No.	Client Sample ID	Test Hole	Depth (m)	Description	BD (t/m³)	FMC (%)	DD (t/m³)	PL (%)	PI (%)	LS (%)
3215/76	ME1 Top	-	-	sampled 17/03/03	1.592	23.1	1.293	-	-	-
3215/74	*ME1 middle*	-	-	*sampled 17/03/03*	*1.639*	*29.1*	*1.270*	-	-	-
3215/60	ME1 Base	-	-	sampled 17/03/03	1.667	26.4	1.318	-	-	-
		-	-							
3215/62	HE1 Top	-	-	sampled 17/03/03	1.694	35.9	1.247	-	-	-
3215/65	HE1 Middle	-	-	sampled 17/03/03	1.711	35.1	1.266	-	-	-
3215/63	HE1 Base	-	-	sampled 17/03/03	1.713	33.6	1.282	-	-	-

Abbreviations :

LL	Liquid Limit
PL	Plastic Limit
PI	Plasticity Index
LS	Linear Shrinkage
FMC	Field Moisture Content
n/a	not applicable
nt	not tested
n/av	not available

Note :

BD - Bulk Density

DD - Dry Density

Sample History ☐ Natural — Liquid Limit ☐ Air Dried ☐ Oven Dried

Preparation Method ☐ Wet — Liquid Limit ☐ Dry

Type of Test ☐ Four Point — Liquid Limit ☐ One Point

Type of Test ☐ 125mm — *Linear Shrinkage - Mould Size* ☐ 150mm ☐ 250mm

Tested by:	DB
Date tested:	21/03/03
Checked by:	
Authorised Signatory :	
Date:	26/3/03

GHD - LONGMAC
36 Oxley Street, Crows Nest NSW 2065
Tel: (02) 9439 4033 Fax: (02) 9436 0606
GEOTECHNICAL TESTING SERVICES

This laboratory is accredited by the National Association of Testing Authorities,Australia.The tests reported herein have been performed in accordance with its terms of accreditation.
NATA Accredited Laboratory Number : 679

This laboratory certificate may not be reproduced except in full unless permission for the publication of an approved extract has been obtained from GHD - LongMac.

Soil Index Properties - Report

Report No. 11172

Client: Newcastle Port Corporation

Job Number: 2111563/07

Project: South Arm Dredging Masterplan

Location: Newcastle

TEST METHODS :					
Moisture Content	-	☒	AS1289.2.1.1	☐	RTA T120
Liquid Limit (Four Point)	-	☐	AS1289.3.1.1	☐	RTA T102
Liquid Limit (One Point)	-	☐	AS1289.3.1.2	☐	RTA T108
Plastic Limit	-	☐	AS1289.3.2.1	☐	RTA T109
Plasticity Index	-	☐	AS1289.3.3.1	☐	RTA T103
Linear Shrinkage	-	☐	AS1289.3.4.1	☐	RTA T113

Sample History : Sampled by GHD-LONGMAC (Geotechnical)

LongMac Sample No.	Client Sample ID	Test Hole	Depth (m)	Description	BD (t/m³)	FMC (%)	DD (t/m³)	PL (%)	PI (%)	LS (%)
3215/71	LE1 Top	-	-	Sampled 17/03/03	1.310	5.1	1.247	-	-	-
3215/72	LE1 Base	-	-	Sampled 17/03/03	nt	9.2	nt	-	-	-
3215/66	LE2 Top	-	-	Sampled 17/03/03	1.379	6.6	1.294	-	-	-
3215/64	HS1 Top	-	-	Sampled 17/03/03	1.654	25.9	1.314	-	-	-
3215/67	HS1 Middle	-	-	Sampled 17/03/03	1.660	29.3	1.284	-	-	-
3215/69	HS1 Base	-	-	Sampled 17/03/03	1.650	29.1	1.278	-	-	-

Abbreviations :

LL	Liquid Limit
PL	Plastic Limit
PI	Plasticity Index
LS	Linear Shrinkage
FMC	Field Moisture Content
n/a	not applicable
nt	not tested
n/av	not available

Note :

BD - Bulk Density

DD - Dry Density

Sample History ☐ Natural — Liquid Limit ☐ Air Dried ☐ Oven Dried

Preparation Method ☐ Wet — *Liquid Limit* ☐ Dry

Type of Test ☐ Four Point — Liquid Limit ☐ One Point

Type of Test ☐ 125mm — Linear Shrinkage - Mould Size ☐ 150mm ☐ 250mm

Tested by:	DB
Date tested:	21/03/03
Checked by:	
Authorised Signatory :	
Date:	26/3/03

GHD - LONGMAC
36 Oxley Street, Crows Nest NSW 2065
Tel: (02) 9439 4033 Fax: (02) 9436 0606
GEOTECHNICAL TESTING SERVICES

This laboratory is accredited by the National Association of Testing Authorities,Australia. The tests reported herein have been performed in accordance with its terms of accreditation.
NATA Accredited Laboratory Number : 679

This laboratory certificate may not be reproduced except in full unless permission for the publication of an approved extract has been obtained from GHD - LongMac.

Soil Index Properties - Report

Report No. 11173

Client: Newcastle Port Corporation

Project: South Arm Dredging Masterplan

Location: Newcastle

Job Number: 2111563/07

TEST METHODS :					
	Moisture Content	-	☒ AS1289.2.1.1	☐ RTA T120
	Liquid Limit (Four Point)	-	☐ AS1289.3.1.1	☐ RTA T102
	Liquid Limit (One Point)	-	☐ AS1289.3.1.2	☐ RTA T108
	Plastic Limit	-	☐ AS1289.3.2.1	☐ RTA T109
	Plasticity Index	-	☐ AS1289.3.3.1	☐ RTA T103
	Linear Shrinkage	-	☐ AS1289.3.4.1	☐ RTA T113

Sample History : Sampled by GHD-LONGMAC (Geotechnical)

LongMac Sample No.	Client Sample ID	Test Hole	Depth (m)	Description	BD (t/m³)	FMC (%)	DD (t/m³)	PL (%)	PI (%)	LS (%)
3215/77	ME2 Top	-	-	Sampled 17/03/03	1.628	20.3	1.353	-	-	-
3215/73	ME2 Middle	-	-	Sampled 17/03/03	1.673	31.0	1.277	-	-	-
3215/75	ME2 Base	-	-	Sampled 17/03/03	1.680	30.2	1.290	-	-	-
3215/68	MS1 Top	-	-	Sampled 17/03/03	1.509	18.3	1.276	-	-	-
3215/72	MS1 Middle	-	-	Sampled 17/03/03	1.573	27.3	1.236	-	-	-
3215/70	MS1 Base	-	-	Sampled 17/03/03	1.575	24.4	1.266	-	-	-
3215/78	LS1 Top Mudcake	-	-	Sampled 17/03/03	1.738	37.0	1.269	-	-	-

Abbreviations :

LL	Liquid Limit
PL	Plastic Limit
PI	Plasticity Index
LS	Linear Shrinkage
FMC	Field Moisture Content
n/a	not applicable
nt	not tested
n/av	not available

Note :

BD - Bulk Density

DD - Dry Density

Sample History ☐ Natural — Liquid Limit ☐ Air Dried ☐ Oven Dried

Preparation Method ☐ Wet — Liquid Limit ☐ Dry

Type of Test ☐ Four Point — Liquid Limit ☐ One Point

Type of Test ☐ 125mm — Linear Shrinkage - Mould Size ☐ 150mm ☐ 250mm

Tested by:	DB
Date tested:	21/03/03
Checked by:	
Authorised Signatory :	D. BROOKE
Date:	26/3/03

GHD - LONGMAC
36 Oxley Street, Crows Nest NSW 2065
Tel: (02) 9439 4033 Fax: (02) 9436 0606
GEOTECHNICAL TESTING SERVICES

This laboratory is accredited by the National Association of Testing Authorities,Australia.The tests reported herein have been performed in accordance with its terms of accreditation.
NATA Accredited Laboratory Number : 679

This laboratory certificate may not be reproduced except in full unless permission for the publication of an approved extract has been obtained from GHD - LongMac.

Soil Index Properties - Report

Report No. 11176

Client: Newcastle Port Corporation

Job Number: 2111563/06

Project: South Arm Dredging Masterplan

Location: Newcastle

TEST METHODS :						
	Moisture Content	-	☒	AS1289.2.1.1	☐	RTA T120
	Liquid Limit (Four Point)	-	☐	AS1289.3.1.1	☐	RTA T102
	Liquid Limit (One Point)	-	☐	AS1289.3.1.2	☐	RTA T108
	Plastic Limit	-	☐	AS1289.3.2.1	☐	RTA T109
	Plasticity Index	-	☐	AS1289.3.3.1	☐	RTA T103
	Linear Shrinkage	-	☐	AS1289.3.4.1	☐	RTA T113

Sample History : Sampled by GHD-LONGMAC

LongMac Sample No.	Client Sample ID	Test Hole	Depth (m)	Description	NDD (t/m³)	FMC (%)	LL (%)	PL (%)	PI (%)	LS (%)
3215/79	Accelerated Air Drying Test	-	0.110	MENB	-	46.5	-	-	-	-
3215/80	Accelerated Air Drying Test	-	0.210	MENB	-	54.9	-	-	-	-
3215/81	Accelerated Air Drying Test	-	0.310	MENB	-	64.6	-	-	-	-
3215/82	Accelerated Air Drying Test	-	0.420	MENB	-	62.0	-	-	-	-

Abbreviations :

LL	Liquid Limit
PL	Plastic Limit
PI	Plasticity Index
LS	Linear Shrinkage
FMC	Field Moisture Content
n/a	not applicable
nt	not tested
n/av	not available

Note :

Sample History Liquid Limit ☐ Natural ☐ Air Dried ☐ Oven Dried

Preparation Method Liquid Limit ☐ Wet ☐ Dry

Type of Test Liquid Limit ☐ Four Point ☐ One Point

Type of Test Linear Shrinkage - Mould Size ☐ 125mm ☐ 150mm ☐ 250mm

Tested by:	LG
Date tested:	25/02/03
Checked by:	
Authorised Signatory :	D.BROOKE
Date:	26/3/03

GHD - LONGMAC
36 Oxley Street, Crows Nest NSW 2065
Tel: (02) 9439 4033 Fax: (02) 9436 0606
GEOTECHNICAL TESTING SERVICES

This laboratory is accredited by the National Association of Testing Authorities, Australia. The tests reported herein have been performed in accordance with its terms of accreditation.
NATA Accredited Laboratory Number : 679

This laboratory certificate may not be reproduced except in full unless permission for the publication of an approved extract has been obtained from GHD - LongMac.

Soil Index Properties - Report

Report No. 11177

Client: Newcastle Port Corporation

Project: South Arm Dredging Masterplan

Location: Newcastle

Job Number: 2111563/06

TEST METHODS :				
Moisture Content	-	☒ AS1289.2.1.1	☐ RTA T120
Liquid Limit (Four Point)	-	☐ AS1289.3.1.1	☐ RTA T102
Liquid Limit (One Point)	-	☐ AS1289.3.1.2	☐ RTA T108
Plastic Limit	-	☐ AS1289.3.2.1	☐ RTA T109
Plasticity Index	-	☐ AS1289.3.3.1	☐ RTA T103
Linear Shrinkage	-	☐ AS1289.3.4.1	☐ RTA T113

Sample History : Sampled by GHD-LONGMAC

LongMac Sample No.	Client Sample ID	Test Hole	Depth (m)	Description	NDD (t/m³)	FMC (%)	LL (%)	PL (%)	PI (%)	LS (%)
3215/87	Accelerated Air Drying Test	-	0.110	HENB	-	51.5	-	-	-	-
3215/88	Accelerated Air Drying Test	-	0.210	HENB	-	79.0	-	-	-	-
3215/89	Accelerated Air Drying Test	-	0.310	HENB	-	87.9	-	-	-	-
3215/90	Accelerated Air Drying Test	-	0.420	HENB	-	85.6	-	-	-	-

Abbreviations :

LL	Liquid Limit
PL	Plastic Limit
PI	Plasticity Index
LS	Linear Shrinkage
FMC	Field Moisture Content
n/a	not applicable
nt	not tested
n/av	not available

Note :

Sample History ☐ Natural — Liquid Limit ☐ Air Dried ☐ Oven Dried

Preparation Method ☐ Wet — Liquid Limit ☐ Dry

Type of Test ☐ Four Point — Liquid Limit ☐ One Point

Type of Test ☐ 125mm — Linear Shrinkage - Mould Size ☐ 150mm ☐ 250mm

Tested by:	LG
Date tested:	25/02/03
Checked by:	
Authorised Signatory :	D. Brooks
Date:	26/3/03

GHD - LONGMAC
36 Oxley Street, Crows Nest NSW 2065
Tel: (02) 9439 4033 Fax: (02) 9436 0606
GEOTECHNICAL TESTING SERVICES

This laboratory is accredited by the National Association of Testing Authorities,Australia.The tests reported herein have been performed in accordance with its terms of accreditation.
NATA Accredited Laboratory Number : 679

This laboratory certificate may not be reproduced except in full unless permission for the publication of an approved extract has been obtained from GHD - LongMac.

Soil Index Properties - Report

Report No. 11178

Client: Newcastle Port Corporation

Job Number: 2111563/06

Project: South Arm Dredging Masterplan

Location: Newcastle

TEST METHODS :					
	Moisture Content	-	☒ AS1289.2.1.1	☐	RTA T120
	Liquid Limit (Four Point)	-	☐ AS1289.3.1.1	☐	RTA T102
	Liquid Limit (One Point)	-	☐ AS1289.3.1.2	☐	RTA T108
	Plastic Limit	-	☐ AS1289.3.2.1	☐	RTA T109
	Plasticity Index	-	☐ AS1289.3.3.1	☐	RTA T103
	Linear Shrinkage	-	☐ AS1289.3.4.1	☐	RTA T113

Sample History : Sampled by GHD-LONGMAC

LongMac Sample No.	Client Sample ID	Test Hole	Depth (m)	Description	NDD (t/m³)	FMC (%)	LL (%)	PL (%)	PI (%)	LS (%)
3215/91	Accelerated Air Drying Test	-	0.110	MENB	-	33.3	-	-	-	-
3215/92	Accelerated Air Drying Test	-	0.210	MENB	-	44.2	-	-	-	-
3215/93	Accelerated Air Drying Test	-	0.310	MENB	-	48.6	-	-	-	-
3215/94	Accelerated Air Drying Test	-	0.420	MENB	-	56.0	-	-	-	-

Abbreviations :

LL	Liquid Limit
PL	Plastic Limit
PI	Plasticity Index
LS	Linear Shrinkage
FMC	Field Moisture Content
n/a	not applicable
nt	not tested
n/av	not available

Note :

Sample History ☐ Natural — Liquid Limit ☐ Air Dried ☐ Oven Dried

Preparation Method ☐ Wet — Liquid Limit ☐ Dry

Type of Test ☐ Four Point — Liquid Limit ☐ One Point

Type of Test ☐ 125mm — Linear Shrinkage - Mould Size ☐ 150mm ☐ 250mm

Tested by:	DB
Date tested:	14/03/03
Checked by:	
Authorised Signatory :	D Bristowe
Date:	26/3/03

GHD - LONGMAC
36 Oxley Street, Crows Nest NSW 2065
Tel: (02) 9439 4033 Fax: (02) 9436 0606
GEOTECHNICAL TESTING SERVICES

This laboratory is accredited by the National Association of Testing Authorities,Australia.The tests reported herein have been performed in accordance with its terms of accreditation.
NATA Accredited Laboratory Number : 679

This laboratory certificate may not be reproduced except in full unless permission for the publication of an approved extract has been obtained from GHD - LongMac.

Soil Index Properties - Report

Report No. 11179

Client: Newcastle Port Corporation

Job Number: 2111563/06

Project: South Arm Dredging Masterplan

Location: Newcastle

TEST METHODS :					
	Moisture Content	-	☒ AS1289.2.1.1	☐	RTA T120
	Liquid Limit (Four Point)	-	☐ AS1289.3.1.1	☐	RTA T102
	Liquid Limit (One Point)	-	☐ AS1289.3.1.2	☐	RTA T108
	Plastic Limit	-	☐ AS1289.3.2.1	☐	RTA T109
	Plasticity Index	-	☐ AS1289.3.3.1	☐	RTA T103
	Linear Shrinkage	-	☐ AS1289.3.4.1	☐	RTA T113

Sample History : Sampled by GHD-LONGMAC

LongMac Sample No.	Client Sample ID	Test Hole	Depth (m)	Description	NDD (t/m³)	FMC (%)	LL (%)	PL (%)	PI (%)	LS (%)
3215/99	Accelerated Air Drying Test	-	0.110	HENB	-	48.5	-	-	-	-
3215/100	Accelerated Air Drying Test	-	0.210	HENB	-	58.9	-	-	-	-
3215/101	Accelerated Air Drying Test	-	0.310	HENB	-	64.2	-	-	-	-
3215/102	Accelerated Air Drying Test	-	0.420	HENB	-	67.5	-	-	-	-

Abbreviations :

LL	Liquid Limit
PL	Plastic Limit
PI	Plasticity Index
LS	Linear Shrinkage
FMC	*Field Moisture Content*
n/a	not applicable
nt	not tested
n/av	not available

Note :

Sample History ☐ Natural — Liquid Limit ☐ Air Dried ☐ Oven Dried

Preparation Method ☐ Wet — Liquid Limit ☐ Dry

Type of Test ☐ Four Point — Liquid Limit ☐ One Point

Type of Test ☐ 125mm — Linear Shrinkage - Mould Size ☐ 150mm ☐ 250mm

Tested by:	DB
Date tested:	14/03/03
Checked by:	SJ
Authorised Signatory :	D.BROOKS
Date:	26/3/03

GHD - LONGMAC
36 Oxley Street, Crows Nest NSW 2065
Tel: (02) 9439 4033 Fax: (02) 9436 0606
GEOTECHNICAL TESTING SERVICES

This laboratory is accredited by the National Association of Testing Authorities,Australia.The tests reported herein have been performed in accordance with its terms of accreditation.
NATA Accredited Laboratory Number : 679

This laboratory certificate may not be reproduced except in full unless permission for the publication of an approved extract has been obtained from GHD - LongMac.

Soil Index Properties - Report

Report No. 11182

Client: Newcastle Port Corporation

Job Number: 2111563/06

Project: South Arm Dredging Masterplan

Location: Newcastle

TEST METHODS :					
	Moisture Content	-	☒ AS1289.2.1.1	☐	RTA T120
	Liquid Limit (Four Point)	-	☐ AS1289.3.1.1	☐	RTA T102
	Liquid Limit (One Point)	-	☐ AS1289.3.1.2	☐	RTA T108
	Plastic Limit	-	☐ AS1289.3.2.1	☐	RTA T109
	Plasticity Index	-	☐ AS1289.3.3.1	☐	RTA T103
	Linear Shrinkage	-	☐ AS1289.3.4.1	☐	RTA T113

Sample History : Sampled by GHD-LONGMAC

LongMac Sample No.	Client Sample ID	Test Hole	Depth (m)	Description	BD (t/m³)	FMC (%)	DD (%)	PL (%)	PI (%)	LS (%)
3215/103	Accelerated Air Drying Test	-	0.95	MENB disturbed sample top	-	42.5	-	-	-	-
3215/104	Accelerated Air Drying Test	-	0.275	MENB disturbed sample middle	-	46.3	-	-	-	-
3215/105	Accelerated Air Drying Test	-	0.4	MENB disturbed sample base	-	51.5	-	-	-	-
3215/106	Accelerated Air Drying Test	-	0.00 to 0.24	MENB U50	1.567	40.8	1.113	-	-	-
3215/07	Accelerated Air Drying Test	-	0.00 to 0.12	MENB U50	1.576	38.9	1.135	-	-	-
3215/108	Accelerated Air Drying Test	-	0.12 to 0.24	MENB U50	1.637	42.7	1.147	-	-	-

Abbreviations :

LL	Liquid Limit
PL	Plastic Limit
PI	Plasticity Index
LS	Linear Shrinkage
FMC	Field Moisture Content
n/a	not applicable
nt	not tested
n/av	not available

Note :

BD - Bulk Density

DD - Dry Density

Sample History ☐ Natural — Liquid Limit ☐ Air Dried ☐ Oven Dried

Preparation Method ☐ Wet — Liquid Limit ☐ Dry

Type of Test ☐ Four Point — Liquid Limit ☐ One Point

Type of Test ☐ 125mm — Linear Shrinkage - Mould Size ☐ 150mm ☐ 250mm

Tested by:	DB
Date tested:	21/03/03
Checked by:	BJ
Authorised Signatory :	D.BROOKE
Date:	26/3/03

GHD - LONGMAC
36 Oxley Street, Crows Nest NSW 2065
Tel: (02) 9439 4033 Fax: (02) 9436 0606
GEOTECHNICAL TESTING SERVICES

This laboratory is accredited by the National Association of Testing Authorities,Australia.The tests reported herein have been performed in accordance with its terms of accreditation.
NATA Accredited Laboratory Number : 679

This laboratory certificate may not be reproduced except in full unless permission for the publication of an approved extract has been obtained from GHD - LongMac.

Soil Index Properties - Report

Report No. 11183

Client: Newcastle Port Corporation

Job Number: 2111563/06

Project: South Arm Dredging Masterplan

Location: Newcastle

TEST METHODS :					
	Moisture Content	-	☒ AS1289.2.1.1	☐ RTA T120
	Liquid Limit (Four Point)	-	☐ AS1289.3.1.1	☐ RTA T102
	Liquid Limit (One Point)	-	☐ AS1289.3.1.2	☐ RTA T108
	Plastic Limit	-	☐ AS1289.3.2.1	☐ RTA T109
	Plasticity Index	-	☐ AS1289.3.3.1	☐ RTA T103
	Linear Shrinkage	-	☐ AS1289.3.4.1	☐ RTA T113

Sample History : Sampled by GHD-LONGMAC

LongMac Sample No.	Client Sample ID	Test Hole	Depth (m)	Description	BD (t/m³)	FMC (%)	DD (%)	PL (%)	PI (%)	LS (%)
3215/109	*Accelerated Air* Drying Test	-	0.95	MEB *disturbed sample top*	-	41.0	-	-	-	-
3215/110	Lab Drying Test No 2	-	0.275	MEB disturbed sample middle	-	46.1	-	-	-	-
3215/111	Lab Drying Test No 2	-	0.4	MEB disturbed sample base	-	48.2	-	-	-	-
3215/112	Lab Drying Test No 2	-	0.0 to 0.23	MEB U50	1.592	42.2	1.120	-	-	-
3215/113	Lab Drying Test No 2	-	0.0 to 0.12	MEB U50	1.568	39.4	1.125	-	-	-
3215/114	Lab Drying Test No 2	-	0.12 to 0.23	MEB U50	1.517	45.6	1.042	-	-	-

Abbreviations :

LL	Liquid Limit
PL	Plastic Limit
PI	Plasticity Index
LS	Linear Shrinkage
FMC	Field Moisture Content
n/a	not applicable
nt	not tested
n/av	not available

Note :

BD - Bulk Density

DD - Dry Density

Sample History ☐ Natural — Liquid Limit ☐ Air Dried ☐ Oven Dried

Preparation Method ☐ Wet — Liquid Limit ☐ Dry

Type of Test ☐ Four Point — Liquid Limit ☐ One Point

Type of Test ☐ 125mm — Linear Shrinkage - Mould Size ☐ 150mm ☐ 250mm

Tested by:	DB
Date tested:	21/03/03
Checked by:	
Authorised Signatory :	DBROOKE
Date:	26/3/03

GHD - LONGMAC
36 Oxley Street, Crows Nest NSW 2065
Tel: (02) 9439 4033 Fax: (02) 9436 0606
GEOTECHNICAL TESTING SERVICES

This laboratory is accredited by the National Association of Testing Authorities,Australia.The tests reported herein have been performed in accordance with its terms of accreditation.
NATA Accredited Laboratory Number : 679

This laboratory certificate may not be reproduced except in full unless permission for the publication of an approved extract has been obtained from GHD - LongMac.

Soil Index Properties - Report

Report No. 11184

Client: Newcastle Port Corporation

Project: South Arm Dredging Masterplan

Location: Newcastle

Job Number: 2111563/06

TEST METHODS :					
	Moisture Content	-	☒ AS1289.2.1.1	☐	RTA T120
	Liquid Limit (Four Point)	-	☐ AS1289.3.1.1	☐	RTA T102
	Liquid Limit (One Point)	-	☐ AS1289.3.1.2	☐	RTA T108
	Plastic Limit	-	☐ AS1289.3.2.1	☐	RTA T109
	Plasticity Index	-	☐ AS1289.3.3.1	☐	RTA T103
	Linear Shrinkage	-	☐ AS1289.3.4.1	☐	RTA T113

Sample History : Sampled by GHD-LONGMAC

LongMac Sample No.	Client Sample ID	Test Hole	Depth (m)	Description	BD (t/m³)	FMC (%)	DD (%)	PL (%)	PI (%)	LS (%)
3215/115	Accelerated Air Drying Test	-	0.95	HENB disturbed sample top	-	53.5	-	-	-	-
3215/116	Accelerated Air Drying Test	-	0.275	HENB disturbed sample middle	-	57.8	-	-	-	-
3215/117	Accelerated Air Drying Test	-	0.4	HENB disturbed sample base	-	62.6	-	-	-	-
3215/118	Accelerated Air Drying Test	-	0.00 to 0.14	HENB U50	1.614	49.2	1.082	-	-	-
3215/119	Accelerated Air Drying Test	-	0.14 to 0.273	HENB U50	1.570	56.6	1.002	-	-	-

Abbreviations :

LL	Liquid Limit
PL	Plastic Limit
PI	Plasticity Index
LS	Linear Shrinkage
FMC	Field Moisture Content
n/a	not applicable
nt	not tested
n/av	not available

Note :

BD - Bulk Density

DD - Dry Density

Sample History ☐ Natural — Liquid Limit ☐ Air Dried ☐ Oven Dried

Preparation Method ☐ Wet — Liquid Limit ☐ Dry

Type of Test ☐ Four Point — Liquid Limit ☐ One Point

Type of Test ☐ 125mm — Linear Shrinkage - Mould Size ☐ 150mm ☐ 250mm

Tested by:	DB
Date tested:	21/03/03
Checked by:	
Authorised Signatory :	
Date:	26/3/03

GHD - LONGMAC
36 Oxley Street, Crows Nest NSW 2065
Tel: (02) 9439 4033 Fax: (02) 9436 0606
GEOTECHNICAL TESTING SERVICES

This laboratory is accredited by the National Association of Testing Authorities,Australia. The tests reported herein have been performed in accordance with its terms of accreditation.
NATA Accredited Laboratory Number : 679

This laboratory certificate may not be reproduced except in full unless permission for the publication of an approved extract has been obtained from GHD - LongMac.

Soil Index Properties - Report

Report No. 11225

Client: Newcastle Port Corporation

Job Number: 2111563/06

Project: South Arm Dredging Masterplan

Location: Newcastle

TEST METHODS :					
	Moisture Content	-	☒ AS1289.2.1.1	☐ RTA T120
	Liquid Limit (Four Point)	-	☐ AS1289.3.1.1	☐ RTA T102
	Liquid Limit (One Point)	-	☐ AS1289.3.1.2	☐ RTA T108
	Plastic Limit	-	☐ AS1289.3.2.1	☐ RTA T109
	Plasticity Index	-	☐ AS1289.3.3.1	☐ RTA T103
	Linear Shrinkage	-	☐ AS1289.3.4.1	☐ RTA T113

Sample History : Sampled by GHD-LONGMAC

LongMac Sample No.	Client Sample ID	Test Hole	Depth (m)	Description	NDD (t/m³)	FMC (%)	LL (%)	PL (%)	PI (%)	LS (%)
3215/95	Accelerated Air Drying Test	-	0.110	MEB	-	39.5	-	-	-	-
3215/96	Accelerated Air Drying Test	-	0.210	MEB	-	45.2	-	-	-	-
3215/97	Accelerated Air Drying Test	-	0.310	MEB	-	50.8	-	-	-	-
3215/98	Accelerated Air Drying Test	-	0.410	MEB	-	56.8	-	-	-	-

Abbreviations :

LL	Liquid Limit
PL	Plastic Limit
PI	Plasticity Index
LS	Linear Shrinkage
FMC	Field Moisture Content
n/a	not applicable
nt	not tested
n/av	not available

Note :

Sample History ☐ Natural — Liquid Limit ☐ Air Dried ☐ Oven Dried

Preparation Method ☐ Wet — Liquid Limit ☐ Dry

Type of Test ☐ Four Point — Liquid Limit ☐ One Point

Type of Test ☐ 125mm — Linear Shrinkage - Mould Size ☐ 150mm ☐ 250mm

Tested by:	DB
Date tested:	14/03/03
Checked by:	
Authorised Signatory :	D. BRIDGE
Date:	26/3/03

GHD - LONGMAC
36 Oxley Street, Crows Nest NSW 2065
Tel: (02) 9439 4033 Fax: (02) 9436 0606
GEOTECHNICAL TESTING SERVICES

This laboratory is accredited by the National Association of Testing Authorities, Australia. The *tests reported herein have been performed in accordance with its terms of accreditation.*
NATA Accredited Laboratory Number : 679

This laboratory certificate may not be reproduced except in full unless permission for the publication of an approved extract has been obtained from GHD - LongMac.

Soil Index Properties - Report

Report No. 11226

Client: Newcastle Port Corporation

Project: South Arm Dredging Masterplan

Location: Newcastle

Job Number: 2111563/06

TEST METHODS :				
Moisture Content	-	☒ AS1289.2.1.1	☐ RTA T120
Liquid Limit (Four Point)	-	☐ AS1289.3.1.1	☐ RTA T102
Liquid Limit (One Point)	-	☐ AS1289.3.1.2	☐ RTA T108
Plastic Limit	-	☐ AS1289.3.2.1	☐ RTA T109
Plasticity Index	-	☐ AS1289.3.3.1	☐ RTA T103
Linear Shrinkage	-	☐ AS1289.3.4.1	☐ RTA T113

Sample History : Sampled by GHD-LONGMAC

LongMac Sample No.	Client Sample ID	Test Hole	Depth (m)	Description	NDD (t/m³)	FMC (%)	LL (%)	PL (%)	PI (%)	LS (%)
3215/83	Accelerated Air Drying Test	-	0.110	MEB	-	47.5	-	-	-	-
3215/84	Accelerated Air Drying Test	-	0.210	MEB	-	59.6	-	-	-	-
3215/85	Accelerated Air Drying Test	-	0.310	MEB	-	64.7	-	-	-	-
3215/86	Accelerated Air Drying Test	-	0.420	MEB	-	65.2	-	-	-	-

Abbreviations :

LL	Liquid Limit
PL	Plastic Limit
PI	Plasticity Index
LS	Linear Shrinkage
FMC	Field Moisture Content
n/a	not applicable
nt	not tested
n/av	not available

Note :

Sample History ☐ Natural — Liquid Limit ☐ Air Dried ☐ Oven Dried

Preparation Method ☐ Wet — Liquid Limit ☐ Dry

Type of Test ☐ Four Point — Liquid Limit ☐ One Point

Type of Test ☐ 125mm — Linear Shrinkage - Mould Size ☐ 150mm ☐ 250mm

Tested by:	LG
Date tested:	25/02/03
Checked by:	
Authorised Signatory :	
Date:	26/3/03

GHD - LONGMAC
36 Oxley Street, Crows Nest NSW 2065
Tel: (02) 9439 4033 Fax: (02) 9436 0606
GEOTECHNICAL TESTING SERVICES

This laboratory is accredited by the National Association of Testing Authorities,Australia.The tests reported herein have been performed in accordance with its terms of accreditation.
NATA Accredited Laboratory Number : 679

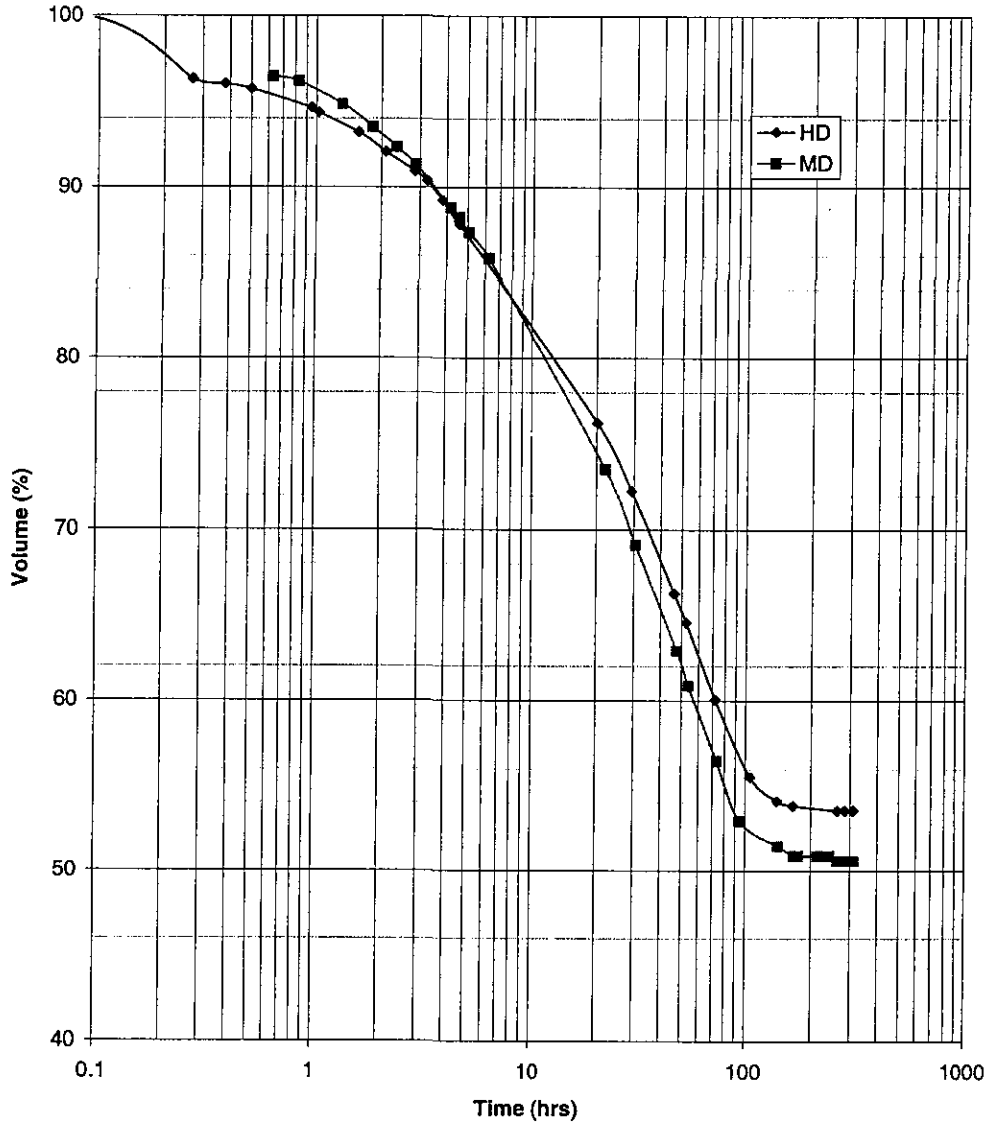
This laboratory certificate may not be reproduced except in full unless permission for the publication of an approved extract has been obtained from GHD - LongMac.

Appendix A4
CDF Simulation Tests

Slurried Sediment Plots	11214	11215	11216	11217	11220		
Placement Simulation Plots		11218	11219				
Tabulated Results	Table No's	L1	L2	L3	L4	L5	L6	L7
Air Drying Plots	Report No.s	11210	11211	11212	11213		

Client:	Newcastle Port Corporation	Job No. :	21/11563/06
Project:	SADM - EIS		
Location:	Newcastle		
METHOD:	**LM Method**	**Client Sample ID:**	**Sediment**

DRAINED TEST - STAGE 1
SLURRY - 'HIGH' & 'MEDIUM' SEDIMENT

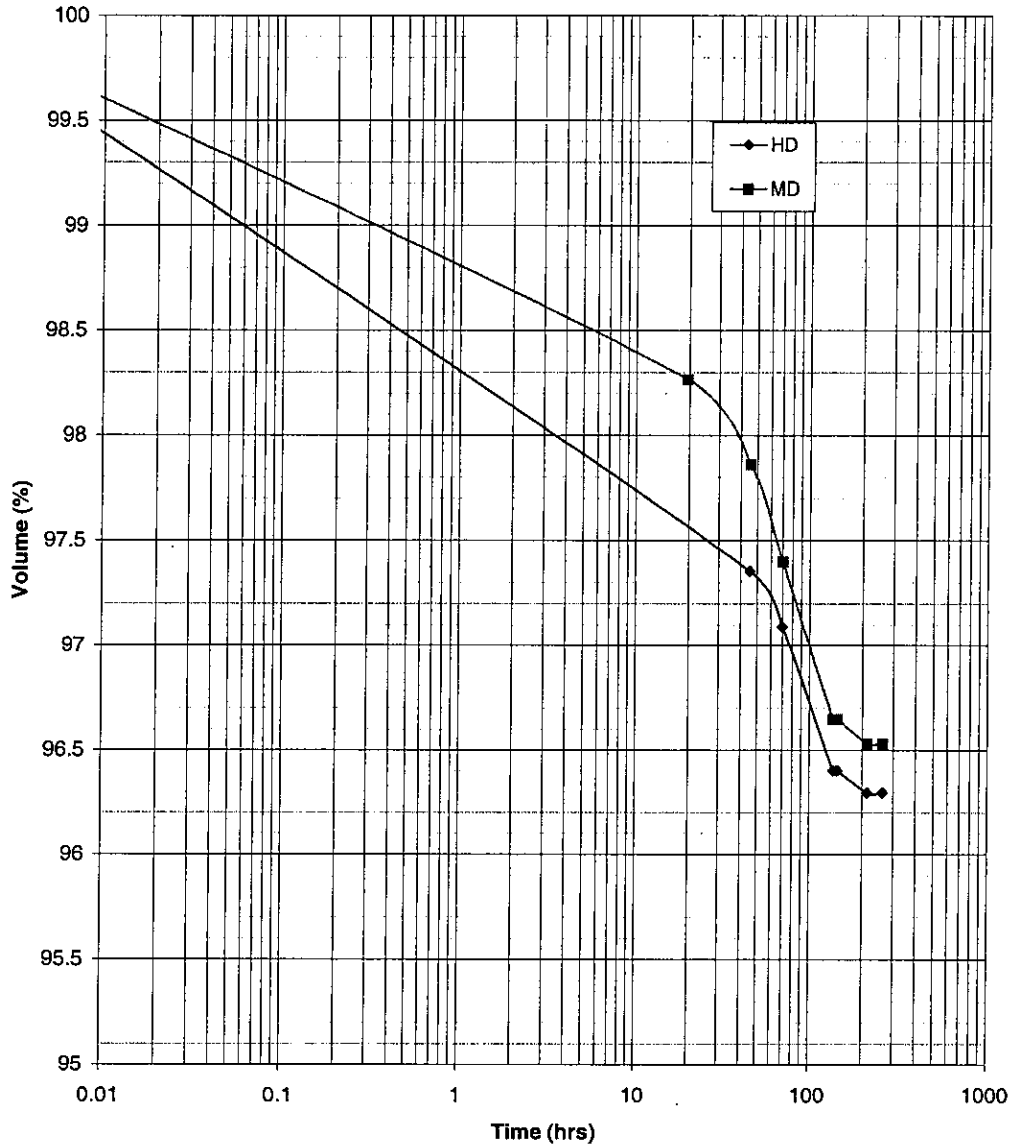


File Name:	Arb computer\arb drive\ Data_ARB\2111563\CDF-Consol\ SlurryD 2 & Fig.xls
Checked By:	
Date:	28/4/03

GHD-LONGMAC
36 Oxley Street, Crows Nest, N.S.W. 2065
Telephone: (02) 9439 4033 Fax: (02) 9436 0606
GEOTECHNICAL TESTING SERVICES

Client:	Newcastle Port Corporation	Job No. :	21/11563/06
Project:	SADM - EIS		
Location:	Newcastle		
METHOD:	**LM Method**	**Client Sample ID:**	**Sediment**

DRAINED TEST - STAGE 2
SLURRY - 'HIGH' & 'MEDIUM' SEDIMENTS

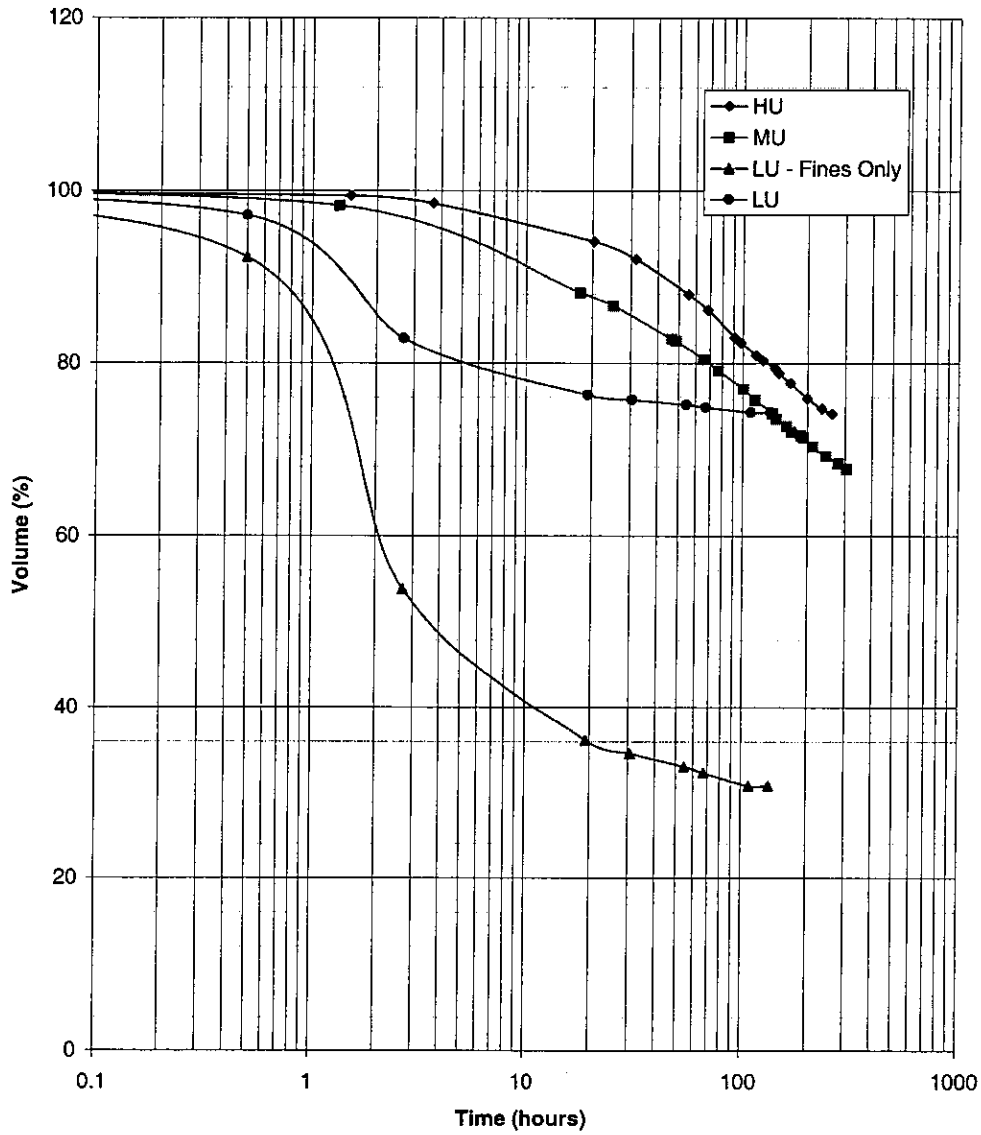


File Name:	Arb computer\arb drive\ Data_ARB\2111563\CDF-Consol\ Slurry D (S2) 2 & Fig.xls
Checked By:	
Date:	28/4/08

GHD-LONGMAC
36 Oxley Street, Crows Nest, N.S.W. 2065
Telephone: (02) 9439 4033 Fax: (02) 9436 0606
GEOTECHNICAL TESTING SERVICES

Client:	Newcastle Port Corporation	Job No. :	21/11563/06
Project:	SADM - EIS		
Location:	Newcastle		
METHOD:	**LM Method**	**Client Sample ID:**	**Sediment**

UNDRAINED TEST - STAGE 1
SLURRY - 'HIGH' & 'MEDIUM' SEDIMENTS



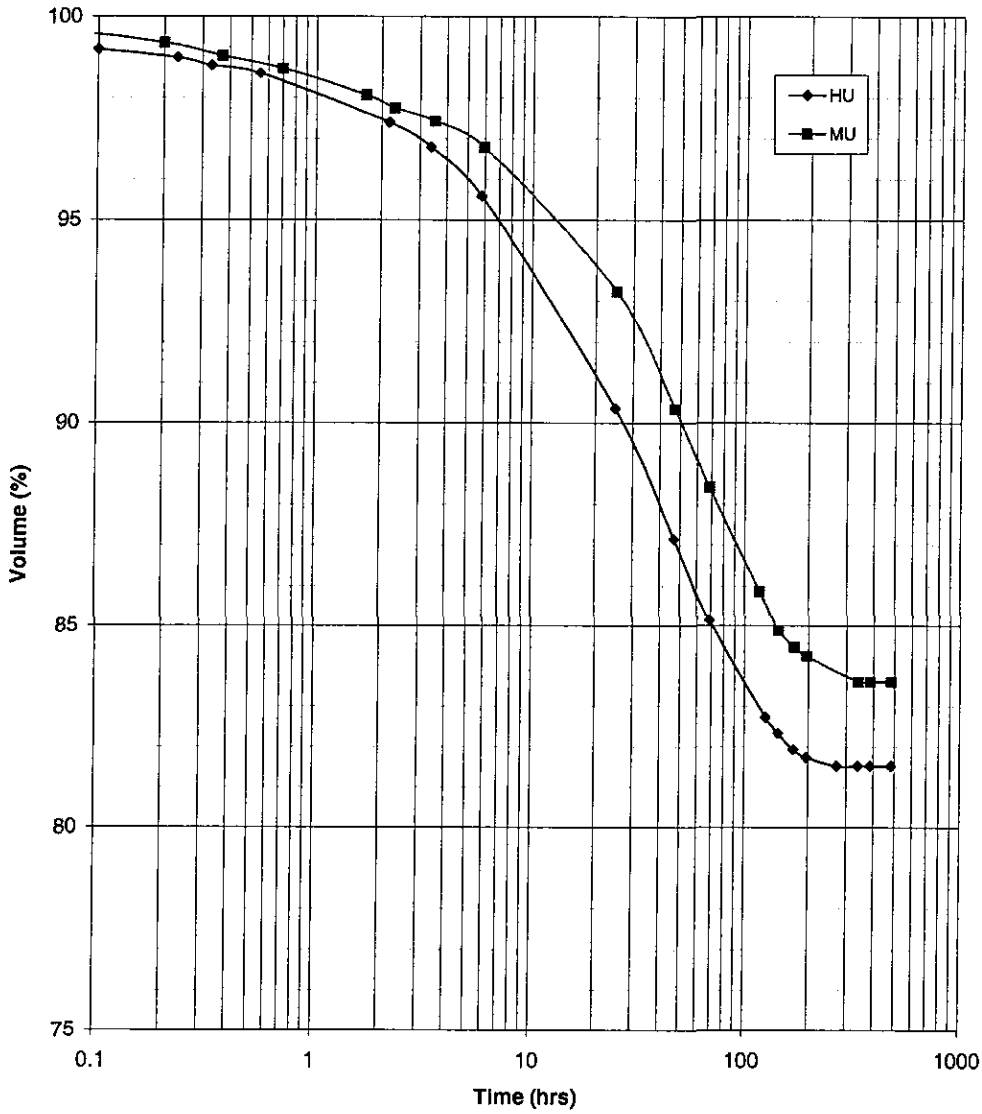
Note: "LU - Fines Only" layer conslidating on top of sedimented sand

File Name:	Arb computer\arb drive\ Data_ARB\2111563\CDF-Conso\ SlurryU 2 & Fig.xls
Checked By:	
Date:	24/03

GHD-LONGMAC
36 Oxley Street, Crows Nest, N.S.W. 2065
Telephone: (02) 9439 4033 Fax: (02) 9436 0606
GEOTECHNICAL TESTING SERVICES

Client:	Newcastle Port Corporation	Job No. :	21/11563/06
Project:	SADM - EIS		
Location:	Newcastle		
METHOD:	**LM Method**	**Client Sample ID:**	**Sediment**

UNDRAINED TEST - STAGE 2
SLURRY - 'HIGH' & 'MEDIUM' SEDIMENTS

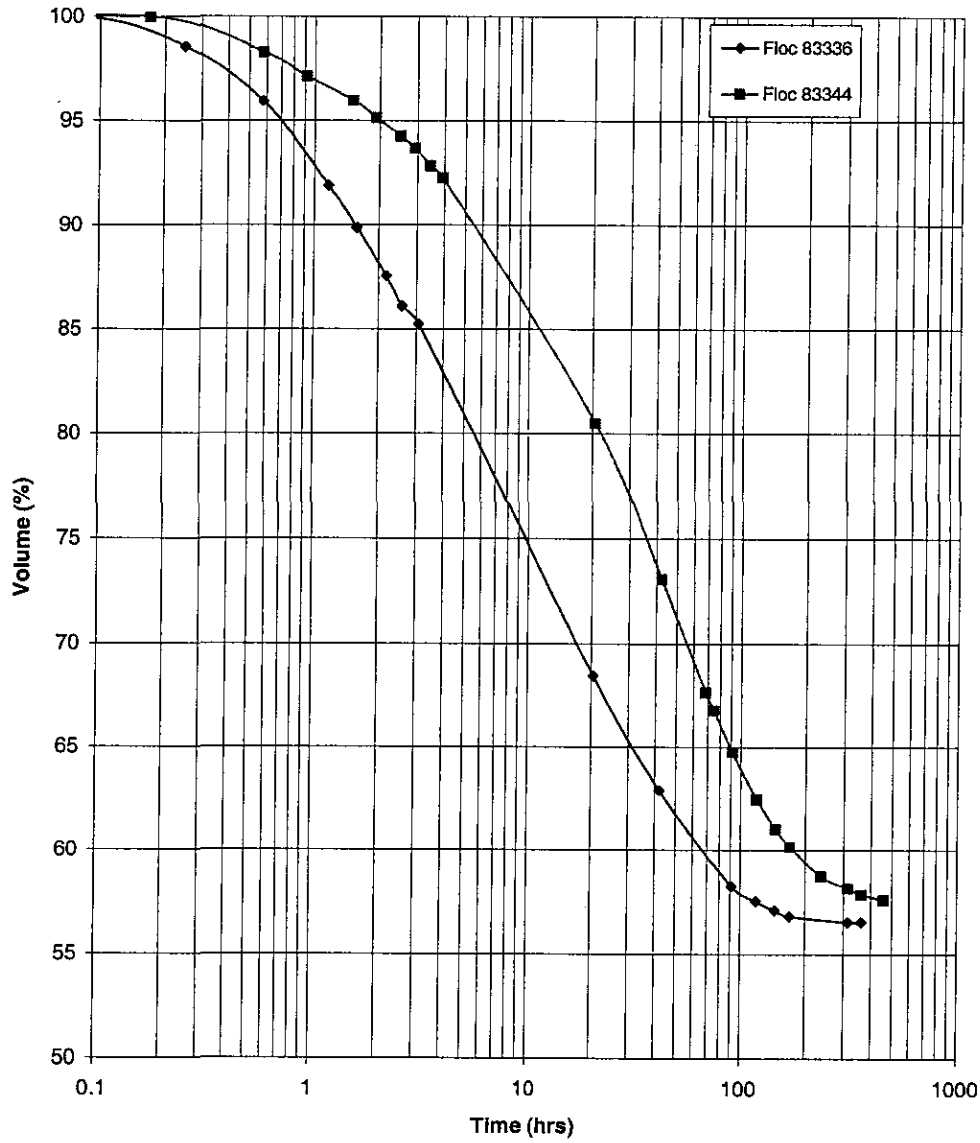


File Name:	Arb computer\arb drive\ Data_ARB\2111563\CDF-Consol\ SlurryU (S2) 2 & Fig.xls
Checked By:	
Date:	28/4/03

GHD-LONGMAC
36 Oxley Street, Crows Nest, N.S.W. 2065
Telephone: (02) 9439 4033 Fax: (02) 9436 0606
GEOTECHNICAL TESTING SERVICES

Client:	Newcastle Port Corporation	Job No. :	21/11563/06
Project:	SADM - EIS		
Location:	Newcastle		
METHOD:	**LM Method**	**Client Sample ID:**	**Sediment**

UNDRAINED TEST - STAGE 1
SLURRY - 'HIGH SEDIMENTS'

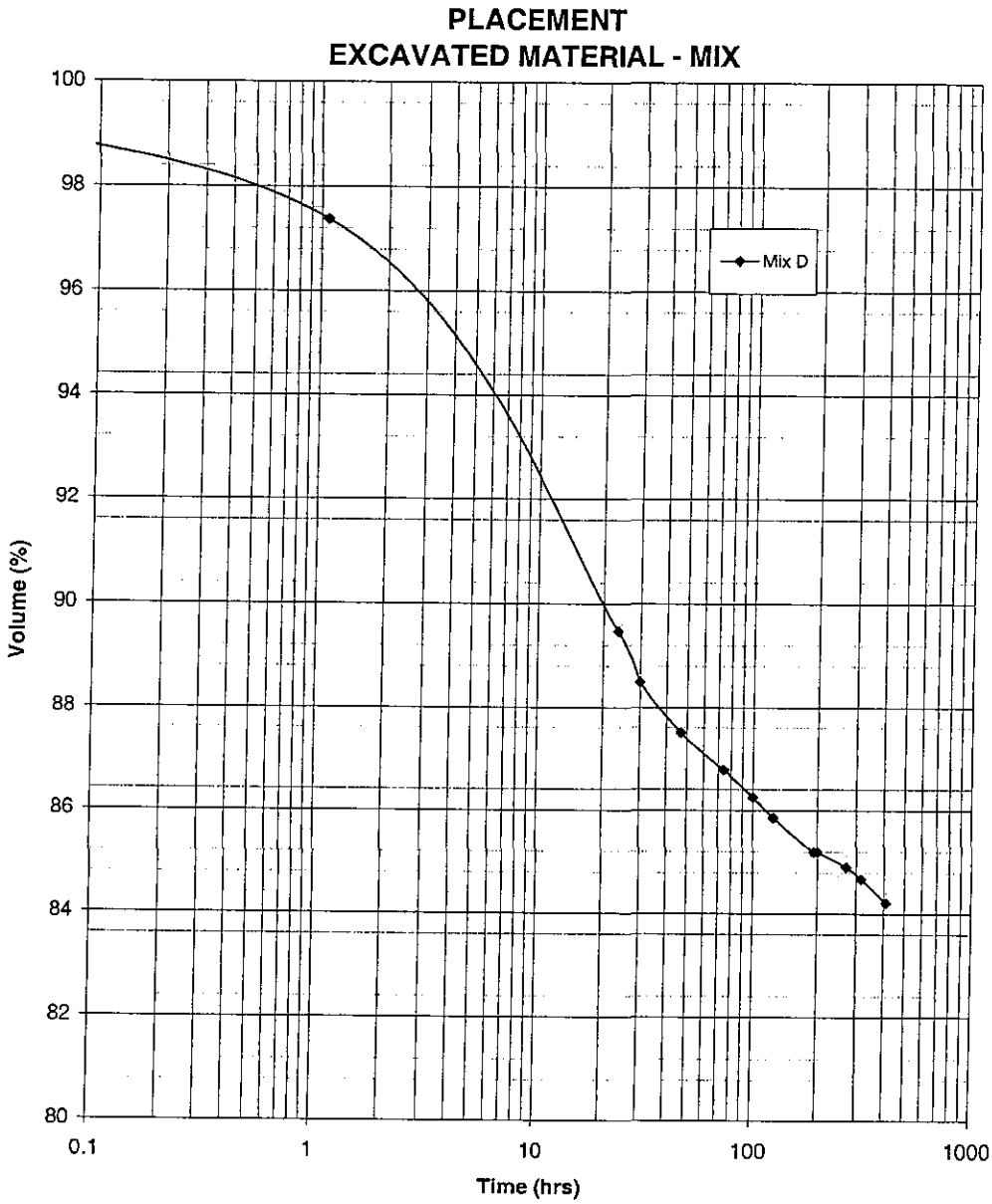


File Name:	Arb computer\arb drive\ Data_ARB\2111563\CDF-Consol\ Floc & Fig 2.xls
Checked By:	
Date:	28/4/03

GHD-LONGMAC
36 Oxley Street, Crows Nest, N.S.W. 2065
Telephone: (02) 9439 4033 Fax: (02) 9436 0606
GEOTECHNICAL TESTING SERVICES

Deposition Simulation Test - Report *Report No.: 11218*

Client:	Newcastle Port Corporation	Job No. :	21/11563/06
Project:	SADM - EIS		
Location:	Newcastle		
METHOD:	**LM Method**	**Client Sample ID:**	**Sediment**

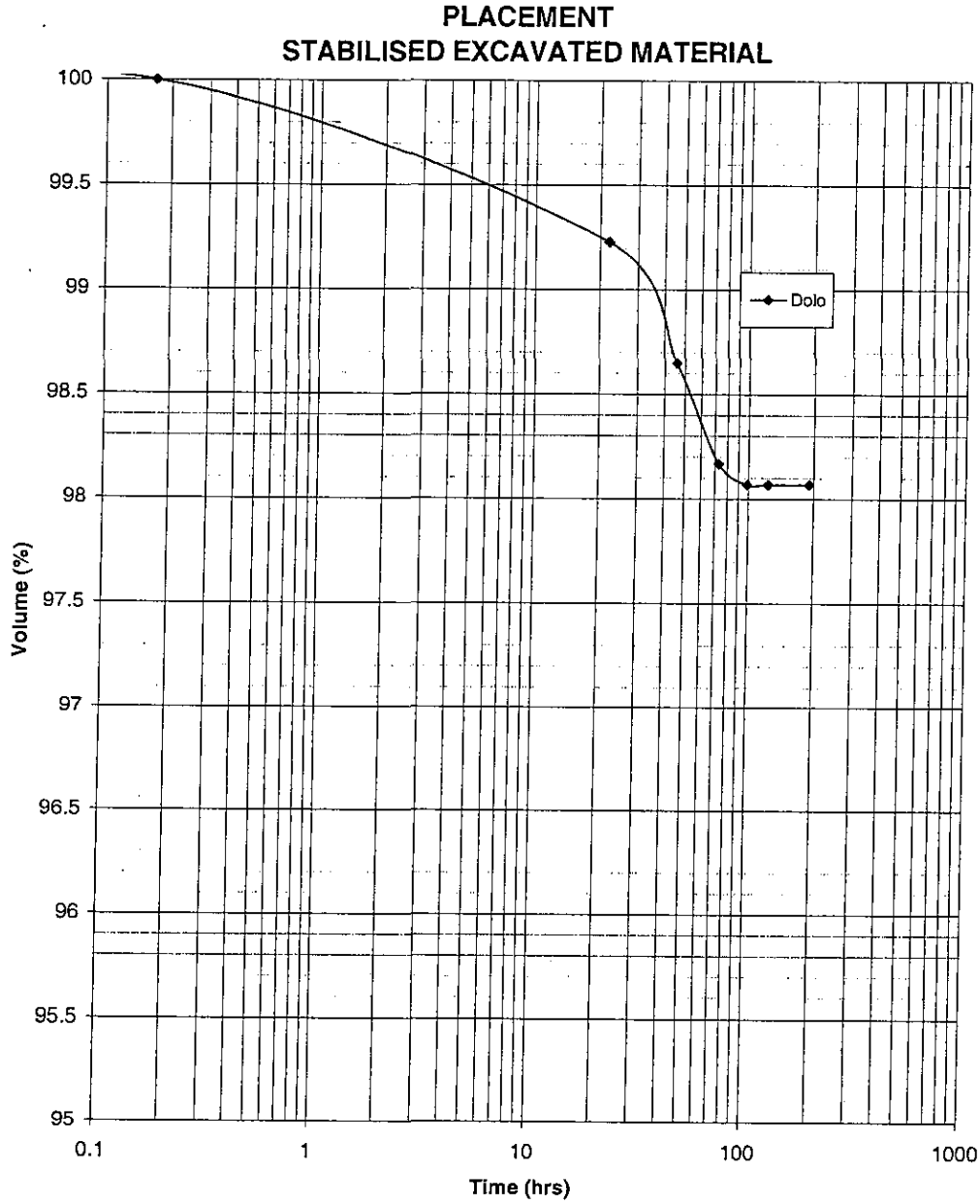


Tested By:	
Date Tested:	
Checked By:	
Authorised Date:	28/5/03

GHD-LONGMAC
36 Oxley Street, Crows Nest, N.S.W. 2065
Telephone: (02) 9439 4033 Fax: (02) 9436 0606
GEOTECHNICAL TESTING SERVICES

Deposition Simulation Test - Report *Report No.: 11219*

Client:	Newcastle Port Corporation	Job No. :	21/11563/06
Project:	SADM - EIS		
Location:	Newcastle		
METHOD:	**LM Method**	**Client Sample ID:**	**Sediment**



Tested By:	
Date Tested:	
Checked By:	
Authorised Date:	28/4/03

GHD-LONGMAC
36 Oxley Street, Crows Nest, N.S.W. 2065
Telephone: (02) 9439 4033 Fax: (02) 9436 0606
GEOTECHNICAL TESTING SERVICES

TABLE L1 SLURRY DEPOSITION SIMULATION - HIGH SEDIMENT - UNDRAINED FIRST STAGE/DRAINED SECOND STAGE (HU1/HU2)

Time	Water		Slurry									
(hrs)	Tape Reading (mm)	Height Above Slurry (mm)	Tape Reading (mm)	Height (mm)	SaturatedDensity (t/m^3)	Volume (%)	Dry Density (t/m^3)	Void Ratio	Ave Eff Stress (kPa)	m_v	k (m/s)	C_v (m^2/yr)
0.001	2440	0	2440	340	1.220	100	0.380	5.526	0.367	N/A	N/A	N/A
1.5	2440	2	2438	338	1.228	99.4	0.382	5.488	0.378			
3.67	2440	5	2435	335	1.230	98.5	0.386	5.430	0.378			
20.33	2440	20	2420	320	1.241	94.1	0.404	5.142	0.378			
31.67	2440	29	2411	311	1.248	91.5	0.415	4.970	0.378			
55.67	2440	41	2399	299	1.258	87.9	0.432	4.739	0.378			
68.33	2440	47	2393	293	1.263	86.2	0.441	4.624	0.378			
91.5	2440	58	2382	282	1.273	82.9	0.458	4.413	0.378			
98	2440	60	2380	280	1.275	82.4	0.461	4.375	0.378			
114.83	2440	65	2375	275	1.280	80.9	0.470	4.279	0.378			
123.5	2440	67	2373	273	1.282	80.3	0.473	4.240	0.378			
140.42	2440	70	2370	270	1.286	79.4	0.479	4.183	0.378			
146.58	2440	72	2368	268	1.288	78.8	0.482	4.144	0.378			
166.5	2440	76	2364	264	1.292	77.6	0.489	4.067	0.378			
199.33	2440	82	2358	258	1.299	75.9	0.501	3.952	0.378			
233.75	2440	86	2354	254	1.304	74.7	0.509	3.876	0.378			
260	2440	88	2352	252	1.306	74.1	0.513	3.837	0.378	Stage 1 - Undrained Settling		
0.001	2685	338	2349	249	1.310	73.2	0.519	3.780	3.254	Stage 2 - Basal Drainage Opened		
0.017	2685	337	2348	248	1.311	72.9	0.521	3.760	3.244			
0.05	2684	336.5	2347.5	247.5	1.312	72.8	0.522	3.751	3.239			
0.1	2684	337	2347	247	1.312	72.6	0.523	3.741	3.239			
0.23	2683	336.5	2346.5	246.5	1.313	72.5	0.524	3.732	3.235			
0.33	2682.5	336.5	2346	246	1.313	72.4	0.525	3.722	3.232			
0.55	2682	336.5	2345.5	245.5	1.314	72.2	0.526	3.712	3.230			
1.27	2680	337	2343	243	1.317	71.5	0.532	3.664	3.220			
2.17	2679	336.5	2342.5	242.5	1.318	71.3	0.533	3.655	3.215			
3.38	2677	337	2340	240	1.321	70.6	0.538	3.607	3.205			
5.8	2675	337	2338	238	1.324	70.0	0.543	3.568	3.195			
24.8	2662	337	2325	225	1.343	66.2	0.574	3.319	3.132			
46.8	2654	337	2317	217	1.355	63.8	0.595	3.165	3.092			
68.55	2678	368	2310	210	1.367	61.8	0.615	3.031	3.210			
117.72	2670	363	2307	207	1.372	60.9	0.624	2.973	3.171			
145.13	2656	351	2305	205	1.376	60.3	0.630	2.935	3.102			
171.05	2649	345	2304	204	1.378	60.0	0.633	2.916	3.068	0.07	4.41E-08	2.00
195.55	2643	339	2304	204	1.378	60.0	0.633	2.916	3.039	0.07	4.06E-08	1.82
262.55	2625	327	2298	198	1.389	58.2	0.653	2.801	2.950	0.08	4.50E-08	1.74

TABLE L2 SLURRY DEPOSITION SIMULATION - MEDIUM SEDIMENT - UNDRAINED FIRST STAGE/DRAINED SECOND STAGE (MU1/MU2)

Time	Water		Slurry									
(hrs)	Tape Reading (mm)	Height Above Slurry (mm)	Tape Reading (mm)	Height (mm)	SaturatedDensity (t/m^3)	Volume (%)	Dry Density (t/m^3)	Void Ratio	Ave Eff Stress (kPa)	m_v	k (m/s)	C_v (m^2/yr)
0.001	565	0	565	465	1.22	100	0.40	4.53	0.50	N/A	N/A	N/A
1.33	565	8	557	457	1.22	98.3	0.41	4.43	0.50			
17.67	565	55	510	410	1.25	88.2	0.45	3.87	0.50			
25	565	62	503	403	1.25	86.7	0.46	3.79	0.50			
41.5	565	70	495	395	1.26	84.9	0.47	3.69	0.50			
46.5	565	80	485	385	1.26	82.8	0.48	3.57	0.50			
48.75	565	81	484	384	1.27	82.6	0.48	3.56	0.50			
65.33	565	91	474	374	1.27	80.4	0.50	3.44	0.50			
76.67	565	97	468	368	1.28	79.1	0.51	3.37	0.50			
100.67	565	107	458	358	1.28	77.0	0.52	3.25	0.50			
113.33	565	113	452	352	1.29	75.7	0.53	3.18	0.50			
137.5	565	120	445	345	1.30	74.2	0.54	3.10	0.50			
143	565	123	442	342	1.30	73.5	0.54	3.06	0.50			
160	565	127	438	338	1.30	72.7	0.55	3.02	0.50			
168.42	565	130	435	335	1.30	72.0	0.56	2.98	0.50			
185.42	565	132	433	333	1.31	71.6	0.56	2.96	0.50			
191.5	565	133	432	332	1.31	71.4	0.56	2.94	0.50			
211.5	565	138	427	327	1.31	70.3	0.57	2.89	0.50			
244.33	565	143	422	322	1.32	69.2	0.58	2.83	0.50			
278.75	565	147	418	318	1.32	68.4	0.58	2.78	0.50			
305	565	150	415	315	1.32	67.7	0.59	2.74	0.50	Stage 1 - Undrained Settling		
0.001	705	290	415	315	1.32	67.7	0.59	2.74	3.46	Stage 2 - Basal Drainage Opened		
0.05	703	293	410	310	1.29	66.7	0.60	3.13	3.40			
0.2	703	294	409	309	1.29	66.5	0.60	3.12	3.40			
0.37	702	294	408	308	1.29	66.2	0.60	3.11	3.39			
0.7	701	294	407	307	1.30	66.0	0.61	3.09	3.39			
1.7	699	294	405	305	1.30	65.6	0.61	3.07	3.38			
2.3	698	294	404	304	1.30	65.4	0.61	3.05	3.37			
3.52	698	295	403	303	1.30	65.2	0.61	3.04	3.37			
5.95	697	296	401	301	1.30	64.7	0.62	3.01	3.37			
24.95	685	295	390	290	1.31	62.4	0.64	2.87	3.31			
46.95	678	297	381	281	1.32	60.4	0.66	2.75	3.28			
68.7	704	329	375	275	1.33	59.1	0.68	2.67	3.40			
117.7	687	320	367	267	1.34	57.4	0.70	2.56	3.32			
145.28	680	316	364	264	1.34	56.8	0.70	2.52	3.29			
171.2	675	312	363	263	1.35	56.6	0.71	2.51	3.26	0.023	4.50E-08	6.34
195.7	670	308	362	262	1.35	56.3	0.71	2.49	3.24	0.024	4.80E-08	6.35
262.7	658	296	362	262	1.35	56.3	0.71	2.49	3.18	0.025	4.32E-08	5.59

Ref:ARB Drive/Data_ARB/2111563/Simulation/Tables-High&MediumU

TABLE L3 SLURRY DEPOSITION SIMULATION - HIGH SEDIMENT- DRAINED FIRST STAGE/DRAINED SECOND STAGE (HD1/HD2)

Time	Water		Slurry									
(hrs)	Tape Reading (mm)	Height Above Slurry (mm)	Tape Reading (mm)	Corrected Height (mm)	SaturatedDensity (t/m^3)	Volume (%)	Dry Density (t/m^3)	Void Ratio	Ave Eff Stress (kPa)	m_v	k (m/s)	C_v (m^2/yr)
0.001	7453	0	7453	353	1.220	100	0.380	5.526	2.110	N/A		N/A
0.083	7453	0	7453	353	1.227	100.0	0.380	5.526	2.122			
0.27	7440	0	7440	340	1.235	96.3	0.395	5.286	2.058			
0.38	7439	0	7439	339	1.236	96.0	0.396	5.267	2.053			
0.5	7439	0	7439	339	1.236	96.0	0.396	5.267	2.053			
0.75	7434	0	7434	334	1.240	94.6	0.402	5.175	2.029			
0.95	7434	0	7434	334	1.240	94.6	0.402	5.175	2.029			
1.03	7433	0	7433	333	1.240	94.3	0.403	5.157	2.024			
1.57	7431	2	7429	329	1.243	93.2	0.408	5.083	2.014			
2.1	7428	3	7425	325	1.246	92.1	0.413	5.009	1.999			
2.85	7428	7	7421	321	1.249	90.9	0.418	4.935	1.999			
3.25	7426	7	7419	319	1.251	90.4	0.421	4.898	1.990			
3.83	7425	10	7415	315	1.254	89.2	0.426	4.824	1.985			
4.58	7423	13	7410	310	1.258	87.8	0.433	4.731	1.975			
20.25	7403	34	7369	269	1.298	76.2	0.499	3.973	1.877			
29.25	7401	46	7355	255	1.314	72.2	0.526	3.714	1.867			
46.25	7392	58	7334	234	1.342	66.3	0.573	3.326	1.823			
52.58	7390	62	7328	228	1.351	64.6	0.588	3.215	1.813			
72.25	7387	75	7312	212	1.378	60.1	0.633	2.919	1.799			
105.08	7372	76	7296	196	1.408	55.5	0.684	2.624	1.725			
139.5	7363	72	7291	191	1.419	54.1	0.702	2.531	1.681		1.90E-07	
165.75	7358	68	7290	190	1.421	53.8	0.706	2.513	1.656		1.44E-07	
240.67	7343	53	7290	190	1.421	53.8	0.706	2.513	1.583		1.75E-07	
262.08	7338	49	7289	189	1.424	53.5	0.710	2.494	1.558		2.41E-07	
283.75	7335	46	7289	189	1.424	53.5	0.710	2.494	1.544		1.53E-07	
309.75	7330	41	7289	189	1.424	53.5	0.710	2.494	1.519 Stage 1		2.32E-07	
0.001	7324	35	7289	189	1.424	53.5	0.710	2.494	1.490 Stage 2			
0.17	7700	411	7289	189	1.424	53.5	0.710	2.494	3.332			
45.5	7684	400	7284	186	1.430	52.7	0.721	2.439	3.264			
70.08	7676	393	7283	185	1.433	52.4	0.725	2.420	3.224			
136.92	7656	374	7282	184	1.435	52.1	0.729	2.402	3.126	0.016	4.00E-08	7.82
144.92	7655	373	7282	184	1.435	52.1	0.729	2.402	3.122			
214	7635	353	7282	184	1.435	52.1	0.729	2.402	3.024	0.018	4.08E-08	7.46
260.92	7623	341	7282	184	1.435	52.1	0.729	2.402	2.965	0.018	3.77E-08	6.62

TABLE L4 SLURRY DEPOSITION SIMULATION - MEDIUM SEDIMENT - DRAINED FIRST STAGE/DRAINED SECOND STAGE (MD1/MD2)

Time	Water		Slurry									
(hrs)	Tape Reading (mm)	Height Above Slurry (mm)	Tape Reading (mm)	Corrected Height (mm)	SaturatedDensity (t/m^3)	Volume (%)	Dry Density (t/m^3)	Void Ratio	Ave Eff Stress (kPa)	m_v	k (m/s)	C_v (m^2/yr)
0.63	5430	2	5428	328	1.220	100	0.400	5.200	1.971	N/A		N/A
0.83	5429	2	5427	327	1.220	99.7	0.401	4.508	1.964			
1.32	5427	6	5421	321	1.199	97.9	0.409	5.068	1.916			
1.82	5425	7	5418	318	1.201	97.0	0.413	5.011	1.906			
2.35	5424	10	5414	314	1.204	95.7	0.418	4.935	1.901			
2.87	5423	14	5409	309	1.207	94.2	0.425	4.841	1.896			
3.42	5420	18	5402	302	1.212	92.1	0.434	4.709	1.882			
4.18	5420	18	5402	302	1.212	92.1	0.434	4.709	1.882			
4.57	5419	19	5400	300	1.213	91.5	0.437	4.671	1.877			
5.07	5418	21	5397	297	1.216	90.5	0.442	4.614	1.872			
6.23	5415	23	5392	292	1.219	89.0	0.449	4.520	1.857			
22.05	5399	49	5350	250	1.256	76.2	0.525	3.726	1.779			
30.57	5398	63	5335	235	1.272	71.6	0.558	3.442	1.774			
47.57	5385	71	5314	214	1.299	65.2	0.613	3.045	1.710			
53.9	5381	79	5302	202	1.317	61.6	0.650	2.818	1.691			
73.57	5375	83	5292	192	1.333	58.5	0.683	2.629	1.661			
106.4	5365	85	5280	180	1.356	54.9	0.729	2.402	1.612			
140.8	5358	83	5275	175	1.366	53.4	0.750	2.308	1.578			
167	5352	79	5273	173	1.370	52.7	0.758	2.270	1.548			
215.5	5343	70	5273	173	1.370	52.7	0.758	2.270	1.504			
238	5337	64	5273	173	1.370	52.7	0.758	2.270	1.475		1.33E-07	
311.07	5325	53	5272	172	1.372	52.4	0.763	2.251	1.416 Stage 1		1.35E-07	
0.001	5319	47	5272	172	1.372	52.4	0.763	2.251	1.387 Stage 2			
0.17	5639	366	5273	173	1.370	52.7	0.758	2.270	2.955			
19.75	5631	361	5270	170	1.377	51.8	0.772	2.213	2.916			
45.75	5617	348	5269	169	1.379	51.5	0.776	2.195	2.847			
70.33	5607	338	5269	169	1.379	51.5	0.776	2.195	2.798			
137.17	5568	301	5267	167	1.383	50.9	0.786	2.157	2.607			
145	5558	291	5267	167	1.383	50.9	0.786	2.157	2.558			
214.25	5533	266	5267	167	1.383	50.9	0.786	2.157	2.435	0.029	6.01E-08	6.78
261.17	5523	256	5267	167	1.383	50.9	0.786	2.157	2.386	0.030	3.79E-08	4.07
357.17	5501	235	5266	166	1.386	50.6	0.790	2.138	2.279	0.040	4.32E-08	3.43

Ref:ARB Drive/Data_ARB/2111563/Simulation/High&MediumD

TABLE L5 'DOLO' PLACEMENT SIMULATION - 3.5% DOLOCRETE STABILISED SEDIMENT- DRAINED

Time	Water		Slurry									
(hrs)	Tape Reading (mm)	Height Above Slurry (mm)	Tape Reading (mm)	Corrected Height (mm)	Saturated Density (t/m^3)	Volume (%)	Dry Density (t/m^3)	Void Ratio	Change in Ave Eff Stress (kPa)	m_v	k (m/s)	C_v (m^2/yr)
0.001	3523	139	3384	259	1.54	100.0	0.910	1.725	0.681			
0.17	3522	138	3384	259	1.54	100.0	0.910	1.725	0.676			
22	3517	135	3382	257	1.49	99.2	0.917	1.704	0.662			
28.75	3516	134	3382	257	1.49	99.2	0.917	1.704	0.657			
29	3643	261	3382	257	1.49	99.2	0.917	1.704	1.279			
45.67	3641	261	3380	255	1.50	98.5	0.924	1.683	1.279			
73.08	3639	260	3379	254	1.50	98.1	0.928	1.673	1.274	0.015	1.98E-08	4.21
99	3637	258	3379	254	1.50	98.1	0.928	1.673	1.264	0.015	2.10E-08	4.43
123.67	3636	257	3379	254	1.50	98.1	0.928	1.673	1.259	0.015	1.11E-08	2.33
190.5	3633	254	3379	254	1.50	98.1	0.928	1.673	1.245	0.016	1.24E-08	2.57
198.08	3632	253	3379	254	1.50	98.1	0.928	1.673	1.240			
267.58	3628	249	3379	254	1.50	98.1	0.928	1.673	1.220	0.016	1.62E-08	3.29
314.5	3624	245	3379	254	1.50	98.1	0.928	1.673	1.201	0.016	2.44E-08	4.87
410.5	3620	241	3379	254	1.50	98.1	0.928	1.673	1.181	0.016	1.21E-08	2.38

TABLE L6 PLACEMENT SIMULATION - MIXED SEDIMENT- DRAINED

Time	Water		Slurry									
(hrs)	Tape Reading (mm)	Height Above Slurry (mm)	Tape Reading (mm)	Corrected Height (mm)	Saturated Density (t/m^3)	Volume (%)	Dry Density (t/m^3)	Void Ratio	Change in Ave Eff Stress (kPa)	m_v	k (m/s)	C_v (m^2/yr)
0.001	4450	198	4252	152	1.52	100.0	0.910	1.571	0.970			
1.08	4445	197	4248	148	1.59	97.4	0.935	1.504	0.965			
23.58	4435	199	4236	136	1.58	89.5	1.017	1.301	0.975			
30.08	4435	202	4233	133	1.59	87.5	1.040	1.250	0.990			
46.83	4429	198	4233	133	1.59	87.5	1.040	1.250	0.960			
74.17	4424	192	4232	132	1.60	86.8	1.048	1.233	0.941			
100.08	4419	187	4232	132	1.60	86.8	1.048	1.233	0.916			
124.75	4415	185	4230	130	1.60	85.5	1.064	1.199	0.907	0.213	3.17E-08	0.48
191.58	4405	175	4230	130	1.60	85.5	1.064	1.199	0.858	0.225	3.00E-08	0.43
199.25	4404	175	4229	129	1.61	84.9	1.072	1.182	0.858	0.232	2.68E-08	0.37
268.67	4392	163	4229	129	1.61	84.9	1.072	1.182	0.799	0.249	3.67E-08	0.47
315.58	4386	157	4229	129	1.61	84.9	1.072	1.182	3.000	0.066	2.86E-08	1.39
411.58	4373	145	4228	128	1.61	84.2	1.081	1.165	0.711	0.289	3.20E-08	0.36

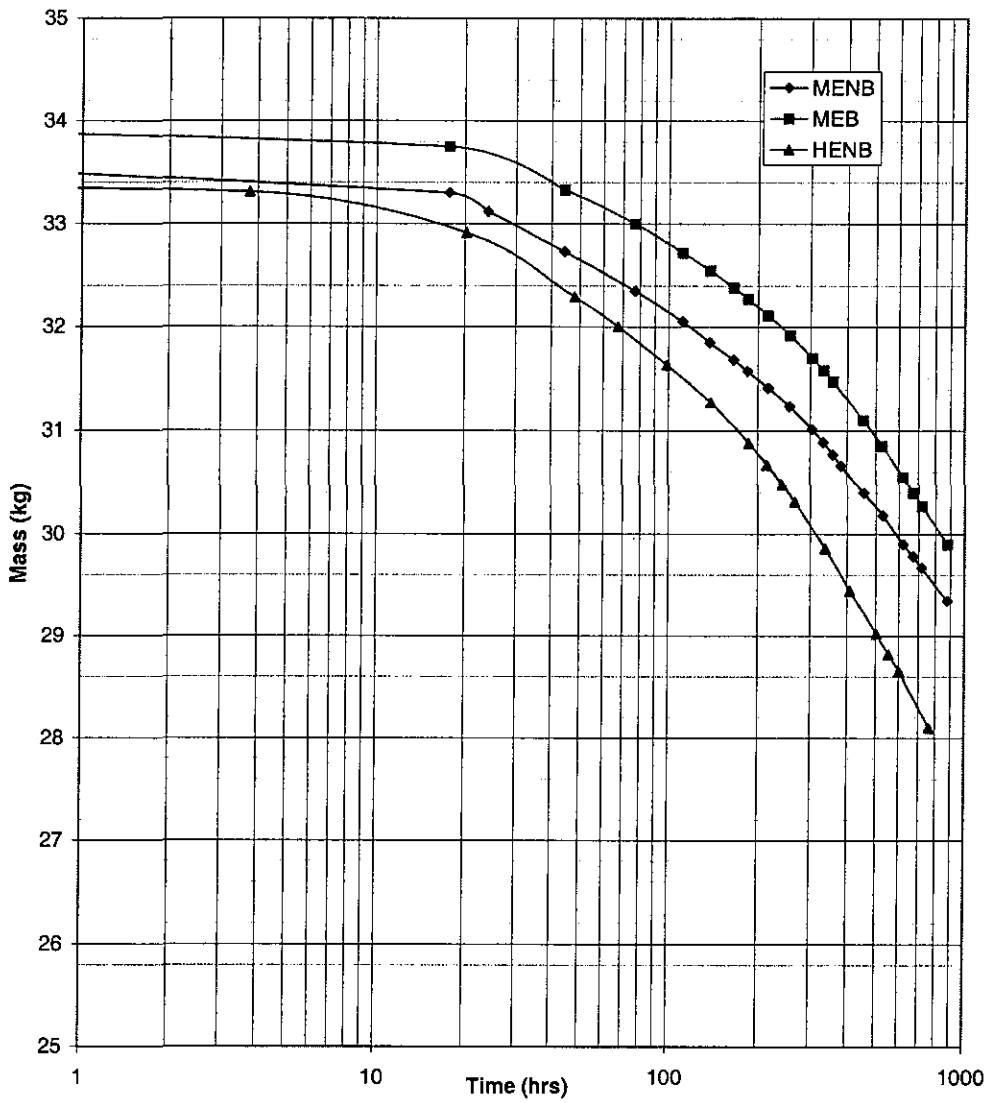
TABLE L7 SLURRY DEPOSITION SIMULATION - LOW SEDIMENT- DRAINED FIRST STAGE

Time	Water		Slurry									
(hrs)	Tape Reading (mm)	Height Above Slurry (mm)	Tape Reading (mm)	Corrected Height (mm)	Saturated Density (t/m^3)	Volume (%)	Dry Density (t/m^3)	Void Ratio	Ave Eff Stress (kPa)	m_v	k (m/s)	C_v (m^2/yr)
0.001	4599	0	4599	499	1.22	100	0.390	4.974	2.983	N/A		N/A
0.017	4595	0	4595	495	1.22	99.1984	0.393	4.926	2.970			
0.1	4585	6	4579	479	1.23	95.99198	0.406	4.735	2.921			
0.27	4578	23	4555	455	1.24	91.18236	0.428	4.448	2.887			
0.35	4576	38	4538	438	1.25	87.77555	0.444	4.244	2.877			
0.85	4570	80	4490	390	1.28	78.15631	0.499	3.669	2.847			
1.43	4565	119	4446	346	1.32	69.33868	0.562	3.143	2.823			
2.35	4560	130	4430	330	1.34	66.13226	0.590	2.951	2.798			
4.52	4553	150	4403	303	1.37	60.72144	0.642	2.628	2.764			
19.4	4527	164	4363	263	1.42	52.70541	0.740	2.149	2.637			
20.68	4520	158	4362	262	1.42	52.50501	0.743	2.137	2.602		2.48E-06	

Ref:ARB Drive/Data_ARB/2111563/Simulation/Tables-DoloMix&Low

Client:	Newcastle Port Corporation	Job No. :	21/11563/06
Project:	SADM - EIS		
Location:	Newcastle		
METHOD:	**LM Method**	**Client Sample ID:**	**Sediment**

AIR DRYING TEST - EXCAVATED 'HIGH' & 'MEDIUM' SEDIMENTS CHANGE IN TOTAL MASS WITH TIME

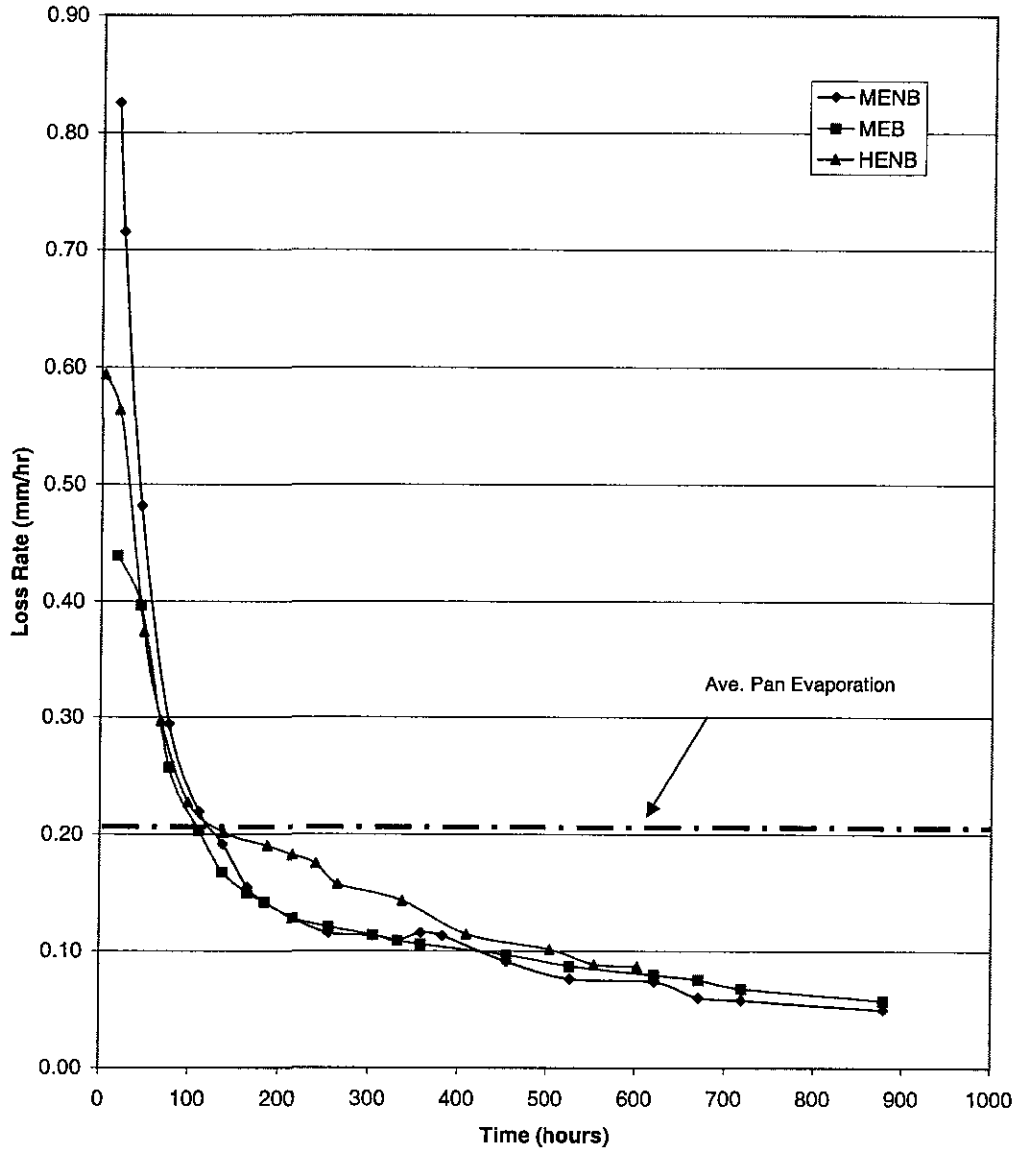


File Name:	Arb computer\arb drive\ Data_ARB\2111563\Air Drying\Air Drying Tests (exc) 2 & Fig.xls
Checked By:	
Date:	28/4/03

GHD-LONGMAC
36 Oxley Street, Crows Nest, N.S.W. 2065
Telephone: (02) 9439 4033 Fax: (02) 9436 0606
GEOTECHNICAL TESTING SERVICES

Client:	Newcastle Port Corporation	Job No. :	21/11563/06
Project:	SADM - EIS		
Location:	Newcastle		
METHOD:	**LM Method**	**Client Sample ID:**	**Sediment**

AIR DRYING TEST - EXCAVATED 'HIGH' & 'MEDIUM' SEDIMENTS RATE OF WATER LOSS WITH TIME

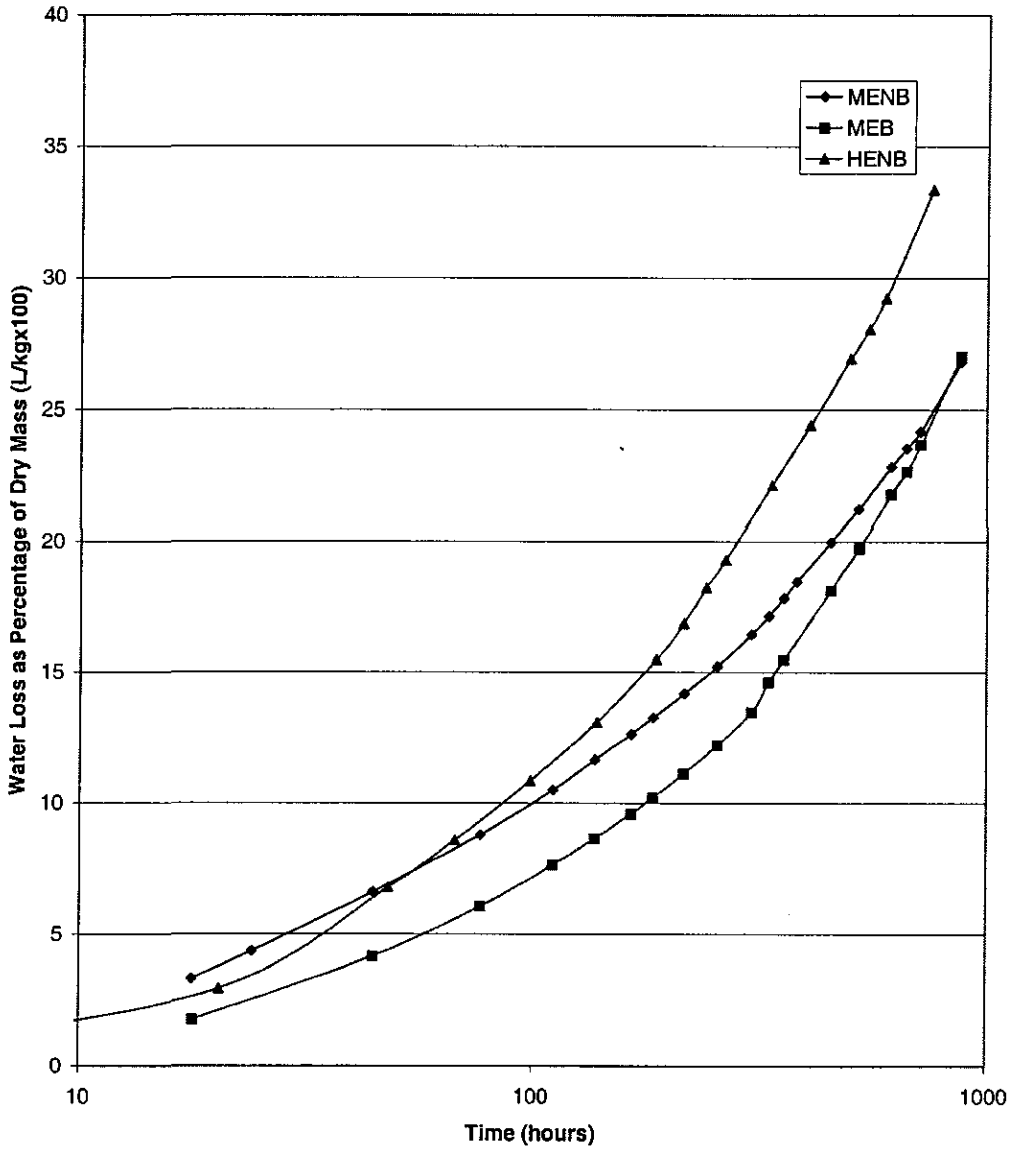


File Name:	Arb computer\arb drive\ Data_ARB\2111563\Air Drying\Air Drying Test (exc) 2 & loss rate Fig.xls
Checked By:	
Date:	3/4/03

GHD-LONGMAC
36 Oxley Street, Crows Nest, N.S.W. 2065
Telephone: (02) 9439 4033 Fax: (02) 9436 0606
GEOTECHNICAL TESTING SERVICES

Client:	Newcastle Port Corporation	Job No. :	21/11563/06
Project:	SADM - EIS		
Location:	Newcastle		
METHOD:	**LM Method**	**Client Sample ID:**	**Sediment**

AIR DRYING TEST - EXCAVATED 'HIGH' & 'MEDIUM' SEDIMENTS CUMULATIVE WATER LOSS WITH TIME

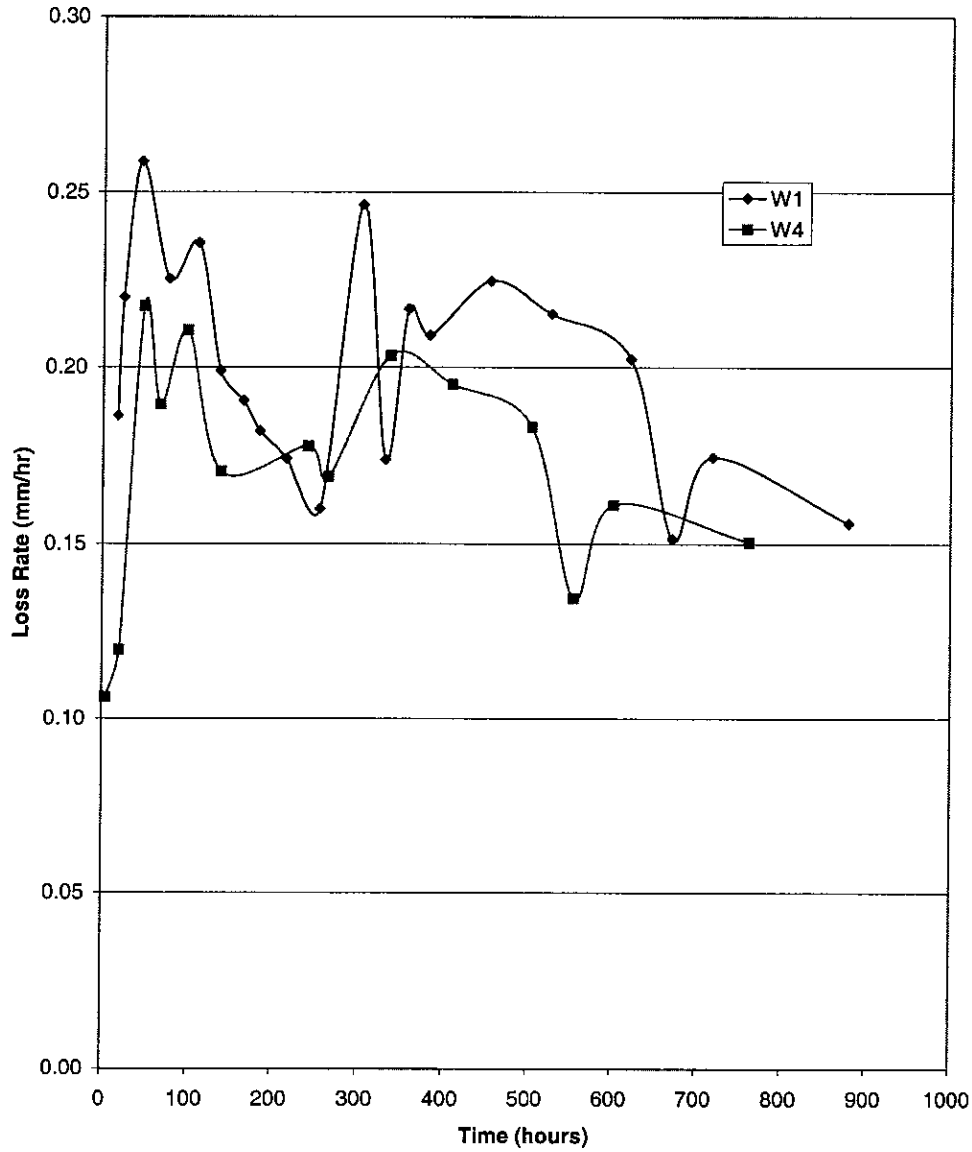


File Name:	Arb computer\arb drive\ Data_ARB\2111563\Air Drying\modified\Air Drying Test (exc) 2 & Comp WL Fig.xls
Checked By:	
Date:	24/4/03

GHD-LONGMAC
36 Oxley Street, Crows Nest, N.S.W. 2065
Telephone: (02) 9439 4033 Fax: (02) 9436 0606
GEOTECHNICAL TESTING SERVICES

Client:	Newcastle Port Corporation	Job No. :	21/11563/06
Project:	SADM - EIS		
Location:	Newcastle		
METHOD:	**LM Method**	**Client Sample ID:**	**Sediment**

AIR DRYING TEST - FREE WATER SURFACE RATE OF LOSS WITH TIME



File Name:	Arb computer\arb drive\ Data_ARB\2111563\Air Drying\Air Drying Tests (water) 2 & loss rate Fig.xls
Checked By:	
Date:	28/4/08

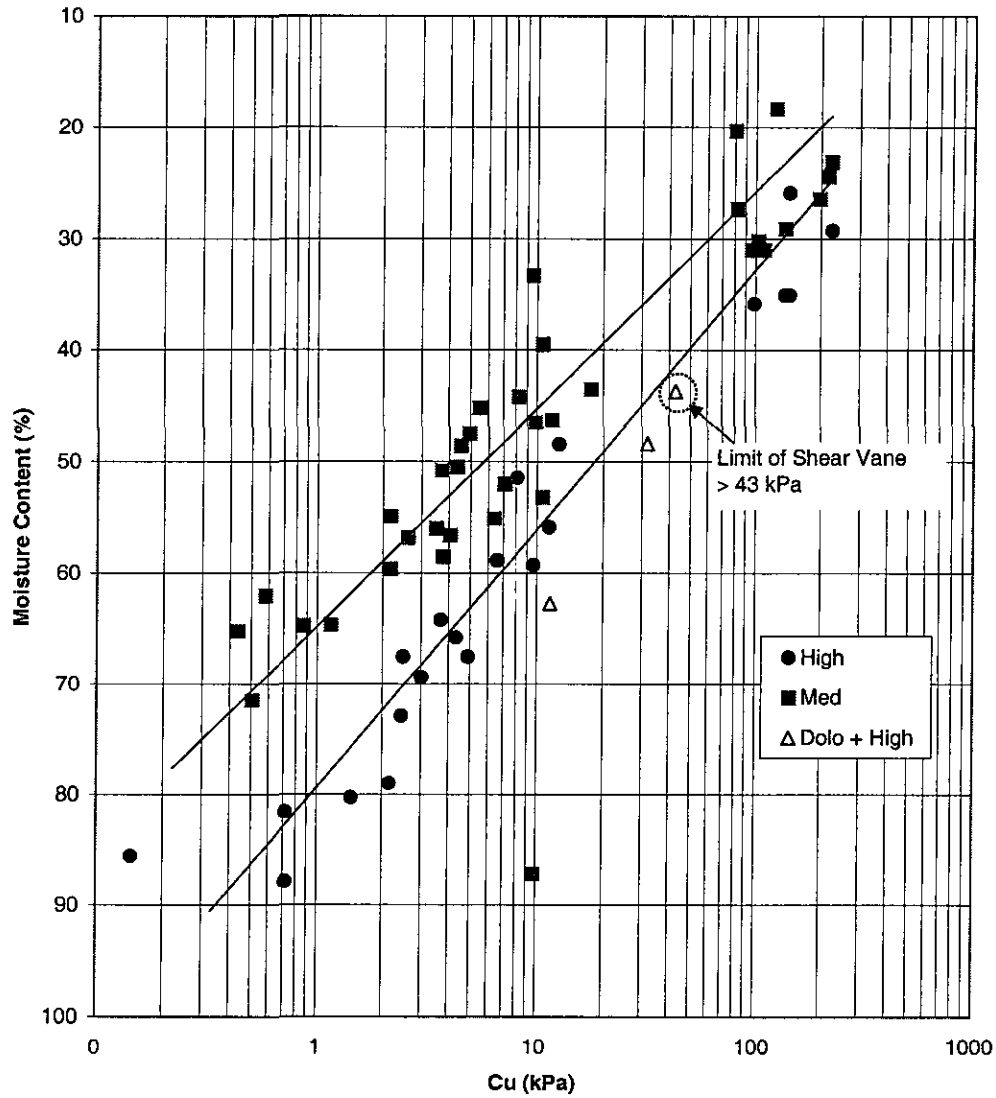
GHD-LONGMAC
36 Oxley Street, Crows Nest, N.S.W. 2065
Telephone: (02) 9439 4033 Fax: (02) 9436 0606
GEOTECHNICAL TESTING SERVICES

Appendix A5
Moisture Content vs Shear Strength Plot

Report No. 11228

Client:	Newcastle Port Corporation	Job No. :	21/11563/06
Project:	SADM - EIS		
Location:	Newcastle		
METHOD:	**LM Method**	**Client Sample ID:**	**Sediment**

MOISTURE CONTENT VS SHEAR STRENGTH



File Name:	Arb computer\arb drive\ Data_ARB\2111563\CDF-Consol\ MC vs Cu Fig.xls
Checked By:	
Date:	28/4/03

GHD-LONGMAC
36 Oxley Street, Crows Nest, N.S.W. 2065
Telephone: (02) 9439 4033 Fax: (02) 9436 0606
GEOTECHNICAL TESTING SERVICES

Appendix A6
Triaxial Permeability Test Certificates

Report No's 11154 11155 11222 11223 SL4019/1(Coffey)

Triaxial Permeability - Report

Report No. 11154

Client:	Newcastle Port Corporation
Project:	South Arm Dredging Masterplan
Location:	Newcastle, NSW
TEST METHOD :	AS.1289.6.7.3

Job No.:	2111563/07
Sample No.:	3215/33
Test Hole No.:	10%PC
Depth (m) :	n/a
Client Sample ID :	10% PC

SAMPLE INFORMATION

Length of Sample :	**(mm)**	102.6
Diameter of Sample :	**(mm)**	50.4
Initial Moist. Content :	**(%)**	n/av
Final Moist. Content :	**(%)**	44.4
Initial Dry Density :	**(t/m³)**	n/a
Final Dry Density :	**(t/m³)**	1.101
Density Ratio:	**(%)**	n/a
Moisture Ratio:	**(%)**	n/a
Compactive Effort :		n/a

SAMPLE HISTORY

Sampled & moulded by DOLO MATRIX

SATURATION STAGE

Cell Pressure :	**(kPa)**	250
Back Pressure :	**(kPa)**	200
B Test :	**(%)**	97

CONSOLIDATION STAGE

Cell Pressure :	**(kPa)**	n/a
Back Pressure :	**(kPa)**	n/a
Drainage Path :	**(cm)**	n/a
Volume Change :	**(mLs)**	nt
t50 :	**(min)**	nt

Direction Drainage

Top Valve	☐	**Closed**
	☒	**Open**
Bottom Valve :	☐	**Closed**
	☒	**Open**

PERMEABILITY STAGE

Permeant :		De aired water	**Back Pressure - top :**	**(kPa)**	0
Cell Pressure :	**(kPa)**	250	**- bottom :**	**(kPa)**	200

TEST RESULTS	k (m/sec)	Run Time (hrs)	Notes/Comments
4	1.4 E -09	2.7	
5	1.4 E -09	2.0	
6	1.4 E -09	2.1	
7	1.3 E -09	3.0	

REMARKS

Initial Wet Density = 1.536 t/m³, Final Wet Density = 1.589 t/m³

Tested by:	DB/SI
Date tested:	07/03/03
Checked by:	
Authorised Signatory :	S. Innain
Date:	27.03.03

GHD - LONGMAC
36 Oxley Street, Crows Nest NSW 2065
Tel: (02) 9439 4033 Fax: (02) 9436 0606
GEOTECHNICAL TESTING SERVICES

This laboratory is accredited by the National Association of Testing Authorities, Australia. The tests reported herein have been performed in accordance with its terms of accreditation. NATA Accredited Laboratory Number 679

This laboratory certificate may not be reproduced except in full unless permission for the publication of an approved extract has been obtained from GHD - LongMac.

Triaxial Permeability - Report

Report No. 11155

Client:	Newcastle Port Corporation
Project:	South Arm Dredging Masterplan
Location:	Newcastle, NSW
TEST METHOD :	AS.1289.6.7.3

Job No.:	2111563
Sample No.:	3215/34
Test Hole No.:	20%PC
Depth (m) :	n/a
Client Sample ID :	20% PC

SAMPLE INFORMATION

Length of Sample :	**(mm)**	101.9
Diameter of Sample :	**(mm)**	50.8
Initial Moist. Content :	**(%)**	n/av
Final Moist. Content :	**(%)**	38.8
Initial Dry Density :	**(t/m³)**	n/a
Final Dry Density :	**(t/m³)**	1.192
Density Ratio:	**(%)**	n/a
Moisture Ratio:	**(%)**	n/a
Compactive Effort :		n/a

SAMPLE HISTORY

Sampled & moulded by DOLO MATRIX

SATURATION STAGE

Cell Pressure :	**(kPa)**	250
Back Pressure :	**(kPa)**	200
B Test :	**(%)**	97

CONSOLIDATION STAGE

Cell Pressure :	**(kPa)**	n/a
Back Pressure :	**(kPa)**	n/a
Drainage Path :	**(cm)**	n/a
Volume Change :	**(mLs)**	n/a
t50 :	**(min)**	n/a

Direction Drainage

Top Valve	☐	**Closed**
	☒	**Open**
Bottom Valve :	☐	**Closed**
	☒	**Open**

PERMEABILITY STAGE

Permeant :		De-aired water	**Back Pressure - top :**	**(kPa)**	0
Cell Pressure :	**(kPa)**	250	**- bottom :**	**(kPa)**	200

TEST RESULTS	k (m/sec)	Run Time (hrs)	Notes/Comments
2	4.8 E -10	23	
3	2.3 E -10	64	
4	1.8 E -10	63	
5	1.8 E -10	8	

REMARKS

Initial wet Density = 1.611 t/m³, Final Wet Density = 1.655 t/m³

Tested by:	DB/SI
Date tested:	7/03/03
Checked by:	
Authorised Signatory :	S. Ignatin
Date:	27.03.03

GHD - LONGMAC
36 Oxley Street, Crows Nest NSW 2065
Tel: (02) 9439 4033 Fax: (02) 9436 0606
GEOTECHNICAL TESTING SERVICES

This laboratory is accredited by the National Association of Testing Authorities, Australia. The tests reported herein have been performed in accordance with its terms of accreditation. NATA Accredited Laboratory Number 679

This laboratory certificate may not be reproduced except in full unless permission for the publication of an approved extract has been obtained from GHD - LongMac.

Triaxial Permeability - Report

Report No. 11222

Client:	Newcastle Port Corporation
Project:	South Arm Dredging Masterplan
Location:	Newcastle
TEST METHOD :	AS.1289.6.7.3

Job No.:	2111563/00
Sample No.:	3215/46
Test Hole No.:	10%PC
Depth (m) :	n/a
Client Sample ID :	10% PC

SAMPLE INFORMATION

Length of Sample :	**(mm)**	96.4
Diameter of Sample :	**(mm)**	48.9
Initial Moist. Content :	**(%)**	n/av
Final Moist. Content :	**(%)**	38.7
Initial Dry Density :	**(t/m³)**	n/a
Final Dry Density :	**(t/m³)**	1.194
Density Ratio:	**(%)**	n/a
Moisture Ratio:	**(%)**	n/a
Compactive Effort :		n/a

SAMPLE HISTORY

Moulded by GHD-LongMac
Tested after 7 day cure @ 23°C

SATURATION STAGE

Cell Pressure :	**(kPa)**	250
Back Pressure :	**(kPa)**	200
B Test :	**(%)**	nt

CONSOLIDATION STAGE

Cell Pressure :	**(kPa)**	200
Back Pressure :	**(kPa)**	100
Drainage Path :	**(cm)**	9.64
Volume Change :	**(mLs)**	nt
t50 :	**(min)**	nt

Direction Drainage

Top Valve	☐	**Closed**
	☒	**Open**
Bottom Valve :	☐	**Closed**
	☒	**Open**

PERMEABILITY STAGE

Permeant :		De-aired Water	**Back Pressure - top :**	**(kPa)**	0
Cell Pressure :	**(kPa)**	200	**- bottom :**	**(kPa)**	100

TEST RESULTS	k (m/sec)	Run Time (hrs)	Notes/Comments
4	6.9 E -10	15.9	
5	3.7 E -10	8.2	
6	3.9 E -10	15.8	
7	4.0 E -10	6.5	

REMARKS

Initial Wet Density (t/m³) = 1.312
Final Wet Density (t/m³) = 1.656

Tested by:	DB
Date tested:	7/03/03
Checked by:	
Authorised Signatory :	S. Hunting
Date:	17.03.03

GHD - LONGMAC
36 Oxley Street, Crows Nest NSW 2065
Tel: (02) 9439 4033 Fax: (02) 9436 0606
GEOTECHNICAL TESTING SERVICES

This laboratory is accredited by the National Association of Testing Authorities, Australia. The tests reported herein have been performed in accordance with its terms of accreditation. NATA Accredited Laboratory Number 679

This laboratory certificate may not be reproduced except in full unless permission for the publication of an approved extract has been obtained from GHD - LongMac.

Triaxial Permeability - Report

Report No. : 11223

Client:	Newcastle Port Corporation
Project:	South Arm Dredging Masterplan
Location:	Newcastle, NSW
TEST METHOD :	AS.1289.6.7.3

Job No.:	2111563/00
Sample No.:	3215/47
Test Hole No.:	n/a
Depth (m) :	n/a
Client Sample ID :	3.5 % Dolo

SAMPLE INFORMATION

Length of Sample :	(mm)	99.0
Diameter of Sample :	(mm)	50.0
Initial Moist. Content :	(%)	38.1
Final Moist. Content :	(%)	34.7
Initial Dry Density :	(t/m³)	1.243
Final Dry Density :	(t/m³)	1.227
Density Ratio:	(%)	86.5
Moisture Ratio:	(%)	144
Compactive Effort :		Standard

SAMPLE HISTORY

Moulded by GHD-LongMac
MDD = 1.43 t/m³
OMC = 26.5 %

SATURATION STAGE

Cell Pressure :	(kPa)	515
Back Pressure :	(kPa)	500
B Test :	(%)	95

CONSOLIDATION STAGE

Cell Pressure :	(kPa)	350
Back Pressure :	(kPa)	300
Drainage Path :	(cm)	9.9
Volume Change :	(mLs)	nt
t50 :	(min)	nt

Direction Drainage

Top Valve	☐	**Closed**
	☒	**Open**
Bottom Valve :	☐	**Closed**
	☒	**Open**

PERMEABILITY STAGE

Permeant :		De-aired Water	**Back Pressure - top :**	(kPa)	0
Cell Pressure :	(kPa)	350	**- bottom :**	(kPa)	300

TEST RESULTS	k (m/sec)	Run Time (hrs)	Notes/Comments
4	1.7E-10	15.9	
5	1.9E-10	8.2	
6	1.8E-10	15.8	
7	1.8E-10	6.5	

REMARKS
Initial Wet Density = 1.717 t/m³
Final Wet Density = 1.652 t/m³

Tested by:	DB
Date tested:	18.03.03
Checked by:	
Authorise Signatory :	S. Thnatin
Date:	22.03.03

GHD - LONGMAC
36 Oxley Street, Crows Nest NSW 2065
Tel: (02) 9439 4033 Fax: (02) 9436 0606
GEOTECHNICAL TESTING SERVICES

This laboratory is accredited by the National Association of Testing Authorities, Australia. The tests reported herein have been performed in accordance with its terms of accreditation. NATA Accredited Laboratory Number 679

This laboratory certificate may not be reproduced except in full unless permission for the publication of an approved extract has been obtained from GHD - LongMac.

Coffey Geosciences Pty Ltd A.C.N. 056 335 516

Geotechnical | Resources | Environmental | Technical | Project Management

142 Wicks Road, North Ryde, NSW, 2113
Ph: (02) 9888 7444 Fax (02) 9878 8155

test results

client : *GHD-LONGMAC PTY LTD*
principal :
project : *MATERIAL ASSESSMENT – Dolocrete 10%*
location :

job no : *SL4019/1*
laboratory : *SYDNEY*
report date : *25 March 2003*
test report :

test procedure : *AS 1289.6.7.3*
test date : *7/3/03 to 13/3/03*

Sample Identification	Sample No. 3215/35
CONSTANT HEAD PERMEABILITY m/sec	*1.4 x E -9*
Initial Moisture Content %	*As received*
Initial Wet Density t/m³	*1.66*
Specimen Dimensions	
Diameter mm	*50.35*
Length mm	*101.7*
Diameter to Length Ratio	*2:1*
Mean Effective Stress kPa	*50*
Material Description	

remarks : ***Sample supplied by the client on the 7/3/03.***
The specimens was tested in an as received condition.

This laboratory is accredited by the National Association of Testing Authorities, Australia. The tests reported herein have been performed in accordance with its terms of accreditation. This document shall not be reproduced except in full.

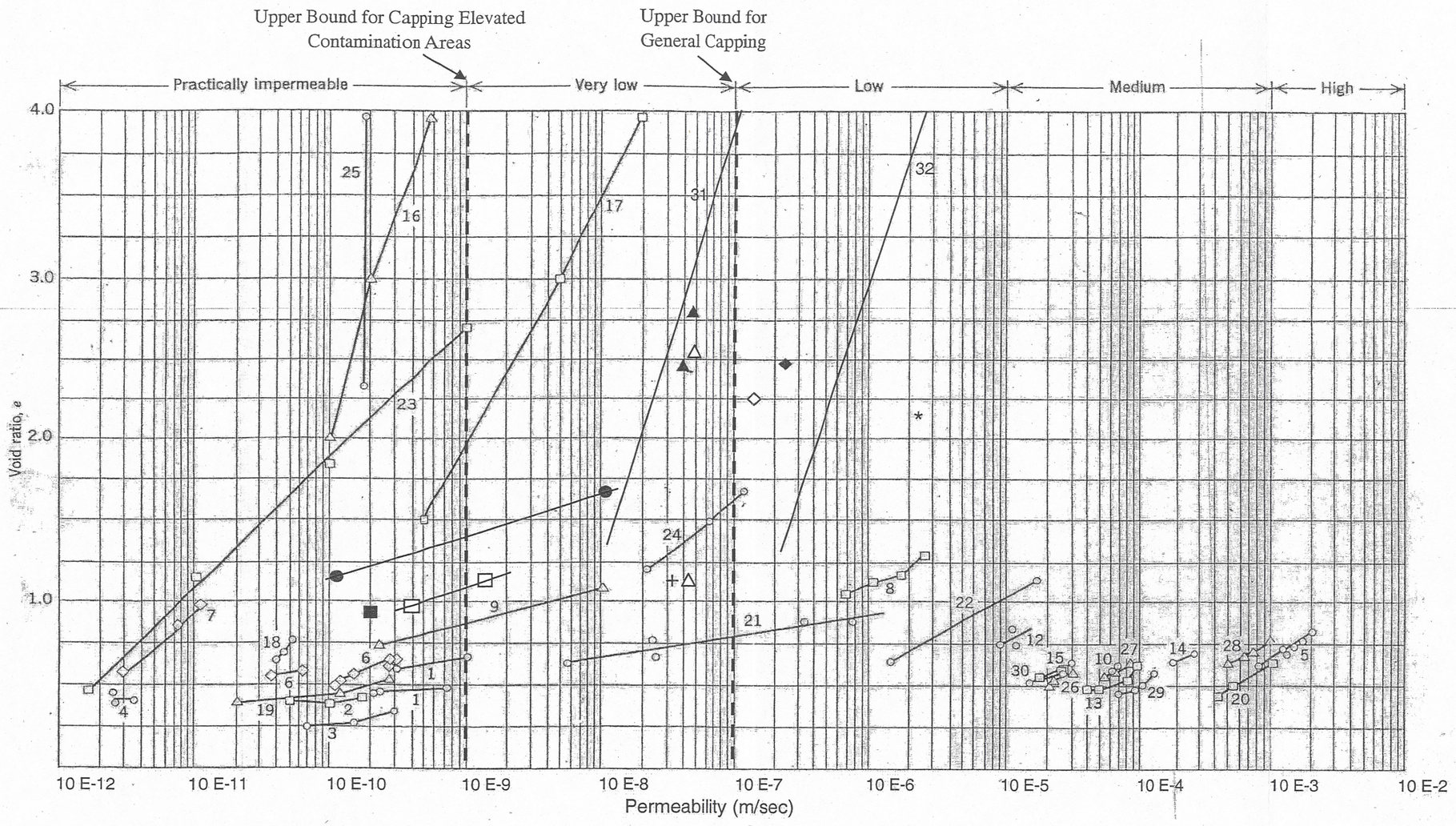
NATA Accredited Laboratory No. 431
Date : *25 March 2003*
Authorised Signature:
James Russell
Laboratory Manager

Form Number L1.0R1 Version 5.1

COPYRIGHT (c) Coffey Geosciences Pty Ltd - 1998

Appendix A7
Permeability vs Void Ratio

Figure No. L5



Soil Identification Code

1 Compacted caliche	10 Ottawa sand	19 Lean clay
2 Compacted caliche	11 Sand—Gaspee Point	20 Sand—Union Falls
3 Silty sand	12 Sand—Franklin Falls	21 Silt—North Carolina
4 Sandy clay	13 Sand—Scituate	22 Sand from dike
5 Beach sand	14 Sand—Plum Island	23 Sodium—Boston blue clay
6 Compacted Boston blue clay	15 Sand—Fort Peck	24 Calcium kaolinite
7 Vicksburg buckshot clay	16 Silt—Boston	25 Sodium montmorillonite
8 Sandy clay	17 Silt—Boston	26–30 Sand (dam filter)
9 Silt—Boston	18 Loess	

Ref: Lambe & Whitman "Soil Mechanics"
Pg 286 Fig 19.5

Legend

31 'Mild' and 'medium' Fines Kooragang
32 'Hot' fines Kooragang
● Dolo - 3.5% Dolocrete with 'high' sediment
□ PC/Mix - 10% Portland Cement with mixed sediment
■ PC.Mix - 20% Portland Cement with mixed sediment
\+ Mix - Mixed sediment at excavated moisture content

* Low - Slurry (first stage)
◆ High -Slurry (first stage)
◇ Medium - Slurry (first stage)
▲ High - Slurry (second stage)
△ Medium - (second stage)

GHD
36 Oxley Street, Crows Nest, N.S.W. 2065
Tel: (02) 9439 4033
Fax: (02) 9436 0606
mail@longmac.com.au
GHD-LONGMAC
LM

SADM EIS

Permeability Test Data

Designed:	ARB
Drawn:	FdF
Checked:	Date: 5/5/03
Date:	May 2003

Figure No: L5
Job No: 21/11563
Scale: —

©

Appendix B
AMDEL Test Certificates

This Laboratory is accredited by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of accreditation. This document shall not be reproduced except in full.
NATA Accredited Laboratory Number: 1464

INDUSTRIAL SERVICES DIVISION

ABN 30 008 127 802

Correspondence to:
PO Box 514
HORNSBY NSW 1630

5 Kelray Place
ASQUITH NSW 2077
Telephone: (02) 9482 1922
Facsimile: (02) 9482 1734

CERTIFICATE OF ANALYSIS

Contents :
1. Cover Pages (2)
2. Analysis Report Pages
3. QA/QC Appendix
4. Additional Reports - External (if applicable)
5. Chain of Custody (if applicable)

Report No.	:	3E0230
Attention	:	Ali Stone
Client	:	Patterson Britton & Partners Pty Ltd : PO Box 515 : NORTH SYDNEY : NSW 2059
Samples	:	12
Reference/Order	:	3878-08
Project	:	SOUTH ARM HUNTER RIVER DREDGING EIS
Received Samples	:	22/01/03 Instructions : 22/01/03
Date Reported	:	03/02/03

PLEASE SEE FOLLOWING PAGE FOR METHOD LISTING

RESULTS

All samples were analysed as received. This report relates specifically to the samples as received. Results relate to the source material only to the extent that the samples as supplied are truly representative of the sample source. This report replaces any preliminary results issued. Note that for methods indicated with "*", NATA accreditation does not cover the performance of this service. Three significant figures (or 2 for <10PQL) are reported for statistical purposes only. Where "Total" concentrations are reported for organic suites of compounds this is the summation of the individual compounds and the PQL is noted for reporting purposes only. This report has been auto-authorized by NATA signatories for PDF format. Refer to the method descriptions for further information.

PLEASE SEE ATTACHED PAGES FOR RESULTS

R. Mooney B.Sc.(Hons)Dip. FDA
Technical Services Manager Sydney

amdel

Report No. : 3E0230

Please note: Where samples are collected/submitted over several days, the date on which the last samples were analysed or extracted is reported.
Unless Ferrous Iron is determined on site, the possibility of a ferrous-ferric ratio change may occur.

Method	Description	Extracted	Analysed	Authorised
E7500	Moisture (%w/w)	24/01/03	28/01/03	SYS 096
E1230	TPH C6-C9 by Purge & Trap	23/01/03	29/01/03	DUM 094
E1221	TPH (C10-C36)	23/01/03	24/01/03	DUM 094
E5910	Metals by ICP-AES	24/01/03	30/01/03	RMO 093
E1110	Polycyclic Aromatic Hydrocarbons	23/01/03	28/01/03	MNG 095
E1142	Total Phenolics as phenol	28/01/03	29/01/03	RMO 101
E3330	Ammonia-N in Soil (1:5 2MKCl extract)	28/01/03	29/01/03	RMO 101
E5950	Mercury in Soil	25/01/03	29/01/03	RMO 093
E3450	Total Cyanide in Soil	23/01/03	28/01/03	RMO 101

amdel

Job Number : 3E0230

Client : Patterson Britton & Partners Pty Ltd

Reference : 3878-08

Project : SOUTH ARM HUNTER RIVER DREDGING EIS

Analyte	Lab No	E22149	E22150	E22151	E22152	E22153
	Sample Id	LEA	LEB	LEPA	LEPB	MEA
	PQL					
Moisture Content	1	24%	26%	22%	22%	42%
E1230 TPH in Soil by Purge & Trap/GC-MS						
C6-C9 Fraction	5	nd	nd	nd	nd	nd
E1221 TPH in Soil						
C10-C14 Fraction	10	460	480	680	620	1700
C15-C28 Fraction	50	1100	1100	1100	980	4700
C29-C36 Fraction	50	240	200	160	160	860
E5910 Metals in Soil						
Lead	5	18	19	18	21	140
Arsenic	5	nd	nd	nd	nd	10
Zinc	5	81	93	92	94	920

PQL = Practical Quantitation Limit

LNR = Samples Listed not Received

nd = <PQL

-- = Not Applicable

Refer to Amdel standard laboratory qualifier codes for comments.

Soils : mg/kg (ppm) dry weight unless otherwise specified

Waters : mg/L (ppm) unless otherwise specified in Method Header

Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

amdel

Job Number : 3E0230

Client : Patterson Britton & Partners Pty Ltd

Reference : 3878-08

Project : SOUTH ARM HUNTER RIVER DREDGING EIS

Analyte	Lab No / Sample Id / PQL	E22154 / MEB	E22155 / MEPA	E22156 / MEPB	E22157 / HEA	E22158 / HEB
Moisture Content	1	40%	42%	43%	48%	50%
E1230 TPH in Soil by Purge & Trap/GC-MS						
C6-C9 Fraction	5	nd	nd	nd	17	17
E1221 TPH in Soil						
C10-C14 Fraction	10	1500	560	1300	4400	4400
C15-C28 Fraction	50	3100	1200	2400	7300	6600
C29-C36 Fraction	50	740	280	580	1000	960
E5910 Metals in Soil						
Lead	5	130	100	130	220	240
Arsenic	5	9	7	9	10	11
Zinc	5	840	670	830	1200	1400

PQL = Practical Quantitation Limit

LNR = Samples Listed not Received

nd = <PQL

-- = Not Applicable

Refer to Amdel standard laboratory qualifier codes for comments.

Soils : mg/kg (ppm) dry weight unless otherwise specified

Waters : mg/L (ppm) unless otherwise specified in Method Header

Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

amdel

Job Number : 3E0230

Client : Patterson Britton & Partners Pty Ltd

Reference : 3878-08

Project : SOUTH ARM HUNTER RIVER DREDGING EIS

Analyte	Lab No	E22159	E22160			
	Sample Id	HEPA	HEPB			
	PQL					
Moisture Content	1	51%	51%			
E1230 TPH in Soil by Purge & Trap/GC-MS						
C6-C9 Fraction	5	9	21			
E1221 TPH in Soil						
C10-C14 Fraction	10	4000	5700			
C15-C28 Fraction	50	5300	8000			
C29-C36 Fraction	50	820	1000			
E5910 Metals in Soil						
Lead	5	190	260			
Arsenic	5	9	12			
Zinc	5	1100	1500			

PQL = Practical Quantitation Limit

LNR = Samples Listed not Received

nd = <PQL

-- = Not Applicable

Refer to Amdel standard laboratory qualifier codes for comments.

Soils : mg/kg (ppm) dry weight unless otherwise specified

Waters : mg/L (ppm) unless otherwise specified in Method Header

Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

amdel

Job Number : 3E0230
Client : Patterson Britton & Partners Pty Ltd
Reference : 3878-08
Project : SOUTH ARM HUNTER RIVER DREDGING EIS

Analyte	Lab No	E22149	E22150	E22151	E22152	E22153
	Sample Id	LEA	LEB	LEPA	LEPB	MEA
	PQL					
E1110 Priority PAH's in Soil						
Naphthalene	0.5	350	360	450	420	1000
Acenaphthylene	0.5	6.6	6.0	8.4	9.0	43
Acenaphthene	0.5	28	25	30	31	98
Fluorene	0.5	14	12	19	21	56
Phenanthrene	0.5	37	34	44	44	220
Anthracene	0.5	12	13	18	25	100
Fluoranthene	0.5	39	39	45	42	300
Pyrene	0.5	41	42	45	43	230
Benz(a)anthracene	0.5	11	12	16	13	92
Chrysene	0.5	8.4	8.8	12	10	60
Benzo(b) & (k)fluoranthene	1	19	20	25	22	140
Benzo(a)pyrene	0.5	13	13	17	15	93
Indeno(1.2.3-cd)pyrene	0.5	6.8	7.0	9.0	7.8	43
Dibenz(a.h)anthracene	0.5	1.0	1.2	1.6	1.4	8.4
Benzo(g.h.i)perylene	0.5	7.6	8.2	10	8.8	46
Total USEPA Priority PAHs	0.5	600	600	750	710	2500
2-Fluorobiphenyl-SURROGATE	1	100%	99%	105%	103%	130%
Anthracene-d10-SURROGATE	1	113%	107%	112%	106%	107%
p-Terphenyl-D14-SURROGATE	1	112%	105%	110%	106%	105%
E1142 Total Phenolics as Phenol in Soil						
Total Phenolics	0.1	0.1	nd	0.2	0.1	0.6

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = <PQL
-- = Not Applicable

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified in Method Header
Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

Refer to Amdel standard laboratory qualifier codes for comments.

amdel

Job Number : 3E0230
Client : Patterson Britton & Partners Pty Ltd
Reference : 3878-08
Project : SOUTH ARM HUNTER RIVER DREDGING EIS

Analyte	Lab No / Sample Id / PQL	E22154 MEB	E22155 MEPA	E22156 MEPB	E22157 HEA	E22158 HEB
E1110 Priority PAH's in Soil						
Naphthalene	0.5	960	380	900	2500	2800
Acenaphthylene	0.5	26	10	17	77	65
Acenaphthene	0.5	54	23	47	420	310
Fluorene	0.5	38	16	31	250	200
Phenanthrene	0.5	130	43	98	540	460
Anthracene	0.5	35	17	27	150	130
Fluoranthene	0.5	130	45	98	320	300
Pyrene	0.5	110	39	78	240	240
Benz(a)anthracene	0.5	35	15	27	71	78
Chrysene	0.5	25	12	19	48	60
Benzo(b) & (k)fluoranthene	1	50	23	36	120	110
Benzo(a)pyrene	0.5	33	15	24	71	78
Indeno(1.2.3-cd)pyrene	0.5	18	8.0	12	37	40
Dibenz(a.h)anthracene	0.5	3.4	1.4	2.4	6.8	7.8
Benzo(g.h.i)perylene	0.5	19	9.0	13	40	45
Total USEPA Priority PAHs	0.5	1700	660	1400	4900	4900
2-Fluorobiphenyl-SURROGATE	1	128%	103%	107%	97%	104%
Anthracene-d10-SURROGATE	1	109%	108%	109%	105%	107%
p-Terphenyl-D14-SURROGATE	1	103%	99%	99%	79%	91%
E1142 Total Phenolics as Phenol in Soil						
Total Phenolics	0.1	0.8	0.2	0.3	1.0	1.2

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = <PQL
-- = Not Applicable

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified in Method Header
Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

Refer to Amdel standard laboratory qualifier codes for comments.

amdel

Job Number : 3E0230
Client : Patterson Britton & Partners Pty Ltd
Reference : 3878-08
Project : SOUTH ARM HUNTER RIVER DREDGING EIS

Analyte	Lab No / Sample Id / PQL	E22159 / HEPA	E22160 / HEPB			
E1110 Priority PAH's in Soil						
Naphthalene	0.5	2400	3300			
Acenaphthylene	0.5	43	73			
Acenaphthene	0.5	260	330			
Fluorene	0.5	150	240			
Phenanthrene	0.5	320	570			
Anthracene	0.5	86	160			
Fluoranthene	0.5	200	400			
Pyrene	0.5	160	320			
Benz(a)anthracene	0.5	56	100			
Chrysene	0.5	42	79			
Benzo(b) & (k)fluoranthene	1	76	160			
Benzo(a)pyrene	0.5	58	110			
Indeno(1.2.3-cd)pyrene	0.5	44	88			
Dibenz(a.h)anthracene	0.5	5.6	11			
Benzo(g.h.i)perylene	0.5	32	65			
Total USEPA Priority PAHs	0.5	3900	6000			
2-Fluorobiphenyl-SURROGATE	1	102%	107%			
Anthracene-d10-SURROGATE	1	106%	112%			
p-Terphenyl-D14-SURROGATE	1	90%	90%			
E1142 Total Phenolics as Phenol in Soil						
Total Phenolics	0.1	1.8	1.2			

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = <PQL
-- = Not Applicable
Refer to Amdel standard laboratory qualifier codes for comments.

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified in Method Header
Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

amdel

Job Number : 3E0230
Client : Patterson Britton & Partners Pty Ltd
Reference : 3878-08
Project : SOUTH ARM HUNTER RIVER DREDGING EIS

Analyte	Lab No	E22149	E22150	E22151	E22152	E22153
	Sample Id	LEA	LEB	LEPA	LEPB	MEA
	PQL					
E3330 Ammonia-N in soil(1:5 2MKCL extract)						
Ammonia as N	0.1	37	39	49	41	29
E5950 Mercury in Soil						
Mercury	0.05	nd	0.06	0.06	nd	0.10
E3450 Total Cyanide in Soil						
Total Cyanide	0.5	1.0	0.7	1.2	1.6	71

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = <PQL
-- = Not Applicable

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified in Method Header
Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

Refer to Amdel standard laboratory qualifier codes for comments.

amdel

Job Number : 3E0230

Client : Patterson Britton & Partners Pty Ltd

Reference : 3878-08

Project : SOUTH ARM HUNTER RIVER DREDGING EIS

Analyte	Lab No	E22154	E22155	E22156	E22157	E22158
	Sample Id	MEB	MEPA	MEPB	HEA	HEB
	PQL					
E3330 Ammonia-N in soil(1:5 2MKCL extract)						
Ammonia as N	0.1	33	41	45	46	53
E5950 Mercury in Soil						
Mercury	0.05	0.09	0.10	0.11	0.18	0.29
E3450 Total Cyanide in Soil						
Total Cyanide	0.5	68	53	65	140	170

PQL = Practical Quantitation Limit

LNR = Samples Listed not Received

nd = <PQL

-- = Not Applicable

Refer to Amdel standard laboratory qualifier codes for comments.

Soils : mg/kg (ppm) dry weight unless otherwise specified

Waters : mg/L (ppm) unless otherwise specified in Method Header

Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

amdel

Job Number : 3E0230

Client : Patterson Britton & Partners Pty Ltd

Reference : 3878-08

Project : SOUTH ARM HUNTER RIVER DREDGING EIS

Analyte	Lab No / Sample Id / PQL	E22159 HEPA	E22160 HEPB			
E3330 Ammonia-N in soil(1:5 2MKCL extract)						
Ammonia as N	0.1	61	57			
E5950 Mercury in Soil						
Mercury	0.05	0.16	0.14			
E3450 Total Cyanide in Soil						
Total Cyanide	0.5	150	160			

PQL = Practical Quantitation Limit

LNR = Samples Listed not Received

nd = <PQL

-- = Not Applicable

Refer to Amdel standard laboratory qualifier codes for comments.

Soils : mg/kg (ppm) dry weight unless otherwise specified

Waters : mg/L (ppm) unless otherwise specified in Method Header

Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

amdel

This Laboratory is accredited by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of accreditation. This document shall not be reproduced except in full.

NATA Accredited Laboratory Number: 1464

INDUSTRIAL SERVICES DIVISION

ABN 30 008 127 802

Correspondence to:
PO Box 514
HORNSBY NSW 1630

5 Kelray Place
ASQUITH NSW 2077
Telephone: (02) 9482 1922
Facsimile: (02) 9482 1734

CERTIFICATE OF ANALYSIS

Contents :
1. Cover Pages (2)
2. Analysis Report Pages
3. QA/QC Appendix
4. Additional Reports - External (if applicable)
5. Chain of Custody (if applicable)

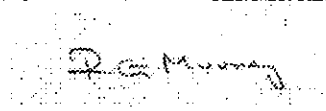
Report No.	:	3E0418
Attention	:	Ali Stone
Client	:	Patterson Britton & Partners Pty Ltd
	:	PO Box 515
	:	NORTH SYDNEY
	:	NSW 2059
Samples	:	18
Reference/Order	:	3878-08
Project	:	Hunter River
Received Samples	:	04/02/03
Instructions	:	04/02/03
Date Reported	:	11/02/03

PLEASE SEE FOLLOWING PAGE FOR METHOD LISTING

RESULTS

All samples were analysed as received. This report relates specifically to the samples as received. Results relate to the source material only to the extent that the samples as supplied are truly representative of the sample source. This report replaces any preliminary results issued. Note that for methods indicated with "*", NATA accreditation does not cover the performance of this service. Three significant figures (or 2 for <10PQL) are reported for statistical purposes only. Where "Total" concentrations are reported for organic suites of compounds this is the summation of the individual compounds and the PQL is noted for reporting purposes only. This report has been auto-authorized by NATA signatories for PDF format. Refer to the method descriptions for further information.

PLEASE SEE ATTACHED PAGES FOR RESULTS



R. Mooney B.Sc.(Hons)Dip. FDA
Technical Services Manager Sydney

amdel

Report No. : 3E0418

Please note: Where samples are collected/submitted over several days, the date on which the last samples were analysed or extracted is reported.
Unless Ferrous Iron is determined on site, the possibility of a ferrous-ferric ratio change may occur.

Method	Description	Extracted	Analysed	Authorised
E2670	Suspended Solids	04/02/03	05/02/03	RMO 101
E2790	Turbidity	05/02/03	06/02/03	RMO 101

amdel

Job Number : 3E0418

Client : Patterson Britton & Partners Pty Ltd

Reference : 3878-08

Project : Hunter River

Analyte	Lab No	E25158	E25159	E25160	E25161	E25162
	Sample Id	LS1K	HS1H	MS1Q	MS1L	MS1R
	PQL					
E2670 Suspended Solids in Water						
Suspended Solids	1	140	12	65	11	62
E2790 Turbidity in Water (NTU)						
Turbidity	0.1	15	2.6	16	3.6	0.5

PQL = Practical Quantitation Limit

LNR = Samples Listed not Received

nd = <PQL

-- = Not Applicable

Refer to Amdel standard laboratory qualifier codes for comments.

Soils : mg/kg (ppm) dry weight unless otherwise specified

Waters : mg/L (ppm) unless otherwise specified in Method Header

Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

amdel

Job Number : 3E0418
Client : Patterson Britton & Partners Pty Ltd
Reference : 3878-08
Project : Hunter River

Analyte	Lab No	E25163	E25164	E25165	E25166	E25167
	Sample Id	MS1O	HS1J	MS1P	HS1I	ME1J
	PQL					
E2670 Suspended Solids in Water						
Suspended Solids	1	56	30	30	9	59
E2790 Turbidity in Water (NTU)						
Turbidity	0.1	16	31	7.2	3.0	13

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = <PQL
-- = Not Applicable
Refer to Amdel standard laboratory qualifier codes for comments.

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified in Method Header
Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

amdel

Job Number : 3E0418
Client : Patterson Britton & Partners Pty Ltd
Reference : 3878-08
Project : Hunter River

Analyte	Lab No	E25168	E25169	E25170	E25171	E25172
	Sample Id	HS1G	MS1M	LE2I	LS1H	MS1N
	PQL					
E2670 Suspended Solids in Water						
Suspended Solids	1	5	17	39	8	16
E2790 Turbidity in Water (NTU)						
Turbidity	0.1	1.6	3.8	4.6	2.6	4.6

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = <PQL
-- = Not Applicable
Refer to Amdel standard laboratory qualifier codes for comments.

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified in Method Header
Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

This Laboratory is accredited by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of accreditation. This document shall not be reproduced except in full.
NATA Accredited Laboratory Number: 1464

INDUSTRIAL SERVICES DIVISION

ABN 30 008 127 802

Correspondence to:
PO Box 514
HORNSBY NSW 1630

5 Kelray Place
ASQUITH NSW 2077
Telephone: (02) 9482 1922
Facsimile: (02) 9482 1734

CERTIFICATE OF ANALYSIS

Contents :
1. Cover Pages (2)
2. Analysis Report Pages
3. QA/QC Appendix
4. Additional Reports - External (if applicable)
5. Chain of Custody (if applicable)

Report No.	:	3E0279
Attention	:	Ali Stone
Client	:	Patterson Britton & Partners Pty Ltd
	:	PO Box 515
	:	NORTH SYDNEY
	:	NSW 2059
Samples	:	59
Reference/Order	:	3878-08
Project	:	HUNTER RIVER
Received Samples	:	23/01/03
Instructions	:	23/01/03
Date Reported	:	29/01/03

PLEASE SEE FOLLOWING PAGE FOR METHOD LISTING

RESULTS

All samples were analysed as received. This report relates specifically to the samples as received. Results relate to the source material only to the extent that the samples as supplied are truly representative of the sample source. This report replaces any preliminary results issued. Note that for methods indicated with "*", NATA accreditation does not cover the performance of this service. Three significant figures (or 2 for <10PQL) are reported for statistical purposes only. Where "Total" concentrations are reported for organic suites of compounds this is the summation of the individual compounds and the PQL is noted for reporting purposes only. This report has been auto-authorized by NATA signatories for PDF format. Refer to the method descriptions for further information.

PLEASE SEE ATTACHED PAGES FOR RESULTS

R. Mooney B.Sc.(Hons)Dip. FDA
Technical Services Manager Sydney

amdel

Report No. : 3E0279

Please note: Where samples are collected/submitted over several days, the date on which the last samples were analysed or extracted is reported.
Unless Ferrous Iron is determined on site, the possibility of a ferrous-ferric ratio change may occur.

Method	Description	Extracted	Analysed	Authorised
E2790	Turbidity	28/01/03	29/01/03	RMO 101
E2670	Suspended Solids	28/01/03	30/01/03	RMO 101

amdel

Job Number : 3E0279
Client : Patterson Britton & Partners Pty Ltd
Reference : 3878-08
Project : HUNTER RIVER

Analyte	Lab No	E22592	E22593	E22594	E22595	E22596
	Sample Id	NS1H	LS1F	HS1C	LE1H	LE2G
	PQL					
E2790 Turbidity in Water (NTU)						
Turbidity	0.1	8.0	3.0	80	7.6	6.6
E2670 Suspended Solids in Water						
Suspended Solids	1	19	17	440	38	64

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = <PQL
-- = Not Applicable
Refer to Amdel standard laboratory qualifier codes for comments.

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified in Method Header
Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

amdel

Job Number : 3E0279
Client : Patterson Britton & Partners Pty Ltd
Reference : 3878-08
Project : HUNTER RIVER

Analyte	Lab No	E22597	E22598	E22599	E22600	E22601
	Sample Id	HE1C	ME1G	HE1E	ME2F	ME1H
	PQL					
E2790 Turbidity in Water (NTU)						
Turbidity	0.1	70	40	10	2.0	10
E2670 Suspended Solids in Water						
Suspended Solids	1	330	110	33	7	35

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = <PQL
-- = Not Applicable
Refer to Amdel standard laboratory qualifier codes for comments.

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified in Method Header
Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

amdel

Job Number : 3E0279
Client : Patterson Britton & Partners Pty Ltd
Reference : 3878-08
Project : HUNTER RIVER

Analyte	Lab No	E22602	E22603	E22604	E22605	E22606
	Sample Id	LE2H	MS1K	LS1G	ME2I	ME2G
	PQL					
E2790 Turbidity in Water (NTU)						
Turbidity	0.1	4.2	8.0	4.4	1.6	15
E2670 Suspended Solids in Water						
Suspended Solids	1	34	35	11	14	27

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = <PQL
-- = Not Applicable
Refer to Amdel standard laboratory qualifier codes for comments.

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified in Method Header
Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

amdel

Job Number : 3E0279
Client : Patterson Britton & Partners Pty Ltd
Reference : 3878-08
Project : HUNTER RIVER

Analyte	Lab No	E22607	E22608	E22609	E22610	E22611
	Sample Id	HE1D	HS1E	LS1G	ME1H	LE1I
	PQL					
E2790 Turbidity in Water (NTU)						
Turbidity	0.1	25	1.2	3.6	3.0	3.0
E2670 Suspended Solids in Water						
Suspended Solids	1	84	6	12	9	64

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = <PQL
-- = Not Applicable

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified in Method Header
Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

Refer to Amdel standard laboratory qualifier codes for comments.

amdel

Job Number : 3E0279
Client : Patterson Britton & Partners Pty Ltd
Reference : 3878-08
Project : HUNTER RIVER

Analyte	Lab No	E22612	E22613	E22614	E22615	E22616
	Sample Id	HS1B	HS1E	LS1D	HE1B	MS1A
	PQL					
E2790 Turbidity in Water (NTU)						
Turbidity	0.1	85	1.4	1.2	95	50
E2670 Suspended Solids in Water						
Suspended Solids	1	610	25	6	520	15000

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = <PQL
-- = Not Applicable
Refer to Amdel standard laboratory qualifier codes for comments.

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified in Method Header
Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

amdel

Job Number : 3E0279
Client : Patterson Britton & Partners Pty Ltd
Reference : 3878-08
Project : HUNTER RIVER

	Lab No	E22617	E22618	E22619	E22620	E22621
Analyte	Sample Id	HS1A	LS1C	MS1C	LS1B	MS1F
	PQL					
E2790 Turbidity in Water (NTU)						
Turbidity	0.1	34	8.0	80	nd	1.2
E2670 Suspended Solids in Water						
Suspended Solids	1	10000	110	1400	22000	56

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = <PQL
-- = Not Applicable
Refer to Amdel standard laboratory qualifier codes for comments.

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified in Method Header
Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

amdel

Job Number : 3E0279
Client : Patterson Britton & Partners Pty Ltd
Reference : 3878-08
Project : HUNTER RIVER

Analyte	Lab No	E22622	E22623	E22624	E22625	E22626
	Sample Id	MS1B	ME1D	MS1E	ME2D	ME2C
	PQL					
E2790 Turbidity in Water (NTU)						
Turbidity	0.1	90	30	5.0	1.6	3.6
E2670 Suspended Solids in Water						
Suspended Solids	1	8300	110	140	29	16

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = <PQL
-- = Not Applicable
Refer to Amdel standard laboratory qualifier codes for comments.

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified in Method Header
Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

amdel

Job Number : 3E0279
Client : Patterson Britton & Partners Pty Ltd
Reference : 3878-08
Project : HUNTER RIVER

Analyte	Lab No	E22627	E22629	E22630	E22631	E22632
	Sample Id	MS1D	LS1E	MS1G	MS1I	MS1F
	PQL					
E2790 Turbidity in Water (NTU)						
Turbidity	0.1	30	2.0	16	1.2	2.4
E2670 Suspended Solids in Water						
Suspended Solids	1	440	37	70	11	31

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = <PQL
-- = Not Applicable

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified in Method Header
Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

Refer to Amdel standard laboratory qualifier codes for comments.

amdel

Job Number : 3E0279
Client : Patterson Britton & Partners Pty Ltd
Reference : 3878-08
Project : HUNTER RIVER

Analyte	Lab No	E22633	E22634	E22635	E22636	E22637
	Sample Id	ME1C	ME2B	LE1B	LE1D	LE2A
	PQL					
E2790 Turbidity in Water (NTU)						
Turbidity	0.1	40	14	150	8.2	150
E2670 Suspended Solids in Water						
Suspended Solids	1	390	78	750	47	1000

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = <PQL
-- = Not Applicable
Refer to Amdel standard laboratory qualifier codes for comments.

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified in Method Header
Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

amdel

Job Number : 3E0279
Client : Patterson Britton & Partners Pty Ltd
Reference : 3878-08
Project : HUNTER RIVER

Analyte	Lab No	E22638	E22639	E22640	E22641	E22642
	Sample Id	LE1E	LE2B	LE2C	LE1C	LE2D
	PQL					
E2790 Turbidity in Water (NTU)						
Turbidity	0.1	6.6	85	10	25	2.0
E2670 Suspended Solids in Water						
Suspended Solids	1	30	2000	69	78	14

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = <PQL
-- = Not Applicable
Refer to Amdel standard laboratory qualifier codes for comments.

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified in Method Header
Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

amdel

Job Number : 3E0279
Client : Patterson Britton & Partners Pty Ltd
Reference : 3878-08
Project : HUNTER RIVER

Analyte	Lab No	E22643	E22644	E22645	E22646	E22647
	Sample Id	LE2F	LE1F	LE1G	ME1B	LE2E
	PQL					
E2790 Turbidity in Water (NTU)						
Turbidity	0.1	5.6	16	10	66	7.6
E2670 Suspended Solids in Water						
Suspended Solids	1	73	50	49	610	73

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = <PQL
-- = Not Applicable
Refer to Amdel standard laboratory qualifier codes for comments.

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified in Method Header
Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

amdel

Job Number : 3E0279
Client : Patterson Britton & Partners Pty Ltd
Reference : 3878-08
Project : HUNTER RIVER

Analyte	Lab No	E23085	E23086	E23087		
	Sample Id	LE1A	LS1A	ME1E		
	PQL					
E2790 Turbidity in Water (NTU)						
Turbidity	0.1	85	29	40		
E2670 Suspended Solids in Water						
Suspended Solids	1	6100	13000	150		

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = <PQL
-- = Not Applicable
Refer to Amdel standard laboratory qualifier codes for comments.

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified in Method Header
Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

amdel

Job Number : 3E0418
Client : Patterson Britton & Partners Pty Ltd
Reference : 3878-08
Project : Hunter River

Analyte	Lab No	E25173	E25174	E25175		
	Sample Id	HS1K	LS1J	HE1F		
	PQL					
E2670 Suspended Solids in Water						
Suspended Solids	1	32	14	44		
E2790 Turbidity in Water (NTU)						
Turbidity	0.1	6.0	2.0	8.2		

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = <PQL
-- = Not Applicable
Refer to Amdel standard laboratory qualifier codes for comments.

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified in Method Header
Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

amdel

This Laboratory is accredited by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of accreditation. This document shall not be reproduced except in full.
NATA Accredited Laboratory Number: 1464

INDUSTRIAL SERVICES DIVISION

ABN 30 008 127 802

Correspondence to:
PO Box 514
HORNSBY NSW 1630

5 Kelray Place
ASQUITH NSW 2077
Telephone: (02) 9482 1922
Facsimile: (02) 9482 1734

CERTIFICATE OF ANALYSIS

Contents :
1. Cover Pages (2)
2. Analysis Report Pages
3. QA/QC Appendix
4. Additional Reports - External (if applicable)
5. Chain of Custody (if applicable)

Report No.	:	3E0279
Attention	:	Ali Stone
Client	:	Patterson Britton & Partners Pty Ltd : PO Box 515 : NORTH SYDNEY : NSW 2059
Samples	:	59
Reference/Order	:	3878-08
Project	:	HUNTER RIVER
Received Samples	:	23/01/03
Instructions	:	23/01/03
Date Reported	:	29/01/03

PLEASE SEE FOLLOWING PAGE FOR METHOD LISTING

RESULTS

All samples were analysed as received. This report relates specifically to the samples as received. Results relate to the source material only to the extent that the samples as supplied are truly representative of the sample source. This report replaces any preliminary results issued. Note that for methods indicated with "*", NATA accreditation does not cover the performance of this service. Three significant figures (or 2 for <10PQL) are reported for statistical purposes only. Where "Total" concentrations are reported for organic suites of compounds this is the summation of the individual compounds and the PQL is noted for reporting purposes only. This report has been auto-authorized by NATA signatories for PDF format. Refer to the method descriptions for further information.

PLEASE SEE ATTACHED PAGES FOR RESULTS

R. Mooney B.Sc.(Hons)Dip. FDA
Technical Services Manager Sydney

amdel

Report No. : 3E0279

Please note: Where samples are collected/submitted over several days, the date on which the last samples were analysed or extracted is reported.
Unless Ferrous Iron is determined on site, the possibility of a ferrous-ferric ratio change may occur.

Method	Description	Extracted	Analysed	Authorised
E2790	Turbidity	28/01/03	29/01/03	RMO 101
E2670	Suspended Solids	28/01/03	30/01/03	RMO 101

amdel

Job Number : 3E0279
Client : Patterson Britton & Partners Pty Ltd
Reference : 3878-08
Project : HUNTER RIVER

Analyte	Lab No	E22592	E22593	E22594	E22595	E22596
	Sample Id	NS1H	LS1F	HS1C	LE1H	LE2G
	PQL					
E2790 Turbidity in Water (NTU)						
Turbidity	0.1	8.0	3.0	80	7.6	6.6
E2670 Suspended Solids in Water						
Suspended Solids	1	19	17	440	38	64

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = <PQL
-- = Not Applicable
Refer to Amdel standard laboratory qualifier codes for comments.

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified in Method Header
Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

amdel

Job Number : 3E0279
Client : Patterson Britton & Partners Pty Ltd
Reference : 3878-08
Project : HUNTER RIVER

Analyte	Lab No	E22597	E22598	E22599	E22600	E22601
	Sample Id	HE1C	ME1G	HE1E	ME2F	ME1H
	PQL					
E2790 Turbidity in Water (NTU)						
Turbidity	0.1	70	40	10	2.0	10
E2670 Suspended Solids in Water						
Suspended Solids	1	330	110	33	7	35

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = <PQL
-- = Not Applicable

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified in Method Header
Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

Refer to Amdel standard laboratory qualifier codes for comments.

amdel

Job Number : 3E0279
Client : Patterson Britton & Partners Pty Ltd
Reference : 3878-08
Project : HUNTER RIVER

Analyte	Lab No	E22602	E22603	E22604	E22605	E22606
	Sample Id	LE2H	MS1K	LS1G	ME2I	ME2G
	PQL					
E2790 Turbidity in Water (NTU)						
Turbidity	0.1	4.2	8.0	4.4	1.6	15
E2670 Suspended Solids in Water						
Suspended Solids	1	34	35	11	14	27

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = <PQL
-- = Not Applicable

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified in Method Header
Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

Refer to Amdel standard laboratory qualifier codes for comments.

amdel

Job Number : 3E0279
Client : Patterson Britton & Partners Pty Ltd
Reference : 3878-08
Project : HUNTER RIVER

Analyte	Lab No	E22607	E22608	E22609	E22610	E22611
	Sample Id	HE1D	HS1E	LS1G	ME1H	LE1I
	PQL					
E2790 Turbidity in Water (NTU)						
Turbidity	0.1	25	1.2	3.6	3.0	3.0
E2670 Suspended Solids in Water						
Suspended Solids	1	84	6	12	9	64

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = <PQL
-- = Not Applicable

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified in Method Header
Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

Refer to Amdel standard laboratory qualifier codes for comments.

amdel

Job Number : 3E0279
Client : Patterson Britton & Partners Pty Ltd
Reference : 3878-08
Project : HUNTER RIVER

	Lab No	E22612	E22613	E22614	E22615	E22616
Analyte	Sample Id	HS1B	HS1E	LS1D	HE1B	MS1A
	PQL					
E2790 Turbidity in Water (NTU)						
Turbidity	0.1	85	1.4	1.2	95	50
E2670 Suspended Solids in Water						
Suspended Solids	1	610	25	6	520	15000

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = <PQL
-- = Not Applicable

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified in Method Header
Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

Refer to Amdel standard laboratory qualifier codes for comments.

amdel

Job Number : 3E0279
Client : Patterson Britton & Partners Pty Ltd
Reference : 3878-08
Project : HUNTER RIVER

Analyte	Lab No	E22617	E22618	E22619	E22620	E22621
	Sample Id	HS1A	LS1C	MS1C	LS1B	MS1F
	PQL					
E2790 Turbidity in Water (NTU)						
Turbidity	0.1	34	8.0	80	nd	1.2
E2670 Suspended Solids in Water						
Suspended Solids	1	10000	110	1400	22000	56

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = <PQL
-- = Not Applicable
Refer to Amdel standard laboratory qualifier codes for comments.

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified in Method Header
Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

amdel

Job Number : 3E0279
Client : Patterson Britton & Partners Pty Ltd
Reference : 3878-08
Project : HUNTER RIVER

Analyte	Lab No	E22622	E22623	E22624	E22625	E22626
	Sample Id	MS1B	ME1D	MS1E	ME2D	ME2C
	PQL					
E2790 Turbidity in Water (NTU)						
Turbidity	0.1	90	30	5.0	1.6	3.6
E2670 Suspended Solids in Water						
Suspended Solids	1	8300	110	140	29	16

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = <PQL
-- = Not Applicable

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified in Method Header
Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

Refer to Amdel standard laboratory qualifier codes for comments.

amdel

Job Number : 3E0279
Client : Patterson Britton & Partners Pty Ltd
Reference : 3878-08
Project : HUNTER RIVER

Analyte	Lab No	E22627	E22629	E22630	E22631	E22632
	Sample Id	MS1D	LS1E	MS1G	MS1I	MS1F
	PQL					
E2790 Turbidity in Water (NTU)						
Turbidity	0.1	30	2.0	16	1.2	2.4
E2670 Suspended Solids in Water						
Suspended Solids	1	440	37	70	11	31

PQL = Practical Quantitation Limit
LNR = *Samples Listed not Received*
nd = <PQL
-- = Not Applicable
Refer to Amdel standard laboratory qualifier codes for comments.

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : *mg/L (ppm) unless otherwise specified in Method Header*
Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

amdel

Job Number : 3E0279
Client : Patterson Britton & Partners Pty Ltd
Reference : 3878-08
Project : HUNTER RIVER

Analyte	Lab No	E22633	E22634	E22635	E22636	E22637
	Sample Id	ME1C	ME2B	LE1B	LE1D	LE2A
	PQL					
E2790 Turbidity in Water (NTU)						
Turbidity	0.1	40	14	150	8.2	150
E2670 Suspended Solids in Water						
Suspended Solids	1	390	78	750	47	1000

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = <PQL
-- = Not Applicable
Refer to Amdel standard laboratory qualifier codes for comments.

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified in Method Header
Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

amdel

Job Number : 3E0279
Client : Patterson Britton & Partners Pty Ltd
Reference : 3878-08
Project : HUNTER RIVER

Analyte	Lab No	E22638	E22639	E22640	E22641	E22642
	Sample Id	LE1E	LE2B	LE2C	LE1C	LE2D
	PQL					
E2790 Turbidity in Water (NTU)						
Turbidity	0.1	6.6	85	10	25	2.0
E2670 Suspended Solids in Water						
Suspended Solids	1	30	2000	69	78	14

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = <PQL
-- = Not Applicable

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified in Method Header
Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

Refer to Amdel standard laboratory qualifier codes for comments.

amdel

Job Number : 3E0279
Client : Patterson Britton & Partners Pty Ltd
Reference : 3878-08
Project : HUNTER RIVER

Analyte	Lab No	E22643	E22644	E22645	E22646	E22647
	Sample Id	LE2F	LE1F	LE1G	ME1B	LE2E
	PQL					
E2790 Turbidity in Water (NTU)						
Turbidity	0.1	5.6	16	10	66	7.6
E2670 Suspended Solids in Water						
Suspended Solids	1	73	50	49	610	73

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = <PQL
-- = Not Applicable
Refer to Amdel standard laboratory qualifier codes for comments.

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified in Method Header
Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

amdel

Job Number : 3E0279
Client : Patterson Britton & Partners Pty Ltd
Reference : 3878-08
Project : HUNTER RIVER

Analyte	Lab No	E23085	E23086	E23087		
	Sample Id	LE1A	LS1A	ME1E		
	PQL					
E2790 Turbidity in Water (NTU)						
Turbidity	0.1	85	29	40		
E2670 Suspended Solids in Water						
Suspended Solids	1	6100	13000	150		

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = <PQL
-- = Not Applicable
Refer to Amdel standard laboratory qualifier codes for comments.

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified in Method Header
Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

amdel

This Laboratory is accredited by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of accreditation. This document shall not be reproduced except in full.
NATA Accredited Laboratory Number: 1464

INDUSTRIAL SERVICES DIVISION

ABN 30 008 127 802

Correspondence to:
PO Box 514
HORNSBY NSW 1630

5 Kelray Place
ASQUITH NSW 2077
Telephone: (02) 9482 1922
Facsimile: (02) 9482 1734

CERTIFICATE OF ANALYSIS

Contents :
1. Cover Pages (2)
2. Analysis Report Pages
3. QA/QC Appendix
4. Additional Reports - External (if applicable)
5. Chain of Custody (if applicable)

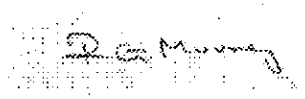
Report No.	:	3E0418			
Attention	:	Ali Stone			
Client	:	Patterson Britton & Partners Pty Ltd PO Box 515 NORTH SYDNEY NSW 2059			
Samples	:	18			
Reference/Order	:	3878-08			
Project	:	Hunter River			
Received Samples	:	04/02/03	Instructions	:	04/02/03
Date Reported	:	11/02/03			

PLEASE SEE FOLLOWING PAGE FOR METHOD LISTING

RESULTS

All samples were analysed as received. This report relates specifically to the samples as received. Results relate to the source material only to the extent that the samples as supplied are truly representative of the sample source. This report replaces any preliminary results issued. Note that for methods indicated with "*", NATA accreditation does not cover the performance of this service. Three significant figures (or 2 for <10PQL) are reported for statistical purposes only. Where "Total" concentrations are reported for organic suites of compounds this is the summation of the individual compounds and the PQL is noted for reporting purposes only. This report has been auto-authorized by NATA signatories for PDF format. Refer to the method descriptions for further information.

PLEASE SEE ATTACHED PAGES FOR RESULTS



R. Mooney B.Sc.(Hons)Dip. FDA
Technical Services Manager Sydney

amdel

Report No. : 3E0418

Please note: Where samples are collected/submitted over several days, the date on which the last samples were analysed or extracted is reported.
Unless Ferrous Iron is determined on site, the possibility of a ferrous-ferric ratio change may occur.

Method	Description	Extracted	Analysed	Authorised
E2670	Suspended Solids	04/02/03	05/02/03	RMO 101
E2790	Turbidity	05/02/03	06/02/03	RMO 101

amdel

Job Number : 3E0418
Client : Patterson Britton & Partners Pty Ltd
Reference : 3878-08
Project : Hunter River

Analyte	Lab No	E25158	E25159	E25160	E25161	E25162
	Sample Id	LS1K	HS1H	MS1Q	MS1L	MS1R
	PQL					
E2670 Suspended Solids in Water						
Suspended Solids	1	140	12	65	11	62
E2790 Turbidity in Water (NTU)						
Turbidity	0.1	15	2.6	16	3.6	0.5
)						

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = <PQL
-- = Not Applicable
Refer to Amdel standard laboratory qualifier codes for comments.

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified in Method Header
Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

amdel

Job Number : 3E0418
Client : Patterson Britton & Partners Pty Ltd
Reference : 3878-08
Project : Hunter River

Analyte	Lab No	E25163	E25164	E25165	E25166	E25167
	Sample Id	MS1O	HS1J	MS1P	HS1I	ME1J
	PQL					
E2670 Suspended Solids in Water						
Suspended Solids	1	56	30	30	9	59
E2790 Turbidity in Water (NTU)						
Turbidity	0.1	16	31	7.2	3.0	13

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = <PQL
-- = Not Applicable
Refer to Amdel standard laboratory qualifier codes for comments.

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified in Method Header
Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

amdel

Job Number : 3E0418
Client : Patterson Britton & Partners Pty Ltd
Reference : 3878-08
Project : Hunter River

Analyte	Lab No	E25168	E25169	E25170	E25171	E25172
	Sample Id	HS1G	MS1M	LE2I	LS1H	MS1N
	PQL					
E2670 Suspended Solids in Water						
Suspended Solids	1	5	17	39	8	16
E2790 Turbidity in Water (NTU)						
Turbidity	0.1	1.6	3.8	4.6	2.6	4.6

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = <PQL
-- = Not Applicable
Refer to Amdel standard laboratory qualifier codes for comments.

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified in Method Header
Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

amdel

Job Number : 3E0418
Client : Patterson Britton & Partners Pty Ltd
Reference : 3878-08
Project : Hunter River

Analyte	Lab No	E25173	E25174	E25175		
	Sample Id	HS1K	LS1J	HE1F		
	PQL					
E2670 Suspended Solids in Water						
Suspended Solids	1	32	14	44		
E2790 Turbidity in Water (NTU)						
Turbidity	0.1	6.0	2.0	8.2		

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = <PQL
-- = Not Applicable
Refer to Amdel standard laboratory qualifier codes for comments.

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified in Method Header
Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

amdel

This Laboratory is accredited by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of accreditation. This document shall not be reproduced except in full.
NATA Accredited Laboratory Number: 1464

INDUSTRIAL SERVICES DIVISION

ABN 30 008 127 802

Correspondence to:
PO Box 514
HORNSBY NSW 1630

5 Kelray Place
ASQUITH NSW 2077
Telephone: (02) 9482 1922
Facsimile: (02) 9482 1734

CERTIFICATE OF ANALYSIS

Contents :
1. Cover Pages (2)
2. Analysis Report Pages
3. QA/QC Appendix
4. Additional Reports - External (if applicable)
5. Chain of Custody (if applicable)

Report No.	:	3E0732
Attention	:	Ali Stone
Client	:	Patterson Britton & Partners Pty Ltd
	:	PO Box 515
	:	NORTH SYDNEY NSW 2059
	:	NSW 2059
Samples	:	2
Reference/Order	:	3878-08
Project	:	HUNTER RIVER
Received Samples	:	21/02/03
Instructions	:	21/02/03
Date Reported	:	25/02/03

PLEASE SEE FOLLOWING PAGE FOR METHOD LISTING

RESULTS

All samples were analysed as received. This report relates specifically to the samples as received. Results relate to the source material only to the extent that the samples as supplied are truly representative of the sample source. This report replaces any preliminary results issued. Note that for methods indicated with "*", NATA accreditation does not cover the performance of this service. Three significant figures (or 2 for <10PQL) are reported for statistical purposes only. Where "Total" concentrations are reported for organic suites of compounds this is the summation of the individual compounds and the PQL is noted for reporting purposes only. This report has been auto-authorized by NATA signatories for PDF format. Refer to the method descriptions for further information.

PLEASE SEE ATTACHED PAGES FOR RESULTS

R. Mooney B.Sc.(Hons)Dip. FDA
Technical Services Manager Sydney

amdel

Report No. : 3E0732

Please note: Where samples are collected/submitted over several days, the date on which the last samples were analysed or extracted is reported.
Unless Ferrous Iron is determined on site, the possibility of a ferrous-ferric ratio change may occur.

Method	Description	Extracted	Analysed	Authorised
E0110	Polycyclic Aromatic Hydrocarbons	21/02/03	24/02/03	DUM 095

amdel

Job Number : 3E0732
Client : Patterson Britton & Partners Pty Ltd
Reference : 3878-08
Project : HUNTER RIVER

Analyte	Lab No / Sample Id / PQL	E28895 LUL	E28896 HUL			
E0110 Priority PAH's in Water (ug/L)						
Naphthalene	1	1400	230			
Acenaphthylene	1	17	1			
Acenaphthene	1	38	3			
Fluorene	1	13	nd			
Phenanthrene	1	3	nd			
Anthracene	1	nd	nd			
Fluoranthene	1	nd	nd			
Pyrene	1	nd	nd			
Benz(a)anthracene	1	nd	nd			
Chrysene	1	nd	nd			
Benzo(b) & (k)fluoranthene	2	nd	nd			
Benzo(a)pyrene	1	nd	nd			
Indeno(1.2.3-cd)pyrene	1	nd	nd			
Dibenz(a.h)anthracene	1	nd	nd			
Benzo(g.h.i)perylene	1	nd	nd			
Total USEPA Priority PAHs	1	1500	240			
2-Fluorobiphenyl-SURROGATE	1	70%	83%			
Anthracene-D10-SURROGATE	1	91%	116%			
p-Terphenyl-D14-SURROGATE	1	96%	116%			

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = <PQL
-- = Not Applicable
Refer to Amdel standard laboratory qualifier codes for comments.

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified in Method Header
Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

amdel

This Laboratory is accredited by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of accreditation. This document shall not be reproduced except in full.

NATA Accredited Laboratory Number: 1464

INDUSTRIAL SERVICES DIVISION

ABN 30 008 127 802

Correspondence to:
PO Box 514
HORNSBY NSW 1630

5 Kelray Place
ASQUITH NSW 2077
Telephone: (02) 9482 1922
Facsimile: (02) 9482 1734

CERTIFICATE OF ANALYSIS

Contents :

1. Cover Pages (2)
2. Analysis Report Pages
3. QA/QC Appendix
4. Additional Reports - External (if applicable)
5. Chain of Custody (if applicable)

Report No.	:	3E0765
Attention	:	Ali Stone
Client	:	Patterson Britton & Partners Pty Ltd
	:	PO Box 515
	:	NORTH SYDNEY NSW 2059
	:	NSW 2059
Samples	:	2
Reference/Order	:	3878-08
Project	:	Hunter River
Received Samples	:	25/02/03
Instructions	:	25/02/03
Date Reported	:	04/03/03

PLEASE SEE FOLLOWING PAGE FOR METHOD LISTING

RESULTS

All samples were analysed as received. This report relates specifically to the samples as received. Results relate to the source material only to the extent that the samples as supplied are truly representative of the sample source. This report replaces any preliminary results issued. Note that for methods indicated with "*", NATA accreditation does not cover the performance of this service. Three significant figures (or 2 for <10PQL) are reported for statistical purposes only. Where "Total" concentrations are reported for organic suites of compounds this is the summation of the individual compounds and the PQL is noted for reporting purposes only. This report has been auto-authorized by NATA signatories for PDF format. Refer to the method descriptions for further information.

PLEASE SEE ATTACHED PAGES FOR RESULTS

R. Mooney B.Sc.(Hons)Dip. FDA
Technical Services Manager Sydney

amdel

Report No. : 3E0765

Please note: Where samples are collected/submitted over several days, the date on which the last samples were analysed or extracted is reported.
Unless Ferrous Iron is determined on site, the possibility of a ferrous-ferric ratio change may occur.

Method	Description	Extracted	Analysed	Authorised
E7500	Moisture (%w/w)	25/02/03	26/02/03	SYS 096
E11101	Polynuclear Aromatic Hydrocarbons	25/02/03	26/02/03	MNG 095
E1230	TPH C6-C9 by Purge & Trap	25/02/03	25/02/03	DUM 094
E1221	TPH (C10-C36)	25/02/03	26/02/03	DUM 094
E3795	Organic Carbon	27/02/03	27/02/03	NSA 101
E5950	Mercury in Soil	25/02/03	26/02/03	RMO 093
E5910	Metals by ICP-AES	25/02/03	26/02/03	RMO 093
E0110	Polycyclic Aromatic Hydrocarbons	25/02/03	25/02/03	DUM 095
E2600	pH	25/02/03	25/02/03	NSA 101
E2430	Conductivity	25/02/03	25/02/03	NSA 101
E2670	Suspended Solids	26/02/03	26/02/03	NSA 101
E2790	Turbidity	26/02/03	26/02/03	NSA 101

amdel

Job Number : 3E0765
Client : Patterson Britton & Partners Pty Ltd
Reference : 3878-08
Project : Hunter River

Analyte	Lab No	E29302				
	Sample Id	DOLO				
	PQL	.				
Moisture Content	1	38%				
E11101 Priority PAH's in Soil						
Naphthalene	0.05	4630				
Acenaphthylene	0.05	85.1				
Acenaphthene	0.05	327				
Fluorene	0.05	227				
Phenanthrene	0.05	585				
Anthracene	0.05	149				
Fluoranthene	0.05	306				
Pyrene	0.05	259				
Benz(a)anthracene	0.05	93.1				
Chrysene	0.05	73.5				
Benzo(b) & (k)fluoranthene	0.1	130				
Benzo(a)pyrene	0.05	87.7				
Indeno(1.2.3-cd)pyrene	0.05	52.1				
Dibenz(a.h)anthracene	0.05	7.68				
Benzo(g.h.i)perylene	0.05	32.1				
Total USEPA Priority PAHs	0.05	7040				
2-Fluorobiphenyl-SURROGATE	1	126%				
anthracene-d10-SURROGATE	1	103%				
p-terphenyl-D14-SURROGATE	1	120%				

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = <PQL
-- = Not Applicable
Refer to Amdel standard laboratory qualifier codes for comments.

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified in Method Header
Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

amdel

Job Number : 3E0765
Client : Patterson Britton & Partners Pty Ltd
Reference : 3878-08
Project : Hunter River

Analyte	Lab No	E29302				
	Sample Id	DOLO				
	PQL					
E1230 TPH in Soil by Purge & Trap/GC-MS						
C6-C9 Fraction	5	7				
E1221 TPH in Soil						
C10-C14 Fraction	10	4900				
C15-C28 Fraction	50	6600				
C29-C36 Fraction	50	2000				

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = <PQL
-- = Not Applicable
Refer to Amdel standard laboratory qualifier codes for comments.

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified in Method Header
Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

amdel

Job Number : 3E0765
Client : Patterson Britton & Partners Pty Ltd
Reference : 3878-08
Project : Hunter River

Analyte	Lab No / Sample Id / PQL	E29302 / DOLO				
E3795 Organic Carbon (% w/w)						
Total Organic Carbon (%)	0.1	16				
E5950 Mercury in Soil						
Mercury	0.05	0.25				
E5910 Metals in Soil						
Arsenic	5	11				
Zinc	5	1000				
Lead	5	160				

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = <PQL
-- = Not Applicable
Refer to Amdel standard laboratory qualifier codes for comments.

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified in Method Header
Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

amdel

Job Number : 3E0765
Client : Patterson Britton & Partners Pty Ltd
Reference : 3878-08
Project : Hunter River

Analyte	Lab No / Sample Id / PQL	E29301 / MXL				
E0110 Priority PAH's in Water (ug/L)						
Naphthalene	1	nd				
Acenaphthylene	1	nd				
Acenaphthene	1	nd				
Fluorene	1	nd				
Phenanthrene	1	nd				
Anthracene	1	nd				
Fluoranthene	1	nd				
Pyrene	1	nd				
Benz(a)anthracene	1	nd				
Chrysene	1	nd				
Benzo(b) & (k)fluoranthene	2	nd				
Benzo(a)pyrene	1	nd				
Indeno(1.2.3-cd)pyrene	1	nd				
Dibenz(a.h)anthracene	1	nd				
Benzo(g.h.i)perylene	1	nd				
Total USEPA Priority PAHs	1	nd				
2-Fluorobiphenyl-SURROGATE	1	77%				
Anthracene-D10-SURROGATE	1	100%				
p-Terphenyl-D14-SURROGATE	1	119%				

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = <PQL
-- = Not Applicable
Refer to Amdel standard laboratory qualifier codes for comments.

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified in Method Header
Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

amdel

Job Number : 3E0765
Client : Patterson Britton & Partners Pty Ltd
Reference : 3878-08
Project : Hunter River

Analyte	Lab No / Sample Id / PQL	E29301 / MXL				
E2600 pH in Water						
pH	0.1	7.9				
E2430 Conductivity (uS/cm at 25.0 C)						
Electrical Conductivity	1	3600				
E2670 Suspended Solids in Water						
Suspended Solids	1	11				
E2790 Turbidity in Water (NTU)						
Turbidity	0.1	7.6				

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = <PQL
-- = Not Applicable
Refer to Amdel standard laboratory qualifier codes for comments.

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified in Method Header
Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

amdel

This Laboratory is accredited by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of accreditation. This document shall not be reproduced except in full.
NATA Accredited Laboratory Number: 1464

INDUSTRIAL SERVICES DIVISION

ABN 30 008 127 802

Correspondence to:
PO Box 514
HORNSBY NSW 1630

5 Kelray Place
ASQUITH NSW 2077
Telephone: (02) 9482 1922
Facsimile: (02) 9482 1734

CERTIFICATE OF ANALYSIS

Contents :
1. Cover Pages (2)
2. Analysis Report Pages
3. QA/QC Appendix
4. Additional Reports - External (if applicable)
5. Chain of Custody (if applicable)

Report No.	:	3E0879
Attention	:	Ali Stone
Client	:	Patterson Britton & Partners Pty Ltd
	:	PO Box 515
	:	NORTH SYDNEY NSW 2059
	:	NSW 2059
Samples	:	7
Reference/Order	:	3878-08
Project	:	Sth Arm Hunter River Dredging EIS
Received Samples	:	04/03/03
Instructions	:	04/03/03
Date Reported	:	07/03/03

PLEASE SEE FOLLOWING PAGE FOR METHOD LISTING

RESULTS

All samples were analysed as received. This report relates specifically to the samples as received. Results relate to the source material only to the extent that the samples as supplied are truly representative of the sample source. This report replaces any preliminary results issued. Note that for methods indicated with "*", NATA accreditation does not cover the performance of this service. Three significant figures (or 2 for <10PQL) are reported for statistical purposes only. Where "Total" concentrations are reported for organic suites of compounds this is the summation of the individual compounds and the PQL is noted for reporting purposes only. This report has been auto-authorized by NATA signatories for PDF format. Refer to the method descriptions for further information.

PLEASE SEE ATTACHED PAGES FOR RESULTS

R. Mooney B.Sc.(Hons)Dip. FDA
Technical Services Manager Sydney

amdel

Report No. : 3E0879

Please note: Where samples are collected/submitted over several days, the date on which the last samples were analysed or extracted is reported.
Unless Ferrous Iron is determined on site, the possibility of a ferrous-ferric ratio change may occur.

Method	Description	Extracted	Analysed	Authorised
E0110	Polycyclic Aromatic Hydrocarbons	04/03/03	06/03/03	DUM 095
E0230	TPH C6-C9 by purge & trap	06/03/03	06/03/03	DUM 094
E0221	TPH (C10-C36)	04/03/03	05/03/03	DUM 094
E2600	pH	04/03/03	04/03/03	NSA 101
E2430	Conductivity	04/03/03	04/03/03	NSA 101
E2670	Suspended Solids	05/03/03	05/03/03	NSA 101
E2790	Turbidity	04/03/03	04/03/03	NSA 101
E2330	Ammonia as N	04/03/03	06/03/03	NSA 101
E2450	Total Cyanide	04/03/03	04/03/03	NSA 101

amdel

Job Number : 3E0879
Client : Patterson Britton & Partners Pty Ltd
Reference : 3878-08
Project : Sth Arm Hunter River Dredging EIS

Analyte	Lab No	E30807	E30808	E30809	E30810	E30811
	Sample Id	DOLO	MIXL	HUL	HDL	MUL
	PQL					
E0110 Priority PAH's in Water (ug/L)						
Naphthalene	1	nd	nd	nd	nd	nd
Acenaphthylene	1	nd	nd	nd	nd	nd
Acenaphthene	1	nd	nd	nd	nd	nd
Fluorene	1	nd	nd	nd	nd	nd
Phenanthrene	1	nd	nd	nd	nd	nd
Anthracene	1	nd	nd	nd	nd	nd
Fluoranthene	1	nd	nd	nd	nd	nd
Pyrene	1	nd	nd	nd	nd	nd
Benz(a)anthracene	1	nd	nd	nd	nd	nd
Chrysene	1	nd	nd	nd	nd	nd
Benzo(b) & (k)fluoranthene	2	nd	nd	nd	nd	nd
Benzo(a)pyrene	1	nd	nd	nd	nd	nd
Indeno(1.2.3-cd)pyrene	1	nd	nd	nd	nd	nd
Dibenz(a.h)anthracene	1	nd	nd	nd	nd	nd
Benzo(g.h.i)perylene	1	nd	nd	nd	nd	nd
Total USEPA Priority PAHs	1	nd	nd	nd	nd	nd
2-Fluorobiphenyl-SURROGATE	1	95%	87%	83%	94%	90%
Anthracene-D10-SURROGATE	1	99%	102%	92%	104%	104%
p-Terphenyl-D14-SURROGATE	1	104%	111%	96%	109%	113%

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = <PQL
-- = Not Applicable

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified in Method Header
Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

Refer to Amdel standard laboratory qualifier codes for comments.

amdel

Job Number : 3E0879
Client : Patterson Britton & Partners Pty Ltd
Reference : 3878-08
Project : Sth Arm Hunter River Dredging EIS

Analyte	Lab No	E30807	E30808	E30809	E30810	E30811
	Sample Id	DOLO	MIXL	HUL	HDL	MUL
	PQL					
E0230 TPH in Water by P&T/GC-MS (ug/L)						
C6-C9 Fraction	20	--	--	--	nd	--
E0221 TPH in Water (ug/L)						
C10-C14 Fraction	20	--	--	--	nd	--
C15-C28 Fraction	100	--	--	--	nd	--
C29-C36 Fraction	100	--	--	--	nd	--
E2600 pH in Water						
pH	0.1	7.6	8.2	8.2	8.3	8.3
E2430 Conductivity (uS/cm at 25.0 C)						
Electrical Conductivity	1	7700	16000	31000	33000	33000
E2670 Suspended Solids in Water						
Suspended Solids	1	nd	4	24	1	9
E2790 Turbidity in Water (NTU)						
Turbidity	0.1	2.0	0.6	1.4	1.0	1.4
E2330 Ammonia as N in Water						
Ammonia as N	0.01	--	--	--	--	--
E2450 Total Cyanide in Water						
Total Cyanide	0.005	--	--	--	--	--

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = <PQL
-- = Not Applicable
Refer to Amdel standard laboratory qualifier codes for comments.

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified in Method Header
Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

amdel

Job Number : 3E0879
Client : Patterson Britton & Partners Pty Ltd
Reference : 3878-08
Project : Sth Arm Hunter River Dredging EIS

Analyte	Lab No / Sample Id / PQL	E30812 MDL	E30816 MDL/MUL			
E0230 TPH in Water by P&T/GC-MS (ug/L)						
C6-C9 Fraction	20	nd	--			
E0221 TPH in Water (ug/L)						
C10-C14 Fraction	20	--	30			
C15-C28 Fraction	100	--	P 220			
C29-C36 Fraction	100	--	nd			
E2600 pH in Water						
pH	0.1	--	--			
E2430 Conductivity (uS/cm at 25.0 C)						
Electrical Conductivity	1	--	--			
E2670 Suspended Solids in Water						
Suspended Solids	1	--	--			
E2790 Turbidity in Water (NTU)						
Turbidity	0.1	--	--			
E2330 Ammonia as N in Water						
Ammonia as N	0.01	5.21	--			
E2450 Total Cyanide in Water						
Total Cyanide	0.005	0.164	--			

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = <PQL
-- = Not Applicable
Refer to Amdel standard laboratory qualifier codes for comments.

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified in Method Header
Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

This Laboratory is accredited by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of accreditation. This document shall not be reproduced except in full.
NATA Accredited Laboratory Number: 1464

INDUSTRIAL SERVICES DIVISION

ABN 30 008 127 802

Correspondence to:
PO Box 514
HORNSBY NSW 1630

5 Kelray Place
ASQUITH NSW 2077
Telephone: (02) 9482 1922
Facsimile: (02) 9482 1734

CERTIFICATE OF ANALYSIS

Contents :
1. Cover Pages (2)
2. Analysis Report Pages
3. QA/QC Appendix
4. Additional Reports - External (if applicable)
5. Chain of Custody (if applicable)

Report No.	:	3E0879
Attention	:	Ali Stone
Client	:	Patterson Britton & Partners Pty Ltd
	:	PO Box 515
	:	NORTH SYDNEY NSW 2059
	:	NSW 2059
Samples	:	7
Reference/Order	:	3878-08
Project	:	Sth Arm Hunter River Dredging EIS
Received Samples	:	04/03/03
Instructions	:	04/03/03
Date Reported	:	07/03/03

PLEASE SEE FOLLOWING PAGE FOR METHOD LISTING

RESULTS

All samples were analysed as received. This report relates specifically to the samples as received. Results relate to the source material only to the extent that the samples as supplied are truly representative of the sample source. This report replaces any preliminary results issued. Note that for methods indicated with "*", NATA accreditation does not cover the performance of this service. Three significant figures (or 2 for <10PQL) are reported for statistical purposes only. Where "Total" concentrations are reported for organic suites of compounds this is the summation of the individual compounds and the PQL is noted for reporting purposes only. This report has been auto-authorized by NATA signatories for PDF format. Refer to the method descriptions for further information.

PLEASE SEE ATTACHED PAGES FOR RESULTS

R. Mooney B.Sc.(Hons)Dip. FDA
Technical Services Manager Sydney

amdel

Report No. : 3E0879

Please note: Where samples are collected/submitted over several days, the date on which the last samples were analysed or extracted is reported.
Unless Ferrous Iron is determined on site, the possibility of a ferrous-ferric ratio change may occur.

Method	Description	Extracted	Analysed	Authorised
E0110	Polycyclic Aromatic Hydrocarbons	04/03/03	06/03/03	DUM 095
E0230	TPH C6-C9 by purge & trap	06/03/03	06/03/03	DUM 094
E0221	TPH (C10-C36)	04/03/03	05/03/03	DUM 094
E2600	pH	04/03/03	04/03/03	NSA 101
E2430	Conductivity	04/03/03	04/03/03	NSA 101
E2670	Suspended Solids	05/03/03	05/03/03	NSA 101
E2790	Turbidity	04/03/03	04/03/03	NSA 101
E2330	Ammonia as N	04/03/03	06/03/03	NSA 101
E2450	Total Cyanide	04/03/03	04/03/03	NSA 101

amdel

Job Number : 3E0879
Client : Patterson Britton & Partners Pty Ltd
Reference : 3878-08
Project : Sth Arm Hunter River Dredging EIS

Analyte	Lab No	E30807	E30808	E30809	E30810	E30811
	Sample Id	DOLO	MIXL	HUL	HDL	MUL
	PQL					
E0110 Priority PAH's in Water (ug/L)						
Naphthalene	1	nd	nd	nd	nd	nd
Acenaphthylene	1	nd	nd	nd	nd	nd
Acenaphthene	1	nd	nd	nd	nd	nd
Fluorene	1	nd	nd	nd	nd	nd
Phenanthrene	1	nd	nd	nd	nd	nd
Anthracene	1	nd	nd	nd	nd	nd
Fluoranthene	1	nd	nd	nd	nd	nd
Pyrene	1	nd	nd	nd	nd	nd
Benz(a)anthracene	1	nd	nd	nd	nd	nd
Chrysene	1	nd	nd	nd	nd	nd
Benzo(b) & (k)fluoranthene	2	nd	nd	nd	nd	nd
Benzo(a)pyrene	1	nd	nd	nd	nd	nd
Indeno(1.2.3-cd)pyrene	1	nd	nd	nd	nd	nd
Dibenz(a.h)anthracene	1	nd	nd	nd	nd	nd
Benzo(g.h.i)perylene	1	nd	nd	nd	nd	nd
Total USEPA Priority PAHs	1	nd	nd	nd	nd	nd
2-Fluorobiphenyl-SURROGATE	1	95%	87%	83%	94%	90%
Anthracene-D10-SURROGATE	1	99%	102%	92%	104%	104%
p-Terphenyl-D14-SURROGATE	1	104%	111%	96%	109%	113%

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = <PQL
-- = Not Applicable
Refer to Amdel standard laboratory qualifier codes for comments.

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified in Method Header
Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

amdel

Job Number : 3E0879
Client : Patterson Britton & Partners Pty Ltd
Reference : 3878-08
Project : Sth Arm Hunter River Dredging EIS

Analyte	Lab No	E30807	E30808	E30809	E30810	E30811
	Sample Id	DOLO	MIXL	HUL	HDL	MUL
	PQL					
E0230 TPH in Water by P&T/GC-MS (ug/L)						
C6-C9 Fraction	20	--	--	--	nd	--
E0221 TPH in Water (ug/L)						
C10-C14 Fraction	20	--	--	--	nd	--
C15-C28 Fraction	100	--	--	--	nd	--
C29-C36 Fraction	100	--	--	--	nd	--
E2600 pH in Water						
pH	0.1	7.6	8.2	8.2	8.3	8.3
E2430 Conductivity (uS/cm at 25.0 C)						
Electrical Conductivity	1	7700	16000	31000	33000	33000
E2670 Suspended Solids in Water						
Suspended Solids	1	nd	4	24	1	9
E2790 Turbidity in Water (NTU)						
Turbidity	0.1	2.0	0.6	1.4	1.0	1.4
E2330 Ammonia as N in Water						
Ammonia as N	0.01	--	--	--	--	--
E2450 Total Cyanide in Water						
Total Cyanide	0.005	--	--	--	--	--

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = <PQL
-- = Not Applicable
Refer to Amdel standard laboratory qualifier codes for comments.

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified in Method Header
Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

amdel

Job Number : 3E0879
Client : Patterson Britton & Partners Pty Ltd
Reference : 3878-08
Project : Sth Arm Hunter River Dredging EIS

Analyte	Lab No / Sample Id / PQL	E30812 / MDL	E30816 / MDL/MUL			
E0230 TPH in Water by P&T/GC-MS (ug/L)						
C6-C9 Fraction	20	nd	--			
E0221 TPH in Water (ug/L)						
C10-C14 Fraction	20	--	30			
C15-C28 Fraction	100	--	P 220			
C29-C36 Fraction	100	--	nd			
E2600 pH in Water						
pH	0.1	--	--			
E2430 Conductivity (uS/cm at 25.0 C)						
Electrical Conductivity	1	--	--			
E2670 Suspended Solids in Water						
Suspended Solids	1	--	--			
E2790 Turbidity in Water (NTU)						
Turbidity	0.1	--	--			
E2330 Ammonia as N in Water						
Ammonia as N	0.01	5.21	--			
E2450 Total Cyanide in Water						
Total Cyanide	0.005	0.164	--			

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = <PQL
-- = Not Applicable
Refer to Amdel standard laboratory qualifier codes for comments.

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified in Method Header
Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

amdel

This Laboratory is accredited by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of accreditation. This document shall not be reproduced except in full.

NATA Accredited Laboratory Number: 1464

INDUSTRIAL SERVICES DIVISION

ABN 30 008 127 802

Correspondence to:
PO Box 514
HORNSBY NSW 1630

5 Kelray Place
ASQUITH NSW 2077
Telephone: (02) 9482 1922
Facsimile: (02) 9482 1734

CERTIFICATE OF ANALYSIS

Contents :

1. Cover Pages (2)
2. Analysis Report Pages
3. QA/QC Appendix
4. Additional Reports - External (if applicable)
5. Chain of Custody (if applicable)

Report No.	:	3E0752
Attention	:	Ali Stone
Client	:	Patterson Britton & Partners Pty Ltd
	:	PO Box 515
	:	NORTH SYDNEY NSW 2059
	:	NSW 2059
Samples	:	4
Reference/Order	:	3878-08
Project	:	HUNTER RIVER
Received Samples	:	24/02/03
Instructions	:	24/02/03
Date Reported	:	27/02/03

PLEASE SEE FOLLOWING PAGE FOR METHOD LISTING

RESULTS

All samples were analysed as received. This report relates specifically to the samples as received. Results relate to the source material only to the extent that the samples as supplied are truly representative of the sample source. This report replaces any preliminary results issued. Note that for methods indicated with "*", NATA accreditation does not cover the performance of this service. Three significant figures (or 2 for <10PQL) are reported for statistical purposes only. Where "Total" concentrations are reported for organic suites of compounds this is the summation of the individual compounds and the PQL is noted for reporting purposes only. This report has been auto-authorized by NATA signatories for PDF format. Refer to the method descriptions for further information.

PLEASE SEE ATTACHED PAGES FOR RESULTS

R. Mooney B.Sc.(Hons)Dip. FDA
Technical Services Manager Sydney

amdel

Report No. : 3E0752

Please note: Where samples are collected/submitted over several days, the date on which the last samples were analysed or extracted is reported.
Unless Ferrous Iron is determined on site, the possibility of a ferrous-ferric ratio change may occur.

Method	Description	Extracted	Analysed	Authorised
E7500	Moisture (%w/w)	24/02/03	25/02/03	SYS 096
E1230	TPH C6-C9 by Purge & Trap	24/02/03	24/02/03	DUM 094
E1221	TPH (C10-C36)	24/02/03	25/02/03	DUM 094
E3795	Organic Carbon	27/02/03	27/02/03	NSA 101
E11101	Polynuclear Aromatic Hydrocarbons	24/02/03	25/02/03	DUM 095
E0110	Polycyclic Aromatic Hydrocarbons	24/02/03	25/02/03	DUM 095
E2600	pH	24/02/03	24/02/03	NSA 101
E2430	Conductivity	24/02/03	24/02/03	NSA 101
E2670	Suspended Solids	24/02/03	25/02/03	NSA 101
E2790	Turbidity	24/02/03	25/02/03	NSA 101
E7500	Moisture (%w/w)	26/02/03	26/02/03	SYS 096
E5910	Metals by ICP-AES	26/02/03	27/02/03	RMO 093
E5950	Mercury in Soil	26/02/03	27/02/03	RMO 093

amdel

Job Number : 3E0752
Client : Patterson Britton & Partners Pty Ltd
Reference : 3878-08
Project : HUNTER RIVER

Analyte	Lab No	E29149				
	Sample Id	MIX				
	PQL					
Moisture Content	1	41%				
E1230 TPH in Soil by Purge & Trap/GC-MS						
C6-C9 Fraction	5	nd				
E1221 TPH in Soil						
C10-C14 Fraction	10	1400				
C15-C28 Fraction	50	2100				
C29-C36 Fraction	50	640				
E3795 Organic Carbon (% w/w)						
Total Organic Carbon (%)	0.1	14				

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = <PQL
-- = Not Applicable
Refer to Amdel standard laboratory qualifier codes for comments.

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified in Method Header
Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

amdel

Job Number : 3E0752
Client : Patterson Britton & Partners Pty Ltd
Reference : 3878-08
Project : HUNTER RIVER

Analyte	Lab No	E29149				
	Sample Id	MIX				
	PQL					
E11101 Priority PAH's in Soil						
Naphthalene	0.05	995				
Acenaphthylene	0.05	20.3				
Acenaphthene	0.05	103				
Fluorene	0.05	65.5				
Phenanthrene	0.05	157				
Anthracene	0.05	35.0				
Fluoranthene	0.05	113				
Pyrene	0.05	96.2				
Benz(a)anthracene	0.05	28.3				
Chrysene	0.05	19.6				
Benzo(b) & (k)fluoranthene	0.1	41				
Benzo(a)pyrene	0.05	28.7				
Indeno(1.2.3-cd)pyrene	0.05	17.9				
Dibenz(a.h)anthracene	0.05	3.19				
Benzo(g.h.i)perylene	0.05	17.6				
Total USEPA Priority PAHs	0.05	1740				
2-Fluorobiphenyl-SURROGATE	1	101%				
anthracene-d10-SURROGATE	1	108%				
p-terphenyl-D14-SURROGATE	1	100%				

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = <PQL
-- = Not Applicable
Refer to Amdel standard laboratory qualifier codes for comments.

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified in Method Header
Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

amdel

Job Number : 3E0752
Client : Patterson Britton & Partners Pty Ltd
Reference : 3878-08
Project : HUNTER RIVER

Analyte	Lab No	E29150	E29151	E29152		
	Sample Id	MIXD	HUL	MUL		
	PQL					
E0110 Priority PAH's in Water (ug/L)						
Naphthalene	1	2	nd	nd		
Acenaphthylene	1	nd	nd	nd		
Acenaphthene	1	nd	nd	nd		
Fluorene	1	nd	nd	nd		
Phenanthrene	1	nd	nd	nd		
Anthracene	1	nd	nd	nd		
Fluoranthene	1	nd	nd	nd		
Pyrene	1	nd	nd	nd		
Benz(a)anthracene	1	nd	nd	nd		
Chrysene	1	nd	nd	nd		
Benzo(b) & (k)fluoranthene	2	nd	nd	nd		
Benzo(a)pyrene	1	nd	nd	nd		
Indeno(1.2.3-cd)pyrene	1	nd	nd	nd		
Dibenz(a.h)anthracene	1	nd	nd	nd		
Benzo(g.h.i)perylene	1	nd	nd	nd		
Total USEPA Priority PAHs	1	2	nd	nd		
2-Fluorobiphenyl-SURROGATE	1	78%	78%	85%		
Anthracene-D10-SURROGATE	1	92%	94%	105%		
p-Terphenyl-D14-SURROGATE	1	97%	92%	107%		

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = <PQL
-- = Not Applicable
Refer to Amdel standard laboratory qualifier codes for comments.

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified in Method Header
Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

amdel

Job Number : 3E0752
Client : Patterson Britton & Partners Pty Ltd
Reference : 3878-08
Project : HUNTER RIVER

Analyte	Lab No	E29150	E29151	E29152		
	Sample Id	MIXD	HUL	MUL		
	PQL					
E2600 pH in Water						
pH	0.1	8.2	8.2	8.2		
E2430 Conductivity (uS/cm at 25.0 C)						
Electrical Conductivity	1	360	43000	44000		
E2670 Suspended Solids in Water						
Suspended Solids	1	20	7	8		
E2790 Turbidity in Water (NTU)						
Turbidity	0.1	3.4	1.2	2.4		

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = *<PQL*
-- = Not Applicable

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified in Method Header
Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

Refer to Amdel standard laboratory qualifier codes for comments.

amdel

This Laboratory is accredited by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of accreditation. This document shall not be reproduced except in full.
NATA Accredited Laboratory Number: 1464

INDUSTRIAL SERVICES DIVISION

ABN 30 008 127 802

Correspondence to:
PO Box 514
HORNSBY NSW 1630

5 Kelray Place
ASQUITH NSW 2077
Telephone: (02) 9482 1922
Facsimile: (02) 9482 1734

CERTIFICATE OF ANALYSIS

Contents :
1. Cover Pages (2)
2. Analysis Report Pages
3. QA/QC Appendix
4. Additional Reports - External (if applicable)
5. Chain of Custody (if applicable)

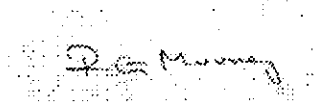
Report No.	:	3E0752A
Attention	:	Ali Stone
Client	:	Patterson Britton & Partners Pty Ltd
	:	PO Box 515
	:	NORTH SYDNEY NSW 2059
	:	NSW 2059
Samples	:	1
Reference/Order	:	3878-08
Project	:	Hunter River
Received Samples	:	25/02/03
Instructions	:	25/02/03
Date Reported	:	27/02/03

PLEASE SEE FOLLOWING PAGE FOR METHOD LISTING

RESULTS

All samples were analysed as received. This report relates specifically to the samples as received. Results relate to the source material only to the extent that the samples as supplied are truly representative of the sample source. This report replaces any preliminary results issued. Note that for methods indicated with "*", NATA accreditation does not cover the performance of this service. Three significant figures (or 2 for <10PQL) are reported for statistical purposes only. Where "Total" concentrations are reported for organic suites of compounds this is the summation of the individual compounds and the PQL is noted for reporting purposes only. This report has been auto-authorized by NATA signatories for PDF format. Refer to the method descriptions for further information.

PLEASE SEE ATTACHED PAGES FOR RESULTS



R. Mooney B.Sc.(Hons)Dip. FDA
Technical Services Manager Sydney

amdel

Report No. : 3E0752A

Please note: Where samples are collected/submitted over several days, the date on which the last samples were analysed or extracted is reported.
Unless Ferrous Iron is determined on site, the possibility of a ferrous-ferric ratio change may occur.

Method	Description	Extracted	Analysed	Authorised
E7500	Moisture (%w/w)	26/02/03	26/02/03	SYS 096
E5910	Metals by ICP-AES	26/02/03	27/02/03	RMO 093
E5950	Mercury in Soil	26/02/03	27/02/03	RMO 093

amdel

Job Number : 3E0752A
Client : Patterson Britton & Partners Pty Ltd
Reference : 3878-08
Project : Hunter River

Analyte	Lab No	E29149				
	Sample Id	MIX				
	PQL					
Moisture Content	1	34%				
E5910 Metals in Soil						
Arsenic	5	11				
Zinc	5	570				
Lead	5	86				
E5950 Mercury in Soil						
Mercury	0.05	0.17				

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = <PQL
-- = Not Applicable
Refer to Amdel standard laboratory qualifier codes for comments.

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified in Method Header
Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

amdel

This Laboratory is accredited by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of accreditation. This document shall not be reproduced except in full.

NATA Accredited Laboratory Number: 1464

INDUSTRIAL SERVICES DIVISION

ABN 30 008 127 802

Correspondence to:
PO Box 514
HORNSBY NSW 1630

5 Kelray Place
ASQUITH NSW 2077
Telephone: (02) 9482 1922
Facsimile: (02) 9482 1734

CERTIFICATE OF ANALYSIS

Contents :

1. Cover Pages (2)
2. Analysis Report Pages
3. QA/QC Appendix
4. Additional Reports - External (if applicable)
5. Chain of Custody (if applicable)

Report No.	:	3E1005A
Attention	:	Ali Stone
Client	:	Patterson Britton & Partners Pty Ltd
	:	PO Box 515
	:	NORTH SYDNEY NSW 2059
	:	NSW 2059
Samples	:	13
Reference/Order	:	3878-08
Project	:	Hunter River
Received Samples	:	10/03/03
Instructions	:	10/03/03
Date Reported	:	14/03/03

PLEASE SEE FOLLOWING PAGE FOR METHOD LISTING

RESULTS

All samples were analysed as received. This report relates specifically to the samples as received. Results relate to the source material only to the extent that the samples as supplied are truly representative of the sample source. This report replaces any preliminary results issued. Note that for methods indicated with "*", NATA accreditation does not cover the performance of this service. Three significant figures (or 2 for <10PQL) are reported for statistical purposes only. Where "Total" concentrations are reported for organic suites of compounds this is the summation of the individual compounds and the PQL is noted for reporting purposes only. This report has been auto-authorized by NATA signatories for PDF format. Refer to the method descriptions for further information.

PLEASE SEE ATTACHED PAGES FOR RESULTS

R. Mooney B.Sc.(Hons)Dip. FDA
Technical Services Manager Sydney

amdel

Report No. : 3E1005A

Please note: Where samples are collected/submitted over several days, the date on which the last samples were analysed or extracted is reported.
Unless Ferrous Iron is determined on site, the possibility of a ferrous-ferric ratio change may occur.

Method	Description	Extracted	Analysed	Authorised
E7500	Moisture (%w/w)	11/03/03	12/03/03	SYS 096
E11101	Polynuclear Aromatic Hydrocarbons	10/03/03	11/03/03	DUM 095
E1230	TPH C6-C9 by Purge & Trap	10/03/03	10/03/03	DUM 094
E1221	TPH (C10-C36)	10/03/03	11/03/03	DUM 094
E3795	Organic Carbon	13/03/03	14/03/03	NSA 101
E0230	TPH C6-C9 by purge & trap	10/03/03	10/03/03	DUM 094
E0221	TPH (C10-C36)	11/03/03	12/03/03	DUM 094
E0110	Polycyclic Aromatic Hydrocarbons	11/03/03	12/03/03	MNG 095
E2600	pH	11/03/03	11/03/03	NSA 101
E2430	Conductivity	11/03/03	11/03/03	NSA 101
E2670	Suspended Solids	11/03/03	11/03/03	NSA 101
E2790	Turbidity	12/03/03	12/03/03	NSA 101

amdel

Job Number : 3E1005A
Client : Patterson Britton & Partners Pty Ltd
Reference : 3878-08
Project : Hunter River

Analyte	Lab No	E32151	E32152	E32153		
	Sample Id	LOW	MED	HIGH		
	PQL					
Moisture Content	1	26%	37%	50%		
E11101 Priority PAH's in Soil						
Naphthalene	0.05	378	810	2850		
Acenaphthylene	0.05	17.4	24.0	57.5		
Acenaphthene	0.05	27.9	58.9	331		
Fluorene	0.05	17.6	31.7	208		
Phenanthrene	0.05	84.9	120	440		
Anthracene	0.05	22.7	29.7	127		
Fluoranthene	0.05	115	144	294		
Pyrene	0.05	101	114	229		
Benz(a)anthracene	0.05	24.8	44.3	73.6		
Chrysene	0.05	15.7	25.3	38.9		
Benzo(b) & (k)fluoranthene	0.1	42	65	110		
Benzo(a)pyrene	0.05	29.3	41.0	71.3		
Indeno(1.2.3-cd)pyrene	0.05	27.8	37.2	51.3		
Dibenz(a.h)anthracene	0.05	3.35	5.04	8.69		
Benzo(g.h.i)perylene	0.05	17.7	22.5	38.1		
Total USEPA Priority PAHs	0.05	926	1570	4930		
2-Fluorobiphenyl-SURROGATE	1	127%	129%	117%		
anthracene-d10-SURROGATE	1	101%	105%	100%		
p-terphenyl-D14-SURROGATE	1	95%	80%	81%		

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = <PQL
-- = Not Applicable
Refer to Amdel standard laboratory qualifier codes for comments.

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified in Method Header
Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

amdel

Job Number : 3E1005A
Client : Patterson Britton & Partners Pty Ltd
Reference : 3878-08
Project : Hunter River

Analyte	Lab No / Sample Id / PQL	E32151 LOW	E32152 MED	E32153 HIGH		
E1230 TPH in Soil by Purge & Trap/GC-MS						
C6-C9 Fraction	5	nd	nd	nd		
E1221 TPH in Soil						
C10-C14 Fraction	10	500	1000	5500		
C15-C28 Fraction	50	920	2300	6400		
C29-C36 Fraction	50	260	780	1000		
E3795 Organic Carbon (% w/w)						
Total Organic Carbon (%)	0.5	2.6	17	16		

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = <PQL
-- = Not Applicable
Refer to Amdel standard laboratory qualifier codes for comments.

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified in Method Header
Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

amdel

Job Number : 3E1005A
Client : Patterson Britton & Partners Pty Ltd
Reference : 3878-08
Project : Hunter River

Analyte	Lab No	E32141	E32142	E32143	E32144	E32145
	Sample Id	C+ T+	C+ T0	C+ T-	C0 T+	C0 T0
	PQL					
E0230 TPH in Water by P&T/GC-MS (ug/L)						
C6-C9 Fraction	20	nd	nd	nd	nd	nd
E0221 TPH in Water (ug/L)						
C10-C14 Fraction	20	2100	600	120	620	160
C15-C28 Fraction	100	2950	627	nd	1050	106
C29-C36 Fraction	100	757	nd	nd	489	nd

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = <PQL
-- = Not Applicable
Refer to Amdel standard laboratory qualifier codes for comments.

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified in Method Header
Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

amdel

Job Number : 3E1005A
Client : Patterson Britton & Partners Pty Ltd
Reference : 3878-08
Project : Hunter River

Analyte	Lab No	E32146	E32147	E32148	E32149	E32150
	Sample Id	C0 T-	C- T+	C- T0	C- T-	C* T*
	PQL					
E0230 TPH in Water by P&T/GC-MS (ug/L)						
C6-C9 Fraction	20	nd	nd	nd	nd	nd
E0221 TPH in Water (ug/L)						
C10-C14 Fraction	20	nd	180	100	nd	nd
C15-C28 Fraction	100	nd	285	112	nd	nd
C29-C36 Fraction	100	nd	nd	nd	nd	nd

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = <PQL
-- = Not Applicable
Refer to Amdel standard laboratory qualifier codes for comments.

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified in Method Header
Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

amdel

Job Number : 3E1005A
Client : Patterson Britton & Partners Pty Ltd
Reference : 3878-08
Project : Hunter River

Analyte	Lab No	E32141	E32142	E32143	E32144	E32145
	Sample Id	C+ T+	C+ T0	C+ T-	C0 T+	C0 T0
	PQL					
E0110 Priority PAH's in Water (ug/L)						
Naphthalene	1	350	120	23	54	6
Acenaphthylene	1	10	3	nd	2	nd
Acenaphthene	1	70	29	7	12	1
Fluorene	1	38	19	4	6	nd
Phenanthrene	1	61	39	9	15	1
Anthracene	1	15	10	2	5	nd
Fluoranthene	1	28	22	5	15	1
Pyrene	1	21	17	4	12	nd
Benz(a)anthracene	1	5	4	1	3	nd
Chrysene	1	4	3	nd	2	nd
Benzo(b) & (k)fluoranthene	2	6	6	nd	4	nd
Benzo(a)pyrene	1	3	4	nd	2	nd
Indeno(1.2.3-cd)pyrene	1	2	2	nd	1	nd
Dibenz(a.h)anthracene	1	nd	nd	nd	nd	nd
Benzo(g.h.i)perylene	1	2	2	nd	1	nd
Total USEPA Priority PAHs	1	610	280	57	130	9
2-Fluorobiphenyl-SURROGATE	1	73%	71%	73%	70%	71%
Anthracene-D10-SURROGATE	1	91%	93%	91%	92%	86%
p-Terphenyl-D14-SURROGATE	1	97%	97%	100%	99%	103%

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = <PQL
-- = Not Applicable
Refer to Amdel standard laboratory qualifier codes for comments.

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified in Method Header
Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

amdel

Job Number : 3E1005A
Client : Patterson Britton & Partners Pty Ltd
Reference : 3878-08
Project : Hunter River

Analyte	Lab No	E32146	E32147	E32148	E32149	E32150
	Sample Id	C0 T-	C- T+	C- T0	C- T-	C* T*
	PQL					
E0110 Priority PAH's in Water (ug/L)						
Naphthalene	1	37	43	17	4	nd
Acenaphthylene	1	1	3	1	nd	nd
Acenaphthene	1	7	10	4	nd	nd
Fluorene	1	4	5	3	nd	nd
Phenanthrene	1	10	15	6	1	nd
Anthracene	1	4	8	3	nd	nd
Fluoranthene	1	10	21	7	1	nd
Pyrene	1	8	22	8	1	nd
Benz(a)anthracene	1	2	5	2	nd	nd
Chrysene	1	2	4	1	nd	nd
Benzo(b) & (k)fluoranthene	2	3	9	3	nd	nd
Benzo(a)pyrene	1	2	6	2	nd	nd
Indeno(1.2.3-cd)pyrene	1	1	4	1	nd	nd
Dibenz(a.h)anthracene	1	nd	nd	nd	nd	nd
Benzo(g.h.i)perylene	1	nd	4	1	nd	nd
Total USEPA Priority PAHs	1	91	160	60	8	nd
2-Fluorobiphenyl-SURROGATE	1	74%	73%	71%	72%	93%
Anthracene-D10-SURROGATE	1	98%	85%	84%	90%	106%
p-Terphenyl-D14-SURROGATE	1	101%	97%	99%	103%	107%

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = <PQL
-- = Not Applicable
Refer to Amdel standard laboratory qualifier codes for comments.

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified in Method Header
Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

amdel

Job Number : 3E1005A
Client : Patterson Britton & Partners Pty Ltd
Reference : 3878-08
Project : Hunter River

Bottle must have been acid preserved!

Analyte	Lab No	E32141	E32142	E32143	E32144	E32145
	Sample Id	C+ T+	C+ T0	C+ T-	C0 T+	C0 T0
	PQL					
E2600 pH in Water						
pH	0.1	8.0	8.0	8.0	8.0	3.0
E2430 Conductivity (uS/cm at 25.0 C)						
Electrical Conductivity	1	38000	37000	36000	35000	35000
E2670 Suspended Solids in Water						
Suspended Solids	1	2300	230	49	550	210
E2790 Turbidity in Water (NTU)						
Turbidity	0.1	>1000	50	12	80	45

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = <PQL
-- = Not Applicable
Refer to Amdel standard laboratory qualifier codes for comments.

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified in Method Header
Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

amdel

Job Number : 3E1005A
Client : Patterson Britton & Partners Pty Ltd
Reference : 3878-08
Project : Hunter River

BLANK

Analyte	Lab No	E32146	E32147	E32148	E32149	E32150
	Sample Id	C0 T-	C- T+	C- T0	C- T-	C* T*
	PQL					
E2600 pH in Water						
pH	0.1	8.0	8.1	8.1	8.1	6.7
E2430 Conductivity (uS/cm at 25.0 C)						
Electrical Conductivity	1	36000	38000	37000	36000	9500
E2670 Suspended Solids in Water						
Suspended Solids	1	46	240	96	25	4
E2790 Turbidity in Water (NTU)						
Turbidity	0.1	6.6	70	35	8.6	1.0

PQL = Practical Quantitation Limit
LNR = Samples Listed not Received
nd = <PQL
-- = Not Applicable
Refer to Amdel standard laboratory qualifier codes for comments.

Soils : mg/kg (ppm) dry weight unless otherwise specified
Waters : mg/L (ppm) unless otherwise specified in Method Header
Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

level 2
104 Mount Street
North Sydney 2060

PO Box 515
North Sydney 2059
Australia

telephone (02) 9957 1619
facsimile (02) 9957 1291
email: reception@pattbrit.com.au
A.C.N. 003 220 226

Patterson Britton
& Partners Pty Ltd

consulting engineers

ENVIRONMENTAL WATER SAMPLES
CHAIN OF CUSTODY

Job Title: South Arm Hunter River Dredging EIS
Job Number: 3878-08
Sample Location: Hunter River
Sampled By: Bob Batchelder

Lab Ref: AMDEL
Date: 10/3/03
Project Manager: All Stone / Bob Batchelder C+P—Lm

	SAMPLE		CONTAINER	PRESERVATION	METHOD CODE & PQL
	ID	Date	Type/No	Method	
E32141	C^+, T^+	10/3	40ml Vial	4°C	TPH C_6-C_9 (20µg/L)
42	C^+, T^0	"	"	4°C	"
43	C^+, T^-	"	"	4°C	"
44	C^0, T^+	"	"	4°C	"
45	C^0, T^0	"	"	4°C	"
46	C^0, T^-	"	"	4°C	"
47	C^-, T^+	"	"	4°C	"
48	C^-, T^0	"	"	4°C	"
49	C^-, T^-	"	"	4°C	"
50	C^*, T^*	"	"	4°C	"
				4°C	
				4°C	
				4°C	
				4°C	
				4°C	

RECEIVED
11 MAR
3E1005

Special Instructions: Results reqd 4 days

Relinquished by: BCB	Date: 10/3	Relinquished by:	Date: .....
Organisation: C+P Lm	Time:	Organisation:	Time: .....
Received by:	Date: 10/3/03	Received by:	Date: .....
Organisation: Amdel	Time: 12:20pm	Organisation:	Time: .....

Appendix C

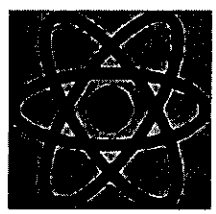
Haztec Pty Ltd Cementitious Testing Report

Newcastle Port Corporation

Proposed Extension of Shipping Channels EIS – Port of Newcastle

Sediment Stabilisation Trials

Prepared by:



Dr Karl Baltpurvins
Haztech Industries Pty Ltd

March 2003

Table of Contents

1 Executive Summary ____ *3*

2 Introduction ____ *4*

3 Statutory Requirements and Other Issues Considered ____ *5*

4 Methodology ____ *6*

4.1 Testing Protocols ____ 8

5 Results of Treatment Evaluation ____ *9*

5.1 Toxicity Characteristic Leaching Procedure ____ 9

5.2 Unconfined Compressive Strength ____ 9

5.3 Technology Comparison ____ 11

6 Mechanism of Immobilisation ____ *11*

6.1 Portland Cement Mechanism ____ 11

6.2 Dolocrete Mechanism ____ 12

7 Conclusions ____ *12*

1 Executive Summary

This report has been commissioned by GHD, to accompany the preparation of the Environmental Impact Statement for the Proposed Dredging of the South Arm of the Hunter River. Moreover, it forms part the Bulk Sampling and Testing Programme devised to assess the relative merits of a number of treatment processes. This report investigates the feasibility of stabilisation technology for the treatment of contaminated sediments within the Hunter River.

The proposed development will generate approximately 250,000 cubic metres of contaminated sediments that will require treatment prior to disposal. One of the treatment approaches being considered for the proposal is Chemical Fixation and Solidification (CFS). The CFS approach would involve the physical and chemical stabilisation of the sediments, via the addition and mixing of specific reagents, producing a solid with an improved degree of compressive strength. It is proposed that the treated product be used for beneficial re-use in the region.

In order to assess the viability of the CFS approach, two technologies were selected for evaluation, namely Portland Cement and Dolocrete™ technologies. A number of laboratory trials (72 in total) were undertaken to assess various reagent formulations for the various permutations of moisture content and contaminant loadings. The selection of the formulations was based on economic considerations such that the total reagent cost did not exceed the estimated cost of competing destructive technologies (ie ~$60.00/tonne). This approach was based on the NSW Environment Protection Authorities (EPA) preference for destructive technologies over micro-encapsulation technologies.

The performance of two CFS technologies were evaluated against the achievement of the treatment standards stipulated by the NSW EPA under the Immobilisation Approval Scheme. This included evaluating the treated sediments for TCLP leachability (pH 4.99) and Unconfined Compressive Strength (UCS).

The results of the trials found that both the Portland Cement and Dolocrete™ technologies were effective in treating the sediments to the standards prescribed by the NSW EPA. A comparison of the technologies found that the Dolocrete™ process was marginally more effective in immobilizing the contaminants. However, the Portland Cement technology was more effective in producing a treated product with a higher degree of compressive strength for re-use applications.

A number of optimum treatment formulations were provided on the basis of satisfying the requirements stipulated by the NSW EPA under Immobilisation Approval Scheme. These optimum formulations require consideration in conjunction with the engineering requirements with a view to maintaining the water quality

objectives. To this end, deposition and placement simulation tests have been conducted, and permeability testing of the sediments and the treated product has been carried out by others, as part of the Bulk Sampling and Testing Report.

2 Introduction

This report has been commissioned by GHD, to accompany the preparation of the Environmental Impact Statement for the Proposed Dredging of the South Arm of the Hunter River. This report investigates the feasibility of stabilisation technology for the treatment of contaminated sediments within the Hunter River.

One of the most common methods of treating hazardous wastes is by using a group of technologies called Chemical Fixation and Solidification (CFS). These technologies involve the physical and chemical stabilisation of the sediments via the addition and mixing of specific reagents, producing a solid with a high degree of compressive strength.

A variety of CFS technologies are available for the treatment of both organic and inorganic contaminants. Most recently, a number of coal tar impacted soils have been treated in the Hunter Region, including soils from a former Gas Works located in Newcastle and soils/sediments from a former Oyster lease located in Port Stephens.

The effectiveness of the CFS treatment is dependent on a number of variables including contaminant type, contaminant concentration, physical matrix, chemical composition etc. Following a review of the various CFS technologies that are commercially available for the treatment of sediments, two technologies were selected for evaluation. These technologies were Portland Cement and the Dolocrete™ technology. The technology selection was based on the past performance of the technology in similar applications.

The use of Portland Cement as a CFS reagent is not subject to any patents. The international rights to the Dolocrete™ technology is owned by Dolomatrix Australia Ltd and has patent protection in key jurisdictions throughout the world. Dolomatrix Australia Ltd is a publicly listed company on the Australian Stock Exchange (ASX).

The Portland Cement technology has been used throughout the world for the treatment of hazardous wastes containing organic and inorganic contaminants. The treated product has found extensive geo-mechanical applications.

The Dolocrete™ technology is a magnesium based CFS process involving the reaction of proprietary reagents with specifically calcined Dolomite [ie MgO/CO_3]. It is

claimed that the treated product demonstrates a low degree of leachability and a high degree of compressive strength.

The Dolocrete™ technology has been used for a number of projects within Australia and has been assessed by the NSW EPA, WA EPA and the TAS Department of Primary Industries, Water and Environment. To date, it is understood the technology has been commercially used to treat contaminants including heavy-metals (e.g. lead, zinc, mercury, selenium, arsenic, cadmium, nickel etc), polyaromatic hydrocarbons, ammonia, phenols, cyanide and the organophosphate pesticide, chorpyrifos.

The treated product generated from both technologies can potentially be disposed of either to landfill, placed in a repository or reused in other suitable applications. To date in Australia, all three of the above methods have been utilised for the CFS products.

3 Statutory Requirements and Other Issues Considered

The assessment of waste materials is specified under the NSW EPA *Environmental Guidelines: Assessment Classification and Management of Liquid and Non-liquid Wastes*. Under this scheme, *hazardous* wastes can be re-classified to either an *inert, solid* or *industrial* waste classification under the Immobilisation Approval process. The waste can then be disposed of to a facility with the appropriate engineering standards to receive wastes of this type. Following advice from the NSW EPA, the assessment of the treated sediments would be undertaken using this scheme.

In order to obtain an Immobilisation Approval from the NSW EPA, a number of conditions must be satisfied. These conditions are specified in the above-mentioned guidelines. One of the principal testing methods to assess the chemical stability of the treated waste is the Toxicity Characteristic Leaching Procedure (TCLP) analysis. This system involves crushing a sample of the treated waste to < 1mm then extracting the sample for 18 hours with a dilute solution of acetic acid. For the purposes of the current project, the NSW EPA has specified that the TCLP method (US EPA method 1311) be limited to the pH 4.99 to simulate the geo-chemical conditions of the proposed re-use site.

The NSW EPA has also stipulated that the TCLP extractants be assessed for heavy metals (arsenic, cadmium, chromium(t), copper, nickel, lead, zinc and mercury), Total Petroleum Hydrocarbons (TPH), Polyaromatic Hydrocarbons (PAH's), cyanide(t), BETX (benzene, toluene, ethylbenzene, and xylene), and phenols. It should be noted that under the Immobilisation Approval Scheme various analytes contained within this testing sequence do not have corresponding TCLP threshold values (eg TPH).

Another physical testing measure accepted by the NSW EPA for CFS treatment of organic containing *hazardous* wastes is Unconfined Compressive Strength (UCS). Typically a minimum strength of about 350 kPa is required. **Appendix 1** provides information from the NSW EPA with regard to the use of UCS as a physical testing measure in CFS treatments.

The management of wastes in NSW is governed by the NSW EPA's *Protection of the Environment and Operation Act, 1997*. Under this legislation facilities that process and dispose of waste materials may require licensing as waste facilities. As a result, both the CFS treatment facility and the emplaced product may require individual licenses under the above mentioned legislation. This will require maintaining the operating conditions of the facilities including discharge limits stipulated on the license. Most notably, the discharge of leachate (if any) from the emplaced material would be assessed under a suitable Level of Protection specified in the Australian and New Zealand Guidelines for Freshwater and Marine Water Quality, 2000.

4 Methodology

In order to assess the efficiency of the CFS treatment according to the protocols established by the NSW EPA, a range of trials were undertaken. These trials involved assessing various permutations of moisture content (mass of water/mass of solid) and contaminant loadings as shown in **Table 1**. In addition, a range of formulations were trialled for each of the above-mentioned permutations using both the Portland Cement and Dolocrete technologies. A summary of the various formulations that were assessed is shown in **Table 2**.

Table 1. Permutations of Moisture Content and Contaminant Loadings

Moisture#/Contaminant Loadings	**High [+]** [>10000 mg/kg PAH(t)]	**Med[0]** [<10000/>500 mg/kg PAH(t)]	**Low [-]** [<500 mg/kg PAH(t)]
High [+] (>80%)	[+,+]	[+,0]	[+,-]*
Medium [0] (~60% w/w)	[0,+]	[0,0]	[0,-]*
Low [-] (<40% w/w)	[-,+]	[-,0]	[-,-]*

* The low contaminant samples [C-] were predominantly comprised of sand. As a result, the moisture contents were less than for the higher contaminant samples and were in the vicinity of [M+] = 50%, [Mo] = 40% and [M-]=30%.
# Moisture content = (mass of moisture/mass of solid)×100

Table 2. CFS Trial Formulations

Sample No	ID	Sample No	ID
1	[M+,C+,P, 0.10]	37	[M+,C+,D, 0.05]
2	[Mo,C+, P, 0.10]	38	[Mo,C+, D, 0.05]
3	[M-,C+, P, 0.10]	39	[M-,C+, D, 0.05]
4	[M+,Co, P, 0.10]	40	[M+,Co, D, 0.05]
5	[Mo,Co, P, 0.10]	41	[Mo,Co, D, 0.05]
6	[M-,Co, P, 0.10]	42	[M-,Co, D, 0.05]
7	[M+,C-, P, 0.10]	43	[M+,C-, D, 0.05]
8	[Mo,C-, P, 0.10]	44	[Mo,C-, D, 0.05]
9	[M-,C-, P, 0.10]	45	[M-,C-, D, 0.05]
10	[M+,C+,P, 0.20]	46	[M+,C+,D, 0.10]
11	[Mo,C+, P, 0.20]	47	[Mo,C+, D, 0.10]
12	[M-,C+, P, 0.20]	48	[M-,C+, D, 0.10]
13	[M+,Co, P, 0.20]	49	[M+,Co, D, 0.10]
14	[Mo,Co, P, 0.20]	50	[Mo,Co, D, 0.10]
15	[M-,Co, P, 0.20]	51	[M-,Co, D, 0.10]
16	[M+,C-, P, 0.20]	52	[M+,C-, D, 0.10]
17	[Mo,C-, P, 0.20]	53	[Mo,C-, D, 0.10]
18	[M-,C-, P, 0.20]	54	[M-,C-, D, 0.10]
19	[M+,C+,P, 0.30]	55	[M+,C+,D, 0.15]
20	[Mo,C+, P, 0.30]	56	[Mo,C+, D, 0.15]
21	[M-,C+, P, 0.30]	57	[M-,C+, D, 0.15]
22	[M+,Co, P, 0.30]	58	[M+,Co, D, 0.15]
23	[Mo,Co, P, 0.30	59	[Mo,Co, D, 0.15]
24	[M-,Co, P, 0.30]	60	[M-,Co, D, 0.15]
25	[M+,C-, P, 0.30]	61	[M+,C-, D, 0.15]
26	[Mo,C-, P, 0.30]	62	[Mo,C-, D, 0.15]
27	[M-,C-, P, 0.30]	63	[M-,C-, D, 0.15]
28	[M+,C+,P, 0.40]	64	[M+,C+,D, 0.20]
29	[Mo,C+, P, 0.40]	65	[Mo,C+, D, 0.20]
30	[M-,C+, P, 0.40]	66	[M-,C+, D, 0.20]
31	[M+,Co, P, 0.40]	67	[M+,Co, D, 0.20]
32	[Mo,Co, P, 0.40]	68	[Mo,Co, D, 0.20]
33	[M-,Co, P, 0.40]	69	[M-,Co, D, 0.20]
34	[M+,C-, P, 0.40]	70	[M+,C-, D, 0.20]
35	[Mo,C-, P, 0.40]	71	[Mo,C-, D, 0.20]
36	[M-,C-, P, 0.40]	72	[M-,C-, D, 0.20]

M-= Low Moisture Content, Mo= Medium Moisture Content, M+= High Moisture Content
C-=Low Contaminant Loading, Co= Medium Contaminant Loading, C+= High Contaminant Loading
D= Dolocrete™
P= Portland Cement

The numerical decimal corresponds to the ratio of reagents (Weigh of reagent/Weight of Sediment)

Samples (30kg) of each of the 9 permutations of moisture content and contaminant loading as listed in **Table 1** were provided for evaluation. Each of these samples was sub-sampled to prepare the formulations listed in **Table 2**. Following is the methodology used for the preparation of the trial formulations.

A 2 kg sub-sample of the appropriate sediment sample (see **Table 1**) was removed from the sample container using a clean stainless steel sampling trowel. The sub-samples were immediately transferred to the 10 L mixing chamber of a dough mixer. This mixing approach is considered as the most appropriate method of demonstrating the mixing conditions (eg shear) found in commercial CFS processing systems (eg pugmill).To the sub-samples was added the reagents and the appropriate quantity of dilution water (Hunter River water) to marginally adjust the sediment the appropriate moisture content. The material was then mixed to produce typical CFS slurry (~ 5 minutes). The resulting slurry was then split into two sub-samples.

The first sub-sample was placed into an open top curing vessel, whilst the second sample was placed into an Unconfined Compressive Strength (UCS) testing mould. It should be noted that due to UCS molding constraints only the samples with reagent loadings corresponding to 0.40 and 0.20 for Portland Cement and the 0.10 and 0.20 Dolocrete were assessed for UCS.

The treated product was observed to physically solidify rapidly with complete setting generally occurring within 24 hours of treatment. The samples of the treated product in the open top containers were cured for ~ 7-days then transferred for analytical testing. The UCS moulds were cured for 14 days then transferred for UCS evaluation. All testing and subsequent curing was undertaken at ambient temperatures. The selection of curing times was taken as the general industrial standard for treatments of this type.

4.1 Testing Protocols

The following table provides an overview of the relevance of the above-mentioned analyses.

Table 3: Analysis Methodologies

Analysis	Purpose	Method	Laboratory
TCLP	To demonstrate the tendency of the waste to leach in the environment under mildly acidic conditions	USEPA 1311	ALS
UCS	To demonstrate the geo-mechanical stability of the treated product.	AS1012.8.1	HW

ALS Australian Laboratory Services (NATA Certified) and HW Hunter Water Corporation (NATA Certified)

The TCLP extracts were evaluated for the contaminants listed previously.

5 Results of Treatment Evaluation

A summary of the analysis results compared against the threshold limits stipulated by the NSW EPA under the Immobilisation Approval scheme are shown in **Appendix 2.** The detailed analytical results can be found in **Appendix 3**

5.1 *Toxicity Characteristic Leaching Procedure*

The TCLP results for the trial formulations were found to be below the TCLP1 limit set in Table A4 of *the NSW EPA Environmental Guidelines: Assessment Classification and Management of Liquid and Non-liquid Wastes.* As a result, it can be concluded that all formulations were successful in treating the sediment to an *inert* waste classification based on TCLP result in reference to the NSW EPA Immobilisation Approval process.

5.2 Unconfined Compressive Strength

The UCS results for the various formulations were found to be in the range of 600 KPa to 20 MPa. We note that the lowest Dolocrete additive rate tested for UCS was 10% and the lowest Portland Cement 20%. In keeping with NSW EPA requirements, strengths are subjective dependent on site conditions and proposed use. Typically a strength in excess of 350 kPa would be envisaged.

The use of UCS as a quantitative measure for CFS treatment also provides an indicative relationship between leachability and UCS. In essence, the higher the UCS, the lower the permeability and the less likely the contaminants are to leach. We note that permeability tests are being conducted by others on the treated products, as part of the Bulk Sampling and Testing Programme. As a result, the optimal formulations will be dictated by the UCS stipulated in the NSW EPA Immobilisation Approval in reference to the proposed reuse application.

Results for the midrange formulations for both the Dolocrete [Waste : Dolocrete = 0.1 (10%)] and Portland Cement [Waste : Portland Cement = 0.2(20%)] are shown in **Table 4** and **Table 5** respectively.

Table 4. Results for Waste : Dolocrete = 0.1 (10%)

Contaminant										
Sample	[M+,C+]	[MoC+]	[M-,C+]	[M+,Co]	[Mo,Co]	[M-,Co]	[M+,C-]	[Mo,C-]	[M-,C-]	Inert Waste
Optimum Formulation	D 0.10	D 0.10	D 0.10	D 0.10	D 0.10	D 0.10	D 0.10	D 0.10	D 0.10	Threshold
phenol (µg/L)	<0.5	0.8	1.2	<0.5	0.6	0.8	<0.5	<0.5	<0.5	1440
2,4,5-trichlorophenol (µg/L)	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	40000
2,4,6-trichlorophenol (µg/L)	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	200
Benzene (µg/L)	<1	<1	<1	<1	<1	<1	<1	<1	<1	50
Toluene (µg/L)	<2	<2	<2	<2	<2	<2	<2	<2	<2	1440
chlorobenzene (µg/L)	<2	<2	<2	<2	<2	<2	<2	<2	<2	10000
ethyl benzene (µg/L)	15	<2	<2	7	<2	<2	9	<2	<2	3000
xylene (t) (µg/L)	45	<4	<4	73	<4	<4	<4	<4	<4	5000
benzo(a)pyrene (µg/L)	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	4
cyanide (t) (µg/L)	19	15	7	23	13	18	<5	70	10	1600
arsenic (µg/L)	<100	<100	<100	<100	<100	<100	<100	<100	<100	500
cadmium (µg/L)	<100	<100	<100	<100	<100	<100	<100	<100	<100	100
chromium(t)# (µg/L)	<100	<100	<100	<100	<100	<100	<100	<100	<100	500
nickel (µg/L)	<100	<100	<100	<100	<100	<100	<100	<100	<100	200
lead (µg/L)	<100	<100	<100	<100	<100	<100	<100	<100	<100	500
mercury (µg/L)	<10	<10	<10	<10	<10	<10	<10	<10	<10	20
UCS (Mpa)	0.8	0.7	0.7	0.7	0.8	0.7	0.6	0.6	0.6	*

 # Chromium (VI)< Chromium (t)

*** Dependent on the conditions of the Immobilisation Approval**

Table 5. Results for Waste : Portland Cement = 0.2 (20%)

Contaminant										
Sample	[M+,C+]	[MoC+]	[M-,C+]	[M+,Co]	[Mo,Co]	[M-,Co]	[M+,C-]	[Mo,C-]	[M-,C-]	Inert Waste
Optimum Formulation	P 0.20	P 0.20	P 0.20	P 0.20	P 0.20	P 0.20	P 0.20	P 0.20	P 0.20	Threshold
phenol (µg/L)	2	1.4	1.9	1.2	0.9	1.1	<0.5	0.8	0.9	1440
2,4,5-trichlorophenol (µg/L)	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	40000
2,4,6-trichlorophenol (µg/L)	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	200
Benzene (µg/L)	<1	<1	<1	<1	<1	<1	<1	<1	<1	50
Toluene (µg/L)	<2	<2	<2	<2	<2	<2	7	<2	<2	1440
chlorobenzene (µg/L)	<2	<2	<2	<2	<2	<2	<2	<2	<2	10000
ethyl benzene (µg/L)	3	<2	<2	<2	<2	<2	9	<2	<2	3000
xylene (t) (µg/L)	15	<4	<4	7	<4	<4	76	<4	<4	5000
benzo(a)pyrene (µg/L)	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	4
cyanide (t) (µg/L)	34	270	198	23	55	169	12	6	8	1600
arsenic (µg/L)	<100	<100	<100	<100	<100	<100	<100	<100	<100	500
cadmium (µg/L)	<100	<100	<100	<100	<100	<100	<100	<100	<100	100
chromium(t)# (µg/L)	<100	<100	<100	<100	<100	<100	<100	<100	<100	500
nickel (µg/L)	<100	<100	<100	<100	<100	<100	<100	<100	<100	200
lead (µg/L)	<100	<100	<100	<100	<100	<100	<100	<100	<100	500
mercury (µg/L)	<10	<10	<10	<10	<10	<10	<10	<10	<10	20
UCS (Mpa)	3.3	3.1	1.8	3.8	1.8	1.5	6.6	5.6	7.4	*

5.3 Technology Comparison

The selection of the formulations assessed for the two technologies was based on a direct commercial comparison. The maximum formulations namely 0.40 and 0.20 for Portland Cement and Dolocrete™ respectively corresponded to the approximate reagent cost of $60.00/tonne. This was considered to equate to the approximate cost of the destructive technologies (eg thermal desorption). Given that destructive techniques are preferred over microencapsulation CFS techniques under POEO legislation, no formulations that represented a cost in excess of thermal desorption were considered. However, it should be noted that the performance of the CFS treatment could be improved by the addition of secondary immobilisation reagents.

It can be seen from the results in **Appendix 2** that both the Portland Cement and Dolocrete technologies were effective in the treatment of the sediments. The notable differences and trends are as follows:

1. The use of both technologies resulted in the rapid stabilization of the sediments producing a very stiff to rigid material within 24 hours of treatment;

2. On a weight for weight and cost basis the Portland Cement formulations displayed a higher degree of UCS; and

3. The Dolocrete technology was slightly more effective in immobilising the contaminants as assessed by TCLP testing. Though both Dolocrete and Portland Cement met the requirements for TCLP1.

6 Mechanism of Immobilisation

6.1 Portland Cement Mechanism

The mechanism for the Portland Cement CFS process has been well documented[1] and is based around the hydration reaction of a calcium silicates, calcium aluminates and calcium aluminoferrites. Inorganic contaminants are immobilized into the structure via co-precipitative or adsorptive processes, whereas organic contaminants are physically incorporated into the structure by a process resembling macro-encapsulation.

The pH of the treated waste product produced by the Portland Cement system is regulated by hydration of lime (CaO). Typically, the treated product will equilibrate to a pH in the region of 11.5 to 12. One of the limitations of this system is that amphoteric inorganic species and some organic species that solubilise at high pH's

[1] J.R. Conner; Chemical Fixation and Solidification of Hazardous Wastes; VNR; New York, 1990

can become mobile. Both naphthalene and phenol are examples of such contaminants thus leading to some re-solubilisation after treatment in this system.

6.2 Dolocrete Mechanism

It has been proposed by Dolomatrix Australia Ltd that the Dolocrete™ mechanism is based on the layering structure of the brucite [$Mg(OH)_2$] family of minerals. Specifically, the layered "brucite" structure consists of alternating layers of $[Mg_9(OH)_{16}]^{2+}$ with disordered $[CO_3.4H_20]^{2-}$. This structure is thought to have the ability to accommodate for an array of substitution ions including cations and anions into the alternating layers. The exact reaction process is thought to produce a mineral phase resembling hydromagnesite $Mg_9(OH)CO_3.xH_20$. This system is prototypical of many heavy metal hydroxides. Heavy-metal ions and organic contaminants are thought to be readily accommodated into the structure of the phase(s) either by the formation of distinct separate mineral phases, or structurally accommodated into the matrix of the solid.

Unlike Portland Cement, the pH of the treated wastes in the Dolocrete system is dictated by the hydrolysis of magnesite (MgO) to produce brucite [$Mg(OH)_2$], which has an equilibrium pH in the range of 9.5 to 10.0. As a result, amphoteric species do not tend to re-solubilise and generally higher treatment efficiency is observed as was evidenced with naphthalene and phenol in the current study.

7 Conclusions

Based on the results obtained the following conclusions can be drawn:

1. Both the Portland Cement and Dolocrete™ technologies achieved the treatment requirements likely to be prescribed by the NSW EPA under the Immobilisation Approval Scheme;

2. The Dolocrete™ technology is marginally more effective than the Portland Cement technology in immobilising all of the contaminants present in the waste;

3. The Portland Cement technology was marginally more effective than Dolocrete™ technology in producing a treated product with a higher degree of compressive strength;

4. The treated product would be suitable for on-site reuse, subject to leachability considerations; and

5. The technologies evaluated can be viewed as industrial "best practice" CFS approaches for the treatment of sediments of this type.

APPENDIX 1

Our reference : HOF29060: HO1865/03
Contact : Martina Sangster, (02) 9995 5645

NSW EPA
Chemicals and Waste

Dr Karl Baltpurvins
Haztech Industries
PO BOX 32
Union Building
The University of Newcastle
CALLAGHAN NSW 2308

Dear Dr Baltpurvins

Compressive Strength in Waste Treatment

I refer to your recent email inquiry about compressive strength requirements in chemical fixation and solidification treatment.

The EPA's *'Application Form for Specific Approval of Immobilisation of Contaminants in Waste'* (see: http://www.epa.nsw.gov.au/waste/wiform1.pdf) states that:

> "There is no single assessment criteria for establishing the mechanism of immobilisation, or the performance of treatment processes that result in the immobilisation of contaminants in waste. Since the chemistry of different waste types and/or treatment processes used to treat chemical contaminants can be very different and complex, generalisations about the assessment criteria required for all treated wastes is not possible."

In the EPA's *'Environmental Guidelines: Assessment Classification and Management of Liquid and Non-Liquid Wastes'* Technical Appendix 2 it is stated that a Specific Approval of Immobilisation Applicant should include evidence that the treated waste is likely to be stable in the long term and it is noted that:

> "This aspect is especially relevant to the immobilisation of waste with high concentrations of contaminants that are bonded within the matrix solely by physical means, (for example, in some cases of microencapsulation), where, for example, it is desirable for the treated waste to attain an unconfined compressive strength in excess of 350 kPa as an indicator of long term stability..."

The criteria for successful immobilisation of contaminants in wastes is very case specific. In cement fixation treatment, both the chemical and physical reactions that occur during the curing of cement concrete are important for effective immobilisation of the contaminants in the waste. Hence, in this type of waste treatment, the EPA deems that both leachable contaminant concentrations and structural strength are important for demonstrating that the immobilisation has occurred.

In terms of environmental performance, compressive strength is an important indicator in cement fixation. A cement treated material with high structural integrity would not break up in a landfill, especially when under loading, and as a result:

- the cement barrier established between the waste particles and the adjacent environment inhibits mass transfer of the contaminants into the landfill leachate;
- the contaminants within the cured waste are encapsulated securely and hence become immobile; and
- the surface area of the cured waste available for the leaching of contaminants by acidic landfill leachate or groundwater is kept and maintained to a minimum.

Industry has successfully treated waste using cement. The EPA is aware of certain cement treated waste that has achieved an unconfined compressive strength of up to 12 MPa. In a number of Applications for Specific Approval of Immobilisation using cement fixation, the EPA has accepted a minimum unconfined compressive strength of 1 MPa. If the chemical reactions necessary to immobilise the contaminants occur successfully, an unconfined compressive strength of 1 MPa for cement fixated waste should be readily achievable.

It is known that organics generally are not strongly bound within the inorganic cement matrix, and, instead are sorbed or encapsulated within the pores of the material. Therefore, the EPA would consider strength as an especially important criterion in the cement fixation of wastes contaminated with organic chemicals (such as hydrocarbons, PAHs etc).

While we do not have references readily on-hand which directly discuss the significance of strength in an environmental context, some more general references are provided in the attachment and may be of interest to you.

I hope this information provides you with some background to the importance of strength in waste treatment by contaminant immobilisation and some useful references. For further clarification on the above information you could contact Martina Sangster (Waste Advisor) Ph (02) 9995 5645. However, for specific advice on this matter with respect to your project you should contact Grahame Clarke in the EPA's Newcastle office.

Yours sincerely

21/2/03

Dr BILL GARA
Manager Technical and Data Unit

Attachment: References
cc: Mr Grahame Clarke (EPA – Hunter Region)

Attachment: References

(1) OSWER Directive 9487.00-2A *'Prohibition on the Placement of Bulk Liquid Hazardous Waste in Landfills - Statutory Interpretive Guidance'.* http://yosemite.epa.gov/osw/rcra.nsf/23e68e459512b15f85256bf000632213/ea4819c384ab2f3985 25670f006c0e5a?OpenDocument

(2) *'Stabilization/Solidification of CERCLA and RCRA Wastes: Physical Tests, Chemical Testing Procedures, Technology Screening and Field Activities'* (USEPA Centre for Environmental Information; USEPA Risk Reduction Engineering Laboratory - Cincinnati, May 1989) (Document No EPA/625/6-89/022).

(3) *'Technical Resource Document: Solidification/Stabilization and its Application to Waste Materials'* (USEPA, Office of Research and Development - Washington, June 1993) (document No EPA/630/R-93/012).

(4) *'Solidification/Stabilization Resource Guide'* (USEPA, Office of Solid Waste and Emergency Response, April 1999) (document No EPA/542-B-99-002. (Note: this contains a comprehensive list of references to other documents and literature download .pdf from: http://www.epa.gov/swertio1/pubitech.htm).

(5) *'The Application of Solidification/Stabilization to Waste Materials'* (Means J., et al, 1995) Lewis Publishers.

(6) Connor, J.R., "Fixation and Solidification of Wastes", Chemical Engineering p79, Nov., 10, 1986 in *'Hazardous Waste Treatment Technologies'* (Jackman A.P., Powell R.L, 1991) Noyes Publications New Jersey.

(7) *'Chemical Fixation and Solidification of Hazardous Wastes'* (Connor J.R., 1990) Van Nostrand Reinhold, New York.

APPENDIX 2

APPENDIX 3

ALS Environmental

CERTIFICATE OF ANALYSIS

CONTACT:	MR KARL BALTPURVINS	**BATCH:**	NE9121
CLIENT:	HAZTECH INDUSTRIES PTY LTD	**SUB BATCH:**	0
ADDRESS:		**LABORATORY:**	NEWCASTLE
	PO BOX 32	**DATE RECEIVED:**	03/02/2003
	UNION BUILDING CALLAGHAN NSW 23	**DATE COMPLETED:**	25/02/2003
		SAMPLE TYPE:	TCLP LEACHATE
ORDER No.:		**No. of SAMPLES:**	27
PROJECT:	GHD		

COMMENTS

The concentrations reported are those determined on the TCLP leachate.

Extraction fluid #1 pH 4.88-4.98. Analysis conducted by ALS Sydney,

NATA Site No. 10911.

NOTES

This is the Final Report and supersedes any preliminary reports with this batch number.
All pages of this report have been checked and approved for release.

ISSUING LABORATORY: NEWCASTLE

Address
5 Rosegum Close
WARABROOK NSW 2304

Phone: 61-2-4968 9433
Fax: 61-2-4968 0349
Email: kathy.mcdermott@alsenviro.com

Signatory

This laboratory is accredited by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of accreditation. This document shall not be reproduced except in full.

NATA Accredited Laboratory Number 825

Batch: NE9121
Sub Batch: 0
Date of Issue: 25/02/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference: GHD

CERTIFICATE OF ANALYSIS

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		1	2	3	4	5	6	7	8	9	10
		Date Sampled		31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	GHD-M+C-	GHD-M+CO	GHD-M+C+	GHD-01	GHD-04	GHD-07	GHD-10	GHD-13	GHD-16	GHD-19
ALS3	Extraction Fluid Number		1	1	1	1	1	1	1	1	1	1	1
ALS4	pH After Extract		0.1	5.6	6.2	5.9	10.2	11.0	11.9	12.0	12.0	12.3	12.1
EG-005C	Arsenic - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
EG-005C	Cadmium - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
EG-005C	Cobalt - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
EG-005C	Chromium - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
EG-005C	Nickel - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
EG-005C	Lead - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
EG-005C	Zinc - TCLP	mg/L	0.1	0.9	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
EG-035C	Mercury - TCLP	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Batch: NE9121
Sub Batch: 0
Date of Issue: 25/02/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference: GHD

CERTIFICATE OF ANALYSIS

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		11	12	13	14	15	16	17	18	19	20
		Date Sampled		31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	GHD-22	GHD-25	GHD-28	GHD-31	GHD-34	GHD-37	GHD-40	GHD-43	GHD-46	GHD-49
ALS3	Extraction Fluid Number		1	1	1	1	1	1	1	1	1	1	1
ALS4	pH After Extract		0.1	12.1	12.3	12.3	12.3	12.3	9.4	9.3	9.8	9.7	9.7
EG-005C	Arsenic - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
EG-005C	Cadmium - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
EG-005C	Cobalt - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
EG-005C	Chromium - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
EG-005C	Nickel - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
EG-005C	Lead - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
EG-005C	Zinc - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
EG-035C	Mercury - TCLP	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Batch: NE9121
Sub Batch: 0
Date of Issue: 25/02/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference: GHD

CERTIFICATE OF ANALYSIS

				SAMPLE IDENTIFICATION									
	Laboratory I.D.			21	22	23	24	25	26	27			
	Date Sampled			31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003			
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	GHD-52	GHD-55	GHD-58	GHD-61	GHD-64	GHD-67	GHD-70			
ALS3	Extraction Fluid Number		1	1	1	1	1	1	1	1			
ALS4	pH After Extract		0.1	9.8	9.8	9.9	9.4	9.1	9.3	9.3			
EG-005C	Arsenic - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
EG-005C	Cadmium - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
EG-005C	Cobalt - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
EG-005C	Chromium - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
EG-005C	Nickel - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
EG-005C	Lead - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
EG-005C	Zinc - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
EG-035C	Mercury - TCLP	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			

Batch: NE9121
Sub Batch: 0
Date of Issue: 25/02/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference: GHD

QUALITY CONTROL REPORT

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		1	1	11	11	200	201	205	206		
		Date Sampled		31/01/2003	31/01/2003	31/01/2003	31/01/2003	03/02/2003	03/02/2003	03/02/2003	03/02/2003		
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	GHD-M+C-MS	GHD-M+C-CHK	GHD-22 MS	GHD-22 CHK	METHOD BLANK1	LCS1	METHOD BLANK2	LCS2		
				CHECKS AND SPIKES									
ALS3	Extraction Fluid Number		1	----	1	----	1	1	----	1	----		
ALS4	pH After Extract		0.1	----	----	----	----	----	----	----	----		
EG-005C	Arsenic - TCLP	mg/L	0.1	120%	<0.1	121%	<0.1	<0.1	100%	<0.1	100%		
EG-005C	Cadmium - TCLP	mg/L	0.1	108%	<0.1	106%	<0.1	<0.1	99.0%	<0.1	100%		
EG-005C	Cobalt - TCLP	mg/L	0.1	110%	<0.1	107%	<0.1	<0.1	----	<0.1	----		
EG-005C	Chromium - TCLP	mg/L	0.1	112%	<0.1	109%	<0.1	<0.1	99.0%	<0.1	100%		
EG-005C	Nickel - TCLP	mg/L	0.1	107%	<0.1	105%	<0.1	<0.1	98.0%	<0.1	100%		
EG-005C	Lead - TCLP	mg/L	0.1	109%	<0.1	109%	<0.1	<0.1	98.0%	<0.1	99.0%		
EG-005C	Zinc - TCLP	mg/L	0.1	106%	0.9	102%	<0.1	<0.1	98.0%	<0.1	100%		
EG-035C	Mercury - TCLP	mg/L	0.01	93.0%	<0.01	96.0%	<0.01	<0.01	103%	<0.01	100%		

ALS Environmental

CERTIFICATE OF ANALYSIS

CONTACT:	MR KARL BALTPURVINS	**BATCH:**	NE9121
CLIENT:	HAZTECH INDUSTRIES PTY LTD	**SUB BATCH:**	1
ADDRESS:		**LABORATORY:**	NEWCASTLE
	PO BOX 32	**DATE RECEIVED:**	03/02/2003
	UNION BUILDING CALLAGHAN NSW 23	**DATE COMPLETED:**	25/02/2003
		SAMPLE TYPE:	ZHE LEACHATE
ORDER No.:		**No. of SAMPLES:**	27
PROJECT:	GHD		

COMMENTS

The concentrations reported are those determined on a ZHE TCLP leachate, using extraction fluid #1 (pH 4.88-4.98). Analysis conducted by ALS Sydney, NATA Site No. 10911.

NOTES

This is the Final Report and supersedes any preliminary reports with this batch number.
All pages of this report have been checked and approved for release.

ISSUING LABORATORY: NEWCASTLE

Address
5 Rosegum Close
WARABROOK NSW 2304

Phone: 61-2-4968 9433
Fax: 61-2-4968 0349
Email: kathy.mcdermott@alsenviro.com

Signatory

This Laboratory is accredited by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of accreditation. This document shall not be reproduced except in full.

NATA Accredited Laboratory Number 825

Batch: NE9121
Sub Batch: 1
Date of Issue: 25/02/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference: GHD

CERTIFICATE OF ANALYSIS

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		1	2	3	4	5	6	7	8	9	10
		Date Sampled		31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	GHD-M+C-	GHD-M+CO	GHD-M+C+	GHD-01	GHD-04	GHD-07	GHD-10	GHD-13	GHD-16	GHD-19
EK-026MA	Total Cyanide	mg/L	0.005	0.025	<0.005	<0.005	1.11	0.625	<0.005	0.034	0.023	0.012	0.009

Batch: NE9121
Sub Batch: 1
Date of Issue: 25/02/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference: GHD

CERTIFICATE OF ANALYSIS

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		11	12	13	14	15	16	17	18	19	20
		Date Sampled		31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	GHD-22	GHD-25	GHD-28	GHD-31	GHD-34	GHD-37	GHD-40	GHD-43	GHD-46	GHD-49
EK-026MA	Total Cyanide	mg/L	0.005	<0.005	<0.005	0.029	0.029	0.029	0.050	0.059	<0.005	0.019	0.023

Batch: NE9121
Sub Batch: 1
Date of Issue: 25/02/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference: GHD

CERTIFICATE OF ANALYSIS

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		21	22	23	24	25	26	27			
		Date Sampled		31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003			
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	GHD-52	GHD-55	GHD-58	GHD-61	GHD-64	GHD-67	GHD-70			
EK-026MA	Total Cyanide	mg/L	0.005	<0.005	0.088	0.006	<0.005	0.039	0.031	0.038			

Batch: NE9121
Sub Batch: 1
Date of Issue: 25/02/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference: GHD

QUALITY CONTROL REPORT

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		200	201	202							
		Date Sampled		03/02/2003	03/02/2003	03/02/2003							
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	METHOD BLANK1	LCS1	MS							
				CHECKS AND SPIKES									
EK-026MA	Total Cyanide	mg/L	0.005	<0.005	104%	101%							

ALS Environmental

CERTIFICATE OF ANALYSIS

CONTACT:	MR KARL BALTPURVINS	**BATCH:**	NE9121
CLIENT:	HAZTECH INDUSTRIES PTY LTD	**SUB BATCH:**	2
ADDRESS:		**LABORATORY:**	NEWCASTLE
	PO BOX 32	**DATE RECEIVED:**	03/02/2003
	UNION BUILDING CALLAGHAN NSW 23	**DATE COMPLETED:**	25/02/2003
		SAMPLE TYPE:	TCLP LEACHATE
ORDER No.:		**No. of SAMPLES:**	27
PROJECT:	GHD		

COMMENTS

The concentrations reported for TPH volatile C6-C6 are those determined on a ZHE TCLP leachate, using extraction fluid #1 (pH 4.88-4.98). The concentrations reported for TPH semivolatile C10-C36 are those determined on the TCLP leachate. Extraction fluid #1 pH 4.88-4.98. Analysis conducted by ALS Sydney.

NOTES

This is the Final Report and supersedes any preliminary reports with this batch number.
All pages of this report have been checked and approved for release.

ISSUING LABORATORY: NEWCASTLE

Address
5 Rosegum Close
WARABROOK NSW 2304

Phone: 61-2-4968 9433
Fax: 61-2-4968 0349
Email: kathy.mcdermott@alsenviro.com

Signatory

This laboratory is accredited by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of accreditation. This document shall not be reproduced except in full.

NATA Accredited Laboratory Number 825

Batch: NE9121
Sub Batch: 2
Date of Issue: 25/02/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference: GHD

CERTIFICATE OF ANALYSIS

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		1	2	3	4	5	6	7	8	9	10
		Date Sampled		31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	GHD-M+C-	GHD-M+CO	GHD-M+C+	GHD-01	GHD-04	GHD-07	GHD-10	GHD-13	GHD-16	GHD-19
ALS3	Extraction Fluid Number		1	1	1	1	1	1	1	1	1	1	1
ALS4	pH After Extract		0.1	5.6	6.2	5.9	10.2	11.0	11.9	12.0	12.0	12.3	12.1
EP-071-WS	**TOTAL PETROLEUM HYDROCARBONS**												
EP-071-WS	C6 - C9 Fraction	ug/L	20	87	244	156	63	51	160	<20	<20	109	23
EP-071-WS	C10 - C14 Fraction	ug/L	50	3530	<50	19.7mg/L	15.1mg/L	110	797	19.8mg/L	128	811	8150
EP-071-WS	C15 - C28 Fraction	ug/L	100	916	<100	3000	3720	199	932	3280	169	422	2830
EP-071-WS	C29 - C36 Fraction	ug/L	50	<50	<50	<50	241	<50	<50	203	<50	<50	129
EP-080-WS	**BTEX**												
EP-080-WS	Benzene	ug/L	1	<1	<1	3	<1	<1	<1	<1	<1	<1	<1
EP-080-WS	Toluene	ug/L	2	<2	12	3	<2	<2	10	<2	<2	7	<2
EP-080-WS	Chlorobenzene	ug/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
EP-080-WS	Ethylbenzene	ug/L	2	<2	17	23	<2	<2	16	3	<2	9	3
EP-080-WS	meta- & para-Xylene	ug/L	2	4	106	28	4	<2	93	8	4	56	9
EP-080-WS	ortho-Xylene	ug/L	2	3	49	41	4	3	31	7	3	20	6
EP-080S-WS	**VOLATILE TPH/BTEX COMPOUND SURROGATES**												
EP-080S-WS	1.2-Dichloroethane-D4	%	1	101	96	96	101	99	97	99	103	97	89
EP-080S-WS	Toluene-D8	%	1	106	98	102	98	98	102	101	100	103	100
EP-080S-WS	4-Bromofluorobenzene	%	1	105	106	103	107	99	101	100	107	98	92

Batch: NE9121
Sub Batch: 2
Date of Issue: 25/02/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference: GHD

CERTIFICATE OF ANALYSIS

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		11	12	13	14	15	16	17	18	19	20
		Date Sampled		31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	GHD-22	GHD-25	GHD-28	GHD-31	GHD-34	GHD-37	GHD-40	GHD-43	GHD-46	GHD-49
ALS3	Extraction Fluid Number		1	1	1	1	1	1	1	1	1	1	1
ALS4	pH After Extract		0.1	12.1	12.3	12.3	12.3	12.3	9.4	9.3	9.8	9.7	9.7
EP-071-WS	**TOTAL PETROLEUM HYDROCARBONS**												
EP-071-WS	C6 - C9 Fraction	ug/L	20	<20	52	35	<20	93	356	65	99	105	130
EP-071-WS	C10 - C14 Fraction	ug/L	50	93	446	28.1mg/L	<50	786	16.7mg/L	<50	740	16.3mg/L	<50
EP-071-WS	C15 - C28 Fraction	ug/L	100	114	373	3210	<100	120	3070	132	711	2630	<100
EP-071-WS	C29 - C36 Fraction	ug/L	50	<50	<50	168	<50	<50	169	<50	<50	<50	<50
EP-080-WS	**BTEX**												
EP-080-WS	Benzene	ug/L	1	<1	4	<1	<1	<1	<1	<1	<1	<1	<1
EP-080-WS	Toluene	ug/L	2	<2	3	<2	<2	7	31	<2	4	2	6
EP-080-WS	Chlorobenzene	ug/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
EP-080-WS	Ethylbenzene	ug/L	2	<2	3	6	<2	9	40	<2	5	15	7
EP-080-WS	meta- & para-Xylene	ug/L	2	<2	17	9	<2	62	195	7	34	17	46
EP-080-WS	ortho-Xylene	ug/L	2	<2	8	13	<2	38	104	4	18	28	27
EP-080S-WS	**VOLATILE TPH/BTEX COMPOUND SURROGATES**												
EP-080S-WS	1.2-Dichloroethane-D4	%	1	91	91	94	92	112	96	97	95	94	96
EP-080S-WS	Toluene-D8	%	1	104	105	101	102	90	99	103	105	102	100
EP-080S-WS	4-Bromofluorobenzene	%	1	97	96	103	101	102	98	100	98	102	99

Batch: NE9121
Sub Batch: 2
Date of Issue: 25/02/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference: GHD

CERTIFICATE OF ANALYSIS

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		21	22	23	24	25	26	27			
		Date Sampled		31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003			
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	GHD-52	GHD-55	GHD-58	GHD-61	GHD-64	GHD-67	GHD-70			
ALS3	Extraction Fluid Number		1	1	1	1	1	1	1	1			
ALS4	pH After Extract		0.1	9.8	9.8	9.9	9.4	9.1	9.3	9.3			
EP-071-WS	**TOTAL PETROLEUM HYDROCARBONS**												
EP-071-WS	C6 - C9 Fraction	ug/L	20	47	51	49	131	112	54	49			
EP-071-WS	C10 - C14 Fraction	ug/L	50	1300	10.9mg/L	103	663	16.2mg/L	<50	1160			
EP-071-WS	C15 - C28 Fraction	ug/L	100	706	2800	175	586	2790	133	572			
EP-071-WS	C29 - C36 Fraction	ug/L	50	<50	<50	<50	<50	<50	<50	<50			
EP-080-WS	**BTEX**												
EP-080-WS	Benzene	ug/L	1	<1	<1	<1	<1	<1	<1	<1			
EP-080-WS	Toluene	ug/L	2	<2	<2	<2	5	<2	<2	<2			
EP-080-WS	Chlorobenzene	ug/L	2	<2	<2	<2	<2	<2	<2	<2			
EP-080-WS	Ethylbenzene	ug/L	2	<2	<2	<2	7	<2	<2	<2			
EP-080-WS	meta- & para-Xylene	ug/L	2	2	2	6	41	27	7	3			
EP-080-WS	ortho-Xylene	ug/L	2	2	2	4	17	14	5	<2			
EP-080S-WS	**VOLATILE TPH/BTEX COMPOUND SURROGATES**												
EP-080S-WS	1.2-Dichloroethane-D4	%	1	98	101	103	90	107	103	104			
EP-080S-WS	Toluene-D8	%	1	107	102	103	103	101	100	107			
EP-080S-WS	4-Bromofluorobenzene	%	1	101	99	100	96	113	113	113			

Batch: NE9121
Sub Batch: 2
Date of Issue: 25/02/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference: GHD

QUALITY CONTROL REPORT

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		100	101	102	105	106	107				
		Date Sampled		03/02/2003	03/02/2003	03/02/2003	03/02/2003	03/02/2003	03/02/2003				
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	METHOD BLANK1	NTPHW1374 SCS	NTPHW1374 DCS	METHOD BLANK2	NTPHW1375 SCS	NTPHW1375 DCS				
				CHECKS AND SPIKES									
ALS3	Extraction Fluid Number		1	1	----	----	1	----	----				
ALS4	pH After Extract		0.1	----	----	----	----	----	----				
EP-071-WS	**TOTAL PETROLEUM HYDROCARBONS**												
EP-071-WS	C6 - C9 Fraction	ug/L	20	<20	101%	103%	<20	99.0%	102%				
EP-071-WS	C10 - C14 Fraction	ug/L	50	<50	106%	104%	<50	110%	108%				
EP-071-WS	C15 - C28 Fraction	ug/L	100	<100	102%	98.0%	<100	107%	104%				
EP-071-WS	C29 - C36 Fraction	ug/L	50	<50	98.0%	96.0%	<50	105%	101%				
EP-080-WS	**BTEX**												
EP-080-WS	Benzene	ug/L	1	<1	95.0%	102%	<1	96.0%	100%				
EP-080-WS	Toluene	ug/L	2	<2	100%	108%	<2	105%	104%				
EP-080-WS	Chlorobenzene	ug/L	2	<2	98.0%	105%	<2	103%	102%				
EP-080-WS	Ethylbenzene	ug/L	2	<2	99.0%	109%	<2	102%	108%				
EP-080-WS	meta- & para-Xylene	ug/L	2	<2	108%	106%	<2	103%	107%				
EP-080-WS	ortho-Xylene	ug/L	2	<2	105%	110%	<2	98.0%	104%				
EP-080S-WS	**VOLATILE TPH/BTEX COMPOUND SURROGATES**												
EP-080S-WS	1.2-Dichloroethane-D4	%	1	105	105	97	105	103	101				
EP-080S-WS	Toluene-D8	%	1	101	100	104	101	98	101				
EP-080S-WS	4-Bromofluorobenzene	%	1	100	102	103	100	106	107				

ALS Environmental

CERTIFICATE OF ANALYSIS

CONTACT:	MR KARL BALTPURVINS	**BATCH:**	NE9121
CLIENT:	HAZTECH INDUSTRIES PTY LTD	**SUB BATCH:**	3
ADDRESS:		**LABORATORY:**	NEWCASTLE
	PO BOX 32	**DATE RECEIVED:**	03/02/2003
	UNION BUILDING CALLAGHAN NSW 23	**DATE COMPLETED:**	25/02/2003
		SAMPLE TYPE:	TCLP LEACHATE
ORDER No.:		**No. of SAMPLES:**	27
PROJECT:	GHD		

COMMENTS

The concentrations reported are those determined on the TCLP leachate.
Extraction fluid #1 pH 4.88-4.98. Surrogates were determined due to sample matrix effects. Analysis conducted by ALS Sydney.

NOTES

This is the Final Report and supersedes any preliminary reports with this batch number.
All pages of this report have been checked and approved for release.

ISSUING LABORATORY: NEWCASTLE

Address
5 Rosegum Close
WARABROOK NSW 2304

Phone: 61-2-4968 9433
Fax: 61-2-4968 0349
Email: kathy.mcdermott@alsenviro.com

Signatory

This Laboratory is accredited by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of accreditation. This document shall not be reproduced except in full.

NATA Accredited Laboratory Number 825

Batch: NE9121
Sub Batch: 3
Date of Issue: 25/02/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference: GHD

CERTIFICATE OF ANALYSIS

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		1	2	3	4	5	6	7	8	9	10
		Date Sampled		31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	GHD-M+C-	GHD-M+CO	GHD-M+C+	GHD-01	GHD-04	GHD-07	GHD-10	GHD-13	GHD-16	GHD-19
ALS3	Extraction Fluid Number		1	1	1	1	1	1	1	1	1	1	1
ALS4	pH After Extract		0.1	5.6	6.2	5.9	10.2	11.0	11.9	12.0	12.0	12.3	12.1
EP-075A-WS	**PHENOLS**												
EP-075A-WS	Phenol	ug/L	0.5	0.6	0.7	<0.5	2.7	0.8	1.3	2.0	1.2	<0.5	1.9
EP-075A-WS	2-Chlorophenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
EP-075A-WS	2-Methylphenol	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
EP-075A-WS	3- & 4-Methylphenol	ug/L	0.5	<0.5	<0.5	<0.5	4.0	<0.5	1.1	3.7	0.7	<0.5	3.3
EP-075A-WS	2-Nitrophenol	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
EP-075A-WS	2.4-Dimethylphenol	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
EP-075A-WS	2.4-Dichlorophenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
EP-075A-WS	2.6-Dichlorophenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
EP-075A-WS	4-Chloro-3-methylphenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
EP-075A-WS	2.4.6-Trichlorophenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
EP-075A-WS	2.4.5-Trichlorophenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
EP-075A-WS	Pentachlorophenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
EP-075B-WS	**POLYNUCLEAR AROMATICS**												
EP-075B-WS	Naphthalene	ug/L	0.5	3870	47.0	17.2mg/L	14.2mg/L	82.9	712	17.6mg/L	103	880	7730
EP-075B-WS	2-Methylnaphthalene	ug/L	0.5	153	1.4	825	583	3.7	36.3	563	3.8	17.4	464
EP-075B-WS	2-Chloronaphthalene	ug/L	0.5	<0.5	<0.5	<0.5	0.8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
EP-075B-WS	Acenaphthylene	ug/L	0.5	53.0	2.0	100	64.8	3.2	20.5	51.6	4.2	11.4	55.0
EP-075B-WS	Acenaphthene	ug/L	0.5	177	15.7	809	678	16.3	89.4	579	17.8	53.4	520
EP-075B-WS	Fluorene	ug/L	0.5	96.8	3.9	220	209	4.3	37.6	171	3.6	10.4	151
EP-075B-WS	Phenanthrene	ug/L	0.5	105	5.9	190	223	8.4	79.8	189	9.3	30.4	206
EP-075B-WS	Anthracene	ug/L	0.5	24.8	1.5	37.5	49.0	1.9	22.2	36.8	2.8	6.1	38.1
EP-075B-WS	Fluoranthene	ug/L	0.5	16.9	1.8	23.8	36.2	2.9	23.5	29.0	6.2	7.9	35.1
EP-075B-WS	Pyrene	ug/L	0.5	15.7	1.4	13.5	22.2	2.3	23.3	18.0	4.8	8.0	22.2
EP-075B-WS	N-2-Fluorenylacetamide	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
EP-075B-WS	Benz(a)anthracene	ug/L	0.5	<0.5	<0.5	<0.5	1.3	<0.5	0.9	1.0	<0.5	<0.5	1.1
EP-075B-WS	Chrysene	ug/L	0.5	<0.5	<0.5	<0.5	0.9	<0.5	0.6	0.6	<0.5	<0.5	0.8
EP-075B-WS	Benzo(b) & (k)fluoranthene	ug/L	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
EP-075B-WS	7.12-Dimethylbenz(a)anthracene	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
EP-075B-WS	Benzo(a)pyrene	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
EP-075B-WS	3-Methylcholanthrene	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
EP-075B-WS	Indeno(1.2.3-cd)pyrene	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

Batch: NE9121
Sub Batch: 3
Date of Issue: 25/02/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference: GHD

CERTIFICATE OF ANALYSIS

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		1	2	3	4	5	6	7	8	9	10
		Date Sampled		31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	GHD-M+C-	GHD-M+CO	GHD-M+C+	GHD-01	GHD-04	GHD-07	GHD-10	GHD-13	GHD-16	GHD-19
EP-075B-WS	Dibenz(a.h)anthracene	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
EP-075B-WS	Benzo(g.h.i)perylene	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
EP-075S-WS	**ACID EXTRACTABLE SURROGATES**												
EP-075S-WS	2-Fluorophenol	%	1	84	75	78	55	63	61	52	50	Not Det'd	47
EP-075S-WS	Phenol-D6	%	1	50	46	46	34	38	35	31	31	Not Det'd	29
EP-075S-WS	2-Chlorophenol-D4	%	1	116	106	111	95	99	96	87	85	Not Det'd	78
EP-075S-WS	2.4.6-Tribromophenol	%	1	118	115	122	123	116	110	108	108	Not Det'd	87
EP-075T-WS	**BASE/NEUTRAL EXTRACTABLE SURROGATES**												
EP-075T-WS	Nitrobenzene-D5	%	1	125	112	119	108	109	111	101	95	103	104
EP-075T-WS	1.2-Dichlorobenzene-D4	%	1	75	73	74	75	83	74	62	72	82	71
EP-075T-WS	2-Fluorobiphenyl	%	1	88	92	60	56	102	86	Not Det'd	87	86	Not Det'd
EP-075T-WS	Anthracene-d10	%	1	122	112	113	99	111	106	93	95	101	100
EP-075T-WS	p-Terphenyl-D14	%	1	125	116	115	112	120	123	102	102	105	108

Batch: NE9121
Sub Batch: 3
Date of Issue: 25/02/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference: GHD

CERTIFICATE OF ANALYSIS

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		11	12	13	14	15	16	17	18	19	20
		Date Sampled		31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	GHD-22	GHD-25	GHD-28	GHD-31	GHD-34	GHD-37	GHD-40	GHD-43	GHD-46	GHD-49
ALS3	Extraction Fluid Number		1	1	1	1	1	1	1	1	1	1	1
ALS4	pH After Extract		0.1	12.1	12.3	12.3	12.3	12.3	9.4	9.3	9.8	9.7	9.7
EP-075A-WS	**PHENOLS**												
EP-075A-WS	Phenol	ug/L	0.5	1.2	1.3	<0.5	0.8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
EP-075A-WS	2-Chlorophenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
EP-075A-WS	2-Methylphenol	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
EP-075A-WS	3- & 4-Methylphenol	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
EP-075A-WS	2-Nitrophenol	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
EP-075A-WS	2.4-Dimethylphenol	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
EP-075A-WS	2.4-Dichlorophenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
EP-075A-WS	2.6-Dichlorophenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
EP-075A-WS	4-Chloro-3-methylphenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
EP-075A-WS	2.4.6-Trichlorophenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
EP-075A-WS	2.4.5-Trichlorophenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
EP-075A-WS	Pentachlorophenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
EP-075B-WS	**POLYNUCLEAR AROMATICS**												
EP-075B-WS	Naphthalene	ug/L	0.5	68.7	493	27.7mg/L	64.7	968	14.7mg/L	80.6	772	13.7mg/L	76.0
EP-075B-WS	2-Methylnaphthalene	ug/L	0.5	2.1	12.3	601	1.7	9.6	609	3.2	34.6	570	3.9
EP-075B-WS	2-Chloronaphthalene	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
EP-075B-WS	Acenaphthylene	ug/L	0.5	2.0	7.1	45.0	1.8	4.5	70.0	3.2	22.3	65.0	7.3
EP-075B-WS	Acenaphthene	ug/L	0.5	7.4	36.7	764	5.9	24.9	695	17.8	72.6	599	23.0
EP-075B-WS	Fluorene	ug/L	0.5	2.0	7.1	170	1.2	2.1	192	4.3	46.4	176	5.5
EP-075B-WS	Phenanthrene	ug/L	0.5	4.4	26.3	192	3.4	8.2	191	7.1	79.2	183	9.9
EP-075B-WS	Anthracene	ug/L	0.5	0.9	6.5	39.4	0.7	1.8	64.8	1.7	21.9	38.1	2.3
EP-075B-WS	Fluoranthene	ug/L	0.5	1.2	14.5	27.7	1.0	1.7	26.2	2.2	16.4	25.1	2.6
EP-075B-WS	Pyrene	ug/L	0.5	1.0	13.7	16.7	0.8	1.8	15.6	1.8	16.0	14.5	2.0
EP-075B-WS	N-2-Fluorenylacetamide	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
EP-075B-WS	Benz(a)anthracene	ug/L	0.5	<0.5	2.6	0.8	<0.5	<0.5	0.8	<0.5	<0.5	0.7	<0.5
EP-075B-WS	Chrysene	ug/L	0.5	<0.5	2.0	0.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
EP-075B-WS	Benzo(b) & (k)fluoranthene	ug/L	1	<1	3	<1	<1	<1	<1	<1	<1	<1	<1
EP-075B-WS	7.12-Dimethylbenz(a)anthracene	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
EP-075B-WS	Benzo(a)pyrene	ug/L	0.3	<0.3	2.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
EP-075B-WS	3-Methylcholanthrene	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
EP-075B-WS	Indeno(1.2.3-cd)pyrene	ug/L	0.5	<0.5	0.9	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

Batch: NE9121
Sub Batch: 3
Date of Issue: 25/02/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference: GHD

CERTIFICATE OF ANALYSIS

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		11	12	13	14	15	16	17	18	19	20
		Date Sampled		31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	GHD-22	GHD-25	GHD-28	GHD-31	GHD-34	GHD-37	GHD-40	GHD-43	GHD-46	GHD-49
EP-075B-WS	Dibenz(a.h)anthracene	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
EP-075B-WS	Benzo(g.h.i)perylene	ug/L	0.5	<0.5	1.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
EP-075S-WS	**ACID EXTRACTABLE SURROGATES**												
EP-075S-WS	2-Fluorophenol	%	1	51	51	Not Det'd	Not Det'd	Not Det'd	59	52	51	56	51
EP-075S-WS	Phenol-D6	%	1	32	31	Not Det'd	21	Not Det'd	42	35	34	38	34
EP-075S-WS	2-Chlorophenol-D4	%	1	85	84	Not Det'd	29	Not Det'd	99	80	86	91	81
EP-075S-WS	2.4.6-Tribromophenol	%	1	102	88	Not Det'd	Not Det'd	Not Det'd	109	92	85	97	87
EP-075T-WS	**BASE/NEUTRAL EXTRACTABLE SURROGATES**												
EP-075T-WS	Nitrobenzene-D5	%	1	86	100	102	86	92	114	94	99	106	93
EP-075T-WS	1.2-Dichlorobenzene-D4	%	1	62	80	75	64	56	76	59	60	71	64
EP-075T-WS	2-Fluorobiphenyl	%	1	76	88	Not Det'd	81	65	Not Det'd	81	73	Not Det'd	85
EP-075T-WS	Anthracene-d10	%	1	86	98	93	96	95	107	102	98	101	101
EP-075T-WS	p-Terphenyl-D14	%	1	90	101	101	97	95	122	105	111	111	105

Batch: NE9121
Sub Batch: 3
Date of Issue: 25/02/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference: GHD

CERTIFICATE OF ANALYSIS

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		21	22	23	24	25	26	27			
		Date Sampled		31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003			
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	GHD-52	GHD-55	GHD-58	GHD-61	GHD-64	GHD-67	GHD-70			
ALS3	Extraction Fluid Number		1	1	1	1	1	1	1	1			
ALS4	pH After Extract		0.1	9.8	9.8	9.9	9.4	9.1	9.3	9.3			
EP-075A-WS	**PHENOLS**												
EP-075A-WS	Phenol	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5			
EP-075A-WS	2-Chlorophenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3			
EP-075A-WS	2-Methylphenol	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5			
EP-075A-WS	3- & 4-Methylphenol	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5			
EP-075A-WS	2-Nitrophenol	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5			
EP-075A-WS	2.4-Dimethylphenol	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5			
EP-075A-WS	2.4-Dichlorophenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3			
EP-075A-WS	2.6-Dichlorophenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3			
EP-075A-WS	4-Chloro-3-methylphenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3			
EP-075A-WS	2.4.6-Trichlorophenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3			
EP-075A-WS	2.4.5-Trichlorophenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3			
EP-075A-WS	Pentachlorophenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3			
EP-075B-WS	**POLYNUCLEAR AROMATICS**												
EP-075B-WS	Naphthalene	ug/L	0.5	1410	12.9mg/L	89.6	620	17.3mg/L	84.8	1230			
EP-075B-WS	2-Methylnaphthalene	ug/L	0.5	42.0	620	5.0	32.2	756	4.5	60.0			
EP-075B-WS	2-Chloronaphthalene	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5			
EP-075B-WS	Acenaphthylene	ug/L	0.5	25.2	75.4	4.2	23.4	185	8.1	22.4			
EP-075B-WS	Acenaphthene	ug/L	0.5	97.4	728	26.0	87.2	652	23.7	119			
EP-075B-WS	Fluorene	ug/L	0.5	54.0	211	6.4	50.8	262	7.0	62.4			
EP-075B-WS	Phenanthrene	ug/L	0.5	80.2	234	10.7	69.6	265	11.8	57.3			
EP-075B-WS	Anthracene	ug/L	0.5	24.7	86.8	2.6	20.3	52.6	2.7	16.5			
EP-075B-WS	Fluoranthene	ug/L	0.5	11.9	34.0	2.6	8.7	38.5	2.0	5.4			
EP-075B-WS	Pyrene	ug/L	0.5	12.0	20.4	2.0	8.1	22.5	1.6	5.8			
EP-075B-WS	N-2-Fluorenylacetamide	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5			
EP-075B-WS	Benz(a)anthracene	ug/L	0.5	<0.5	1.0	<0.5	<0.5	1.1	<0.5	<0.5			
EP-075B-WS	Chrysene	ug/L	0.5	<0.5	0.6	<0.5	<0.5	0.7	<0.5	<0.5			
EP-075B-WS	Benzo(b) & (k)fluoranthene	ug/L	1	<1	<1	<1	<1	<1	<1	<1			
EP-075B-WS	7.12-Dimethylbenz(a)anthracene	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5			
EP-075B-WS	Benzo(a)pyrene	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3			
EP-075B-WS	3-Methylcholanthrene	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5			
EP-075B-WS	Indeno(1.2.3-cd)pyrene	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5			

Batch: NE9121
Sub Batch: 3
Date of Issue: 25/02/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference: GHD

CERTIFICATE OF ANALYSIS

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		21	22	23	24	25	26	27			
		Date Sampled		31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003	31/01/2003			
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	GHD-52	GHD-55	GHD-58	GHD-61	GHD-64	GHD-67	GHD-70			
EP-075B-WS	Dibenz(a.h)anthracene	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5			
EP-075B-WS	Benzo(g.h.i)perylene	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5			
EP-075S-WS	**ACID EXTRACTABLE SURROGATES**												
EP-075S-WS	2-Fluorophenol	%	1	56	60	77	56	61	55	58			
EP-075S-WS	Phenol-D6	%	1	37	39	50	35	41	37	37			
EP-075S-WS	2-Chlorophenol-D4	%	1	94	95	118	86	97	90	93			
EP-075S-WS	2.4.6-Tribromophenol	%	1	93	108	100	83	108	95	89			
EP-075T-WS	**BASE/NEUTRAL EXTRACTABLE SURROGATES**												
EP-075T-WS	Nitrobenzene-D5	%	1	105	109	117	101	116	103	107			
EP-075T-WS	1.2-Dichlorobenzene-D4	%	1	66	71	90	65	76	71	73			
EP-075T-WS	2-Fluorobiphenyl	%	1	77	Not Det'd	111	74	Not Det'd	92	77			
EP-075T-WS	Anthracene-d10	%	1	108	107	119	99	116	111	105			
EP-075T-WS	p-Terphenyl-D14	%	1	118	121	120	112	124	117	115			

Batch: NE9121
Sub Batch: 3
Date of Issue: 25/02/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference: GHD

QUALITY CONTROL REPORT

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		100	103	101	102	104	105				
		Date Sampled		03/02/2003	03/02/2003	03/02/2003	03/02/2003	03/02/2003	03/02/2003				
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	METHOD BLANK1	METHOD BLANK2	NSVOCW1271 SCS	NSVOCW1271 DCS	NSVOCW1272 SCS	NSVOCW1272 DCS				
				CHECKS AND SPIKES									
ALS3	Extraction Fluid Number		1	1	1	---	---	---	---				
ALS4	pH After Extract		0.1	---	---	---	---	---	---				
EP-075A-WS	**PHENOLS**												
EP-075A-WS	Phenol	ug/L	0.5	<0.5	<0.5	49.1%	48.7%	42.3%	40.7%				
EP-075A-WS	2-Chlorophenol	ug/L	0.3	<0.3	<0.3	103%	91.8%	93.3%	88.7%				
EP-075A-WS	2-Methylphenol	ug/L	0.5	<0.5	<0.5	82.7%	90.8%	81.8%	79.7%				
EP-075A-WS	3- & 4-Methylphenol	ug/L	0.5	<0.5	<0.5	116%	126%	111%	111%				
EP-075A-WS	2-Nitrophenol	ug/L	0.5	<0.5	<0.5	99.4%	89.3%	89.6%	87.5%				
EP-075A-WS	2.4-Dimethylphenol	ug/L	0.5	<0.5	<0.5	92.1%	83.5%	71.3%	70.5%				
EP-075A-WS	2.4-Dichlorophenol	ug/L	0.3	<0.3	<0.3	97.5%	84.1%	86.4%	83.3%				
EP-075A-WS	2.6-Dichlorophenol	ug/L	0.3	<0.3	<0.3	102%	91.3%	91.3%	88.5%				
EP-075A-WS	4-Chloro-3-methylphenol	ug/L	0.3	<0.3	<0.3	99.2%	89.9%	88.4%	83.8%				
EP-075A-WS	2.4.6-Trichlorophenol	ug/L	0.3	<0.3	<0.3	96.5%	85.2%	84.6%	81.4%				
EP-075A-WS	2.4.5-Trichlorophenol	ug/L	0.3	<0.3	<0.3	96.9%	85.1%	84.1%	80.0%				
EP-075A-WS	Pentachlorophenol	ug/L	0.3	<0.3	<0.3	56.4%	43.8%	47.3%	40.7%				
EP-075B-WS	**POLYNUCLEAR AROMATICS**												
EP-075B-WS	Naphthalene	ug/L	0.5	<0.5	<0.5	103%	91.3%	97.2%	91.3%				
EP-075B-WS	2-Methylnaphthalene	ug/L	0.5	<0.5	<0.5	97.0%	91.2%	94.5%	89.5%				
EP-075B-WS	2-Chloronaphthalene	ug/L	0.5	<0.5	<0.5	96.9%	91.8%	93.0%	87.3%				
EP-075B-WS	Acenaphthylene	ug/L	0.5	<0.5	<0.5	99.0%	94.0%	94.2%	90.9%				
EP-075B-WS	Acenaphthene	ug/L	0.5	<0.5	<0.5	107%	96.1%	97.6%	93.1%				
EP-075B-WS	Fluorene	ug/L	0.5	<0.5	<0.5	105%	90.6%	94.7%	89.5%				
EP-075B-WS	Phenanthrene	ug/L	0.5	<0.5	<0.5	107%	95.5%	97.1%	92.0%				
EP-075B-WS	Anthracene	ug/L	0.5	<0.5	<0.5	105%	94.2%	95.8%	90.8%				
EP-075B-WS	Fluoranthene	ug/L	0.5	<0.5	<0.5	105%	91.0%	93.1%	87.9%				
EP-075B-WS	Pyrene	ug/L	0.5	<0.5	<0.5	95.8%	84.7%	87.5%	83.5%				
EP-075B-WS	N-2-Fluorenylacetamide	ug/L	0.5	<0.5	<0.5	100%	86.5%	88.1%	82.1%				
EP-075B-WS	Benz(a)anthracene	ug/L	0.5	<0.5	<0.5	101%	90.7%	96.3%	91.7%				
EP-075B-WS	Chrysene	ug/L	0.5	<0.5	<0.5	98.5%	83.7%	86.0%	81.7%				
EP-075B-WS	Benzo(b) & (k)fluoranthene	ug/L	1	<1	<1	97.6%	86.3%	88.9%	82.1%				
EP-075B-WS	7.12-Dimethylbenz(a)anthracene	ug/L	0.5	<0.5	<0.5	86.0%	74.0%	76.2%	71.2%				
EP-075B-WS	Benzo(a)pyrene	ug/L	0.3	<0.3	<0.3	97.0%	85.3%	89.2%	82.5%				

Batch: NE9121
Sub Batch: 3
Date of Issue: 25/02/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference: GHD

QUALITY CONTROL REPORT

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		100	103	101	102	104	105				
		Date Sampled		03/02/2003	03/02/2003	03/02/2003	03/02/2003	03/02/2003	03/02/2003				
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	METHOD BLANK1	METHOD BLANK2	NSVOCW1271 SCS	NSVOCW1271 DCS	NSVOCW1272 SCS	NSVOCW1272 DCS				
				CHECKS AND SPIKES									
EP-075B-WS	3-Methylcholanthrene	ug/L	0.5	<0.5	<0.5	103%	89.0%	93.2%	88.1%				
EP-075B-WS	Indeno(1.2.3-cd)pyrene	ug/L	0.5	<0.5	<0.5	96.8%	85.9%	90.4%	84.5%				
EP-075B-WS	Dibenz(a.h)anthracene	ug/L	0.5	<0.5	<0.5	94.4%	83.3%	87.6%	81.7%				
EP-075B-WS	Benzo(g.h.i)perylene	ug/L	0.5	<0.5	<0.5	99.4%	88.1%	92.0%	85.4%				
EP-075S-WS	**ACID EXTRACTABLE SURROGATES**												
EP-075S-WS	2-Fluorophenol	%	1	77	66	72	79	65	59				
EP-075S-WS	Phenol-D6	%	1	47	41	46	52	41	38				
EP-075S-WS	2-Chlorophenol-D4	%	1	109	91	102	112	95	87				
EP-075S-WS	2.4.6-Tribromophenol	%	1	102	81	101	112	94	82				
EP-075T-WS	**BASE/NEUTRAL EXTRACTABLE SURROGATES**												
EP-075T-WS	Nitrobenzene-D5	%	1	114	95	106	116	102	91				
EP-075T-WS	1.2-Dichlorobenzene-D4	%	1	89	70	80	88	78	65				
EP-075T-WS	2-Fluorobiphenyl	%	1	105	85	94	109	91	78				
EP-075T-WS	Anthracene-d10	%	1	111	112	108	121	104	94				
EP-075T-WS	p-Terphenyl-D14	%	1	116	104	107	120	103	91				

ALS Environmental

ORGANICS QUALITY CONTROL REPORT

BATCH NO: NE9121 **DATE BATCH RECEIVED:** 3/02/2003

CLIENT: Haztech Industries **DATE BATCH COMPLETED:** 24/02/2003

PROJECT: ghd

Method Code	Test	Matrix	Method Reference		QC Lot Number	Date Samples Extracted	Date Samples Analysed
			Extraction	Analysis			
EP-071	TPH(SV)	Water	USEPA 3510B	USEPA 8015A	NTPHW1374	06/02/03	07/02/03
EP-071	TPH(SV)	Water	USEPA 3510B	USEPA 8015A	NTPHW1375	06/02/03	07/02/03
EP-071/80	TPH(V)/BTEX	Water	USEPA 5030A	USEPA 8260A	NVOCW1374	06/02/03	16/02/03
EP-071/80	TPH(V)/BTEX	Water	USEPA 5030A	USEPA 8260A	NVOCW1375	06/02/03	16/02/03
EP-075	SV Scan	Water	USEPA 3510B	USEPA 8270B	NSVOCW1271	06/02/03	06/02/03
EP-075	SV Scan	Water	USEPA 3510B	USEPA 8270B	NSVOCW1272	06/02/03	06/02/03

Where applicable, internal standards are added to sample extracts prior to instrumental analysis. Absolute peak areas and retention times fall within the criteria specified in the individual methods. Continuing Calibration (CC) standards are run at the frequency of 1 in every 20 samples.

Abbreviations: SV = semivolatile, V = volatile

*: In-house methods

A Campbell Brothers Limited Company

BATCH QUALITY CONTROL - CONTROL SPIKE/DUPLICATE

ALS EP-071 : Total Petroleum Hydrocarbons by Fractions

Vol QC Lot : NVOCW 1374
Semi-Vol QC Lot : NTPHW1374

MATRIX : Water

COMPOUND	BATCH ADJ. (MDL)	Blank Conc.	Spike Conc.	Spike Results				Control Limits		
				SCS Conc.	DCS Conc.	Av. Rec.	RPD	Recovery %		RPD
	ug/L	ug/L	ug/L	ug/L	ug/L	%	%	Low	High	%
C6-C9	20	<LOR	200	202	206	102	2	94	106	20
C10-C14	25	<LOR	200	212	208	105	2	71	116	20
C15-C28	25	<LOR	200	203	195	100	4	82	112	20
C29-C36	25	<LOR	200	196	192	97	2	86	114	20

COMMENTS:

1) The control limits are based on ALS laboratory statistical data (Method QWI-ORG/07).
2) * : Recovery or RPD falls outside the recommended control limit.
3) MDL = Method Detection Limit
4) LOR = Level Of Reporting

BATCH QUALITY CONTROL - CONTROL SPIKE/DUPLICATE

ALS EP-080 : BTEX ANALYSIS

QC Lot No. : NVOCW 1374 MATRIX : Water

COMPOUND	BATCH ADJ. (MDL)	Blank Conc.	Spike Conc.	Spike Results				Control Limits		
				SCS Conc.	DCS Conc.	Av. Rec.	RPD	Recovery %		RPD
	ug/L	ug/L	ug/L	ug/L	ug/L	%	%	Low	High	%
Benzene	1.0	<LOR	10	9.52	10.22	99	7	87	115	20
Toluene	1.0	<LOR	10	9.98	10.79	104	8	87	114	20
Chlorobenzene	1.0	<LOR	10	9.83	10.46	101	6	89	112	20
Ethylbenzene	1.0	<LOR	10	9.94	10.87	104	9	88	115	20
m- & p-Xylene	1.0	<LOR	10	10.76	10.62	107	1	89	115	20
o-Xylene	1.0	<LOR	10	10.46	10.96	107	5	89	114	20

COMMENTS :

1) The control limits are based on ALS laboratory statistical data (Method QWI-ORG/07).
2) * : Recovery or RPD falls outside the recommended control limit.
3) MDL = Method Detection Limit
4) LOR = Level Of Reporting

BATCH QUALITY CONTROL - CONTROL SPIKE/DUPLICATE

ALS EP-071 : Total Petroleum Hydrocarbons by Fractions

Vol QC Lot : NVOCW 1375 MATRIX : Water
Semi-Vol QC Lot : NTPHW1375

COMPOUND	BATCH ADJ. (MDL)	Blank Conc.	Spike Conc.	Spike Results				Control Limits		
				SCS Conc.	DCS Conc.	Av. Rec.	RPD	Recovery %		RPD
	ug/L	ug/L	ug/L	ug/L	ug/L	%	%	Low	High	%
C6-C9	20	<LOR	200	198	204	101	3	94	106	20
C10-C14	25	<LOR	200	219	216	109	1	71	116	20
C15-C28	25	<LOR	200	214	208	106	3	82	112	20
C29-C36	25	<LOR	200	210	203	103	3	86	114	20

COMMENTS:

1) The control limits are based on ALS laboratory statistical data (Method QWI-ORG/07).
2) * : Recovery or RPD falls outside the recommended control limit.
3) MDL = Method Detection Limit
4) LOR = Level Of Reporting

BATCH QUALITY CONTROL - CONTROL SPIKE/DUPLICATE

ALS EP-080 : BTEX ANALYSIS

QC Lot No. : NVOCW 1375 MATRIX : Water

COMPOUND	BATCH ADJ. (MDL)	Blank Conc.	Spike Conc.	Spike Results				Control Limits		
				SCS Conc.	DCS Conc.	Av. Rec.	RPD	Recovery %		RPD
	ug/L	ug/L	ug/L	ug/L	ug/L	%	%	Low	High	%
Benzene	1.0	<LOR	10	9.57	9.98	98	4	87	115	20
Toluene	1.0	<LOR	10	10.49	10.42	105	1	87	114	20
Chlorobenzene	1.0	<LOR	10	10.33	10.24	103	1	89	112	20
Ethylbenzene	1.0	<LOR	10	10.19	10.84	105	6	88	115	20
m- & p-Xylene	1.0	<LOR	10	10.28	10.70	105	4	89	115	20
o-Xylene	1.0	<LOR	10	9.78	10.37	101	6	89	114	20

COMMENTS :

1) The control limits are based on ALS laboratory statistical data (Method QWI-ORG/07).
2) * : Recovery or RPD falls outside the recommended control limit.
3) MDL = Method Detection Limit
4) LOR = Level Of Reporting

BATCH QUALITY CONTROL -- CONTROL SPIKE/DUPLICATE

ALS EP-075 : Semivolatile Organic Compounds

QC LOT No. : NSVOCW1271 ANALYST ALICE TAT

MATRIX: Waters

	Blank	Spike	SPIKE QC RESULTS				Control Limits		
	Conc	Level	SCS Rec.	DCS Rec.	Average Rec.	RPD	Rec.		RPD
COMPOUND	ug/L	ug/L	%		%	%	Low	High	%
EP-075A : PHENOLS									
Phenol	<0.5	5.0	49.1	48.7	48.9	0.82	29.4	60.5	0 - 35
2-Chlorophenol	<0.3	5.0	103	91.8	97.4	11.5	72.1	114	0 - 35
2-Methylphenol	<0.5	5.0	82.7	90.8	86.8	9.34	65.9	109	0 - 35
4-Methylphenol	<0.5	10.0	116	126	121 *	8.26	25.8	112	0 - 35
2-Nitrophenol	<0.5	5.0	99.4	89.3	94.4	10.7	66	127	0 - 35
2,4-Dimethylphenol	<0.5	5.0	92.1	83.5	87.8	9.79	60.5	121	0 - 35
2,4-Dichlorophenol	<0.3	5.0	97.5	84.1	90.8	14.8	60.8	128	0 - 35
2,6-Dichlorophenol	<0.3	5.0	102	91.3	96.7	11.1	75.6	121	0 - 35
4-Chloro-3-methylphenol	<0.3	5.0	99.2	89.9	94.6	9.84	72.3	115	0 - 35
2,4,6-Trichlorophenol	<0.3	5.0	96.5	85.2	90.9	12.4	58.4	127	0 - 35
2,4,5-Trichlorophenol	<0.3	5.0	96.9	85.1	91	13	57.6	119	0 - 35
Pentachlorophenol	<0.3	10.0	56.4	43.8	50.1	25.1	0	130	0 - 35
EP-075B : POLYAROMATIC HYDROCARBONS									
Naphthalene	<0.5	5.0	103	91.3	97.2	12	65.3	104	0 - 35
2-Methylnaphthalene	<0.5	5.0	97	91.2	94.1	6.16	66.2	103	0 - 35
2-Chloronaphthalene	<0.5	5.0	96.9	91.8	94.4	5.41	67	107	0 - 35
Acenaphthylene	<0.5	5.0	99	94	96.5	5.18	68	118	0 - 35
Acenaphthene	<0.5	5.0	107	96.1	102	10.7	74.5	115	0 - 35
Fluorene	<0.5	5.0	105	90.6	97.8	14.7	74.8	117	0 - 35
Phenanthrene	<0.5	5.0	107	95.5	101	11.4	78.6	122	0 - 35
Anthracene	<0.5	5.0	105	94.2	99.6	10.8	80.6	120	0 - 35
Fluoranthene	<0.5	5.0	104	91	97.5	13.3	81.4	120	0 - 35
Pyrene	<0.5	5.0	95.8	84.7	90.3	12.3	81.9	122	0 - 35
N-2-Fluorenylacetamide	<0.5	5.0	100	86.5	93.3	14.5	71.1	118	0 - 35
Benz(a)anthracene	<0.5	5.0	101	90.7	95.9	10.7	78	118	0 - 35
Chrysene	<0.5	5.0	98.5	83.7	91.1	16.2	78.5	123	0 - 35
Benzo(b)&(k)fluoranthene	<1.0	10.0	97.6	86.3	92	12.3	74.9	122	0 - 35
7,12-Dimethylbenz(a)anthracene	<0.5	5.0	86	74	80	15	66.4	128	0 - 35
Benzo(a)pyrene	<0.3	5.0	97	85.3	91.2	12.8	71.9	124	0 - 35
3-Methylchloanthrene	<0.5	5.0	103	89	96	14.6	76.6	118	0 - 35
Indeno(1,2,3-cd)pyrene	<0.5	5.0	96.8	85.9	91.4	11.9	69.3	119	0 - 35
Dibenz(a,h)anthracene	<0.5	5.0	94.4	83.3	88.9	12.5	70.6	118	0 - 35
Benzo(g,h,i)perylene	<0.5	5.0	99.4	88.1	93.8	12.1	73.6	116	0 - 35

BATCH QUALITY CONTROL -- CONTROL SPIKE/DUPLICATE

ALS EP-075 : Semivolatile Organic Compounds

QC LOT No. : NSVOCW1271 ANALYST ALICE TAT

MATRIX: Waters

	Blank Conc	Spike Level	SPIKE QC RESULTS				Control Limits		
			SCS Rec.	DCS Rec.	Average Rec.	RPD	Rec.		RPD
COMPOUND	ug/L	ug/L	%		%	%	Low	High	%
EP-075S : ACID EXTRACTABLE SURROGATES									
2-Fluorophenol	76.9%	10.0	72.4	78.6	75.5	8.21	37.3	86.7	0 - 35
Phenol-d6	46.8%	10.0	46.2	51.5	48.9	10.8	24.1	56.7	0 - 35
2-Chlorophenol-d4	109%	10.0	102	112	107	9.35	60.7	121	0 - 35
2,4,6-Tribromophenol	102%	10.0	101	112	107	10.3	44.4	134	0 - 35
EP-075T : BASE/NEUTRAL EXTRACTABLE SURROGATES									
Nitrobenzene-d5	114%	10.0	105	116	111	9.95	59.1	130	0 - 35
1,2-Dichlorobenzene-d4	89.3%	10.0	79.8	87.5	83.7	9.21	38.7	96.6	0 - 35
2-Fluorobiphenyl	105%	10.0	94.2	109	102	14.6	50	116	0 - 35
Anthracene-d10	111%	10.0	108	121	115	11.4	71.7	129	0 - 35
4-Terphenyl-d14	116%	10.0	106	120	113	12.4	70.1	126	0 - 35

BATCH QUALITY CONTROL -- CONTROL SPIKE/DUPLICATE

ALS EP-075 : Semivolatile Organic Compounds

QC LOT No. : NSVOCW1272 ANALYST ALICE TAT

MATRIX: Waters

	Blank	Spike	SPIKE QC RESULTS				Control Limits		
	Conc	Level	SCS Rec.	DCS Rec.	Average Rec.	RPD	Rec.		RPD
COMPOUND	ug/L	ug/L	%		%	%	Low	High	%
EP-075A : PHENOLS									
Phenol	<0.5	5.0	42.3	40.7	41.5	3.86	29.4	60.5	0 - 35
2-Chlorophenol	<0.3	5.0	93.3	88.7	91	5.05	72.1	114	0 - 35
2-Methylphenol	<0.5	5.0	81.8	79.7	80.8	2.6	65.9	109	0 - 35
4-Methylphenol	<0.5	10.0	111	111	111	0	25.8	112	0 - 35
2-Nitrophenol	<0.5	5.0	89.6	87.5	88.6	2.37	66	127	0 - 35
2,4-Dimethylphenol	<0.5	5.0	71.3	70.5	70.9	1.13	60.5	121	0 - 35
2,4-Dichlorophenol	<0.3	5.0	86.4	83.3	84.9	3.65	60.8	128	0 - 35
2,6-Dichlorophenol	<0.3	5.0	91.3	88.5	89.9	3.11	75.6	121	0 - 35
4-Chloro-3-methylphenol	<0.3	5.0	88.4	83.8	86.1	5.34	72.3	115	0 - 35
2,4,6-Trichlorophenol	<0.3	5.0	84.6	81.4	83	3.86	58.4	127	0 - 35
2,4,5-Trichlorophenol	<0.3	5.0	84.1	80	82.1	5	57.6	119	0 - 35
Pentachlorophenol	<0.3	10.0	47.3	40.7	44	15	0	130	0 - 35
EP-075B : POLYAROMATIC HYDROCARBONS									
Naphthalene	<0.5	5.0	97.2	91.3	94.3	6.26	65.3	104	0 - 35
2-Methylnaphthalene	<0.5	5.0	94.5	89.5	92	5.43	66.2	103	0 - 35
2-Chloronaphthalene	<0.5	5.0	93	87.3	90.2	6.32	67	107	0 - 35
Acenaphthylene	<0.5	5.0	94.2	90.9	92.6	3.57	68	118	0 - 35
Acenaphthene	<0.5	5.0	97.6	93.1	95.4	4.72	74.5	115	0 - 35
Fluorene	<0.5	5.0	94.7	89.5	92.1	5.65	74.8	117	0 - 35
Phenanthrene	<0.5	5.0	97.1	92	94.6	5.39	78.6	122	0 - 35
Anthracene	<0.5	5.0	95.8	90.8	93.3	5.36	80.6	120	0 - 35
Fluoranthene	<0.5	5.0	93.1	87.9	90.5	5.75	81.4	120	0 - 35
Pyrene	<0.5	5.0	87.5	83.5	85.5	4.68	81.9	122	0 - 35
N-2-Fluorenylacetamide	<0.5	5.0	88.1	82.1	85.1	7.05	71.1	118	0 - 35
Benz(a)anthracene	<0.5	5.0	96.3	91.7	94	4.89	78	118	0 - 35
Chrysene	<0.5	5.0	86	81.7	83.9	5.13	78.5	123	0 - 35
Benzo(b)&(k)fluoranthene	<1.0	10.0	88.9	82.1	85.5	7.95	74.9	122	0 - 35
7,12-Dimethylbenz(a)anthracene	<0.5	5.0	76.2	71.2	73.7	6.78	66.4	128	0 - 35
Benzo(a)pyrene	<0.3	5.0	89.2	82.5	85.9	7.8	71.9	124	0 - 35
3-Methylchloanthrene	<0.5	5.0	93.2	88.1	90.7	5.63	76.6	118	0 - 35
Indeno(1,2,3-cd)pyrene	<0.5	5.0	90.4	84.5	87.5	6.75	69.3	119	0 - 35
Dibenz(a,h)anthracene	<0.5	5.0	87.6	81.7	84.7	6.97	70.6	118	0 - 35
Benzo(g,h,i)perylene	<0.5	5.0	92	85.4	88.7	7.44	73.6	116	0 - 35

BATCH QUALITY CONTROL -- CONTROL SPIKE/DUPLICATE

ALS EP-075 : Semivolatile Organic Compounds

QC LOT No. : NSVOCW1272 ANALYST ALICE TAT

MATRIX: Waters

	Blank	Spike	SPIKE QC RESULTS				Control Limits		
	Conc	Level	SCS Rec.	DCS Rec.	Average Rec.	RPD	Rec.		RPD
COMPOUND	ug/L	ug/L	%		%	%	Low	High	%
EP-075S : ACID EXTRACTABLE SURROGATES									
2-Fluorophenol	65.8%	10.0	65.1	59.3	62.2	9.32	37.3	86.7	0 - 35
Phenol-d6	40.5%	10.0	41.1	37.9	39.5	8.1	24.1	56.7	0 - 35
2-Chlorophenol-d4	90.6%	10.0	94.9	87	91	8.69	60.7	121	0 - 35
2,4,6-Tribromophenol	80.7%	10.0	93.9	82.3	88.1	13.2	44.4	134	0 - 35
EP-075T : BASE/NEUTRAL EXTRACTABLE SURROGATES									
Nitrobenzene-d5	95.4%	10.0	102	90.7	96.4	11.7	59.1	130	0 - 35
1,2-Dichlorobenzene-d4	69.8%	10.0	78.3	65.1	71.7	18.4	38.7	96.6	0 - 35
2-Fluorobiphenyl	84.7%	10.0	90.9	77.5	84.2	15.9	50	116	0 - 35
Anthracene-d10	112%	10.0	104	94.3	99.2	9.78	71.7	129	0 - 35
4-Terphenyl-d14	104%	10.0	103	91	97	12.4	70.1	126	0 - 35

ALS Environmental

CERTIFICATE OF ANALYSIS

CONTACT:	MR KARL BALTPURVINS	**BATCH:**	ANE9122
CLIENT:	HAZTECH INDUSTRIES PTY LTD	**SUB BATCH:**	0
ADDRESS:		**LABORATORY:**	NEWCASTLE
	PO BOX 32	**DATE RECEIVED:**	06/02/2003
	UNION BUILDING CALLAGHAN NSW 23	**DATE COMPLETED:**	07/03/2003
		SAMPLE TYPE:	TCLP LEACHATE
ORDER No.:		**No. of SAMPLES:**	15
PROJECT:	GHD		

COMMENTS

The concentrations reported are those determined on the TCLP leachate.
Extraction fluid #1 pH 4.88-4.98. Analysis conducted by ALS Sydney,
NATA Accreditation No. 10918. This report supersedes any previous
preliminary reports of the same batch number.

NOTES

This is the Final Report and supersedes any preliminary reports with this batch number.
All pages of this report have been checked and approved for release.

ISSUING LABORATORY: NEWCASTLE

Address
5 Rosegum Close
WARABROOK NSW 2304

Phone: 61-2-4968 9433
Fax: 61-2-4968 0349
Email: kathy.mcdermott@alsenviro.com

Signatory Greg Vogel

This Laboratory is accredited by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of accreditation. This document shall not be reproduced except in full.

NATA Accredited Laboratory Number 825

Batch: ANE9122
Sub Batch: 0
Date of Issue: 07/03/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference: GHD

CERTIFICATE OF ANALYSIS

				SAMPLE IDENTIFICATION									
	Laboratory I.D.			1	2	3	4	5	6	7	8	9	10
	Date Sampled			06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	GHD-03	GHD-06	GHD-09	GHD-11	GHD-12	GHD-14	GHD-15	GHD-17	GHD-18	GHD-29
ALS3	Extraction Fluid Number		1	1	1	1	1	1	1	1	1	1	1
ALS4	pH After Extract		0.1	9.2	9.4	10.8	11.1	11.2	11.4	11.5	11.9	11.9	11.9
EG-005C	Arsenic - TCLP	mg/L	0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
EG-005C	Cadmium - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
EG-005C	Cobalt - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
EG-005C	Chromium - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
EG-005C	Nickel - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
EG-005C	Lead - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
EG-005C	Zinc - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
EG-035C	Mercury - TCLP	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Batch: ANE9122
Sub Batch: 0
Date of Issue: 07/03/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference: GHD

CERTIFICATE OF ANALYSIS

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		11	12	13	14	15					
		Date Sampled		06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003					
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	GHD-30	GHD-32	GHD-33	GHD-35	GHD-36					
ALS3	Extraction Fluid Number		1	1	1	1	1	1					
ALS4	pH After Extract		0.1	11.8	12.0	12.0	12.1	12.1					
EG-005C	Arsenic - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1					
EG-005C	Cadmium - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1					
EG-005C	Cobalt - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1					
EG-005C	Chromium - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1					
EG-005C	Nickel - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1					
EG-005C	Lead - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1					
EG-005C	Zinc - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1					
EG-035C	Mercury - TCLP	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01					

Batch: ANE9122
Sub Batch: 0
Date of Issue: 07/03/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference: *GHD*

QUALITY CONTROL REPORT

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		1	1	200	201						
		Date Sampled		06/02/2003	06/02/2003	06/02/2003	06/02/2003						
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	GHD-03 MS	GHD-03 CHK	METHOD BLANK	LCS						
				CHECKS AND SPIKES									
ALS3	Extraction Fluid Number		1	----	----	1	----						
ALS4	pH After Extract		0.1	----	----	----	----						
EG-005C	Arsenic - TCLP	mg/L	0.1	119%	0.1	<0.1	96.0%						
EG-005C	Cadmium - TCLP	mg/L	0.1	107%	<0.1	<0.1	96.0%						
EG-005C	Cobalt - TCLP	mg/L	0.1	109%	<0.1	<0.1	----						
EG-005C	Chromium - TCLP	mg/L	0.1	111%	<0.1	<0.1	96.0%						
EG-005C	Nickel - TCLP	mg/L	0.1	120%	<0.1	<0.1	95.0%						
EG-005C	Lead - TCLP	mg/L	0.1	121%	<0.1	<0.1	96.0%						
EG-005C	Zinc - TCLP	mg/L	0.1	113%	<0.1	<0.1	93.0%						
EG-035C	Mercury - TCLP	mg/L	0.01	94.0%	<0.01	<0.01	96.0%						

ALS Environmental

CERTIFICATE OF ANALYSIS

CONTACT:	MR KARL BALTPURVINS	**BATCH:**	ANE9122
CLIENT:	HAZTECH INDUSTRIES PTY LTD	**SUB BATCH:**	1
ADDRESS:		**LABORATORY:**	NEWCASTLE
	PO BOX 32	**DATE RECEIVED:**	06/02/2003
	UNION BUILDING CALLAGHAN NSW 23	**DATE COMPLETED:**	07/03/2003
		SAMPLE TYPE:	ZHE LEACHATE
ORDER No.:		**No. of SAMPLES:**	15
PROJECT:	GHD		

COMMENTS

The concentrations reported are those determined on a ZHE TCLP leachate, using extraction fluid #1 (pH 4.88-4.98). ZHE TCLP conducted by ALS Sydney, NATA Accreditation No. 10918. All analysis conducted by ALS Sydney, NATA Site No. 10911.

NOTES

This is the Final Report and supersedes any preliminary reports with this batch number.
All pages of this report have been checked and approved for release.

ISSUING LABORATORY: NEWCASTLE

Address
5 Rosegum Close
WARABROOK NSW 2304

Phone: 61-2-4968 9433
Fax: 61-2-4968 0349
Email: kathy.mcdermott@alsenviro.com

Signatory Greg Vogel

This Laboratory is accredited by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of accreditation. This document shall not be reproduced except in full.

NATA Accredited Laboratory Number 825

Batch: ANE9122
Sub Batch: 1
Date of Issue: 07/03/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference: GHD

CERTIFICATE OF ANALYSIS

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		1	2	3	4	5	6	7	8	9	10
		Date Sampled		06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	GHD-03	GHD-06	GHD-09	GHD-11	GHD-12	GHD-14	GHD-15	GHD-17	GHD-18	GHD-29
EK-026MA	Total Cyanide	mg/L	0.005	1.27	0.123	0.006	0.270	0.198	0.055	0.169	0.006	0.008	0.057

Batch: ANE9122
Sub Batch: 1
Date of Issue: 07/03/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference: GHD

CERTIFICATE OF ANALYSIS

				SAMPLE IDENTIFICATION										
		Laboratory I.D.		11	12	13	14	15						
		Date Sampled		06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003						
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	GHD-30	GHD-32	GHD-33	GHD-35	GHD-36						
EK-026MA	Total Cyanide	mg/L	0.005	0.029	<0.005	0.013	0.005	0.009						

Batch: ANE9122
Sub Batch: 1
Date of Issue: 07/03/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference: GHD

QUALITY CONTROL REPORT

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		10	200	201	202						
		Date Sampled		06/02/2003	06/02/2003	06/02/2003	06/02/2003						
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	GHD-29 CHK	BLANK	LCS	MS						
				CHECKS AND SPIKES									
EK-026MA	Total Cyanide	mg/L	0.005	0.061	<0.005	97.0%	95.0%						

ALS Environmental

CERTIFICATE OF ANALYSIS

CONTACT:	MR KARL BALTPURVINS	**BATCH:**	ANE9122
CLIENT:	HAZTECH INDUSTRIES PTY LTD	**SUB BATCH:**	2
ADDRESS:		**LABORATORY:**	NEWCASTLE
	PO BOX 32	**DATE RECEIVED:**	06/02/2003
	UNION BUILDING CALLAGHAN NSW 23	**DATE COMPLETED:**	07/03/2003
		SAMPLE TYPE:	TCLP LEACHATE
ORDER No.:		**No. of SAMPLES:**	15
PROJECT:	GHD		

COMMENTS

The concentrations reported for C6-C9 and BTEX are those determined on a ZHE TCLP leachate, using extraction fluid #1 (pH 4.88-4.98). The concentrations reported for C10-C36 are those determined on the TCLP leachate. Extraction fluid #1 pH 4.88-4.98. Analysis conducted by ALS Sydney, NATA Site No. 10911. This report supersedes NE9122.

NOTES

This is the Final Report and supersedes any preliminary reports with this batch number.
All pages of this report have been checked and approved for release.

ISSUING LABORATORY: NEWCASTLE

Address
5 Rosegum Close
WARABROOK NSW 2304

Phone: 61-2-4968 9433
Fax: 61-2-4968 0349
Email: kathy.mcdermott@alsenviro.com

Signatory

This Laboratory is accredited by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of accreditation. This document shall not be reproduced except in full.

NATA Accredited Laboratory Number 825

Batch: ANE9122
Sub Batch: 2
Date of Issue: 07/03/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference: GHD

CERTIFICATE OF ANALYSIS

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		1	2	3	4	5	6	7	8	9	10
		Date Sampled		06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	GHD-03	GHD-06	GHD-09	GHD-11	GHD-12	GHD-14	GHD-15	GHD-17	GHD-18	GHD-29
ALS3	Extraction Fluid Number		1	1	1	1	1	1	1	1	1	1	1
ALS4	pH After Extract		0.1	9.2	9.4	10.8	11.1	11.2	11.4	11.5	11.9	11.9	11.9
EP-071-WS	**TOTAL PETROLEUM HYDROCARBONS**												
EP-071-WS	C6 - C9 Fraction	ug/L	20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
EP-071-WS	C10 - C14 Fraction	ug/L	50	19.4mg/L	174	199	10.8mg/L	18.3mg/L	112	153	186	108	10.8mg/L
EP-071-WS	C15 - C28 Fraction	ug/L	100	3220	348	571	2410	3290	255	309	275	162	2840
EP-071-WS	C29 - C36 Fraction	ug/L	50	298	<50	89	228	322	<50	<50	<50	<50	156
EP-080-WS	**BTEX**												
EP-080-WS	Benzene	ug/L	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
EP-080-WS	Toluene	ug/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
EP-080-WS	Chlorobenzene	ug/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
EP-080-WS	Ethylbenzene	ug/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
EP-080-WS	meta- & para-Xylene	ug/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
EP-080-WS	ortho-Xylene	ug/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
EP-080S-WS	**VOLATILE TPH/BTEX COMPOUND SURROGATES**												
EP-080S-WS	1.2-Dichloroethane-D4	%	1	97	108	99	96	90	81	86	81	84	92
EP-080S-WS	Toluene-D8	%	1	96	96	93	107	92	100	96	93	96	102
EP-080S-WS	4-Bromofluorobenzene	%	1	99	112	95	114	92	95	95	89	94	103

Batch: ANE9122
Sub Batch: 2
Date of Issue: 07/03/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference: GHD

CERTIFICATE OF ANALYSIS

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		11	12	13	14	15					
		Date Sampled		06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003					
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	GHD-30	GHD-32	GHD-33	GHD-35	GHD-36					
ALS3	Extraction Fluid Number		1	1	1	1	1	1					
ALS4	pH After Extract		0.1	11.8	12.0	12.0	12.1	12.1					
EP-071-WS	**TOTAL PETROLEUM HYDROCARBONS**												
EP-071-WS	C6 - C9 Fraction	ug/L	20	<20	<20	<20	<20	<20					
EP-071-WS	C10 - C14 Fraction	ug/L	50	16.8mg/L	156	144	118	70					
EP-071-WS	C15 - C28 Fraction	ug/L	100	3180	230	234	<100	<100					
EP-071-WS	C29 - C36 Fraction	ug/L	50	196	<50	<50	<50	<50					
EP-080-WS	**BTEX**												
EP-080-WS	Benzene	ug/L	1	<1	<1	<1	<1	<1					
EP-080-WS	Toluene	ug/L	2	<2	<2	<2	<2	<2					
EP-080-WS	Chlorobenzene	ug/L	2	<2	<2	<2	<2	<2					
EP-080-WS	Ethylbenzene	ug/L	2	<2	<2	<2	<2	<2					
EP-080-WS	meta- & para-Xylene	ug/L	2	<2	<2	<2	<2	<2					
EP-080-WS	ortho-Xylene	ug/L	2	<2	<2	<2	<2	<2					
EP-080S-WS	**VOLATILE TPH/BTEX COMPOUND SURROGATES**												
EP-080S-WS	1.2-Dichloroethane-D4	%	1	86	90	80	82	82					
EP-080S-WS	Toluene-D8	%	1	88	95	91	91	96					
EP-080S-WS	4-Bromofluorobenzene	%	1	90	93	89	92	97					

Batch: ANE9122
Sub Batch: 2
Date of Issue: 07/03/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference: GHD

QUALITY CONTROL REPORT

				SAMPLE IDENTIFICATION										
		Laboratory I.D.		100	101	102								
		Date Sampled		06/02/2003	06/02/2003	06/02/2003								
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	METHOD BLANK	NTPHW1378 SCS	NTPHW1378 DCS								
				CHECKS AND SPIKES										
ALS3	Extraction Fluid Number		1	1	----	----								
ALS4	pH After Extract		0.1	----	----	----								
EP-071-WS	**TOTAL PETROLEUM HYDROCARBONS**													
EP-071-WS	C6 - C9 Fraction	ug/L	20	<20	101%	103%								
EP-071-WS	C10 - C14 Fraction	ug/L	50	<50	89.0%	87.0%								
EP-071-WS	C15 - C28 Fraction	ug/L	100	<100	107%	103%								
EP-071-WS	C29 - C36 Fraction	ug/L	50	<50	99.0%	96.0%								
EP-080-WS	**BTEX**													
EP-080-WS	Benzene	ug/L	1	<1	105%	102%								
EP-080-WS	Toluene	ug/L	2	<2	100%	92.0%								
EP-080-WS	Chlorobenzene	ug/L	2	<2	109%	92.0%								
EP-080-WS	Ethylbenzene	ug/L	2	<2	109%	103%								
EP-080-WS	meta- & para-Xylene	ug/L	2	<2	105%	97.0%								
EP-080-WS	ortho-Xylene	ug/L	2	<2	108%	99.0%								
EP-080S-WS	**VOLATILE TPH/BTEX COMPOUND SURROGATES**													
EP-080S-WS	1.2-Dichloroethane-D4	%	1	86	109	101								
EP-080S-WS	Toluene-D8	%	1	90	108	91								
EP-080S-WS	4-Bromofluorobenzene	%	1	91	108	100								

ALS Environmental

CERTIFICATE OF ANALYSIS

CONTACT:	MR KARL BALTPURVINS	**BATCH:**	ANE9122
CLIENT:	HAZTECH INDUSTRIES PTY LTD	**SUB BATCH:**	3
ADDRESS:		**LABORATORY:**	NEWCASTLE
	PO BOX 32	**DATE RECEIVED:**	06/02/2003
	UNION BUILDING CALLAGHAN NSW 23	**DATE COMPLETED:**	07/03/2003
		SAMPLE TYPE:	TCLP LEACHATE
ORDER No.:		**No. of SAMPLES:**	15
PROJECT:	GHD		

COMMENTS

The concentrations reported are those determined on the TCLP leachate. Extraction fluid #1 pH 4.88-4.98. Acid surrogates for sample GHD-36 could not be determined due to sample matrix effect. Analysis conducted by ALS Sydney.

NOTES

This is the Final Report and supersedes any preliminary reports with this batch number.
All pages of this report have been checked and approved for release.

ISSUING LABORATORY: NEWCASTLE

Address
5 Rosegum Close
WARABROOK NSW 2304

Phone: 61-2-4968 9433
Fax: 61-2-4968 0349
Email: kathy.mcdermott@alsenviro.com

Signatory

This Laboratory is accredited by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of accreditation. This document shall not be reproduced except in full.

NATA Accredited Laboratory Number 825

Batch: ANE9122
Sub Batch: 3
Date of Issue: 07/03/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference: GHD

CERTIFICATE OF ANALYSIS

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		1	2	3	4	5	6	7	8	9	10
		Date Sampled		06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	GHD-03	GHD-06	GHD-09	GHD-11	GHD-12	GHD-14	GHD-15	GHD-17	GHD-18	GHD-29
ALS3	Extraction Fluid Number		1	1	1	1	1	1	1	1	1	1	1
ALS4	pH After Extract		0.1	9.2	9.4	10.8	11.1	11.2	11.4	11.5	11.9	11.9	11.9
EP-075A-WS	**PHENOLS**												
EP-075A-WS	Phenol	ug/L	0.5	2.1	0.9	0.9	1.4	1.9	0.9	1.1	0.8	0.9	1.5
EP-075A-WS	2-Chlorophenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
EP-075A-WS	2-Methylphenol	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	<0.5	<0.5	<0.5	<0.5
EP-075A-WS	3- & 4-Methylphenol	ug/L	0.5	2.7	<0.5	<0.5	1.2	2.2	<0.5	<0.5	<0.5	<0.5	1.2
EP-075A-WS	2-Nitrophenol	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
EP-075A-WS	2.4-Dimethylphenol	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	1.5	<0.5	<0.5	<0.5	<0.5	<0.5
EP-075A-WS	2.4-Dichlorophenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
EP-075A-WS	2.6-Dichlorophenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
EP-075A-WS	4-Chloro-3-methylphenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
EP-075A-WS	2.4.6-Trichlorophenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
EP-075A-WS	2.4.5-Trichlorophenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
EP-075A-WS	Pentachlorophenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
EP-075B-WS	**POLYNUCLEAR AROMATICS**												
EP-075B-WS	Naphthalene	ug/L	0.5	14.6mg/L	90.0	80.6	8810	15.0mg/L	80.2	72.4	92.8	60.0	6610
EP-075B-WS	2-Methylnaphthalene	ug/L	0.5	719	3.6	4.3	418	600	3.0	2.1	2.5	1.4	358
EP-075B-WS	2-Chloronaphthalene	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
EP-075B-WS	Acenaphthylene	ug/L	0.5	101	4.2	3.4	53.4	90.2	7.6	6.4	2.3	1.7	52.6
EP-075B-WS	Acenaphthene	ug/L	0.5	532	20.9	24.2	407	441	20.2	17.4	17.0	11.6	371
EP-075B-WS	Fluorene	ug/L	0.5	205	5.4	14.4	155	186	5.2	4.0	5.2	2.8	150
EP-075B-WS	Phenanthrene	ug/L	0.5	257	10.4	27.5	202	259	13.0	10.5	10.2	6.9	203
EP-075B-WS	Anthracene	ug/L	0.5	39.0	2.4	7.6	36.1	36.0	2.6	2.2	2.6	1.7	35.4
EP-075B-WS	Fluoranthene	ug/L	0.5	40.5	3.4	10.3	33.6	39.1	4.1	3.5	4.0	3.4	35.3
EP-075B-WS	Pyrene	ug/L	0.5	23.9	2.5	8.7	19.5	22.9	2.9	2.6	3.9	3.2	21.0
EP-075B-WS	N-2-Fluorenylacetamide	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
EP-075B-WS	Benz(a)anthracene	ug/L	0.5	1.4	<0.5	<0.5	1.0	1.3	<0.5	<0.5	<0.5	<0.5	1.0
EP-075B-WS	Chrysene	ug/L	0.5	0.8	<0.5	<0.5	0.6	0.7	<0.5	<0.5	<0.5	<0.5	0.6
EP-075B-WS	Benzo(b) & (k)fluoranthene	ug/L	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
EP-075B-WS	7.12-Dimethylbenz(a)anthracene	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
EP-075B-WS	Benzo(a)pyrene	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
EP-075B-WS	3-Methylcholanthrene	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
EP-075B-WS	Indeno(1.2.3-cd)pyrene	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

Batch: ANE9122
Sub Batch: 3
Date of Issue: 07/03/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference: GHD

CERTIFICATE OF ANALYSIS

				SAMPLE IDENTIFICATION									
	Laboratory I.D.			1	2	3	4	5	6	7	8	9	10
	Date Sampled			06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	GHD-03	GHD-06	GHD-09	GHD-11	GHD-12	GHD-14	GHD-15	GHD-17	GHD-18	GHD-29
EP-075B-WS	Dibenz(a.h)anthracene	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
EP-075B-WS	Benzo(g.h.i)perylene	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
EP-075S-WS	**ACID EXTRACTABLE SURROGATES**												
EP-075S-WS	2-Fluorophenol	%	1	56	48	49	48	49	44	48	50	49	44
EP-075S-WS	Phenol-D6	%	1	36	29	30	30	31	28	29	30	30	28
EP-075S-WS	2-Chlorophenol-D4	%	1	100	85	87	85	85	78	84	87	84	78
EP-075S-WS	2.4.6-Tribromophenol	%	1	103	126	122	123	127	116	124	115	107	108
EP-075T-WS	**BASE/NEUTRAL EXTRACTABLE SURROGATES**												
EP-075T-WS	Nitrobenzene-D5	%	1	103	89	92	88	89	82	86	90	89	82
EP-075T-WS	1.2-Dichlorobenzene-D4	%	1	50	61	61	47	55	51	58	57	60	54
EP-075T-WS	2-Fluorobiphenyl	%	1	80	79	79	93	70	67	71	74	74	60
EP-075T-WS	Anthracene-d10	%	1	107	99	97	94	93	88	94	100	94	87
EP-075T-WS	p-Terphenyl-D14	%	1	116	97	102	100	105	90	97	99	93	92

Batch: ANE9122
Sub Batch: 3
Date of Issue: 07/03/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference: GHD

CERTIFICATE OF ANALYSIS

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		11	12	13	14	15					
		Date Sampled		06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003					
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	GHD-30	GHD-32	GHD-33	GHD-35	GHD-36					
ALS3	Extraction Fluid Number		1	1	1	1	1	1					
ALS4	pH After Extract		0.1	11.8	12.0	12.0	12.1	12.1					
EP-075A-WS	**PHENOLS**												
EP-075A-WS	Phenol	ug/L	0.5	2.0	1.0	1.1	0.9	0.6					
EP-075A-WS	2-Chlorophenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3					
EP-075A-WS	2-Methylphenol	ug/L	0.5	0.6	<0.5	<0.5	<0.5	<0.5					
EP-075A-WS	3- & 4-Methylphenol	ug/L	0.5	2.0	<0.5	<0.5	<0.5	<0.5					
EP-075A-WS	2-Nitrophenol	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5					
EP-075A-WS	2.4-Dimethylphenol	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5					
EP-075A-WS	2.4-Dichlorophenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3					
EP-075A-WS	2.6-Dichlorophenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3					
EP-075A-WS	4-Chloro-3-methylphenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3					
EP-075A-WS	2.4.6-Trichlorophenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3					
EP-075A-WS	2.4.5-Trichlorophenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3					
EP-075A-WS	Pentachlorophenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3					
EP-075B-WS	**POLYNUCLEAR AROMATICS**												
EP-075B-WS	Naphthalene	ug/L	0.5	12.8mg/L	85.9	75.4	54.4	38.9					
EP-075B-WS	2-Methylnaphthalene	ug/L	0.5	480	3.3	1.9	1.1	0.7					
EP-075B-WS	2-Chloronaphthalene	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5					
EP-075B-WS	Acenaphthylene	ug/L	0.5	71.8	14.4	8.1	0.8	0.6					
EP-075B-WS	Acenaphthene	ug/L	0.5	395	20.8	14.3	5.8	4.1					
EP-075B-WS	Fluorene	ug/L	0.5	176	5.8	3.7	1.5	0.8					
EP-075B-WS	Phenanthrene	ug/L	0.5	250	16.1	10.2	3.6	2.4					
EP-075B-WS	Anthracene	ug/L	0.5	35.2	2.7	2.0	0.8	0.5					
EP-075B-WS	Fluoranthene	ug/L	0.5	41.0	4.0	3.3	1.0	0.9					
EP-075B-WS	Pyrene	ug/L	0.5	24.2	2.8	2.4	0.9	0.8					
EP-075B-WS	N-2-Fluorenylacetamide	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5					
EP-075B-WS	Benz(a)anthracene	ug/L	0.5	1.4	<0.5	<0.5	<0.5	<0.5					
EP-075B-WS	Chrysene	ug/L	0.5	0.8	<0.5	<0.5	<0.5	<0.5					
EP-075B-WS	Benzo(b) & (k)fluoranthene	ug/L	1	<1	<1	<1	<1	<1					
EP-075B-WS	7.12-Dimethylbenz(a)anthracene	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5					
EP-075B-WS	Benzo(a)pyrene	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3					
EP-075B-WS	3-Methylcholanthrene	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5					
EP-075B-WS	Indeno(1.2.3-cd)pyrene	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5					

Batch: ANE9122
Sub Batch: 3
Date of Issue: 07/03/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference: GHD

CERTIFICATE OF ANALYSIS

				SAMPLE IDENTIFICATION									
	Laboratory I.D.			11	12	13	14	15					
	Date Sampled			06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003					
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	GHD-30	GHD-32	GHD-33	GHD-35	GHD-36					
EP-075B-WS	Dibenz(a.h)anthracene	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5					
EP-075B-WS	Benzo(g.h.i)perylene	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5					
EP-075S-WS	**ACID EXTRACTABLE SURROGATES**												
EP-075S-WS	2-Fluorophenol	%	1	41	47	47	51	Not Det'd					
EP-075S-WS	Phenol-D6	%	1	27	29	27	31	Not Det'd					
EP-075S-WS	2-Chlorophenol-D4	%	1	73	85	79	87	Not Det'd					
EP-075S-WS	2.4.6-Tribromophenol	%	1	100	108	102	95	Not Det'd					
EP-075T-WS	**BASE/NEUTRAL EXTRACTABLE SURROGATES**												
EP-075T-WS	Nitrobenzene-D5	%	1	77	89	83	93	89					
EP-075T-WS	1.2-Dichlorobenzene-D4	%	1	51	62	61	64	64					
EP-075T-WS	2-Fluorobiphenyl	%	1	60	79	74	78	75					
EP-075T-WS	Anthracene-d10	%	1	81	95	93	100	102					
EP-075T-WS	p-Terphenyl-D14	%	1	85	96	92	99	98					

Batch: ANE9122
Sub Batch: 3
Date of Issue: 07/03/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference: GHD

QUALITY CONTROL REPORT

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		100	101	102							
		Date Sampled		06/02/2003	06/02/2003	06/02/2003							
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	METHOD BLANK	NSVOCW1273 SCS	NSVOCW1273 DCS							
				CHECKS AND SPIKES									
ALS3	Extraction Fluid Number		1	1	----	----							
ALS4	pH After Extract		0.1	----	----	----							
EP-075A-WS	**PHENOLS**												
EP-075A-WS	Phenol	ug/L	0.5	<0.5	38.2%	45.3%							
EP-075A-WS	2-Chlorophenol	ug/L	0.3	<0.3	83.7%	96.5%							
EP-075A-WS	2-Methylphenol	ug/L	0.5	<0.5	74.8%	87.4%							
EP-075A-WS	3- & 4-Methylphenol	ug/L	0.5	<0.5	66.3%	78.4%							
EP-075A-WS	2-Nitrophenol	ug/L	0.5	<0.5	77.7%	93.4%							
EP-075A-WS	2.4-Dimethylphenol	ug/L	0.5	<0.5	85.4%	97.1%							
EP-075A-WS	2.4-Dichlorophenol	ug/L	0.3	<0.3	80.9%	96.6%							
EP-075A-WS	2.6-Dichlorophenol	ug/L	0.3	<0.3	79.5%	94.6%							
EP-075A-WS	4-Chloro-3-methylphenol	ug/L	0.3	<0.3	81.9%	95.0%							
EP-075A-WS	2.4.6-Trichlorophenol	ug/L	0.3	<0.3	76.2%	90.2%							
EP-075A-WS	2.4.5-Trichlorophenol	ug/L	0.3	<0.3	76.9%	90.3%							
EP-075A-WS	Pentachlorophenol	ug/L	0.3	<0.3	21.2%	32.2%							
EP-075B-WS	**POLYNUCLEAR AROMATICS**												
EP-075B-WS	Naphthalene	ug/L	0.5	<0.5	80.8%	94.0%							
EP-075B-WS	2-Methylnaphthalene	ug/L	0.5	<0.5	78.2%	90.0%							
EP-075B-WS	2-Chloronaphthalene	ug/L	0.5	<0.5	79.1%	90.4%							
EP-075B-WS	Acenaphthylene	ug/L	0.5	<0.5	84.0%	95.7%							
EP-075B-WS	Acenaphthene	ug/L	0.5	<0.5	81.5%	95.9%							
EP-075B-WS	Fluorene	ug/L	0.5	<0.5	85.9%	99.2%							
EP-075B-WS	Phenanthrene	ug/L	0.5	<0.5	85.2%	105%							
EP-075B-WS	Anthracene	ug/L	0.5	<0.5	82.2%	94.2%							
EP-075B-WS	Fluoranthene	ug/L	0.5	<0.5	80.8%	92.9%							
EP-075B-WS	Pyrene	ug/L	0.5	<0.5	86.3%	99.4%							
EP-075B-WS	N-2-Fluorenylacetamide	ug/L	0.5	<0.5	90.3%	102%							
EP-075B-WS	Benz(a)anthracene	ug/L	0.5	<0.5	88.8%	101%							
EP-075B-WS	Chrysene	ug/L	0.5	<0.5	80.9%	92.8%							
EP-075B-WS	Benzo(b) & (k)fluoranthene	ug/L	1	<1	82.5%	95.9%							
EP-075B-WS	7.12-Dimethylbenz(a)anthracene	ug/L	0.5	<0.5	71.3%	85.4%							
EP-075B-WS	Benzo(a)pyrene	ug/L	0.3	<0.3	82.4%	94.7%							

Batch: ANE9122
Sub Batch: 3
Date of Issue: 07/03/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference: GHD

QUALITY CONTROL REPORT

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		100	101	102							
		Date Sampled		06/02/2003	06/02/2003	06/02/2003							
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	METHOD BLANK	NSVOCW1273 SCS	NSVOCW1273 DCS							
				CHECKS AND SPIKES									
EP-075B-WS	3-Methylcholanthrene	ug/L	0.5	<0.5	84.1%	99.9%							
EP-075B-WS	Indeno(1.2.3-cd)pyrene	ug/L	0.5	<0.5	81.3%	95.8%							
EP-075B-WS	Dibenz(a.h)anthracene	ug/L	0.5	<0.5	79.0%	93.8%							
EP-075B-WS	Benzo(g.h.i)perylene	ug/L	0.5	<0.5	82.9%	98.5%							
EP-075S-WS	**ACID EXTRACTABLE SURROGATES**												
EP-075S-WS	2-Fluorophenol	%	1	61	56	63							
EP-075S-WS	Phenol-D6	%	1	39	34	40							
EP-075S-WS	2-Chlorophenol-D4	%	1	88	85	96							
EP-075S-WS	2.4.6-Tribromophenol	%	1	74	85	103							
EP-075T-WS	**BASE/NEUTRAL EXTRACTABLE SURROGATES**												
EP-075T-WS	Nitrobenzene-D5	%	1	90	86	100							
EP-075T-WS	1.2-Dichlorobenzene-D4	%	1	60	60	70							
EP-075T-WS	2-Fluorobiphenyl	%	1	75	78	91							
EP-075T-WS	Anthracene-d10	%	1	91	89	103							
EP-075T-WS	p-Terphenyl-D14	%	1	91	89	99							

ALS Environmental

CERTIFICATE OF ANALYSIS

CONTACT:	MR KARL BALTPURVINS	**BATCH:**	NE9122
CLIENT:	HAZTECH INDUSTRIES PTY LTD	**SUB BATCH:**	0
ADDRESS:		**LABORATORY:**	NEWCASTLE
	PO BOX 32	**DATE RECEIVED:**	06/02/2003
	UNION BUILDING CALLAGHAN NSW 23	**DATE COMPLETED:**	28/02/2003
		SAMPLE TYPE:	TCLP LEACHATE
ORDER No.:		**No. of SAMPLES:**	15
PROJECT:	GHD		

COMMENTS

The concentrations reported are those determined on the TCLP leachate. Extraction fluid #1 pH 4.88-4.98. Analysis conducted by ALS Sydney, NATA Accreditation No. 10918. This report supersedes any previous preliminary reports of the same batch number.

NOTES

This is the Final Report and supersedes any preliminary reports with this batch number.
All pages of this report have been checked and approved for release.

ISSUING LABORATORY: NEWCASTLE

Address
5 Rosegum Close
WARABROOK NSW 2304

Phone: 61-2-4968 9433
Fax: 61-2-4968 0349
Email: kathy.mcdermott@alsenviro.com

Signatory

This Laboratory is accredited by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of accreditation. This document shall not be reproduced except in full.

NATA Accredited Laboratory Number 825

Batch: NE9122
Sub Batch: 0
Date of Issue: 04/03/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference: GHD

CERTIFICATE OF ANALYSIS

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		1	2	3	4	5	6	7	8	9	10
		Date Sampled		06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	GHD-03	GHD-06	GHD-09	GHD-11	GHD-12	GHD-14	GHD-15	GHD-17	GHD-18	GHD-29
ALS3	Extraction Fluid Number		1	1	1	1	1	1	1	1	1	1	1
ALS4	pH After Extract		0.1	9.2	9.4	10.8	11.1	11.2	11.4	11.5	11.9	11.9	11.9
EG-005C	Arsenic - TCLP	mg/L	0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
EG-005C	Cadmium - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
EG-005C	Cobalt - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
EG-005C	Chromium - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
EG-005C	Nickel - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
EG-005C	Lead - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
EG-005C	Zinc - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
EG-035C	Mercury - TCLP	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Batch: NE9122
Sub Batch: 0
Date of Issue: 04/03/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference: GHD

CERTIFICATE OF ANALYSIS

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		11	12	13	14	15					
		Date Sampled		06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003					
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	GHD-30	GHD-32	GHD-33	GHD-35	GHD-36					
ALS3	Extraction Fluid Number		1	1	1	1	1	1					
ALS4	pH After Extract		0.1	11.8	12.0	12.0	12.1	12.1					
EG-005C	Arsenic - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1					
EG-005C	Cadmium - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1					
EG-005C	Cobalt - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1					
EG-005C	Chromium - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1					
EG-005C	Nickel - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1					
EG-005C	Lead - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1					
EG-005C	Zinc - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1					
EG-035C	Mercury - TCLP	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01					

Batch: NE9122
Sub Batch: 0
Date of Issue: 04/03/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference: GHD

QUALITY CONTROL REPORT

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		1	1	200	201						
		Date Sampled		06/02/2003	06/02/2003	06/02/2003	06/02/2003						
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	GHD-03 MS	GHD-03 CHK	METHOD BLANK	LCS						
				CHECKS AND SPIKES									
ALS3	Extraction Fluid Number		1	----	----	1	----						
ALS4	pH After Extract		0.1	----	----	----	----						
EG-005C	Arsenic - TCLP	mg/L	0.1	119%	0.1	<0.1	96.0%						
EG-005C	Cadmium - TCLP	mg/L	0.1	107%	<0.1	<0.1	96.0%						
EG-005C	Cobalt - TCLP	mg/L	0.1	109%	<0.1	<0.1	----						
EG-005C	Chromium - TCLP	mg/L	0.1	111%	<0.1	<0.1	96.0%						
EG-005C	Nickel - TCLP	mg/L	0.1	120%	<0.1	<0.1	95.0%						
EG-005C	Lead - TCLP	mg/L	0.1	121%	<0.1	<0.1	96.0%						
EG-005C	Zinc - TCLP	mg/L	0.1	113%	<0.1	<0.1	93.0%						
EG-035C	Mercury - TCLP	mg/L	0.01	94.0%	<0.01	<0.01	96.0%						

ALS Environmental

CERTIFICATE OF ANALYSIS

CONTACT:	MR KARL BALTPURVINS	**BATCH:**	NE9122
CLIENT:	HAZTECH INDUSTRIES PTY LTD	**SUB BATCH:**	1
ADDRESS:		**LABORATORY:**	NEWCASTLE
	PO BOX 32	**DATE RECEIVED:**	06/02/2003
	UNION BUILDING CALLAGHAN NSW 23	**DATE COMPLETED:**	28/02/2003
		SAMPLE TYPE:	ZHE LEACHATE
ORDER No.:		**No. of SAMPLES:**	15
PROJECT:	GHD		

COMMENTS

The concentrations reported are those determined on a ZHE TCLP leachate, using extraction fluid #1 (pH 4.88-4.98). ZHE TCLP conducted by ALS Sydney, NATA Accreditation No. 10918. All analysis conducted by ALS Sydney, NATA Site No. 10911.

NOTES

This is the Final Report and supersedes any preliminary reports with this batch number.
All pages of this report have been checked and approved for release.

ISSUING LABORATORY: NEWCASTLE

Address
5 Rosegum Close
WARABROOK NSW 2304

Phone: 61-2-4968 9433
Fax: 61-2-4968 0349
Email: kathy.mcdermott@alsenviro.com

Signatory Lucy Vogel

This Laboratory is accredited by the National Association of Testing Authorities, Australia. The tests reported herein have been performed in accordance with its terms of accreditation. This document shall not be reproduced except in full.

NATA Accredited Laboratory Number 825

Batch: NE9122
Sub Batch: 1
Date of Issue: 04/03/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference: GHD

CERTIFICATE OF ANALYSIS

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		1	2	3	4	5	6	7	8	9	10
		Date Sampled		06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	GHD-03	GHD-06	GHD-09	GHD-11	GHD-12	GHD-14	GHD-15	GHD-17	GHD-18	GHD-29
EK-026MA	Total Cyanide	mg/L	0.005	1.27	0.123	0.006	0.270	0.198	0.055	0.169	0.006	0.008	0.057

Batch: NE9122
Sub Batch: 1
Date of Issue: 04/03/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference: GHD

CERTIFICATE OF ANALYSIS

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		11	12	13	14	15					
		Date Sampled		06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003					
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	GHD-30	GHD-32	GHD-33	GHD-35	GHD-36					
EK-026MA	Total Cyanide	mg/L	0.005	0.029	<0.005	0.013	0.005	0.009					

Batch: NE9122
Sub Batch: 1
Date of Issue: 04/03/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference: GHD

QUALITY CONTROL REPORT

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		10	200	201	202						
		Date Sampled		06/02/2003	06/02/2003	06/02/2003	06/02/2003						
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	GHD-29 CHK	BLANK	LCS	MS						
				CHECKS AND SPIKES									
EK-026MA	Total Cyanide	mg/L	0.005	0.061	<0.005	97.0%	95.0%						

ALS Environmental

CERTIFICATE OF ANALYSIS

CONTACT:	MR KARL BALTPURVINS	**BATCH:**	NE9122
CLIENT:	HAZTECH INDUSTRIES PTY LTD	**SUB BATCH:**	2
ADDRESS:		**LABORATORY:**	NEWCASTLE
	PO BOX 32	**DATE RECEIVED:**	06/02/2003
	UNION BUILDING CALLAGHAN NSW 23	**DATE COMPLETED:**	28/02/2003
		SAMPLE TYPE:	TCLP LEACHATE
ORDER No.:		**No. of SAMPLES:**	15
PROJECT:	GHD		

COMMENTS

The concentrations reported for C6-C9 are those determined on a ZHE TCLP leachate, using extraction fluid #1 (pH 4.88-4.98). The concentrations reported for C10-C36 are those determined on the TCLP leachate. Extraction fluid #1 pH 4.88-4.98. Analysis conducted by ALS Sydney, NATA Site No. 10911.

NOTES

This is the Final Report and supersedes any preliminary reports with this batch number.
All pages of this report have been checked and approved for release.

ISSUING LABORATORY: NEWCASTLE

Address
5 Rosegum Close
WARABROOK NSW 2304

Phone: 61-2-4968 9433
Fax: 61-2-4968 0349
Email: kathy.mcdermott@alsenviro.com

Signatory

This Laboratory is accredited by the National Association of Testing Authorities, Australia. The tests/ reported herein have been performed in accordance with its terms of accreditation. This document shall not be reproduced except in full.

NATA Accredited Laboratory Number 825

Batch: NE9122
Sub Batch: 2
Date of Issue: 04/03/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference: GHD

CERTIFICATE OF ANALYSIS

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		1	2	3	4	5	6	7	8	9	10
		Date Sampled		06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	GHD-03	GHD-06	GHD-09	GHD-11	GHD-12	GHD-14	GHD-15	GHD-17	GHD-18	GHD-29
ALS3	Extraction Fluid Number		1	1	1	1	1	1	1	1	1	1	1
ALS4	pH After Extract		0.1	9.2	9.4	10.8	11.1	11.2	11.4	11.5	11.9	11.9	11.9
EP-071-WS	**TOTAL PETROLEUM HYDROCARBONS**												
EP-071-WS	C6 - C9 Fraction	ug/L	20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
EP-071-WS	C10 - C14 Fraction	ug/L	50	19.4mg/L	174	199	10.8mg/L	18.3mg/L	112	153	186	108	10.8mg/L
EP-071-WS	C15 - C28 Fraction	ug/L	100	3220	348	571	2410	3290	255	309	275	162	2840
EP-071-WS	C29 - C36 Fraction	ug/L	50	298	<50	89	228	322	<50	<50	<50	<50	156
EP-080S-WS	**VOLATILE TPH/BTEX COMPOUND SURROGATES**												
EP-080S-WS	1.2-Dichloroethane-D4	%	1	97	108	99	96	90	81	86	81	84	92
EP-080S-WS	Toluene-D8	%	1	96	96	93	107	92	100	96	93	96	102
EP-080S-WS	4-Bromofluorobenzene	%	1	99	112	95	114	92	95	95	89	94	103

Batch: NE9122
Sub Batch: 2
Date of Issue: 04/03/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference: GHD

CERTIFICATE OF ANALYSIS

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		11	12	13	14	15					
		Date Sampled		06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003					
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	GHD-30	GHD-32	GHD-33	GHD-35	GHD-36					
ALS3	Extraction Fluid Number		1	1	1	1	1	1					
ALS4	pH After Extract		0.1	11.8	12.0	12.0	12.1	12.1					
EP-071-WS	**TOTAL PETROLEUM HYDROCARBONS**												
EP-071-WS	C6 - C9 Fraction	ug/L	20	<20	<20	<20	<20	<20					
EP-071-WS	C10 - C14 Fraction	ug/L	50	16.8mg/L	156	144	118	70					
EP-071-WS	C15 - C28 Fraction	ug/L	100	3180	230	234	<100	<100					
EP-071-WS	C29 - C36 Fraction	ug/L	50	196	<50	<50	<50	<50					
EP-080S-WS	**VOLATILE TPH/BTEX COMPOUND SURROGATES**												
EP-080S-WS	1.2-Dichloroethane-D4	%	1	86	90	80	82	82					
EP-080S-WS	Toluene-D8	%	1	88	95	91	91	96					
EP-080S-WS	4-Bromofluorobenzene	%	1	90	93	89	92	97					

Batch: NE9122
Sub Batch: 2
Date of Issue: 04/03/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference: GHD

QUALITY CONTROL REPORT

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		100	101	102							
		Date Sampled		06/02/2003	06/02/2003	06/02/2003							
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	METHOD BLANK	NTPHW1378 SCS	NTPHW1378 DCS							
				CHECKS AND SPIKES									
ALS3	Extraction Fluid Number		1	1	----	----							
ALS4	pH After Extract		0.1	----	----	----							
EP-071-WS	**TOTAL PETROLEUM HYDROCARBONS**												
EP-071-WS	C6 - C9 Fraction	ug/L	20	<20	101%	103%							
EP-071-WS	C10 - C14 Fraction	ug/L	50	<50	89.0%	87.0%							
EP-071-WS	C15 - C28 Fraction	ug/L	100	<100	107%	103%							
EP-071-WS	C29 - C36 Fraction	ug/L	50	<50	99.0%	96.0%							
EP-080S-WS	**VOLATILE TPH/BTEX COMPOUND SURROGATES**												
EP-080S-WS	1.2-Dichloroethane-D4	%	1	86	109	101							
EP-080S-WS	Toluene-D8	%	1	90	108	91							
EP-080S-WS	4-Bromofluorobenzene	%	1	91	108	100							

ALS Environmental

CERTIFICATE OF ANALYSIS

CONTACT:	MR KARL BALTPURVINS	**BATCH:**	NE9122
CLIENT:	HAZTECH INDUSTRIES PTY LTD	**SUB BATCH:**	3
ADDRESS:		**LABORATORY:**	NEWCASTLE
	PO BOX 32 UNION BUILDING CALLAGHAN NSW 23	**DATE RECEIVED:**	06/02/2003
		DATE COMPLETED:	28/02/2003
		SAMPLE TYPE:	TCLP LEACHATE
ORDER No.:		**No. of SAMPLES:**	15
PROJECT:	GHD		

COMMENTS

The concentrations reported are those determined on the TCLP leachate. Extraction fluid #1 pH 4.88-4.98. Acid surrogates for sample GHD-36 could not be determined due to sample matrix effect. Analysis conducted by ALS Sydney.

NOTES

This is the Final Report and supersedes any preliminary reports with this batch number.
All pages of this report have been checked and approved for release.

ISSUING LABORATORY: NEWCASTLE

Address
5 Rosegum Close
WARABROOK NSW 2304

Phone: 61-2-4968 9433
Fax: 61-2-4968 0349
Email: kathy.mcdermott@alsenviro.com

Signatory

This Laboratory is accredited by the National Association of Testing Authorities, Australia. The tests reported herein have been performed in accordance with its terms of accreditation. This document shall not be reproduced except in full.

NATA Accredited Laboratory Number 825

Batch: NE9122
Sub Batch: 3
Date of Issue: 04/03/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference: GHD

CERTIFICATE OF ANALYSIS

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		1	2	3	4	5	6	7	8	9	10
		Date Sampled		06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	GHD-03	GHD-06	GHD-09	GHD-11	GHD-12	GHD-14	GHD-15	GHD-17	GHD-18	GHD-29
ALS3	Extraction Fluid Number		1	1	1	1	1	1	1	1	1	1	1
ALS4	pH After Extract		0.1	9.2	9.4	10.8	11.1	11.2	11.4	11.5	11.9	11.9	11.9
EP-075A-WS	**PHENOLS**												
EP-075A-WS	Phenol	ug/L	0.5	2.1	0.9	0.9	1.4	1.9	0.9	1.1	0.8	0.9	1.5
EP-075A-WS	2-Chlorophenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
EP-075A-WS	2-Methylphenol	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	<0.5	<0.5	<0.5	<0.5
EP-075A-WS	3- & 4-Methylphenol	ug/L	0.5	2.7	<0.5	<0.5	1.2	2.2	<0.5	<0.5	<0.5	<0.5	1.2
EP-075A-WS	2-Nitrophenol	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
EP-075A-WS	2.4-Dimethylphenol	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	1.5	<0.5	<0.5	<0.5	<0.5	<0.5
EP-075A-WS	2.4-Dichlorophenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
EP-075A-WS	2.6-Dichlorophenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
EP-075A-WS	4-Chloro-3-methylphenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
EP-075A-WS	2.4.6-Trichlorophenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
EP-075A-WS	2.4.5-Trichlorophenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
EP-075A-WS	Pentachlorophenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
EP-075B-WS	**POLYNUCLEAR AROMATICS**												
EP-075B-WS	Naphthalene	ug/L	0.5	14.6mg/L	90.0	80.6	8810	15.0mg/L	80.2	72.4	92.8	60.0	6610
EP-075B-WS	2-Methylnaphthalene	ug/L	0.5	719	3.6	4.3	418	600	3.0	2.1	2.5	1.4	358
EP-075B-WS	2-Chloronaphthalene	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
EP-075B-WS	Acenaphthylene	ug/L	0.5	101	4.2	3.4	53.4	90.2	7.6	6.4	2.3	1.7	52.6
EP-075B-WS	Acenaphthene	ug/L	0.5	532	20.9	24.2	407	441	20.2	17.4	17.0	11.6	371
EP-075B-WS	Fluorene	ug/L	0.5	205	5.4	14.4	155	186	5.2	4.0	5.2	2.8	150
EP-075B-WS	Phenanthrene	ug/L	0.5	257	10.4	27.5	202	259	13.0	10.5	10.2	6.9	203
EP-075B-WS	Anthracene	ug/L	0.5	39.0	2.4	7.6	36.1	36.0	2.6	2.2	2.6	1.7	35.4
EP-075B-WS	Fluoranthene	ug/L	0.5	40.5	3.4	10.3	33.6	39.1	4.1	3.5	4.0	3.4	35.3
EP-075B-WS	Pyrene	ug/L	0.5	23.9	2.5	8.7	19.5	22.9	2.9	2.6	3.9	3.2	21.0
EP-075B-WS	N-2-Fluorenylacetamide	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
EP-075B-WS	Benz(a)anthracene	ug/L	0.5	1.4	<0.5	<0.5	1.0	1.3	<0.5	<0.5	<0.5	<0.5	1.0
EP-075B-WS	Chrysene	ug/L	0.5	0.8	<0.5	<0.5	0.6	0.7	<0.5	<0.5	<0.5	<0.5	0.6
EP-075B-WS	Benzo(b) & (k)fluoranthene	ug/L	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
EP-075B-WS	7.12-Dimethylbenz(a)anthracene	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
EP-075B-WS	Benzo(a)pyrene	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
EP-075B-WS	3-Methylcholanthrene	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
EP-075B-WS	Indeno(1.2.3-cd)pyrene	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

Batch: NE9122
Sub Batch: 3
Date of Issue: 04/03/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference: GHD

CERTIFICATE OF ANALYSIS

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		1	2	3	4	5	6	7	8	9	10
		Date Sampled		06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	GHD-03	GHD-06	GHD-09	GHD-11	GHD-12	GHD-14	GHD-15	GHD-17	GHD-18	GHD-29
EP-075B-WS	Dibenz(a.h)anthracene	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
EP-075B-WS	Benzo(g.h.i)perylene	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
EP-075S-WS	**ACID EXTRACTABLE SURROGATES**												
EP-075S-WS	2-Fluorophenol	%	1	56	48	49	48	49	44	48	50	49	44
EP-075S-WS	Phenol-D6	%	1	36	29	30	30	31	28	29	30	30	28
EP-075S-WS	2-Chlorophenol-D4	%	1	100	85	87	85	85	78	84	87	84	78
EP-075S-WS	2.4.6-Tribromophenol	%	1	103	126	122	123	127	116	124	115	107	108
EP-075T-WS	**BASE/NEUTRAL EXTRACTABLE SURROGATES**												
EP-075T-WS	Nitrobenzene-D5	%	1	103	89	92	88	89	82	86	90	89	82
EP-075T-WS	1.2-Dichlorobenzene-D4	%	1	50	61	61	47	55	51	58	57	60	54
EP-075T-WS	2-Fluorobiphenyl	%	1	80	79	79	93	70	67	71	74	74	60
EP-075T-WS	Anthracene-d10	%	1	107	99	97	94	93	88	94	100	94	87
EP-075T-WS	p-Terphenyl-D14	%	1	116	97	102	100	105	90	97	99	93	92

Batch: NE9122
Sub Batch: 3
Date of Issue: 04/03/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference: GHD

CERTIFICATE OF ANALYSIS

				SAMPLE IDENTIFICATION									
	Laboratory I.D.			11	12	13	14	15					
	Date Sampled			06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003					
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	GHD-30	GHD-32	GHD-33	GHD-35	GHD-36					
ALS3	Extraction Fluid Number		1	1	1	1	1	1					
ALS4	pH After Extract		0.1	11.8	12.0	12.0	12.1	12.1					
EP-075A-WS	**PHENOLS**												
EP-075A-WS	Phenol	ug/L	0.5	2.0	1.0	1.1	0.9	0.6					
EP-075A-WS	2-Chlorophenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3					
EP-075A-WS	2-Methylphenol	ug/L	0.5	0.6	<0.5	<0.5	<0.5	<0.5					
EP-075A-WS	3- & 4-Methylphenol	ug/L	0.5	2.0	<0.5	<0.5	<0.5	<0.5					
EP-075A-WS	2-Nitrophenol	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5					
EP-075A-WS	2.4-Dimethylphenol	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5					
EP-075A-WS	2.4-Dichlorophenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3					
EP-075A-WS	2.6-Dichlorophenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3					
EP-075A-WS	4-Chloro-3-methylphenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3					
EP-075A-WS	2.4.6-Trichlorophenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3					
EP-075A-WS	2.4.5-Trichlorophenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3					
EP-075A-WS	Pentachlorophenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3					
EP-075B-WS	**POLYNUCLEAR AROMATICS**												
EP-075B-WS	Naphthalene	ug/L	0.5	12.8mg/L	85.9	75.4	54.4	38.9					
EP-075B-WS	2-Methylnaphthalene	ug/L	0.5	480	3.3	1.9	1.1	0.7					
EP-075B-WS	2-Chloronaphthalene	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5					
EP-075B-WS	Acenaphthylene	ug/L	0.5	71.8	14.4	8.1	0.8	0.6					
EP-075B-WS	Acenaphthene	ug/L	0.5	395	20.8	14.3	5.8	4.1					
EP-075B-WS	Fluorene	ug/L	0.5	176	5.8	3.7	1.5	0.8					
EP-075B-WS	Phenanthrene	ug/L	0.5	250	16.1	10.2	3.6	2.4					
EP-075B-WS	Anthracene	ug/L	0.5	35.2	2.7	2.0	0.8	0.5					
EP-075B-WS	Fluoranthene	ug/L	0.5	41.0	4.0	3.3	1.0	0.9					
EP-075B-WS	Pyrene	ug/L	0.5	24.2	2.8	2.4	0.9	0.8					
EP-075B-WS	N-2-Fluorenylacetamide	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5					
EP-075B-WS	Benz(a)anthracene	ug/L	0.5	1.4	<0.5	<0.5	<0.5	<0.5					
EP-075B-WS	Chrysene	ug/L	0.5	0.8	<0.5	<0.5	<0.5	<0.5					
EP-075B-WS	Benzo(b) & (k)fluoranthene	ug/L	1	<1	<1	<1	<1	<1					
EP-075B-WS	7.12-Dimethylbenz(a)anthracene	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5					
EP-075B-WS	Benzo(a)pyrene	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3					
EP-075B-WS	3-Methylcholanthrene	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5					
EP-075B-WS	Indeno(1.2.3-cd)pyrene	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5					

Batch: NE9122
Sub Batch: 3
Date of Issue: 04/03/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference: GHD

CERTIFICATE OF ANALYSIS

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		11	12	13	14	15					
		Date Sampled		06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003					
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	GHD-30	GHD-32	GHD-33	GHD-35	GHD-36					
EP-075B-WS	Dibenz(a.h)anthracene	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5					
EP-075B-WS	Benzo(g.h.i)perylene	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5					
EP-075S-WS	**ACID EXTRACTABLE SURROGATES**												
EP-075S-WS	2-Fluorophenol	%	1	41	47	47	51	Not Det'd					
EP-075S-WS	Phenol-D6	%	1	27	29	27	31	Not Det'd					
EP-075S-WS	2-Chlorophenol-D4	%	1	73	85	79	87	Not Det'd					
EP-075S-WS	2.4.6-Tribromophenol	%	1	100	108	102	95	Not Det'd					
EP-075T-WS	**BASE/NEUTRAL EXTRACTABLE SURROGATES**												
EP-075T-WS	Nitrobenzene-D5	%	1	77	89	83	93	89					
EP-075T-WS	1.2-Dichlorobenzene-D4	%	1	51	62	61	64	64					
EP-075T-WS	2-Fluorobiphenyl	%	1	60	79	74	78	75					
EP-075T-WS	Anthracene-d10	%	1	81	95	93	100	102					
EP-075T-WS	p-Terphenyl-D14	%	1	85	96	92	99	98					

Batch: NE9122
Sub Batch: 3
Date of Issue: 04/03/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference: GHD

QUALITY CONTROL REPORT

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		100	101	102							
		Date Sampled		06/02/2003	06/02/2003	06/02/2003							
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	METHOD BLANK	NSVOCW1273 SCS	NSVOCW1273 DCS							
				CHECKS AND SPIKES									
ALS3	Extraction Fluid Number		1	1	----	----							
ALS4	pH After Extract		0.1	----	----	----							
EP-075A-WS	**PHENOLS**												
EP-075A-WS	Phenol	ug/L	0.5	<0.5	38.2%	45.3%							
EP-075A-WS	2-Chlorophenol	ug/L	0.3	<0.3	83.7%	96.5%							
EP-075A-WS	2-Methylphenol	ug/L	0.5	<0.5	74.8%	87.4%							
EP-075A-WS	3- & 4-Methylphenol	ug/L	0.5	<0.5	66.3%	78.4%							
EP-075A-WS	2-Nitrophenol	ug/L	0.5	<0.5	77.7%	93.4%							
EP-075A-WS	2.4-Dimethylphenol	ug/L	0.5	<0.5	85.4%	97.1%							
EP-075A-WS	2.4-Dichlorophenol	ug/L	0.3	<0.3	80.9%	96.6%							
EP-075A-WS	2.6-Dichlorophenol	ug/L	0.3	<0.3	79.5%	94.6%							
EP-075A-WS	4-Chloro-3-methylphenol	ug/L	0.3	<0.3	81.9%	95.0%							
EP-075A-WS	2.4.6-Trichlorophenol	ug/L	0.3	<0.3	76.2%	90.2%							
EP-075A-WS	2.4.5-Trichlorophenol	ug/L	0.3	<0.3	76.9%	90.3%							
EP-075A-WS	Pentachlorophenol	ug/L	0.3	<0.3	21.2%	32.2%							
EP-075B-WS	**POLYNUCLEAR AROMATICS**												
EP-075B-WS	Naphthalene	ug/L	0.5	<0.5	80.8%	94.0%							
EP-075B-WS	2-Methylnaphthalene	ug/L	0.5	<0.5	78.2%	90.0%							
EP-075B-WS	2-Chloronaphthalene	ug/L	0.5	<0.5	79.1%	90.4%							
EP-075B-WS	Acenaphthylene	ug/L	0.5	<0.5	84.0%	95.7%							
EP-075B-WS	Acenaphthene	ug/L	0.5	<0.5	81.5%	95.9%							
EP-075B-WS	Fluorene	ug/L	0.5	<0.5	85.9%	99.2%							
EP-075B-WS	Phenanthrene	ug/L	0.5	<0.5	85.2%	105%							
EP-075B-WS	Anthracene	ug/L	0.5	<0.5	82.2%	94.2%							
EP-075B-WS	Fluoranthene	ug/L	0.5	<0.5	80.8%	92.9%							
EP-075B-WS	Pyrene	ug/L	0.5	<0.5	86.3%	99.4%							
EP-075B-WS	N-2-Fluorenylacetamide	ug/L	0.5	<0.5	90.3%	102%							
EP-075B-WS	Benz(a)anthracene	ug/L	0.5	<0.5	88.8%	101%							
EP-075B-WS	Chrysene	ug/L	0.5	<0.5	80.9%	92.8%							
EP-075B-WS	Benzo(b) & (k)fluoranthene	ug/L	1	<1	82.5%	95.9%							
EP-075B-WS	7.12-Dimethylbenz(a)anthracene	ug/L	0.5	<0.5	71.3%	85.4%							
EP-075B-WS	Benzo(a)pyrene	ug/L	0.3	<0.3	82.4%	94.7%							

Batch: NE9122
Sub Batch: 3
Date of Issue: 04/03/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference: GHD

QUALITY CONTROL REPORT

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		100	101	102							
		Date Sampled		06/02/2003	06/02/2003	06/02/2003							
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	METHOD BLANK	NSVOCW1273 SCS	NSVOCW1273 DCS							
				CHECKS AND SPIKES									
EP-075B-WS	3-Methylcholanthrene	ug/L	0.5	<0.5	84.1%	99.9%							
EP-075B-WS	Indeno(1.2.3-cd)pyrene	ug/L	0.5	<0.5	81.3%	95.8%							
EP-075B-WS	Dibenz(a.h)anthracene	ug/L	0.5	<0.5	79.0%	93.8%							
EP-075B-WS	Benzo(g.h.i)perylene	ug/L	0.5	<0.5	82.9%	98.5%							
EP-075S-WS	**ACID EXTRACTABLE SURROGATES**												
EP-075S-WS	2-Fluorophenol	%	1	61	56	63							
EP-075S-WS	Phenol-D6	%	1	39	34	40							
EP-075S-WS	2-Chlorophenol-D4	%	1	88	85	96							
EP-075S-WS	2.4.6-Tribromophenol	%	1	74	85	103							
EP-075T-WS	**BASE/NEUTRAL EXTRACTABLE SURROGATES**												
EP-075T-WS	Nitrobenzene-D5	%	1	90	86	100							
EP-075T-WS	1.2-Dichlorobenzene-D4	%	1	60	60	70							
EP-075T-WS	2-Fluorobiphenyl	%	1	75	78	91							
EP-075T-WS	Anthracene-d10	%	1	91	89	103							
EP-075T-WS	p-Terphenyl-D14	%	1	91	89	99							

ALS Environmental

CERTIFICATE OF ANALYSIS

CONTACT:	MR KARL BALTPURVINS	**BATCH:**	NE9267
CLIENT:	HAZTECH INDUSTRIES PTY LTD	**SUB BATCH:**	0
ADDRESS:	PO BOX 32 UNION BUILDING CALLAGHAN NSW 2308	**LABORATORY:**	NEWCASTLE
		DATE RECEIVED:	13/02/2003
		DATE COMPLETED:	12/03/2003
		SAMPLE TYPE:	TCLP LEACHATE
ORDER No.:		**No. of SAMPLES:**	15
PROJECT:			

COMMENTS

The concentrations reported are those determined on the TCLP leachate.
Extraction fluid #1 pH 4.88-4.98. All analysis conducted by ALS Sydney, NATA Site No. 10911. This report supersedes any previous preliminary reports of the same batch number.

NOTES

This is the Final Report and supersedes any preliminary reports with this batch number.
All pages of this report have been checked and approved for release.

ISSUING LABORATORY: NEWCASTLE

Address
5 Rosegum Close
WARABROOK NSW 2304

Phone: 61-2-4968 9433
Fax: 61-2-4968 0349
Email: kathy.mcdermott@alsenviro.com

Signatory Kathy Vogel

This Laboratory is accredited by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of accreditation. This document shall not be reproduced except in full.

NATA Accredited Laboratory Number 825

Batch: NE9267
Sub Batch: 0
Date of Issue: 12/03/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference:

CERTIFICATE OF ANALYSIS

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		1	2	3	4	5	6	7	8	9	10
		Date Sampled		06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	GHD-02	GHD-05	GHD-08	GHD-20	GHD-21	GHD-23	GHD-24	GHD-26	GHD-27	GHD-65
ALS3	Extraction Fluid Number		1	1	1	1	1	1	1	1	1	1	1
ALS4	pH After Extract		0.1	9.2	9.3	10.0	11.6	11.6	12.2	11.8	12.0	12.0	9.2
EG-005C	Arsenic - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
EG-005C	Cadmium - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
EG-005C	Cobalt - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
EG-005C	Chromium - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
EG-005C	Nickel - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
EG-005C	Lead - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
EG-005C	Zinc - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
EG-035C	Mercury - TCLP	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Batch: NE9267
Sub Batch: 0
Date of Issue: 12/03/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference:

CERTIFICATE OF ANALYSIS

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		11	12	13	14	15					
		Date Sampled		06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003					
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	GHD-66	GHD-68	GHD-69	GHD-71	GHD-72					
ALS3	Extraction Fluid Number		1	1	1	1	1	1					
ALS4	pH After Extract		0.1	9.1	9.2	9.2	9.2	9.1					
EG-005C	Arsenic - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1					
EG-005C	Cadmium - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1					
EG-005C	Cobalt - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1					
EG-005C	Chromium - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1					
EG-005C	Nickel - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1					
EG-005C	Lead - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1					
EG-005C	Zinc - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1					
EG-035C	Mercury - TCLP	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01					

Batch: NE9267
Sub Batch: 0
Date of Issue: 12/03/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference:

QUALITY CONTROL REPORT

				SAMPLE IDENTIFICATION										
		Laboratory I.D.		200	201	202								
		Date Sampled		13/02/2003	13/02/2003	13/02/2003								
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	METHOD BLANK	LCS	MS								
				CHECKS AND SPIKES										
ALS3	Extraction Fluid Number		1	1	----	----								
ALS4	pH After Extract		0.1	----	----	----								
EG-005C	Arsenic - TCLP	mg/L	0.1	<0.1	104%	120%								
EG-005C	Cadmium - TCLP	mg/L	0.1	<0.1	105%	105%								
EG-005C	Cobalt - TCLP	mg/L	0.1	<0.1	----	107%								
EG-005C	Chromium - TCLP	mg/L	0.1	<0.1	104%	108%								
EG-005C	Nickel - TCLP	mg/L	0.1	<0.1	102%	104%								
EG-005C	Lead - TCLP	mg/L	0.1	<0.1	103%	105%								
EG-005C	Zinc - TCLP	mg/L	0.1	<0.1	102%	101%								
EG-035C	Mercury - TCLP	mg/L	0.01	<0.01	113%	101%								

ALS Environmental

CERTIFICATE OF ANALYSIS

CONTACT:	MR KARL BALTPURVINS	**BATCH:**	NE9267
CLIENT:	HAZTECH INDUSTRIES PTY LTD	**SUB BATCH:**	1
ADDRESS:	PO BOX 32 UNION BUILDING CALLAGHAN NSW 2308	**LABORATORY:**	NEWCASTLE
		DATE RECEIVED:	13/02/2003
		DATE COMPLETED:	12/03/2003
		SAMPLE TYPE:	ZHE LEACHATE
ORDER No.:		**No. of SAMPLES:**	15
PROJECT:			

COMMENTS

The concentrations reported are those determined on a ZHE TCLP leachate, using extraction fluid #1 (pH 4.88-4.98). Analysis conducted by ALS Sydney, NATA Site No. 10911.

NOTES

This is the Final Report and supersedes any preliminary reports with this batch number.
All pages of this report have been checked and approved for release.

ISSUING LABORATORY: NEWCASTLE

Address
5 Rosegum Close
WARABROOK NSW 2304

Phone: 61-2-4968 9433
Fax: 61-2-4968 0349
Email: kathy.mcdermott@alsenviro.com

Signatory Greg Vojcl

This Laboratory is accredited by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of accreditation. This document shall not be reproduced except in full.

NATA Accredited Laboratory Number 825

Batch: NE9267
Sub Batch: 1
Date of Issue: 12/03/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference:

CERTIFICATE OF ANALYSIS

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		1	2	3	4	5	6	7	8	9	10
		Date Sampled		06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	GHD-02	GHD-05	GHD-08	GHD-20	GHD-21	GHD-23	GHD-24	GHD-26	GHD-27	GHD-65
EK-026MA	Total Cyanide	mg/L	0.005	1.37	0.454	<0.005	0.024	0.066	<0.005	<0.005	0.011	0.010	0.029

Batch: NE9267
Sub Batch: 1
Date of Issue: 12/03/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference:

CERTIFICATE OF ANALYSIS

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		11	12	13	14	15					
		Date Sampled		06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003					
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	GHD-66	GHD-68	GHD-69	GHD-71	GHD-72					
EK-026MA	Total Cyanide	mg/L	0.005	0.042	0.023	0.015	<0.005	0.006					

Batch: NE9267
Sub Batch: 1
Date of Issue: 12/03/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference:

QUALITY CONTROL REPORT

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		200	201	202							
		Date Sampled		13/02/2003	13/02/2003	13/02/2003							
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	METHOD BLANK	LCS	MS							
				CHECKS AND SPIKES									
EK-026MA	Total Cyanide	mg/L	0.005	<0.005	96.0%	116%							

ALS Environmental

CERTIFICATE OF ANALYSIS

CONTACT:	MR KARL BALTPURVINS	**BATCH:**	NE9267
CLIENT:	HAZTECH INDUSTRIES PTY LTD	**SUB BATCH:**	2
ADDRESS:	PO BOX 32 UNION BUILDING CALLAGHAN NSW 2308	**LABORATORY:**	NEWCASTLE
		DATE RECEIVED:	13/02/2003
		DATE COMPLETED:	12/03/2003
		SAMPLE TYPE:	TCLP LEACHATE
ORDER No.:		**No. of SAMPLES:**	15
PROJECT:			

COMMENTS

The concentrations reported for TPH volatile C6-C9 and BTEX are those determined on a ZHE TCLP leachate, using extraction fluid #1 (pH 4.88-4.98). The concentrations reported for TPH semivolate C10-C36 are those determined on the TCLP leachate. Extraction fluid #1 pH 4.88-4.98. Analysis conducted by ALS Sydney, NATA Site No. 10911.

NOTES

This is the Final Report and supersedes any preliminary reports with this batch number.
All pages of this report have been checked and approved for release.

ISSUING LABORATORY: NEWCASTLE

Address
5 Rosegum Close
WARABROOK NSW 2304

Phone: 61-2-4968 9433
Fax: 61-2-4968 0349
Email: kathy.mcdermott@alsenviro.com

Signatory

This Laboratory is accredited by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of accreditation. This document shall not be reproduced except in full.

NATA Accredited Laboratory Number 825

Batch: NE9267
Sub Batch: 2
Date of Issue: 12/03/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference:

CERTIFICATE OF ANALYSIS

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		1	2	3	4	5	6	7	8	9	10
		Date Sampled		06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	GHD-02	GHD-05	GHD-08	GHD-20	GHD-21	GHD-23	GHD-24	GHD-26	GHD-27	GHD-65
ALS3	Extraction Fluid Number		1	1	1	1	1	1	1	1	1	1	1
ALS4	pH After Extract		0.1	9.2	9.3	10.0	11.6	11.6	12.2	11.8	12.0	12.0	9.2
EP-071-WS	**TOTAL PETROLEUM HYDROCARBONS**												
EP-071-WS	C6 - C9 Fraction	ug/L	20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
EP-071-WS	C10 - C14 Fraction	ug/L	50	13.4mg/L	162	198	13.7mg/L	14.5mg/L	85	193	151	118	14.5mg/L
EP-071-WS	C15 - C28 Fraction	ug/L	100	3320	297	642	3730	3210	<100	254	<100	<100	2900
EP-071-WS	C29 - C36 Fraction	ug/L	50	199	<50	67	197	253	<50	<50	<50	<50	111
EP-080-WS	**BTEX**												
EP-080-WS	Benzene	ug/L	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
EP-080-WS	Toluene	ug/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
EP-080-WS	Chlorobenzene	ug/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
EP-080-WS	Ethylbenzene	ug/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
EP-080-WS	meta- & para-Xylene	ug/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
EP-080-WS	ortho-Xylene	ug/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
EP-080S-WS	**VOLATILE TPH/BTEX COMPOUND SURROGATES**												
EP-080S-WS	1.2-Dichloroethane-D4	%	1	101	101	98	105	99	88	88	85	84	91
EP-080S-WS	Toluene-D8	%	1	102	107	102	106	106	96	108	97	100	104
EP-080S-WS	4-Bromofluorobenzene	%	1	97	98	90	106	104	88	93	90	94	99

Batch: NE9267
Sub Batch: 2
Date of Issue: 12/03/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference:

CERTIFICATE OF ANALYSIS

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		11	12	13	14	15					
		Date Sampled		06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003					
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	GHD-66	GHD-68	GHD-69	GHD-71	GHD-72					
ALS3	Extraction Fluid Number		1	1	1	1	1	1					
ALS4	pH After Extract		0.1	9.1	9.2	9.2	9.2	9.1					
EP-071-WS	**TOTAL PETROLEUM HYDROCARBONS**												
EP-071-WS	C6 - C9 Fraction	ug/L	20	<20	<20	<20	<20	<20					
EP-071-WS	C10 - C14 Fraction	ug/L	50	13.6mg/L	223	<50	148	<50					
EP-071-WS	C15 - C28 Fraction	ug/L	100	2200	132	121	250	160					
EP-071-WS	C29 - C36 Fraction	ug/L	50	104	<50	<50	<50	<50					
EP-080-WS	**BTEX**												
EP-080-WS	Benzene	ug/L	1	<1	<1	<1	<1	<1					
EP-080-WS	Toluene	ug/L	2	<2	<2	<2	<2	<2					
EP-080-WS	Chlorobenzene	ug/L	2	<2	<2	<2	<2	<2					
EP-080-WS	Ethylbenzene	ug/L	2	<2	<2	<2	<2	<2					
EP-080-WS	meta- & para-Xylene	ug/L	2	<2	<2	<2	<2	<2					
EP-080-WS	ortho-Xylene	ug/L	2	<2	<2	<2	<2	<2					
EP-080S-WS	**VOLATILE TPH/BTEX COMPOUND SURROGATES**												
EP-080S-WS	1.2-Dichloroethane-D4	%	1	88	95	81	92	80					
EP-080S-WS	Toluene-D8	%	1	93	108	109	94	102					
EP-080S-WS	4-Bromofluorobenzene	%	1	94	104	102	88	96					

Batch: NE9267
Sub Batch: 2
Date of Issue: 12/03/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference:

QUALITY CONTROL REPORT

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		100	101	102							
		Date Sampled		13/02/2003	13/02/2003	13/02/2003							
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	METHOD BLANK	NTPHW1385 SCS	NTPHW1385 DCS							
				CHECKS AND SPIKES									
ALS3	Extraction Fluid Number		1	1	----	----							
ALS4	pH After Extract		0.1	----	----	----							
EP-071-WS	**TOTAL PETROLEUM HYDROCARBONS**												
EP-071-WS	C6 - C9 Fraction	ug/L	20	<20	95.0%	101%							
EP-071-WS	C10 - C14 Fraction	ug/L	50	<50	102%	109%							
EP-071-WS	C15 - C28 Fraction	ug/L	100	<100	90.0%	96.0%							
EP-071-WS	C29 - C36 Fraction	ug/L	50	<50	109%	108%							
EP-080-WS	**BTEX**												
EP-080-WS	Benzene	ug/L	1	<1	94.0%	96.0%							
EP-080-WS	Toluene	ug/L	2	<2	95.0%	102%							
EP-080-WS	Chlorobenzene	ug/L	2	<2	96.0%	113%							
EP-080-WS	Ethylbenzene	ug/L	2	<2	94.0%	100%							
EP-080-WS	meta- & para-Xylene	ug/L	2	<2	94.0%	102%							
EP-080-WS	ortho-Xylene	ug/L	2	<2	92.0%	104%							
EP-080S-WS	**VOLATILE TPH/BTEX COMPOUND SURROGATES**												
EP-080S-WS	1.2-Dichloroethane-D4	%	1	100	96	102							
EP-080S-WS	Toluene-D8	%	1	102	88	96							
EP-080S-WS	4-Bromofluorobenzene	%	1	91	96	106							

ALS Environmental

CERTIFICATE OF ANALYSIS

CONTACT:	MR KARL BALTPURVINS	**BATCH:**	NE9267
CLIENT:	HAZTECH INDUSTRIES PTY LTD	**SUB BATCH:**	3
ADDRESS:	PO BOX 32 UNION BUILDING CALLAGHAN NSW 2308	**LABORATORY:**	NEWCASTLE
		DATE RECEIVED:	13/02/2003
		DATE COMPLETED:	12/03/2003
		SAMPLE TYPE:	TCLP LEACHATE
ORDER No.:		**No. of SAMPLES:**	15
PROJECT:			

COMMENTS

Acid surrogates for samples GHD-23, GHD-24, GHD-26 & GHD-27 were not determined due to matrix interference. The concentrations reported are those determined on the TCLP leachate. Extraction fluid #1 pH 4.88-4.98. Analysis conducted by ALS Sydney, NATA Site No. 10911.

NOTES

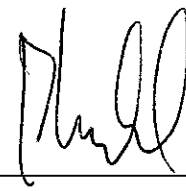
This is the Final Report and supersedes any preliminary reports with this batch number.
All pages of this report have been checked and approved for release.

ISSUING LABORATORY: NEWCASTLE

Address
5 Rosegum Close
WARABROOK NSW 2304

Phone: 61-2-4968 9433
Fax: 61-2-4968 0349
Email: kathy.mcdermott@alsenviro.com

Signatory



This Laboratory is accredited by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of accreditation. This document shall not be reproduced except in full.

NATA Accredited Laboratory Number 825

Batch: NE9267
Sub Batch: 3
Date of Issue: 12/03/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference:

CERTIFICATE OF ANALYSIS

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		1	2	3	4	5	6	7	8	9	10
		Date Sampled		06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	GHD-02	GHD-05	GHD-08	GHD-20	GHD-21	GHD-23	GHD-24	GHD-26	GHD-27	GHD-65
ALS3	Extraction Fluid Number		1	1	1	1	1	1	1	1	1	1	1
ALS4	pH After Extract		0.1	9.2	9.3	10.0	11.6	11.6	12.2	11.8	12.0	12.0	9.2
EP-075A-WS	**PHENOLS**												
EP-075A-WS	Phenol	ug/L	0.5	2.3	1.3	1.0	2.9	2.6	<0.5	<0.5	<0.5	<0.5	0.8
EP-075A-WS	2-Chlorophenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
EP-075A-WS	2-Methylphenol	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
EP-075A-WS	3- & 4-Methylphenol	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
EP-075A-WS	2-Nitrophenol	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
EP-075A-WS	2.4-Dimethylphenol	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
EP-075A-WS	2.4-Dichlorophenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
EP-075A-WS	2.6-Dichlorophenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
EP-075A-WS	4-Chloro-3-methylphenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
EP-075A-WS	2.4.6-Trichlorophenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
EP-075A-WS	2.4.5-Trichlorophenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
EP-075A-WS	Pentachlorophenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
EP-075B-WS	**POLYNUCLEAR AROMATICS**												
EP-075B-WS	Naphthalene	ug/L	0.5	8850	84.1	99.1	9000	14.3mg/L	110	123	80.8	60.2	8890
EP-075B-WS	2-Methylnaphthalene	ug/L	0.5	523	2.9	5.3	510	639	3.4	3.2	1.7	1.1	482
EP-075B-WS	2-Chloronaphthalene	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
EP-075B-WS	Acenaphthylene	ug/L	0.5	72.4	6.1	3.2	64.4	98.2	4.6	9.4	1.1	0.8	78.6
EP-075B-WS	Acenaphthene	ug/L	0.5	478	22.9	32.1	516	595	19.7	31.1	9.9	6.3	426
EP-075B-WS	Fluorene	ug/L	0.5	196	4.6	19.3	206	245	4.2	6.5	2.4	1.2	179
EP-075B-WS	Phenanthrene	ug/L	0.5	225	12.4	52.6	251	277	14.1	23.6	6.5	3.9	193
EP-075B-WS	Anthracene	ug/L	0.5	36.8	2.4	11.4	40.4	44.4	2.3	3.9	1.6	0.8	34.2
EP-075B-WS	Fluoranthene	ug/L	0.5	30.2	4.3	15.3	35.2	34.8	4.2	6.6	2.2	1.6	34.7
EP-075B-WS	Pyrene	ug/L	0.5	25.4	2.9	12.2	31.4	29.6	2.8	4.3	1.9	1.4	17.9
EP-075B-WS	N-2-Fluorenylacetamide	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
EP-075B-WS	Benz(a)anthracene	ug/L	0.5	1.2	<0.5	0.5	1.2	1.3	<0.5	<0.5	<0.5	<0.5	0.7
EP-075B-WS	Chrysene	ug/L	0.5	<0.5	<0.5	<0.5	0.6	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
EP-075B-WS	Benzo(b) & (k)fluoranthene	ug/L	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
EP-075B-WS	7.12-Dimethylbenz(a)anthracene	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
EP-075B-WS	Benzo(a)pyrene	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
EP-075B-WS	3-Methylcholanthrene	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
EP-075B-WS	Indeno(1.2.3-cd)pyrene	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

Batch: NE9267
Sub Batch: 3
Date of Issue: 12/03/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference:

CERTIFICATE OF ANALYSIS

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		1	2	3	4	5	6	7	8	9	10
		Date Sampled		06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	GHD-02	GHD-05	GHD-08	GHD-20	GHD-21	GHD-23	GHD-24	GHD-26	GHD-27	GHD-65
EP-075B-WS	Dibenz(a.h)anthracene	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
EP-075B-WS	Benzo(g.h.i)perylene	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
EP-075S-WS	**ACID EXTRACTABLE SURROGATES**												
EP-075S-WS	2-Fluorophenol	%	1	77	67	69	79	77	Not Det'd	Not Det'd	Not Det'd	Not Det'd	67
EP-075S-WS	Phenol-D6	%	1	37	31	31	37	36	Not Det'd	Not Det'd	Not Det'd	Not Det'd	37
EP-075S-WS	2-Chlorophenol-D4	%	1	97	84	87	104	100	Not Det'd	Not Det'd	Not Det'd	Not Det'd	88
EP-075S-WS	2.4.6-Tribromophenol	%	1	110	113	114	117	107	Not Det'd	Not Det'd	Not Det'd	Not Det'd	96
EP-075T-WS	**BASE/NEUTRAL EXTRACTABLE SURROGATES**												
EP-075T-WS	Nitrobenzene-D5	%	1	115	102	105	126	121	106	117	105	112	99
EP-075T-WS	1.2-Dichlorobenzene-D4	%	1	85	60	60	74	72	64	70	64	67	61
EP-075T-WS	2-Fluorobiphenyl	%	1	110	74	75	117	111	78	88	77	83	106
EP-075T-WS	Anthracene-d10	%	1	106	92	98	122	118	106	114	103	112	98
EP-075T-WS	p-Terphenyl-D14	%	1	119	102	115	113	124	115	129	110	114	103

Batch: NE9267
Sub Batch: 3
Date of Issue: 12/03/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference:

CERTIFICATE OF ANALYSIS

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		11	12	13	14	15					
		Date Sampled		06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003					
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	GHD-66	GHD-68	GHD-69	GHD-71	GHD-72					
ALS3	Extraction Fluid Number		1	1	1	1	1	1					
ALS4	pH After Extract		0.1	9.1	9.2	9.2	9.2	9.1					
EP-075A-WS	**PHENOLS**												
EP-075A-WS	Phenol	ug/L	0.5	<0.5	0.6	0.6	0.5	<0.5					
EP-075A-WS	2-Chlorophenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3					
EP-075A-WS	2-Methylphenol	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5					
EP-075A-WS	3- & 4-Methylphenol	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5					
EP-075A-WS	2-Nitrophenol	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5					
EP-075A-WS	2.4-Dimethylphenol	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5					
EP-075A-WS	2.4-Dichlorophenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3					
EP-075A-WS	2.6-Dichlorophenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3					
EP-075A-WS	4-Chloro-3-methylphenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3					
EP-075A-WS	2.4.6-Trichlorophenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3					
EP-075A-WS	2.4.5-Trichlorophenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3					
EP-075A-WS	Pentachlorophenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3					
EP-075B-WS	**POLYNUCLEAR AROMATICS**												
EP-075B-WS	Naphthalene	ug/L	0.5	12.5mg/L	59.4	60.4	131	87.8					
EP-075B-WS	2-Methylnaphthalene	ug/L	0.5	491	2.3	2.0	5.8	2.9					
EP-075B-WS	2-Chloronaphthalene	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5					
EP-075B-WS	Acenaphthylene	ug/L	0.5	82.8	5.1	4.7	3.9	3.8					
EP-075B-WS	Acenaphthene	ug/L	0.5	390	20.1	19.3	36.8	22.6					
EP-075B-WS	Fluorene	ug/L	0.5	162	4.4	3.9	14.7	8.2					
EP-075B-WS	Phenanthrene	ug/L	0.5	170	10.4	9.3	21.9	14.3					
EP-075B-WS	Anthracene	ug/L	0.5	31.2	1.9	1.9	6.2	3.5					
EP-075B-WS	Fluoranthene	ug/L	0.5	30.4	2.3	2.4	2.7	2.6					
EP-075B-WS	Pyrene	ug/L	0.5	15.5	1.5	1.6	2.1	2.1					
EP-075B-WS	N-2-Fluorenylacetamide	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5					
EP-075B-WS	Benz(a)anthracene	ug/L	0.5	0.8	<0.5	<0.5	<0.5	<0.5					
EP-075B-WS	Chrysene	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5					
EP-075B-WS	Benzo(b) & (k)fluoranthene	ug/L	1	<1	<1	<1	<1	<1					
EP-075B-WS	7.12-Dimethylbenz(a)anthracene	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5					
EP-075B-WS	Benzo(a)pyrene	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3					
EP-075B-WS	3-Methylcholanthrene	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5					
EP-075B-WS	Indeno(1.2.3-cd)pyrene	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5					

Batch: NE9267
Sub Batch: 3
Date of Issue: 12/03/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference:

CERTIFICATE OF ANALYSIS

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		11	12	13	14	15					
		Date Sampled		06/02/2003	06/02/2003	06/02/2003	06/02/2003	06/02/2003					
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	GHD-66	GHD-68	GHD-69	GHD-71	GHD-72					
EP-075B-WS	Dibenz(a.h)anthracene	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5					
EP-075B-WS	Benzo(g.h.i)perylene	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5					
EP-075S-WS	***ACID EXTRACTABLE SURROGATES***												
EP-075S-WS	2-Fluorophenol	%	1	60	75	69	65	58					
EP-075S-WS	Phenol-D6	%	1	31	39	36	34	31					
EP-075S-WS	2-Chlorophenol-D4	%	1	73	93	90	84	78					
EP-075S-WS	2.4.6-Tribromophenol	%	1	79	117	112	95	92					
EP-075T-WS	**BASE/NEUTRAL EXTRACTABLE SURROGATES**												
EP-075T-WS	Nitrobenzene-D5	%	1	85	109	102	95	90					
EP-075T-WS	1.2-Dichlorobenzene-D4	%	1	53	64	62	58	57					
EP-075T-WS	2-Fluorobiphenyl	%	1	103	79	77	70	71					
EP-075T-WS	Anthracene-d10	%	1	77	98	99	91	93					
EP-075T-WS	p-Terphenyl-D14	%	1	82	107	107	95	96					

Batch: NE9267
Sub Batch: 3
Date of Issue: 12/03/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference:

QUALITY CONTROL REPORT

				SAMPLE IDENTIFICATION										
		Laboratory I.D.		100	101	102								
		Date Sampled		13/02/2003	13/02/2003	13/02/2003								
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	METHOD BLANK	NSVOCW1278 SCS	NSVOCW1278 DCS								
				CHECKS AND SPIKES										
ALS3	Extraction Fluid Number		1	1	----	----								
ALS4	pH After Extract		0.1	----	----	----								
EP-075A-WS	**PHENOLS**													
EP-075A-WS	Phenol	ug/L	0.5	<0.5	50.6%	50.3%								
EP-075A-WS	2-Chlorophenol	ug/L	0.3	<0.3	109%	105%								
EP-075A-WS	2-Methylphenol	ug/L	0.5	<0.5	85.4%	83.2%								
EP-075A-WS	3- & 4-Methylphenol	ug/L	0.5	<0.5	87.1%	83.0%								
EP-075A-WS	2-Nitrophenol	ug/L	0.5	<0.5	96.0%	95.8%								
EP-075A-WS	2.4-Dimethylphenol	ug/L	0.5	<0.5	99.2%	97.3%								
EP-075A-WS	2.4-Dichlorophenol	ug/L	0.3	<0.3	97.8%	95.6%								
EP-075A-WS	2.6-Dichlorophenol	ug/L	0.3	<0.3	101%	99.8%								
EP-075A-WS	4-Chloro-3-methylphenol	ug/L	0.3	<0.3	103%	104%								
EP-075A-WS	2.4.6-Trichlorophenol	ug/L	0.3	<0.3	94.1%	87.1%								
EP-075A-WS	2.4.5-Trichlorophenol	ug/L	0.3	<0.3	93.1%	90.3%								
EP-075A-WS	Pentachlorophenol	ug/L	0.3	<0.3	19.8%	19.4%								
EP-075B-WS	**POLYNUCLEAR AROMATICS**													
EP-075B-WS	Naphthalene	ug/L	0.5	<0.5	92.6%	90.9%								
EP-075B-WS	2-Methylnaphthalene	ug/L	0.5	<0.5	88.4%	87.0%								
EP-075B-WS	2-Chloronaphthalene	ug/L	0.5	<0.5	92.4%	93.2%								
EP-075B-WS	Acenaphthylene	ug/L	0.5	<0.5	99.5%	97.9%								
EP-075B-WS	Acenaphthene	ug/L	0.5	<0.5	103%	103%								
EP-075B-WS	Fluorene	ug/L	0.5	<0.5	107%	104%								
EP-075B-WS	Phenanthrene	ug/L	0.5	<0.5	109%	106%								
EP-075B-WS	Anthracene	ug/L	0.5	<0.5	105%	108%								
EP-075B-WS	Fluoranthene	ug/L	0.5	<0.5	107%	106%								
EP-075B-WS	Pyrene	ug/L	0.5	<0.5	108%	107%								
EP-075B-WS	N-2-Fluorenylacetamide	ug/L	0.5	<0.5	117%	115%								
EP-075B-WS	Benz(a)anthracene	ug/L	0.5	<0.5	109%	107%								
EP-075B-WS	Chrysene	ug/L	0.5	<0.5	106%	105%								
EP-075B-WS	Benzo(b) & (k)fluoranthene	ug/L	1	<1	109%	108%								
EP-075B-WS	7.12-Dimethylbenz(a)anthracene	ug/L	0.5	<0.5	105%	105%								
EP-075B-WS	Benzo(a)pyrene	ug/L	0.3	<0.3	108%	107%								

Batch: NE9267
Sub Batch: 3
Date of Issue: 12/03/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference:

QUALITY CONTROL REPORT

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		100	101	102							
		Date Sampled		13/02/2003	13/02/2003	13/02/2003							
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	METHOD BLANK	NSVOCW1278 SCS	NSVOCW1278 DCS							
				CHECKS AND SPIKES									
EP-075B-WS	3-Methylcholanthrene	ug/L	0.5	<0.5	111%	108%							
EP-075B-WS	Indeno(1.2.3-cd)pyrene	ug/L	0.5	<0.5	107%	107%							
EP-075B-WS	Dibenz(a.h)anthracene	ug/L	0.5	<0.5	105%	105%							
EP-075B-WS	Benzo(g.h.i)perylene	ug/L	0.5	<0.5	114%	112%							
EP-075S-WS	**ACID EXTRACTABLE SURROGATES**												
EP-075S-WS	2-Fluorophenol	%	1	80	99	99							
EP-075S-WS	Phenol-D6	%	1	39	53	52							
EP-075S-WS	2-Chlorophenol-D4	%	1	94	115	113							
EP-075S-WS	2.4.6-Tribromophenol	%	1	64	102	98							
EP-075T-WS	**BASE/NEUTRAL EXTRACTABLE SURROGATES**												
EP-075T-WS	Nitrobenzene-D5	%	1	99	111	110							
EP-075T-WS	1.2-Dichlorobenzene-D4	%	1	74	97	97							
EP-075T-WS	2-Fluorobiphenyl	%	1	86	107	105							
EP-075T-WS	Anthracene-d10	%	1	112	117	114							
EP-075T-WS	p-Terphenyl-D14	%	1	108	116	114							

ALS Environmental

ORGANICS QUALITY CONTROL REPORT

BATCH NO: NE9267

DATE BATCH RECEIVED: 12/02/2003

CLIENT: Haztech Industries

DATE BATCH COMPLETED: 11/03/2003

PROJECT:

Method Code	Test	Matrix	Method Reference		QC Lot Number	Date Samples Extracted	Date Samples Analysed
			Extraction	Analysis			
EP-071	TPH(SV)	Water	USEPA 3510B	USEPA 8015A	NTPHW1385	21/02/03	02/03/03
EP-071/80	TPH(V)/BTEX	Water	USEPA 5030A	USEPA 8260A	NVOCW1385	25/02/03	04/03/03
EP-075	SV Scan	Water	USEPA 3510B	USEPA 8270B	NSVOCW1278	21/02/03	22/02/03

Where applicable, internal standards are added to sample extracts prior to instrumental analysis. Absolute peak areas and retention times fall within the criteria specified in the individual methods. Continuing Calibration (CC) standards are run at the frequency of 1 in every 20 samples.

Abbreviations: SV = semivolatile, V = volatile

*: In-house methods

A Campbell Brothers Limited Company

NE9281

CHAIN OF CUSTODY DOCUMENTATION

CLIENT: Haztech Industries Pty Ltd		LABORATORY BATCH NO.:	Australian Laboratory Services Pty Ltd
POSTAL ADDRESS:		SAMPLERS:	
SEND REPORT TO: Karl Baltpurvins	SEND INVOICE TO:Karl Baltpurvins	PHONE:(02)49460170 FAX:0249426921E-MAIL: karl_baltpurvins@haztech-industries.com	
DATA NEEDED BY:ASAP	REPORT NEEDED BY: ASAP	REPORT FORMAT: HARD:X FAX: X DISK: ☐ BULLETIN BOARD: ☐ E-MAIL: X	
PROJECT ID:GHD	**QUOTE NO.:SYN/532/02**	QC LEVEL: QCS1:☐ QCS2:☐ QCS3:☐ QCS4:☐	
P.O. NO.:	COMMENTS/SPECIAL HANDLING/STORAGE OR DIPOSAL:		
FOR LAB USE ONLY	**Do TCLP as fluid pH4.99- See Cindy if any Questions**		
COOLER SEAL	**or call Karl on Number above or 0412071059**		
Yes No	**All Analysis on TCLP**		
Broken Intact	**Samples should be batched in as NE samples**		
COOLER TEMP: deg.C	**as per Kathy at Newcastle.**		

SAMPLE DATA				CONTAINER DATA			ANALYSIS REQUIRED														
SAMPLE ID	MATRIX	DATE	TIME	TYPE & PRESERVATIVE	NO.	Ph	TPH	BTEX	Metals (see side)	Phenols	PAH	Total Cyanide									NOTES
GHD-38 (1)	Solid	13.02.03		-			X	X	X	X	X	X									**All Analysis on**
GHD-39 (2)	Solid	13.02.03					X	X	X	X	X	X									**TCLP pH 4.99**
GHD-41 (3)	Solid	13.02.03					X	X	X	X	X	X									**Metals-**
GHD-42 (4)	Solid	13.02.03					X	X	X	X	X	X									**As, Cd, Cr, Co, Hg, N**
GHD-44 (5)	Solid	13.02.03					X	X	X	X	X	X									**Zn, Pb**
GHD-45 (6)	Solid	13.02.03					X	X	X	X	X	X									
GHD-47 (7)	Solid	13.02.03					X	X	X	X	X	X									**Do TCLP as fluid**
GHD-48 (8)	Solid	13.02.03					X	X	X	X	X	X									**pH4.99- See Cindy**
GHD-50 (9)	Solid	13.02.03					X	X	X	X	X	X									**if any questions**
GHD-51 (10)	Solid	13.02.03					X	X	X	X	X	X									Samples should be
GHD-53 (11)	Solid	13.02.03					X	X	X	X	X	X									batched in as NE
GHD-54 (12)	Solid	13.02.03					X	X	X	X	X	X									samples. See Kathy
GHD-56 (13)	Solid	13.02.03					X	X	X	X	X	X									at Newcastle.
GHD-57 (14)	Solid	13.02.03					X	X	X	X	X	X									
cont'd.																					

Lab No.: NE9281 4/2
Temperature Received: C
Time Received:
Date Received:
Received By:
Due Date:
Turn Around Time:
Prac. Contract Work
Date to Return
Comm. And. Actioned

RELINQUISHED BY:		RECEIVED BY		
NAME :LISA CALDER	DATE: 13/02/03	NAME : K-CHEANOUR	DATE: 13/2	METHOD OF SHIPMENT
OF:DOLOMATRIX	TIME:	OF: ALS	TIME: 5:30pm	CONSIGNMENT NOTE NO.
NAME :	DATE:	NAME :	DATE:	TRANSPORT CO. NAME.
OF:	TIME:	OF:	TIME:	

'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.

AUSTRALIAN LABORATORY SERVICES P/L

CHAIN OF CUSTODY DOCUMENTATION

CLIENT: Haztech Industries Pty Ltd		LABORATORY BATCH NO.	Australian Laboratory Services Pty Ltd
POSTAL ADDRESS:		SAMPLERS:	
SEND REPORT TO: Karl Baltpurvins	SEND INVOICE TO:Karl Baltpurvins	PHONE:(02)49460170 FAX:0249426921E-MAIL: karl_baltpurvins@haztech-industries.com	
DATA NEEDED BY:ASAP	REPORT NEEDED BY: ASAP	REPORT FORMAT: HARD:X FAX: X DISK: ☐ BULLETIN BOARD: ☐ E-MAIL: X	
PROJECT ID:GHD	**QUOTE NO.:SYN/532/02**	QC LEVEL: QCS1:☐ QCS2:☐ QCS3:☐ QCS4:☐	
P.O. NO.:	COMMENTS/SPECIAL HANDLING/STORAGE OR DIPOSAL:		
FOR LAB USE ONLY	~~Do TCLP as fluid pH4.99- See Cindy if any Questions~~		
COOLER SEAL	**or call Karl on Number above or 0412071059**		
Yes No	**All Analysis on TCLP**		
Broken Intact	**Samples should be batched in as NE samples**		
COOLER TEMP: deg.C	**as per Kathy at Newcastle.**		

SAMPLE DATA				CONTAINER DATA			ANALYSIS REQUIRED														
SAMPLE ID	MATRIX	DATE	TIME	TYPE & PRESERVATIVE	NO.	Ph	TPH	BTEX	Metals (see side)	Phenols	PAH	Total Cyanide									NOTES
GHD-59 (15)	Solid	13.02.03		-			X	X	X	X	X	X				NE9287					~~All Analysis on~~
GHD-60 (16)	Solid	13.02.03					X	X	X	X	X	X									~~TCLP pH 4.99~~
GHD-62 (17)	Solid	13.02.03					X	X	X	X	X	X									**Metals-**
GHD-63 (18)	Solid	13.02.03					X	X	X	X	X	X									**As, Cd, Cr, Co, Hg, Ni**
																					Zn, Pb
																					~~Do TCLP as fluid~~
																					~~pH4.99- See Cindy~~
																					~~if any questions~~
																					Samples should be
																					batched in as NE
																					samples. See Kathy
																					at Newcastle.

RELINQUISHED BY:		RECEIVED BY		
NAME :LISA CALDER	DATE: 13/02/03	NAME : K-Stefanovic	DATE:13/2	METHOD OF SHIPMENT
OF:DOLOMATRIX	TIME:	OF: ALS	TIME:5.30pm	CONSIGNMENT NOTE NO.
NAME :	DATE:	NAME :	DATE:	TRANSPORT CO. NAME.
OF:	TIME:	OF:	TIME:	

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; /C = 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.

AUSTRALIAN LABORATORY SERVICES P/L

CHAIN OF CUSTODY DOCUMENTATION

NE 7122

n Industries Pty Ltd	LABORATORY BATCH NO.
RESS:	SAMPLERS:
ORT TO: Karl Baltpurvins SEND INVOICE TO:Karl Baltpurvins	PHONE:(02)49460170 FAX:024942692E-MAIL: karl_baltpurvins@haztech-industries.com
NEEDED BY:ASAP REPORT NEEDED BY: ASAP	REPORT FORMAT: HARD:X FAX: X DISK: ☐ BULLETIN BOARD: ☐ E-MAIL: X
OJECT ID:GHD	**QUOTE NO.:SYN/532/02**
P.O. NO.:	COMMENTS/SPECIAL HANDLING/STORAGE OR DIPOSAL:
FOR LAB USE ONLY	~~Do TCLP as fluid pH4.99 See Cindy if any Questions~~
COOLER SEAL	**or call Karl on Number above or 0412071059**
Yes No	**All Analysis on TCLP**
Broken Intact	**Samples should be batched in as NE samples**
COOLER TEMP: deg.C	**as per Kathy at Newcastle.**

Australian Laboratory Services Pty Ltd

QC LEVEL: QCS1:☐ QCS2:☐ QCS3:☐ QCS4:☐

ANALYSIS REQUIRED

SAMPLE DATA				CONTAINER DATA			TPH	BTEX	Metals (see side)	Phenols	PAH	Total Cyanide										NOTES
SAMPLE ID	MATRIX	DATE	TIME	TYPE & PRESERVATIVE	NO.	Ph																
GHD-03 (1)	Solid	06.02.03		-			X	X	X	X	X	X										
GHD-06 (2)	Solid	06.02.03					X	X	X	X	X	X										
GHD-09 (3)	Solid	06.02.03					X	X	X	X	X	X										
GHD-11 (4)	Solid	06.02.03					X	X	X	X	X	X										
GHD-12 (5)	Solid	06.02.03					X	X	X	X	X	X										
GHD-14 (6)	Solid	06.02.03					X	X	X	X	X	X										
GHD-15 (7)	Solid	06.02.03					X	X	X	X	X	X										
GHD-17 (8)	Solid	06.02.03					X	X	X	X	X	X										
GHD-18 (9)	Solid	06.02.03					X	X	X	X	X	X										
GHD-29 (10)	Solid	06.02.03					X	X	X	X	X	X										
GHD-30 (11)	Solid	06.02.03					X	X	X	X	X	X										
GHD-32 (12)	Solid	06.02.03					X	X	X	X	X	X										
GHD-33 (13)	Solid	06.02.03					X	X	X	X	X	X										
GHD-35 (14)	Solid	06.02.03					X	X	X	X	X	X										
GHD-36 (15)	Solid	06.02.03					X	X	X	X	X	X										

Sch No: NE 9122 ched: 07-2-03 Soil ✓ Water Other Subco Bottle Imm.

All Analysis on TCLP pH 4.99

Metals- As, Cd, Cr, Co, Hg, Ni, Zn, Pb

Do TCLP as fluid pH4.99 See Cindy if any questions

~~Samples should be batched in as NE samples. See Kathy at Newcastle.~~

RELINQUISHED BY:		RECEIVED BY	
NAME :LISA CALDER	DATE: 31/01/03	NAME : Sally	DATE: 06/2/3
OF:DOLOMATRIX	TIME:	OF:	TIME: 4-35pm
NAME :	DATE:	NAME :	DATE:
OF:	TIME:	OF:	TIME:

METHOD OF SHIPMENT

CONSIGNMENT NOTE NO.

TRANSPORT CO. NAME.

*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.

AUSTRALIAN LABORATORY SERVICES P/L

O - Metals - TCLP
1 - CN - ZHE
2 - TPH - TCLP

ALS Environmental

CERTIFICATE OF ANALYSIS

CONTACT:	MR KARL BALTPURVINS	**BATCH:**	NE9287
CLIENT:	HAZTECH INDUSTRIES PTY LTD	**SUB BATCH:**	0
ADDRESS:	PO BOX 32 UNION BUILDING CALLAGHAN NSW 2308	**LABORATORY:**	NEWCASTLE
		DATE RECEIVED:	13/02/2003
		DATE COMPLETED:	14/03/2003
		SAMPLE TYPE:	TCLP LEACHATE
ORDER No.:		**No. of SAMPLES:**	18
PROJECT:	GHD		

COMMENTS

The concentrations reported are those determined on the TCLP leachate.

Extraction fluid #1 pH 4.88-4.98. Analysis conducted by ALS Sydney, NATA Site No. 10911. This report supersedes any previous preliminary reports of the same batch number.

NOTES

This is the Final Report and supersedes any preliminary reports with this batch number.
All pages of this report have been checked and approved for release.

ISSUING LABORATORY: NEWCASTLE

Address
5 Rosegum Close
WARABROOK NSW 2304

Phone: 61-2-4968 9433
Fax: 61-2-4968 0349
Email: kathy.mcdermott@alsenviro.com

Signatory Greg Vogel

This Laboratory is accredited by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of accreditation. This document shall not be reproduced except in full.

NATA Accredited Laboratory Number 825

Batch: NE9287
Sub Batch: 0
Date of Issue: 14/03/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference: GHD

CERTIFICATE OF ANALYSIS

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		1	2	3	4	5	6	7	8	9	10
		Date Sampled		13/02/2003	13/02/2003	13/02/2003	13/02/2003	13/02/2003	13/02/2003	13/02/2003	13/02/2003	13/02/2003	13/02/2003
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	GHD-38	GHD-39	GHD-41	GHD-42	GHD-44	GHD-45	GHD-47	GHD-48	GHD-50	GHD-51
ALS3	Extraction Fluid Number		1	1	1	1	1	1	1	1	1	1	1
ALS4	pH After Extract		0.1	9.0	8.7	8.5	9.0	9.4	9.0	8.0	8.1	8.2	8.6
EG-005C	Arsenic - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
EG-005C	Cadmium - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
EG-005C	Cobalt - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
EG-005C	Chromium - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
EG-005C	Nickel - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
EG-005C	Lead - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
EG-005C	Zinc - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
EG-035C	Mercury - TCLP	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Batch: NE9287
Sub Batch: 0
Date of Issue: 14/03/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference: GHD

CERTIFICATE OF ANALYSIS

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		11	12	13	14	15	16	17	18		
		Date Sampled		13/02/2003	13/02/2003	13/02/2003	13/02/2003	13/02/2003	13/02/2003	13/02/2003	13/02/2003		
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	GHD-53	GHD-54	GHD-56	GHD-57	GHD-59	GHD-60	GHD-62	GHD-63		
ALS3	Extraction Fluid Number		1	1	1	1	1	1	1	1	1		
ALS4	pH After Extract		0.1	8.4	8.5	8.7	8.7	8.5	9.2	8.8	9.0		
EG-005C	Arsenic - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		
EG-005C	Cadmium - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		
EG-005C	Cobalt - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		
EG-005C	Chromium - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		
EG-005C	Nickel - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		
EG-005C	Lead - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		
EG-005C	Zinc - TCLP	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		
EG-035C	Mercury - TCLP	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		

Batch: NE9287
Sub Batch: 0
Date of Issue: 14/03/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference: GHD

QUALITY CONTROL REPORT

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		1	1	11	11	200	201				
		Date Sampled		13/02/2003	13/02/2003	13/02/2003	13/02/2003	13/02/2003	13/02/2003				
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	GHD-38 MS	GHD-38 CHK	GHD-53 MS	GHD-53 CHK	METHOD BLANK	LCS				
				CHECKS AND SPIKES									
ALS3	Extraction Fluid Number		1	1	1	1	1	1	----				
ALS4	pH After Extract		0.1	----	----	----	----	----	----				
EG-005C	Arsenic - TCLP	mg/L	0.1	125%	<0.1	116%	<0.1	<0.1	101%				
EG-005C	Cadmium - TCLP	mg/L	0.1	118%	<0.1	108%	<0.1	<0.1	103%				
EG-005C	Cobalt - TCLP	mg/L	0.1	119%	<0.1	109%	<0.1	<0.1	----				
EG-005C	Chromium - TCLP	mg/L	0.1	121%	<0.1	109%	<0.1	<0.1	102%				
EG-005C	Nickel - TCLP	mg/L	0.1	118%	<0.1	108%	<0.1	<0.1	100%				
EG-005C	Lead - TCLP	mg/L	0.1	116%	<0.1	106%	<0.1	<0.1	100%				
EG-005C	Zinc - TCLP	mg/L	0.1	113%	<0.1	104%	<0.1	<0.1	100%				
EG-035C	Mercury - TCLP	mg/L	0.01	78.0%	<0.01	83.0%	----	<0.01	109%				

ALS Environmental

CERTIFICATE OF ANALYSIS

CONTACT:	MR KARL BALTPURVINS	**BATCH:**	NE9287
CLIENT:	HAZTECH INDUSTRIES PTY LTD	**SUB BATCH:**	1
ADDRESS:	PO BOX 32 UNION BUILDING CALLAGHAN NSW 2308	**LABORATORY:**	NEWCASTLE
		DATE RECEIVED:	13/02/2003
		DATE COMPLETED:	14/03/2003
		SAMPLE TYPE:	ZHE LEACHATE
ORDER No.:		**No. of SAMPLES:**	18
PROJECT:	GHD		

COMMENTS

The concentrations reported are those determined on a ZHE TCLP leachate, using extraction fluid #1 (pH 4.88-4.98). Analysis conducted by ALS Sydney, NATA Site No. 10911.

NOTES

This is the Final Report and supersedes any preliminary reports with this batch number.
All pages of this report have been checked and approved for release.

ISSUING LABORATORY: NEWCASTLE

Address
5 Rosegum Close
WARABROOK NSW 2304

Phone: 61-2-4968 9433
Fax: 61-2-4968 0349
Email: kathy.mcdermott@alsenviro.com

Signatory Greg Vejar

This Laboratory is accredited by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of accreditation. This document shall not be reproduced except in full.

NATA Accredited Laboratory Number 825

Batch: NE9287
Sub Batch: 1
Date of Issue: 14/03/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference: GHD

CERTIFICATE OF ANALYSIS

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		1	2	3	4	5	6	7	8	9	10
		Date Sampled		13/02/2003	13/02/2003	13/02/2003	13/02/2003	13/02/2003	13/02/2003	13/02/2003	13/02/2003	13/02/2003	13/02/2003
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	GHD-38	GHD-39	GHD-41	GHD-42	GHD-44	GHD-45	GHD-47	GHD-48	GHD-50	GHD-51
EK-026MA	Total Cyanide	mg/L	0.005	0.117	0.200	0.256	0.137	0.032	0.011	0.015	0.007	0.013	0.018

Batch: NE9287
Sub Batch: 1
Date of Issue: 14/03/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference: GHD

CERTIFICATE OF ANALYSIS

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		11	12	13	14	15	16	17	18		
		Date Sampled		13/02/2003	13/02/2003	13/02/2003	13/02/2003	13/02/2003	13/02/2003	13/02/2003	13/02/2003		
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	GHD-53	GHD-54	GHD-56	GHD-57	GHD-59	GHD-60	GHD-62	GHD-63		
EK-026MA	Total Cyanide	mg/L	0.005	0.070	0.010	0.065	0.053	0.020	0.017	0.007	0.007		

Batch: NE9287
Sub Batch: 1
Date of Issue: 14/03/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference: GHD

QUALITY CONTROL REPORT

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		11	200	201	202						
		Date Sampled		13/02/2003	13/02/2003	13/02/2003	13/02/2003						
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	GHD-53 MS	METHOD BLANK	LCS	MS						
				CHECKS AND SPIKES									
EK-026MA	Total Cyanide	mg/L	0.005	110%	<0.005	108%	94.0%						

ALS Environmental

CERTIFICATE OF ANALYSIS

CONTACT:	MR KARL BALTPURVINS	**BATCH:**	NE9287
CLIENT:	HAZTECH INDUSTRIES PTY LTD	**SUB BATCH:**	2
ADDRESS:	PO BOX 32 UNION BUILDING CALLAGHAN NSW 2308	**LABORATORY:**	NEWCASTLE
		DATE RECEIVED:	13/02/2003
		DATE COMPLETED:	14/03/2003
		SAMPLE TYPE:	TCLP LEACHATE
ORDER No.:		**No. of SAMPLES:**	18
PROJECT:	GHD		

COMMENTS

The concentrations reported for TPH volatile C6 -C9 and BTEX are those determined on a ZHE TCLP leachate using extraction fluid #1 (pH 4.88-4.98). The concentrations reported for TPH semivolatile C10 - C36 are those determined on the TCLP leachate. Extraction fluid #1 pH 4.88-4.98. All analysis conducted by ALS Sydney, NATA Site No. 10911.

NOTES

This is the Final Report and supersedes any preliminary reports with this batch number.
All pages of this report have been checked and approved for release.

ISSUING LABORATORY: NEWCASTLE

Address
5 Rosegum Close
WARABROOK NSW 2304

Phone: 61-2-4968 9433
Fax: 61-2-4968 0349
Email: kathy.mcdermott@alsenviro.com

Signatory

This Laboratory is accredited by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of accreditation. This document shall not be reproduced except in full.

NATA Accredited Laboratory Number 825

Batch: NE9287
Sub Batch: 2
Date of Issue: 14/03/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference: GHD

CERTIFICATE OF ANALYSIS

				SAMPLE IDENTIFICATION									
	Laboratory I.D.			1	2	3	4	5	6	7	8	9	10
	Date Sampled			13/02/2003	13/02/2003	13/02/2003	13/02/2003	13/02/2003	13/02/2003	13/02/2003	13/02/2003	13/02/2003	13/02/2003
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	GHD-38	GHD-39	GHD-41	GHD-42	GHD-44	GHD-45	GHD-47	GHD-48	GHD-50	GHD-51
ALS3	Extraction Fluid Number		1	1	1	1	1	1	1	1	1	1	1
ALS4	pH After Extract		0.1	9.0	8.7	8.5	9.0	9.4	9.0	8.0	8.1	8.2	8.6
EP-071-WS	**TOTAL PETROLEUM HYDROCARBONS**												
EP-071-WS	C6 - C9 Fraction	ug/L	20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
EP-071-WS	C10 - C14 Fraction	ug/L	50	13.2mg/L	16.5mg/L	<50	112	194	110	14.7mg/L	16.2mg/L	104	115
EP-071-WS	C15 - C28 Fraction	ug/L	100	2970	3080	136	211	455	366	2990	2870	204	198
EP-071-WS	C29 - C36 Fraction	ug/L	50	<50	187	<50	<50	61	<50	171	193	<50	<50
EP-080-WS	**BTEX**												
EP-080-WS	Benzene	ug/L	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
EP-080-WS	Toluene	ug/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
EP-080-WS	Chlorobenzene	ug/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
EP-080-WS	Ethylbenzene	ug/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
EP-080-WS	meta- & para-Xylene	ug/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
EP-080-WS	ortho-Xylene	ug/L	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
EP-080S-WS	**VOLATILE TPH/BTEX COMPOUND SURROGATES**												
EP-080S-WS	1.2-Dichloroethane-D4	%	1	90	85	87	82	88	86	85	88	88	83
EP-080S-WS	Toluene-D8	%	1	95	95	94	89	94	93	95	89	94	98
EP-080S-WS	4-Bromofluorobenzene	%	1	93	91	90	90	93	94	89	86	86	95

Batch: NE9287
Sub Batch: 2
Date of Issue: 14/03/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference: GHD

CERTIFICATE OF ANALYSIS

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		11	12	13	14	15	16	17	18		
		Date Sampled		13/02/2003	13/02/2003	13/02/2003	13/02/2003	13/02/2003	13/02/2003	13/02/2003	13/02/2003		
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	GHD-53	GHD-54	GHD-56	GHD-57	GHD-59	GHD-60	GHD-62	GHD-63		
ALS3	Extraction Fluid Number		1	1	1	1	1	1	1	1	1		
ALS4	pH After Extract		0.1	8.4	8.5	8.7	8.7	8.5	9.2	8.8	9.0		
EP-071-WS	**TOTAL PETROLEUM HYDROCARBONS**												
EP-071-WS	C6 - C9 Fraction	ug/L	20	<20	<20	<20	<20	<20	<20	<20	<20		
EP-071-WS	C10 - C14 Fraction	ug/L	50	1080	196	15.4mg/L	13.8mg/L	116	132	258	144		
EP-071-WS	C15 - C28 Fraction	ug/L	100	513	308	2980	2250	123	210	377	309		
EP-071-WS	C29 - C36 Fraction	ug/L	50	<50	<50	174	169	<50	<50	<50	<50		
EP-080-WS	**BTEX**												
EP-080-WS	Benzene	ug/L	1	<1	<1	<1	<1	<1	<1	<1	<1		
EP-080-WS	Toluene	ug/L	2	<2	<2	<2	<2	<2	<2	<2	<2		
EP-080-WS	Chlorobenzene	ug/L	2	<2	<2	<2	<2	<2	<2	<2	<2		
EP-080-WS	Ethylbenzene	ug/L	2	<2	<2	<2	<2	<2	<2	<2	<2		
EP-080-WS	meta- & para-Xylene	ug/L	2	<2	<2	<2	<2	<2	<2	<2	<2		
EP-080-WS	ortho-Xylene	ug/L	2	<2	<2	<2	<2	<2	<2	<2	<2		
EP-080S-WS	**VOLATILE TPH/BTEX COMPOUND SURROGATES**												
EP-080S-WS	1,2-Dichloroethane-D4	%	1	85	84	91	86	81	86	86	86		
EP-080S-WS	Toluene-D8	%	1	88	97	94	98	96	100	90	96		
EP-080S-WS	4-Bromofluorobenzene	%	1	89	93	91	93	89	95	94	92		

Batch: NE9287
Sub Batch: 2
Date of Issue: 14/03/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference: GHD

QUALITY CONTROL REPORT

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		100	101	102							
		Date Sampled		13/02/2003	13/02/2003	13/02/2003							
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	METHOD BLANK	NTPHW1390 SCS	NTPHW1390 DCS							
				CHECKS AND SPIKES									
ALS3	Extraction Fluid Number		1	1	----	----							
ALS4	pH After Extract		0.1	----	----	----							
EP-071-WS	**TOTAL PETROLEUM HYDROCARBONS**												
EP-071-WS	C6 - C9 Fraction	ug/L	20	<20	97.0%	95.0%							
EP-071-WS	C10 - C14 Fraction	ug/L	50	<50	95.0%	93.0%							
EP-071-WS	C15 - C28 Fraction	ug/L	100	<100	95.0%	96.0%							
EP-071-WS	C29 - C36 Fraction	ug/L	50	<50	94.0%	96.0%							
EP-080-WS	**BTEX**												
EP-080-WS	Benzene	ug/L	1	<1	104%	97.0%							
EP-080-WS	Toluene	ug/L	2	<2	97.0%	90.0%							
EP-080-WS	Chlorobenzene	ug/L	2	<2	92.0%	95.0%							
EP-080-WS	Ethylbenzene	ug/L	2	<2	89.0%	88.0%							
EP-080-WS	meta- & para-Xylene	ug/L	2	<2	92.0%	90.0%							
EP-080-WS	ortho-Xylene	ug/L	2	<2	93.0%	91.0%							
EP-080S-WS	**VOLATILE TPH/BTEX COMPOUND SURROGATES**												
EP-080S-WS	1.2-Dichloroethane-D4	%	1	85	104	102							
EP-080S-WS	Toluene-D8	%	1	89	94	105							
EP-080S-WS	4-Bromofluorobenzene	%	1	86	90	99							

ALS Environmental

CERTIFICATE OF ANALYSIS

CONTACT:	MR KARL BALTPURVINS	**BATCH:**	NE9287
CLIENT:	HAZTECH INDUSTRIES PTY LTD	**SUB BATCH:**	3
ADDRESS:	PO BOX 32 UNION BUILDING CALLAGHAN NSW 2308	**LABORATORY:**	NEWCASTLE
		DATE RECEIVED:	13/02/2003
		DATE COMPLETED:	14/03/2003
		SAMPLE TYPE:	TCLP LEACHATE
ORDER No.:		**No. of SAMPLES:**	18
PROJECT:	GHD		

COMMENTS

The concentrations reported are those determined on the TCLP leachate. Extraction fluid #1 pH 4.88-4.98. Surrogate 2-Fluorobiphenyl could not be determined in samples GHD-38, GHD-39, GHD-47, GHD-48, GHD-56 and GHD-57 due to matrix interferences. Analysis conducted by ALS Sydney, NATA Site No. 10911.

NOTES

This is the Final Report and supersedes any preliminary reports with this batch number.
All pages of this report have been checked and approved for release.

ISSUING LABORATORY: NEWCASTLE

Address
5 Rosegum Close
WARABROOK NSW 2304

Phone: 61-2-4968 9433
Fax: 61-2-4968 0349
Email: kathy.mcdermott@alsenviro.com

Signatory

This Laboratory is accredited by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its terms of accreditation. This document shall not be reproduced except in full.

NATA Accredited Laboratory Number 825

Batch: NE9287
Sub Batch: 3
Date of Issue: 14/03/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference: GHD

CERTIFICATE OF ANALYSIS

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		1	2	3	4	5	6	7	8	9	10
		Date Sampled		13/02/2003	13/02/2003	13/02/2003	13/02/2003	13/02/2003	13/02/2003	13/02/2003	13/02/2003	13/02/2003	13/02/2003
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	GHD-38	GHD-39	GHD-41	GHD-42	GHD-44	GHD-45	GHD-47	GHD-48	GHD-50	GHD-51
ALS3	Extraction Fluid Number		1	1	1	1	1	1	1	1	1	1	1
ALS4	pH After Extract		0.1	9.0	8.7	8.5	9.0	9.4	9.0	8.0	8.1	8.2	8.6
EP-075A-WS	**PHENOLS**												
EP-075A-WS	Phenol	ug/L	0.5	0.9	1.2	0.6	0.8	0.7	0.6	0.8	1.2	0.6	0.8
EP-075A-WS	2-Chlorophenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
EP-075A-WS	2-Methylphenol	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
EP-075A-WS	3- & 4-Methylphenol	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
EP-075A-WS	2-Nitrophenol	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
EP-075A-WS	2.4-Dimethylphenol	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
EP-075A-WS	2.4-Dichlorophenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
EP-075A-WS	2.6-Dichlorophenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
EP-075A-WS	4-Chloro-3-methylphenol	ug/L	0.3	<0.3	0.4	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
EP-075A-WS	2.4.6-Trichlorophenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
EP-075A-WS	2.4.5-Trichlorophenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
EP-075A-WS	Pentachlorophenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
EP-075B-WS	**POLYNUCLEAR AROMATICS**												
EP-075B-WS	Naphthalene	ug/L	0.5	7660	14.7mg/L	50.4	45.8	109	38.9	9190	13.7mg/L	45.7	46.8
EP-075B-WS	2-Methylnaphthalene	ug/L	0.5	412	544	3.4	2.2	6.9	3.9	394	519	3.2	2.6
EP-075B-WS	2-Chloronaphthalene	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
EP-075B-WS	Acenaphthylene	ug/L	0.5	67.0	97.2	9.3	5.6	5.5	4.1	62.6	88.4	12.5	6.5
EP-075B-WS	Acenaphthene	ug/L	0.5	420	519	19.9	15.5	23.5	17.9	383	504	17.3	15.5
EP-075B-WS	Fluorene	ug/L	0.5	170	207	6.5	4.4	19.0	13.8	164	208	6.6	4.7
EP-075B-WS	Phenanthrene	ug/L	0.5	182	230	14.2	9.7	30.3	24.1	182	227	13.1	9.0
EP-075B-WS	Anthracene	ug/L	0.5	29.3	28.4	3.2	2.2	11.5	7.9	26.2	32.5	2.9	2.1
EP-075B-WS	Fluoranthene	ug/L	0.5	24.5	28.2	5.2	3.9	12.1	9.7	22.3	27.6	4.4	3.5
EP-075B-WS	Pyrene	ug/L	0.5	18.0	20.9	4.3	3.3	10.9	9.0	16.2	19.7	3.6	3.0
EP-075B-WS	N-2-Fluorenylacetamide	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
EP-075B-WS	Benz(a)anthracene	ug/L	0.5	0.9	1.2	<0.5	<0.5	<0.5	<0.5	0.9	1.2	<0.5	<0.5
EP-075B-WS	Chrysene	ug/L	0.5	0.6	0.7	<0.5	<0.5	<0.5	<0.5	0.6	0.7	<0.5	<0.5
EP-075B-WS	Benzo(b) & (k)fluoranthene	ug/L	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
EP-075B-WS	7.12-Dimethylbenz(a)anthracene	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
EP-075B-WS	Benzo(a)pyrene	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
EP-075B-WS	3-Methylcholanthrene	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
EP-075B-WS	Indeno(1.2.3-cd)pyrene	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

Batch: NE9287
Sub Batch: 3
Date of Issue: 14/03/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference: GHD

QUALITY CONTROL REPORT

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		100	101	102							
		Date Sampled		13/02/2003	13/02/2003	13/02/2003							
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	METHOD BLANK	NSVOCW1284 SCS	NSVOCW1284 DCS							
				CHECKS AND SPIKES									
ALS3	Extraction Fluid Number		1	1	----	----							
ALS4	pH After Extract		0.1	----	----	----							
EP-075A-WS	**PHENOLS**												
EP-075A-WS	Phenol	ug/L	0.5	<0.5	35.7%	31.7%							
EP-075A-WS	2-Chlorophenol	ug/L	0.3	<0.3	78.8%	71.2%							
EP-075A-WS	2-Methylphenol	ug/L	0.5	<0.5	68.3%	63.0%							
EP-075A-WS	3- & 4-Methylphenol	ug/L	0.5	<0.5	60.9%	54.8%							
EP-075A-WS	2-Nitrophenol	ug/L	0.5	<0.5	65.5%	61.8%							
EP-075A-WS	2.4-Dimethylphenol	ug/L	0.5	<0.5	78.1%	69.9%							
EP-075A-WS	2.4-Dichlorophenol	ug/L	0.3	<0.3	73.6%	68.7%							
EP-075A-WS	2.6-Dichlorophenol	ug/L	0.3	<0.3	55.9%	61.4%							
EP-075A-WS	4-Chloro-3-methylphenol	ug/L	0.3	<0.3	73.9%	66.3%							
EP-075A-WS	2.4.6-Trichlorophenol	ug/L	0.3	<0.3	75.6%	58.4%							
EP-075A-WS	2.4.5-Trichlorophenol	ug/L	0.3	<0.3	73.1%	62.0%							
EP-075A-WS	Pentachlorophenol	ug/L	0.3	<0.3	58.2%	43.5%							
EP-075B-WS	**POLYNUCLEAR AROMATICS**												
EP-075B-WS	Naphthalene	ug/L	0.5	<0.5	99.6%	72.6%							
EP-075B-WS	2-Methylnaphthalene	ug/L	0.5	<0.5	78.3%	67.3%							
EP-075B-WS	2-Chloronaphthalene	ug/L	0.5	<0.5	76.6%	67.6%							
EP-075B-WS	Acenaphthylene	ug/L	0.5	<0.5	77.2%	69.4%							
EP-075B-WS	Acenaphthene	ug/L	0.5	<0.5	78.7%	69.1%							
EP-075B-WS	Fluorene	ug/L	0.5	<0.5	80.8%	68.1%							
EP-075B-WS	Phenanthrene	ug/L	0.5	<0.5	80.0%	72.1%							
EP-075B-WS	Anthracene	ug/L	0.5	<0.5	77.0%	66.7%							
EP-075B-WS	Fluoranthene	ug/L	0.5	<0.5	75.1%	69.8%							
EP-075B-WS	Pyrene	ug/L	0.5	0.5	82.2%	63.1%							
EP-075B-WS	N-2-Fluorenylacetamide	ug/L	0.5	<0.5	69.9%	63.0%							
EP-075B-WS	Benz(a)anthracene	ug/L	0.5	<0.5	80.0%	72.0%							
EP-075B-WS	Chrysene	ug/L	0.5	<0.5	68.0%	60.7%							
EP-075B-WS	Benzo(b) & (k)fluoranthene	ug/L	1	<1	75.7%	66.4%							
EP-075B-WS	7.12-Dimethylbenz(a)anthracene	ug/L	0.5	<0.5	66.7%	58.7%							
EP-075B-WS	Benzo(a)pyrene	ug/L	0.3	<0.3	81.0%	71.6%							

Batch: NE9287
Sub Batch: 3
Date of Issue: 14/03/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference: GHD

CERTIFICATE OF ANALYSIS

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		1	2	3	4	5	6	7	8	9	10
		Date Sampled		13/02/2003	13/02/2003	13/02/2003	13/02/2003	13/02/2003	13/02/2003	13/02/2003	13/02/2003	13/02/2003	13/02/2003
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	GHD-38	GHD-39	GHD-41	GHD-42	GHD-44	GHD-45	GHD-47	GHD-48	GHD-50	GHD-51
EP-075B-WS	Dibenz(a.h)anthracene	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
EP-075B-WS	Benzo(g.h.i)perylene	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
EP-075S-WS	**ACID EXTRACTABLE SURROGATES**												
EP-075S-WS	2-Fluorophenol	%	1	48	50	58	49	50	47	47	44	40	44
EP-075S-WS	Phenol-D6	%	1	39	40	44	41	43	40	42	39	35	38
EP-075S-WS	2-Chlorophenol-D4	%	1	84	87	96	90	90	85	86	84	80	85
EP-075S-WS	2.4.6-Tribromophenol	%	1	97	100	105	101	111	109	106	103	116	113
EP-075T-WS	**BASE/NEUTRAL EXTRACTABLE SURROGATES**												
EP-075T-WS	Nitrobenzene-D5	%	1	93	95	102	98	101	89	97	55	92	93
EP-075T-WS	1.2-Dichlorobenzene-D4	%	1	72	66	73	71	79	76	88	82	76	70
EP-075T-WS	2-Fluorobiphenyl	%	1	Not Det'd	Not Det'd	92	89	95	90	Not Det'd	Not Det'd	109	96
EP-075T-WS	Anthracene-d10	%	1	87	90	102	100	97	89	92	90	101	99
EP-075T-WS	p-Terphenyl-D14	%	1	93	99	102	99	99	90	100	102	111	104

Batch: NE9287
Sub Batch: 3
Date of Issue: 14/03/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference: GHD

CERTIFICATE OF ANALYSIS

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		11	12	13	14	15	16	17	18		
		Date Sampled		13/02/2003	13/02/2003	13/02/2003	13/02/2003	13/02/2003	13/02/2003	13/02/2003	13/02/2003		
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	GHD-53	GHD-54	GHD-56	GHD-57	GHD-59	GHD-60	GHD-62	GHD-63		
ALS3	Extraction Fluid Number		1	1	1	1	1	1	1	1	1		
ALS4	pH After Extract		0.1	8.4	8.5	8.7	8.7	8.5	9.2	8.8	9.0		
EP-075A-WS	**PHENOLS**												
EP-075A-WS	Phenol	ug/L	0.5	<0.5	<0.5	1.0	1.2	0.6	0.9	0.7	0.7		
EP-075A-WS	2-Chlorophenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3		
EP-075A-WS	2-Methylphenol	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
EP-075A-WS	3- & 4-Methylphenol	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
EP-075A-WS	2-Nitrophenol	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
EP-075A-WS	2.4-Dimethylphenol	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
EP-075A-WS	2.4-Dichlorophenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3		
EP-075A-WS	2.6-Dichlorophenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3		
EP-075A-WS	4-Chloro-3-methylphenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3		
EP-075A-WS	2.4.6-Trichlorophenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3		
EP-075A-WS	2.4.5-Trichlorophenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3		
EP-075A-WS	Pentachlorophenol	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3		
EP-075B-WS	**POLYNUCLEAR AROMATICS**												
EP-075B-WS	Naphthalene	ug/L	0.5	753	113	9700	14.9mg/L	43.2	49.5	140	54.4		
EP-075B-WS	2-Methylnaphthalene	ug/L	0.5	22.8	5.4	460	506	2.5	2.8	7.5	4.5		
EP-075B-WS	2-Chloronaphthalene	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
EP-075B-WS	Acenaphthylene	ug/L	0.5	15.0	4.3	69.4	79.4	6.1	6.7	4.9	3.8		
EP-075B-WS	Acenaphthene	ug/L	0.5	34.7	18.9	490	496	13.6	15.3	22.5	17.1		
EP-075B-WS	Fluorene	ug/L	0.5	26.1	11.8	192	192	3.9	4.7	15.8	11.6		
EP-075B-WS	Phenanthrene	ug/L	0.5	33.1	18.5	201	214	8.6	9.5	19.3	15.2		
EP-075B-WS	Anthracene	ug/L	0.5	11.9	6.1	29.7	33.0	2.0	2.4	7.2	5.7		
EP-075B-WS	Fluoranthene	ug/L	0.5	8.1	5.6	25.9	27.4	3.1	3.4	3.6	3.8		
EP-075B-WS	Pyrene	ug/L	0.5	7.0	5.2	19.0	19.7	2.6	3.0	3.1	3.5		
EP-075B-WS	N-2-Fluorenylacetamide	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
EP-075B-WS	Benz(a)anthracene	ug/L	0.5	<0.5	<0.5	1.1	1.2	<0.5	<0.5	<0.5	<0.5		
EP-075B-WS	Chrysene	ug/L	0.5	<0.5	<0.5	0.7	0.8	<0.5	<0.5	<0.5	<0.5		
EP-075B-WS	Benzo(b) & (k)fluoranthene	ug/L	1	<1	<1	<1	<1	<1	<1	<1	<1		
EP-075B-WS	7.12-Dimethylbenz(a)anthracene	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
EP-075B-WS	Benzo(a)pyrene	ug/L	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3		
EP-075B-WS	3-Methylcholanthrene	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
EP-075B-WS	Indeno(1.2.3-cd)pyrene	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		

Batch: NE9287
Sub Batch: 3
Date of Issue: 14/03/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference: GHD

CERTIFICATE OF ANALYSIS

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		11	12	13	14	15	16	17	18		
		Date Sampled		13/02/2003	13/02/2003	13/02/2003	13/02/2003	13/02/2003	13/02/2003	13/02/2003	13/02/2003		
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	GHD-53	GHD-54	GHD-56	GHD-57	GHD-59	GHD-60	GHD-62	GHD-63		
EP-075B-WS	Dibenz(a.h)anthracene	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
EP-075B-WS	Benzo(g.h.i)perylene	ug/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
EP-075S-WS	**ACID EXTRACTABLE SURROGATES**												
EP-075S-WS	2-Fluorophenol	%	1	41	44	45	41	42	48	49	46		
EP-075S-WS	Phenol-D6	%	1	35	37	40	35	35	40	41	39		
EP-075S-WS	2-Chlorophenol-D4	%	1	78	81	90	79	82	93	91	86		
EP-075S-WS	2.4.6-Tribromophenol	%	1	104	110	114	102	113	128	126	118		
EP-075T-WS	**BASE/NEUTRAL EXTRACTABLE SURROGATES**												
EP-075T-WS	Nitrobenzene-D5	%	1	86	89	103	42	88	103	105	98		
EP-075T-WS	1.2-Dichlorobenzene-D4	%	1	63	73	80	73	73	88	95	78		
EP-075T-WS	2-Fluorobiphenyl	%	1	117	93	Not Det'd	Not Det'd	101	113	119	101		
EP-075T-WS	Anthracene-d10	%	1	91	93	97	90	96	108	108	103		
EP-075T-WS	p-Terphenyl-D14	%	1	95	96	109	100	104	114	112	108		

Batch: NE9287
Sub Batch: 3
Date of Issue: 14/03/2003
Client: HAZTECH INDUSTRIES PTY LTD
Client Reference: GHD

QUALITY CONTROL REPORT

				SAMPLE IDENTIFICATION										
		Laboratory I.D.		100	101	102								
		Date Sampled		13/02/2003	13/02/2003	13/02/2003								
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	METHOD BLANK	NSVOCW1284 SCS	NSVOCW1284 DCS								
				CHECKS AND SPIKES										
EP-075B-WS	3-Methylcholanthrene	ug/L	0.5	<0.5	89.7%	75.4%								
EP-075B-WS	Indeno(1.2.3-cd)pyrene	ug/L	0.5	<0.5	83.3%	71.5%								
EP-075B-WS	Dibenz(a.h)anthracene	ug/L	0.5	<0.5	80.6%	69.3%								
EP-075B-WS	Benzo(g.h.i)perylene	ug/L	0.5	<0.5	88.2%	78.2%								
EP-075S-WS	**ACID EXTRACTABLE SURROGATES**													
EP-075S-WS	2-Fluorophenol	%	1	59	59	52								
EP-075S-WS	Phenol-D6	%	1	35	38	32								
EP-075S-WS	2-Chlorophenol-D4	%	1	83	87	76								
EP-075S-WS	2.4.6-Tribromophenol	%	1	80	45	54								
EP-075T-WS	**BASE/NEUTRAL EXTRACTABLE SURROGATES**													
EP-075T-WS	Nitrobenzene-D5	%	1	87	90	79								
EP-075T-WS	1.2-Dichlorobenzene-D4	%	1	65	75	65								
EP-075T-WS	2-Fluorobiphenyl	%	1	74	82	72								
EP-075T-WS	Anthracene-d10	%	1	91	95	82								
EP-075T-WS	p-Terphenyl-D14	%	1	89	96	81								

ALS Environmental

ORGANICS QUALITY CONTROL REPORT

BATCH NO: NE9287

DATE BATCH RECEIVED: 13/02/2003

CLIENT: Haztech Industries

DATE BATCH COMPLETED: 13/03/2003

PROJECT:

Method Code	Test	Matrix	Method Reference		QC Lot Number	Date Samples Extracted	Date Samples Analysed
			Extraction	Analysis			
EP-071	TPH(SV)	Water	USEPA 3510B	USEPA 8015A	NTPHW1390	25/02/03	02/03/03
EP-071/80	TPH(V)/BTEX	Water	USEPA 5030A	USEPA 8260A	NVOCW1390	25/02/03	08/03/03
EP-075	SV Scan	Water	USEPA 3510B	USEPA 8270B	NSVOCW1284	25/02/03	25/02/03

Where applicable, internal standards are added to sample extracts prior to instrumental analysis. Absolute peak areas and retention times fall within the criteria specified in the individual methods. Continuing Calibration (CC) standards are run at the frequency of 1 in every 20 samples.

Abbreviations: SV = semivolatile, V = volatile

*: *In-house methods*

A Campbell Brothers Limited Company

BATCH QUALITY CONTROL - CONTROL SPIKE/DUPLICATE

ALS EP-071 : Total Petroleum Hydrocarbons by Fractions

Vol QC Lot : NVOCW 1390
Semi-Vol QC Lot : NTPHW1390

MATRIX : Water

COMPOUND	BATCH ADJ. (MDL)	Blank Conc.	Spike Conc.	Spike Results				Control Limits		
				SCS Conc.	DCS Conc.	Av. Rec.	RPD	Recovery %		RPD
	ug/L	ug/L	ug/L	ug/L	ug/L	%	%	Low	High	%
C6-C9	20	<LOR	200	195	190	96	2	94	106	20
C10-C14	25	<LOR	200	190	185	94	3	72	119	20
C15-C28	25	<LOR	200	189	191	95	1	88	115	20
C29-C36	25	<LOR	200	188	193	95	3	83	117	20

COMMENTS:

1) The control limits are based on ALS laboratory statistical data (Method QWI-ORG/07).
2) * : Recovery or RPD falls outside the recommended control limit.
3) MDL = Method Detection Limit
4) LOR = Level Of Reporting

BATCH QUALITY CONTROL - CONTROL SPIKE/DUPLICATE

ALS EP-080 : BTEX ANALYSIS

QC Lot No. : NVOCW 1390 MATRIX : Water

COMPOUND	BATCH ADJ. (MDL)	Blank Conc.	Spike Conc.	Spike Results				Control Limits		
				SCS Conc.	DCS Conc.	Av. Rec.	RPD	Recovery %		RPD
	ug/L	ug/L	ug/L	ug/L	ug/L	%	%	Low	High	%
Benzene	1.0	<LOR	10	10.38	9.71	100	7	87	115	20
Toluene	1.0	<LOR	10	9.65	8.95	93	8	87	114	20
Chlorobenzene	1.0	<LOR	10	9.21	9.54	94	4	89	112	20
Ethylbenzene	1.0	<LOR	10	8.92	8.83	89	1	88	115	20
m- & p-Xylene	1.0	<LOR	10	9.19	9.00	91	2	89	115	20
o-Xylene	1.0	<LOR	10	9.32	9.06	92	3	89	114	20

COMMENTS :

1) The control limits are based on ALS laboratory statistical data (Method QWI-ORG/07).
2) * : Recovery or RPD falls outside the recommended control limit.
3) MDL = Method Detection Limit
4) LOR = Level Of Reporting

BATCH QUALITY CONTROL -- CONTROL SPIKE/DUPLICATE

ALS EP-075 : Semivolatile Organic Compounds

QC LOT No. : NSVOCW1284 ANALYST ALICE TAT

MATRIX: Waters

	Blank	Spike	SPIKE QC RESULTS				Control Limits		
	Conc	Level	SCS Rec.	DCS Rec.	Average Rec.	RPD	Rec.		RPD
COMPOUND	ug/L	ug/L	%		%	%	Low	High	%
EP-075A : PHENOLS									
Phenol	<0.5	5.0	35.7	31.7	33.7	11.9	27.2	53.6	0 - 35
2-Chlorophenol	<0.3	5.0	78.8	71.2	75	10.1	62.4	112	0 - 35
2-Methylphenol	<0.5	5.0	68.3	63	65.7	8.07	50.8	108	0 - 35
4-Methylphenol	<0.5	10.0	60.9	54.8	57.9	10.5	49.9	95.9	0 - 35
2-Nitrophenol	<0.5	5.0	65.5	61.8	63.7	5.81	55.4	119	0 - 35
2,4-Dimethylphenol	<0.5	5.0	78.1	69.9	74	11.1	63.5	107	0 - 35
2,4-Dichlorophenol	<0.3	5.0	73.6	68.7	71.2	6.89	59.4	112	0 - 35
2,6-Dichlorophenol	<0.3	5.0	55.9	61.4	58.7 *	9.38	66	109	0 - 35
4-Chloro-3-methylphenol	<0.3	5.0	73.9	66.3	70.1	10.8	58.1	111	0 - 35
2,4,6-Trichlorophenol	<0.3	5.0	75.6	58.4	67	25.7	57.4	110	0 - 35
2,4,5-Trichlorophenol	<0.3	5.0	73.1	62	67.6	16.4	49.5	112	0 - 35
Pentachlorophenol	<0.3	10.0	58.2	43.5	50.9	28.9	6.45	124	0 - 35
EP-075B : POLYAROMATIC HYDROCARBONS									
Naphthalene	<0.5	5.0	99.6	72.6	86.1	31.4	66.2	111	0 - 35
2-Methylnaphthalene	<0.5	5.0	78.3	67.3	72.8	15.1	63	112	0 - 35
2-Chloronaphthalene	<0.5	5.0	76.6	67.6	72.1	12.5	64.6	109	0 - 35
Acenaphthylene	<0.5	5.0	77.2	69.4	73.3	10.6	63.1	111	0 - 35
Acenaphthene	<0.5	5.0	78.7	69.1	73.9	13	66.5	114	0 - 35
Fluorene	<0.5	5.0	80.8	68.1	74.5	17.1	65.4	111	0 - 35
Phenanthrene	<0.5	5.0	80	72.1	76.1	10.4	66.5	115	0 - 35
Anthracene	<0.5	5.0	77	66.7	71.9	14.3	66.9	115	0 - 35
Fluoranthene	<0.5	5.0	75.1	69.8	72.5	7.32	62.1	118	0 - 35
Pyrene	0.529	5.0	82.2	63.1	72.7	26.3	64.6	116	0 - 35
N-2-Fluorenylacetamide	<0.5	5.0	69.9	63	66.5	10.4	56.7	114	0 - 35
Benz(a)anthracene	<0.5	5.0	80	72	76	10.5	66	115	0 - 35
Chrysene	<0.5	5.0	68	60.7	64.4 *	11.3	66.8	116	0 - 35
Benzo(b)&(k)fluoranthene	<1.0	10.0	75.7	66.4	71.1	13.1	67.3	110	0 - 35
7,12-Dimethylbenz(a)anthracene	<0.5	5.0	66.7	58.7	62.7	12.8	52.1	98.3	0 - 35
Benzo(a)pyrene	<0.3	5.0	81	71.6	76.3	12.3	65.7	109	0 - 35
3-Methylchloanthrene	<0.5	5.0	89.7	75.4	82.6	17.3	59.7	111	0 - 35
Indeno(1,2,3-cd)pyrene	<0.5	5.0	83.3	71.5	77.4	15.2	60.8	110	0 - 35
Dibenz(a,h)anthracene	<0.5	5.0	80.6	69.3	75	15.1	61.1	110	0 - 35
Benzo(g,h,i)perylene	<0.5	5.0	88.2	78.2	83.2	12	57.9	114	0 - 35

BATCH QUALITY CONTROL -- CONTROL SPIKE/DUPLICA

ALS EP-075 : Semivolatile Organic Compounds

QC LOT No. : NSVOCW1284 ANALYST ALICE T

MATRIX: Waters

COMPOUND	Blank Conc	Spike Level	SPIKE QC RESULTS			
			SCS Rec.	DCS Rec.	Average Rec.	RPD
	ug/L	ug/L	%		%	%
EP-075S : ACID EXTRACTABLE SURROGATES						
2-Fluorophenol	59.4%	10.0	58.5	51.9	55.2	12
Phenol-d6	35.2%	10.0	37.7	32.2	35	15.7
2-Chlorophenol-d4	83.2%	10.0	87.2	75.7	81.5	14.1
2,4,6-Tribromophenol	80.4%	10.0	45.4	53.6	49.5 *	16.6
EP-075T : BASE/NEUTRAL EXTRACTABLE SURROGATES						
Nitrobenzene-d5	86.7%	10.0	90.3	79.3	84.8	13
1,2-Dichlorobenzene-d4	65.1%	10.0	74.5	64.5	69.5	14.4
2-Fluorobiphenyl	74.3%	10.0	81.5	71.6	76.6	12.9
Anthracene-d10	90.5%	10.0	94.7	82	88.4	14.4
4-Terphenyl-d14	88.7%	10.0	95.6	80.6	88.1	17

ALS Environmental

ORGANICS QUALITY CONTROL REPORT

BATCH NO: NE9122

DATE BATCH RECEIVED: 7/02/2003

CLIENT: Haztech Industries

DATE BATCH COMPLETED: 28/02/2003

PROJECT: ghd

Method Code	Test	Matrix	Method Reference		QC Lot Number	Date Samples Extracted	Date Samples Analysed
			Extraction	Analysis			
EP-071	TPH(SV)	Water	USEPA 3510B	USEPA 8015A	NTPHW1378	15/02/03	24/02/03
EP-071/80	TPH(V)/BTEX	Water	USEPA 5030A	USEPA 8260A	NVOCW1378	17/02/03	26/02/03
EP-075	SV Scan	Water	USEPA 3510B	USEPA 8270B	NSVOCW1273	15/02/03	16/02/03

Where applicable, internal standards are added to sample extracts prior to instrumental analysis. Absolute peak areas and retention times fall within the criteria specified in the individual methods. Continuing Calibration (CC) standards are run at the frequency of 1 in every 20 samples.

Abbreviations: SV = semivolatile, V = volatile

*: In-house methods

A Campbell Brothers Limited Company

BATCH QUALITY CONTROL - CONTROL SPIKE/DUPLICATE

ALS EP-071 : Total Petroleum Hydrocarbons by Fractions

Vol QC Lot : NVOCW 1378 MATRIX : Water
Semi-Vol QC Lot : NTPHW1378

COMPOUND	BATCH ADJ. (MDL)	Blank Conc.	Spike Conc.	Spike Results				Control Limits		
				SCS Conc.	DCS Conc.	Av. Rec.	RPD	Recovery %		RPD
	ug/L	ug/L	ug/L	ug/L	ug/L	%	%	Low	High	%
C6-C9	20	<LOR	200	203	205	102	1	94	106	20
C10-C14	25	<LOR	200	177	174	88	2	72	119	20
C15-C28	25	<LOR	200	213	206	105	3	88	115	20
C29-C36	25	<LOR	200	199	192	98	4	83	117	20

COMMENTS:

1) The control limits are based on ALS laboratory statistical data (Method QWI-ORG/07).
2) * : Recovery or RPD falls outside the recommended control limit.
3) MDL = Method Detection Limit
4) LOR = Level Of Reporting

BATCH QUALITY CONTROL - CONTROL SPIKE/DUPLICATE

ALS EP-080 : BTEX ANALYSIS

QC Lot No. : NVOCW 1378 MATRIX : Water

COMPOUND	BATCH ADJ. (MDL)	Blank Conc.	Spike Conc.	Spike Results				Control Limits		
				SCS Conc.	DCS Conc.	Av. Rec.	RPD	Recovery %		RPD
	ug/L	ug/L	ug/L	ug/L	ug/L	%	%	Low	High	%
Benzene	1.0	<LOR	10	10.46	10.15	103	3	87	115	20
Toluene	1.0	<LOR	10	9.95	9.20	96	8	87	114	20
Chlorobenzene	1.0	<LOR	10	10.86	9.24	101	16	89	112	20
Ethylbenzene	1.0	<LOR	10	10.85	10.25	106	6	88	115	20
m- & p-Xylene	1.0	<LOR	10	10.48	9.66	101	8	89	115	20
o-Xylene	1.0	<LOR	10	10.77	9.86	103	9	89	114	20

COMMENTS :

1) The control limits are based on ALS laboratory statistical data (Method QWI-ORG/07).
2) * : Recovery or RPD falls outside the recommended control limit.
3) MDL = Method Detection Limit
4) LOR = Level Of Reporting

BATCH QUALITY CONTROL -- CONTROL SPIKE/DUPLICATE

ALS EP-075 : Semivolatile Organic Compounds

QC LOT No. : NSVOCW1273 ANALYST ALICE TAT

MATRIX: Waters

	Blank	Spike	SPIKE QC RESULTS				Control Limits		
	Conc	Level	SCS Rec.	DCS Rec.	Average Rec.	RPD	Rec.		RPD
COMPOUND	ug/L	ug/L	%		%	%	Low	High	%
EP-075A : PHENOLS									
Phenol	<0.5	5.0	38.2	45.3	41.8	17	27.2	53.6	0 - 35
2-Chlorophenol	<0.3	5.0	83.7	96.5	90.1	14.2	62.4	112	0 - 35
2-Methylphenol	<0.5	5.0	74.8	87.4	81.1	15.5	50.8	108	0 - 35
4-Methylphenol	<0.5	10.0	66.3	78.4	72.4	16.7	49.9	95.9	0 - 35
2-Nitrophenol	<0.5	5.0	77.7	93.4	85.6	18.4	55.4	119	0 - 35
2,4-Dimethylphenol	<0.5	5.0	85.4	97.1	91.3	12.8	63.5	107	0 - 35
2,4-Dichlorophenol	<0.3	5.0	80.9	96.6	88.8	17.7	59.4	112	0 - 35
2,6-Dichlorophenol	<0.3	5.0	79.5	94.6	87.1	17.3	66	109	0 - 35
4-Chloro-3-methylphenol	<0.3	5.0	81.9	95	88.5	14.8	58.1	111	0 - 35
2,4,6-Trichlorophenol	<0.3	5.0	76.2	90.2	83.2	16.8	57.4	110	0 - 35
2,4,5-Trichlorophenol	<0.3	5.0	76.9	90.3	83.6	16	49.5	112	0 - 35
Pentachlorophenol	<0.3	10.0	21.2	32.2	26.7	41.2 *	6.45	124	0 - 35
EP-075B : POLYAROMATIC HYDROCARBONS									
Naphthalene	<0.5	5.0	80.8	94	87.4	15.1	66.2	111	0 - 35
2-Methylnaphthalene	<0.5	5.0	78.2	90	84.1	14	63	112	0 - 35
2-Chloronaphthalene	<0.5	5.0	79.1	90.4	84.8	13.3	64.6	109	0 - 35
Acenaphthylene	<0.5	5.0	84	95.7	89.9	13	63.1	111	0 - 35
Acenaphthene	<0.5	5.0	81.5	95.9	88.7	16.2	66.5	114	0 - 35
Fluorene	<0.5	5.0	85.9	99.2	92.6	14.4	65.4	111	0 - 35
Phenanthrene	<0.5	5.0	85.2	105	95.1	20.8	66.5	115	0 - 35
Anthracene	<0.5	5.0	82.2	94.2	88.2	13.6	66.9	115	0 - 35
Fluoranthene	<0.5	5.0	80.8	92.9	86.9	13.9	62.1	118	0 - 35
Pyrene	<0.5	5.0	86.3	99.4	92.9	14.1	64.6	116	0 - 35
N-2-Fluorenylacetamide	<0.5	5.0	90.3	102	96.2	12.2	56.7	114	0 - 35
Benz(a)anthracene	<0.5	5.0	88.8	101	94.9	12.9	66	115	0 - 35
Chrysene	<0.5	5.0	80.9	92.8	86.9	13.7	66.8	116	0 - 35
Benzo(b)&(k)fluoranthene	<1.0	10.0	82.5	95.9	89.2	15	67.3	110	0 - 35
7,12-Dimethylbenz(a)anthracene	<0.5	5.0	71.3	85.4	78.4	18	52.1	98.3	0 - 35
Benzo(a)pyrene	<0.3	5.0	82.4	94.7	88.6	13.9	65.7	109	0 - 35
3-Methylchloanthrene	<0.5	5.0	84.1	99.9	92	17.2	59.7	111	0 - 35
Indeno(1,2,3-cd)pyrene	<0.5	5.0	81.3	95.8	88.6	16.4	60.8	110	0 - 35
Dibenz(a,h)anthracene	<0.5	5.0	79	93.8	86.4	17.1	61.1	110	0 - 35
Benzo(g,h,i)perylene	<0.5	5.0	82.9	98.5	90.7	17.2	57.9	114	0 - 35

BATCH QUALITY CONTROL -- CONTROL SPIKE/DUPLICATE

ALS EP-075 : Semivolatile Organic Compounds

QC LOT No. : NSVOCW1273 ANALYST ALICE TAT

MATRIX: Waters

	Blank	Spike	SPIKE QC RESULTS				Control Limits		
	Conc	Level	SCS Rec.	DCS Rec.	Average Rec.	RPD	Rec.		RPD
COMPOUND	ug/L	ug/L	%		%	%	Low	High	%
EP-075S : ACID EXTRACTABLE SURROGATES									
2-Fluorophenol	60.8%	10.0	56.1	62.8	59.5	11.3	42.3	82	0 - 35
Phenol-d6	39%	10.0	33.5	40.3	36.9	18.4	28.2	49.3	0 - 35
2-Chlorophenol-d4	87.9%	10.0	85.3	95.7	90.5	11.5	65.2	113	0 - 35
2,4,6-Tribromophenol	73.6%	10.0	85.1	103	94.1	19	60.7	114	0 - 35
EP-075T : BASE/NEUTRAL EXTRACTABLE SURROGATES									
Nitrobenzene-d5	89.9%	10.0	86.2	99.5	92.9	14.3	65.6	120	0 - 35
1,2-Dichlorobenzene-d4	60.1%	10.0	59.8	70.4	65.1	16.3	50.3	102	0 - 35
2-Fluorobiphenyl	75.4%	10.0	78.2	91.3	84.8	15.5	57	113	0 - 35
Anthracene-d10	91.1%	10.0	88.7	103	95.9	14.9	64.3	115	0 - 35
4-Terphenyl-d14	90.5%	10.0	88.5	99.3	93.9	11.5	55.4	114	0 - 35

BATCH QUALITY CONTROL - CONTROL SPIKE/DUPLICATE

ALS EP-071 : Total Petroleum Hydrocarbons by Fractions

Vol QC Lot : NVOCW1385
Semi-Vol QC Lot : NTPHW1385

MATRIX : Water

COMPOUND	BATCH ADJ. (MDL)	Blank Conc.	Spike Conc.	Spike Results				Control Limits		
				SCS Conc.	DCS Conc.	Av. Rec.	RPD	Recovery %		RPD
	ug/L	ug/L	ug/L	ug/L	ug/L	%	%	Low	High	%
C6-C9	20	<LOR	200	190	203	98	6	94	106	20
C10-C14	25	<LOR	200	204	218	106	7	72	119	20
C15-C28	25	<LOR	200	179	192	93	7	88	115	20
C29-C36	25	<LOR	200	219	216	109	1	83	117	20

COMMENTS:

1) The control limits are based on ALS laboratory statistical data (Method QWI-ORG/07).
2) * : Recovery or RPD falls outside the recommended control limit.
3) MDL = Method Detection Limit
4) LOR = Level Of Reporting

BATCH QUALITY CONTROL - CONTROL SPIKE/DUPLICATE

ALS EP-080 : BTEX ANALYSIS

QC Lot No. : NVOCW1385 MATRIX : Water

COMPOUND	BATCH ADJ. (MDL)	Blank Conc.	Spike Conc.	Spike Results				Control Limits		
				SCS Conc.	DCS Conc.	Av. Rec.	RPD	Recovery %		RPD
	ug/L	ug/L	ug/L	ug/L	ug/L	%	%	Low	High	%
Benzene	1.0	<LOR	10	9.37	9.59	95	2	87	115	20
Toluene	1.0	<LOR	10	9.45	10.19	98	8	87	114	20
Chlorobenzene	1.0	<LOR	10	9.57	11.33	105	17	89	112	20
Ethylbenzene	1.0	<LOR	10	9.39	10.02	97	6	88	115	20
m- & p-Xylene	1.0	<LOR	10	9.39	10.18	98	8	89	115	20
o-Xylene	1.0	<LOR	10	9.17	10.35	98	12	89	114	20

COMMENTS :

1) The control limits are based on ALS laboratory statistical data (Method QWI-ORG/07).
2) * : Recovery or RPD falls outside the recommended control limit.
3) MDL = Method Detection Limit
4) LOR = Level Of Reporting

BATCH QUALITY CONTROL -- CONTROL SPIKE/DUPLICATE

ALS EP-075 : Semivolatile Organic Compounds

QC LOT No. : NSVOCW1278 ANALYST ALICE TAT

MATRIX: Waters

	Blank	Spike	SPIKE QC RESULTS				Control Limits		
	Conc	Level	SCS Rec.	DCS Rec.	Average Rec.	RPD	Rec.		RPD
COMPOUND	ug/L	ug/L	%		%	%	Low	High	%
EP-075A : PHENOLS									
Phenol	<0.5	5.0	50.6	50.3	50.5	0.6	27.2	53.6	0 - 35
2-Chlorophenol	<0.3	5.0	109	105	107	3.74	62.4	112	0 - 35
2-Methylphenol	<0.5	5.0	85.4	83.2	84.3	2.61	50.8	108	0 - 35
4-Methylphenol	<0.5	10.0	87.1	83	85.1	4.82	49.9	95.9	0 - 35
2-Nitrophenol	<0.5	5.0	96	95.8	95.9	0.21	55.4	119	0 - 35
2,4-Dimethylphenol	<0.5	5.0	99.2	97.3	98.3	1.93	63.5	107	0 - 35
2,4-Dichlorophenol	<0.3	5.0	97.8	95.6	96.7	2.28	59.4	112	0 - 35
2,6-Dichlorophenol	<0.3	5.0	101	99.8	100	1.2	66	109	0 - 35
4-Chloro-3-methylphenol	<0.3	5.0	103	104	104	0.97	58.1	111	0 - 35
2,4,6-Trichlorophenol	<0.3	5.0	94.1	87.1	90.6	7.73	57.4	110	0 - 35
2,4,5-Trichlorophenol	<0.3	5.0	93.1	90.3	91.7	3.05	49.5	112	0 - 35
Pentachlorophenol	<0.3	10.0	19.8	19.4	19.6	2.04	6.45	124	0 - 35
EP-075B : POLYAROMATIC HYDROCARBONS									
Naphthalene	<0.5	5.0	92.6	90.9	91.8	1.85	66.2	111	0 - 35
2-Methylnaphthalene	<0.5	5.0	88.4	87	87.7	1.6	63	112	0 - 35
2-Chloronaphthalene	<0.5	5.0	92.4	93.2	92.8	0.86	64.6	109	0 - 35
Acenaphthylene	<0.5	5.0	99.5	97.9	98.7	1.62	63.1	111	0 - 35
Acenaphthene	*<0.5*	*5.0*	*103*	*103*	*103*	*0*	66.5	*114*	0 - 35
Fluorene	<0.5	5.0	107	104	106	2.84	65.4	111	0 - 35
Phenanthrene	<0.5	5.0	109	106	108	2.79	66.5	115	0 - 35
Anthracene	<0.5	5.0	105	108	107	2.82	66.9	115	0 - 35
Fluoranthene	<0.5	5.0	107	106	107	0.94	62.1	118	0 - 35
Pyrene	<0.5	5.0	108	107	108	0.93	64.6	116	0 - 35
N-2-Fluorenylacetamide	<0.5	5.0	117	115	116 *	1.72	56.7	114	0 - 35
Benz(a)anthracene	<0.5	5.0	109	107	108	1.85	66	115	0 - 35
Chrysene	<0.5	5.0	106	105	106	0.95	66.8	116	0 - 35
Benzo(b)&(k)fluoranthene	<1.0	10.0	109	108	109	0.92	67.3	110	0 - 35
7,12-Dimethylbenz(a)anthracene	<0.5	5.0	105	105	105 *	0	52.1	98.3	0 - 35
Benzo(a)pyrene	<0.3	5.0	108	107	108	0.93	65.7	109	0 - 35
3-Methylchloanthrene	<0.5	5.0	111	108	110	2.74	59.7	111	0 - 35
Indeno(1,2,3-cd)pyrene	<0.5	5.0	107	107	107	0	60.8	110	0 - 35
Dibenz(a,h)anthracene	<0.5	5.0	105	105	105	0	61.1	110	0 - 35
Benzo(g,h,i)perylene	<0.5	5.0	114	112	113	1.77	57.9	114	0 - 35

BATCH QUALITY CONTROL -- CONTROL SPIKE/DUPLICATE

ALS EP-075 : Semivolatile Organic Compounds

QC LOT No. : NSVOCW1278 ANALYST ALICE TAT

MATRIX: Waters

	Blank	Spike	SPIKE QC RESULTS				Control Limits		
	Conc	Level	SCS Rec.	DCS Rec.	Average Rec.	RPD	Rec.		RPD
COMPOUND	ug/L	ug/L	%		%	%	Low	High	%
EP-075S : ACID EXTRACTABLE SURROGATES									
2-Fluorophenol	80%	10.0	98.7	98.5	98.6 *	0.2	42.3	82	0 - 35
Phenol-d6	39.3%	10.0	53.3	51.7	52.5 *	3.05	28.2	49.3	0 - 35
2-Chlorophenol-d4	93.6%	10.0	115	113	114 *	1.75	65.2	113	0 - 35
2,4,6-Tribromophenol	64.2%	10.0	102	97.8	99.9	4.2	60.7	114	0 - 35
EP-075T : BASE/NEUTRAL EXTRACTABLE SURROGATES									
Nitrobenzene-d5	99.2%	10.0	111	110	111	0.91	65.6	120	0 - 35
1,2-Dichlorobenzene-d4	73.6%	10.0	97.2	96.7	97	0.52	50.3	102	0 - 35
2-Fluorobiphenyl	85.7%	10.0	107	105	106	1.89	57	113	0 - 35
Anthracene-d10	112%	10.0	117	114	116 *	2.6	64.3	115	0 - 35
4-Terphenyl-d14	108%	10.0	116	114	115 *	1.74	55.4	114	0 - 35

HUNTER WATER LABORATORIES
MATERIALS TESTING LABORATORY
CONCRETE TEST RESULTS

Hunter Water Australia

NATA Accreditation No 3228

CLIENT: Haztech Industries Pty Ltd

ADDRESS: PO Box 32 Gallaghan NSW 2308

CONTACT: Karl Baltpurvins **PROJECT:** UCS Evaluation

SAMPLED BY: Client **DATE RECEIVED:** 12 Feb 2003

The concrete was not sampled by this laboratory. Data reported on initial curing, consistence and age at test is not covered by this NATA Accreditation, therefore note 2 does not apply.

LABORATORY REF No: 0052

The following test results were obtained by our laboratory for concrete speciements supplied by you for testing

REPORT No: 887

Details Supplied by Client				Details of Test Specimens and Results											
Date Sampled	Time Sampled	Slump (mm)	Initial Curing (hrs) Note 4	Client Specimen Identification	Condition When Received	Date of Test	Age of Test (days) Note 4	Specimen Dimensions		Mass (g)	Cross Section Area (mm^2)	Mass per Unit Volume (kg/m^3)	Load Max (kN)	Compressive Strength (MPa)	
								Diameter (mm)	Height (mm)					Actual	Required
26/1/03	N/A	N/A	N/A	10	Dry	12/2/03	15	99.9	198	1869	7838	1190	26	3.3	N/A

REMARKS:

NOTE 1: Tests on speciemens in accordance with AS1012.8.1 clause 9.3.9 and 12.1

NOTE 2: Standard temperature zone

NOTE 3: All speciments capped with ✓ 1.= Sulphur
2 = Portland Cement Mortar
3 = Cement Fondu Mortar
4 = Rubber

NOTE 4: Age of specimen based on date of casting as advised by client

The code used for comment is:

0 = Conical Fracture
✓ 1 = Shear Failure
2 = Cap Failure
3 = Damaged Specimens
4 = Convex end
5 = Concave end
6 = Ends non perp. to axis
7 = Non std. dimensions

DBell

DAVID BELL
Approved Signatory

14 . 2 03

Date

HUNTER WATER LABORATORIES
MATERIALS TESTING LABORATORY
CONCRETE TEST RESULTS

Hunter Water Australia

NATA Accreditation No 3228

CLIENT: Haztech Industries Pty Ltd

ADDRESS: PO Box 32 Gallaghan NSW 2308

CONTACT: Karl Baltpurvins **PROJECT:** UCS Evaluation

SAMPLED BY: Client **DATE RECEIVED:** 24 February 03

The concrete was not sampled by this laboratory. Data reported on initial curing, consistence and age at test is not covered by this NATA Accreditation, therefore note 2 does not apply.

LABORATORY REF No: 0054

The following test results were obtained by our laboratory for concrete speciements supplied by you for testing

REPORT No: 908

Details Supplied by Client				Details of Test Specimens and Results												
Date Sampled	Time Sampled	Slump (mm)	Initial Curing (hrs) Note 4	Client Specimen Identification	Condition When Received	Date of Test	Age of Test (days) Note 4	Specimen Dimensions Diameter (mm)	Specimen Dimensions Height (mm)	Mass (g)	Cross Section Area (mm^2)	Mass per Unit Volume (kg/m^3)	Load Max (kN)	Compressive Strength (MPa) Actual	Compressive Strength (MPa) Required
N/A	N/A	N/A	N/A	11	Dry	26/2/03	N/A	99.4	198	2228	7760	1418	24	3.1	N/A

REMARKS:

NOTE 1: Tests on speciemens in accordance with AS1012.8.1 clause 9.3.9 and 12.1

NOTE 2: Standard temperature zone

NOTE 3: All speciments capped with ✓
1.= Sulphur
2 = Portland Cement Mortar
3 = Cement Fondu Mortar
4 = Rubber

NOTE 4: Age of specimen based on date of casting as advised by client

The code used for comment is:

0 = Conical Fracture
✓ 1 = Shear Failure
2 = Cap Failure
3 = Damaged Specimens
4 = Convex end
5 = Concave end
6 = Ends non perp. to axis
7 = Non std. dimensions

DBell

DAVID BELL
Approved Signatory

26 . 2 . 03

Date

Hunter Water Australia

HUNTER WATER LABORATORIES
MATERIALS TESTING LABORATORY
CONCRETE TEST RESULTS

NATA Accreditation No 3228

CLIENT: Haztech Industries Pty Ltd

ADDRESS: PO Box 32 Gallaghan NSW 2308

CONTACT: Karl Baltpurvins **PROJECT:** UCS Evaluation

SAMPLED BY: Client **DATE RECEIVED:** 24 February 03

The concrete was not sampled by this laboratory. Data reported on initial curing, consistence and age at test is not covered by this NATA Accreditation, therefore note 2 does not apply.

LABORATORY REF No: 0054

The following test results were obtained by our laboratory for concrete speciements supplied by you for testing

REPORT No: 909

Details Supplied by Client				Details of Test Specimens and Results											
Date Sampled	Time Sampled	Slump (mm)	Initial Curing (hrs) Note 4	Client Specimen Identification	Condition When Received	Date of Test	Age of Test (days) Note 4	Specimen Dimensions Diameter (mm)	Specimen Dimensions Height (mm)	Mass (g)	Cross Section Area (mm^2)	Mass per Unit Volume (kg/m^3)	Load Max (kN)	Compressive Strength (MPa) Actual	Compressive Strength (MPa) Required
N/A	N/A	N/A	N/A	12	Dry	26/2/03	N/A	99.0	198	2058	7698	1310	14	1.8	N/A

REMARKS:

NOTE 1: Tests on speciemens in accordance with AS1012.8.1 clause 9.3.9 and 12.1

NOTE 2: Standard temperature zone

NOTE 3: All speciments capped with ✓ 1.= Sulphur
2 = Portland Cement Mortar
3 = Cement Fondu Mortar
4 = Rubber

NOTE 4: Age of specimen based on date of casting as advised by client

The code used for comment is:

0 = Conical Fracture
✓ 1 = Shear Failure
2 = Cap Failure
3 = Damaged Specimens
4 = Convex end
5 = Concave end
6 = Ends non perp. to axis
7 = Non std. dimensions

DBell

DAVID BELL
Approved Signatory

26 - 2 - 03

Date

HUNTER WATER LABORATORIES
MATERIALS TESTING LABORATORY
CONCRETE TEST RESULTS

Hunter Water Australia

NATA Accreditation No 3228

CLIENT: Haztech Industries Pty Ltd

ADDRESS: PO Box 32 Gallaghan NSW 2308

CONTACT: Karl Baltpurvins **PROJECT:** UCS Evaluation

SAMPLED BY: Client **DATE RECEIVED:** 12 Feb 2003

The concrete was not sampled by this laboratory. Data reported on initial curing, consistence and age at test is not covered by this NATA Accreditation, therefore note 2 does not apply.

LABORATORY REF No: 0052

The following test results were obtained by our laboratory for concrete speciements supplied by you for testing

REPORT No: 889

Details Supplied by Client				Details of Test Specimens and Results											
Date Sampled	Time Sampled	Slump (mm)	Initial Curing (hrs) **Note 4**	Client Specimen Identification	Condition When Received	Date of Test	Age of Test (days) **Note 4**	Specimen Dimensions Diameter (mm)	Specimen Dimensions Height (mm)	Mass (g)	Cross Section Area (mm^2)	Mass per Unit Volume (kg/m^3)	Load Max (kN)	Compressive Strength (MPa) Actual	Compressive Strength (MPa) Required
26/1/03	N/A	N/A	N/A	S 13	Dry	12/2/03	15	99.8	185	1897	7823	1208	30	3.8	N/A

REMARKS: Poorly moulded sample

NOTE 1: Tests on speciemens in accordance with AS1012.8.1 clause 9.3.9 and 12.1

NOTE 2: Standard temperature zone

NOTE 3: All speciments capped with ✓ 1.= Sulphur
2 = Portland Cement Mortar
3 = Cement Fondu Mortar
4 = Rubber

NOTE 4: Age of specimen based on date of casting as advised by client

The code used for comment is:

0 = Conical Fracture
✓ 1 = Shear Failure
2 = Cap Failure
3 = Damaged Specimens
4 = Convex end
5 = Concave end
6 = Ends non perp. to axis
7 = Non std. dimensions

DBell

DAVID BELL
Approved Signatory

14.2.03

Date

HUNTER WATER LABORATORIES
MATERIALS TESTING LABORATORY
CONCRETE TEST RESULTS

Hunter Water Australia

NATA Accreditation No 3228

CLIENT: Haztech Industries Pty Ltd

ADDRESS: PO Box 32 Gallaghan NSW 2308

CONTACT: Karl Baltpurvins **PROJECT:** UCS Evaluation

SAMPLED BY: Client **DATE RECEIVED:** 24 February 03

The concrete was not sampled by this laboratory. Data reported on initial curing, consistence and age at test is not covered by this NATA Accreditation, therefore note 2 does not apply.

The following test results were obtained by our laboratory for concrete speciements supplied by you for testing

LABORATORY REF No: 0054

REPORT No: 910

Details Supplied by Client				Details of Test Specimens and Results												
Date Sampled	Time Sampled	Slump (mm)	Initial Curing (hrs) **Note 4**	Client Specimen Identification	Condition When Received	Date of Test	Age of Test (days) **Note 4**	Specimen Dimensions Diameter (mm)	Specimen Dimensions Height (mm)	Mass (g)	Cross Section Area (mm^2)	Mass per Unit Volume (kg/m^3)	Load Max (kN)	Compressive Strength (MPa) Actual	Compressive Strength (MPa) Required
N/A	N/A	N/A	N/A	14	Dry	26/2/03	N/A	99.0	200	2029	7698	1292	14	1.8	N/A

REMARKS:

NOTE 1: Tests on speciemens in accordance with AS1012.8.1 clause 9.3.9 and 12.1

NOTE 2: Standard temperature zone

NOTE 3: All speciments capped with ✓ 1.= Sulphur
2 = Portland Cement Mortar
3 = Cement Fondu Mortar
4 = Rubber

NOTE 4: Age of specimen based on date of casting as advised by client

The code used for comment is:

0 = Conical Fracture
✓ 1 = Shear Failure
2 = Cap Failure
3 = Damaged Specimens
4 = Convex end
5 = Concave end
6 = Ends non perp. to axis
7 = Non std. dimensions

DBell

DAVID BELL
Approved Signatory

26 . 2 . 03

Date

HUNTER WATER LABORATORIES
MATERIALS TESTING LABORATORY
CONCRETE TEST RESULTS

HunterWater Australia

NATA Accreditation No 3228

CLIENT: Haztech Industries Pty Ltd

ADDRESS: PO Box 32 Gallaghan NSW 2308

CONTACT: Karl Baltpurvins **PROJECT:** UCS Evaluation

SAMPLED BY: Client **DATE RECEIVED:** 24 February 03

The concrete was not sampled by this laboratory. Data reported on initial curing, consistence and age at test is not covered by this NATA Accreditation, therefore note 2 does not apply.

The following test results were obtained by our laboratory for concrete speciements supplied by you for testing

LABORATORY REF No: 0054

REPORT No: 911

Details Supplied by Client				Details of Test Specimens and Results											
Date Sampled	Time Sampled	Slump (mm)	Initial Curing (hrs) Note 4	Client Specimen Identification	Condition When Received	Date of Test	Age of Test (days) Note 4	Specimen Dimensions		Mass (g)	Cross Section Area (mm^2)	Mass per Unit Volume (kg/m^3)	Load Max (kN)	Compressive Strength (MPa)	
								Diameter (mm)	Height (mm)					Actual	Required
N/A	N/A	N/A	N/A	15	Dry	26/2/03	N/A	99.3	196	2077	7744	1322	12	1.5	N/A

REMARKS:

NOTE 1: Tests on speciemens in accordance with AS1012.8.1 clause 9.3.9 and 12.1

NOTE 2: Standard temperature zone

NOTE 3: All speciments capped with ✓ 1.= Sulphur
2 = Portland Cement Mortar
3 = Cement Fondu Mortar
4 = Rubber

NOTE 4: Age of specimen based on date of casting as advised by client

The code used for comment is:

0 = Conical Fracture
✓ 1 = Shear Failure
2 = Cap Failure
3 = Damaged Specimens
4 = Convex end
5 = Concave end
6 = Ends non perp. to axis
7 = Non std. dimensions

DBell

DAVID BELL
Approved Signatory

26 . 2 . 03

Date

Hunter Water Australia

HUNTER WATER LABORATORIES
MATERIALS TESTING LABORATORY
CONCRETE TEST RESULTS

NATA Accreditation No 3228

CLIENT: Haztech Industries Pty Ltd

ADDRESS: PO Box 32 Gallaghan NSW 2308

CONTACT: Karl Baltpurvins **PROJECT:** UCS Evaluation

SAMPLED BY: Client **DATE RECEIVED:** 12 Feb 2003

The concrete was not sampled by this laboratory. Data reported on initial curing, consistence and age at test is not covered by this NATA Accreditation, therefore note 2 does not apply.

LABORATORY REF No: 0052

The following test results were obtained by our laboratory for concrete speciements supplied by you for testing

REPORT No: 882

Details Supplied by Client				Details of Test Specimens and Results												
Date Sampled	Time Sampled	Slump (mm)	Initial Curing (hrs) **Note 4**	Client Specimen Identification	Condition When Received	Date of Test	Age of Test (days) **Note 4**	Specimen Dimensions		Mass (g)	Cross Section Area (mm^2)	Mass per Unit Volume (kg/m^3)	Load Max (kN)	Compressive Strength (MPa)	
								Diameter (mm)	Height (mm)					Actual	Required
26/1/03	N/A	N/A	N/A	16	Dry	12/2/03	15	100.0	198	2474	7854	1591	52	6.6	N/A

REMARKS:

NOTE 1: Tests on speciemens in accordance with AS1012.8.1 clause 9.3.9 and 12.1

NOTE 2: Standard temperature zone

NOTE 3: All speciments capped with ✓
- 1.= Sulphur
- 2 = Portland Cement Mortar
- 3 = Cement Fondu Mortar
- 4 = Rubber

The code used for comment is:
- 0 = Conical Fracture
- ✓ 1 = Shear Failure
- 2 = Cap Failure
- 3 = Damaged Specimens
- 4 = Convex end
- 5 = Concave end
- 6 = Ends non perp. to axis
- 7 = Non std. dimensions

NOTE 4: Age of specimen based on date of casting as advised by client

DBell

DAVID BELL
Approved Signatory

14 . 2 . 03

Date

HUNTER WATER LABORATORIES
MATERIALS TESTING LABORATORY
CONCRETE TEST RESULTS

Hunter Water Australia

NATA Accreditation No 3228

CLIENT: Haztech Industries Pty Ltd

ADDRESS: PO Box 32 Gallaghan NSW 2308

CONTACT: Karl Baltpurvins **PROJECT:** UCS Evaluation

SAMPLED BY: Client **DATE RECEIVED:** 24 February 03

The concrete was not sampled by this laboratory. Data reported on initial curing, consistence and age at test is not covered by this NATA Accreditation, therefore note 2 does not apply.

LABORATORY REF No: 0054

The following test results were obtained by our laboratory for concrete speciements supplied by you for testing

REPORT No: 912

Details Supplied by Client				Details of Test Specimens and Results											
Date Sampled	Time Sampled	Slump (mm)	Initial Curing (hrs) Note 4	Client Specimen Identification	Condition When Received	Date of Test	Age of Test (days) Note 4	Specimen Dimensions		Mass (g)	Cross Section Area (mm^2)	Mass per Unit Volume (kg/m^3)	Load Max (kN)	Compressive Strength (MPa)	
								Diameter (mm)	Height (mm)					Actual	Required
N/A	N/A	N/A	N/A	17	Dry	26/2/03	N/A	99.8	200	2544	7823	1620	44	5.6	N/A

REMARKS:

NOTE 1: Tests on speciemens in accordance with AS1012.8.1 clause 9.3.9 and 12.1

NOTE 2: Standard temperature zone

NOTE 3: All speciments capped with ✓ 1.= Sulphur
2 = Portland Cement Mortar
3 = Cement Fondu Mortar
4 = Rubber

NOTE 4: Age of specimen based on date of casting as advised by client

The code used for comment is:

0 = Conical Fracture
✓ 1 = Shear Failure
2 = Cap Failure
3 = Damaged Specimens
4 = Convex end
5 = Concave end
6 = Ends non perp. to axis
7 = Non std. dimensions

DBell

DAVID BELL
Approved Signatory

26 . 2 . 03

Date

HUNTER WATER LABORATORIES
MATERIALS TESTING LABORATORY
CONCRETE TEST RESULTS

Hunter Water Australia

NATA Accreditation No 3228

CLIENT: Haztech Industries Pty Ltd

ADDRESS: PO Box 32 Gallaghan NSW 2308

CONTACT: Karl Baltpurvins **PROJECT:** UCS Evaluation

SAMPLED BY: Client **DATE RECEIVED:** 24 February 03

The concrete was not sampled by this laboratory. Data reported on initial curing, consistence and age at test is not covered by this NATA Accreditation, therefore note 2 does not apply.

LABORATORY REF No: 0054

The following test results were obtained by our laboratory for concrete speciements supplied by you for testing

REPORT No: 913

Details Supplied by Client				Details of Test Specimens and Results											
Date Sampled	Time Sampled	Slump (mm)	Initial Curing (hrs) **Note 4**	Client Specimen Identification	Condition When Received	Date of Test	Age of Test (days) **Note 4**	Specimen Dimensions Diameter (mm)	Specimen Dimensions Height (mm)	Mass (g)	Cross Section Area (mm^2)	Mass per Unit Volume (kg/m^3)	Load Max (kN)	Compressive Strength (MPa) Actual	Compressive Strength (MPa) Required
N/A	N/A	N/A	N/A	18	Dry	26/2/03	N/A	100.0	200	2598	7854	1654	58	7.4	N/A

REMARKS:

NOTE 1: Tests on speciemens in accordance with AS1012.8.1 clause 9.3.9 and 12.1

NOTE 2: Standard temperature zone

NOTE 3: All speciments capped with ✓
- 1.= Sulphur
- 2 = Portland Cement Mortar
- 3 = Cement Fondu Mortar
- 4 = Rubber

NOTE 4: Age of specimen based on date of casting as advised by client

The code used for comment is:
- 0 = Conical Fracture
- ✓ 1 = Shear Failure
- 2 = Cap Failure
- 3 = Damaged Specimens
- 4 = Convex end
- 5 = Concave end
- 6 = Ends non perp. to axis
- 7 = Non std. dimensions

DBell

DAVID BELL
Approved Signatory

26 . 2 . 03

Date

HUNTER WATER LABORATORIES
MATERIALS TESTING LABORATORY
CONCRETE TEST RESULTS

Hunter Water Australia

NATA Accreditation No 3228

CLIENT: Haztech Industries Pty Ltd

ADDRESS: PO Box 32 Gallaghan NSW 2308

CONTACT: Karl Baltpurvins **PROJECT:** UCS Evaluation

SAMPLED BY: Client **DATE RECEIVED:** 12 Feb 2003

The concrete was not sampled by this laboratory. Data reported on initial curing, consistence and age at test is not covered by this NATA Accreditation, therefore note 2 does not apply.

LABORATORY REF No: 0052

The following test results were obtained by our laboratory for concrete speciements supplied by you for testing

REPORT No: 886

Details Supplied by Client				Details of Test Specimens and Results											
Date Sampled	Time Sampled	Slump (mm)	Initial Curing (hrs) Note 4	Client Specimen Identification	Condition When Received	Date of Test	Age of Test (days) Note 4	Specimen Dimensions		Mass (g)	Cross Section Area (mm^2)	Mass per Unit Volume (kg/m^3)	Load Max (kN)	Compressive Strength (MPa)	
								Diameter (mm)	Height (mm)					Actual	Required
26/1/03	N/A	N/A	N/A	S 28	Dry	12/2/03	15	100.0	200	2229	7854	1419	76	9.7	N/A

REMARKS:

NOTE 1: Tests on speciemens in accordance with AS1012.8.1 clause 9.3.9 and 12.1

NOTE 2: Standard temperature zone

NOTE 3: All speciments capped with ✓ 1.= Sulphur
2 = Portland Cement Mortar
3 = Cement Fondu Mortar
4 = Rubber

NOTE 4: Age of specimen based on date of casting as advised by client

The code used for comment is:

0 = Conical Fracture
✓ 1 = Shear Failure
2 = Cap Failure
3 = Damaged Specimens
4 = Convex end
5 = Concave end
6 = Ends non perp. to axis
7 = Non std. dimensions

DBell

DAVID BELL
Approved Signatory

14. 2. 03

Date

HUNTER WATER LABORATORIES
MATERIALS TESTING LABORATORY
CONCRETE TEST RESULTS

Hunter Water Australia

NATA Accreditation No 3228

CLIENT: Haztech Industries Pty Ltd

ADDRESS: PO Box 32 Gallaghan NSW 2308

CONTACT: Karl Baltpurvins **PROJECT:** UCS Evaluation

SAMPLED BY: Client **DATE RECEIVED:** 24 February 03

The concrete was not sampled by this laboratory. Data reported on initial curing, consistence and age at test is not covered by this NATA Accreditation, therefore note 2 does not apply.

LABORATORY REF No: 0054

The following test results were obtained by our laboratory for concrete speciements supplied by you for testing

REPORT No: 914

Details Supplied by Client				Details of Test Specimens and Results											
Date Sampled	Time Sampled	Slump (mm)	Initial Curing (hrs) **Note 4**	Client Specimen Identification	Condition When Received	Date of Test	Age of Test (days) **Note 4**	Specimen Dimensions Diameter (mm)	Specimen Dimensions Height (mm)	Mass (g)	Cross Section Area (mm^2)	Mass per Unit Volume (kg/m^3)	Load Max (kN)	Compressive Strength (MPa) Actual	Compressive Strength (MPa) Required
N/A	N/A	N/A	N/A	29	Dry	26/2/03	N/A	99.5	200	2450	7776	1560	50	6.4	N/A

REMARKS:

NOTE 1: Tests on speciemens in accordance with AS1012.8.1 clause 9.3.9 and 12.1

NOTE 2: Standard temperature zone

NOTE 3: All speciments capped with ✓
1.= Sulphur
2 = Portland Cement Mortar
3 = Cement Fondu Mortar
4 = Rubber

NOTE 4: Age of specimen based on date of casting as advised by client

The code used for comment is:

0 = Conical Fracture
✓ 1 = Shear Failure
2 = Cap Failure
3 = Damaged Specimens
4 = Convex end
5 = Concave end
6 = Ends non perp. to axis
7 = Non std. dimensions

DBell

DAVID BELL
Approved Signatory

26. 2. 03

Date

Hunter Water Australia

HUNTER WATER LABORATORIES
MATERIALS TESTING LABORATORY
CONCRETE TEST RESULTS

NATA Accreditation No 3228

CLIENT: Haztech Industries Pty Ltd

ADDRESS: PO Box 32 Gallaghan NSW 2308

CONTACT: Karl Baltpurvins **PROJECT:** UCS Evaluation

SAMPLED BY: Client **DATE RECEIVED:** 24 February 03

The concrete was not sampled by this laboratory. Data reported on initial curing, consistence and age at test is not covered by this NATA Accreditation, therefore note 2 does not apply.

LABORATORY REF No: 0054

The following test results were obtained by our laboratory for concrete speciements supplied by you for testing

REPORT No: 915

Details Supplied by Client				Details of Test Specimens and Results												
Date Sampled	Time Sampled	Slump (mm)	Initial Curing (hrs) Note 4	Client Specimen Identification	Condition When Received	Date of Test	Age of Test (days) Note 4	Specimen Dimensions Diameter (mm)	Specimen Dimensions Height (mm)	Mass (g)	Cross Section Area (mm^2)	Mass per Unit Volume (kg/m^3)	Load Max (kN)	Compressive Strength (MPa) Actual	Compressive Strength (MPa) Required
N/A	N/A	N/A	N/A	30	Dry	26/2/03	N/A	99.0	200	2228	7698	1418	56	7.3	N/A

REMARKS:

NOTE 1: Tests on speciemens in accordance with AS1012.8.1 clause 9.3.9 and 12.1

NOTE 2: Standard temperature zone

NOTE 3: All speciments capped with ✓ 1.= Sulphur
2 = Portland Cement Mortar
3 = Cement Fondu Mortar
4 = Rubber

The code used for comment is:

0 = Conical Fracture
✓ 1 = Shear Failure
2 = Cap Failure
3 = Damaged Specimens
4 = Convex end
5 = Concave end
6 = Ends non perp. to axis
7 = Non std. dimensions

NOTE 4: Age of specimen based on date of casting as advised by client

DBell

DAVID BELL
Approved Signatory

26 . 2 . 03

Date

HUNTER WATER LABORATORIES
MATERIALS TESTING LABORATORY
CONCRETE TEST RESULTS

Hunter Water Australia

NATA Accreditation No 3228

CLIENT: Haztech Industries Pty Ltd

ADDRESS: PO Box 32 Gallaghan NSW 2308

CONTACT: Karl Baltpurvins **PROJECT:** UCS Evaluation

SAMPLED BY: Client **DATE RECEIVED:** 12 Feb 2003

The concrete was not sampled by this laboratory. Data reported on initial curing, consistence and age at test is not covered by this NATA Accreditation, therefore note 2 does not apply.

LABORATORY REF No: 0052

The following test results were obtained by our laboratory for concrete speciements supplied by you for testing

REPORT No: 885

Details Supplied by Client				Details of Test Specimens and Results											
Date Sampled	Time Sampled	Slump (mm)	Initial Curing (hrs) **Note 4**	Client Specimen Identification	Condition When Received	Date of Test	Age of Test (days) **Note 4**	Specimen Dimensions		Mass (g)	Cross Section Area (mm^2)	Mass per Unit Volume (kg/m^3)	Load Max (kN)	Compressive Strength (MPa)	
								Diameter (mm)	Height (mm)					Actual	Required
26/1/03	N/A	N/A	N/A	31	Dry	12/2/03	15	100.0	198	2313	7854	1473	107	13.6	N/A

REMARKS:

NOTE 1: Tests on speciemens in accordance with AS1012.8.1 clause 9.3.9 and 12.1

NOTE 2: Standard temperature zone

NOTE 3: All speciments capped with ✓ 1.= Sulphur
2 = Portland Cement Mortar
3 = Cement Fondu Mortar
4 = Rubber

NOTE 4: Age of specimen based on date of casting as advised by client

The code used for comment is:

0 = Conical Fracture
✓ 1 = Shear Failure
2 = Cap Failure
3 = Damaged Specimens
4 = Convex end
5 = Concave end
6 = Ends non perp. to axis
7 = Non std. dimensions

DBell

DAVID BELL
Approved Signatory

14 · 2 · 03

Date

HUNTER WATER LABORATORIES
MATERIALS TESTING LABORATORY
CONCRETE TEST RESULTS

Hunter Water Australia

NATA Accreditation No 3228

CLIENT: Haztech Industries Pty Ltd

ADDRESS: PO Box 32 Gallaghan NSW 2308

CONTACT: Karl Baltpurvins **PROJECT:** UCS Evaluation

SAMPLED BY: Client **DATE RECEIVED:** 24 February 03

The concrete was not sampled by this laboratory. Data reported on initial curing, consistence and age at test is not covered by this NATA Accreditation, therefore note 2 does not apply.

The following test results were obtained by our laboratory for concrete speciements supplied by you for testing

LABORATORY REF No: 0054

REPORT No: 916

Details Supplied by Client				Details of Test Specimens and Results												
Date Sampled	Time Sampled	Slump (mm)	Initial Curing (hrs) Note 4	Client Specimen Identification	Condition When Received	Date of Test	Age of Test (days) Note 4	Specimen Dimensions		Mass (g)	Cross Section Area (mm^2)	Mass per Unit Volume (kg/m^3)	Load Max (kN)	Compressive Strength (MPa)	
								Diameter (mm)	Height (mm)					Actual	Required
N/A	N/A	N/A	N/A	32	Dry	26/2/03	N/A	99.5	200	2311	7776	1471	46	5.9	N/A

REMARKS:

NOTE 1: Tests on speciemens in accordance with AS1012.8.1 clause 9.3.9 and 12.1

NOTE 2: Standard temperature zone

NOTE 3: All speciments capped with ✓ 1.= Sulphur
2 = Portland Cement Mortar
3 = Cement Fondu Mortar
4 = Rubber

NOTE 4: Age of specimen based on date of casting as advised by client

The code used for comment is:

0 = Conical Fracture
✓ 1 = Shear Failure
2 = Cap Failure
3 = Damaged Specimens
4 = Convex end
5 = Concave end
6 = Ends non perp. to axis
7 = Non std. dimensions

DBell

DAVID BELL
Approved Signatory

26 . 2 . 03

Date

HUNTER WATER LABORATORIES
MATERIALS TESTING LABORATORY
CONCRETE TEST RESULTS

Hunter Water Australia

NATA Accreditation No 3228

CLIENT: Haztech Industries Pty Ltd

ADDRESS: PO Box 32 Gallaghan NSW 2308

CONTACT: Karl Baltpurvins **PROJECT:** UCS Evaluation

SAMPLED BY: Client **DATE RECEIVED:** 24 February 03

The concrete was not sampled by this laboratory. Data reported on initial curing, consistence and age at test is not covered by this NATA Accreditation, therefore note 2 does not apply.

The following test results were obtained by our laboratory for concrete speciements supplied by you for testing

LABORATORY REF No: 0054

REPORT No: 917

Details Supplied by Client				Details of Test Specimens and Results											
Date Sampled	Time Sampled	Slump (mm)	Initial Curing (hrs) Note 4	Client Specimen Identification	Condition When Received	Date of Test	Age of Test (days) Note 4	Specimen Dimensions		Mass (g)	Cross Section Area (mm^2)	Mass per Unit Volume (kg/m^3)	Load Max (kN)	Compressive Strength (MPa)	
								Diameter (mm)	Height (mm)					Actual	Required
N/A	N/A	N/A	N/A	33	Dry	26/2/03	N/A	99.3	200	2228	7744	1418	70	9.0	N/A

REMARKS:

NOTE 1: Tests on speciemens in accordance with AS1012.8.1 clause 9.3.9 and 12.1

NOTE 2: Standard temperature zone

NOTE 3: All speciments capped with ✓ 1.= Sulphur
2 = Portland Cement Mortar
3 = Cement Fondu Mortar
4 = Rubber

NOTE 4: Age of specimen based on date of casting as advised by client

The code used for comment is:

0 = Conical Fracture
✓ 1 = Shear Failure
2 = Cap Failure
3 = Damaged Specimens
4 = Convex end
5 = Concave end
6 = Ends non perp. to axis
7 = Non std. dimensions

DBell

DAVID BELL
Approved Signatory

26. 2. 03

Date

Hunter Water Australia

HUNTER WATER LABORATORIES
MATERIALS TESTING LABORATORY
CONCRETE TEST RESULTS

NATA Accreditation No 3228

CLIENT: Haztech Industries Pty Ltd

ADDRESS: PO Box 32 Gallaghan NSW 2308

CONTACT: Karl Baltpurvins **PROJECT:** UCS Evaluation

SAMPLED BY: Client

DATE RECEIVED: 12 Feb 2003

LABORATORY REF No: 0052

REPORT No: 883

The concrete was not sampled by this laboratory. Data reported on initial curing, consistence and age at test is not covered by this NATA Accreditation, therefore note 2 does not apply.

The following test results were obtained by our laboratory for concrete speciements supplied by you for testing

Details Supplied by Client				Details of Test Specimens and Results											
Date Sampled	Time Sampled	Slump (mm)	Initial Curing (hrs) Note 4	Client Specimen Identification	Condition When Received	Date of Test	Age of Test (days) Note 4	Specimen Dimensions Diameter (mm)	Specimen Dimensions Height (mm)	Mass (g)	Cross Section Area (mm^2)	Mass per Unit Volume (kg/m^3)	Load Max (kN)	Compressive Strength (MPa) Actual	Compressive Strength (MPa) Required
26/1/03	N/A	N/A	N/A	34	Dry	12/2/03	15	100.0	200	2823	7854	1797	160	20.4	N/A

REMARKS:

NOTE 1: Tests on speciemens in accordance with AS1012.8.1 clause 9.3.9 and 12.1

NOTE 2: Standard temperature zone

NOTE 3: All speciments capped with ✓ 1.= Sulphur
2 = Portland Cement Mortar
3 = Cement Fondu Mortar
4 = Rubber

NOTE 4: Age of specimen based on date of casting as advised by client

The code used for comment is:

0 = Conical Fracture
✓ 1 = Shear Failure
2 = Cap Failure
3 = Damaged Specimens
4 = Convex end
5 = Concave end
6 = Ends non perp. to axis
7 = Non std. dimensions

DBell

DAVID BELL
Approved Signatory

14 · 2 · 03

Date

HUNTER WATER LABORATORIES
MATERIALS TESTING LABORATORY
CONCRETE TEST RESULTS

Hunter Water Australia

NATA Accreditation No 3228

CLIENT: Haztech Industries Pty Ltd

ADDRESS: PO Box 32 Gallaghan NSW 2308

CONTACT: Karl Baltpurvins **PROJECT:** UCS Evaluation

SAMPLED BY: Client **DATE RECEIVED:** 24 February 03

The concrete was not sampled by this laboratory. Data reported on initial curing, consistence and age at test is not covered by this NATA Accreditation, therefore note 2 does not apply.

The following test results were obtained by our laboratory for concrete speciements supplied by you for testing

LABORATORY REF No: 0054

REPORT No: 918

Details Supplied by Client				Details of Test Specimens and Results												
Date Sampled	Time Sampled	Slump (mm)	Initial Curing (hrs) Note 4	Client Specimen Identification	Condition When Received	Date of Test	Age of Test (days) Note 4	Specimen Dimensions		Mass (g)	Cross Section Area (mm^2)	Mass per Unit Volume (kg/m^3)	Load Max (kN)	Compressive Strength (MPa)	
								Diameter (mm)	Height (mm)					Actual	Required
N/A	N/A	N/A	N/A	35	Dry	26/2/03	N/A	99.5	200	2802	7776	1784	138	17.7	N/A

REMARKS:

NOTE 1: Tests on speciemens in accordance with AS1012.8.1 clause 9.3.9 and 12.1

NOTE 2: Standard temperature zone

NOTE 3: All speciments capped with ✓
1.= Sulphur
2 = Portland Cement Mortar
3 = Cement Fondu Mortar
4 = Rubber

NOTE 4: Age of specimen based on date of casting as advised by client

The code used for comment is:

0 = Conical Fracture
✓ 1 = Shear Failure
2 = Cap Failure
3 = Damaged Specimens
4 = Convex end
5 = Concave end
6 = Ends non perp. to axis
7 = Non std. dimensions

DBell

DAVID BELL
Approved Signatory

26 . 2 . 03

Date

HUNTER WATER LABORATORIES
MATERIALS TESTING LABORATORY
CONCRETE TEST RESULTS

Hunter Water Australia

NATA Accreditation No 3228

CLIENT: Haztech Industries Pty Ltd

ADDRESS: PO Box 32 Gallaghan NSW 2308

CONTACT: Karl Baltpurvins **PROJECT:** UCS Evaluation

SAMPLED BY: Client **DATE RECEIVED:** 24 February 03

The concrete was not sampled by this laboratory. Data reported on initial curing, consistence and age at test is not covered by this NATA Accreditation, therefore note 2 does not apply.

The following test results were obtained by our laboratory for concrete speciements supplied by you for testing

LABORATORY REF No: 0054

REPORT No: 919

Details Supplied by Client				Details of Test Specimens and Results											
Date Sampled	Time Sampled	Slump (mm)	Initial Curing (hrs) Note 4	Client Specimen Identification	Condition When Received	Date of Test	Age of Test (days) Note 4	Specimen Dimensions		Mass (g)	Cross Section Area (mm^2)	Mass per Unit Volume (kg/m^3)	Load Max (kN)	Compressive Strength (MPa)	
								Diameter (mm)	Height (mm)					Actual	Required
N/A	N/A	N/A	N/A	36	Dry	26/2/03	N/A	99.8	200	2799	7823	1782	152	19.4	N/A

REMARKS:

NOTE 1: Tests on speciemens in accordance with AS1012.8.1 clause 9.3.9 and 12.1

NOTE 2: Standard temperature zone

NOTE 3: All speciments capped with ✓ 1.= Sulphur
2 = Portland Cement Mortar
3 = Cement Fondu Mortar
4 = Rubber

NOTE 4: Age of specimen based on date of casting as advised by client

The code used for comment is:

0 = Conical Fracture
✓ 1 = Shear Failure
2 = Cap Failure
3 = Damaged Specimens
4 = Convex end
5 = Concave end
6 = Ends non perp. to axis
7 = Non std. dimensions

DBell

DAVID BELL
Approved Signatory

26 . 2 . 03

Date

HUNTER WATER LABORATORIES
MATERIALS TESTING LABORATORY
CONCRETE TEST RESULTS

Hunter Water Australia

NATA Accreditation No 3228

CLIENT: Haztech Industries Pty Ltd

ADDRESS: PO Box 32 Gallaghan NSW 2308

CONTACT: Karl Baltpurvins **PROJECT:** UCS Evaluation

SAMPLED BY: Client **DATE RECEIVED:** 12 Feb 2003

The concrete was not sampled by this laboratory. Data reported on initial curing, consistence and age at test is not covered by this NATA Accreditation, therefore note 2 does not apply.

LABORATORY REF No: 0052

The following test results were obtained by our laboratory for concrete speciements supplied by you for testing

REPORT No: 893

Details Supplied by Client				Details of Test Specimens and Results											
Date Sampled	Time Sampled	Slump (mm)	Initial Curing (hrs) Note 4	Client Specimen Identification	Condition When Received	Date of Test	Age of Test (days) Note 4	Specimen Dimensions		Mass (g)	Cross Section Area (mm^2)	Mass per Unit Volume (kg/m^3)	Load Max (kN)	Compressive Strength (MPa)	
								Diameter (mm)	Height (mm)					Actual	Required
26/1/03	N/A	N/A	N/A	46	Dry	12/2/03	15	90.0	180	1927	6362	1227	5	0.8	N/A

REMARKS: Soft sample properties

NOTE 1: Tests on speciemens in accordance with AS1012.8.1 clause 9.3.9 and 12.1

NOTE 2: Standard temperature zone

NOTE 3: All speciments capped with ✓ 1.= Sulphur
2 = Portland Cement Mortar
3 = Cement Fondu Mortar
4 = Rubber

The code used for comment is:

0 = Conical Fracture
✓ 1 = Shear Failure
2 = Cap Failure
3 = Damaged Specimens
4 = Convex end
5 = Concave end
6 = Ends non perp. to axis
7 = Non std. dimensions

NOTE 4: Age of specimen based on date of casting as advised by client

DBell

DAVID BELL
Approved Signatory

14 . 2 . 03

Date

Hunter Water Australia

HUNTER WATER LABORATORIES
MATERIALS TESTING LABORATORY
CONCRETE TEST RESULTS

NATA Accreditation No 3228

CLIENT: Haztech Industries Pty Ltd

ADDRESS: PO Box 32 Gallaghan NSW 2308

CONTACT: Karl Baltpurvins **PROJECT:** UCS Evaluation

SAMPLED BY: Client **DATE RECEIVED:** 24 February 03

The concrete was not sampled by this laboratory. Data reported on initial curing, consistence and age at test is not covered by this NATA Accreditation, therefore note 2 does not apply.

The following test results were obtained by our laboratory for concrete speciements supplied by you for testing

LABORATORY REF No: 0054

REPORT No: 923

Details Supplied by Client				Details of Test Specimens and Results											
Date Sampled	Time Sampled	Slump (mm)	Initial Curing (hrs) Note 4	Client Specimen Identification	Condition When Received	Date of Test	Age of Test (days) Note 4	Specimen Dimensions		Mass (g)	Cross Section Area (mm^2)	Mass per Unit Volume (kg/m^3)	Load Max (kN)	Compressive Strength (MPa)	
								Diameter (mm)	Height (mm)					Actual	Required
N/A	N/A	N/A	N/A	47	Dry	26/2/03	N/A	95.0	180	1978	7088	1259	5	0.7	N/A

REMARKS:

NOTE 1: Tests on speciemens in accordance with AS1012.8.1 clause 9.3.9 and 12.1

NOTE 2: Standard temperature zone

NOTE 3: All speciments capped with ✓ 1.= Sulphur
2 = Portland Cement Mortar
3 = Cement Fondu Mortar
4 = Rubber

NOTE 4: Age of specimen based on date of casting as advised by client

The code used for comment is:

0 = Conical Fracture
✓ 1 = Shear Failure
2 = Cap Failure
3 = Damaged Specimens
4 = Convex end
5 = Concave end
6 = Ends non perp. to axis
7 = Non std. dimensions

DBell

DAVID BELL
Approved Signatory

26 . 2 . 03

Date

HUNTER WATER LABORATORIES
MATERIALS TESTING LABORATORY
CONCRETE TEST RESULTS

Hunter Water Australia

NATA Accreditation No 3228

CLIENT: Haztech Industries Pty Ltd

ADDRESS: PO Box 32 Gallaghan NSW 2308

CONTACT: Karl Baltpurvins **PROJECT:** UCS Evaluation

SAMPLED BY: Client **DATE RECEIVED:** 24 February 03

The concrete was not sampled by this laboratory. Data reported on initial curing, consistence and age at test is not covered by this NATA Accreditation, therefore note 2 does not apply.

LABORATORY REF No: 0054

The following test results were obtained by our laboratory for concrete speciements supplied by you for testing

REPORT No: 922

Details Supplied by Client				Details of Test Specimens and Results											
Date Sampled	Time Sampled	Slump (mm)	Initial Curing (hrs) Note 4	Client Specimen Identification	Condition When Received	Date of Test	Age of Test (days) Note 4	Specimen Dimensions Diameter (mm)	Specimen Dimensions Height (mm)	Mass (g)	Cross Section Area (mm^2)	Mass per Unit Volume (kg/m^3)	Load Max (kN)	Compressive Strength (MPa) Actual	Compressive Strength (MPa) Required
N/A	N/A	N/A	N/A	48	Dry	26/2/03	N/A	95.0	186	2024	7088	1289	5	0.7	N/A

REMARKS:

NOTE 1: Tests on speciemens in accordance with AS1012.8.1 clause 9.3.9 and 12.1

NOTE 2: Standard temperature zone

NOTE 3: All speciments capped with ✓
1.= Sulphur
2 = Portland Cement Mortar
3 = Cement Fondu Mortar
4 = Rubber

NOTE 4: Age of specimen based on date of casting as advised by client

The code used for comment is:

0 = Conical Fracture
✓ 1 = Shear Failure
2 = Cap Failure
3 = Damaged Specimens
4 = Convex end
5 = Concave end
6 = Ends non perp. to axis
7 = Non std. dimensions

DBell

DAVID BELL
Approved Signatory

26 · 2 · 03

Date

HUNTER WATER LABORATORIES
MATERIALS TESTING LABORATORY
CONCRETE TEST RESULTS

Hunter Water Australia

NATA Accreditation No 3228

CLIENT: Haztech Industries Pty Ltd

ADDRESS: PO Box 32 Gallaghan NSW 2308

CONTACT: Karl Baltpurvins **PROJECT:** UCS Evaluation

SAMPLED BY: Client **DATE RECEIVED:** 12 Feb 2003

The concrete was not sampled by this laboratory. Data reported on initial curing, consistence and age at test is not covered by this NATA Accreditation, therefore note 2 does not apply.

LABORATORY REF No: 0052

The following test results were obtained by our laboratory for concrete speciements supplied by you for testing

REPORT No: 892

Details Supplied by Client				Details of Test Specimens and Results											
Date Sampled	Time Sampled	Slump (mm)	Initial Curing (hrs) Note 4	Client Specimen Identification	Condition When Received	Date of Test	Age of Test (days) Note 4	Specimen Dimensions		Mass (g)	Cross Section Area (mm^2)	Mass per Unit Volume (kg/m^3)	Load Max (kN)	Compressive Strength (MPa)	
								Diameter (mm)	Height (mm)					Actual	Required
26/1/03	N/A	N/A	N/A	49	Dry	12/2/03	15	93.0	185	1962	6793	1249	5	0.7	N/A

REMARKS: Soft sample properties

NOTE 1: Tests on speciemens in accordance with AS1012.8.1 clause 9.3.9 and 12.1

NOTE 2: Standard temperature zone

NOTE 3: All speciments capped with ✓ 1.= Sulphur
2 = Portland Cement Mortar
3 = Cement Fondu Mortar
4 = Rubber

NOTE 4: Age of specimen based on date of casting as advised by client

The code used for comment is:

0 = Conical Fracture
✓ 1 = Shear Failure
2 = Cap Failure
3 = Damaged Specimens
4 = Convex end
5 = Concave end
6 = Ends non perp. to axis
7 = Non std. dimensions

DBell

DAVID BELL
Approved Signatory

14.2.03

Date

Hunter Water Australia

HUNTER WATER LABORATORIES
MATERIALS TESTING LABORATORY
CONCRETE TEST RESULTS

NATA Accreditation No 3228

CLIENT: Haztech Industries Pty Ltd

ADDRESS: PO Box 32 Gallaghan NSW 2308

CONTACT: Karl Baltpurvins **PROJECT:** UCS Evaluation

SAMPLED BY: Client **DATE RECEIVED:** 24 February 03

The concrete was not sampled by this laboratory. Data reported on initial curing, consistence and age at test is not covered by this NATA Accreditation, therefore note 2 does not apply.

LABORATORY REF No: 0054

The following test results were obtained by our laboratory for concrete speciements supplied by you for testing

REPORT No: 924

Details Supplied by Client				Details of Test Specimens and Results												
Date Sampled	Time Sampled	Slump (mm)	Initial Curing (hrs) **Note 4**	Client Specimen Identification	Condition When Received	Date of Test	Age of Test (days) **Note 4**	Specimen Dimensions		Mass (g)	Cross Section Area (mm^2)	Mass per Unit Volume (kg/m^3)	Load Max (kN)	Compressive Strength (MPa)	
								Diameter (mm)	Height (mm)					Actual	Required
N/A	N/A	N/A	N/A	50	Dry	26/2/03	N/A	92.0	182	1888	6648	1202	5	0.8	N/A

REMARKS:

NOTE 1: Tests on speciemens in accordance with AS1012.8.1 clause 9.3.9 and 12.1

NOTE 2: Standard temperature zone

NOTE 3: All speciments capped with ✓
1.= Sulphur
2 = Portland Cement Mortar
3 = Cement Fondu Mortar
4 = Rubber

The code used for comment is:
0 = Conical Fracture
✓ 1 = Shear Failure
2 = Cap Failure
3 = Damaged Specimens
4 = Convex end
5 = Concave end
6 = Ends non perp. to axis
7 = Non std. dimensions

NOTE 4: Age of specimen based on date of casting as advised by client

DBell

DAVID BELL
Approved Signatory

26. 2. 03

Date

HUNTER WATER LABORATORIES
MATERIALS TESTING LABORATORY
CONCRETE TEST RESULTS

Hunter Water Australia

NATA Accreditation No 3228

CLIENT: Haztech Industries Pty Ltd

ADDRESS: PO Box 32 Gallaghan NSW 2308

CONTACT: Karl Baltpurvins **PROJECT:** UCS Evaluation

SAMPLED BY: Client **DATE RECEIVED:** 24 February 03

The concrete was not sampled by this laboratory. Data reported on initial curing, consistence and age at test is not covered by this NATA Accreditation, therefore note 2 does not apply.

LABORATORY REF No: 0054

The following test results were obtained by our laboratory for concrete speciements supplied by you for testing

REPORT No: 925

Details Supplied by Client				Details of Test Specimens and Results											
Date Sampled	Time Sampled	Slump (mm)	Initial Curing (hrs) Note 4	Client Specimen Identification	Condition When Received	Date of Test	Age of Test (days) Note 4	Specimen Dimensions		Mass (g)	Cross Section Area (mm^2)	Mass per Unit Volume (kg/m^3)	Load Max (kN)	Compressive Strength (MPa)	
								Diameter (mm)	Height (mm)					Actual	Required
N/A	N/A	N/A	N/A	51	Dry	26/2/03	N/A	95.0	190	2045	7088	1302	5	0.7	N/A

REMARKS:

NOTE 1: Tests on speciemens in accordance with AS1012.8.1 clause 9.3.9 and 12.1

NOTE 2: Standard temperature zone

NOTE 3: All speciments capped with ✓ 1.= Sulphur
2 = Portland Cement Mortar
3 = Cement Fondu Mortar
4 = Rubber

The code used for comment is:

0 = Conical Fracture
✓ 1 = Shear Failure
2 = Cap Failure
3 = Damaged Specimens
4 = Convex end
5 = Concave end
6 = Ends non perp. to axis
7 = Non std. dimensions

NOTE 4: Age of specimen based on date of casting as advised by client

DBell

DAVID BELL
Approved Signatory

26 . 2 . 03

Date

HUNTER WATER LABORATORIES
MATERIALS TESTING LABORATORY
CONCRETE TEST RESULTS

Hunter Water Australia

NATA Accreditation No 3228

CLIENT: Haztech Industries Pty Ltd

ADDRESS: PO Box 32 Gallaghan NSW 2308

CONTACT: Karl Baltpurvins **PROJECT:** UCS Evaluation

SAMPLED BY: Client **DATE RECEIVED:** 12 Feb 2003

The concrete was not sampled by this laboratory. Data reported on initial curing, consistence and age at test is not covered by this NATA Accreditation, therefore note 2 does not apply.

LABORATORY REF No: 0052

The following test results were obtained by our laboratory for concrete speciements supplied by you for testing

REPORT No: 888

Details Supplied by Client				Details of Test Specimens and Results												
Date Sampled	Time Sampled	Slump (mm)	Initial Curing (hrs) **Note 4**	Client Specimen Identification	Condition When Received	Date of Test	Age of Test (days) **Note 4**	Specimen Dimensions		Mass (g)	Cross Section Area (mm^2)	Mass per Unit Volume (kg/m^3)	Load Max (kN)	Compressive Strength (MPa)	
								Diameter (mm)	Height (mm)					Actual	Required
26/1/03	N/A	N/A	N/A	52	Dry	12/2/03	15	100.0	200	2281	7854	1452	5	0.6	N/A

REMARKS:

NOTE 1: Tests on speciemens in accordance with AS1012.8.1 clause 9.3.9 and 12.1

NOTE 2: Standard temperature zone

NOTE 3: All speciments capped with ✓ 1.= Sulphur
2 = Portland Cement Mortar
3 = Cement Fondu Mortar
4 = Rubber

NOTE 4: Age of specimen based on date of casting as advised by client

The code used for comment is:

0 = Conical Fracture
✓ 1 = Shear Failure
2 = Cap Failure
3 = Damaged Specimens
4 = Convex end
5 = Concave end
6 = Ends non perp. to axis
7 = Non std. dimensions

DBell

DAVID BELL
Approved Signatory

14 . 2 . 03

Date

Hunter Water Australia

HUNTER WATER LABORATORIES
MATERIALS TESTING LABORATORY
CONCRETE TEST RESULTS

NATA Accreditation No 3228

CLIENT: Haztech Industries Pty Ltd

ADDRESS: PO Box 32 Gallaghan NSW 2308

CONTACT: Karl Baltpurvins **PROJECT:** UCS Evaluation

SAMPLED BY: Client **DATE RECEIVED:** 24 February 03

The concrete was not sampled by this laboratory. Data reported on initial curing, consistence and age at test is not covered by this NATA Accreditation, therefore note 2 does not apply.

LABORATORY REF No: 0054

The following test results were obtained by our laboratory for concrete speciements supplied by you for testing

REPORT No: 926

Details Supplied by Client				Details of Test Specimens and Results											
Date Sampled	Time Sampled	Slump (mm)	Initial Curing (hrs) Note 4	Client Specimen Identification	Condition When Received	Date of Test	Age of Test (days) Note 4	Specimen Dimensions Diameter (mm)	Specimen Dimensions Height (mm)	Mass (g)	Cross Section Area (mm^2)	Mass per Unit Volume (kg/m^3)	Load Max (kN)	Compressive Strength (MPa) Actual	Compressive Strength (MPa) Required
N/A	N/A	N/A	N/A	53	Dry	26/2/03	N/A	99.5	198	2306	7776	1468	5	0.6	N/A

REMARKS:

NOTE 1: Tests on speciemens in accordance with AS1012.8.1 clause 9.3.9 and 12.1

NOTE 2: Standard temperature zone

NOTE 3: All speciments capped with ✓
- 1.= Sulphur
- 2 = Portland Cement Mortar
- 3 = Cement Fondu Mortar
- 4 = Rubber

NOTE 4: Age of specimen based on date of casting as advised by client

The code used for comment is:
- 0 = Conical Fracture
- ✓ 1 = Shear Failure
- 2 = Cap Failure
- 3 = Damaged Specimens
- 4 = Convex end
- 5 = Concave end
- 6 = Ends non perp. to axis
- 7 = Non std. dimensions

DBell

DAVID BELL
Approved Signatory

26 . 2 . 03

Date

Hunter Water Australia

HUNTER WATER LABORATORIES
MATERIALS TESTING LABORATORY
CONCRETE TEST RESULTS

NATA Accreditation No 3228

CLIENT: Haztech Industries Pty Ltd

ADDRESS: PO Box 32 Gallaghan NSW 2308

CONTACT: Karl Baltpurvins **PROJECT:** UCS Evaluation

SAMPLED BY: Client **DATE RECEIVED:** 24 February 03

The concrete was not sampled by this laboratory. Data reported on initial curing, consistence and age at test is not covered by this NATA Accreditation, therefore note 2 does not apply.

LABORATORY REF No: 0054

The following test results were obtained by our laboratory for concrete speciements supplied by you for testing

REPORT No: 927

Details Supplied by Client				Details of Test Specimens and Results											
Date Sampled	Time Sampled	Slump (mm)	Initial Curing (hrs) **Note 4**	Client Specimen Identification	Condition When Received	Date of Test	Age of Test (days) **Note 4**	Specimen Dimensions Diameter (mm)	Specimen Dimensions Height (mm)	Mass (g)	Cross Section Area (mm^2)	Mass per Unit Volume (kg/m^3)	Load Max (kN)	Compressive Strength (MPa) Actual	Compressive Strength (MPa) Required
N/A	N/A	N/A	N/A	54	Dry	26/2/03	N/A	99.4	198	2381	7760	1516	5	0.6	N/A

REMARKS:

NOTE 1: Tests on speciemens in accordance with AS1012.8.1 clause 9.3.9 and 12.1

NOTE 2: Standard temperature zone

NOTE 3: All speciments capped with ✓ 1.= Sulphur
2 = Portland Cement Mortar
3 = Cement Fondu Mortar
4 = Rubber

NOTE 4: Age of specimen based on date of casting as advised by client

The code used for comment is:

0 = Conical Fracture
✓ 1 = Shear Failure
2 = Cap Failure
3 = Damaged Specimens
4 = Convex end
5 = Concave end
6 = Ends non perp. to axis
7 = Non std. dimensions

DBell

DAVID BELL
Approved Signatory

26. 2. 03

Date

Hunter Water Australia

HUNTER WATER LABORATORIES
MATERIALS TESTING LABORATORY
CONCRETE TEST RESULTS

NATA
Accreditation No
3228

CLIENT: Haztech Industries Pty Ltd

ADDRESS: PO Box 32 Gallaghan NSW 2308

CONTACT: Karl Baltpurvins **PROJECT:** UCS Evaluation

SAMPLED BY: Client **DATE RECEIVED:** 12 Feb 2003

The concrete was not sampled by this laboratory. Data reported on initial curing, consistence and age at test is not covered by this NATA Accreditation, therefore note 2 does not apply.

LABORATORY REF No: 0052

The following test results were obtained by our laboratory for concrete speciements supplied by you for testing

REPORT No: 891

Details Supplied by Client				Details of Test Specimens and Results											
Date Sampled	Time Sampled	Slump (mm)	Initial Curing (hrs) Note 4	Client Specimen Identification	Condition When Received	Date of Test	Age of Test (days) Note 4	Specimen Dimensions		Mass (g)	Cross Section Area (mm^2)	Mass per Unit Volume (kg/m^3)	Load Max (kN)	Compressive Strength (MPa)	
								Diameter (mm)	Height (mm)					Actual	Required
26/1/03	N/A	N/A	N/A	64	Dry	12/2/03	15	96.0	195	1864	7238	1187	6	0.8	N/A

REMARKS:

NOTE 1: Tests on speciemens in accordance with AS1012.8.1 clause 9.3.9 and 12.1

NOTE 2: Standard temperature zone

NOTE 3: All speciments capped with ✓ 1.= Sulphur
2 = Portland Cement Mortar
3 = Cement Fondu Mortar
4 = Rubber

NOTE 4: Age of specimen based on date of casting as advised by client

The code used for comment is:

0 = Conical Fracture
✓ 1 = Shear Failure
2 = Cap Failure
3 = Damaged Specimens
4 = Convex end
5 = Concave end
6 = Ends non perp. to axis
7 = Non std. dimensions

DBell

DAVID BELL
Approved Signatory

14. 2. 03

Date

HUNTER WATER LABORATORIES
MATERIALS TESTING LABORATORY
CONCRETE TEST RESULTS

Hunter Water Australia

NATA Accreditation No 3228

CLIENT: Haztech Industries Pty Ltd

ADDRESS: PO Box 32 Gallaghan NSW 2308

CONTACT: Karl Baltpurvins **PROJECT:** UCS Evaluation

SAMPLED BY: Client **DATE RECEIVED:** 24 February 03

The concrete was not sampled by this laboratory. Data reported on initial curing, consistence and age at test is not covered by this NATA Accreditation, therefore note 2 does not apply.

The following test results were obtained by our laboratory for concrete speciements supplied by you for testing

LABORATORY REF No: 0054

REPORT No: 928

Details Supplied by Client				Details of Test Specimens and Results											
Date Sampled	Time Sampled	Slump (mm)	Initial Curing (hrs) Note 4	Client Specimen Identification	Condition When Received	Date of Test	Age of Test (days) Note 4	Specimen Dimensions Diameter (mm)	Specimen Dimensions Height (mm)	Mass (g)	Cross Section Area (mm^2)	Mass per Unit Volume (kg/m^3)	Load Max (kN)	Compressive Strength (MPa) Actual	Compressive Strength (MPa) Required
N/A	N/A	N/A	N/A	65	Dry	26/2/03	N/A	97.0	190	2088	7390	1329	6	0.8	N/A

REMARKS:

NOTE 1: Tests on speciemens in accordance with AS1012.8.1 clause 9.3.9 and 12.1

NOTE 2: Standard temperature zone

NOTE 3: All speciments capped with ✓ 1.= Sulphur
2 = Portland Cement Mortar
3 = Cement Fondu Mortar
4 = Rubber

NOTE 4: Age of specimen based on date of casting as advised by client

The code used for comment is:

0 = Conical Fracture
✓ 1 = Shear Failure
2 = Cap Failure
3 = Damaged Specimens
4 = Convex end
5 = Concave end
6 = Ends non perp. to axis
7 = Non std. dimensions

DBell

DAVID BELL
Approved Signatory

26 . 2 . 03

Date

HUNTER WATER LABORATORIES
MATERIALS TESTING LABORATORY
CONCRETE TEST RESULTS

Hunter Water Australia

NATA Accreditation No 3228

CLIENT: Haztech Industries Pty Ltd

ADDRESS: PO Box 32 Gallaghan NSW 2308

CONTACT: Karl Baltpurvins **PROJECT:** UCS Evaluation

SAMPLED BY: Client **DATE RECEIVED:** 24 February 03

The concrete was not sampled by this laboratory. Data reported on initial curing, consistence and age at test is not covered by this NATA Accreditation, therefore note 2 does not apply.

LABORATORY REF No: 0054

The following test results were obtained by our laboratory for concrete speciements supplied by you for testing

REPORT No: 929

Details Supplied by Client				Details of Test Specimens and Results												
Date Sampled	Time Sampled	Slump (mm)	Initial Curing (hrs) Note 4	Client Specimen Identification	Condition When Received	Date of Test	Age of Test (days) Note 4	Specimen Dimensions		Mass (g)	Cross Section Area (mm^2)	Mass per Unit Volume (kg/m^3)	Load Max (kN)	Compressive Strength (MPa)	
								Diameter (mm)	Height (mm)					Actual	Required
N/A	N/A	N/A	N/A	66	Dry	26/2/03	N/A	97.0	188	2031	7390	1293	8	1.1	N/A

REMARKS:

NOTE 1: Tests on speciemens in accordance with AS1012.8.1 clause 9.3.9 and 12.1

NOTE 2: Standard temperature zone

NOTE 3: All speciments capped with ✓ 1.= Sulphur
2 = Portland Cement Mortar
3 = Cement Fondu Mortar
4 = Rubber

NOTE 4: Age of specimen based on date of casting as advised by client

The code used for comment is:

0 = Conical Fracture
✓ 1 = Shear Failure
2 = Cap Failure
3 = Damaged Specimens
4 = Convex end
5 = Concave end
6 = Ends non perp. to axis
7 = Non std. dimensions

DBell

DAVID BELL
Approved Signatory

26. 2. 03

Date

HUNTER WATER LABORATORIES
MATERIALS TESTING LABORATORY
CONCRETE TEST RESULTS

Hunter Water Australia

NATA Accreditation No 3228

CLIENT: Haztech Industries Pty Ltd

ADDRESS: PO Box 32 Gallaghan NSW 2308

CONTACT: Karl Baltpurvins **PROJECT:** UCS Evaluation

SAMPLED BY: Client **DATE RECEIVED:** 12 Feb 2003

The concrete was not sampled by this laboratory. Data reported on initial curing, consistence and age at test is not covered by this NATA Accreditation, therefore note 2 does not apply.

LABORATORY REF No: 0052

The following test results were obtained by our laboratory for concrete speciements supplied by you for testing

REPORT No: 890

Details Supplied by Client				Details of Test Specimens and Results											
Date Sampled	Time Sampled	Slump (mm)	Initial Curing (hrs) Note 4	Client Specimen Identification	Condition When Received	Date of Test	Age of Test (days) Note 4	Specimen Dimensions		Mass (g)	Cross Section Area (mm^2)	Mass per Unit Volume (kg/m^3)	Load Max (kN)	Compressive Strength (MPa)	
								Diameter (mm)	Height (mm)					Actual	Required
26/1/03	N/A	N/A	N/A	67	Dry	12/2/03	15	96.0	190	1943	7238	1237	8	1.1	N/A

REMARKS:

NOTE 1: Tests on speciemens in accordance with AS1012.8.1 clause 9.3.9 and 12.1

NOTE 2: Standard temperature zone

NOTE 3: All speciments capped with ✓ 1.= Sulphur
2 = Portland Cement Mortar
3 = Cement Fondu Mortar
4 = Rubber

NOTE 4: Age of specimen based on date of casting as advised by client

The code used for comment is:

0 = Conical Fracture
✓ 1 = Shear Failure
2 = Cap Failure
3 = Damaged Specimens
4 = Convex end
5 = Concave end
6 = Ends non perp. to axis
7 = Non std. dimensions

DBell

DAVID BELL
Approved Signatory

14 . 2 . 03

Date

HUNTER WATER LABORATORIES
MATERIALS TESTING LABORATORY
CONCRETE TEST RESULTS

Hunter Water Australia

NATA Accreditation No 3228

CLIENT: Haztech Industries Pty Ltd

ADDRESS: PO Box 32 Gallaghan NSW 2308

CONTACT: Karl Baltpurvins **PROJECT:** UCS Evaluation

SAMPLED BY: Client **DATE RECEIVED:** 24 February 03

The concrete was not sampled by this laboratory. Data reported on initial curing, consistence and age at test is not covered by this NATA Accreditation, therefore note 2 does not apply.

The following test results were obtained by our laboratory for concrete speciements supplied by you for testing

LABORATORY REF No: 0054

REPORT No: 930

Details Supplied by Client				Details of Test Specimens and Results											
Date Sampled	Time Sampled	Slump (mm)	Initial Curing (hrs) Note 4	Client Specimen Identification	Condition When Received	Date of Test	Age of Test (days) Note 4	Specimen Dimensions Diameter (mm)	Specimen Dimensions Height (mm)	Mass (g)	Cross Section Area (mm^2)	Mass per Unit Volume (kg/m^3)	Load Max (kN)	Compressive Strength (MPa) Actual	Compressive Strength (MPa) Required
N/A	N/A	N/A	N/A	68	Dry	26/2/03	N/A	97.5	190	1981	7466	1261	5	0.7	N/A

REMARKS:

NOTE 1: Tests on speciemens in accordance with AS1012.8.1 clause 9.3.9 and 12.1

NOTE 2: Standard temperature zone

NOTE 3: All speciments capped with ✓
1.= Sulphur
2 = Portland Cement Mortar
3 = Cement Fondu Mortar
4 = Rubber

NOTE 4: Age of specimen based on date of casting as advised by client

The code used for comment is:

0 = Conical Fracture
✓ 1 = Shear Failure
2 = Cap Failure
3 = Damaged Specimens
4 = Convex end
5 = Concave end
6 = Ends non perp. to axis
7 = Non std. dimensions

DBell

DAVID BELL
Approved Signatory

26 . 2 . 03

Date

HUNTER WATER LABORATORIES
MATERIALS TESTING LABORATORY
CONCRETE TEST RESULTS

Hunter Water Australia

NATA Accreditation No 3228

CLIENT: Haztech Industries Pty Ltd

ADDRESS: PO Box 32 Gallaghan NSW 2308

CONTACT: Karl Baltpurvins **PROJECT:** UCS Evaluation

SAMPLED BY: Client **DATE RECEIVED:** 24 February 03

The concrete was not sampled by this laboratory. Data reported on initial curing, consistence and age at test is not covered by this NATA Accreditation, therefore note 2 does not apply.

LABORATORY REF No: 0054

The following test results were obtained by our laboratory for concrete speciements supplied by you for testing

REPORT No: 931

Details Supplied by Client				Details of Test Specimens and Results												
Date Sampled	Time Sampled	Slump (mm)	Initial Curing (hrs) Note 4	Client Specimen Identification	Condition When Received	Date of Test	Age of Test (days) Note 4	Specimen Dimensions		Mass (g)	Cross Section Area (mm^2)	Mass per Unit Volume (kg/m^3)	Load Max (kN)	Compressive Strength (MPa)	
								Diameter (mm)	Height (mm)					Actual	Required
N/A	N/A	N/A	N/A	69	Dry	26/2/03	N/A	97.0	192	2058	7390	1310	6	0.8	N/A

REMARKS:

NOTE 1: Tests on speciemens in accordance with AS1012.8.1 clause 9.3.9 and 12.1

NOTE 2: Standard temperature zone

NOTE 3: All speciments capped with ✓ 1.= Sulphur
2 = Portland Cement Mortar
3 = Cement Fondu Mortar
4 = Rubber

NOTE 4: Age of specimen based on date of casting as advised by client

The code used for comment is:

0 = Conical Fracture
✓ 1 = Shear Failure
2 = Cap Failure
3 = Damaged Specimens
4 = Convex end
5 = Concave end
6 = Ends non perp. to axis
7 = Non std. dimensions

DBell

DAVID BELL
Approved Signatory

26 . 2 . 03

Date

Hunter Water Australia

HUNTER WATER LABORATORIES
MATERIALS TESTING LABORATORY
CONCRETE TEST RESULTS

NATA Accreditation No 3228

CLIENT: Haztech Industries Pty Ltd

ADDRESS: PO Box 32 Gallaghan NSW 2308

CONTACT: Karl Baltpurvins **PROJECT:** UCS Evaluation

SAMPLED BY: Client

DATE RECEIVED: 12 Feb 2003

LABORATORY REF No: 0052

REPORT No: 884

The concrete was not sampled by this laboratory. Data reported on initial curing, consistence and age at test is not covered by this NATA Accreditation, therefore note 2 does not apply.

The following test results were obtained by our laboratory for concrete speciements supplied by you for testing

Details Supplied by Client				Details of Test Specimens and Results											
Date Sampled	Time Sampled	Slump (mm)	Initial Curing (hrs) **Note 4**	Client Specimen Identification	Condition When Received	Date of Test	Age of Test (days) **Note 4**	Specimen Dimensions Diameter (mm)	Specimen Dimensions Height (mm)	Mass (g)	Cross Section Area (mm^2)	Mass per Unit Volume (kg/m^3)	Load Max (kN)	Compressive Strength (MPa) Actual	Compressive Strength (MPa) Required
26/1/03	N/A	N/A	N/A	70	Dry	12/2/03	15	100.3	200	2404	7901	1530	12	1.5	N/A

REMARKS:

NOTE 1: Tests on speciemens in accordance with AS1012.8.1 clause 9.3.9 and 12.1

NOTE 2: Standard temperature zone

NOTE 3: All speciments capped with ✓ 1.= Sulphur
2 = Portland Cement Mortar
3 = Cement Fondu Mortar
4 = Rubber

NOTE 4: Age of specimen based on date of casting as advised by client

The code used for comment is:

0 = Conical Fracture
✓ 1 = Shear Failure
2 = Cap Failure
3 = Damaged Specimens
4 = Convex end
5 = Concave end
6 = Ends non perp. to axis
7 = Non std. dimensions

DBell

DAVID BELL
Approved Signatory

14 . 2 . 03

Date

Hunter Water Australia

HUNTER WATER LABORATORIES
MATERIALS TESTING LABORATORY
CONCRETE TEST RESULTS

NATA Accreditation No 3228

CLIENT: Haztech Industries Pty Ltd

ADDRESS: PO Box 32 Gallaghan NSW 2308

CONTACT: Karl Baltpurvins **PROJECT:** UCS Evaluation

SAMPLED BY: Client **DATE RECEIVED:** 24 February 03

The concrete was not sampled by this laboratory. Data reported on initial curing, consistence and age at test is not covered by this NATA Accreditation, therefore note 2 does not apply.

LABORATORY REF No: 0054

The following test results were obtained by our laboratory for concrete speciements supplied by you for testing

REPORT No: 921

Details Supplied by Client				Details of Test Specimens and Results												
Date Sampled	Time Sampled	Slump (mm)	Initial Curing (hrs) Note 4	Client Specimen Identification	Condition When Received	Date of Test	Age of Test (days) Note 4	Specimen Dimensions Diameter (mm)	Specimen Dimensions Height (mm)	Mass (g)	Cross Section Area (mm^2)	Mass per Unit Volume (kg/m^3)	Load Max (kN)	Compressive Strength (MPa) Actual	Compressive Strength (MPa) Required
N/A	N/A	N/A	N/A	71	Dry	26/2/03	N/A	99.5	200	2467	7776	1571	10	1.3	N/A

REMARKS:

NOTE 1: Tests on speciemens in accordance with AS1012.8.1 clause 9.3.9 and 12.1

NOTE 2: Standard temperature zone

NOTE 3: All speciments capped with ✓
1.= Sulphur
2 = Portland Cement Mortar
3 = Cement Fondu Mortar
4 = Rubber

The code used for comment is:
0 = Conical Fracture
✓ 1 = Shear Failure
2 = Cap Failure
3 = Damaged Specimens
4 = Convex end
5 = Concave end
6 = Ends non perp. to axis
7 = Non std. dimensions

NOTE 4: Age of specimen based on date of casting as advised by client

DBell

DAVID BELL
Approved Signatory

26 . 2 . 03
Date

Hunter Water Australia

HUNTER WATER LABORATORIES
MATERIALS TESTING LABORATORY
CONCRETE TEST RESULTS

NATA Accreditation No 3228

CLIENT: Haztech Industries Pty Ltd

ADDRESS: PO Box 32 Gallaghan NSW 2308

CONTACT: Karl Baltpurvins **PROJECT:** UCS Evaluation

SAMPLED BY: Client **DATE RECEIVED:** 24 February 03

The concrete was not sampled by this laboratory. Data reported on initial curing, consistence and age at test is not covered by this NATA Accreditation, therefore note 2 does not apply.

LABORATORY REF No: 0054

The following test results were obtained by our laboratory for concrete speciements supplied by you for testing

REPORT No: 920

Details Supplied by Client				Details of Test Specimens and Results												
Date Sampled	Time Sampled	Slump (mm)	Initial Curing (hrs) **Note 4**	Client Specimen Identification	Condition When Received	Date of Test	Age of Test (days) **Note 4**	Specimen Dimensions Diameter (mm)	Specimen Dimensions Height (mm)	Mass (g)	Cross Section Area (mm^2)	Mass per Unit Volume (kg/m^3)	Load Max (kN)	Compressive Strength (MPa) Actual	Compressive Strength (MPa) Required
N/A	N/A	N/A	N/A	72	Dry	26/2/03	N/A	99.5	200	2553	7776	1625	12	1.5	N/A

REMARKS:

NOTE 1: Tests on speciemens in accordance with AS1012.8.1 clause 9.3.9 and 12.1

NOTE 2: Standard temperature zone

NOTE 3: All speciments capped with ✓ 1.= Sulphur
2 = Portland Cement Mortar
3 = Cement Fondu Mortar
4 = Rubber

NOTE 4: Age of specimen based on date of casting as advised by client

The code used for comment is:

0 = Conical Fracture
✓ 1 = Shear Failure
2 = Cap Failure
3 = Damaged Specimens
4 = Convex end
5 = Concave end
6 = Ends non perp. to axis
7 = Non std. dimensions

DBell

DAVID BELL
Approved Signatory

26 . 2 . 03

Date

Appendix D
CSIRO Report on Toxicity

Centre for Advanced Analytical Chemistry
Energy Technology

TOXICITY ASSESSMENT OF SEDIMENT FILTRATES FROM THE HUNTER RIVER, NEWCASTLE

by J. L. Stauber, M. S. Adams and M. T. Binet

Report No: ET/IR577R

Prepared for Patterson Britton & Partners
Consulting Engineers

February, 2003

Disclaimer

This report was prepared by the Centre for Advanced Analytical Chemistry, CSIRO Energy Technology. The material reflects the best professional judgement by the authors in light of the results of the requested study and information available at the time of preparation. However, as the authors and CSIRO cannot control the conditions under which this report may be used, the authors and CSIRO will not be held responsible for damages of any nature resulting from incorrect use of, or incorrect reliance upon this report.

Limited Circulation

This document is not to be given additional distribution or be cited in other documents without the consent of the first author or the Manager of the Centre for Advanced Analytical Chemistry, CSIRO Energy Technology.

Copyright © CSIRO 2002

No individual part of this report may be reproduced without the expressed written permission from Centre for Advanced Analytical Chemistry, CSIRO Energy Technology.

EXECUTIVE SUMMARY

To assess the effectiveness of dewatering contaminated dredged sediment from the South Arm of the Hunter River, Newcastle, Patterson Britton & Partners Consulting Engineers engaged CSIRO to undertake toxicity testing of the sediment filtrates. Geo bags were filled with sediment containing low, medium and high PAH contamination, and the first flush seepage water (filtrate) was sent to CSIRO for toxicity testing. Bioassays included the acute Microtox® test and a chronic test measuring growth rate inhibition in the microalga *Nitzschia closterium*. This work formed part of a larger chemical and ecotoxicological study of the quality of the sediments, which were unsuitable for ocean disposal due to PAH contamination.

The sediment filtrates were of low acute toxicity to the bacteria (Microtox®), with EC50 concentrations i.e. the concentration of filtrate to cause a 50% reduction in bacterial light output after a 5 or 15 min exposure, of 27 - >90%. The filtrate from the high PAH sediment was more toxic to the bacteria than the filtrates from the low and medium PAH sediments. The filtrate from the high PAH sediment would have to be diluted about 100 times to be below the no effect level for acute toxicity to the bacteria.

The three filtrates were also of low toxicity to microalgal growth in the chronic tests, with IC50 values i.e. the concentration of filtrate to inhibit algal growth rate by 50%, of 24-55% (where 100% is undiluted filtrate). The order of toxicity (based on IC50 values) was (from most toxic to least toxic): low PAH > high PAH > medium PAH filtrate. The order of toxicity correlated with the concentrations of ammonia in the filtrates, released from the sediments during the dewatering procedure. Ammonia was the most likely cause of toxicity to algal growth, although this would need to be confirmed by further toxicity identification evaluation (TIE) phase III procedures.

Algal growth was more sensitive to the low and medium PAH filtrates than Microtox®, whereas Microtox® was more sensitive to the filtrate from the highly PAH contaminated sediment. Both tests were less sensitive than tests run concurrently using sea urchin fertilisation and larval development.

TABLE OF CONTENTS

EXECUTIVE SUMMARY ii
1 INTRODUCTION 1
2 METHODS 2
2.1 Sediment Collection and Dewatering 2
2.2 Toxicity Tests 3
2.2.1 Preparation of quality assurance controls 3
2.2.2 Dilution water 3
2.2.3 Microtox® 3
2.2.4 *Nitzschia closterium* growth inhibition test 3
3 RESULTS AND DISCUSSION 6
3.1 Filtrate Analyses 6
3.2 Toxicity Testing 6
3.2.1 Microtox® 6
3.2.2 Microalgal growth inhibition test 7
3.2.3 Causes of the observed toxicity 10
4 CONCLUSIONS 13
5 ACKNOWLEDGEMENTS 14
6 REFERENCES 14

List of Tables:

Table 1. Characteristics of Each Sediment Contamination Zone 2
Table 2. Summary of the Test Protocol for the *Nitzschia closterium* Growth Inhibition Bioassay 5
Table 3. Physico-Chemical Measurements of Filtrates 6
Table 4. Dissolved Metal Concentrations 6
Table 5. Toxicity of Filtrates to Microtox® after a 5- and 15-min Exposure 7
Table 6. The Effect of Low PAH Filtrate on the Growth Rate of *Nitzschia closterium* over a 72-h Exposure 8
Table 7. The Effect of Medium PAH Filtrate on the Growth Rate of *Nitzschia closterium* over a 72-h Exposure 9
Table 8. The Effect of High PAH Filtrate on the Growth Rate of *Nitzschia closterium* over a 72-h Exposure 9

Table 9 Comparison of the Observed Toxicity of the Filtrates to the Toxicity Predicted from the Filtrate Ammonia Concentrations 11

Table 10 Summary of Filtrate Toxicity to All Test Species 11

1 INTRODUCTION

Patterson Britton & Partners Consulting Engineers engaged CSIRO to undertake toxicity testing of filtrates from contaminated sediments in the South Arm of the Hunter River, Newcastle. Previous work has shown that these sediments contain elevated concentrations of polycyclic aromatic hydrocarbons (PAHs) and are therefore considered unsuitable for ocean disposal. When disturbed, the sediments emit odour, possibly due to their naphthalene content.

A bulk sediment sampling and testing program was developed to evaluate the most effective process for dredging, dewatering and remediation of the contaminated sediments. The sediments, which are located along the southern shoreline of the Hunter River adjacent to the former BHP Steelworks Site, are to be isolated from the remaining soft sediment using a sheet pile wall, prior to dredging/remediation.

To assess the effectiveness of dewatering the dredged sediment, a dewatering trial using experimental-sized Geo tubes was used to determine the quality of the seepage water from the bags and the potential benefits in terms of odour control. Bags were filled with sediment and the first flush seepage water (filtrate) was sent to CSIRO for toxicity testing. Bioassays included the acute Microtox® test and a chronic test measuring growth rate inhibition in the microalga *Nitzschia closterium*. In addition, the toxicity of the filtrates to sea urchin fertilisation and larval development was determined by Ecotox Services Australasia.

The Microtox® test is an acute bioassay that determines the decrease in light output of the estuarine bacterium *Vibrio fischeri* after exposure to a sample for 5 and 15 min. The highest concentration of sample that can be tested with this method is 90%, assuming 100% is undiluted filtrate. The advantage of this test is that standard protocols and standard preparations of test bacteria are used. There is a large database on the toxicity of a wide range of chemicals to Microtox®. Microtox® is known to be particularly sensitive to organic contaminants (Kaiser and Devillers, 1994).

Nitzschia closterium, a marine diatom isolated from Port Hacking NSW, is commonly found in Australian estuaries and coastal waters and is very sensitive to both organic and inorganic compounds. This bioassay, which is highly reproducible compared to higher organism tests, is currently being used as a standard test for monitoring industrial discharges throughout Australia (ANZECC/ARMCANZ, 2000). The chronic bioassay measures the decrease in cell division rate (growth rate) of the alga over 72 h in various dilutions of filtrate compared to salinity-matched controls (Stauber et al., 1994).

2 METHODS

2.1 Sediment Collection and Dewatering

The bulk sediment sampling was co-ordinated by Patterson Britton & Partners using a barge-mounted excavator. Bulk samples (ten 200 L barrels) were retrieved from three zones to obtain samples of sediment with 'low', 'medium', and 'high' PAH contamination (Table 1). Each 200 L barrel of sediment was analysed to confirm the PAH concentration in each barrel. These results were then used to select eight barrels from each contamination range for use in the various trials.

Table 1. Characteristics of Each Sediment Contamination Zone

Contamination Zone	PAH (mg/kg)	TPH (mg/kg)
High	> 5000	>15000
Medium	1000-5000	5000-15000
Low	200-1000	500-5000

Sediments from each contamination zone were mixed using equal parts of each of the eight barrels per contaminant range to produce samples of 'low', 'medium' and 'high' PAH concentrations for the test work. It was noted during this mixing process that the 'low' concentration was principally a 'dirty' sand, while the 'medium' & 'high' were principally clays with varying amounts of sand and silt.

To assess the effectiveness of dewatering the sediment and to assess the quality of the seepage water, a dewatering trial was carried out using geotextile tubes (5 m high x 10 m wide x 200 m long). These tubes were suspended from a scaffolding frame and filled with approximately 200 kg of dredged sediment from each of the contamination ranges. Samples (high, medium, low) of the first flush water (filtrate) draining out of the sediments through the permeable tube were used for ecotoxicity testing (as requested by the NSW EPA). Water quality analyses were also conducted on the filtrate from each of the geo-tube test bags. Composite filtrates from each of two tubes were combined in approximately equal proportions, and the three filtrates (low, medium and high) were immediately sent to CAAC Sydney. On arrival, physical and chemical parameters were determined and sub-samples taken for dissolved metals analyses by ICPAES.

For the Microtox® bioassay, the samples were tested after centrifugation to remove particulate material. For the algal bioassay, the filtrates were filtered through a 0.45 µm acid-washed membrane filter prior to testing. Toxicity tests were commenced within 48 h of sample receipt.

2.2 Toxicity Tests

2.2.1 Preparation of quality assurance controls

Two reference toxicants were prepared. A phenol stock solution (100 mg/L) was prepared for the Microtox® test. A copper stock solution (5 mg Cu/L) was prepared from copper sulfate and acidified to <pH 2 for use in the microalgal bioassay.

2.2.2 Dilution water

Seawater was collected from Cronulla, NSW and filtered immediately through a 0.45 µm membrane filter. The seawater was stored in acid-washed polyethylene containers at 4°C. An additional filtration through a 0.22 µm membrane filter was carried out for the Microtox® bioassay.

2.2.3 Microtox®

This test measures the decrease in light output of the luminescent marine bacteria *Vibrio fischeri* after exposure to the diluted sample for 5 and 15 min. The test was carried out on 23/1/03.

The standard Microtox® 90% Test Protocol (Strategic Diagnostics Inc.) was used, with filtered seawater as the diluent. Eight concentrations of each sample were tested (1:2 dilutions), each in duplicate. Exposure duration was 5 and 15 min.

A phenol standard (four concentrations in duplicate) was also run with each test for QA purposes.

Statistical analyses

Toxicity was expressed as the concentration of sample that caused a 50% reduction in the light output of the bacteria, i.e. EC50. The lower the EC50 the more toxic the sample. EC50 values were determined using Microtox® software (SDI). The lowest observable effect (LOEC) and no observable effect (NOEC) concentrations were calculated using a t-test with Bonferroni adjustment (ToxCalc Version 5.0.23, Tidepool software).

2.2.4 *Nitzschia closterium* growth inhibition test

This test determines the inhibition of growth rate of the marine alga *Nitzschia closterium* over 72 h. The test is based on the OECD Test Guideline 201(1984) and the protocol of Stauber et al. (1994). The test protocol is summarised in Table 2. This test was commenced on 22/1/03.

Algal stock cultures

The unicellular marine diatom *Nitzschia closterium* (Ehrenberg) W. Smith (Strain CS 5) was originally isolated from Port Hacking, NSW. The diatom was cultured in f medium (Guillard and Ryther, 1962) with the iron and trace element concentrations halved. The culture was maintained axenically on a 12 h light:12 h dark cycle (Philips TL 40 W fluorescent daylight, 60 µmol photons s^{-1} m^{-2}) at 21°C.

Cells in log phase growth were used in the algal bioassays according to the standard protocol (Stauber et al., 1994). The inoculum was washed and centrifuged three times prior to use in the algal bioassays, to remove culture medium.

Algal bioassay

Algal tests commenced within 24 h of filtrate receipt. The filtrates were filtered through a 0.45 µm membrane filter prior to dilution with seawater.

Two sets of controls and one reference toxicant (each in triplicate) were tested:

1. Natural seawater controls (34‰)

2. Natural seawater controls (28‰) matched to the same salinity as the 'high' filtrate

3. Reference toxicant (20 µg Cu/L)

Six concentrations of each filtrate (0.1-100%), each in triplicate, were prepared by diluting with filtered seawater. Fifty millilitres of each concentration was dispensed into 250 mL silanised (Coatasil, Ajax) glass Erlenmeyer flasks. To each flask, 0.5 mL of 26 mM sodium nitrate and 0.5 mL of 1.3 mM potassium dihydrogen phosphate were added as nutrients.

Each flask was inoculated with 3.5 x 10^4 cells/mL of a prewashed *Nitzschia* suspension. Flasks were incubated at 21°C on a 12 h light:12 h dark cycle (Philips LTD 36 W fluorescent daylight) at 150 µmol photons s^{-1} m^{-2}. Temperature and pH were monitored at the beginning and end of the bioassay.

Cell density in each treatment was determined daily for 3 days using a Coulter Multisizer II Particle Analyser with 70 µm aperture or by counting in a hemocytometer using a phase contrast microscope. Background particle counts in flasks containing seawater or filtrate and no algae were subtracted off all treatment flask counts. A regression line was fitted to a plot of $\log_{10}$ (cell density) versus time (h) for each flask and the cell division rate (µ) determined from the slope. Cell division rates per day (3.32 x µ x 24) were calculated. The bioassay was acceptable if the cell division rate in the controls was 1.4 ± 0.4 divisions per day.

Table 2. Summary of the Test Protocol for the *Nitzschia closterium* Growth Inhibition Bioassay

Test type	Static
Temperature	21 ± 1°C
Light quality	Daylight Fluorescent Lighting
Light intensity	150 µmol photons s-1 m-2
Photoperiod	12 hour light : 12 hour dark
Test chamber size	250 mL
Test solution volume	50 mL
Renewal of test solutions	None
Age of test organisms	5-6 days
Initial cell density in test chambers	2-4 x 104 cells/mL
No. of replicate chambers/concentration	3
Shaking rate	*Twice daily by hand*
Dilution water	Natural 0.45 µm filtered seawater
Effluent concentrations	Minimum of 5 and a control
Dilution factor	1:2 or 1:3
Test duration	72 h
Endpoint	Growth (cell division rate)
Test acceptability	Cell division rate in controls 1.4 ± 0.4 divisions per day. Variability in the controls less than 20%.

Statistical analyses

The 72-h IC50 value (the inhibitory concentration of filtrates which gave a 50% reduction in cell division rate compared to the controls) was calculated using Linear Interpolation in ToxCalc Version 5.0.23 (Tidepool Software). After testing the data for normality and homogeneity of variance, Dunnett's Multiple Comparison Test was used to determine which filtrate concentrations were significantly different to the controls in order to estimate LOEC (lowest observable effect concentration) and NOEC (no observable effect concentration) values.

3 RESULTS AND DISCUSSION

3.1 Filtrate Analyses

Results for general physical and chemical parameters of the samples as received are shown in Table 3. With the exception of Mn, dissolved metal concentrations in the three filtrates were <60 µg/L (Table 4).

Table 3. Physico-Chemical Measurements of Filtrates

Sample	As Received		After Filtering	
	pH	Salinity (‰)	pH	Salinity (‰)
Low PAH (WQE03024)	7.88	35	7.83	35
Medium PAH (WQE03025)	8.18	32	8.12	32
High PAH (WQE03026)	8.11	28	8.09	28

Table 4. Dissolved Metal Concentrations

Metal (µg/L)	Low (WQE03024)	Medium (WQE03025)	High (WQE03026)
Al	2	10	4
As	10	10	8
Cd	13	3	<1
Cu	8	3	2
Fe	30	55	37
Mn	290	820	1160
Pb	<2	<2	7
Zn	31	33	12

3.2 Toxicity Testing

3.2.1 Microtox®

Quality assurance

The phenol reference toxicant gave a 5 min EC50 of 17 mg/L (95% confidence limits of 16-18 mg/L), within the range 13-26 mg/L for test acceptability.

Toxicity tests

The toxicity of the three filtrates to Microtox® is shown in Table 5, with the raw data and statistics reports in Appendix A.

Samples from the low and medium PAH contamination range were of low toxicity to the bacteria, with 26% inhibition of bacterial light output in undiluted filtrate i.e. EC50 values >90%. Some inhibition (3-4%) of bacterial light output was also observed at dilutions of 11% for the low filtrate after a 5 or 15 min exposure. Similarly, there was significant inhibition (7%) of light output in the 23% medium filtrate after a 5 and 15 min exposure. There was no effect on bacterial light output in low filtrate diluted to 5.6% or in medium filtrate diluted to 11%.

Table 5. Toxicity of Filtrates to Microtox® after a 5- and 15-min Exposure

Sample	5 min			15 min		
	EC50 (%)	LOEC (%)	NOEC (%)	EC50 (%)	LOEC (%)	NOEC (%)
Low PAH	>90	11	5.6	>90	11	5.6
Medium PAH	>90	23	11	>90	23	11
High PAH	32 (28-35)	1.4	0.7	27 (26-29)	2.8	1.4
Phenol (mg/L)	17 (16-18)	5.6	<5.6	18 (17-19)	5.6	<5.6

The high range filtrate was more toxic to the bacteria than the low and medium PAH range filtrates. Bacterial light output was inhibited by 50% at dilutions of filtrate of 32% i.e the EC50 was 32% after a 5 min exposure. Longer exposure times did not substantially alter filtrate toxicity. Small but significant inhibition (4%) of light output was found at filtrate concentrations as low as 1.4% after a 5-min exposure.

3.2.2 Microalgal growth inhibition test

The growth of the alga at various concentrations of the three filtrates compared with seawater controls, is shown in Tables 6-8. Raw data and ToxCalc statistics reports are given in Appendix B.

Quality assurance

Growth rate in the natural seawater control was 1.37 doublings/day, within the normal range for growth of 1.4 ± 0.4 doublings per day. There was no significant difference between algal growth rates in 34‰ or 28‰ salinity seawater controls (1.37 and 1.46 doublings per day). Variability in both sets of controls was 3-4%, indicating test acceptability. The copper reference toxicant (20 µg/L) was toxic to

the alga (32% of control) confirming that the alga was responding as usual to a known toxicant.

The pH of the natural seawater control ranged from 8.0 to 8.25 throughout the test.

Filtrate toxicity tests

Precipitation onto the bottom surface of the glass flasks in the 100% filtrates was observed after 48 and 72 h. These samples had to be counted manually.

The low filtrate inhibited the growth of the alga over 72 h, with a 72-h IC50 of 24% (95% confidence limits of 23-24%). Significant inhibitory effects on growth rate were not detectable at concentrations of filtrate of 11% i.e. the NOEC was 11%. Significant stimulation of algal growth (109-116% of control) occurred at low filtrate concentrations (0.1-3.7%).

Table 6. The Effect of Low PAH Filtrate on the Growth Rate of *Nitzschia closterium* over a 72-h Exposure

Filtrate Concentration	Algal Growth Rate		CV
(%)	Doublings/day	% of Control	(%)
0 (Seawater Control)	1.37	100	3.8
0.1[a]	1.50	109	3.8
1.2[a]	1.59	116	1.6
3.7[a]	1.56	114	2.1
11	1.44	105	1.4
33[b]	0.26	19	11
100[b]	0	0	-

[a] Significantly greater than the control at alpha=0.05 by Dunnett's test
[b] Significantly less than the control at alpha=0.05 by Dunnett's test

Table 7. The Effect of Medium PAH Filtrate on the Growth Rate of *Nitzschia closterium* over a 72-h Exposure

Filtrate Concentration	Algal Growth Rate		CV
(%)	Doublings/day	% of Control	(%)
0 (Seawater Control)	1.37	100	3.8
0.1	1.52	111	3.8
1.2	1.48	108	0.64
3.7	1.49	109	9.5
11[a]	1.61	118	1.4
33[b]	1.11	81	2.0
100[b]	0.02	1	73

[a] Significantly greater than the control at alpha=0.05 by Dunnett's test
[b] Significantly less than the control at alpha=0.05 by Dunnett's test

The medium filtrate was less toxic to the alga over 72 h than the low range filtrate, with a 72-h IC50 of 55% (95% confidence limits of 54-57%). Significant inhibitory effects on growth rate were not detectable at concentrations of filtrate of 11% i.e. the NOEC was 11%. Stimulation of algal growth (108-118% of control) occurred at low filtrate concentrations (0.1-11%), however this stimulation was only statistically significant in the 11% filtrate.

Table 8. The Effect of High PAH Filtrate on the Growth Rate of *Nitzschia closterium* over a 72-h Exposure

Filtrate Concentration	Algal Growth Rate		CV
(%)	Doublings/day	% of Control	(%)
0 (Seawater Control)	1.37	100	3.8
0 (28‰ Seawater Control)	1.46	106	2.9
0.1[a]	1.52	111	3.9
1.2[a]	1.48	108	1.6
3.7[a]	1.60	117	3.1
11[a]	1.54	112	4.0
33[b]	0.81	59	7.3
100[b]	0	0	-

[a] Significantly greater than the control at alpha=0.05 by Dunnett's test
[b] Significantly less than the control at alpha=0.05 by Dunnett's test

The high filtrate inhibited the growth of the alga over 72 h, with a 72-h IC50 of 38% (95% confidence limits of 30-44%). Significant inhibitory effects on growth rate were not detectable at concentrations of filtrate of 11% i.e. the NOEC was 11%. Significant stimulation of algal growth (108-117% of control) occurred at filtrate concentrations from 0.1-11%.

3.2.3 Causes of the observed toxicity

In order to aid interpretation of the toxicity test results, chemical analyses of the filtrates at the time of sampling in Newcastle, undertaken by AGAL, were provided by Patterson Britton & Partners and are shown in Appendix C. Samples were analysed from each of the two bags used to prepare each composite filtrate.

It is difficult to relate the toxicity of the filtrates to their total PAH concentrations. The low PAH sample actually contained 3700 µg/L total PAHs in one of the two bags used to composite the sample. The other sample contained only 41 µg/L total PAHs, so it is likely that the former sample was largely sand, in agreement with the observations during sediment sampling. Total PAH concentrations in the filtrate from the medium PAH sediment sample were 45 and 16 µg/L in the two bags, and 290 and 170 µg/L in the high sample.

Ammonia concentrations in the filtrates were high. The highest total ammonia concentration (about 44 mg N/L) was found in the low PAH sediment filtrate, followed by the high PAH sediment filtrate (about 18 mg N/L) and finally the medium PAH sediment filtrate (15 mg N/L). Total cyanide concentrations were also high and zinc concentrations also exceeded the ANZECC/ARMCANZ (2000) guideline trigger values.

Microtox® tests showed that the acute toxicity of the filtrate from the high PAH contaminated sediment was greater than that of the low and medium PAH contaminated sediment. However, toxicity did not appear to correlate with any of the measured chemicals in the filtrates. Microtox® is insensitive to ammonia (5-min EC50 >900 mg N/L), so despite the high ammonia released into the filtrate during the dewatering procedure, ammonia could not account for the observed toxicity to Microtox®.

In contrast, toxicity of the filtrates to algal growth was correlated with measured ammonia, total PAH, naphthalene and total phenolics. Of these, ammonia is most likely to be the major cause of toxicity to *Nitzschia*. Table 9 shows the observed toxicity of the filtrates compared to the toxicity predicted from the ammonia concentration in the filtrates. Observed toxicity is calculated from the filtrate toxicity test in Toxic Units (TU = 100/EC50). The predicted toxicity is calculated form the measured ammonia concentration in the filtrate and the known sensitivity of *Nitzschia* growth to ammonia (72-h EC50 of 9 mg N/L total ammonia or 0.38 mg N/L unionised ammonia). On the basis of total ammonia and unionised ammonia, the observed and predicted toxicity of the low PAH and medium PAH sediment filtrates were similar. For the high PAH sediment filtrate,

the observed toxicity was slightly higher than the predicted toxicity, suggesting that some other contaminant may also be contributing to toxicity.

Table 9 Comparison of the Observed Toxicity of the Filtrates to the Toxicity Predicted from the Filtrate Ammonia Concentrations

Filtrate Sample	Ammonia (mg N/L)	Observed Toxicity (TU)	Predicted Toxicity (TU)
Low	44 (total)	4.2	4.9
	1.7 (unionised)	4.2	4.5
Medium	15 (total)	1.8	1.7
	0.6 (unionised)	1.8	1.5
High	18 (total)	2.6	2.0
	0.7 (unionised)	2.6	1.8

Toxicity tests using sea urchin fertilisation and larval development were carried out concurrently with the bacteria and algal testing, by Ecotox Services Australasia. These results were provided by Patterson Britton & Partners to CSIRO and are given in Table 10.

Table 10 Summary of Filtrate Toxicity to All Test Species

Test Species	Endpoint	EC/IC50 (%)			NOEC		
		Low	Medium	High	Low	Medium	High
V. fischeri (Microtox®)	5-min light output	>90	>90	32 (28-35)	6	11	0.7
N. closterium	72-h growth	24 (23-24)	55 (54-57)	38 (30-44)	11	11	11
H. tuberculata	2-h fertilisation	16 (15-17)	12 (11-13)	11 (11-12)	3.3	3.3	3.3
	48-h larval devel.	6 (5.9-6.0)	5.7 (5.6-5.8)	5.9 (5.8-6.0)	3.3	3.3	3.3

The filtrates were more toxic to both sea urchin fertilisation and larval development than to algal growth and bacterial light output. The order of sensitivity of the tests (based on EC/IC50 values, from most sensitive to least sensitive was:

Sea urchin larval development > sea urchin fertilisation > algal growth > bacterial light output.

It should be noted, however, that unfiltered samples were tested for toxicity to sea urchins while filtrates were centrifuged for Microtox® and filtered through a 0.45 µm membrane filter for algal growth tests. It is possible that toxicants associated with particulates may have contributed to the sensitivity of the sea urchin tests.

Toxicity of all filtrates to sea urchin larval development was similar, and was not correlated with any particular contaminant measured in the filtrates. Toxicity of the low filtrate was slightly less than the medium and high filtrate toxicity to sea urchin fertilsation. Toxicity of the filtrates to sea urchin fertilisation and larval development was much greater than that predicted based on the measured ammonia concentrations. Sea urchin larval development is particularly sensitive to ammonia, with a 48-h EC50 of 0.17 mg N/L unionised ammonia. Ammonia accounted for less than 60%, 20% and 25% of the observed toxicity to sea urchin larval development in the low, medium and high filtrates respectively. Sea urchin fertilisation is about 10 times less sensitive to ammonia (2-h EC50 of 1.7 mg N/L unionised ammonia) than larval development. Ammonia accounted for less than 20%, 5% and 5% of the observed toxicity to sea urchin fertilisation for the low, *medium and high filtrates respectively.*

4 CONCLUSIONS

The dewatering filtrates from the sediments from the Hunter River were of low toxicity to bacterial light output (Microtox®) and microalgal growth. Sea urchin fertilsation and larval development were more sensitive to the filtrates, with little difference in the toxicity observed between filtrates from low, medium and high PAH sediment.

Microtox® tests showed that the acute toxicity of the filtrates from the high PAH contaminated sediment was greater than that of the low and medium PAH contaminated sediment. In contrast, the chronic toxicity of the filtrates to microalgal growth was similar for all three samples, with the same LOEC and NOEC values. Algal growth was only affected at concentrations of filtrate of 33% and 100% (undiluted). Based on IC50 values, however, filtrate from the low PAH sediment was slightly more toxic to algal growth than filtrate from the high PAH sediment, with the medium PAH sediment filtrate the least toxic. The toxicity of the filtrates to *Nitzschia* was most likely due to ammonia released from the sediment during the dewatering procedure.

Algal growth was more sensitive to the low and medium filtrates than Microtox®, whereas Microtox® was more sensitive to the filtrate from the highly PAH contaminated sediment. The filtrate from the high PAH sediment would have to be diluted about 100 times to be below the no effect level for acute toxicity to the bacteria.

Ammonia released from the dewatered sediments in the filtrates may be an issue if the water is returned to the river. These ammonia levels are not dissimilar to sewage effluents, and ammonia is not likely to adsorb to particles. Whether or not it is toxic will depend on the volume of dewatered filtrate and its dilution in the river. Substantial dilution would be required (at least 1:100) as ammonia at low concentrations can also stimulate algal growth.

5 ACKNOWLEDGEMENTS

The authors would like to thank David Spadaro, Jacqui Levy and Natasha Franklin for carrying out the algal and Microtox® bioassays.

6 REFERENCES

ANZECC/ARMCANZ (2000) Australian and New Zealand Guidelines for Marine and Fresh Water Quality.

Guillard, R.R.L. and Ryther, J.H. (1962). Studies of marine planktonic diatoms. I. *Cyclotella nana* and *Detonula confervaceae* Hustedt (Cleve) Gran. *Can. J. Microbiol.* 8, 229-239.

Kaiser, K.L.E. and Devillers, J. (1994) Ecotoxicity of Chemicals *to Photobacterium phosphoreum.* Vol. 2, Gordon and Breach Science Publishers, Switzerland, 879 pp.

OECD (1984). Guideline for testing of chemicals. Alga growth inhibition test. Test Guideline No. 201. Organisation for Economic Cooperation and Development, Paris, France.

Stauber, J.L., Tsai, J., Vaughan, G.T., Peterson, S.M. and Brockbank, C.I. (1994). Algae as indicators of toxicity of the effluent from bleached eucalypt kraft paper mills. National Pulp Mills Research Program Technical Report No. 3 Canberra: CSIRO, 146 pp.