Appendix F
Acid Sulphate Soils Report

R E P O R T

Acid Sulfate Soils

Prepared for

Gladstone Pacific Nickel Pty Ltd

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42625791

URS

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Contents

1.1 Background

Gladstone Pacific Nickel Limited (GPNL) is proposing to build and operate the Gladstone Nickel Project (GNP). The GNP includes a fourth generation high-pressure acid leach (HPAL) nickel cobalt refinery (Yarwun Refinery), located in Gladstone, Queensland.

The Yarwun Refinery, located at the intersection of Hanson and Reid Road, approximately 7km north-west of the central business district of Gladstone, will process nickel laterite ores from the south west Pacific region that are supplied by ship through the Gladstone Port and beneficiated ore slurry supplied via a pipeline from GPNL's mine near Marlborough.

1.2 Previous Investigations

Two acid sulfate soil investigations have previously been undertaken within the project area. One, undertaken by the Department of Natural Resources and Mines in Rockhampton, was for the purpose of mapping the Central Queensland Coast from Tannum Sands to Fisherman's Landing (Ross, 2004). A second investigation was recently undertaken by Douglas Partners for the Central Queensland Ports Authority (CQPA) in connection with the proposed construction of the Wiggins Island Coal Terminal (WICT) (Douglas Partners, 2006). The results from both of these investigations have been included and discussed in this report.

1.3 Objectives

The overall objectives of this study were to:

- Conduct an acid sulfate soil (ASS) investigation on the site in accordance with State Planning Policy – SPP 2/02 and the Guidelines for Sampling and Testing of ASS established by the Queensland Acid Sulfate Soil Investigation Team (QASSIT) (Ahern *et al.*, 1998);
- Use the results from this investigation and prior investigations to assess the occurrence, distribution and the levels of concentration of ASS within the site; and,
- Develop and recommend appropriate strategies for the sustainable management of ASS during construction.

2.1 Sampling Strategy

2.1.1 May 2006 Investigation by URS

A site visit was undertaken on the 18th of May 2006. Five hand auger holes were taken at various selected locations throughout the refinery site that had not been assessed for ASS in previous investigations by Douglas Partners (2006) or Ross (2004). Hand augers were taken using 75mm diameter hand augering equipment ranging from depths of 1.2m to 3.0 m.

Hand auger holes were taken as follows:

- One at the intersection of Hanson and Reid Road, which is likely to require upgrading as a result of the GNP (ASS1);
- Two at the proposed locations of the transfer stations for the sulphur and imported ore conveyor (ASS3 and ASS4); and
- Two along the proposed alignment of the sulphur and imported ore conveyor and sea water pipelines (ASS2 and ASS5).

These hand auger holes are shown in Figure 1a.

Soil sampling was conducted in accordance with the provisions of the *State Planning Policy 2/02* (SPP 2/02) guidelines and the *"Guidelines for Sampling and Analysis of Lowland Acid Sulfate Soils (ASS) in Queensland 1988"*. Samples were collected from the surface and at 0.25 m intervals down the profile. In the field, samples were individually sealed and stored on ice within eskies. They were sent to an approved ASS testing laboratory, Australian Laboratory Services (ALS) in Brisbane, for analysis. All samples were received within required holding times in accordance with QASSIT soil sample handling and testing guidelines.

Laboratory testing was carried out using the accepted analytical procedures described in the *Queensland Acid Sulfate Soil Laboratory Methods Guidelines (Version 2.1 – June 2004)*. Samples were analysed for indicative soil pH (pH_F) and pH following rapid peroxide oxidation (pH_{FOX}). Based on the results of the indicative tests, a select number of samples were analysed using Chromium suite, which includes Titrateable Actual Acidity (TAA), Chromium Reducible Sulfur (S_{CR}), Net Acid Soluble Sulfur (NAS) and Acid Neutralising Capacity (ANC). As a cross-check for analytical accuracy, a small percentage of samples were also analysed using the peroxide oxidisable sulfur (S_{POS}), TAA and Titrateable Peroxide Acidity (TPA) using the Suspension Peroxide Oxidation Combined Acidity and Sulfate (SPOCAS) Suite.

2.1.2 Previous investigation by DNRME

A total of 188 sites were tested for ASS in the mapping program conducted by the DNRME (Ross, 2004). This mapping program covers coastal locations in the greater Gladstone area. Of the 188 sites sampled as

part of this mapping program, 18 sites are in areas relevant to the GNP. These sites are presented in Figure 2 and Table C1 in Appendix C.

2.1.3 January 2006 Investigation by Douglas Partners

In January 2006, Douglas Partners undertook geotechnical and ASS investigations as part of the WICT project. A total of 12 test pits were excavated by backhoe. The test pits (designated Pits 1 to 7 and Pits 9 to 12 on Figure 2) were selected due to their location on the "coastal plains" and "alluvial plains" sediments.

Sixty-one samples were screened for pH_F and pH_{FOX}. Six (6) of these screening test samples were selected for more rigorous Chromium Suite chemical testing at ALS (refer Table C2 in Appendix C).

2.2 Explanation of Acid Sulfate Soil Terminology

Acid Sulfate Soil (ASS) is a common name for naturally occurring clays, muds, sands and gravels rich in the iron sulfide pyrite. When such sediments are exposed to the air by excavation or drainage works (which may lower the ground water table) the iron sulfides react with moisture and oxygen to form sulfuric acid according to the following overall reaction:

$$\mathbf{FeS_2 + \tfrac{15}{4} O_2 + \tfrac{7}{2} H_2O \dashrightarrow Fe(OH)_3 + 2\, H_2SO_4}$$

The decrease in pH causes iron, aluminium and other heavy metals to become soluble. The flushing or leaching of the disturbed ASS enables the dissolved metals to enter waterways and drains. This can cause significant impact to the environment, engineered structures and human health in the receiving areas.

In natural environments, the iron sulfides in the soil are stable. These are called potential acid sulfate soils (PASS) because they have the potential to produce acidity when disturbed or exposed to air. PASS materials generally have a pH close to neutral (pH 6.5 – 7.5). PASS materials are only problematic when they are disturbed and exposed to air, typically via excavation, filling or extraction of groundwater. Disturbed PASS material can become actual acid sulfate soils (AASS) through exposure to oxygen. AASS are acidic and have a pH of less than 4.

In Queensland, action criteria define when ASS disturbed at a site will need to be managed (refer Table 2.1). Action criteria are based on the sum of existing, potential and retained acidity minus the acid neutralising capacity:

Net Acidity = Potential Sulfidic Acidity (S_{POS} or S_{CR}) + Existing Acidity – ANC/Fineness factor

where Existing acidity = Titrateable Actual Acidity (s-TAA) + Retained Acidity (s-NAS)

In this study, the potential acidity was measured using the chromium reducible sulfur (S_{CR}) method, whilst the existing acidity was measured using the TAA and s-NAS methods.

Table 2.1. Action Criteria based on ASS analysis for three broad texture categories

Type of Material		**Action Criteria if 1 to 1000 tonnes of material is disturbed**		**Action Criteria if more than 1000 tonnes of material is disturbed**	
		(S_{CR} + TAA+S_{NAS})		(S_{CR} + TAA S-$_{NAS}$)	
Texture Range	Approximate clay content (%)	Equivalent Sulfur (%S) (oven-dry basis)	Equivalent Acidity (mol H^+/tonne) (oven-dry basis)	Equivalent Sulfur (%S) (oven-dry basis)	Equivalent Acidity (mol H^+/tonne) (oven-dry basis)
Coarse Texture Sands to loamy sand	≤5	0.03	18	0.03	18
Medium texture Sandy loams to light clays	5-40	0.06	36	0.03	18
Fine texture Medium to heavy clays and silty clays	≥40	0.1	62	0.03	18

3.1 Identification of ASS

The results from the URS field ASS investigations are presented in Sections 3.1.1 and 3.1.2.

3.1.1 Indicative Field Testing

Field pH (pH_F) and oxidised field pH (pH_{FOX}) tests were carried out on 32 borehole samples from ASS01, ASS02, ASS03, ASS04 and ASS05 (refer to Appendix A for results). These tests are used to indicate the likelihood of a soil being either an actual or potential acid sulfate soil (AASS or PASS) respectively. The following combination of factors is used in the assessment of samples:

1. pH_F value of less than 4 may indicate that AASS are present. The results of the pH_F tests for all borehole samples ranged from pH 4.2 to 8.7 indicating that AASS are unlikely in the areas sampled.

2. pH_{FOX} value of less than 3 may indicate that PASS are present. The results of the pH_{FOX} tests indicate that soil from all boreholes, apart from ASS1, has the potential to produce sulphuric acid if exposed to oxidising conditions.

3. pH_{FOX} value 1 pH unit below pH_F may indicate PASS with larger reductions in pH_{FOX} generally providing a stronger indication of PASS. The drop in pH observed in samples from ASS1, ASS2, ASS3, ASS4 and ASS5 averaged 2.1, 3.3, 3.3, 1.5, and 1.6 pH units respectively. This indicates that PASS may be present in most samples from all boreholes.

4. A strong reaction to peroxide in the pH_{FOX} test may indicate PASS. Most samples had a moderate reaction rate; some surface samples from ASS2 recorded a high reaction rate (*i.e.* reaction rate number of 4); however this is likely to be associated with the oxidation of organic matter.

The indicative test results therefore generally indicate that PASS are likely in all soil bores samples at shallow depths.

3.1.2 Laboratory Testing

Further detailed laboratory testing was carried out on selected samples based on the indicative laboratory results. Laboratory testing using the Chromium Reducible Sulfur (S_{CR}) Suite was carried out on 12 samples recovered from boreholes ASS1, ASS2, ASS3, ASS4 and ASS5. As a cross-check, three samples recovered from AAS2, ASS3 and ASS5 were tested using the Suspension Peroxide Oxidation-Combined Acidity and Sulfate (SPOCAS) suite. The test results are included in Appendix A. All ALS test certificates are included in Appendix B.

The laboratory test results indicate the following:

Intersection of Hanson and Reid Road

ASS1

- Despite pH_F values above 4, laboratory test results indicate the dark-grey, light to medium, soft clays at a depth between 0.45 -0.80 mbgl (metres below ground level) are actual acid sulfate soils as they have a very high content of retained[1] (or 'net acid soluble" [NAS]) acidity. The S_{NAS} is 4.09% at a depth of between 0.45-0.55 mbgl and 1.31% at a depth of between 0.7-0.8 mbgl. The samples also have a small amount of actual acidity but no potential, or oxidisable, acidity. The acid producing capacity (s-TAA+S_{NAS}), for the light to medium, soft clay material averages 2.75 %S which is in excess of the Action Criteria of 0.03% for sandy loams to light clays (Table 2.1). The material does not have any acid neutralising capacity.

- The underlying gravely clay located at depths of greater than 1.4 mbgl has no potential or actual acidity.

These high net acidity results are consistent with those obtained by Ross (2004) from site number 512 which is also located at the intersection of Hanson and Reid Road (refer to Table C1 in Appendix C).

Transfer Stations

ASS3

- At ASS3, the bright red, silty medium to heavy clays above 0.5 mbgl are actual ASS (s-TAA = 0.03%S). The dark-grey brown silty medium clay, present at a depth of 0.5 mbgl is predominantly a potential ASS as it has an oxidisable sulfur content of 0.18%S (S_{POS}) and a small content of actual acidity (0.02%).

- The blue-ish to pale grey silty medium to heavy clays located at a depth of 1.2 mbgl are potential ASS and have a high oxidisable sulfur content (S_{CR}) of 1.28 %S and no actual acidity (TAA). This material has no acid neutralising capacity.

ASS4

- The light to medium clay and sandy to silty heavy clay in the top 1.5 m of the soil profile have a net acidity ranging from 0.04 to 0.05 %S which is above the Action Criteria of 0.03%. There is both actual and potential acidity within the top metre of the profile and only potential acidity below 1 mbgl.

[1] Retained acidity is the acidity stored in largely insoluble compounds such as jarosite and other iron and aluminium sulfate minerals, which tend not to be measured using the TAA titration.

High potential acidities observed in ASS3 and ASS4 are consistent with results obtained by Ross (2004) from site number 496 and 520, which are located in nearby areas (refer to Table C1 in Appendix C).

Proposed Conveyor and Seawater Pipeline Route

ASS2

Despite low pH_{FOX} values below 3 and very vigorous reaction rates, laboratory test results indicate that the medium and heavy clays from ASS2 are not potential or actual ASSs. The very vigorous pH_{FOX} reaction rate is most likely due to the reaction of organic matter found within the surface layers of the soil profile. One sample has an oxidisable sulfur content of 0.3% however this sample has a high neutralising capacity (0.12%S) which is sufficient to buffer the acidity potentially produced upon oxidation.

ASS5

The light brown to dark brown sandy, light to medium clay within the top 0.5 m of the soil profile has no potential or actual acidity and does not require treatment. The underlying dark grey, light to medium clay, present at about 1 mbgl and below the groundwater level, has a high oxidisable sulfur content (S_{POS}) of 2.06 %S and an actual acidity (s-TAA) of 0.05%. The heavy clays that underlie the predominantly PASS light to medium clays have some oxidisable acidity (average of 0.10 %S) but no actual acidity. The material has some acid neutralising capacity and hence there would be no need to treat this material with lime.

The laboratory results show that actual ASS sediments with levels of titratable acidity in the range 0.2 to 0.5 %S are present within the top 0.5 m in ASS3 and ASS5. Similar levels of titratable acidity are present at ASS4 however actual ASS are present up to 1.5 mbgl. Very high levels of actual ASS (averaging 2.7 %S) exist within the top 1 metre at ASS1. PASS materials are found underlying the actual ASS materials at ASS3 (at a depth of 0.5 mbgl) and at ASS5 (at a depth of 1.0 mbgl).

Douglas Partners Results

Three testpits (Testpits 4, 5 and 6; refer to Figure 1a and 2) were excavated for ASS investigation undertaken by Douglas Partners (2006). PASS material comprised of estuarine silty clays with organic matter was identified in all test pits, extending to a depth of 1.5m. These PASS materials were underlain by non-PASS alluvial sediments. The net acidity of the PASS material at Testpits 4, 5 and 6 were 3.51, 1.20 and 0.73 %S respectively (Table C2 in Appendix C). One testpit (Testpit 1; refer to Figure 1a) was excavated at Golding Point. At this location, PASS was identified to a depth of 2.5 mbgl. The net acidity at this location was 1.08 %S.

The results obtained by Douglas Partners (2006) from screening and laboratory testing (Appendix C) indicates the presence of ASS across the tidal and mangrove flats (Quaternary Holocene sediments), within “estuarine mud (typically very soft, soft or firm grey silty clays with organics), but not within the underlying older alluvium or residual soils (typically very stiff or hard clays)”. This is consistent with the findings of this study.

4.1 Construction Activities

Much of the site for the proposed refinery is located on high ground above 5m AHD and hence the majority of construction activities do not pose any significant acid sulfate issues. However, some construction activities will also be occurring in tidal and mangrove flats at elevations close to or just above sea level. These activities include the construction of:

- Conveyor for transferring imported nickel ore and sulphur from WICT to the refinery;
- Sea water pipelines for process water and cooling water; and
- An upgrade to the intersection of Hanson and Reid Road for vehicular access to the refinery site.

These areas are shown in Figure 2.

4.2 Mitigation Measures

Many of the sediments in the tidal and mangrove flats were deposited during the Quaternary (specifically, the Holocene epoch) and have been found to contain elevated levels of the iron disulfide, pyrite (Ross, 2004) which can oxidise to produce sulfuric acid when exposed to atmospheric conditions. These soils are termed 'Potential Acid Sulfate Soils' (PASS). When the pyrite is oxidised or exposed to air, Actual Acid Sulphate Soils (AASS) are formed. These are commonly collectively referred to as Acid Sulphate Soils (ASS). According to the State Planning Policy 2/02, acid sulfate soils are required to be managed when disturbed.

The ASS test results indicate that the underlying very stiff clays (alluvium or residual soils) contain no actual or potential acidity which negates the requirement for any treatment of the material, whilst the overlying Holocene (estuarine mud) sediments comprise actual and/or potential acidity and will require treatment if disturbed and allowed to oxidise. However, acid sulfate soil issues are unlikely to occur during the construction of the GNP for the following reasons:

1. Prior to any construction works being undertaken in the tidal and mangrove flats, it has been proposed that as part of the adjoining WICT expansion project, non-acid sulfate soil fill material will be placed on the existing natural ground surface over this area to a level of 7m AHD nominally (refer Figure 1a and 2). This will prevent underlying natural materials from being exposed to the atmosphere during the construction works.

2. The seawater pipelines will pass under Hanson Road which will be elevated over the WICT access railway. To the south of Hanson Road construction of the pipelines will not disturb ASS because of the amount of filling in these areas as outlined above. To the north of Hanson Road, the pipelines are proposed to be supported at intervals on reinforced concrete pile caps on driven piles. The pipelines will be nominally above grade and the pile caps constructed in grade typically to a depth of 0.5m. Unless ASS is disturbed by the initial earthworks there need be no disturbance due to pipeline construction if it is in fill, well above existing levels.

3. The conveyor will pass under the proposed Hanson Road overpass and be supported on strip footings, typically at about 3.5m spacing, that will penetrate the grade by about 0.5m. As for the pipeline supports, if the finished grade level is well above the existing surface there need be no disturbance of ASS.

4. Ground improvement, where a depth of soil is removed and replaced with non-reactive compacted fill material to reduce settlement may also disturb ASS. Disturbance of ASS can be avoided by filling over rather than cutting the existing surface during the bulk earthworks. The selection of an appropriate finished grade level will be considered to minimise disturbance of ASS.

5. Some disturbance of soil may occur when driving piles, however ASS are not expected to be oxidised using this method.. Driven piles will be needed to:

    - Support the conveyor and transfer stations on the Refinery side of Hanson Road (refer Figure 2); and

    - Support the pipelines to / from WICT.

    Driven piles will be used to support heavily loaded foundations, either by large displacement (*i.e*. precast concrete) or small displacement (*i.e*. steel H or tubes). This method of construction will reduce disturbance to ASS compared to other pile systems involving bored piles and limit exposure of ASS to the excavation depth for pile cap construction. Durability of the pile penetrating ASS and the selection of a suitable corrosion allowance will be considered during the detailed design of the piles.

6. Any construction works associated with the intersection of Hanson and Reid Road will require significant amounts of fill, rather than excavation. Hence, it is unlikely that these works will expose ASS.

7. All construction activities will be undertaken in accordance with an ASS Management Plan which contains a number of measures designed to limit potential ASS impacts (refer Appendix D).

It is anticipated that appropriate geotechnical investigations will be undertaken as part of the WICT project to determine appropriate soil fill rates to apply so that resultant ASS "bow waves" are avoided as a result of filling. It has been assumed that geotechnical methods, such as placing a bridging layer *e.g*. geotextile liner, between the fill layer and the natural ground surface, building up the fill platform using a series of layers and stepping the edge of the fill profile to distribute the load at the edges, will be implemented to prevent displacing ASS outside the load areas into oxidising environments.

Intersection of Hanson and Reid Road

The investigation found ASS sediments with high levels of net acidity (between 4.14 %S and 1.36 %S) extending to a depth of approximately 1.0 m at ASS1. These ASS sediments are underlain by brown to

pale yellow brown alluvial or residual stiff to very stiff clays which contain nil levels of oxidisable sulfur and represent essentially Non-ASS sediments.

At present, it is likely that fill material will be used during any construction activities and no natural materials will require excavation. However, if excavation of the natural material is required, the underlying non-ASS materials should be stockpiled separately from the overyling dark grey to brown estuarine soft clayey (ASS) materials. This will enable the ASS materials to be appropriately lime treated prior to backfilling.

The calculated maximum liming rate for the ASS sediments range between 194 and 63 kg/t. These rates are considered high and could be attributed to the high level of retained acidity in the samples (refer Appendix A). If during detailed design, it is determined that disturbance to the soil profile is required as a result of construction, it is considered appropriate that liming rates be re-calculated prior to the construction phase based on revised testing information. Validation testing would also be necessary following lime treatment, to confirm that sufficient Aglime (including a 1.5 x factor of safety) has been added to treat acidity levels.

Transfer Stations

The investigation found actual ASS sediments with relatively low levels of acidity (0.05 to 0.03%S) within the top 0.5m. PASS sediments with high levels of net acidity (between 0.04 %S and 1.3 %S) extend to a depth of approximately 1.5 m. These PASS sediments are underlain by brown diffusely mottled heavy alluvial or residual stiff to very stiff clays which contain no levels of oxidisable sulfur and represent essentially Non-ASS sediments.

During the construction of the transfer stations, driven piles will be used to support heavily loaded foundations, either by large displacement (i.e. precast concrete) or small displacement (i.e. steel H or tubes). This method of construction will reduce the disturbance to ASS and PASS compared to other pile systems involving bored piles. Materials are not excavated using this technique and no faces of excavation trenches are exposed; hence PASS materials are not exposed to the atmosphere.

It is not expected that any specific management of ASS will be required during the construction of the transfer stations. However, if materials from the top 1.5m of the soil profile become exposed during construction, these should be separated from the underlying non-PASS materials. The calculated maximum liming rate for the sediments was 2 kg/t in the vicinity of ASS4 and 61 kg/t in the vicinity of ASS5.

If during detailed design, it is determined that disturbance to the soil profile is required as a result of construction, it is considered appropriate that liming rates be re-calculated prior to the construction phase based on revised testing information. Validation testing would also be necessary following lime treatment, to confirm that sufficient Aglime (including a 1.5 x factor of safety) has been added to treat potential acidity levels should the materials become completely oxidised.

Conveyor and Seawater Pipeline Route

The investigations found the following:

- PASS sediments with high levels of net acidity (2.11 %S) at a depth of 1 to 1.5 mbgl at the southern end of the proposed Conveyor (ASS5). Should material become disturbed at the southern end of the conveyor, a liming rate of 99 kg of Aglime per tonne of soil excavated (using a Fineness Factor for the Aglime of 1.5) would be required to treat this soil.

- No actual or potential ASS were detected at the middle of the conveyor alignment. The samples have no net acidity and liming is not required. At the northern end of the alignment, material has a low net acidity and would require 2 kg/t of Aglime per tonne of soil excavated. PASS materials were detected towards the northern end of the alignment within the top 1.5 m (see results for ASS4).

- On the eastern side of Hanson Road (refer Figure 1a), the Douglas Partners investigations found PASS sediments with high levels of net acidity (ranging from 0.73 to 3.51 %S) extending to a depth of 1.5 mbgl along the majority of the alignment. At Golding Point, the PASS sediments extended to a depth of 2.5 mbgl. Soils are unlikely to be disturbed in these areas. However, in the event that material does become exposed during construction, PASS materials (silty clays with organic matter) should be separated from the underlying non-PASS alluvial material and treated. Liming rates of 51, 164, 56 and 34 kg of Aglime per tonne of soil excavated (using a Fineness Factor for the Aglime of 1.5) would be required for soil in the vicinity of Testpits 1, 4, 5 and 6 respectively.

If during detailed design, it is determined that disturbance to the soil profile is required as a result of construction, it is considered appropriate that liming rates be re-calculated prior to the construction phase based on revised testing information. Validation testing would also be necessary following lime treatment, to confirm that sufficient Aglime (including a 1.5 x factor of safety) has been added to treat potential acidity levels should the materials become completely oxidised.

URS Australia Pty Ltd (URS) has prepared this report in accordance with the usual care and thoroughness of the consulting profession for the use of Gladstone Pacific Nickel Limited and only those third parties who have been authorised in writing by URS to rely on the report. It is based on generally accepted practices and standards at the time it was prepared. No other warranty, expressed or implied, is made as to the professional advice included in this report. It is prepared in accordance with the scope of work and for the purpose outlined in the Proposal dated 21st October 2005.

The methodology adopted and sources of information used by URS are outlined in this report. URS has made no independent verification of this information beyond the agreed scope of works and URS assumes no responsibility for any inaccuracies or omissions. No indications were found during our investigations that information contained in this report as provided to URS was false.

This report was prepared between May and July 2006 and is based on the conditions encountered and information reviewed at the time of preparation. URS disclaims responsibility for any changes that may have occurred after this time.

This report should be read in full. No responsibility is accepted for use of any part of this report in any other context or for any other purpose or by third parties. This report does not purport to give legal advice. Legal advice can only be given by qualified legal practitioners.

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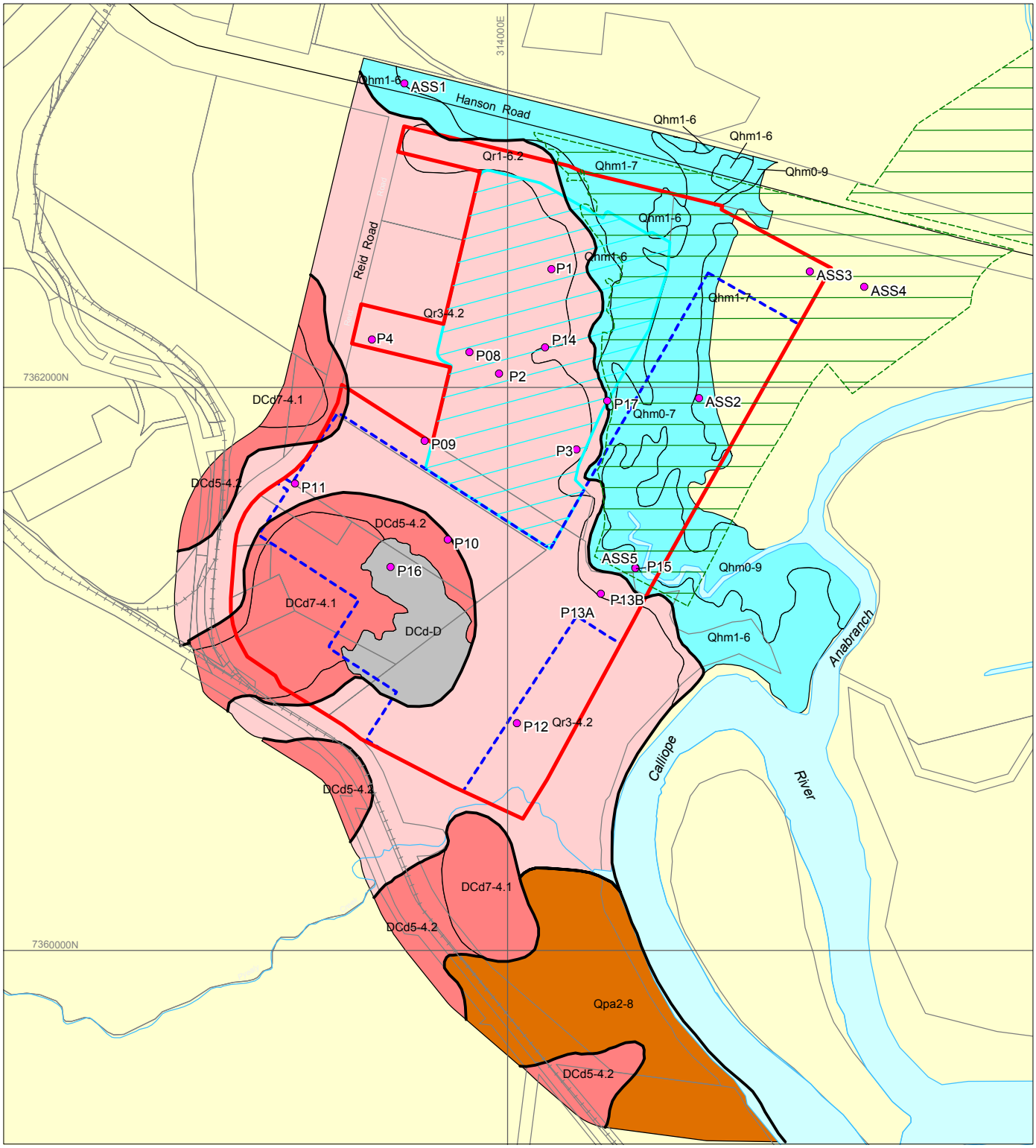
Figures



NOTE:
This Figure 8.1.2a must be viewed with Figure 8.1.2b (Terrain Units Identification Key)

0 250m 500m
Scale 1:20 000 (A4)
MGA Z56, GDA94

P08 Soil sampling location

Geological Regime Boundary

Cr4-6.2 Terrain Unit and Terrain Unit Boundary

Refinery Site Boundary

Proposed Development Footprint

Potential construction pad area (Stage 3)

Proposed CQPA reclamation area

Client: Gladstone Pacific Nickel Ltd

Project: GLADSTONE NICKEL PROJECT
ACID SULFATE SOILS REPORT

Title: **TERRAIN UNITS AND GEOLOGICAL REGIMES - REFINERY SITE**

URS

Drawn: VH	Approved: CMP	Date: 23-10-06	Figure: **1a**	Rev:A
Job No: **4262 5791**	File No: 42625791-g-156.wor			**A4**

Client: Gladstone Pacific Nickel Ltd

Project: GLADSTONE NICKEL PROJECT
ACID SULFATE SOILS REPORT

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Title: IDENTIFICATION KEY - TERRAIN UNITS

Figure: 1b | Rev: A | A4

Key to the Identification of Terrain Units

Geological Regime		Landform		Soil Class	
Symbol	**Formation/Lithology**	**Class**	**Description – Surface Form and (Slope Range)**	**Class**	**Soil/Material Type**
Qa	Quaternary:- creek and floodplain alluvial deposits; clay silt, sand and gravel.	0	Seasonal or permanent swamps, tidal lands and drainage–ways; areas subject to regular inundation.	1	Predominantly rocky or coarse gravelly residual, colluvial or alluvial soils (K-Uc to K-Um) - *Rudosols*
Qpa	Quaternary Pleistocene:- older alluvium on higher terraces; clay sand mud and gravel commonly with melon hole gilgai	1	Low-lying poorly drained lower slopes, drainage flats with intermittent stream channels and depressional drainageways; estuarine/marine extratidal and supratidal flats; periodically floodprone or inundated; slopes mostly <1%.	2	Coarse textured sandy soils (Uc) – siliceous or calcareous sands - *Rudosols*
Qr	Quaternary:-residual soils and colluvial deposits: clay, silt, sand and gravel.	2	Alluvial plains, terraces, outwash and residual plains; slopes <2%- frequently <1%; areas infrequently floodprone or inundated; some locally poorly drained areas.	3	Sandy to silty medium to coarse-textured soils, earthy sands-sandy earths (Uc-Um2-4) - *Tenosols*.
Qhm	Quaternary Holocene:- estuarine coastal flats, supratidal flats and coastal grass-lands; saline mud, muddy sand, silt and clays	3	Gently undulating higher plains and colluvial footslopes; slopes of up to 3%.	4	Silty to loamy mostly medium-textured soils, uniform or gradational profiles (Um1-7 or Gn1-2) -*Kandosols.*
TQr	Tertiary-Quaternary:-alluvio-colluvial deposits and residual soils; clay, silt, sand, gravel	4	Near level to undulating erosional surfaces; broadly rounded crestal surfaces separated by depressional erosion gullies and ill-defined drainageways slopes mostly in the range of 3 to 5%.	5	Sandy to silt loamy surface duplex soils mostly with acidic to alkaline non to low sodic, non-saline clay or sandy clay subsoils (Dr-Db-Dy): - *Chromosols*
PRg	Late Permian-Early Triassic Intrusives:- grey fine to coarse-grained porphyritic gabbro, hornblende quartz biotite diorite	5	Undulating rises and planar-concave footslopes (typically flanking steeper hills); broadly rounded dissection slope interfluves and irregular low rounded rises; slopes up to12% mostly in the range of 3 to 7%	6	Silty or clay loamy surface duplex soils with strongly acidic or strongly alkaline, sodic often saline clay subsoils (Dr-Db-Dy) - *Kurosols, Sodosols*
CPk	Permian-Carboniferous Berserker Group: - mudstone, siltstone, felsic volcaniclastic sandstone and conglomerate, minor limestone and rhyolitic ignimbrite	6	Rolling to moderately steep hilly lands and rises mostly with planar to broadly rounded hill slopes and dissection slope interfluves; slopes typically 12 to 25% locally steeper.	7	Uniform or weakly gradational (non-cracking) clay or silty clay soils (incipient cracking clays) (Uf6, Gn3-4): *Dermosols, Ferrosols*
Cr	Early Carboniferous Rockhampton Group :- dark grey sandstone, siltstone, poly-mictic conglomerate, oolitic limestone	7	Moderately steep to steep dissected low hilly lands; with ridge and spur slopes up to 35% , locally steeper in dissection gullies	8	Uniform (cracking) grey, brown or red clay soils (Ug1 – Ug5); - *Vertosols*
DCd	Devonian-Carboniferous Doonside Formation:- chert, jasper, siltstone, sandstone, tuff, limestone and altered basalt	8	Mostly steep to very steep higher hilly lands, with locally sharply incised erosion gullies; hill and ridge slopes are typically convex to planar mostly in a range 25 to 50%.	9	Organic soils with organic rich or peaty surface horizons (O), saline clays or muds, seasonally or permanently saturated – *Organosols, Hydrosols.*
DCa	Devonian-Carboniferous Mt. Alma Formation:- thinly interbedded fine-grained sandstone, siltstone and conglomerate	D	Disturbed lands modified by cut and/or fill operations or existing industrial development activities.		

Example :- Terrain Unit (Cr 6-6.1)

Cr 6 - 6.1

Geological Regime Landform Soil Type

Note:
1. Dual symbols for soil type, eg.(4-5) indicate that both material types or integrades between the two types occur within the mapping unit.

2. Soil types designated 4.1, 5.1, 6.1, 7.1 etc. indicate shallow soil variants (<0.6m) mostly underlain by HW Rock
Soil types designated 4.2, 5.2, 6.2, 7.2 etc., indicate the occurrence of medium deep (0.6-1.2m) or deep (1.2-1.5m+) soil variants over HW Rock or other substrate materials.

URS

Client: Gladstone Pacific Nickel Ltd

Project: GLADSTONE NICKEL PROJECT
ACID SULFATE SOILS REPORT

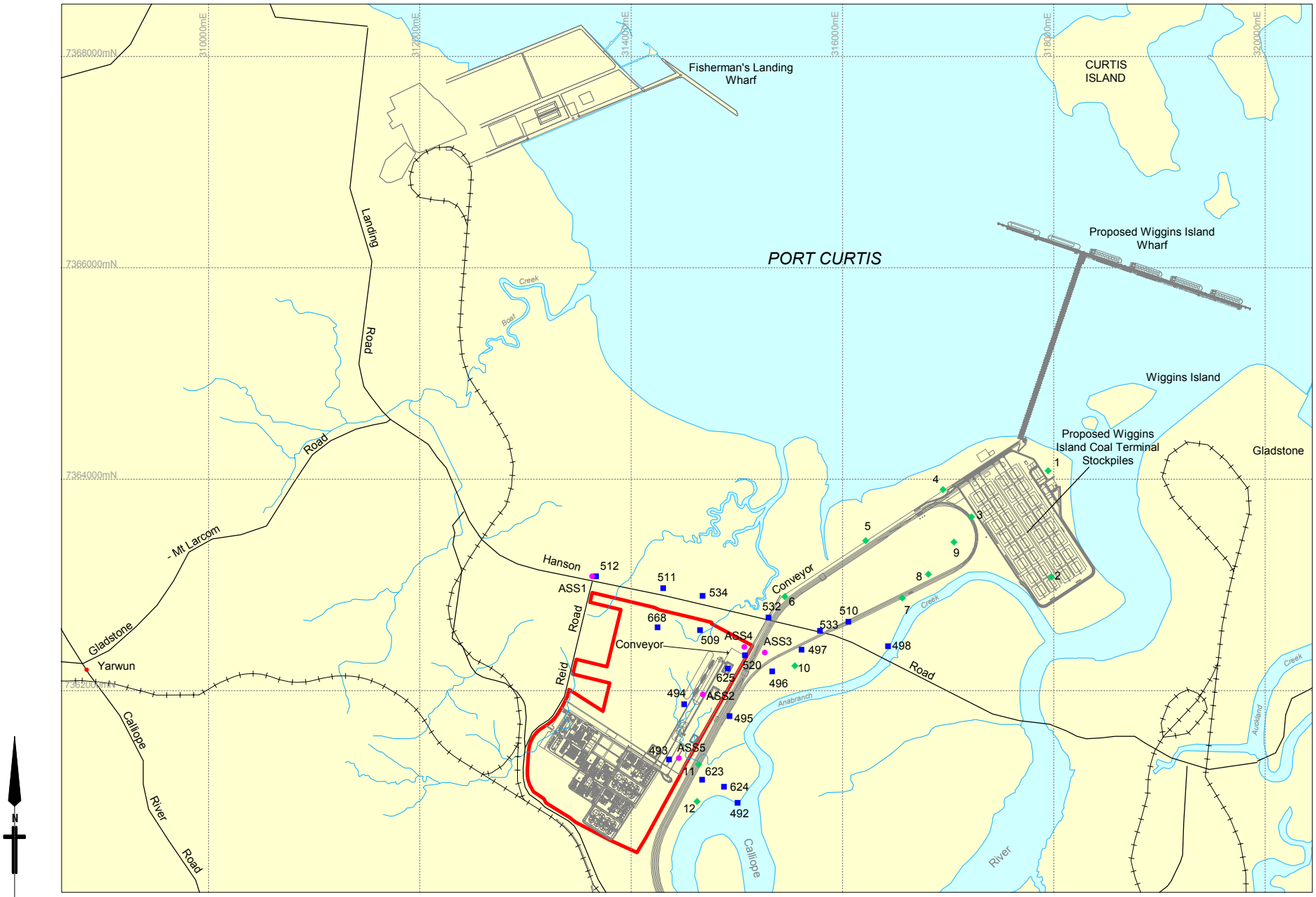
Drawn: TN | Approved: CMP | Date: 08-01-07

Job No: 4262 5791 | File No: 42625791-g-155.wor

Figure: 2

Title: ACID SULPHATE SOIL SAMPLING LOCATIONS

Rev: A | A4



Appendix A
Test Results

Table A1
Acid Sulfate Soil Test Results for Hand Augers ASS1 to ASS5

Sample Date	Hand Auger No.	Sample Depth (m)	Soil Description	pH_F value	pH_{FOX} value	Δ pH	pH_{FOX} Reaction Rate	Lab Test	pH KCl	S_{Cr}[2]		S_{POS}[2]		TAA[2]		NAS		AGC[2]		ANC[2]		Acid Reacted Ca		Acid Reacted Mg		Net Acidity[3]		liming rate[4]
										% S	mole H+/t	% S	mole H+/t	% S	mole H+/t	% S	mole H+/t	% S	mole H+/t	% S	mole H+/t	% S	mole H+/t	% S	mole H+/t	% S	mole H+/t	(kg Aglime /tonne)
18/05/2006	ASS1	0-0.1	Dark Grey- Brown, Medium to Heavy Clay. Some Silt., Firm	7.6	5.5	2.1	2																					
18/05/2006	ASS1	0.25-0.35	Light Yellow-Brown Mottled, Medium to Heavy Clay, Stiff	7.7	5.5	2.2	2																					
18/05/2006	ASS1	0.45-0.55	Variegated Grey-Brown and Light Yellow Brown Mottled, Silty Light to Medium Clay, Soft	8.1	5.8	2.3	2	X	4.4	<0.02	<10			0.05	34	4.09	2550	<0.07	<44	ND	ND					4.14	2580	194
18/05/2006	ASS1	0.7-0.8	Dark Grey-Brown with some Yellow Mottling, Silty Light to Medium Clay, Very Soft	8.2	6.1	2.1	2	X	4.4	<0.02	<10			0.04	26	1.31	820									1.36	846	63
18/05/2006	ASS1	0.95-1.0	Greyish Brown, Yellow and Red Mottled, Gravelly Clay, Stiff	8.2	6.2	2.0	2																					
18/05/2006	ASS1	1.4-1.5	Brown, Saturated Sandy Clay Gravel,	7.6	6.6	1.0	3																					
18/05/2006	ASS1	2.2-2.5	Pale Yellow Brown and Coarse Red Mottled, Gravelly Clay, Stiff to very stiff	6	3.3	2.7	2	X	5.4	<0.02	<10			<0.02	6			<0.04	<16							<0.02	<10	<1
18/05/2006	ASS2	0-0.1	Grey-Brown and Yellowish Brown Mottled, Silty Medium Clay, Soft	4.8	1.6	3.2	4	X	8.4	<0.02	<10			<0.02	<2			<0.04	<12	1.56	973					<0.02	<10	<1
18/05/2006	ASS2	0.4-0.5	Dark Grey-Brown, Silty Medium Clay, Soft-Firm	5.9	1.6	4.3	4																					
18/05/2006	ASS2	0.7-0.8	Dark Grey to Greyish-Brown, Silty Medium Clay, Firm to Stiff	7.4	1.7	5.7	4	X	7.1			0.03	17	<0.02	<2			<0.05	<19	0.12	73	<0.02	10	0.1	60	<0.02	<10	<1
18/05/2006	ASS2	0.8-0.95	Yellow-Brown Grey and Red Mottled Sandy Heavy Clay. Stiff to very Stiff	8.4	8.7	-0.3	2																					
18/05/2006	ASS2	1.1-1.2	Yellow-Brown and Grey Mottled Sandy Clay. Stiff to very Stiff	8.1	4.8	3.3	3	X	7.3	<0.02	<10		<0.02	<2				<0.04	<12	0.29	182					<0.02	<10	<1
18/05/2006	ASS3	0-0.1	Brown, Diffusely Mottled Grey Brown-Brown, Silty Medium to Heavy Clay, Firm-Stiff	7.6	5.6	2.0	3																					
18/05/2006	ASS3	0.2-0.3	Bright Red, Grey and Brown Mottled, Silty Medium to Heavy Clay, Soft	7	4.3	2.7	2	X	5.3	<0.02	<10			0.03	21			<0.05	<31	ND	ND					0.03	21	2
18/05/2006	ASS3	0.5-0.65	Dark Grey-Brown, Silty Medium Clay, Soft	6.6	1.5	5.1	4	X	5.4			0.18	112	0.02	14			0.2	126			<0.02	>10	<0.02	<10	0.20	126	9
18/05/2006	ASS3	0.9-1.0	Dark Grey-Brown, Silty Mud – some Fine Sand, Very Soft	6.7	2.3	4.4	2																					
18/05/2006	ASS3	1.2-1.25	Bluish to Pale Grey, Silty Medium to Heavy Clay, Firm to Stiff	8	2.6	5.4	2	X	5.7	1.28	804			<0.02	9			<1.30	813	ND	ND					1.3	814	61
18/05/2006	ASS3	1.35-1.5	Brown, Diffusely Mottled Grey Brown Heavy Clay with Sand and Gravelly Pockets, Firm to Stiff and some Very Stiff Pockets	7.9	7.7	0.2	2																					
18/05/2006	ASS4	0-0.2	Brown, Silty Medium Clay, Massive-Cohesive Firm to Stiff	7.4	7	0.4	2																					
18/05/2006	ASS4	0.45-0.6	Coarsely Mottled – Grey, Yellowish brown and Red, Silty – Light to Medium Clay, Soft to Firm	8.2	8.3	-0.1	4																					
18/05/2006	ASS4	0.7-0.8	Dark Brown Mottled Yellowish Brown and Grey. Some Organic (Black) Inclusions, Silty Light to Medium Clay, Soft to Firm Saturated	6.5	4.1	2.4	2	X	4.9	0.02	12			0.03	19			0.05	31	ND	ND					0.05	31	2
18/05/2006	ASS4	0.9-0.95	Mottled Dark Brown and Yellowish Brown, Silty Light to Medium Clay, Soft to Firm Saturated	5	2.6	2.4	2																					
18/05/2006	ASS4	1.1-1.2	Mottled Greyish Brown and Orange, Fine Sandy to Silty Heavy Clay, Firm to Stiff to Very Stiff	4.8	2.8	2.0	2	X	4.7	<0.02	<10			0.04	24			<0.06	<34	ND	ND					0.04	24	2
18/05/2006	ASS4	1.4-1.5	Yellowish Brown and Grey Mottled, Fine Sandy to Silty Heavy Clay, Very Stiff	4.9	3.4	1.5	2																					
18/05/2006	ASS5	0-0.15	Diffusely Mottled Dark Brown-Brown, Fine Sandy to Silty Clay Loam, Firm to Stiff	5	3.6	1.4	2																					
18/05/2006	ASS5	0.3-0.4	Diffusely Mottled Light Brown – Dark Brown, Fine Sandy Light to Medium Clay. Fine Sand Pockets, Firm to Stiff	4.2	2.6	1.6	2	X	7.1	<0.02	<10			<0.02	<2			<0.04	<12	0.18	112					<0.02	<10	<1
18/05/2006	ASS5	0.6-0.75	Grey-Yellowish Brown, Orange and Red Mottled, Medium Clay. Some Gravel Pockets,	4.2	2.7	1.5	2																					
18/05/2006	ASS5	1.0-1.1	Dark Grey, Light to Medium Clay, Wet	4.2	2.5	1.7	2	X	4.7			2.06	1290	0.05	29			2.11	1319			<0.02	<10	<0.02	<10	2.11	1320	99
18/05/2006	ASS5	1.4-1.5	Dark Grey, some Brown Mottling, Medium Clay. Some Large Gravel, Wet	4.6	2.5	2.1	2																					
18/05/2006	ASS5	2.0-2.1	Yellowish Brown, Grey and Orange Mottled, Heavy Clay, Stiff to Very Stiff	6.6	2.8	3.8	2	X	7.1	0.19	118			<0.02	<2			<0.21	<120	0.27	170					<0.02	<10	<1
18/05/2006	ASS5	2.5-2.6	Yellowish Brown, Heavy Clay, Stiff to Very Stiff	4.5	6.7	-2.2	4																					
18/05/2006	ASS5	2.9-3.0	Yellowish Brown, Heavy Clay, Stiff to Very Stiff	6.7	5.8	0.9	2	X	6.5	0.02	12			<0.02	<2			<0.04	<12	ND	ND					<0.02	<10	<1

pH_{FOX} Reaction Rate: 1 - slight, 2 - Moderate, 3 - Vigorous, 4 - Very vigorous

2. S_{Cr} = Chromium reducible sulfur, S_{POS} = Peroxide oxidisable sulfur, AGC = Acid generating capacity, TAA = Total/Titrateable actual acidity, ANC = Acid neutralising capacity

3. net acidity = s-TAA + S_{CR}+S_{NAS} or s-TAA + S_{POS}+S_{NAS}

4. Liming rate = %S x 30.59 x 1.02 x 1.5 where 30.59 converts to H_2SO_4, 1.02 converts to $CaCO_3$ and 1.5 is the safety factor

ND = Not Detected

Appendix B
ALS Certificates

CHAIN OF CUSTODY DOCUMENTATION

CLIENT: Gladstone Pacific Nickel
ADDRESS / OFFICE: URS - 240 Queen st Level 14
PROJECT MANAGER (PM):
PROJECT ID: 42625741
SITE:
RESULTS REQUIRED (Date): Standard 7day
P.O. NO.:
QUOTE NO.:

SAMPLER: D. Ford
MOBILE:
PHONE: 32432149
EMAIL REPORT TO: Silvana_Santomartino@urscorp.com
EMAIL INVOICE TO: (if different to report)

Australian Laboratory Services Pty Ltd

FOR LABORATORY USE ONLY
COOLER SEAL (circle appropriate)
Intact: Yes No N/A
SAMPLE TEMPERATURE
CHILLED: Yes No

COMMENTS / SPECIAL HANDLING / STORAGE OR DIPOSAL:
- Potential Acid Sulphate Soils Please Analyse ASAP
- Please hold - may require further analysis

ALS Environmental
Brisbane
Work Order
EB0604851
Report Version: AliquotLabel 1.02
Telephone : 61-7-32437222

SAMPLE INFORMATION (note: S = Soil, W=Water) / CONTAINER INFORMATION / ANALYSIS REQUIRED including SUITES (note - suite codes must be listed to attract suite prices)

ALS ID	SAMPLE ID	MATRIX	DATE	Time	Type / Code	Total bottles	pH	pH Fox	Drying	Storage
1	ASS02 -0-0.1		18/5				\	\	\	\
2	ASS02 -0.4-0.5		"				\	\	\	\
3	ASS02 -0.7-0.8		"				\	\	\	\
4	ASS02 - 0.8-0.95		"				\	\	\	\
5	ASS02 - 1.1-1.2		"				\	\	\	\
6	ASS3 - 0-0.1		"				\	\	\	\
7	ASS3 - 0.2-0.3		"				\	\	\	\
8	ASS3 - 0.5-0.65		"				\	\	\	\
9	ASS3 - 0.9-1.0		"				\	\	\	\
10	ASS3 - 1.2-1.25		"				\	\	\	\
11	ASS3 - 1.35-1.5		"				\	\	\	\

RELINQUISHED BY:
Name: D. Ford
Of: URS
Date: 18/5
Time:
Name:
Of:
Date:
Time:

RECEIVED BY
Name: Charles Allom
Of: ALS
Date: 19/05/06
Time: 1630
Name:
Of:
Date:
Time:

METHOD OF SHIPMENT
Con' Note No:
Transport Co:

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserveed Plastic; AG = Amber Glass Unpreserved; V = VOA Vial HCl Preserved; VS = VOA Vial Sulphuric Preserved; SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bad for Acid Sulphate Soils; B = Unpreserved Bag.

AUSTRALIAN LABORATORY SERVICES P/L

CHAIN OF CUSTODY DOCUMENTATION

Australian Laboratory Services Pty Ltd

CLIENT:	SAMPLER:
ADDRESS / OFFICE:	MOBILE:
PROJECT MANAGER (PM):	PHONE
PROJECT ID:	EMAIL REPORT TO:
SITE: P.O. NO.:	EMAIL INVOICE TO: (if different to report)
RESULTS REQUIRED (Date): QUOTE NO.:	**ANALYSIS REQUIRED including SUITES** (note - suite codes must be listed to attract suite prices)

FOR LABORATORY USE ONLY
COOLER SEAL (circle appropriate)
Intact: Yes No N/A
SAMPLE TEMPERATURE
CHILLED: Yes No

COMMENTS / SPECIAL HANDLING / STORAGE OR DIPOSAL:

Notes: e.g. Highly contaminated samples e.g. "High PAHs expected". Extra volume for QC or trace LORs etc.

SAMPLE INFORMATION (note: S = Soil, W=Water)					CONTAINER INFORMATION		pH	pH FOX	Drying	Storage
ALS ID	SAMPLE ID	MATRIX	DATE	Time	Type / Code	Total bottles				
(12)	ASS5 -0 -0.15						/	/	/	/
(13)	ASS5 - 0.3 - 0.4						/	/	/	/
(14)	ASS5 - 0.6 - 0.75						/	/	/	/
(15)	ASS5 - 1.0 - 1.1						/	/	/	/
(16)	ASS5 - 1.4 - 1.5						/	/	/	/
(17)	ASS5 - 2.0 - 2.1						/	/	/	/
(18)	ASS5 - 2.5 - 2.6						/	/	/	/
(19)	ASS5 2.9 - 3.0						/	/	/	/

RELINQUISHED BY:		RECEIVED BY		METHOD OF SHIPMENT
Name:	Date:	Name: Charles Allom	Date: 19/05/06	Con' Note No:
Of:	Time:	Of: ALS	Time: 1630	
Name:	Date:	Name:	Date:	Transport Co:
Of:	Time:	Of:	Time:	

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserveed Plastic; AG = Amber Glass Unpreserved; V = VOA Vial HCl Preserved; VS = VOA Vial Sulphuric Preserved; SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bad for Acid Sulphate Soils; B = Unpreserved Bag.

AUSTRALIAN LABORATORY SERVICES P/L

CHAIN OF CUSTODY DOCUMENTATION

Australian Laboratory Services Pty Ltd

CLIENT:	SAMPLER:
ADDRESS / OFFICE:	MOBILE:
PROJECT MANAGER (PM):	PHONE
PROJECT ID:	EMAIL REPORT TO:
SITE: P.O. NO.:	EMAIL INVOICE TO: (if different to report)
RESULTS REQUIRED (Date): QUOTE NO.:	ANALYSIS REQUIRED including SUITES (note - suite codes must be listed to attract suite prices)

FOR LABORATORY USE ONLY
COOLER SEAL (circle appropriate)
Intact: Yes No N/A
SAMPLE TEMPERATURE
CHILLED: Yes No

COMMENTS / SPECIAL HANDLING / STORAGE OR DIPOSAL:

Notes: e.g. Highly contaminated samples
e.g. "High PAHs expected".
Extra volume for QC or trace LORs etc.

SAMPLE INFORMATION (note: S = Soil, W=Water)					CONTAINER INFORMATION		pH	pH FOX	Drying	Sieve 75								
ALS ID	SAMPLE ID	MATRIX	DATE	Time	Type / Code	Total bottles												
20	ASS4-0-0.2		18/5				/	/	/	/								
21	ASS4-0.45-0.6		1				/	/	/	/								
22	ASS4-0.7-0.8		"				/	/	/	/								
23	ASS4-0.9-0.95		"				/	/	/	/								
24	ASS4-1.1-1.2		"				/	/	/	/								
25	ASS4-1.4-1.5		"				/	/	/	/								
			/				/	/	/	/								
			/				/	/	/	/								
			/				/	/	/	/								
			/				/	/	/	/								
			/				/	/	/	/								
			/				/	/	/	/								

RELINQUISHED BY:		RECEIVED BY		METHOD OF SHIPMENT
Name:	Date:	Name: Charles Allom	Date: 19/02/06	Con' Note No:
Of:	Time:	Of: ALS	Time: 1630	
Name:	Date:	Name:	Date:	Transport Co:
Of:	Time:	Of:	Time:	

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserveed Plastic; AG = Amber Glass Unpreserved; V = VOA Vial HCl Preserved; VS = VOA Vial Sulphuric Preserved; SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bad for Acid Sulphate Soils; B = Unpreserved Bag.

AUSTRALIAN LABORATORY SERVICES P/L

CHAIN OF CUSTODY DOCUMENTATION

Australian Laboratory Services Pty Ltd

CLIENT:	SAMPLER:
ADDRESS / OFFICE:	MOBILE:
PROJECT MANAGER (PM):	PHONE
PROJECT ID:	EMAIL REPORT TO:
SITE: P.O. NO.:	EMAIL INVOICE TO: (if different to report)
RESULTS REQUIRED (Date): QUOTE NO.:	**ANALYSIS REQUIRED including SUITES** (note - suite codes must be listed to attract suite prices)

FOR LABORATORY USE ONLY
COOLER SEAL (circle appropriate)
Intact: Yes No N/A
SAMPLE TEMPERATURE
CHILLED: Yes No

COMMENTS / SPECIAL HANDLING / STORAGE OR DIPOSAL:

pH, pH FOX, Cr VI, Cr III

Notes: e.g. Highly contaminated samples, Extra volume for QC or trace LORs etc.

SAMPLE INFORMATION (note: S = Soil, W=Water)					CONTAINER INFORMATION	
ALS ID	SAMPLE ID	MATRIX	DATE	Time	Type / Code	Total bottles
26	ASS1-0-0.1		18/5			
27	ASS1-0.25-0.35		"			
28	ASS1-0.45-0.55		"			
29	ASS1-0.7-0.8		"			
30	ASS1-0.95-1.0		"			
31	ASS1-1.4-1.5		"			
32	ASS1-2.2-2.5		"			

RELINQUISHED BY:		RECEIVED BY		METHOD OF SHIPMENT
Name:	Date:	Name: Charles Attom	Date: 19/05/06	Con' Note No:
Of:	Time:	Of: ALS	Time: 1630	
Name:	Date:	Name:	Date	Transport Co:
Of:	Time:	Of:	Time	

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide ...ed Plastic; AG = Amber Glass Unpreserved; V = VOA Vial HCl Preserved; VS = VOA Vial Sulphuric Preserved; SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfu... Preserved Plastic; F = Formaldehyde Preserved Glass; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bad for Acid Sulphate Soils; B = Unpreserved Bag.

AUSTRALIAN LABORATORY SERVICES PTY LTD ABN 84 009 936 029
32 Shand Street Stafford QLD 4053 Australia
Telephone: 61-7-32437222 Facsimile: 61-7-32437259 http://www.alsenviro.com/

ALS Environmental

SAMPLE RECEIPT NOTIFICATION (SRN)

Comprehensive report

Client Details

Client	:	**URS AUSTRALIA PTY LTD (QLD)**
Contact	:	**ALL RESULTS BRISBANE**
Address	:	GPO BOX 302 BRISBANE QLD AUSTRALIA 4001
Project	:	**42625741**
Order number	:	**- Not provided -**
C-O-C Number	:	**- Not provided -**
Site	:	**- Not provided -**
Sampler	:	**D.Ford**
E-mail	:	brisbane@urscorp.com
Telephone	:	07 3243 2111
Facsimile	:	07 3243 2199

Laboratory Details

Laboratory	:	**ALS Environmental Brisbane**
Manager	:	**Michael Heery**
Address	:	32 Shand Street Stafford QLD Australia 4053
Quote number	:	EB20050096
Work order	:	**EB0604851**
E-mail	:	Michael.Heery@alsenviro.com
Telephone	:	61-7-32437222
Facsimile	:	61-7-32437259

Dates

Date Samples Received	:	19 May 2006
SRA Issue Date	:	22 May 2006
Scheduled Reporting Date	:	**31 May 2006**

Delivery Details

Mode of Delivery	:	Carrier.	**Temperature**	:	0.5 C
No. of coolers/boxes	:	1 MEDIUM	**No. of samples** - **Received**		32
Security Seal	:	Intact.	- **Analysed**		32

Comments

- **Samples received in appropriately pretreated and preserved containers.**
- **Sample(s) have been received within recommended holding times.**

- Analytical work for this work order will be conducted at ALSE Brisbane.
- Please direct any queries related to sample condition / numbering / breakages to Charles Allom.
- Sample Disposal - Aqueous (14 days), Solid (90 days) from date of completion of work order.
- Please direct any turn around / technical queries to the laboratory contact designated above.
- When the sampling time is not supplied on the COC documentation, ALSE defaults the sampling time to that of the COC 'relinquishment' time (if supplied). If this also is not supplied, ALSE defaults the sampling time to the 'time of receipt at Laboratory'.

Client	: URS AUSTRALIA PTY LTD (QLD)	**Work Order**	: EB0604851
Project	: 42625741	**ALS Quote Reference**	: EB20050096

Summary of Sample(s) / Container(s) and Requested Analysis

Some items described below may be part of a laboratory process neccessary for the execution of client requested tasks. Packages may contain additional analyses, such as moisture and preparation tasks, that form an implicit part of that package.

ALS Sample ID.	Client Sample ID - Sample Date	**Requested Analysis**									
		EA003 - SOIL pH field/fox									
EB0604851-001	**ASS02-0-0.1 - 18 May 2006**	]									
EB0604851-002	**ASS02-0.4-0.5 - 18 May 2006**	]									
EB0604851-003	**ASS02-0.7-0.8 - 18 May 2006**	]									
EB0604851-004	**ASS02-0.8-0.95 - 18 May 2006**	]									
EB0604851-005	**ASS02-1.1-1.2 - 18 May 2006**	]									
EB0604851-006	**ASS3-0-0.1 - 18 May 2006**	]									
EB0604851-007	**ASS3-0.2-0.3 - 18 May 2006**	]									
EB0604851-008	**ASS3-0.5-0.65 - 18 May 2006**	]									
EB0604851-009	**ASS3-0.9-1.0 - 18 May 2006**	]									
EB0604851-010	**ASS3-1.2-1.25 - 18 May 2006**	]									
EB0604851-011	**ASS3-1.35-1.5 - 18 May 2006**	]									
EB0604851-012	**ASS5-0-0.15 - 18 May 2006**	]									
EB0604851-013	**ASS5-0.3-0.4 - 18 May 2006**	]									
EB0604851-014	**ASS5-0.6-0.75 - 18 May 2006**	]									
EB0604851-015	**ASS5-1.0-1.1 - 18 May 2006**	]									
EB0604851-016	**ASS5-1.4-1.5 - 18 May 2006**	]									
EB0604851-017	**ASS5-2.0-2.1 - 18 May 2006**	]									
EB0604851-018	**ASS5-2.5-2.6 - 18 May 2006**	]									
EB0604851-019	**ASS5-2.9-3.0 - 18 May 2006**	]									
EB0604851-020	**ASS4-0-0.2 - 18 May 2006**	]									
EB0604851-021	**ASS4-0.45-0.6 - 18 May 2006**	]									
EB0604851-022	**ASS4-0.7-0.8 - 18 May 2006**	]									
EB0604851-023	**ASS4-0.9-0.95 - 18 May 2006**	]									
EB0604851-024	**ASS4-1.1-1.2 - 18 May 2006**	]									
EB0604851-025	**ASS4-1.4-1.5 - 18 May 2006**	]									
EB0604851-026	**ASS1-0-0.1 - 18 May 2006**	]									
EB0604851-027	**ASS1-0.25-0.35 - 18 May 2006**	]									
EB0604851-028	**ASS1-0.45-0.55 - 18 May 2006**	]									
EB0604851-029	**ASS1-0.7-0.8 - 18 May 2006**	]									
EB0604851-030	**ASS1-0.95-1.0 - 18 May 2006**	]									
EB0604851-031	**ASS1-1.4-1.5 - 18 May 2006**	]									
EB0604851-032	**ASS1-2.2-2.5 - 18 May 2006**	]									
	Total(s) :	**32**									

Client	: URS AUSTRALIA PTY LTD (QLD)	**Work Order**	: EB0604851
Project	: 42625741	**ALS Quote Reference**	: EB20050096

Requested Reports

l	**ALL RESULTS BRISBANE**		
-	A4 - Certificate of Analysis - NEPM format	Email	brisbane@urscorp.com
-	A4 - Quality Control Report - NEPM format	Email	brisbane@urscorp.com
-	A4 - Interpretive Quality Control Report - NEPM format	Email	brisbane@urscorp.com
-	MRED Export Format	Email	brisbane@urscorp.com
-	Chain of Custody Acknowledgement	Email	brisbane@urscorp.com
-	A4 - Sample Receipt Notification - Comprehensive format	Email	brisbane@urscorp.com
-	Invoice	Email	brisbane@urscorp.com
l	**MS SILVANA SANTOMARTINO**		
-	A4 - Certificate of Analysis - NEPM format	Email	silvana_santomartino@urscorp.com
-	A4 - Quality Control Report - NEPM format	Email	silvana_santomartino@urscorp.com
-	A4 - Interpretive Quality Control Report - NEPM format	Email	silvana_santomartino@urscorp.com
-	MRED Export Format	Email	silvana_santomartino@urscorp.com
-	Chain of Custody Acknowledgement	Email	silvana_santomartino@urscorp.com
-	A4 - Sample Receipt Notification - Comprehensive format	Email	silvana_santomartino@urscorp.com
l	**NATASHA GAVIN**		
-	Invoice	Email	natasha_gavin@urscorp.com

Sample Container(s) / Preservation Non-Compliance Log

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

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

ALS Environmental

CERTIFICATE OF ANALYSIS

Client	: **URS AUSTRALIA PTY LTD (QLD)**	*Laboratory*	: **ALS Environmental Brisbane**	*Page*	: **1 of 10**
Contact	: **ALL RESULTS BRISBANE**	*Contact*	: **Michael Heery**	*Work Order*	: **EB0604851**
Address	: **GPO BOX 302 BRISBANE QLD AUSTRALIA 4001**	*Address*	: **32 Shand Street Stafford QLD Australia 4053**		
E-mail	: **brisbane@urscorp.com**	*E-mail*	: **Michael.Heery@alsenviro.com**		
Telephone	: **07 3243 2111**	*Telephone*	: **61-7-32437222**		
Facsimile	: **07 3243 2199**	*Facsimile*	: **61-7-32437259**		
Project	: **42625741**	*Quote number*	: **EN/001/05**	*Date received*	: **19 May 2006**
Order number	: **- Not provided -**			*Date issued*	: **5 Jun 2006**
C-O-C number	: **- Not provided -**			*No. of samples*	- *Received* : **32**
Site	: **- Not provided -**				*Analysed* : **32**

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NATA Accredited Laboratory 825

This document is issued in accordance with NATA's accreditation requirements.

Accredited for compliance with ISO/IEC 17025.

This document has been digitally signed by those names that appear on this report and are the authorised signatories. Digital signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatory	*Position*	*Department*
Cass Sealby		**Inorganics - NATA 825 (818 - Brisbane)**

ALS Environmental

Comments

This report for the ALSE reference EB0604851 supersedes any previous reports with this reference. Results apply to the samples as submitted. All pages of this report have been checked and approved for release.

This report contains the following information:

- **Analytical results for samples submitted**

When moisture determination has been performed, results are reported on a dry weight basis. When a reported 'less than' result is higher than the LOR, this may be due to primary sample extracts/digestion dilution and/or insuffient sample amount for analysis. Surrogate Recovery Limits are static and based on USEPA SW846 or ALS-QWI/EN38 (in the absence of specified USEPA limits). Where LOR of reported result differ from standard LOR, this may be due to high moisture, reduced sample amount or matrix interference. When date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for process purposes. Abbreviations: CAS number = Chemical Abstract Services number, LOR = Limit of Reporting. * Indicates failed Surrogate Recoveries.

- **Surrogate control limits**

The analytical procedures used by ALS Environmental are based on established internationally-recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house procedure are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported herein. Reference methods from which ALSE methods are based are provided in parenthesis.

Specific comments for Work Order **EB0604851**

pH FOX Reaction Rate: 1 - Slight; 2 - Moderate; 3 - Vigorous; 4 - Very Vigorous

ALS Environmental

Analytical Results

				Client Sample ID :	ASS02-0-0.1	ASS02-0.4-0.5	ASS02-0.7-0.8	ASS02-0.8-0.95	ASS02-1.1-1.2
				Sample Matrix Type / Description :	SOLID	SOLID	SOLID	SOLID	SOLID
				Sample Date / Time :	18 May 2006 15:00	18 May 2006 15:00	18 May 2006 15:00	18 May 2006 15:00	18 May 2006 15:00
				Laboratory Sample ID :	EB0604851-001	EB0604851-002	EB0604851-003	EB0604851-004	EB0604851-005
Analyte	*CAS number*	*LOR*	*Units*						
EA003 :pH (field/fox)									
pH (F)		0.1	pH Unit		7.6	7.7	8.1	8.2	8.2
pH (Fox)		0.1	pH Unit		5.5	5.5	5.8	6.1	6.2
Reaction Rate		1	--		2	2	2	2	2

ALS Environmental

Analytical Results

			Client Sample ID :	ASS3-0-0.1	ASS3-0.2-0.3	ASS3-0.5-0.65	ASS3-0.9-1.0	ASS3-1.2-1.25
			Sample Matrix Type / Description :	SOLID	SOLID	SOLID	SOLID	SOLID
			Sample Date / Time :	18 May 2006 15:00	18 May 2006 15:00	18 May 2006 15:00	18 May 2006 15:00	18 May 2006 15:00
			Laboratory Sample ID :	EB0604851-006	EB0604851-007	EB0604851-008	EB0604851-009	EB0604851-010
Analyte	*CAS number*	*LOR*	*Units*					
EA003 :pH (field/fox)								
pH (F)		0.1	pH Unit	7.6	6.0	4.8	5.9	7.4
pH (Fox)		0.1	pH Unit	6.6	3.3	1.6	1.6	1.7
Reaction Rate		1	--	3	2	4	4	4

ALS Environmental

Analytical Results

				Client Sample ID :	ASS3-1.35-1.5	ASS5-0-0.15	ASS5-0.3-0.4	ASS5-0.6-0.75	ASS5-1.0-1.1
				Sample Matrix Type / Description :	SOLID	SOLID	SOLID	SOLID	SOLID
				Sample Date / Time :	18 May 2006 15:00	18 May 2006 15:00	18 May 2006 15:00	18 May 2006 15:00	18 May 2006 15:00
				Laboratory Sample ID :	EB0604851-011	EB0604851-012	EB0604851-013	EB0604851-014	EB0604851-015
Analyte	*CAS number*	*LOR*	*Units*						
EA003 :pH (field/fox)									
pH (F)		0.1	pH Unit		8.4	8.1	7.6	7.0	6.6
pH (Fox)		0.1	pH Unit		8.7	4.8	5.6	4.3	1.5
Reaction Rate		1	--		2	3	3	2	4

ALS Environmental

Analytical Results

			Client Sample ID :	**ASS5-1.4-1.5**	**ASS5-2.0-2.1**	**ASS5-2.5-2.6**	**ASS5-2.9-3.0**	**ASS4-0-0.2**
			Sample Matrix Type / Description :	SOLID	SOLID	SOLID	SOLID	SOLID
			Sample Date / Time :	18 May 2006 15:00	18 May 2006 15:00	18 May 2006 15:00	18 May 2006 15:00	18 May 2006 15:00
			Laboratory Sample ID :					
Analyte	***CAS number***	***LOR***	***Units***	**EB0604851-016**	**EB0604851-017**	**EB0604851-018**	**EB0604851-019**	**EB0604851-020**
EA003 :pH (field/fox)								
pH (F)		0.1	pH Unit	6.7	8.0	7.9	7.4	8.2
pH (Fox)		0.1	pH Unit	2.3	2.6	7.7	7.0	8.3
Reaction Rate		1	--	2	2	2	2	4

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Analytical Results

			Client Sample ID :	ASS4-0.45-0.6	ASS4-0.7-0.8	ASS4-0.9-0.95	ASS4-1.1-1.2	ASS4-1.4-1.5
			Sample Matrix Type / Description :	SOLID	SOLID	SOLID	SOLID	SOLID
			Sample Date / Time :	18 May 2006 15:00	18 May 2006 15:00	18 May 2006 15:00	18 May 2006 15:00	18 May 2006 15:00
			Laboratory Sample ID :	EB0604851-021	EB0604851-022	EB0604851-023	EB0604851-024	EB0604851-025
Analyte	*CAS number*	*LOR*	*Units*					
EA003 :pH (field/fox)								
pH (F)		0.1	pH Unit	6.5	5.0	4.8	4.9	5.0
pH (Fox)		0.1	pH Unit	4.1	2.6	2.8	3.4	3.6
Reaction Rate		1	--	2	2	2	2	2

ALS Environmental

Analytical Results

				Client Sample ID :	ASS1-0-0.1	ASS1-0.25-0.35	ASS1-0.45-0.55	ASS1-0.7-0.8	ASS1-0.95-1.0
				Sample Matrix Type / Description :	SOLID	SOLID	SOLID	SOLID	SOLID
				Sample Date / Time :	18 May 2006 15:00	18 May 2006 15:00	18 May 2006 15:00	18 May 2006 15:00	18 May 2006 15:00
				Laboratory Sample ID :	EB0604851-026	EB0604851-027	EB0604851-028	EB0604851-029	EB0604851-030
Analyte	*CAS number*	*LOR*	*Units*						
EA003 :pH (field/fox)									
pH (F)		0.1	pH Unit		4.2	4.2	4.2	4.6	6.6
pH (Fox)		0.1	pH Unit		2.6	2.7	2.5	2.5	2.8
Reaction Rate		1	--		2	2	2	2	2

ALS Environmental

Analytical Results

			Client Sample ID :	ASS1-1.4-1.5	ASS1-2.2-2.5			
			Sample Matrix Type / Description :	SOLID	SOLID			
			Sample Date / Time :	18 May 2006 15:00	18 May 2006 15:00			
			Laboratory Sample ID :	EB0604851-031	EB0604851-032			
Analyte	*CAS number*	*LOR*	*Units*					
EA003 :pH (field/fox)								
pH (F)		0.1	pH Unit	4.5	6.7			
pH (Fox)		0.1	pH Unit	6.7	5.8			
Reaction Rate		1	--	4	2			

ALS Environmental

Surrogate Control Limits

- **No surrogates present on this report.**

ALS Environmental

QUALITY CONTROL REPORT

Client	:	**URS AUSTRALIA PTY LTD (QLD)**	**Laboratory**	:	ALS Environmental Brisbane	**Page**	: **1 of 4**
Contact	:	ALL RESULTS BRISBANE	**Contact**	:	Michael Heery		
Address	:	GPO BOX 302 BRISBANE QLD AUSTRALIA 4001	**Address**	:	32 Shand Street Stafford QLD Australia 4053	**Work order**	: **EB0604851**
						Amendment No.	:
Project	:	42625741	**Quote number**	:	EN/001/05	**Date received**	: 19 May 2006
Order number	:	- Not provided -				**Date issued**	: 5 Jun 2006
C-O-C number	:	- Not provided -					
Site	:	- Not provided -					
E-mail	:	brisbane@urscorp.com	**E-mail**	:	Michael.Heery@alsenviro.com	**No. of samples**	
Telephone	:	07 3243 2111	**Telephone**	:	61-7-32437222	**Received**	: 32
Facsimile	:	07 3243 2199	**Facsimile**	:	61-7-32437259	**Analysed**	: 32

This final report for the ALSE work order reference EB0604851 supersedes any previous reports with this reference.

Results apply to the samples as submitted. All pages of this report have been checked and approved for release.

This report contains the following information:

- Laboratory Duplicates (DUP); Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Samples (LCS); Recovery and Acceptance Limits
- Matrix Spikes (MS); Recovery and Acceptance Limits

Work order specific comments

pH FOX Reaction Rate: 1 - Slight; 2 - Moderate; 3 - Vigorous; 4 - Very Vigorous

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Accredited for compliance with ISO/IED 17025

This document has been digitally signed by those names that appear on this report and are the authorised signatories. Digital signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatory	Department
Cass Sealby	Inorganics - NATA 825 (818 - Brisbane)

Quality Control Report - Laboratory Duplicates (DUP)

The quality control term **Laboratory Duplicate** refers to an intralaboratory split sample randomly selected from the sample batch. Laboratory duplicates provide information on method precision and sample heterogeneity.
- Anonymous - Client Sample IDs refer to samples which are not specifically part of this work order but formed part of the QC process lot. *Abbreviations:* ***LOR*** = *Limit of Reporting,* ***RPD*** = *Relative Percent Difference.*
* Indicates failed QC. The permitted ranges for the RPD of Laboratory Duplicates (relative percent deviation) are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting:- Result < 10 times LOR, no limit - Result between 10 and 20 times LOR, 0% - 50% - Result > 20 times LOR, 0% - 20%

Matrix Type: SOIL ***Laboratory Duplicates (DUP) Report***

Laboratory Sample ID	*Client Sample ID*	*Analyte name*	*LOR*	*Original Result*	*Duplicate Result*	*RPD*
EA003 :pH (field/fox)						
EA003 :pH (field/fox) - (QC Lot: 217856)				**pH Unit**	**pH Unit**	**%**
EB0604851-001	ASS02-0-0.1	pH (F)	0.1 pH Unit	7.6	7.5	1.3
		pH (Fox)	0.1 pH Unit	5.5	5.8	5.3
		Reaction Rate	1 --	2	2	0.0
EB0604851-011	ASS3-1.35-1.5	pH (F)	0.1 pH Unit	8.4	8.4	0.0
		pH (Fox)	0.1 pH Unit	8.7	8.4	3.5
		Reaction Rate	1 --	2	2	0.0
EA003 :pH (field/fox) - (QC Lot: 217857)				**pH Unit**	**pH Unit**	**%**
EB0604851-021	ASS4-0.45-0.6	pH (F)	0.1 pH Unit	6.5	6.3	3.1
		pH (Fox)	0.1 pH Unit	4.1	3.9	5.0
		Reaction Rate	1 --	2	2	0.0
EB0604851-031	ASS1-1.4-1.5	pH (F)	0.1 pH Unit	4.5	4.5	0.0
		pH (Fox)	0.1 pH Unit	6.7	6.8	1.5
		Reaction Rate	1 --	4	4	0.0

Quality Control Report - Method Blank (MB) and Laboratory Control Samples (LCS)

The quality control term **Method / Laboratory Blank** refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC type is to monitor potential laboratory contamination. The quality control term **Laboratory Control Sample (LCS)** refers to a known, interference free matrix spiked with target analytes or certified reference material. The purpose of this QC type is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of actual laboratory data. Abbreviations: LOR = Limit of reporting.

Method Blank (MB) and Laboratory Control Samples (LCS) Report

Analyte name	*LOR*	*Method blank result*	*Actual Results*		*Recovery Limits*	
			Spike concentration	*Spike Recovery*	*Dynamic Recovery Limits*	
				LCS	*Low*	*High*
- (QC Lot:)				**%**	**%**	**%**
			----	**----**	**----**	**----**

l **No Method Blank (MB) or Laboratory Control Samples (LCS) carried out on this Work Order.**

Quality Control Report - Matrix Spikes (MS)

The quality control term **Matrix Spike (MS)** refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC type is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQO's). 'Ideal' recovery ranges stated may be waived in the event of sample matrix interferences. - Anonymous - Client Sample IDs refer to samples which are not specifically part of this work order but formed part of the QC process lot. *Abbreviations:* ***LOR*** *= Limit of Reporting,* ***RPD*** *= Relative Percent Difference.*

* Indicates failed QC

Matrix Spike (MS) Report

					Actual Results		*Recovery Limits*	
					Sample Result	*Spike Recovery*	*Static Limits*	
Analyte name	*Laboratory Sample ID*	*Client Sample ID*	*LOR*	*Spike Concentration*		*MS*	*Low*	*High*
- (QC Lot:)						%	%	%
					----			

l **No Matrix Spike (MS) carried out on this Work Order.**

ALS Environmental

INTERPRETIVE QUALITY CONTROL REPORT

Client	:	**URS AUSTRALIA PTY LTD (QLD)**	**Laboratory**	:	ALS Environmental Brisbane	**Page**	: **1 of 5**
Contact	:	ALL RESULTS BRISBANE	**Contact**	:	Michael Heery		
Address	:	GPO BOX 302 BRISBANE QLD AUSTRALIA 4001	**Address**	:	32 Shand Street Stafford QLD Australia 4053	**Work order**	: **EB0604851**
						Amendment No.	:
Project	:	42625741	**Quote number**	:	EN/001/05	**Date received**	: 19 May 2006
Order number	:	- Not provided -				**Date issued**	: 5 Jun 2006
C-O-C number	:	- Not provided -					
Site	:	- Not provided -					
E-mail	:	brisbane@urscorp.com	**E-mail**	:	Michael.Heery@alsenviro.com	**No. of samples**	
Telephone	:	07 3243 2111	**Telephone**	:	61-7-32437222	**Received**	: 32
Facsimile	:	07 3243 2199	**Facsimile**	:	61-7-32437259	**Analysed**	: 32

This Interpretive Quality Control Report was issued on 5 Jun 2006 for the ALS work order reference EB0604851 and supersedes any previous reports with this reference.
This report contains the following information:

- Analysis Holding Time Compliance
- Quality Control Type Frequency Compliance
- Summary of all Quality Control Outliers
- Brief Method Summaries

ALS Environmental

Interpretive Quality Control Report - Analysis Holding Time

The following report summarises extraction / preparation and analysis times and compares with recommended holding times. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. Information is also provided re the sample container (preservative) from which the sample aliquot was taken. Elapsed time to analysis represents time from sampling where no extraction / digestion is involved or time from extraction / digestion where this is present. For composite samples, sampling date/time is taken as that of the oldest sample contributing to that composite. Sample date/time for laboratory produced leaches are taken from the completion date/time of the leaching process. Outliers for holding time are based on USEPA SW846, APHA, AS and NEPM (1999). Failed outliers, refer to the 'Summary of Outliers'.

Matrix Type: SOIL

Analysis Holding Time and Preservation

Method / **Container /** Client Sample ID(s)		Date Sampled	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Pass?	Date analysed	Due for analysis	Pass?
EA003: pH field/fox								
Snap Lock Bag								
ASS02-0-0.1,	ASS02-0.4-0.5,	**18 May 2006**	----	----	----	**19 May 2006**	19 May 2006	Pass
ASS02-0.7-0.8,	ASS02-0.8-0.95,							
ASS02-1.1-1.2,	ASS3-0-0.1,							
ASS3-0.2-0.3,	ASS3-0.5-0.65,							
ASS3-0.9-1.0,	ASS3-1.2-1.25,							
ASS3-1.35-1.5,	ASS5-0-0.15,							
ASS5-0.3-0.4,	ASS5-0.6-0.75,							
ASS5-1.0-1.1,	ASS5-1.4-1.5,							
ASS5-2.0-2.1,	ASS5-2.5-2.6,							
ASS5-2.9-3.0,	ASS4-0-0.2,							
ASS4-0.45-0.6,	ASS4-0.7-0.8,							
ASS4-0.9-0.95,	ASS4-1.1-1.2,							
ASS4-1.4-1.5,	ASS1-0-0.1,							
ASS1-0.25-0.35,	ASS1-0.45-0.55,							
ASS1-0.7-0.8,	ASS1-0.95-1.0,							
ASS1-1.4-1.5,	ASS1-2.2-2.5							

Interpretive Quality Control Report - Frequency of Quality Control Samples

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which this work order was processed. Actual rate should be greater than or equal to the expected rate.

Matrix Type: SOIL

Frequency of Quality Control Samples

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	**Actual**	**Expected**	
Laboratory Duplicates (DUP)					
EA003: pH field/fox	4	32	**12.5**	**10.0**	NEPM 1999 Schedule B(3) and ALSE QCS3 requirement

Interpretive Quality Control Report - Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged on the 'Quality Control Report'. Surrogate recovery limits are static and based on USEPA SW846 or ALS-QWI/EN/38 (in the absence of specific USEPA limits). - Anonymous - Client Sample IDs refer to samples which are not specifically part of this work order but formed part of the QC process lot.

Non-surrogates

- **For all matrices, no RPD recovery outliers occur for the duplicate analysis.**
- **For all matrices, no method blank result outliers occur.**
- **For all matrices, no laboratory spike recoveries breaches occur.**
- **For all matrices, no matrix spike recoveries breaches occur.**

Surrogates

- **For all matrices, no surrogate recovery outliers occur.**

Outliers : Analysis Holding Time

The following report highlights outliers within this 'Interpretive Quality Control Report - Analysis Holding Time'.

- **No holding time outliers occur.**

Outliers : Frequency of Quality Control Samples

The following report highlights outliers within this 'Interpretive Quality Control Report - Frequency of Quality Control Samples'.

- **No frequency outliers occur.**

Method Reference Summary

The analytical procedures used by ALS Environmental are based on established internationally-recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house procedure are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported herein. Reference methods from which ALSE methods are based are provided in parenthesis.

Matrix Type: SOLID ***Method Reference Summary***

Analytical Methods

EA003 : pH field/fox - Ahern et al 1998 - determined on a 1:5 soil/water extract designed to simulate field measured pH and pH after the extract has been oxidised with peroxide.

CHAIN OF CUSTODY FORM

Sheet 1 of 1

THIS COLUMN FOR LAB USE ONLY

Job Code:

Due Date:

FROM: Silvana Santomartino
URS (AUSTRALIA)
ACN 000 691 690
Level 1, 240 Queen Street
Brisbane QLD 4000
Ph: 07 32432111 Fax: 07 3243 2199

DATE: 13/06/06

TO: Australian Laboratory S

Project No: 42625791 (Gladstone Pacific Nickel)

Project Manager: Silvana Santomartino

Agreement No: : EN/105/04

Sampler(s): Silvana Santomartino

Signature(s):

Checked: 14/06/06

Container Size, Type, Preservative and Analysis

Container Identification

Size						
Type*						
Preservative Code						
Analytes	Complete Chromium Suite	CompleteS POCAS suite				

ALS Environmental
Brisbane
Work Order
EB0605706

Report Version: WOLabel 1.01

Telephone : 61-7-32437222

Custody seal intact? YES NO

Sample cold? YES NO

Revised COC by:

Date: Time:

Received for Laboratory by:

Date: Time:

Lab identification	Date	Time	Matrix	Sample Number	Comments	Total no	Tick required analytes										
EB0604851-001 (1)	18-May-06		Soil	ASS02 0-0.1	Acid Sulfate Soil	1	X										
EB0604851-003 (2)	18-May-06		Soil	ASS02 0.7-0.8	Acid Sulfate Soil	1		X									
EB0604851-005 (3)	18-May-06		Soil	ASS02 1.1-1.2	Acid Sulfate Soil	1	X										
EB0604851-007 (4)	18-May-06		Soil	ASS3 0.2-0.3	Acid Sulfate Soil	1	X										
EB0604851-008 (5)	18-May-06		Soil	ASS3 0.5-0.65	Acid Sulfate Soil	1		X									
EB0604851-010 (6)	18-May-06		Soil	ASS3 1.2-1.25	Acid Sulfate Soil	1	X										
EB0604851-013 (7)	18-May-06		Soil	ASS5 0.3-0.4	Acid Sulfate Soil	1	X										
EB0604851-015 (8)	18-May-06		Soil	ASS5 1.0-1.1	Acid Sulfate Soil	1		X									
EB0604851-017 (9)	18-May-06		Soil	ASS5 2.0-2.1	Acid Sulfate Soil	1	X										
EB0604851-019 (10)	18-May-06		Soil	ASS5 2.9-3.0	Acid Sulfate Soil	1	X										
EB0604851-022 (11)	18-May-06		Soil	ASS4 0.7-0.8	Acid Sulfate Soil	1	X										
EB0604851-024 (12)	18-May-06		Soil	ASS4 1.1-1.2	Acid Sulfate Soil	1	X										
EB0604851-028 (13)	18-May-06		Soil	ASS1 0.45-0.55	Acid Sulfate Soil	1	X										
EB0604851-029 (14)	18-May-06		Soil	ASS1 0.7-0.8	Acid Sulfate Soil	1	X										
EB0604851-032 (15)	18-May-06		Soil	ASS1 2.2-2.5	Acid Sulfate Soil	1	X										
					TOTAL	15	12	3	0	0	0	0	0	0	0	0	

Remarks: Samples are with ALS

Courier Job No:

Pleae email results to : silvana_santomartino@urscorp.com

Specify Turnaround Time:

Standard

NOTE: SAMPLES MAY CONTAIN DANGEROUS AND HAZARDOUS SUBSTANCES

AUSTRALIAN LABORATORY SERVICES PTY LTD ABN 84 009 936 029
Stafford QLD 4053 Australia
Telephone: 61-7-32437222 Facsimile: 61-7-32437259 http://www.alsenviro.com/

ALS Environmental

SAMPLE RECEIPT NOTIFICATION (SRN)

Comprehensive report

Client Details

Client	:	**URS AUSTRALIA PTY LTD (QLD)**
Contact	:	**DR SILVANA SANTOMARTINO**
Address	:	GPO BOX 302 BRISBANE QLD AUSTRALIA 4001
Project	:	**42625791**
Order number	:	**- Not provided -**
C-O-C Number	:	**- Not provided -**
Site	:	**- Not provided -**
Sampler	:	**- Not provided -**
E-mail	:	silvana_santomartino@urscorp.com
Telephone	:	07 3243 2111
Facsimile	:	07 3243 2199

Laboratory Details

Laboratory	:	**ALS Environmental Brisbane**
Manager	:	**Michael Heery**
Address	:	Stafford QLD Australia 4053
Quote number	:	EB20050096
Work order	:	**EB0605706**
E-mail	:	Michael.Heery@alsenviro.com
Telephone	:	61-7-32437222
Facsimile	:	61-7-32437259

Dates

Date Samples Received	:	14 Jun 2006
SRA Issue Date	:	14 Jun 2006
Scheduled Reporting Date	:	**22 Jun 2006**

Delivery Details

Mode of Delivery	:	Samples on hand.	**Temperature**	:	AMBIENT
No. of coolers/boxes	:	REBATCH	**No. of samples** - **Received**		15
Security Seal	:	Intact.	- **Analysed**		15

Comments

- **Samples received in appropriately pretreated and preserved containers.**
- **Sample(s) have been received within recommended holding times.**

- Analytical work for this work order will be conducted at ALSE Brisbane.
- Please direct any queries related to sample condition / numbering / breakages to Charles Allom.
- Sample Disposal - Aqueous (14 days), Solid (90 days) from date of completion of work order.
- Please direct any turn around / technical queries to the laboratory contact designated above.
- When the sampling time is not supplied on the COC documentation, ALSE defaults the sampling time to that of the COC 'relinquishment' time (if supplied). If this also is not supplied, ALSE defaults the sampling time to the 'time of receipt at Laboratory'.

Client	: URS AUSTRALIA PTY LTD (QLD)	**Work Order**	: EB0605706
Project	: 42625791	**ALS Quote Reference**	: EB20050096

Summary of Sample(s) / Container(s) and Requested Analysis

Some items described below may be part of a laboratory process neccessary for the execution of client requested tasks. Packages may contain additional analyses, such as moisture and preparation tasks, that form an implicit part of that package.

ALS Sample ID.	Client Sample ID - Sample Date	**Requested Analysis**									
		EA029 - SOIL SPOCAS	**EA033 - SOIL** Chromium Suite for Acid Sulphate Soils								
EB0605706-001	**EB0604851-001 - 18 May 2006**		]								
EB0605706-002	**EB0604851-003 - 18 May 2006**	]									
EB0605706-003	**EB0604851-005 - 18 May 2006**		]								
EB0605706-004	**EB0604851-007 - 18 May 2006**		]								
EB0605706-005	**EB0604851-008 - 18 May 2006**	]									
EB0605706-006	**EB0604851-010 - 18 May 2006**		]								
EB0605706-007	**EB0604851-013 - 18 May 2006**		]								
EB0605706-008	**EB0604851-015 - 18 May 2006**	]									
EB0605706-009	**EB0604851-017 - 18 May 2006**		]								
EB0605706-010	**EB0604851-019 - 18 May 2006**		]								
EB0605706-011	**EB0604851-022 - 18 May 2006**		]								
EB0605706-012	**EB0604851-024 - 18 May 2006**		]								
EB0605706-013	**EB0604851-028 - 18 May 2006**		]								
EB0605706-014	**EB0604851-029 - 18 May 2006**		]								
EB0605706-015	**EB0604851-032 - 18 May 2006**		]								
	Total(s) :	**3**	**12**								

Client	: URS AUSTRALIA PTY LTD (QLD)	**Work Order**	: EB0605706
Project	: 42625791	**ALS Quote Reference**	: EB20050096

Requested Reports

l **DR SILVANA SANTOMARTINO**

- A4 - Certificate of Analysis - NEPM format	Email	silvana_santomartino@urscorp.com
- A4 - Quality Control Report - NEPM format	Email	silvana_santomartino@urscorp.com
- A4 - Interpretive Quality Control Report - NEPM format	Email	silvana_santomartino@urscorp.com
- MRED Export Format	Email	silvana_santomartino@urscorp.com
- Chain of Custody Acknowledgement	Email	silvana_santomartino@urscorp.com
- A4 - Sample Receipt Notification - Comprehensive format	Email	silvana_santomartino@urscorp.com

l **NATASHA GAVIN**

- Invoice	Email	natasha_gavin@urscorp.com

Sample Container(s) / Preservation Non-Compliance Log

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

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

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CERTIFICATE OF ANALYSIS

Client	: URS AUSTRALIA PTY LTD (QLD)	Laboratory	: ALS Environmental Brisbane	Page	: 1 of 8
Contact	: DR SILVANA SANTOMARTINO	Contact	: Michael Heery	Work Order	: EB0605706
Address	: GPO BOX 302 BRISBANE QLD AUSTRALIA 4001	Address	: 32 Shand Street Stafford QLD Australia 4053		
E-mail	: silvana_santomartino@urscorp.com	E-mail	: services.brisbane@alsenviro.com		
Telephone	: 07 3243 2111	Telephone	: 61-7-32437222		
Facsimile	: 07 3243 2199	Facsimile	: 61-7-32437259		
Project	: 42625791	Quote number	: EN/001/05	Date received	: 14 Jun 2006
Order number	: - Not provided -			Date issued	: 22 Jun 2006
C-O-C number	: - Not provided -			No. of samples	- Received : 15
Site	: - Not provided -				Analysed : 15

ALSE - Excellence in Analytical Testing

NATA Accredited Laboratory 825

This document is issued in accordance with NATA's accreditation requirements.

Accredited for compliance with ISO/IEC 17025.

This document has been digitally signed by those names that appear on this report and are the authorised signatories. Digital signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatory	Position	Department
Cass Sealby		Inorganics - NATA 825 (818 - Brisbane)

ALS Environmental

Comments

This report for the ALSE reference EB0605706 supersedes any previous reports with this reference. Results apply to the samples as submitted. All pages of this report have been checked and approved for release.

This report contains the following information:

- **Analytical results for samples submitted**

When moisture determination has been performed, results are reported on a dry weight basis. When a reported 'less than' result is higher than the LOR, this may be due to primary sample extracts/digestion dilution and/or insuffient sample amount for analysis. Surrogate Recovery Limits are static and based on USEPA SW846 or ALS-QWI/EN38 (in the absence of specified USEPA limits). Where LOR of reported result differ from standard LOR, this may be due to high moisture, reduced sample amount or matrix interference. When date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for process purposes. Abbreviations: CAS number = Chemical Abstract Services number, LOR = Limit of Reporting. * Indicates failed Surrogate Recoveries.

- **Surrogate control limits**

The analytical procedures used by ALS Environmental are based on established internationally-recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house procedure are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported herein. Reference methods from which ALSE methods are based are provided in parenthesis.

Specific comments for Work Order **EB0605706**

Liming rate is calculated and reported on a dry weight basis assuming use of fine agricultural lime ($CaCO_3$) and using a safety factor of 1.5 to allow for non-homogeneous mixing and poor reactivity of lime. Conversion to liming rate in kg/m3 = kg/t x wet bulk density in t/m3.

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Analytical Results

Analyte	CAS number	LOR	Units	Client Sample ID : EB0604851-001	EB0604851-003	EB0604851-005	EB0604851-007	EB0604851-008
				Sample Matrix Type / Description : PULP	PULP	PULP	PULP	PULP
				Sample Date / Time : 18 May 2006 15:00	18 May 2006 15:00	18 May 2006 15:00	18 May 2006 15:00	18 May 2006 15:00
				Laboratory Sample ID : EB0605706-001	EB0605706-002	EB0605706-003	EB0605706-004	EB0605706-005
EA029-A: pH Measurements								
pH KCl (23A)		0.1	pH Unit	----	7.1	----	----	5.4
pH OX (23B)		0.1	pH Unit	----	7.1	----	----	3.3
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)		2	mole H+ / t	----	<2	----	----	14
Titratable Peroxide Acidity (23G)		2	mole H+ / t	----	<2	----	----	172
Titratable Sulfidic Acidity (23H)		2	mole H+ / t	----	<2	----	----	158
sulfidic - Titratable Actual Acidity (s-23F)		0.02	% pyrite S	----	<0.02	----	----	0.02
sulfidic - Titratable Peroxide Acidity (s-23G)		0.02	% pyrite S	----	<0.02	----	----	0.28
sulfidic - Titratable Sulfidic Acidity (s-23H)		0.02	% pyrite S	----	<0.02	----	----	0.25
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)		0.02	% S	----	0.12	----	----	0.31
Peroxide Sulfur (23De)		0.02	% S	----	0.15	----	----	0.49
Peroxide Oxidisable Sulfur (23E)		0.02	% S	----	0.03	----	----	0.18
acidity - Peroxide Oxidisable Sulfur (a-23E)		10	mole H+ / t	----	17	----	----	112
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)		0.02	% Ca	----	0.04	----	----	0.08
Peroxide Calcium (23Wh)		0.02	% Ca	----	0.06	----	----	0.09
Acid Reacted Calcium (23X)		0.02	% Ca	----	0.02	----	----	<0.02
acidity - Acid Reacted Calcium (a-23X)		10	mole H+ / t	----	10	----	----	<10
sulfidic - Acid Reacted Calcium (s-23X)		0.02	% S	----	<0.02	----	----	<0.02
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)		0.02	% Mg	----	0.23	----	----	0.54
Peroxide Magnesium (23Tm)		0.02	% Mg	----	0.31	----	----	0.52
Acid Reacted Magnesium (23U)		0.02	% Mg	----	0.07	----	----	<0.02
acidity - Acid Reacted Magnesium (a-23U)		10	mole H+ / t	----	60	----	----	<10
sulfidic - Acid Reacted Magnesium (s-23U)		0.02	% S	----	0.10	----	----	<0.02
EA029-F: Excess Acid Neutralising Capacity								
Excess Acid Neutralising Capacity (23Q)		0.02	% CaCO3	----	0.36	----	----	----
acidity - Excess Acid Neutralising Capacity (a-23Q)		10	mole H+ / t	----	73	----	----	----
sulfidic - Excess Acid Neutralising Capacity (s-23Q)		0.02	% S	----	0.12	----	----	----

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Analytical Results

Analyte	CAS number	LOR	Units	Client Sample ID : EB0604851-001	EB0604851-003	EB0604851-005	EB0604851-007	EB0604851-008
				Sample Matrix Type / Description : PULP	PULP	PULP	PULP	PULP
				Sample Date / Time : 18 May 2006 15:00	18 May 2006 15:00	18 May 2006 15:00	18 May 2006 15:00	18 May 2006 15:00
				Laboratory Sample ID : EB0605706-001	EB0605706-002	EB0605706-003	EB0605706-004	EB0605706-005
EA029-H: Acid Base Accounting								
ANC Fineness Factor		0.5		----	1.5	----	----	1.5
Net Acidity (sulfur units)		0.02	% S	----	<0.02	----	----	0.20
Net Acidity (acidity units)		10	mole H+ / t	----	<10	----	----	126
Liming Rate		1	kg CaCO3/t	----	<1	----	----	9
EA033-A: Actual Acidity								
pH KCl (23A)		0.1	pH Unit	8.4	----	7.3	5.3	----
Titratable Actual Acidity (23F)		2	mole H+ / t	<2	----	<2	21	----
sulfidic - Titratable Actual Acidity (s-23F)		0.02	% pyrite S	<0.02	----	<0.02	0.03	----
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)		0.02	% S	<0.02	----	<0.02	<0.02	----
acidity - Chromium Reducible Sulfur (a-22B)		10	mole H+ / t	<10	----	<10	<10	----
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A1)		0.01	% CaCO3	4.87	----	0.91	----	----
acidity - Acid Neutralising Capacity (a-19A1)		10	mole H+ / t	973	----	182	----	----
sulfidic - Acid Neutralising Capacity (s-19A1)		0.01	% pyrite S	1.56	----	0.29	----	----
EA033-E: Acid Base Accounting								
ANC Fineness Factor		0.5		1.5	----	1.5	1.5	----
Net Acidity (sulfur units)		0.02	% S	<0.02	----	<0.02	0.03	----
Net Acidity (acidity units)		10	mole H+ / t	<10	----	<10	21	----
Liming Rate		1	kg CaCO3/t	<1	----	<1	2	----

ALS Environmental

Analytical Results

Analyte	CAS number	LOR	Units	Client Sample ID: EB0604851-010	EB0604851-013	EB0604851-015	EB0604851-017	EB0604851-019
Sample Matrix Type / Description:				PULP	PULP	PULP	PULP	PULP
Sample Date / Time:				18 May 2006 15:00	18 May 2006 15:00	18 May 2006 15:00	18 May 2006 15:00	18 May 2006 15:00
Laboratory Sample ID:				EB0605706-006	EB0605706-007	EB0605706-008	EB0605706-009	EB0605706-010
EA029-A: pH Measurements								
pH KCl (23A)		0.1	pH Unit	----	----	4.7	----	----
pH OX (23B)		0.1	pH Unit	----	----	1.9	----	----
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)		2	mole H+ / t	----	----	29	----	----
Titratable Peroxide Acidity (23G)		2	mole H+ / t	----	----	2070	----	----
Titratable Sulfidic Acidity (23H)		2	mole H+ / t	----	----	2040	----	----
sulfidic - Titratable Actual Acidity (s-23F)		0.02	% pyrite S	----	----	0.05	----	----
sulfidic - Titratable Peroxide Acidity (s-23G)		0.02	% pyrite S	----	----	3.32	----	----
sulfidic - Titratable Sulfidic Acidity (s-23H)		0.02	% pyrite S	----	----	3.27	----	----
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)		0.02	% S	----	----	0.20	----	----
Peroxide Sulfur (23De)		0.02	% S	----	----	2.26	----	----
Peroxide Oxidisable Sulfur (23E)		0.02	% S	----	----	2.06	----	----
acidity - Peroxide Oxidisable Sulfur (a-23E)		10	mole H+ / t	----	----	1290	----	----
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)		0.02	% Ca	----	----	0.08	----	----
Peroxide Calcium (23Wh)		0.02	% Ca	----	----	0.04	----	----
Acid Reacted Calcium (23X)		0.02	% Ca	----	----	<0.02	----	----
acidity - Acid Reacted Calcium (a-23X)		10	mole H+ / t	----	----	<10	----	----
sulfidic - Acid Reacted Calcium (s-23X)		0.02	% S	----	----	<0.02	----	----
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)		0.02	% Mg	----	----	0.17	----	----
Peroxide Magnesium (23Tm)		0.02	% Mg	----	----	0.10	----	----
Acid Reacted Magnesium (23U)		0.02	% Mg	----	----	<0.02	----	----
acidity - Acid Reacted Magnesium (a-23U)		10	mole H+ / t	----	----	<10	----	----
sulfidic - Acid Reacted Magnesium (s-23U)		0.02	% S	----	----	<0.02	----	----
EA029-H: Acid Base Accounting								
ANC Fineness Factor		0.5		----	----	1.5	----	----
Net Acidity (sulfur units)		0.02	% S	----	----	2.11	----	----
Net Acidity (acidity units)		10	mole H+ / t	----	----	1320	----	----
Liming Rate		1	kg CaCO3/t	----	----	99	----	----

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Analytical Results

Analyte	CAS number	LOR	Units	Client Sample ID : EB0604851-010	EB0604851-013	EB0604851-015	EB0604851-017	EB0604851-019
				Sample Matrix Type / Description : PULP	PULP	PULP	PULP	PULP
				Sample Date / Time : 18 May 2006 15:00	18 May 2006 15:00	18 May 2006 15:00	18 May 2006 15:00	18 May 2006 15:00
				Laboratory Sample ID : EB0605706-006	EB0605706-007	EB0605706-008	EB0605706-009	EB0605706-010
EA033-A: Actual Acidity								
pH KCl (23A)		0.1	pH Unit	5.7	7.1	----	7.1	6.5
Titratable Actual Acidity (23F)		2	mole H+ / t	9	<2	----	<2	<2
sulfidic - Titratable Actual Acidity (s-23F)		0.02	% pyrite S	<0.02	<0.02	----	<0.02	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)		0.02	% S	1.29	<0.02	----	0.19	0.02
acidity - Chromium Reducible Sulfur (a-22B)		10	mole H+ / t	804	<10	----	118	12
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A1)		0.01	% CaCO3	----	0.56	----	0.85	0.68
acidity - Acid Neutralising Capacity (a-19A1)		10	mole H+ / t	----	112	----	170	136
sulfidic - Acid Neutralising Capacity (s-19A1)		0.01	% pyrite S	----	0.18	----	0.27	0.22
EA033-E: Acid Base Accounting								
ANC Fineness Factor		0.5		1.5	1.5	----	1.5	1.5
Net Acidity (sulfur units)		0.02	% S	1.30	<0.02	----	<0.02	<0.02
Net Acidity (acidity units)		10	mole H+ / t	814	<10	----	<10	<10
Liming Rate		1	kg CaCO3/t	61	<1	----	<1	<1

ALS Environmental

Analytical Results

Analyte	CAS number	LOR	Units	Client Sample ID : EB0604851-022	EB0604851-024	EB0604851-028	EB0604851-029	EB0604851-032
				Sample Matrix Type / Description : PULP	PULP	PULP	PULP	PULP
				Sample Date / Time : 18 May 2006 15:00	18 May 2006 15:00	18 May 2006 15:00	18 May 2006 15:00	18 May 2006 15:00
				Laboratory Sample ID : EB0605706-011	EB0605706-012	EB0605706-013	EB0605706-014	EB0605706-015
EA033-A: Actual Acidity								
pH KCl (23A)		0.1	pH Unit	4.9	4.7	4.4	4.4	5.4
Titratable Actual Acidity (23F)		2	mole H+ / t	19	24	34	26	6
sulfidic - Titratable Actual Acidity (s-23F)		0.02	% pyrite S	0.03	0.04	0.05	0.04	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)		0.02	% S	0.02	<0.02	<0.02	<0.02	<0.02
acidity - Chromium Reducible Sulfur (a-22B)		10	mole H+ / t	12	<10	<10	<10	<10
EA033-D: Retained Acidity								
Net Acid Soluble Sulfur (20Je)		0.02	% S	----	----	5.45	1.75	----
acidity - Net Acid Soluble Sulfur (a-20J)		10	mole H+ / t	----	----	2550	820	----
sulfidic - Net Acid Soluble Sulfur (s-20J)		0.02	% pyrite S	----	----	4.09	1.31	----
KCl Extractable Sulfur (23Ce)		0.02	% S	----	----	0.10	0.04	----
HCl Extractable Sulfur (20Be)		0.02	% S	----	----	5.55	1.79	----
EA033-E: Acid Base Accounting								
ANC Fineness Factor		0.5		1.5	1.5	1.5	1.5	1.5
Net Acidity (sulfur units)		0.02	% S	0.05	0.04	4.14	1.36	<0.02
Net Acidity (acidity units)		10	mole H+ / t	31	24	2580	846	<10
Liming Rate		1	kg CaCO3/t	2	2	194	63	<1

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Surrogate Control Limits

- **No surrogates present on this report.**

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INTERPRETIVE QUALITY CONTROL REPORT

Client	:	**URS AUSTRALIA PTY LTD (QLD)**	**Laboratory**	:	ALS Environmental Brisbane	**Page**	: **1 of 5**
Contact	:	DR SILVANA SANTOMARTINO	**Contact**	:	Michael Heery		
Address	:	GPO BOX 302 BRISBANE QLD AUSTRALIA 4001	**Address**	:	32 Shand Street Stafford QLD Australia 4053	**Work order**	: **EB0605706**
						Amendment No.	:
Project	:	42625791	**Quote number**	:	EN/001/05	**Date received**	: 14 Jun 2006
Order number	:	- Not provided -				**Date issued**	: 22 Jun 2006
C-O-C number	:	- Not provided -					
Site	:	- Not provided -					
E-mail	:	silvana_santomartino@urscorp.com	**E-mail**	:	services.brisbane@alsenviro.com	**No. of samples**	
Telephone	:	07 3243 2111	**Telephone**	:	61-7-32437222	**Received**	: 15
Facsimile	:	07 3243 2199	**Facsimile**	:	61-7-32437259	**Analysed**	: 15

This Interpretive Quality Control Report was issued on 22 Jun 2006 for the ALS work order reference EB0605706 and supersedes any previous reports with this reference.
This report contains the following information:

- Analysis Holding Time Compliance
- Quality Control Type Frequency Compliance
- Summary of all Quality Control Outliers
- Brief Method Summaries

Interpretive Quality Control Report - Analysis Holding Time

The following report summarises extraction / preparation and analysis times and compares with recommended holding times. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. Information is also provided re the sample container (preservative) from which the sample aliquot was taken. Elapsed time to analysis represents time from sampling where no extraction / digestion is involved or time from extraction / digestion where this is present. For composite samples, sampling date/time is taken as that of the oldest sample contributing to that composite. Sample date/time for laboratory produced leaches are taken from the completion date/time of the leaching process. Outliers for holding time are based on USEPA SW846, APHA, AS and NEPM (1999). Failed outliers, refer to the 'Summary of Outliers'.

Matrix Type: SOIL ***Analysis Holding Time and Preservation***

Method / **Container /** Client Sample ID(s)	**Date Sampled**	**Extraction / Preparation**			**Analysis**		
		Date extracted	Due for extraction	Pass?	Date analysed	Due for analysis	Pass?
EA029: Suspension Peroxide Oxidation-Combined Acidity and Sulphate							
80* dried soil							
EB0604851-003, EB0604851-008, EB0604851-015	**18 May 2006**	**14 Jun 2006**	18 May 2007	Pass	**15 Jun 2006**	13 Sep 2006	Pass
EA033: Chromium Suite for Acid Sulphate Soils							
80* dried soil							
EB0604851-001, EB0604851-005, EB0604851-007, EB0604851-010, EB0604851-013, EB0604851-017, EB0604851-019, EB0604851-022, EB0604851-024, EB0604851-028, EB0604851-029, EB0604851-032	**18 May 2006**	**14 Jun 2006**	18 May 2007	Pass	**15 Jun 2006**	13 Sep 2006	Pass

Interpretive Quality Control Report - Frequency of Quality Control Samples

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which this work order was processed. Actual rate should be greater than or equal to the expected rate.

Matrix Type: SOIL ***Frequency of Quality Control Samples***

Quality Control Sample Type / Method	Count		Rate (%)		Quality Control Specification
	QC	Regular	**Actual**	**Expected**	
Laboratory Duplicates (DUP)					
EA029: Suspension Peroxide Oxidation-Combined Acidity and Sulphate	1	3	**33.3**	**10.0**	NEPM 1999 Schedule B(3) and ALSE QCS3 requirement
EA033: Chromium Suite for Acid Sulphate Soils	2	12	**16.7**	**10.0**	NEPM 1999 Schedule B(3) and ALSE QCS3 requirement
Method Blanks (MB)					
EA029: Suspension Peroxide Oxidation-Combined Acidity and Sulphate	1	3	**33.3**	**5.0**	NEPM 1999 Schedule B(3) and ALSE QCS3 requirement
EA033: Chromium Suite for Acid Sulphate Soils	1	12	**8.3**	**5.0**	NEPM 1999 Schedule B(3) and ALSE QCS3 requirement

Interpretive Quality Control Report - Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged on the 'Quality Control Report'. Surrogate recovery limits are static and based on USEPA SW846 or ALS-QWI/EN/38 (in the absence of specific USEPA limits). - Anonymous - Client Sample IDs refer to samples which are not specifically part of this work order but formed part of the QC process lot.

Non-surrogates

- **For all matrices, no RPD recovery outliers occur for the duplicate analysis.**
- **For all matrices, no method blank result outliers occur.**
- **For all matrices, no laboratory spike recoveries breaches occur.**
- **For all matrices, no matrix spike recoveries breaches occur.**

Surrogates

- **For all matrices, no surrogate recovery outliers occur.**

Outliers : Analysis Holding Time

The following report highlights outliers within this 'Interpretive Quality Control Report - Analysis Holding Time'.

- **No holding time outliers occur.**

Outliers : Frequency of Quality Control Samples

The following report highlights outliers within this 'Interpretive Quality Control Report - Frequency of Quality Control Samples'.

- **No frequency outliers occur.**

Method Reference Summary

The analytical procedures used by ALS Environmental are based on established internationally-recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house procedure are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported herein. Reference methods from which ALSE methods are based are provided in parenthesis.

Matrix Type: PULP ***Method Reference Summary***

Preparation Methods

EN020PR : Drying at 85 degrees, bagging and labelling (ASS) - In house

Analytical Methods

EA029 : Suspension Peroxide Oxidation-Combined Acidity and Sulphate - Ahern et al 2004 - a suspension peroxide oxidation method following the 'sulfur trail' by determining the level of 1M KCL extractable sulfur and the sulfur level after oxidation of soil sulphides. The 'acidity trail' is followed by measurement of TAA, TPA and TSA. Liming Rate is based on results for samples as submitted and incorporates a minimum safety factor of 1.5.

EA033 : Chromium Suite for Acid Sulphate Soils - Ahern et al 2004. This method covers the determination of Chromium Reducible Sulfur (SCR); pHKCl; titratable actual acidity (TAA); acid neutralising capacity by back titration (ANC); and net acid soluble sulfur (SNAS) which incorporates peroxide sulfur. It applies to soils and sediments (including sands) derived from coastal regions. Liming Rate is based on results for samples as submitted and incorporates a minimum safety factor of 1.5.

ALS Environmental

QUALITY CONTROL REPORT

Client	:	**URS AUSTRALIA PTY LTD (QLD)**	**Laboratory**	:	ALS Environmental Brisbane	**Page**	: **1 of 7**
Contact	:	DR SILVANA SANTOMARTINO	**Contact**	:	Michael Heery		
Address	:	GPO BOX 302 BRISBANE QLD AUSTRALIA 4001	**Address**	:	32 Shand Street Stafford QLD Australia 4053	**Work order**	: **EB0605706**
						Amendment No.	:
Project	:	42625791	**Quote number**	:	EN/001/05	**Date received**	: 14 Jun 2006
Order number	:	- Not provided -				**Date issued**	: 22 Jun 2006
C-O-C number	:	- Not provided -					
Site	:	- Not provided -					
E-mail	:	silvana_santomartino@urscorp.com	**E-mail**	:	services.brisbane@alsenviro.com	**No. of samples**	
Telephone	:	07 3243 2111	**Telephone**	:	61-7-32437222	**Received**	: 15
Facsimile	:	07 3243 2199	**Facsimile**	:	61-7-32437259	**Analysed**	: 15

This final report for the ALSE work order reference EB0605706 supersedes any previous reports with this reference.

Results apply to the samples as submitted. All pages of this report have been checked and approved for release.

This report contains the following information:

- Laboratory Duplicates (DUP); Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Samples (LCS); Recovery and Acceptance Limits
- Matrix Spikes (MS); Recovery and Acceptance Limits

Work order specific comments

Liming rate is calculated and reported on a dry weight basis assuming use of fine agricultural lime (CaCO3) and using a safety factor of 1.5 to allow for non-homogeneous mixing and poor reactivity of lime. Conversion to liming rate in kg/m3 = kg/t x wet bulk density in t/m3.

ALSE - Excellence in Analytical Testing

NATA

WORLD RECOGNISED ACCREDITATION

NATA Accredited Laboratory - 825

This document is issued in accordance with NATA's accreditation requirements.

Accredited for compliance with ISO/IED 17025

This document has been digitally signed by those names that appear on this report and are the authorised signatories. Digital signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatory	Department
Cass Sealby	Inorganics - NATA 825 (818 - Brisbane)

Quality Control Report - Laboratory Duplicates (DUP)

The quality control term **Laboratory Duplicate** refers to an intralaboratory split sample randomly selected from the sample batch. Laboratory duplicates provide information on method precision and sample heterogeneity.
- Anonymous - Client Sample IDs refer to samples which are not specifically part of this work order but formed part of the QC process lot. *Abbreviations:* ***LOR*** = *Limit of Reporting,* ***RPD*** = *Relative Percent Difference.*
* Indicates failed QC. The permitted ranges for the RPD of Laboratory Duplicates (relative percent deviation) are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting:- Result < 10 times LOR, no limit - Result between 10 and 20 times LOR, 0% - 50% - Result > 20 times LOR, 0% - 20%

Matrix Type: SOIL ***Laboratory Duplicates (DUP) Report***

Laboratory Sample ID	*Client Sample ID*	*Analyte name*	*LOR*	*Original Result*	*Duplicate Result*	*RPD*
EA029-A: pH Measurements						
EA029-A: pH Measurements - (QC Lot: 226363)				**pH Unit**	**pH Unit**	**%**
EB0605706-002	EB0604851-003	pH KCl (23A)	0.1 pH Unit	7.1	7.0	1.4
		pH OX (23B)	0.1 pH Unit	7.1	7.1	0.0
EA029-B: Acidity Trail						
EA029-B: Acidity Trail - (QC Lot: 226363)				**mole H+ / t**	**mole H+ / t**	**%**
EB0605706-002	EB0604851-003	Titratable Actual Acidity (23F)	2 mole H+ / t	<2	<2	0.0
		Titratable Peroxide Acidity (23G)	2 mole H+ / t	<2	<2	0.0
		Titratable Sulfidic Acidity (23H)	2 mole H+ / t	<2	<2	0.0
		sulfidic - Titratable Actual Acidity (s-23F)	0.02 % pyrite S	<0.02	<0.02	0.0
		sulfidic - Titratable Peroxide Acidity (s-23G)	0.02 % pyrite S	<0.02	<0.02	0.0
		sulfidic - Titratable Sulfidic Acidity (s-23H)	0.02 % pyrite S	<0.02	<0.02	0.0
EA029-C: Sulfur Trail						
EA029-C: Sulfur Trail - (QC Lot: 226363)				**% S**	**% S**	**%**
EB0605706-002	EB0604851-003	KCl Extractable Sulfur (23Ce)	0.02 % S	0.12	0.12	0.0
		Peroxide Sulfur (23De)	0.02 % S	0.15	0.12	16.4
		Peroxide Oxidisable Sulfur (23E)	0.02 % S	0.03	<0.02	0.0
		Acidity - Peroxide Oxidisable Sulfur (a-23E)	10 mole H+ / t	17	<10	53.4
EA029-D: Calcium Values						
EA029-D: Calcium Values - (QC Lot: 226363)				**% Ca**	**% Ca**	**%**
EB0605706-002	EB0604851-003	KCl Extractable Calcium (23Vh)	0.02 % Ca	0.04	0.04	0.0
		Peroxide Calcium (23Wh)	0.02 % Ca	0.06	0.05	0.0
		Acid Reacted Calcium (23X)	0.02 % Ca	0.02	<0.02	0.0
		Acidity - Acid Reacted Calcium (a-23X)	10 mole H+ / t	10	<10	0.0
		sulfidic - Acid Reacted Calcium (s-23X)	0.02 % S	<0.02	<0.02	0.0
EA029-E: Magnesium Values						
EA029-E: Magnesium Values - (QC Lot: 226363)				**% Mg**	**% Mg**	**%**

ALS Environmental

Matrix Type: SOIL

Laboratory Duplicates (DUP) Report

Laboratory Sample ID	Client Sample ID	Analyte name	LOR	Original Result	Duplicate Result	RPD
EA029-E: Magnesium Values - continued						
EA029-E: Magnesium Values - (QC Lot: 226363) - continued				% Mg	% Mg	%
EB0605706-002	EB0604851-003	KCl Extractable Magnesium (23Sm)	0.02 % Mg	0.23	0.23	0.0
		Peroxide Magnesium (23Tm)	0.02 % Mg	0.31	0.27	12.7
		Acid Reacted Magnesium (23U)	0.02 % Mg	0.07	0.04	68.6
		Acidity - Acid Reacted Magnesium (a-23U)	10 mole H+ / t	60	30	68.6
		sulfidic - Acid Reacted Magnesium (s-23U)	0.02 % S	0.10	0.05	68.6
EA029-F: Excess Acid Neutralising Capacity						
EA029-F: Excess Acid Neutralising Capacity - (QC Lot: 226363)				% CaCO3	% CaCO3	%
EB0605706-002	EB0604851-003	Excess Acid Neutralising Capacity (23Q)	0.02 % CaCO3	0.36	0.40	9.2
		Acidity - Excess Acid Neutralising Capacity (a-23Q)	10 mole H+ / t	73	80	9.2
		sulfidic - Excess Acid Neutralising Capacity (s-23Q)	0.02 % S	0.12	0.13	9.2
EA033-A: Actual Acidity						
EA033-A: Actual Acidity - (QC Lot: 226362)				pH Unit	pH Unit	%
EB0605706-001	EB0604851-001	pH KCl (23A)	0.1 pH Unit	8.4	8.4	0.0
		Titratable Actual Acidity (23F)	2 mole H+ / t	<2	<2	0.0
		sulfidic - Titratable Actual Acidity (s-23F)	0.02 % pyrite S	<0.02	<0.02	0.0
EB0605706-014	EB0604851-029	pH KCl (23A)	0.1 pH Unit	4.4	4.4	0.0
		Titratable Actual Acidity (23F)	2 mole H+ / t	26	24	8.0
		sulfidic - Titratable Actual Acidity (s-23F)	0.02 % pyrite S	0.04	0.04	0.0
EA033-B: Potential Acidity						
EA033-B: Potential Acidity - (QC Lot: 226362)				% S	% S	%
EB0605706-001	EB0604851-001	Chromium Reducible Sulfur (22B)	0.02 % S	<0.02	<0.02	0.0
		Acidity - Chromium Reducible Sulfur (a-22B)	10 mole H+ / t	<10	<10	0.0
EB0605706-014	EB0604851-029	Chromium Reducible Sulfur (22B)	0.02 % S	<0.02	<0.02	0.0
		Acidity - Chromium Reducible Sulfur (a-22B)	10 mole H+ / t	<10	<10	0.0
EA033-C: Acid Neutralising Capacity						
EA033-C: Acid Neutralising Capacity - (QC Lot: 226362)				% CaCO3	% CaCO3	%
EB0605706-001	EB0604851-001	Acid Neutralising Capacity (19A1)	0.01 % CaCO3	4.87	4.77	2.1
		Acidity - Acid Neutralising Capacity (a-19A1)	10 mole H+ / t	973	953	2.1

Matrix Type: SOIL

Laboratory Duplicates (DUP) Report

Laboratory Sample ID	*Client Sample ID*	*Analyte name*	*LOR*	*Original Result*	*Duplicate Result*	*RPD*
EA033-C: Acid Neutralising Capacity - continued						
EA033-C: Acid Neutralising Capacity - (QC Lot: 226362) - continued				**% pyrite S**	**% pyrite S**	**%**
EB0605706-001	EB0604851-001	sulfidic - Acid Neutralising Capacity (s-19A1)	0.01 % pyrite S	1.56	1.53	2.1
EA033-D: Retained Acidity						
EA033-D: Retained Acidity - (QC Lot: 226362)				**% S**	**% S**	**%**
EB0605706-014	EB0604851-029	Net Acid Soluble Sulfur (20Je)	0.02 % S	1.75	1.72	1.7
		Acidity - Net Acid Soluble Sulfur (a-20J)	10 mole H+ / t	820	806	1.7
		sulfidic - Net Acid Soluble Sulfur (s-20J)	0.02 % pyrite S	1.31	1.29	1.7
		KCl Extractable Sulfur (23Ce)	0.02 % S	0.04	0.04	0.0
		HCl Extractable Sulfur (20Be)	0.02 % S	1.79	1.76	1.7

Quality Control Report - Method Blank (MB) and Laboratory Control Samples (LCS)

The quality control term **Method / Laboratory Blank** refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC type is to monitor potential laboratory contamination. The quality control term **Laboratory Control Sample (LCS)** refers to a known, interference free matrix spiked with target analytes or certified reference material. The purpose of this QC type is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of actual laboratory data. Abbreviations: LOR = Limit of reporting.

Matrix Type: SOIL

Method Blank (MB) and Laboratory Control Samples (LCS) Report

		Method blank result	*Actual Results*		*Recovery Limits*	
			Spike concentration	*Spike Recovery*	*Dynamic Recovery Limits*	
Analyte name	*LOR*			*LCS*	*Low*	*High*
EA029-B: Acidity Trail						
EA029-B: Acidity Trail - (QC Lot: 226363)		% pyrite S	% pyrite S	%	%	%
sulfidic - Titratable Actual Acidity (s-23F)	0.02 % pyrite S	<0.02	----	----	----	----
sulfidic - Titratable Peroxide Acidity (s-23G)	0.02 % pyrite S	<0.02	----	----	----	----
sulfidic - Titratable Sulfidic Acidity (s-23H)	0.02 % pyrite S	<0.02	----	----	----	----
Titratable Actual Acidity (23F)	2 mole H+ / t	<2	----	----	----	----
Titratable Peroxide Acidity (23G)	2 mole H+ / t	<2	----	----	----	----
Titratable Sulfidic Acidity (23H)	2 mole H+ / t	<2	----	----	----	----
EA029-C: Sulfur Trail						
EA029-C: Sulfur Trail - (QC Lot: 226363)		mole H+ / t	mole H+ / t	%	%	%
Acidity - Peroxide Oxidisable Sulfur (a-23E)	10 mole H+ / t	<10	----	----	----	----
KCl Extractable Sulfur (23Ce)	0.02 % S	<0.02	----	----	----	----
Peroxide Oxidisable Sulfur (23E)	0.02 % S	<0.02	----	----	----	----
Peroxide Sulfur (23De)	0.02 % S	<0.02	----	----	----	----
EA029-D: Calcium Values						
EA029-D: Calcium Values - (QC Lot: 226363)		% Ca	% Ca	%	%	%
Acid Reacted Calcium (23X)	0.02 % Ca	<0.02	----	----	----	----
Acidity - Acid Reacted Calcium (a-23X)	10 mole H+ / t	<10	----	----	----	----
KCl Extractable Calcium (23Vh)	0.02 % Ca	<0.02	----	----	----	----
Peroxide Calcium (23Wh)	0.02 % Ca	<0.02	----	----	----	----
sulfidic - Acid Reacted Calcium (s-23X)	0.02 % S	<0.02	----	----	----	----
EA029-E: Magnesium Values						
EA029-E: Magnesium Values - (QC Lot: 226363)		% Mg	% Mg	%	%	%
Acid Reacted Magnesium (23U)	0.02 % Mg	<0.02	----	----	----	----
Acidity - Acid Reacted Magnesium (a-23U)	10 mole H+ / t	<10	----	----	----	----
KCl Extractable Magnesium (23Sm)	0.02 % Mg	<0.02	----	----	----	----

Matrix Type: SOIL

Method Blank (MB) and Laboratory Control Samples (LCS) Report

Analyte name	*LOR*	*Method blank result*	*Actual Results*		*Recovery Limits*	
			Spike concentration	*Spike Recovery*	*Dynamic Recovery Limits*	
				LCS	*Low*	*High*
EA029-E: Magnesium Values - continued						
EA029-E: Magnesium Values - (QC Lot: 226363) - continued		% Mg	% Mg	%	%	%
Peroxide Magnesium (23Tm)	0.02 % Mg	<0.02	----	----	----	----
sulfidic - Acid Reacted Magnesium (s-23U)	0.02 % S	<0.02	----	----	----	----
EA029-F: Excess Acid Neutralising Capacity						
EA029-F: Excess Acid Neutralising Capacity - (QC Lot: 226363)		mole H+ / t	mole H+ / t	%	%	%
Acidity - Excess Acid Neutralising Capacity (a-23Q)	10 mole H+ / t	<10	----	----	----	----
Excess Acid Neutralising Capacity (23Q)	0.02 % CaCO3	<0.02	----	----	----	----
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	0.02 % S	<0.02	----	----	----	----
EA033-A: Actual Acidity						
EA033-A: Actual Acidity - (QC Lot: 226362)		% pyrite S	% pyrite S	%	%	%
sulfidic - Titratable Actual Acidity (s-23F)	0.02 % pyrite S	<0.02	----	----	----	----
Titratable Actual Acidity (23F)	2 mole H+ / t	<2	----	----	----	----
EA033-B: Potential Acidity						
EA033-B: Potential Acidity - (QC Lot: 226362)		mole H+ / t	mole H+ / t	%	%	%
Acidity - Chromium Reducible Sulfur (a-22B)	10 mole H+ / t	<10	----	----	----	----
Chromium Reducible Sulfur (22B)	0.02 % S	<0.02	----	----	----	----
EA033-C: Acid Neutralising Capacity						
EA033-C: Acid Neutralising Capacity - (QC Lot: 226362)		% CaCO3	% CaCO3	%	%	%
Acid Neutralising Capacity (19A1)	0.01 % CaCO3	<0.01	----	----	----	----
Acidity - Acid Neutralising Capacity (a-19A1)	10 mole H+ / t	<10	----	----	----	----
sulfidic - Acid Neutralising Capacity (s-19A1)	0.01 % pyrite S	<0.01	----	----	----	----
EA033-D: Retained Acidity						
EA033-D: Retained Acidity - (QC Lot: 226362)		mole H+ / t	mole H+ / t	%	%	%
Acidity - Net Acid Soluble Sulfur (a-20J)	10 mole H+ / t	<10	----	----	----	----
HCl Extractable Sulfur (20Be)	0.02 % S	<0.02	----	----	----	----
KCl Extractable Sulfur (23Ce)	0.02 % S	<0.02	----	----	----	----
Net Acid Soluble Sulfur (20Je)	0.02 % S	<0.02	----	----	----	----
sulfidic - Net Acid Soluble Sulfur (s-20J)	0.02 % pyrite S	<0.02	----	----	----	----

ALS Environmental

Quality Control Report - Matrix Spikes (MS)

The quality control term **Matrix Spike (MS)** refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC type is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQO's). 'Ideal' recovery ranges stated may be waived in the event of sample matrix interferences. - Anonymous - Client Sample IDs refer to samples which are not specifically part of this work order but formed part of the QC process lot. *Abbreviations:* ***LOR*** *= Limit of Reporting,* ***RPD*** *= Relative Percent Difference.*

* Indicates failed QC

Matrix Spike (MS) Report

					Actual Results		*Recovery Limits*	
					Sample Result	*Spike Recovery*	*Static Limits*	
Analyte name	*Laboratory Sample ID*	*Client Sample ID*	*LOR*	*Spike Concentration*		*MS*	*Low*	*High*
- (QC Lot:)						%	%	%
					----			

l **No Matrix Spike (MS) carried out on this Work Order.**

Appendix C
Test Results from Previous Investigations

Table C1

Acid Sulfate Soil Data for Selected Depth Samples from 2004 Investigation[1]

Location	Site No.	Depth	Landform	S_{POS}[2]	TAA[2]	TPA[2]	Net acidity		Liming Rate
		m		%S	mol H^+/t	mol H^+/t	mol H^+/t	% S	kg Aglime/tonne
Near proposed roundabout (near ASS1)	512	0.6-0.8	Supratidal flat	2.779	44	1881	1777	2.85	133
		1.1-1.3		3.505	25	2252	2211	3.54	166
Near proposed transfer station (close to ASS4)	520	0.5-0.6	Extratidal flat	0.048	36	55	1227	1.97	92
		1.1-1.3		0.091	26	84	83	0.13	6
Near proposed transfer station (close to ASS3)	496	0.3-0.5	Supratidal flat	1.616	0	925	951	1.52	71
		1.0-1.2		1.256	0	622	740	1.19	56
Along proposed sea water pipeline alignment	510	0.3-0.5	Supratidal flat	0.834	26	516	546	0.88	41
		1.3-1.5		1.24	0	742	778	1.25	58
Along proposed sea water pipeline alignment	533	0.5-0.7	Supratidal flat	1.37	68	1030	922	1.48	69
		1.0-0.2		1.11	20	722	712	1.14	53
Along proposed sea water pipeline alignment	497	0.3-0.5	Supratidal flat	1.655	33	1103	1065	1.71	80
		1.1-1.3		1.331	14	794	844	1.35	63
Along proposed sea water pipeline alignment	495	2.3-2.5	Plain	0.087	0	39	38	0.06	3
Along proposed sea water pipeline alignment	623	0.8-1.0	Extratidal Flat	0.031	0	0	2	0.00	0
		4.8-5.0		0.036	0	10	15	0.02	1
Along proposed sea water pipeline alignment	493	0.8-1.0	Supratidal flat	0.526	0	263	301	0.48	23
		1.3-1.5		0.505	0	187	248	0.40	19
West of proposed sea water pipeline alignment	532	0.3-0.5	Intertidal Flat	0.851	0	498	530	0.85	40
		1.3-1.5		1.02	11	634	647	1.04	49
West of proposed sea water pipeline alignment	494	0.4-0.5	Supratidal flat	3.752	17	2524	2357	3.78	177
		1.4-1.6		1.927	0	1142	1170	1.88	88
East of proposed sea water pipeline alignment	498	0.2-0.3	Intertidal Flat	2.083	24	1363	1323	2.12	99
		1.5-1.7		1.9	60	1302	1245	2.00	93
East of proposed sea water pipeline alignment	624	1.0-1.2	Alluvial Plain	0.013	0	0	8	0.01	1
		2.7-2.9		<0.01	0	23	0	0.00	0
East of proposed sea water pipeline alignment	492	0.8-1.0	Extratidal Flat	2.806	51	2022	1801	2.89	135
		1.6-1.8		2.169	41	1458	1394	2.24	105
North of Hanson Rd	534	0.8-1.0	Extratidal flat	2.97	138	2091	1990	3.19	149
		1.5-1.7		1.73	74	1154	1153	1.85	87
South of Hanson Rd	509	0.8-1.0	Extratidal flat	0.035	41	66	87	0.14	7
		1.5-1.7		6.491	173	4497	4221	6.77	317
North of Hanson Rd	511	0.3-0.5	Supratidal flat	2.938	44	1954	1875	3.01	141
		1.2-1.4		2.078	10	1279	1306	2.09	98
South of Hanson Rd	668	0.3-0.5	Supratidal flat	0.024	44	75	457	0.73	34
		1.0-1.2		1.62	99	1142	1110	1.78	83
		1.6-1.8		2.46	51	1524	1582	2.54	119

1. Ross, D.J. (2004) Acid Sulfate Soils Tannum Sands – Gladstone Area, Central Queensland Coast. Department of Natural Resources and Mines.

2. S_{POS} = Peroxide Oxidisable Sulfur, TAA = Total/Titrateable actual acidity, TPA = Total/Titrateable Potential Acidity

Table C2. Acid Sulfate Soil Data for Selected Depth Samples from 2006 Investigation[1]

Depth (m)	Sample Description	Origin	Field Screening Test Results				Chromium Suite Test Results (%S)					Liming Rate (kg/t)
			pH_F	pH_{FOX}	ΔpH	Reaction (1,2,3,4)*	S_{CR}	TAA	NASS	ANC	Net Acidity	
Pit 1												
0.0-0.5	Silty clay with organics	Estuarine	5.4	1.3	4.1	4	-	-	-	-	-	-
0.5-1.0	Silty clay with organics	Estuarine	7.1	1.4	5.7	4	1.02	0.06	ND	ND	1.08	51
1.0-1.5	Silty clay with organics	Estuarine	7.1	1.5	5.6	4	-	-	-	-	-	-
1.5-2.0	Silty clay with sand	Estuarine	6.8	1.7	5.1	4	-	-	-	-	-	-
2.0-2.5	Silty clay with sand	Estuarine	7.0	1.6	5.4	4	-	-	-	-	-	-
2.5-3.0	Silty clay	Alluvial	8.9	2.1	6.8	4	-	-	-	-	-	-
Pit 2												
1.2-1.5	Silty clay with organics	Estuarine	6.7	1.6	5.1	4	-	-	-	-	-	-
1.5-2.0	Silty clay with organics	Estuarine	8.0	1.7	6.3	4	-	-	-	-	-	-
2.0-2.5	Silty clay with organics	Estuarine	8.4	1.8	6.6	4	-	-	-	-	-	-
2.5-3.0	Silty clay	Alluvial	7.9	6.4	1.5	1	-	-	-	-	-	-
3.0-3.2	Silty clay	Alluvial	7.4	6.0	1.4	1	-	-	-	-	-	-
Pit 3												
0.0-0.5	Sandy clay	Alluvial	4.4	3.7	0.7	1	-	-	-	-	-	-
0.5-1.0	Sandy clay with gravel	Alluvial	6.8	6.1	0.7	1	-	-	-	-	-	-
1.0-1.5	Sandy clay with gravel	Alluvial	7.3	6.5	0.8	3	-	-	-	-	-	-
1.5-2.0	Sandy clay with gravel	Alluvial	7.5	7.2	0.3	1	-	-	-	-	-	-
2.0-2.5	Sandy clay with gravel	Alluvial	6.8	5.8	1.0	3	-	-	-	-	-	-
2.5-3.0	Sandy clay with gravel	Alluvial	6.5	5.7	0.8	3	-	-	-	-	-	-
Pit 4												
0.1-0.5	Silty clay with organics	Estuarine	6.8	1.3	5.5	4	3.22	0.29	<0.02	ND	3.51	164
0.5-1.0	Silty clay with organics	Estuarine	7.5	0.3	6.2	4	-	-	-	-	-	-
1.0-1.5	Silty clay with organics	Estuarine	8.6	2.3	6.3	3	-	-	-	-	-	-
1.5-2.0	Sandy silty clay	Alluvial	7.6	6.5	1.1	2	-	-	-	-	-	-
2.0-2.5	Sandy silty clay	Alluvial	7.4	6.8	0.6	4	-	-	-	-	-	-
2.5-3.0	Sandy silty clay	Alluvial	7.6	6.1	1.5	2	-	-	-	-	-	-
Pit 5												
0.7-1.0	Silty clay with organics	Estuarine	7.4	1.5	5.9	4	1.09	0.10	<0.02	ND	1.20	56
1.0-1.5	Silty clay with organics	Estuarine	8.2	1.9	6.3	4	-	-	-	-	-	-
1.5-2.0	Silty clay	Alluvial	8.1	6..3	1.8	3	-	-	-	-	-	-
2.0-2.5	Silty clay	Alluvial	8.3	6.3	2.0	2	-	-	-	-	-	-
2.5-3.0	Silty clay	Alluvial	8.1	6.7	1.4	2	-	-	-	-	-	-

Depth (m)	Sample Description	Origin	Field Screening Test Results				Chromium Suite Test Results (%S)					Liming Rate (kg/t)
			pH_F	pH_{FOX}	ΔpH	Reaction (1,2,3,4)*	S_{CR}	TAA	NASS	ANC	Net Acidity	
Pit 6												
0.0-0.5	Silty clay with organics	Estuarine	7.5	6.0	1.5	4	-	-	-	-	-	-
0.5-1.0	Silty clay with organics	Estuarine	7.2	1.7	5.5	4	-	-	-	-	-	-
1.0-1.4	Silty clay with organics	Estuarine	8.0	1.7	6.3	4	0.96	<0.02	ND	0.34	0.73	34
Pit 7												
0.0-0.5	Sandy silty clay	Alluvial	3.1	1.8	1.3	4	-	-	-	-	-	-
0.5-10	Sandy silty clay	Alluvial	6.7	6.2	0.5	3	-	-	-	-	-	-
1.0-1.5	Sandy silty clay	Alluvial	6.5	5.2	1.3	3	-	-	-	-	-	-
1.5-2.0	Sandy silty clay	Alluvial	6.6	5.9	0.7	3	-	-	-	-	-	-
2.0-2.5	Silty clay with gravel	Residual	6.9	5.4	1.5	3	-	-	-	-	-	-
2.5-3.0	Silty clay with gravel	Residual	6.7	5.3	1.4	1	-	-	-	-	-	-
Pit 9												
0.0-0.5	Silty sandy clay	Alluvial	6.4	4.8	1.6	1	-	-	-	-	-	-
0.5-1.0	Silty sandy clay	Residual	5.5	4.8	0.7	2	-	-	-	-	-	-
1.0-1.5	Silty sandy clay	Residual	5.8	4.5	1.3	1	-	-	-	-	-	-
1.5-20.	Silty sandy clay	Residual	5.8	4.6	1.2	3	-	-	-	-	-	-
2.0-2.5	Silty sandy clay	Residual	3.7	3.2	0.5	3	-	-	-	-	-	-
2.5-3.0	Silty sandy clay	Residual	3.9	1.9	2.0	2	-	-	-	-	-	-
Pit 10												
0.0-05	Silty clay with sand	Estuarine	5.0	3.3	1.7	1	0.03	0.03	ND	ND	0.06	3
0.5-1.0	Silty clay with sand	Residual	7.0	6.8	0.3	4	-	-	-	-	-	-
1.0-1.5	Silty clay with sand	Residual	7.2	6.8	0.4	4	-	-	-	-	-	-
1.5-2.0	Silty clay with sand	Residual	7.0	6.4	0.6	2	-	-	-	-	-	-
2.0-2.5	Silty clay with sand	Residual	7.2	6.7	0.5	4	-	-	-	-	-	-
2.5-3.0	Silty clay with sand	Residual	6.8	5.9	0.9	3	-	-	-	-	-	-
Pit 11												
0.0-0.5	Sandy silt	Fill	7.0	5.3	1.7	3F	-	-	-	-	-	-
0.5-1.0	Silty clay with organics	Fill-Estuarine	6.8	5.0	1.8	1	-	-	-	-	-	-
1.0-1.5	Silty clay with organics	Estuarine	7.3	1.5	5.8	4	1.20	0.06	<0.02	ND	1.26	9
1.5-2.0	Silty clay with organics	Estuarine	7.6	1.7	5.9	4	-	-	-	-	-	-
2.0-2.5	Silty clay with organics	Estuarine	7.3	1.6	5.7	4	-	-	-	-	-	-
2.5-3.0	Silty clay with organics	Estuarine	7.4	2.0	5.4	4	-	-	-	-	-	-
Pit 12												
0.0-0.5	Gravelly silty clay	Alluvial/ colluvial	6.5	4.5	2.0	2	-	-	-	-	-	-
0.5-1.0	Silty clay	Alluvial/ colluvial	6.8	5.3	1.5	2	-	-	-	-	-	-
1.0-	Silty clay	Alluvial/	6.7	5.4	1.3	3	-	-	-	-	-	-

Depth (m)	Sample Description	Origin	Field Screening Test Results				Chromium Suite Test Results (%S)					Liming Rate (kg/t)
			pH_F	pH_{FOX}	ΔpH	Reaction (1,2,3,4)*	S_{CR}	TAA	NASS	ANC	Net Acidity	
1.5		colluvial										
1.5-2.0	Silty clay with gravel	Alluvial/ colluvial	6.5	4.9	1.6	2	-	-	-	-	-	-
2.0-2.5	Silty clay with gravel	Alluvial/ colluvial	6.7	5.3	1.4	3	-	-	-	-	-	-
2.5-3.0	Sandy silty clay	Alluvial/ colluvial	6.4	5.6	0.8	2	-	-	-	-	-	-

[1] Douglas Partners (2006) Report on Preliminary Onshore Geotechnical and Acid Sulfate Soil Evaluation – Wiggins Island Coal Terminal Gladstone. Prepared for Central Queensland Ports Authority

Notes:

- No results were provided in the Douglas Partners report for Pit 8
- pH_{FOX} Reaction Rate: 1 - slight, 2 - Moderate, 3 - Vigorous, 4 - Very vigorous
- S_{CR} = Chromium reducible sulfur, TAA = Total/Titrateable actual acidity, NASS = Net Acid Soluble Sulfur, ANC = Acid Neutralising Capacity
- Liming rate includes fineness factor of 1.5

Appendix D
Acid Sulfate Soil Management Plan Summary

Table D.1
Acid Sulfate Soil Management Plan (ASSMP) Summary

Policy/Objectives	The objective of this ASSMP is to control acid generation from the in-situ soils and to minimise to an acceptable level, the potential for on-site and off-site environmental impacts This will be achieved by adopting appropriate strategies: • To minimise the potential for inappropriate material handling through accurate identification of ASS. • To treat disturbed ASS so that potential environmental harm is minimised.
Performance Requirements	To prevent any net increase in existing soil acidity due to oxidation of in-situ or excavated materials. To ensure there is no direct or indirect release of runoff waters or leachate that do not meet the established water quality parameters
Performance Indicators	1. **Laboratory Testing of Soils** – This will determine if action levels for oxidisable sulfur (S_{POS}, or S_{CR} %), retained acidity (S_{RAS}) (if required), total actual acidity (TAA), or total potential acidity (TPA) are exceeded as per the Queensland Acid Sulfate Soil Technical Manual – Soil Management Guidelines Version 3.8 – Dear et. al. (2002). If exceeded, determine the management or treatment of the material through acid-base accounting to determine the amount of neutralising agent necessary to exhaust the acid generation potential. 2. **Neutralising Agents –** Aglime or other approved neutralising agents will be used for the purposes of neutralising potential acidity in the excavated soil. A test certificate providing details on the acid neutralising value (ANV), particle size distribution (PSD) and moisture content (MC), will be obtained from the supplier of the neutralising agent being used. The equivalent fine lime application rate for the neutralising agent will be calculated, based on the ANV, particle size and moisture content of the product being used.
Elements and Implementation Strategies	According to current design plans for this project, It is not expected that any specific management will be required for potential acid sulfate spoil due to the following: • Fill will be placed over the site to a level of 7m AHD nominally and hence the majority of works should encounter fill material and not the underlying natural materials; • Fill will be used during construction activities at the intersection of Hanson and Reid Road and hence no excavation of soil in this area will be required; • Deep pile foundations for the construction of the transfer stations, the sea water pipeline and the conveyor will be undertaken using the driven pile method which prevents exposure of PASS material to the atmosphere. However, In the event that acid sulfate soils do become exposed, the following actions should be undertaken. **Intersection of Hanson and Reid Road** Test results from one hand auger indicates that the liming rate for ASS sediments (dark grey to brown estuarine soft clayey present only the top 1m of the profile) is between 194 and 63 kg/t and hence a standard liming rate of about 195 kg/t should be adopted. **Transfer Stations**

	Test results from two hand augers indicate that the liming rate for ASS sediments (the light to medium clay and sandy to silty heavy clay present only the top 1.5 m of the profile) is between 2 kg/t in the vicinity of ASS4 and 61 kg/t in the vicinity of ASS5. Non-PASS material exists below 1.5 mbgl. **Conveyor and Sea Water Pipeline Route** • Test results from three hand augers indicate that the liming rate for ASS sediments within the top 1.5 m only is 99 kg/t at the southern end of the conveyor and sea water pipeline route, 1 and 2 kg/t at the northern end; the middle of the alignment does not require treatment. Non-PASS material exists below 1.5 mbgl. • Test results from four testpits (Douglas Partners, 2006) indicate that the liming rate for ASS sediments within the top 1.5 m (silty clay material with organics) ranges from 34 to 164 kg/t. ***If during detailed design, it is determined that disturbance to the soil profile is required as a result of construction, it is considered appropriate that liming rates be re-calculated prior to the construction phase based on revised testing information. Validation testing would also be necessary following lime treatment, to confirm that sufficient Aglime (including a 1.5 x factor of safety) has been added to treat potential acidity levels should the materials become completely oxidised.*** **1. ASS Management and Treatment** If ASS material is excavated, the material will be trucked to a designated area and spread out in loose layers approximately 300 mm thick for moisture conditioning and subsequent lime treatment if required. Non-ASS material (residual or alluvial) should be stockpiled separately to estuarine ASS material. Prior to the placement of the material: • A low bund will be constructed around the perimeter of the stockpile to prevent overland flows entering the area and/or to contain runoff or leachate from exiting the treatment area • Bunds will be comprised of non-ASS materials and will be approximately 0.5m to 1m high. • The surface of the treatment pad will comprise a layer of imported (non-PASS) fill 0.3-0.5 m thick, compacted so as to effectively restrict infiltration into the substrate soils. • A surface layer of Aglime applied at a rate of 5 kg/m^2, will be worked into the soil surface to act as a guard layer to neutralise any leachate from the materials being treated on the treatment area. • Recommended liming rates are provided above. Lime will be blended into the material using a disk plough, rotary hoe etc., to neutralise any potential acid production. Lime will be added at the rate of 1.5 times the theoretical amount necessary to neutralise the potential acidity as recommended by the Geotechnical Consultant – ASS **2. Lime Treatment of Excavated Material** Following placement and spreading of material: • Samples will be obtained at a rate of 1 sample per 250 m^3 of fill for Laboratory Verification (Phase 2) testing. Sample handling and transport will be in accordance with the ASS sampling and analysis guidelines – Ahern et al. (1998) • Once the material is sufficiently dry, lime will be mixed in to the fill at a rate of 1.5 times the theoretical amount necessary to neutralise the existing and potential acidity. • Blend the lime thoroughly using a rotary hoe, disk plough or other approved alternative method.

	• After the lime has been blended into the material, should the Verification (Phase 2) test results indicate insufficient lime has been added, an appropriate amount of extra lime will be incorporated. If the test results indicate that sufficient lime has already been added, then the treated material will be sampled and tested to confirm that effective neutralisation has been achieved; i.e. at 1.5 times the theoretical amount (of lime) necessary to neutralise total existing and potential acidity. **3. Validation (Phase 3) Testing** Validation (Phase 3) testing will be carried out by obtaining a representative composite sample of the treated area at the rate of one sample for 500 m^3 of treated material for laboratory testing using either the SPOCAS or combined S_{CR} plus ANC test method or other approved testing methods. A TPA test result of 0 mols H^+/t together with an average ANC value of 1.5 times the theoretical amount (of lime) necessary to neutralise the total of any existing and potential acidity, is the target for Validation (Phase 3) testing: • The addition and mixing of extra lime (as specified by the ASS Representative) and further Validation (Phase 3) testing will be carried out if necessary until satisfactory results are achieved. **4. Self-Neutralising Soils** Some sediments contain naturally occurring calcium or magnesium carbonates in the form of crushed shell (shell-grit) coral and foraminifera, and when present in appreciable quantities, the oxidisable sulfur (% S) levels determined from the SPOCAS or the S_{CR} suite of tests, may be reduced somewhat to reflect the self neutralising capability of the sediments. Where appropriate, the SPOCAS or combined S_{CR} plus ANC test methods will be carried out to determine the inherent soil self-neutralising capacity of the sample being tested.
Frequency/Timing	• Validation sampling and testing of the lime treated natural ground material will be repeated until satisfactory results are obtained. • The turn-around time for the completion of TAA/TPA, CRS testing is expected to be 2-3 days. For SPOCAS testing, it may take up to 5 days or more before test results will be available.
Corrective Action	If lime treatment of PASS is unsuccessful or performance targets are not being met as indicated by the validation and water quality testing procedures: • The earthworks schedule will be reassessed and action taken to determine the problems causing the breach of standards. • Should results of verification testing indicate residual acidity outside allowable limits, the effected material must remain in place and additional lime be added and the verification process repeated until 'Performance Criteria' are met. • If the problems are related to ineffective implementation of the ASSMP then the plan will be audited to ensure improved implementation. Monitoring and testing will be increased to ensure compliance with the established standards. • Any major changes to the management plan will be subject to discussions with and the approval of the relevant regulatory authorities.
Contingency Plan	In the event that the construction schedule is interrupted for a lengthy period, the earthworks design and construction methodology will be reviewed in consultation with Regulatory Authorities. If any failures in the ASS management / treatment strategies are found to be related to ineffective implementation of the ASSMP, then the plan will be audited to ensure improved implementation. Monitoring and testing will be increased to ensure compliance with the established standards. Any substantive changes to or departure from the approved ASSMP will be subject to discussion and approval of the Regulatory

	Authority.
Responsibilities	The satisfactory implementation of the ASSMP by the Construction Contractor will be the responsibility of the site management team and monitored by the ASS Representative who by agreement of the Project Engineer will ensure: • The Construction Contractor is made aware of site specific conditions and implications for the management of ASS within the site. • Compliance with the elements of the ASSMP by the Contractor. • Correct methods for the collection of samples and testing are employed and the reporting of results to the relevant site authorities. • Approve and monitor the mixing and soil amelioration process. • Approve any corrective action measures proposed by the contractor. The Contractor's responsibilities will include: • Awareness of site conditions and requirements for the implementation of the ASSMP, including OH&S matters relating to the use of neutralising agents. • Modifying earthworks / construction procedures to comply with the ASSMP. • Propose any corrective action measures to be approved by the ASS Representative. • Implementing approved corrective actions.
Reporting	The ASS Representative shall report to the Project Engineer (cc Contractor) on a monthly basis (or sooner if appropriate) on the performance of the ASSMP. The Contractor shall report to the Project Engineer and the ASS Representative on: • The effectiveness of the operating strategies. • Problems in implementing the ASSMP management strategies. • Compliance with testing requirements, runoff control and materials handling. • Effectiveness of any corrective action adopted. • Deviations from the ASSMP.