Kemerton Lateral Pipeline – Acid Sulphate Soil and Dewatering Management Plan

October 2005

DBNGP (WA) Nominees Pty Ltd

PARSONS BRINCKERHOFF

Parsons Brinckerhoff Australia Pty Limited ACN 078 004 798 and
Parsons Brinckerhoff International (Australia) Pty Limited ACN 006 475 056
trading as Parsons Brinckerhoff ABN 84 797 323 433

1 Alvan Street
Subiaco WA 6008
PO Box 1232
Subiaco WA 6904
Australia
Telephone +61 8 9489 9700
Facsimile +61 8 9380 4060
Email perth@pb.com.au

ABN 84 797 323 433
NCSI Certified Quality System ISO 9001

2145177A
PR2:15141:RevA

Author: Julie Palich.....

Reviewer: Alinta Gas/ECOS Consulting .....

Approved by: Michael Lambert .....

Signed: .....

Date: 12/10/2005 .....

Distribution: electronic copies (ECOS, Alinta Gas).....

Contents

Contents (continued)

Page Number

List of Tables

List of Figures

Appendices

1. Introduction

Acid sulphate soil is the common name for soil that contains iron sulphides or sulphide oxidation products. When acid sulphate soils are exposed to air and water, the iron sulphides can oxidise to produce sulphuric acid, iron precipitates and groundwater with elevated concentrations of dissolved metals such as aluminium, iron and arsenic. Although these materials are typically benign if left in the natural environment, the dewatering, excavation and/or stockpiling of acid sulphate soils may result in the aforementioned impacts. As a result, acid sulphate soils are recognised as a potentially contaminating material by the Department of Environment and therefore require specific consideration and management if present on a development site.

DBNGP Nominees Pty Ltd is proposing to construct a 5 km lateral pipeline to run from the Dampier-Bunbury Natural Gas Pipeline to the Kemerton Power Station (Figure 1). According to the WA Planning Commission (WAPC) Bulletin No 64, the pipeline route passes through an area classified as having a medium risk of containing acid sulphate soils. In particular the pipeline passes through a series of wetlands that are likely to contain peaty acid generating soils.

Parsons Brinckerhoff was commissioned by Ecos Consulting in June 2005 to undertake a Preliminary Acid Sulphate Soil Investigation and to determine if acid generating soils are present along the pipeline route and to delineate their extent to assist in the development of the Environmental Management Plan (EMP) for the project. In addition, PB were commissioned to prepare an acid sulphate soil and dewatering management plan to mitigate potential impacts associated with the disturbance of soils along the pipeline route.

1.1 Background

Installation of the lateral pipeline will involve the excavation of a trench 5 km long, 1.5 m deep and approximately 2 m wide, resulting in the disturbance of approximately 15,000 m^3 of soil. Where possible the excavated soils will be reused to backfill the trenches once the pipeline has been laid.

In additional, dewatering may be locally required to drop the water table sufficiently to open the trench. Based on regional information on the topography and the depth to water in the area, it is anticipated that dewatering may be required during the excavation of the of the pipeline trench, dependant upon the time of year that earthworks are undertaken.

1.2 Scope of Works

Based on PB's understanding of the issue, the recommendations put forth in the Department of Environment's *Acid Sulfate Soil Guideline Series* (2003/2004) and PB's understanding of the current regulatory requirements of the Department of Environment (DoE), the following scope of works was undertaken as part of the preliminary investigation of the Kemerton Lateral Pipeline:

1. Liaison with the DoE to receive pre-approval of the sampling and analysis plan;
2. Preparation of a Health, Environment and Safety Plan (HESP) including a risk assessment for the on-site investigation;
3. Installation of 23 soil bores to depths up to 3 m and collection of up to 188 soil samples;
4. Field pH (pH_F) and pH after oxidation (pH_{FOX}) testing of the 188 samples;
5. Submission of 48 samples to the ALS for laboratory analysis of using the Chromium Reducible Sulphur Suite;
6. Interpretation of results;
7. Provision of this report, which includes the findings of the preliminary investigation and management strategies for soil handling and dewatering.

2. Acid Sulphate Soil Investigation Methodology

A site investigation for acid sulphate soils was undertaken in July 2005. The soil investigation included:

- Installation of 23 auger holes to a maximum depth of 3 m;
- Sampling of soils at 0.25 m intervals (where recovery of sample was possible);
- Analysis of 188 soil samples for field pH (pH_F) and field peroxide pH (pH_{FOX}) using recognised methods; and
- Analysis of groundwater at 13 sites that intersected the water table for total titratable acidity (TTA) and pH.

Soil bore locations are provided in Figure 2 and soil bore logs are provided in Appendix 1. Table 2.1 summarises the methodology adopted during the fieldwork for the assessment of soils.

Table 2.1: Soil assessment methodology

Activity	Details
Services Location	Site plans, including services locations were inspected prior to drilling. An Alinta Gas Supervisor provided clearances for bore installation locations.
Soil Bore Installation	23 hand augered soil bores were installed at intervals of approximately 200 m through those low lying areas designated as heaths (16 bores over 5 areas), and at 500 m intervals through those areas identified as woodlands (9 bores over 4 areas) (Figure 2). Soil bores were installed to 2 mBGL except where bore collapse occurred due to high water table levels. Two bores were installed to 3 mBGL to determine the vertical continuity of the sand unit encountered..
Soil Logging	Soil and rock type classification based on AS1726 – 1993.
Soil Sampling	Soil samples were obtained from the auger head and preserved in airtight plastic bags.
Soil Field pH Testing	pH_F was measured on a 1:5 soil:water slurry. pH_{FOX} was measured by mixing a 3:1 soil:hydrogen peroxide mix, and letting the reaction proceed to completion. The mixture was then made up to the same volume as used in the pH_F tests (using deionised water), from which the pH_{FOX} was measured.
Laboratory Sample Selection	48 samples were selected for analysis using the Chromium Reducible Sulphur Suite based on field results. The 48 samples comprised: the highest potential acid generating soil from each bore (23 samples), soils samples at 0.5 m intervals from the highest potential acid generating bore in each of the 5 heath areas, and 3 QA/QC samples
Soil Bore Abandonment	Auger holes were backfilled post sample collection and logging.
Sample Preservation	Samples were stored in stapled airtight plastic bags on ice while on-site and whilst in transit.

3. Assessment Criteria

3.1 pH_F and pH_{FOX} Testing

In the Draft Acid Sulphate Soil Guidelines Series (2003), the Department of Environment (DoE) has provided guidelines defining indicator field pH values for pH_F and peroxide pH (pH_{FOX}) to assist with identifying likely acid generating soils. The pH indicator values are defined as:

- $pH_F \leq 4$ (when pH_F >4 but <5 may indicate some existing acidity); and
- pH_{FOX} <3 or a much lower pH_{FOX} than pH (greater than 1 pH unit change).

As a general rule of thumb, soils are considered to contain some actual acidity (oxidised sulphide material and / or organic acids dependent on the sample depth) if their pH is less than 4 and may contain actual acidity if their pH is between 4 and 5. Potential acidity (unoxidised sulphide material), or the ability of a material to generate acid is determined through the pH_{FOX} test. As a general rule of thumb, soils are considered to contain potential acidity if their pH_{FOX} is less than 3.

3.2 Laboratory Analysis

Western Australia's *Draft Acid Sulphate Soil Guidelines* (2003) have established action criteria for the assessment of the environmental risk of acid sulphate soils. The action criteria are based on the sum of existing plus potential acidity, calculated as equivalent sulphur (e.g. s-TAA +S_{CR} in %S units) or equivalent acidity (e.g. TAA +TPA in mol H^+/tonne).

As clay content tends to influence a soil's natural pH buffering capacity, the action criteria are grouped by three broad texture categories – coarse, medium and fine. The criteria are used to define when acid sulphate soils disturbed at a site will need to be treated and managed. Table 3.1 summarises the action criteria.

Table 3.1: Texture based acid sulphate soils action criteria

Type of Material		Action Criteria if <1,000 tonnes of material is disturbed		Action Criteria if >1,000 tonnes of material is disturbed	
Texture Range	**Approx. Clay Content**	**Equivalent Sulphur (%)**	**Equivalent Acidity (mol H^+/tonne)**	**Equivalent Sulphur (%)**	**Equivalent Acidity (mol H^+/tonne)**
Coarse – sands to loamy sands	≤5%	0.03	18	0.03	18
Medium – sandy loams to light clays	5 – 40%	0.06	36	0.03	18
Fine – medium to heavy clays and silty clays	≥40%	0.1	62	0.03	18

4. Geology, Hydrogeology and Surrounding Environment

Information regarding the geology and hydrogeology of the site is derived from the site specific information collected during the investigations undertaken at the site.

4.1 Geology

Soils within the proposed development were interpreted to be predominantly of the Bassendean Sands Formation. Soils in the shallow profile are dominated by white quartz sand, which is locally organic rich dependent on depth and topography.

Ferruginised "coffee rock" was intersected in AH 03 at a depth of 2.75 mBGL, below which the sands were orange. Ferruginisation has also been observed in dune profiles approximately 1.5 km away from the project area, and has a suspected widespread occurrence throughout the area, especially in the topographically higher areas. Although not encountered, it is interpreted that localised ferruginous sand lenses may be present along the southern portion of the line between AH01 and AH07 where togographic highs are present. These lenses are interpreted to occur at depths greater than 1.5 mBGL, and therefore would not be directly disturbed by the installation of the gas pipeline.

Organic-rich quartz sands were intersected throughout the area at the surface with typically thicker profiles in the lower topographic areas. Organic acids liberated from this widespread soil horizon cause discolouration of the underlying sands to depths of approximately 0.5 – 1.5 m.

Two lenses of peat, interpreted as unlikely to be associated with modern wetland processes, were intersected in AH 20 at depths of 0.5 and 1.9 mBGL. This peat is suspected to have formed in wetlands during the early Holocene. Although not intersected in other bores, it is interpreted that the deeper peat lens may be extensive throughout the northern portion of the site between AH14 and AH25. The deeper peats are not expected to be directly disturbed by the installation of the gas pipeline

Detailed bore logs from the acid sulphate soil investigation bores are shown in Appendix A, the spatial distribution of the soil horizons is shown in Figure 3, and the typical soil profile is shown in Table 4.1.

Table 4.1: Generic soil profile

Soil Type	Depth (mBGL)	Geological Distribution
Clean White Quartz Sands	0 – 0.1	Widespread
Organic Rich Sands	0.1 – 0.5	Widespread
Peat	0.5 – 0.6	Localised
Quartz sands	0.5 - 2.75	Widespread
Peat	1.9 – 2.0	Localised
Ferruginised Coffee Rock	2.75 – 3.0	Localised

4.2 Hydrogeology

Groundwater was encountered at approximately 0.5 mBGL in bores taken in the lower topographic wetland areas. In the higher topographic areas, groundwater was typically not encountered above 2 mBGL. In the northern area of the line (AH 22 – 23) the ground surface was covered with water, suggesting possibly slightly higher water tables in the north of the study area than the south, though this may also be due to differences in topography from the south of the line to the north.

Groundwater pH and TTA levels were recorded at 13 sites and tabulated in Appendix C. The pH of the groundwater is generally between 3.5 and 4.5, indicating that the groundwater is already acidic. The TTA was <1% as H_2SO_4 at all sites where groundwater was sampled. A tannin discolouration was highly visible in both ground and surface water and is indicative of organic acids. Acidity in the groundwater is inferred to be derived from the degradation of the widespread organic rich sands profile that typically occurs between 0.1 – 0.5 m, thus the depressed pH levels of the ground and surface waters are believed to represent natural conditions. None of the groundwater samples had a characteristic sulphur smell.

4.3 Sensitive Receptors

The key sensitive receptors are the wetland flora and fauna of the Environmental Protection Policy (EPP) designated Kemerton Wetlands. The Kemerton Wetland area consists predominantly of open eucalypt and banksia woodlands (higher topographic areas), and dense heath-lands dominated by native low lying wetland vegetation (Kunzea, Astarea), native grasses, melaleuca and occasional eucalypts.

Existing sensitive land uses (other than the Dampier to Bunbury Pipeline) in the area include:

- Industrial – Kemerton Silica Sand Mine and Processing Plant
- Industrial –high power transmission lines, which run parallel to the pipeline alignment, and the Kemerton Power Plant
- Agricultural – cattle grazing
- Plantations – blue gum located at the southern end of the study area.

Land not allocated to the above land uses is owned by the Department of Conservation and Land Management (CALM) and forms part of the Kemerton Wetlands.

5. Results of Investigation

5.1 Field Results

Results of the field pH (pH_F) tests indicated the following acid generating characteristics of the soils:

- Limited actual acidity is contained in the soil profile as all samples exhibited pH_F values greater than 4.0 and most samples were greater than pH_F 5.0;
- pH_{FOX} test results indicate an absence of potential acidity in the soil profile with all soil pH_{FOX} values being greater than 4.0;
- Several samples within the clean quartz topsoil (0 – 0.1 m) exhibited a pH_F to pH_{FOX} change of greater than 1 in the low-lying wetland areas;
- The peat shallow peat horizon exhibited a pH change greater than 1 indicating that it may be acid generating. This trend was not observed in the lower peat horizon.; and
- Several samples in the higher areas of the topsoil and white sands exhibited an increase in pH between pH_F and pH_{FOX}. These results are typically indicative of the presence of organic acids.

5.2 Laboratory Results

Results of the laboratory testing indicate that the quartz rich sands extensive throughout the region are unlikely to be acid generating with the majority of the samples analysed returning net acidity concentrations less than 0.02% S and less than 10 mol H^+/tonne (Figure 5). Of the twenty-seven samples analysed from this unit, three exhibited an actual acidity of 0.05% S, which slightly exceeds the action criteria of 0.03% S for this material. Despite these exceedences, the mean plus one standard deviation of all samples analysed in the unit is equal to 0.03% S, indicating that this soil unit does not exceed the action criteria and therefore is not likely to be acid generating. Although the twenty-seven samples analysed from this unit meet both the Department of Environment's waste classification criteria (DoE, 2002), and the 1 lab sample per 10 field samples frequency that the DoE applies to confirming field results for treated soils, further laboratory testing of this unit may be required by the Department of Environment to confirm that the unit is not acid generating.

Laboratory results indicate that organic sands located within the top 0.25 m of the soil profile are locally acid generating in the low-lying areas with net acidity concentrations in the low-lying areas ranging from 0.04% S to 0.1% S (25 to 64 mol H^+/tonne). This acidity was present entirely as actual sulphide acidity, likely due to the long-term exposure of the soil to an oxygen-rich environment.

Organic sands taken from areas beyond the seasonal wetlands, were not found to be acid generating with net acidity concentrations below the detection limit of the analytical method (<0.02% S).

Both of the peat units, locally intersected in AH20 exhibited a large concentration of actual acidity with actual acidity concentrations ranging from 0.11% S in the upper peat unit to 0.37% S in the lower peat unit. Despite occurring at depth, both units showed an absence of potential acidity. The absence of potential acidity may be indicative of a soil profile that is subjected to seasonal flooding, or may indicate that the sulphide materials within the unit oxidise rapidly upon exposure to atmospheric conditions.

The localised coffee rock unit intersected at depth at AH03 also exhibited a large concentration of actual acidity (0.08% S to 0.11% S). Again, the absence of potential acidity may be indicative of a soil profile that is subjected to seasonal flooding, or may indicate that the sulphide materials within the unit oxidise rapidly upon exposure to atmospheric conditions.

5.3 Implications for Acid Generation During Earthworks

Table 5.1 lists the inferred acid generating potential of the geological units intersected based on the results of the field and laboratory data.

Table 5.1 Inferred acid generating capacity of soil units encountered

Soil Type	Depth (mBGL)	Geological Distribution	Acid Generating Potential
Clean White Quartz Sands	0 – 0.1	Widespread	No
Organic Rich Sands	0.1 – 0.25	Widespread	Yes (lowland areas)
Peat	0.5 – 0.75	Localised	Yes
Quartz sands	0.25 - 2.75	Widespread	No
Peat	1.9 – 2.0	Localised	Yes
Ferruginised Coffee Rock	2.5 – 3.0	Localised	Yes

Table 5.1 shows that the acid generating potential of most of the widespread geological units is low. The three units which are potentially acid generating are the peat units locally intersected at depths 0.5 – 0.75 mBGL and 1.9 to 2.0 mBGL in AH20, the organic-rich white quartz sand unit that occurs between 0.1 and 0.25 m throughout the project area, and the coffee rock (Figure 3).

Excavation works proposed during the construction process will not occur below depths of 1.5 mBGL. Therefore the only intersected units, with a moderate acid generating potential, that occurs above 1.5 mBGL is likely to be the organic sands in the wetland areas (approximately 1000 m^3) and the peat unit intersected at 0.5 – 0.75m in AH 20 (250 m^3).

Additionally, the near surface groundwater drawdown that will form during the dewatering process typically occur at least 0.5 m below the dewatered zone (i.e. 1.5 mBGL). Consequently the peat layer intersected at depths 1.75 – 2.0 mBGL in AH20 may also become an acid generating unit during dewatering. This unit was only intersected in AH20, however, the lateral extent of this peat is interpreted to be laterally extensive beneath AH16 and AH24.

Given that the only intersection of the ferruginised coffee rock occurred at depths greater than 2 mBGL it is unlikely that hydrogeological disturbance during the dewatering process will impact the acid generating potential of the ferruginised zone.

5.4 Additional Investigative Works

The following additional investigation should be undertaken prior to the earthworks to confirm site conditions:

- An additional 15 samples from the Bassendean sand unit will be submitted for laboratory analysis using the Chromium Reducible Sulphur Suite to provide sufficient data to meet DoE sampling and analysis requirements;
- 10 samples will be collected from the topsoil located beyond the pipeline easement, in the low lying wetland areas, to determine whether actual acidity in the topsoil within the easement is due to previous disturbance of the soils or is endemic to the area;
- Submission of 10 samples from the Bassendean sand and peat units for analysis of heavy metals to determine potential for metals mobility from the soils (Bassendean sand) and suitability for off-site disposal (peats);
- Sampling of groundwater quality from monitoring standpipes and nearby natural water bodies adjacent to the pipeline, one month prior to the commencement of dewatering activities to confirm background groundwater quality.

6. Acid Sulphate Soil Management

Appropriate management of the acid generating soils will be essential to ensure that there are no adverse impacts to the sensitive receptors in the area. The following management practices will be implemented to minimise the risks associated with the disturbance of acid sulphate soils.

6.1 Timing and Duration

The timing for the earthworks for the excavation of the Kemerton Lateral Pipeline is planned to occur during Q4 2005 or Q1 2006. This timing has been chosen to take advantage of low water table levels.

The total project duration is expected to be approximately 35 days.

6.2 Soil Handling Strategies

6.2.1 Trench Management

The following practices will be adopted to reduce the potential impacts of oxidation by acid sulphate soils:

- The first 100 m of the trench will be open for up to 5 days to allow for connection to existing pipework in the area.
- Subsequent trench lengths will be open for a maximum duration of 12 hours to minimise the exposure time of in-situ acid generating soils;

6.2.2 Soil Handling

The following soil handling strategies will be adopted during the excavation programme:

- Topsoil will be stockpiled to one side of the pipeline for a period of 4-5 weeks;
- The peat lens identified at AH20 will be excavated and disposed to an appropriate landfill (Class II or greater) or licenced soil treatment facility. Any other peat lens (not anticipated) encountered in the excavation will also be removed from site;
- If the full extent of a peat lens is not excavated (i.e. – peat is left exposed on the walls or base of the trench), a 5 cm thick guard layer of lime sands will be emplaced over the impacted areas prior to backfilling with sand;
- The sand unit excavated from the trench will be used as backfill material in the trench. These sands will be excavated and returned to the trench within 12 hours. This material does not require treatment prior to reuse;
- In the low-lying areas defined by wetland vegetation, a neutralising layer of lime sands will be emplaced on top of the sands to neutralise acidity that may be generated from the topsoil. The lime will not be blended with the topsoil to preserve

the environmental value of the soils as a vegetation source. The amount of lime to be used will be calculated using the following equation:

Lime required (kg/$CaCO_3$/tonne untreated topsoil) = (kg H_2SO_4/tonne) x (1.5/ENV)

where:

kg H_2SO_4/tonne is taken to be 65 based on the maximum actual acidity detected in the topsoil samples, and

ENV is the effective neutralising value of the lime as quoted by the supplier.

6.3 Contingency Plans

The following contingency plans will be adopted:

- If additional investigative works beyond the pipeline easement indicate that topsoil outside the easement also contains actual acidity, soils from within the easement will not be stockpiled on a lime pad. If the actual acidity observed in the topsoil is found to be local to the easement area, topsoil will be stockpiled on a 200 mm lime pad;
- If heavy metals are found to be present at concentrations exceeding the Ecological Investigation Levels for soils, or additional lab testing of the Bassendean sands finds localised areas that are acid generating, the base of the excavation will be lime dosed where relevant;

7. Dewatering Management

As groundwater in the area may already be acidic, appropriate management of the groundwater during dewatering will be essential to ensure that there are no adverse impacts to the sensitive receptors in the area. The following management practices will be implemented to minimise the risks of acid generation associated with dewatering.

7.1 Dewatering Programme

The essential components of the proposed dewatering programme are:

- Dry excavation of soils to the water table;
- Localised drawdown of the water table to a maximum depth of 0.5 m below the base of the trench in the first 100 m of the excavation;
- Potential dewatering along localised segments of the pipeline in low-lying areas if necessary;
- Where necessary, treatment of the water through a lime treatment unit and disposal to the environment as appropriate.

7.2 Drawdown Management

If dewatering is necessary, drawdown of the water table will not occur below the base of the pit in the following areas to minimise the possibility of dewatering potentially acid generating units underlying the trench:

- Between AH19 and AH23 at the northern end of the pipeline, where a peat unit is interpreted to be present at approximately 0.5 m below the base of the proposed trench; and
- Between AH2 and AH7 at the southern end of the pipeline, where coffee rock is interpreted to be locally present at approximately 0.25 m below the base of the proposed trench.

7.3 Groundwater Neutralisation & Disposal

The following groundwater neutralisation and disposal practices will be undertaken:

- If groundwater exceeds the pH or total titratable acidity performance criteria defined in Section 7.4.1, groundwater will be neutralised through a mobile lime dosing plant prior to disposal.
- Following treatment, disposal of groundwater will be undertaken using a combination of the following methods:

- Where groundwater is found to be of similar composition to nearby surface waters, groundwater will be reinfiltrated to the environment in dieback infected areas preferentially within the easement;

- Where groundwater is found to be of a different composition to nearby surface waters, permissions will be sought to dispose of water to a holding pond at Kemerton Silica Sands or to an appropriate off-site location.

Given that the composition of the groundwater may change seasonally, it is not possible to confirm a suitable disposal method until the background water quality sampling is undertaken. As discussed in Section 5.4, this monitoring will be undertaken one month before the dewatering programme commences.

7.4 Groundwater Quality Monitoring

The following routine groundwater monitoring will be undertaken in areas where dewatering occurs:

- A flow meter will be installed on the pump and cumulative flow will be recorded daily
- Temporary piezometers will be installed within the expected area of groundwater drawdown in areas where drawdown occurs. Measurements of total titratable acidity, pH, EC and DO will be performed daily during the works on relevant piezometers and at the discharge outlet to the pump;
- Laboratory analysis of total acidity, total alkalinity, pH, sulphate, chloride, dissolved aluminium (filtered), total aluminium, dissolved arsenic (filtered), dissolved chromium (filtered), dissolved cadmium (filtered), total iron, dissolved iron (filtered), dissolved manganese (filtered), dissolved nickel (filtered), dissolved zinc (filtered), dissolved selenium (filtered), ammoniacal nitrogen, hydrogen sulphide, EC and TDS will be carried out at the conclusion of dewatering in each area.
- After completion of the works, groundwater monitoring of relevant piezometers from areas of dewatering, including laboratory analysis, will continue on a monthly basis for 3 months to determine whether there are any long-term impacts to groundwater from dewatering.

7.4.1 Performance Criteria

Table 7.1 summarises the performance criteria that will be adopted for the site during the monitoring programme.

Table 7.1: Performance criteria for groundwater monitoring

Acceptable Threshold	Exceedance Triggering Contingency Plan
pH > 6.0 (effluent)	pH < 6.0 (effluent)
ΔpH<0.5 in one week (groundwater bores)	ΔpH>0.5 in one week (groundwater bores)
EC< 2000 μS/cm	EC>2000 μS/cm AND pH or TA exceed acceptable threshold
TSS < 100 mg/L	TSS > 100 mg/L
TA< 35 mg/L	TA>35 mg/L
Total Acidity-Total Alkalinity < 35 mg/L	Total Acidity-Total Alkalinity > 35 mg/L
SO_4/Cl<0.5	SO_4/Cl>0.5
Fe < 0.3 mg/L	One or more metals exceed acceptable threshold by 10x
Mn < 0.5 mg/L	
Al < 0.2 mg/L	
As < 0.007 mg/L	
Se < 0.01 mg/L	
Zn < 3.0 mg/L	

7.5 Contingency Planning

The following contingency plans will be adopted:

- If neutralised groundwater does not meet the performance criteria outlined in Section 7.4.1, groundwater will be disposed off-site, except in the case of elevated TSS whereby a sand filter will be fitted to the discharge pipe.
- If groundwater results indicate a deterioration of groundwater quality over the long-term for reasons directly attributable to dewatering, an appropriate soil investigation will be undertaken to determine the source of acidification and a groundwater and soil management strategy will be prepared.

7.6 Reporting

The Department of Environment will be sent water quality results on a weekly basis and will be provided with a summary report at the conclusion of the 3 month groundwater monitoring programme.

8. References

DoE, 2004, Identification and Investigation of Acid Sulfate Soils, Acid Sulfate Soil Management Series.

DoE, 2004, Guidance for Groundwater Management in Urban Areas on Acid Sulfate Soils, Acid Sulfate Soil Management Series.

DoE, 2004, Treatment and Management of Disturbed Acid Sulfate Soils, Acid Sulfate Soil Management Series.

DoE, 2004, Preparation of Acid Sulphate Soil Management Plans, Acid Sulfate Soil Management Series.

Appendix A

Soil Bore Logs

Appendix B

pH_F and pH_{FOX} Test Results

Appendix C

Groundwater Testing Results

Appendix D

Laboratory Analysis Results

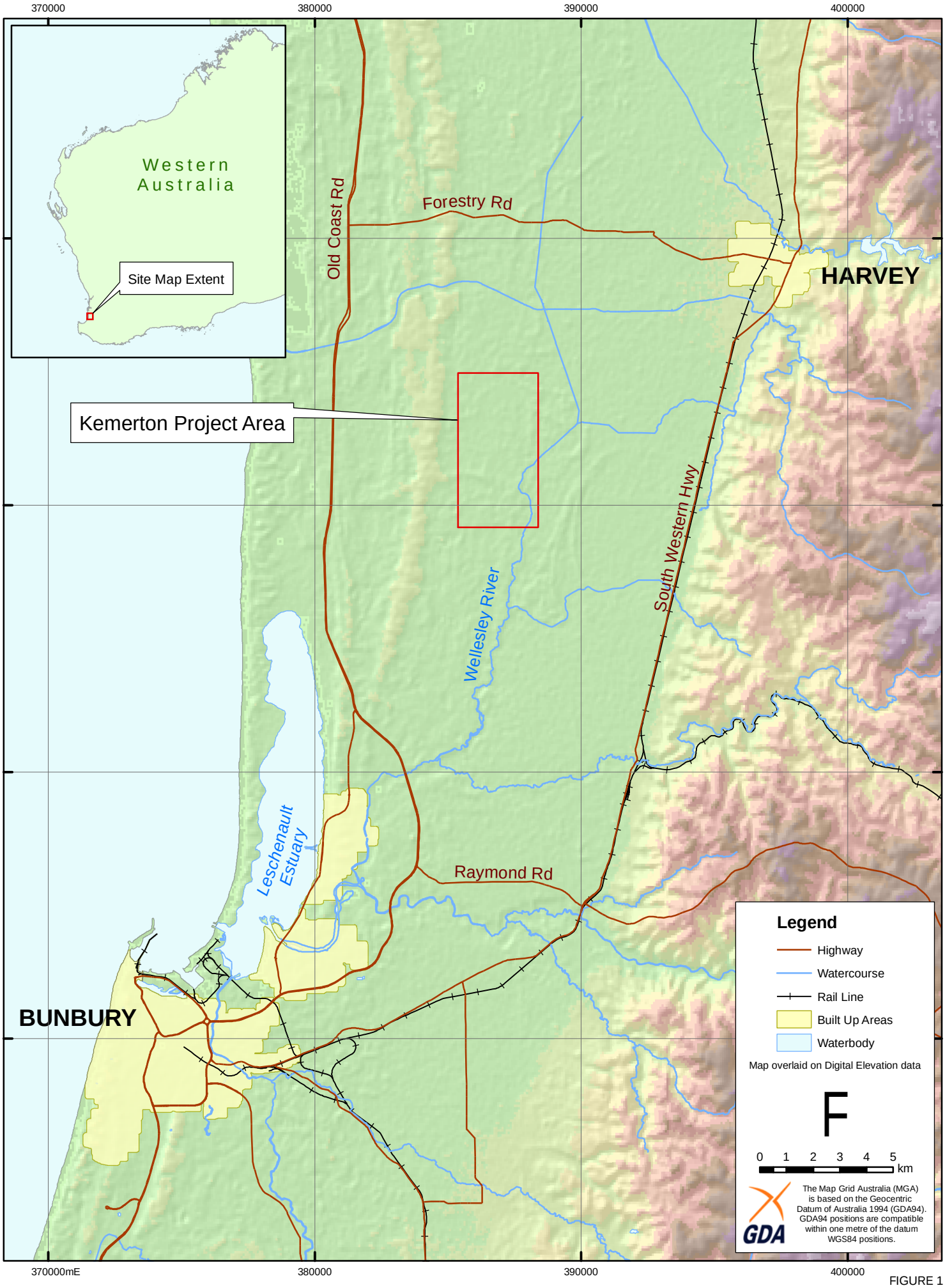


FIGURE 1

KEMERTON PRELIMINARY ACID SULPHATE SOIL INVESTIGATION

SITE MAP

386000 387000 388000 389000

6334000 6333000 6332000 6331000 6330000mN

25A W1d
24A H2
23A H3
22A W1d
21A As H3
20A CL/P H2
W2d
19A
18A H3
17A Wmb
16A
15A W2
14A
13A
Gate
As W2
11A
9A H2
8A As H3
7A LI Wmb H1
6A W2
As
5A W2
4A H2
BJ As W1
3A
2A H2
1A
CL/P

386000mE 387000 388000 389000

LEGEND

A Soil Bores

Cadastral Boundary

Woodlands

W1: Open Low Woodland of *Eucalyptus marginata* and *Corymbia calophyte* over tall shrubs dominated by *Kunzea glabrescens* on grey sand

W1d: Disturbed areas of plant community W1

W2: Low Woodland of *Eucalyptus marginata*, *Banksia ilicifolia* and *Banksia attenuata* over shrubs dominated by *Kunzea glabrescens* and *Adenanthos meisneri* on grey sand

W2d: Disturbed areas of plant community W2

Heaths

H1: Dense Heath of *Kunzea glabrescens* and *Adenanthos meisneri* with occasional emergent *Eucalyptus marginata* and *Melaleuca preissiana* on grey sand

H2: Dense Heath dominated by *Astartea affinis* with occasional emergent *Melaleuca preissiana* on black peaty loam

H3: Dense Heath dominated by *Kunzea glabrescens*, *Hypocalymma angustifolium* and *Pericalymma ellipticum* over sedges on sandy peat

Priority Species

As: *Acacia semitrullata* (Priority 3) and
BJ: *Boronia juncea* subsp. (Priority 1)

Perennial Weeds

LI: *Leptospermum laevigatum* and
Wmb: *Watsonia meriana* var. *bulbillifera*

CL/P: Areas covered by Eucalyptus plantations or cleared

0 200 400 600 800 1,000 m

F

GDA

The Map Grid Australia (MGA) is based on the Geocentric Datum of Australia 1994 (GDA94). GDA94 positions are compatible within one metre of the datum WGS84 positions.

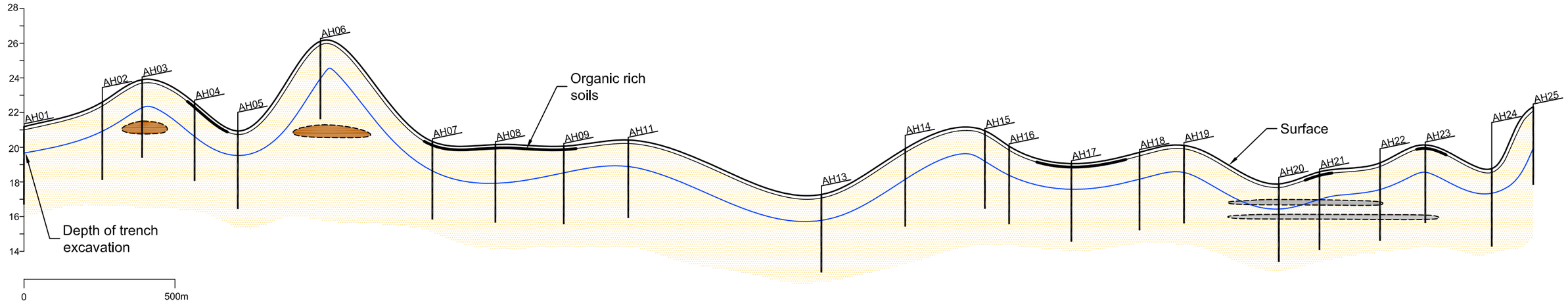
KEMERTON PRELIMINARY ACID SULPHATE SOIL INVESTIGATION

FIGURE 2

SOIL BORE LOCATION MAP

PB PARSONS BRINCKERHOFF • Email: perth@pb.com.au

Date: 23/08/2005 • Scale 1:13 250 @ A3 • PLAN No: 5177A-002

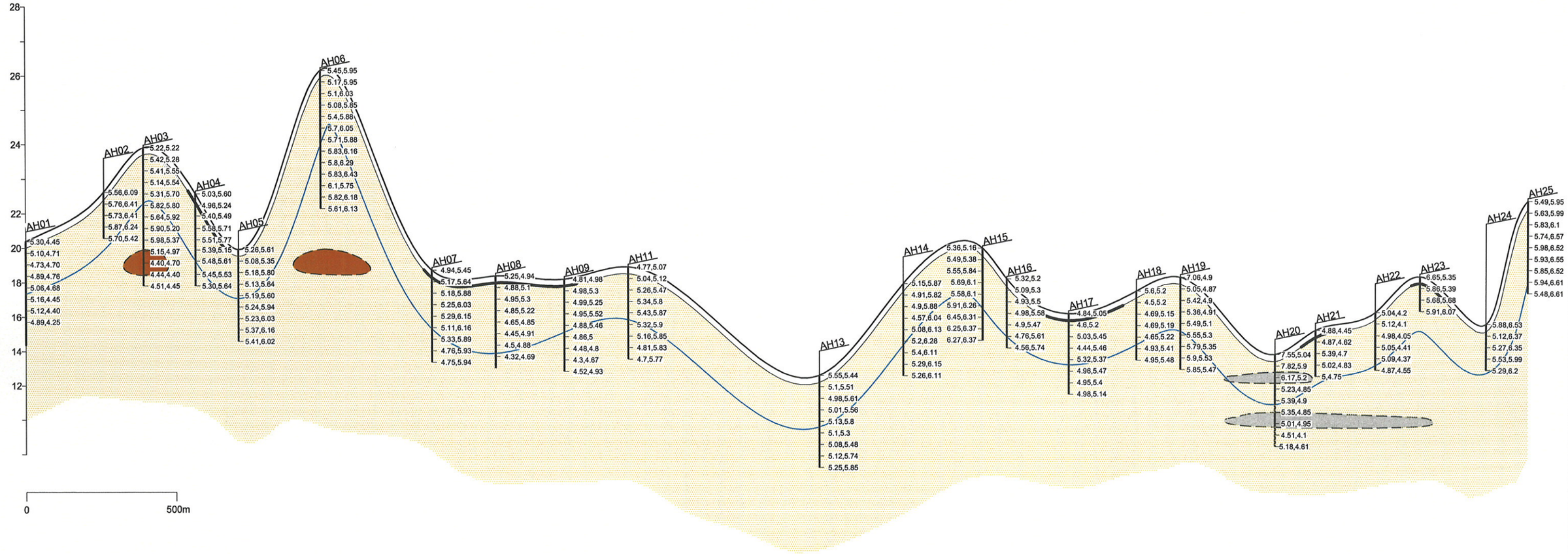


Legend

- White Sands
- Peats
- Coffee Rock and Ferruginous Soils
- Bores

DRN: R.Bargerbos Aug '05 CHKD: E.Oldmeadow Aug '05 DATUM: N/A SCALE: Diagramatic	Kemerton Pipeline ASS Investigation Inferred Geological Cross-Section CLIENT: DBNGP Nominees Pty Ltd	PB 100 YEARS Figure 3 2145177A

J:\A657-HAZ\PROJ\2145177A_KemertonPipelin\9_Drafting\ACAD\Figure 3.dwg

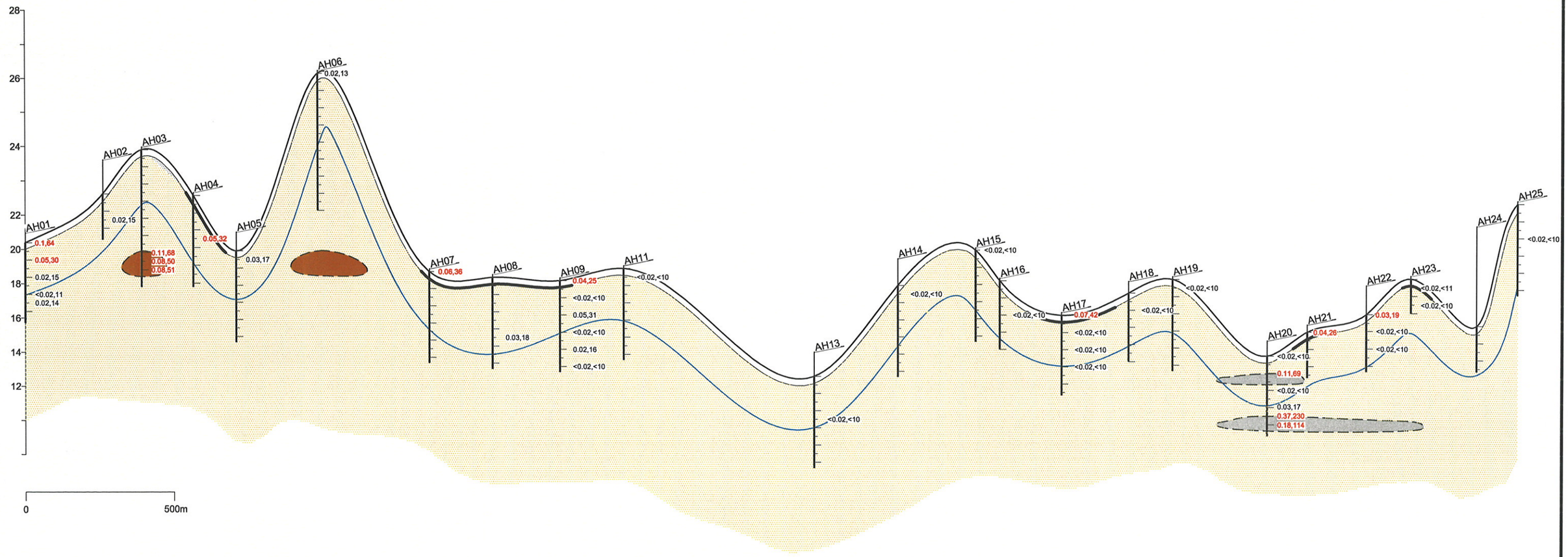


Legend

- Organics
- Topsoil Sands
- White Sands
- Peats
- Coffee Rock and Ferruginous Soils
- Bores
- 5.35,4.85 pH_F pH_{FOX}

DRN: R.Bargerbos Aug '05 CHKD: E.Oldmeadow Aug '05 DATUM: N/A SCALE: Diagramatic	**Kemerton Pipeline ASS Investigation** Acid Generating Potential of Soil Horizons- Field pH Results CLIENT: Ecos Consulting	PB 100 YEARS Figure 4 2145177A

J:\A657-HAZ\PROJ\2145177A_KemertonPipelin\9_Drafting\ACAD\Figure 4.dwg



Legend

- Organics
- Topsoil Sands
- White Sands
- Peats
- Coffee Rock and Ferruginous Soils
- Bores
- 0.1,15 %S , H+ / tonne

DRN: R.Bargerbos Aug '05 CHKD: E.Oldmeadow Aug '05 DATUM: N/A SCALE: Diagramatic	**Kemerton Pipeline ASS Investigation** Acid Generating Potential of Soil Horizons- Laboratory Results CLIENT: Ecos Consulting	PB 100 YEARS Figure 5 2145177A

J:\A657-HAZ\PROJ\2145177A_KemertonPipelin\9_Drafting\ACAD\Figure 5.dwg

Appendix A

Soil Bore Logs

BOREHOLE ENVIRONMENTAL LOG

BOREHOLE NO.

AH01

SHEET 1 OF 1

Client:	**DBNGP Nominees Pty Ltd**	Date Commenced:	**28/07/05**
Project:	**Kemerton Acid Sulphate Soils Preliminary Investigation**	Date Completed:	**28/07/05**
Borehole Location:	**Kemerton Lateral Pipeline**	Recorded By:	**EO**
Project Number:	**2144177A**	Log Checked By:	**JP**

Drill Model/Mounting:		Driller:		Surface RL:	
Borehole Diameter:	**50 mm**	Driller Lic No:		Co-ords:	**E 386707 N 6330152 WGS 84 Zone 50**

Borehole Information							Field Material Description					
1	2	3	4	5	6	7	8	9	10	11	12	13
METHOD	SUPPORT	WATER	WELL CONSTRUCTION	RL(m) mAHD(est) / DEPTH(m)	FIELD TEST	SAMPLE	GRAPHIC LOG	USC SYMBOL	SOIL/ROCK MATERIAL FIELD DESCRIPTION	MOISTURE	RELATIVE DENSITY /CONSISTENCY (VS S F ST VST H / FB VL L MD D VD)	STRUCTURE AND ADDITIONAL OBSERVATIONS
HA		▼		0.10				SP	Well sorted, moderately well rounded to moderately angular, medium grained white quartz dominated sand.			Trace organic matter Approximately 50% organic matter
								SP	Well sorted, moderately well rounded to moderately angular, medium grained brown quartz dominated sand.			
				0.75				SP	Well sorted, moderately well rounded to moderately angular, medium grained light brown quartz dominated sand.			Approximately 20% organic matter
				1.00 1				SP	Well sorted, moderately well rounded to moderately angular, medium to fine grained white quartz dominated sand.			Approximately 5 - 10% organic matter
				1.25				SP	Well sorted, moderately well rounded to moderately angular, medium to fine grained white quartz dominated sand.			Less than 5% organic matter
				1.75					END OF BOREHOLE AT 1.75 m			
				2								

This borehole log should be read in conjunction with Parsons Brinckerhoff's accompanying standard notes.

BOREHOLE ENVIRONMENTAL LOG

BOREHOLE NO.

AH02

SHEET 1 OF 1

Client:	**DBNGP Nominees Pty Ltd**	Date Commenced:	**28/07/05**
Project:	**Kemerton Acid Sulphate Soils Preliminary Investigation**	Date Completed:	**28/07/05**
Borehole Location:	**Kemerton Lateral Pipeline**	Recorded By:	**EO**
Project Number:	**2144177A**	Log Checked By:	**JP**

Drill Model/Mounting:		Driller:		Surface RL:	
Borehole Diameter:	**50 mm**	Driller Lic No:		Co-ords:	**E 386700 N 6330347 WGS 84 Zone 50**

Borehole Information							Field Material Description					
1	2	3	4	5	6	7	8	9	10	11	12	13
METHOD	SUPPORT	WATER	WELL CONSTRUCTION	RL(m) mAHD(est) / DEPTH(m)	FIELD TEST	SAMPLE	GRAPHIC LOG	USC SYMBOL	SOIL/ROCK MATERIAL FIELD DESCRIPTION	MOISTURE	RELATIVE DENSITY /CONSISTENCY (FB VL L MD VD / VS S F ST VST H)	STRUCTURE AND ADDITIONAL OBSERVATIONS
HA		▼		0.10				SP	Well sorted, moderately well rounded to moderately angular, medium grained white quartz dominated sand.			Trace organic matter
								SP	Well sorted, moderately well rounded to moderately angular, medium grained brown quartz dominated sand.			Approximately 50% organic matter
				0.25				SP	Well sorted, moderately well rounded to moderately angular, medium grained light brown quartz dominated sand.			Approximately 10 - 15% organic matter
				0.50				SP	Well sorted, moderately well rounded to moderately angular, medium grained white quartz dominated sand.			Less than 5% organic matter
				0.75				SP	Well sorted, moderately well rounded to moderately angular, medium grained white quartz dominated sand.			Trace organic matter
				1.00 1					END OF BOREHOLE AT 1.00 m			
				2								

This borehole log should be read in conjunction with Parsons Brinckerhoff's accompanying standard notes.

BOREHOLE ENVIRONMENTAL LOG

BOREHOLE NO.

AH03

SHEET 1 OF 1

Client:	**DBNGP Nominees Pty Ltd**	Date Commenced:	**28/07/05**
Project:	**Kemerton Acid Sulphate Soils Preliminary Investigation**	Date Completed:	**28/07/05**
Borehole Location:	**Kemerton Lateral Pipeline**	Recorded By:	**EO**
Project Number:	**2144177A**	Log Checked By:	**JP**

Drill Model/Mounting:		Driller:		Surface RL:	
Borehole Diameter:	**50 mm**	Driller Lic No:		Co-ords:	**E 386705 N 6330485 WGS 84 Zone 50**

Borehole Information							Field Material Description					
1	2	3	4	5	6	7	8	9	10	11	12	13
METHOD	SUPPORT	WATER	WELL CONSTRUCTION	RL(m) mAHD(est) / DEPTH(m)	FIELD TEST	SAMPLE	GRAPHIC LOG	USC SYMBOL	SOIL/ROCK MATERIAL FIELD DESCRIPTION	MOISTURE	RELATIVE DENSITY /CONSISTENCY (FB VL L MD D VD / VS S F ST VST H)	STRUCTURE AND ADDITIONAL OBSERVATIONS
HA				0.10				SP	Well sorted, moderately well rounded to moderately angular, medium grained white quartz dominated sand.			Trace organic matter
								SP	Well sorted, moderately well rounded to moderately angular, medium grained light brown quartz dominated sand.			Approximately 15% organic matter
				0.25				SP	Well sorted, moderately well rounded to moderately angular, medium grained white quartz dominated sand.			Approximately 5% organic matter
				1.00 1				SP	Well sorted, moderately well rounded to moderately angular, fine to medium grained white quartz dominated sand.			Approximately 5% organic matter, minor degraded root material
				2								
				2.10				GP	Ferric stained fine to medium grained sand with scattered ferruginised nodules (1 - 3 cm diameter)			Start of the ferruginised zone
				2.25					Orange / brown consolidated, highly ferruginised "coffee rock".			Highly consolidated
		▼		2.50				GP	Ferric stained fine to medium grained sand with scattered ferruginised nodules (1 - 3 cm diameter)			End of the ferruginised zone
				2.75				SP	Orange, well sorted, moderately well rounded to moderately angular, medium grained quartz dominated sand			
				2.90					END OF BOREHOLE AT 2.90 m			

This borehole log should be read in conjunction with Parsons Brinckerhoff's accompanying standard notes.

BOREHOLE ENVIRONMENTAL LOG

BOREHOLE NO.

AH04

SHEET 1 OF 1

Client:	**DBNGP Nominees Pty Ltd**	Date Commenced:	**28/07/05**
Project:	**Kemerton Acid Sulphate Soils Preliminary Investigation**	Date Completed:	**28/07/05**
Borehole Location:	**Kemerton Lateral Pipeline**	Recorded By:	**EO**
Project Number:	**2144177A**	Log Checked By:	**JP**

Drill Model/Mounting:		Driller:		Surface RL:	
Borehole Diameter:	**50 mm**	Driller Lic No:		Co-ords:	**E 386710 N 6330646 WGS 84 Zone 50**

Borehole Information							Field Material Description					
1	2	3	4	5	6	7	8	9	10	11	12	13
METHOD	SUPPORT	WATER	WELL CONSTRUCTION	RL(m) mAHD(est) / DEPTH(m)	FIELD TEST	SAMPLE	GRAPHIC LOG	USC SYMBOL	SOIL/ROCK MATERIAL FIELD DESCRIPTION	MOISTURE	RELATIVE DENSITY /CONSISTENCY (FB VL L MD D VD / VS S F ST VST H)	STRUCTURE AND ADDITIONAL OBSERVATIONS
HA		▼		0.10				SP	Well sorted, moderately well rounded to moderately angular, medium grained white quartz dominated sand.			Trace organic matter
								SP	Well sorted, moderately well rounded to moderately angular, medium grained brown to light brown quartz dominated sand.			Between approximately 15 - 50% organic matter
				1.00 1				SP	Well sorted, moderately well rounded to moderately angular, medium grained light brown quartz dominated sand.			Approximately 10 % organic matter
				1.90					END OF BOREHOLE AT 1.90 m			
				2								

This borehole log should be read in conjunction with Parsons Brinckerhoff's accompanying standard notes.

BOREHOLE ENVIRONMENTAL LOG

BOREHOLE NO.

AH05

SHEET 1 OF 1

Client:	**DBNGP Nominees Pty Ltd**	Date Commenced:	**28/07/05**
Project:	**Kemerton Acid Sulphate Soils Preliminary Investigation**	Date Completed:	**28/07/05**
Borehole Location:	**Kemerton Lateral Pipeline**	Recorded By:	**EO**
Project Number:	**2144177A**	Log Checked By:	**JP**

Drill Model/Mounting:		Driller:	Surface RL:
Borehole Diameter:	**50 mm**	Driller Lic No:	Co-ords: **E 386717 N 6330759 WGS 84 Zone 50**

Borehole Information							Field Material Description					
1	2	3	4	5	6	7	8	9	10	11	12	13
METHOD	SUPPORT	WATER	WELL CONSTRUCTION	RL(m) mAHD(est) / DEPTH(m)	FIELD TEST	SAMPLE	GRAPHIC LOG	USC SYMBOL	SOIL/ROCK MATERIAL FIELD DESCRIPTION	MOISTURE	RELATIVE DENSITY /CONSISTENCY (VS S F ST VST H / FB VL L MD D VD)	STRUCTURE AND ADDITIONAL OBSERVATIONS
HA				0.10				SP	Well sorted, moderately well rounded to moderately angular, medium grained white quartz dominated sand.			Trace organic matter
								SP	Well sorted, moderately well rounded to moderately angular, medium grained brown quartz dominated sand.			Approximately 50% organic matter
				0.25				SP	Well sorted, moderately well rounded to moderately angular, medium grained brown to light brown quartz dominated sand.			Approximately 15 - 30% organic matter
				0.50				SP	Well sorted, moderately well rounded to moderately angular, medium grained light brown to white quartz dominated sand.			Less than 5% organic matter
				1								
				2.00 2					END OF BOREHOLE AT 2.00 m			

This borehole log should be read in conjunction with Parsons Brinckerhoff's accompanying standard notes.

BOREHOLE ENVIRONMENTAL LOG

BOREHOLE NO.

AH06

SHEET 1 OF 2

Client:	**DBNGP Nominees Pty Ltd**	Date Commenced:	**28/07/05**
Project:	**Kemerton Acid Sulphate Soils Preliminary Investigation**	Date Completed:	**28/07/05**
Borehole Location:	**Kemerton Lateral Pipeline**	Recorded By:	**EO**
Project Number:	**2144177A**	Log Checked By:	**JP**

Drill Model/Mounting:		Driller:	Surface RL:
Borehole Diameter:	**50 mm**	Driller Lic No:	Co-ords: **E 386722 N 6331191 WGS 84 Zone 50**

Borehole Information							Field Material Description					
1	2	3	4	5	6	7	8	9	10	11	12	13
METHOD	SUPPORT	WATER	WELL CONSTRUCTION	RL(m) mAHD(est) / DEPTH(m)	FIELD TEST	SAMPLE	GRAPHIC LOG	USC SYMBOL	SOIL/ROCK MATERIAL FIELD DESCRIPTION	MOISTURE	RELATIVE DENSITY /CONSISTENCY (FB VL L MD D VD / VS S F ST VST H)	STRUCTURE AND ADDITIONAL OBSERVATIONS
HA				0.10				SP	Well sorted, moderately well rounded to moderately angular, medium grained white quartz dominated sand.			Trace organic matter
								SP	Well sorted, moderately well rounded to moderately angular, medium grained brown quartz dominated sand.			Approximately 30 - 40% organic matter
				0.25				SP	Well sorted, moderately well rounded to moderately angular, medium grained brown to light brown quartz dominated sand.			Approximately 5 - 20% organic matter
				0.50				SP	Well sorted, moderately well rounded to moderately angular, medium grained white quartz dominated sand.			Less than 5% organic matter, decreasing with depth
				1								
				2								

END OF BOREHOLE AT 3.00 m

This borehole log should be read in conjunction with Parsons Brinckerhoff's accompanying standard notes.

BOREHOLE ENVIRONMENTAL LOG

BOREHOLE NO.

AH07

SHEET 1 OF 1

Client:	**DBNGP Nominees Pty Ltd**	Date Commenced:	**28/07/05**
Project:	**Kemerton Acid Sulphate Soils Preliminary Investigation**	Date Completed:	**28/07/05**
Borehole Location:	**Kemerton Lateral Pipeline**	Recorded By:	**EO**
Project Number:	**2144177A**	Log Checked By:	**JP**

Drill Model/Mounting:		Driller:	Surface RL:
Borehole Diameter:	**50 mm**	Driller Lic No:	Co-ords: **E 386723 N 6331299 WGS 84 Zone 50**

Borehole Information							Field Material Description					
1	2	3	4	5	6	7	8	9	10	11	12	13
METHOD	SUPPORT	WATER	WELL CONSTRUCTION	RL(m) mAHD(est) / DEPTH(m)	FIELD TEST	SAMPLE	GRAPHIC LOG	USC SYMBOL	SOIL/ROCK MATERIAL FIELD DESCRIPTION	MOISTURE	RELATIVE DENSITY /CONSISTENCY (FB VL L MD D VD / VS S F ST VST H)	STRUCTURE AND ADDITIONAL OBSERVATIONS
HA		▼		0.10				SP	Well sorted, moderately well rounded to moderately angular, medium grained white quartz dominated sand.			Trace organic matter Approximately 50% organic matter
				0.25				SP	Well sorted, moderately well rounded to moderately angular, medium grained brown quartz dominated sand.			Between 1 - 10% organic matter, decreasing content wth depth
				1				SP	Well sorted, moderately well rounded to moderately angular, medium grained light brown to white quartz dominated sand.			
				2.00 2					END OF BOREHOLE AT 2.00 m			

This borehole log should be read in conjunction with Parsons Brinckerhoff's accompanying standard notes.

BOREHOLE ENVIRONMENTAL LOG

BOREHOLE NO.

AH08

SHEET 1 OF 1

Client:	**DBNGP Nominees Pty Ltd**	Date Commenced:	**28/07/05**
Project:	**Kemerton Acid Sulphate Soils Preliminary Investigation**	Date Completed:	**28/07/05**
Borehole Location:	**Kemerton Lateral Pipeline**	Recorded By:	**EO**
Project Number:	**2144177A**	Log Checked By:	**JP**

Drill Model/Mounting:		Driller:	Surface RL:
Borehole Diameter:	**50 mm**	Driller Lic No:	Co-ords: **E 386733 N 6331467 WGS 84 Zone 50**

Borehole Information							Field Material Description					
1	2	3	4	5	6	7	8	9	10	11	12	13
METHOD	SUPPORT	WATER	WELL CONSTRUCTION	RL(m) mAHD(est) / DEPTH(m)	FIELD TEST	SAMPLE	GRAPHIC LOG	USC SYMBOL	SOIL/ROCK MATERIAL FIELD DESCRIPTION	MOISTURE	RELATIVE DENSITY /CONSISTENCY (FB VL L MD D VD / VS S F ST VST H)	STRUCTURE AND ADDITIONAL OBSERVATIONS
HA		▼		0.10				SP	Well sorted, moderately well rounded to moderately angular, medium grained white quartz dominated sand.			Trace organic matter
								SP	Well sorted, moderately well rounded to moderately angular, medium grained brown quartz dominated sand.			Approximately 30 - 60% organic matter
				0.25				SP	Well sorted, moderately well rounded to moderately angular, medium grained brown to light brown quartz dominated sand.			Approximately 20 - 30% organic matter
				0.50				SP	Well sorted, moderately well rounded to moderately angular, medium grained off white quartz dominated sand.			Less than 10% organic matter, decreasing content with depth
				1								
				1.75					END OF BOREHOLE AT 1.75 m			
				2								

This borehole log should be read in conjunction with Parsons Brinckerhoff's accompanying standard notes.

BOREHOLE ENVIRONMENTAL LOG

BOREHOLE NO.

AH09

SHEET 1 OF 1

Client:	**DBNGP Nominees Pty Ltd**	Date Commenced:	**28/07/05**
Project:	**Kemerton Acid Sulphate Soils Preliminary Investigation**	Date Completed:	**28/07/05**
Borehole Location:	**Kemerton Lateral Pipeline**	Recorded By:	**EO**
Project Number:	**2144177A**	Log Checked By:	**JP**

Drill Model/Mounting:		Driller:	Surface RL:
Borehole Diameter:	**50 mm**	Driller Lic No:	Co-ords: **E 386739 N 6331576 WGS 84 Zone 50**

Borehole Information							Field Material Description					
1	2	3	4	5	6	7	8	9	10	11	12	13
METHOD	SUPPORT	WATER	WELL CONSTRUCTION	RL(m) mAHD(est) / DEPTH(m)	FIELD TEST	SAMPLE	GRAPHIC LOG	USC SYMBOL	SOIL/ROCK MATERIAL FIELD DESCRIPTION	MOISTURE	RELATIVE DENSITY /CONSISTENCY (FB VL L MD VD / VS S F ST VST H)	STRUCTURE AND ADDITIONAL OBSERVATIONS
HA		▼		0.10				SP	Well sorted, moderately well rounded to moderately angular, medium grained white quartz dominated sand.			Trace organic matter
								SP	Well sorted, moderately well rounded to moderately angular, medium grained brown quartz dominated sand.			Approximately 50% organic matter
				0.25				SP	Well sorted, moderately well rounded to moderately angular, medium grained brown to light brown quartz dominated sand.			Approximately 20% organic matter
				0.50				SP	Well sorted, moderately well rounded to moderately angular, medium grained off white quartz dominated sand.			Approximately 1 - 10% organic matter, decreasing content with depth
				1								
				2.00 2					END OF BOREHOLE AT 2.00 m			

This borehole log should be read in conjunction with Parsons Brinckerhoff's accompanying standard notes.

BOREHOLE ENVIRONMENTAL LOG

BOREHOLE NO.

AH11

SHEET 1 OF 1

Client:	**DBNGP Nominees Pty Ltd**	Date Commenced:	**28/07/05**
Project:	**Kemerton Acid Sulphate Soils Preliminary Investigation**	Date Completed:	**28/07/05**
Borehole Location:	**Kemerton Lateral Pipeline**	Recorded By:	**EO**
Project Number:	**2144177A**	Log Checked By:	**JP**

Drill Model/Mounting:		Driller:	Surface RL:
Borehole Diameter:	**50 mm**	Driller Lic No:	Co-ords: **E 386742 N 6331895 WGS 84 Zone 50**

Borehole Information							Field Material Description					
1	2	3	4	5	6	7	8	9	10	11	12	13
METHOD	SUPPORT	WATER	WELL CONSTRUCTION	RL(m) mAHD(est) / DEPTH(m)	FIELD TEST	SAMPLE	GRAPHIC LOG	USC SYMBOL	SOIL/ROCK MATERIAL FIELD DESCRIPTION	MOISTURE	RELATIVE DENSITY /CONSISTENCY (FB VL L MD VD / VS S F ST VST H)	STRUCTURE AND ADDITIONAL OBSERVATIONS
HA		▼		0.10				SP	Well sorted, moderately well rounded to moderately angular, medium grained white quartz dominated sand.			Trace organic matter
								SP	Well sorted, moderately well rounded to moderately angular, medium grained brown quartz dominated sand.			Approximately 25% organic matter
				0.25				SP	Well sorted, moderately well rounded to moderately angular, medium grained light brown to off white quartz dominated sand.			Approximately 1 - 10% organic matter, decreasing content with depth
				1								
				2.00 2					END OF BOREHOLE AT 2.00 m			

This borehole log should be read in conjunction with Parsons Brinckerhoff's accompanying standard notes.

BOREHOLE ENVIRONMENTAL LOG

BOREHOLE NO.

AH13

SHEET 1 OF 1

Client:	**DBNGP Nominees Pty Ltd**	Date Commenced:	**28/07/05**
Project:	**Kemerton Acid Sulphate Soils Preliminary Investigation**	Date Completed:	**28/07/05**
Borehole Location:	**Kemerton Lateral Pipeline**	Recorded By:	**EO**
Project Number:	**2144177A**	Log Checked By:	**JP**

Drill Model/Mounting:		Driller:	Surface RL:
Borehole Diameter:	**50 mm**	Driller Lic No:	Co-ords: **E 386767 N 6332456 WGS 84 Zone 50**

Borehole Information							Field Material Description					
1	2	3	4	5	6	7	8	9	10	11	12	13
METHOD	SUPPORT	WATER	WELL CONSTRUCTION	RL(m) mAHD(est) / DEPTH(m)	FIELD TEST	SAMPLE	GRAPHIC LOG	USC SYMBOL	SOIL/ROCK MATERIAL FIELD DESCRIPTION	MOISTURE	RELATIVE DENSITY /CONSISTENCY (VS S F ST VST H / FB VL L MD D VD)	STRUCTURE AND ADDITIONAL OBSERVATIONS
HA				0.10				SP	Well sorted, moderately well rounded to moderately angular, medium grained white quartz dominated sand.			Trace organic matter Approximately 40 - 60% organic matter
				0.25				SP	Well sorted, moderately well rounded to moderately angular, medium grained brown quartz dominated sand.			Approximately 20 - 40% organic matter
				0.50				SP	Well sorted, moderately well rounded to moderately angular, medium grained brown to light brown quartz dominated sand.			
				1				SP	Well sorted, moderately well rounded to moderately angular, medium grained light brown to off white quartz dominated sand.			Between 1 - 10% organic matter, decreasing content with depth
				2.00 2					END OF BOREHOLE AT 2.00 m			

This borehole log should be read in conjunction with Parsons Brinckerhoff's accompanying standard notes.

BOREHOLE ENVIRONMENTAL LOG

BOREHOLE NO.

AH14

SHEET 1 OF 1

Client:	**DBNGP Nominees Pty Ltd**	Date Commenced:	**28/07/05**
Project:	**Kemerton Acid Sulphate Soils Preliminary Investigation**	Date Completed:	**28/07/05**
Borehole Location:	**Kemerton Lateral Pipeline**	Recorded By:	**EO**
Project Number:	**2144177A**	Log Checked By:	**JP**

Drill Model/Mounting:		Driller:	Surface RL:
Borehole Diameter:	**50 mm**	Driller Lic No:	Co-ords: **E 386773 N 6332701 WGS 84 Zone 50**

Borehole Information							Field Material Description					
1	2	3	4	5	6	7	8	9	10	11	12	13
METHOD	SUPPORT	WATER	WELL CONSTRUCTION	RL(m) mAHD(est) / DEPTH(m)	FIELD TEST	SAMPLE	GRAPHIC LOG	USC SYMBOL	SOIL/ROCK MATERIAL FIELD DESCRIPTION	MOISTURE	RELATIVE DENSITY /CONSISTENCY (VS S F ST VST H / FB VL L MD D VD)	STRUCTURE AND ADDITIONAL OBSERVATIONS
HA				0.10				SP	Well sorted, moderately well rounded to moderately angular, medium grained white quartz dominated sand.			Trace organic matter
								SP	Well sorted, moderately well rounded to moderately angular, medium grained brown quartz dominated sand.			Approximately 40 - 60% organic matter
				0.25				SP	Well sorted, moderately well rounded to moderately angular, medium grained brown to light brown quartz dominated sand.			Approximately 20 - 40% organic matter
				0.50				SP	Well sorted, moderately well rounded to moderately angular, medium grained light brown to off white quartz dominated sand.			Between 1 - 10% organic matter, decreasing content with depth
				1								
				2.00 2					END OF BOREHOLE AT 2.00 m			

This borehole log should be read in conjunction with Parsons Brinckerhoff's accompanying standard notes.

BOREHOLE ENVIRONMENTAL LOG

BOREHOLE NO.

AH15

SHEET 1 OF 1

Client:	**DBNGP Nominees Pty Ltd**	Date Commenced:	**28/07/05**
Project:	**Kemerton Acid Sulphate Soils Preliminary Investigation**	Date Completed:	**28/07/05**
Borehole Location:	**Kemerton Lateral Pipeline**	Recorded By:	**EO**
Project Number:	**2144177A**	Log Checked By:	**JP**

Drill Model/Mounting:		Driller:	Surface RL:
Borehole Diameter:	**50 mm**	Driller Lic No:	Co-ords: **E 386776 N 6332927 WGS 84 Zone 50**

Borehole Information							Field Material Description					
1	2	3	4	5	6	7	8	9	10	11	12	13
METHOD	SUPPORT	WATER	WELL CONSTRUCTION	RL(m) mAHD(est) / DEPTH(m)	FIELD TEST	SAMPLE	GRAPHIC LOG	USC SYMBOL	SOIL/ROCK MATERIAL FIELD DESCRIPTION	MOISTURE	RELATIVE DENSITY /CONSISTENCY (FB VL L MD D VD / VS S F ST VST H)	STRUCTURE AND ADDITIONAL OBSERVATIONS
HA				0.10				SP	Well sorted, moderately well rounded to moderately angular, medium grained white quartz dominated sand.			Trace organic matter Approximately 20% organic matter
				0.25				SP	Well sorted, moderately well rounded to moderately angular, medium grained brown to light brown quartz dominated sand.			Approximately 10% organic matter
				0.50				SP	Well sorted, moderately well rounded to moderately angular, medium grained light brown quartz dominated sand.			Between 1 - 10% organic matter, decraesing content with depth
				1				SP	Well sorted, moderately well rounded to moderately angular, medium grained light brown to off white quartz dominated sand.			
				2.00 2					END OF BOREHOLE AT 2.00 m			

This borehole log should be read in conjunction with Parsons Brinckerhoff's accompanying standard notes.

BOREHOLE ENVIRONMENTAL LOG

BOREHOLE NO.

AH16

SHEET 1 OF 1

Client:	**DBNGP Nominees Pty Ltd**	Date Commenced:	**28/07/05**
Project:	**Kemerton Acid Sulphate Soils Preliminary Investigation**	Date Completed:	**28/07/05**
Borehole Location:	**Kemerton Lateral Pipeline**	Recorded By:	**EO**
Project Number:	**2144177A**	Log Checked By:	**JP**

Drill Model/Mounting:		Driller:		Surface RL:	
Borehole Diameter:	**50 mm**	Driller Lic No:		Co-ords:	**E 386778 N 6333015 WGS 84 Zone 50**

Borehole Information							Field Material Description					
1	2	3	4	5	6	7	8	9	10	11	12	13
METHOD	SUPPORT	WATER	WELL CONSTRUCTION	RL(m) mAHD(est) / DEPTH(m)	FIELD TEST	SAMPLE	GRAPHIC LOG	USC SYMBOL	SOIL/ROCK MATERIAL FIELD DESCRIPTION	MOISTURE	RELATIVE DENSITY /CONSISTENCY (FB VL L MD D VD / VS S F ST VST H)	STRUCTURE AND ADDITIONAL OBSERVATIONS
HA		▼		0.10				SP	Well sorted, moderately well rounded to moderately angular, medium grained white quartz dominated sand.			Trace organic matter Approximately 50% organic matter
				0.25				SP	Well sorted, moderately well rounded to moderately angular, medium grained brown quartz dominated sand.			Between 1 - 10% organic matter decreasing content with depth
				1				SP	Well sorted, moderately well rounded to moderately angular, medium grained light brown to off white quartz dominated sand.			
				2.00 2					END OF BOREHOLE AT 1.50 m			

This borehole log should be read in conjunction with Parsons Brinckerhoff's accompanying standard notes.

BOREHOLE ENVIRONMENTAL LOG

BOREHOLE NO.

AH17

SHEET 1 OF 1

Client:	**DBNGP Nominees Pty Ltd**	Date Commenced:	**29/07/05**
Project:	**Kemerton Acid Sulphate Soils Preliminary Investigation**	Date Completed:	**29/07/05**
Borehole Location:	**Kemerton Lateral Pipeline**	Recorded By:	**EO**
Project Number:	**2144177A**	Log Checked By:	**JP**

Drill Model/Mounting:		Driller:	Surface RL:
Borehole Diameter:	**50 mm**	Driller Lic No:	Co-ords: **E 386779 N 6333168 WGS 84 Zone 50**

Borehole Information							Field Material Description					
1	2	3	4	5	6	7	8	9	10	11	12	13
METHOD	SUPPORT	WATER	WELL CONSTRUCTION	RL(m) mAHD(est) / DEPTH(m)	FIELD TEST	SAMPLE	GRAPHIC LOG	USC SYMBOL	SOIL/ROCK MATERIAL FIELD DESCRIPTION	MOISTURE	RELATIVE DENSITY /CONSISTENCY (FB VL L MD D VD / VS S F ST VST H)	STRUCTURE AND ADDITIONAL OBSERVATIONS
HA		▼		0.10				SP	Well sorted, moderately well rounded to moderately angular, medium grained white quartz dominated sand.			Trace organic matter Approximately 50 - 60% organic matter
								SP	Well sorted, moderately well rounded to moderately angular, medium grained brown quartz dominated sand.			
				0.25				SP	Well sorted, moderately well rounded to moderately angular, medium grained light brown to brown quartz dominated sand.			Approximately 20 - 50% organic matter
				0.50				SP	Well sorted, moderately well rounded to moderately angular, medium grained light brown to off white quartz dominated sand.			Between 1 - 10% organic matter, decreasing content with depth
				1								
				1.50					END OF BOREHOLE AT 1.75 m			
				2								

This borehole log should be read in conjunction with Parsons Brinckerhoff's accompanying standard notes.

BOREHOLE ENVIRONMENTAL LOG

BOREHOLE NO.

AH18

SHEET 1 OF 1

Client:	**DBNGP Nominees Pty Ltd**	Date Commenced:	**29/07/05**
Project:	**Kemerton Acid Sulphate Soils Preliminary Investigation**	Date Completed:	**29/07/05**
Borehole Location:	**Kemerton Lateral Pipeline**	Recorded By:	**EO**
Project Number:	**2144177A**	Log Checked By:	**JP**

Drill Model/Mounting:		Driller:	Surface RL:
Borehole Diameter:	**50 mm**	Driller Lic No:	Co-ords: **E 386786 N 6333368 WGS 84 Zone 50**

Borehole Information							Field Material Description					
1	2	3	4	5	6	7	8	9	10	11	12	13
METHOD	SUPPORT	WATER	WELL CONSTRUCTION	RL(m) mAHD(est) / DEPTH(m)	FIELD TEST	SAMPLE	GRAPHIC LOG	USC SYMBOL	SOIL/ROCK MATERIAL FIELD DESCRIPTION	MOISTURE	RELATIVE DENSITY /CONSISTENCY (FB VL L MD D VD / VS S F ST VST H)	STRUCTURE AND ADDITIONAL OBSERVATIONS
HA		▼		0.10				SP	Well sorted, moderately well rounded to moderately angular, medium grained white quartz dominated sand.			Trace organic matter
								SP	Well sorted, moderately well rounded to moderately angular, medium grained brown quartz dominated sand.			Approximately 60 - 70% organic matter
				0.25				SP	Well sorted, moderately well rounded to moderately angular, medium grained light brown to brown quartz dominated sand.			Approximately 30 - 50% organic matter
				0.50				SP	Well sorted, moderately well rounded to moderately angular, medium grained light brown to off white quartz dominated sand.			Between 1 - 10% organic matter, decreasing content with depth
				1								
				2.00 2					END OF BOREHOLE AT 1.50 m			

This borehole log should be read in conjunction with Parsons Brinckerhoff's accompanying standard notes.

BOREHOLE ENVIRONMENTAL LOG

BOREHOLE NO.

AH19

SHEET 1 OF 1

Client:	**DBNGP Nominees Pty Ltd**	Date Commenced:	**29/07/05**
Project:	**Kemerton Acid Sulphate Soils Preliminary Investigation**	Date Completed:	**29/07/05**
Borehole Location:	**Kemerton Lateral Pipeline**	Recorded By:	**EO**
Project Number:	**2144177A**	Log Checked By:	**JP**

Drill Model/Mounting:		Driller:		Surface RL:	
Borehole Diameter:	**50 mm**	Driller Lic No:		Co-ords:	**E 386782 N 6333514 WGS 84 Zone 50**

Borehole Information							Field Material Description					
1	2	3	4	5	6	7	8	9	10	11	12	13
METHOD	SUPPORT	WATER	WELL CONSTRUCTION	RL(m) mAHD(est) / DEPTH(m)	FIELD TEST	SAMPLE	GRAPHIC LOG	USC SYMBOL	SOIL/ROCK MATERIAL FIELD DESCRIPTION	MOISTURE	RELATIVE DENSITY /CONSISTENCY (VS S F ST VST H / FB VL L MD D VD)	STRUCTURE AND ADDITIONAL OBSERVATIONS
HA				0.10				SP	Well sorted, moderately well rounded to moderately angular, medium grained white quartz dominated sand.			Trace organic matter
								SP	Well sorted, moderately well rounded to moderately angular, medium grained light brown quartz dominated sand.			Approximately 10 - 30% organic matter
				0.25				SP	Well sorted, moderately well rounded to moderately angular, medium grained light brown to off white quartz dominated sand.			Between 1 - 5% organic matter, decreasing content with depth
				1								
				2.00 2					END OF BOREHOLE AT 2.00 m			

This borehole log should be read in conjunction with Parsons Brinckerhoff's accompanying standard notes.

BOREHOLE ENVIRONMENTAL LOG

BOREHOLE NO.

AH20

SHEET 1 OF 1

Client:	**DBNGP Nominees Pty Ltd**	Date Commenced:	**29/07/05**
Project:	**Kemerton Acid Sulphate Soils Preliminary Investigation**	Date Completed:	**29/07/05**
Borehole Location:	**Kemerton Lateral Pipeline**	Recorded By:	**EO**
Project Number:	**2144177A**	Log Checked By:	**JP**

Drill Model/Mounting:		Driller:	Surface RL:
Borehole Diameter:	**50 mm**	Driller Lic No:	Co-ords: **E 386798 N 6333779 WGS 84 Zone 50**

Borehole Information							Field Material Description					
1	2	3	4	5	6	7	8	9	10	11	12	13
METHOD	SUPPORT	WATER	WELL CONSTRUCTION	RL(m) mAHD(est) / DEPTH(m)	FIELD TEST	SAMPLE	GRAPHIC LOG	USC SYMBOL	SOIL/ROCK MATERIAL FIELD DESCRIPTION	MOISTURE	RELATIVE DENSITY /CONSISTENCY (FB VL L MD D VD / VS S F ST VST H)	STRUCTURE AND ADDITIONAL OBSERVATIONS
HA				0.10				SP	Well sorted, moderately well rounded to moderately angular, medium grained white quartz dominated sand.			Trace organic matter
								SP	Well sorted, moderately well rounded to moderately angular, medium grained off white quartz dominated sand.			Approximately 10 - 15% organic matter
				0.50				PT	Dense dark brown peat layer, increasing sand with depth			Approximately 90% organics, weak sulphidic smell, decreasing content with depth
				0.75				SP	Well sorted, moderately well rounded to moderately angular, medium grained off white quartz dominated sand.			Between 1 - 5% organic matter, decreasing content with depth
				1								
				1.90				PT	Dense dark brown peat layer			Approximately 95% organics, weak sulphidic smell
				2.00 2					END OF BOREHOLE AT 2.00 m			

This borehole log should be read in conjunction with Parsons Brinckerhoff's accompanying standard notes.

BOREHOLE ENVIRONMENTAL LOG

BOREHOLE NO.

AH21

SHEET 1 OF 1

Client:	**DBNGP Nominees Pty Ltd**	Date Commenced:	**29/07/05**
Project:	**Kemerton Acid Sulphate Soils Preliminary Investigation**	Date Completed:	**29/07/05**
Borehole Location:	**Kemerton Lateral Pipeline**	Recorded By:	**EO**
Project Number:	**2144177A**	Log Checked By:	**JP**

Drill Model/Mounting:		Driller:		Surface RL:	
Borehole Diameter:	**50 mm**	Driller Lic No:		Co-ords:	**E 386804 N 6333918 WGS 84 Zone 50**

Borehole Information							Field Material Description					
1	2	3	4	5	6	7	8	9	10	11	12	13
METHOD	SUPPORT	WATER	WELL CONSTRUCTION	RL(m) mAHD(est) / DEPTH(m)	FIELD TEST	SAMPLE	GRAPHIC LOG	USC SYMBOL	SOIL/ROCK MATERIAL FIELD DESCRIPTION	MOISTURE	RELATIVE DENSITY /CONSISTENCY (FB VL L MD D VD / VS S F ST VST H)	STRUCTURE AND ADDITIONAL OBSERVATIONS
HA		▼		0.05				SP	Well sorted, moderately well rounded to moderately angular, medium grained white quartz dominated sand.			Trace organic matter
								SP	Well sorted, moderately well rounded to moderately angular, medium grained brown quartz dominated sand.			Approximately 60 - 75% organic matter
				0.25				SP	Well sorted, moderately well rounded to moderately angular, medium grained brown to light brown quartz dominated sand.			Approximately 20 - 40% organic matter, decreasing content with depth
												Approximately 1 - 10% organic matter, decreasing content with depth
				0.75				SP	Well sorted, moderately well rounded to moderately angular, medium grained off white quartz dominated sand.			
				1.00 1					END OF BOREHOLE AT 1.00 m			
				2								

This borehole log should be read in conjunction with Parsons Brinckerhoff's accompanying standard notes.

BOREHOLE ENVIRONMENTAL LOG

BOREHOLE NO.

AH22

SHEET 1 OF 1

Client:	**DBNGP Nominees Pty Ltd**	Date Commenced:	**29/07/05**
Project:	**Kemerton Acid Sulphate Soils Preliminary Investigation**	Date Completed:	**29/07/05**
Borehole Location:	**Kemerton Lateral Pipeline**	Recorded By:	**EO**
Project Number:	**2144177A**	Log Checked By:	**JP**

Drill Model/Mounting:		Driller:	Surface RL:
Borehole Diameter:	**50 mm**	Driller Lic No:	Co-ords: **E 386810 N 6334077 WGS 84 Zone 50**

Borehole Information							Field Material Description					
1	2	3	4	5	6	7	8	9	10	11	12	13
METHOD	SUPPORT	WATER	WELL CONSTRUCTION	RL(m) mAHD(est) / DEPTH(m)	FIELD TEST	SAMPLE	GRAPHIC LOG	USC SYMBOL	SOIL/ROCK MATERIAL FIELD DESCRIPTION	MOISTURE	RELATIVE DENSITY /CONSISTENCY (FB VL L MD D VD / VS S F ST VST H)	STRUCTURE AND ADDITIONAL OBSERVATIONS
HA		▼		0.05				SP	Well sorted, moderately well rounded to moderately angular, medium grained white quartz dominated sand.			Trace organic matter Approximately 40 - 60% organic matter
								SP	Well sorted, moderately well rounded to moderately angular, medium grained brown quartz dominated sand.			
				0.25				SP	Well sorted, moderately well rounded to moderately angular, medium grained brown to light brown quartz dominated sand.			Approximately 10 - 30% organic matter
				0.50				SP	Well sorted, moderately well rounded to moderately angular, medium grained light brown to off white quartz dominated sand.			Approximately 1 - 10% organic matter, decreasing content with depth
				1								
				1.25					END OF BOREHOLE AT 1.25 m			
				2								

This borehole log should be read in conjunction with Parsons Brinckerhoff's accompanying standard notes.

BOREHOLE ENVIRONMENTAL LOG

BOREHOLE NO.

AH23

SHEET 1 OF 1

Client:	**DBNGP Nominees Pty Ltd**	Date Commenced:	**29/07/05**
Project:	**Kemerton Acid Sulphate Soils Preliminary Investigation**	Date Completed:	**29/07/05**
Borehole Location:	**Kemerton Lateral Pipeline**	Recorded By:	**EO**
Project Number:	**2144177A**	Log Checked By:	**JP**

Drill Model/Mounting:		Driller:		Surface RL:	
Borehole Diameter:	**50 mm**	Driller Lic No:		Co-ords:	**E 386817 N 6334244 WGS 84 Zone 50**

Borehole Information							Field Material Description					
1	2	3	4	5	6	7	8	9	10	11	12	13
METHOD	SUPPORT	WATER	WELL CONSTRUCTION	RL(m) mAHD(est) / DEPTH(m)	FIELD TEST	SAMPLE	GRAPHIC LOG	USC SYMBOL	SOIL/ROCK MATERIAL FIELD DESCRIPTION	MOISTURE	RELATIVE DENSITY /CONSISTENCY (FB VL L MD D VD / VS S F ST VST H)	STRUCTURE AND ADDITIONAL OBSERVATIONS
HA		▼		0.05				SP	Well sorted, moderately well rounded to moderately angular, medium grained white quartz dominated sand.			Trace organic content
								SP	Well sorted, moderately well rounded to moderately angular, medium grained light brown to off white quartz dominated sand.			Approximately 10 - 30% organic matter, decreasing content with depth
				0.75					END OF BOREHOLE AT 0.75 m			
				1								
				2								

This borehole log should be read in conjunction with Parsons Brinckerhoff's accompanying standard notes.

BOREHOLE ENVIRONMENTAL LOG

BOREHOLE NO.

AH24

SHEET 1 OF 1

Client:	**DBNGP Nominees Pty Ltd**	Date Commenced:	**29/07/05**
Project:	**Kemerton Acid Sulphate Soils Preliminary Investigation**	Date Completed:	**29/07/05**
Borehole Location:	**Kemerton Lateral Pipeline**	Recorded By:	**EO**
Project Number:	**2144177A**	Log Checked By:	**JP**

Drill Model/Mounting:		Driller:		Surface RL:	
Borehole Diameter:	**50 mm**	Driller Lic No:		Co-ords:	**E 386828 N 6334386 WGS 84 Zone 50**

Borehole Information							Field Material Description					
1	2	3	4	5	6	7	8	9	10	11	12	13
METHOD	SUPPORT	WATER	WELL CONSTRUCTION	RL(m) mAHD(est) / DEPTH(m)	FIELD TEST	SAMPLE	GRAPHIC LOG	USC SYMBOL	SOIL/ROCK MATERIAL FIELD DESCRIPTION	MOISTURE	RELATIVE DENSITY /CONSISTENCY (VS S F ST VST H / FB VL L MD D VD)	STRUCTURE AND ADDITIONAL OBSERVATIONS
HA		▼		0.05				SP	Well sorted, moderately well rounded to moderately angular, medium grained white quartz dominated sand.			Trace organic content Approximately 10 - 15% organic matter
								SP	Well sorted, moderately well rounded to moderately angular, medium grained off white quartz dominated sand.			
				0.25				SP	Well sorted, moderately well rounded to moderately angular, medium grained off white quartz dominated sand.			Approximately 1 - 5% organic matter, decreasing with depth
				1.00 1					END OF BOREHOLE AT 1.00 m			
				2								

This borehole log should be read in conjunction with Parsons Brinckerhoff's accompanying standard notes.

BOREHOLE ENVIRONMENTAL LOG

BOREHOLE NO.

AH25

SHEET 1 OF 1

Client:	**DBNGP Nominees Pty Ltd**	Date Commenced:	**29/07/05**
Project:	**Kemerton Acid Sulphate Soils Preliminary Investigation**	Date Completed:	**29/07/05**
Borehole Location:	**Kemerton Lateral Pipeline**	Recorded By:	**EO**
Project Number:	**2144177A**	Log Checked By:	**JP**

Drill Model/Mounting:		Driller:		Surface RL:	
Borehole Diameter:	**50 mm**	Driller Lic No:		Co-ords:	**E 386871 N 6334515 WGS 84 Zone 50**

Borehole Information							Field Material Description					
1	2	3	4	5	6	7	8	9	10	11	12	13
METHOD	SUPPORT	WATER	WELL CONSTRUCTION	RL(m) mAHD(est) / DEPTH(m)	FIELD TEST	SAMPLE	GRAPHIC LOG	USC SYMBOL	SOIL/ROCK MATERIAL FIELD DESCRIPTION	MOISTURE	RELATIVE DENSITY /CONSISTENCY (FB VL L MD D VD / VS S F ST VST H)	STRUCTURE AND ADDITIONAL OBSERVATIONS
HA				0.10				SP	Well sorted, moderately well rounded to moderately angular, medium grained white quartz dominated sand.			Trace organic content
								SP	Well sorted, moderately well rounded to moderately angular, medium grained light brown quartz dominated sand.			Approximately 20 - 40% organic matter, decreasing content with depth
				0.25				SP	Well sorted, moderately well rounded to moderately angular, medium grained off white to white quartz dominated sand.			Approximately 1 - 5% organic matter, decreasing content with depth
				1								
				2.00 2					END OF BOREHOLE AT 2.00 m			

This borehole log should be read in conjunction with Parsons Brinckerhoff's accompanying standard notes.

Appendix B

pH_F and pH_{FOX} Test Results

Acid Sulphate Soil Test Results

Project	ASS Kemerton	Tested By	EO/KS	Office	Perth
		Date	29/07/2005	Job No.	2145177A
Client	DBNGP Nominees	Checked	JP	Page No.	
Location	Kemerton Lateral Pipeline	Date	15/08/2005		

Sample Depth (m)	pH_F		pH_{FOX}		Lithology
	pH	EC	pH	EC	
AH01					
0	5.30		4.45		
0.25	5.10		4.71		
0.5	4.73		4.70		
0.75	4.89		4.76		
1	5.06		4.68		
1.25	5.16		4.45		
1.5	5.12		4.40		
1.75	4.89		4.25		
AH02					
0	5.56		6.09		
0.25	5.73		6.41		
0.5	5.76		6.41		
0.75	5.87		6.24		
1	5.70		5.42		
AH03					
0	5.22		5.22		
0.25	5.42		5.28		
0.5	5.41		5.55		
0.75	5.14		5.54		
1	5.31		5.70		
1.25	5.82		5.80		
1.5	5.64		5.92		
1.75	5.90		5.20		
2	5.98		5.37		
2.25	5.15		4.97		
2.5	4.40		4.70		
2.75	4.44		4.40		
2.9	4.51		4.45		
AH04					
0	5.03		5.60		
0.25	4.96		5.24		
0.5	5.40		5.49		
0.75	5.58		5.71		
1	5.51		5.77		
1.25	5.39		5.15		
1.5	5.48		5.61		
1.75	5.45		5.53		
1.9	5.30		5.64		
AH05					
0	5.26		5.61		
0.25	5.08		5.35		
0.5	5.18		5.80		
0.75	5.13		5.64		
1	5.19		5.60		
1.25	5.24		5.94		
1.5	5.23		6.03		
1.75	5.37		6.16		
2	5.41		6.02		

Acid Sulphate Soil Test Results

Project	ASS Kemerton	Tested By	EO/KS	Office	Perth
		Date	29/07/2005	Job No.	2145177A
Client	DBNGP Nominees	Checked	JP	Page No.	
Location	Kemerton Lateral Pipeline	Date	15/08/2005		

Sample Depth (m)	pH_F		pH_{FOX}		Lithology
	pH	EC	pH	EC	
AH06					
0	5.45		5.95		
0.25	5.17		5.95		
0.5	5.1		6.03		
0.75	5.08		5.85		
1	5.4		5.88		
1.25	5.7		6.05		
1.5	5.71		5.88		
1.75	5.83		6.16		
2	5.8		6.29		
2.25	5.83		6.43		
2.5	6.1		5.75		
2.75	5.82		6.18		
3	5.61		6.13		
AH07					
0	4.94		5.45		
0.25	5.17		5.64		
0.5	5.18		5.88		
0.75	5.25		6.03		
1	5.29		6.15		
1.25	5.11		6.16		
1.5	5.33		5.89		
1.75	4.76		5.93		
2	4.75		5.94		
AH08					
0	5.25		4.94		
0.25	4.88		5.1		
0.5	4.95		5.3		
0.75	4.85		5.22		
1	4.65		4.85		
1.25	4.45		4.91		
1.5	4.5		4.88		
1.75	4.32		4.69		
AH09					
0	4.81		4.98		
0.25	4.98		5.3		
0.5	4.99		5.25		
0.75	4.95		5.52		
1	4.88		5.46		
1.25	4.86		5		
1.5	4.48		4.8		
1.75	4.3		4.67		
2	4.52		4.93		
AH11					
0	4.77		5.07		
0.25	5.04		5.12		
0.5	5.26		5.47		
0.75	5.34		5.8		
1	5.43		5.87		

Acid Sulphate Soil Test Results

Project	ASS Kemerton	Tested By	EO/KS	Office	Perth
		Date	29/07/2005	Job No.	2145177A
Client	DBNGP Nominees	Checked	JP	Page No.	
Location	Kemerton Lateral Pipeline	Date	15/08/2005		

Sample Depth (m)	pH_F		pH_{FOX}		Lithology
	pH	EC	pH	EC	
1.25	5.32		5.9		
1.5	5.16		5.85		
1.75	4.81		5.83		
2	4.7		5.77		
AH13					
0	5.55		5.44		
0.25	5.1		5.51		
0.5	4.98		5.61		
0.75	5.01		5.56		
1	5.13		5.8		
1.25	5.1		5.3		
1.5	5.08		5.48		
1.75	5.12		5.74		
2	5.25		5.85		
AH14					
0	5.15		5.87		
0.25	4.91		5.82		
0.5	4.9		5.88		
0.75	4.57		6.04		
1	5.08		6.13		
1.25	5.2		6.28		
1.5	5.4		6.11		
1.75	5.29		6.15		
2	5.26		6.11		
AH15					
0	5.36		5.16		
0.25	5.49		5.38		
0.5	5.55		5.84		
0.75	5.69		6.1		
1	5.58		6.1		
1.25	5.91		6.26		
1.5	6.45		6.31		
1.75	6.25		6.37		
2	6.27		6.37		
AH16					
0	5.32		5.2		
0.25	5.09		5.3		
0.5	4.93		5.5		
0.75	4.98		5.58		
1	4.9		5.47		
1.25	4.76		5.61		
1.5	4.56		5.74		
AH17					
0	4.84		5.05		
0.25	4.6		5.2		
0.5	5.03		5.45		
0.75	4.44		5.46		
1	5.32		5.37		
1.25	4.96		5.47		

Acid Sulphate Soil Test Results

Project	ASS Kemerton	Tested By	EO/KS	Office	Perth
		Date	29/07/2005	Job No.	2145177A
Client	DBNGP Nominees	Checked	JP	Page No.	
Location	Kemerton Lateral Pipeline	Date	15/08/2005		

Sample Depth (m)	pH_F		pH_{FOX}		Lithology
	pH	EC	pH	EC	
1.5	4.95		5.4		
1.75	4.98		5.14		
AH18					
0	5.6		5.2		
0.25	4.5		5.2		
0.5	4.69		5.15		
0.75	4.69		5.19		
1	4.65		5.22		
1.25	4.93		5.41		
1.5	4.95		5.48		
AH19					
0	7.06		4.9		
0.25	5.05		4.87		
0.5	5.42		4.9		
0.75	5.36		4.91		
1	5.49		5.1		
1.25	5.55		5.3		
1.5	5.79		5.35		
1.75	5.9		5.53		
2	5.85		5.47		
AH20					
0	7.55		5.04		
0.25	7.82		5.9		
0.5	6.17		5.2		
0.75	5.23		4.85		
1	5.39		4.9		
1.25	5.35		4.85		
1.5	5.01		4.95		
1.75	4.51		4.1		
2	5.18		4.61		
AH21					
0	4.88		4.45		
0.25	4.87		4.62		
0.5	5.39		4.7		
0.75	5.02		4.83		
1	5		4.75		
AH22					
0	5.04		4.2		
0.25	5.12		4.1		
0.5	4.98		4.05		
0.75	5.05		4.41		
1	5.09		4.37		
1.25	4.87		4.55		
AH23					
0	6.65		5.35		
0.25	5.86		5.39		
0.5	5.68		5.68		
0.75	5.91		6.07		
AH24					

Acid Sulphate Soil Test Results

Project	ASS Kemerton	Tested By	EO/KS	Office	Perth
		Date	29/07/2005	Job No.	2145177A
Client	DBNGP Nominees	Checked	JP	Page No.	
Location	Kemerton Lateral Pipeline	Date	15/08/2005		

Sample Depth (m)	pH_F		pH_{FOX}		Lithology
	pH	EC	pH	EC	
0	5.88		6.53		
0.25	5.12		6.37		
0.5	5.27		6.35		
0.75	5.53		5.99		
1	5.29		6.2		
AH25					
0	5.49		5.95		
0.25	5.63		5.99		
0.5	5.83		6.1		
0.75	5.74		6.57		
1	5.98		6.52		
1.25	5.93		6.55		
1.5	5.85		6.52		
1.75	5.94		6.61		
2	5.48		6.61		

Appendix C

Groundwater Testing Results

Attachment 3: Results of Groundwater Field Testing

	Depth to Groundwater mBGL	pH	TTA % H_2SO_4
AH01	0.8	3.9	<1
AH02	0.5	5.25	<1
AH03	2.6	-	-
AH04	0.25	5.25	<1
AH07	1.9	4.46	<1
AH08	1	3.65	<1
AH09	1.75	3.9	<1
AH11	2	4.46	<1
AH16	1.1	3.88	<1
AH17	1.1	4.13	<1
AH18	0.9	4.19	<1
AH21	0.2	4.21	<1
AH22	1.25	4.28	<1
AH23	0.2	4.69	<1
AH24	1	3.84	<1

Appendix D

Laboratory Analysis Results

ALS Environmental

CERTIFICATE OF ANALYSIS

Client	:	**PARSONS BRINCKERHOFF AUST P/L**	**Laboratory**	:	ALS Environmental Perth	**Page**	: **1 of 12**
Contact	:	MS JULIE PALICH	**Contact**	:	Shaun Crabb		
Address	:	P O BOX 1232 SUBIACO WA AUSTRALIA 6904	**Address**	:	10 Hod Way Malaga WA Australia 6090	**Work order**	: **EP0500812**
Project	:	2145177A	**Quote number**	:	EN/008/05	**Date received**	: 16 Aug 2005
Order number	:	- Not provided -				**Date issued**	: 25 Aug 2005
C-O-C number	:	22162					
Site	:	Kemerton Pipeline					
E-mail	:	jpalich@pb.com.au	**E-mail**	:	Shaun.Crabb@alsenviro.com	**No. of samples**	
Telephone	:	(08)9489-9700	**Telephone**	:	61-8-9209-7655	**Received**	: 191
Facsimile	:	(08)9380-4060	**Facsimile**	:	61-8-9209-7600	**Analysed**	: 47

This final report for the ALSE work order reference EP0500812 supersedes any previous reports with this reference.
Results apply to the samples as submitted. All pages of this report have been checked and approved for release.
This report contains the following information:

- Analytical results for samples submitted
- Surrogate control limits

Work order specific comments

Liming Rate is based on results for samples as submitted and incorporates a minimum safety factor of 1.5.
Excess ANC not required because pH KCl less than 6.5

ALSE - Excellence in Analytical Testing

NATA Accredited Laboratory - 825

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

Accredited for compliance with ISO/IEC 17025.

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

Signatory	Department
Rebecca Walther	Perth Inorganics - NATA 15847 (Perth)

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

Analytical Results

				Client Sample ID :	**AH01 0**	**AH01 0.5**	**AH01 1**	**AH01 1.5**	**AH01 1.75**
				Sample Matrix Type / Description :	SOIL / SOIL	SOIL / SOIL	SOIL / SOIL	SOIL / SOIL	SOIL / SOIL
				Sample Date / Time :	16 Aug 2005 17:05	16 Aug 2005 17:05	16 Aug 2005 17:05	16 Aug 2005 17:05	16 Aug 2005 17:05
				Laboratory Sample ID :					
Analyte	***CAS number***	***LOR***	***Units***		**EP0500812-001**	**EP0500812-003**	**EP0500812-005**	**EP0500812-007**	**EP0500812-008**
EA033-A: Actual Acidity									
pH KCl (23A)		0.1	pH Unit		4.7	5.1	5.6	5.6	5.6
Titratable Actual Acidity (23F)		2	mole H+ / t		63	25	11	7	9
sulfidic - Titratable Actual Acidity (s-23F)		0.02	% pyrite S		0.10	0.04	<0.02	<0.02	<0.02
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)		0.02	% S		<0.02	<0.02	<0.02	<0.02	<0.02
Acidity - Chromium Reducible Sulfur (a-22B)		10	mole H+ / t		<10	<10	<10	<10	<10
EA033-E: Acid Base Accounting									
ANC Fineness Factor		0.5			1.5	1.5	1.5	1.5	1.5
Net Acidity (sulfur units)		0.02	% S		0.10	0.05	0.02	<0.02	0.02
Net Acidity (acidity units)		10	mole H+ / t		64	30	15	11	14
Liming Rate		1	kg CaCO3/t		5	2	1	<1	1

ALS Environmental

Analytical Results

			Client Sample ID :	**AH02**	**AH03**	**AH03**
				0.75	**2.25**	**2.5**
			Sample Matrix Type / Description :	SOIL / SOIL	SOIL / SOIL	SOIL / SOIL
			Sample Date / Time :	16 Aug 2005 17:05	16 Aug 2005 17:05	16 Aug 2005 17:05
			Laboratory Sample ID :			
Analyte	***CAS number***	***LOR***	***Units***	**EP0500812-012**	**EP0500812-023**	**EP0500812-024**
EA033-A: Actual Acidity						
pH KCl (23A)		0.1	pH Unit	5.7	5.0	5.1
Titratable Actual Acidity (23F)		2	mole H+ / t	8	57	46
sulfidic - Titratable Actual Acidity (s-23F)		0.02	% pyrite S	<0.02	0.09	0.07
EA033-B: Potential Acidity						
Chromium Reducible Sulfur (22B)		0.02	% S	<0.02	<0.02	<0.02
Acidity - Chromium Reducible Sulfur (a-22B)		10	mole H+ / t	<10	11	<10
EA033-E: Acid Base Accounting						
ANC Fineness Factor		0.5		1.5	1.5	1.5
Net Acidity (sulfur units)		0.02	% S	0.02	0.11	0.08
Net Acidity (acidity units)		10	mole H+ / t	15	68	50
Liming Rate		1	kg CaCO3/t	1	5	4

Client Sample ID :	**AH03**	**AH03**	**AH04**	
	2.75	**1.25**		
Sample Matrix Type / Description :	SOIL / SOIL	SOIL / SOIL		
Sample Date / Time :	16 Aug 2005 17:05	16 Aug 2005 17:05		
Laboratory Sample ID :				
	EP0500812-025	**EP0500812-032**		
EA033-A: Actual Acidity				
pH KCl (23A)	5.2	5.2		
Titratable Actual Acidity (23F)	40	25		
sulfidic - Titratable Actual Acidity (s-23F)	0.06	0.04		
EA033-B: Potential Acidity				
Chromium Reducible Sulfur (22B)	<0.02	<0.02		
Acidity - Chromium Reducible Sulfur (a-22B)	11	<10		
EA033-E: Acid Base Accounting				
ANC Fineness Factor	1.5	1.5		
Net Acidity (sulfur units)	0.08	0.05		
Net Acidity (acidity units)	51	32		
Liming Rate	4	2		

Analytical Results

Analyte	CAS number	LOR	Units	AH05	AH06	AH07	AH08	AH09
Client Sample ID:				AH05 0.25	AH06 0	AH07 0	AH08 1.75	AH09 0
Sample Matrix Type / Description:				SOIL / SOIL	SOIL / SOIL	SOIL / SOIL	SOIL / SOIL	SOIL / SOIL
Sample Date / Time:				16 Aug 2005 17:05	16 Aug 2005 17:05	16 Aug 2005 17:05	16 Aug 2005 17:05	16 Aug 2005 17:05
Laboratory Sample ID:				**EP0500812-037**	**EP0500812-045**	**EP0500812-058**	**EP0500812-074**	**EP0500812-075**
EA033-A: Actual Acidity								
pH KCl (23A)		0.1	pH Unit	6.0	5.3	4.8	5.6	4.8
Titratable Actual Acidity (23F)		2	mole H+ / t	12	10	32	11	25
sulfidic - Titratable Actual Acidity (s-23F)		0.02	% pyrite S	<0.02	<0.02	0.05	<0.02	0.04
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)		0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02
Acidity - Chromium Reducible Sulfur (a-22B)		10	mole H+ / t	<10	<10	<10	<10	<10
EA033-E: Acid Base Accounting								
ANC Fineness Factor		0.5		1.5	1.5	1.5	1.5	1.5
Net Acidity (sulfur units)		0.02	% S	0.03	0.02	0.06	0.03	0.04
Net Acidity (acidity units)		10	mole H+ / t	17	13	36	18	25
Liming Rate		1	kg CaCO3/t	1	<1	3	1	2

ALS Environmental

Analytical Results

Analyte	*CAS number*	*LOR*	*Units*	**Client Sample ID** :	**AH09 0.5**	**AH09 1**	**AH09 1.5**	**AH09 1.75**	**AH09 2**
				Sample Matrix Type / Description :	SOIL / SOIL	SOIL / SOIL	SOIL / SOIL	SOIL / SOIL	SOIL / SOIL
				Sample Date / Time :	16 Aug 2005 17:05	16 Aug 2005 17:05	16 Aug 2005 17:05	16 Aug 2005 17:05	16 Aug 2005 17:05
				Laboratory Sample ID :	**EP0500812-077**	**EP0500812-079**	**EP0500812-081**	**EP0500812-082**	**EP0500812-083**
EA033-A: Actual Acidity									
pH KCl (23A)		0.1	pH Unit		5.5	3.6	5.4	5.3	5.4
Titratable Actual Acidity (23F)		2	mole H+ / t		4	21	7	10	6
sulfidic - Titratable Actual Acidity (s-23F)		0.02	% pyrite S		<0.02	0.03	<0.02	<0.02	<0.02
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)		0.02	% S		<0.02	<0.02	<0.02	<0.02	<0.02
Acidity - Chromium Reducible Sulfur (a-22B)		10	mole H+ / t		<10	<10	<10	<10	<10
EA033-D: Retained Acidity									
Net Acid Soluble Sulfur (20Je)		0.02	% S		----	0.02	----	----	----
Acidity - Net Acid Soluble Sulfur (a-20J)		10	mole H+ / t		----	<10	----	----	----
sulfidic - Net Acid Soluble Sulfur (s-20J)		0.02	% pyrite S		----	<0.02	----	----	----
KCl Extractable Sulfur (23Ce)		0.02	% S		----	<0.02	----	----	----
HCl Extractable Sulfur (20Be)		0.02	% S		----	0.02	----	----	----
EA033-E: Acid Base Accounting									
ANC Fineness Factor		0.5			1.5	1.5	1.5	1.5	1.5
Net Acidity (sulfur units)		0.02	% S		<0.02	0.05	<0.02	0.02	<0.02
Net Acidity (acidity units)		10	mole H+ / t		<10	31	<10	16	<10
Liming Rate		1	kg CaCO3/t		<1	2	<1	1	<1

ALS Environmental

Analytical Results

Analyte	*CAS number*	*LOR*	*Units*	**Client Sample ID** : **AH11** **0.25**	**AH13** **1.25**	**AH14** **0.25**	**AH15** **0**	**AH016** **1.5**
			Sample Matrix Type / Description :	SOIL / SOIL	SOIL / SOIL	SOIL / SOIL	SOIL / SOIL	SOIL / SOIL
			Sample Date / Time :	16 Aug 2005 17:05	16 Aug 2005 17:05	16 Aug 2005 17:05	16 Aug 2005 17:05	16 Aug 2005 17:05
			Laboratory Sample ID :	**EP0500812-085**	**EP0500812-097**	**EP0500812-102**	**EP0500812-110**	**EP0500812-125**
EA033-A: Actual Acidity								
pH KCl (23A)		0.1	pH Unit	5.8	5.8	5.5	5.4	5.8
Titratable Actual Acidity (23F)		2	mole H+ / t	<2	2	6	2	<2
sulfidic - Titratable Actual Acidity (s-23F)		0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)		0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02
Acidity - Chromium Reducible Sulfur (a-22B)		10	mole H+ / t	<10	<10	<10	<10	<10
EA033-E: Acid Base Accounting								
ANC Fineness Factor		0.5		1.5	1.5	1.5	1.5	1.5
Net Acidity (sulfur units)		0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02
Net Acidity (acidity units)		10	mole H+ / t	<10	<10	<10	<10	<10
Liming Rate		1	kg CaCO3/t	<1	<1	<1	<1	<1

Analytical Results

Analyte	CAS number	LOR	Units	AH017 0	AH017 0.5	AH017 1	AH017 1.5	AH018 0.5
Sample Matrix Type / Description :				SOIL / SOIL	SOIL / SOIL	SOIL / SOIL	SOIL / SOIL	SOIL / SOIL
Sample Date / Time :				16 Aug 2005 17:05	16 Aug 2005 17:05	16 Aug 2005 17:05	16 Aug 2005 17:05	16 Aug 2005 17:05
Laboratory Sample ID :				**EP0500812-126**	**EP0500812-128**	**EP0500812-130**	**EP0500812-132**	**EP0500812-136**
EA033-A: Actual Acidity								
pH KCl (23A)		0.1	pH Unit	4.6	5.6	5.7	5.6	5.5
Titratable Actual Acidity (23F)		2	mole H+ / t	39	4	<2	2	2
sulfidic - Titratable Actual Acidity (s-23F)		0.02	% pyrite S	0.06	<0.02	<0.02	<0.02	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)		0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02
Acidity - Chromium Reducible Sulfur (a-22B)		10	mole H+ / t	<10	<10	<10	<10	<10
EA033-E: Acid Base Accounting								
ANC Fineness Factor		0.5		1.5	1.5	1.5	1.5	1.5
Net Acidity (sulfur units)		0.02	% S	0.07	<0.02	<0.02	<0.02	<0.02
Net Acidity (acidity units)		10	mole H+ / t	42	<10	<10	<10	<10
Liming Rate		1	kg CaCO3/t	3	<1	<1	<1	<1

ALS Environmental

Analytical Results

			Client Sample ID :	**AH019 0.25**	**AH020 0**	**AH020 0.5**	**AH020 1**	**AH020 1.5**
			Sample Matrix Type / Description :	SOIL / SOIL	SOIL / SOIL	SOIL / SOIL	SOIL / SOIL	SOIL / SOIL
			Sample Date / Time :	16 Aug 2005 17:05	16 Aug 2005 17:05	16 Aug 2005 17:05	16 Aug 2005 17:05	16 Aug 2005 17:05
			Laboratory Sample ID :					
Analyte	***CAS number***	***LOR***	***Units***	**EP0500812-142**	**EP0500812-150**	**EP0500812-152**	**EP0500812-154**	**EP0500812-156**
EA033-A: Actual Acidity								
pH KCl (23A)		0.1	pH Unit	5.9	6.4	4.6	5.6	5.2
Titratable Actual Acidity (23F)		2	mole H+ / t	<2	<2	63	4	13
sulfidic - Titratable Actual Acidity (s-23F)		0.02	% pyrite S	<0.02	<0.02	0.10	<0.02	0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)		0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02
Acidity - Chromium Reducible Sulfur (a-22B)		10	mole H+ / t	<10	<10	<10	<10	<10
EA033-E: Acid Base Accounting								
ANC Fineness Factor		0.5		1.5	1.5	1.5	1.5	1.5
Net Acidity (sulfur units)		0.02	% S	<0.02	<0.02	0.11	<0.02	0.03
Net Acidity (acidity units)		10	mole H+ / t	<10	<10	69	<10	17
Liming Rate		1	kg CaCO3/t	<1	<1	5	<1	1

ALS Environmental

Analytical Results

Analyte	*CAS number*	*LOR*	*Units*	**Client Sample ID** :	**AH020 1.75**	**AH020 2**	**AH021 0**	**AH022 0**	**AH022 0.5**
				Sample Matrix Type / Description :	SOIL / SOIL	SOIL / SOIL	SOIL / SOIL	SOIL / SOIL	SOIL / SOIL
				Sample Date / Time :	16 Aug 2005 17:05	16 Aug 2005 17:05	16 Aug 2005 17:05	16 Aug 2005 17:05	16 Aug 2005 17:05
				Laboratory Sample ID :	**EP0500812-157**	**EP0500812-158**	**EP0500812-159**	**EP0500812-164**	**EP0500812-166**
EA033-A: Actual Acidity									
pH KCl (23A)		0.1	pH Unit		3.8	4.4	5.0	5.0	5.6
Titratable Actual Acidity (23F)		2	mole H+ / t		208	99	18	16	4
sulfidic - Titratable Actual Acidity (s-23F)		0.02	% pyrite S		0.33	0.16	0.03	0.02	<0.02
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)		0.02	% S		<0.02	<0.02	<0.02	<0.02	<0.02
Acidity - Chromium Reducible Sulfur (a-22B)		10	mole H+ / t		11	<10	<10	<10	<10
EA033-D: Retained Acidity									
Net Acid Soluble Sulfur (20Je)		0.02	% S		0.02	0.02	----	----	----
Acidity - Net Acid Soluble Sulfur (a-20J)		10	mole H+ / t		11	<10	----	----	----
sulfidic - Net Acid Soluble Sulfur (s-20J)		0.02	% pyrite S		<0.02	<0.02	----	----	----
KCl Extractable Sulfur (23Ce)		0.02	% S		<0.02	<0.02	----	----	----
HCl Extractable Sulfur (20Be)		0.02	% S		0.03	0.02	----	----	----
EA033-E: Acid Base Accounting									
ANC Fineness Factor		0.5			1.5	1.5	1.5	1.5	1.5
Net Acidity (sulfur units)		0.02	% S		0.37	0.18	0.04	0.03	<0.02
Net Acidity (acidity units)		10	mole H+ / t		230	114	26	19	<10
Liming Rate		1	kg CaCO3/t		17	8	2	1	<1

ALS Environmental

Analytical Results

Analyte	*CAS number*	*LOR*	*Units*	**Client Sample ID** :	**AH022 1**	**AH23 0.25**	**AH23 0.75**	**AH25 1**	**QC1**
				Sample Matrix Type / Description :	SOIL / SOIL	SOIL / SOIL	SOIL / SOIL	SOIL / SOIL	SOIL / SOIL
				Sample Date / Time :	16 Aug 2005 17:05	16 Aug 2005 17:05	16 Aug 2005 17:05	16 Aug 2005 17:05	16 Aug 2005 17:05
				Laboratory Sample ID :	**EP0500812-168**	**EP0500812-171**	**EP0500812-173**	**EP0500812-183**	**EP0500812-188**
EA033-A: Actual Acidity									
pH KCl (23A)		0.1	pH Unit		5.9	5.4	5.7	6.0	5.6
Titratable Actual Acidity (23F)		2	mole H+ / t		4	5	<2	<2	4
sulfidic - Titratable Actual Acidity (s-23F)		0.02	% pyrite S		<0.02	<0.02	<0.02	<0.02	<0.02
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)		0.02	% S		<0.02	<0.02	<0.02	<0.02	<0.02
Acidity - Chromium Reducible Sulfur (a-22B)		10	mole H+ / t		<10	<10	<10	<10	<10
EA033-E: Acid Base Accounting									
ANC Fineness Factor		0.5			1.5	1.5	1.5	1.5	1.5
Net Acidity (sulfur units)		0.02	% S		<0.02	<0.02	<0.02	<0.02	<0.02
Net Acidity (acidity units)		10	mole H+ / t		<10	11	<10	<10	<10
Liming Rate		1	kg CaCO3/t		<1	<1	<1	<1	<1

Analytical Results

			Client Sample ID :	QC2	QC3			
			Sample Matrix Type / Description :	SOIL / SOIL	SOIL / SOIL			
			Sample Date / Time :	16 Aug 2005 17:05	16 Aug 2005 17:05			
			Laboratory Sample ID :	**EP0500812-189**	**EP0500812-190**			
Analyte	*CAS number*	*LOR*	*Units*					
EA033-A: Actual Acidity								
pH KCl (23A)		0.1	pH Unit	5.6	5.7			
Titratable Actual Acidity (23F)		2	mole H+ / t	4	<2			
sulfidic - Titratable Actual Acidity (s-23F)		0.02	% pyrite S	<0.02	<0.02			
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)		0.02	% S	<0.02	<0.02			
Acidity - Chromium Reducible Sulfur (a-22B)		10	mole H+ / t	<10	<10			
EA033-E: Acid Base Accounting								
ANC Fineness Factor		0.5		1.5	1.5			
Net Acidity (sulfur units)		0.02	% S	<0.02	<0.02			
Net Acidity (acidity units)		10	mole H+ / t	<10	<10			
Liming Rate		1	kg CaCO3/t	<1	<1			

Surrogate Control Limits

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

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

ALS Environmental

QUALITY CONTROL REPORT

Client	:	**PARSONS BRINCKERHOFF AUST P/L**	**Laboratory**	: ALS Environmental Perth	**Page**	:	**1 of 6**
Contact	:	MS JULIE PALICH	**Contact**	: Shaun Crabb			
Address	:	P O BOX 1232 SUBIACO WA AUSTRALIA 6904	**Address**	: 10 Hod Way Malaga WA Australia 6090	**Work order**	:	**EP0500812**
					Amendment No.	:	
Project	:	2145177A	**Quote number**	: EN/008/05	**Date received**	:	16 Aug 2005
Order number	:	- Not provided -			**Date issued**	:	25 Aug 2005
C-O-C number	:	22162					
Site	:	Kemerton Pipeline					
E-mail	:	jpalich@pb.com.au	**E-mail**	: Shaun.Crabb@alsenviro.com	**No. of samples**		
Telephone	:	(08)9489-9700	**Telephone**	: 61-8-9209-7655	**Received**	:	191
Facsimile	:	(08)9380-4060	**Facsimile**	: 61-8-9209-7600	**Analysed**	:	47

This final report for the ALSE work order reference EP0500812 supersedes any previous reports with this reference.

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

This report contains the following information:

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

Work order specific comments

Liming Rate is based on results for samples as submitted and incorporates a minimum safety factor of 1.5.
Excess ANC not required because pH KCl less than 6.5

ALSE - Excellence in Analytical Testing

NATA Accredited Laboratory - 825

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

Accredited for compliance with ISO/IED 17025

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

Signatory	Department
Rebecca Walther	Perth Inorganics - NATA 15847 (Perth)

Quality Control Report - Laboratory Duplicates (DUP)

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

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

Laboratory Sample ID	*Client Sample ID*	*Analyte name*	*LOR*	*Original Result*	*Duplicate Result*	*RPD*
EA033-A: Actual Acidity						
EA033-A: Actual Acidity - (QC Lot: 104105)				**pH Unit**	**pH Unit**	**%**
EP0500812-001	AH01 - 0	pH KCl (23A)	0.1 pH Unit	4.7	4.6	0.0
		Titratable Actual Acidity (23F)	2 mole H+ / t	63	61	3.7
		sulfidic - Titratable Actual Acidity (s-23F)	0.02 % pyrite S	0.10	0.10	0.0
EP0500812-037	AH05 - 0.25	pH KCl (23A)	0.1 pH Unit	6.0	5.5	8.0
		Titratable Actual Acidity (23F)	2 mole H+ / t	12	12	0.0
		sulfidic - Titratable Actual Acidity (s-23F)	0.02 % pyrite S	<0.02	0.02	0.0
EA033-A: Actual Acidity - (QC Lot: 104106)				**pH Unit**	**pH Unit**	**%**
EP0500812-085	AH11 - 0.25	pH KCl (23A)	0.1 pH Unit	5.8	5.7	0.0
		Titratable Actual Acidity (23F)	2 mole H+ / t	<2	<2	0.0
		sulfidic - Titratable Actual Acidity (s-23F)	0.02 % pyrite S	<0.02	<0.02	0.0
EP0500812-142	AH019 - 0.25	pH KCl (23A)	0.1 pH Unit	5.9	5.8	1.7
		Titratable Actual Acidity (23F)	2 mole H+ / t	<2	<2	0.0
		sulfidic - Titratable Actual Acidity (s-23F)	0.02 % pyrite S	<0.02	<0.02	0.0
EA033-A: Actual Acidity - (QC Lot: 104107)				**pH Unit**	**pH Unit**	**%**
EP0500812-168	AH022 - 1	pH KCl (23A)	0.1 pH Unit	5.9	5.7	2.8
		Titratable Actual Acidity (23F)	2 mole H+ / t	4	4	0.0
		sulfidic - Titratable Actual Acidity (s-23F)	0.02 % pyrite S	<0.02	<0.02	0.0
EA033-B: Potential Acidity						
EA033-B: Potential Acidity - (QC Lot: 104105)				**% S**	**% S**	**%**
EP0500812-001	AH01 - 0	Chromium Reducible Sulfur (22B)	0.02 % S	<0.02	<0.02	0.0
		Acidity - Chromium Reducible Sulfur (a-22B)	10 mole H+ / t	<10	<10	0.0
EP0500812-037	AH05 - 0.25	Chromium Reducible Sulfur (22B)	0.02 % S	<0.02	<0.02	0.0
		Acidity - Chromium Reducible Sulfur (a-22B)	10 mole H+ / t	<10	<10	0.0
EA033-B: Potential Acidity - (QC Lot: 104106)				**% S**	**% S**	**%**
EP0500812-085	AH11 - 0.25	Chromium Reducible Sulfur (22B)	0.02 % S	<0.02	<0.02	0.0
		Acidity - Chromium Reducible Sulfur (a-22B)	10 mole H+ / t	<10	<10	0.0
EP0500812-142	AH019 - 0.25	Chromium Reducible Sulfur (22B)	0.02 % S	<0.02	<0.02	0.0
		Acidity - Chromium Reducible Sulfur (a-22B)	10 mole H+ / t	<10	<10	0.0

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

Laboratory Sample ID	*Client Sample ID*	*Analyte name*	*LOR*	*Original Result*	*Duplicate Result*	*RPD*
EA033-B: Potential Acidity - continued						
EA033-B: Potential Acidity - (QC Lot: 104106) - continued				**mole H+ / t**	**mole H+ / t**	**%**
EA033-B: Potential Acidity - (QC Lot: 104107)				**% S**	**% S**	**%**
EP0500812-168	AH022 - 1	Chromium Reducible Sulfur (22B)	0.02 % S	<0.02	<0.02	0.0
		Acidity - Chromium Reducible Sulfur (a-22B)	10 mole H+ / t	<10	<10	0.0
EA033-E: Acid Base Accounting						
EA033-E: Acid Base Accounting - (QC Lot: 104105)						**%**
EP0500812-001	AH01 - 0	ANC Fineness Factor		1.5	1.5	0.0
		Net Acidity (sulfur units)	0.02 % S	0.10	0.10	0.0
		Net Acidity (acidity units)	10 mole H+ / t	64	62	3.6
		Liming Rate	1 kg CaCO3/t	5	5	0.0
EP0500812-037	AH05 - 0.25	ANC Fineness Factor		1.5	1.5	0.0
		Net Acidity (sulfur units)	0.02 % S	0.03	0.03	0.0
		Net Acidity (acidity units)	10 mole H+ / t	17	17	0.0
		Liming Rate	1 kg CaCO3/t	1	1	0.0
EA033-E: Acid Base Accounting - (QC Lot: 104106)						**%**
EP0500812-085	AH11 - 0.25	ANC Fineness Factor		1.5	1.5	0.0
		Net Acidity (sulfur units)	0.02 % S	<0.02	<0.02	0.0
		Net Acidity (acidity units)	10 mole H+ / t	<10	<10	0.0
		Liming Rate	1 kg CaCO3/t	<1	<1	0.0
EP0500812-142	AH019 - 0.25	ANC Fineness Factor		1.5	1.5	0.0
		Net Acidity (sulfur units)	0.02 % S	<0.02	<0.02	0.0
		Net Acidity (acidity units)	10 mole H+ / t	<10	<10	0.0
		Liming Rate	1 kg CaCO3/t	<1	<1	0.0
EA033-E: Acid Base Accounting - (QC Lot: 104107)						**%**
EP0500812-168	AH022 - 1	ANC Fineness Factor		1.5	1.5	0.0
		Net Acidity (sulfur units)	0.02 % S	<0.02	<0.02	0.0
		Net Acidity (acidity units)	10 mole H+ / t	<10	<10	0.0
		Liming Rate	1 kg CaCO3/t	<1	<1	0.0

ALS Environmental

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

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

Matrix Type: SOIL

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

		Method blank result	*Actual Results*		*Recovery Limits*	
			Spike concentration	*Spike Recovery*	*Dynamic Recovery Limits*	
Analyte name	*LOR*			*LCS*	*Low*	*High*
EA033-A: Actual Acidity						
EA033-A: Actual Acidity - (QC Lot: 104105)		pH Unit	pH Unit	%	%	%
pH KCl (23A)	0.1 pH Unit	<0.1	----	----	----	----
sulfidic - Titratable Actual Acidity (s-23F)	0.02 % pyrite S	<0.02	----	----	----	----
Titratable Actual Acidity (23F)	2 mole H+ / t	<2	----	----	----	----
EA033-A: Actual Acidity - (QC Lot: 104106)		pH Unit	pH Unit	%	%	%
pH KCl (23A)	0.1 pH Unit	<0.1	----	----	----	----
sulfidic - Titratable Actual Acidity (s-23F)	0.02 % pyrite S	<0.02	----	----	----	----
Titratable Actual Acidity (23F)	2 mole H+ / t	<2	----	----	----	----
EA033-A: Actual Acidity - (QC Lot: 104107)		pH Unit	pH Unit	%	%	%
pH KCl (23A)	0.1 pH Unit	<0.1	----	----	----	----
sulfidic - Titratable Actual Acidity (s-23F)	0.02 % pyrite S	<0.02	----	----	----	----
Titratable Actual Acidity (23F)	2 mole H+ / t	<2	----	----	----	----
EA033-B: Potential Acidity						
EA033-B: Potential Acidity - (QC Lot: 104105)		mole H+ / t	mole H+ / t	%	%	%
Acidity - Chromium Reducible Sulfur (a-22B)	10 mole H+ / t	<10	----	----	----	----
Chromium Reducible Sulfur (22B)	0.02 % S	<0.02	----	----	----	----
EA033-B: Potential Acidity - (QC Lot: 104106)		mole H+ / t	mole H+ / t	%	%	%
Acidity - Chromium Reducible Sulfur (a-22B)	10 mole H+ / t	<10	----	----	----	----
Chromium Reducible Sulfur (22B)	0.02 % S	<0.02	----	----	----	----
EA033-B: Potential Acidity - (QC Lot: 104107)		mole H+ / t	mole H+ / t	%	%	%
Acidity - Chromium Reducible Sulfur (a-22B)	10 mole H+ / t	<10	----	----	----	----
Chromium Reducible Sulfur (22B)	0.02 % S	<0.02	----	----	----	----
EA033-D: Retained Acidity						
EA033-D: Retained Acidity - (QC Lot: 104105)		mole H+ / t	mole H+ / t	%	%	%
Acidity - Net Acid Soluble Sulfur (a-20J)	10 mole H+ / t	<10	----	----	----	----

ALS Environmental

Matrix Type: SOIL

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

Analyte name	*LOR*	*Method blank result*	*Actual Results*		*Recovery Limits*	
			Spike concentration	*Spike Recovery*	*Dynamic Recovery Limits*	
				LCS	*Low*	*High*
EA033-D: Retained Acidity - continued						
EA033-D: Retained Acidity - (QC Lot: 104105) - continued		% S	% S	%	%	%
HCl Extractable Sulfur (20Be)	0.02 % S	<0.02	----	----	----	----
KCl Extractable Sulfur (23Ce)	0.02 % S	<0.02	----	----	----	----
Net Acid Soluble Sulfur (20Je)	0.02 % S	<0.02	----	----	----	----
sulfidic - Net Acid Soluble Sulfur (s-20J)	0.02 % pyrite S	<0.02	----	----	----	----
EA033-D: Retained Acidity - (QC Lot: 104106)		mole H+ / t	mole H+ / t	%	%	%
Acidity - Net Acid Soluble Sulfur (a-20J)	10 mole H+ / t	<10	----	----	----	----
HCl Extractable Sulfur (20Be)	0.02 % S	<0.02	----	----	----	----
KCl Extractable Sulfur (23Ce)	0.02 % S	<0.02	----	----	----	----
Net Acid Soluble Sulfur (20Je)	0.02 % S	<0.02	----	----	----	----
sulfidic - Net Acid Soluble Sulfur (s-20J)	0.02 % pyrite S	<0.02	----	----	----	----
EA033-E: Acid Base Accounting						
EA033-E: Acid Base Accounting - (QC Lot: 104105)				%	%	%
ANC Fineness Factor		<0.5	----	----	----	----
Liming Rate	1 kg CaCO3/t	<1	----	----	----	----
Net Acidity (acidity units)	10 mole H+ / t	<10	----	----	----	----
Net Acidity (sulfur units)	0.02 % S	<0.02	----	----	----	----
EA033-E: Acid Base Accounting - (QC Lot: 104106)				%	%	%
ANC Fineness Factor		<0.5	----	----	----	----
Liming Rate	1 kg CaCO3/t	<1	----	----	----	----
Net Acidity (acidity units)	10 mole H+ / t	<10	----	----	----	----
Net Acidity (sulfur units)	0.02 % S	<0.02	----	----	----	----
EA033-E: Acid Base Accounting - (QC Lot: 104107)				%	%	%
ANC Fineness Factor		<0.5	----	----	----	----
Liming Rate	1 kg CaCO3/t	<1	----	----	----	----
Net Acidity (acidity units)	10 mole H+ / t	<10	----	----	----	----
Net Acidity (sulfur units)	0.02 % S	<0.02	----	----	----	----

ALS Environmental

Quality Control Report - Matrix Spikes (MS)

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

* Indicates failed QC

Matrix Spike (MS) Report

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

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

ALS Environmental

INTERPRETIVE QUALITY CONTROL REPORT

Client	:	**PARSONS BRINCKERHOFF AUST P/L**	**Laboratory**	:	ALS Environmental Perth	**Page**	: **1 of 5**
Contact	:	MS JULIE PALICH	**Contact**	:	Shaun Crabb		
Address	:	P O BOX 1232 SUBIACO WA AUSTRALIA 6904	**Address**	:	10 Hod Way Malaga WA Australia 6090	**Work order**	: **EP0500812**
						Amendment No.	:
Project	:	2145177A	**Quote number**	:	EN/008/05	**Date received**	: 16 Aug 2005
Order number	:	- Not provided -				**Date issued**	: 25 Aug 2005
C-O-C number	:	22162					
Site	:	Kemerton Pipeline					
E-mail	:	jpalich@pb.com.au	**E-mail**	:	Shaun.Crabb@alsenviro.com	**No. of samples**	
Telephone	:	(08)9489-9700	**Telephone**	:	61-8-9209-7655	**Received**	: 191
Facsimile	:	(08)9380-4060	**Facsimile**	:	61-8-9209-7600	**Analysed**	: 47

This Interpretive Quality Control Report was issued on 25 Aug 2005 for the ALS work order reference EP0500812 and supersedes any previous reports with this reference.
This report contains the following information:

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

ALS Environmental

Interpretive Quality Control Report - Analysis Holding Time

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

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

Method / **Container /** Client Sample ID(s)	**Date Sampled**	**Extraction / Preparation**			**Analysis**		
		Date extracted	Due for extraction	Pass?	Date analysed	Due for analysis	Pass?
EA033: Chromium Suite for Acid Sulphate Soils							
Snap Lock Bag							
AH01 - 0, AH01 - 0.5, AH01 - 1, AH01 - 1.5, AH01 - 1.75, AH02 - 0.75, AH03 - 2.25, AH03 - 2.5, AH03 - 2.75, AH04 - 1.25, AH05 - 0.25, AH06 - 0, AH07 - 0, AH08 - 1.75, AH09 - 0, AH09 - 0.5, AH09 - 1, AH09 - 1.5, AH09 - 1.75, AH09 - 2, AH11 - 0.25, QC1, AH14 - 0.25, AH15 - 0, AH016 - 1.5, AH017 - 0, AH017 - 0.5, AH017 - 1, AH017 - 1.5, AH018 - 0.5, AH019 - 0.25, AH020 - 0, AH020 - 0.5, AH020 - 1, AH020 - 1.5, AH020 - 1.75, AH020 - 2, AH021 - 0, AH022 - 0, AH022 - 0.5, AH022 - 1, AH25 - 1, AH23 - 0.25, AH23 - 0.75, QC2, QC3	**16 Aug 2005**	**17 Aug 2005**	17 Aug 2005	Pass	**23 Aug 2005**	15 Nov 2005	Pass

Interpretive Quality Control Report - Frequency of Quality Control Samples

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

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

Quality Control Sample Type / Method	Count		Rate (%)		Quality Control Specification
	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
EA033: Chromium Suite for Acid Sulphate Soils	5	47	**10.6**	**10.0**	NEPM 1999 Schedule B(3) and ALSE QCS3 requirement
Laboratory Control Samples (LCS)					
EA033: Chromium Suite for Acid Sulphate Soils	3	47	**6.4**	**5.0**	NEPM 1999 Schedule B(3) and ALSE QCS3 requirement
Method Blanks (MB)					
EA033: Chromium Suite for Acid Sulphate Soils	3	47	**6.4**	**5.0**	NEPM 1999 Schedule B(3) and ALSE QCS3 requirement

Interpretive Quality Control Report - Summary of Outliers

Outliers : Quality Control Samples

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

Non-surrogates

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

Surrogates

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

Outliers : Analysis Holding Time

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

- **No holding time outliers occur.**

Outliers : Frequency of Quality Control Samples

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

- **No frequency outliers occur.**

Method Reference Summary

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

Matrix Type: SOIL ***Method Reference Summary***

Preparation Methods

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

Analytical Methods

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

AUSTRALIAN LABORATORY SERVICES PTY LTD ABN 84 009 936 029
10 Hod Way Malaga WA 6090 Australia
Telephone: 61-8-9209-7655 Facsimile: 61-8-9209-7600 http://www.alsenviro.com/

ALS Environmental

SAMPLE RECEIPT NOTIFICATION (SRN)

Comprehensive report

Client Details

Client	:	**PARSONS BRINCKERHOFF AUST P/L**
Contact	:	**MS JULIE PALICH**
Address	:	P O BOX 1232 SUBIACO WA AUSTRALIA 6904
Project	:	**2145177A**
Order number	:	**- Not provided -**
C-O-C Number	:	**22162**
Site	:	**Kemerton Pipeline**
Sampler	:	**- Not provided -**
E-mail	:	jpalich@pb.com.au
Telephone	:	(08)9489-9700
Facsimile	:	(08)9380-4060

Laboratory Details

Laboratory	:	**ALS Environmental Perth**
Manager	:	**Shaun Crabb**
Address	:	10 Hod Way Malaga WA Australia 6090
Quote number	:	EP20050010
Work order	:	**EP0500812**
E-mail	:	Shaun.Crabb@alsenviro.com
Telephone	:	61-8-9209-7655
Facsimile	:	61-8-9209-7600

Dates

Date Samples Received	:	16 Aug 2005
SRA Issue Date	:	17 Aug 2005
Scheduled Reporting Date	:	**24 Aug 2005**

Delivery Details

Mode of Delivery	:	Carrier.	**Temperature**	:	Chilled - Ice bricks present
No. of coolers/boxes	:	4 Hard Large	**No. of samples** - **Received**		191
Security Seal	:	Intact.	- **Analysed**		191

Comments

- **Samples received in appropriately pretreated and preserved containers.**

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

Client	: PARSONS BRINCKERHOFF AUST P/L	**Work Order**	: EP0500812
Project	: 2145177A	**ALS Quote Reference**	: EP20050010

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

Some items described below may be packages. A package may contain additional analyses, such as moisture and preparation tasks, that form an implicit part of that package.

ALS Sample ID.	Client Sample ID - Sample Date	**Requested Analysis**									
		EA033 Chromium Suite for Acid Sulphate Soils									
EP0500812-001	**AH01 - 0 - 16 Aug 2005**	]									
EP0500812-002	**AH01 - 0.25 - 16 Aug 2005**										
EP0500812-003	**AH01 - 0.5 - 16 Aug 2005**	]									
EP0500812-004	**AH01 - 0.75 - 16 Aug 2005**										
EP0500812-005	**AH01 - 1 - 16 Aug 2005**	]									
EP0500812-006	**AH01 - 1.25 - 16 Aug 2005**										
EP0500812-007	**AH01 - 1.5 - 16 Aug 2005**	]									
EP0500812-008	**AH01 - 1.75 - 16 Aug 2005**	]									
EP0500812-009	**AH02 - 0 - 16 Aug 2005**										
EP0500812-010	**AH02 - 0.25 - 16 Aug 2005**										
EP0500812-011	**AH02 - 0.5 - 16 Aug 2005**										
EP0500812-012	**AH02 - 0.75 - 16 Aug 2005**	]									
EP0500812-013	**AH02 - 1 - 16 Aug 2005**										
EP0500812-014	**AH03 - 0 - 16 Aug 2005**										
EP0500812-015	**AH03 - 0.25 - 16 Aug 2005**										
EP0500812-016	**AH03 - 0.5 - 16 Aug 2005**										
EP0500812-017	**AH03 - 0.75 - 16 Aug 2005**										
EP0500812-018	**AH03 - 1 - 16 Aug 2005**										
EP0500812-019	**AH03 - 1.25 - 16 Aug 2005**										
EP0500812-020	**AH03 - 1.5 - 16 Aug 2005**										
EP0500812-021	**AH03 - 1.75 - 16 Aug 2005**										
EP0500812-022	**AH03 - 2 - 16 Aug 2005**										
EP0500812-023	**AH03 - 2.25 - 16 Aug 2005**	]									
EP0500812-024	**AH03 - 2.5 - 16 Aug 2005**	]									
EP0500812-025	**AH03 - 2.75 - 16 Aug 2005**	]									
EP0500812-026	**AH03 - 2.9 - 16 Aug 2005**										
EP0500812-027	**AH04 - 0 - 16 Aug 2005**										
EP0500812-028	**AH04 - 0.25 - 16 Aug 2005**										
EP0500812-029	**AH04 - 0.5 - 16 Aug 2005**										
EP0500812-030	**AH04 - 0.75 - 16 Aug 2005**										
EP0500812-031	**AH04 - 1 - 16 Aug 2005**										
EP0500812-032	**AH04 - 1.25 - 16 Aug 2005**	]									
EP0500812-033	**AH04 - 1.5 - 16 Aug 2005**										
EP0500812-034	**AH04 - 1.75 - 16 Aug 2005**										
EP0500812-035	**AH04 - 1.9 - 16 Aug 2005**										
EP0500812-036	**AH05 - 0 - 16 Aug 2005**										
EP0500812-037	**AH05 - 0.25 - 16 Aug 2005**	]									
EP0500812-038	**AH05 - 0.5 - 16 Aug 2005**										
EP0500812-039	**AH05 - 0.75 - 16 Aug 2005**										
EP0500812-040	**AH05 - 1 - 16 Aug 2005**										
EP0500812-041	**AH05 - 1.25 - 16 Aug 2005**										
EP0500812-042	**AH05 - 1.5 - 16 Aug 2005**										
EP0500812-043	**AH05 - 1.75 - 16 Aug 2005**										
EP0500812-044	**AH05 - 2 - 16 Aug 2005**										
EP0500812-045	**AH06 - 0 - 16 Aug 2005**	]									

Client	: PARSONS BRINCKERHOFF AUST P/L	**Work Order**	: EP0500812
Project	: 2145177A	**ALS Quote Reference**	: EP20050010

ALS Environmental

ALS Sample ID.	Client Sample ID - Sample Date	Requested Analysis									
		EA033 Chromium Suite for Acid Sulphate Soils									
EP0500812-046	AH06 - 0.25 - 16 Aug 2005										
EP0500812-047	AH06 - 0.5 - 16 Aug 2005										
EP0500812-048	AH06 - 0.75 - 16 Aug 2005										
EP0500812-049	AH06 - 1 - 16 Aug 2005										
EP0500812-050	AH06 - 1.25 - 16 Aug 2005										
EP0500812-051	AH06 - 1.5 - 16 Aug 2005										
EP0500812-052	AH06 - 1.75 - 16 Aug 2005										
EP0500812-053	AH06 - 2 - 16 Aug 2005										
EP0500812-054	AH06 - 2.25 - 16 Aug 2005										
EP0500812-055	AH06 - 2.5 - 16 Aug 2005										
EP0500812-056	AH06 - 2.75 - 16 Aug 2005										
EP0500812-057	AH06 - 3 - 16 Aug 2005										
EP0500812-058	AH07 - 0 - 16 Aug 2005	]									
EP0500812-059	AH07 - 0.25 - 16 Aug 2005										
EP0500812-060	AH07 - 0.5 - 16 Aug 2005										
EP0500812-061	AH07 - 0.75 - 16 Aug 2005										
EP0500812-062	AH07 - 1 - 16 Aug 2005										
EP0500812-063	AH07 - 1.25 - 16 Aug 2005										
EP0500812-064	AH07 - 1.5 - 16 Aug 2005										
EP0500812-065	AH07 - 1.75 - 16 Aug 2005										
EP0500812-066	AH07 - 2 - 16 Aug 2005										
EP0500812-067	AH08 - 0 - 16 Aug 2005										
EP0500812-068	AH08 - 0.25 - 16 Aug 2005										
EP0500812-069	AH08 - 0.5 - 16 Aug 2005										
EP0500812-070	AH08 - 0.75 - 16 Aug 2005										
EP0500812-071	AH08 - 1 - 16 Aug 2005										
EP0500812-072	AH08 - 1.25 - 16 Aug 2005										
EP0500812-073	AH08 - 1.5 - 16 Aug 2005										
EP0500812-074	AH08 - 1.75 - 16 Aug 2005	]									
EP0500812-075	AH09 - 0 - 16 Aug 2005	]									
EP0500812-076	AH09 - 0.25 - 16 Aug 2005										
EP0500812-077	AH09 - 0.5 - 16 Aug 2005	]									
EP0500812-078	AH09 - 0.75 - 16 Aug 2005										
EP0500812-079	AH09 - 1 - 16 Aug 2005	]									
EP0500812-080	AH09 - 1.25 - 16 Aug 2005										
EP0500812-081	AH09 - 1.5 - 16 Aug 2005	]									
EP0500812-082	AH09 - 1.75 - 16 Aug 2005	]									
EP0500812-083	AH09 - 2 - 16 Aug 2005	]									
EP0500812-084	AH11 - 0 - 16 Aug 2005										
EP0500812-085	AH11 - 0.25 - 16 Aug 2005	]									
EP0500812-086	AH11 - 0.5 - 16 Aug 2005										
EP0500812-087	AH11 - 0.75 - 16 Aug 2005										
EP0500812-088	AH11 - 1 - 16 Aug 2005										
EP0500812-089	AH11 - 1.25 - 16 Aug 2005										
EP0500812-090	AH11 - 1.5 - 16 Aug 2005										
EP0500812-091	AH11 - 1.75 - 16 Aug 2005										
EP0500812-092	AH13 - 0 - 16 Aug 2005										
EP0500812-093	AH13 - 0.25 - 16 Aug 2005										
EP0500812-094	AH13 - 0.5 - 16 Aug 2005										

Client	: PARSONS BRINCKERHOFF AUST P/L	**Work Order**	: EP0500812
Project	: 2145177A	**ALS Quote Reference**	: EP20050010

ALS Sample ID.	Client Sample ID - Sample Date	**Requested Analysis**									
		EA033 Chromium Suite for Acid Sulphate Soils									
EP0500812-095	**AH13 - 0.75 - 16 Aug 2005**										
EP0500812-096	**AH13 - 1 - 16 Aug 2005**										
EP0500812-097	**AH13 - 1.25 - 16 Aug 2005**	]									
EP0500812-098	**AH13 - 1.5 - 16 Aug 2005**										
EP0500812-099	**AH13 - 1.75 - 16 Aug 2005**										
EP0500812-100	**AH13 - 2 - 16 Aug 2005**										
EP0500812-101	**AH14 - 0 - 16 Aug 2005**										
EP0500812-102	**AH14 - 0.25 - 16 Aug 2005**	]									
EP0500812-103	**AH14 - 0.5 - 16 Aug 2005**										
EP0500812-104	**AH14 - 0.75 - 16 Aug 2005**										
EP0500812-105	**AH14 - 1 - 16 Aug 2005**										
EP0500812-106	**AH14 - 1.25 - 16 Aug 2005**										
EP0500812-107	**AH14 - 1.5 - 16 Aug 2005**										
EP0500812-108	**AH14 - 1.75 - 16 Aug 2005**										
EP0500812-109	**AH14 - 2 - 16 Aug 2005**										
EP0500812-110	**AH15 - 0 - 16 Aug 2005**	]									
EP0500812-111	**AH15 - 0.25 - 16 Aug 2005**										
EP0500812-112	**AH15 - 0.5 - 16 Aug 2005**										
EP0500812-113	**AH15 - 0.75 - 16 Aug 2005**										
EP0500812-114	**AH15 - 1 - 16 Aug 2005**										
EP0500812-115	**AH15 - 1.25 - 16 Aug 2005**										
EP0500812-116	**AH15 - 1.5 - 16 Aug 2005**										
EP0500812-117	**AH15 - 1.75 - 16 Aug 2005**										
EP0500812-118	**AH15 - 2 - 16 Aug 2005**										
EP0500812-119	**AH016 - 0 - 16 Aug 2005**										
EP0500812-120	**AH016 - 0.25 - 16 Aug 2005**										
EP0500812-121	**AH016 - 0.5 - 16 Aug 2005**										
EP0500812-122	**AH016 - 0.75 - 16 Aug 2005**										
EP0500812-123	**AH016 - 1 - 16 Aug 2005**										
EP0500812-124	**AH016 - 1.25 - 16 Aug 2005**										
EP0500812-125	**AH016 - 1.5 - 16 Aug 2005**	]									
EP0500812-126	**AH017 - 0 - 16 Aug 2005**	]									
EP0500812-127	**AH017 - 0.25 - 16 Aug 2005**										
EP0500812-128	**AH017 - 0.5 - 16 Aug 2005**	]									
EP0500812-129	**AH017 - 0.75 - 16 Aug 2005**										
EP0500812-130	**AH017 - 1 - 16 Aug 2005**	]									
EP0500812-131	**AH017 - 1.25 - 16 Aug 2005**										
EP0500812-132	**AH017 - 1.5 - 16 Aug 2005**	]									
EP0500812-133	**AH017 - 1.75 - 16 Aug 2005**										
EP0500812-134	**AH018 - 0 - 16 Aug 2005**										
EP0500812-135	**AH018 - 0.25 - 16 Aug 2005**										
EP0500812-136	**AH018 - 0.5 - 16 Aug 2005**	]									
EP0500812-137	**AH018 - 0.75 - 16 Aug 2005**										
EP0500812-138	**AH018 - 1 - 16 Aug 2005**										
EP0500812-139	**AH018 - 1.25 - 16 Aug 2005**										
EP0500812-140	**AH018 - 1.5 - 16 Aug 2005**										
EP0500812-141	**AH019 - 0 - 16 Aug 2005**										
EP0500812-142	**AH019 - 0.25 - 16 Aug 2005**	]									
EP0500812-143	**AH019 - 0.5 - 16 Aug 2005**										

Client	: PARSONS BRINCKERHOFF AUST P/L	**Work Order**	: EP0500812
Project	: 2145177A	**ALS Quote Reference**	: EP20050010

ALS Sample ID.	Client Sample ID - Sample Date	**Requested Analysis**									
		EA033 Chromium Suite for Acid Sulphate Soils									
EP0500812-144	**AH019 - 0.75 - 16 Aug 2005**										
EP0500812-145	**AH019 - 1 - 16 Aug 2005**										
EP0500812-146	**AH019 - 1.25 - 16 Aug 2005**										
EP0500812-147	**AH019 - 1.5 - 16 Aug 2005**										
EP0500812-148	**AH019 - 1.75 - 16 Aug 2005**										
EP0500812-149	**AH019 - 2 - 16 Aug 2005**										
EP0500812-150	**AH020 - 0 - 16 Aug 2005**	]									
EP0500812-151	**AH020 - 0.25 - 16 Aug 2005**										
EP0500812-152	**AH020 - 0.5 - 16 Aug 2005**	]									
EP0500812-153	**AH020 - 0.75 - 16 Aug 2005**										
EP0500812-154	**AH020 - 1 - 16 Aug 2005**	]									
EP0500812-155	**AH020 - 1.25 - 16 Aug 2005**										
EP0500812-156	**AH020 - 1.5 - 16 Aug 2005**	]									
EP0500812-157	**AH020 - 1.75 - 16 Aug 2005**	]									
EP0500812-158	**AH020 - 2 - 16 Aug 2005**	]									
EP0500812-159	**AH021 - 0 - 16 Aug 2005**	]									
EP0500812-160	**AH021 - 0.25 - 16 Aug 2005**										
EP0500812-161	**AH021 - 0.5 - 16 Aug 2005**										
EP0500812-162	**AH021 - 0.75 - 16 Aug 2005**										
EP0500812-163	**AH021 - 1 - 16 Aug 2005**										
EP0500812-164	**AH022 - 0 - 16 Aug 2005**	]									
EP0500812-165	**AH022 - 0.25 - 16 Aug 2005**										
EP0500812-166	**AH022 - 0.5 - 16 Aug 2005**	]									
EP0500812-167	**AH022 - 0.75 - 16 Aug 2005**										
EP0500812-168	**AH022 - 1 - 16 Aug 2005**	]									
EP0500812-169	**AH022 - 1.25 - 16 Aug 2005**										
EP0500812-170	**AH23 - 0 - 16 Aug 2005**										
EP0500812-171	**AH23 - 0.25 - 16 Aug 2005**	]									
EP0500812-172	**AH23 - 0.5 - 16 Aug 2005**										
EP0500812-173	**AH23 - 0.75 - 16 Aug 2005**	]									
EP0500812-174	**AH24 - 0 - 16 Aug 2005**										
EP0500812-175	**AH24 - 0.25 - 16 Aug 2005**										
EP0500812-176	**AH24 - 0.5 - 16 Aug 2005**										
EP0500812-177	**AH24 - 0.75 - 16 Aug 2005**										
EP0500812-178	**AH24 - 1 - 16 Aug 2005**										
EP0500812-179	**AH25 - 0 - 16 Aug 2005**										
EP0500812-180	**AH25 - 0.25 - 16 Aug 2005**										
EP0500812-181	**AH25 - 0.5 - 16 Aug 2005**										
EP0500812-182	**AH25 - 0.75 - 16 Aug 2005**										
EP0500812-183	**AH25 - 1 - 16 Aug 2005**	]									
EP0500812-184	**AH25 - 1.25 - 16 Aug 2005**										
EP0500812-185	**AH25 - 1.5 - 16 Aug 2005**										
EP0500812-186	**AH25 - 1.75 - 16 Aug 2005**										
EP0500812-187	**AH25 - 2 - 16 Aug 2005**										
EP0500812-188	**QC1 - 16 Aug 2005**	]									
EP0500812-189	**QC2 - 16 Aug 2005**	]									
EP0500812-190	**QC3 - 16 Aug 2005**	]									
EP0500812-191	**AH11 - 2.00 - 16 Aug 2005**										

Client	: PARSONS BRINCKERHOFF AUST P/L	**Work Order**	: EP0500812
Project	: 2145177A	**ALS Quote Reference**	: EP20050010

ALS Sample ID. Client Sample ID - Sample Date	**Requested Analysis**									
	EA033 Chromium Suite for Acid Sulphate Soils									
Total(s) :	**47**									

Client	: PARSONS BRINCKERHOFF AUST P/L	**Work Order**	: EP0500812
Project	: 2145177A	**ALS Quote Reference**	: EP20050010

Requested Reports

l **MS JULIE PALICH**

-	A4 - Certificate of Analysis - NEPM format	Email	jpalich@pb.com.au
-	A4 - Quality Control Report - NEPM format	Email	jpalich@pb.com.au
-	A4 - Interpretive Quality Control Report - NEPM format	Email	jpalich@pb.com.au
-	ENMRG Export Format	Email	jpalich@pb.com.au
-	Chain of Custody Acknowledgement	Email	jpalich@pb.com.au
-	A4 - Sample Receipt Notification - Comprehensive format	Email	jpalich@pb.com.au
-	Invoice	Email	jpalich@pb.com.au

Sample Container(s) / Preservation Non-Compliance Log

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

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

PB 100 YEARS

White Page - Laboratory Copy
Yellow Page - Project File Copy
Green Page - Remains in Book

ABN 84 797 323 433

☐ **Bathurst** 59 Sydney Road, Kelso NSW 2795 Tel: (02) 6331 4188 Fax: (02) 6331 6798
☐ **Singleton** 100 George Street, Singleton NSW 2330 Tel: (02) 6572 3377 Fax: (02) 6572 4080
☐ **Newcastle** Suite 1, 3rd Floor, 55 Bolton Street, Newcastle NSW, 2300 Tel: (02) 4929 3900 Fax: (02) 4929 7299
☐ **Adelaide** 101 Pirie Street, Adelaide SA 5000 Tel: (08) 8405 4300 Fax: (08) 8405 4301
☐ **Brisbane** 12th Floor, 348 Edward Street, Brisbane QLD 4000 Tel: (07) 3218 2222 Fax: (07) 3831 4223
☐ **Melbourne** Level 7, 457 St. Kilda Road, Melbourne VIC 3004 Tel: (03) 9861 1111 Fax: (03) 9861 1144
☒ **Perth** 589 Hay Street, Subiaco WA 6008 Tel: (08) 9489 9700 Fax: (08) 9380 4060
☐ **Sydney** 9 Blaxland Road, Rhodes NSW 2138 Tel: (02) 9743 0333 Fax: (02) 9736 1568

Chain o

Order No:

Job Title:	Kemerton Pipeline ASS
PB Job Number:	2145177A
Job Location:	Kemerton.
Laboratory Name:	ALS
Address:	10 Hod Way Malaga WA6090
Fax Number:	9209 7600
Phone Number:	9209 7655
Contact Name:	John Houlahan.
Delivery Method:	courier
Quote Number:	EN/008/05
Project Manager:	Julie Palich
Results Expected by/on:	5 days.
Fax Results to:	J. Palich
Fax Number:	9380 4060
Phone Number:	9489 9708
Spreadsheet of Results Required:	(Y) / N
Format:	xls.
Turnaround Time Required:	
Invoice to:	
Comments:	

Terms of Business	PB	Other	Checked

Date Sampled	Time	Sample I.D.	Container Size	Sample Location	Medium*	Preservative Type	Filtered (X)	TPH	BTEX	PAH's	OC/OP/PCB's	Metals**						Initials	Comments/Additional Information and/or Analysis Required
		See Attached list of 190 samples	green bags.		S													JP	- ~~Sample~~ Analyse orange highlighted samples for SCR suite.
																			- dry all samples.

ALS Environmental
Perth
Work Order
EP0500812
Report Version: AliquotLabel 1.01
Telephone : 61-8-9209-7655

Relinquished by: J. Palich	Relinquished by:	Relinquished by:
Date & Time: 16/8/05	Date & Time:	Date & Time:
Company: PB	Company:	Company:
Signature: [signature]	Signature:	Signature:
Received in Good Order & Condition by (Name): SHAUN CRABB	Received in Good Order & Condition by (Name):	Received in Good Order & Condition by (Name):
Date & Time: 16/8/05 1705	Date & Time:	Date & Time:
Company: ALSE	Company:	Company:
Signature: [signature]	Signature:	Signature:

Medium*: S = Soil, W = Water, V = Vapour

Legend**: (circle the following to be tested)

Metals: Al As Be Cd Co Cr Cu Fe Hg Li Mg Mn Ni Pb Se Sn V Zn

Samples on Ice: ☒ Yes ☐ No

Please fax back a signed copy when samples are received at the laboratory

√AH01

0	1
0.25	2
0.5	3
0.75	4
1	5
1.25	6
1.5	7
1.75	8

√AH02

0	9
0.25	10
0.5	11
0.75	12
1	13

√AH03

0	14
0.25	15
0.5	16
0.75	17
1	18
1.25	19
1.5	20
1.75	21
2	22
2.25	23
2.5	24
2.75	25
2.9	26

√AH04

0	27
0.25	28
0.5	29
0.75	30
1	31
1.25	32
1.5	33
1.75	34
1.9	35

√AH05

0	36
0.25	37
0.5	38
0.75	39
1	40
1.25	41
1.5	42
1.75	43
2	44

√AH06

0	45
0.25	46
0.5	47
0.75	48
1	49
1.25	50
1.5	51
1.75	52
2	53
2.25	54
2.5	55
2.75	56
3	57

√AH07

0	58
0.25	59
0.5	60
0.75	61
1	62
1.25	63
1.5	64
1.75	65
2	66

AH08

0	67
0.25	68
0.5	69
0.75	70
1	71
1.25	72
1.5	73
1.75	74

AH09

0	75
0.25	76
0.5	77
0.75	78
1	79
1.25	80
1.5	81
1.75	82
2	83

AH11

0	84
0.25	85
0.5	86
0.75	87
1	88
1.25	89
1.5	90
1.75	91

AH13

0	92
0.25	93
0.5	94
0.75	95
1	96
1.25	97
1.5	98
1.75	99
2	100

AH14

0	101
0.25	102
0.5	103
0.75	104
1	105
1.25	106
1.5	107
1.75	108
2	109

AH15

0	110
0.25	111
0.5	112
0.75	113
1	114
1.25	115
1.5	116
1.75	117
2	118

√AH016

0	119
0.25	120
0.5	121
0.75	122
1	123
1.25	124
1.5	125

AH017

0	126
0.25	127
0.5	128
0.75	129
1	130
1.25	131
1.5	132
1.75	133

√AH018

0	134
0.25	135
0.5	136
0.75	137
1	138
1.25	139
1.5	140

AH019

0	141
0.25	142
0.5	143
0.75	144
1	145
1.25	146
1.5	147
1.75	148
2	149

AH020

0	150
0.25	151
0.5	152
0.75	153
1	154
1.25	155
1.5	156
1.75	157
2	158

√AH021

0	159
0.25	160
0.5	161
0.75	162
1	163

√AH022

0	164
0.25	165
0.5	166
0.75	167
1	168
1.25	69

AH23

0	170
0.25	171
0.5	172
0.75	173

AH24

0	174
0.25	175
0.5	176
0.75	177
1	178

AH25

0	179
0.25	180
0.5	181
0.75	182
1	183
1.25	184
1.5	185
1.75	186
2	187

QC 1 188

QC 2 189

QC 3 190

AH11 2.00 191

NOT TO BE ANALISED AS PER J.P 9:30 am 17/8/ M.V.