Appendix 17

Onshore topography, geology, geomorphology and soils study

REPORT

Ichthys Gas Field Development Project

Onshore topography, geology, geomorphology and soils study

Prepared for

INPEX Browse, Ltd

Level 35 Exchange Plaza
2 The Esplanade
Perth, Western Australia

12 August 2009

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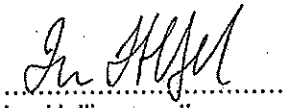
URS

Project Manager:

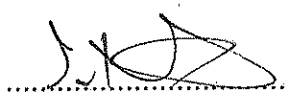


Ian Hollingsworth
Principal Environmental Scientist

URS Australia Pty Ltd

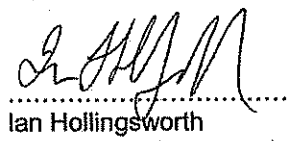
Level 3, 93 Mitchell Street
Darwin, NT 0801
GPO Box 2005, Darwin NT 0801
Australia
T: 61 8 8980 2900
F: 61 8 8941 3920

Project Director:



Ian Baxter
Senior Principal Environmental Scientist

Author:



Ian Hollingsworth
Principal Environmental Scientist

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1.1 Standard

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 INPEX Browse Ltd 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 13th May 2008.

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 August 2008 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.

Introduction Section 2

2.1 Background

INPEX Browse, Ltd. (INPEX) proposes to develop the natural gas and associated condensate contained in the Ichthys Field in the Browse Basin at the western edge of the Timor Sea about 200 km off Western Australia's Kimberley coast. The field is about 850 km west-south-west of Darwin in the Northern Territory.

The two reservoirs which make up the field are estimated to contain 12.8 tcf (trillion cubic feet) of sales gas and 527 MMbbl (million barrels) of condensate. INPEX will process the gas and condensate to produce liquefied natural gas (LNG), liquefied petroleum gas (LPG) and condensate for export to overseas markets.

For the Ichthys Gas Field Development Project (the Project), the company plans to install offshore facilities for the extraction of the natural gas and condensate at the Ichthys Field and a subsea gas pipeline from the field to onshore facilities at Blaydin Point in Darwin Harbour in the Northern Territory. A two-train LNG plant, an LPG fractionation plant, a condensate stabilisation plant and a product loading jetty will be constructed at a site zoned for development on Blaydin Point. Around 85% of the condensate will be extracted and exported directly from the offshore facilities while the remaining 15% will be processed at and exported from Blaydin Point.

In May 2008 INPEX referred its proposal to develop the Ichthys Field to the Commonwealth's Department of the Environment, Water, Heritage and the Arts and the Northern Territory's Department of Natural Resources, Environment and the Arts. The Commonwealth and Northern Territory ministers responsible for environmental matters both determined that the Project should be formally assessed at the environmental impact statement (EIS) level to ensure that potential impacts associated with the Project are identified and appropriately addressed.

Assessment will be undertaken in accordance with the Environment Protection and Biodiversity Conservation Act 1999 (Cwlth) (EPBC Act) and the Environmental Assessment Act (NT) (EA Act). It was agreed that INPEX should submit a single EIS document to the two responsible government departments for assessment.

URS Australia Pty Ltd was commissioned to carry out environmental work associated with INPEX's preparation of the EIS and this technical report was prepared in part fulfilment of that commission.

The scope of this environmental assessment is based on the Notice of Intent that INPEX Browse Ltd has submitted to initiate the environmental approvals process to develop an onshore gas plant at Blaydin Point in Darwin Harbour (INPEX 2008). The facility will process gas from its Icthys gas field in the Browse Basin off the Kimberly Coast approximately 900 km west southwest of Darwin. The plant site, covering approximately two hundred and fifty hectares is identified with NT Government planning for gas based industry development (Figure 1).

Figure 1 Conceptual site plan

2.2 Terms of Reference

INPEX set out the terms of reference in Tender Document 800058, Plan C Environmental Study Part B1 – Information Requested by the Company, Section 1.08 Projected Studies. The terms that were specific to this investigation were:

1) describe the topography, geology and geomorphology of the land based development area (including pipeline route, shore crossing location and location of onshore facilities

2) identify the soils associated with the proposed development area (pipeline landfall crossing location, onshore section of the pipeline and onshore facilities) and;

3) determine the potential implications for the Project.

2.3 Scope of Work

The approved scope of work included the following items.

1) Desktop review of available:
- digital topographic data;
- geological mapping; and
- geomorphic interpretation of landscape processes.

2) Field survey, of 1250 ha including:
- the pipeline shore crossing;
- pipeline/road access corridor;
- LNG plant;
- jetty and a large offloading ramp;
- borrow area; and
- administration area.

3) Laboratory testing, of up to 100 samples including:
- dispersibility surface and sub-soil;
- pH; Electrical Conductivity; soil fertility surface and sub-soil (cation exchange capacity, sodicity)
- potential acid sulfate soil tests - dichromate oxidisable sulfides and acid neutralising capacity.

4) Reporting, soil implications for project construction and operation, including:
- sediment & erosion control; and
- acid sulfate soil (ASS) risk and management.

2.4 Report Structure

Processes associated with terrain, geology, geomorphology and soil determine the environmental pattern at the site. Section 3 reviews these processes at Blaydin Point to set the context for a field survey reported in Section 4, which is designed to assess critical environmental issues associated project. Section 5 presents the results of laboratory analyses from the field survey work. The assessment from the survey and analysis for environmental management at the site are discussed in Section 6.

3.1 Climate

The Blaydin Point Project site has a monsoonal climate with pronounced wet and dry seasons according to monthly climatic averages for the closest Bureau of Meteorology (BoM) weather station to the site that is currently operating (Darwin Airport Station 014015). The mean annual rainfall is 1714 mm (BoM 2008, 67 years of data), ninety seven percent of which falls as heavy monsoonal rainfall during the wet season (Figure 2) between October and May.

Mean daily pan evaporation ranges from 5.7 mm in February to 8.0 mm in October (Figure 2). There is a rainfall surplus over pan evaporation during the wet season of 264 mm that goes to groundwater and runoff.

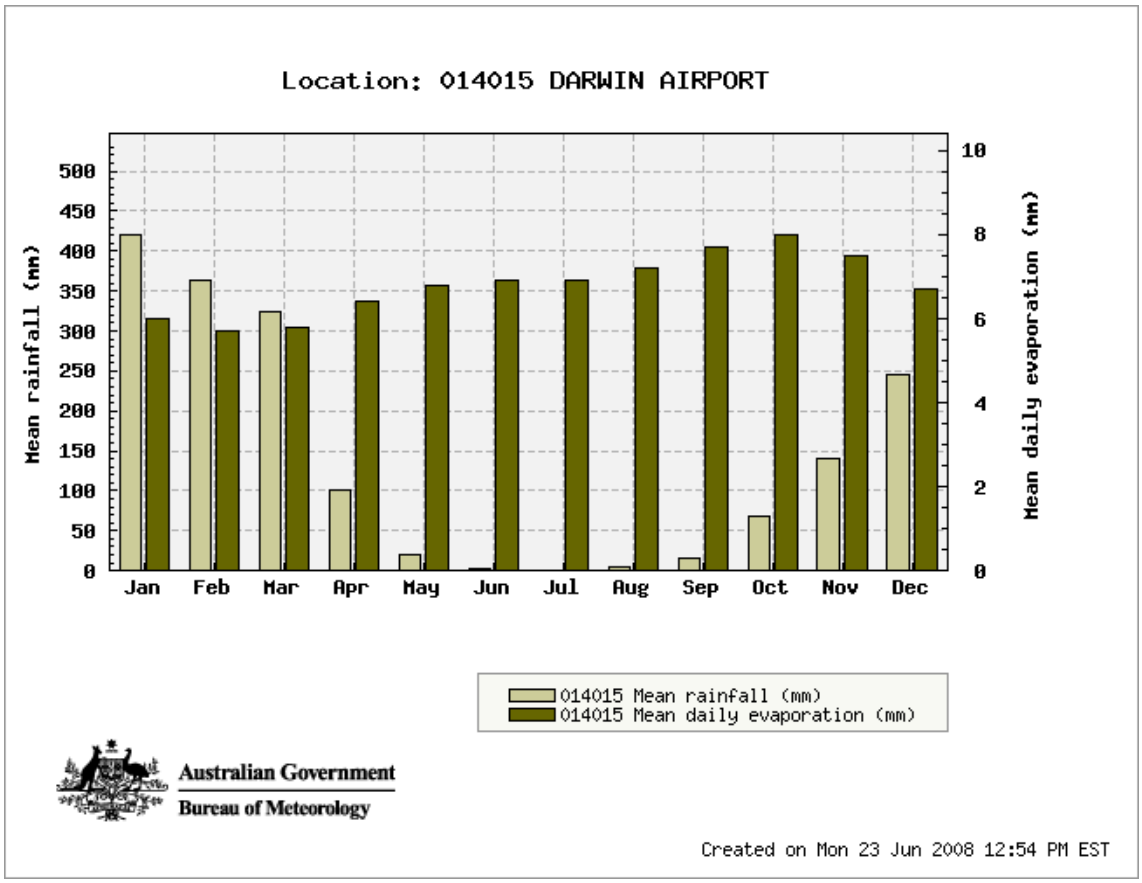


Figure 2 Darwin mean monthly rainfall and evaporation

The site is subject to cyclone activity between November and April. Cyclones occur on average once every two years. Aside from the impacts of strong winds, storm surge could be of concern.

The possible effects of global warming (IPCC 2001) are:

- increased global average surface temperature relative to 1990. This is projected to increase between 1.4°C to 5.8°C by 2100. This rate of warming is greater than earlier projections, and is much greater than observed changed during the 20th Century and is very likely without precedent during the last 10,000 years

- increased air turbulence (higher incidences of cyclones and storms),
- altered rainfall patterns, and
- average, projected sea level rise due to warmer ocean temperatures of 0.09 to 0.88 above present levels by 2100.

There is no direct evidence that the frequency, distribution and intensity of tropical cyclones will change with increasing greenhouse gas concentrations. However, it is likely that any changes in tropical cyclone frequency that do occur due to climate change will be small in comparison to their observed natural variability, which is considerable. Annual rainfall averages are projected to increase in some tropical, summer rainfall areas by up to 20% (CSIRO 2001). This increase is likely to be in the form of more frequent or heavier rainfall events.

3.2 Terrain

Blaydin Point is flat and undulating up to 11 m above sea level. Exposed ridges of cretaceous sediments are fringed by broad quaternary mudflats, beaches and mangrove faces. Regional topographic mapping is overlaid with a topographic index (MrVBF) (Figure 3) to identify erosional terrain consisting of low relief rises with short, relatively steep side slopes in the project area.

3.3 Geological Processes

3.3.1 Landscape Evolution

Darwin, on the north coast of the Australian mainland lies only 12° south of the equator, and experiences a pronounced wet–dry tropical monsoonal climate. Sedimentation during the Cretaceous marine transgressions smoothed an already subdued landscape to one that is now dominated by broad, flat to undulating surfaces. The present low-relief landscape is a function of deep weathering under a tropical monsoonal climate and structural controls in the Cretaceous strata (Nott 2003). This weathering environment has produced lateritic crusts and soils. Also, close to 2 billion years of geological history is lost from this immediate region because the largely horizontally bedded Cretaceous strata unconformably overlie folded Proterozoic metasediments.The low relief of this landscape, low rates of denudation and preservation of Cainozoic deep weathering profiles and predominantly rocky shore have meant that Quaternary sediments are restricted to shallow alluvial deposits in creek valleys and marine sediments forming mud flats and beaches with limited dune and beach ridge development.

3.3.2 Seismicity

Distant earthquakes near Indonesia can affect Darwin but to date there have been no recorded tsunami impacting Darwin's shores despite its relative proximity to the convergent margin between the Australian and South East Asian tectonic plates. Seismically, the northern part of Australia and the Darwin region are comparatively stable. Large magnitude earthquakes are rare. Most of the earthquakes felt in the Darwin region occur approximately 500–600 km to the north along the convergent plate margin near the Banda Sea to the north-east of Timor. The greatest felt earthquake intensity in Darwin, during historical times, was from the MS 7.3 earthquake which occurred at a depth of 16 km, 530 km north of Darwin on 7 October 1960 (Vanden Broek 1980). Damage to concrete fixtures, toilet fixtures, and walls occurred as a result of this event. An earthquake with a similar intensity in the Darwin area can be expected at least once every 50 years. Buildings in the immediate Darwin City area that are built upon soft alluvial foundations where liquefaction and amplification of seismic waves could occur are at risk. The specific geology, therefore, will determine the extent of damage during these one in 50 years or greater magnitude events.

Figure 3 Darwin topographic map (1:250,000) and MrVBF terrain index

3.3.3 Regional Geology

The Darwin region forms part of the Australian Precambrian shield which has been comparatively stable since middle Proterozoic times (Stuart-Smith et al. 1980). Metasediments of the Pine Creek geosyncline that overly the Archaean basement were successively folded and uplifted during the early to middle Proterozoic. Flat bedded Mesozoic and Cainozoic strata were deposited following erosion of the Proterozoic rocks.

Proterozoic strata in the Darwin region vary according to metamorphic grade. To the west, near Cox Peninsula the unconformable Cretaceous strata overlie upper greenschist to amphibolite facies quartzofeldspathic and mica schists, gneiss and minor quartzite. To the east, near Gunn Point, lower greenschist facies metasediments occur. The Proterozoic strata underwent one major deformation approximately 1800 Ma resulting in tight folds with limbs dipping steeply at more than 50° (Pietsch 1983).

The Darwin Member of the early Cretaceous Bathurst Island Formation dominates Mesozoic strata in the Darwin region, the shore margin of which is exposed at Blaydin Point. Other units within the Bathurst Island formation include the Wangarlu Mudstone Member and overlying Mookinu Member. The Wangarlu Mudstone Member does not crop out in the urban Darwin area and is restricted to the region near Gunn Point. The Mookinu Member is not present at all on the mainland but lies stratigraphically above the Wangarlu Member which in turn overlies the Darwin Member on Bathurst Island to the north of Darwin.

In the Darwin region, the Darwin Member is composed dominantly of a white siliceous siltstone containing numerous radiolarians. At the base, resting unconformably upon the Proterozoic Burrell Creek Formation, is a coarser-grained facies composed of a layer of lag gravels, generally no greater than 1–2 m thick, which grades upwards into sandstone and then siltstone. The texture of the Darwin Member coarsens westwards to Cox Peninsula, to the west of Darwin, where it is dominated by fine to coarse–grained sands.

Cainozoic sediments cover much of the Darwin area. These can be divided into two main groups, namely Tertiary weathering products or regolith and Quaternary sediments. Deeply weathered Cretaceous strata form a slightly elevated plain, while the Quaternary sediments are restricted in area to coastal beach and dune sands and minor amounts of alluvium in creek valleys and colluvium on shallow slopes. Sea level stabilised in the region by approximately 6500 yr BP (Figure 4).

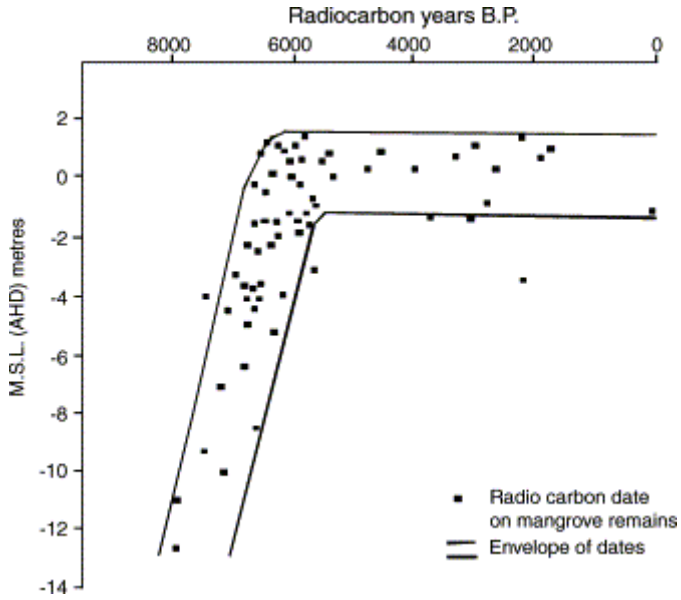


Figure 4 Sea-level envelope curve developed from carbon-dated mangrove remains in the Alligator Rivers region (Woodroffe & Mulrennan 1993).

3.3.4 Local Geology

The shore margin of the Bathurst Island Group of the Cretaceous System of the Money Shoals Platform outcrops locally at Blaydin Point. The Bathurst Island Group nonconformably overlies the Precambrian basement. The base of the Darwin Member of the Bathurst Island Group consisting of a layer of lag gravels, 1–2 m thick rests unconformably upon the Proterozoic Burrell Creek Formation, which outcrops on the coast at Blaydin Point (Plate 1).

This coarser-grained facies grades upwards into sandstone and then siltstone. Glauconitic sandstone and radiolarian mudstone are characteristic facies, indicative of the sedimentary environment in the shallow transgressive sea which received wind-driven, plankton-bearing currents from the shelf edge 400 km to the north.

Plate 1 Gravel base of Cretaceous Darwin Member overlying Proterozoic rocks 708649 E 8616192 N

The upper part of the Bathurst Island group comprises bioturbated glauconitic and quartzose sandstone displaying sedimentary evidence of high-energy depositional conditions consistent with regression. It is viewed as a prograding/aggrading, shelf margin systems tract. Three eustatic episodes related to global patterns are recognised: late Aptian (125 – 112 Ma) transgressive onlap, early Albian (112 – 99.6 Ma) maximum flooding and late Turonian (93.5 – 89.3 Ma) regression (Henderson 1998). Pedogenic clay minerals in the underlying radiolarian mudstone are associated with weathering of moderate intensity on a poorly drained, low relief landscape. The interrupted sedimentary record reflects Mid-Cretaceous landscape rejuvenation events.

3.4 Geomorphic Processes

Coastal morphology near Darwin is controlled mainly by the gentle warping of a lateritic profile. The lateritic cuirasse forms extensive shore platforms in synclines, but on the anticlines the pallid zone of the weathering profile is eroded by waves, causing the undercut cuirasse to collapse. The dominant modern process on the shore platforms is solutional attack on the laterite, resulting in large depressions (Nott 1994). Many of the platforms are covered by relict layers of cemented laterite cobbles transported by waves of high energy. C-14 ages on carbonate cement between the cobbles show that one sheet was deposited at about 3700 BP and the other sheet at about 1700 BP. Waves generated during devastating tropical hurricanes this century had little

effect on the cobble sheets, and they were probably transported onshore by tsunamis originating in the Indonesian archipelago (Young and Bryant 1998).

The development of landsurfaces in the north of the Northern Territory has traditionally been attributed to successive episodes of uplift, erosion and weathering (Hays 1967). The lower and younger two of the four landsurfaces attributed to such development, the Wave Hill and Koolpinyah surfaces, dominate the landscape in the Darwin region (Hays 1967). However, investigations of the relationship between the Cretaceous stratigraphy and the nature of deep weathering in the Darwin region show that these surfaces are structurally controlled and detrital laterite profiles are considered to have formed in situ and are not markers for regional peneplanated surfaces (Nott 1994).

3.5 Previous Soil Surveys

3.5.1 Soil Morphology

Land unit surveys of the Blackmore and Elizabeth River catchments (Fogharty et al. 1984) described soil morphology at twenty five locations in or adjacent to the proposed development area (Figure 5) in undulating (1 - 3% slope) to gently undulating (3 - 10%) rises (<30 m relief) terrain. Underlying rocks outcrop on crests and moderately deep to deep soils occur on deep weathered Cretaceous sediments in the undulating terrain. Estuarine mangrove, tidal flat and dune facies deposited during the Quaternary fringe Blaydin Point.

The dominant soils (> 50% of the area) on the undulating terrain were described as shallow (<0.25 m) to moderately deep (0.25<0.5 m), very gravelly, massive earths. The soils were classified as Rudosols and Brown Kandosols in the Australian Soil Classification (Isbell 1996). Soils in drainage lines and estuarine frontage are very poorly drained (Hydrosols) and subject to regular or seasonal inundation and waterlogging. A very high risk of occurrence of potential acid sulphate soils was identified in these areas.

The risk of erosion is moderate to high due to the intense monsoonal rainfall environment and the structureless nature of soils. Land management factors such as increased fire frequency and increased traffic leading to soil exposure exacerbate soil erosion. Even very gentle slopes are prone to gully and sheet erosion if disturbed or exposed.

The Tertiary sediments and underlying rocks of the Lower Proterozoic metasedimentary formations (steeply dipping phyllites and schists) are weathered to a depth of approximately 40 m. The residual soils are typically lateritic with ferricrete layers often close to the surface or outcropping. Background levels of heavy metals tend to be elevated on similar land surfaces in this terrain.

The phreatic groundwater table varies seasonally by up to 10 m and discharges to the drainage lines and estuarine fringes.

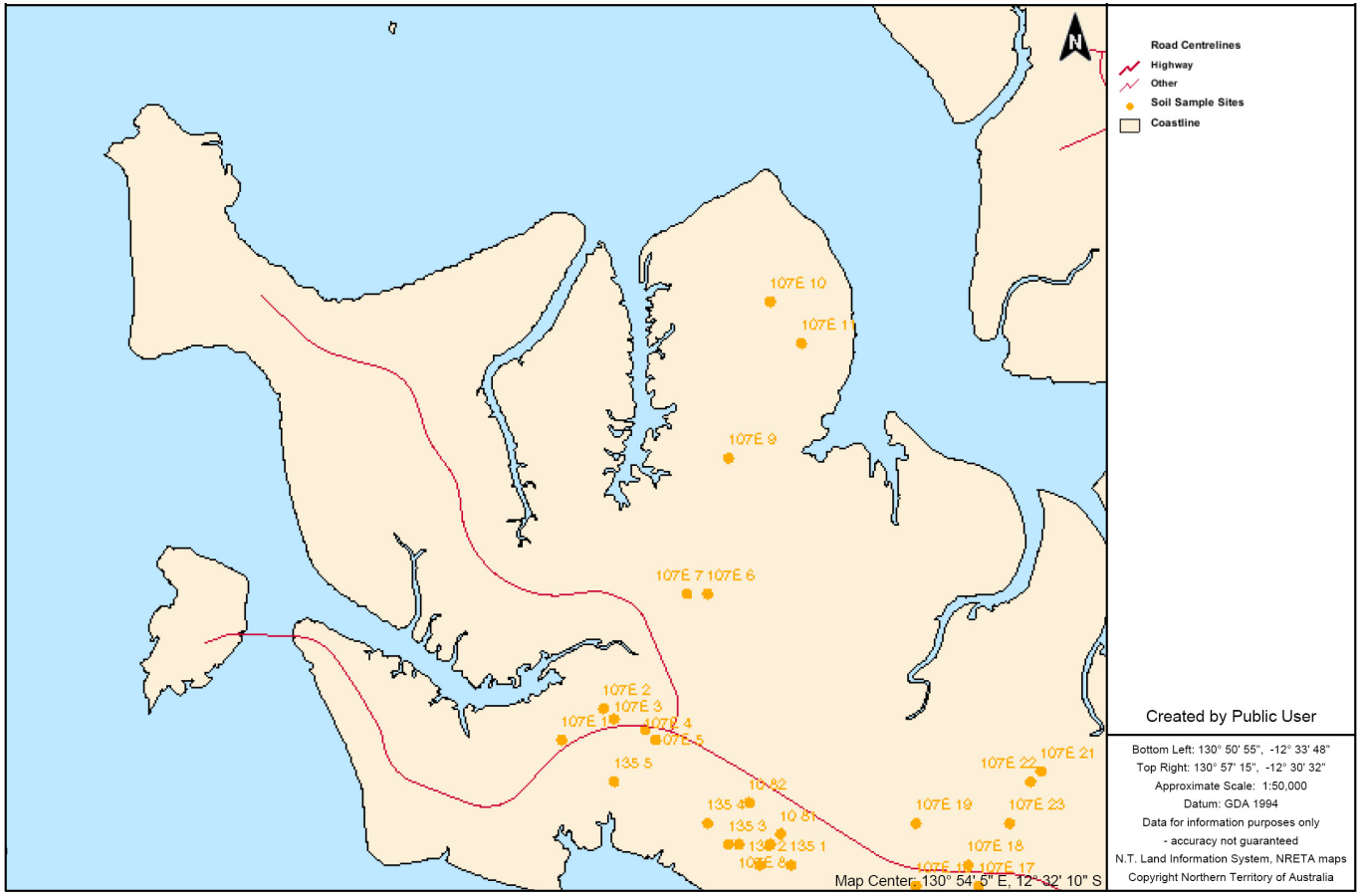


Figure 5 Historical soil survey locations from the NRETA database (Fogharty et al. 1984).

3.5.2 Background Soil Chemistry

The cretaceous land surface in the Darwin region can exhibit elevated background concentrations of heavy metals in the near surface, in common with many deep weathered landscapes in Australia (Naidu et.al. 1996). The arsenic results from Northern Territory exploration survey soil sampling of Cretaceous sediments over the NT (DPIFM 2008) can be higher in the surface two metres than generic, human health risk guidelines for contamination risk assessment (Figure 6). This can occur in deeply weathered lateritic terrain where silicate weathering reduces rock volume over geological time leading to enhanced residual concentration of heavy metals.

In the context of the Blaydin Point development, elevated background concentrations of heavy metals may be factor in accurately assessing future on-site and off-site contamination. Metals are bound tightly to iron and aluminium sequioxides in the natural environment and bioavailable fraction tends to be very low (Ng et al. 2003). Consequently, the direct risk of heavy metals to human health from heavy metals in dust is low; dust *perse* is a more significant issue. However, determining whether background levels are elevated underpins an accurate assessment of contamination risk.

In the natural environment at Blaydin Point, background hydrocarbon concentrations are likely to be below detection levels and screening for hydrocarbons is not warranted.

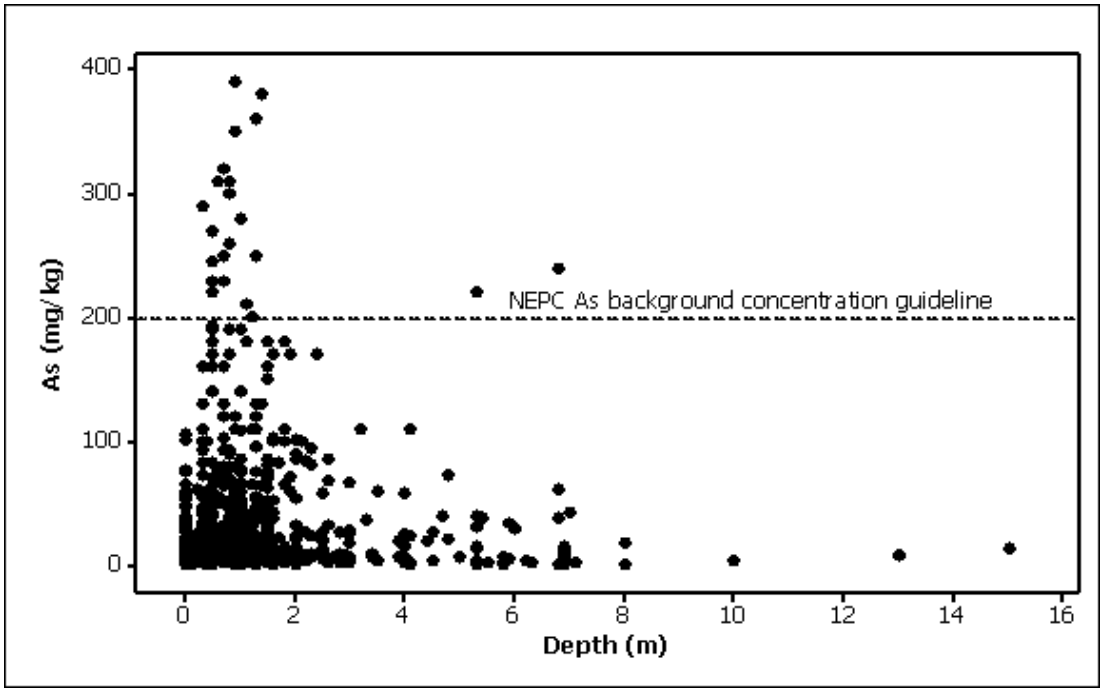


Figure 6 Soil arsenic concentrations versus depth for Cretaceous sediments (from DPIFM 2008) plotted with the generic human health risk guideline (NEPC 1999a)

3.5.3 Erosion Risk

Erosion risk is related to slope properties and soil, cover and rainfall erosivity factors using the Universal Soil Loss Equation (USLE) (Renard et al. 1997). Soil particles that disperse (Emerson 1967) when they are wet are prone to erosion by water.

3.5.4 Dust

Construction activity during the dry season will create dust that will be a health and safety risk on-site and a potential environmental impact off-site depending on the prevailing wind direction which is dominantly south easterly. When they are dry, pulverulent soils generate a lot of dust when traffic and earthmoving equipment disturb the surface. Soil with a high fine sand content that range in field texture from fine sandy loam to fine sandy clay loam are highly pulverulent and need to be kept wet to minimise the risk of dusty working conditions.

3.5.5 Potential Acid Sulfate Soils

Potential acid sulfate soils (PASS) form in coastal estuarine and mangrove swamp environments because these waterlogged and anaerobic environments provide the conditions needed to form iron sulfide minerals (for example, pyrite) via the process of microbial sulfate reduction. They are widely distributed around the northern Australian coastline (Bowman 1996) and often occur near population centres where environmental issues have a high political profile (Hicks *et al*. 1999). PASS underlie coastal estuaries, embayments and floodplains.

While undisturbed, PASS are innocuous although the iron sulfides that they contain will oxidise to produce sulfuric acid and transform into actual acid sulfate soils (ASS) if they are exposed to air by excavation or by lowering of the water table. Water draining from oxidised PASS can be strongly acidic (pH<3.5). The acid acts on the soil and sediment to produce further deleterious effects due high solution concentrations of toxic metals especially aluminium and iron. There have been many instances of fish kills over the past two decades in rivers and estuaries along the eastern seaboard of Australia as a result of disturbance of ASS. However, there have been no recorded fish kills in the Elizabeth River or anywhere else in Darwin harbour ascribed to the effects of ASS (Roland Griffin, DPIFM, *personal communication*).

Acid runoff and drainage from disturbed areas of ASS can cause adverse impacts to the environment, coastal development, fishing and agricultural industries. Costs to local and regional communities can include:

- Poor water quality with attendant loss of amenity, damage to estuarine environments and reduction of wetland biodiversity;
- Rehabilitation of disturbed areas to improve water quality and minimise impacts;
- Loss of fisheries;
- Damage to physical infrastructure, as a result of corrosion by acid.

Identification, delineation and pro-active and effective management plans for addressing ASS risk have become key components of the development process in coastal Australia.

4.1 Survey Design

The survey applied a secondary sampling design to extend the geotechnical survey (Appendix A) with infill sites to provide a minimum resolution of approximately two hundred metres over the development area. The field survey assessed the environmental risks associated with disturbing soils in the project area during construction, namely:

- Heavy metal levels in the surface and subsoil
- Pulverulence
- Erosion in terms of Infiltration erodibility
- Acid sulfate soil risk

Soil profiles at selected locations were described and sampled from hand auger holes (75 mm diameter) to 1.0 m depth or point of refusal. The number and location of sites was determined from:

- existing geotechnical pit profile sites (Appendix A), which were revisited to use the additional information that pits provide and to ensure that materials being assessed for construction activities were included in the sampling program;
- survey and sampling guidelines to assess background metal levels (NEPC 1999b); and
- guidelines for potential acid sulfate soil risk assessment (Dear et al. 2002).

4.2 Soil Sampling & Testing Program

Soil morphology was described according to Australian standards for soil and land survey (McDonald et al. 1996) and representative soil profiles were classified according to the Australian Soil Classification (Isbell 1996).

Disturbed soil samples were collected at regular depth increments from the surface A1 horizon (0-0.2 m) and subsoil B horizon (0.5-0.6 cm), or other soil horizon type depending on the site. Sufficient quality assurance samples (10% field duplicates) were collected to assess replicate percent difference. Samples were consigned to a NATA accredited laboratory (SGS Environmental Laboratory in Cairns) for the laboratory analyses

Infiltration rate through the surface was measured on representative free-draining lateritic soils using the double ring infiltration method. Saturated hydraulic conductivity in the subsoil was measured using a bore hole permeameter (McKenzie et al. 2002) in hand augered holes (0.5 m depth) at the same sites.

Table 1 outlines the sampling program for laboratory testing.

Table 1 Numbers of samples in the laboratory testing in the sampling program

			Analytes					
Area	**No. of Sites**	**Sample Depths**	**pH, EC**	**Cation Exchange**	**Acid Sulfate Soil (chromium suite)**	**Major and micro nutrients**	**Extractable heavy metals**	**Dispersibility (Emerson Test)**
MOF	3	0 – 10	3	1	5	1	3	0
(3 ha)		50 - 60	3	1	5	1	3	0
Flare	5	0 – 10	6	1	5	1	9	1
(9 ha)		50 - 60	6	1	5	1	9	1
Plant	9	0 – 10	9	3	1	3	6	3
(157 ha)		50 - 60	9	3	1	3	6	3
Pipeline	11	0 – 10	11	2	10	2	8	na
		50 - 60	11	2	10	2	8	na
Shore Crossing	6	0 – 10	6	na	13	na	na	na
(6 ha)		50 - 60	6	na	13	na	na	na
Jetty	3	0 – 10	3	na	4	na	na	na
		50 - 60	3	na	4	na	na	na

4.3 General Description of Soils

The extent of soils formed on Cretaceous Bathurst Island formation sediments is limited on the mainland although extensive areas occur on Bathurst and Melville Islands. Consequently, the general description of soils refers to soil classifications developed for Bathurst and Melville Islands (fifty kilometres to the north) where these parent materials occur commonly. Soil families are the highest level of classification in the Australian Soil Classification System (Isbell 1996). Consistent variation in the taxonomic properties, diagnostic colour, texture, depth properties and gravel content within each soil order were used to define the soil families that are described below.

The morphology of soil groups in this survey was consistent with an earlier soil family classification (Van Cuylenburg and Dunlop 1973). Hollingsworth (2003) correlated and extended the soil family names from this earlier study. New soil families, Wangiti and Rinamatta, were created for podzols identified with Chenier plains. A new soil family, Mullalgah was created for organic peat. Two soil families, Euro and Maand, were identified with tidal swamps and tidal flats. This soil family classification applies with some minor modification to the soil units in the current mapping project. An additional soil family was created, Blaydin Soil Family, to describe soils that occur on Blaydin Point with very deep (>0.5 m) accumulation of melanic (organic matter content > 5%) in the surface. Soil variation in the project area was mapped using six soil families in three soil orders in the Australian Soil Classification, namely two Kandosols, one Organosol, two Hydrosols and one Podosols/Tenosol.

Descriptions of the soil families are provided below. Soil family descriptions have been grouped into the soil orders of the Australian Soil Classification system, namely Kandosols, Hydrosols, Organosols, Podosols/Tenosols to provide a broad pedological organisation. Graphics in each family description depict the measured range in depth of each soil horizon. Colour and texture is included in the graphics to depict gravel, hardpan and gley features.

4.3.1 Kandosols

Gradually increasing clay content and colour intensity with depth characterises these soils. They are massive soils with many fine pores. Two soil families were differentiated within the Kandosols primarily on the structure and organic matter content of the A horizon (surface soil horizon).

Blaydin Soil Family

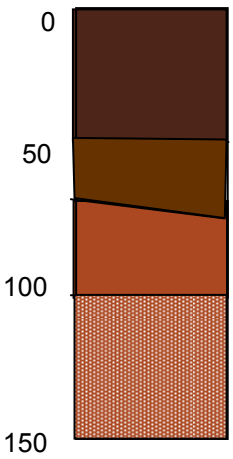
This soil family represents deep, earthy soils with well structured A horizons forming on flat crests in deep weathered Cretaceous sedimentary rocks. The soils support tall, closed monsoon vine forest vegetation (Plate 2).

CONCEPT: Deep, slightly or non-gravelly, well drained, red, fine sandy clay loam over sandy clay loam to sandy clay formed in Tertiary sandstone on plateau surfaces and rises. The A horizon is very thick and melanic. Soils support closed monsoon vine forest

Australian Soil Classification: Melanic Mesotropic Red Kandosol Medium Non-gravelly Clay-loamy Clayey deep

RANGE IN CHARACTERISTICS:

Depth range cm	Horizon or layer	Morphological range
0	A1	Dark brown (5YR3/1 Moist) to dark reddish brown (5YR3/3 Moist) fine sandy loam changing gradually to,
50	B1	Reddish brown (2.5YR4/4-Moist); Fine sandy clay loam;
100	B2m	Red (5YR4/4 Moist), ferricrete, gradually changing to,
150	Cr	Red (5YR4/8 Moist) sandy medium clay.



Remarks: These soils are deep and support tall woodland. The surface is easily disturbed by traffic and prone to dusting and wind and water erosion once the vegetative cover is removed. Fertility level is high and related to enhanced organic carbon content relative to other soils.

Plate 2 Blaydin soil pit profile 709300 E 8614700 N

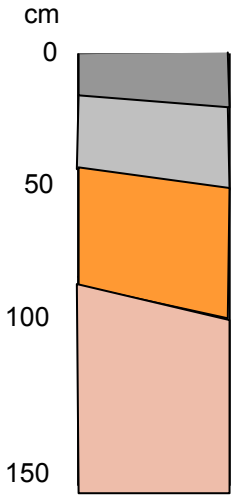
Hotham Soils

This soil family represents deep, gravelly earths with massive A horizons forming on crests and slopes in deep weathered Cretaceous sedimentary rocks. The soils support tall, open eucalypt woodland vegetation.

CONCEPT: deep, gravelly, well drained, red, sandy loam over sandy clay loam in lateritised Tertiary sediments.

Australian Soil Classification: Ferric Petroferric Red Kandosol Medium Gravelly (or very gravelly) Loamy Clay-loamy Moderately deep

RANGE IN CHARACTERISTICS:



Depth range	Horizon or layer	Morphological range
0	A1	Brown (7.5YR4/3-Moist); Fine sandy loam; 2-10%, medium gravelly, 6-20mm, subrounded, Sandstone, coarse fragments; Field pH 6.5 (Raupach); Gradual change to,
50	B1	Yellowish red (5YR4/6-Moist); Fine sandy clay loam; Massive grade of structure; Earthy fabric; Dry; Very weak consistence; 10-20%, medium gravelly, 6-20mm, subrounded, dispersed, Sandstone, coarse fragments; Field pH 6 (Raupach); Gradual change to
100	B2	Red (2.5YR4/6-Moist); Fine sandy clay loam (Heavy); 10-20%, medium gravelly, 6-20mm, subrounded, Sandstone and ferricrete, coarse fragments; Field pH 6 (Raupach);
150	Cr	Earthy fabric; Very strong consistence

Remarks: These soils are moderately deep and support tall woodland.

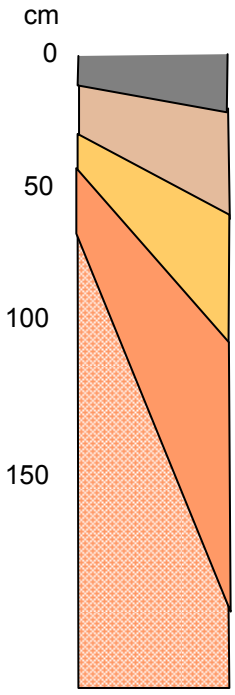
Koolpinyah Soil Family

This soil family represents deep, earthy soils with massive A horizons forming on slopes in deep weathered Cretaceous sedimentary rocks . The soils support eucalypt woodland vegetation. Subsoils are sodic (exchangeable sodium percentage >5%). This condition combined with the fine sandy loam textures and Emerson Dispersion values of 5 or more make these soils pulverulent when trafficked and prone to water erosion.

CONCEPT: Moderately deep, gravelly, imperfectly drained, yellow sandy loam over sandy clay loam, formed in lateritised Cretaceous sediments.

Australian Soil Classification: Ferric-Sodic Dystrophic Brown Kandosol Medium Gravelly Sandy Clay-loamy Very deep

RANGE IN CHARACTERISTICS:



Depth range	Horizon or layer	Morphological range
	A1	Dark greyish brown (10YR4/2-Moist); Loamy fine sand; Single grain grade of structure; Earthy fabric; Dry; Loose consistence; 0-2%, fine gravelly, 2-6mm, subrounded, dispersed, Ironstone, coarse fragments; Field pH 6.5 (Raupach); Gradual change to -
	A3	Brown (10YR4/3-Moist); Fine sandy loam (light); Massive grade of structure; Earthy fabric; Moderately moist; Very weak consistence; 0-2%, fine gravelly, 2-6mm, subrounded, dispersed, Ironstone, coarse fragments; Field pH 6.5 (Raupach); Gradual change to –
	B1	Brown (7.5YR5/4-Moist); Fine sandy loam (light); Massive grade of structure; Earthy fabric; Moderately moist; Very weak consistence; 0-2%, fine gravelly, 2-6mm, subrounded, dispersed, Ironstone, coarse fragments; Field pH 6.5 (Raupach); Gradual change to -
	B2	Yellowish brown (10YR5/4-Moist); 10-20%, 5-15 mm, Distinct, 2.5YR5/8; Fine sandy loam (light); Massive grade of structure; Earthy fabric; Moist; Very weak consistence; Very few (0 - 2 %), Ferromanganiferous, Nodules, Medium (2 -6 mm) segregations; Field pH 6.5 (Raupach); Gradual change to -
	Cr	Reddish brown (5YR4/4-Moist); 0-2%, 5-15 mm, Distinct, 2.5YR5/8; Fine sandy clay loam (light); Massive grade of structure; Earthy fabric; Moist; Weak consistence; 10-20%, medium gravelly, 6-20mm, subangular, dispersed, Ironstone, coarse fragments; Common (10 - 20 %), Ferromanganiferous, Nodules, Medium (2 -6 mm) segregations; Field pH 5

Remarks: These soils are shallow to deep and support tall open woodland. The sandy surface is easily disturbed by traffic and prone to wind erosion and dusting once the vegetative cover is removed.

4.3.2 Organosols

Deep soils where organic materials dominate in the surface 0.4 m, that occur above the range of tidal inundation, are classed as Organosols (Isbell 1996). The depth constraint is less (0.1 m) where these soils overly rock. These soils were observed on footslopes fringing estuary mangrove swamps in the project area at Blaydin Point. The organic layer is associated with higher sea levels and mangrove environments during the Pleistocene (Woodroffe & Mulrennan 1993).

Mullalgah Soil Family

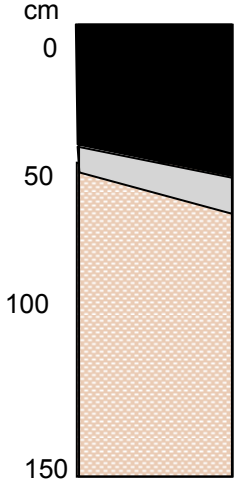
This soil family represents deep soils formed on marine sediments with organic (peaty) A horizons on foot slopes of the Cretaceous upland terrain and fringing estuary mangrove swamps . Acidic groundwater discharge leaves a layer of iron floc on the surface (Plate 3) and the soils are formed in estuarine sediments (Plate 4).

CONCEPT: Deep, non-gravelly, poorly drained, black, peaty organic soils.

Australian Soil Classification: Terric Acidic Sapric Organosol Deep

RANGE IN CHARACTERISTICS:

Depth range	Horizon or layer	Morphological range
cm 0	A11	Black (2.5Y2/1-Moist); Loamy peat; Massive grade of structure; Earthy fabric; Very weak consistence; Field pH 4.5 (Raupach); Gradual change to
50	A12	Very dark grey (2.5Y3/1-Moist); Loamy sand; Massive grade of structure; Earthy fabric; Wet; Very weak consistence; Field pH 4 (Raupach);
100	C	
150		



Remarks: Acid peat surface horizon and groundwater discharge producing iron floc.

Plate 3 Mullalgah soil showing iron floc on the surface 708621 E 8614985 N

Plate 4 Mullalgah soil profile TP02A 708838 E 8615864 N

4.3.3 Hydrosols

Hydrosols are soils other than Organosols, Podosols and Vertosols that are saturated for at least 2-3 months in most years. The soils generally experience reducing conditions during the period of saturation.

Euro

This family represents soils formed on intertidal flats under mangrove vegetation that experience regular saline tidal inundation. Organic materials from mangrove debris dominate to depths of 0.5 m or more (Plate 3). Sulfidic materials sufficient to produce a pH drop of 0.5 or more to a pH of 4 or less result from bacterial reduction of sulfate under anaerobic conditions. A pit profile is described in Appendix A, Site TP02A.

CONCEPT:	Deep, non-gravelly, poorly drained, marine mud, formed in tidal swamp.
Australian Soil Classification:	Histic-Sulfidic Intertidal Hydrosols
Remarks:	Potential acid sulfate soil.

Maand

This family represents shallow to moderately deep soils (Plate 5) formed on supratidal flats that are bare of vegetation except for halophytes. Tidal inundation is infrequent (spring tides) but a saline water table is present at shallow depths.

CONCEPT:	Shallow, non-gravelly, poorly drained, marine mud over laterite formed on saline supratidal flats.
Australian Soil Classification:	Mottled Supratidal Hydrosol Medium Moderately gravelly Loamy Clay-loamy; shallow to moderately deep
Type Sites:	
Remarks:	Shallow saline soil over hardpan.

TP 09 Photo 1

Plate 5 Maand soil profile 708054 E 8612686 N

4.3.4 Podosols, Tenosols

Podosols have B horizons dominated by the accumulation of compounds of organic matter, aluminium and/or iron. At Blaydin Point they occur in complex with Tenosols, soils with only weak pedologic organisation apart form organic darkening in the A horizon, on sand dunes.

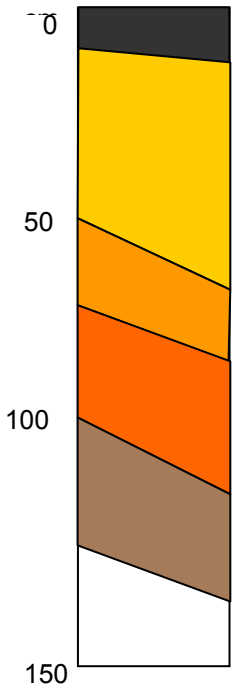
Rinamatta

This family represents soils formed on sandy dunes at the coastal margin of Blaydin Point. Organic materials. Podosols with organic-aluminium compound accumulation in the subsoil (Bh horizon) occur at the foot of dunes adjacent to tidal swamps. Weakly developed B horizons (Bw) typical of Tenosols occur higher in the dune sequence. The morphology of these soils is described below.

CONCEPT: Deep, non-gravelly, well drained, siliceous sand formed in sand dunes fringing tidal swamps.

Australian Soil Classification: Basic Arenic Orthic Tenosol Medium Non-gravelly Sandy Sandy Very deep
Fragic Humic Aquic Podosol Medium Non-gravelly Sandy Sandy Deep

RANGE IN CHARACTERISTICS:



Depth range	Horizon or layer	Morphological range
	A1	Very dark grey (10YR3/1-Moist); Sand; Single grain grade of structure; Loose consistence; Field pH 7 (Raupach); Gradual change to,
	A3	Dark yellowish brown (10YR4/4-Moist); Sand; Single grain grade of structure; Very weak consistence; Field pH 6.5 (Raupach); Gradual change to
	B1	Strong brown (7.5YR5/6-Moist); Sand; Single grain grade of structure; Very weak consistence; Very few (0 - 2 %), Ferromanganiferous, Concretions, Medium (2 -6 mm) segregations; Field pH 6.5 (Raupach);, Reddish yellow (5YR6/5-Moist); Mottles, 2-10%, 5-15 mm, Distinct, 10R3/7; Mottles, 2-10%, 5-15 mm, Distinct, 10YR5/4; Clayey sand; Wet; 0-2%, medium gravelly, 6-20mm, subrounded, Very few (0 - 2 %), Ferromanganiferous, Concretions, Medium (2 -6 mm) segregations; Field pH 7 (Raupach); Gradual change to,
	B2w	Dark greyish brown (2.5Y4/3-Moist); ; Common (10 - 20 %), Calcareous, Nodules, Medium (2 -6 mm) segregations; Field pH 8.5 (Raupach)
	B2k	

Remarks: Prone to wind erosion and wave erosion when surface cover is removed. Areas are sensitive to traffic impact.

4.3.5 Soil Correlation

Table 2 outlines the correlation between this survey and other classification systems in use.

Table 2 Soil correlation table

Soil Family	Great Soil Group	Principle Profile Form	Australian Soil Classification
Blaydin	Red earths	Gn2.14	Melanic Mesotropic Red Kandosol Medium Non-gravelly Clay-loamy Clayey deep
Hotham	Yellow earths (lateritic)	Gn2.24	Ferric-Sodic Dystrophic Brown Kandosol Medium Gravelly Sandy Clay-loamy Very deep
Koolpinyah			Ferric-Sodic Petro-ferric Yellow Kandosol
Mullalgah	Moor peats	No suitable group	Terric Acidic Sapric Organosol Deep
Euro	No suitable group	Uf1	Histic-Sulfidic Intertidal Hydrosols
Maand	No suitable group	Um1	Mottled Supratidal Hydrosol Medium Moderately gravelly Loamy Clay-loamy; shallow to moderately deep
Rinnamatta	Podsols	Uc2.21	Fragic Humic Aquic Podosol Medium Non-gravelly Sandy Sandy Deep
			Basic Arenic Orthic Tenosol Medium Non-gravelly Sandy Sandy Very deep

Section 5 presents the laboratory results for selected soil horizon samples used to support the soil classification and to assess environmental risks.

Laboratory Results Section 5

Laboratory results obtained to characterise extractable metals concentrations, soil fertility levels and potential acid sulfate soil risk are provided in Appendix C.

5.1 Quality Assurance

Laboratory replicate sample results were reported for one sample in ten. Replicate percent differences (RPD) for suspension pH, electrical conductivity (EC) and extractable metals are reported in Table 3. RPD values for acid sulfate soil analyses are shown in Table 4. RPD values for soil fertility analyses are shown in Table 5. RPD values increased for analytical concentrations close to the limit of detection. However, RPD Values for analytes were within the acceptable range (AS4482.1, 1997).

Table 3 Replicate percent differences for pH, EC and heavy metals

Sample	Replicate	pH (1:5)	EC (1:5)	As	Cd	Cr	Cu	Hg	Pb	Ni	Zn	Mn
				(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
1	0	4.9	230	<5	<0.5	54	<3	<0.05	4	<3	56	<20
1	1	4.9	230	<5	<0.5	54	<3	<0.05	4	<3	57	<20
RPD		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**		**0**
21	0	5.9	280	<5	<0.5	23	<3	<0.05	5	4	3	72
21	1	5.9	270	<5	<0.5	23	<3	<0.05	5	4	3	73
RPD		**0**		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**
31	0	5.4	270	<5	<0.5	13	5	<0.05	9	<3	11	<20
31	1	5.4	260	<5	<0.5	12	6	<0.05	9	<3	10	<20
RPD		**0**		**0**	**0**	**8**	**18**	**0**	**0**	**0**	**9**	**0**
51	0	5.4	17000	32	<0.5	34	7	<0.05	6	4	22	160
51	1	5.4	18000	32	<0.5	35	7	<0.05	6	5	24	160
RPD		**0**		**0**	**0**	**3**	**0**	**0**	**0**	**22**	**3**	**0**
11	0	6.1	800	<5	<0.5	20	6	<0.05	3	9	28	1100
11	1	6.1	790	<5	<0.5	20	5	<0.05	6	8	29	1100
RPD		**0**	**1**	**0**	**0**	**0**	**18**	**0**	**60**	**22**	**3**	**0**

Table 4 Replicate percent differences for chromium suite acid sulfate soil characterisation

Sample	Replicate	pH KCl	Chromium Reducible Sulfur	a-Chromium Reducible Sulfur	s-Net Acidity	a-Net Acidity	Liming Rate	Verification s-Net Acidity	a-Net Acidity without ANC	Liming Rate without ANC
		Units	% w/w	moles H^+ / tonne	% w/w S	moles H^+/tonne	kg $CaCO_3$ /tonne	% w/w S	moles H^+/tonne	kg $CaCO_3$/tonne
		PQL	<0.005	<5	<0.01	<5	<0.1		<5	<0.1
41	0	6.4	0.068	43	0.07	44	3.3	0.07	44	3.3
41	1	6.4	0.071	44	0.07	45	3.4	0.07	45	3.4
	RPD	0	4	2	0	2	3	0	2	3
81	0	6.4	0.12	74	0.12	75	5.6	0.12	75	5.6
81	1	6.4	0.12	73	0.12	74	5.6	0.12	74	5.6
	RPD	0		1	0	1	0	0	1	0
91	0	7.6	<0.005	<5	<0.01	<5	NA	NA	<5	NA
91	1	7.7	<0.005	<5	<0.01	<5	NA	NA	<5	NA
	RPD			0	0	0			0	
61	0	7.4	0.32	200	0.31	0.25	160	12	0.25	200
61	1	7.1	0.33	210	0.25	0.28	170	13	0.28	210
	RPD		3	5	21	11	6	8	11	5
71	0	7	0.16	99	1.1	<0.01	<5	NA	-0.081	99
71	1	7	0.15	94	0.94	<0.01	<5	NA	-0.049	94
	RPD	0	6	5	15		0		42	5

Table 5 Replicate percent differences for soil fertility characterisation

				N		P		Carbon			Exchangeable Cations						Trace Metals			
Sample	Replicate	pH - $CaCl_2$	Total S	Total Nitrogen Kjeldahl	Total N	Total P Kjeldahl	Avail. P Colwell	Org. C	Org. Matter	C:N	ESP	Na	K	Ca	Mg	CEC	Fe	Mn (DTPA) *	Cu	Zn
	PCL[1]		<1	<0.3	<5	<5	<1	<0.05	<0.01	<0.01	<1			<0.01				<0.5		
	Units			(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(% w/w)	(% w/w)		(%)			(meq%)				(mg/kg)		
11	0	6	70	820	820	66	8	3.7	6.4	45	16	23	0.36	9	2.8	14	94	220	1	12
11	1	5.9	70	[NT]	[NT]	[NT]	9	[NT]	[NT]	[NT]	16	23	0.36	9	2.8	14	95	220	1	11
	RPD	2	0				11				0	0	0	0	0	0	1	0	0	8

[1] PCL, practical quantification limit

5.2 Soil Chemical Properties

Soil sampling locations are indicated on the soil map (Figure 8).

5.2.1 Extractable Metal Concentrations

A total of seventy three samples were collected for pH, electrical conductivity (EC) and extractable metal analysis. Extractable metals were measured from aqua regia digest (USEPA Method 200.8) of air dried soil samples, lightly ground to pass through a 2 mm sieve. The results are summarised according to areas in the gas plant infrastructure plan in Table 6. Acid extractable metal concentrations in the soils of the development area did not exceed generic environmental criteria (NEPC 1999b) (Table 6). Soils in all areas in or near the tidal zone were saline. The air dried pH for soils in the flare, MOF and along the pipeline in mangroves were strongly acid (Table 6).

Table 6 Summary of extractable soil metal concentrations

Area	pH	EC	As	Cd	Cr	Cu	Hg	Pb	Ni	Zn	Mn
		uS/cm	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
LOR	0.1	5	5	0.5	5	3	0.05	3	3	3	20
Flare											
n	14	14	13	13	13	13	13	13	13	13	13
Minimum	40.3	110	<5	<0.5	<5	<3	<0.05	<3	<3	<3	<20
Maximum	7.0	28000	36	<0.5	42	6	<0.05	14	11	33	92
Average	**5.64**	**9006**	**13.5**	**<0.5**	**15.1**	**3**	**<0.05**	**5**	**3**	**12**	**31**
Jetty											
n	3	3	4	4	4	4	4	4	4	4	4
Minimum	5.6	4000	<5	<0.5	7	<3	<0.05	<3	<3	6	35
Maximum	6.8	7000	32	<0.5	31	6	<0.05	4	3	20	72
Average	**6.4**	**5333**	**5**	**<0.5**	**13**	**3**	**<0.05**	**2.5**	**<3**	**11**	**52**
MOF											
n	6	6	8	8	8	8	8	8	8	8	8
Minimum	4.9	230	<5	<0.5	5	<3	<0.05	<3	<3	7	<20
Maximum	5.4	18000	32	<0.5	54	8	<0.05	11	6	57	200
Average	**5.43**	**6635**	**11**	**<0.5**	**29**	**4**	**<0.05**	**4**	**3**	**29**	**83**
Pipeline											
n	21	21	20	20	20	20	20	20	20	20	20
Minimum	4	120	<5	<0.5	7	<3	<0.05	4	<3	<3	24
Maximum	7.8	40000	57	<0.5	35	10	<0.05	13	21	30	670
Average	**10.93**	**13380.33**	**57**	**<0.5**	**20.67**	**10**	**<0.05**	**8**	**4**	**11**	**114**
Plant area											
n	21	21	20	20	20	20	20	20	20	20	20
Minimum	5.3	31	<5	<0.5	10	<3	<0.05	3	<3	<3	32
Maximum	6.8	2100	36	<0.5	37	9	<0.05	14	16	43	1100
Average	**5.7**	**444**	**6**	**<0.5**	**24**	**3**	**<0.05**	**7**	**5**	**11**	**354**
Shore crossing											
n	8	8	2	2	2	2	2	2	2	2	2
Minimum	6.2	16000	10	<0.5	16	3	<0.05	6	<3	11	55
Maximum	8.3	27000	10	<0.5	22	6	<0.05	12	24	21	110
Average	**7.5**	**21500**	**10**	**<0.5**	**19**	**4**	**<0.05**	**9**	**12**	**16**	**82**
Total n	*73*	*73*	*67*	*67*	*67*	*67*	*67*	*67*	*67*	*67*	*67*
Global minimum	*4.0*	*31*	*<5*	*<0.5*	*<5*	*<3*	*<0.05*	*<3*	*<3*	*<3*	*<20*
Global maximum	*8.3*	*40000*	*57*	*<0.5*	*72*	*10*	*<0.05*	*14*	*24*	*57*	*1100*
Global average	*6.0*	*8624*	*11*	*<0.5*	*20*	*4*	*<0.05*	*6*	*4*	*14*	*161*
***Guideline*[1]**			***200***	***40***	***400***	***2000***	***30***	***600***	***600***	***14000***	***3000***

[1]NEPC Category E health risk assessment guidelines Table 5-A (NEPC 1996)

5.2.2 Soil Fertility

Soil organic carbon and major nutrient results for soils in the plant area show that the Blaydin soil is relatively fertile in the near surface horizon with respect to nitrogen and phosphorus and the organic matter content is high (Table 7). High nutrient levels for this soil were associated with relatively high organic carbon content in the near surface horizon.

Table 7 Major nutrients and organic carbon

Soil type	Site	Depth	pH - $CaCl_2$	Chloride, Cl (1:5)	Sulphur, S *	Total Oxidised Nitrogen	Total Kjeldahl Nitrogen	Total Nitrogen (as N)	Total Kjeldahl Phosphorus	Colwell Phosphorus	Total Organic Carbon	Organic Matter	Carbon-Nitrogen Ratio
		m	pH units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	% w/w	% w/w	
Hotham	7	0-0.1	4.7	22	19	1.6	310	310	37	7	2	3.4	65
	7	0.5-0.6	4.9	33	20	<0.3	44	44	21	3	0.54	0.93	120
	47	0-0.1	5.5	1200	94	<0.3	180	180	30	3	1.2	2.1	67
	47	0.5-0.6	3.1	490	28	0.4	76	76	24	2	0.56	0.97	74
	46	0-0.1	3.9	320	30	0.5	320	320	33	6	2.9	5	91
	46	0.5-0.6	3.7	98	8	0.4	39	39	24	2	0.68	1.2	170
Koolpinyah	6	0-0.1	3.3	32	40	0.3	310	310	42	3	1.4	2.4	45
	6	0.5-0.6	4.7	52	72	<0.3	48	48	27	2	0.6	1	120
Blaydin	8	0-0.1	6	940	70	1.6	820	820	66	8	3.7	6.4	45
	8	0.5-0.6	5.2	2700	140	<0.3	580	580	80	3	1.6	2.8	28

Trace metal results for soils in the plant area are deficient in copper and zinc (Table 8). The exchangeable sodium percent (ESP) data in Table 8 indicates that all the soils are sodic. This is a feature that predisposes them to being pulverulent and erodible. Exchangeable cations and cation exchange capacity (CEC) are low, typical of highly leached soils, apart from the Blaydin soil (Table 8). The ability of the Blaydin soil to retain cations is associated with its high organic carbon content.

Table 8 Trace elements and exchangeable cations

Soil type	Site	Depth	Fe (DTPA) *	Mn (DTPA) *	Cu (DTPA) *	Zn (DTPA) *	ESP	Exch. K	Exch.Ca	Exch.Mg	CEC
		m	mg/kg	mg/kg	mg/kg	mg/kg	%	(meq%)	(meq%)	(meq%)	(meq%)
Hotham	7	0-0.1	120	110	1.5	5.5	4	0.25	1.3	0.66	2.3
	7	0.5-0.6	70	56	0.6	2.9	11	0.11	0.5	0.39	1.1
Koolpinyah	6	0-0.1	90	19	<0.5	2.4	20	0.16	0.33	0.55	1.3
	6	0.5-0.6	90	13	0.7	2.1	20	0.24	0.27	0.9	1.8
Blaydin	8	0-0.1	95	220	1	11	16	0.36	9	2.8	14
	8	0.5-0.6	130	120	0.6	4.8	58	0.28	2.4	2.3	12
Koolpinyah	47	0-0.1	170	100	<0.5	2	42	0.14	0.6	0.8	2.7
	47	0.5-0.6	95	45	<0.5	1.4	12	0.19	3.6	2.1	6.7
	46	0-0.1	200	21	0.5	1.1	15	0.06	0.9	0.56	1.8
	46	0.5-0.6	110	5	<0.5	<0.5	55	0.22	1.1	1.4	6

5.2.3 Potential Acid Sulfate Soils

Chromium reducible sulfur, acid neutralising capacity and liming rate results identified potential acid sulfate soil risks (Table 9). The chromium reducible sulfur method measures reduced inorganic sulfide content using an acidic chromous chloride extraction. Organic sulfur sources do not interfere with this method, which is an advantage when organic rich mangrove soils are assessed. Acid neutralising capacity measures the soil's inherent ability to buffer acidity and resist acidification. Titratable actual acidity (s-TAA 6.5) in Table 9 is the acidity measured by titration with dilute NaOH to ph 6.5 following extraction.

Very high lime requirements (maximum of 140 kg lime/tonne soil) were measured for soils in intertidal habitats (Euro soil family). Much lower lime requirements (maximum of 3.4 kg lime/tonne soil) were measured for soils in saline flat habitats (Maand soil family). Soils formed in marine sediments, above the current tidal range (Mullalgah soil family) supported Melaleuca woodland habitat and exhibited potential acid sulfate properties in the subsoil (maximum of 32 kg lime/tonne soil but generally about 6 kg lime/tonne soil).

The Rinnamatta soils represent a low acid sulfate soil risk. This risk was identified from bore logs in the geotechnical test drilling and occurs at depths of four metres or more below the land surface, associated with low pH, grey marine mudstones.

The acid neutralising capacity of the soils tested was low and consequently has little effect on the liming rate required to neutralise potential acid production. The average liming rate for the soils tested was 30 kg $CaCO_3$ per tonne and ranged from zero to 140 kg $CaCO_3$ per tonne of soil.

Acid sulfate soil risk was generally an order of magnitude higher in the subsoil than at the surface. The surface soil in intertidal mangroves was frequently aggraded by sediment and didn't have the same degree of organic matter accumulation and reducing conditions as the subsoil, which was typically darker and had a rotten egg odour.

Table 9 Acid sulfate soil characterisation

Project Area	Habitat type	Soil type	Site	Depth	pH $_{KCl}$	s-TAA pH 6.5	Chromium Reducible Sulfur	s-ANC	s-Net Acidity	Liming Rate	Liming Rate without ANC
					pH Units	% w/w S	(S_{CR})% w/w	% w/w S	% w/w S	kg $CaCO_3$/tonne	kg $CaCO_3$/tonne
					<0.1	<0.01	<0.005	<0.01	<0.01	<0.1	<0.1
Flare	Intertidal mangrove	Euro	4	0-0.1	6.4	<0.01	0.12	---	0.12	5.6	5.6
Flare			4	0.5-0.6	4.5	0.14	2.2	---	2.3	110	110
Flare			51	0-0.1	6.1	0.02	0.18	---	0.2	9.3	9.3
Flare		Euro	51	0.5-0.6	4.6	0.11	1.5	---	1.6	75	75
Flare		Euro	52	0-0.1	7.9	<0.01	0.37	0.22	0.23	11	17
Flare			52	0.5-0.6	7.4	<0.01	0.58	0.12	0.5	23	27
Jetty		Euro	10	0-0.1	5.9	0.02	0.81	---	0.83	39	39
Jetty			10	0.5-0.6	6.3	0.01	0.52	---	0.53	25	25
Jetty		Euro	53	0-0.1	8.6	<0.01	0.26	0.14	0.16	7.6	12
Jetty			53	0.5-0.6	7.6	<0.01	0.47	0.06	0.43	20	22
MOF		Euro	54	0-0.1	7.1	<0.01	0.33	0.08	0.28	13	16
MOF			54	0.5-0.6	6.2	0.01	0.71	---	0.72	34	34
MOF		Euro	9	0-0.1	6.4	<0.01	0.23	---	0.24	11	11
MOF			9	0.5-0.6	5.1	0.1	1.3	---	1.4	65	65
Pipeline	Melaleuca woodland	Mullalgah	16	0-0.1	4.6	0.11	0.01	---	0.12	5.7	5.7
Pipeline			16	0.5-0.6	4.7	0.13	0.02	---	0.15	6.9	6.9
Pipeline	Saline flat	Maand	5	0-0.1	6.4	<0.01	0.068	---	0.07	3.3	3.3
Pipeline			5	0.5-0.6	6.4	<0.01	0.071	---	0.07	3.4	3.4
Pipeline	Intertidal mangrove	Euro	57	0-0.1	6	0.02	0.41	---	0.42	20	20
Pipeline			57	0.5-0.6	6.2	<0.01	0.46	---	0.47	22	22
Pipeline		Euro	F51	0-0.1	7	<0.01	0.15	0.3	<0.01	---	7.1
Pipeline			F51	0.5-0.6	6	0.03	3	---	3	140	140
Plant area	Melaleuca woodland	Mullalgah	50	0-0.1	6.4	<0.01	0.021	---	0.02	---	---
Plant area		Mullalgah	50	0.5-0.6	5.8	0.03	0.016	---	0.05	2.2	2.2
Plant area		Mullalgah	6	0.5-0.6	4.6	0.12	0.011	---	0.13	6	6
Shore crossing	Saline flat	Maand	17	0-0.1	7.6	<0.01	<0.005	---	<0.01	---	---
Shore crossing			17	0.5-0.6	7.7	<0.01	<0.005	---	<0.01	---	---
Shore crossing	Intertidal mangrove	Euro	18	0-0.1	7.7	<0.01	0.27	0.8	<0.01	---	13
Shore crossing			18	0.5-0.6	7.3	<0.01	1.3	0.46	0.98	46	60
Shore crossing		Euro	19	0-0.1	7.8	<0.01	0.2	10	<0.01	---	9.4
Shore crossing			19	0.5-0.6	7.1	<0.01	1.6	0.36	1.3	62	73
Shore crossing	Melaleuca woodland	Mullalgah	21	0-0.1	6.8	<0.01	<0.005	---	<0.01	---	---
Shore crossing			21	0.5-0.6	5.3	0.04	0.64	---	0.68	32	32
									Minimum	2.2	2.2
									Maximum	140	140
									Average	30.7	30.1

5.3 Soil Physical Properties

Soil infiltration and bore hole permeameter test results are provided in Appendix D for freely draining soils in the plant area. Infiltration rates and permeability's are high (Table 10). Consequently, runoff rates are likely to be low until the soils become saturated.

Table 10 Infiltration rates and subsoil permeability

Site	Infiltration rate (dry soil) mm/min	Infiltration rate (wet soil) mm/min	Borehole Permeability mm/min
1	36.91	12.86	70.03
2	39.00	14.35	12.42
5	56.34	27.31	75.48
8	19.53	8.61	16.54
9	57.39	13.32	12.44
10	35.98	13.76	7.40
12	46.27	14.34	9.04
21	24.94	9.54	6.86
23	23.46	9.06	28.63
27	49.48	23.13	43.38

Emerson dispersion test scores of 5 and 6 (Table 11) indicate that the soils do not readily disperse, i.e. they appear to be stable when wet.

Table 11 Emerson dispersion test results

Area	Site	Emerson Class Number
PLANT	2	5
PLANT	2	5
PLANT	7	5
PLANT	7	6
PLANT	8	5
PLANT	8	6
PLANT	47	6
PLANT	47	6
PLANT	46	6
PLANT	46	5
PLANT	11	5
PLANT	11	5
FLARE	49	5
FLARE	49	5

6.1 Earthworks Plan

Preliminary earthworks of 7.5 m of cut in the plant area and fill in the MOF Wharf and Ground Flare Area is planned. Preliminary estimates of stripping quantities are broken down into construction areas in Table 12.

Table 12 Blaydin Point earthworks quantities

Area	Stripping (m^2)	Cut (m^3)	Fill (m^3)	Balance (m^3)
Plant Site	1,570,800	-997,000	795,900	-201,000
Flare	85,800	-1,600	573,600	572,000
Flare replacement of unsuitable material	0	0	448,700	448,700
Flare Causeway	4,700	-400	19,000	18,700
MOF	30,000	0	179,000	179,000
Total	1,691,300	-999,000	179,000	1,017,400

6.2 Erosion Risk

Erosion risk was associated with sodic soil properties and short relatively steep sloping areas (shown in reddish hues in the slope map (Figure 7), under the plant footprint. Erosion risk will be high for disturbed soils in this environment. Using the cleared vegetation as a mulch to protect the soil surface from high energy raindrop impact will reduce erosion risk.

A 0.1 m layer of surface wash was observed in mangrove soils, indicating a natural sedimentation process in the mangroves. This surface wash was sandy close to the coast and derived from the upland soils rather than marine sediment. The mangroves fringing the estuary act as a natural sediment trap.

Although the capacity for the natural environment to contain elevated sediment loads during construction appears to be high, every effort needs to be made to limit erosion and intercept sedimentation from the construction site before it reaches the receiving environment using established sediment and erosion control practices (NRETA 2008; Witheridge & Walker 1996).

6.3 Soil Mapping

Soil family units were mapped by association with mapped vegetation boundaries with some minor modifications (Figure 8). The mapped soil associations represent the dominant soil family in a continuum of soil variation. There are inclusions of sub-dominant soil types within the dominant class that gives its name to the map unit. For instance sites 7 and 47 were classified as Hotham soils and occur within the Blaydin map unit. These sites represent inclusions. The dominant Blaydin soil has been formed by biological accumulation of organic carbon under the monsoon vine forest vegetation. In the absence of the monsoon vine forest and with frequent fires, the soil may well revert to the Hotham type. Environmental assessment of each of the soil family units (Table 13) was based on survey work and laboratory tests in Section 5. Surface flow paths towards the mangrove flats surrounding the Catalina Creeks (Figure 9).

Table 13 Environmental assessment of soil units

Soil Unit	PASS	ASS	Pulverulence	Water Erosion	Wind Erosion	Fertility
Blaydin	nil	nil	moderate	low	low	high
Hotham	nil	nil	high	high	moderate	low
Koolpinyah	nil	nil	very high	high	moderate	low
Mullalgah	moderate	moderate	moderate	low	low	low, waterlogged, saline
Euro	Very high	low	low	low	moderate	low, waterlogged, saline
Maand	low	low	low	low	low	low, waterlogged, saline, acid sulfate
Rinnamatta	low	low	low	moderate	high	low, saline

The tonnes (t) of pure fine aglime, $CaCO_3$ required to fully treat the total weight/volume of acid sulfate soils (ASS) can be read from the table at the intersection of the weight of disturbed soil [row] with the existing plus potential acidity [column]. Where the exact weight or soil analysis figure does not appear in the heading of the row or column, use the next highest value.

Disturbed ASS (tonnes) (≈m^3×BD) †	**Soil Analysis# – Existing Acidity plus Potential Acidity (converted to equivalent S% units)**													
	0.03	***0.06***	***0.1***	***0.2***	***0.4***	***0.6***	***0.8***	***1***	***1.5***	***2***	***2.5***	***3***	***4***	***5***
1	0	0	0	0	0	0.03	0.04	0.05	0.1	0.1	0.1	0.1	0.2	0.2
5	0	0	0	0.05	0.1	0.1	0.2	0.2	0.4	0.5	0.6	0.7	0.9	1.2
10	0	0.03	0.05	0.1	0.2	0.3	0.4	0.5	0.7	0.9	1.2	1.4	1.9	2.3
50	0.1	0.1	0.2	0.5	0.9	1.4	1.9	2.3	3.5	4.7	5.9	7.0	9.4	12
100	0.1	0.3	0.5	0.9	1.9	2.8	3.7	4.7	7.0	9.4	12	14	19	23
200	0.3	0.6	0.9	1.9	3.7	5.6	7.5	9.4	14	19	23	28	37	47
250	0.4	0.7	1.2	2.3	4.7	7.0	9.4	12	18	23	29	35	47	59
350	0.5	1.0	1.6	3.3	6.6	10	13	16	25	33	41	49	66	82
500	0.7	1.4	2.3	4.7	9.4	14	19	23	35	47	59	70	94	117
600	0.8	1.7	2.8	5.6	11	17	22	28	42	56	70	84	112	140
750	1.1	2.1	3.5	7.0	14	21	28	35	53	70	88	105	140	176
900	1.3	2.5	4.2	8.4	17	25	34	42	63	84	105	126	168	211
1000	1.4	2.8	4.7	9.4	19	28	37	47	70	94	117	140	187	234
2000	2.8	5.6	9.4	19	37	56	75	94	140	187	234	281	374	468
5000	7.0	14	23	47	94	140	187	234	351	468	585	702	936	1170
10000	14	28	47	94	187	281	374	468	702	936	1170	1404	1872	2340

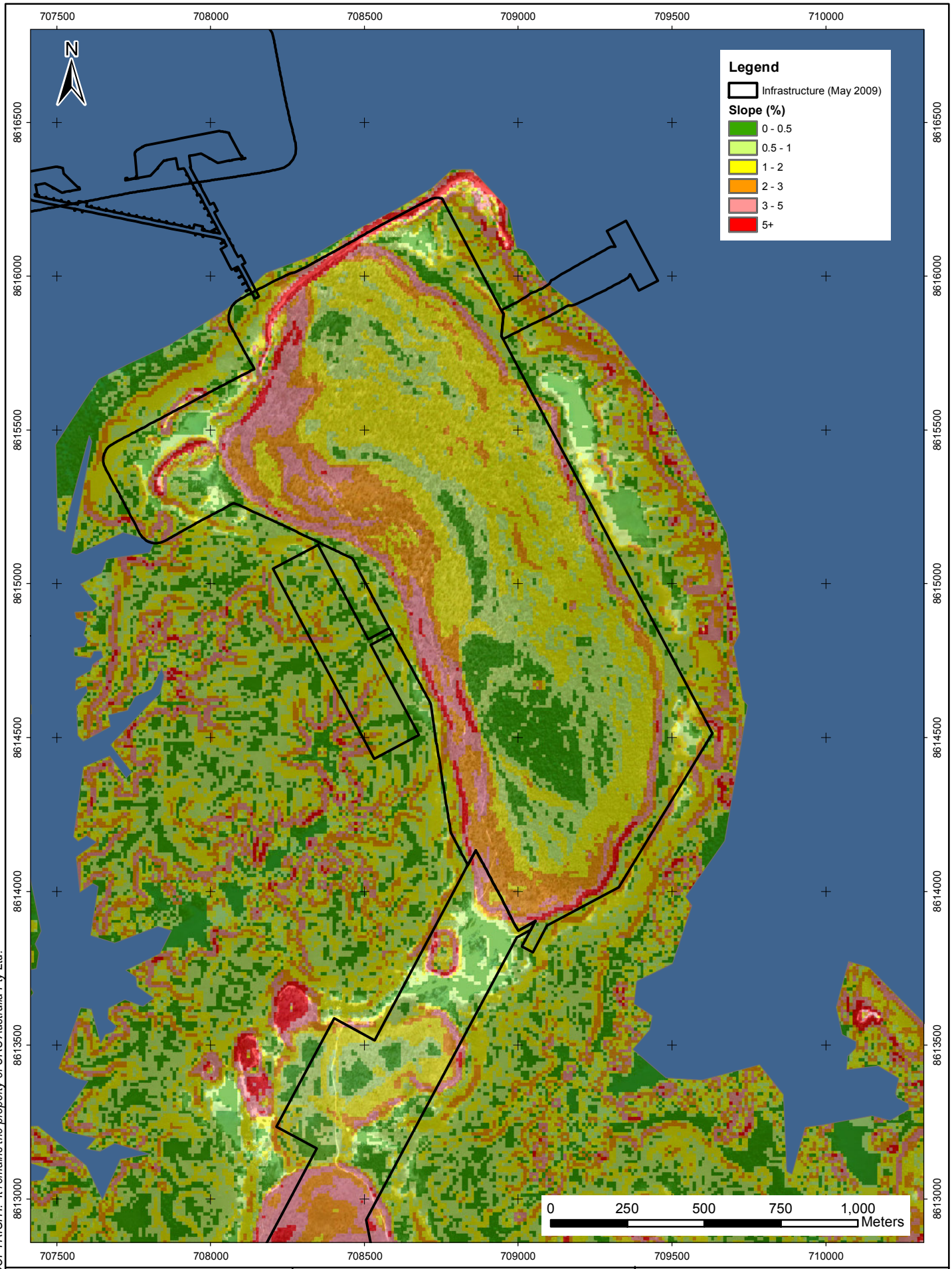
L	**Low treatment:** (≤0.1 tonnes lime)
M	**Medium treatment:** (>0.1 to 1 tonne lime)
H	**High treatment:** (>1 to 5 tonnes lime)
VH	**Very High treatment:** (>5 to 25 tonnes lime)
XH	**Extra High treatment:** (>25 tonnes lime)

Note: Lime rates are for pure fine aglime, $CaCO_3$ assuming an NV of 100% and using a safety factor of 1.5. A factor that accounts for Effective Neutralising Value is needed for commercial grade lime. (See the *Information Sheets* on *Neutralising Agents – Neutralising Considerations*).

† An approximate soil weight (tonnes) can be obtained from the calculated volume by multiplying volume (cubic m) by bulk density (t/m^3). (Use 1.7 if B.D. is not known.) Dense fine sandy soils may have a BD up to 1.7, and hence 100 m^3 of such soil may weigh up to 170 t. In these calculations, it is necessary to convert to dry soil masses, since analyses are reported on a dry weight basis.

Potential acidity can be determined by Chromium Reducible Sulfur (S_{CR}), Peroxide Oxidisable Sulfur (S_{POS}) and Total Oxidisable Sulfur (S_{TOS}). For samples with pH <5.5, the existing acidity must also be determined by appropriate laboratory analysis eg. Titratable Actual Acidity (TAA). Soils with retained acidity eg. jarosite or other similar insoluble compounds have a less available acidity and will require more detailed analysis. The amount of treatment required may be reduced if the self-neutralising capacity of the soil is appropriately measured. Consult the **Queensland Acid Sulfate Soils Technical Manual, Laboratory Methods Guidelines**.

Table 14 Acid sulfate soil risk assessment (Dear et.al. 2002, Table 2)



Client: Inpex	Project: ICHTHYS GAS FIELD DEVELOPMENT		Title: SLOPE MAP OF BLAYDIN POINT
URS	Drawn: JD	Approved: IH	Date: 30/7/2009
	Job No.: 42906730	File No.:42906730-Slope.mxd	Figure: 7
			Rev. A A4

Legend

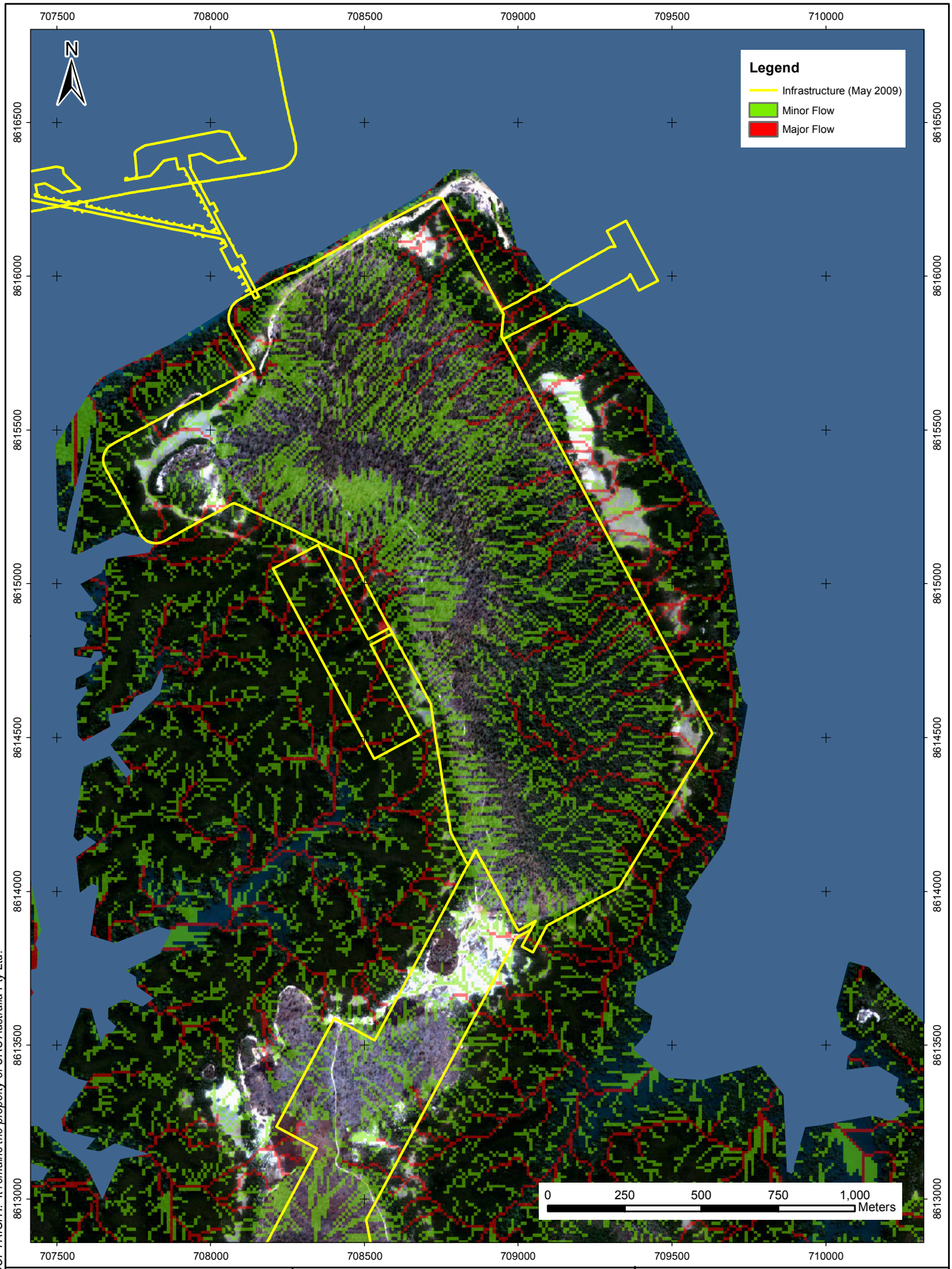
- Survey Sites
- Infrastructure (May 2009)

Soil Classification

- Blaydin Soil Family; Melanic Mesotropic Red Kandosol Medium Non-gravelly Clay-loamy Clayey Deep
- Euro Soil Family; Histic, Sulfidic, Hydrosols
- Hotham Soil Family, Ferric Petroferric Red Kandosol Medium Gravelly (or very gravelly) Loamy Clay-loamy Moderately deep
- Koolpinyah Soil Family; Haplic Petroferric Yellow Kandosol Medium Gravelly Loamy Clay-loamy Moderately deep
- Maand Soil Family; Petroferric, Oxyaquic, Hydrosol, Medium, Moderately gravelly, Loamy Clay-loamy, Moderately deep
- Mullalgah Soil Family; Terric, Acidic, Sapric, Organosol, Deep
- Rinamatta Soil Family; Basic Arenic Orthic Tenosol Medium Non-gravelly Sandy Sandy Very deep
  Fragic Humic Aquic Podosol Medium Non-gravelly Sandy Sandy Deep

009 001 054 010 F6E 046 053 048 002 011 014 014 050 049 051 003 013 F3F PIT1 008 012 052 F42 047 057 004 056 007 006 005 023 F57 024 025 026 F5A 027 F45 F45 028 044 F48 12DE E05 E02 F54 F5D 055 F51 021 015 018 020 019 017 016 F7A

Client: INPEX Browse, Ltd	Project: ICHTHYS GAS FIELD DEVELOPMENT		Title: SOILS OF BLAYDIN POINT
URS	Drawn: JD	Approved: IH	Date: 30/7/2009
	Job No.: 42906730	File No.: 42906730-Soils.mxd	Figure: 8
			Rev. A
			A3



Client: Inpex	Project: ICHTHYS GAS FIELD DEVELOPMENT		Title: FLOW ACCUMULATIONS ON BLAYDIN POINT
URS	Drawn: JD	Approved: IH	Date: 30/7/2009
	Job No.: 42906730	File No.:42906730-Flow Accumulation.mxd	Figure: 9
			Rev. A A4

6.4 Soil Metal Levels

Acid extractable metal concentrations were below generic guidelines (NEPC 1999a). Consequently, no environmental or human health risk is associated with disturbing soil material in relation to heavy metals. Differences between the data reported here and the background reported in Figure 6 may relate to the more aggressive digest used for mineral assay tests reported in DPIFM (2008).

6.5 Soil Fertility

Fertile soil materials suited to revegetation and environmental remediation work were associated with the Blaydin soil family (Melanic Kandosols) that support a relatively extensive closed monsoon vine thicket vegetation type on Blaydin Point. The relatively high fertility level was associated with high levels of organic carbon accumulation. Topsoil to 0.5 m depth where areas of monsoon vine thicket are going to be cleared is a valuable resource to be conserved during construction and used in revegetation and landscaping work that will be needed to stabilise the site.

6.6 Dust

Due to the pulverulence of the soils there is a high risk that traffic and earthworks during dry season construction work will cause a dust problem on the site unless effective mitigation measures are in place. INPEX will need to consider the frequency of watering needed to mitigate a potentially dusty working environment. Use of chemical dust suppressants may be warranted in some situations.

6.7 Actual and Potential Acid Sulfate Soils

Potential acid sulfate soils occurred in the MOF, Flare, Pipeline and Shore Crossing (Table 9 and 13). Excavations to four or metres depth in the coastal dune sediments forming the Rinnamatta soils would intersect with potentially acid sulfate material associated with marine sediments (Section 5.2.3). The proposed development does not impact on these soils.

The risk assessment method (Table 14) is based on the amount of material disturbed and the lime required to neutralise the acid generating potential of these soils.

Based on the draft earthmoving plan estimates (Table 12) and the lime requirement results reported in Table 14, the acid sulfate soil risk in areas likely to be disturbed is very high. In this situation best practice guidelines recommend that a comprehensive environmental management plan is prepared to provide for ongoing treatment and monitoring the effects of ASS disturbance though construction and operational phases of the project and describe the construction schedules and environmental management procedures (Dear et al. 2002).

Avoidance is the preferred strategy. Where avoidance is unavoidable the following risk-based management strategies are preferred:

- Minimising disturbance;
- Neutralisation of acid sulfate soils;
- Hydraulic separation;
- Strategic reburial of potential ASS below the permanent water table, or low tide level.

A strategy of covering undisturbed Potential Acid Sulfate Soils (PASS) with clean fill can be used to provide adequate depth for foundations with minimum risk to the receiving environment.

Handling of ASS will inevitably result in a certain amount of oxidation. In most cases, the natural buffering capacity of the system will initially contribute to the neutralisation of acid produced. However, depending on the sulfide content, substantially more neutralising material than present in the soil usually needs to be added as shown in Table 14. The most common acid sulfate soils treatments rely on providing sufficient neutralising agent to neutralise acid as it is produced over time due to the gradual oxidation of the sulfides.

Fine agricultural lime with a pH of about 8.2 is the lowest cost, most widely used and the safest neutralising material. Other more caustic neutralising agents such as magnesium hydroxide (pH 12) or slaked lime (pH 12) impose environmental risks from overdosing with the potential to damage estuarine ecosystems (Bowman, 1993). A safety factor of two should be applied to allow for inefficient mixing of the lime and its low reactivity. The purity and effective neutralising value also need to be incorporated in calculations. Over the longer term, iron, aluminium and gypsum are likely to coat the neutralising agents, reducing their effectiveness.

If excavation and disposal is considered, an existing acid sulfate soil disposal area was developed at Blaydin Point for the public works construction of the Wickham Point road (Plate 6). Revegetation and drainage of the site is poor. However, this could be improved with a properly designed cover.

Plate 6 Borrow pit disposal of Potential Acid Sulfate Soil at Blaydin Point 708190 E 8612060 N

6.8 Geoheritage Values

Significant geoheritage values are associated with the natural coastline forming a peninsula into the harbour. As well as defining the shape of the harbour the peninsula isolates habitats from disruptive environmental processes that influence biodiversity, particularly fire. Consequently, relatively extensive fire sensitive Monsoon Vine Forest ecosystems have developed at Blaydin Point in comparison with the extent of this ecosystem type across the rest of the Elizabeth River catchment. Relative isolation is likely to afford other peninsular areas with similar reserve values and there may be a case for reviewing their conservation status.

Apart from the definition of the harbour environment, geoheritage values relate specifically to clear geological markers of the extent of the Cretaceous Bathurst Island formation (Plate 1), mangrove areas which define the appearance of the coastline and sand dunes on the coastal fringe that have an association with Aboriginal habitation and act as natural buffers to wind and waves.

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Appendices

Appendix A Geotechnical Pit Profiles

Appendix A

ARUP | Test Pit Log

Job No.	Hole ref	Page
205190	**TP01**	1 of 1

Contractor: Mark Cundall

Ichthys Gas Field Development
Onshore Geotechnical GI

NG co-ordinates	Ground Level (mAHD)	Date
708182 E 8615674 N	3.51	23-Apr-08

Samples & tests			Strata log					
Depth	Sample Type Ref	Test Result	Reduced Level	Legend	Depth (Thickness)	Description	Stratum	Geology
0.25	D 1A					Clayey SAND (SC) fine to medium grained, pale grey, loose to medium dense, with red-brown sandy clay pockets (20mm), clay content increases with depth. Dry.		
0.30	B 2A				(1.40)			
0.75	D 3A					.... 1.00m clay content increasing with depth		
1.25	D 4A		2.1		1.40			
1.50	D 5A				(0.40)	Silty CLAY (CH) high plasticity, grey. Dry to moist. Inferred very soft.		
1.80	D 6A		1.7		1.80			
					(0.70)	CLAY (CH) high plasticity, pale grey, with pale brown-yellow sandy clay pockets (20mm). Moist. Soft to firm.		
			1.0		2.50			
						Trial pit completed at 2.5m depth		

Remarks

B = Bulk disturbed
D = Small Disturbed

Local coords:
Ground level = 3.511mAHD
Investigation/cluster ref: Test Pits

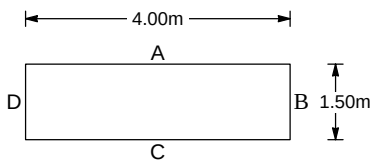
Plant: PC300
Crew: Mike Pengelly

Groundwater

water ingress at 0.4m depth

Shoring/Support: None

Stability: Stable



Client	INPEX Browse Ltd	Logged by:AH	Database check: KN

Hole/test made by Contractor but logged by Arup.
<<DrawingFileSpec>>

TP 01 Photo 1

TP 01 Photo 2

ARUP | Test Pit Log

Job No.	Hole ref	Page
205190	**TP01A**	1 of 1

Contractor: Mark Cundall

Ichthys Gas Field Development
Onshore Geotechnical GI

NG co-ordinates	Ground Level (mAHD)	Date
708200 E 8615684 N	3.72	03-Jun-08

Samples & tests			Strata log					
Depth	Sample Type Ref	Test Result	Reduced Level	Legend	Depth (Thickness)	Description	Stratum	Geology
0.25	B 1A					SAND (SP) fine to medium grained, pale grey (quartz) Dry to moist. Loose. .... 0.00m - 1.00m root and root fibres.		
0.50	D 2A					.... 0.50m becoming moist to wet .... 0.60m roots grading out.		
1.00	D 3A				(1.50)			
			2.2		1.50			
2.00	B 4B					Clayey SILT (MH) high plasticity, pale grey mottled pale orange-brown and red-brown, with friable pockets and weakly cemented in siltstone zones. Moist to wet. Inferred firm. .... 2.00m becoming drier (moist) and more friable. Inferred stiff.		
2.00	D 4A				(1.90)			
						.... 2.70m mottled pale orange-brown and pale grey.		
			0.3		3.40			
						Trial pit completed at 3.4m depth		

Remarks

B = Bulk disturbed
D = Small Disturbed

Local coords:
Ground level = 3.719mAHD
Investigation/cluster ref: Test Pits

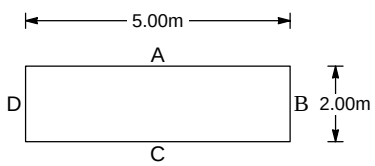
Plant: PC300
Crew: Mike Pengelly

Groundwater

water ingress at 0.8m depth

Shoring/Support: None

Stability: Stable



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Hole/test made by Contractor but logged by Arup.
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TP 01A Photo 1

TP 01A Photo 2

ARUP | Test Pit Log

Job No.	Hole ref	Page
205190	**TP02**	1 of 1

Contractor: Mark Cundall

Ichthys Gas Field Development
Onshore Geotechnical GI

NG co-ordinates	Ground Level (mAHD)	Date
708838 E 8615868 N	4.14	23-Apr-08

Samples & tests			Strata log					
Depth	Sample Type Ref	Test Result	Reduced Level	Legend	Depth (Thickness)	Description	Stratum	Geology
0.05	D 1A		3.9		(0.25) 0.25	SILT (ML) low plasticity, black, with gravel, medium sized, with with roots and root fibres to 40mm. Inferred soft.		
0.30	D 5A					Sandy CLAY (CL) medium plasticity, grey grading pale brown to brown, sand, fine to medium grained. with Soft.		
0.30	B 5B				(0.65)			
0.50	D 2A		3.2		0.90			
					(0.60)	CLAY (CL) medium plasticity, pale grey with red-brown, with pockets of pale yellow-brown sandy clay, medium grained, with gravel, medium sized.		
1.20	D 3A		2.6		1.50			
1.50	D 4A					*Trial pit completed at 1.5m depth*		

Remarks

B = Bulk disturbed
D = Small Disturbed

Local coords:
Ground level = 4.14mAHD
Investigation/cluster ref: Test Pits

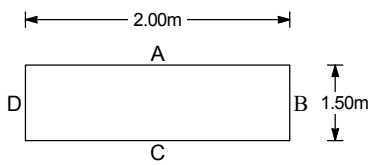
Plant: PC300
Crew: Mike Pengelly

Groundwater

No groundwater encountered

Shoring/Support: None

Stability: Stable



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Hole/test made by Contractor but logged by Arup.
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TP 02 Photo 1

TP 02 Photo 2

ARUP | Test Pit Log

Job No.	Hole ref	Page
205190	**TP02A**	1 of 1

Contractor: Mark Cundall

Ichthys Gas Field Development
Onshore Geotechnical GI

NG co-ordinates	Ground Level (mAHD)	Date
708838 E 8615864 N	4.12	03-Jun-08

Samples & tests			Strata log					
Depth	Sample Type Ref	Test Result	Reduced Level	Legend	Depth (Thickness)	Description	Stratum	Geology
			3.6		(0.55) 0.55	Silty SAND (SM) fine to medium grained, brown-grey, with roots and root fibres (to 15mm). Dry to moist. Loose - medium dense.		
0.50	D 1A							
0.50	B 1B							
1.00	D 2A		2.4		(1.15) 1.70	Clayey SAND (SC) fine to medium grained, pale orange-brown mottled orange-brown and pale grey, with gravel, fine size, sub-rounded, occasional weakly to strongly cemented zones, with root fibres. Moist to wet. Medium dense.		
2.00	D 3A		1.6		(0.80) 2.50	Silty CLAY (CH) high plasticity, pale grey mottled pale red-brown and orange-brown. Moist. Firm.		
2.00	B 3B							
						Trial pit completed at 2.5m depth		

Remarks

B = Bulk disturbed
D = Small Disturbed

Local coords:
Ground level = 4.118mAHD
Investigation/cluster ref: Test Pits

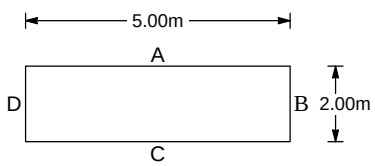
Plant: PC300
Crew: Mike Pengelly

Groundwater

water ingress at 1.0m depth

Shoring/Support: None

Stability: Unstable, walls collapsing at 1.5m depth



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TP 02A Photo 1

TP 02A Photo 2

ARUP | Test Pit Log

Job No.	Hole ref	Page
205190	**TP03**	1 of 1

Contractor: Mark Cundall

Ichthys Gas Field Development
Onshore Geotechnical GI

NG co-ordinates	Ground Level (mAHD)	Date
708754 E 8614894 N	7.44	23-Apr-08

Samples & tests			Strata log					
Depth	Sample Type Ref	Test Result	Reduced Level	Legend	Depth (Thickness)	Description	Stratum	Geology
			7.2		(0.20) 0.20	Gravelly Silty SAND (SM) fine grained, grey-brown, gravel, fine sized and rounded with with roots and root fibres to 40mm. Dry. Inferred loose.		
0.10	D 1A		6.9		(0.30) 0.50	Gravelly SILT (ML) low plasticity, grey-brown, gravel, fine sized, sub-rounded. Dry. Inferred dense.		
0.30	D 2A							
0.30	B 2B					Clayey SILT (ML) low plasticity orange-brown mottled red-brown and yellow-brown, friable, desiccated, weakly to strongly cemented, trace inclusions of red-brown and yellow-brown clayey sand. Dry. Inferred Hard.		
0.70	D 3A							
					(2.50)	.... 1.70m grading pale grey mottled pale orange-brown		
2.00	D 4A		4.4		3.00			
						.... 3.00m low to medium strength rock material encountered *Trial pit completed at 3m depth*		

Remarks

B = Bulk disturbed
D = Small Disturbed

Local coords:
Ground level = 7.444mAHD
Investigation/cluster ref: Test Pits

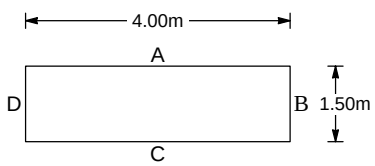
Plant: PC300
Crew: Mike Pengelly

Groundwater

No groundwater encountered

Shoring/Support: None

Stability: Stable



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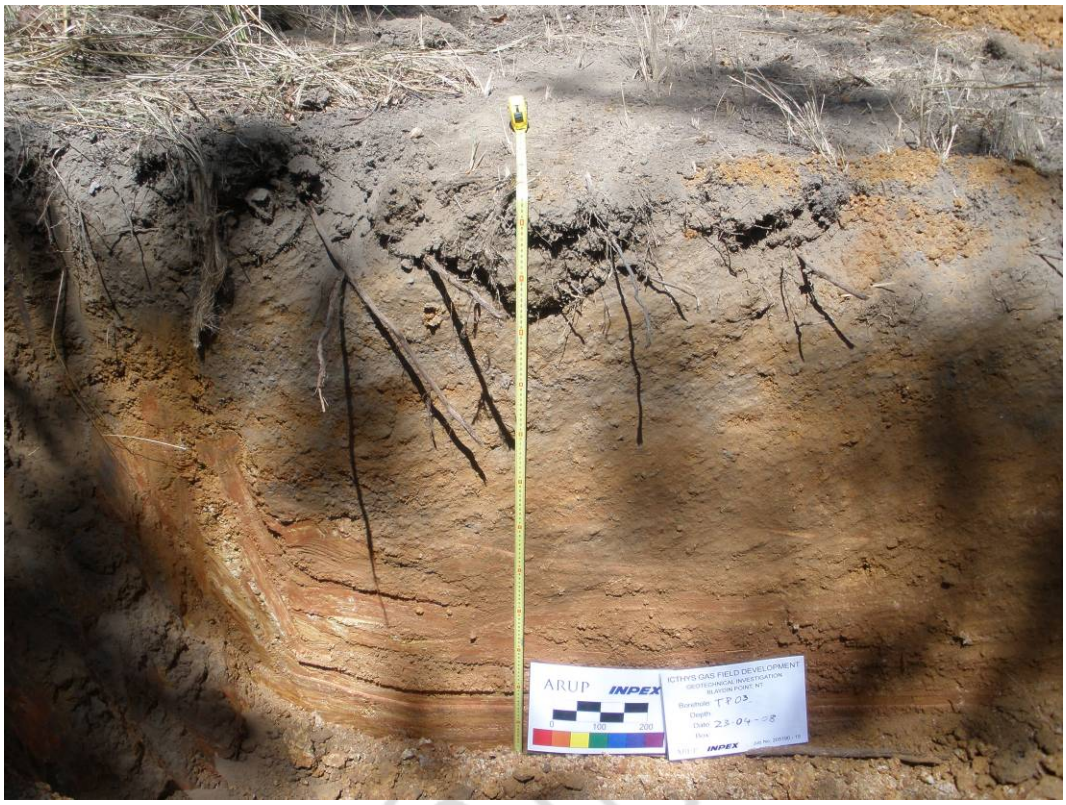


TP 03 Photo 1

TP 03 Photo 2

ARUP | Test Pit Log

Job No.	Hole ref	Page
205190	**TP03A**	1 of 1

Contractor: Mark Cundall

Ichthys Gas Field Development
Onshore Geotechnical GI

NG co-ordinates	Ground Level (mAHD)	Date
708753 E 8614888 N	7.33	03-Jun-08

Samples & tests			Strata log					
Depth	Sample Type Ref	Test Result	Reduced Level	Legend	Depth (Thickness)	Description	Stratum	Geology
			7.1		(0.20) 0.20	Silty SAND (SM) fine to medium grained, pale grey-brown, with gravel, fine size, sub-rounded, with root and root fibres. Dry. Medium dense to very dense.		
0.50	D 1A				(2.80)	Sandy SILT (ML) low plasticity, pale orange-brown mottled pale grey and red-brown, with weakly to strongly cemented zones and lateritic weathering. Dry. Dense to very dense.		
0.75	B 2A							
1.00	D 3A							
2.00	D 4A							
2.50	B 5A							
			4.3		3.00	*Trial pit completed at 3m depth*		

Remarks

B = Bulk disturbed
D = Small Disturbed

Local coords:
Ground level = 7.329mAHD
Investigation/cluster ref: Test Pits

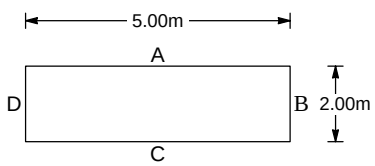
Plant: PC300
Crew: Mike Pengelly

Groundwater

No groundwater encountered

Shoring/Support: None

Stability: Stable



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TP 03A Photo 1

TP 03A Photo 2

ARUP | Test Pit Log

Job No.	Hole ref	Page
205190	**TP04**	1 of 1

Contractor: Mark Cundall

Ichthys Gas Field Development
Onshore Geotechnical GI

NG co-ordinates	Ground Level (mAHD)	Date
709283 E 8614694 N	5.63	23-Apr-08

Samples & tests			Strata log					
Depth	Sample Type Ref	Test Result	Reduced Level	Legend	Depth (Thickness)	Description	Stratum	Geology
0.10	D 1A		5.3		(0.30) 0.30	SAND (SW) fine grained, grey-brown, with gravel, fine to medium grained, sub-rounded to rounded, with roots and root fibres to 40mm. Dry. Loose.		
0.40	B 2B					SILT (ML) low plasticity, grey-brown with some orange-brown mottling, with gravel fine grained, sub-rounded. Dry. Dense.		
0.50	D 2A		4.6		(0.70) 1.00			
1.20	D 3A		3.6		(1.00) 2.00	SILT (ML) low plasticity, red-brown mottled orange-brown and yellow brown, with weathering induced gravels, fine to medium sized. Moist. Hard.		
2.10	D 5A		2.3		(1.30) 3.30	Silty CLAY (CL) low plasticity, white with yellow-brown and orange-brown mottling, fissured with zones of silty sand and clayey sand. .... 2.40m water ingress		
3.30	D 4A					*Trial pit completed at 2.4m depth*		

Remarks

B = Bulk disturbed
D = Small Disturbed

Local coords:
Ground level = 5.625mAHD
Investigation/cluster ref: Test Pits

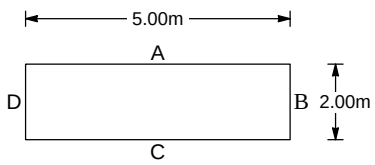
Plant: PC300
Crew: Mike Pengelly

Groundwater

water ingress at 2.4m depth

Shoring/Support: None

Stability: Stable



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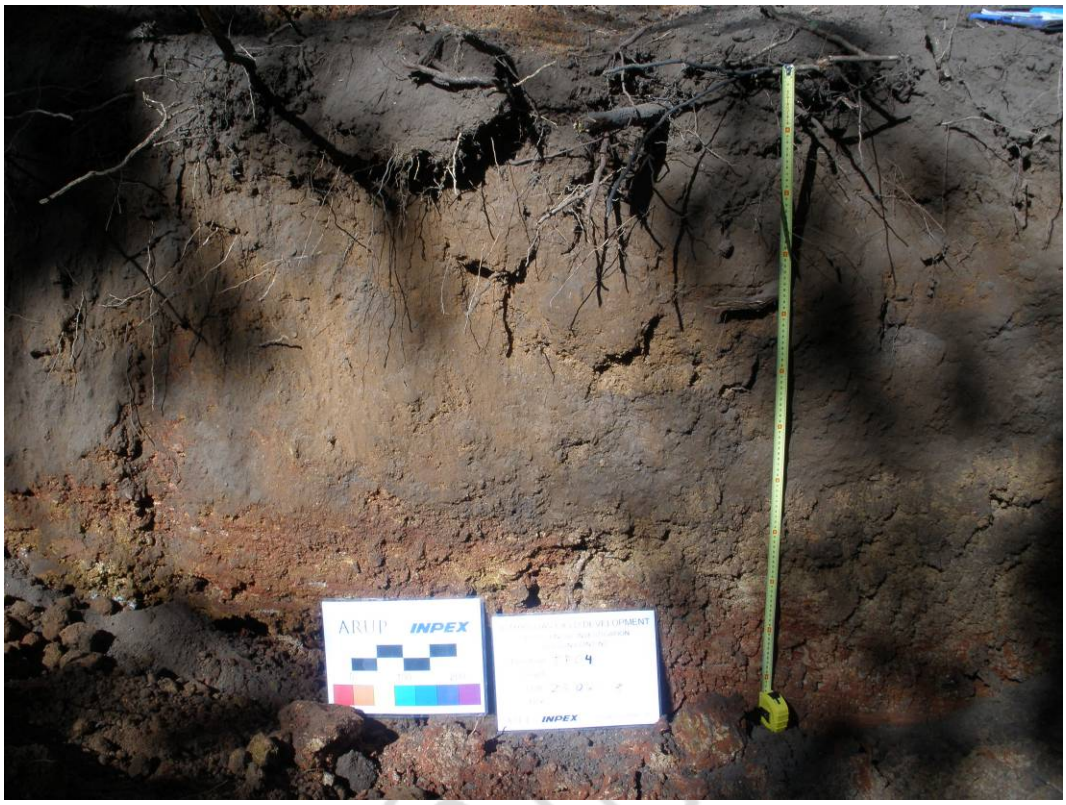


TP 04 Photo 1

TP 04 Photo 2

ARUP | Test Pit Log

Job No.	Hole ref	Page
205190	**TP04A**	1 of 1

Contractor: Mark Cundall

Ichthys Gas Field Development
Onshore Geotechnical GI

NG co-ordinates	Ground Level (mAHD)	Date
709299 E 8614702 N	5.58	03-Jun-08

Samples & tests			Strata log					
Depth	Sample Type Ref	Test Result	Reduced Level	Legend	Depth (Thickness)	Description	Stratum	Geology
			5.0		(0.60) 0.60	Silty Gravelly SAND (SW) fine to medium grained, pale orange-brown, gravel, fine to medium size, sub-angular (pisolitic/ lateritic). Dry to moist. Medium dense to dense.		
0.50	D 1A							
0.75	B 2A							
1.00	D 3A				(1.20)	Silty SAND (SM) fine to medium grained, red-brown mottled pale orange-brown, occasionally weakly cemented zones. Dry to moist. Dense to very dense.		
			3.8		1.80	.... 1.70m moist		
2.00	B 4B					Clayey Silty SAND (SM) fine to medium grained, pale grey mottled red-brown and pale orange-brown, fines, medium plasticity, occasionally weakly cemented zones. Moist to wet. Loose to medium dense.		
2.00	D 4A				(1.80)			
			2.0		3.60	*Trial pit completed at 3.6m depth*		

Remarks

B = Bulk disturbed
D = Small Disturbed

Local coords:
Ground level = 5.577mAHD
Investigation/cluster ref: Test Pits

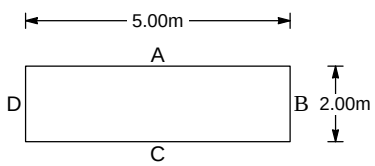
Plant: PC300
Crew: Mike Pengelly

Groundwater

water ingress at 3.2m depth

Shoring/Support: None

Stability: Unstable, walls caving in at 2.2m depth



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TP 04A Photo 1

TP 04A Photo 2

ARUP | Test Pit Log

Job No.	Hole ref	Page
205190	**TP05**	1 of 1

Contractor: Mark Cundall

Ichthys Gas Field Development
Onshore Geotechnical GI

NG co-ordinates	Ground Level (mAHD)	Date
708432 E 8612846 N	9.79	24-Apr-08

Samples & tests			Strata log					
Depth	Sample Type Ref	Test Result	Reduced Level	Legend	Depth (Thickness)	Description	Stratum	Geology
0.30	D 1A		9.3		(0.50) 0.50	Sandy SILT (ML) low plasticity, dark grey-brown, sand, fine to medium grained, trace gravel, fine to medium grained, sub-rounded, with roots and root fibres to 40mm. Dry. Medium dense.		
0.30	B 1B							
0.90	D 2A		8.3		(1.00) 1.50	Sandy CLAY (CL) low plasticity, orange-brown mottled pale red-brown and yellow-brown, sand, fine to medium grained, with gravel fine to medium sized weakly cemented. Dry. Very dense.		
2.50	D 3A		6.1		(2.20) 3.70	Silty CLAY (CL) low plasticity, white to pale grey with some pale orange-brown and red-brown mottling, weakly to strongly cemented. Dry. Very dense.		
						.... 3.70m low strength rock material encountered *Trial pit completed at 3.7m depth*		

Remarks

B = Bulk disturbed
D = Small Disturbed

Local coords:
Ground level = 9.789mAHD
Investigation/cluster ref: Test Pits

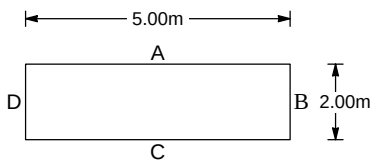
Plant: PC300
Crew: Mike Pengelly

Groundwater

No groundwater encountered

Shoring/Support: None

Stability: Stable



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Hole/test made by Contractor but logged by Arup.
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TP 05 Photo 1

TP 05 Photo 2

ARUP | Test Pit Log

Job No.	Hole ref	Page
205190	**TP05A**	1 of 1

Contractor: Mark Cundall

Ichthys Gas Field Development
Onshore Geotechnical GI

NG co-ordinates	Ground Level (mAHD)	Date
708436 E 8612848 N	9.89	03-Jun-08

Samples & tests			Strata log					
Depth	Sample Type Ref	Test Result	Reduced Level	Legend	Depth (Thickness)	Description	Stratum	Geology
			9.5		(0.40) 0.40	Silty Gravelly SAND (SW) fine to medium grained, gravel, fine to medium size, sub-angular to sub-rounded. Dry. Medium Dense.		
0.50	D 1A					Silty SAND (SM) fine to medium grained, red-brown mottled pale grey and pale orange-brown, with gravel, fine to medium size, subangular-sub-rounded, with weakly to strongly cemented zones. Dry. Dense.		
0.50	B 1B							
1.00	D 2A				(2.60)			
2.00	D 3A							
2.00	B 3B		6.9		3.00			
						Trial pit completed at 3m depth		

Remarks

B = Bulk disturbed
D = Small Disturbed

Local coords:
Ground level = 9.891mAHD
Investigation/cluster ref: Test Pits

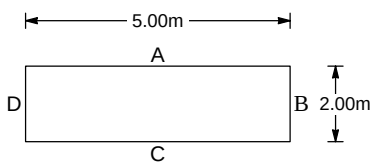
Plant: PC300
Crew: Mike Pengelly

Groundwater

No groundwater encountered

Shoring/Support: None

Stability: Stable



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Hole/test made by Contractor but logged by Arup.
<<DrawingFileSpec>>

TP 05A Photo 1

TP 05A Photo 2

ARUP | Test Pit Log

Job No.	Hole ref	Page
205190	**TP06**	1 of 1

Contractor: Mark Cundall

Ichthys Gas Field Development
Onshore Geotechnical GI

NG co-ordinates	Ground Level (mAHD)	Date
708309 E 8612666 N	10.64	24-Apr-08

Samples & tests			Strata log					
Depth	Sample Type Ref	Test Result	Reduced Level	Legend	Depth (Thickness)	Description	Stratum	Geology
0.30	B 1B		10.0		(0.60) 0.60	Sandy CLAY (CL) low plasticity, pale grey-brown with some orange-brown mottling, with gravel, medium to coarse sized. Dry.		
0.30	D 1A							
0.80	D 2A					PHYLLITE fine grained, poorly developed bedding, dipping sub-vertically, very low strength, pale grey with pale yellow-brown and pale red-brown mottling.		
2.50	D 3A		6.1		(3.90) 4.50			
						Trial pit completed at 4.5m depth		

Remarks

B = Bulk disturbed
D = Small Disturbed

Local coords:
Ground level = 10.638mAHD
Investigation/cluster ref: Test Pits

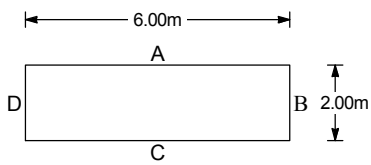
Plant: PC300
Crew: Mike Pengelly

Groundwater

No groundwater encountered

Shoring/Support: None

Stability: Stable



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Hole/test made by Contractor but logged by Arup.
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TP 06 Photo 1

TP 06 Photo 2

ARUP | Test Pit Log

Job No.	Hole ref	Page
205190	**TP07**	1 of 1

Contractor: Mark Cundall

Ichthys Gas Field Development
Onshore Geotechnical GI

NG co-ordinates	Ground Level (mAHD)	Date
708190 E 8612312 N	10.25	24-Apr-08

Samples & tests			Strata log					
Depth	Sample Type Ref	Test Result	Reduced Level	Legend	Depth (Thickness)	Description	Stratum	Geology
0.30	D 1A		9.7		(0.50) 0.50	Sandy CLAY (CL) low to medium plasticity, brown grading orange-brown, sand, fine to medium grained, with gravel, medium to coarse sized. Dry. Medium dense.		
0.30	D 1B					PHYLLITE fine grained, poorly developed bedding, dipping sub-vertically, poorly developed foliation dipping sub-vertically, extremely to very low strength, pale grey with red-brown and pale orange-brown staining.		
0.30	B 1c							
0.70	D 2A							
1.70	D 3A				(2.80)			
			6.9		3.30			
						Trial pit completed at 3.3m depth		

Remarks

B = Bulk disturbed
D = Small Disturbed

Local coords:
Ground level = 10.247mAHD
Investigation/cluster ref: Test Pits

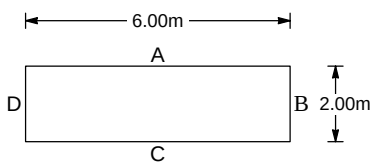
Plant: PC300
Crew: Mike Pengelly

Groundwater

No groundwater encountered

Shoring/Support: None

Stability: Stable



Client	INPEX Browse Ltd	Logged by:AH	Database check: KN

Hole/test made by Contractor but logged by Arup.
<<DrawingFileSpec>>

TP 07 Photo 1

TP 07 Photo 2

ARUP | Test Pit Log

Job No.	Hole ref	Page
205190	**TP08**	1 of 1

Contractor: Mark Cundall

Ichthys Gas Field Development
Onshore Geotechnical GI

NG co-ordinates	Ground Level (mAHD)	Date
708188 E 8612054 N	11.57	25-Apr-08

Samples & tests			Strata log					
Depth	Sample Type Ref	Test Result	Reduced Level	Legend	Depth (Thickness)	Description	Stratum	Geology
0.05	D 1A		11.4		(0.20) 0.20	Sandy SILT (ML) low plasticity dark grey/ black, sand, medium grained. Moist. Soft.		
0.05	D 1B					Sandy CLAY (CL) medium plasticity, pale orange-brown sand, fine to medium grained, with gravel, medium to coarse sized, with some pockets of silty clay, weakly cemented. Moist. Firm.		
0.30	D 2A							
0.30	D 2B							
0.30	B 2C				(1.80)			
			9.6		2.00	.... 1.80m water ingress, pit walls collapsing		
2.00	D 3A		9.4		(0.20) 2.20	Sandy CLAY (CL) high plasticity, pale grey mottled pale red-brown, sand fine to medium grained, with some pockets of silt. Moist. Firm.		
						.... 2.20m low strength rock material encountered *Trial pit completed at 2.2m depth*		

Remarks

B = Bulk disturbed
D = Small Disturbed

Local coords:
Ground level = 11.565mAHD
Investigation/cluster ref: Test Pits

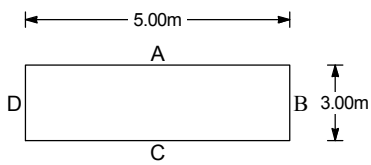
Plant: PC300
Crew: Mike Pengelly

Groundwater

water ingress at 1.8m depth

Shoring/Support: None

Stability: Unstable, walls caving in at 1.8m depth due to water ingress



Client	INPEX Browse Ltd	Logged by: AH	Database check: KN

TP 08 Photo 1

TP 08 Photo 2

ARUP | Test Pit Log

Job No.	Hole ref	Page
205190	**TP09**	1 of 1

Contractor: Mark Cundall

Ichthys Gas Field Development
Onshore Geotechnical GI

NG co-ordinates	Ground Level (mAHD)	Date
708054 E 8612686 N	4.50	24-Apr-08

Samples & tests			Strata log					
Depth	Sample Type Ref	Test Result	Reduced Level	Legend	Depth (Thickness)	Description	Stratum	Geology
0.05	D 1A		4.2		(0.30) 0.30	Silty CLAY (OL) low to medium plasticity, black,.		
0.05	D 1B					Sandy CLAY medium to high plasticity, grey with some red-brown and pale orange-brown mottling sand, fine to medium grained, weakly to strongly cemented zones as a result of lateritic weathering. Moist. Very Stiff.		
0.40	D 2A							
0.40	D 2B					.... 0.70m water ingress		
0.40	B 2C							
0.60	D 3A				(2.20)			
0.60	D 3B							
			2.0		2.50			
2.80	D 4A				(1.00)	PHYLLITE fine grained, indeterminate bedding, poorly developed sub-vertical foliation, very low to low strength, pale yellow-brown/ pale grey-brown with some red-brown staining.		
			1.0		3.50			
						Trial pit completed at 3.5m depth		

Remarks

B = Bulk disturbed
D = Small Disturbed

Local coords:
Ground level = 4.501mAHD
Investigation/cluster ref: Test Pits

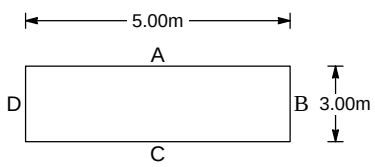
Plant: PC300
Crew: Mike Pengelly

Groundwater

water ingress at 0.7m depth

Shoring/Support: None

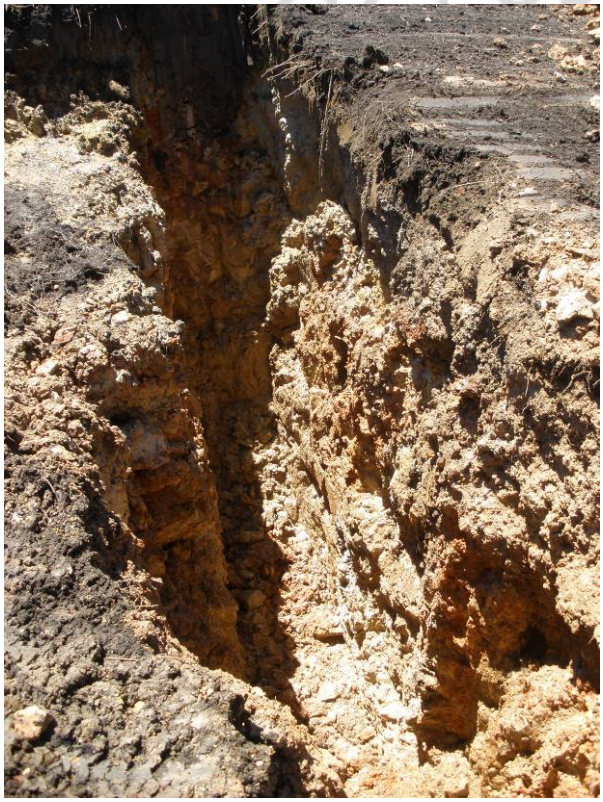
Stability: Stable



Client	INPEX Browse Ltd	Logged by:AH	Database check: KN

Hole/test made by Contractor but logged by Arup.
<<DrawingFileSpec>>

TP 09 Photo 1



TP 09 Photo 2

Appendix B Laboratory Report

Appendix B

B.1 Laboratory Report

B.2 Chain of Custody

B.3 Sample Log Sheets

LABORATORY REPORT COVERSHEET

Date: 3 July 2008

To: URS Corporation
Level 3
93 Mitchell Street
DARWIN NT 0801

Attention: Ian Hollingsworth

Your Reference: Blaydin Point
Laboratory Report No: 60022
Samples Received: 17/06/2008
Samples / Quantity: 100 Soils

The above samples were received intact and analysed according to your written instructions. Unless otherwise stated, solid samples are reported on a dry weight basis and liquid samples as received.

This report supersedes our preliminary results issued 27 June 2008.

Shey Goddard
Administration Manager
CAIRNS

Jon Dicker
Manager
CAIRNS

SGS Australia Pty Ltd
ABN 44 000 964 278
Environmental Services Unit 2, 58 Comport Street, Portsmith 4870 QLD Australia
t +61 (0)7 4035 5111 f +61 (0)7 4035 5122

CLIENT: URS Corporation **Laboratory Report No:** 60022
PROJECT: Blaydin Point

LABORATORY REPORT

-------- Our Reference Your Reference Date Sampled	Units	60022-1 42906730 - 001 27/05/2008	60022-2 42906730 - 002 27/05/2008	60022-3 42906730 - 003 27/05/2008
pH (1:5)	pH Units	4.9	5.4	5.8
Electrical Conductivity (1:5)	µS/cm	230	620	94
Emmerson Class Number #		[NA]	[NA]	5

-------- Our Reference Your Reference Date Sampled	Units	60022-4 42906730 - 004 27/05/2008	60022-5 42906730 - 005 27/05/2008	60022-6 42906730 - 006 27/05/2008
pH (1:5)	pH Units	5.8	5.8	5.9
Electrical Conductivity (1:5)	µS/cm	42	40	31
Emmerson Class Number #		5	[NA]	[NA]

-------- Our Reference Your Reference Date Sampled	Units	60022-7 42906730 - 007 27/05/2008	60022-8 42906730 - 008 27/05/2008	60022-11 42906730 - 011 27/05/2008
Emmerson Class Number #		5	6	5

-------- Our Reference Your Reference Date Sampled	Units	60022-12 42906730 - 012 27/05/2008	60022-13 42906730 - 013 28/05/2008	60022-14 42906730 - 014 28/05/2008
pH (1:5)	pH Units	[NA]	7.6	5.4
Electrical Conductivity (1:5)	µS/cm	[NA]	13,000	17,000
Emmerson Class Number #		6	[NA]	[NA]

-------- Our Reference Your Reference Date Sampled	Units	60022-15 42906730 - 015 28/05/2008	60022-16 42906730 - 016 28/05/2008	60022-17 42906730 - 017 28/05/2008
pH (1:5)	pH Units	[NA]	[NA]	6.8
Electrical Conductivity (1:5)	µS/cm	[NA]	[NA]	7,000
Emmerson Class Number #		6	6	[NA]

CLIENT: URS Corporation **Laboratory Report No:** 60022

PROJECT: Blaydin Point

LABORATORY REPORT

-------- Our Reference Your Reference Date Sampled	Units	60022-18 42906730 - 018 28/05/2008	60022-19 42906730 - 019 28/05/2008	60022-20 42906730 - 020 28/05/2008
pH (1:5)	pH Units	5.6	[NA]	[NA]
Electrical Conductivity (1:5)	µS/cm	5,000	[NA]	[NA]
Emmerson Class Number #		[NA]	6	5

-------- Our Reference Your Reference Date Sampled	Units	60022-21 42906730 - 021 28/05/2008	60022-22 42906730 - 022 28/05/2008	60022-23 42906730 - 023 29/05/2008
pH (1:5)	pH Units	5.9	5.9	5.7
Electrical Conductivity (1:5)	µS/cm	280	140	1,700
Emmerson Class Number #		5	5	[NA]

-------- Our Reference Your Reference Date Sampled	Units	60022-24 42906730 - 024 29/05/2008	60022-25 42906730 - 025 29/05/2008	60022-26 42906730 - 026 29/05/2008
pH (1:5)	pH Units	5.3	5.8	6.1
Electrical Conductivity (1:5)	µS/cm	1,300	3,000	2,600

-------- Our Reference Your Reference Date Sampled	Units	60022-27 42906730 - 027 29/05/2008	60022-28 42906730 - 028 29/05/2008	60022-29 42906730 - 029 29/05/2008
pH (1:5)	pH Units	5.4	5.3	7.7
Electrical Conductivity (1:5)	µS/cm	120	1,100	9,000

-------- Our Reference Your Reference Date Sampled	Units	60022-30 42906730 - 030 29/05/2008	60022-31 42906730 - 031 29/05/2008	60022-32 42906730 - 032 29/05/2008
pH (1:5)	pH Units	7.8	5.4	5.3
Electrical Conductivity (1:5)	µS/cm	4,000	270	140

CLIENT: URS Corporation **Laboratory Report No:** 60022
PROJECT: Blaydin Point

LABORATORY REPORT

-------- Our Reference Your Reference Date Sampled	Units	60022-33 42906730 - 033 29/05/2008	60022-34 42906730 - 034 29/05/2008	60022-35 42906730 - 035 29/05/2008
pH (1:5)	pH Units	5.5	5.4	5.4
Electrical Conductivity (1:5)	µS/cm	210	110	7,000
Emmerson Class Number #		5	5	[NA]

-------- Our Reference Your Reference Date Sampled	Units	60022-36 42906730 - 036 29/05/2008	60022-37 42906730 - 037 29/05/2008	60022-38 42906730 - 038 29/05/2008
pH (1:5)	pH Units	6.3	6.8	6.7
Electrical Conductivity (1:5)	µS/cm	1,100	6,000	12,000

-------- Our Reference Your Reference Date Sampled	Units	60022-51 42906730 - 051 30/05/2008	60022-52 42906730 - 052 30/05/2008	60022-53 42906730 - 053 30/05/2008
pH (1:5)	pH Units	5.4	5.4	4.5
Electrical Conductivity (1:5)	µS/cm	17,000	17,000	8,000

-------- Our Reference Your Reference Date Sampled	Units	60022-54 42906730 - 054 30/05/2008	60022-55 42906730 - 055 30/05/2008	60022-67 42906730 - 067 2/06/2008
pH (1:5)	pH Units	7.0	6.8	5.5
Electrical Conductivity (1:5)	µS/cm	11,000	4,000	2,200

-------- Our Reference Your Reference Date Sampled	Units	60022-68 42906730 - 068 2/06/2008	60022-69 42906730 - 069 2/06/2008	60022-70 42906730 - 070 2/06/2008
pH (1:5)	pH Units	6.0	6.8	5.1
Electrical Conductivity (1:5)	µS/cm	1,800	29,000	32,000

CLIENT: URS Corporation **Laboratory Report No:** 60022

PROJECT: Blaydin Point

LABORATORY REPORT

-------- Our Reference Your Reference Date Sampled	Units	60022-73 42906730 - 073 2/06/2008	60022-74 42906730 - 074 2/06/2008	60022-75 42906730 - 075 2/06/2008
pH (1:5)	pH Units	7.6	4.0	7.5
Electrical Conductivity (1:5)	µS/cm	13,000	36,000	18,000

-------- Our Reference Your Reference Date Sampled	Units	60022-76 42906730 - 076 2/06/2008	60022-77 42906730 - 077 2/06/2008	60022-79 42906730 - 079 2/06/2008
pH (1:5)	pH Units	4.4	5.8	6.2
Electrical Conductivity (1:5)	µS/cm	40,000	1,200	25,000

-------- Our Reference Your Reference Date Sampled	Units	60022-80 42906730 - 080 2/06/2008	60022-82 42906730 - 082 2/06/2008	60022-85 42906730 - 085 2/06/2008
pH (1:5)	pH Units	4.7	4.3	6.3
Electrical Conductivity (1:5)	µS/cm	27,000	28,000	14,000

-------- Our Reference Your Reference Date Sampled	Units	60022-86 42906730 - 086 2/06/2008	60022-87 42906730 - 087 2/06/2008	60022-88 42906730 - 088 2/06/2008
pH (1:5)	pH Units	6.5	5.5	5.4
Electrical Conductivity (1:5)	µS/cm	15,000	500	530

-------- Our Reference Your Reference Date Sampled	Units	60022-90 42906730 - 090 2/06/2008	60022-91 42906730 - 091 2/06/2008	60022-92 42906730 - 092 2/06/2008
pH (1:5)	pH Units	5.3	8.3	8.3
Electrical Conductivity (1:5)	µS/cm	480	16,000	18,000

CLIENT: URS Corporation **Laboratory Report No:** 60022

PROJECT: Blaydin Point

LABORATORY REPORT

-------- Our Reference Your Reference Date Sampled	Units	60022-94 42906730 - 094 2/06/2008	60022-95 42906730 - 095 2/06/2008	60022-96 42906730 - 096 2/06/2008
pH (1:5)	pH Units	8.3	7.4	6.2
Electrical Conductivity (1:5)	µS/cm	17,000	27,000	26,000

-------- Our Reference Your Reference Date Sampled	Units	60022-97 42906730 - 097 2/06/2008	60022-98 42906730 - 098 2/06/2008	60022-99 42906730 - 099 2/06/2008
pH (1:5)	pH Units	7.4	7.0	7.3
Electrical Conductivity (1:5)	µS/cm	24,000	23,000	21,000

CLIENT: URS Corporation **Laboratory Report No:** 60022

PROJECT: Blaydin Point

LABORATORY REPORT

Chromium Suite - Acid Base Accounting Our Reference Your Reference Date Sampled	Units	60022-39 42906730 - 039 29/05/2008	60022-40 42906730 - 040 29/05/2008	60022-41 42906730 - 041 29/05/2008
Moisture	% w/w	30	18	32
pH KCl	pH Units	5.9	6.3	6.4
s-TAA pH 6.5	% w/w S	0.02	0.01	<0.01
TAA pH 6.5	moles H^+/tonne	15	6	<5
Chromium Reducible Sulfur (SCR)	% w/w	0.81	0.52	0.068
a-Chromium Reducible Sulfur	moles H^+ / tonne	500	330	43
SHCl ^	% w/w	NA	NA	NA
S KCl ^	% w/w	NA	NA	NA
S NAS ^	% w/w	NA	NA	NA
Acid Neutralisation Capacity	% $CaCO_3$	NA	NA	NA
s-ANC	% w/w S	NA	NA	NA
a-ANC	moles H^+ / tonne	NA	NA	NA
s-Net Acidity	% w/w S	0.83	0.53	0.07
a-Net Acidity	moles H^+/tonne	520	330	44
Liming Rate	kg $CaCO_3$/tonne	39	25	3.3
Verification s-Net Acidity	% w/w S	0.81	0.52	0.07
a-Net Acidity without ANC	moles H^+/tonne	520	330	44
Liming Rate without ANC	kg $CaCO_3$/tonne	39	25	3.3

CLIENT: URS Corporation **Laboratory Report No:** 60022

PROJECT: Blaydin Point

LABORATORY REPORT

Chromium Suite - Acid Base Accounting Our Reference Your Reference Date Sampled	Units	60022-42 42906730 - 042 29/05/2008	60022-43 42906730 - 043 29/05/2008	60022-44 42906730 - 044 29/05/2008
Moisture	% w/w	49	21	42
pH KCl	pH Units	4.6	6.4	6.1
s-TAA pH 6.5	% w/w S	0.11	<0.01	0.02
TAA pH 6.5	moles H^+/tonne	67	<5	10
Chromium Reducible Sulfur (SCR)	% w/w	1.5	0.021	0.18
a-Chromium Reducible Sulfur	moles H^+ / tonne	940	13	110
SHCl ^	% w/w	NA	NA	NA
S KCl ^	% w/w	NA	NA	NA
S NAS ^	% w/w	NA	NA	NA
Acid Neutralisation Capacity	% $CaCO_3$	NA	NA	NA
s-ANC	% w/w S	NA	NA	NA
a-ANC	moles H^+ / tonne	NA	NA	NA
s-Net Acidity	% w/w S	1.6	0.02	0.20
a-Net Acidity	moles H^+/tonne	1,000	15	120
Liming Rate	kg $CaCO_3$/tonne	75	NA	9.3
Verification s-Net Acidity	% w/w S	1.5	NA	0.18
a-Net Acidity without ANC	moles H^+/tonne	1,000	15	120
Liming Rate without ANC	kg $CaCO_3$/tonne	75	NA	9.3

CLIENT: URS Corporation **Laboratory Report No:** 60022

PROJECT: Blaydin Point

LABORATORY REPORT

Chromium Suite - Acid Base Accounting Our Reference Your Reference Date Sampled	Units	60022-45 42906730 - 045 29/05/2008	60022-46 42906730 - 046 29/05/2008	60022-47 42906730 - 047 30/05/2008
Moisture	% w/w	27	11	54
pH KCl	pH Units	5.8	5.8	6.4
s-TAA pH 6.5	% w/w S	0.03	0.02	<0.01
TAA pH 6.5	moles H^+/tonne	20	10	<5
Chromium Reducible Sulfur (SCR)	% w/w	0.016	<0.005	0.23
a-Chromium Reducible Sulfur	moles H^+ / tonne	9.9	<5	150
SHCl ^	% w/w	NA	NA	NA
S KCl ^	% w/w	NA	NA	NA
S NAS ^	% w/w	NA	NA	NA
Acid Neutralisation Capacity	% $CaCO_3$	NA	NA	NA
s-ANC	% w/w S	NA	NA	NA
a-ANC	moles H^+ / tonne	NA	NA	NA
s-Net Acidity	% w/w S	0.05	0.02	0.24
a-Net Acidity	moles H^+/tonne	30	10	150
Liming Rate	kg $CaCO_3$/tonne	2.2	NA	11
Verification s-Net Acidity	% w/w S	NA	NA	0.23
a-Net Acidity without ANC	moles H^+/tonne	30	10	150
Liming Rate without ANC	kg $CaCO_3$/tonne	2.2	NA	11

CLIENT: URS Corporation **Laboratory Report No:** 60022

PROJECT: Blaydin Point

LABORATORY REPORT

Chromium Suite - Acid Base Accounting Our Reference Your Reference Date Sampled	Units	60022-48 42906730 - 048 30/05/2008	60022-49 42906730 - 049 30/05/2008	60022-50 42906730 - 050 30/05/2008
Moisture	% w/w	54	37	34
pH KCl	pH Units	5.1	7.9	7.4
s-TAA pH 6.5	% w/w S	0.10	<0.01	<0.01
TAA pH 6.5	moles H^+/tonne	60	<5	<5
Chromium Reducible Sulfur (SCR)	% w/w	1.3	0.37	0.58
a-Chromium Reducible Sulfur	moles H^+ / tonne	810	230	360
SHCl ^	% w/w	NA	NA	NA
S KCl ^	% w/w	NA	NA	NA
S NAS ^	% w/w	NA	NA	NA
Acid Neutralisation Capacity	% $CaCO_3$	NA	0.69	0.38
s-ANC	% w/w S	NA	0.22	0.12
a-ANC	moles H^+ / tonne	NA	140	75
s-Net Acidity	% w/w S	1.4	0.23	0.50
a-Net Acidity	moles H^+/tonne	870	140	310
Liming Rate	kg $CaCO_3$/tonne	65	11	23
Verification s-Net Acidity	% w/w S	1.3	0.23	0.50
a-Net Acidity without ANC	moles H^+/tonne	870	230	360
Liming Rate without ANC	kg $CaCO_3$/tonne	65	17	27

CLIENT: URS Corporation **Laboratory Report No:** 60022

PROJECT: Blaydin Point

LABORATORY REPORT

Chromium Suite - Acid Base Accounting Our Reference Your Reference Date Sampled	Units	60022-59 42906730 - 059 30/05/2008	60022-60 42906730 - 060 30/05/2008	60022-61 42906730 - 061 30/05/2008
Moisture	% w/w	24	24	33
pH KCl	pH Units	8.6	7.6	7.4
s-TAA pH 6.5	% w/w S	<0.01	<0.01	<0.01
TAA pH 6.5	moles H^+/tonne	<5	<5	<5
Chromium Reducible Sulfur (SCR)	% w/w	0.26	0.47	0.32
a-Chromium Reducible Sulfur	moles H^+ / tonne	160	290	200
SHCl ^	% w/w	NA	NA	NA
S KCl ^	% w/w	NA	NA	NA
S NAS ^	% w/w	NA	NA	NA
Acid Neutralisation Capacity	% $CaCO_3$	0.44	0.19	0.31
s-ANC	% w/w S	0.14	0.06	0.10
a-ANC	moles H^+ / tonne	87	37	62
s-Net Acidity	% w/w S	0.16	0.43	0.25
a-Net Acidity	moles H^+/tonne	100	270	160
Liming Rate	kg $CaCO_3$/tonne	7.6	20	12
Verification s-Net Acidity	% w/w S	0.16	0.43	0.25
a-Net Acidity without ANC	moles H^+/tonne	160	290	200
Liming Rate without ANC	kg $CaCO_3$/tonne	12	22	15

CLIENT: URS Corporation **Laboratory Report No:** 60022

PROJECT: Blaydin Point

LABORATORY REPORT

Chromium Suite - Acid Base Accounting Our Reference Your Reference Date Sampled	Units	60022-62 42906730 - 062 30/05/2008	60022-65 42906730 - 065 30/05/2008	60022-66 42906730 - 066 30/05/2008
Moisture	% w/w	40	20	28
pH KCl	pH Units	6.2	6.8	5.3
s-TAA pH 6.5	% w/w S	0.01	<0.01	0.04
TAA pH 6.5	moles H^+/tonne	7	<5	25
Chromium Reducible Sulfur (SCR)	% w/w	0.71	<0.005	0.64
a-Chromium Reducible Sulfur	moles H^+ / tonne	440	<5	400
SHCl ^	% w/w	NA	NA	NA
S KCl ^	% w/w	NA	NA	NA
S NAS ^	% w/w	NA	NA	NA
Acid Neutralisation Capacity	% $CaCO_3$	NA	NA	NA
s-ANC	% w/w S	NA	NA	NA
a-ANC	moles H^+ / tonne	NA	NA	NA
s-Net Acidity	% w/w S	0.72	<0.01	0.68
a-Net Acidity	moles H^+/tonne	450	<5	420
Liming Rate	kg $CaCO_3$/tonne	34	NA	32
Verification s-Net Acidity	% w/w S	0.71	NA	0.64
a-Net Acidity without ANC	moles H^+/tonne	450	<5	420
Liming Rate without ANC	kg $CaCO_3$/tonne	34	NA	32

CLIENT: URS Corporation **Laboratory Report No:** 60022

PROJECT: Blaydin Point

LABORATORY REPORT

Chromium Suite - Acid Base Accounting Our Reference Your Reference Date Sampled	Units	60022-71 42906730 - 071 2/06/2008	60022-72 42906730 - 072 2/06/2008	60022-81 42906730 - 081 2/06/2008
Moisture	% w/w	46	59	38
pH KCl	pH Units	7.0	6.0	6.4
s-TAA pH 6.5	% w/w S	<0.01	0.03	<0.01
TAA pH 6.5	moles H^+/tonne	<5	17	<5
Chromium Reducible Sulfur (SCR)	% w/w	0.16	3.0	0.12
a-Chromium Reducible Sulfur	moles H^+ / tonne	99	1,900	74
SHCl ^	% w/w	NA	NA	NA
S KCl ^	% w/w	NA	NA	NA
S NAS ^	% w/w	NA	NA	NA
Acid Neutralisation Capacity	% $CaCO_3$	1.1	NA	NA
s-ANC	% w/w S	0.36	NA	NA
a-ANC	moles H^+ / tonne	220	NA	NA
s-Net Acidity	% w/w S	<0.01	3.0	0.12
a-Net Acidity	moles H^+/tonne	<5	1,900	75
Liming Rate	kg $CaCO_3$/tonne	NA	140	5.6
Verification s-Net Acidity	% w/w S	-0.08	3.0	0.12
a-Net Acidity without ANC	moles H^+/tonne	99	1,900	75
Liming Rate without ANC	kg $CaCO_3$/tonne	7.5	140	5.6

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Chromium Suite - Acid Base Accounting Our Reference Your Reference Date Sampled	Units	60022-82 42906730 - 082 2/06/2008	60022-85 42906730 - 085 2/06/2008	60022-86 42906730 - 086 2/06/2008
Moisture	% w/w	46	36	35
pH KCl	pH Units	4.5	6.0	6.2
s-TAA pH 6.5	% w/w S	0.14	0.02	<0.01
TAA pH 6.5	moles H^+/tonne	90	10	<5
Chromium Reducible Sulfur (SCR)	% w/w	2.2	0.41	0.46
a-Chromium Reducible Sulfur	moles H^+ / tonne	1,400	250	290
SHCl ^	% w/w	NA	NA	NA
S KCl ^	% w/w	NA	NA	NA
S NAS ^	% w/w	NA	NA	NA
Acid Neutralisation Capacity	% $CaCO_3$	NA	NA	NA
s-ANC	% w/w S	NA	NA	NA
a-ANC	moles H^+ / tonne	NA	NA	NA
s-Net Acidity	% w/w S	2.3	0.42	0.47
a-Net Acidity	moles H^+/tonne	1,400	260	290
Liming Rate	kg $CaCO_3$/tonne	110	20	22
Verification s-Net Acidity	% w/w S	2.2	0.41	0.46
a-Net Acidity without ANC	moles H^+/tonne	1,400	260	290
Liming Rate without ANC	kg $CaCO_3$/tonne	110	20	22

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Chromium Suite - Acid Base Accounting Our Reference Your Reference Date Sampled	Units	60022-87 42906730 - 087 2/06/2008	60022-88 42906730 - 088 2/06/2008	60022-89 42906730 - 089 2/06/2008
Moisture	% w/w	10	17	11
pH KCl	pH Units	4.6	4.6	4.7
s-TAA pH 6.5	% w/w S	0.15	0.11	0.13
TAA pH 6.5	moles H^+/tonne	95	70	80
Chromium Reducible Sulfur (SCR)	% w/w	0.032	0.010	0.020
a-Chromium Reducible Sulfur	moles H^+ / tonne	20	6.0	12
SHCl ^	% w/w	NA	NA	NA
S KCl ^	% w/w	NA	NA	NA
S NAS ^	% w/w	NA	NA	NA
Acid Neutralisation Capacity	% $CaCO_3$	NA	NA	NA
s-ANC	% w/w S	NA	NA	NA
a-ANC	moles H^+ / tonne	NA	NA	NA
s-Net Acidity	% w/w S	0.18	0.12	0.15
a-Net Acidity	moles H^+/tonne	110	76	92
Liming Rate	kg $CaCO_3$/tonne	8.6	5.7	6.9
Verification s-Net Acidity	% w/w S	0.03	NA	NA
a-Net Acidity without ANC	moles H^+/tonne	110	76	92
Liming Rate without ANC	kg $CaCO_3$/tonne	8.6	5.7	6.9

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Chromium Suite - Acid Base Accounting Our Reference Your Reference Date Sampled	Units	60022-90 42906730 - 090 2/06/2008	60022-91 42906730 - 091 2/06/2008	60022-92 42906730 - 092 2/06/2008
Moisture	% w/w	16	20	32
pH KCl	pH Units	4.6	7.6	8.2
s-TAA pH 6.5	% w/w S	0.12	<0.01	<0.01
TAA pH 6.5	moles H^+/tonne	72	<5	<5
Chromium Reducible Sulfur (SCR)	% w/w	0.011	<0.005	<0.005
a-Chromium Reducible Sulfur	moles H^+ / tonne	7.0	<5	<5
SHCl ^	% w/w	NA	NA	NA
S KCl ^	% w/w	NA	NA	NA
S NAS ^	% w/w	NA	NA	NA
Acid Neutralisation Capacity	% $CaCO_3$	NA	NA	NA
s-ANC	% w/w S	NA	NA	NA
a-ANC	moles H^+ / tonne	NA	NA	NA
s-Net Acidity	% w/w S	0.13	<0.01	<0.01
a-Net Acidity	moles H^+/tonne	79	<5	<5
Liming Rate	kg $CaCO_3$/tonne	6.0	NA	NA
Verification s-Net Acidity	% w/w S	NA	NA	NA
a-Net Acidity without ANC	moles H^+/tonne	79	<5	<5
Liming Rate without ANC	kg $CaCO_3$/tonne	6.0	NA	NA

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Chromium Suite - Acid Base Accounting Our Reference Your Reference Date Sampled	Units	60022-93 42906730 - 093 2/06/2008	60022-94 42906730 - 094 2/06/2008	60022-95 42906730 - 095 2/06/2008
Moisture	% w/w	21	25	53
pH KCl	pH Units	8.1	8.1	7.8
s-TAA pH 6.5	% w/w S	<0.01	<0.01	<0.01
TAA pH 6.5	moles H^+/tonne	<5	<5	<5
Chromium Reducible Sulfur (SCR)	% w/w	<0.005	<0.005	0.20
a-Chromium Reducible Sulfur	moles H^+ / tonne	<5	<5	130
SHCl ^	% w/w	NA	NA	NA
S KCl ^	% w/w	NA	NA	NA
S NAS ^	% w/w	NA	NA	NA
Acid Neutralisation Capacity	% $CaCO_3$	NA	NA	32
s-ANC	% w/w S	NA	NA	10
a-ANC	moles H^+ / tonne	NA	NA	6,500
s-Net Acidity	% w/w S	<0.01	<0.01	<0.01
a-Net Acidity	moles H^+/tonne	<5	<5	<5
Liming Rate	kg $CaCO_3$/tonne	NA	NA	NA
Verification s-Net Acidity	% w/w S	NA	NA	-6.7
a-Net Acidity without ANC	moles H^+/tonne	<5	<5	130
Liming Rate without ANC	kg $CaCO_3$/tonne	NA	NA	9.4

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Chromium Suite - Acid Base Accounting Our Reference Your Reference Date Sampled	Units	60022-96 42906730 - 096 2/06/2008	60022-97 42906730 - 097 2/06/2008	60022-98 42906730 - 098 2/06/2008
Moisture	% w/w	66	54	57
pH KCl	pH Units	7.1	7.7	7.3
s-TAA pH 6.5	% w/w S	<0.01	<0.01	<0.01
TAA pH 6.5	moles H^+/tonne	<5	<5	<5
Chromium Reducible Sulfur (SCR)	% w/w	1.6	0.27	1.3
a-Chromium Reducible Sulfur	moles H^+ / tonne	980	170	800
SHCl ^	% w/w	NA	NA	NA
S KCl ^	% w/w	NA	NA	NA
S NAS ^	% w/w	NA	NA	NA
Acid Neutralisation Capacity	% $CaCO_3$	1.1	2.5	1.4
s-ANC	% w/w S	0.36	0.80	0.46
a-ANC	moles H^+ / tonne	220	500	290
s-Net Acidity	% w/w S	1.3	<0.01	0.98
a-Net Acidity	moles H^+/tonne	830	<5	610
Liming Rate	kg $CaCO_3$/tonne	62	NA	46
Verification s-Net Acidity	% w/w S	1.3	-0.27	0.98
a-Net Acidity without ANC	moles H^+/tonne	980	170	800
Liming Rate without ANC	kg $CaCO_3$/tonne	73	13	60

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LABORATORY REPORT

Chromium Suite - Acid Base Accounting Our Reference Your Reference Date Sampled	Units	60022-99 42906730 - 099 2/06/2008	60022-100 42906730 - 100 2/06/2008
Moisture	% w/w	57	59
pH KCl	pH Units	7.5	7.2
s-TAA pH 6.5	% w/w S	<0.01	<0.01
TAA pH 6.5	moles H^+/tonne	<5	<5
Chromium Reducible Sulfur (SCR)	% w/w	0.31	0.60
a-Chromium Reducible Sulfur	moles H^+ / tonne	190	370
SHCl ^	% w/w	NA	NA
S KCl ^	% w/w	NA	NA
S NAS ^	% w/w	NA	NA
Acid Neutralisation Capacity	% $CaCO_3$	2.2	1.7
s-ANC	% w/w S	0.72	0.56
a-ANC	moles H^+ / tonne	450	350
s-Net Acidity	% w/w S	<0.01	0.22
a-Net Acidity	moles H^+/tonne	<5	140
Liming Rate	kg $CaCO_3$/tonne	NA	10
Verification s-Net Acidity	% w/w S	-0.17	0.22
a-Net Acidity without ANC	moles H^+/tonne	190	370
Liming Rate without ANC	kg $CaCO_3$/tonne	14	28

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Agricultural Soil Analyses Our Reference Your Reference Date Sampled	Units	60022-7 42906730 - 007 27/05/2008	60022-8 42906730 - 008 27/05/2008	60022-9 42906730 - 009 27/05/2008
pH (1:5)	pH Units	5.4	5.4	5.7
Electrical Conductivity (1:5)	µS/cm	59	49	70
TDS	mg/kg	200	160	230
pH - $CaCl_2$	pH units	4.7	4.9	3.3
Chloride, Cl (1:5)	mg/kg	22	33	32
Sulphur, S *	mg/kg	19	20	40
Total Oxidised Nitrogen (as N)	mg/kg	1.6	<0.3	0.3
Total Kjeldahl Nitrogen (as N)	mg/kg	310	44	310
Total Nitrogen (as N) (TKN + TON)	mg/kg	310	44	310
Total Kjeldahl Phosphorus	mg/kg	37	21	42
Colwell Phosphorus	mg/kg	7	3	3
Total Organic Carbon	% w/w	2.0	0.54	1.4
Organic Matter	% w/w	3.4	0.93	2.4
Carbon-Nitrogen Ratio		65	120	45
Sodium, Na *	mg/kg	24	28	58
Sodium (meq%)	meq%	0.10	0.12	0.25
Exchangeable Sodium *	%	4	11	20
Potassium, K *	mg/kg	97	43	64
Potassium (meq%)	meq%	0.25	0.11	0.16
Exchangeable Potassium *	%	11	10	13
Calcium, Ca *	mg/kg	260	100	65
Calcium (meq%)	meq%	1.3	0.50	0.33
Exchangeable Calcium *	%	56	44	25
Magnesium, Mg *	mg/kg	81	48	67
Magnesium (meq%)	meq%	0.66	0.39	0.55
Exchangeable Magnesium *	%	29	35	43
CEC	meq%	2.3	1.1	1.3
Iron, Fe (DTPA) *	mg/kg	120	70	90
Manganese, Mn (DTPA) *	mg/kg	110	56	19
Copper, Cu (DTPA) *	mg/kg	1.5	0.6	<0.5
Zinc, Zn (DTPA) *	mg/kg	5.5	2.9	2.4

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Agricultural Soil Analyses Our Reference Your Reference Date Sampled	Units	60022-10 42906730 - 010 27/05/2008	60022-11 42906730 - 011 27/05/2008	60022-12 42906730 - 012 27/05/2008
pH (1:5)	pH Units	5.5	6.1	5.8
Electrical Conductivity (1:5)	µS/cm	100	80	2,100
TDS	mg/kg	330	270	7,000
pH - $CaCl_2$	pH units	4.7	6.0	5.2
Chloride, Cl (1:5)	mg/kg	52	940	2,700
Sulphur, S *	mg/kg	72	70	140
Total Oxidised Nitrogen (as N)	mg/kg	<0.3	1.6	<0.3
Total Kjeldahl Nitrogen (as N)	mg/kg	48	820	580
Total Nitrogen (as N) (TKN + TON)	mg/kg	48	820	580
Total Kjeldahl Phosphorus	mg/kg	27	66	80
Colwell Phosphorus	mg/kg	2	8	3
Total Organic Carbon	% w/w	0.60	3.7	1.6
Organic Matter	% w/w	1.0	6.4	2.8
Carbon-Nitrogen Ratio		120	45	28
Sodium, Na *	mg/kg	81	530	1,600
Sodium (meq%)	meq%	0.35	2.3	7.0
Exchangeable Sodium *	%	20	16	58
Potassium, K *	mg/kg	92	140	110
Potassium (meq%)	meq%	0.24	0.36	0.28
Exchangeable Potassium *	%	13	2	2
Calcium, Ca *	mg/kg	54	1,800	490
Calcium (meq%)	meq%	0.27	9.0	2.4
Exchangeable Calcium *	%	15	62	20
Magnesium, Mg *	mg/kg	110	340	280
Magnesium (meq%)	meq%	0.90	2.8	2.3
Exchangeable Magnesium *	%	51	19	19
CEC	meq%	1.8	14	12
Iron, Fe (DTPA) *	mg/kg	90	94	130
Manganese, Mn (DTPA) *	mg/kg	13	220	120
Copper, Cu (DTPA) *	mg/kg	0.7	1.0	0.6
Zinc, Zn (DTPA) *	mg/kg	2.1	12	4.8

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Agricultural Soil Analyses Our Reference Your Reference Date Sampled	Units	60022-15 42906730 - 015 28/05/2008	60022-16 42906730 - 016 28/05/2008	60022-19 42906730 - 019 28/05/2008
pH (1:5)	pH Units	5.8	5.6	5.8
Electrical Conductivity (1:5)	µS/cm	950	370	300
TDS	mg/kg	3,200	1,200	1,000
pH - $CaCl_2$	pH units	5.5	3.1	3.9
Chloride, Cl (1:5)	mg/kg	1,200	490	320
Sulphur, S *	mg/kg	94	28	30
Total Oxidised Nitrogen (as N)	mg/kg	<0.3	0.4	0.5
Total Kjeldahl Nitrogen (as N)	mg/kg	180	76	320
Total Nitrogen (as N) (TKN + TON)	mg/kg	180	76	320
Total Kjeldahl Phosphorus	mg/kg	30	24	33
Colwell Phosphorus	mg/kg	3	2	6
Total Organic Carbon	% w/w	1.2	0.56	2.9
Organic Matter	% w/w	2.1	0.97	5.0
Carbon-Nitrogen Ratio		67	74	91
Sodium, Na *	mg/kg	750	260	190
Sodium (meq%)	meq%	3.3	1.1	0.83
Exchangeable Sodium *	%	55	42	12
Potassium, K *	mg/kg	85	53	75
Potassium (meq%)	meq%	0.22	0.14	0.19
Exchangeable Potassium *	%	4	5	3
Calcium, Ca *	mg/kg	220	120	720
Calcium (meq%)	meq%	1.1	0.60	3.6
Exchangeable Calcium *	%	18	22	53
Magnesium, Mg *	mg/kg	170	98	260
Magnesium (meq%)	meq%	1.4	0.80	2.1
Exchangeable Magnesium *	%	23	30	32
CEC	meq%	6.0	2.7	6.7
Iron, Fe (DTPA) *	mg/kg	170	95	200
Manganese, Mn (DTPA) *	mg/kg	100	45	21
Copper, Cu (DTPA) *	mg/kg	<0.5	<0.5	0.5
Zinc, Zn (DTPA) *	mg/kg	2.0	1.4	1.1

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Agricultural Soil Analyses Our Reference Your Reference Date Sampled	Units	60022-20 42906730 - 020 28/05/2008
pH (1:5)	pH Units	5.9
Electrical Conductivity (1:5)	µS/cm	79
TDS	mg/kg	260
pH - $CaCl_2$	pH units	3.7
Chloride, Cl (1:5)	mg/kg	98
Sulphur, S *	mg/kg	8
Total Oxidised Nitrogen (as N)	mg/kg	0.4
Total Kjeldahl Nitrogen (as N)	mg/kg	39
Total Nitrogen (as N) (TKN + TON)	mg/kg	39
Total Kjeldahl Phosphorus	mg/kg	24
Colwell Phosphorus	mg/kg	2
Total Organic Carbon	% w/w	0.68
Organic Matter	% w/w	1.2
Carbon-Nitrogen Ratio		170
Sodium, Na *	mg/kg	61
Sodium (meq%)	meq%	0.27
Exchangeable Sodium *	%	15
Potassium, K *	mg/kg	25
Potassium (meq%)	meq%	0.06
Exchangeable Potassium *	%	4
Calcium, Ca *	mg/kg	180
Calcium (meq%)	meq%	0.90
Exchangeable Calcium *	%	50
Magnesium, Mg *	mg/kg	68
Magnesium (meq%)	meq%	0.56
Exchangeable Magnesium *	%	31
CEC	meq%	1.8
Iron, Fe (DTPA) *	mg/kg	110
Manganese, Mn (DTPA) *	mg/kg	5.0
Copper, Cu (DTPA) *	mg/kg	<0.5
Zinc, Zn (DTPA) *	mg/kg	<0.5

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Heavy Metal Suite - 8 Our Reference Your Reference Date Sampled	Units	60022-1 42906730 - 001 27/05/2008	60022-2 42906730 - 002 27/05/2008	60022-3 42906730 - 003 27/05/2008
Arsenic, As	mg/kg	<5	<5	<5
Cadmium, Cd	mg/kg	<0.5	<0.5	<0.5
Chromium, Cr	mg/kg	54	5	22
Copper, Cu	mg/kg	<3	<3	3
Mercury, Hg	mg/kg	<0.05	<0.05	<0.05
Lead, Pb	mg/kg	4	<3	3
Nickel, Ni	mg/kg	<3	<3	<3
Zinc, Zn	mg/kg	56	29	4
Manganese, Mn	mg/kg	<20	36	230

Heavy Metal Suite - 8 Our Reference Your Reference Date Sampled	Units	60022-4 42906730 - 004 27/05/2008	60022-5 42906730 - 005 27/05/2008	60022-6 42906730 - 006 27/05/2008
Arsenic, As	mg/kg	<5	<5	<5
Cadmium, Cd	mg/kg	<0.5	<0.5	0.5
Chromium, Cr	mg/kg	24	21	35
Copper, Cu	mg/kg	<3	<3	<3
Mercury, Hg	mg/kg	<0.05	<0.05	<0.05
Lead, Pb	mg/kg	9	6	5
Nickel, Ni	mg/kg	<3	<3	<3
Zinc, Zn	mg/kg	<3	<3	6
Manganese, Mn	mg/kg	96	260	96

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Heavy Metal Suite - 8 Our Reference Your Reference Date Sampled	Units	60022-7 42906730 - 007 27/05/2008	60022-8 42906730 - 008 27/05/2008	60022-9 42906730 - 009 27/05/2008
Arsenic, As	mg/kg	<5	<5	7
Cadmium, Cd	mg/kg	<0.5	<0.5	<0.5
Chromium, Cr	mg/kg	18	17	37
Copper, Cu	mg/kg	9	5	3
Mercury, Hg	mg/kg	<0.05	<0.05	<0.05
Lead, Pb	mg/kg	8	4	8
Nickel, Ni	mg/kg	6	16	11
Zinc, Zn	mg/kg	43	26	10
Manganese, Mn	mg/kg	890	750	62

Heavy Metal Suite - 8 Our Reference Your Reference Date Sampled	Units	60022-10 42906730 - 010 27/05/2008	60022-11 42906730 - 011 27/05/2008	60022-12 42906730 - 012 27/05/2008
Arsenic, As	mg/kg	11	<5	<5
Cadmium, Cd	mg/kg	<0.5	<0.5	0.5
Chromium, Cr	mg/kg	72	20	15
Copper, Cu	mg/kg	5	6	3
Mercury, Hg	mg/kg	<0.05	<0.05	<0.05
Lead, Pb	mg/kg	11	3	6
Nickel, Ni	mg/kg	13	9	5
Zinc, Zn	mg/kg	13	28	14
Manganese, Mn	mg/kg	130	1,100	550

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Heavy Metal Suite - 8 Our Reference Your Reference Date Sampled	Units	60022-13 42906730 - 013 28/05/2008	60022-14 42906730 - 014 28/05/2008	60022-15 42906730 - 015 28/05/2008
Arsenic, As	mg/kg	12	19	<5
Cadmium, Cd	mg/kg	<0.5	<0.5	<0.5
Chromium, Cr	mg/kg	16	28	10
Copper, Cu	mg/kg	<3	3	<3
Mercury, Hg	mg/kg	<0.05	<0.05	<0.05
Lead, Pb	mg/kg	6	8	4
Nickel, Ni	mg/kg	<3	6	<3
Zinc, Zn	mg/kg	11	18	4
Manganese, Mn	mg/kg	35	24	520

Heavy Metal Suite - 8 Our Reference Your Reference Date Sampled	Units	60022-16 42906730 - 016 28/05/2008	60022-17 42906730 - 017 28/05/2008	60022-18 42906730 - 018 28/05/2008
Arsenic, As	mg/kg	<5	6	7
Cadmium, Cd	mg/kg	<0.5	<0.5	<0.5
Chromium, Cr	mg/kg	11	14	31
Copper, Cu	mg/kg	<3	6	<3
Mercury, Hg	mg/kg	<0.05	<0.05	<0.05
Lead, Pb	mg/kg	6	4	3
Nickel, Ni	mg/kg	<3	3	<3
Zinc, Zn	mg/kg	4	10	6
Manganese, Mn	mg/kg	240	49	72

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Heavy Metal Suite - 8 Our Reference Your Reference Date Sampled	Units	60022-19 42906730 - 019 28/05/2008	60022-20 42906730 - 020 28/05/2008	60022-21 42906730 - 021 28/05/2008
Arsenic, As	mg/kg	<5	<5	<5
Cadmium, Cd	mg/kg	<0.5	<0.5	<0.5
Chromium, Cr	mg/kg	13	19	23
Copper, Cu	mg/kg	<3	<3	<3
Mercury, Hg	mg/kg	<0.05	<0.05	<0.05
Lead, Pb	mg/kg	5	4	5
Nickel, Ni	mg/kg	<3	<3	4
Zinc, Zn	mg/kg	5	<3	3
Manganese, Mn	mg/kg	89	32	72

Heavy Metal Suite - 8 Our Reference Your Reference Date Sampled	Units	60022-22 42906730 - 022 28/05/2008	60022-23 42906730 - 023 29/05/2008	60022-24 42906730 - 024 29/05/2008
Arsenic, As	mg/kg	<5	36	21
Cadmium, Cd	mg/kg	<0.5	<0.5	<0.5
Chromium, Cr	mg/kg	28	28	18
Copper, Cu	mg/kg	<3	6	5
Mercury, Hg	mg/kg	<0.05	<0.05	<0.05
Lead, Pb	mg/kg	6	14	14
Nickel, Ni	mg/kg	<3	3	<3
Zinc, Zn	mg/kg	3	9	7
Manganese, Mn	mg/kg	33	660	92

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Heavy Metal Suite - 8 Our Reference Your Reference Date Sampled	Units	60022-25 42906730 - 025 29/05/2008	60022-26 42906730 - 026 29/05/2008	60022-27 42906730 - 027 29/05/2008
Arsenic, As	mg/kg	8	57	41
Cadmium, Cd	mg/kg	<0.5	<0.5	2.0
Chromium, Cr	mg/kg	15	20	14
Copper, Cu	mg/kg	8	7	<3
Mercury, Hg	mg/kg	<0.05	<0.05	<0.05
Lead, Pb	mg/kg	8	8	7
Nickel, Ni	mg/kg	3	<3	4
Zinc, Zn	mg/kg	6	9	<3
Manganese, Mn	mg/kg	27	<20	63

Heavy Metal Suite - 8 Our Reference Your Reference Date Sampled	Units	60022-28 42906730 - 028 29/05/2008	60022-29 42906730 - 029 29/05/2008	60022-30 42906730 - 030 29/05/2008
Arsenic, As	mg/kg	10	25	36
Cadmium, Cd	mg/kg	<0.5	<0.5	<0.5
Chromium, Cr	mg/kg	15	7	9
Copper, Cu	mg/kg	6	<3	4
Mercury, Hg	mg/kg	<0.05	<0.05	<0.05
Lead, Pb	mg/kg	8	8	9
Nickel, Ni	mg/kg	<3	<3	<3
Zinc, Zn	mg/kg	3	3	5
Manganese, Mn	mg/kg	75	44	66

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Heavy Metal Suite - 8 Our Reference Your Reference Date Sampled	Units	60022-31 42906730 - 031 29/05/2008	60022-32 42906730 - 032 29/05/2008	60022-33 42906730 - 033 29/05/2008
Arsenic, As	mg/kg	<5	<5	<5
Cadmium, Cd	mg/kg	<0.5	<0.5	<0.5
Chromium, Cr	mg/kg	13	42	<5
Copper, Cu	mg/kg	5	6	3
Mercury, Hg	mg/kg	<0.05	<0.05	<0.05
Lead, Pb	mg/kg	9	14	3
Nickel, Ni	mg/kg	<3	<3	6
Zinc, Zn	mg/kg	11	24	9
Manganese, Mn	mg/kg	<20	27	92

Heavy Metal Suite - 8 Our Reference Your Reference Date Sampled	Units	60022-34 42906730 - 034 29/05/2008	60022-35 42906730 - 035 29/05/2008	60022-36 42906730 - 036 29/05/2008
Arsenic, As	mg/kg	<5	<5	<5
Cadmium, Cd	mg/kg	<0.5	<0.5	<0.5
Chromium, Cr	mg/kg	<5	10	6
Copper, Cu	mg/kg	<3	5	<3
Mercury, Hg	mg/kg	<0.05	<0.05	<0.05
Lead, Pb	mg/kg	<3	<3	<3
Nickel, Ni	mg/kg	6	<3	<3
Zinc, Zn	mg/kg	4	4	<3
Manganese, Mn	mg/kg	<20	<20	<20

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Heavy Metal Suite - 8 Our Reference Your Reference Date Sampled	Units	60022-37 42906730 - 037 29/05/2008	60022-38 42906730 - 038 29/05/2008	60022-51 42906730 - 051 30/05/2008
Arsenic, As	mg/kg	<5	10	32
Cadmium, Cd	mg/kg	<0.5	<0.5	<0.5
Chromium, Cr	mg/kg	6	12	34
Copper, Cu	mg/kg	<3	3	7
Mercury, Hg	mg/kg	<0.05	<0.05	<0.05
Lead, Pb	mg/kg	<3	4	6
Nickel, Ni	mg/kg	<3	5	4
Zinc, Zn	mg/kg	3	8	22
Manganese, Mn	mg/kg	<20	<20	160

Heavy Metal Suite - 8 Our Reference Your Reference Date Sampled	Units	60022-52 42906730 - 052 30/05/2008	60022-53 42906730 - 053 30/05/2008	60022-54 42906730 - 054 30/05/2008
Arsenic, As	mg/kg	17	10	8
Cadmium, Cd	mg/kg	<0.5	<0.5	<0.5
Chromium, Cr	mg/kg	35	20	20
Copper, Cu	mg/kg	8	4	4
Mercury, Hg	mg/kg	<0.05	<0.05	<0.05
Lead, Pb	mg/kg	11	3	4
Nickel, Ni	mg/kg	6	<3	<3
Zinc, Zn	mg/kg	30	9	13
Manganese, Mn	mg/kg	200	49	64

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Heavy Metal Suite - 8 Our Reference Your Reference Date Sampled	Units	60022-55 42906730 - 055 30/05/2008	60022-56 42906730 - 056 30/05/2008	60022-57 42906730 - 057 30/05/2008
Arsenic, As	mg/kg	<5	5	<5
Cadmium, Cd	mg/kg	<0.5	<0.5	<0.5
Chromium, Cr	mg/kg	<5	7	6
Copper, Cu	mg/kg	3	3	3
Mercury, Hg	mg/kg	<0.05	<0.05	<0.05
Lead, Pb	mg/kg	<3	<3	<3
Nickel, Ni	mg/kg	<3	<3	<3
Zinc, Zn	mg/kg	7	20	10
Manganese, Mn	mg/kg	35	52	40

Heavy Metal Suite - 8 Our Reference Your Reference Date Sampled	Units	60022-58 42906730 - 058 30/05/2008	60022-63 42906730 - 063 30/05/2008	60022-64 42906730 - 064 30/05/2008
Arsenic, As	mg/kg	<5	10	10
Cadmium, Cd	mg/kg	<0.5	<0.5	<0.5
Chromium, Cr	mg/kg	6	16	22
Copper, Cu	mg/kg	<3	3	6
Mercury, Hg	mg/kg	<0.05	<0.05	<0.05
Lead, Pb	mg/kg	<3	6	12
Nickel, Ni	mg/kg	<3	<3	24
Zinc, Zn	mg/kg	7	11	21
Manganese, Mn	mg/kg	51	55	110

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Heavy Metal Suite - 8 Our Reference Your Reference Date Sampled	Units	60022-67 42906730 - 067 2/06/2008	60022-68 42906730 - 068 2/06/2008	60022-69 42906730 - 069 2/06/2008
Arsenic, As	mg/kg	<5	<5	17
Cadmium, Cd	mg/kg	<0.5	<0.5	<0.5
Chromium, Cr	mg/kg	7	15	32
Copper, Cu	mg/kg	8	10	6
Mercury, Hg	mg/kg	<0.05	<0.05	<0.05
Lead, Pb	mg/kg	4	8	10
Nickel, Ni	mg/kg	<3	<3	3
Zinc, Zn	mg/kg	4	4	22
Manganese, Mn	mg/kg	92	62	77

Heavy Metal Suite - 8 Our Reference Your Reference Date Sampled	Units	60022-70 42906730 - 070 2/06/2008	60022-73 42906730 - 073 2/06/2008	60022-74 42906730 - 074 2/06/2008
Arsenic, As	mg/kg	22	15	38
Cadmium, Cd	mg/kg	<0.5	<0.5	<0.5
Chromium, Cr	mg/kg	31	10	28
Copper, Cu	mg/kg	5	4	7
Mercury, Hg	mg/kg	<0.05	<0.05	<0.05
Lead, Pb	mg/kg	8	13	9
Nickel, Ni	mg/kg	4	<3	21
Zinc, Zn	mg/kg	24	6	29
Manganese, Mn	mg/kg	95	39	94

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Heavy Metal Suite - 8 Our Reference Your Reference Date Sampled	Units	60022-75 42906730 - 075 2/06/2008	60022-76 42906730 - 076 2/06/2008	60022-77 42906730 - 077 2/06/2008
Arsenic, As	mg/kg	15	38	<5
Cadmium, Cd	mg/kg	<0.5	<0.5	<0.5
Chromium, Cr	mg/kg	14	35	10
Copper, Cu	mg/kg	4	7	6
Mercury, Hg	mg/kg	<0.05	<0.05	<0.05
Lead, Pb	mg/kg	12	8	5
Nickel, Ni	mg/kg	<3	13	<3
Zinc, Zn	mg/kg	6	30	5
Manganese, Mn	mg/kg	42	170	670

Heavy Metal Suite - 8 Our Reference Your Reference Date Sampled	Units	60022-78 42906730 - 078 2/06/2008	60022-79 42906730 - 079 2/06/2008	60022-80 42906730 - 080 2/06/2008
Arsenic, As	mg/kg	<5	17	36
Cadmium, Cd	mg/kg	<0.5	<0.5	<0.5
Chromium, Cr	mg/kg	14	38	27
Copper, Cu	mg/kg	5	4	5
Mercury, Hg	mg/kg	<0.05	<0.05	<0.05
Lead, Pb	mg/kg	4	11	8
Nickel, Ni	mg/kg	<3	5	11
Zinc, Zn	mg/kg	4	26	33
Manganese, Mn	mg/kg	460	38	63

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Heavy Metal Suite - 8 Our Reference Your Reference Date Sampled	Units	60022-83 42906730 - 083 2/06/2008	60022-84 42906730 - 084 2/06/2008
Arsenic, As	mg/kg	20	22
Cadmium, Cd	mg/kg	<0.5	<0.5
Chromium, Cr	mg/kg	27	25
Copper, Cu	mg/kg	3	4
Mercury, Hg	mg/kg	<0.05	<0.05
Lead, Pb	mg/kg	4	5
Nickel, Ni	mg/kg	<3	3
Zinc, Zn	mg/kg	21	19
Manganese, Mn	mg/kg	99	45

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LABORATORY REPORT

TEST PARAMETERS	UNITS	LOR	METHOD
--------			
pH (1:5)	pH Units	0.1	AN101
Electrical Conductivity (1:5)	µS/cm	5	AN106
Emmerson Class Number #			External
Chromium Suite - Acid Base Accounting			
Moisture	% w/w	0.1	AN002
pH KCl	pH Units	0.1	ASSMAC_23A / CEI-401
s-TAA pH 6.5	% w/w S	0.01	ASSMAC_S_23F/CEI-401
TAA pH 6.5	moles H^+/tonne	5	ASSMAC_23F / CEI-401
Chromium Reducible Sulfur (SCR)	% w/w	0.005	ASSMAC_22B / CEI-405
a-Chromium Reducible Sulfur	moles H^+ / tonne	5	ASSMAC_22B / CEI-405
SHCl ^	% w/w	0.005	ASSMAC_20B
S KCl ^	% w/w	0.005	ASSMAC_23Ce
S NAS ^	% w/w	0.005	ASSMAC_20J
Acid Neutralisation Capacity	% $CaCO_3$	0.01	AN214 CEI-402
s-ANC	% w/w S	0.01	AN214 CEI-402
a-ANC	moles H^+ / tonne	5	AN214 CEI-402
s-Net Acidity	% w/w S	0.01	Calculation
a-Net Acidity	moles H^+/tonne	5	Calculation
Liming Rate	kg $CaCO_3$/tonne	0.1	ASSMAC_23H
Verification s-Net Acidity	% w/w S		Calculation
a-Net Acidity without ANC	moles H^+/tonne	5	Calculation
Liming Rate without ANC	kg $CaCO_3$/tonne	0.1	ASSMAC_23H
Agricultural Soil Analyses			
pH (1:5)	pH Units	0.1	AN101
Electrical Conductivity (1:5)	µS/cm	5	AN106
TDS	mg/kg	20	Calculation
pH - $CaCl_2$	pH units	0.1	R & H**
Chloride, Cl (1:5)	mg/kg	10	AN274 CEA-020
Sulphur, S *	mg/kg	1	R & H**
Total Oxidised Nitrogen (as N)	mg/kg	0.3	AN248 CEA-001
Total Kjeldahl Nitrogen (as N)	mg/kg	5	AN281 CEA-016
Total Nitrogen (as N) (TKN + TON)	mg/kg	5	Calculation
Total Kjeldahl Phosphorus	mg/kg	5	AN279 CEA-015

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TEST PARAMETERS	UNITS	LOR	METHOD
Colwell Phosphorus	mg/kg	1	AN278 CEA-017
Total Organic Carbon	% w/w	0.05	AN190 CEI-019
Organic Matter	% w/w	0.01	Calculation
Carbon-Nitrogen Ratio		0.01	Calculation
Sodium, Na *	mg/kg	2	AN122 CEI-014
Sodium (meq%)	meq%	0.01	Calculation
Exchangeable Sodium *	%	1	Calculation
Potassium, K *	mg/kg	2	AN122 CEI-014
Potassium (meq%)	meq%	0.01	Calculation
Exchangeable Potassium *	%	1	Calculation
Calcium, Ca *	mg/kg	2	AN122 CEI-014
Calcium (meq%)	meq%	0.01	Calculation
Exchangeable Calcium *	%	1	Calculation
Magnesium, Mg *	mg/kg	2	AN122 CEI-014
Magnesium (meq%)	meq%	0.01	Calculation
Exchangeable Magnesium *	%	1	Calculation
CEC	meq%	0.01	R & H**
Iron, Fe (DTPA) *	mg/kg	0.5	R & H**
Manganese, Mn (DTPA) *	mg/kg	0.5	R & H**
Copper, Cu (DTPA) *	mg/kg	0.5	R & H**
Zinc, Zn (DTPA) *	mg/kg	0.5	R & H**
Heavy Metal Suite - 8			
Arsenic, As	mg/kg	5	AN304 CEI-201
Cadmium, Cd	mg/kg	0.5	AN300 CEI-200
Chromium, Cr	mg/kg	5	AN300 CEI-200
Copper, Cu	mg/kg	3	AN300 CEI-200
Mercury, Hg	mg/kg	0.05	AN312 CEI-202
Lead, Pb	mg/kg	3	AN300 CEI-200
Nickel, Ni	mg/kg	3	AN300 CEI-200
Zinc, Zn	mg/kg	3	AN300 CEI-200
Manganese, Mn	mg/kg	20	AN300 CEI-200

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QUALITY CONTROL	UNITS	Blank	Replicate Sm#	Replicate Sample||Replicate
pH (1:5)	pH Units	-	60022-1	4.9 || 4.9 || RPD: 0
Electrical Conductivity (1:5)	µS/cm	-	60022-1	230 || 230 || RPD: 0
Emmerson Class Number #		-	[NT]	[NT]

QUALITY CONTROL	UNITS	Blank
Moisture	% w/w	-
pH KCl	pH Units	5.8
s-TAA pH 6.5	% w/w S	-
TAA pH 6.5	moles H^+/tonne	-
Chromium Reducible Sulfur (S_{CR})	% w/w	-
a-Chromium Reducible Sulfur	moles H^+ / tonne	-
S_{HCl} ^	% w/w	-
S KCl ^	% w/w	-
S NAS ^	% w/w	-
Acid Neutralisation Capacity	% $CaCO_3$	-
s-ANC	% w/w S	-
a-ANC	moles H^+ / tonne	-
s-Net Acidity	% w/w S	-
a-Net Acidity	moles H^+/tonne	-
Liming Rate	kg $CaCO_3$/tonne	-
Verification s-Net Acidity	% w/w S	-
a-Net Acidity without ANC	moles H^+/tonne	-
Liming Rate without ANC	kg $CaCO_3$/tonne	-

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QUALITY CONTROL	UNITS	Blank
pH (1:5)	pH Units	-
Electrical Conductivity (1:5)	µS/cm	-
TDS	mg/kg	-
pH - $CaCl_2$	pH units	-
Chloride, Cl (1:5)	mg/kg	-
Sulphur, S *	mg/kg	-
Total Oxidised Nitrogen (as N)	mg/kg	-
Total Kjeldahl Nitrogen (as N)	mg/kg	-
Total Nitrogen (as N) (TKN + TON)	mg/kg	-
Total Kjeldahl Phosphorus	mg/kg	-
Colwell Phosphorus	mg/kg	-
Total Organic Carbon	% w/w	-
Organic Matter	% w/w	-
Carbon-Nitrogen Ratio		-
Sodium, Na *	mg/kg	<2
Sodium (meq%)	meq%	-
Exchangeable Sodium *	%	-
Potassium, K *	mg/kg	<2
Potassium (meq%)	meq%	-
Exchangeable Potassium *	%	-
Calcium, Ca *	mg/kg	<2
Calcium (meq%)	meq%	-
Exchangeable Calcium *	%	-
Magnesium, Mg *	mg/kg	<2
Magnesium (meq%)	meq%	-
Exchangeable Magnesium *	%	-
CEC	meq%	-
Iron, Fe (DTPA) *	mg/kg	<0.5
Manganese, Mn (DTPA) *	mg/kg	<0.5
Copper, Cu (DTPA) *	mg/kg	<0.5
Zinc, Zn (DTPA) *	mg/kg	<0.5

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QUALITY CONTROL	UNITS	Blank	Replicate Sm#	Replicate Sample||Replicate
Arsenic, As	mg/kg	<5	60022-1	<5 || <5
Cadmium, Cd	mg/kg	<0.5	60022-1	<0.5 || <0.5
Chromium, Cr	mg/kg	<5	60022-1	54 || 54 || RPD: 0
Copper, Cu	mg/kg	<3	60022-1	<3 || <3
Mercury, Hg	mg/kg	<0.05	60022-1	<0.05 || <0.05
Lead, Pb	mg/kg	<3	60022-1	4 || 4 || RPD: 0
Nickel, Ni	mg/kg	<3	60022-1	<3 || <3
Zinc, Zn	mg/kg	<3	60022-1	56 || 57 || RPD: 2
Manganese, Mn	mg/kg	<20	60022-1	<20 || <20

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QUALITY CONTROL	UNITS	Blank	Replicate Sm#	Replicate Sample||Replicate
pH (1:5)	pH Units	[NT]	[NT]	[NT]
Electrical Conductivity (1:5)	µS/cm	[NT]	[NT]	[NT]
Emmerson Class Number #		[NT]	60022-11	5 || [N/T]
QUALITY CONTROL	UNITS	Blank	Replicate Sm#	Replicate Sample||Replicate
pH (1:5)	pH Units	[NT]	60022-11	6.1 || 6.1 || RPD: 0
Electrical Conductivity (1:5)	µS/cm	[NT]	60022-11	80 || 790 || RPD: 163
TDS	mg/kg	[NT]	60022-11	270 || 2600 || RPD: 162
pH - $CaCl_2$	pH units	[NT]	60022-11	6.0 || 5.9 || RPD: 2
Chloride, Cl (1:5)	mg/kg	[NT]	60022-11	940 || 950 || RPD: 1
Sulphur, S *	mg/kg	[NT]	60022-11	70 || 70 || RPD: 0
Total Oxidised Nitrogen (as N)	mg/kg	[NT]	60022-11	1.6 || 1.5 || RPD: 6
Total Kjeldahl Nitrogen (as N)	mg/kg	[NT]	60022-11	820 || [N/T]
Total Nitrogen (as N) (TKN + TON)	mg/kg	[NT]	60022-11	820 || [N/T]
Total Kjeldahl Phosphorus	mg/kg	[NT]	60022-11	66 || [N/T]
Colwell Phosphorus	mg/kg	[NT]	60022-11	8 || 9 || RPD: 12
Total Organic Carbon	% w/w	[NT]	60022-11	3.7 || [N/T]
Organic Matter	% w/w	[NT]	60022-11	6.4 || [N/T]
Carbon-Nitrogen Ratio		[NT]	60022-11	45 || [N/T]
Sodium, Na *	mg/kg	[NT]	60022-11	530 || 530 || RPD: 0
Sodium (meq%)	meq%	[NT]	60022-11	2.3 || 2.3 || RPD: 0
Exchangeable Sodium *	%	[NT]	60022-11	16 || 16 || RPD: 0
Potassium, K *	mg/kg	[NT]	60022-11	140 || 140 || RPD: 0
Potassium (meq%)	meq%	[NT]	60022-11	0.36 || 0.36 || RPD: 0
Exchangeable Potassium *	%	[NT]	60022-11	2 || 2 || RPD: 0
Calcium, Ca *	mg/kg	[NT]	60022-11	1800 || 1800 || RPD: 0
Calcium (meq%)	meq%	[NT]	60022-11	9.0 || 9.0 || RPD: 0
Exchangeable Calcium *	%	[NT]	60022-11	62 || 62 || RPD: 0
Magnesium, Mg *	mg/kg	[NT]	60022-11	340 || 340 || RPD: 0
Magnesium (meq%)	meq%	[NT]	60022-11	2.8 || 2.8 || RPD: 0
Exchangeable Magnesium *	%	[NT]	60022-11	19 || 19 || RPD: 0
CEC	meq%	[NT]	60022-11	14 || 14 || RPD: 0

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QUALITY CONTROL	UNITS	Blank	Replicate Sm#	Replicate Sample||Replicate
Iron, Fe (DTPA) *	mg/kg	[NT]	60022-11	94 || 95 || RPD: 1
Manganese, Mn (DTPA) *	mg/kg	[NT]	60022-11	220 || 220 || RPD: 0
Copper, Cu (DTPA) *	mg/kg	[NT]	60022-11	1.0 || 1.0 || RPD: 0
Zinc, Zn (DTPA) *	mg/kg	[NT]	60022-11	12 || 11 || RPD: 9
QUALITY CONTROL	UNITS	Blank	Replicate Sm#	Replicate Sample||Replicate
Arsenic, As	mg/kg	[NT]	60022-11	<5 || <5
Cadmium, Cd	mg/kg	[NT]	60022-11	<0.5 || <0.5
Chromium, Cr	mg/kg	[NT]	60022-11	20 || 20 || RPD: 0
Copper, Cu	mg/kg	[NT]	60022-11	6 || 5 || RPD: 18
Mercury, Hg	mg/kg	[NT]	60022-11	<0.05 || <0.05
Lead, Pb	mg/kg	[NT]	60022-11	3 || 6 || RPD: 67
Nickel, Ni	mg/kg	[NT]	60022-11	9 || 8 || RPD: 12
Zinc, Zn	mg/kg	[NT]	60022-11	28 || 29 || RPD: 4
Manganese, Mn	mg/kg	[NT]	60022-11	1100 || 1100 || RPD: 0
QUALITY CONTROL	UNITS	Blank	Replicate Sm#	Replicate Sample||Replicate
pH (1:5)	pH Units	[NT]	60022-21	5.9 || 5.9 || RPD: 0
Electrical Conductivity (1:5)	µS/cm	[NT]	60022-21	280 || 270 || RPD: 4
Emmerson Class Number #		[NT]	60022-21	5 || [N/T]
QUALITY CONTROL	UNITS	Blank	Replicate Sm#	Replicate Sample||Replicate
Arsenic, As	mg/kg	[NT]	60022-21	<5 || <5
Cadmium, Cd	mg/kg	[NT]	60022-21	<0.5 || <0.5
Chromium, Cr	mg/kg	[NT]	60022-21	23 || 23 || RPD: 0
Copper, Cu	mg/kg	[NT]	60022-21	<3 || <3
Mercury, Hg	mg/kg	[NT]	60022-21	<0.05 || <0.05
Lead, Pb	mg/kg	[NT]	60022-21	5 || 5 || RPD: 0
Nickel, Ni	mg/kg	[NT]	60022-21	4 || 4 || RPD: 0
Zinc, Zn	mg/kg	[NT]	60022-21	3 || 3 || RPD: 0
Manganese, Mn	mg/kg	[NT]	60022-21	72 || 73 || RPD: 1

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QUALITY CONTROL	UNITS	Blank	Replicate Sm#	Replicate Sample||Replicate
pH (1:5)	pH Units	[NT]	60022-31	5.4 || 5.4 || RPD: 0
Electrical Conductivity (1:5)	µS/cm	[NT]	60022-31	270 || 260 || RPD: 4
Emmerson Class Number #		[NT]	[NT]	[NT]
QUALITY CONTROL	UNITS	Blank	Replicate Sm#	Replicate Sample||Replicate
Arsenic, As	mg/kg	[NT]	60022-31	<5 || <5
Cadmium, Cd	mg/kg	[NT]	60022-31	<0.5 || <0.5
Chromium, Cr	mg/kg	[NT]	60022-31	13 || 12 || RPD: 8
Copper, Cu	mg/kg	[NT]	60022-31	5 || 6 || RPD: 18
Mercury, Hg	mg/kg	[NT]	60022-31	<0.05 || <0.05
Lead, Pb	mg/kg	[NT]	60022-31	9 || 9 || RPD: 0
Nickel, Ni	mg/kg	[NT]	60022-31	<3 || <3
Zinc, Zn	mg/kg	[NT]	60022-31	11 || 10 || RPD: 10
Manganese, Mn	mg/kg	[NT]	60022-31	<20 || <20
QUALITY CONTROL	UNITS	Blank	Replicate Sm#	Replicate Sample||Replicate
pH (1:5)	pH Units	[NT]	60022-51	5.4 || 5.4 || RPD: 0
Electrical Conductivity (1:5)	µS/cm	[NT]	60022-51	17000 || 18000 || RPD: 6
Emmerson Class Number #		[NT]	[NT]	[NT]
QUALITY CONTROL	UNITS	Blank	Replicate Sm#	Replicate Sample||Replicate
Arsenic, As	mg/kg	[NT]	60022-51	32 || 32 || RPD: 0
Cadmium, Cd	mg/kg	[NT]	60022-51	<0.5 || <0.5
Chromium, Cr	mg/kg	[NT]	60022-51	34 || 35 || RPD: 3
Copper, Cu	mg/kg	[NT]	60022-51	7 || 7 || RPD: 0
Mercury, Hg	mg/kg	[NT]	60022-51	<0.05 || <0.05
Lead, Pb	mg/kg	[NT]	60022-51	6 || 6 || RPD: 0
Nickel, Ni	mg/kg	[NT]	60022-51	4 || 5 || RPD: 22
Zinc, Zn	mg/kg	[NT]	60022-51	22 || 24 || RPD: 9
Manganese, Mn	mg/kg	[NT]	60022-51	160 || 160 || RPD: 0

CLIENT: URS Corporation **Laboratory Report No:** 60022
PROJECT: Blaydin Point

LABORATORY REPORT

QUALITY CONTROL	UNITS	Blank	Replicate Sm#	Replicate Sample||Replicate
Moisture	% w/w	[NT]	60022-41	32 || [N/T]
pH KCl	pH Units	[NT]	60022-41	6.4 || 6.4 || RPD: 0
s-TAA pH 6.5	% w/w S	[NT]	60022-41	<0.01 || <0.01
TAA pH 6.5	moles H^+/tonne	[NT]	60022-41	<5 || <5
Chromium Reducible Sulfur (SCR)	% w/w	[NT]	60022-41	0.068 || 0.071 || RPD: 4
a-Chromium Reducible Sulfur	moles H^+ / tonne	[NT]	60022-41	43 || 44 || RPD: 2
SHCl ^	% w/w	[NT]	60022-41	NA || NA
S KCl ^	% w/w	[NT]	60022-41	NA || NA
S NAS ^	% w/w	[NT]	60022-41	NA || NA
Acid Neutralisation Capacity	% $CaCO_3$	[NT]	60022-41	NA || NA
s-ANC	% w/w S	[NT]	60022-41	NA || NA
a-ANC	moles H^+ / tonne	[NT]	60022-41	NA || NA
s-Net Acidity	% w/w S	[NT]	60022-41	0.07 || 0.07 || RPD: 0
a-Net Acidity	moles H^+/tonne	[NT]	60022-41	44 || 45 || RPD: 2
Liming Rate	kg $CaCO_3$/tonne	[NT]	60022-41	3.3 || 3.4 || RPD: 3
Verification s-Net Acidity	% w/w S	[NT]	60022-41	0.07 || 0.07 || RPD: 0
a-Net Acidity without ANC	moles H^+/tonne	[NT]	60022-41	44 || 45 || RPD: 2
Liming Rate without ANC	kg $CaCO_3$/tonne	[NT]	60022-41	3.3 || 3.4 || RPD: 3

CLIENT: URS Corporation **Laboratory Report No:** 60022

PROJECT: Blaydin Point

LABORATORY REPORT

QUALITY CONTROL	UNITS	Blank	Replicate Sm#	Replicate Sample||Replicate
Moisture	% w/w	[NT]	60022-61	33 || [N/T]
pH KCl	pH Units	[NT]	60022-61	7.4 || 7.1 || RPD: 4
s-TAA pH 6.5	% w/w S	[NT]	60022-61	<0.01 || <0.01
TAA pH 6.5	moles H^+/tonne	[NT]	60022-61	<5 || <5
Chromium Reducible Sulfur (SCR)	% w/w	[NT]	60022-61	0.32 || 0.33 || RPD: 3
a-Chromium Reducible Sulfur	moles H^+ / tonne	[NT]	60022-61	200 || 210 || RPD: 5
SHCl ^	% w/w	[NT]	60022-61	NA || NA
S KCl ^	% w/w	[NT]	60022-61	NA || NA
S NAS ^	% w/w	[NT]	60022-61	NA || NA
Acid Neutralisation Capacity	% $CaCO_3$	[NT]	60022-61	0.31 || 0.25 || RPD: 21
s-ANC	% w/w S	[NT]	60022-61	0.10 || 0.08 || RPD: 22
a-ANC	moles H^+ / tonne	[NT]	60022-61	62 || 50 || RPD: 21
s-Net Acidity	% w/w S	[NT]	60022-61	0.25 || 0.28 || RPD: 11
a-Net Acidity	moles H^+/tonne	[NT]	60022-61	160 || 170 || RPD: 6
Liming Rate	kg $CaCO_3$/tonne	[NT]	60022-61	12 || 13 || RPD: 8
Verification s-Net Acidity	% w/w S	[NT]	60022-61	0.25 || 0.28 || RPD: 11
a-Net Acidity without ANC	moles H^+/tonne	[NT]	60022-61	200 || 210 || RPD: 5
Liming Rate without ANC	kg $CaCO_3$/tonne	[NT]	60022-61	15 || 16 || RPD: 6

CLIENT: URS Corporation **Laboratory Report No:** 60022

PROJECT: Blaydin Point

LABORATORY REPORT

QUALITY CONTROL	UNITS	Blank	Replicate Sm#	Replicate Sample||Replicate
Moisture	% w/w	[NT]	60022-71	46 || [N/T]
pH KCl	pH Units	[NT]	60022-71	7.0 || 7.0 || RPD: 0
s-TAA pH 6.5	% w/w S	[NT]	60022-71	<0.01 || <0.01
TAA pH 6.5	moles H^+/tonne	[NT]	60022-71	<5 || <5
Chromium Reducible Sulfur (SCR)	% w/w	[NT]	60022-71	0.16 || 0.15 || RPD: 6
a-Chromium Reducible Sulfur	moles H^+ / tonne	[NT]	60022-71	99 || 94 || RPD: 5
SHCl ^	% w/w	[NT]	60022-71	NA || NA
S KCl ^	% w/w	[NT]	60022-71	NA || NA
S NAS ^	% w/w	[NT]	60022-71	NA || NA
Acid Neutralisation Capacity	% $CaCO_3$	[NT]	60022-71	1.1 || 0.94 || RPD: 16
s-ANC	% w/w S	[NT]	60022-71	0.36 || 0.30 || RPD: 18
a-ANC	moles H^+ / tonne	[NT]	60022-71	220 || 190 || RPD: 15
s-Net Acidity	% w/w S	[NT]	60022-71	<0.01 || <0.01
a-Net Acidity	moles H^+/tonne	[NT]	60022-71	<5 || <5
Liming Rate	kg $CaCO_3$/tonne	[NT]	60022-71	NA || NA
Verification s-Net Acidity	% w/w S	[NT]	60022-71	-0.08 || -0.05 || RPD: -46
a-Net Acidity without ANC	moles H^+/tonne	[NT]	60022-71	99 || 94 || RPD: 5
Liming Rate without ANC	kg $CaCO_3$/tonne	[NT]	60022-71	7.5 || 7.1 || RPD: 5

CLIENT: URS Corporation **Laboratory Report No:** 60022

PROJECT: Blaydin Point

LABORATORY REPORT

QUALITY CONTROL	UNITS	Blank	Replicate Sm#	Replicate Sample||Replicate
Moisture	% w/w	[NT]	60022-81	38 || <0.1
pH KCl	pH Units	[NT]	60022-81	6.4 || 6.4 || RPD: 0
s-TAA pH 6.5	% w/w S	[NT]	60022-81	<0.01 || <0.01
TAA pH 6.5	moles H^+/tonne	[NT]	60022-81	<5 || <5
Chromium Reducible Sulfur (SCR)	% w/w	[NT]	60022-81	0.12 || 0.12 || RPD: 0
a-Chromium Reducible Sulfur	moles H^+ / tonne	[NT]	60022-81	74 || 73 || RPD: 1
SHCl ^	% w/w	[NT]	60022-81	NA || NA
S KCl ^	% w/w	[NT]	60022-81	NA || NA
S NAS ^	% w/w	[NT]	60022-81	NA || NA
Acid Neutralisation Capacity	% $CaCO_3$	[NT]	60022-81	NA || NA
s-ANC	% w/w S	[NT]	60022-81	NA || NA
a-ANC	moles H^+ / tonne	[NT]	60022-81	NA || NA
s-Net Acidity	% w/w S	[NT]	60022-81	0.12 || 0.12 || RPD: 0
a-Net Acidity	moles H^+/tonne	[NT]	60022-81	75 || 74 || RPD: 1
Liming Rate	kg $CaCO_3$/tonne	[NT]	60022-81	5.6 || 5.6 || RPD: 0
Verification s-Net Acidity	% w/w S	[NT]	60022-81	0.12 || 0.12 || RPD: 0
a-Net Acidity without ANC	moles H^+/tonne	[NT]	60022-81	75 || 74 || RPD: 1
Liming Rate without ANC	kg $CaCO_3$/tonne	[NT]	60022-81	5.6 || 5.6 || RPD: 0

CLIENT: URS Corporation **Laboratory Report No:** 60022
PROJECT: Blaydin Point

LABORATORY REPORT

QUALITY CONTROL	UNITS	Blank	Replicate Sm#	Replicate Sample||Replicate
pH (1:5)	pH Units	[NT]	60022-91	8.3 || [N/T]
Electrical Conductivity (1:5)	µS/cm	[NT]	60022-91	16000 || [N/T]
Emmerson Class Number #		[NT]	[NT]	[NT]
QUALITY CONTROL	UNITS	Blank	Replicate Sm#	Replicate Sample||Replicate
Moisture	% w/w	[NT]	60022-91	20 || [N/T]
pH KCl	pH Units	[NT]	60022-91	7.6 || 7.7 || RPD: 1
s-TAA pH 6.5	% w/w S	[NT]	60022-91	<0.01 || <0.01
TAA pH 6.5	moles H^+/tonne	[NT]	60022-91	<5 || <5
Chromium Reducible Sulfur (SCR)	% w/w	[NT]	60022-91	<0.005 || <0.005
a-Chromium Reducible Sulfur	moles H^+ / tonne	[NT]	60022-91	<5 || <5
SHCl ^	% w/w	[NT]	60022-91	NA || NA
S KCl ^	% w/w	[NT]	60022-91	NA || NA
S NAS ^	% w/w	[NT]	60022-91	NA || NA
Acid Neutralisation Capacity	% $CaCO_3$	[NT]	60022-91	NA || NA
s-ANC	% w/w S	[NT]	60022-91	NA || NA
a-ANC	moles H^+ / tonne	[NT]	60022-91	NA || NA
s-Net Acidity	% w/w S	[NT]	60022-91	<0.01 || <0.01
a-Net Acidity	moles H^+/tonne	[NT]	60022-91	<5 || <5
Liming Rate	kg $CaCO_3$/tonne	[NT]	60022-91	NA || NA
Verification s-Net Acidity	% w/w S	[NT]	60022-91	NA || NA
a-Net Acidity without ANC	moles H^+/tonne	[NT]	60022-91	<5 || <5
Liming Rate without ANC	kg $CaCO_3$/tonne	[NT]	60022-91	NA || NA

CLIENT: URS Corporation **Laboratory Report No:** 60022
PROJECT: Blaydin Point

LABORATORY REPORT

NOTES:

LOR - Limit of Reporting.

* This test is not covered by our current NATA accreditation.

^ Sulphur, Calcium and Magnesium results are determined at our Toowoomba Laboratory, (214 McDougal St, Toowoomba, QLD) who have NATA accreditation for these parameters.

This analysis determined at Golder Associates (Cairns, QLD), their reference NQ-08229, who are NATA accreditated (Accreditation No: 3732) for this parameter.

**Method from Rayment & Higginson - "Australian Laboratory Handbook of Soil and Water Chemical Methods".

Liming rate calculated using a Fineness factor of 1.5 (which is equivalent to finely divided Ag Lime <0.5mm) and Neutralising Value (NV) of 100%

If using Liming Material <100% NV, then Liming Rate can be adusted as follows:

Actual Liming Rate equals Calculated Liming Rate times 100 divided by NV of actual Liming Material

Bulk Density of Material of 1g/cm3 assumed.

If Bulk Density differs from 1g/cm3 then Liming rate can be adjusted as follows:

Actual Liming Rate equals Calculated Liming Rate times Actual Bulk Density

Geneva Legal Comment

ISO 17025

Unless otherwise stated the results shown in this test report only refer to the sample(s) tested and such sample(s) are only retained for 60 days only. This document cannot be reproduced except in full, without prior approval of the Company.

Analysis Date: **Between** 17/06/08 **and** 3/07/08

Disclaimer:

SGS and the authors have prepared this document in good faith, consulting with Ahern CR, McElnea AE, Sullivan LA (2004) *Acid Sulphate Soils Laboratory Methods Guidelines,* Queensland Department of Natural Resources, Mines and Energy, Indooroopilly, Qld Aust. While this is done exercising all due care and attention, no representation or warranty, expressed or implied is made as to the accuracy, completeness or fitness of the document in respect of any user's circumstances. Users of the results or data should seek appropriate expert advice where necessary in relation to their particular situation or circumstances. Any representation, statement, opinion or advice, expressed or implied on this publication is made in good faith and on the basis that SGS, its agents and employees are not liable to any person taking or not taking (as the case may be) action in respect of any representation, statement or advice referred to above.

URS CHAIN OF CUSTODY - INPEX Project

ADDRESS:	URS Australia level 3 93 Mitchell Street Darwin, NT, 0800	LABORATORY:	SGS	All results to be provided in MRED format email address:	ian_hollingsworth@urscorp.c
PHONE NO:	08 8980 2900	PHONE NO:	07 4035 5111	TURNAROUND DETAILS	COC SEQUENCE NUMBER
FAX NO:	08 8941 3920	FAX NO:	07 40355122	[X] Standard - 5 days [ ] Non standard	1 2 3 4 please circle

FOR LABORATORY USE ONLY	
Custody Seal ?	Y N NA
Free ice / frozen icebricks present upon receipt?	Y N
Random Sample Temperature on Receipt	oC

URS PROJECT NO:	42906730			RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
URS PM:	Ian Hollingsworth	INPEX SITE :	Blaydin Point				
URS SAMPLERS :	Ian Hollingsworth	INPEX PM:	Sean Redden	DATE: 6/6/08 TIME: 9.30	DATE: TIME:	DATE: TIME:	DATE: TIME:
COMMENTS:	Ian_Hollingsworth@urs.corp.com						

	SAMPLE DETAILS			CONTAINER TYPE & PRESERVATIVE																		
				Solid	Liquid																	
LAB ID	SAMPLE ID	DATE dd/mm/yy (enter in text format in computer)	MATRIX (Solid / Liquid)	Soil bag (G)		40ml VOA Vial (G) HCL	1 L Amber (G) Unpr.	100ml (P) HNO3	250ml (G) H2SO4	100ml (P) Unpr.	100ml (P) HCL		Other:	Total Containers	pH/EC (1:5 soil:water)	CEC	Chromium Suite Reduceable Sulfur	Agriculture Suite	Extractable heavy metals (As,Cd,Cr,Cu,Pb,Zn,M n,Hg,Ni)	Emmerson Class			HOLD
	42906730-001 ✓	27/05/08	Solid	1										1	2				2				
	42906730-002 ✓	27/05/08	Solid	1										1	1				1				
	42906730-003 ✓	27/05/08	Solid	1										1	1				1	2			
	42906730-004 ✓	27/05/08	Solid	1										1	1				1	1			
	42906730-005 ✓	27/05/08	Solid	1										1	1				1				
	42906730-006 ✓	27/05/08	Solid	1										1	1				1				
	42906730-007 ✓	27/05/08	Solid	1										1	1			2	1	1			
	42906730-008 ✓	27/05/08	Solid	1										1	1			1	1	1			
	42906730-009 (2)	27/05/08	Solid	1										1	1			1	1				
	42906730-010 ✗	27/05/08	Solid	1										1	1			1	1				
	42906730-011 ✓	27/05/08	Solid	1										1	1			1	1	2			
	TOTAL													11	12	0	0	6	12	7			

URS CHAIN OF CUSTODY - INPEX Project

ADDRESS:	URS Australia level 3 93 Mitchell Street Darwin, NT, 0800	LABORATORY:	SGS	All results to be provided in MRED format email address:	ian_hollingsworth@urscorp.c
PHONE NO:	08 8980 2900	PHONE NO:	07 4035 5111	TURNAROUND DETAILS	COC SEQUENCE NUMBER
FAX NO:	08 8941 3920	FAX NO:	07 40355122	☒ Standard - 5 days ☐ Non standard	1 2 3 4 (please circle)

FOR LABORATORY USE ONLY

Custody Seal ? Y N NA

Free ice / frozen icebricks present upon receipt? Y N

Random Sample Temperature on Receipt oC

URS PROJECT NO:	42906730			RELINQUISHED BY: IDH	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
URS PM:	Ian Hollingsworth	INPEX SITE :	Blaydin Point				
URS SAMPLERS :	Ian Hollingsworth	INPEX PM:	Sean Redden	DATE: 11/6/08 TIME: 9-30	DATE: TIME:	DATE: TIME:	DATE: TIME:
COMMENTS:							

	SAMPLE DETAILS			CONTAINER TYPE & PRESERVATIVE																	
				Solid	Liquid																
LAB ID	SAMPLE ID	DATE dd/mm/yy (enter in text format in computer)	MATRIX (Solid / Liquid)	Soil bag (G)		40ml VOA Vial (G) HCL	1 L Amber (G) Unpr.	100ml (P) HNO3	250ml (G) H2SO4	100ml (P) Unpr.	100ml (P) HCL		Other:	Total Containers	pH/EC (1:5 soil:water)	CEC	Chromium Suite Reduceable Sulfur	Agriculture Suite	Extractable heavy metals (As,Cd,Cr,Cu,Pb,Zn,Mn,Hg,Ni)	Emmerson Class			HOLD
	42906730-012 ✓	27/05/08	Solid	1										12	1			2	2	1			
	42906730-013 ✓	28/05/08	Solid	1										1	1				1				
	42906730-014 ✓	28/05/08	Solid	1										1	1				1				
	42906730-015 ✓	28/05/08	Solid	1										1	1			1	1	1			
	42906730-016 ✓	28/05/08	Solid	1										1	1			1	1	1			
	42906730-017 ✓	28/05/08	Solid	1										1	1				1				
	42906730-018 ✓	28/05/08	Solid	1										1	1				1				
	42906730-019 ✓	28/05/08	Solid	1										1	1			1	1	1			
	42906730-020 ✓	28/05/08	Solid	1										1	1			1	1	1			
	42906730-021 ✓	28/05/08	Solid	1										1	1				1	1			
	42906730-022 ✓	28/05/08	Solid	1										1	1				1	1			
	TOTAL													22	11	0	0	6	12	7			

URS CHAIN OF CUSTODY - INPEX Project

ADDRESS:	URS Australia level 3 93 Mitchell Street Darwin, NT, 0800	LABORATORY:	SGS	All results to be provided in MRED format email address:	ian_hollingsworth@urscorp.c
PHONE NO:	08 8980 2900	PHONE NO:	6/6/08	TURNAROUND DETAILS	COC SEQUENCE NUMBER
FAX NO:	08 8941 3920	FAX NO:	6/6/08	[X] Standard - 5 days [ ] Non standard	1 2 3 4 please circle

URS PROJECT NO:	42906730			RELINQUISHED BY: IDH	
URS PM:	Ian Hollingsworth	INPEX SITE :	Blaydin Point		
URS SAMPLERS :	Ian Hollingsworth	INPEX PM:	Sean Redden	DATE: 11/6/08 TIME: 9.30	
COMMENTS:					

FOR LABORATORY USE ONLY

Custody Seal ? Y N NA

Free ice / frozen icebricks present upon receipt? Y N

Random Sample Temperature on Receipt oC

RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE: TIME:	DATE: TIME:	DATE: TIME:

	SAMPLE DETAILS			CONTAINER TYPE & PRESERVATIVE																		
				Solid	Liquid																	
LAB ID	SAMPLE ID	DATE dd/mm/yy (enter in text format in computer)	MATRIX (Solid / Liquid)	Soil bag (G)		40ml VOA Vial (G) HCL	1 L Amber (G) Unpr.	100ml (P) HNO3	250ml (G) H2SO4	100ml (P) Unpr.	100ml (P) HCL		Other:	Total Containers	pH/EC (1:5 soil:water)	CEC	Chromium Suite Reduceable Sulfur	Agriculture Suite	Extractable heavy metals (As,Cd,Cr,Cu,Pb,Zn,M n,Hg,Ni)	Emmerson Class			HOLD
	42906730-023	29/05/08	Solid	1										23	1				2				
	42906730-024	29/05/08	Solid	1										1	1				1				
	42906730-025	29/05/08	Solid	1										1	1				1				
	42906730-026	29/05/08	Solid	1										1	1				1				
	42906730-027	29/05/08	Solid	1										1	1				1				
	42906730-028	29/05/08	Solid	1										1	1				1				
	42906730-029	29/05/08	Solid	1										1	1				1				
	42906730-030	29/05/08	Solid	1										1	1				1				
	42906730-031	29/05/08	Solid	1										1	1				1				
	42906730-032	29/05/08	Solid	1										1	1				1				
	42906730-033	29/05/08	Solid	1										1	1				1	1			
	TOTAL													33	11	0	0	0	12	1			

URS CHAIN OF CUSTODY - INPEX Project

ADDRESS:	URS Australia level 3 93 Mitchell Street Darwin, NT, 0800	LABORATORY:	SGS	All results to be provided in MRED format email address:	ian_hollingsworth@urscorp.c
PHONE NO:	08 8980 2900	PHONE NO:	07 4035 5111	TURNAROUND DETAILS: [X] Standard - 5 days [ ] Non standard	COC SEQUENCE NUMBER: [1] 2 3 4 (please circle)
FAX NO:	08 8941 3920	FAX NO:	07 40355122		
URS PROJECT NO:	42906730			RELINQUISHED BY:	
URS PM:	Ian Hollingsworth	INPEX SITE :	Blaydin Point		
URS SAMPLERS :	Ian Hollingsworth	INPEX PM:	Sean Redden	DATE: 6/6/08 TIME:	
COMMENTS:					

FOR LABORATORY USE ONLY

Custody Seal ? Y N NA

Free ice / frozen icebricks present upon receipt? Y N

Random Sample Temperature on Receipt oC

RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE: TIME:	DATE: TIME:	DATE: TIME:

	SAMPLE DETAILS			CONTAINER TYPE & PRESERVATIVE																		
				Solid	Liquid																	
LAB ID	SAMPLE ID	DATE dd/mm/yy (enter in text format in computer)	MATRIX (Solid / Liquid)	Soil bag (G)		40ml VOA Vial (G) HCL	1 L Amber (G) Unpr.	100ml (P) HNO3	250ml (G) H2SO4	100ml (P) Unpr.	100ml (P) HCL		Other:	Total Containers	pH/EC (1:5 soil:water)	CEC	Chromium Suite Reduceable Sulfur	Agriculture Suite	Extractable heavy metals (As,Cd,Cr,Cu,Pb,Zn,Mn,Hg,Ni)	Emmerson Class			HOLD
	42906730-034	29/05/08	Solid	1										34	1				2	1			
	42906730-035	29/05/08	Solid	1										1	1				1				
	42906730-036	29/05/08	Solid	1										1	1				1				
	42906730-037	29/05/08	Solid	1										1	1				1				
	42906730-038	29/05/08	Solid	1										1	1				1				
	42906730-039	29/05/08	Solid	1										1			2						
	42906730-040	29/05/08	Solid	1										1			1						
	42906730-041	29/05/08	Solid	1										1			1						
	42906730-042	29/05/08	Solid	1										1			1						
	42906730-043	29/05/08	Solid	1										1			1						
	42906730-044	29/05/08	Solid	1										1			1						
	TOTAL													44	5	0	7	0	6	1			

URS CHAIN OF CUSTODY - INPEX Project

ADDRESS:	URS Australia level 3 93 Mitchell Street Darwin, NT, 0800	LABORATORY:	SGS	All results to be provided in MRED format email address: ian_hollingsworth@urscorp.c	FOR LABORATORY USE ONLY Custody Seal ? Y N NA Free ice / frozen icebricks present upon receipt? Y N Random Sample Temperature on Receipt oC
PHONE NO:	08 8980 2900	PHONE NO:	07 4035 5111	TURNAROUND DETAILS: [X] Standard - 5 days [ ] Non standard	COC SEQUENCE NUMBER: 1 2 3 4 (please circle)
FAX NO:	08 8941 3920	FAX NO:	07 40355122		
URS PROJECT NO:	42906730			RELINQUISHED BY:	RECEIVED BY: / RELINQUISHED BY: / RECEIVED BY:
URS PM:	Ian Hollingsworth	INPEX SITE :	Blaydin Point	11/6/08	
URS SAMPLERS :	Ian Hollingsworth	INPEX PM:	Sean Redden	DATE: 6/6/08 TIME: 9.30	DATE: TIME: / DATE: TIME: / DATE: TIME:
COMMENTS:					

	SAMPLE DETAILS			CONTAINER TYPE & PRESERVATIVE																		
				Solid	Liquid																	
LAB ID	SAMPLE ID	DATE dd/mm/yy (enter in text format in computer)	MATRIX (Solid / Liquid)	Soil bag (G)		40ml VOA Vial (G) HCL	1 L Amber (G) Unpr.	100ml (P) HNO3	250ml (G) H2SO4	100ml (P) Unpr.	100ml (P) HCL		Other:	Total Containers	pH/EC (1:5 soil:water)	CEC	Chromium Suite Reduceable Sulfur	Agriculture Suite	Extractable heavy metals (As,Cd,Cr,Cu,Pb,Zn,M n,Hg,Ni)	Emmerson Class			HOLD
	42906730-045 ✓	29/05/08	Solid	1										45			1						
	42906730-046 ✓	29/05/08	Solid	1										1			1						
	42906730-047 (2)	30/05/08	Solid	1										1			1						
	42906730-048 (2)	30/05/08	Solid	1										1			1						
	42906730-049 ✓	30/05/08	Solid	1										1			1						
	42906730-050 ✓	30/05/08	Solid	1										1			2						
	42906730-051 X	30/05/08	Solid	1										1	2				1				
	42906730-052 X	30/05/08	Solid	1										1	1				2				
	42906730-053 ✓	30/05/08	Solid	1										1	1				1				
	42906730-054 ✓	30/05/08	Solid	1										1	1				1				
	42906730-055 ✓	30/05/08	Solid	1										1	1				1				
	TOTAL													55	6	0	7	0	6	0			

URS CHAIN OF CUSTODY - INPEX Project

ADDRESS:	URS Australia level 3 93 Mitchell Street Darwin, NT, 0800	LABORATORY:	SGS	All results to be provided in MRED format email address:	ian_hollingsworth@urscorp.c
PHONE NO:	08 8980 2900	PHONE NO:	07 4035 5111	TURNAROUND DETAILS	COC SEQUENCE NUMBER
FAX NO:	08 8941 3920	FAX NO:	07 40355122	[X] Standard - 5 days [ ] Non standard	1 2 3 4 please circle

URS PROJECT NO:	42906730			RELINQUISHED BY: IDLE	RECEIVED BY:	RELINQUISHED BY: / RECEIVED BY:
URS PM:	Ian Hollingsworth	INPEX SITE :	Blaydin Point	11/6/08		
URS SAMPLERS :	Ian Hollingsworth	INPEX PM:	Sean Redden	DATE: 6/6/08 TIME: 9:30	DATE: TIME:	DATE: TIME: / DATE: TIME:
COMMENTS:						

FOR LABORATORY USE ONLY

Custody Seal ? Y N NA

Free ice / frozen icebricks present upon receipt? Y N

Random Sample Temperature on Receipt oC

LAB ID	SAMPLE ID	DATE dd/mm/yy (enter in text format in computer)	MATRIX (Solid / Liquid)	CONTAINER TYPE & PRESERVATIVE: Solid: Soil bag (G)	Liquid: 40ml VOA Vial (G) HCL	1 L Amber (G) Unpr.	100ml (P) HNO3	250ml (G) H2SO4	100ml (P) Unpr.	100ml (P) HCL	Other:	Total Containers	pH/EC (1:5 soil:water)	CEC	Chromium Suite Reduceable Sulfur	Agriculture Suite	Extractable heavy metals (As,Cd,Cr,Cu,Pb,Zn,M n,Hg,Ni)	Emmerson Class			HOLD
	SAMPLE DETAILS			CONTAINER TYPE & PRESERVATIVE																	
	42906730-056	30/05/08	Solid	1								56					1				
	42906730-057	30/05/08	Solid	1								1					1				
	42906730-058	30/05/08	Solid	1								1					1				
	42906730-059	30/05/08	Solid	1								1			2						
	42906730-060	30/05/08	Solid	1								1			1						
	42906730-061	30/05/08	Solid	1								1			1						
	42906730-062	30/05/08	Solid	1								1			1						
	42906730-063	30/05/08	Solid	1								1					1				
	42906730-064	30/05/08	Solid	1								1					1				
	42906730-065	30/05/08	Solid	1								1			1						
	42906730-066	30/05/08	Solid	1								1			1						
	TOTAL											66	0	0	7	0	5	0			

URS CHAIN OF CUSTODY - INPEX Project

ADDRESS:	URS Australia level 3 93 Mitchell Street Darwin, NT, 0800	LABORATORY:	SGS	All results to be provided in MRED format email address:	ian_hollingsworth@urscorp.c
PHONE NO:	08 8980 2900	PHONE NO:	07 4035 5111	TURNAROUND DETAILS	COC SEQUENCE NUMBER
FAX NO:	08 8941 3920	FAX NO:	07 40355122	[X] Standard - 5 days [ ] Non standard	1 2 3 4 please circle

FOR LABORATORY USE ONLY		
Custody Seal ? Y N NA		
Free ice / frozen icebricks present upon receipt? Y N		
Random Sample Temperature on Receipt oC		

URS PROJECT NO:	42906730			RELINQUISHED BY: IDH	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
URS PM:	Ian Hollingsworth	INPEX SITE :	Blaydin Point	11/6/08			
URS SAMPLERS :	Ian Hollingsworth	INPEX PM:	Sean Redden	DATE: 6/6/08 TIME: 7:30	DATE: TIME:	DATE: TIME:	DATE: TIME:

COMMENTS:

	SAMPLE DETAILS			CONTAINER TYPE & PRESERVATIVE																	
				Solid	Liquid																
LAB ID	SAMPLE ID	DATE dd/mm/yy (enter in text format in computer)	MATRIX (Solid / Liquid)	Soil bag (G)		40ml VOA Vial (G) HCL	1 L Amber (G) Unpr.	100ml (P) HNO3	250ml (G) H2SO4	100ml (P) Unpr.	100ml (P) HCL		Other:	Total Containers	pH/EC (1:5 soil:water)	CEC	Chromium Suite Reduceable Sulfur	Agriculture Suite	Extractable heavy metals (As,Cd,Cr,Cu,Pb,Zn,M n,Hg,Ni)	Emmerson Class			HOLD
	42906730-067	2/06/08	Solid	1										67	2				1				
	42906730-068	2/06/08	Solid	1										1	1				1				
	42906730-069	2/06/08	Solid	1										1	1				1				
	42906730-070	2/06/08	Solid	1										1	1				1				
	42906730-071	2/06/08	Solid	1										1			1						
	42906730-072	2/06/08	Solid	1										1			1						
	42906730-073	2/06/08	Solid	1										1	1				1				
	42906730-074	2/06/08	Solid	1										1	1				1				
	42906730-075	2/06/08	Solid	1										1	1				1				
	42906730-076	2/06/08	Solid	1										1	1				1				
	42906730-077	2/06/08	Solid	1										1	1				1				
	TOTAL													77	10	0	2	0	9	0			

URS CHAIN OF CUSTODY - INPEX Project

ADDRESS:	URS Australia level 3 93 Mitchell Street Darwin, NT, 0800	LABORATORY:	SGS	All results to be provided in MRED format email address:	ian_hollingsworth@urscorp.c
PHONE NO:	08 8980 2900	PHONE NO:	07 4035 5111	TURNAROUND DETAILS	COC SEQUENCE NUMBER
FAX NO:	08 8941 3920	FAX NO:	07 40355122	[X] Standard - 5 days [ ] Non standard	1 2 3 4 please circle

URS PROJECT NO:	42906730			RELINQUISHED BY: IDH	RECEIVED BY:	RELINQUISHED BY: / RECEIVED BY:
URS PM:	Ian Hollingsworth	INPEX SITE :	Blaydin Point	11/6/06		
URS SAMPLERS :	Ian Hollingsworth	INPEX PM:	Sean Redden	DATE: 6/6/08 TIME: 9:30	DATE: TIME:	DATE: TIME: / DATE: TIME:
COMMENTS:						

FOR LABORATORY USE ONLY

Custody Seal ? Y N NA

Free ice / frozen icebricks present upon receipt? Y N

Random Sample Temperature on Receipt oC

	SAMPLE DETAILS			CONTAINER TYPE & PRESERVATIVE																		
				Solid	Liquid																	
LAB ID	SAMPLE ID	DATE dd/mm/yy (enter in text format in computer)	MATRIX (Solid / Liquid)	Soil bag (G)		40ml VOA Vial (G) HCL	1 L Amber (G) Unpr.	100ml (P) HNO3	250ml (G) H2SO4	100ml (P) Unpr.	100ml (P) HCL		Other:	Total Containers	pH/EC (1:5 soil:water)	CEC	Chromium Suite Reduceable Sulfur	Agriculture Suite	Extractable heavy metals (As,Cd,Cr,Cu,Pb,Zn,M n,Hg,Ni)	Emmerson Class			HOLD
	42906730-078	2/06/08	Solid	1										78					1				
	42906730-079	2/06/08	Solid	1										1	1				1				
	42906730-080	2/06/08	Solid	1										1	1				1				
	42906730-081	2/06/08	Solid	1										1			2						
	42906730-082	2/06/08	Solid	1										1	1		1						
	42906730-083	2/06/08	Solid	1										1					1				
	42906730-084	2/06/08	Solid	1										1					1				
	42906730-085	2/06/08	Solid	1										1	1		1						
	42906730-086	2/06/08	Solid	1										1	1		1						
	42906730-087	2/06/08	Solid	1										1	1		1						
	42906730-088	2/06/08	Solid	1										1	1		1						
	TOTAL													88	7	0	7	0	5	0			

URS CHAIN OF CUSTODY - INPEX Project

ADDRESS:	URS Australia level 3 93 Mitchell Street Darwin, NT, 0800	LABORATORY:	SGS	All results to be provided in MRED format email address: ian_hollingsworth@urscorp.c	FOR LABORATORY USE ONLY Custody Seal ? Y N NA Free ice / frozen icebricks present upon receipt? Y N Random Sample Temperature on Receipt oC
PHONE NO:	08 8980 2900	PHONE NO:	07 4035 5111	TURNAROUND DETAILS: [X] Standard - 5 days [ ] Non standard	COC SEQUENCE NUMBER: [1] 2 3 4 (please circle)
FAX NO:	08 8941 3920	FAX NO:	07 40355122		
URS PROJECT NO:	42906730			RELINQUISHED BY: IDT	RECEIVED BY:
URS PM:	Ian Hollingsworth	INPEX SITE :	Blaydin Point	11/6/08	RELINQUISHED BY:
URS SAMPLERS :	Ian Hollingsworth	INPEX PM:	Sean Redden	DATE: 6/6/08 TIME: 9:30	RECEIVED BY:
COMMENTS:				DATE: TIME:	DATE: TIME: DATE: TIME:

	SAMPLE DETAILS			CONTAINER TYPE & PRESERVATIVE																		
				Solid	Liquid																	
LAB ID	SAMPLE ID	DATE dd/mm/yy (enter in text format in computer)	MATRIX (Solid / Liquid)	Soil bag (G)		40ml VOA Vial (G) HCL	1 L Amber (G) Unpr.	100ml (P) HNO3	250ml (G) H2SO4	100ml (P) Unpr.	100ml (P) HCL		Other:	Total Containers	pH/EC (1:5 soil:water)	CEC	Chromium Suite Reduceable Sulfur	Agriculture Suite	Extractable heavy metals (As,Cd,Cr,Cu,Pb,Zn,M n,Hg,Ni)	Emmerson Class			HOLD
	42906730-089 ✓	2/06/08	Solid	1										89			1					
	42906730-090 ✓	2/06/08	Solid	1										1	2		1					
	42906730-091 ✓	2/06/08	Solid	1										1	1		1					
	42906730-092 ✓	2/06/08	Solid	1										1	1		1					
	42906730-093 ✓	2/06/08	Solid	1										1			1					
	42906730-094 ✓	2/06/08	Solid	1										1	1		1					
	42906730-095 ✓	2/06/08	Solid	1										1	1		1					
	42906730-096 ✓	2/06/08	Solid	1										1	1		1					
	42906730-097 ✓	2/06/08	Solid	1										1	1		1					
	42906730-098 ✓	2/06/08	Solid	1										1	1		1					
	42906730-99 ✓	2/06/08	Solid	1										1	2		1					
	TOTAL													99	11	0	11	0	0	0		

URS CHAIN OF CUSTODY - INPEX Project

ADDRESS:	URS Australia level 3 93 Mitchell Street Darwin, NT, 0800	LABORATORY:	SGS	All results to be provided in MRED format email address:	FOR LABORATORY USE ONLY
PHONE NO:	08 8980 2900	PHONE NO:	07 4035 5111	TURNAROUND DETAILS: [X] Standard - 5 days [ ] Non standard	COC SEQUENCE NUMBER: [1] 2 3 4 (please circle)
FAX NO:	08 8941 3920	FAX NO:	07 40355122		Custody Seal ? Y N NA Free ice / frozen icebricks present upon receipt? Y N Random Sample Temperature on Receipt oC

URS PROJECT NO:	42906730			RELINQUISHED BY: IDH	RECEIVED BY:	RELINQUISHED BY: / RECEIVED BY:
URS PM:	Ian Hollingsworth	INPEX SITE :	Blaydin Point	11/6/08 9:30		
URS SAMPLERS :	Ian Hollingsworth	INPEX PM:	Sean Redden	DATE: 6/6/08 TIME:	DATE: TIME:	DATE: TIME: / DATE: TIME:
COMMENTS:						

	SAMPLE DETAILS			CONTAINER TYPE & PRESERVATIVE																	
				Solid	Liquid																
LAB ID	SAMPLE ID	DATE dd/mm/yy (enter in text format in computer)	MATRIX (Solid / Liquid)	Soil bag (G)		40ml VOA Vial (G) HCL	1 L Amber (G) Unpr.	100ml (P) HNO3	250ml (G) H2SO4	100ml (P) Unpr.	100ml (P) HCL		Other:	Total Containers	pH/EC (1:5 soil:water)	CEC	Chromium Suite Reduceable Sulfur	Agriculture Suite	Extractable heavy metals (As,Cd,Cr,Cu,Pb,Zn,Mn,Hg,Ni)	Emmerson Class			HOLD
	42906730-100 ✓	2/06/08	Solid	1										100			1						
	42906730-101 X	2/06/08	Solid	1										1			1						
	42906730-102 X	2/06/08	Solid	1										1			1						
	42906730-103 X	2/06/08	Solid	1										1			1						
	42906730-104 X	2/06/08	Solid	1										1			1						
TOTAL														104	0	0	5	0	0	0			
															73	0	46	12	67	16			

ATTN: JOHN OCCLESTON, CARNS ENVIRONMENTAL LAB

URS

Soil Sample Data Sheet

Date: 28/05/2008

Job Name: 42906730INPEX Geographic Study

Field Staff: Ian Hollingsworth

Field Equipment: auger, ph test kit

Site ID	Time	Sample no.	Duplicate	depth (cm)	pH	Colour	Texture	Comment	Horizon
5	7:35	42906730_013		0-10	9	GLEY1 4/N	silty light clay		A1
5	7:50	42906730_014		50-60	9	GLEY1 4/10Y	silty medium clay		B2
47	9:00	42906730_015		0-10	5	7.5YR4/2	fine sandy loam		A1
47	9:10	42906730_016		50-60	5.5	5YR3/1	fine sandy clay loam		B2
10	9:30	42906730_017		0-10	9	GLEY1 4/10Y	fine silty clay loam		A1
10	9:40	42906730_018		50-60	9	GLEY 1 8/N	fine sandy clay loam		B2
46	9:50	42906730_019		0-10		5YR4/2	fine sandy loam		A1
46	10:10	42906730_020		50-60		5YR4/6	fine sandy clay loam		B2
11	10:15	42906730_021		0-10		5YR1/2	fine sandy loam		A1
11	10:20	42906730_022		50-60		5YR4/6	fine sandy clay loam		B2

Field Staff Signature:

URS

Soil Sample Data Sheet

Date: 27/05/2008

Job Name: 42906730INPEX Geographic Study

Field Staff: Ian Hollingsworth, Julie Crawford

Field Equipment: auger, ph test kit

Site ID	Time	Sample no.	depth (cm)	Duplicate	pH	Colour	Texture	Comment	Horizon
1	7:00	42906730_001	0-10		5	7.5YR3/1	fine sandy loam	plain, eucalypt woodland	A1
1	7:10	42906730_002	50-60		5.5	10YR4/3	sandy clay	plain, eucalypt woodland	B2
2	7:40	42906730_003	0-10		5.5	5YR3/1	fine sandy loam	plain, eucalypt woodland	A1
2	7:45	42906730_004	50-60		5	5YR3/3	fine sandy clay loam	plain, eucalypt woodland	B2
3	8:00	42906730_005	0-10		5.5	7.5YR4/2	fine sandy loam	plain, eucalypt woodland	A1
3	8:10	42906730_006	50-60		6	7.5YR4/3	fine sandy clay loam	plain, eucalypt woodland	B2
7	8:30	42906730_007	0-10		5.5	5YR3/1	fine sandy loam	vine thicket	A1
7	8:45	42906730_008	50-60		5	5YR4/4	fine sandy clay loam	vine thicket	B2
6	9:09	42906730_009	0-10		5.5	10YR4/3	sapric peat	swamp, melaleuca woodland	A1
6	9:20	42906730_010	50-60		5	10YR4/1	fine sandy clay loam	swamp, melaleuca woodland	Bg
8	9:35	42906730_011	0-10		5.5	5YR3/1	fine sandy loam	vine thicket	A1
8	9:45	42906730_012	50-60		6	5YR3/2	fine sandy clay loam	vine thicket	B1

Field Staff Signature:

URS Soil Sample Data Sheet

Date: 29/05/2008

Job Name: 42906730INPEX Geographic Study

Field Staff: Ian Hollingsworth

Field Equipment: auger, ph test kit

Site ID	Time	Sample no.	depth (cm)	Duplicate	pH	Colour	Texture	Comment	Horizon
42	7:20	42906730_023	0-10		5	7.5YR4/1	fine sandy loam		A1
42	7:30	42906730_024	50-60		5	7.5YR5/6	fine sandy clay loam		B2
27	7:45	42906730_025	0-10		5.5	10YR3/1	fine sandy loam		A1
27	7:50	42906730_026	50-60		5	10YR4/4	fine sandy loam		B2
24	8:00	42906730_027	0-10		5.5	10YR3/1	fine sandy loam		A1
24	8:10	42906730_028	50-60		5.5	10YR4/4	fine sandy clay loam		B2
F57	8:30	42906730_029	0-10		5.5	10YR4/3	fine silty loam		A1
F57	8:40	42906730_030	50-60		5	10YR4/6	fine silty loam		B2
13	9:00	42906730_031	0-10		5	10YR3/1	fine sandy loam		A1
13	9:10	42906730_032	50-60		5	10YR4/6	fine sandy clay loam		B2
49	9:20	42906730_033	0-10		4.5	10YR2/1	silty loam		A1
49	9:30	42906730_034	50-60		4.5	10YR3/3	silty loam		B2
50	9:40	42906730_035	0-10		4	10YR2.5/N	silty loam		A1
50	10:00	42906730_036	50-60		4.5	10YR5/N	sand		B2
51	10:30	42906730_037	0-10		6.5	GLEY 1 5/10Y	sand		A1
51	10:40	42906730_038	50-60		6.5	GLEY 1 5/10Y	silty clay		B2
10	10:50	42906730_039	0-10		9	GLEY1 4/10Y	fine silty clay loam		A1
10	11:00	42906730_040	50-60		9	GLEY 1 8/N	fine sandy clay loam		B2
5	11:10	42906730_041	0-10		9	GLEY1 4/N	silty light clay		A1
5	11:20	42906730_042	50-60		9	GLEY1 4/10Y	silty medium clay		B2

Field Staff Signature:

URS

Soil Sample Data Sheet

Date: 29/05/2008

Job Name: 42906730INPEX Geographic Study

Field Staff: Ian Hollingsworth

Field Equipment: auger, ph test kit

Site ID	Time	Sample no.	depth (cm)	Duplicate	pH	Colour	Texture	Comment	Horizon
51	11:00	42906730_043	0-10		6.5	GLEY 1 5/10	sand		Ag
51	11:10	42906730_044	50-60		6.5	GLEY 1 5/10	silty clay		Bg
50	11:20	42906730_045	0-10		4	10YR2.5/N	silty loam		A1
50	11:30	42906730_046	50-60		4.5	10YR5/N	sand		A3

Field Staff Signature:

URS

Soil Sample Data Sheet

Date: 30/05/2008

Job Name: 42906730INPEX Geographic Study

Field Staff: Ian Hollingsworth

Field Equipment: auger, ph test kit

Site ID	Time	Sample no.	depth (cm)	Duplicate	pH	Colour	Texture	Comment	Horizon
9	7:20	42906730_047	0-10		6.5	GLEY 1 5/10	sand		Ag
9	7:30	42906730_048	50-60		6.5	GLEY 1 5/10	silty clay		Bg
52	8:00	42906730_049	0-10		4	10YR2.5/N	silty loam		A1
52	8:15	42906730_050	50-60		4.5	10YR5/N	sand		A3
9	9:00	42906730_051	0-10		9	GLEY 1 5/10	sand		Ag
9	9:15	42906730_052	50-60		9	GLEY 1 5/10	silty clay		Bg
52	9:30	42906730_053	0-10		4	10YR2.5/N	silty loam		A1
52	9:45	42906730_054	50-60		4.5	10YR5/N	sand		A3
53	10:00	42906730_055	0-10		9	GLEY 1 5/10	silty loam		Ag
53	10:15	42906730_056	50-60		9	GLEY 1 5/10	silty loam		Bg
54	10:30	42906730_057	0-10		6.5	GLEY 1 5/10	sand		Ag
54	10:45	42906730_058	50-60		6.5	GLEY 1 5/10	silty clay		Bg
53	11:00	42906730_059	0-10		9	GLEY 1 5/10	silty loam		Ag
53	11:20	42906730_060	50-60		9	GLEY 1 5/10	silty loam		Bg
54	11:45	42906730_061	0-10		6.5	GLEY 1 5/10	sand		Ag
54	12:00	42906730_062	50-60		6.5	GLEY 1 5/10	silty clay		Bg
21	12:30	42906730_063	0-10		9	GLEY 1 5/10	silty loam		Ag
21	12:45	42906730_064	50-60		9	GLEY 1 5/10	silty loam		Bg
21	13:00	42906730_065	0-10		9	GLEY 1 5/10	silty loam		Ag
21	13:30	42906730_066	50-60		9	GLEY 1 5/10	silty loam		Bg

Field Staff Signature:

URS

Soil Sample Data Sheet

Date: 2/06/2008

Job Name: 42906730INPEX Geographic Study

Field Staff: Ian Hollingsworth

Field Equipment: auger, ph test kit

Site ID	Time	Sample no.	depth (cm)	Duplicate	pH	Colour	Texture	Comment	Horizon
F54	8:00	42906730_067	0-10		8.5	10YR4/2	silty loam		A1
F54	8:20	42906730_068	50-60		9	10YR4/3	silty clay loam		B2
F50	8:30	42906730_069	0-10			GLEY 1 5/10	silty clay loam	mono-sulfide odour	A1
F50	8:30	42906730_070	50-60			GLEY 1 5/10	silty clay loam	mono-sulfide odour	Bg
F50	8:40	42906730_071	0-10			GLEY 1 5/10	silty clay loam	mono-sulfide odour	Ag
F50	8:50	42906730_072	50-60			GLEY 1 5/10	silty clay loam	mono-sulfide odour	Bg
55	9:00	42906730_073	0-10			7.5YR3/3	silty clay loam	mono-sulfide odour	Ag
55	9:10	42906730_074	50-60			G12.5Y/N	silty clay loam	mono-sulfide odour	Bg
55	9:15	42906730_075	0-10			7.5YR3/3	silty clay loam	mono-sulfide odour	Ag
55	9:20	42906730_076	50-60			G12.5Y/N	silty clay loam	mono-sulfide odour	Bg
15	9:30	42906730_077	0-10			7.5YR3/2	fine sandy loam	vine thicket	
15	9:40	42906730_078	50-60			7.5YR4/4	fine sandy clay loam	vine thicket	
4	9:50	42906730_079	0-10			G1 4/N	silty clay loam	mono-sulfide odour	
4	10:00	42906730_080	50-60			G1 4/N	silty clay loam	mono-sulfide odour	
4	10:10	42906730_081	0-10			G1 3/N	silty clay loam	mono-sulfide odour	
4	10:20	42906730_082	50-60			G1 4/N	silty clay loam	mono-sulfide odour	
57	10:30	42906730_083	0-10			G1 3/N	silty clay loam	mono-sulfide odour	
57	10:40	42906730_084	50-60			G1 4/N	silty clay loam	mono-sulfide odour	
57	10:50	42906730_085	0-10			G1 3/N	silty clay loam	mono-sulfide odour	
57	11:00	42906730_086	50-60			G1 4/N	silty clay loam	mono-sulfide odour	

Field Staff Signature:

URS

Soil Sample Data Sheet

Date: 2/06/2008

Job Name: 42906730INPEX Geographic Study

Field Staff: Ian Hollingsworth

Field Equipment: auger, ph test kit

Site ID	Time	Sample no.	depth (cm)		pH	Colour	Texture	Comment	Horizon
16	8:00	42906730_087	0-10			GLEY 1 5/10	silty clay loam	mono-sulfide odour	A1
16	8:20	42906730_088	50-60			GLEY 1 5/10	silty clay loam	mono-sulfide odour	Bg
16	8:25	42906730_089	0-10			GLEY 1 5/10	silty clay loam	mono-sulfide odour	A1
16	8:30	42906730_090	50-60			GLEY 1 5/10	silty clay loam	mono-sulfide odour	Bg
17	8:30	42906730_091	0-10			GLEY 1 5/10	silty clay loam	mono-sulfide odour	A1
17	8:30	42906730_092	50-60			GLEY 1 5/10	silty clay loam	mono-sulfide odour	Bg
17	8:45	42906730_093	0-10			GLEY 1 5/10	silty clay loam	mono-sulfide odour	A1
17	8:50	42906730_094	50-60			GLEY 1 5/10	silty clay loam	mono-sulfide odour	Bg
19	8:40	42906730_095	0-10			GLEY 1 5/10	silty clay loam	mono-sulfide odour	A1
19	8:50	42906730_096	50-60			GLEY 1 5/10	silty clay loam	mono-sulfide odour	Bg
18	9:00	42906730_097	0-10			GLEY 1 5/10	silty clay loam	mono-sulfide odour	A1
18	9:10	42906730_098	50-60			GLEY 1 5/10	silty clay loam	mono-sulfide odour	Bg
18	9:15	42906730_099	0-10			GLEY 1 5/10	silty clay loam	mono-sulfide odour	A1
18	9:20	42906730_100	50-60			GLEY 1 5/10	silty clay loam	mono-sulfide odour	Bg
12	9:30	42906730_101	0-10			GLEY 1 5/10	silty clay loam	mono-sulfide odour	A1
12	9:40	42906730_102	50-60			GLEY 1 5/10	silty clay loam	mono-sulfide odour	Bg
14	9:50	42906730_103	0-10			GLEY 1 5/10	silty clay loam	mono-sulfide odour	A1
14	10:00	42906730_104	50-60			GLEY 1 5/10	silty clay loam	mono-sulfide odour	Bg

Field Staff Signature: