Appendix H

Acid sulfate soil, contamination and salinity assessment

Settlement City Shopping Centre – Port Macquarie
Environmental Assessment proposed Stage 1

ING REAL ESTATE

Manidis Roberts

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Acid Sulfate Soil, Stage 2 Contamination and Salinity Assessment: Settlement City Port Macquarie NSW

martens consulting engineers

ENVIRONMENTAL

WATER

WASTEWATER

GEOTECHNICAL

CIVIL

PROJECT MANAGEMENT

P0902316JR03_v3
June 2009

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The sole purpose of this report and the associated services performed by Martens & Associates Pty Ltd is to provide an acid sulfate soil, salinity and contamination advice in accordance with the scope of services set out in the contract / quotation between Martens & Associates Pty Ltd and Manidis Roberts Pty Ltd (hereafter known as the Client). That scope of works and services were defined by the requests of the Client, by the time and budgetary constraints imposed by the Client, and by the availability of access to the site.

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All enquiries regarding this project are to be directed to the Project Manager.

Executive Summary

Overview

The purpose of this report is to provide an acid sulfate soils assessment, Stage 2 contamination assessment and a salinity assessment in accordance with NSW Department of Planning (DoP) Director-General's Requirements (Reference Number MP 05_0134).

Salinity Assessment

During field investigations soil samples were collected for salinity testing purposes to determine the salinity of the site's soil and establish the concentration of chlorides present in the soil. This information was used to determine the aggressiveness of site soils, which may have implications for the final material selection for site foundation solutions.

Examination and laboratory testing of site soils indicate that salinity is not a constraint that needs to be considered in concrete pile design for the proposal. However, given the site contains potential acid sulfate soils within deeper natural stratum (see next) we recommend the aggressiveness of sulfates be determined at CC stage, in accordance with AS 2159 (1995).

Acid Sulfate Soils Assessment

In accordance with recommendations made in the preliminary ASS assessment and requirements specified by the DoP in their DGEAR's, a full ASS assessment was carried out and sub-surface material onsite tested for the presence of potential and actual ASS.

Following site investigations and desktop review of borelogs, site soil stratigraphy was found to be consistent across the site. Sand fill was found to occur down to 2.0 – 2.5m, overlying clays and sandy clay (estuarine deposits) and, deeper down, natural sands. Samples evaluated by laboratory testing were then chosen to accurately assess each layer of observed soil stratigraphy and test material likely to be exposed should excavation for footings and foundations become necessary.

Results indicate:

1. No samples are classified as actual ASS.
2. Seven of the twenty five (25) samples collected from the site are classified as potential ASS (shown in bold in Table 3)

The samples with ASS potential came from depths below 3.0 m b.g.l. within the natural estuarine deposits. Fill material (generally 2.5m deep) is free of AASS and PASS.

The proposed development does not involve the excavation of the deeper PASS materials (below 3.0m b.g.l). Given this, there is no need for an ASS Management Plan.

Stage 2 Contamination Assessment

In accordance with DoP's requirements in the DGEAR's, a Stage 2 Assessment was undertaken to test subsurface material and confirm the site is not contaminated. The testing regime was configured to provide a broad understanding of the likely nature of contamination within the underlying site fill material.

Results indicate that there is no evidence of contamination (heavy metals, TRH, BTEX, PAH, PCB, OC & OP pesticides) within the development footprint. Therefore, a remedial action plan (RAP) and site remediation is not required. On the basis of completed analysis SCC testing the material tested on site is classified as 'General Solid Waste' in accordance with NSW DECC (2008).

The observed character of fill sands indicates the material may be able to be reclassified as Excavated Natural Material (ENM) subject to testing in accordance with the ENM exemption. Natural sands will not be able to be reclassified to ENM VENM due to their acid sulfate soil nature.

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Tables

1 Overview

1.1 Background

The purpose of this report is to provide an acid sulfate soils assessment, Stage 2 contamination assessment and a salinity assessment to satisfy requirements of the NSW Department of Planning Director-General's Requirements (Reference Number MP 05_0134).

A Stage 1 contamination assessment (P0902316JR02_V2) and preliminary acid sulfate soils assessment ((P0902316JR01_V2) were previously prepared by Martens and Associates.

1.2 Project Scope

1.2.1 Acid Sulfate Soils Assessment

The main objectives of the acid sulfate soil assessment are as follows:

- Provide an assessment of the presence and extent of acid sulfate soils (ASS) at the site in accordance with the ASSMAC guidelines, and
- Determine whether an ASS Management Plan is required.

In addition to this and in accordance with DoP requirements, the Department of Environment and Climate Change (DECC) have been consulted regarding level and distribution of sampling, laboratory results and conclusions drawn from these results.

1.2.2 Contamination Assessment

The main objectives of the Stage 2 contamination assessment are as follows:

- Provide an assessment of site soil contamination in accordance with NSW EPA guidelines, SEPP 55 and the findings of the Stage 1 Contamination assessment (P0902316JR02_v2, dated February 2009).
- Assess the suitability of the site for the continued commercial land use.
- Provide a waste classification (in accordance with DECC, 2008) for the underlying soil should threshold levels of potential

contaminants exceed those provided by relevant NSW EPA guidelines in any areas identified as likely to require remediation.

1.2.3 Salinity Assessment

The main objectives of the salinity assessment are as follows:

- Assess the salinity of soils beneath the site.
- Provide an assessment of salinity levels in terms of the aggressiveness, in accordance with AS 2159 (1995).
- To determine if the above is a constraint to be considered during concrete pile design at Construction Certificate stage.

2 Site Description

2.1 Field Investigations

Site inspections were undertaken on May 3, 4 and 5, 2009. Works conducted during the field investigations included:

- A walk over inspection of the site and surrounding property to review drainage and topography.
- Location of underground services via an accredited underground services locator.
- Excavation of thirty geotechnical bore holes to depths ranging between 1.4 and 9.0 m below ground level (b.g.l.) using a 4WD mounted auger.
- Collection of 73 soil samples for contamination, acid sulfate soil and salinity testing purposes.

Bore hole locations can be found on the site plan in Attachment A. Borehole logs are provided in Attachment C.

2.2 Location & Existing Landuse

The site is located on the corner of Bay and Park Street, Port Macquarie (on Lots 4 and 5 DP 1018087 and Lot 2 DP 702484) and is within the Port Macquarie Hastings Council (PMHC) LGA. The allotment covers an area of approximately 7.4 ha. An existing shopping centre complex is located on the site, with associated on-grade paved carparking in the south east of the site and multi storey carparking in the south western corner of the site.

The site is bounded by Park St and the Hastings River to the east, Bay St to the south and a constructed canal system to the west and north. Attachment A provides the site plan with pertinent site features and Figure 1 (Attachment B) shows the site in its regional context.

2.3 Topography, Vegetation and Drainage

Historic aerial photography interpretation suggests that the site is located on 'reclaimed land', with site topography formerly consisting of flat low lying estuary deposits (and possibly wetland/mangrove) of the Hastings River. It is likely that the dredged material from the adjacent river and/or canal system was used for site filling.

The majority of the site is flat, with grades generally 0-1°. The western and northern boundaries of the site have batter grades of approximately 10-15° down to the canal system.

The majority of the site and surrounding area is covered by buildings or hardstand features. The site is drained by roof drainage and a pit and pipe network, with drainage directed to the Hastings River or the canal system.

There are no significant vegetation communities on the site, however some remnant wetland (mangrove) is located adjacent and east of the site.

2.4 Local Geology and Soil Profile

A review of the 1:250 000 Hastings geology series sheet 56-14 (1970) indicates that the site is underlain by Quaternary Alluvium. Field investigations confirm the site is underlain by sand fill overlying natural estuarine (Quaternary) deposits consisting of clay, sandy clay and sand.

3 Environmental Geotechnical Assessment

3.1 Overview

During field investigations 33 samples were collected for salinity testing purposes. These shall determine the salinity of the site's soil and be used to establish the concentration of chlorides present in the soil and thus the aggressiveness of the site's sub-surface material. This information may have implications for the final material selection for site foundation solutions (to be finalised at CC stage).

3.2 Results of Laboratory Testing

Soil samples were taken from the different soil horizons down to a maximum depth of 9.0m below ground. Soil samples were sent to Envirolab (NATA accredited) for laboratory testing to determine the salinity of the site soils. Salinity results are summarised in Table 1 with the full laboratory report in Attachment D.

Table 1: Summary of soil salinity results.

Bore Hole & Sample ID	Depth (m)	EC[1] (dS/m)	Multiplyer	ECe (dS/m)	Salinity Rating [2]
2316/14/0.5	0.5	0.33	23.0	7.6	Moderately Saline
2316/16/0.5	0.5	0.11	23.0	2.5	Slightly saline
2316/25/1.0	1.0	0.05	23.0	1.2	Non-Saline
2316/27/1.0	1.0	0.07	23.0	1.6	Non-Saline
2316/28/1.0	1.0	0.08	23.0	1.8	Non-Saline
2316/24/1.4	1.4	0.06	23.0	1.3	Non-Saline
2316/14/1.5	1.5	0.09	23.0	2.1	Slightly Saline
2316/5/2.0	2.0	0.19	8.6	1.6	Non-Saline
2316/8/2.0	2.0	0.06	8.6	0.5	Non-Saline
2316/18/2.0	2.0	0.10	8.6	0.9	Non-Saline
2316/5/2.5	2.5	0.13	8.6	1.1	Non-Saline
2316/13/2.8	2.8	0.23	8.6	2.0	Slightly Saline
2316/13/2.8	2.8	0.23	8.6	2.0	Slightly Saline
2316/1/3.3	3.3	0.16	8.6	1.4	Non-Saline
2316/8/4.0	4.0	0.11	8.6	0.9	Non-Saline
2316/27/4.0	4.0	0.06	8.6	0.5	Non-Saline
2316/13/4.2	4.2	0.12	8.6	1.0	Non-Saline
2316/13/4.2	4.2	0.12	8.6	1.0	Non-Saline

Bore Hole & Sample ID	Depth (m)	EC[1] (dS/m)	Multiplyer	ECe (dS/m)	Salinity Rating [2]
2316/1/4.5	4.5	0.14	8.6	1.2	Non-Saline
2316/5/4.5	4.5	0.29	8.6	2.5	Slightly Saline
2316/24/4.5	4.5	0.17	8.6	1.5	Non-Saline
2316/16/5.0	5.0	0.19	8.6	1.6	Non-Saline
2316/16/5.0	5.0	0.20	8.6	1.7	Non-Saline
2316/5/5.5	5.5	0.23	8.6	2.0	Slightly Saline
2316/5/6.0	6.0	0.30	8.6	2.6	Slightly Saline
2316/8/6.0	6.0	0.90	8.6	7.7	Moderately Saline
2316/28/6.0	6.0	0.12	8.6	1.0	Non-Saline
2316/5/6.0	6.0	0.33	8.6	2.8	Slightly Saline
2316/1/7.5	7.5	0.11	23.0	2.5	Slightly Saline
2316/8/7.5 [3]	7.5	1.10	23.0	25.3	Extremely Saline
2316/28/7.5	7.5	0.11	23.0	2.5	Slightly Saline
2316/1/9.0	9.0	0.10	23.0	2.3	Slightly Saline
2316/14/9.0 [3]	9.0	0.45	23.0	10.4	Highly Saline

Notes: [1] Electrical Conductivity [2] Salinity Rating based on the Department of Conservation and Land Management (1992), *What Do All The Numbers Mean* and Table 6.2 of Department of Land and Water Conservation (2002), *Site Investigations for Urban Salinity.* [3] Bold samples indicate those likely to be outliers and not a true reflection of site salinity at that depth

The majority of ECe results indicate non-saline to slightly saline soils. According to the Department of Conservation and Land Management (CALM, 1992) and Department of Land and Water Conservation (DLWC,2002) these results indicate that salinity effects are mostly negligible for the site.

Two (2) samples, 2316/8/7.5 and 2316/14/9.0, are classed as extremely saline and highly saline, respectively. Given the differences between salinity results of these samples and those from adjacent boreholes at similar depths, it is likely these are outliers and not a true reflection of the material at that depth.

Table 2 established the concentration of chlorides present in the soil and determines the aggressiveness of the site's sub-surface material in accordance with AS 2159 (1995).

Table 2: Salinity Assessment: Exposure classification for concrete piles.

Sample	Depth (m)	EC (µS/cm)	NaCl (ppm) [1]	Chloride in soil (%) [3]	Exposure Classification: from Table 6.3 of AS 2159 (1995) [2]
2316/14/0.5	0.5	330	211.2	1.29	Mild
2316/16/0.5	0.5	110	70.4	0.43	Non-aggressive
2316/25/1.0	1.0	54	34.6	0.21	Non-aggressive
2316/27/1.0	1.0	70	44.8	0.27	Non-aggressive
2316/28/1.0	1.0	80	51.2	0.31	Non-aggressive
2316/24/1.4	1.4	56	35.8	0.22	Non-aggressive
2316/14/1.5	1.5	92	58.9	0.36	Non-aggressive
2316/5/2.0	2.0	190	121.6	0.74	Mild
2316/8/2.0	2.0	59	37.8	0.23	Non-aggressive
2316/18/2.0	2.0	99	63.4	0.39	Non-aggressive
2316/5/2.5	2.5	130	83.2	0.51	Mild
2316/13/2.8	2.8	230	147.2	0.90	Mild
2316/13/2.8	2.8	230	147.2	0.90	Mild
2316/1/3.3	3.3	160	102.4	0.62	Mild
2316/8/4.0	4.0	110	70.4	0.43	Non-aggressive
2316/27/4.0	4.0	58	37.1	0.23	Non-aggressive
2316/13/4.2	4.2	120	76.8	0.47	Non-aggressive
2316/13/4.2	4.2	120	76.8	0.47	Non-aggressive
2316/1/4.5	4.5	140	89.6	0.55	Mild
2316/5/4.5	4.5	290	185.6	1.13	Mild

Sample	Depth (m)	EC (µS/cm)	NaCl (ppm) [1]	Chloride in soil (%) [3]	Exposure Classification: from Table 6.3 of AS 2159 (1995) [2]
2316/24/4.5	4.5	170	108.8	0.66	Mild
2316/16/5.0	5.0	190	121.6	0.74	Mild
2316/16/5.0	5.0	200	128.0	0.78	Mild
2316/5/5.5	5.5	230	147.2	0.90	Mild
2316/5/6.0	6.0	300	192.0	1.17	Mild
2316/8/6.0	6.0	900	576.0	3.51	Moderate
2316/28/6.0	6.0	120	76.8	0.47	Non-aggressive
2316/5/6.0	6.0	330	211.2	1.29	Mild
2316/1/7.5	7.5	110	70.4	0.43	Non-aggressive
2316/8/7.5	7.5	1100	704.0	4.29	Moderate
2316/28/7.5	7.5	110	70.4	0.43	Non-aggressive
2316/1/9.0	9.0	100	64.0	0.39	Non-aggressive
2316/14/9.0	9.0	450	288.0	1.76	Mild

Note: [1] EC (µS/cm) converted to salt concentration (ppm) using estimates provided in DLWC (2002) '*Site Investigations for Urban Salinity*: Appendix 1: Units used to Express Salinity' (pg 20) [2] Soil conditions A (high permeability soils which are below groundwater) in accordance with Table 6.3 of AS 2159 (1995). [3] Table 1 assesses salinity in terms of aggressiveness of chloride present in each sample. Given the presence of potential acid sulphate soils (Section 4) within deeper stratum, we recommend the aggressiveness of sulfates (SO_3) be considered in accordance with AS 2159 (1995) at Construction Certificate stage.

All chloride results, excluding 2 samples, are below 2%. According to Table 6.3 of AS 2159 (1995) *Piling - Design and Installation* this classes the aggressiveness of the site's sub-surface material as 'non-aggressive' – 'mild' (in terms of chloride only). Two samples, sample 2316/8/6.0 and sample 2316/8/7.5, are classed as 'moderate', however considering both samples came from the one borehole (BH8), it is not considered to be a reflection of wider site soil conditions.

3.3 Conclusion and Recommendations

Examination and laboratory testing of site soils indicate that salinity is not a constraint that needs to be considered in concrete pile design for the proposal. However, given the site contains potential acid sulfate soils within deeper natural stratum (Section 4) we recommend the aggressiveness of Sulfates be determined at CC stage, in accordance with AS 2159 (1995).

3.4 Limitations

The salinity assessment was undertaken in accordance with current industry standards. However, no salinity assessment can be considered to be a complete and exhaustive characterisation of a site and it cannot be guaranteed that any assessment shall identify and characterise all areas of potential salinity. Should material be exposed during the site development process which appears, due to visual indications, to be high in saline, the material should be assessed by Martens & Associates Pty Ltd to determine salinity and land use implications.

Martens & Associates Pty Ltd has undertaken this assessment for the purposes of a residential re-development on the site. No reliance on this report should be made for any other investigation or proposal.

4 Acid Sulfate Soils Assessment

4.1 Findings of Preliminary Acid Sulfate Soils (ASS) Assessment (Martens, 2009)

The preliminary ASS Assessment (Martens Report P0902316JR01_v2, February 2009) provided a desktop assessment of the site and the likelihood of ASS being present at the site. The findings and recommendations of this assessment is summarised as follows:

- The Wauchope/Port Macquarie Acid Sulfate Soil Risk Map (1997) identifies the site as disturbed terrain at elevations of 2-4 m ('X2'). This classification reflects past site filling.
- A review of historical aerial photography of the site indicated that the site was most likely a coastal wetland prior to its development in the early 1980s. Development works most likely included the burial of the site's layers of actual and/or potential acid sulfate soils with material of marine / estuarine origin.
- The combination of the geomorphic setting and past management activities result in a significant risk of site acid sulfate soils issues.
- Any aspects of the proposed development which have the potential for lowering the local groundwater table may have significant local impacts through acid sulfate soil processes. It is recommended such works be avoided where possible.
- Further investigation of the characteristics of underlying soil materials and required management measures for any affected spoil is necessary.

In accordance with recommendations made in the preliminary ASS assessment and requirements specified by the Department of Planning (DoP) in their DGEAR's, a full ASS assessment was carried out and site sub-surface material tested for the presence of potential and actual ASS.

4.2 Preliminary Sampling Strategy

Analyses of the presence of ASS material on the site has been evaluated by laboratory testing of 25 soil samples. As material was found to be consistent across the testing area, soil samples were analysed from thirteen (13) of the thirty (30) boreholes.

Following site investigations and desktop review of borelogs, site soil stratigraphy was found to be consistent across the site. Sand fill was found to occur down to 2.0 – 2.5m, overlying clays and sandy clay (estuarine deposits) and natural sands at depth. Given the consistency across the site, sampling was conducted at a reduced rate to that recommended in the ASSMAC guidelines. Samples evaluated by laboratory testing were then chosen to accurately assess each layer of observed soil stratigraphy and test material likely to be exposed through excavation for footings and foundations. Soil samples were analysed with the sPOCUS method by a NATA accredited laboratory.

4.3 DECC Consultation

Glenn Atkinson (Senior Environmental Scientist, DECC) was contacted to provide comment on ASS sampling completed on May 3 - 6, 2009 and subsequent laboratory results.

Correspondence received on May 27, 2009 (Attachment F) recommended that further ASS testing of fill material be undertaken to confirm that there is no AASS or PASS within this layer and confirm, therefore, that an ASS Management Plan is not required.

Subsequently an additional 10 samples were sent to the laboratory for ASS testing.

All laboratory results (original and additional testing) are provided in Section 4.4 and laboratory reports are provided in Attachment D.

4.4 Results

Results for the 25 samples are summarised in Table 3 with the complete laboratory reports provided in Attachment D.

Table 3: Results of SPOCUS testing.

Sample ID	Bore Hole	Sample Depth (m)	pH_{KCL}[1]	pH_{OX}[2]	TPA (mol H+/t)[3]	TSA (mol H+/t)[4]	S_{POS} (%S oxidisable)[5]
2316/24/0.5	24	0.5	9.6	6.1	<5.0	<5.0	0.005
2316/16/1.0	16	1.0	9.7	6.6	<5.0	<5.0	0.008
2316/2/1.0 [6]	2	1.0	9.3	7.0	<5.0	<5.0	0.014
2316/9/1.0 [6]	9	1.0	9.5	7.1	<5.0	<5.0	0.014
2316/18/1.0 [6]	18	1.0	9.6	7.2	<5.0	<5.0	0.012
2316/27/1.0 [6]	27	1.0	9.5	6.6	<5.0	<5.0	<0.005
2316/29/1.0 [6]	29	1.0	9.5	7.0	<5.0	<5.0	0.008
2316/24/1.4	24	1.4	9.7	6.3	<5.0	<5.0	<0.005
2316/6/1.4 [6]	6	1.4	9.6	7.0	<5.0	<5.0	<0.005
2316/29/1.4 [6]	29	1.4	9.6	7.0	<5.0	<5.0	<0.005
2316/14/1.5 [6]	14	1.5	9.7	7.0	<5.0	<5.0	<0.005
2316/16/1.5 [6]	16	1.5	9.6	7.0	<5.0	<5.0	0.008
2316/18/1.5 [6]	18	1.5	9.4	7.2	<5.0	<5.0	0.005
2316/1/2.5	1	2.5	9.3	5.4	<5.0	<5.0	0.044
2316/28/2.9	28	2.9	4.8	3.1	190	165	**0.31**
2316/14/3.0	14	3.0	8.6	**2.4**	130	130	**0.43**
2316/1/3.3	1	3.3	7.3	3.3	80	80	**0.22**
2316/5/4.0	5	4.0	6.7	**2.0**	685	685	**1.4**
2316/8/4.0	8	4.0	6.9	**2.3**	143	143	**0.39**
2316/18/4.5	18	4.5	8.6	**2.6**	155	155	**0.58**
2316/28/5.0	28	5.0	5.3	**2.8**	125	120	**0.24**
2316/27/5.5	27	5.5	6.2	**2.8**	<5.0	<5.0	**0.23**
2316/16/6.0	16	6.0	7.4	3.1	120	120	**0.29**
2316/8/7.5	8	7.5	6.7	3.6	17	17	**0.075**

Note: [1] Actual pH; [2] Post peroxide oxidation pH; [3] Total Potential Acidity; [4] Total Sulfidic Acidity; [5] Percentage peroxide oxidisable sulfur. Bold results indicate those exceeding limits in ASSMAC Table 4.4 [6] Further testing of fill material based on DECC recommendations

Using pH_{KCL} and post peroxide oxidation pH_{OX} criteria (ASSMAC, 1998, p12) all soils with a pH_{KCL} of < 4.0 are considered actual ASS. Soils with pH_{KCL} > 4.0 and pH_{OX} < 3.0 are classified as potential ASS. On the basis of this classification system we note the following:

1. No samples are classified as actual ASS.

2. Seven of the twenty five samples collected from the site are classified as potential ASS (in bold in Table 3).

The samples with ASS potential came from depths below 3.0 m b.g.l. within the natural estuarine deposits.

4.5 Management Recommendations

In accordance with ASSMAC Action Criteria (p27), a detailed management plan is required for disturbance of potential or actual ASS. Results indicate fill material (generally 2.5m deep) is free of AASS and PASS. The proposed development does not involve the excavation of the deeper PASS materials (below 3.0m b.g.l). Current planning for the development assumes a foundation solution of driven piers into sub-surface material; as such no AASS or PASS material will be retrieved. Given this, there is no need for an ASS Management Plan.

Should construction methods be revised, such that material below the surface fill (approximately 2.5m) will be disturbed or retrieved or the groundwater table is lowered beyond this depth, an ASS Management Plan will be required.

4.6 Conclusion

On the basis of site sub-surface investigations and results of the pH_{KCL} and pH_{OX}, materials at the site below a depth of approximately 4.0m has been found to be PASS or AASS. As all excavation works are presently proposed in the non-ASS material and no works likely to lower the groundwater table are proposed further site ASS testing is not required.

A site management plan is not required at this stage as no excavation of subsurface material is proposed. However, should this change a detailed Management Plan will be required prior to the start of site works. Such a plan should provide management recommendations for the underlying potential ASS material and outline required treatment measures prior to removal off-site or on-site re-use.

5 Stage 2 Assessment: Site Sampling

5.1 Summary of Stage 1 Assessment

The Stage 1 assessment completed for the site (Martens report P00902316JR02_v2, February 2009) indicates that there is low potential for past contamination of the site from previous uses which included minor agricultural activity; filling of the site (more than likely with locally sourced sandy soils, possibly from dredging of the Hastings River); and the current commercial land use including petrol retail outlet.

In accordance with DoP's requirements in the DGEAR's, a Stage 2 Assessment was undertaken to test subsurface material and confirm the site is not contaminated.

5.2 DECC Consultation

Consultation with DECC regarding the contamination assessment of the site is ongoing. Preliminary discussions with Mark Bourne (DECC) on May 22, 2009 suggested the site is not mapped as a contamination risk and thus contamination should not be a constraint to the proposal.

5.3 Sampling Density

NSW EPA (1995) sampling guidelines do not provide guidance for testing site's with an area greater than 5 ha. Such site's are usually sub-divided into smaller areas depending on the Stage 1 assessment and sampled based on site specific consideration. Accordingly, sampling was undertaken in accessible areas within the development footprint (approximately 1.5 ha). In accordance with Table A of the sampling guidelines, sampling was undertaken from a total of 30 locations within development footprint which included: 27 within the proposed carpark area, 2 within the proposed access road area and 1 where minor landscape works will be undertaken.

5.4 Sampling Locations and Sampling Depths

Due to portions of the site being inaccessible for drilling, soil sampling locations were distributed in as regular and evenly-spaced grid pattern as possible. Sample depths were specified to achieve sampling of both fill and underlying natural soil profiles.

Approximate sample depths are shown on the bore logs (Attachment C) with sampling locations approximately on the site plan (Attachment

A). All collected samples were stored in glass jars with Teflon lined lids, kept on ice in an esky and delivered to the nominated laboratory by courier within 48 hours of sampling.

5.5 Sample Analysis

Soil samples submitted for laboratory analysis are shown in Table 4. The testing regime was configured to provide a broad understanding of the likely nature of contamination within the underlying site fill material.

The soil samples selected included:

- 20 soil samples (not including 4 duplicate samples) were tested for OCP/OPP and heavy metals, and
- 10 samples were tested for OCP/OPP; heavy metals; PCB's; total recoverable hydrocarbons (TPH) and benzene, toluene, ethylbenzene and xylene (BTEX).

Laboratory analysis was conducted by the NATA accredited laboratory, 'EnviroLab'.

Table 4: Soil samples submitted for laboratory analysis.

Sample ID	Composite	Heavy Metals[1]	OCP/OPP	Combination 6 [3]
2316/11/0.4				X
2316/9/0.25				X
2316/19/0.2				X
2316/23/0.2				X
2316/29/0.3				X
2316/22/3.0				X
2316/13/2.8				X
2316/13/4.2				X
2316/16/3.0				X
2316/24/2.8				X
2316/4/0.5	C1	Y	Y	
2316/12/0.4		Y	Y	
2316/13/0.5		Y	Y	
2316/9/2.7	C2	Y	Y	
2316/18/3.0		Y	Y	
2316/16/02	C3	Y	Y	
2316/21/0.2		Y	Y	

Sample ID	Composite	Heavy Metals[1]	OCP/OPP	Combination 6 [3]
2316/25/0.2		Y	Y	
2316/17/0.2		Y	Y	
2316/18/0.2	C4	Y	Y	
2316/10/0.2		Y	Y	
2316/19/0.5		Y	Y	
2316/20/0.5	C5	Y	Y	
2316/26/0.5		Y	Y	
2316/15/0.5		Y	Y	
2316/22/0.5	C6	Y	Y	
2316/23/0.5		Y	Y	
2316/11/0.2		Y	Y	
2316/12/0.2	C7	Y	Y	
2316/15/0.25		Y	Y	
2316/z3 [2]		Y		
2316/z10 [2]		Y		
2316/z11 [2]		Y		
2316/z12 [2]		Y		

Note: [1] Eight heavy metals suite: As, Cd, Cr, Cu, Pb, Hg, Ni, Zn. [2] Field duplicate samples. [3] Combination 6: TPH, BTEX, PAH, OCP, OPP, PCB and 8 Heavy Metals.

5.6 Quality Assurance and Quality Control

5.6.1 Field QA/QC

All sampling was undertaken by an experienced environmental engineer. Soil samples were collected directly from the pushtube core or end of the soil auger and placed in Teflon lined glass sample jars. Sample jars were uniquely labelled and an appropriate chain of custody form used (Attachment E). Twelve (12) duplicate samples were taken during fieldwork, four (4) of these samples were tested for heavy metals and results compared to the corresponding sample. Results showed, in most cases, comparable levels of contaminants (Table 5).

Table 5: QA/QC duplicate testing results.

Sample ID	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc
2316/z3	6	<0.5	11	7	4	<0.1	4	17
2316/11/0.4	6	<0.5	8	6	4	<0.1	4	17
Difference (%)	0	0	27	14	0	0	0	0
2316/z10	8	<0.5	24	10	6	<0.1	14	21
2316/13/2.8	15	<0.5	39	15	12	<0.1	28	45
Difference (%)	87	0	62	50	100	0	100	114
2316/z11	7	<0.5	11	4	3	<0.1	15	13
2316/16/3.0	6	<0.5	11	4	3	<0.1	13	11
Difference (%)	14	0	0	0	0	0	13	15
2316/z12	4	<0.5	28	6	5	<0.1	17	21
2316/24/2.8	8	<0.5	34	10	7	<0.1	25	26
Difference (%)	100	0	21	66	40	0	47	24

5.6.2 Laboratory QA/QC

As indicated by the Envirolab laboratory report (Attachment D), the laboratory QA/QC included the analysis of reagent blanks, sample portion duplicates, matrix spike duplicates and surrogate spikes. Results indicate that acceptable recovery rates were achieved by the laboratory.

5.7 Contamination Guidelines

Soil sample laboratory analysis results were assessed with reference to the following guidelines (Table 6):

- NSW EPA (2006) *Guidelines for the NSW Site Auditor Scheme: Soil Investigation Levels* (Column 4 – commercial and industrial) – for assessment of heavy metals, PAH, OCP/OPP and PCB concentrations.

- NSW EPA (1994) *Contaminated Sites: Guidelines for Assessing Service Station Sites* - for assessment of TRH and BTEX concentrations in the absence of other suitable guidelines for C6 – C40 hydrocarbon chains.

Table 6: Contamination guideline limits adopted for assessment of Settlement City Shopping Centre site.

	Guideline Limit (mg/kg)	
Contaminant	**NSW EPA (2006) [1]**	**NSW EPA (1994) [2]**
Arsenic	500	-
Cadmium	100	-
Chromium	500	-
Copper	5,000	-
Lead	1,500	-
Mercury	75	-
Nickel	3,000	-
Zinc	35,000	-
PAHs (total)	100	-
Benzo(a)pyrene	5	-
PCBs (total)	50	-
Aldrin and Dieldrin	50	-
DDT + DDD + DDE	1,000	-
Heptachlor	50	-
TRH C6 – C9	-	65
TRH C10 – C40	-	1,000
Benzene	-	1.0
Toluene	-	1.4
Ethyl benzene	-	3.1
Total Xylenes	-	14.0

Notes: [1] *Guidelines for the NSW Site Auditor Scheme: Soil Investigation Levels* (Column 4 – Commercial / Industrial). [2] *Contaminated Sites: Guidelines for Assessing Service Station Sites.*

6 Stage 2 Assessment Results

6.1 Site Contamination Observations

Site contamination investigations indicate that the site is free of land contamination.

6.2 Laboratory Analysis Results

Laboratory test results are summarised for heavy metals (Table 7), PAHs (Table 8) and TRH (Table 9) with complete laboratory reports provided as Attachment D.

6.2.1 Heavy Metals

No heavy metal contaminants are above the guideline limits for commercial / industrial land (Table 7).

All of the samples SCC1 tested had heavy metal values less than the 'General Solid Waste' threshold levels.

Table 7: Results of heavy metal analysis of soil samples (mg/kg).

Sample ID	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc
2316/11/0.4	6	<0.5	8	6	4	<0.1	4	17
2316/9/0.25	5	<0.5	13	8	6	<0.1	6	20
2316/19/0.2	7	<0.5	11	7	8	<0.1	8	32
2316/23/0.2	6	<0.5	24	9	6	<0.1	15	18
2316/29/0.3	4	<0.5	5	3	4	<0.1	3	20
2316/22/3.0	7	<0.5	5	10	1	<0.1	10	8
2316/13/2.8	15	<0.5	39	15	12	<0.1	28	45
2316/13/4.2	<4	<0.5	6	1	1	<0.1	6	6
2316/16/3.0	6	<0.5	11	4	3	<0.1	13	11
2316/24/2.8	8	<0.5	34	10	7	<0.1	25	26
2316/Z3	6	<0.5	11	7	4	<0.1	4	17
2316/Z10	8	<0.5	24	10	6	<0.1	14	21
2316/Z11	7	<0.5	11	4	3	<0.1	15	13
2316/Z12	4	<0.5	28	6	5	<0.1	17	21
C1	7	<0.5	13	14	4	<0.1	3	14
C2	12	<0.5	20	5	4	<0.1	12	24
C3	7	<0.5	15	8	5	<0.1	5	14
C4	7	<0.5	10	9	11	<0.1	7	42
C5	<4	<0.5	12	1	1	<0.1	10	5
C6	5	<0.5	16	7	5	<0.1	11	10
C7	5	<0.5	13	10	4	<0.1	2	11
2316/11/0.4	6	<0.5	14	8	5	<0.1	5	16
Guideline Limit[1]	**500**	**100**	**500**	**5000**	**1500**	**75**	**3000**	**35000**
Guideline Limit[2]	**250**	**50**	**250**	**2500**	**750**	**37.5**	**1500**	**17500**
Guideline Limit[3]	**167**	**34**	**167**	**1667**	**500**	**25**	**1000**	**11667**
General Solid Waste[4]	**100**	**20**	**100**	**Na[5]**	**100**	**4**	**40**	**Na[5]**
Restricted Solid Waste[4]	**400**	**80**	**400**	**Na[5]**	**400**	**16**	**160**	**Na[5]**
Hazardous Waste[4]	**>400**	**>80**	**>400**	**Na[5]**	**>400**	**>16**	**>160**	**Na[5]**

Note: [1] SIL guideline limit for commercial or industrial landuse (NSW EPA, (2006). [2] SIL for double composite. [3] SIL for triple composite. [4] NSW DECC (2008) *Waste Classification Guidelines:* Table 1 *Contaminant threshold values for classifying waste by chemical assessment without the leaching test*. [5] No criteria listed.

6.2.2 Polycyclic Aromatic Hydrocarbons (PAH)

Results (Table 8) show that PAH levels in tested samples were all below the laboratory testing detection limits. Level for benzo(a)pyrene and total PAH's were all below the guideline limits.

Table 8: Results of PAH analysis of soil samples.

Sample ID	Benzo(a) pyrene	Fluorene	Napthalene	Phen-anthrene	Total PAHs
2316/11/0.4	<0.05	<0.1	<0.1	<0.1	<0.35
2316/9/0.25	<0.05	<0.1	<0.1	<0.1	<0.35
2316/19/0.2	<0.05	<0.1	<0.1	<0.1	<0.35
2316/23/0.2	<0.05	<0.1	<0.1	<0.1	<0.35
2316/29/0.3	<0.05	<0.1	<0.1	<0.1	<0.35
2316/22/3.0	<0.05	<0.1	<0.1	<0.1	<0.35
2316/13/2.8	<0.05	<0.1	<0.1	<0.1	<0.35
2316/13/4.2	<0.05	<0.1	<0.1	<0.1	<0.35
2316/16/3.0	<0.05	<0.1	<0.1	<0.1	<0.35
2316/24/2.8	<0.05	<0.1	<0.1	<0.1	<0.35
Guideline Limit [1]	**5.0**	**Na[3]**	**Na[3]**	**Na[3]**	**100**
General Solid Waste[2]	**0.8**	**Na[3]**	**Na[3]**	**Na[3]**	**200[4]**
Restricted Solid Waste[2]	**3.2**	**Na[3]**	**Na[3]**	**Na[3]**	**800[4]**
Hazardous Waste[2]	**<3.2**	**Na[3]**	**Na[3]**	**Na[3]**	**<800[4]**

Note: [1] NSW EPA (2006) *Guidelines for the NSW Site Auditor Scheme*, guideline limits for commercial /industrial use (Column 4). [2] NSW DECC (2008) *Waste Classification Guidelines:* Table 1 *Contaminant threshold values for classifying waste by chemical assessment without the leaching test*. [3] No criteria listed. [4] NSW DECC (2008) *Waste Classification Guidelines:* Table 2 *Leachable concentration (TCLP) and specific contaminant concentration (SCC) values for classifying waste by chemical assessment.*

6.2.3 Total Recoverable Hydrocarbons (TRH)

Result in Table 9 show that out of the ten (10) samples tested, none recorded that hydrocarbons were present in a detectible concentration.

Table 9: Results of TRH analysis of soil samples.

Sample ID	C6 –C9	C10 – C14	C15 – C28	C29 – C36	C10 – C36 TOTAL
2316/11/0.4	<25	<50	<100	<100	<250
2316/9/0.25	<25	<50	<100	<100	<250
2316/19/0.2	<25	<50	<100	<100	<250
2316/23/0.2	<25	<50	<100	<100	<250
2316/29/0.3	<25	<50	<100	<100	<250
2316/22/3.0	<25	<50	<100	<100	<250
2316/13/2.8	<25	<50	<100	<100	<250
2316/13/4.2	<25	<50	<100	<100	<250
2316/16/3.0	<25	<50	<100	<100	<250
2316/24/2.8	<25	<50	<100	<100	<250
Guideline Limit [1]	**65**	**n/a[3]**	**n/a[3]**	**n/a[3]**	**1000**
General Solid Waste[2]	**650**	**n/a[3]**	**n/a[3]**	**n/a[3]**	**10 000[4]**
Restricted Solid Waste[2]	**2600**	**n/a[3]**	**n/a[3]**	**n/a[3]**	**40 000[4]**
Hazardous Waste[2]	**>2600**	**n/a[3]**	**n/a[3]**	**n/a[3]**	**>40 000[4]**

Note: [1] NSW EPA (2006) *Guidelines for the NSW Site Auditor Scheme*, guideline limits for commercial /industrial use (Column 4). [2] NSW DECC (2008) *Waste Classification Guidelines:* Table 1 *Contaminant threshold values for classifying waste by chemical assessment without the leaching test*. [3] No criteria listed. [4] NSW DECC (2008) *Waste Classification Guidelines:* Table 2 *Leachable concentration (TCLP) and specific contaminant concentration (SCC) values for classifying waste by chemical assessment.*

6.2.4 *BTEX (Benzene, Toluene, Ethyl Benzene and Xylene)*

All BTEX results are below guideline limits and less than laboratory detection limits.

6.2.5 *Polychlorinated Biphenyls (PCBs)*

All PCB results are below guideline limits and less than laboratory detection limits.

6.2.6 *OC/OP pesticides*

All OC/OP results are below guideline limits and less than laboratory detection limits.

6.3 Summary & Conclusion

Results indicate that there is no evidence of contamination within the development footprint. As a result, a remedial action plan (RAP) and site remediation will not be required.

6.4 Waste Classification

On the basis of completed analysis SCC testing the material tested on site is classified as 'General Solid Waste' (figures in bold) in accordance with NSW DECC (2008).

The observed character of fill sands indicates the material may be able to be reclassified as Excavated Natural Material (ENM) subject to testing in accordance with the ENM exemption. Natural sands will not be able to be reclassified to ENM or VENM due to their acid sulfate soil nature.

7 Stage 2 Assessment - Conclusions

Site investigations (Stage 2 assessment) completed included the collection and analysis of soil samples for a range of parameters determined to assess potential contamination from various past uses.

The field and laboratory investigations revealed that the site is free of contamination with levels below those specified for commercial / industrial land uses, and below laboratory testing detection limits, with the exception of heavy metals (which were at background levels).

In accordance with DECC's Waste Classification Guidelines, all the material tested is classified as ''General solid waste'.

8 Stage 2 Assessment - Limitations Statement

The site contamination assessment undertaken and documented in this report has been undertaken in accordance with the current industry standard for 2 contamination assessments (NSW EPA, 2006). Sampling design has been undertaken in accordance with NSW EPA (1995) sampling design guidelines.

However, it is noted that no site sampling strategy can be considered to be a complete and exhaustive characterisation of a site, nor can it be guaranteed that any assessment shall identify and characterise all areas of contamination. This is particularly the case where filling has occurred on the site. Therefore, this report should not be read as a guarantee that no additional contamination shall be found on the site. Should material be exposed during any future site works which was not encountered during the investigations undertaken, the newly discovered material should be specifically assessed by Martens & Associates to determine contamination implications.

Martens & Associates Pty Ltd has undertaken this assessment for the purpose of evaluating existing site contamination. No reliance on this report should be made for any other investigation or proposal. Martens & Associates accepts no responsibility, and provides no guarantee regarding the characteristics of areas of the site not specifically sampled in this investigation.

9 References

Australian Standard 2159 (1995) *Piling – Design and Installation.*

Department of Conservation and Land Management (CALM, 1992), *What Do All The numbers Mean?*

Department of Land and Water Conservation (2002*), Site Investigations for Urban Salinity*

Geological Survey of NSW (1983), *Geological Series - Sydney Sheet 9130.*

NSW EPA (1994) *Contaminated Sites: Guidelines for Assessing Service Station Sites*.

NSW EPA (1995) *Contaminated Sites: Sampling Design Guidelines.*

NSW EPA (1998) *Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites.*

NSW EPA (2006) 2nd Ed. Contaminated Sites: *Guidelines for the NSW Site Auditor Scheme.*

NSW DECC (2008) *Waste Classification Guidelines; Part 1: Classifying Waste.*

10 Attachment A – Site Plan

0 14 28 42 56 70

UNITS – METRES
SCALE – 1:500 @ A1 1:1000 @ A3

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MARTENS & ASSOCIATES PTY LTD
Sustainable Solutions
Environmental - Geotechnical - Civil
Hydraulic - Wastewater Engineers

CLIENT/ PROJECT
MANIDIS ROBERTS

THIS PLAN MUST NOT BE USED FOR CONSTRUCTION UNLESS SIGNED AS APPROVED BY PRINCIPAL CERTIFYING AUTHORITY
All measurements in mm unless otherwise specified.

TITLE
SITE PLAN AND BOREHOLE LOCATIONS;
SETTLEMENT CITY SHOPPING CENTRE; PORT MACQUARIE

PROJECT MANAGER: ANDREW NORRIS
DRAWING NUMBER: P0902316JD03_v1

DESIGNED:	MLB
DRAWN:	MLB
REVIEWED:	AN
DATUM:	mAHD
HORIZONTAL RATIO:	1:500 @ A1 1:1000 @ A3
VERTICAL RATIO:	1:500 @ A1 1:1000 @ A3
SHEET	1
OF	1
SHEETS	
PAPER SIZE:	A1 / A3

REV.	DESCRIPTION	DATE	ISSUED
1	DRAFT	26.05.2009	AN
2	FINAL	17.06.2009	AN

11 Attachment B – Figures

martens

Martens & Associates Pty Ltd ABN 85 070 240 890		**Environment | Water | Wastewater | Geotechnical | Civil | Management**	
Drawn:	NA	**Aerial Photograph of the Site and its Environmental Context (approximate site boundaries in red)**	Drawing No: **FIGURE 1**
Approved:	AN		
Date:	01.06.09		
Scale:	NA		Job No: P0902316JR03_v2

12 Attachment C – Soil Borehole logs

CLIENT	**Manidis Roberts**	**COMMENCED**	5/5/09	**COMPLETED**	5/5/09	**REF**	**BH1**
PROJECT	**Engineering services**	**LOGGED**	GT/JF	**CHECKED**	JF/AN	**Sheet**	**1 of 2**
SITE	**Settlement City Shopping Centre, Port Macquarie**	**GEOLOGY**	Quaternary Alluvium	**VEGETATION**	None	**PROJECT NO.**	P0902316
EQUIPMENT	Hydraulic Auger	**EASTING**	NA	**RL SURFACE**	NA		
EXCAVATION DIMENSIONS	Ø 0.1m X 9.0m depth	**NORTHING**	NA	**ASPECT**	North East	**SLOPE**	0-1%

EXCAVATION DATA						MATERIAL DATA					SAMPLING & TESTING			
METHOD	SUPPORT	WATER	MOISTURE	DEPTH (M)	PENETRATION RESISTANCE (L M H R)	GRAPHIC LOG	CLASSIFICATION	DESCRIPTION OF STRATA Soil type, texture, structure, mottling, colour, plasticity, rocks, oxidation, particle characteristics, organics, secondary and minor components, fill, contamination, odour.	CONSISTENCY	DENSITY INDEX	TYPE	DEPTH (M)	RESULTS AND ADDITIONAL OBSERVATIONS
A	Nil	N	M	0.15			XX GM	BITUMEN, ROAD BASE		D			
A	Nil	N	M	0.3			XX SM	SILTY SAND FILL – Dark brown, gravels, loose.		L			
A	Nil	N	M	1.0 2.0 2.1 2.3			XX SP	SAND FILL – Light brown, medium grained, minor shell fragments, medium dense, wet from 2.0m.		L			1.0 2.0 Ground water observed at 2.1m below ground level.
A	Nil	-	W	3.0			SP	SAND - Dark grey, wet, loose to medium dense, shells, medium grained, natural soils.		L MD	A	2.5	2316/1/2.5 SPOS = 0.044 3.0
A	Nil	-	W	4.0			CL	SANDY CLAY - Dark grey, medium grained sand (50%), strong sulfur odour, soft, some organics.	S		A	3.3	2316/1/3.3 SPOS = 0.22 4.0
A	Nil	-	W	4.5			SM	SILTY SAND - Dark grey, wet, medium dense, strong sulfur odour, minor clay content.		MD	A	4.5	2316/1/4.5 4.5

EQUIPMENT / METHOD
N Natural exposure
X Existing excavation
BH Backhoe bucket
E Excavator
HA Hand auger
S Hand spade
PT Push tube
A Auger
CC Concrete Corer

SUPPORT
SH Shoring
SC Shotcrete
RB Rock Bolts
Nil No support

WATER
N None observed
X Not measured
Water level
Water outflow
Water inflow

MOISTURE
D Dry
M Moist
W Wet
Wp Plastic limit
Wl Liquid limit

PENETRATION
L Low
M Moderate
H High
R Refusal

CONSISTENCY
VS Very Soft
S Soft
F Firm
St Stiff
VSt Very Stiff
H Hard
F Friable

DENSITY
VL Very Loose
L Loose
MD Medium Dense
D Dense
VD Very Dense

SAMPLING & TESTING
A Auger sample
B Bulk sample
U Undisturbed sample
D Disturbed sample
M Moisture content
Ux Tube sample (x mm)
pp Pocket penetrometer
S Standard penetration test
VS Vane shear
DCP Dynamic cone penetrometer
FD Field density
WS Water sample

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
Y USCS
N Agricultural

EXCAVATION LOG TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

Quality Sheet No. 4

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Engineering Log - Borehole

CLIENT	Manidis Roberts	**COMMENCED**	5/5/09	**COMPLETED**	5/5/09	**REF**	**BH1**
PROJECT	Engineering services	**LOGGED**	GT/JF	**CHECKED**	JF/AN	**Sheet**	**2** of **2**
SITE	Settlement City Shopping Centre, Port Macquarie	**GEOLOGY**	Quaternary Alluvium	**VEGETATION**	None	**PROJECT NO.**	P0902316
EQUIPMENT	Hydraulic Auger	**EASTING**	NA	**RL SURFACE**	NA		
EXCAVATION DIMENSIONS	Ø 0.1m X 9.0m depth	**NORTHING**	NA	**ASPECT**	North East	**SLOPE**	0-1%

EXCAVATION DATA						MATERIAL DATA				SAMPLING & TESTING			
METHOD	SUPPORT	WATER	MOISTURE	DEPTH (M)	PENETRATION RESISTANCE (L M H R)	GRAPHIC LOG	CLASSIFICATION	DESCRIPTION OF STRATA Soil type, texture, structure, mottling, colour, plasticity, rocks, oxidation, particle characteristics, organics, secondary and minor components, fill, contamination, odour.	CONSISTENCY	DENSITY INDEX	TYPE	DEPTH (M)	RESULTS AND ADDITIONAL OBSERVATIONS
A	Nil	-	W	4.5 5.0 6.0			SM	SILTY SAND - Dark grey, wet, medium dense, strong sulfur odour, minor clay content, medium grained.		MD			
A	Nil	-	W	7.0 8.0 9.0			SP	SAND - Brown, wet, dense, medium grained. Borehole terminated at 9.0m on sand.		D	A A	7.5 9.0	2316/1/ 7.5 2316/1/9.0 SPOS = 0.29

EQUIPMENT / METHOD
N Natural exposure
X Existing excavation
BH Backhoe bucket
E Excavator
HA Hand auger
S Hand spade
PT Push tube
A Auger
CC Concrete Corer

SUPPORT
SH Shoring
SC Shotcrete
RB Rock Bolts
Nil No support

WATER
N None observed
X Not measured
Water level
Water outflow
Water inflow

MOISTURE
D Dry
M Moist
W Wet
Wp Plastic limit
Wl Liquid limit

PENETRATION
L Low
M Moderate
H High
R Refusal

CONSISTENCY
VS Very Soft
S Soft
F Firm
St Stiff
VSt Very Stiff
H Hard
F Friable

DENSITY
VL Very Loose
L Loose
MD Medium Dense
D Dense
VD Very Dense

SAMPLING & TESTING
A Auger sample
B Bulk sample
U Undisturbed sample
D Disturbed sample
M Moisture content
Ux Tube sample (x mm)

pp Pocket penetrometer
S Standard penetration test
VS Vane shear
DCP Dynamic cone penetrometer
FD Field density
WS Water sample

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
Y USCS
N Agricultural

EXCAVATION LOG TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

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Engineering Log - Borehole

CLIENT	Manidis Roberts	COMMENCED	5/5/09	COMPLETED	5/5/09	**REF**	**BH2**
PROJECT	Engineering services	LOGGED	GT/JF	CHECKED	JF/AN	Sheet	1 of 1
SITE	Settlement City Shopping Centre, Port Macquarie	GEOLOGY	Quaternary Alluvium	VEGETATION	None	PROJECT NO.	P0902316
EQUIPMENT	Hydraulic Auger	EASTING	NA	RL SURFACE	NA		
EXCAVATION DIMENSIONS	Ø 0.1m X 1.4m depth	NORTHING	NA	ASPECT	North East	SLOPE	0-1%

EXCAVATION DATA						MATERIAL DATA					SAMPLING & TESTING			
METHOD	SUPPORT	WATER	MOISTURE	DEPTH (M)	PENETRATION RESISTANCE (L M H R)	GRAPHIC LOG	CLASSIFICATION	DESCRIPTION OF STRATA Soil type, texture, structure, mottling, colour, plasticity, rocks, oxidation, particle characteristics, organics, secondary and minor components, fill, contamination, odour.	CONSISTENCY	DENSITY INDEX	TYPE	DEPTH (M)	RESULTS AND ADDITIONAL OBSERVATIONS
A	Nil	N	M	0.35			XX GM	ASPHALT AND ROAD BASE GRAVELS		D			
A	Nil	N	M	0.6			XX SM	SILTY/CLAYEY SAND FILL – Brown, gravels, medium dense, moist.		MD	A	0.5	2316/2/ 0.5
A	Nil	N	M	1.0 1.4			XX SP	SAND FILL – Light brown, medium grained, minor shell fragments, medium dense.		MD	A	1.0	2316/2/ 1.0
				2.0 3.0 4.0 4.5				Borehole terminated at 1.4m on sand fill.					

EQUIPMENT / METHOD
N Natural exposure
X Existing excavation
BH Backhoe bucket
E Excavator
HA Hand auger
S Hand spade
PT Push tube
A Auger
CC Concrete Corer

SUPPORT
SH Shoring
SC Shotcrete
RB Rock Bolts
Nil No support

WATER
N None observed
X Not measured
Water level
Water outflow
Water inflow

MOISTURE
D Dry
M Moist
W Wet
Wp Plastic limit
Wl Liquid limit

PENETRATION
L Low
M Moderate
H High
R Refusal

CONSISTENCY
VS Very Soft
S Soft
F Firm
St Stiff
VSt Very Stiff
H Hard
F Friable

DENSITY
VL Very Loose
L Loose
MD Medium Dense
D Dense
VD Very Dense

SAMPLING & TESTING
A Auger sample
B Bulk sample
U Undisturbed sample
D Disturbed sample
M Moisture content
Ux Tube sample (x mm)

pp Pocket penetrometer
S Standard penetration test
VS Vane shear
DCP Dynamic cone penetrometer
FD Field density
WS Water sample

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
Y USCS
N Agricultural

EXCAVATION LOG TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

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Engineering Log - Borehole

CLIENT	Manidis Roberts	**COMMENCED**	5/5/09	**COMPLETED**	5/5/09
PROJECT	Engineering services	**LOGGED**	GT/JF	**CHECKED**	JF/AN
SITE	Settlement City Shopping Centre, Port Macquarie	**GEOLOGY**	Quaternary Alluvium	**VEGETATION**	None
EQUIPMENT	Hydraulic Auger	**EASTING**	NA	**RL SURFACE**	NA
EXCAVATION DIMENSIONS	Ø 0.1m X 1.4m depth	**NORTHING**	NA	**ASPECT**	North East

REF BH3
Sheet 1 of 1
PROJECT NO. P0902316
SLOPE 0-1%

EXCAVATION DATA						MATERIAL DATA				SAMPLING & TESTING			
METHOD	SUPPORT	WATER	MOISTURE	DEPTH (M)	PENETRATION RESISTANCE (L M H R)	GRAPHIC LOG	CLASSIFICATION	DESCRIPTION OF STRATA Soil type, texture, structure, mottling, colour, plasticity, rocks, oxidation, particle characteristics, organics, secondary and minor components, fill, contamination, odour.	CONSISTENCY	DENSITY INDEX	TYPE	DEPTH (M)	RESULTS AND ADDITIONAL OBSERVATIONS
CC	Nil	N	-	0.2			-	CONCRETE SLAB		-			
A	Nil	N	M	0.3			XX GM	ROAD BASE		D	A	0.3	2316/3/ 0.3
A	Nil	N	M	0.45			XX SP	SAND FILL – Coarse grained, brown, medium dense, moist.		MD			
								Borehole refused at 0.45m on concrete/floater in fill.					
				1.0									
				2.0									
				3.0									
				4.0									
				4.5									

EQUIPMENT / METHOD
N Natural exposure
X Existing excavation
BH Backhoe bucket
E Excavator
HA Hand auger
S Hand spade
PT Push tube
A Auger
CC Concrete Corer

SUPPORT
SH Shoring
SC Shotcrete
RB Rock Bolts
Nil No support

WATER
N None observed
X Not measured
Water level
Water outflow
Water inflow

MOISTURE
D Dry
M Moist
W Wet
Wp Plastic limit
Wl Liquid limit

PENETRATION
L Low
M Moderate
H High
R Refusal

CONSISTENCY
VS Very Soft
S Soft
F Firm
St Stiff
VSt Very Stiff
H Hard
F Friable

DENSITY
VL Very Loose
L Loose
MD Medium Dense
D Dense
VD Very Dense

SAMPLING & TESTING
A Auger sample
B Bulk sample
U Undisturbed sample
D Disturbed sample
M Moisture content
Ux Tube sample (x mm)

pp Pocket penetrometer
S Standard penetration test
VS Vane shear
DCP Dynamic cone penetrometer
FD Field density
WS Water sample

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
Y USCS
N Agricultural

EXCAVATION LOG TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

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Engineering Log - Borehole

CLIENT	Manidis Roberts	**COMMENCED**	5/5/09	**COMPLETED**	5/5/09	**REF**	**BH4**
PROJECT	Engineering services	**LOGGED**	GT/JF	**CHECKED**	JF/AN	**Sheet**	1 of 1
SITE	Settlement City Shopping Centre, Port Macquarie	**GEOLOGY**	Quaternary Alluvium	**VEGETATION**	None	**PROJECT NO.**	P0902316
EQUIPMENT	Hydraulic Auger	**EASTING**	NA	**RL SURFACE**	NA		
EXCAVATION DIMENSIONS	Ø 0.1m X 1.4m depth	**NORTHING**	NA	**ASPECT**	North East	**SLOPE**	0-1%

EXCAVATION DATA						MATERIAL DATA				SAMPLING & TESTING			
METHOD	SUPPORT	WATER	MOISTURE	DEPTH (M)	PENETRATION RESISTANCE (L M H R)	GRAPHIC LOG	CLASSIFICATION	DESCRIPTION OF STRATA Soil type, texture, structure, mottling, colour, plasticity, rocks, oxidation, particle characteristics, organics, secondary and minor components, fill, contamination, odour.	CONSISTENCY	DENSITY INDEX	TYPE	DEPTH (M)	RESULTS AND ADDITIONAL OBSERVATIONS
CC	Nil	N	M	0.15			XX	CONCRETE SLAB		XX			
A	Nil	N	M	0.4			XX GM	BITUMEN ROAD BASE FILL		D	A	0.3	2316/4/ 0.3
A	Nil	N	M	0.6			XX SP	SAND FILL – Brown, gravels (1-10mm, approx 5%), medium dense.		MD	A	0.5	2316/4/ 0.5
A	Nil	N	M	1.0 1.4			XX SP	SAND FILL – Light brown, medium grained, minor shell fragments, medium dense.		MD	A	1.0	2316/4/ 1.0
				2.0 3.0 4.0 4.5				Borehole terminated at 1.4m on sand fill.					

EQUIPMENT / METHOD
N Natural exposure
X Existing excavation
BH Backhoe bucket
E Excavator
HA Hand auger
S Hand spade
PT Push tube
A Auger
CC Concrete Corer

SUPPORT
SH Shoring
SC Shotcrete
RB Rock Bolts
Nil No support

WATER
N None observed
X Not measured
Water level
Water outflow
Water inflow

MOISTURE
D Dry
M Moist
W Wet
Wp Plastic limit
Wl Liquid limit

PENETRATION
L Low
M Moderate
H High
R Refusal

CONSISTENCY
VS Very Soft
S Soft
F Firm
St Stiff
VSt Very Stiff
H Hard
F Friable

DENSITY
VL Very Loose
L Loose
MD Medium Dense
D Dense
VD Very Dense

SAMPLING & TESTING
A Auger sample
B Bulk sample
U Undisturbed sample
D Disturbed sample
M Moisture content
Ux Tube sample (x mm)

pp Pocket penetrometer
S Standard penetration test
VS Vane shear
DCP Dynamic cone penetrometer
FD Field density
WS Water sample

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
Y USCS
N Agricultural

EXCAVATION LOG TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

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Engineering Log - Borehole

CLIENT	**Manidis Roberts**	**COMMENCED**	5/5/09	**COMPLETED**	5/5/09	**REF**	**BH5**
PROJECT	**Engineering services**	**LOGGED**	GT/JF	**CHECKED**	JF/AN	**Sheet**	**1 of 2**
SITE	**Settlement City Shopping Centre, Port Macquarie**	**GEOLOGY**	Quaternary Alluvium	**VEGETATION**	None	**PROJECT NO.**	P0902316
EQUIPMENT	Hydraulic Auger	**EASTING**	NA	**RL SURFACE**	NA		
EXCAVATION DIMENSIONS	Ø 0.1m X 6.0m depth	**NORTHING**	NA	**ASPECT**	North East	**SLOPE**	0-1%

EXCAVATION DATA						MATERIAL DATA				SAMPLING & TESTING			
METHOD	SUPPORT	WATER	MOISTURE	DEPTH (M)	PENETRATION RESISTANCE (L M H R)	GRAPHIC LOG	CLASSIFICATION	DESCRIPTION OF STRATA Soil type, texture, structure, mottling, colour, plasticity, rocks, oxidation, particle characteristics, organics, secondary and minor components, fill, contamination, odour.	CONSISTENCY	DENSITY INDEX	TYPE	DEPTH (M)	RESULTS AND ADDITIONAL OBSERVATIONS
CC	Nil	N		0.15				CONCRETE		-			
A	Nil	N	M	0.2			GM	ROAD BASE FILL		D			
A	Nil	N	M	0.35			XX	CRUSHED SANDSTONE FILL		D			
A	Nil	N	M	0.7			XX SM	SILTY/CLAYEY SAND FILL – Brown, gravels, medium dense, moist.		MD			
A	Nil	N	M	1.0 2.0 2.3			XX SP	SAND FILL – Light brown, medium grained, minor shell fragments, medium dense.		MD			1.0
		2.0 ▽									A	2.0	Ground water observed at 2.0m below ground level. 2316/5/ 2.0 2.0
A	Nil	-	W	2.6			SP	SAND - Dark grey, wet, medium dense, shells, medium grained, natural soils.		MD	A A	2.5 2.5	2316/5/ 2.5 Z 7
A	Nil	-	W	3.0 4.0 4.3			CL	SANDY CLAY - Dark grey, medium grained sand (50%), strong sulfur odour, soft, some organics.	S		A A	3.0 4.0	2316/5/ 3.0 3.0 2316/5/ 4.0 SPOS = 1.4 4.0
A	Nil	-	W	4.5			SM	SILTY SAND - Dark grey, wet, medium dense, strong sulfur odour, minor clay content.		MD	A	4.5	2316/5/ 4.5 4.5

EQUIPMENT / METHOD
N Natural exposure
X Existing excavation
BH Backhoe bucket
E Excavator
HA Hand auger
S Hand spade
PT Push tube
A Auger
CC Concrete Corer

SUPPORT
SH Shoring
SC Shotcrete
RB Rock Bolts
Nil No support

WATER
N None observed
X Not measured
▽ Water level
◁ Water outflow
▷ Water inflow

MOISTURE
D Dry
M Moist
W Wet
Wp Plastic limit
Wl Liquid limit

PENETRATION
L Low
M Moderate
H High
R Refusal

CONSISTENCY
VS Very Soft
S Soft
F Firm
St Stiff
VSt Very Stiff
H Hard
F Friable

DENSITY
VL Very Loose
L Loose
MD Medium Dense
D Dense
VD Very Dense

SAMPLING & TESTING
A Auger sample
B Bulk sample
U Undisturbed sample
D Disturbed sample
M Moisture content
Ux Tube sample (x mm)
pp Pocket penetrometer
S Standard penetration test
VS Vane shear
DCP Dynamic cone penetrometer
FD Field density
WS Water sample

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
Y USCS
N Agricultural

EXCAVATION LOG TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

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Engineering Log - Borehole

CLIENT	Manidis Roberts	**COMMENCED**	5/5/09	**COMPLETED**	5/5/09	**REF**	**BH5**
PROJECT	Engineering services	**LOGGED**	GT/JF	**CHECKED**	JF/AN	**Sheet**	**2** of **2**
SITE	Settlement City Shopping Centre, Port Macquarie	**GEOLOGY**	Quaternary Alluvium	**VEGETATION**	None	**PROJECT NO.**	P0902316
EQUIPMENT	Hydraulic Auger	**EASTING**	NA	**RL SURFACE**	NA		
EXCAVATION DIMENSIONS	Ø 0.1m X 6.0m depth	**NORTHING**	NA	**ASPECT**	North East	**SLOPE**	0-1%

EXCAVATION DATA						MATERIAL DATA				SAMPLING & TESTING			
METHOD	SUPPORT	WATER	MOISTURE	DEPTH (M)	PENETRATION RESISTANCE (L M H R)	GRAPHIC LOG	CLASSIFICATION	DESCRIPTION OF STRATA Soil type, texture, structure, mottling, colour, plasticity, rocks, oxidation, particle characteristics, organics, secondary and minor components, fill, contamination, odour.	CONSISTENCY	DENSITY INDEX	TYPE	DEPTH (M)	RESULTS AND ADDITIONAL OBSERVATIONS
A	Nil	-	W	4.5 4.8			SM	SILTY SAND - Dark grey, wet, medium dense, strong sulfur odour, minor clay content, medium grained.		MD			4.5
A	Nil	-	W	5.0 5.2			SM	SILTY SAND - Dark brown, wet, medium grained.		MD			5.0
A	Nil	-	W	5.6			-	COFFEE ROCK - Dark brown, very dense.		VD	A	5.5	2316/5/ 5.5
A	Nil	-	W	6.0			SM	SILTY SAND - Dark grey, wet, medium dense, strong sulfur odour, minor clay content, medium grained.		MD	A	6.0	2316/5/ 6.0 6.0
				7.0 8.0 7.5 9.0				Borehole terminated at 6.0m on silty sand.					7.0 8.0 9.0

EQUIPMENT / METHOD
N Natural exposure
X Existing excavation
BH Backhoe bucket
E Excavator
HA Hand auger
S Hand spade
PT Push tube
A Auger
CC Concrete Corer

SUPPORT
SH Shoring
SC Shotcrete
RB Rock Bolts
Nil No support

WATER
N None observed
X Not measured
Water level
Water outflow
Water inflow

MOISTURE
D Dry
M Moist
W Wet
Wp Plastic limit
Wl Liquid limit

PENETRATION
L Low
M Moderate
H High
R Refusal

CONSISTENCY
VS Very Soft
S Soft
F Firm
St Stiff
VSt Very Stiff
H Hard
F Friable

DENSITY
VL Very Loose
L Loose
MD Medium Dense
D Dense
VD Very Dense

SAMPLING & TESTING
A Auger sample
B Bulk sample
U Undisturbed sample
D Disturbed sample
M Moisture content
Ux Tube sample (x mm)

pp Pocket penetrometer
S Standard penetration test
VS Vane shear
DCP Dynamic cone penetrometer
FD Field density
WS Water sample

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
Y USCS
N Agricultural

EXCAVATION LOG TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

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Engineering Log - Borehole

CLIENT	Manidis Roberts	COMMENCED	5/5/09	COMPLETED	5/5/09	**REF**	**BH6**
PROJECT	Engineering services	LOGGED	GT/JF	CHECKED	JF/AN	Sheet	1 of 1
SITE	Settlement City Shopping Centre, Port Macquarie	GEOLOGY	Quaternary Alluvium	VEGETATION	None	PROJECT NO.	P0902316
EQUIPMENT	Hydraulic Auger	EASTING	NA	RL SURFACE	NA		
EXCAVATION DIMENSIONS	Ø 0.1m X 1.4m depth	NORTHING	NA	ASPECT	North East	SLOPE	0-1%

EXCAVATION DATA						MATERIAL DATA				SAMPLING & TESTING			
METHOD	SUPPORT	WATER	MOISTURE	DEPTH (M)	PENETRATION RESISTANCE (L M H R)	GRAPHIC LOG	CLASSIFICATION	DESCRIPTION OF STRATA Soil type, texture, structure, mottling, colour, plasticity, rocks, oxidation, particle characteristics, organics, secondary and minor components, fill, contamination, odour.	CONSISTENCY	DENSITY INDEX	TYPE	DEPTH (M)	RESULTS AND ADDITIONAL OBSERVATIONS
A	Nil	N	M	0.7			XX SM	ORGANIC SILTY SAND FILL – Dark brown, minor clay (topsoil fill), loose.		L			
A	Nil	N	M	1.0			XX SP	SAND FILL – Light brown, medium grained, minor shell fragments, medium dense.		MD	A	1.0	2316/6/ 1.0
				1.4							A	1.4	2316/6/ 1.4
								Borehole terminated at 1.4m on sand fill.					
				2.0									
				3.0									
				4.0									
				4.5									

EQUIPMENT / METHOD
N Natural exposure
X Existing excavation
BH Backhoe bucket
E Excavator
HA Hand auger
S Hand spade
PT Push tube
A Auger
CC Concrete Corer

SUPPORT
SH Shoring
SC Shotcrete
RB Rock Bolts
Nil No support

WATER
N None observed
X Not measured
Water level
Water outflow
Water inflow

MOISTURE
D Dry
M Moist
W Wet
Wp Plastic limit
Wl Liquid limit

PENETRATION
L Low
M Moderate
H High
R Refusal

CONSISTENCY
VS Very Soft
S Soft
F Firm
St Stiff
VSt Very Stiff
H Hard
F Friable

DENSITY
VL Very Loose
L Loose
MD Medium Dense
D Dense
VD Very Dense

SAMPLING & TESTING
A Auger sample
B Bulk sample
U Undisturbed sample
D Disturbed sample
M Moisture content
Ux Tube sample (x mm)

pp Pocket penetrometer
S Standard penetration test
VS Vane shear
DCP Dynamic cone penetrometer
FD Field density
WS Water sample

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
Y USCS
N Agricultural

EXCAVATION LOG TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

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Engineering Log - Borehole

CLIENT	Manidis Roberts	**COMMENCED**	5/5/09	**COMPLETED**	5/5/09	**REF**	**BH7**
PROJECT	Engineering services	**LOGGED**	GT/JF	**CHECKED**	JF/AN	**Sheet**	1 of 1
SITE	Settlement City Shopping Centre, Port Macquarie	**GEOLOGY**	Quaternary Alluvium	**VEGETATION**	None	**PROJECT NO.**	P0902316
EQUIPMENT	Hydraulic Auger	**EASTING**	NA	**RL SURFACE**	NA		
EXCAVATION DIMENSIONS	Ø 0.1m X 0.8m depth	**NORTHING**	NA	**ASPECT**	North East	**SLOPE**	0-1%

EXCAVATION DATA						MATERIAL DATA				SAMPLING & TESTING			
METHOD	SUPPORT	WATER	MOISTURE	DEPTH (M)	PENETRATION RESISTANCE (L M H R)	GRAPHIC LOG	CLASSIFICATION	DESCRIPTION OF STRATA Soil type, texture, structure, mottling, colour, plasticity, rocks, oxidation, particle characteristics, organics, secondary and minor components, fill, contamination, odour.	CONSISTENCY	DENSITY INDEX	TYPE	DEPTH (M)	RESULTS AND ADDITIONAL OBSERVATIONS
A	Nil	N	M	0.3			XX SM	ORGANIC SILTY SAND FILL – Dark brown, minor clay (topsoil fill), medium dense.		MD			
A	Nil	N	M	0.8			XX CL	CLAY FILL – Orange/grey/brown, gravels (1-15mm, approx 10%), firm.	F		A	0.5	2316/7/0.5
				1.0				Borehole terminated at 0.8m on concrete pipe, possibly the disused rising main.					
				2.0									
				3.0									
				4.0									
				4.5									

EQUIPMENT / METHOD
N Natural exposure
X Existing excavation
BH Backhoe bucket
E Excavator
HA Hand auger
S Hand spade
PT Push tube
A Auger
CC Concrete Corer

SUPPORT
SH Shoring
SC Shotcrete
RB Rock Bolts
Nil No support

WATER
N None observed
X Not measured
Water level
Water outflow
Water inflow

MOISTURE
D Dry
M Moist
W Wet
Wp Plastic limit
Wl Liquid limit

PENETRATION
L Low
M Moderate
H High
R Refusal

CONSISTENCY
VS Very Soft
S Soft
F Firm
St Stiff
VSt Very Stiff
H Hard
F Friable

DENSITY
VL Very Loose
L Loose
MD Medium Dense
D Dense
VD Very Dense

SAMPLING & TESTING
A Auger sample
B Bulk sample
U Undisturbed sample
D Disturbed sample
M Moisture content
Ux Tube sample (x mm)

pp Pocket penetrometer
S Standard penetration test
VS Vane shear
DCP Dynamic cone penetrometer
FD Field density
WS Water sample

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
Y USCS
N Agricultural

EXCAVATION LOG TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

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Engineering Log - Borehole

CLIENT	**Manidis Roberts**	**COMMENCED**	4/5/09	**COMPLETED**	4/5/09	**REF**	**BH8**
PROJECT	**Engineering services**	**LOGGED**	GT/JF	**CHECKED**	JF/AN	**Sheet**	**1 of 2**
SITE	**Settlement City Shopping Centre, Port Macquarie**	**GEOLOGY**	Quaternary Alluvium	**VEGETATION**	None	**PROJECT NO.**	P0902316
EQUIPMENT	Hydraulic Auger	**EASTING**	NA	**RL SURFACE**	NA		
EXCAVATION DIMENSIONS	Ø 0.1m X 7.5m depth	**NORTHING**	NA	**ASPECT**	North East	**SLOPE**	0-1%

EXCAVATION DATA						MATERIAL DATA				SAMPLING & TESTING			
METHOD	SUPPORT	WATER	MOISTURE	DEPTH (M)	PENETRATION RESISTANCE (L M H R)	GRAPHIC LOG	CLASSIFICATION	DESCRIPTION OF STRATA Soil type, texture, structure, mottling, colour, plasticity, rocks, oxidation, particle characteristics, organics, secondary and minor components, fill, contamination, odour.	CONSISTENCY	DENSITY INDEX	TYPE	DEPTH (M)	RESULTS AND ADDITIONAL OBSERVATIONS
A	Nil	N	-	0.12			XX	ASPHALT/ROAD BASE					
A	Nil	N	M	0.3			XX	RIPPED SANDSTONE FILL		D			
A	Nil	N	D	1.0 1.5			XX SM	SILTY SAND FILL - Dark brown, red, dense, dry, minor gravels.		MD	A	1.4	2316/8/1.4 1.0
A	Nil	N 2.0 ▽	M	2.0 2.1			XX SP	SAND FILL – Light brown, medium grained, minor shell fragments, medium dense.		MD	A	2.0	Ground water observed at 2.0m below ground level. 2316/8/2.0 2.0
A	Nil	-	W	2.7			SW	SAND – Grey, medium to coarse grained, minor shell fragments (approx 20%), natural soils.		MD			
A	Nil	-	W	3.0 3.3			CL	SANDY CLAY - Dark grey, medium grained sand (50%), strong sulfur odour, soft, some organics.	S		A	2.8	2316/8/2.8 3.0
A	Nil	-	W	4.0 4.5			SP	SAND - Brown grey, medium grained, wet, dense, minor shells.		D	A	4.0	2316/8/4.0 SPOS = 0.39 4.0 4.5

EQUIPMENT / METHOD
N Natural exposure
X Existing excavation
BH Backhoe bucket
E Excavator
HA Hand auger
S Hand spade
PT Push tube
A Auger
CC Concrete Corer

SUPPORT
SH Shoring
SC Shotcrete
RB Rock Bolts
Nil No support

WATER
N None observed
X Not measured
▽ Water level
◁ Water outflow
▷ Water inflow

MOISTURE
D Dry
M Moist
W Wet
Wp Plastic limit
Wl Liquid limit

PENETRATION
L Low
M Moderate
H High
R Refusal

CONSISTENCY
VS Very Soft
S Soft
F Firm
St Stiff
VSt Very Stiff
H Hard
F Friable

DENSITY
VL Very Loose
L Loose
MD Medium Dense
D Dense
VD Very Dense

SAMPLING & TESTING
A Auger sample
B Bulk sample
U Undisturbed sample
D Disturbed sample
M Moisture content
Ux Tube sample (x mm)
pp Pocket penetrometer
S Standard penetration test
VS Vane shear
DCP Dynamic cone penetrometer
FD Field density
WS Water sample

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
Y USCS
N Agricultural

EXCAVATION LOG TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

Quality Sheet No. 4

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Engineering Log - Borehole

CLIENT	Manidis Roberts	**COMMENCED**	4/5/09	**COMPLETED**	4/5/09	**REF**	**BH8**
PROJECT	Engineering services	**LOGGED**	GT/JF	**CHECKED**	JF/AN	**Sheet**	**2** of **2**
SITE	Settlement City Shopping Centre, Port Macquarie	**GEOLOGY**	Quaternary Alluvium	**VEGETATION**	None	**PROJECT NO.**	P0902316
EQUIPMENT	Hydraulic Auger	**EASTING**	NA	**RL SURFACE**	NA		
EXCAVATION DIMENSIONS	Ø 0.1m X 7.5m depth	**NORTHING**	NA	**ASPECT**	North East	**SLOPE**	0-1%

EXCAVATION DATA						MATERIAL DATA				SAMPLING & TESTING			
METHOD	SUPPORT	WATER	MOISTURE	DEPTH (M)	PENETRATION RESISTANCE (L M H R)	GRAPHIC LOG	CLASSIFICATION	DESCRIPTION OF STRATA Soil type, texture, structure, mottling, colour, plasticity, rocks, oxidation, particle characteristics, organics, secondary and minor components, fill, contamination, odour.	CONSISTENCY	DENSITY INDEX	TYPE	DEPTH (M)	RESULTS AND ADDITIONAL OBSERVATIONS
A	Nil	-	W	4.5 5.0 5.9			SP	SAND - Brown grey, medium grained, wet, dense, minor shells.		D			
A	Nil	-	W	6.0 7.0 7.5			CL	SANDY CLAY - Cream, stiff to very stiff, some gravels.	St-VSt		A A	6.0 7.5	2316/8/ 6.0 2316/8/ 7.5 SPOS = 0.075
				8.0 9.0				Borehole terminated at 7.5m on sandy clay.					

EQUIPMENT / METHOD
N Natural exposure
X Existing excavation
BH Backhoe bucket
E Excavator
HA Hand auger
S Hand spade
PT Push tube
A Auger
CC Concrete Corer

SUPPORT
SH Shoring
SC Shotcrete
RB Rock Bolts
Nil No support

WATER
N None observed
X Not measured
Water level
Water outflow
Water inflow

MOISTURE
D Dry
M Moist
W Wet
Wp Plastic limit
Wl Liquid limit

PENETRATION
L Low
M Moderate
H High
R Refusal

CONSISTENCY
VS Very Soft
S Soft
F Firm
St Stiff
VSt Very Stiff
H Hard
F Friable

DENSITY
VL Very Loose
L Loose
MD Medium Dense
D Dense
VD Very Dense

SAMPLING & TESTING
A Auger sample
B Bulk sample
U Undisturbed sample
D Disturbed sample
M Moisture content
Ux Tube sample (x mm)

pp Pocket penetrometer
S Standard penetration test
VS Vane shear
DCP Dynamic cone penetrometer
FD Field density
WS Water sample

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
Y USCS
N Agricultural

EXCAVATION LOG TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

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Engineering Log - Borehole

CLIENT	**Manidis Roberts**	**COMMENCED**	5/5/09	**COMPLETED**	5/5/09	**REF**	**BH9**
PROJECT	**Engineering services**	**LOGGED**	GT/JF	**CHECKED**	JF/AN	**Sheet**	**1 of 1**
SITE	**Settlement City Shopping Centre, Port Macquarie**	**GEOLOGY**	Quaternary Alluvium	**VEGETATION**	Grasses	**PROJECT NO.**	P0902316
EQUIPMENT	Hydraulic Auger	**EASTING**	NA	**RL SURFACE**	NA		
EXCAVATION DIMENSIONS	Ø 0.1m X 3.0m depth	**NORTHING**	NA	**ASPECT**	North East	**SLOPE**	0-1%

EXCAVATION DATA						MATERIAL DATA				SAMPLING & TESTING			
METHOD	SUPPORT	WATER	MOISTURE	DEPTH (M)	PENETRATION RESISTANCE (L M H R)	GRAPHIC LOG	CLASSIFICATION	DESCRIPTION OF STRATA Soil type, texture, structure, mottling, colour, plasticity, rocks, oxidation, particle characteristics, organics, secondary and minor components, fill, contamination, odour.	CONSISTENCY	DENSITY INDEX	TYPE	DEPTH (M)	RESULTS AND ADDITIONAL OBSERVATIONS
A	Nil	N	M	0.4			XX MH	ORGANIC SANDY SILT FILL – Brown, moist, some minor gravels.	S		A	0.25	2316/9/ 0.25
A	Nil	N	M	0.6			XX GM	ROAD BASE GRAVELS		MD			
A	Nil	N	M	1.0 2.0 2.1			XX SP	SAND FILL – Light brown, medium grained, minor shell fragments, medium dense.		MD	A	1.0	2316/9/ 1.0 1.0 2.0
A	Nil	2.25 ▽ Y	W	2.4			SP	SAND – Grey, medium to coarse grained, minor shell fragments (approx 20%), natural soils.		L/ MD	A	2.4	Ground water observed at 2.25m below ground level. 2316/9/ 2.4
A	Nil	-	W	2.8			CL	SANDY CLAY - Brown, medium grained sand (50%), strong sulfur odour, soft, some organics.	S		A	2.7	2316/9/ 2.7
A	Nil	-	W	3.0			SM	SILTY SAND - Dark brown, wet, medium dense.		MD			3.0
				4.0 4.5				Borehole terminated at 3.0m on silty sand.					4.0 4.5

EQUIPMENT / METHOD
N Natural exposure
X Existing excavation
BH Backhoe bucket
E Excavator
HA Hand auger
S Hand spade
PT Push tube
A Auger
CC Concrete Corer

SUPPORT
SH Shoring
SC Shotcrete
RB Rock Bolts
Nil No support

WATER
N None observed
X Not measured
▽ Water level
◁ Water outflow
▷ Water inflow

MOISTURE
D Dry
M Moist
W Wet
Wp Plastic limit
Wl Liquid limit

PENETRATION
L Low
M Moderate
H High
R Refusal

CONSISTENCY
VS Very Soft
S Soft
F Firm
St Stiff
VSt Very Stiff
H Hard
F Friable

DENSITY
VL Very Loose
L Loose
MD Medium Dense
D Dense
VD Very Dense

SAMPLING & TESTING
A Auger sample
B Bulk sample
U Undisturbed sample
D Disturbed sample
M Moisture content
Ux Tube sample (x mm)
pp Pocket penetrometer
S Standard penetration test
VS Vane shear
DCP Dynamic cone penetrometer
FD Field density
WS Water sample

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
Y USCS
N Agricultural

EXCAVATION LOG TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

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Engineering Log - Borehole

CLIENT	Manidis Roberts	COMMENCED	4/5/09	COMPLETED	4/5/09	**REF**	**BH10**
PROJECT	Engineering services	LOGGED	GT/JF	CHECKED	JF/AN	Sheet	1 of 1
SITE	Settlement City Shopping Centre, Port Macquarie	GEOLOGY	Quaternary Alluvium	VEGETATION	None	PROJECT NO.	P0902316
EQUIPMENT	Hydraulic Auger	EASTING	NA	RL SURFACE	NA		
EXCAVATION DIMENSIONS	Ø 0.1m X 1.5m depth	NORTHING	NA	ASPECT	North East	SLOPE	0-1%

EXCAVATION DATA						MATERIAL DATA				SAMPLING & TESTING			
METHOD	SUPPORT	WATER	MOISTURE	DEPTH (M)	PENETRATION RESISTANCE (L M H R)	GRAPHIC LOG	CLASSIFICATION	DESCRIPTION OF STRATA Soil type, texture, structure, mottling, colour, plasticity, rocks, oxidation, particle characteristics, organics, secondary and minor components, fill, contamination, odour.	CONSISTENCY	DENSITY INDEX	TYPE	DEPTH (M)	RESULTS AND ADDITIONAL OBSERVATIONS
A	Nil	N	M	0.1		XX	SM	SILTY SAND FILL – Brown, gravels (1-10mm, approx 5%).		MD			
A	Nil	N	M	0.4		XX		BLUE METAL GRAVELS/SILTY SAND FILL - Brown.		MD	A	0.2	2316/10/ 0.2
A	Nil	N	M	0.6		XX	SP	SAND FILL – Brown, red gravels.		MD	A	0.5	2316/10/ 0.5
A	Nil	N	M	1.0 1.1		XX	SP	SAND/CRUSHED SANDSTONE FILL – Brown/red/orange, gravels.		MD	A	1.0	2316/10/ 1.0
A	Nil	N	M	1.5			SP	SAND FILL – Light brown, medium grained, minor shell fragments, medium dense.		MD			
				2.0				Borehole terminated at 1.5m on sand fill.					
				3.0									
				4.0									
				4.5									

EQUIPMENT / METHOD
N Natural exposure
X Existing excavation
BH Backhoe bucket
E Excavator
HA Hand auger
S Hand spade
PT Push tube
A Auger
CC Concrete Corer

SUPPORT
SH Shoring
SC Shotcrete
RB Rock Bolts
Nil No support

WATER
N None observed
X Not measured
Water level
Water outflow
Water inflow

MOISTURE
D Dry
M Moist
W Wet
Wp Plastic limit
Wl Liquid limit

PENETRATION
L Low
M Moderate
H High
R Refusal

CONSISTENCY
VS Very Soft
S Soft
F Firm
St Stiff
VSt Very Stiff
H Hard
F Friable

DENSITY
VL Very Loose
L Loose
MD Medium Dense
D Dense
VD Very Dense

SAMPLING & TESTING
A Auger sample
B Bulk sample
U Undisturbed sample
D Disturbed sample
M Moisture content
Ux Tube sample (x mm)

pp Pocket penetrometer
S Standard penetration test
VS Vane shear
DCP Dynamic cone penetrometer
FD Field density
WS Water sample

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
Y USCS
N Agricultural

EXCAVATION LOG TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

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Engineering Log - Borehole

CLIENT	Manidis Roberts	COMMENCED	4/5/09	COMPLETED	4/5/09	**REF**	**BH11**
PROJECT	Engineering services	LOGGED	GT/JF	CHECKED	JF/AN	Sheet	1 of 1
SITE	Settlement City Shopping Centre, Port Macquarie	GEOLOGY	Quaternary Alluvium	VEGETATION	None	PROJECT NO.	P0902316
EQUIPMENT	Hydraulic Auger	EASTING	NA	RL SURFACE	NA		
EXCAVATION DIMENSIONS	Ø 0.1m X 1.4m depth	NORTHING	NA	ASPECT	North East	SLOPE	0-1%

EXCAVATION DATA						MATERIAL DATA				SAMPLING & TESTING			
METHOD	SUPPORT	WATER	MOISTURE	DEPTH (M)	PENETRATION RESISTANCE (L M H R)	GRAPHIC LOG	CLASSIFICATION	DESCRIPTION OF STRATA Soil type, texture, structure, mottling, colour, plasticity, rocks, oxidation, particle characteristics, organics, secondary and minor components, fill, contamination, odour.	CONSISTENCY	DENSITY INDEX	TYPE	DEPTH (M)	RESULTS AND ADDITIONAL OBSERVATIONS
A	Nil	N	M	0.1			XX GM	ASPHALT AND ROAD BASE GRAVELS					
A	Nil	N	M	0.4			XX	CRUSHED SANDSTONE FILL - Orange/red, moist, dense.		D	A A	0.2 0.4	2316/11/ 0.2 2316/11/ 0.4 + Z3
A	Nil	N	M	0.7			XX SP	SAND FILL – Brown/light brown, gravels (1-20mm, approx 30%).		MD			
A	Nil	N	M	1.0 1.4			XX SP	SAND FILL – Light brown, medium grained, minor shell fragments, medium dense.		MD	A	1.0	2316/11/ 1.0
				2.0 3.0 4.0 4.5				Borehole terminated at 1.4m on sand fill					

EQUIPMENT / METHOD
N Natural exposure
X Existing excavation
BH Backhoe bucket
E Excavator
HA Hand auger
S Hand spade
PT Push tube
A Auger
CC Concrete Corer

SUPPORT
SH Shoring
SC Shotcrete
RB Rock Bolts
Nil No support

WATER
N None observed
X Not measured
Water level
Water outflow
Water inflow

MOISTURE
D Dry
M Moist
W Wet
Wp Plastic limit
Wl Liquid limit

PENETRATION
L Low
M Moderate
H High
R Refusal

CONSISTENCY
VS Very Soft
S Soft
F Firm
St Stiff
VSt Very Stiff
H Hard
F Friable

DENSITY
VL Very Loose
L Loose
MD Medium Dense
D Dense
VD Very Dense

SAMPLING & TESTING
A Auger sample
B Bulk sample
U Undisturbed sample
D Disturbed sample
M Moisture content
Ux Tube sample (x mm)
pp Pocket penetrometer
S Standard penetration test
VS Vane shear
DCP Dynamic cone penetrometer
FD Field density
WS Water sample

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
Y USCS
N Agricultural

EXCAVATION LOG TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

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Engineering Log - Borehole

CLIENT	**Manidis Roberts**	**COMMENCED**	4/5/09	**COMPLETED**	4/5/09	**REF**	**BH12**
PROJECT	**Engineering services**	**LOGGED**	GT/JF	**CHECKED**	JF/AN	**Sheet**	**1 of 1**
SITE	**Settlement City Shopping Centre, Port Macquarie**	**GEOLOGY**	Quaternary Alluvium	**VEGETATION**	None	**PROJECT NO.**	P0902316
EQUIPMENT	Hydraulic Auger	**EASTING**	NA	**RL SURFACE**	NA		
EXCAVATION DIMENSIONS	Ø 0.1m X 1.4m depth	**NORTHING**	NA	**ASPECT**	North East	**SLOPE**	0-1%

EXCAVATION DATA						MATERIAL DATA				SAMPLING & TESTING			
METHOD	SUPPORT	WATER	MOISTURE	DEPTH (M)	PENETRATION RESISTANCE (L M H R)	GRAPHIC LOG	CLASSIFICATION	DESCRIPTION OF STRATA Soil type, texture, structure, mottling, colour, plasticity, rocks, oxidation, particle characteristics, organics, secondary and minor components, fill, contamination, odour.	CONSISTENCY	DENSITY INDEX	TYPE	DEPTH (M)	RESULTS AND ADDITIONAL OBSERVATIONS
A	Nil	N	-	0.1			GM	ASPHALT AND ROAD BASE GRAVELS		VD			
A	Nil	N	M	0.5			XX	CRUSHED SANDSTONE FILL - Orange/red, moist, dense.		D	A A	0.2 0.4	2316/12/ 0.2 2316/12/ 0.4
A	Nil	N	M	1.0 1.4			XX SP	SAND FILL – Light brown, medium grained, minor shell fragments, medium dense.		MD	A A	1.0 1.4	2316/12/ 1.0 2316/12/ 1.4
				2.0 3.0 4.0 4.5				Borehole terminated at 1.4m on sand fill.					

EQUIPMENT / METHOD
N Natural exposure
X Existing excavation
BH Backhoe bucket
E Excavator
HA Hand auger
S Hand spade
PT Push tube
A Auger
CC Concrete Corer

SUPPORT
SH Shoring
SC Shotcrete
RB Rock Bolts
Nil No support

WATER
N None observed
X Not measured
Water level
Water outflow
Water inflow

MOISTURE
D Dry
M Moist
W Wet
Wp Plastic limit
Wl Liquid limit

PENETRATION
L Low
M Moderate
H High
R Refusal

CONSISTENCY
VS Very Soft
S Soft
F Firm
St Stiff
VSt Very Stiff
H Hard
F Friable

DENSITY
VL Very Loose
L Loose
MD Medium Dense
D Dense
VD Very Dense

SAMPLING & TESTING
A Auger sample
B Bulk sample
U Undisturbed sample
D Disturbed sample
M Moisture content
Ux Tube sample (x mm)
pp Pocket penetrometer
S Standard penetration test
VS Vane shear
DCP Dynamic cone penetrometer
FD Field density
WS Water sample

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
Y USCS
N Agricultural

EXCAVATION LOG TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

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Engineering Log - Borehole

CLIENT	Manidis Roberts	COMMENCED 5/5/09	COMPLETED 5/5/09	**REF**	**BH13**
PROJECT	Engineering services	LOGGED GT/JF	CHECKED JF/AN	Sheet 1 of 1	
SITE	Settlement City Shopping Centre, Port Macquarie	GEOLOGY Quaternary Alluvium	VEGETATION None	PROJECT NO. P0902316	
EQUIPMENT	Hydraulic Auger	EASTING NA	RL SURFACE NA		
EXCAVATION DIMENSIONS	Ø 0.1m X 4.3m depth	NORTHING NA	ASPECT North East	SLOPE 0-1%	

EXCAVATION DATA						MATERIAL DATA				SAMPLING & TESTING			
METHOD	SUPPORT	WATER	MOISTURE	DEPTH (M)	PENETRATION RESISTANCE (L M H R)	GRAPHIC LOG	CLASSIFICATION	DESCRIPTION OF STRATA Soil type, texture, structure, mottling, colour, plasticity, rocks, oxidation, particle characteristics, organics, secondary and minor components, fill, contamination, odour.	CONSISTENCY	DENSITY INDEX	TYPE	DEPTH (M)	RESULTS AND ADDITIONAL OBSERVATIONS
A	Nil	N	M	0.4			XX GM	BLUE METAL GRAVELS ROAD BASE		D			
A	Nil	N	M	1.0 2.0 2.1			XX SP	SAND FILL – Light brown, medium grained, minor shell fragments, medium dense.		MD	A A	0.5 1.0	2316/13/ 0.5 2316/13/ 1.0 1.0 2.0
A	Nil	2.2 ▽ Y	M	2.5			SP	SAND – Grey, medium to coarse grained, minor shell fragments (approx 20%), natural soils.		L/ MD			Ground water observed at 2.2m below ground level.
A	Nil	-	W	3.0			CL	SANDY CLAY - Dark grey, medium grained sand (50%), strong sulfur odour, soft, some organics.	S		A	2.8	2316/13/ 2.8 3.0
A	Nil	-	W	4.0 4.3			SM	SILTY SAND - Dark grey, wet, medium dense, strong sulfur odour, minor clay content.		MD	A	4.2	4.0 2316/13/ 4.2
				4.5				Borehole terminated at 4.3m on silty sand.					4.5

EQUIPMENT / METHOD
N Natural exposure
X Existing excavation
BH Backhoe bucket
E Excavator
HA Hand auger
S Hand spade
PT Push tube
A Auger
CC Concrete Corer

SUPPORT
SH Shoring
SC Shotcrete
RB Rock Bolts
Nil No support

WATER
N None observed
X Not measured
▽ Water level
◁ Water outflow
▷ Water inflow

MOISTURE
D Dry
M Moist
W Wet
Wp Plastic limit
Wl Liquid limit

PENETRATION
L Low
M Moderate
H High
R Refusal

CONSISTENCY
VS Very Soft
S Soft
F Firm
St Stiff
VSt Very Stiff
H Hard
F Friable

DENSITY
VL Very Loose
L Loose
MD Medium Dense
D Dense
VD Very Dense

SAMPLING & TESTING
A Auger sample
B Bulk sample
U Undisturbed sample
D Disturbed sample
M Moisture content
Ux Tube sample (x mm)
pp Pocket penetrometer
S Standard penetration test
VS Vane shear
DCP Dynamic cone penetrometer
FD Field density
WS Water sample

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
Y USCS
N Agricultural

EXCAVATION LOG TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

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Engineering Log - Borehole

CLIENT	**Manidis Roberts**	**COMMENCED**	5/5/09	**COMPLETED**	5/5/09	**REF**	**BH14**
PROJECT	**Engineering services**	**LOGGED**	GT/JF	**CHECKED**	JF/AN	**Sheet**	**1 of 2**
SITE	**Settlement City Shopping Centre, Port Macquarie**	**GEOLOGY**	Quaternary Alluvium	**VEGETATION**	None	**PROJECT NO.**	P0902316
EQUIPMENT	Hydraulic Auger	**EASTING**	NA	**RL SURFACE**	NA		
EXCAVATION DIMENSIONS	Ø 0.1m X 9.0m depth	**NORTHING**	NA	**ASPECT**	North East	**SLOPE**	0-1%

EXCAVATION DATA						MATERIAL DATA					SAMPLING & TESTING			
METHOD	SUPPORT	WATER	MOISTURE	DEPTH (M)	PENETRATION RESISTANCE (L M H R)	GRAPHIC LOG	CLASSIFICATION	DESCRIPTION OF STRATA Soil type, texture, structure, mottling, colour, plasticity, rocks, oxidation, particle characteristics, organics, secondary and minor components, fill, contamination, odour.	CONSISTENCY	DENSITY INDEX	TYPE	DEPTH (M)	RESULTS AND ADDITIONAL OBSERVATIONS	
A	Nil	N	-	0.05			GM	BITUMEN/ROAD BASE						
A	Nil	N	M	0.35			XX SW	SAND FILL – Yellow/orange/brown, gravels (1-10mm, approx 15%).		L				
A	Nil	N	M	1.0 1.6			XX SP	SAND FILL – Light brown, medium grained, minor shell fragments, medium dense.		MD	A A	0.5 1.0 1.5	2316/14/0.5 2316/14/1.0 1.0 2316/14/1.5	
A	Nil	N 1.9	M	2.0			SW	SAND – Grey, medium to coarse grained, minor shell fragments (approx 20%), natural soils.		L/ MD	A	2.0	Ground water observed at 1.9m below ground level. 2316/14/2.0 2.0	
A	Nil	-	W	2.4			CL	SANDY CLAY - Dark grey, medium grained sand (50%), strong sulfur odour, soft, some organics.	S		A	2.3	2316/14/2.3	
A	Nil	-	W	2.6			SW	SAND - Grey, medium to course grained, shells (approx 20%).		L/ MD				
A	Nil	-	W	2.8			CL	SANDY CLAY - Brown/grey, moist, soft, strong sulfur odour.	S		A	2.7	2316/14/2.7	
A	Nil	-	W	3.0 4.0 4.5			SM	SILTY SAND - Dark grey, wet, medium dense, strong sulfur odour, minor clay content.		MD	A A A	3.0 4.0 4.5	2316/14/3.0 SPOS = 0.43 3.0 2316/14/4.0 4.0 2316/14/4.5 4.5	

EQUIPMENT / METHOD
N Natural exposure
X Existing excavation
BH Backhoe bucket
E Excavator
HA Hand auger
S Hand spade
PT Push tube
A Auger
CC Concrete Corer

SUPPORT
SH Shoring
SC Shotcrete
RB Rock Bolts
Nil No support

WATER
N None observed
X Not measured
Water level
Water outflow
Water inflow

MOISTURE
D Dry
M Moist
W Wet
Wp Plastic limit
Wl Liquid limit

PENETRATION
L Low
M Moderate
H High
R Refusal

CONSISTENCY
VS Very Soft
S Soft
F Firm
St Stiff
VSt Very Stiff
H Hard
F Friable

DENSITY
VL Very Loose
L Loose
MD Medium Dense
D Dense
VD Very Dense

SAMPLING & TESTING
A Auger sample
B Bulk sample
U Undisturbed sample
D Disturbed sample
M Moisture content
Ux Tube sample (x mm)

pp Pocket penetrometer
S Standard penetration test
VS Vane shear
DCP Dynamic cone penetrometer
FD Field density
WS Water sample

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
Y USCS
N Agricultural

EXCAVATION LOG TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

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Engineering Log - Borehole

CLIENT	Manidis Roberts	**COMMENCED**	5/5/09	**COMPLETED**	5/5/09	**REF**	**BH14**
PROJECT	Engineering services	**LOGGED**	GT/JF	**CHECKED**	JF/AN	**Sheet**	2 of 2
SITE	Settlement City Shopping Centre, Port Macquarie	**GEOLOGY**	Quaternary Alluvium	**VEGETATION**	None	**PROJECT NO.**	P0902316
EQUIPMENT	Hydraulic Auger	**EASTING**	NA	**RL SURFACE**	NA		
EXCAVATION DIMENSIONS	Ø 0.1m X 9.0m depth	**NORTHING**	NA	**ASPECT**	North East	**SLOPE**	0-1%

EXCAVATION DATA						MATERIAL DATA				SAMPLING & TESTING			
METHOD	SUPPORT	WATER	MOISTURE	DEPTH (M)	PENETRATION RESISTANCE (L M H R)	GRAPHIC LOG	CLASSIFICATION	DESCRIPTION OF STRATA Soil type, texture, structure, mottling, colour, plasticity, rocks, oxidation, particle characteristics, organics, secondary and minor components, fill, contamination, odour.	CONSISTENCY	DENSITY INDEX	TYPE	DEPTH (M)	RESULTS AND ADDITIONAL OBSERVATIONS
A	Nil	-	W	4.5 4.6			SM	SILTY SAND - Dark grey, wet, medium dense, strong sulfur odour, minor clay content.		MD			4.5
A	Nil	-	W	5.0 5.4			SM	SILTY SAND - Dark brown, wet.		MD			5.0
A	Nil	-	W	6.0 7.0 7.5			-	COFFEE ROCK - Dark brown, very dense.		VD	A A	5.5 6.0	2316/14/ 5.5 2316/14/ 6.0 6.0 7.0
A	Nil	-	W	8.0 9.0			SM	SILTY SAND - Dark grey, wet, medium dense, strong sulfur odour, minor clay content. Borehole terminated at 9.0m on silty sand.		MD	A	9.0	2316/14/ 9.0 8.0 9.0

EQUIPMENT / METHOD
N Natural exposure
X Existing excavation
BH Backhoe bucket
E Excavator
HA Hand auger
S Hand spade
PT Push tube
A Auger
CC Concrete Corer

SUPPORT
SH Shoring
SC Shotcrete
RB Rock Bolts
Nil No support

WATER
N None observed
X Not measured
Water level
Water outflow
Water inflow

MOISTURE
D Dry
M Moist
W Wet
Wp Plastic limit
Wl Liquid limit

PENETRATION
L Low
M Moderate
H High
R Refusal

CONSISTENCY
VS Very Soft
S Soft
F Firm
St Stiff
VSt Very Stiff
H Hard
F Friable

DENSITY
VL Very Loose
L Loose
MD Medium Dense
D Dense
VD Very Dense

SAMPLING & TESTING
A Auger sample
B Bulk sample
U Undisturbed sample
D Disturbed sample
M Moisture content
Ux Tube sample (x mm)

pp Pocket penetrometer
S Standard penetration test
VS Vane shear
DCP Dynamic cone penetrometer
FD Field density
WS Water sample

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
Y USCS
N Agricultural

EXCAVATION LOG TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

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Engineering Log - Borehole

CLIENT	Manidis Roberts	**COMMENCED**	5/5/09	**COMPLETED**	5/5/09	**REF**	**BH15**
PROJECT	Engineering services	**LOGGED**	GT/JF	**CHECKED**	JF/AN	**Sheet**	1 of 1
SITE	Settlement City Shopping Centre, Port Macquarie	**GEOLOGY**	Quaternary Alluvium	**VEGETATION**	None	**PROJECT NO.**	P0902316
EQUIPMENT	Hydraulic Auger	**EASTING**	NA	**RL SURFACE**	NA		
EXCAVATION DIMENSIONS	Ø 0.1m X 1.4m depth	**NORTHING**	NA	**ASPECT**	North East	**SLOPE**	0-1%

EXCAVATION DATA						MATERIAL DATA				SAMPLING & TESTING			
METHOD	SUPPORT	WATER	MOISTURE	DEPTH (M)	PENETRATION RESISTANCE (L M H R)	GRAPHIC LOG	CLASSIFICATION	DESCRIPTION OF STRATA Soil type, texture, structure, mottling, colour, plasticity, rocks, oxidation, particle characteristics, organics, secondary and minor components, fill, contamination, odour.	CONSISTENCY	DENSITY INDEX	TYPE	DEPTH (M)	RESULTS AND ADDITIONAL OBSERVATIONS
A	Nil	N	-	0.1			GM	BITUMEN AND ROAD BASE.					
A	Nil	N	M	0.2			XX	CRUSHED SANDSTONE – Yellow, gravels.		D			
A	Nil	N	M	0.4			XX SM	SILTY SAND FILL – Brown/red, gravels (1-10mm, approx 15%).		L	A	0.25	2316/15/ 0.25
A	Nil	N	M	1.0			XX SP	SAND FILL – Light brown, medium grained, minor shell fragments, medium dense.		MD	A	0.5	2316/15/ 0.5
				1.4							A	1.4	2316/15/ 1.4 + Z8
								Borehole terminated at 1.4m on sand fill.					
				2.0									
				3.0									
				4.0									
				4.5									

EQUIPMENT / METHOD
N Natural exposure
X Existing excavation
BH Backhoe bucket
E Excavator
HA Hand auger
S Hand spade
PT Push tube
A Auger
CC Concrete Corer

SUPPORT
SH Shoring
SC Shotcrete
RB Rock Bolts
Nil No support

WATER
N None observed
X Not measured
Water level
Water outflow
Water inflow

MOISTURE
D Dry
M Moist
W Wet
Wp Plastic limit
Wl Liquid limit

PENETRATION
L Low
M Moderate
H High
R Refusal

CONSISTENCY
VS Very Soft
S Soft
F Firm
St Stiff
VSt Very Stiff
H Hard
F Friable

DENSITY
VL Very Loose
L Loose
MD Medium Dense
D Dense
VD Very Dense

SAMPLING & TESTING
A Auger sample
B Bulk sample
U Undisturbed sample
D Disturbed sample
M Moisture content
Ux Tube sample (x mm)
pp Pocket penetrometer
S Standard penetration test
VS Vane shear
DCP Dynamic cone penetrometer
FD Field density
WS Water sample

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
Y USCS
N Agricultural

EXCAVATION LOG TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

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Engineering Log - Borehole

CLIENT	**Manidis Roberts**	**COMMENCED** 4/5/09	**COMPLETED** 4/5/09	**REF**	**BH16**
PROJECT	**Engineering services**	**LOGGED** GT/JF	**CHECKED** JF/AN	**Sheet**	**1 of 2**
SITE	**Settlement City Shopping Centre, Port Macquarie**	**GEOLOGY** Quaternary Alluvium	**VEGETATION** None	**PROJECT NO.**	P0902316
EQUIPMENT	Hydraulic Auger	**EASTING** NA	**RL SURFACE** NA		
EXCAVATION DIMENSIONS	Ø 0.1m X 6.0m depth	**NORTHING** NA	**ASPECT** North East	**SLOPE**	0-1%

EXCAVATION DATA						MATERIAL DATA				SAMPLING & TESTING			
METHOD	SUPPORT	WATER	MOISTURE	DEPTH (M)	PENETRATION RESISTANCE (L M H R)	GRAPHIC LOG	CLASSIFICATION	DESCRIPTION OF STRATA Soil type, texture, structure, mottling, colour, plasticity, rocks, oxidation, particle characteristics, organics, secondary and minor components, fill, contamination, odour.	CONSISTENCY	DENSITY INDEX	TYPE	DEPTH (M)	RESULTS AND ADDITIONAL OBSERVATIONS
A	Nil	N	M	0.08				BITUMEN/ROAD BASE		D			
A	Nil	N	M	0.45			XX CL	SANDY CLAY FILL – Dark brown/orange, gravels, medium to coarse grained sands.	F-St		A	0.2	2316/16/0.2
A	Nil	N	M	1.0			XX SP	SAND FILL – Light brown, medium grained, minor shell fragments, medium dense.		MD	A	0.5	2316/16/0.5
											A	1.0	2316/16/1.0 + Z1 SPOS = 0.008 1.0
											A	1.5	2316/16/1.5
		1.8 ▽		1.9									Ground water observed at 1.8m below ground level.
A	Nil	-	W	2.0			CL	SANDY CLAY - Dark grey, medium grained sand (50%), strong sulfur odour, soft, some organics, natural soils.	S		A	2.0	2316/16/2.0 2.0
											A	2.5	2316/16/2.5
				3.0							A	3.0	2316/16/3.0 3.0
A	Nil	-	W	3.8			SM	SILTY SAND - Dark grey, wet, medium dense, strong sulfur odour, minor clay content.		MD			
				4.0							A	4.0	2316/16/4.0 4.0
				4.5									4.5

EQUIPMENT / METHOD
N Natural exposure
X Existing excavation
BH Backhoe bucket
E Excavator
HA Hand auger
S Hand spade
PT Push tube
A Auger
CC Concrete Corer

SUPPORT
SH Shoring
SC Shotcrete
RB Rock Bolts
Nil No support

WATER
N None observed
X Not measured
Water level
Water outflow
Water inflow

MOISTURE
D Dry
M Moist
W Wet
Wp Plastic limit
Wl Liquid limit

PENETRATION
L Low
M Moderate
H High
R Refusal

CONSISTENCY
VS Very Soft
S Soft
F Firm
St Stiff
VSt Very Stiff
H Hard
F Friable

DENSITY
VL Very Loose
L Loose
MD Medium Dense
D Dense
VD Very Dense

SAMPLING & TESTING
A Auger sample
B Bulk sample
U Undisturbed sample
D Disturbed sample
M Moisture content
Ux Tube sample (x mm)
pp Pocket penetrometer
S Standard penetration test
VS Vane shear
DCP Dynamic cone penetrometer
FD Field density
WS Water sample

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
Y USCS
N Agricultural

EXCAVATION LOG TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

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Engineering Log - Borehole

CLIENT	Manidis Roberts	**COMMENCED**	4/5/09	**COMPLETED**	4/5/09	**REF**	**BH16**
PROJECT	Engineering services	**LOGGED**	GT/JF	**CHECKED**	JF/AN	**Sheet**	**2 of 2**
SITE	Settlement City Shopping Centre, Port Macquarie	**GEOLOGY**	Quaternary Alluvium	**VEGETATION**	None	**PROJECT NO.**	P0902316
EQUIPMENT	Hydraulic Auger	**EASTING**	NA	**RL SURFACE**	NA		
EXCAVATION DIMENSIONS	Ø 0.1m X 6.0m depth	**NORTHING**	NA	**ASPECT**	North East	**SLOPE**	0-1%

EXCAVATION DATA						MATERIAL DATA				SAMPLING & TESTING			
METHOD	SUPPORT	WATER	MOISTURE	DEPTH (M)	PENETRATION RESISTANCE (L M H R)	GRAPHIC LOG	CLASSIFICATION	DESCRIPTION OF STRATA Soil type, texture, structure, mottling, colour, plasticity, rocks, oxidation, particle characteristics, organics, secondary and minor components, fill, contamination, odour.	CONSISTENCY	DENSITY INDEX	TYPE	DEPTH (M)	RESULTS AND ADDITIONAL OBSERVATIONS
A	Nil	-	W	4.5			SM	SILTY SAND - Dark grey, wet, medium dense, strong sulfur odour, minor clay content.		MD	A	5.0	2316/16/5.0
				5.0 5.1									
A	Nil	-	W					COFFEE ROCK - Dark brown.		VD	A	6.0	2316/16/6.0 SPOS = 0.29
				6.0									
								Borehole terminated at 6.0m on coffee rock.					
				7.0									
				8.0									
				9.0									

EQUIPMENT / METHOD
N Natural exposure
X Existing excavation
BH Backhoe bucket
E Excavator
HA Hand auger
S Hand spade
PT Push tube
A Auger
CC Concrete Corer

SUPPORT
SH Shoring
SC Shotcrete
RB Rock Bolts
Nil No support

WATER
N None observed
X Not measured
Water level
Water outflow
Water inflow

MOISTURE
D Dry
M Moist
W Wet
Wp Plastic limit
Wl Liquid limit

PENETRATION
L Low
M Moderate
H High
R Refusal

CONSISTENCY
VS Very Soft
S Soft
F Firm
St Stiff
VSt Very Stiff
H Hard
F Friable

DENSITY
VL Very Loose
L Loose
MD Medium Dense
D Dense
VD Very Dense

SAMPLING & TESTING
A Auger sample
B Bulk sample
U Undisturbed sample
D Disturbed sample
M Moisture content
Ux Tube sample (x mm)

pp Pocket penetrometer
S Standard penetration test
VS Vane shear
DCP Dynamic cone penetrometer
FD Field density
WS Water sample

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
Y USCS
N Agricultural

EXCAVATION LOG TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

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Engineering Log - Borehole

CLIENT	**Manidis Roberts**	**COMMENCED**	4/5/09	**COMPLETED**	4/5/09	**REF**	**BH17**
PROJECT	**Engineering services**	**LOGGED**	GT/JF	**CHECKED**	JF/AN	**Sheet**	**1 of 1**
SITE	**Settlement City Shopping Centre, Port Macquarie**	**GEOLOGY**	Quaternary Alluvium	**VEGETATION**	None	**PROJECT NO.**	P0902316
EQUIPMENT	Hydraulic Auger	**EASTING**	NA	**RL SURFACE**	NA		
EXCAVATION DIMENSIONS	Ø 0.1m X 1.4m depth	**NORTHING**	NA	**ASPECT**	North East	**SLOPE**	0-1%

EXCAVATION DATA						MATERIAL DATA				SAMPLING & TESTING			
METHOD	SUPPORT	WATER	MOISTURE	DEPTH (M)	PENETRATION RESISTANCE (L M H R)	GRAPHIC LOG	CLASSIFICATION	DESCRIPTION OF STRATA Soil type, texture, structure, mottling, colour, plasticity, rocks, oxidation, particle characteristics, organics, secondary and minor components, fill, contamination, odour.	CONSISTENCY	DENSITY INDEX	TYPE	DEPTH (M)	RESULTS AND ADDITIONAL OBSERVATIONS
A	Nil	N	-	0.18				ASPHALT AND ROAD BASE GRAVELS		D	A	0.2	2316/17/ 0.2
A	Nil	N	M	0.45			XX SM	SILTY SAND FILL - Yellow/brown, gravels and shells (20%), tree roots.		MD			
A	Nil	N	M	1.0			XX SP	SAND FILL – Light brown, medium grained, minor shell fragments, medium dense.		MD	A	0.5	2316/17/ 0.5
				1.4							A	1.0	2316/17/ 1.0
								Borehole terminated at 1.4m on sand fill.					
				2.0									
				3.0									
				4.0									
				4.5									

EQUIPMENT / METHOD
N Natural exposure
X Existing excavation
BH Backhoe bucket
E Excavator
HA Hand auger
S Hand spade
PT Push tube
A Auger
CC Concrete Corer

SUPPORT
SH Shoring
SC Shotcrete
RB Rock Bolts
Nil No support

WATER
N None observed
X Not measured
Water level
Water outflow
Water inflow

MOISTURE
D Dry
M Moist
W Wet
Wp Plastic limit
Wl Liquid limit

PENETRATION
L Low
M Moderate
H High
R Refusal

CONSISTENCY
VS Very Soft
S Soft
F Firm
St Stiff
VSt Very Stiff
H Hard
F Friable

DENSITY
VL Very Loose
L Loose
MD Medium Dense
D Dense
VD Very Dense

SAMPLING & TESTING
A Auger sample
B Bulk sample
U Undisturbed sample
D Disturbed sample
M Moisture content
Ux Tube sample (x mm)

pp Pocket penetrometer
S Standard penetration test
VS Vane shear
DCP Dynamic cone penetrometer
FD Field density
WS Water sample

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
Y USCS
N Agricultural

EXCAVATION LOG TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

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Engineering Log - Borehole

CLIENT	Manidis Roberts	**COMMENCED**	4/5/09	**COMPLETED**	4/5/09	**REF**	**BH18**
PROJECT	Engineering services	**LOGGED**	GT/JF	**CHECKED**	JF/AN	**Sheet**	1 of 2
SITE	Settlement City Shopping Centre, Port Macquarie	**GEOLOGY**	Quaternary Alluvium	**VEGETATION**	None	**PROJECT NO.**	P0902316
EQUIPMENT	Hydraulic Auger	**EASTING**	NA	**RL SURFACE**	NA		
EXCAVATION DIMENSIONS	Ø 0.1m X 9.0m depth	**NORTHING**	NA	**ASPECT**	North East	**SLOPE**	0-1%

EXCAVATION DATA						MATERIAL DATA				SAMPLING & TESTING			
METHOD	SUPPORT	WATER	MOISTURE	DEPTH (M)	PENETRATION RESISTANCE (L M H R)	GRAPHIC LOG	CLASSIFICATION	DESCRIPTION OF STRATA Soil type, texture, structure, mottling, colour, plasticity, rocks, oxidation, particle characteristics, organics, secondary and minor components, fill, contamination, odour.	CONSISTENCY	DENSITY INDEX	TYPE	DEPTH (M)	RESULTS AND ADDITIONAL OBSERVATIONS
A	Nil	N	-	0.1			GM	BITUMEN/ROAD BASE					
A	Nil	N	M	0.4			XX CL	SANDY CLAY (FILL) – Dark brown/orange, gravels, medium to coarse grained sands.	F-St		A	0.2	2316/18/0.2
A	Nil	N	D	1.0 2.0 2.4 2.5			XX SP	SAND FILL – Light brown, medium grained, minor shell fragments, medium dense.		MD	A A A A	0.5 1.0 1.5 2.0 2.5	2316/18/0.5 2316/18/1.0 1.0 2316/18/1.5 + Z2 2316/18/2.0 2.0 Ground water observed at 2.4m below ground level. 2316/18/2.5
A	Nil	-	W	3.0 4.0 4.2			CL	SANDY CLAY - Dark grey, medium grained sand (50%), strong sulfur odour, soft, some organics, natural soils.	S		A	3.0	2316/18/3.0 3.0 4.0
A	Nil	-	W	4.5			SM	SILTY SAND - Dark grey, wet, medium dense, strong sulfur odour, minor clay content.		MD	A	4.5	2316/18/4.5 SPOS = 0.58 4.5

EQUIPMENT / METHOD
N Natural exposure
X Existing excavation
BH Backhoe bucket
E Excavator
HA Hand auger
S Hand spade
PT Push tube
A Auger
CC Concrete Corer

SUPPORT
SH Shoring
SC Shotcrete
RB Rock Bolts
Nil No support

WATER
N None observed
X Not measured
Water level
Water outflow
Water inflow

MOISTURE
D Dry
M Moist
W Wet
Wp Plastic limit
Wl Liquid limit

PENETRATION
L Low
M Moderate
H High
R Refusal

CONSISTENCY
VS Very Soft
S Soft
F Firm
St Stiff
VSt Very Stiff
H Hard
F Friable

DENSITY
VL Very Loose
L Loose
MD Medium Dense
D Dense
VD Very Dense

SAMPLING & TESTING
A Auger sample
B Bulk sample
U Undisturbed sample
D Disturbed sample
M Moisture content
Ux Tube sample (x mm)

pp Pocket penetrometer
S Standard penetration test
VS Vane shear
DCP Dynamic cone penetrometer
FD Field density
WS Water sample

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
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N Agricultural

EXCAVATION LOG TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

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Engineering Log - Borehole

CLIENT	Manidis Roberts	**COMMENCED**	4/5/09	**COMPLETED**	4/5/09	**REF**	**BH18**
PROJECT	Engineering services	**LOGGED**	GT/JF	**CHECKED**	JF/AN	**Sheet**	2 of 2
SITE	Settlement City Shopping Centre, Port Macquarie	**GEOLOGY**	Quaternary Alluvium	**VEGETATION**	None	**PROJECT NO.**	P0902316
EQUIPMENT	Hydraulic Auger	**EASTING**	NA	**RL SURFACE**	NA		
EXCAVATION DIMENSIONS	Ø 0.1m X 9.0m depth	**NORTHING**	NA	**ASPECT**	North East	**SLOPE**	0-1%

EXCAVATION DATA						MATERIAL DATA					SAMPLING & TESTING		
METHOD	SUPPORT	WATER	MOISTURE	DEPTH (M)	PENETRATION RESISTANCE (L M H R)	GRAPHIC LOG	CLASSIFICATION	DESCRIPTION OF STRATA Soil type, texture, structure, mottling, colour, plasticity, rocks, oxidation, particle characteristics, organics, secondary and minor components, fill, contamination, odour.	CONSISTENCY	DENSITY INDEX	TYPE	DEPTH (M)	RESULTS AND ADDITIONAL OBSERVATIONS
A	Nil	-	W	4.5 5.0 5.5			SM	SILTY SAND - Dark grey, wet, medium dense, strong sulfur odour, minor clay content, medium grained.		MD			
A	Nil	-	W	6.0 7.0 8.0 9.0			SM	SILTY SAND - Brown, wet, medium dense, strong sulfur odour, minor clay content, medium grained. Borehole terminated at 9.0m on silty sand.		MD	A A	6.0 9.0	2316/18/ 6.0 2316/18/ 9.0

EQUIPMENT / METHOD
N Natural exposure
X Existing excavation
BH Backhoe bucket
E Excavator
HA Hand auger
S Hand spade
PT Push tube
A Auger
CC Concrete Corer

SUPPORT
SH Shoring
SC Shotcrete
RB Rock Bolts
Nil No support

WATER
N None observed
X Not measured
Water level
Water outflow
Water inflow

MOISTURE
D Dry
M Moist
W Wet
Wp Plastic limit
Wl Liquid limit

PENETRATION
L Low
M Moderate
H High
R Refusal

CONSISTENCY
VS Very Soft
S Soft
F Firm
St Stiff
VSt Very Stiff
H Hard
F Friable

DENSITY
VL Very Loose
L Loose
MD Medium Dense
D Dense
VD Very Dense

SAMPLING & TESTING
A Auger sample
B Bulk sample
U Undisturbed sample
D Disturbed sample
M Moisture content
Ux Tube sample (x mm)

pp Pocket penetrometer
S Standard penetration test
VS Vane shear
DCP Dynamic cone penetrometer
FD Field density
WS Water sample

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
Y USCS
N Agricultural

EXCAVATION LOG TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

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Engineering Log - Borehole

CLIENT	**Manidis Roberts**	**COMMENCED**	4/5/09	**COMPLETED**	4/5/09	**REF**	**BH19**
PROJECT	**Engineering services**	**LOGGED**	GT/JF	**CHECKED**	JF/AN	**Sheet**	**1 of 1**
SITE	**Settlement City Shopping Centre, Port Macquarie**	**GEOLOGY**	Quaternary Alluvium	**VEGETATION**	None	**PROJECT NO.**	P0902316
EQUIPMENT	Hydraulic Auger	**EASTING**	NA	**RL SURFACE**	NA		
EXCAVATION DIMENSIONS	Ø 0.1m X 1.4m depth	**NORTHING**	NA	**ASPECT**	North East	**SLOPE**	0-1%

EXCAVATION DATA						MATERIAL DATA				SAMPLING & TESTING			
METHOD	SUPPORT	WATER	MOISTURE	DEPTH (M)	PENETRATION RESISTANCE (L M H R)	GRAPHIC LOG	CLASSIFICATION	DESCRIPTION OF STRATA Soil type, texture, structure, mottling, colour, plasticity, rocks, oxidation, particle characteristics, organics, secondary and minor components, fill, contamination, odour.	CONSISTENCY	DENSITY INDEX	TYPE	DEPTH (M)	RESULTS AND ADDITIONAL OBSERVATIONS
A	Nil	N	-	0.15			GM	ASPHALT AND ROAD BASE GRAVELS					
A	Nil	N	D	0.6			XX SM	SILTY SAND FILL - Dark brown, gravels (1-15mm, approx 15%), dry.		MD	A	0.2	2316/19/ 0.2
											A	0.5	2316/19/ 0.5
A	Nil	N	M	1.0			XX SP	SAND FILL – Light brown, medium grained, minor shell fragments, medium dense.		MD			1.0
				1.4							A	1.4	2316/19/ 1.4
								Borehole terminated at 1.4m on sand fill.					
				2.0									2.0
				3.0									3.0
				4.0									4.0
				4.5									4.5

EQUIPMENT / METHOD
N Natural exposure
X Existing excavation
BH Backhoe bucket
E Excavator
HA Hand auger
S Hand spade
PT Push tube
A Auger
CC Concrete Corer

SUPPORT
SH Shoring
SC Shotcrete
RB Rock Bolts
Nil No support

WATER
N None observed
X Not measured
Water level
Water outflow
Water inflow

MOISTURE
D Dry
M Moist
W Wet
Wp Plastic limit
Wl Liquid limit

PENETRATION
L Low
M Moderate
H High
R Refusal

CONSISTENCY
VS Very Soft
S Soft
F Firm
St Stiff
VSt Very Stiff
H Hard
F Friable

DENSITY
VL Very Loose
L Loose
MD Medium Dense
D Dense
VD Very Dense

SAMPLING & TESTING
A Auger sample
B Bulk sample
U Undisturbed sample
D Disturbed sample
M Moisture content
Ux Tube sample (x mm)
pp Pocket penetrometer
S Standard penetration test
VS Vane shear
DCP Dynamic cone penetrometer
FD Field density
WS Water sample

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
Y USCS
N Agricultural

EXCAVATION LOG TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

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Engineering Log - Borehole

CLIENT	**Manidis Roberts**	**COMMENCED**	5/5/09	**COMPLETED**	5/5/09	**REF**	**BH20**
PROJECT	**Engineering services**	**LOGGED**	GT/JF	**CHECKED**	JF/AN	**Sheet**	**1 of 1**
SITE	**Settlement City Shopping Centre, Port Macquarie**	**GEOLOGY**	Quaternary Alluvium	**VEGETATION**	None	**PROJECT NO.**	P0902316
EQUIPMENT	Hydraulic Auger	**EASTING**	NA	**RL SURFACE**	NA		
EXCAVATION DIMENSIONS	Ø 0.1m X 1.4m depth	**NORTHING**	NA	**ASPECT**	North East	**SLOPE**	0-1%

EXCAVATION DATA						MATERIAL DATA				SAMPLING & TESTING			
METHOD	SUPPORT	WATER	MOISTURE	DEPTH (M)	PENETRATION RESISTANCE (L M H R)	GRAPHIC LOG	CLASSIFICATION	DESCRIPTION OF STRATA Soil type, texture, structure, mottling, colour, plasticity, rocks, oxidation, particle characteristics, organics, secondary and minor components, fill, contamination, odour.	CONSISTENCY	DENSITY INDEX	TYPE	DEPTH (M)	RESULTS AND ADDITIONAL OBSERVATIONS
A	Nil	N	M	0.1			GM	BITUMEN AND ROAD BASE.		D			
A	Nil	N	M	0.2			XX	CRUSHED SANDSTONE – Yellow, gravels.		D			
A	Nil	N	M	0.45			XX SM	SILTY SAND FILL – Brown/red, gravels (1-10mm, approx 15%).		L	A	0.25	2316/20/0.25
A	Nil	N	M	1.0 1.4			XX SP	SAND FILL – Light brown, medium grained, minor shell fragments, medium dense.		MD	A A	0.5 1.0	2316/20/ 0.5 2316/20/ 1.0
				2.0 3.0 4.0 4.5				Borehole terminated at 1.4m on sand fill.					

EQUIPMENT / METHOD
N Natural exposure
X Existing excavation
BH Backhoe bucket
E Excavator
HA Hand auger
S Hand spade
PT Push tube
A Auger
CC Concrete Corer

SUPPORT
SH Shoring
SC Shotcrete
RB Rock Bolts
Nil No support

WATER
N None observed
X Not measured
Water level
Water outflow
Water inflow

MOISTURE
D Dry
M Moist
W Wet
Wp Plastic limit
Wl Liquid limit

PENETRATION
L Low
M Moderate
H High
R Refusal

CONSISTENCY
VS Very Soft
S Soft
F Firm
St Stiff
VSt Very Stiff
H Hard
F Friable

DENSITY
VL Very Loose
L Loose
MD Medium Dense
D Dense
VD Very Dense

SAMPLING & TESTING
A Auger sample
B Bulk sample
U Undisturbed sample
D Disturbed sample
M Moisture content
Ux Tube sample (x mm)

pp Pocket penetrometer
S Standard penetration test
VS Vane shear
DCP Dynamic cone penetrometer
FD Field density
WS Water sample

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
Y USCS
N Agricultural

EXCAVATION LOG TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

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Engineering Log - Borehole

CLIENT	Manidis Roberts	COMMENCED	4/5/09	COMPLETED	4/5/09	**REF**	**BH21**
PROJECT	Engineering services	LOGGED	GT/JF	CHECKED	JF/AN	Sheet	1 of 1
SITE	Settlement City Shopping Centre, Port Macquarie	GEOLOGY	Quaternary Alluvium	VEGETATION	None	PROJECT NO.	P0902316
EQUIPMENT	Hydraulic Auger	EASTING	NA	RL SURFACE	NA		
EXCAVATION DIMENSIONS	Ø 0.1m X 1.5m depth	NORTHING	NA	ASPECT	North East	SLOPE	0-1%

EXCAVATION DATA						MATERIAL DATA					SAMPLING & TESTING		
METHOD	SUPPORT	WATER	MOISTURE	DEPTH (M)	PENETRATION RESISTANCE (L M H R)	GRAPHIC LOG	CLASSIFICATION	DESCRIPTION OF STRATA Soil type, texture, structure, mottling, colour, plasticity, rocks, oxidation, particle characteristics, organics, secondary and minor components, fill, contamination, odour.	CONSISTENCY	DENSITY INDEX	TYPE	DEPTH (M)	RESULTS AND ADDITIONAL OBSERVATIONS
A	Nil	N	-	0.05			GM	BITUMEN AND ROAD BASE.		D			
A	Nil	N	M	0.15			XX	CRUSHED SANDSTONE FILL		D			
A	Nil	N	M	0.45			XX SM	SILTY SAND FILL – Brown, gravels (1-15mm, approx 20%), loose.		L	A	0.2	2316/21/ 0.2
A	Nil	N 1.2 ▽	M	1.0			XX SP	SAND FILL – Light brown and yellow, medium grained, minor shell fragments, medium dense, wet from 1.2m.		MD	A	0.5	2316/21/ 0.5 Ground water observed at 1.2m below ground level. 2316/21/ 1.4
				1.5				Borehole terminated at 1.5m on sands fill.					
				2.0									
				3.0									
				4.0									
				4.5									

EQUIPMENT / METHOD
N Natural exposure
X Existing excavation
BH Backhoe bucket
E Excavator
HA Hand auger
S Hand spade
PT Push tube
A Auger
CC Concrete Corer

SUPPORT
SH Shoring
SC Shotcrete
RB Rock Bolts
Nil No support

WATER
N None observed
X Not measured
▽ Water level
◁ Water outflow
▷ Water inflow

MOISTURE
D Dry
M Moist
W Wet
Wp Plastic limit
Wl Liquid limit

PENETRATION
L Low
M Moderate
H High
R Refusal

CONSISTENCY
VS Very Soft
S Soft
F Firm
St Stiff
VSt Very Stiff
H Hard
F Friable

DENSITY
VL Very Loose
L Loose
MD Medium Dense
D Dense
VD Very Dense

SAMPLING & TESTING
A Auger sample
B Bulk sample
U Undisturbed sample
D Disturbed sample
M Moisture content
Ux Tube sample (x mm)
pp Pocket penetrometer
S Standard penetration test
VS Vane shear
DCP Dynamic cone penetrometer
FD Field density
WS Water sample

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
Y USCS
N Agricultural

EXCAVATION LOG TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

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Engineering Log - Borehole

CLIENT	Manidis Roberts	**COMMENCED**	4/5/09	**COMPLETED**	4/5/09	**REF**	**BH22**
PROJECT	Engineering services	**LOGGED**	GT/JF	**CHECKED**	JF/AN	**Sheet**	1 of 1
SITE	Settlement City Shopping Centre, Port Macquarie	**GEOLOGY**	Quaternary Alluvium	**VEGETATION**	Grasses	**PROJECT NO.**	P0902316
EQUIPMENT	Hydraulic Auger	**EASTING**	NA	**RL SURFACE**	NA		
EXCAVATION DIMENSIONS	Ø 0.1m X 3.0m depth	**NORTHING**	NA	**ASPECT**	North East	**SLOPE**	0-1%

EXCAVATION DATA						MATERIAL DATA				SAMPLING & TESTING			
METHOD	SUPPORT	WATER	MOISTURE	DEPTH (M)	PENETRATION RESISTANCE (L M H R)	GRAPHIC LOG	CLASSIFICATION	DESCRIPTION OF STRATA Soil type, texture, structure, mottling, colour, plasticity, rocks, oxidation, particle characteristics, organics, secondary and minor components, fill, contamination, odour.	CONSISTENCY	DENSITY INDEX	TYPE	DEPTH (M)	RESULTS AND ADDITIONAL OBSERVATIONS
A	Nil	N	-	0.15			GM	ASPHALT AND ROAD BASE GRAVELS		D			
A	Nil	N	D	0.35			XX SM	SILTY SAND FILL – Red/orange/brown, gravels (1-10mm, approx 10%).		MD			
A	Nil	N	D	1.0			XX SP	SAND FILL – Light brown, medium grained, minor shell fragments, medium dense, no smell.		MD	A	0.5	2316/22/ 0.5
			M								A	1.5	2316/22/ 1.5
		1.95 ▽		1.9									
A	Nil	Y	W	2.0			SW	SAND – Grey, medium to coarse grained, minor shell fragments (approx 20%), natural soils.		L/ MD	A	2.0	Ground water observed at 1.95m below ground level. 2316/22/ 2.0
				2.4									
A	Nil	-	W	2.6			CL	SANDY CLAY - Brown, medium grained sand (50%), strong sulfur odour, soft.	S		A	2.5	2316/22/ 2.5 + Z6
A	Nil	-	W	3.0			SW	SAND - Grey, medium to course grained, shells (approx 20%), medium dense.		MD	A	3.0	2316/22/ 3.0
				4.0				Borehole terminated at 3.0m on sand.					
				4.5									

EQUIPMENT / METHOD
N Natural exposure
X Existing excavation
BH Backhoe bucket
E Excavator
HA Hand auger
S Hand spade
PT Push tube
A Auger
CC Concrete Corer

SUPPORT
SH Shoring
SC Shotcrete
RB Rock Bolts
Nil No support

WATER
N None observed
X Not measured
▽ Water level
◁ Water outflow
▷ Water inflow

MOISTURE
D Dry
M Moist
W Wet
Wp Plastic limit
Wl Liquid limit

PENETRATION
L Low
M Moderate
H High
R Refusal

CONSISTENCY
VS Very Soft
S Soft
F Firm
St Stiff
VSt Very Stiff
H Hard
F Friable

DENSITY
VL Very Loose
L Loose
MD Medium Dense
D Dense
VD Very Dense

SAMPLING & TESTING
A Auger sample
B Bulk sample
U Undisturbed sample
D Disturbed sample
M Moisture content
Ux Tube sample (x mm)
pp Pocket penetrometer
S Standard penetration test
VS Vane shear
DCP Dynamic cone penetrometer
FD Field density
WS Water sample

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
Y USCS
N Agricultural

EXCAVATION LOG TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

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Engineering Log - Borehole

CLIENT	Manidis Roberts	**COMMENCED**	4/5/09	**COMPLETED**	4/5/09	**REF**	**BH23**
PROJECT	Engineering services	**LOGGED**	GT/JF	**CHECKED**	JF/AN	**Sheet**	1 of 1
SITE	Settlement City Shopping Centre, Port Macquarie	**GEOLOGY**	Quaternary Alluvium	**VEGETATION**	Grasses	**PROJECT NO.**	P0902316
EQUIPMENT	Hydraulic Auger	**EASTING**	NA	**RL SURFACE**	NA		
EXCAVATION DIMENSIONS	Ø 0.1m X 1.5m depth	**NORTHING**	NA	**ASPECT**	North East	**SLOPE**	0-1%

EXCAVATION DATA						MATERIAL DATA				SAMPLING & TESTING			
METHOD	SUPPORT	WATER	MOISTURE	DEPTH (M)	PENETRATION RESISTANCE (L M H R)	GRAPHIC LOG	CLASSIFICATION	DESCRIPTION OF STRATA Soil type, texture, structure, mottling, colour, plasticity, rocks, oxidation, particle characteristics, organics, secondary and minor components, fill, contamination, odour.	CONSISTENCY	DENSITY INDEX	TYPE	DEPTH (M)	RESULTS AND ADDITIONAL OBSERVATIONS
A	Nil	N	-	0.13			GM	ASPHALT AND ROAD BASE GRAVELS		D			
A	Nil	N	M	0.6			XX SM	SILTY SANDY CLAY FILL – Dark brown, sands (25%), tree roots, gravels (1-10mm, approx 15%).		MD	A A	0.2 0.5	2316/23/ 0.2 2316/23/ 0.5
A	Nil	N	M	1.0 1.5			XX SP	SAND FILL – Light brown, medium grained, minor shell fragments, medium dense, no smell.		MD	A	1.5	2316/23/ 1.5 + Z5
				2.0 3.0 4.0 4.5				Borehole terminated at 1.5m on sand fill.					

EQUIPMENT / METHOD
N Natural exposure
X Existing excavation
BH Backhoe bucket
E Excavator
HA Hand auger
S Hand spade
PT Push tube
A Auger
CC Concrete Corer

SUPPORT
SH Shoring
SC Shotcrete
RB Rock Bolts
Nil No support

WATER
N None observed
X Not measured
Water level
Water outflow
Water inflow

MOISTURE
D Dry
M Moist
W Wet
Wp Plastic limit
Wl Liquid limit

PENETRATION
L Low
M Moderate
H High
R Refusal

CONSISTENCY
VS Very Soft
S Soft
F Firm
St Stiff
VSt Very Stiff
H Hard
F Friable

DENSITY
VL Very Loose
L Loose
MD Medium Dense
D Dense
VD Very Dense

SAMPLING & TESTING
A Auger sample
B Bulk sample
U Undisturbed sample
D Disturbed sample
M Moisture content
Ux Tube sample (x mm)
pp Pocket penetrometer
S Standard penetration test
VS Vane shear
DCP Dynamic cone penetrometer
FD Field density
WS Water sample

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
Y USCS
N Agricultural

EXCAVATION LOG TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

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Engineering Log - Borehole

CLIENT	Manidis Roberts	**COMMENCED**	4/5/09	**COMPLETED**	4/5/09	**REF**	**BH24**
PROJECT	Engineering services	**LOGGED**	GT/JF	**CHECKED**	JF/AN	**Sheet**	1 of 1
SITE	Settlement City Shopping Centre, Port Macquarie	**GEOLOGY**	Quaternary Alluvium	**VEGETATION**	None	**PROJECT NO.**	P0902316
EQUIPMENT	Hydraulic Auger	**EASTING**	NA	**RL SURFACE**	NA		
EXCAVATION DIMENSIONS	Ø 0.1m X 4.5m depth	**NORTHING**	NA	**ASPECT**	North East	**SLOPE**	0-1%

EXCAVATION DATA						MATERIAL DATA					SAMPLING & TESTING			
METHOD	SUPPORT	WATER	MOISTURE	DEPTH (M)	PENETRATION RESISTANCE (L M H R)	GRAPHIC LOG	CLASSIFICATION	DESCRIPTION OF STRATA Soil type, texture, structure, mottling, colour, plasticity, rocks, oxidation, particle characteristics, organics, secondary and minor components, fill, contamination, odour.	CONSISTENCY	DENSITY INDEX	TYPE	DEPTH (M)	RESULTS AND ADDITIONAL OBSERVATIONS
A	Nil	N	-	0.1			GM	BITUMEN/ROAD BASE		D			
A	Nil	N	D	0.6			XX SM	SILTY SAND FILL – Light brown/brown, gravels.		MD			
A	Nil	N	M	1.0 1.5			XX SP	SAND FILL – Light brown, medium grained, minor shell fragments, medium dense.		MD	A	0.7	2316/24/0.7 1.0 A 1.4 2316/24/1.4 SPOS = <0.005
A	Nil	N 2.0 Y	M	2.0 2.5			SP	SAND – Light grey, medium to coarse grained, minor shell fragments (approx 20%), natural soils.		L/ MD	A	2.0	2316/24/2.0 2.0 Ground water observed at 2.0m below ground level.
A	Nil	-	W	2.9			CL	SANDY CLAY - Dark grey, medium grained sand (50%), slight sulfur odour, soft, some organics.	S		A	2.8	2316/24/2.8
A	Nil	-	W	3.0 3.6			SW	SAND - Grey with minor clay content, wet, dense, medium grained.		MD			3.0
A	Nil	-	W	4.0 4.5			SM	SILTY SAND - Dark grey, wet, medium dense, strong sulfur odour, minor clay content. Borehole terminated at 4.5m on silty sand.		MD	A	4.5	4.0 2316/24/4.5 4.5

EQUIPMENT / METHOD
N Natural exposure
X Existing excavation
BH Backhoe bucket
E Excavator
HA Hand auger
S Hand spade
PT Push tube
A Auger
CC Concrete Corer

SUPPORT
SH Shoring
SC Shotcrete
RB Rock Bolts
Nil No support

WATER
N None observed
X Not measured
Water level
Water outflow
Water inflow

MOISTURE
D Dry
M Moist
W Wet
Wp Plastic limit
Wl Liquid limit

PENETRATION
L Low
M Moderate
H High
R Refusal

CONSISTENCY
VS Very Soft
S Soft
F Firm
St Stiff
VSt Very Stiff
H Hard
F Friable

DENSITY
VL Very Loose
L Loose
MD Medium Dense
D Dense
VD Very Dense

SAMPLING & TESTING
A Auger sample
B Bulk sample
U Undisturbed sample
D Disturbed sample
M Moisture content
Ux Tube sample (x mm)
pp Pocket penetrometer
S Standard penetration test
VS Vane shear
DCP Dynamic cone penetrometer
FD Field density
WS Water sample

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
Y USCS
N Agricultural

EXCAVATION LOG TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

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Engineering Log - Borehole

CLIENT	**Manidis Roberts**	**COMMENCED**	4/5/09	**COMPLETED**	4/5/09	**REF**	**BH25**
PROJECT	**Engineering services**	**LOGGED**	GT/JF	**CHECKED**	JF/AN	**Sheet**	**1 of 1**
SITE	**Settlement City Shopping Centre, Port Macquarie**	**GEOLOGY**	Quaternary Alluvium	**VEGETATION**	None	**PROJECT NO.**	P0902316
EQUIPMENT	Hydraulic Auger	**EASTING**	NA	**RL SURFACE**	NA		
EXCAVATION DIMENSIONS	Ø 0.1m X 1.5m depth	**NORTHING**	NA	**ASPECT**	North East	**SLOPE**	0-1%

EXCAVATION DATA						MATERIAL DATA				SAMPLING & TESTING			
METHOD	SUPPORT	WATER	MOISTURE	DEPTH (M)	PENETRATION RESISTANCE (L M H R)	GRAPHIC LOG	CLASSIFICATION	DESCRIPTION OF STRATA Soil type, texture, structure, mottling, colour, plasticity, rocks, oxidation, particle characteristics, organics, secondary and minor components, fill, contamination, odour.	CONSISTENCY	DENSITY INDEX	TYPE	DEPTH (M)	RESULTS AND ADDITIONAL OBSERVATIONS
A	Nil	N	-	0.15			GM	ASPHALT AND ROAD BASE GRAVELS		D	A	0.2	2316/25/ 0.2
A	Nil	N	D	0.4			XX SM	SILTY SAND FILL - Yellow/brown, gravels and shells (20%).		MD			
A	Nil	N	M	1.0			XX SP	SAND FILL – Light brown, medium grained, minor shell fragments, medium dense.		MD	A A	0.5 1.0	2316/25/ 0.5 2316/25/ 1.0
				1.5				Borehole terminated at 1.5m on sand fill.					
				2.0									
				3.0									
				4.0									
				4.5									

EQUIPMENT / METHOD
N Natural exposure
X Existing excavation
BH Backhoe bucket
E Excavator
HA Hand auger
S Hand spade
PT Push tube
A Auger
CC Concrete Corer

SUPPORT
SH Shoring
SC Shotcrete
RB Rock Bolts
Nil No support

WATER
N None observed
X Not measured
Water level
Water outflow
Water inflow

MOISTURE
D Dry
M Moist
W Wet
Wp Plastic limit
Wl Liquid limit

PENETRATION
L Low
M Moderate
H High
R Refusal

CONSISTENCY
VS Very Soft
S Soft
F Firm
St Stiff
VSt Very Stiff
H Hard
F Friable

DENSITY
VL Very Loose
L Loose
MD Medium Dense
D Dense
VD Very Dense

SAMPLING & TESTING
A Auger sample
B Bulk sample
U Undisturbed sample
D Disturbed sample
M Moisture content
Ux Tube sample (x mm)
pp Pocket penetrometer
S Standard penetration test
VS Vane shear
DCP Dynamic cone penetrometer
FD Field density
WS Water sample

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
Y USCS
N Agricultural

EXCAVATION LOG TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

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Engineering Log - Borehole

CLIENT	Manidis Roberts	COMMENCED	4/5/09	COMPLETED	4/5/09	**REF**	**BH26**
PROJECT	Engineering services	LOGGED	GT/JF	CHECKED	JF/AN	Sheet	1 of 1
SITE	Settlement City Shopping Centre, Port Macquarie	GEOLOGY	Quaternary Alluvium	VEGETATION	None	PROJECT NO.	P0902316
EQUIPMENT	Hydraulic Auger	EASTING	NA	RL SURFACE	NA		
EXCAVATION DIMENSIONS	Ø 0.1m X 1.4m depth	NORTHING	NA	ASPECT	North East	SLOPE	0-1%

EXCAVATION DATA						MATERIAL DATA					SAMPLING & TESTING		
METHOD	SUPPORT	WATER	MOISTURE	DEPTH (M)	PENETRATION RESISTANCE (L M H R)	GRAPHIC LOG	CLASSIFICATION	DESCRIPTION OF STRATA Soil type, texture, structure, mottling, colour, plasticity, rocks, oxidation, particle characteristics, organics, secondary and minor components, fill, contamination, odour.	CONSISTENCY	DENSITY INDEX	TYPE	DEPTH (M)	RESULTS AND ADDITIONAL OBSERVATIONS
A	Nil	N	-	0.13			GM	ASPHALT AND ROAD BASE GRAVELS		D	A	0.2	2316/26/ 0.2
A	Nil	N	D	0.3			XX SM	SILTY SAND FILL - Yellow/brown, gravels and shells (20%).		MD			
A	Nil	N	M	1.0			XX SP	SAND FILL – Light brown, medium grained, minor shell fragments, medium dense, wet from 1.3m.		MD	A	0.5	2316/26/ 0.5 +Z4
				1.4							A	1.0	2316/26/ 1.0
				2.0				Borehole terminated at 1.4m on sand fill.					
				3.0									
				4.0									
				4.5									

EQUIPMENT / METHOD
N Natural exposure
X Existing excavation
BH Backhoe bucket
E Excavator
HA Hand auger
S Hand spade
PT Push tube
A Auger
CC Concrete Corer

SUPPORT
SH Shoring
SC Shotcrete
RB Rock Bolts
Nil No support

WATER
N None observed
X Not measured
Water level
Water outflow
Water inflow

MOISTURE
D Dry
M Moist
W Wet
Wp Plastic limit
Wl Liquid limit

PENETRATION
L Low
M Moderate
H High
R Refusal

CONSISTENCY
VS Very Soft
S Soft
F Firm
St Stiff
VSt Very Stiff
H Hard
F Friable

DENSITY
VL Very Loose
L Loose
MD Medium Dense
D Dense
VD Very Dense

SAMPLING & TESTING
A Auger sample
B Bulk sample
U Undisturbed sample
D Disturbed sample
M Moisture content
Ux Tube sample (x mm)

pp Pocket penetrometer
S Standard penetration test
VS Vane shear
DCP Dynamic cone penetrometer
FD Field density
WS Water sample

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
Y USCS
N Agricultural

EXCAVATION LOG TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

Quality Sheet No. 4

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Engineering Log - Borehole

CLIENT	Manidis Roberts	**COMMENCED**	4/5/09	**COMPLETED**	4/5/09	**REF**	**BH27**
PROJECT	Engineering services	**LOGGED**	GT/JF	**CHECKED**	JF/AN	**Sheet**	1 of 2
SITE	Settlement City Shopping Centre, Port Macquarie	**GEOLOGY**	Quaternary Alluvium	**VEGETATION**	None	**PROJECT NO.**	P0902316
EQUIPMENT	Hydraulic Auger	**EASTING**	NA	**RL SURFACE**	NA		
EXCAVATION DIMENSIONS	Ø 0.1m X 7.5m depth	**NORTHING**	NA	**ASPECT**	North East	**SLOPE**	0-1%

EXCAVATION DATA						MATERIAL DATA				SAMPLING & TESTING			
METHOD	SUPPORT	WATER	MOISTURE	DEPTH (M)	PENETRATION RESISTANCE (L M H R)	GRAPHIC LOG	CLASSIFICATION	DESCRIPTION OF STRATA Soil type, texture, structure, mottling, colour, plasticity, rocks, oxidation, particle characteristics, organics, secondary and minor components, fill, contamination, odour.	CONSISTENCY	DENSITY INDEX	TYPE	DEPTH (M)	RESULTS AND ADDITIONAL OBSERVATIONS
A	Nil	N	-	0.2			XX GM	BITUMEN/ROAD BASE		D			
A	Nil	N	M	0.5			XX SM	SILTY SAND FILL – Dark brown, red, medium dense, dry, minor gravels.		MD			
A	Nil	N 1.4	M	1.0 1.6			XX SP	SAND FILL – Light brown, medium grained, minor shell fragments, medium dense.		MD	A	1.0	2316/27/ 1.0 Ground water observed at 1.4m below ground level.
A	Nil	-	W	1.9			SP	SAND – Grey, medium to coarse grained, minor shell fragments (approx 20%).		L/ MD			
A	Nil	-	W	2.0 2.4			CL	SANDY CLAY - Dark grey, medium grained sand (40%), strong sulfur odour, soft.	S				
A	Nil	-	W	3.0 3.2			SP	SAND - Grey with minor clay content, wet, dense, medium grained.		L/ MD	A	2.7	2316/27/ 2.7
A	Nil	-	W	4.0 4.4			SM	SILTY SAND - Dark grey, wet, medium dense, strong sulfur odour, minor clay content.		MD	A A	3.5 4.0	2316/27/ 3.5 2316/27/ 4.0
A	Nil	-	W	4.5			SM	SILTY SAND - Dark brown, wet.		MD			

EQUIPMENT / METHOD
N Natural exposure
X Existing excavation
BH Backhoe bucket
E Excavator
HA Hand auger
S Hand spade
PT Push tube
A Auger
CC Concrete Corer

SUPPORT
SH Shoring
SC Shotcrete
RB Rock Bolts
Nil No support

WATER
N None observed
X Not measured
Water level
Water outflow
Water inflow

MOISTURE
D Dry
M Moist
W Wet
Wp Plastic limit
Wl Liquid limit

PENETRATION
L Low
M Moderate
H High
R Refusal

CONSISTENCY
VS Very Soft
S Soft
F Firm
St Stiff
VSt Very Stiff
H Hard
F Friable

DENSITY
VL Very Loose
L Loose
MD Medium Dense
D Dense
VD Very Dense

SAMPLING & TESTING
A Auger sample
B Bulk sample
U Undisturbed sample
D Disturbed sample
M Moisture content
Ux Tube sample (x mm)
pp Pocket penetrometer
S Standard penetration test
VS Vane shear
DCP Dynamic cone penetrometer
FD Field density
WS Water sample

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
Y USCS
N Agricultural

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Engineering Log - Borehole

CLIENT	Manidis Roberts	**COMMENCED**	4/5/09	**COMPLETED**	4/5/09	**REF**	**BH27**
PROJECT	Engineering services	**LOGGED**	GT/JF	**CHECKED**	JF/AN	**Sheet**	**2** of **2**
SITE	Settlement City Shopping Centre, Port Macquarie	**GEOLOGY**	Quaternary Alluvium	**VEGETATION**	None	**PROJECT NO.**	P0902316
EQUIPMENT	Hydraulic Auger	**EASTING**	NA	**RL SURFACE**	NA		
EXCAVATION DIMENSIONS	Ø 0.1m X 7.5m depth	**NORTHING**	NA	**ASPECT**	North East	**SLOPE**	0-1%

EXCAVATION DATA						MATERIAL DATA				SAMPLING & TESTING		
METHOD	SUPPORT	WATER	MOISTURE	DEPTH (M)	PENETRATION RESISTANCE (L M H R)	GRAPHIC LOG	CLASSIFICATION	DESCRIPTION OF STRATA Soil type, texture, structure, mottling, colour, plasticity, rocks, oxidation, particle characteristics, organics, secondary and minor components, fill, contamination, odour.	CONSISTENCY	DENSITY INDEX	TYPE	DEPTH (M)	RESULTS AND ADDITIONAL OBSERVATIONS
				4.5							A	5.5	2316/27/ 5.5
A	Nil	-	W	6.0			SM	SILTY SAND - Dark brown, wet.		MD			
				7.0									
				7.5							A	7.5	2316/27/ 7.5
								Borehole terminated at 7.5m on silty sand.					
				8.0									
				9.0									

EQUIPMENT / METHOD
N Natural exposure
X Existing excavation
BH Backhoe bucket
E Excavator
HA Hand auger
S Hand spade
PT Push tube
A Auger
CC Concrete Corer

SUPPORT
SH Shoring
SC Shotcrete
RB Rock Bolts
Nil No support

WATER
N None observed
X Not measured
Water level
Water outflow
Water inflow

MOISTURE
D Dry
M Moist
W Wet
Wp Plastic limit
Wl Liquid limit

PENETRATION
L Low
M Moderate
H High
R Refusal

CONSISTENCY
VS Very Soft
S Soft
F Firm
St Stiff
VSt Very Stiff
H Hard
F Friable

DENSITY
VL Very Loose
L Loose
MD Medium Dense
D Dense
VD Very Dense

SAMPLING & TESTING
A Auger sample
B Bulk sample
U Undisturbed sample
D Disturbed sample
M Moisture content
Ux Tube sample (x mm)

pp Pocket penetrometer
S Standard penetration test
VS Vane shear
DCP Dynamic cone penetrometer
FD Field density
WS Water sample

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
Y USCS
N Agricultural

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Engineering Log - Borehole

CLIENT	Manidis Roberts	**COMMENCED**	5/5/09	**COMPLETED**	5/5/09	**REF**	**BH28**
PROJECT	Engineering services	**LOGGED**	GT/JF	**CHECKED**	JF/AN	**Sheet**	1 of 2
SITE	Settlement City Shopping Centre, Port Macquarie	**GEOLOGY**	Quaternary Alluvium	**VEGETATION**	None	**PROJECT NO.**	P0902316
EQUIPMENT	Hydraulic Auger	**EASTING**	NA	**RL SURFACE**	NA		
EXCAVATION DIMENSIONS	Ø 0.1m X 7.5m depth	**NORTHING**	NA	**ASPECT**	North East	**SLOPE**	0-1%

EXCAVATION DATA						MATERIAL DATA					SAMPLING & TESTING			
METHOD	SUPPORT	WATER	MOISTURE	DEPTH (M)	PENETRATION RESISTANCE (L M H R)	GRAPHIC LOG	CLASSIFICATION	DESCRIPTION OF STRATA Soil type, texture, structure, mottling, colour, plasticity, rocks, oxidation, particle characteristics, organics, secondary and minor components, fill, contamination, odour.	CONSISTENCY	DENSITY INDEX	TYPE	DEPTH (M)	RESULTS AND ADDITIONAL OBSERVATIONS	
A	Nil	N	-	0.2			XX	ASPHALT/ROAD BASE		D				
A	Nil	N	M	0.7			XX SP	SAND FILL – Brown red, then cream, moist, medium grained, medium dense.		MD				
A	Nil	N	M	1.0 1.1			XX SP	SAND FILL – Grey, moist, medium dense, medium grained.		MD				1.0
A	Nil	N	M	2.0 2.2			XX SP	SAND FILL – (With some bands of silty sand), dark grey, moist, medium dense, minor organics.		MD	A A	1.5 2.0	2316/28/1.5 2316/28/2.0	2.0
A	Nil	N 2.7 ▽	M	2.7			XX SP	SAND FILL – Brown, red, moist, medium grained.		MD	A	2.5	2316/28/2.5 Ground water observed at 2.7m below ground level.	
A	Nil	-	W	3.0 3.3			CL	SANDY CLAY - Dark grey, medium grained sand (50%), strong sulfur odour, soft, natural soils.	S		A	2.9	2316/28/2.9 SPOS = 0.31	3.0
A	Nil	-	W	4.0 4.5			SP	SAND - Light grey, wet, medium dense, medium grained.		MD	A A	3.5 4.5	2316/28/3.5 2316/28/4.5	4.0 4.5

EQUIPMENT / METHOD
N Natural exposure
X Existing excavation
BH Backhoe bucket
E Excavator
HA Hand auger
S Hand spade
PT Push tube
A Auger
CC Concrete Corer

SUPPORT
SH Shoring
SC Shotcrete
RB Rock Bolts
Nil No support

WATER
N None observed
X Not measured
▽ Water level
◁ Water outflow
▷ Water inflow

MOISTURE
D Dry
M Moist
W Wet
Wp Plastic limit
Wl Liquid limit

PENETRATION
L Low
M Moderate
H High
R Refusal

CONSISTENCY
VS Very Soft
S Soft
F Firm
St Stiff
VSt Very Stiff
H Hard
F Friable

DENSITY
VL Very Loose
L Loose
MD Medium Dense
D Dense
VD Very Dense

SAMPLING & TESTING
A Auger sample
B Bulk sample
U Undisturbed sample
D Disturbed sample
M Moisture content
Ux Tube sample (x mm)
pp Pocket penetrometer
S Standard penetration test
VS Vane shear
DCP Dynamic cone penetrometer
FD Field density
WS Water sample

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
Y USCS
N Agricultural

EXCAVATION LOG TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

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Engineering Log - Borehole

CLIENT	Manidis Roberts	**COMMENCED**	5/5/09	**COMPLETED**	5/5/09	**REF**	**BH28**
PROJECT	Engineering services	**LOGGED**	GT/JF	**CHECKED**	JF/AN	**Sheet**	**2 of 2**
SITE	Settlement City Shopping Centre, Port Macquarie	**GEOLOGY**	Quaternary Alluvium	**VEGETATION**	None	**PROJECT NO.**	P0902316
EQUIPMENT	Hydraulic Auger	**EASTING**	NA	**RL SURFACE**	NA		
EXCAVATION DIMENSIONS	Ø 0.1m X 7.5m depth	**NORTHING**	NA	**ASPECT**	North East	**SLOPE**	0-1%

EXCAVATION DATA						MATERIAL DATA				SAMPLING & TESTING			
METHOD	SUPPORT	WATER	MOISTURE	DEPTH (M)	PENETRATION RESISTANCE (L M H R)	GRAPHIC LOG	CLASSIFICATION	DESCRIPTION OF STRATA Soil type, texture, structure, mottling, colour, plasticity, rocks, oxidation, particle characteristics, organics, secondary and minor components, fill, contamination, odour.	CONSISTENCY	DENSITY INDEX	TYPE	DEPTH (M)	RESULTS AND ADDITIONAL OBSERVATIONS
A	Nil	-	W	4.5			SP	SAND - Light grey, wet, medium dense, medium grained.		MD			4.5
				5.0							A	5.0	2316/28/ 5.0 SPOS = 0.24 5.0
A	Nil	-	W				SP	SAND - Light grey, brown, wet, medium dense, medium grained.		MD			
				5.5									
A	Nil	-	W	6.0			SP	SAND - Red/brown, wet, dense, medium grained, (possibly coffee rock/as depth).		D	A	6.0	2316/28/ 6.0 6.0
				6.5							A	6.5	2316/28/ 6.5
A	Nil	-	W	7.0			SP	SAND - Grey, wet, dense, medium grained.		D			7.0
				7.5							A	7.5	2316/28/ 7.5
								Borehole terminated at 7.5m on sands.					
				8.0									8.0
				9.0									9.0

EQUIPMENT / METHOD
N Natural exposure
X Existing excavation
BH Backhoe bucket
E Excavator
HA Hand auger
S Hand spade
PT Push tube
A Auger
CC Concrete Corer

SUPPORT
SH Shoring
SC Shotcrete
RB Rock Bolts
Nil No support

WATER
N None observed
X Not measured
Water level
Water outflow
Water inflow

MOISTURE
D Dry
M Moist
W Wet
Wp Plastic limit
Wl Liquid limit

PENETRATION
L Low
M Moderate
H High
R Refusal

CONSISTENCY
VS Very Soft
S Soft
F Firm
St Stiff
VSt Very Stiff
H Hard
F Friable

DENSITY
VL Very Loose
L Loose
MD Medium Dense
D Dense
VD Very Dense

SAMPLING & TESTING
A Auger sample
B Bulk sample
U Undisturbed sample
D Disturbed sample
M Moisture content
Ux Tube sample (x mm)

pp Pocket penetrometer
S Standard penetration test
VS Vane shear
DCP Dynamic cone penetrometer
FD Field density
WS Water sample

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
Y USCS
N Agricultural

EXCAVATION LOG TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

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Engineering Log - Borehole

CLIENT	Manidis Roberts	**COMMENCED**	5/5/09	**COMPLETED**	5/5/09	**REF**	**BH29**
PROJECT	Engineering services	**LOGGED**	GT/JF	**CHECKED**	JF/AN	**Sheet**	1 of 1
SITE	Settlement City Shopping Centre, Port Macquarie	**GEOLOGY**	Quaternary Alluvium	**VEGETATION**	None	**PROJECT NO.**	P0902316
EQUIPMENT	Hydraulic Auger	**EASTING**	NA	**RL SURFACE**	NA		
EXCAVATION DIMENSIONS	Ø 0.1m X 1.4m depth	**NORTHING**	NA	**ASPECT**	North East	**SLOPE**	0-1%

EXCAVATION DATA						MATERIAL DATA				SAMPLING & TESTING			
METHOD	SUPPORT	WATER	MOISTURE	DEPTH (M)	PENETRATION RESISTANCE (L M H R)	GRAPHIC LOG	CLASSIFICATION	DESCRIPTION OF STRATA Soil type, texture, structure, mottling, colour, plasticity, rocks, oxidation, particle characteristics, organics, secondary and minor components, fill, contamination, odour.	CONSISTENCY	DENSITY INDEX	TYPE	DEPTH (M)	RESULTS AND ADDITIONAL OBSERVATIONS
A	Nil	N	-	0.3			XX	BITUMEN AND ROAD BASE.		D	A	0.3	2316/29/ 0.3
A	Nil	N	M	0.6			XX SM	SILTY SAND FILL – Brown/red, gravels (1-10mm, approx 15%).		L	A	0.6	2316/29/ 0.6
A	Nil	N	M	1.0			XX SP	SAND FILL – Light brown, medium grained, minor shell fragments, medium dense.		MD	A	1.0	2316/29/ 1.0
				1.4							A	1.4	2316/29/ 1.4
								Borehole terminated at 1.4m on sand fill.					
				2.0									
				3.0									
				4.0									
				4.5									

EQUIPMENT / METHOD
N Natural exposure
X Existing excavation
BH Backhoe bucket
E Excavator
HA Hand auger
S Hand spade
PT Push tube
A Auger
CC Concrete Corer

SUPPORT
SH Shoring
SC Shotcrete
RB Rock Bolts
Nil No support

WATER
N None observed
X Not measured
Water level
Water outflow
Water inflow

MOISTURE
D Dry
M Moist
W Wet
Wp Plastic limit
Wl Liquid limit

PENETRATION
L Low
M Moderate
H High
R Refusal

CONSISTENCY
VS Very Soft
S Soft
F Firm
St Stiff
VSt Very Stiff
H Hard
F Friable

DENSITY
VL Very Loose
L Loose
MD Medium Dense
D Dense
VD Very Dense

SAMPLING & TESTING
A Auger sample
B Bulk sample
U Undisturbed sample
D Disturbed sample
M Moisture content
Ux Tube sample (x mm)

pp Pocket penetrometer
S Standard penetration test
VS Vane shear
DCP Dynamic cone penetrometer
FD Field density
WS Water sample

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
Y USCS
N Agricultural

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Engineering Log - Borehole

CLIENT	Manidis Roberts	COMMENCED	5/5/09	COMPLETED	5/5/09	**REF**	**BH30**
PROJECT	Engineering services	LOGGED	GT/JF	CHECKED	JF/AN	Sheet	1 of 1
SITE	Settlement City Shopping Centre, Port Macquarie	GEOLOGY	Quaternary Alluvium	VEGETATION	Mulch	PROJECT NO.	P0902316
EQUIPMENT	Hydraulic Auger	EASTING	NA	RL SURFACE	NA		
EXCAVATION DIMENSIONS	Ø 0.1m X 1.4m depth	NORTHING	NA	ASPECT	North East	SLOPE	0-1%

EXCAVATION DATA						MATERIAL DATA					SAMPLING & TESTING			
METHOD	SUPPORT	WATER	MOISTURE	DEPTH (M)	PENETRATION RESISTANCE (L M H R)	GRAPHIC LOG	CLASSIFICATION	DESCRIPTION OF STRATA Soil type, texture, structure, mottling, colour, plasticity, rocks, oxidation, particle characteristics, organics, secondary and minor components, fill, contamination, odour.	CONSISTENCY	DENSITY INDEX	TYPE	DEPTH (M)	RESULTS AND ADDITIONAL OBSERVATIONS	
A	Nil	N	M	0.8		XX SM		SILTY SAND FILL – Dark brown, roots, minor gravels.		L	A	0.3	2316/30/ 0.3	
											A	0.6	2316/30/ 0.6	
A	Nil	N	M	1.0 1.1		XX SP		SAND FILL – Light brown, medium grained, minor shell fragments, medium dense.		MD	A	1.0	2316/30/ 1.0	1.0
A	Nil	N	M	1.4		XX SM		SILTY SAND FILL – Orange/brown, gravels (1-15mm, approx 20%).		MD	A	1.4	2316/30/ 1.4	
				2.0				Borehole terminated at 1.4m on silty sand fill.						2.0
				3.0										3.0
				4.0										4.0
				4.5										4.5

EQUIPMENT / METHOD
N Natural exposure
X Existing excavation
BH Backhoe bucket
E Excavator
HA Hand auger
S Hand spade
PT Push tube
A Auger
CC Concrete Corer

SUPPORT
SH Shoring
SC Shotcrete
RB Rock Bolts
Nil No support

WATER
N None observed
X Not measured
Water level
Water outflow
Water inflow

MOISTURE
D Dry
M Moist
W Wet
Wp Plastic limit
Wl Liquid limit

PENETRATION
L Low
M Moderate
H High
R Refusal

CONSISTENCY
VS Very Soft
S Soft
F Firm
St Stiff
VSt Very Stiff
H Hard
F Friable

DENSITY
VL Very Loose
L Loose
MD Medium Dense
D Dense
VD Very Dense

SAMPLING & TESTING
A Auger sample
B Bulk sample
U Undisturbed sample
D Disturbed sample
M Moisture content
Ux Tube sample (x mm)
pp Pocket penetrometer
S Standard penetration test
VS Vane shear
DCP Dynamic cone penetrometer
FD Field density
WS Water sample

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Engineering Log - Borehole

Dynamic Cone Penetrometer Test Log Summary

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Site	Settlement City S-Center, Port Macquarie	**DCP Group Reference**	**P0902316**
Client	Manidis Roberts	**Log Date**	4/05/2009
Logged by	GT/JF		
Checked by	JF/AN		
Comments			

TEST DATA

Depth Interval (m)	DCP 8	DCP 5	DCP 1	DCP 28	DCP 14	DCP 16	DCP 18	Geomean
0.15	2	29	4	25	3	12	18	9
0.30	2	4	2	38	8	28	12	8
0.45	4	11	3	23	4	12	2	6
0.60	10	9	3	32	10	11	3	8
0.75	15	11	3	33	14	13	10	12
0.90	11	29	3	28	21	28	10	15
1.05	14	28	2	12	18	32	9	13
1.20	13	25	2	10	13	34	10	12
1.35	12	18	2	15	12	35	14	12
1.50	14	14	6	32	10	30	14	15
1.65	9	11	5	27	9	23	10	12
1.80	10	12	4	21	5	20	9	10
1.95	14	9	1	21	4	18	10	8
2.10	17	5	1	21	3	13	14	7
2.25	9	6	2	18	3	5	14	6
2.40	4	7	3	18	3	3	12	6
2.55	5	5	6	17	6	3	14	7
2.70	4	5	12	11	7	5	17	8
2.85	3	6	10	8	4	6	15	7
3.00	7	8	4	18	9	6	14	8
3.15	7	7	4	26	14	7	5	8
3.30	12	7	5	31	16	4	2	8
3.45	23	7	5	24	16	5	3	9
3.60	26	11	7	30	17	7	3	11
3.75	28	11	7	22	18	11	3	12
3.90	32	9	12	25	16	15	4	14
4.05	32	10	21	26	16	14	11	17
4.20	34	14	20	26	15	11	15	18
4.35	40	20	20	40	14	11	16	21
4.50		18	21	36	12	13	16	18
4.65		15	21	21	10	11	15	15
4.80		12	22	14	11	24	20	16
4.95		21	23	14	11	31	21	19
5.10		55	21	12	12	41	18	22
5.25			20	20	16	60	18	23
5.40			17	36	35	refused at5.20m	17	25
5.55			14	38	45		27	28
5.70			13	36	refused at5.50m		25	23
5.85			14	41			28	25
6.00			14	33			21	21
6.15			15	36			20	22
6.30			22	45			24	29
6.45			20				27	23
6.60			24				32	28
6.75			21				31	26
6.90			28				24	26
7.05			26				20	23
7.20			26				23	24
7.35			28				21	24
7.50			27				22	24
7.65			26				25	25
7.80			22				22	22
7.95			22				18	20
8.10			27				21	24
8.25			28				18	22
8.40			24				12	17
8.55			25				21	23
8.70			24				20	22
8.85			24				16	20
9.00			24				21	22
9.15			25				21	23
9.30			24				20	22
9.45							19	19
9.60							21	21

Dynamic Cone Penetrometer Test Log Summary

martens
consulting engineers since 1989

6 / 37 Leighton Place, Hornsby, NSW 2159, Ph: (02) 9476 9999 Fax: (02) 9476 8767, mail@martens.com.au, www.martens.com.au

Site	Settlement City S-Center, Port Macquarie	DCP Group Reference	P0902316
Client	Manidis Roberts	Log Date	4/05/2009
Logged by	GT/JF		
Checked by	JF/AN		
Comments			

TEST DATA

Depth Interval (m)	DCP 27							Geomean
0.15	-							
0.30	17							17
0.45	33							33
0.60	40							40
0.75	38							38
0.90	21							21
1.05	16							16
1.20	15							15
1.35	10							10
1.50	8							8
1.65	12							12
1.80	15							15
1.95	15							15
2.10	17							17
2.25	13							13
2.40	20							20
2.55	17							17
2.70	10							10
2.85	11							11
3.00	19							19
3.15	25							25
3.30	27							27
3.45	25							25
3.60	22							22
3.75	25							25
3.90	19							19
4.05	17							17
4.20	25							25
4.35	38							38
4.50	35							35
4.65	47							47
4.80	41							41
4.95	16							16
5.10	16							16
5.25	17							17
5.40	12							12
5.55	12							12
5.70	13							13
5.85	14							14
6.00	19							19
6.15	24							24
6.30	40							40
6.45	45							45

13 Attachment D – Laboratory Results

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
enquiries@envirolabservices.com.au
www.envirolabservices.com.au

CERTIFICATE OF ANALYSIS 28732

Client:
Martens & Associates
6/37 Leighton Place
Hornsby
NSW 2077

Attention: Gray Taylor

Sample log in details:

Your Reference:	**P0902316, Port Macquarie**
No. of samples:	73 Soils
Date samples received:	07/05/09
Date completed instructions received:	07/05/09

Analysis Details:
Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by:	15/05/09
Date of Preliminary Report:	Not Issued
Issue Date:	13/05/09

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Tests not covered by NATA are denoted with *.

Results Approved By:

David Springer
Business Development & Quality Manager

Jacinta Hurst
Operations Manager

ACCREDITED FOR TECHNICAL COMPETENCE

vTPH & BTEX in Soil						
Our Reference:	UNITS	28732-1	28732-2	28732-3	28732-4	28732-5
Your Reference	----------	2316/11/0.4	2316/9/0.25	2316/19/0.2	2316/23/0.2	2316/29/0.3
Composite Reference	----------	-	-	-	-	-
Date Sampled		04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	11/05/2009	11/05/2009	11/05/2009	11/05/2009	11/05/2009
Date analysed	-	11/05/2009	11/05/2009	11/05/2009	11/05/2009	11/05/2009
vTPH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0
m+p-xylene	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0
o-Xylene	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0
Surrogate aaa-Trifluorotoluene	%	124	131	128	127	131

vTPH & BTEX in Soil						
Our Reference:	UNITS	28732-6	28732-7	28732-8	28732-9	28732-10
Your Reference	----------	2316/22/3.0	2316/13/2.8	2316/13/4.2	2316/16/3.0	2316/24/2.8
Composite Reference	----------	-	-	-	-	-
Date Sampled		04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	11/05/2009	11/05/2009	11/05/2009	11/05/2009	11/05/2009
Date analysed	-	11/05/2009	11/05/2009	11/05/2009	11/05/2009	11/05/2009
vTPH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0
m+p-xylene	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0
o-Xylene	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0
Surrogate aaa-Trifluorotoluene	%	122	113	121	120	121

sTPH in Soil (C10-C36)						
Our Reference:	UNITS	28732-1	28732-2	28732-3	28732-4	28732-5
Your Reference	----------	2316/11/0.4	2316/9/0.25	2316/19/0.2	2316/23/0.2	2316/29/0.3
Composite Reference	----------	-	-	-	-	-
Date Sampled		04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	11/05/2009	11/05/2009	11/05/2009	11/05/2009	11/05/2009
Date analysed	-	11/05/2009	11/05/2009	11/05/2009	11/05/2009	11/05/2009
TPH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TPH C_{15} - C_{28}	mg/kg	<100	<100	<100	<100	<100
TPH C_{29} - C_{36}	mg/kg	<100	<100	<100	<100	<100
Surrogate o-Terphenyl	%	104	101	104	106	88

sTPH in Soil (C10-C36)						
Our Reference:	UNITS	28732-6	28732-7	28732-8	28732-9	28732-10
Your Reference	----------	2316/22/3.0	2316/13/2.8	2316/13/4.2	2316/16/3.0	2316/24/2.8
Composite Reference	----------	-	-	-	-	-
Date Sampled		04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	11/05/2009	11/05/2009	11/05/2009	11/05/2009	11/05/2009
Date analysed	-	11/05/2009	11/05/2009	11/05/2009	11/05/2009	11/05/2009
TPH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TPH C_{15} - C_{28}	mg/kg	<100	<100	<100	<100	<100
TPH C_{29} - C_{36}	mg/kg	<100	<100	<100	<100	<100
Surrogate o-Terphenyl	%	103	101	105	111	85

PAHs in Soil						
Our Reference:	UNITS	28732-1	28732-2	28732-3	28732-4	28732-5
Your Reference	----------	2316/11/0.4	2316/9/0.25	2316/19/0.2	2316/23/0.2	2316/29/0.3
Composite Reference	----------	-	-	-	-	-
Date Sampled		04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	11/05/2009	11/05/2009	11/05/2009	11/05/2009	11/05/2009
Date analysed	-	11/05/2009	11/05/2009	11/05/2009	11/05/2009	11/05/2009
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate p-Terphenyl-d_{14}	%	96	91	94	95	99

PAHs in Soil						
Our Reference:	UNITS	28732-6	28732-7	28732-8	28732-9	28732-10
Your Reference	----------	2316/22/3.0	2316/13/2.8	2316/13/4.2	2316/16/3.0	2316/24/2.8
Composite Reference	----------	-	-	-	-	-
Date Sampled		04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	11/05/2009	11/05/2009	11/05/2009	11/05/2009	11/05/2009
Date analysed	-	11/05/2009	11/05/2009	11/05/2009	11/05/2009	11/05/2009
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate p-Terphenyl-d_{14}	%	96	100	95	98	97

Organochlorine Pesticides in soil						
Our Reference:	UNITS	28732-1	28732-2	28732-3	28732-4	28732-5
Your Reference	----------	2316/11/0.4	2316/9/0.25	2316/19/0.2	2316/23/0.2	2316/29/0.3
Composite Reference	----------	-	-	-	-	-
Date Sampled		04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	11/05/2009	11/05/2009	11/05/2009	11/05/2009	11/05/2009
Date analysed	-	11/05/2009	11/05/2009	11/05/2009	11/05/2009	11/05/2009
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCLMX	%	94	97	98	97	101

Organochlorine Pesticides in soil						
Our Reference:	UNITS	28732-6	28732-7	28732-8	28732-9	28732-10
Your Reference	----------	2316/22/3.0	2316/13/2.8	2316/13/4.2	2316/16/3.0	2316/24/2.8
Composite Reference	----------	-	-	-	-	-
Date Sampled		04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	11/05/2009	11/05/2009	11/05/2009	11/05/2009	11/05/2009
Date analysed	-	11/05/2009	11/05/2009	11/05/2009	11/05/2009	11/05/2009
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCLMX	%	104	92	97	101	97

Organochlorine Pesticides in soil						
Our Reference:	UNITS	28732-74	28732-75	28732-76	28732-77	28732-78
Your Reference	----------	Composite 4/0.5 + 12/0.4 + 13/0.5	Composite 9/2.7 + 18/3.0	Composite 16/0.2 + 21/0.2 + 25/0.2	Composite 17/0.2 + 18/0.2 + 10/0.2	Composite 19/0.5 + 20/0.5 + 26/0.5
Composite Reference	----------	11+12+13	14+15	16+17+18	19+20+21	22+23+24
Date Sampled		04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	11/05/2009	11/05/2009	11/05/2009	11/05/2009	11/05/2009
Date analysed	-	11/05/2009	11/05/2009	11/05/2009	11/05/2009	11/05/2009
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCLMX	%	99	88	95	98	96

Organochlorine Pesticides in soil			
Our Reference:	UNITS	28732-79	28732-80
Your Reference	----------	Composite 15/0.5 + 22/0.5 + 23/0.5	Composite 11/0.2 + 12/0.2 + 15/0.25
Composite Reference	----------	25+26+27	28+29+30
Date Sampled		04/05/09 & 05/05/09	04/05/09 & 05/05/09
Type of sample		Soil	Soil
Date extracted	-	11/05/2009	11/05/2009
Date analysed	-	11/05/2009	11/05/2009
HCB	mg/kg	<0.1	<0.1
alpha-BHC	mg/kg	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1
Surrogate TCLMX	%	95	95

Organophosphorus Pesticides						
Our Reference:	UNITS	28732-1	28732-2	28732-3	28732-4	28732-5
Your Reference	----------	2316/11/0.4	2316/9/0.25	2316/19/0.2	2316/23/0.2	2316/29/0.3
Composite Reference	----------	-	-	-	-	-
Date Sampled		04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	11/05/2009	11/05/2009	11/05/2009	11/05/2009	11/05/2009
Date analysed	-	11/05/2009	11/05/2009	11/05/2009	11/05/2009	11/05/2009
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCLMX	%	94	97	98	97	101

Organophosphorus Pesticides						
Our Reference:	UNITS	28732-6	28732-7	28732-8	28732-9	28732-10
Your Reference	----------	2316/22/3.0	2316/13/2.8	2316/13/4.2	2316/16/3.0	2316/24/2.8
Composite Reference	----------	-	-	-	-	-
Date Sampled		04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	11/05/2009	11/05/2009	11/05/2009	11/05/2009	11/05/2009
Date analysed	-	11/05/2009	11/05/2009	11/05/2009	11/05/2009	11/05/2009
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCLMX	%	104	92	97	101	97

Organophosphorus Pesticides						
Our Reference:	UNITS	28732-74	28732-75	28732-76	28732-77	28732-78
Your Reference	----------	Composite 4/0.5 + 12/0.4 + 13/0.5	Composite 9/2.7 + 18/3.0	Composite 16/0.2 + 21/0.2 + 25/0.2	Composite 17/0.2 + 18/0.2 + 10/0.2	Composite 19/0.5 + 20/0.5 + 26/0.5
Composite Reference	----------	11+12+13	14+15	16+17+18	19+20+21	22+23+24
Date Sampled		04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	11/05/2009	11/05/2009	11/05/2009	11/05/2009	11/05/2009
Date analysed	-	11/05/2009	11/05/2009	11/05/2009	11/05/2009	11/05/2009
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCLMX	%	99	88	95	98	96

Organophosphorus Pesticides			
Our Reference:	UNITS	28732-79	28732-80
Your Reference	----------	Composite 15/0.5 + 22/0.5 + 23/0.5	Composite 11/0.2 + 12/0.2 + 15/0.25
Composite Reference	----------	25+26+27	28+29+30
Date Sampled		04/05/09 & 05/05/09	04/05/09 & 05/05/09
Type of sample		Soil	Soil
Date extracted	-	11/05/2009	11/05/2009
Date analysed	-	11/05/2009	11/05/2009
Diazinon	mg/kg	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1
Surrogate TCLMX	%	95	95

PCBs in Soil						
Our Reference:	UNITS	28732-1	28732-2	28732-3	28732-4	28732-5
Your Reference	----------	2316/11/0.4	2316/9/0.25	2316/19/0.2	2316/23/0.2	2316/29/0.3
Composite Reference	----------	-	-	-	-	-
Date Sampled		04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	11/05/2009	11/05/2009	11/05/2009	11/05/2009	11/05/2009
Date analysed	-	11/05/2009	11/05/2009	11/05/2009	11/05/2009	11/05/2009
Arochlor 1016	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Arochlor 1232	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Arochlor 1242	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Arochlor 1248	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Arochlor 1254	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Arochlor 1260	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCLMX	%	94	97	98	97	101

PCBs in Soil						
Our Reference:	UNITS	28732-6	28732-7	28732-8	28732-9	28732-10
Your Reference	----------	2316/22/3.0	2316/13/2.8	2316/13/4.2	2316/16/3.0	2316/24/2.8
Composite Reference	----------	-	-	-	-	-
Date Sampled		04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	11/05/2009	11/05/2009	11/05/2009	11/05/2009	11/05/2009
Date analysed	-	11/05/2009	11/05/2009	11/05/2009	11/05/2009	11/05/2009
Arochlor 1016	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Arochlor 1232	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Arochlor 1242	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Arochlor 1248	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Arochlor 1254	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Arochlor 1260	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCLMX	%	104	92	97	101	97

Acid Extractable metals in soil						
Our Reference:	UNITS	28732-1	28732-2	28732-3	28732-4	28732-5
Your Reference	----------	2316/11/0.4	2316/9/0.25	2316/19/0.2	2316/23/0.2	2316/29/0.3
Composite Reference	----------	-	-	-	-	-
Date Sampled		04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09
Type of sample		Soil	Soil	Soil	Soil	Soil
Date digested	-	11/05/2009	11/05/2009	11/05/2009	11/05/2009	11/05/2009
Date analysed	-	11/05/2009	11/05/2009	11/05/2009	11/05/2009	11/05/2009
Arsenic	mg/kg	6	5	7	6	4
Cadmium	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium	mg/kg	8	13	11	24	5
Copper	mg/kg	6	8	7	9	3
Lead	mg/kg	4	6	8	6	4
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	4	6	8	15	3
Zinc	mg/kg	17	20	32	18	20

Acid Extractable metals in soil						
Our Reference:	UNITS	28732-6	28732-7	28732-8	28732-9	28732-10
Your Reference	----------	2316/22/3.0	2316/13/2.8	2316/13/4.2	2316/16/3.0	2316/24/2.8
Composite Reference	----------	-	-	-	-	-
Date Sampled		04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09
Type of sample		Soil	Soil	Soil	Soil	Soil
Date digested	-	11/05/2009	11/05/2009	11/05/2009	11/05/2009	11/05/2009
Date analysed	-	11/05/2009	11/05/2009	11/05/2009	11/05/2009	11/05/2009
Arsenic	mg/kg	7	15	<4	6	8
Cadmium	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium	mg/kg	5	39	6	11	34
Copper	mg/kg	10	15	1	4	10
Lead	mg/kg	1	12	1	3	7
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	10	28	6	13	25
Zinc	mg/kg	8	45	6	11	26

Acid Extractable metals in soil						
Our Reference:	UNITS	28732-69	28732-70	28732-71	28732-72	28732-74
Your Reference	----------	2316/Z3	2316/Z10	2316/Z11	2316/Z12	Composite 4/0.5 + 12/0.4 + 13/0.5
Composite Reference	----------	-	-	-	-	11+12+13
Date Sampled		04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09
Type of sample		Soil	Soil	Soil	Soil	Soil
Date digested	-	11/05/2009	11/05/2009	11/05/2009	11/05/2009	11/05/2009
Date analysed	-	11/05/2009	11/05/2009	11/05/2009	11/05/2009	11/05/2009
Arsenic	mg/kg	6	8	7	4	7
Cadmium	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium	mg/kg	11	24	11	28	13
Copper	mg/kg	7	10	4	6	14
Lead	mg/kg	4	6	3	5	4
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	4	14	15	17	3
Zinc	mg/kg	17	21	13	21	14

Acid Extractable metals in soil						
Our Reference:	UNITS	28732-75	28732-76	28732-77	28732-78	28732-79
Your Reference	----------	Composite 9/2.7 + 18/3.0	Composite 16/0.2 + 21/0.2 + 25/0.2	Composite 17/0.2 + 18/0.2 + 10/0.2	Composite 19/0.5 + 20/0.5 + 26/0.5	Composite 15/0.5 + 22/0.5 + 23/0.5
Composite Reference	----------	14+15	16+17+18	19+20+21	22+23+24	25+26+27
Date Sampled		04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09
Type of sample		Soil	Soil	Soil	Soil	Soil
Date digested	-	11/05/2009	11/05/2009	11/05/2009	11/05/2009	11/05/2009
Date analysed	-	11/05/2009	11/05/2009	11/05/2009	11/05/2009	11/05/2009
Arsenic	mg/kg	12	7	7	<4	5
Cadmium	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium	mg/kg	20	15	10	12	16
Copper	mg/kg	5	8	9	1	7
Lead	mg/kg	4	5	11	1	5
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	12	5	7	10	11
Zinc	mg/kg	24	14	42	5	10

Acid Extractable metals in soil		
Our Reference:	UNITS	28732-80
Your Reference	----------	Composite 11/0.2 + 12/0.2 + 15/0.25
Composite Reference	----------	28+29+30
Date Sampled		04/05/09 & 05/05/09
Type of sample		Soil
Date digested	-	11/05/2009
Date analysed	-	11/05/2009
Arsenic	mg/kg	5
Cadmium	mg/kg	<0.5
Chromium	mg/kg	13
Copper	mg/kg	10
Lead	mg/kg	4
Mercury	mg/kg	<0.1
Nickel	mg/kg	2
Zinc	mg/kg	11

Miscellaneous Inorg - soil						
Our Reference:	UNITS	28732-7	28732-8	28732-32	28732-33	28732-34
Your Reference	----------	2316/13/2.8	2316/13/4.2	2316/1/3.3	2316/1/4.5	2316/1/7.5
Composite Reference	----------	-	-	-	-	-
Date Sampled		04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	11/08/2009	11/08/2009	11/08/2009	11/08/2009	11/08/2009
Date analysed	-	11/05/2009	11/08/2009	11/08/2009	11/08/2009	11/08/2009
Electrical Conductivity 1:5 soil:water	µS/cm	230	120	160	140	110

Miscellaneous Inorg - soil						
Our Reference:	UNITS	28732-35	28732-36	28732-37	28732-39	28732-40
Your Reference	----------	2316/1/9.0	2316/5/2.0	2316/5/2.5	2316/5/4.5	2316/5/5.5
Composite Reference	----------	-	-	-	-	-
Date Sampled		04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	11/08/2009	11/08/2009	11/08/2009	11/08/2009	11/08/2009
Date analysed	-	11/08/2009	11/08/2009	11/08/2009	11/08/2009	11/08/2009
Electrical Conductivity 1:5 soil:water	µS/cm	100	190	130	290	230

Miscellaneous Inorg - soil						
Our Reference:	UNITS	28732-41	28732-42	28732-43	28732-44	28732-45
Your Reference	----------	2316/5/6.0	2316/8/2.0	2316/8/4.0	2316/8/6.0	2316/8/7.5
Composite Reference	----------	-	-	-	-	-
Date Sampled		04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	11/08/2009	11/08/2009	11/08/2009	11/08/2009	11/08/2009
Date analysed	-	11/08/2009	11/08/2009	11/08/2009	11/08/2009	11/08/2009
Electrical Conductivity 1:5 soil:water	µS/cm	300	59	110	900	1,100

Miscellaneous Inorg - soil						
Our Reference:	UNITS	28732-46	28732-47	28732-48	28732-50	28732-51
Your Reference	----------	2316/13/4.2	2316/14/0.5	2316/14/1.5	2316/14/9.0	2316/16/0.5
Composite Reference	----------	-	-	-	-	-
Date Sampled		04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	11/08/2009	11/08/2009	11/08/2009	11/08/2009	11/08/2009
Date analysed	-	11/08/2009	11/08/2009	11/08/2009	11/08/2009	11/08/2009
Electrical Conductivity 1:5 soil:water	µS/cm	120	330	92	450	110

Miscellaneous Inorg - soil						
Our Reference:	UNITS	28732-53	28732-55	28732-58	28732-59	28732-60
Your Reference	----------	2316/16/5.0	2316/18/2.0	2316/24/1.4	2316/24/4.5	2316/25/1.0
Composite Reference	----------	-	-	-	-	-
Date Sampled		04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	11/08/2009	11/08/2009	11/08/2009	11/08/2009	11/08/2009
Date analysed	-	11/08/2009	11/08/2009	11/08/2009	11/08/2009	11/08/2009
Electrical Conductivity 1:5 soil:water	µS/cm	190	99	56	170	54

Miscellaneous Inorg - soil						
Our Reference:	UNITS	28732-61	28732-62	28732-64	28732-67	28732-68
Your Reference	----------	2316/27/1.0	2316/27/4.0	2316/28/1.0	2316/28/6.0	2316/28/7.5
Composite Reference	----------	-	-	-	-	-
Date Sampled		04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	11/08/2009	11/08/2009	11/08/2009	11/08/2009	11/08/2009
Date analysed	-	11/08/2009	11/08/2009	11/08/2009	11/08/2009	11/08/2009
Electrical Conductivity 1:5 soil:water	µS/cm	70	58	80	120	110

Moisture						
Our Reference:	UNITS	28732-1	28732-2	28732-3	28732-4	28732-5
Your Reference	----------	2316/11/0.4	2316/9/0.25	2316/19/0.2	2316/23/0.2	2316/29/0.3
Composite Reference	----------	-	-	-	-	-
Date Sampled		04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	11/05/2009	11/05/2009	11/05/2009	11/05/2009	11/05/2009
Date analysed	-	11/05/2009	11/05/2009	11/05/2009	11/05/2009	11/05/2009
Moisture	%	8.3	9.1	9.8	15	4.7

Moisture						
Our Reference:	UNITS	28732-6	28732-7	28732-8	28732-9	28732-10
Your Reference	----------	2316/22/3.0	2316/13/2.8	2316/13/4.2	2316/16/3.0	2316/24/2.8
Composite Reference	----------	-	-	-	-	-
Date Sampled		04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	11/05/2009	11/05/2009	11/05/2009	11/05/2009	11/05/2009
Date analysed	-	11/05/2009	11/05/2009	11/05/2009	11/05/2009	11/05/2009
Moisture	%	21	33	20	24	28

Moisture						
Our Reference:	UNITS	28732-69	28732-70	28732-71	28732-72	28732-74
Your Reference	----------	2316/Z3	2316/Z10	2316/Z11	2316/Z12	Composite 4/0.5 + 12/0.4 + 13/0.5
Composite Reference	----------	-	-	-	-	11+12+13
Date Sampled		04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	11/05/2009	11/05/2009	11/05/2009	11/05/2009	11/05/2009
Date analysed	-	11/05/2009	11/05/2009	11/05/2009	11/05/2009	11/05/2009
Moisture	%	8.3	27	23	19	6.9

Moisture						
Our Reference:	UNITS	28732-75	28732-76	28732-77	28732-78	28732-79
Your Reference	----------	Composite 9/2.7 + 18/3.0	Composite 16/0.2 + 21/0.2 + 25/0.2	Composite 17/0.2 + 18/0.2 + 10/0.2	Composite 19/0.5 + 20/0.5 + 26/0.5	Composite 15/0.5 + 22/0.5 + 23/0.5
Composite Reference	----------	14+15	16+17+18	19+20+21	22+23+24	25+26+27
Date Sampled		04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09	04/05/09 & 05/05/09
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	11/05/2009	11/05/2009	11/05/2009	11/05/2009	11/05/2009
Date analysed	-	11/05/2009	11/05/2009	11/05/2009	11/05/2009	11/05/2009
Moisture	%	36	7.8	8.2	5.0	6.0

Moisture		
Our Reference:	UNITS	28732-80
Your Reference	----------	Composite 11/0.2 + 12/0.2 + 15/0.25
Composite Reference	----------	28+29+30
Date Sampled		04/05/09 & 05/05/09
Type of sample		Soil
Date prepared	-	11/05/2009
Date analysed	-	11/05/2009
Moisture	%	9.7

sPOCAS Our Reference: Your Reference Composite Reference Date Sampled Type of sample	UNITS ---------- ----------	28732-31 2316/1/2.5 - 04/05/09 & 05/05/09 Soil	28732-32 2316/1/3.3 - 04/05/09 & 05/05/09 Soil	28732-35 2316/1/9.0 - 04/05/09 & 05/05/09 Soil	28732-38 2316/5/4.0 - 04/05/09 & 05/05/09 Soil	28732-43 2316/8/4.0 - 04/05/09 & 05/05/09 Soil
Date prepared	-	8/05/2009	8/05/2009	8/05/2009	8/05/2009	8/05/2009
Date analysed	-	8/05/2009	8/05/2009	8/05/2009	8/05/2009	8/05/2009
pH $_{kcl}$	pH units	9.3	7.3	6.2	6.7	6.9
TAA pH 6.5	moles H^+/t	<5	<5	<5	<5	<5
s-TAA pH 6.5	%w/w S	<0.01	<0.01	<0.01	<0.01	<0.01
pH $_{Ox}$	pH units	5.4	3.3	2.6	2.0	2.3
TPA pH 6.5	moles H^+/t	<5.0	80	110	685	143
s-TPA pH 6.5	%w/w S	<0.01	0.13	0.18	1.1	0.23
TSA pH 6.5	moles H^+/t	<5.0	80	109	685	143
s-TSA pH 6.5	%w/w S	<0.01	0.13	0.17	1.1	0.23
ANC$_E$	% $CaCO_3$	<0.05	<0.05	<0.05	<0.05	<0.05
a-ANC$_E$	moles H^+/t	<5	<5	<5	<5	<5
s-ANC$_E$	%w/w S	<0.05	<0.05	<0.05	<0.05	<0.05
S$_{KCl}$	%w/w S	0.009	0.014	0.016	0.089	0.026
S$_P$	%w/w	0.052	0.23	0.30	1.5	0.41
S$_{POS}$	%w/w	0.044	0.22	0.29	1.4	0.39
a-S$_{POS}$	moles H^+/t	27	138	179	866	243
Ca$_{KCl}$	%w/w	0.073	0.084	0.019	0.092	0.041
Ca$_P$	%w/w	0.13	0.11	0.027	0.13	0.064
Ca$_A$	%w/w	0.057	0.022	0.007	0.039	0.022
Mg$_{KCl}$	%w/w	<0.005	0.019	0.007	0.036	<0.005
Mg$_P$	%w/w	<0.005	0.019	0.008	0.043	0.005
Mg$_A$	%w/w	<0.005	<0.005	<0.005	0.007	<0.005
SRAS	%w/w	<0.005	<0.005	<0.005	<0.005	<0.005
S$_{HCl}$	%w/w S	0.007	0.014	0.012	0.077	0.024
S$_{NAS}$	%w/w S	<0.005	<0.005	<0.005	<0.005	<0.005
a-S$_{NAS}$	moles H^+/t	<5	<5	<5	<5	<5
s-S$_{NAS}$	%w/w S	<0.01	<0.01	<0.01	<0.01	<0.01
a-Net Acidity	moles H^+/t	27	99	180	745	176
Liming rate	kg $CaCO_3$/t	2.0	7.5	14	56	13
a-Net Acidity without ANCE	moles H^+/t	NA	NA	NA	NA	NA
Liming rate without ANCE	kg $CaCO_3$/t	NA	NA	NA	NA	NA

sPOCAS Our Reference: Your Reference Composite Reference Date Sampled Type of sample	UNITS ---------- ----------	28732-45 2316/8/7.5 - 04/05/09 & 05/05/09 Soil	28732-49 2316/14/3.0 - 04/05/09 & 05/05/09 Soil	28732-52 2316/16/1.0 - 04/05/09 & 05/05/09 Soil	28732-54 2316/16/6.0 - 04/05/09 & 05/05/09 Soil	28732-56 2316/18/4.5 - 04/05/09 & 05/05/09 Soil
Date prepared	-	8/05/2009	8/05/2009	8/05/2009	8/05/2009	8/05/2009
Date analysed	-	8/05/2009	8/05/2009	8/05/2009	8/05/2009	8/05/2009
pH $_{kcl}$	pH units	6.7	8.6	9.7	7.4	8.6
TAA pH 6.5	moles H^+/t	<5	<5	<5	<5	<5
s-TAA pH 6.5	%w/w S	<0.01	<0.01	<0.01	<0.01	<0.01
pH $_{Ox}$	pH units	3.6	2.4	6.6	3.1	2.6
TPA pH 6.5	moles H^+/t	17	130	<5.0	120	155
s-TPA pH 6.5	%w/w S	0.028	0.21	<0.01	0.19	0.25
TSA pH 6.5	moles H^+/t	17	130	<5.0	120	155
s-TSA pH 6.5	%w/w S	0.028	0.21	<0.01	0.19	0.25
ANC$_E$	% $CaCO_3$	<0.05	<0.05	0.2	<0.05	<0.05
a-ANC$_E$	moles H^+/t	<5	<5	50	<5	<5
s-ANC$_E$	%w/w S	<0.05	<0.05	0.08	<0.05	<0.05
S$_{KCl}$	%w/w S	0.028	0.042	0.007	0.020	0.042
S$_P$	%w/w	0.10	0.47	0.015	0.31	0.63
S$_{POS}$	%w/w	0.075	0.43	0.008	0.29	0.58
a-S$_{POS}$	moles H^+/t	47	267	<5.0	180	365
Ca$_{KCl}$	%w/w	0.043	0.075	0.087	0.047	0.12
Ca$_P$	%w/w	0.047	0.17	0.31	0.063	0.27
Ca$_A$	%w/w	<0.005	0.092	0.22	0.016	0.15
Mg$_{KCl}$	%w/w	0.056	0.005	<0.005	0.016	0.018
Mg$_P$	%w/w	0.058	0.007	0.010	0.018	0.025
Mg$_A$	%w/w	<0.005	<0.005	0.006	<0.005	0.007
SRAS	%w/w	<0.005	<0.005	<0.005	<0.005	<0.005
S$_{HCl}$	%w/w S	0.024	0.030	0.012	0.024	0.039
S$_{NAS}$	%w/w S	<0.005	<0.005	0.005	<0.005	<0.005
a-S$_{NAS}$	moles H^+/t	<5	<5	<5	<5	<5
s-S$_{NAS}$	%w/w S	<0.01	<0.01	<0.01	<0.01	<0.01
a-Net Acidity	moles H^+/t	27	176	<10	140	225
Liming rate	kg $CaCO_3$/t	2.0	13	<0.75	11	17
a-Net Acidity without ANCE	moles H^+/t	NA	NA	<10	NA	NA
Liming rate without ANCE	kg $CaCO_3$/t	NA	NA	<0.75	NA	NA

sPOCAS Our Reference: Your Reference Composite Reference Date Sampled Type of sample	UNITS ---------- ---------- -	28732-57 2316/24/0.5 - 04/05/09 & 05/05/09 Soil	28732-58 2316/24/1.4 - 04/05/09 & 05/05/09 Soil	28732-63 2316/27/5.5 - 04/05/09 & 05/05/09 Soil	28732-65 2316/28/2.9 - 04/05/09 & 05/05/09 Soil	28732-66 2316/28/5.0 - 04/05/09 & 05/05/09 Soil
Date prepared	-	8/05/2009	8/05/2009	8/05/2009	8/05/2009	8/05/2009
Date analysed	-	8/05/2009	8/05/2009	8/05/2009	8/05/2009	8/05/2009
pH $_{kcl}$	pH units	9.6	9.7	6.2	4.8	5.3
TAA pH 6.5	moles H^+/t	<5	<5	<5	25	5
s-TAA pH 6.5	%w/w S	<0.01	<0.01	<0.01	0.040	<0.01
pH $_{Ox}$	pH units	6.1	6.3	2.8	3.1	2.8
TPA pH 6.5	moles H^+/t	<5.0	<5.0	<5.0	190	125
s-TPA pH 6.5	%w/w S	<0.01	<0.01	<0.01	0.30	0.20
TSA pH 6.5	moles H^+/t	<5.0	<5.0	<5.0	165	120
s-TSA pH 6.5	%w/w S	<0.01	<0.01	<0.01	0.26	0.19
ANC_E	% $CaCO_3$	<0.05	<0.05	<0.05	<0.05	<0.05
a-ANC_E	moles H^+/t	<5	<5	<5	<5	<5
s-ANC_E	%w/w S	<0.05	<0.05	<0.05	<0.05	<0.05
S_{KCl}	%w/w S	<0.005	<0.005	0.023	0.061	0.020
S_P	%w/w	0.009	<0.005	0.25	0.38	0.26
S_{POS}	%w/w	0.005	<0.005	0.23	0.31	0.24
a-S_{POS}	moles H^+/t	<5.0	<5.0	141	196	149
Ca_{KCl}	%w/w	0.070	0.076	0.044	0.046	0.026
Ca_P	%w/w	0.11	0.12	0.042	0.059	0.024
Ca_A	%w/w	0.037	0.046	<0.005	0.013	<0.005
Mg_{KCl}	%w/w	<0.005	<0.005	0.006	0.024	<0.005
Mg_P	%w/w	<0.005	<0.005	0.006	0.027	<0.005
Mg_A	%w/w	<0.005	<0.005	<0.005	<0.005	<0.005
SRAS	%w/w	<0.005	<0.005	<0.005	<0.005	<0.005
S_{HCl}	%w/w S	0.005	<0.005	0.030	0.078	0.022
S_{NAS}	%w/w S	<0.005	<0.005	0.007	0.017	<0.005
a-S_{NAS}	moles H^+/t	<5	<5	<5	7.7	<5
s-S_{NAS}	%w/w S	<0.01	<0.01	<0.01	0.012	<0.01
a-Net Acidity	moles H^+/t	<10	<10	142	221	154
Liming rate	kg $CaCO_3$/t	<0.75	<0.75	11	17	12
a-Net Acidity without ANCE	moles H^+/t	NA	NA	NA	NA	NA
Liming rate without ANCE	kg $CaCO_3$/t	NA	NA	NA	NA	NA

Method ID	Methodology Summary
GC.16	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS.
GC.3	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID.
GC.12 subset	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS.
GC-5	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's.
GC.8	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's.
GC-6	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD.
Metals.20 ICP-AES	Determination of various metals by ICP-AES.
Metals.21 CV-AAS	Determination of Mercury by Cold Vapour AAS.
LAB.2	Conductivity and Salinity - measured using a conductivity cell and dedicated meter, in accordance with APHA2510 20th ED and Rayment & Higginson.
LAB.8	Moisture content determined by heating at 105 deg C for a minimum of 4 hours.
LAB.64	sPOCAS determined using titrimetric and ICP-AES techniques. Based on Acid Sulfate Soils Laboratory Methods Guidelines, Version 2.1 - June 2004.

QUALITY CONTROL vTPH & BTEX in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			11/5/09	28732-1	11/05/2009 || 11/05/2009	LCS-1	11/5/09
Date analysed	-			11/5/09	28732-1	11/05/2009 || 11/05/2009	LCS-1	11/5/09
vTPH C_6 - C_9	mg/kg	25	GC.16	<25	28732-1	<25 || <25	LCS-1	107%
Benzene	mg/kg	0.5	GC.16	<0.5	28732-1	<0.5 || <0.5	LCS-1	112%
Toluene	mg/kg	0.5	GC.16	<0.5	28732-1	<0.5 || <0.5	LCS-1	94%
Ethylbenzene	mg/kg	1	GC.16	<1.0	28732-1	<1.0 || <1.0	LCS-1	110%
m+p-xylene	mg/kg	2	GC.16	<2.0	28732-1	<2.0 || <2.0	LCS-1	109%
o-Xylene	mg/kg	1	GC.16	<1.0	28732-1	<1.0 || <1.0	LCS-1	114%
Surrogate aaa-Trifluorotoluene	%		GC.16	135	28732-1	124 || 119 || RPD: 4	LCS-1	133%

QUALITY CONTROL sTPH in Soil (C10-C36)	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			11/5/09	28732-1	11/05/2009 || 11/05/2009	LCS-1	11/5/09
Date analysed	-			11/5/09	28732-1	11/05/2009 || 11/05/2009	LCS-1	11/5/09
TPH C_{10} - C_{14}	mg/kg	50	GC.3	<50	28732-1	<50 || <50	LCS-1	126%
TPH C_{15} - C_{28}	mg/kg	100	GC.3	<100	28732-1	<100 || <100	LCS-1	123%
TPH C_{29} - C_{36}	mg/kg	100	GC.3	<100	28732-1	<100 || <100	LCS-1	118%
Surrogate o-Terphenyl	%		GC.3	110	28732-1	104 || 108 || RPD: 4	LCS-1	116%

QUALITY CONTROL PAHs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			11/05/2009	28732-1	11/05/2009 || 11/05/2009	LCS-1	11/05/2009
Date analysed	-			11/05/2009	28732-1	11/05/2009 || 11/05/2009	LCS-1	11/05/2009
Naphthalene	mg/kg	0.1	GC.12 subset	<0.1	28732-1	<0.1 || <0.1	LCS-1	93%
Acenaphthylene	mg/kg	0.1	GC.12 subset	<0.1	28732-1	<0.1 || <0.1	[NR]	[NR]
Acenaphthene	mg/kg	0.1	GC.12 subset	<0.1	28732-1	<0.1 || <0.1	[NR]	[NR]
Fluorene	mg/kg	0.1	GC.12 subset	<0.1	28732-1	<0.1 || <0.1	LCS-1	94%
Phenanthrene	mg/kg	0.1	GC.12 subset	<0.1	28732-1	<0.1 || <0.1	LCS-1	99%
Anthracene	mg/kg	0.1	GC.12 subset	<0.1	28732-1	<0.1 || <0.1	[NR]	[NR]
Fluoranthene	mg/kg	0.1	GC.12 subset	<0.1	28732-1	<0.1 || <0.1	LCS-1	94%
Pyrene	mg/kg	0.1	GC.12 subset	<0.1	28732-1	<0.1 || <0.1	LCS-1	99%
Benzo(a)anthracene	mg/kg	0.1	GC.12 subset	<0.1	28732-1	<0.1 || <0.1	[NR]	[NR]
Chrysene	mg/kg	0.1	GC.12 subset	<0.1	28732-1	<0.1 || <0.1	LCS-1	108%

QUALITY CONTROL PAHs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Benzo(b+k)fluoranthene	mg/kg	0.2	GC.12 subset	<0.2	28732-1	<0.2 || <0.2	[NR]	[NR]
Benzo(a)pyrene	mg/kg	0.05	GC.12 subset	<0.05	28732-1	<0.05 || <0.05	LCS-1	88%
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	GC.12 subset	<0.1	28732-1	<0.1 || <0.1	[NR]	[NR]
Dibenzo(a,h)anthracene	mg/kg	0.1	GC.12 subset	<0.1	28732-1	<0.1 || <0.1	[NR]	[NR]
Benzo(g,h,i)perylene	mg/kg	0.1	GC.12 subset	<0.1	28732-1	<0.1 || <0.1	[NR]	[NR]
Surrogate p-Terphenyl-d_{14}	%		GC.12 subset	99	28732-1	96 || 97 || RPD: 1	LCS-1	95%

QUALITY CONTROL Organochlorine Pesticides in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			11/5/09	28732-1	11/05/2009 || 11/05/2009	LCS-1	11/5/09
Date analysed	-			11/5/09	28732-1	11/05/2009 || 11/05/2009	LCS-1	11/5/09
HCB	mg/kg	0.1	GC-5	<0.1	28732-1	<0.1 || <0.1	[NR]	[NR]
alpha-BHC	mg/kg	0.1	GC-5	<0.1	28732-1	<0.1 || <0.1	LCS-1	99%
gamma-BHC	mg/kg	0.1	GC-5	<0.1	28732-1	<0.1 || <0.1	[NR]	[NR]
beta-BHC	mg/kg	0.1	GC-5	<0.1	28732-1	<0.1 || <0.1	LCS-1	122%
Heptachlor	mg/kg	0.1	GC-5	<0.1	28732-1	<0.1 || <0.1	LCS-1	100%
delta-BHC	mg/kg	0.1	GC-5	<0.1	28732-1	<0.1 || <0.1	[NR]	[NR]
Aldrin	mg/kg	0.1	GC-5	<0.1	28732-1	<0.1 || <0.1	LCS-1	113%
Heptachlor Epoxide	mg/kg	0.1	GC-5	<0.1	28732-1	<0.1 || <0.1	LCS-1	106%
gamma-Chlordane	mg/kg	0.1	GC-5	<0.1	28732-1	<0.1 || <0.1	[NR]	[NR]
alpha-chlordane	mg/kg	0.1	GC-5	<0.1	28732-1	<0.1 || <0.1	[NR]	[NR]
Endosulfan I	mg/kg	0.1	GC-5	<0.1	28732-1	<0.1 || <0.1	[NR]	[NR]
pp-DDE	mg/kg	0.1	GC-5	<0.1	28732-1	<0.1 || <0.1	LCS-1	100%
Dieldrin	mg/kg	0.1	GC-5	<0.1	28732-1	<0.1 || <0.1	LCS-1	107%
Endrin	mg/kg	0.1	GC-5	<0.1	28732-1	<0.1 || <0.1	LCS-1	112%
pp-DDD	mg/kg	0.1	GC-5	<0.1	28732-1	<0.1 || <0.1	LCS-1	113%
Endosulfan II	mg/kg	0.1	GC-5	<0.1	28732-1	<0.1 || <0.1	[NR]	[NR]
pp-DDT	mg/kg	0.1	GC-5	<0.1	28732-1	<0.1 || <0.1	[NR]	[NR]
Endrin Aldehyde	mg/kg	0.1	GC-5	<0.1	28732-1	<0.1 || <0.1	[NR]	[NR]
Endosulfan Sulphate	mg/kg	0.1	GC-5	<0.1	28732-1	<0.1 || <0.1	LCS-1	104%
Methoxychlor	mg/kg	0.1	GC-5	<0.1	28732-1	<0.1 || <0.1	[NR]	[NR]
Surrogate TCLMX	%		GC-5	93	28732-1	94 || 96 || RPD: 2	LCS-1	92%

QUALITY CONTROL Organophosphorus Pesticides	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			11/5/09	28732-1	11/05/2009 || 11/05/2009	LCS-1	11/5/09
Date analysed	-			11/5/09	28732-1	11/05/2009 || 11/05/2009	LCS-1	11/5/09
Diazinon	mg/kg	0.1	GC.8	<0.1	28732-1	<0.1 || <0.1	[NR]	[NR]
Dimethoate	mg/kg	0.1	GC.8	<0.1	28732-1	<0.1 || <0.1	[NR]	[NR]
Chlorpyriphos-methyl	mg/kg	0.1	GC.8	<0.1	28732-1	<0.1 || <0.1	[NR]	[NR]
Ronnel	mg/kg	0.1	GC.8	<0.1	28732-1	<0.1 || <0.1	[NR]	[NR]
Chlorpyriphos	mg/kg	0.1	GC.8	<0.1	28732-1	<0.1 || <0.1	LCS-1	101%
Fenitrothion	mg/kg	0.1	GC.8	<0.1	28732-1	<0.1 || <0.1	LCS-1	135%
Bromophos-ethyl	mg/kg	0.1	GC.8	<0.1	28732-1	<0.1 || <0.1	[NR]	[NR]
Ethion	mg/kg	0.1	GC.8	<0.1	28732-1	<0.1 || <0.1	LCS-1	119%
Surrogate TCLMX	%		GC.8	93	28732-1	94 || 96 || RPD: 2	LCS-1	92%

QUALITY CONTROL PCBs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			11/5/09	28732-1	11/05/2009 || 11/05/2009	LCS-1	11/5/09
Date analysed	-			11/5/09	28732-1	11/05/2009 || 11/05/2009	LCS-1	11/5/09
Arochlor 1016	mg/kg	0.1	GC-6	<0.1	28732-1	<0.1 || <0.1	[NR]	[NR]
Arochlor 1232	mg/kg	0.1	GC-6	<0.1	28732-1	<0.1 || <0.1	[NR]	[NR]
Arochlor 1242	mg/kg	0.1	GC-6	<0.1	28732-1	<0.1 || <0.1	[NR]	[NR]
Arochlor 1248	mg/kg	0.1	GC-6	<0.1	28732-1	<0.1 || <0.1	[NR]	[NR]
Arochlor 1254	mg/kg	0.1	GC-6	<0.1	28732-1	<0.1 || <0.1	LCS-1	110%
Arochlor 1260	mg/kg	0.1	GC-6	<0.1	28732-1	<0.1 || <0.1	[NR]	[NR]
Surrogate TCLMX	%		GC-6	93	28732-1	94 || 96 || RPD: 2	LCS-1	110%

QUALITY CONTROL Acid Extractable metals in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date digested	-			11/5/09	28732-1	11/05/2009 || 11/05/2009	LCS-5	11/5/09
Date analysed	-			11/5/09	28732-1	11/05/2009 || 11/05/2009	LCS-5	11/5/09
Arsenic	mg/kg	4	Metals.20 ICP-AES	<4	28732-1	6 || 6 || RPD: 0	LCS-5	105%
Cadmium	mg/kg	0.5	Metals.20 ICP-AES	<0.5	28732-1	<0.5 || <0.5	LCS-5	101%
Chromium	mg/kg	1	Metals.20 ICP-AES	<1	28732-1	8 || 14 || RPD: 55	LCS-5	106%
Copper	mg/kg	1	Metals.20 ICP-AES	<1	28732-1	6 || 8 || RPD: 29	LCS-5	103%
Lead	mg/kg	1	Metals.20 ICP-AES	<1	28732-1	4 || 5 || RPD: 22	LCS-5	102%
Mercury	mg/kg	0.1	Metals.21 CV-AAS	<0.1	28732-1	<0.1 || <0.1	LCS-5	104%
Nickel	mg/kg	1	Metals.20 ICP-AES	<1	28732-1	4 || 5 || RPD: 22	LCS-5	106%

QUALITY CONTROL Acid Extractable metals in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Zinc	mg/kg	1	Metals.20 ICP-AES	<1	28732-1	17 || 16 || RPD: 6	LCS-5	107%

QUALITY CONTROL Miscellaneous Inorg - soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			11/08/2009	28732-7	11/08/2009 || 11/08/2009	LCS-1	11/08/2009
Date analysed	-			11/08/2009	28732-7	11/05/2009 || 11/08/2009	LCS-1	11/08/2009
Electrical Conductivity 1:5 soil:water	µS/cm	1	LAB.2	<1.0	28732-7	230 || 230 || RPD: 0	LCS-1	104%

QUALITY CONTROL Moisture	UNITS	PQL	METHOD	Blank
Date prepared	-			11/05/2009
Date analysed	-			11/05/2009
Moisture	%	0.1	LAB.8	<0.10

QUALITY CONTROL sPOCAS	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			8/5/09	28732-56	8/05/2009 || 8/05/2009	LCS	8/5/09
Date analysed	-			8/5/09	28732-56	8/05/2009 || 8/05/2009	LCS	8/5/09
pH $_{kcl}$	pH units		LAB.64	5.9	28732-56	8.6 || 8.7 || RPD: 1	LCS	101%
TAA pH 6.5	moles H^+/t	5	LAB.64	<5	28732-56	<5 || <5	LCS	117%
s-TAA pH 6.5	%w/w S	0.01	LAB.64	<0.01	28732-56	<0.01 || <0.01	LCS	120%
pH $_{Ox}$	pH units		LAB.64	4.0	28732-56	2.6 || 2.6 || RPD: 0	LCS	94%
TPA pH 6.5	moles H^+/t	5	LAB.64	<5.0	28732-56	155 || 168 || RPD: 8	LCS	93%
s-TPA pH 6.5	%w/w S	0.01	LAB.64	<0.01	28732-56	0.25 || 0.27 || RPD: 8	LCS	93%
TSA pH 6.5	moles H^+/t	5	LAB.64	<5.0	28732-56	155 || 168 || RPD: 8	LCS	92%
s-TSA pH 6.5	%w/w S	0.01	LAB.64	<0.01	28732-56	0.25 || 0.27 || RPD: 8	LCS	93%
ANC_E	% $CaCO_3$	0.05	LAB.64	<0.05	28732-56	<0.05 || <0.05	[NR]	[NR]
a-ANC_E	moles H^+/t	5	LAB.64	<5	28732-56	<5 || <5	[NR]	[NR]
s-ANC_E	%w/w S	0.05	LAB.64	<0.05	28732-56	<0.05 || <0.05	[NR]	[NR]
S_{KCl}	%w/w S	0.005	LAB.64	<0.005	28732-56	0.042 || 0.038 || RPD: 10	LCS	118%

QUALITY CONTROL sPOCAS	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
S_P	%w/w	0.005	LAB.64	<0.005	28732-56	0.63 || 0.63 || RPD: 0	LCS	106%
S_{POS}	%w/w	0.005	LAB.64	<0.005	28732-56	0.58 || 0.59 || RPD: 2	LCS	103%
a-S_{POS}	moles H^+/t	5	LAB.64	<5.0	28732-56	365 || 368 || RPD: 1	LCS	103%
Ca_{KCl}	%w/w	0.005	LAB.64	<0.005	28732-56	0.12 || 0.11 || RPD: 9	LCS	99%
Ca_P	%w/w	0.005	LAB.64	<0.005	28732-56	0.27 || 0.25 || RPD: 8	LCS	94%
Ca_A	%w/w	0.005	LAB.64	<0.005	28732-56	0.15 || 0.14 || RPD: 7	[NR]	[NR]
Mg_{KCl}	%w/w	0.005	LAB.64	<0.005	28732-56	0.018 || 0.015 || RPD: 18	LCS	98%
Mg_P	%w/w	0.005	LAB.64	<0.005	28732-56	0.025 || 0.025 || RPD: 0	LCS	92%
Mg_A	%w/w	0.005	LAB.64	<0.005	28732-56	0.007 || 0.009 || RPD: 25	[NR]	[NR]
SRAS	%w/w	0.005	LAB.64	<0.005	28732-56	<0.005 || <0.005	[NR]	[NR]
S_{HCl}	%w/w S	0.005	LAB.64	<0.005	28732-56	0.039 || 0.042 || RPD: 7	LCS	82%
S_{NAS}	%w/w S	0.005	LAB.64	<0.005	28732-56	<0.005 || <0.005	[NR]	[NR]
a-S_{NAS}	moles H^+/t	5	LAB.64	<5	28732-56	<5 || <5	[NR]	[NR]
s-S_{NAS}	%w/w S	0.01	LAB.64	<0.01	28732-56	<0.01 || <0.01	[NR]	[NR]
a-Net Acidity	moles H^+/t	10	LAB.64	<10	28732-56	225 || 234 || RPD: 4	LCS	104%
Liming rate	kg $CaCO_3$/t	0.75	LAB.64	<0.75	28732-56	17 || 18 || RPD: 6	LCS	104%
a-Net Acidity without ANCE	moles H^+/t	10	LAB.64	<10	28732-56	NA || NA	[NR]	[NR]
Liming rate without ANCE	kg $CaCO_3$/t	0.75	LAB.64	<0.75	28732-56	NA || NA	[NR]	[NR]

QUALITY CONTROL vTPH & BTEX in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	[NT]	[NT]	28732-2	11/5/09
Date analysed	-	[NT]	[NT]	28732-2	11/5/09
vTPH C_6 - C_9	mg/kg	[NT]	[NT]	28732-2	88%
Benzene	mg/kg	[NT]	[NT]	28732-2	89%
Toluene	mg/kg	[NT]	[NT]	28732-2	86%
Ethylbenzene	mg/kg	[NT]	[NT]	28732-2	87%
m+p-xylene	mg/kg	[NT]	[NT]	28732-2	89%
o-Xylene	mg/kg	[NT]	[NT]	28732-2	92%
Surrogate aaa-Trifluorotoluene	%	[NT]	[NT]	28732-2	138%

QUALITY CONTROL sTPH in Soil (C10-C36)	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	[NT]	[NT]	28732-2	11/5/09
Date analysed	-	[NT]	[NT]	28732-2	11/5/09
TPH C_{10} - C_{14}	mg/kg	[NT]	[NT]	28732-2	111%
TPH C_{15} - C_{28}	mg/kg	[NT]	[NT]	28732-2	108%
TPH C_{29} - C_{36}	mg/kg	[NT]	[NT]	28732-2	101%
Surrogate o-Terphenyl	%	[NT]	[NT]	28732-2	101%
QUALITY CONTROL PAHs in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	[NT]	[NT]	28732-2	11/05/2009
Date analysed	-	[NT]	[NT]	28732-2	11/05/2009
Naphthalene	mg/kg	[NT]	[NT]	28732-2	96%
Acenaphthylene	mg/kg	[NT]	[NT]	[NR]	[NR]
Acenaphthene	mg/kg	[NT]	[NT]	[NR]	[NR]
Fluorene	mg/kg	[NT]	[NT]	28732-2	95%
Phenanthrene	mg/kg	[NT]	[NT]	28732-2	101%
Anthracene	mg/kg	[NT]	[NT]	[NR]	[NR]
Fluoranthene	mg/kg	[NT]	[NT]	28732-2	93%
Pyrene	mg/kg	[NT]	[NT]	28732-2	99%
Benzo(a)anthracene	mg/kg	[NT]	[NT]	[NR]	[NR]
Chrysene	mg/kg	[NT]	[NT]	28732-2	109%
Benzo(b+k)fluoranthene	mg/kg	[NT]	[NT]	[NR]	[NR]
Benzo(a)pyrene	mg/kg	[NT]	[NT]	28732-2	89%
Indeno(1,2,3-c,d)pyrene	mg/kg	[NT]	[NT]	[NR]	[NR]
Dibenzo(a,h)anthracene	mg/kg	[NT]	[NT]	[NR]	[NR]
Benzo(g,h,i)perylene	mg/kg	[NT]	[NT]	[NR]	[NR]
Surrogate p-Terphenyl-d_{14}	%	[NT]	[NT]	28732-2	95%

QUALITY CONTROL Organochlorine Pesticides in soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	[NT]	[NT]	28732-2	11/5/09
Date analysed	-	[NT]	[NT]	28732-2	11/5/09
HCB	mg/kg	[NT]	[NT]	[NR]	[NR]
alpha-BHC	mg/kg	[NT]	[NT]	28732-2	101%
gamma-BHC	mg/kg	[NT]	[NT]	[NR]	[NR]
beta-BHC	mg/kg	[NT]	[NT]	28732-2	125%
Heptachlor	mg/kg	[NT]	[NT]	28732-2	110%
delta-BHC	mg/kg	[NT]	[NT]	[NR]	[NR]
Aldrin	mg/kg	[NT]	[NT]	28732-2	114%
Heptachlor Epoxide	mg/kg	[NT]	[NT]	28732-2	107%
gamma-Chlordane	mg/kg	[NT]	[NT]	[NR]	[NR]
alpha-chlordane	mg/kg	[NT]	[NT]	[NR]	[NR]
Endosulfan I	mg/kg	[NT]	[NT]	[NR]	[NR]
pp-DDE	mg/kg	[NT]	[NT]	28732-2	100%
Dieldrin	mg/kg	[NT]	[NT]	28732-2	108%
Endrin	mg/kg	[NT]	[NT]	28732-2	114%
pp-DDD	mg/kg	[NT]	[NT]	28732-2	114%
Endosulfan II	mg/kg	[NT]	[NT]	[NR]	[NR]
pp-DDT	mg/kg	[NT]	[NT]	[NR]	[NR]
Endrin Aldehyde	mg/kg	[NT]	[NT]	[NR]	[NR]
Endosulfan Sulphate	mg/kg	[NT]	[NT]	28732-2	105%
Methoxychlor	mg/kg	[NT]	[NT]	[NR]	[NR]
Surrogate TCLMX	%	[NT]	[NT]	28732-2	93%

QUALITY CONTROL Organophosphorus Pesticides	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	[NT]	[NT]	28732-2	11/5/09
Date analysed	-	[NT]	[NT]	28732-2	11/5/09
Diazinon	mg/kg	[NT]	[NT]	[NR]	[NR]
Dimethoate	mg/kg	[NT]	[NT]	[NR]	[NR]
Chlorpyriphos-methyl	mg/kg	[NT]	[NT]	[NR]	[NR]
Ronnel	mg/kg	[NT]	[NT]	[NR]	[NR]
Chlorpyriphos	mg/kg	[NT]	[NT]	28732-2	100%
Fenitrothion	mg/kg	[NT]	[NT]	28732-2	134%
Bromophos-ethyl	mg/kg	[NT]	[NT]	[NR]	[NR]
Ethion	mg/kg	[NT]	[NT]	28732-2	123%
Surrogate TCLMX	%	[NT]	[NT]	28732-2	101%
QUALITY CONTROL PCBs in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	[NT]	[NT]	28732-2	11/5/09
Date analysed	-	[NT]	[NT]	28732-2	11/5/09
Arochlor 1016	mg/kg	[NT]	[NT]	[NR]	[NR]
Arochlor 1232	mg/kg	[NT]	[NT]	[NR]	[NR]
Arochlor 1242	mg/kg	[NT]	[NT]	[NR]	[NR]
Arochlor 1248	mg/kg	[NT]	[NT]	[NR]	[NR]
Arochlor 1254	mg/kg	[NT]	[NT]	28732-2	107%
Arochlor 1260	mg/kg	[NT]	[NT]	[NR]	[NR]
Surrogate TCLMX	%	[NT]	[NT]	28732-2	122%
QUALITY CONTROL Acid Extractable metals in soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date digested	-	28732-69	11/05/2009 || 11/05/2009	LCS-6	11/5/09
Date analysed	-	28732-69	11/05/2009 || 11/05/2009	LCS-6	11/5/09
Arsenic	mg/kg	28732-69	6 || 6 || RPD: 0	LCS-6	102%
Cadmium	mg/kg	28732-69	<0.5 || <0.5	LCS-6	99%
Chromium	mg/kg	28732-69	11 || 10 || RPD: 10	LCS-6	103%
Copper	mg/kg	28732-69	7 || 8 || RPD: 13	LCS-6	103%
Lead	mg/kg	28732-69	4 || 4 || RPD: 0	LCS-6	100%
Mercury	mg/kg	28732-69	<0.1 || <0.1	LCS-6	103%
Nickel	mg/kg	28732-69	4 || 4 || RPD: 0	LCS-6	103%
Zinc	mg/kg	28732-69	17 || 14 || RPD: 19	LCS-6	104%

QUALITY CONTROL Miscellaneous Inorg - soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	28732-41	11/08/2009 || 11/08/2009	LCS-2	11/08/2009
Date analysed	-	28732-41	11/08/2009 || 11/08/2009	LCS-2	11/08/2009
Electrical Conductivity 1:5 soil:water	µS/cm	28732-41	300 || 330 || RPD: 10	LCS-2	102%
QUALITY CONTROL Acid Extractable metals in soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date digested	-	[NT]	[NT]	28732-2	11/5/09
Date analysed	-	[NT]	[NT]	28732-2	11/5/09
Arsenic	mg/kg	[NT]	[NT]	28732-2	100%
Cadmium	mg/kg	[NT]	[NT]	28732-2	96%
Chromium	mg/kg	[NT]	[NT]	28732-2	102%
Copper	mg/kg	[NT]	[NT]	28732-2	107%
Lead	mg/kg	[NT]	[NT]	28732-2	95%
Mercury	mg/kg	[NT]	[NT]	28732-2	103%
Nickel	mg/kg	[NT]	[NT]	28732-2	100%
Zinc	mg/kg	[NT]	[NT]	28732-2	96%
QUALITY CONTROL Miscellaneous Inorg - soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD		
Date prepared	-	28732-53	11/08/2009 || 11/08/2009		
Date analysed	-	28732-53	11/08/2009 || 11/08/2009		
Electrical Conductivity 1:5 soil:water	µS/cm	28732-53	190 || 200 || RPD: 5		

Report Comments:

Asbestos was analysed by Approved Identifier: Not applicable for this job
INS: Insufficient sample for this test NT: Not tested PQL: Practical Quantitation Limit <: Less than >: Greater than
RPD: Relative Percent Difference NA: Test not required LCS: Laboratory Control Sample NR: Not requested

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike: A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample): This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria:

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the sample batch were within laboratory acceptance criteria.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
Matrix Spikes and LCS: Generally 70-130% for inorganics/metals; 60-140% for organics and 10-140% for SVOC and speciated phenols is acceptable. Surrogates: 60-140% is acceptable for general organics and 10-140% for SVOC and speciated phenols.

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CERTIFICATE OF ANALYSIS 29273

Client:
Martens & Associates
6/37 Leighton Place
Hornsby
NSW 2077

Attention: Megan Bowling

Sample log in details:

Your Reference:	**P0902316, Port Macquarie**
No. of samples:	10 Soils
Date samples received:	28/05/09
Date completed instructions received:	28/05/09

Analysis Details:
Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by:	5/06/09
Date of Preliminary Report:	Not Issued
Issue Date:	5/06/09

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Accredited for compliance with ISO/IEC 17025.
Tests not covered by NATA are denoted with *.

Results Approved By:

David Springer
Business Development & Quality Manager

sPOCAS Our Reference: Your Reference Type of sample Date Sampled	UNITS ---------- ----------	29273-1 2316/2/1.0 Soil 04-05/05/09	29273-2 2316/6/1.4 Soil 04-05/05/09	29273-3 2316/9/1.0 Soil 04-05/05/09	29273-4 2316/14/1.5 Soil 04-05/05/09	29273-5 2316/16/1.5 Soil 04-05/05/09
Date prepared	-	29/05/2009	29/05/2009	29/05/2009	29/05/2009	29/05/2009
Date analysed	-	29/05/2009	29/05/2009	29/05/2009	29/05/2009	29/05/2009
pH $_{kcl}$	pH units	9.3	9.6	9.5	9.7	9.6
TAA pH 6.5	moles H^+/t	<5	<5	<5	<5	<5
s-TAA pH 6.5	%w/w S	<0.01	<0.01	<0.01	<0.01	<0.01
pH $_{Ox}$	pH units	7.0	7.0	7.1	7.0	7.0
TPA pH 6.5	moles H^+/t	<5.0	<5.0	<5.0	<5.0	<5.0
s-TPA pH 6.5	%w/w S	<0.01	<0.01	<0.01	<0.01	<0.01
TSA pH 6.5	moles H^+/t	<5.0	<5.0	<5.0	<5.0	<5.0
s-TSA pH 6.5	%w/w S	<0.01	<0.01	<0.01	<0.01	<0.01
ANCE	% $CaCO_3$	0.75	0.88	0.75	0.75	0.63
a-ANCE	moles H^+/t	150	175	150	150	125
s-ANCE	%w/w S	0.24	0.28	0.24	0.24	0.20
SKCl	%w/w S	0.008	<0.005	<0.005	<0.005	0.011
SP	%w/w	0.022	0.005	0.015	0.009	0.019
SPOS	%w/w	0.014	<0.005	0.014	<0.005	0.008
a-SPOS	moles H^+/t	8.6	<5.0	8.5	<5.0	5.0
CaKCl	%w/w	0.11	0.093	0.10	0.10	0.10
CaP	%w/w	0.43	0.41	0.38	0.42	0.47
CaA	%w/w	0.32	0.32	0.27	0.32	0.36
MgKCl	%w/w	<0.005	<0.005	<0.005	<0.005	<0.005
MgP	%w/w	0.005	<0.005	<0.005	<0.005	0.007
MgA	%w/w	<0.005	<0.005	<0.005	<0.005	<0.005
SRAS	%w/w	<0.005	<0.005	<0.005	<0.005	<0.005
SHCl	%w/w S	0.009	<0.005	<0.005	0.007	0.011
SNAS	%w/w S	<0.005	<0.005	<0.005	<0.005	<0.005
a-SNAS	moles H^+/t	<5	<5	<5	<5	<5
s-SNAS	%w/w S	<0.01	<0.01	<0.01	<0.01	<0.01
a-Net Acidity	moles H^+/t	<10	<10	<10	<10	<10
Liming rate	kg $CaCO_3$/t	<0.75	<0.75	<0.75	<0.75	<0.75
a-Net Acidity without ANCE	moles H^+/t	<10	<10	<10	<10	<10
Liming rate without ANCE	kg $CaCO_3$/t	<0.75	<0.75	<0.75	<0.75	<0.75

sPOCAS Our Reference: Your Reference Type of sample Date Sampled	UNITS ---------- ----------	29273-6 2316/18/1.0 Soil 04-05/05/09	29273-7 2316/18/1.5 Soil 04-05/05/09	29273-8 2316/27/1.0 Soil 04-05/05/09	29273-9 2316/29/1.0 Soil 04-05/05/09	29273-10 2316/29/1.4 Soil 04-05/05/09
Date prepared	-	29/05/2009	29/05/2009	29/05/2009	29/05/2009	29/05/2009
Date analysed	-	29/05/2009	29/05/2009	29/05/2009	29/05/2009	29/05/2009
pH kcl	pH units	9.6	9.4	9.5	9.5	9.6
TAA pH 6.5	moles H^+/t	<5	<5	<5	<5	<5
s-TAA pH 6.5	%w/w S	<0.01	<0.01	<0.01	<0.01	<0.01
pH Ox	pH units	7.2	7.2	6.6	7.0	7.0
TPA pH 6.5	moles H^+/t	<5.0	<5.0	<5.0	<5.0	<5.0
s-TPA pH 6.5	%w/w S	<0.01	<0.01	<0.01	<0.01	<0.01
TSA pH 6.5	moles H^+/t	<5.0	<5.0	<5.0	<5.0	<5.0
s-TSA pH 6.5	%w/w S	<0.01	<0.01	<0.01	<0.01	<0.01
ANCE	% $CaCO_3$	0.75	0.63	0.2	0.50	0.4
a-ANCE	moles H^+/t	150	125	50	100	75
s-ANCE	%w/w S	0.24	0.20	0.08	0.16	0.12
SKCl	%w/w S	0.008	0.024	<0.005	0.030	0.014
SP	%w/w	0.019	0.030	0.005	0.039	0.018
SPOS	%w/w	0.012	0.005	<0.005	0.008	<0.005
a-SPOS	moles H^+/t	7.4	<5.0	<5.0	5.1	<5.0
CaKCl	%w/w	0.10	0.12	0.069	0.11	0.094
CaP	%w/w	0.45	0.44	0.097	0.34	0.25
CaA	%w/w	0.34	0.32	0.028	0.23	0.15
MgKCl	%w/w	<0.005	<0.005	<0.005	<0.005	<0.005
MgP	%w/w	<0.005	<0.005	<0.005	0.005	<0.005
MgA	%w/w	<0.005	<0.005	<0.005	<0.005	<0.005
SRAS	%w/w	<0.005	<0.005	<0.005	<0.005	<0.005
SHCl	%w/w S	0.009	0.025	<0.005	0.024	0.014
SNAS	%w/w S	<0.005	<0.005	<0.005	<0.005	<0.005
a-SNAS	moles H^+/t	<5	<5	<5	<5	<5
s-SNAS	%w/w S	<0.01	<0.01	<0.01	<0.01	<0.01
a-Net Acidity	moles H^+/t	<10	<10	<10	<10	<10
Liming rate	kg $CaCO_3$/t	<0.75	<0.75	<0.75	<0.75	<0.75
a-Net Acidity without ANCE	moles H^+/t	<10	<10	<10	<10	<10
Liming rate without ANCE	kg $CaCO_3$/t	<0.75	<0.75	<0.75	<0.75	<0.75

Method ID	Methodology Summary
LAB.64	sPOCAS determined using titrimetric and ICP-AES techniques. Based on Acid Sulfate Soils Laboratory Methods Guidelines, Version 2.1 - June 2004.

QUALITY CONTROL sPOCAS	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			29/5/09	29273-1	29/05/2009 || 29/05/2009	LCS	29/5/09
Date analysed	-			29/5/09	29273-1	29/05/2009 || 29/05/2009	LCS	29/5/09
pH kcl	pH units		LAB.64	5.9	29273-1	9.3 || 9.5 || RPD: 2	LCS	103%
TAA pH 6.5	moles H^+/t	5	LAB.64	<5	29273-1	<5 || <5	LCS	109%
s-TAA pH 6.5	%w/w S	0.01	LAB.64	<0.01	29273-1	<0.01 || <0.01	LCS	112%
pH Ox	pH units		LAB.64	4.3	29273-1	7.0 || 7.0 || RPD: 0	LCS	100%
TPA pH 6.5	moles H^+/t	5	LAB.64	<5.0	29273-1	<5.0 || <5.0	LCS	98%
s-TPA pH 6.5	%w/w S	0.01	LAB.64	<0.01	29273-1	<0.01 || <0.01	LCS	98%
TSA pH 6.5	moles H^+/t	5	LAB.64	<5.0	29273-1	<5.0 || <5.0	LCS	98%
s-TSA pH 6.5	%w/w S	0.01	LAB.64	<0.01	29273-1	<0.01 || <0.01	LCS	99%
ANCE	% $CaCO_3$	0.05	LAB.64	<0.05	29273-1	0.75 || 0.63 || RPD: 17	[NR]	[NR]
a-ANCE	moles H^+/t	5	LAB.64	<5	29273-1	150 || 125 || RPD: 18	[NR]	[NR]
s-ANCE	%w/w S	0.05	LAB.64	<0.05	29273-1	0.24 || 0.20 || RPD: 18	[NR]	[NR]
SKCl	%w/w S	0.005	LAB.64	<0.005	29273-1	0.008 || 0.006 || RPD: 29	LCS	111%
SP	%w/w	0.005	LAB.64	<0.005	29273-1	0.022 || 0.021 || RPD: 5	LCS	111%
SPOS	%w/w	0.005	LAB.64	<0.005	29273-1	0.014 || 0.015 || RPD: 7	LCS	112%
a-SPOS	moles H^+/t	5	LAB.64	<5.0	29273-1	8.6 || 9.3 || RPD: 8	LCS	111%
CaKCl	%w/w	0.005	LAB.64	<0.005	29273-1	0.11 || 0.10 || RPD: 10	LCS	106%
CaP	%w/w	0.005	LAB.64	<0.005	29273-1	0.43 || 0.38 || RPD: 12	LCS	100%
CaA	%w/w	0.005	LAB.64	<0.005	29273-1	0.32 || 0.28 || RPD: 13	[NR]	[NR]
MgKCl	%w/w	0.005	LAB.64	<0.005	29273-1	<0.005 || <0.005	LCS	104%
MgP	%w/w	0.005	LAB.64	<0.005	29273-1	0.005 || 0.005 || RPD: 0	LCS	96%
MgA	%w/w	0.005	LAB.64	<0.005	29273-1	<0.005 || <0.005	[NR]	[NR]
SRAS	%w/w	0.005	LAB.64	<0.005	29273-1	<0.005 || <0.005	[NR]	[NR]
SHCl	%w/w S	0.005	LAB.64	<0.005	29273-1	0.009 || 0.009 || RPD: 0	LCS	80%
SNAS	%w/w S	0.005	LAB.64	<0.005	29273-1	<0.005 || <0.005	[NR]	[NR]
a-SNAS	moles H^+/t	5	LAB.64	<5	29273-1	<5 || <5	[NR]	[NR]
s-SNAS	%w/w S	0.01	LAB.64	<0.01	29273-1	<0.01 || <0.01	[NR]	[NR]
a-Net Acidity	moles H^+/t	10	LAB.64	<10	29273-1	<10 || <10	LCS	111%
Liming rate	kg $CaCO_3$ /t	0.75	LAB.64	<0.75	29273-1	<0.75 || <0.75	LCS	111%

QUALITY CONTROL sPOCAS	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
a-Net Acidity without ANCE	moles H^+/t	10	LAB.64	<10	29273-1	<10 || <10	[NR]	[NR]
Liming rate without ANCE	kg $CaCO_3$/t	0.75	LAB.64	<0.75	29273-1	<0.75 || <0.75	[NR]	[NR]

Report Comments:

Asbestos was analysed by Approved Identifier: Not applicable for this job
INS: Insufficient sample for this test NT: Not tested PQL: Practical Quantitation Limit <: Less than >: Greater than
RPD: Relative Percent Difference NA: Test not required LCS: Laboratory Control Sample NR: Not requested

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike: A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample): This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria:

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the sample batch were within laboratory acceptance criteria.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
Matrix Spikes and LCS: Generally 70-130% for inorganics/metals; 60-140% for organics and 10-140% for SVOC and speciated phenols is acceptable. Surrogates: 60-140% is acceptable for general organics and 10-140% for SVOC and speciated phenols.