Douglas Partners
Geotechnics / Environment / Groundwater

Integrated Practical Solutions

Report on Geotechnical Assessment

Fernhill Estate
Western Precinct
Fairlight Road, Mulgoa

Prepared for
Cubelic Holdings Pty Ltd

Project 71706.01
June 2013

Douglas Partners
Geotechnics / Environment / Groundwater

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The undersigned, on behalf of Douglas Partners Pty Ltd, confirm that this document and all attached drawings, logs and test results have been checked and reviewed for errors, omissions and inaccuracies.

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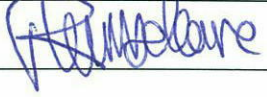
Reviewer		28 June 2013

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Report on Geotechnical Assessment
Fernhill Estate, Western Precinct
Fairlight Road, Mulgoa

1. Introduction

This report presents the results of additional geotechnical studies undertaken by Douglas Partners Pty Ltd (DP) within the western precinct of the proposed Fernhill Estate situated on Fairlight Road, Mulgoa. The work was commissioned by Cubelic Holdings Pty Ltd, on behalf of the property developer.

It is understood that the proposed development will include the subdivision of the site into 38 rural/residential allotments with a typical allotment size of approximately 20,000 m^2. The new lots will be serviced by a new road aligned centrally through the site that will provide access from two entry points located on Fairlight Road and Nepean Gorge Drive. Presently, the development is at a concurrent rezoning and development application stage, with the proposed development layout shown on Drawing 1, in Appendix B.

DP's previous Report on Land Capability Assessment (refer Project 71706.01, dated 26 June 2010), provided considerable geotechnical information for the western precinct. Due to a revised development layout, however, additional works were required to assess site areas that previously lay outside of the proposed development footprint. The additional geotechnical assessment works targeted the proposed on-site disposal of domestic effluent for the 38 new allotments.

The current geotechnical assessment comprised the drilling of boreholes followed by laboratory testing of selected samples, engineering analysis and reporting. Details of the work undertaken and the results obtained are presented in this report.

2. Site Description

The portion of land proposed for rural/residential development is approximately 115 hectares in plan area and encompasses the central and southern sections of a larger 180 hectare site that comprises two properties, namely:

- Lot 1 in DP549247; and
- Lot 31 in DP237163 (refer to Drawing 1).

Most of the proposed development is planned for the northern and southern parts of Lot 1 although the subdivision will also occupy the southern part of Lot 31 (refer Drawing 1). The proposed development area is bordered by:

- North Side – The remainder of Lot 31;

- South Side – Fairlight Road and existing rural/residential properties on the northern side of Fairlight Road;
- East Side – Existing rural/residential properties on the western side of Nepean Gorge Drive; and
- West Side – Fairlight Road.

The site is currently vacant rural land that is covered with grass and scattered to moderately dense natural tree growth. Although the site is essentially undeveloped and appears to follow the inferred natural land form, comparison of the site with those adjoining suggests some degree of vegetation clearing. Prior rural/grazing land use is also indicated by the presence of several existing rural dams.

Topographical relief across the majority of the site is slight, with the overall landform being undulating and varying in elevation from reduced levels of RL 203 m in the south east portion of the site to RL 164 m in the north east portion relative to Australian height datum (AHD). A broad ridge line runs north to south through the centre of the site and falls to the east and west where broad gullies approximate the eastern and western extents of the proposed development area.

3. Geology

Reference to the Penrith 1:100 000 Geological Series Sheet (Ref 2) indicates that the site is almost entirely underlain by Ashfield Shale of the Wianamatta Group of Triassic age. This formation typically comprises dark grey to black claystone-siltstone and fine grained sandstone-siltstone laminate. This formation typically weathers forming clays and silty clays of generally medium plasticity and low permeability.

The same geology map indicates that Hawkesbury Sandstone of Triassic age underlies land immediately to the west of the site and possibly within the western and north-western parts of the site. This formation typically comprises medium to very coarse grained quartz sandstone, minor laminated mudstone and siltstone lenses. This formation typically weathers forming sandy clay, clayey sand and sand soils of low plasticity and medium to high permeability.

4. Field Investigation

4.1 Field Investigation (2010)

The field work for the land capability assessment undertaken in 2010 comprised surface and subsurface investigations that included:

- Excavation of 30 test pits across the Western Precinct;
- Dynamic cone penetrometer (DCP) tests adjacent to selected test pits to aid the assessment of in-situ soil strength;
- Collection of representative bulk and undisturbed soil samples from the test pits for geotechnical laboratory analysis; and

- Collection of additional near-surface soil samples from shallow hand auger bores or manually excavated test pits, where relevant, between test pit locations.

Test pits were excavated by a backhoe, fitted with a 450 mm wide toothed bucket. Test pits were excavated to a maximum depth of 4 m or until practical refusal on rock was reached at depths of between 0.85 m and 4 m.

DCP testing was undertaken adjacent to 18 of the 30 test pits and extended to depths of between 0.9 m and 2.4 m.

Geotechnical sampling from the test pits included large bulk, small disturbed and undisturbed tube samples. A selection of these samples were then scheduled for a variety of laboratory tests including particle size distribution, hydrometer, Atterberg limits, Emerson class number, California bearing ratio, shrink swell index and field moisture content tests to assist the geotechnical assessment.

The results of the 2010 field investigation are presented on the test pit logs sheets in Appendix C.

4.2 Field Investigation (Current)

4.2.1 Field Work Methods

The field work for the current geotechnical assessment was conducted on 18 June 2013 and included:

- A walkover inspection of the site by a geotechnical engineer.
- Drilling of seven boreholes (BH1 to BH7) using a truck-mounted DT100 drill rig. The bores were drilled using solid flight augers fitted with a Tungsten-Carbide (TC) bit until termination in weathered rock (shale and sandstone) at depths of between 0.2 m and 2.2 m in all boreholes.
- Collection of soil samples from the boreholes for examination, logging and to provide laboratory test specimens for a range of geotechnical and chemical testing.

Borehole locations were selected to cover the areas of the site previously excluded from the development footprint and thus not assessed during the 2010 land capability assessment. The borehole locations are shown on Drawing 1, in Appendix B. Locations were chosen based on drill rig accessibility and existing buried services. Prior to drilling at the site, bore locations were scanned for the presence of in-ground (buried) service lines. The surface level for each bore was estimated from the survey data provided by the client, which is understood to be relative to AHD.

4.2.2 Field Work Results

A summary of the typical sequence of subsurface conditions encountered at site is presented below:

Topsoil: Consisting of firm brown silty sandy clay with a trace of rootlets. Topsoil was present at boreholes BH1 to BH5 and extended to depths of between 0.1 m and 0.2 m. Topsoils were generally humid to damp, although are probably wetter now, considering the wet weather experienced since the field investigation.

Residual Soil: Comprising stiff to very stiff and hard, orange brown, mottled red brown and grey silty clay and sandy clay. Residual clays were present in all seven boreholes except BH1 and extended to depths of between 0.7 m and 2.2 m. Residual clays were generally humid to moist and of estimated medium to high plasticity.

Weathered Rock: Comprising Shale and Sandstone encountered from depths of between 0.2 m and 2.2 m. Initially of estimated extremely low to low strength, auger penetration in sandstone was typically less than 0.7 m whereas penetration in shale reached 1.2 m in depth before drilling was terminated prior to refusal.

Soil conditions were relatively uniform across the site, confirming that only one soil landscape is present at the site (Blacktown Soil Landscape), as indicated by the soil landscape maps (refer DP's Report on Land Capability). Sandstone was present within the northern and western parts of the site, whereas shale was present elsewhere, which is consistent with geological maps for the site.

In addition to the above soil profiles, filling should be expected within the existing dam walls and is likely to comprise a blend of the residual soils and upper weathered rock profiles.

The results of the current field investigation are presented on the borehole logs sheets in Appendix D.

4.3 Groundwater

Groundwater was not observed in any of the boreholes drilled at site. Although the boreholes were immediately backfilled, preventing long term monitoring of groundwater levels, the moisture contents of the subsurface soils did not indicate free groundwater to be likely within the depth of the investigation. Given the elevation of the site, regional groundwater levels are expected to lie well below the ground surface.

Surface water was identified only in the existing dams on the site. No other surface water bodies or ponded areas were evident during the field investigation.

5. Laboratory Testing

5.1 Land Capability Assessment Test Results (2010)

Soil and weathered rock samples were collected from the test pits excavated during the 2010 field investigation. Representative samples were selected to undergo a suite of geotechnical and chemical tests to assist the land capability assessment. The results of the 2010 laboratory tests relevant to the current assessment are summarised in Tables 1 and 2 below and are presented in Appendix E.

Table 1: Results of Particle Size Distribution Tests (2010)

Test Pit No.	Depth (m)	Soil Description	% of Soil Mass		
			Sand[-D]	Silt[-E]	Clay[-F]
TP9	1.0	Sandy Silty Clay	28%	25%	43%
TP24	0.5	Sandy Silty Clay	18%	33%	46%
TP25	1.0	Sandy Silty Clay	16%	26%	41%

Notes: [-D] *Sand = 2.36 – 0.075 mm*
[-E] *Silt = 0.075 – 0.002 mm*
[-F] *Clay = <0.002 mm*

The laboratory test results confirm the consistent clayey nature of the residual soils at the site. In conjunction with the 2010 Atterberg limit test results, the 2010 particle size distribution tests indicated soil classifications for the residual soils, in accordance with the unified soil classification system, corresponding to inorganic clays of low to medium plasticity (CL), inorganic clays of high plasticity (CH) and inorganic silts or fine sandy or silty soils (MH).

Emerson Class Number tests were undertaken on selected soil samples, and can be summarised as follows:

- Emerson Class Number 5 – TP5 (0.5 m) and TP14 (0.5 m); and
- Emerson Class Number 6 – TP9 (1.0 m), TP11 (0.5 m), TP24 (1.0 m) and TP28 (1.0 m).

The Emerson Class number for a soil relates to the potential for the soil to slake and disperse. Higher Emerson class numbers correspond to soils with a lower tendency to disperse. Emerson class numbers of 5 and 6 indicates a tendency for the soil to slake with a low susceptibility to dispersion.

Table 2: Results of Soil Chemistry Tests (2010)

TP No.	Depth (m)	$EC_{1:5}$ (ds/m)	Texture Class	EC_e (Ds/m)	pHw (1:2)	ESP (%)	Cl (mg/kg)	SO_4 (mg/kg)	Resis. (Ω.m)	Comments		
										Salinity	Acidity	Sodicity
TP3	0.25	0.04	LC	0.37	7.6	-	17	3.8	230	NS	Neutral	-
TP3	0.5	0.04	LMC	0.30	6.1	7.4	20	2.5	270	NS	Neutral	S
TP3	1.0	0.04	LMC	0.31	6.8	-	18	3.3	250	NS	Neutral	-
TP3	1.5	0.06	LMC	0.46	4.8	-	31	<2.0	170	NS	Acidic	-
TP3	2.0	0.04	LMC	0.30	4.6	-	16	3.7	260	NS	Acidic	-
TP3	2.5	0.04	MC	0.29	7.6	-	15	3.1	240	NS	Neutral	-
TP6	0.25	0.01	L	0.12	5.9	-	-	-	770	NS	Acidic	-
TP6	0.5	0.02	LMC	0.13	5.9	12.8	-	-	630	NS	Acidic	S
TP9	0.25	0.01	LC	0.08	6.0	-	-	-	1100	NS	Neutral	-
TP9	0.5	0.01	LC	0.12	6.0	-	-	-	710	NS	Neutral	-
TP9	1.0	0.01	MC	0.09	5.4	-	-	-	770	NS	Acidic	-
TP12	0.25	0.06	CL	0.50	4.9	-	<20	<20	180	NS	Acidic	-

TP No.	Depth (m)	$EC_{1:5}$ (ds/m)	Texture Class	EC_e (Ds/m)	pHw (1:2)	ESP (%)	Cl (mg/kg)	SO_4 (mg/kg)	Resis. (Ω.m)	Comments		
										Salinity	Acidity	Sodicity
TP12	0.5	0.05	LMC	0.36	4.9	10.5	6.0	6.9	220	NS	Acidic	S
TP14	0.25	0.01	CL	0.09	6.2	-	-	-	1100	NS	Neutral	-
TP14	0.5	0.01	LMC	0.04	6.0	-	-	-	1900	NS	Neutral	-
TP14	1.0	0.01	MC	0.10	5.9	-	-	-	710	NS	Acidic	-
TP14	1.5	0.02	MC	0.11	5.4	-	-	-	670	NS	Acidic	-
TP16	0.25	0.04	LMC	0.30	5.0	18.1	2.2	7.2	260	NS	Acidic	HS
TP16	0.5	0.04	LMC	0.34	7.8	9.4	2.1	6.6	230	NS	Neutral	S
TP18	0.25	0.01	LMC	0.10	5.9	-	-	-	770	NS	Acidic	-
TP18	0.5	0.03	LMC	0.23	8.4	-	5.6	<2.0	340	NS	Basic	-
TP20	0.25	0.02	LMC	0.19	5.1	-	2.8	<2.0	420	NS	Acidic	-
TP20	0.5	0.03	MC	0.22	5.1	-	6.2	2.0	320	NS	Acidic	-
TP22	0.25	0.01	MC	0.08	5.8	-	-	-	910	NS	Acidic	-
TP22	0.5	0.01	MC	0.06	6.3	6.6	-	-	1300	NS	Neutral	S
TP24	0.25	0.01	LMC	0.07	6.1	-	-	-	1100	NS	Neutral	-
TP24	0.5	0.01	LMC	0.10	6.1	-	-	-	770	NS	Neutral	-
TP24	1.0	0.01	MC	0.08	5.4	-	-	-	830	NS	Acidic	-
TP26	0.25	0.01	LMC	0.10	5.8	-	-	-	760	NS	Acidic	-
TP26	0.5	0.05	LMC	0.36	5.1	-	12	<2.0	220	NS	Acidic	-
TP28	0.25	0.01	CL	0.08	6.0	-	-	-	1200	NS	Neutral	-
TP28	0.5	0.01	MC	0.09	6.2	-	-	-	790	NS	Neutral	-

Where $EC_{1:5}$ = *Electrical Conductivity*; EC_e = *Electrical Conductivity corrected for soil texture*; *pHw* = *pH in water*; *Cl* = *Chloride*; SO_4 = *Sulphate*; *ESP* = *Exchangeable Sodium Percentage*; *Resis.* = *Resistivity*

L = *Loam*; *LC* = *Light Clay*; *LMC* = *Light Medium Clay*; *MC* = *Medium Clay*; *CL* = *Clay Loam*; *NS* = *Non-saline*; *S / HS* = *Sodic / Highly Sodic*

5.2 Geotechnical (Current)

Soil samples were collected from the boreholes during the current field investigation. Representative samples were selected to undergo the following suite of geotechnical tests:

- Emerson class number tests – 7 samples
- Particle size distribution tests – 7 samples; and
- Bulk Density tests – 1 sample.

The results of these tests are presented in Appendix F and are summarised in Table 3.

Table 3: Results of Laboratory Tests (Geotechnical)

BH No.	Depth (m)	Soil Description	Bulk Density (t/m^3) [A]	Emerson Class No.	% of Soil Mass		
					Gravel[B]	Sand[C]	Silt+Clay[D]
BH1	0.3 – 0.6	Shaly Sandy Clay	-	2	22	33	45
BH2	0.3 – 0.5	Sandy Silty Clay	-	6	12	15	73
BH3	0.8 – 1.1	Silty Clay	-	6	3	9	88
BH4	0.4 – 0.6	Sandy Silty Clay	1.97	6	10	42	48
BH5	0.6 – 0.8	Silty Clayey Sand	-	6	4	54	42
BH6	0.3 – 0.5	Silty Clayey Sand	-	6	16	56	28
BH7	0.7 – 1.0	Silty Clay	-	6	6	9	85

Notes: [A] *Bulk Density measured at in situ moisture content, which was estimated as within 3-5% of optimum moisture content*
[B] *Gravel = >2.36 mm*
[C] *Sand = 2.36 – 0.075 mm*
[D] *Silt+Clay = <0.075 mm*

The laboratory test results confirm the mostly consistent clayey nature of the residual soils at the site.

The Emerson Class number for a soil relates to the potential for the soil to slake and disperse. Higher Emerson class numbers correspond to soils with a lower tendency to disperse. An Emerson class number of 6 indicates a tendency for the soil to slake with a low susceptibility to dispersion, whereas an Emerson class number of 2 indicates a tendency for the soil to slake and also to partially disperse.

5.3 Chemical (Current)

Representative soil samples collected from the boreholes during the field investigation were selected to undergo the following suite of chemical tests:

- pH;
- Electrical Conductivity ($EC_{1:5}$);
- Cation Exchange Capacity (CEC);
- Sodicity – Exchangeable Sodium Percentage (ESP);
- Phosphorous Sorption (P-sorption); and
- Classification – Soil texture.

The results of these tests are presented in Appendix F and are summarised in Table 4.

Table 4: Results of Laboratory Tests (Chemical)

BH No.	Depth (m)	pHw (1:5)	$EC_{1:5}$ (µs/m)	CEC (mg/kg)	ESP (%)	P-sorp (kg/ha)	Texture Class
BH1	0.3 – 0.6	5.5	16	2.5	4.7	9 500	LC
BH2	0.3 – 0.5	5.8	20	3.3	4.0	9 900	MC
BH3	0.8 – 1.1	5.8	34	8.1	3.3	9 300	LMC
BH4	0.4 – 0.6	6.1	13	3.7	1.7	10 000	LC
BH5	0.6 – 0.8	6.5	13	3.1	2.9	8 700	CL
BH6	0.3 – 0.5	6.1	11	1.6	2.5	7 400	CL
BH7	0.7 – 1.0	5.6	20	3.3	4.7	9 900	LMC

Where *pHw* = *pH in water*; $EC_{1:5}$ = *Electrical Conductivity*; *CEC* = *Cation Exchange Capacity*; *ESP* = *Exchangeable Sodium Percentage*; *P-sorp* = *Phosphorous Sorption*; *LC* = *Light Clay*; *LMC* = *Light Medium Clay*; *MC* = *Medium Clay*; *CL* = *Clay Loam*

6. Proposed Development

It is understood that the proposed development will include the subdivision of the site into 38 rural/residential allotments with a typical allotment size of approximately 20,000 m^2. The new lots will be serviced by a new road aligned centrally through the site that will provide access from two entry points located on Fairlight Road and Nepean Gorge Drive. Presently, the development is at a concurrent rezoning and development application stage, with the current proposed development layout shown on Drawing 1, in Appendix B.

The following sections provide general comments on suggested design parameters for the design and construction of on-site effluent disposal absorption beds.

7. Comments

7.1 Geotechnical Model

Based on the results of the current geotechnical assessment, together with the results of the 2010 land capability assessment, the site may be characterised as exhibiting a typically thin 0.1 m to 0.2 m layer of topsoil overlying stiff to hard residual clay, silty clay and sandy clay, overlying weathered bedrock comprising mostly shale and some sandstone. Rock depths range between 0.2 m and 2.2 m, although typically the rock surface lies close to 1 m depth.

The excavation of test pits and the drilling of boreholes have indicated the soils to be relatively uniform and of a stiff to hard consistency. Accordingly, the soils are generally weakly structured to massive

and of generally low permeability. It is therefore apparent that the design of on-site effluent disposal beds will need to be based on relatively low permeability values, thus resulting in relatively large absorption areas.

7.2 Design Soil Parameters

Based on the results of the current and 2010 assessments, and according to the procedures outlined in AS1547-2012, the following parameters are suggested for the design of on-site effluent disposal beds.

- Depth to bedrock or hardpan – it is suggested that the depth to rock for the given disposal area on each new lot be taken from the relevant test pit and/or borehole log sheet that represents the closest field investigation point to the proposed disposal area.
- Depth to high soil water table – groundwater was not encountered at the site during either the current or 2010 field investigations. It is suggested that the highest likely ground water surface for this site is expected to coincide with minor subsurface seepage flows that intermittently lie at or close to the soil/rock interface.
- Soil structure – soil structure at the site is generally considered as being weakly structured to massive. On further investigation, it may be possible to identify areas of moderately structure clays, although this is considered unlikely.
- Soil texture – soil texture classifications are presented above in Tables 2 and 4.
- Permeability category – it is suggested that the design permeability category for the given disposal area on each new lot be taken from Table 5.1 of AS1547-2012, with relevant soil category and indicative permeability to be based on the texture classification results presented in Tables 2 and 4 and the recommended soil structure outlined above. Where the test results indicate borderline conditions, the least permeable category/value should be adopted.
- Hydraulic loading for soil absorption system – it is suggested that the design hydraulic loading rate for the given disposal area on each new lot be taken from Table 5.2 of AS1547-2012, with relevant soil category, indicative permeability design loading rate to be based on the texture classification results presented in Tables 2 and 4, the recommended soil structure outlined above and the type of disposal system under consideration. Where the test results indicate borderline conditions, the least permeable category/value should be adopted.
- Coarse fragments – the percentage content of coarse fragments within the site's residual soils is low. Design values should be based on the results of particle size distribution tests presented above in Tables 1 and 3.
- Bulk density – a single result of 1.97 t/m^3 was obtained for soil bulk density. The density value was based on the soil conditions at the time of the field work, which were estimated as having a field moisture content within 3% to 5% dry of Standard optimum moisture content. The result is considered reasonable to slightly high for the given clay soil, which is likely to be the result of a relatively well graded soil that comprises an even mix of sand with silt and clay fines and some fine gravel. Based on the results of the investigations, it is considered that soil densities across the site would typically range between 1.8 t/m^3 to 2.0 t/m^3.

- Chemical test results – it is suggested that the design values for soil pH, electrical conductivity (EC), exchangeable sodium percentage (ESP), cation exchange capacity (CEC) and phosphorous sorption (P-sorp) are based on the laboratory test results presented above in Tables 2 and 4.
- Dispersiveness – it is suggested that the design values for soil dispersiveness are based on the Emerson class number tests results presented above in Section 5.1 and Table 3.

8. Limitations

Douglas Partners (DP) has prepared this report for this project at Fernhill Estate, Western Precinct, Fairlight Road, Mulgoa, in accordance with instructions received from Mr Paul Cubelic of Cubelic Holdings Pty Ltd and DP's fee proposal (Ref No. SYD130552, dated 14 June 2013). The work was carried out under DP's Conditions of Engagement. This updated report is provided for the exclusive use of Cubelic Holdings Pty Ltd for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of DP, does so entirely at its own risk and without recourse to DP for any loss or damage. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

The results provided in the report are indicative of the sub-surface conditions on the site only at the specific sampling and/or testing locations, and then only to the depths investigated and at the time the work was carried out. Sub-surface conditions can change abruptly due to variable geological processes and also as a result of human influences. Such changes may occur after DP's field testing has been completed.

DP's advice is based upon the conditions encountered during this investigation. The accuracy of the advice provided by DP in this report may be affected by undetected variations in ground conditions across the site between and beyond the sampling and/or testing locations. The advice may also be limited by budget constraints imposed by others or by site accessibility.

This report must be read in conjunction with all of the attached and should be kept in its entirety without separation of individual pages or sections. DP cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report.

This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by DP. This is because this report has been written as advice and opinion rather than instructions for construction.

The contents of this report do not constitute formal design components such as are required, by the Health and Safety Legislation and Regulations, to be included in a Safety Report specifying the hazards likely to be encountered during construction and the controls required to mitigate risk. This design process requires risk assessment to be undertaken, with such assessment being dependent upon factors relating to likelihood of occurrence and consequences of damage to property and to life. This, in turn, requires project data and analysis presently beyond the knowledge and project role respectively of DP. DP may be able, however, to assist the client in carrying out a risk assessment of

potential hazards contained in the Comments section of this report, as an extension to the current scope of works, if so requested, and provided that suitable additional information is made available to DP. Any such risk assessment would, however, be necessarily restricted to the geotechnical components set out in this report and to their application by the project designers to project design, construction, maintenance and demolition.

Douglas Partners Pty Ltd

Appendix A

About this Report

About this Report

Douglas Partners

Introduction

These notes have been provided to amplify DP's report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

DP's reports are based on information gained from limited subsurface excavations and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

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Borehole and Test Pit Logs

The borehole and test pit logs presented in this report are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, but this is not always practicable or possible to justify on economic grounds. In any case the boreholes and test pits represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than 'straight line' variations between the test locations.

Groundwater

Where groundwater levels are measured in boreholes there are several potential problems, namely:

- In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole is left open;
- A localised, perched water table may lead to an erroneous indication of the true water table;
- Water table levels will vary from time to time with seasons or recent weather changes. They may not be the same at the time of construction as are indicated in the report; and
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water measurements are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from a perched water table.

Reports

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, DP will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical and environmental aspects, and recommendations or suggestions for design and construction. However, DP cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on borehole or pit spacing and sampling frequency;
- Changes in policy or interpretations of policy by statutory authorities; or
- The actions of contractors responding to commercial pressures.

If these occur, DP will be pleased to assist with investigations or advice to resolve the matter.

About this Report

Site Anomalies

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, DP requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later stage, well after the event.

Information for Contractual Purposes

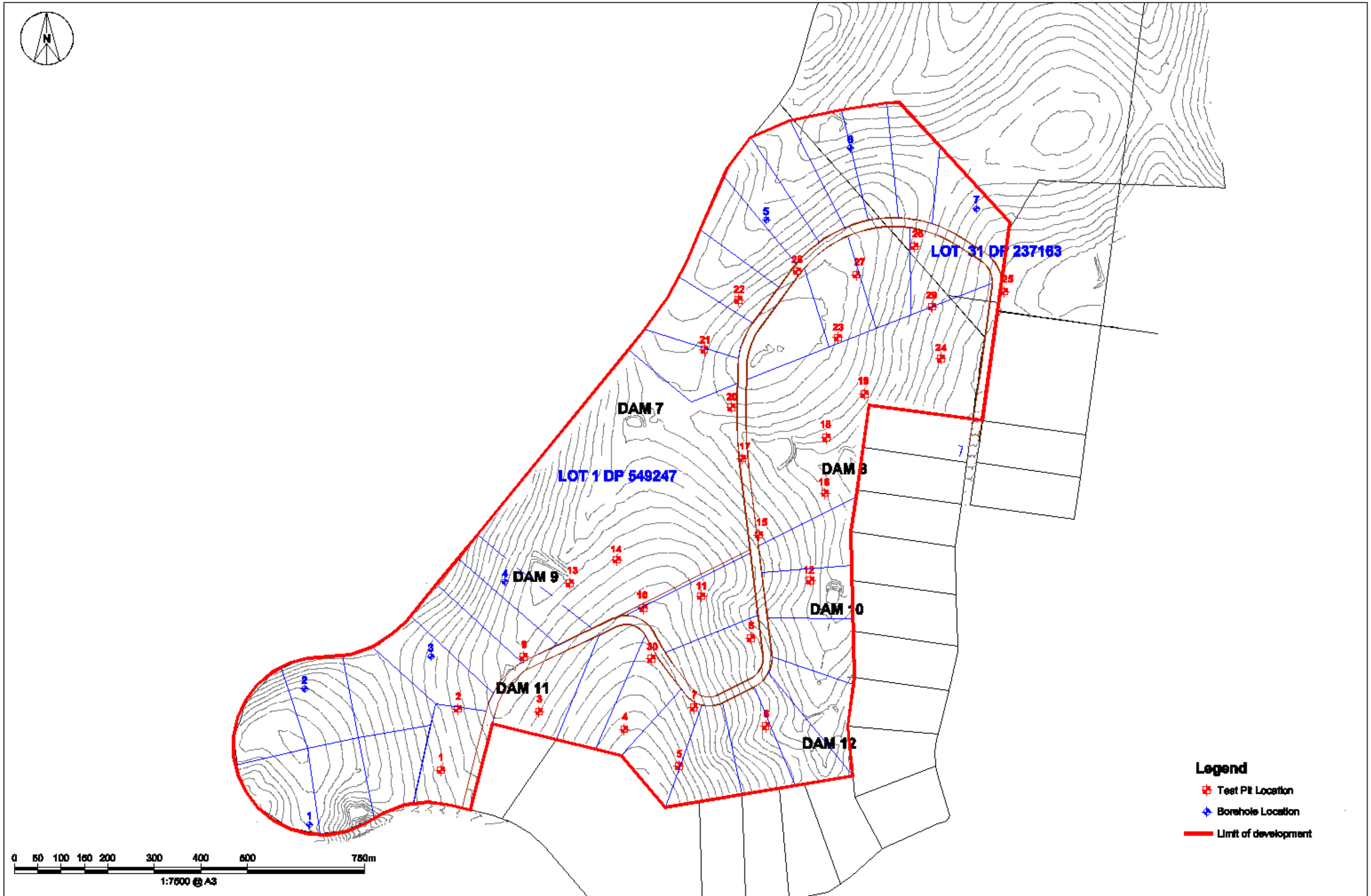
Where information obtained from this report is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. DP would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Site Inspection

The company will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.

Appendix B

Drawing 1



Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: Cubelic Holdings	TITLE: Location of Test Pits Land Capability Assessment - Western Precinct Farlight Road, MULGOA	PROJECT No: 71706.01
	OFFICE: Sydney / DRAWN BY: JCP		DRAWING No: 1
	SCALE: As shown / DATE: 20.6.2013		REVISION: B

50mm on Original

File Name: P:\71706.01 MULGOA, Fernhill Estate, Proposed Subdivision RCB\Drawings\71706.01_DWG01.dwg

Date printed: 28 Jun 2013 - 11:47AM

Appendix C

Field Work Results (2010)

Sampling Methods

Sampling

Sampling is carried out during drilling or test pitting to allow engineering examination (and laboratory testing where required) of the soil or rock.

Disturbed samples taken during drilling provide information on colour, type, inclusions and, depending upon the degree of disturbance, some information on strength and structure.

Undisturbed samples are taken by pushing a thin-walled sample tube into the soil and withdrawing it to obtain a sample of the soil in a relatively undisturbed state. Such samples yield information on structure and strength, and are necessary for laboratory determination of shear strength and compressibility. Undisturbed sampling is generally effective only in cohesive soils.

Test Pits

Test pits are usually excavated with a backhoe or an excavator, allowing close examination of the in-situ soil if it is safe to enter into the pit. The depth of excavation is limited to about 3 m for a backhoe and up to 6 m for a large excavator. A potential disadvantage of this investigation method is the larger area of disturbance to the site.

Large Diameter Augers

Boreholes can be drilled using a rotating plate or short spiral auger, generally 300 mm or larger in diameter commonly mounted on a standard piling rig. The cuttings are returned to the surface at intervals (generally not more than 0.5 m) and are disturbed but usually unchanged in moisture content. Identification of soil strata is generally much more reliable than with continuous spiral flight augers, and is usually supplemented by occasional undisturbed tube samples.

Continuous Spiral Flight Augers

The borehole is advanced using 90-115 mm diameter continuous spiral flight augers which are withdrawn at intervals to allow sampling or in-situ testing. This is a relatively economical means of drilling in clays and sands above the water table. Samples are returned to the surface, or may be collected after withdrawal of the auger flights, but they are disturbed and may be mixed with soils from the sides of the hole. Information from the drilling (as distinct from specific sampling by SPTs or undisturbed samples) is of relatively low reliability, due to the remoulding, possible mixing or softening of samples by groundwater.

Non-core Rotary Drilling

The borehole is advanced using a rotary bit, with water or drilling mud being pumped down the drill rods and returned up the annulus, carrying the drill cuttings. Only major changes in stratification can be determined from the cuttings, together with some information from the rate of penetration. Where drilling mud is used this can mask the cuttings and reliable identification is only possible from separate sampling such as SPTs.

Continuous Core Drilling

A continuous core sample can be obtained using a diamond tipped core barrel, usually with a 50 mm internal diameter. Provided full core recovery is achieved (which is not always possible in weak rocks and granular soils), this technique provides a very reliable method of investigation.

Standard Penetration Tests

Standard penetration tests (SPT) are used as a means of estimating the density or strength of soils and also of obtaining a relatively undisturbed sample. The test procedure is described in Australian Standard 1289, Methods of Testing Soils for Engineering Purposes - Test 6.3.1.

The test is carried out in a borehole by driving a 50 mm diameter split sample tube under the impact of a 63 kg hammer with a free fall of 760 mm. It is normal for the tube to be driven in three successive 150 mm increments and the 'N' value is taken as the number of blows for the last 300 mm. In dense sands, very hard clays or weak rock, the full 450 mm penetration may not be practicable and the test is discontinued.

The test results are reported in the following form.

- In the case where full penetration is obtained with successive blow counts for each 150 mm of, say, 4, 6 and 7 as:

  4,6,7
  N=13

- In the case where the test is discontinued before the full penetration depth, say after 15 blows for the first 150 mm and 30 blows for the next 40 mm as:

  15, 30/40 mm

The results of the SPT tests can be related empirically to the engineering properties of the soils.

Dynamic Cone Penetrometer Tests / Perth Sand Penetrometer Tests

Dynamic penetrometer tests (DCP or PSP) are carried out by driving a steel rod into the ground using a standard weight of hammer falling a specified distance. As the rod penetrates the soil the number of blows required to penetrate each successive 150 mm depth are recorded. Normally there is a depth limitation of 1.2 m, but this may be extended in certain conditions by the use of extension rods. Two types of penetrometer are commonly used.

- Perth sand penetrometer - a 16 mm diameter flat ended rod is driven using a 9 kg hammer dropping 600 mm (AS 1289, Test 6.3.3). This test was developed for testing the density of sands and is mainly used in granular soils and filling.
- Cone penetrometer - a 16 mm diameter rod with a 20 mm diameter cone end is driven using a 9 kg hammer dropping 510 mm (AS 1289, Test 6.3.2). This test was developed initially for pavement subgrade investigations, and correlations of the test results with California Bearing Ratio have been published by various road authorities.

Soil Descriptions

Description and Classification Methods

The methods of description and classification of soils and rocks used in this report are based on Australian Standard AS 1726, Geotechnical Site Investigations Code. In general, the descriptions include strength or density, colour, structure, soil or rock type and inclusions.

Soil Types

Soil types are described according to the predominant particle size, qualified by the grading of other particles present:

Type	Particle size (mm)
Boulder	>200
Cobble	63 - 200
Gravel	2.36 - 63
Sand	0.075 - 2.36
Silt	0.002 - 0.075
Clay	<0.002

The sand and gravel sizes can be further subdivided as follows:

Type	Particle size (mm)
Coarse gravel	20 - 63
Medium gravel	6 - 20
Fine gravel	2.36 - 6
Coarse sand	0.6 - 2.36
Medium sand	0.2 - 0.6
Fine sand	0.075 - 0.2

The proportions of secondary constituents of soils are described as:

Term	Proportion	Example
And	Specify	Clay (60%) and Sand (40%)
Adjective	20 - 35%	Sandy Clay
Slightly	12 - 20%	Slightly Sandy Clay
With some	5 - 12%	Clay with some sand
With a trace of	0 - 5%	Clay with a trace of sand

Definitions of grading terms used are:

- Well graded - a good representation of all particle sizes
- Poorly graded - an excess or deficiency of particular sizes within the specified range
- Uniformly graded - an excess of a particular particle size
- Gap graded - a deficiency of a particular particle size with the range

Cohesive Soils

Cohesive soils, such as clays, are classified on the basis of undrained shear strength. The strength may be measured by laboratory testing, or estimated by field tests or engineering examination. The strength terms are defined as follows:

Description	Abbreviation	Undrained shear strength (kPa)
Very soft	vs	<12
Soft	s	12 - 25
Firm	f	25 - 50
Stiff	st	50 - 100
Very stiff	vst	100 - 200
Hard	h	>200

Cohesionless Soils

Cohesionless soils, such as clean sands, are classified on the basis of relative density, generally from the results of standard penetration tests (SPT), cone penetration tests (CPT) or dynamic penetrometers (PSP). The relative density terms are given below:

Relative Density	Abbreviation	SPT N value	CPT qc value (MPa)
Very loose	vl	<4	<2
Loose	l	4 - 10	2 -5
Medium dense	md	10 - 30	5 - 15
Dense	d	30 - 50	15 - 25
Very dense	vd	>50	>25

Soil Descriptions

Soil Origin

It is often difficult to accurately determine the origin of a soil. Soils can generally be classified as:

- Residual soil - derived from in-situ weathering of the underlying rock;
- Transported soils - formed somewhere else and transported by nature to the site; or
- Filling - moved by man.

Transported soils may be further subdivided into:

- Alluvium - river deposits
- Lacustrine - lake deposits
- Aeolian - wind deposits
- Littoral - beach deposits
- Estuarine - tidal river deposits
- Talus - scree or coarse colluvium
- Slopewash or Colluvium - transported downslope by gravity assisted by water. Often includes angular rock fragments and boulders.

Rock Descriptions

Rock Strength

Rock strength is defined by the Point Load Strength Index ($Is_{(50)}$) and refers to the strength of the rock substance and not the strength of the overall rock mass, which may be considerably weaker due to defects. The test procedure is described by Australian Standard 4133.4.1 - 1993. The terms used to describe rock strength are as follows:

Term	Abbreviation	Point Load Index $Is_{(50)}$ MPa	Approx Unconfined Compressive Strength MPa*
Extremely low	EL	<0.03	<0.6
Very low	VL	0.03 - 0.1	0.6 - 2
Low	L	0.1 - 0.3	2 - 6
Medium	M	0.3 - 1.0	6 - 20
High	H	1 - 3	20 - 60
Very high	VH	3 - 10	60 - 200
Extremely high	EH	>10	>200

* Assumes a ratio of 20:1 for UCS to $Is_{(50)}$

Degree of Weathering

The degree of weathering of rock is classified as follows:

Term	Abbreviation	Description
Extremely weathered	EW	Rock substance has soil properties, i.e. it can be remoulded and classified as a soil but the texture of the original rock is still evident.
Highly weathered	HW	Limonite staining or bleaching affects whole of rock substance and other signs of decomposition are evident. Porosity and strength may be altered as a result of iron leaching or deposition. Colour and strength of original fresh rock is not recognisable
Moderately weathered	MW	Staining and discolouration of rock substance has taken place
Slightly weathered	SW	Rock substance is slightly discoloured but shows little or no change of strength from fresh rock
Fresh stained	Fs	Rock substance unaffected by weathering but staining visible along defects
Fresh	Fr	No signs of decomposition or staining

Degree of Fracturing

The following classification applies to the spacing of natural fractures in diamond drill cores. It includes bedding plane partings, joints and other defects, but excludes drilling breaks.

Term	Description
Fragmented	Fragments of <20 mm
Highly Fractured	Core lengths of 20-40 mm with some fragments
Fractured	Core lengths of 40-200 mm with some shorter and longer sections
Slightly Fractured	Core lengths of 200-1000 mm with some shorter and loner sections
Unbroken	Core lengths mostly > 1000 mm

Rock Descriptions

Rock Quality Designation

The quality of the cored rock can be measured using the Rock Quality Designation (RQD) index, defined as:

$$\text{RQD \%} = \frac{\text{cumulative length of 'sound' core sections} \geq 100 \text{ mm long}}{\text{total drilled length of section being assessed}}$$

where 'sound' rock is assessed to be rock of low strength or better. The RQD applies only to natural fractures. If the core is broken by drilling or handling (i.e. drilling breaks) then the broken pieces are fitted back together and are not included in the calculation of RQD.

Stratification Spacing

For sedimentary rocks the following terms may be used to describe the spacing of bedding partings:

Term	Separation of Stratification Planes
Thinly laminated	< 6 mm
Laminated	6 mm to 20 mm
Very thinly bedded	20 mm to 60 mm
Thinly bedded	60 mm to 0.2 m
Medium bedded	0.2 m to 0.6 m
Thickly bedded	0.6 m to 2 m
Very thickly bedded	> 2 m

Symbols & Abbreviations

Douglas Partners

Introduction

These notes summarise abbreviations commonly used on borehole logs and test pit reports.

Drilling or Excavation Methods

C	Core Drilling
R	Rotary drilling
SFA	Spiral flight augers
NMLC	Diamond core - 52 mm dia
NQ	Diamond core - 47 mm dia
HQ	Diamond core - 63 mm dia
PQ	Diamond core - 81 mm dia

Water

▷	Water seep
▽	Water level

Sampling and Testing

A	Auger sample
B	Bulk sample
D	Disturbed sample
E	Environmental sample
U_{50}	Undisturbed tube sample (50mm)
W	Water sample
pp	pocket penetrometer (kPa)
PID	Photo ionisation detector
PL	Point load strength Is(50) MPa
S	Standard Penetration Test
V	Shear vane (kPa)

Description of Defects in Rock

The abbreviated descriptions of the defects should be in the following order: Depth, Type, Orientation, Coating, Shape, Roughness and Other. Drilling and handling breaks are not usually included on the logs.

Defect Type

B	Bedding plane
Cs	Clay seam
Cv	Cleavage
Cz	Crushed zone
Ds	Decomposed seam
F	Fault
J	Joint
Lam	lamination
Pt	Parting
Sz	Sheared Zone
V	Vein

Orientation

The inclination of defects is always measured from the perpendicular to the core axis.

h	horizontal
v	vertical
sh	sub-horizontal
sv	sub-vertical

Coating or Infilling Term

cln	clean
co	coating
he	healed
inf	infilled
stn	stained
ti	tight
vn	veneer

Coating Descriptor

ca	calcite
cbs	carbonaceous
cly	clay
fe	iron oxide
mn	manganese
slt	silty

Shape

cu	curved
ir	irregular
pl	planar
st	stepped
un	undulating

Roughness

po	polished
ro	rough
sl	slickensided
sm	smooth
vr	very rough

Other

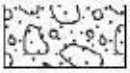
fg	fragmented
bnd	band
qtz	quartz

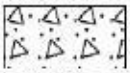
Symbols & Abbreviations

Graphic Symbols for Soil and Rock

General

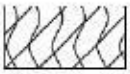

Asphalt

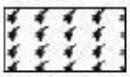

Road base

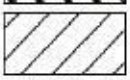

Concrete


Filling

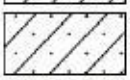
Soils


Topsoil

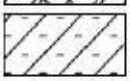

Peat

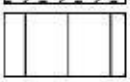

Clay

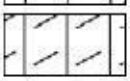

Silty clay

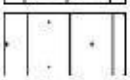

Sandy clay

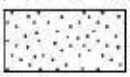

Gravelly clay

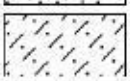

Shaly clay

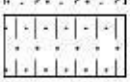

Silt


Clayey silt

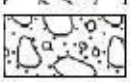

Sandy silt


Sand

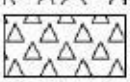

Clayey sand


Silty sand


Gravel

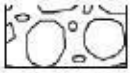

Sandy gravel


Cobbles, boulders

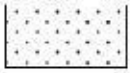

Talus

Sedimentary Rocks

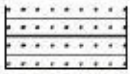

Boulder conglomerate

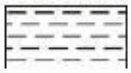

Conglomerate


Conglomeratic sandstone

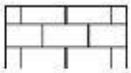

Sandstone


Siltstone

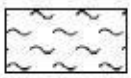

Laminite

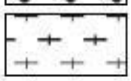

Mudstone, claystone, shale

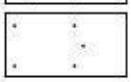

Coal


Limestone

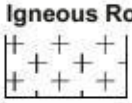
Metamorphic Rocks

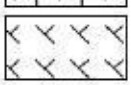

Slate, phyllite, schist

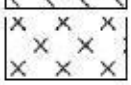

Gneiss

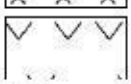

Quartzite

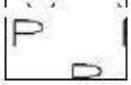
Igneous Rocks


Granite


Dolerite, basalt, andesite


Dacite, epidote


Tuff, breccia


Porphyry

TEST PIT LOG

CLIENT: Owston Nominees No. 2 Pty Ltd
PROJECT: Land Capability Assessment
LOCATION: Fairlight Road, Mulgoa (Western Precinct)

SURFACE LEVEL: 192.5 AHD **PIT No:** 1
EASTING: 278381 **PROJECT No:** 71706
NORTHING: 6253145 **DATE:** 19/4/2010
DIP/AZIMUTH: 90°/-- **SHEET** 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
192	0.45	TOPSOIL - firm to stiff, dark brown, silty clay with some rootlets, damp		D	0.25				
		SILTY CLAY - very stiff to hard, orange brown silty clay, medium to high plasticity		D	0.5				
	1	1.1m: mottled red brown and grey		D	1.0				1
191	1.6	SHALE - extremely low to very low strength, highly weathered, grey shale with some ironstone bands							
	2			D	2.0				2
190									
	3			D	3.0				3
189									
	4	4.0 Pit discontinued at 4.0m - target depth reached		D	4.0				4
188									

RIG: Case 58 Backhoe **LOGGED:** AP

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Survey levels taken from survey plans provided by Urbis Pty Ltd

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials: RCB
Date: 3.8.10

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TEST PIT LOG

CLIENT: Owston Nominees No. 2 Pty Ltd
PROJECT: Land Capability Assessment
LOCATION: Fairlight Road, Mulgoa (Western Precinct)

SURFACE LEVEL: 189.5 AHD **PIT No:** 2
EASTING: 278418 **PROJECT No:** 71706
NORTHING: 6253277 **DATE:** 19/4/2010
DIP/AZIMUTH: 90°/-- **SHEET** 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 0mm)
189	0.37	TOPSOIL - firm, dark brown, silty clay with some rootlets, damp		D	0.25				
		SILTY CLAY - stiff, orange brown silty clay, low to medium plasticity			0.4				
				B	0.5				
				D	0.6				
188	1								1
	2.0	SHALE - extremely low strength, extremely weathered, grey shale with some ironstone banding							2
187	2								
	3								3
186	4								4
	4.0	Pit discontinued at 4.0m - target depth reached							
185									

5 10 15 20

RIG: Case 58 Backhoe

LOGGED: AP

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Survey levels taken from survey plans provided by Urbis Pty Ltd

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo Ionisation detector
B	Bulk sample	S	Standard penetration test
U,	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials: RCB
Date: 3.8.10

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TEST PIT LOG

CLIENT: Owston Nominees No. 2 Pty Ltd
PROJECT: Land Capability Assessment
LOCATION: Fairlight Road, Mulgoa (Western Precinct)

SURFACE LEVEL: 189.0 AHD **PIT No:** 3
EASTING: 278591 **PROJECT No:** 71706
NORTHING: 6253273 **DATE:** 19/4/2010
DIP/AZIMUTH: 90°/-- **SHEET** 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
189	0.23	TOPSOIL - firm, dark brown, silty clay with some rootlets, damp							
		SILTY CLAY - stiff to hard, orange brown silty clay, high plasticity		D	0.25				
				D	0.5				
					0.6		pp>400kPa		
				U_{50}					
		- mottled orange brown and grey from 0.8m			0.87				
188	1			D	1.0				1
	1.8	SHALE/SILTSTONE - extremely low to very low strength, grey and orange brown shale/siltstone with some ironstone banding							
187	2			D	2.0				2
186	3			D	3.0				3
		- high strength ironstone band							
	3.4	Pit discontinued at 3.4m		D	3.4				
		- practical refusal on ironstone band							
185	4								4

RIG: Case 58 Backhoe

LOGGED: AP

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Survey levels taken from survey plans provided by Urbis Pty Ltd

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U,	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials: RCB
Date: 3.8.10

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TEST PIT LOG

CLIENT: Owston Nominees No. 2 Pty Ltd
PROJECT: Land Capability Assessment
LOCATION: Fairlight Road, Mulgoa (Western Precinct)

SURFACE LEVEL: 196.0 AHD **PIT No:** 4
EASTING: 278776 **PROJECT No:** 71706
NORTHING: 6253233 **DATE:** 19/4/2010
DIP/AZIMUTH: 90°/-- **SHEET** 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
196		TOPSOIL - stiff, dark brown, silty clay with some rootlets		D	0.25				
	0.35	SILTY CLAY - stiff to very stiff, mottled red brown and grey silty clay, low to medium plasticity		D	0.5				
	0.85	SHALE - medium strength, slightly weathered to fresh, grey shale		D	1.0				
195	1								1
	1.1	Pit discontinued at 1.1m - refusal in medium strength shale							
194	2								2
193	3								3
192	4								4

RIG: Case 58 Backhoe

LOGGED: AP

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Survey levels taken from survey plans provided by Urbis Pty Ltd

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U,	Tube sample (x mm dia.)	PL	Pointload strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials: RCB
Date: 3.8.10

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TEST PIT LOG

CLIENT: Owston Nominees No. 2 Pty Ltd
PROJECT: Land Capability Assessment
LOCATION: Fairlight Road, Mulgoa (Western Precinct)

SURFACE LEVEL: 195.0 AHD **PIT No:** 5
EASTING: 278892 **PROJECT No:** 71706
NORTHING: 6253156 **DATE:** 19/4/2010
DIP/AZIMUTH: 90°/-- **SHEET** 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
195	0.0	TOPSOIL - firm to stiff, dark brown, silty clay with some rootlets, damp		E	0.0				
					0.1				
				D	0.25				
	0.4	SILTY CLAY - stiff to very stiff, mottled red brown and grey, silty clay, medium to high plasticity		E	0.4				
				D	0.5				
194	0.9	SHALE - extremely low to very low strength, highly to moderately weathered, grey shale with some ironstone bands		D	1.0				
	1								1
		1.6m: medium to high strength							
193	2			D	2.0				2
	2.1	Pit discontinued at 2.1m - practical refusal in medium to high strength shale							
192	3								3
191	4								4

RIG: Case 58 Backhoe

LOGGED: AP

WATER OBSERVATIONS: No free groundwater observed

REMARKS: E = Environmental sample
Survey levels taken from survey plans provided by Urbis Pty Ltd

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U$_x$	Tube sample (x mm dia.)	Pt	Pointload strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED	
Initials:	DCB
Date:	3.8.10

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TEST PIT LOG

CLIENT: Owston Nominees No. 2 Pty Ltd
PROJECT: Land Capability Assessment
LOCATION: Fairlight Road, Mulgoa (Western Precinct)

SURFACE LEVEL: 181.0 AHD **PIT No:** 6
EASTING: 279079 **PROJECT No:** 71706
NORTHING: 6253239 **DATE:** 19/4/2010
DIP/AZIMUTH: 90°/-- **SHEET** 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
181		TOPSOIL - stiff, dark brown, silty clay with some rootlets, damp							
	0.3	SILTY CLAY - stiff, red brown silty clay, low to medium plasticity		D	0.25				
				D	0.5				
180	1								1
	0.95	SHALE - extremely low strength, extremely weathered, grey shale with a trace of orange brown silty clay		D	1.0				
		- medium strength, slightly weathered from 1.2m							
	1.4	Pit discontinued at 1.4m		D	1.4				
		- practical refusal in medium strength shale							
179	2								2
178	3								3
177	4								4

5 10 15 20

RIG: Case 58 Backhoe

LOGGED: AP

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Survey levels taken from survey plans provided by Urbis Pty Ltd

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U$_x$	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED	
Initials:	RCB
Date:	3.8.10

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TEST PIT LOG

CLIENT: Owston Nominees No. 2 Pty Ltd
PROJECT: Land Capability Assessment
LOCATION: Fairlight Road, Mulgoa (Western Precinct)

SURFACE LEVEL: 190.5 AHD **PIT No:** 7
EASTING: 278920 **PROJECT No:** 71706
NORTHING: 6253280 **DATE:** 19/4/2010
DIP/AZIMUTH: 90°/-- **SHEET** 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 0mm)
190	0.41	TOPSOIL - firm, dark brown, silty clay with some rootlets, damp		D	0.25				
		SILTY CLAY - stiff, mottled red brown and grey, silty clay, low to medium plasticity		B	0.4				
				D	0.5				
					0.6				
				D	0.8				
					0.9				
189	1.35	SHALE - medium strength, slightly weathered, grey shale							
	1.4	Pit discontinued at 1.4m - refusal on medium strength shale							
188									
187									
186									

RIG: Case 58 Backhoe

LOGGED: AP

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Survey levels taken from survey plans provided by Urbis Pty Ltd

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Pointload strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials: RCB
Date: 3.8.10

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TEST PIT LOG

CLIENT: Owston Nominees No. 2 Pty Ltd
PROJECT: Land Capability Assessment
LOCATION: Fairlight Road, Mulgoa (Western Precinct)

SURFACE LEVEL: 180.5 AHD **PIT No:** 8
EASTING: 279045 **PROJECT No:** 71706
NORTHING: 6253429 **DATE:** 19/4/2010
DIP/AZIMUTH: 90°/-- **SHEET** 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
180	0.4	TOPSOIL - stiff, dark brown, silty clay with some rootlets, damp		D	0.25				
		SILTY CLAY - stiff, red brown, silty clay with a trace of rootlets, medium plasticity		D	0.5				
179	1	- mottled red brown and grey, with a trace of ironstone		D	1.0				
	1.6	SHALE - extremely low to very low strength, extremely weathered, grey shale							
178	2			D	2.0				
	3	2.9m: low to medium strength, slightly weathered							
	3.1	Pit discontinued at 3.1m - practical refusal on medium strength shale		D	3.1				
177	4								
176									

RIG: Case 58 Backhoe **LOGGED:** AP

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Survey levels taken from survey plans provided by Urbis Pty Ltd

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U$_x$	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED	
Initials:	DCB
Date:	3.8.10

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TEST PIT LOG

CLIENT: Owston Nominees No. 2 Pty Ltd
PROJECT: Land Capability Assessment
LOCATION: Fairlight Road, Mulgoa (Western Precinct)

SURFACE LEVEL: 185.5 AHD **PIT No:** 9
EASTING: 278556 **PROJECT No:** 71706
NORTHING: 6253390 **DATE:** 19/4/2010
DIP/AZIMUTH: 90°/-- **SHEET** 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
185	0.2	TOPSOIL - stiff, brown, silty clay with some rootlets, humid to damp							
		SILTY CLAY - very stiff to hard, orange brown silty clay, low to medium plasticity		D	0.25				
		- some ironstone banding from 0.5m		D	0.5				
	1			D	1.0				1
184	1.3	SHALE - extremely low strength, extremely weathered, grey shale							
		- ironstone bands between 1.6m and 2.5m							
	2			D	2.0				2
183	2.6								
	2.7	SANDSTONE - low to medium strength, moderately weathered, fine grained sandstone		D	2.7				
		Pit discontinued at 2.7m - practical refusal on medium strength sandstone							
	3								3
182									
	4								4
181									

RIG: Case 58 Backhoe

LOGGED: AP

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Survey levels taken from survey plans provided by Urbis Pty Ltd

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U,	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials: RCB
Date: 3.8.10

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TEST PIT LOG

CLIENT: Owston Nominees No. 2 Pty Ltd
PROJECT: Land Capability Assessment
LOCATION: Fairlight Road, Mulgoa (Western Precinct)

SURFACE LEVEL: 189.0 AHD **PIT No:** 10
EASTING: 278815 **PROJECT No:** 71706
NORTHING: 6253493 **DATE:** 19/4/2010
DIP/AZIMUTH: 90°/-- **SHEET** 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
189		TOPSOIL - firm to stiff, dark brown, silty clay with some rootlets, damp		E	0.0				
					0.1				
				D	0.25				
	0.39	SILTY CLAY - soft to firm, mottled red brown and grey, silty clay with a trace of ironstone gravel, medium to high plasticity			0.4				
				E					
				D	0.5				
188	1			D	1.0				
	1.6	SHALE - low to medium strength, slightly weathered, shale							
	1.8	Pit discontinued at 1.8m - refusal on medium strength shale		D	1.8				
187	2								
186	3								
185	4								

RIG: Case 58 Backhoe

LOGGED: AP

WATER OBSERVATIONS: No free groundwater observed

REMARKS: E = Environmental sample
Survey levels taken from survey plans provided by Urbis Pty Ltd

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U$_x$	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED	
Initials:	RCB
Date:	3.8.10

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TEST PIT LOG

CLIENT: Owston Nominees No. 2 Pty Ltd
PROJECT: Land Capability Assessment
LOCATION: Fairlight Road, Mulgoa (Western Precinct)

SURFACE LEVEL: 186.0 AHD **PIT No:** 11
EASTING: 278939 **PROJECT No:** 71706
NORTHING: 6253518 **DATE:** 19/4/2010
DIP/AZIMUTH: 90°/-- **SHEET** 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 0mm)
186	0.39	TOPSOIL - firm to stiff, dark brown, silty clay with some rootlets, damp		E	0.2 0.3				
	0.9	SILTY CLAY - very stiff, orange brown, silty clay with a trace of ironstone gravel, medium plasticity		E D	0.4 0.5				
185	1	SHALE - extremely low strength, extremely weathered, grey shale with some orange brown silty clay seams 1.3m: medium strength		D	1.0				
	1.5	Pit discontinued at 1.5m - refusal on medium strength shale							
184	2								
183	3								
182	4								

5 10 15 20

RIG: Case 58 Backhoe

LOGGED: AP

WATER OBSERVATIONS: No free groundwater observed

REMARKS: E = Environmental sample
Survey levels taken from survey plans provided by Urbis Pty Ltd

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U$_x$	Tube sample (x mm dia.)	PL	Pointload strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials: RCB
Date: 3.8.10

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TEST PIT LOG

CLIENT: Owston Nominees No. 2 Pty Ltd
PROJECT: Land Capability Assessment
LOCATION: Fairlight Road, Mulgoa (Western Precinct)

SURFACE LEVEL: 174.5 AHD **PIT No:** 12
EASTING: 279174 **PROJECT No:** 71706
NORTHING: 6253552 **DATE:** 19/4/2010
DIP/AZIMUTH: 90°/-- **SHEET** 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
174	0.33	TOPSOIL - firm to stiff, dark brown, silty clay with some rootlets, damp		D	0.25				
		SILTY CLAY - very stiff, mottled orange brown and grey silty clay, medium to high plasticity		D	0.5				
					0.6		pp>400kPa		
	0.8			U_{50}	0.77				
		SHALE - extremely low strength, extremely weathered, grey shale with a trace of orange brown silty clay							
173	1.7	1.6m: low to medium strength Pit discontinued at 1.7m - practical refusal on medium strength shale							
172									
171									
170									

Dynamic Penetrometer Test (blows per 150mm): 5, 10, 15, 20; 1, 2, 3, 4

RIG: Case 58 Backhoe **LOGGED:** AP

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Survey levels taken from survey plans provided by Urbis Pty Ltd

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Pointload strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials: RCB
Date: 3.8.10

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TEST PIT LOG

CLIENT: Owston Nominees No. 2 Pty Ltd
PROJECT: Land Capability Assessment
LOCATION: Fairlight Road, Mulgoa (Western Precinct)

SURFACE LEVEL: 184.5 AHD **PIT No:** 13
EASTING: 278656 **PROJECT No:** 71706
NORTHING: 6253547 **DATE:** 20/4/2010
DIP/AZIMUTH: 90°/-- **SHEET** 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
184	0.31	TOPSOIL - soft to firm, dark brown, silty clay with some rootlets, damp		E	0.2				
		SILTY CLAY - very stiff, orange brown, silty clay with some ironstone gravel			0.3				
				E	0.4				
					0.5				
183	1.1	SANDSTONE - low strength, extremely weathered, grey, fine grained sandstone							
		- low to medium strength							
182	2.0	Pit discontinued at 2.0m - practical refusal on medium strength sandstone							
181									
180									

Dynamic Penetrometer Test (blows per 150mm): 5, 10, 15, 20; 1, 2, 3, 4

RIG: Case 58 Backhoe

LOGGED: AP

WATER OBSERVATIONS: No free groundwater observed

REMARKS: E = Environmental sample
Survey levels taken from survey plans provided by Urbis Pty Ltd

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Pointload strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials: RCB
Date: 3.8.10

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TEST PIT LOG

CLIENT: Owston Nominees No. 2 Pty Ltd
PROJECT: Land Capability Assessment
LOCATION: Fairlight Road, Mulgoa (Western Precinct)

SURFACE LEVEL: 185.0 AHD **PIT No:** 14
EASTING: 278759 **PROJECT No:** 71706
NORTHING: 6253597 **DATE:** 20/4/2010
DIP/AZIMUTH: 90°/-- **SHEET** 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 0mm) 5 10 15 20
185	0.0	TOPSOIL - firm, dark brown, silty clay with some rootlets, damp		D	0.25				
	0.42	SILTY CLAY - stiff, orange brown, silty clay with some ironstone gravel and cobbles		D	0.5				
				B	0.7				
184	1			D	1.0				1
	1.4	SHALE - extremely low strength, extremely weathered, grey shale		D	1.5				
183	2	2.3m: low to medium strength with a trace of grey, fine grained sandstone							2
	2.5	Pit discontinued at 2.5m - practical refusal on medium strength sandstone							
182	3								3
181	4								4

RIG: Case 58 Backhoe

LOGGED: AP

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Survey levels taken from survey plans provided by Urbis Pty Ltd

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U,	Tube sample (x mm dia.)	PL	Pointload strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials: RCB
Date: 3.8.10

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TEST PIT LOG

CLIENT: Owston Nominees No. 2 Pty Ltd
PROJECT: Land Capability Assessment
LOCATION: Fairlight Road, Mulgoa (Western Precinct)

SURFACE LEVEL: 179.0 AHD **PIT No:** 15
EASTING: 279064 **PROJECT No:** 71706
NORTHING: 6253652 **DATE:** 20/4/2010
DIP/AZIMUTH: 90°/-- **SHEET** 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 0mm)
179		TOPSOIL - firm, dark brown, silty clay with some rootlets, damp							
	0.32	SILTY CLAY - stiff to very stiff, orange brown silty clay, low plasticity		B	0.4 0.6				
178	1								1
	1.3	SHALE - extremely low to very low strength, extremely to highly weathered, grey shale							
177	2								2
	2.3	- medium strength, slightly weathered Pit discontinued at 2.3m - practical refusal on medium strength shale							
176	3								3
175	4								4

RIG: Case 58 Backhoe

LOGGED: AP

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Survey levels taken from survey plans provided by Urbis Pty Ltd

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials: RCB
Date: 3.8.10

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TEST PIT LOG

CLIENT: Owston Nominees No. 2 Pty Ltd
PROJECT: Land Capability Assessment
LOCATION: Fairlight Road, Mulgoa (Western Precinct)

SURFACE LEVEL: 172.0 AHD **PIT No:** 16
EASTING: 279206 **PROJECT No:** 71706
NORTHING: 6253740 **DATE:** 20/4/2010
DIP/AZIMUTH: 90°/-- **SHEET** 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
172	0.36	TOPSOIL - stiff, brown, silty clay with some rootlets, humid to damp		E	0.2				
				D	0.25				
					0.3				
		SILTY CLAY - very stiff, orange brown, silty clay with some ironstone gravel and cobbles, low to medium plasticity		E	0.4				
171	1.1			D	0.5				
		SHALE - extremely weathered, extremely low strength, grey shale with some fine grained sandstone bands							
		1.9m: low to medium strength							
170	1.95	Pit discontinued at 1.95m - practical refusal on medium strength shale							
169									
168									

RIG: Case 58 Backhoe

LOGGED: AP

WATER OBSERVATIONS: No free groundwater observed

REMARKS: E = Environmental sample
Survey levels taken from survey plans provided by Urbis Pty Ltd

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U,	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials: RCB
Date: 3.8.10

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TEST PIT LOG

CLIENT: Owston Nominees No. 2 Pty Ltd
PROJECT: Land Capability Assessment
LOCATION: Fairlight Road, Mulgoa (Western Precinct)

SURFACE LEVEL: 176.0 AHD **PIT No:** 17
EASTING: 279027 **PROJECT No:** 71706
NORTHING: 6253814 **DATE:** 20/4/2010
DIP/AZIMUTH: 90°/-- **SHEET** 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
176	0	TOPSOIL - stiff, brown, silty clay with some rootlets, humid to damp							
	0.37	SILTY CLAY - stiff to very stiff, orange brown, silty clay with some ironstone gravel, medium plasticity							
175	1								
	1.3	SHALE - extremely low to low strength, extremely weathered, grey shale							
174	2								
	2.4	2.3m: low to medium strength, trace of ironstone Pit discontinued at 2.4m - practical refusal on medium strength shale							
173	3								
172	4								

Dynamic Penetrometer Test (blows per 150mm): 5, 10, 15, 20

RIG: Case 58 Backhoe

LOGGED: AP

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Survey levels taken from survey plans provided by Urbis Pty Ltd

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED	
Initials:	RCB
Date:	3.8.10

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TEST PIT LOG

CLIENT: Owston Nominees No. 2 Pty Ltd
PROJECT: Land Capability Assessment
LOCATION: Fairlight Road, Mulgoa (Western Precinct)

SURFACE LEVEL: 173.5 AHD **PIT No:** 18
EASTING: 279208 **PROJECT No:** 71706
NORTHING: 6253859 **DATE:** 20/4/2010
DIP/AZIMUTH: 90°/-- **SHEET** 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 0mm) 5 10 15 20
173	0.23	TOPSOIL - firm, brown, silty clay with some rootlets, humid to damp							
		SANDY CLAY - stiff, orange brown, sandy clay with some ironstone gravel, low plasticity		D	0.25				
					0.4				
				B	0.5				
				D	0.6				
	0.8								
	0.85	SANDSTONE - medium to high strength, slightly weathered, yellow brown, fine grained sandstone							
172	1	Pit discontinued at 0.85m - refusal on medium to high strength sandstone							1
	2								2
171									
	3								3
170									
	4								4
169									

RIG: Case 58 Backhoe

LOGGED: AP

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Survey levels taken from survey plans provided by Urbis Pty Ltd

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U,	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED	
Initials:	RCB
Date:	3.8.10

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TEST PIT LOG

CLIENT: Owston Nominees No. 2 Pty Ltd
PROJECT: Land Capability Assessment
LOCATION: Fairlight Road, Mulgoa (Western Precinct)

SURFACE LEVEL: 174.0 AHD **PIT No:** 19
EASTING: 279289 **PROJECT No:** 71706
NORTHING: 6253955 **DATE:** 20/4/2010
DIP/AZIMUTH: 90°/-- **SHEET** 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
174	0.22	TOPSOIL - firm to stiff, brown, silty clay with some rootlets, humid							
		SANDY CLAY - stiff to hard, orange brown, sandy clay with some ironstone gravel and cobbles, low to medium plasticity							
173	0.8	SANDSTONE - extremely low to very low strength, grey, fine grained sandstone							
	1.3	1.25m: low to medium strength sandstone Pit discontinued at 1.3m - practical refusal on medium strength sandstone							
172	2								
171	3								
170	4								

Dynamic Penetrometer Test (blows per 150mm): 5, 10, 15, 20

RIG: Case 58 Backhoe

LOGGED: AP

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Survey levels taken from survey plans provided by Urbis Pty Ltd

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U$_x$	Tube sample (x mm dia.)	PL	Pointload strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials: RCB
Date: 3.8.10

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TEST PIT LOG

CLIENT: Owston Nominees No. 2 Pty Ltd
PROJECT: Land Capability Assessment
LOCATION: Fairlight Road, Mulgoa (Western Precinct)

SURFACE LEVEL: 177.5 AHD **PIT No:** 20
EASTING: 279004 **PROJECT No:** 71706
NORTHING: 6253925 **DATE:** 20/4/2010
DIP/AZIMUTH: 90°/-- **SHEET** 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
177	0.19	TOPSOIL - stiff, brown, silty clay with some rootlets, damp							
		SILTY CLAY - stiff to hard, orange brown, silty clay with ironstone gravel, low to medium plasticity		D	0.25				
				D	0.5				
176	1.3	SANDSTONE - extremely low strength, extremely weathered, grey, fine grained sandstone 1.6m: medium to high strength							
	1.7	Pit discontinued at 1.7m - practical refusal on medium to high strength sandstone							
175									
174									
173									

Dynamic Penetrometer Test (blows per 150mm): 5, 10, 15, 20; 1, 2, 3, 4; >>, >>

RIG: Case 58 Backhoe

LOGGED: AP

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Survey levels taken from survey plans provided by Urbis Pty Ltd

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U,	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials: RCB
Date: 3.8.10

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TEST PIT LOG

CLIENT: Owston Nominees No. 2 Pty Ltd
PROJECT: Land Capability Assessment
LOCATION: Fairlight Road, Mulgoa (Western Precinct)

SURFACE LEVEL: 177.0 AHD **PIT No:** 21
EASTING: 278946 **PROJECT No:** 71706
NORTHING: 6254047 **DATE:** 21/4/2010
DIP/AZIMUTH: 90°/-- **SHEET** 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 0mm) 5 10 15 20
177	0.10	TOPSOIL - firm, brown, clayey sand with some rootlets, damp							
		SANDY CLAY - stiff, orange brown sandy clay, low plasticity		E	0.2				
					0.3				
				E	0.4				
		0.5m: ironstone gravel and cobbles from 0.5m			0.5				
176 1	1.1	SANDSTONE - low to medium strength, slightly to moderately weathered, grey sandstone							1
	1.4	Pit discontinued at 1.4m - practical refusal on medium strength sandstone							
175 2									2
174 3									3
173 4									4

RIG: Case 58 Backhoe **LOGGED:** AP

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Undisturbed sample refused at 0.5m, no recovery
Survey levels taken from survey plans provided by Urbis Pty Ltd

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U,	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED	
Initials:	RCB
Date:	3.8.10

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TEST PIT LOG

CLIENT: Owston Nominees No. 2 Pty Ltd
PROJECT: Land Capability Assessment
LOCATION: Fairlight Road, Mulgoa (Western Precinct)

SURFACE LEVEL: 176.0 AHD **PIT No:** 22
EASTING: 279019 **PROJECT No:** 71706
NORTHING: 6254154 **DATE:** 20/4/2010
DIP/AZIMUTH: 90°/-- **SHEET** 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
176	0.21	TOPSOIL - brown, silty clay with some rootlets, humid							
		SANDY CLAY - very stiff, mottled orange brown and red brown, sandy clay with some ironstone gravel, low plasticity		D	0.25				
					0.4				
				B	0.5				
				D	0.6				
175	0.9	SANDSTONE - extremely low strength, extremely weathered sandstone							
	1								1
		1.6m: medium to high strength							
	1.7	Pit discontinued at 1.7m - refusal on medium strength sandstone							
174	2								2
173	3								3
172	4								4

RIG: Case 58 Backhoe

LOGGED: AP

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Survey levels taken from survey plans provided by Urbis Pty Ltd

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo Ionisation detector
B	Bulk sample	S	Standard penetration test
U,	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials: ECB
Date: 3.8.10

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TEST PIT LOG

CLIENT: Owston Nominees No. 2 Pty Ltd
PROJECT: Land Capability Assessment
LOCATION: Fairlight Road, Mulgoa (Western Precinct)

SURFACE LEVEL: 178.0 AHD **PIT No:** 23
EASTING: 279232 **PROJECT No:** 71706
NORTHING: 6254076 **DATE:** 20/4/2010
DIP/AZIMUTH: 90°/-- **SHEET** 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 0mm) 5 10 15 20
178		TOPSOIL - firm, brown, silty clay with some rootlets, humid							
	0.37	SILTY CLAY - stiff, orange brown, silty clay with some ironstone gravel, low plasticity							
177	1			U_{50}	0.7		pp>400kPa		1
					1.08				
	1.3	SHALE - extremely low strength, extremely weathered, grey shale with some ironstone bands and a trace of fine grained, grey sandstone							
	1.9	- medium to high strength							
176	2	Pit discontinued at 1.9m - refusal on medium to high strength shale							2
175	3								3
174	4								4

RIG: Case 58 Backhoe

LOGGED: AP

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Survey levels taken from survey plans provided by Urbis Pty Ltd

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED	
Initials:	RCB
Date:	3.8.10

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TEST PIT LOG

CLIENT: Owston Nominees No. 2 Pty Ltd
PROJECT: Land Capability Assessment
LOCATION: Fairlight Road, Mulgoa (Western Precinct)

SURFACE LEVEL: 167.0 AHD **PIT No:** 24
EASTING: 279453 **PROJECT No:** 71706
NORTHING: 6254029 **DATE:** 21/4/2010
DIP/AZIMUTH: 90°/-- **SHEET** 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 0mm)
167	0.16	TOPSOIL - firm, brown, silty clay with some rootlets, damp							
		SILTY CLAY - stiff to very stiff, mottled orange brown and grey, silty clay with a trace of sand, low to medium plasticity		D	0.25				
				D	0.5				
					0.6		pp>400kPa		
				U_{50}					
166	1			D	1.0				1
	1.1	SANDSTONE - extremely low strength, extremely weathered, grey sandstone							
		1.6m: low to medium strength, grey and yellow brown							
	1.65	Pit discontinued at 1.65m - practical refusal on medium strength sandstone							
165	2								2
164	3								3
163	4								4

RIG: Case 58 Backhoe

LOGGED: AP

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Survey levels taken from survey plans provided by Urbis Pty Ltd

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials: ECB
Date: 3.8.10

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TEST PIT LOG

CLIENT: Owston Nominees No. 2 Pty Ltd
PROJECT: Land Capability Assessment
LOCATION: Fairlight Road, Mulgoa (Western Precinct)

SURFACE LEVEL: 164.0 AHD **PIT No:** 25
EASTING: 279589 **PROJECT No:** 71706
NORTHING: 6254173 **DATE:** 21/4/2010
DIP/AZIMUTH: 90°/-- **SHEET** 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
164	0.19	TOPSOIL - firm, brown, silty clay with some rootlets, damp							
		SILTY CLAY - stiff to very stiff, orange brown and red brown, silty clay with some ironstone gravel and a trace of sand, low to medium plasticity		E	0.2				
					0.3				
				E	0.4				
				D	0.5				
163	0.9	SANDSTONE - extremely low strength, extremely weathered, grey, fine to medium grained sandstone		D	1.0				
162		2.0m: medium strength							
	2.1	Pit discontinued at 2.1m - refusal on medium strength sandstone							
161									
160									

RIG: Case 58 Backhoe

LOGGED: AP

WATER OBSERVATIONS: No free groundwater observed

REMARKS: E = Environmental sample
Survey levels taken from survey plans provided by Urbis Pty Ltd

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U$_x$	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials: RCB
Date: 3.8.10

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TEST PIT LOG

CLIENT: Owston Nominees No. 2 Pty Ltd
PROJECT: Land Capability Assessment
LOCATION: Fairlight Road, Mulgoa (Western Precinct)

SURFACE LEVEL: 172.5 AHD **PIT No:** 26
EASTING: 279397 **PROJECT No:** 71706
NORTHING: 6254270 **DATE:** 21/4/2010
DIP/AZIMUTH: 90°/-- **SHEET** 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 0mm) 5 10 15 20
172	0.25	TOPSOIL - firm, brown, silty clay with some rootlets, damp							
		SILTY CLAY - stiff to very stiff, orange brown, silty clay with a trace of ironstone gravel, medium plasticity		D	0.25				
				D	0.5				
	0.9								
	1.0	SHALE - medium strength, slightly weathered to fresh, grey shale							
		Pit discontinued at 1.0m - refusal on medium strength shale							
171	1								1
	2								2
170									
	3								3
169									
	4								4
168									

RIG: Case 58 Backhoe

LOGGED: AP

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Survey levels taken from survey plans provided by Urbis Pty Ltd

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U,	Tube sample (x mm dia.)	PL	Point oad strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED	
Initials:	RCB
Date:	3.8.10

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TEST PIT LOG

CLIENT: Owston Nominees No. 2 Pty Ltd
PROJECT: Land Capability Assessment
LOCATION: Fairlight Road, Mulgoa (Western Precinct)

SURFACE LEVEL: 177.5 AHD **PIT No:** 27
EASTING: 279271 **PROJECT No:** 71706
NORTHING: 6254208 **DATE:** 20/4/2010
DIP/AZIMUTH: 90°/-- **SHEET** 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
177	0.27	TOPSOIL - firm to stiff, brown, silty clay with some rootlets, damp							
		SILTY CLAY - very stiff to hard, orange brown, silty clay with a trace of ironstone gravel, medium plasticity							
176	1.0	SHALE - extremely low strength, extremely weathered, grey shale							
		2.0m: medium strength							
175	2.4	Pit discontinued at 2.4m - refusal on medium strength shale							
174									
173									

RIG: Case 58 Backhoe

LOGGED: AP

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Survey levels taken from survey plans provided by Urbis Pty Ltd

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U$_x$	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED	
Initials:	RCB
Date:	3.8.10

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TEST PIT LOG

CLIENT: Owston Nominees No. 2 Pty Ltd
PROJECT: Land Capability Assessment
LOCATION: Fairlight Road, Mulgoa (Western Precinct)

SURFACE LEVEL: 177.0 AHD **PIT No:** 28
EASTING: 279144 **PROJECT No:** 71706
NORTHING: 6254218 **DATE:** 20/4/2010
DIP/AZIMUTH: 90°/-- **SHEET** 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 0mm) 5 10 15 20
177		TOPSOIL - firm, brown, silty clay with some rootlets, humid		D	0.25				
	0.37	SANDY CLAY - stiff to very stiff, orange brown, sandy clay with some ironstone gravel and cobbles, low to medium plasticity		D	0.5				
176	1			D	1.0				1
	1.3	SANDSTONE - extremely low to very low strength, extremely weathered, grey, fine grained sandstone		D	1.5				
		1.65m: low to medium strength							
	1.7	Pit discontinued at 1.7m - refusal on low to medium strength sandstone							
175	2								2
174	3								3
173	4								4

RIG: Case 58 Backhoe

LOGGED: AP

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Survey levels taken from survey plans provided by Urbis Pty Ltd

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U,	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials: RCB
Date: 28.10

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TEST PIT LOG

CLIENT: Owston Nominees No. 2 Pty Ltd
PROJECT: Land Capability Assessment
LOCATION: Fairlight Road, Mulgoa (Western Precinct)

SURFACE LEVEL: 169.0 AHD **PIT No:** 29
EASTING: 279435 **PROJECT No:** 71706
NORTHING: 6254141 **DATE:** 20/4/2010
DIP/AZIMUTH: 90°/-- **SHEET** 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 0mm)
169	0	TOPSOIL - firm, brown, silty clay with some rootlets, humid							
	0.4	SILTY CLAY - stiff to very stiff, silty clay with a trace of sand and ironstone gravel, medium to high plasticity		B	0.4 0.6				
168	1								1
	1.3	SHALE - medium strength, slighly weathered, grey shale							
	1.4	Pit discontinued at 1.4m - refusal on medium strength shale							
167	2								2
166	3								3
165	4								4

RIG: Case 58 Backhoe

LOGGED: AP

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Survey levels taken from survey plans provided by Urbis Pty Ltd

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U,	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials: RCB
Date: 3.8.10

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TEST PIT LOG

CLIENT: Owston Nominees No. 2 Pty Ltd
PROJECT: Land Capability Assessment
LOCATION: Fairlight Road, Mulgoa (Western Precinct)

SURFACE LEVEL: 191.5 AHD **PIT No:** 30
EASTING: 278832 **PROJECT No:** 71706
NORTHING: 6253386 **DATE:** 21/4/2010
DIP/AZIMUTH: 90°/-- **SHEET** 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
191	0.36	TOPSOIL - firm, dark brown, silty clay with some rootlets, damp		D	0.25				
		SILTY CLAY - stiff, mottled red brown and grey, silty clay with a trace of ironstone gravel, low to medium plasticity		D	0.5				
190	1.0	SHALE - extremely low strength, extremely weathered, grey shale with some orange brown silty clay seams							
	2.1	2.0m: medium strength Pit discontinued at 2.1m - refusal on medium trength shale							
189									
188									
187									

RIG: Case 58 Backhoe

LOGGED: AP

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Survey levels taken from survey plans provided by Urbis Pty Ltd

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U,	Tube sample (x mm dia.)	PL	Pointload strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED	
Initials:	RCB
Date:	3.8.10

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Appendix D

Field Work Results (Current)

BOREHOLE LOG

CLIENT: Cubelic Holdings Pty Ltd
PROJECT: Fernhill Estate
LOCATION: Fairlight Road, Mulgoa

SURFACE LEVEL: --
EASTING: 278100
NORTHING: 6253030
DIP/AZIMUTH: 90°/--

BORE No: BH1
PROJECT No: 71706.01
DATE: 18/6/2013
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
	0.2	TOPSOIL - brown silty sandy clay topsoil with a trace of ironstone gravel and grass rootlets							
		SHALE - extremely low strength brown shale		A	0.3				
					0.6				
		-from 0.8m: becoming very low to low strength brown shale		A	0.8				
	1				1.0				
	1.4	Bore discontinued at 1.4m-practical refusal on medium strength shale							
	2								
	3								
	4								

Dynamic Penetrometer Test (blows per 150mm): 5, 10, 15, 20

RIG: DT100 **DRILLER:** SS **LOGGED:** SB **CASING:** Uncased

TYPE OF BORING: Solid flight auger (TC bit) to 1.4m

WATER OBSERVATIONS: No free groudwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U,	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Cubelic Holdings Pty Ltd
PROJECT: Fernhill Estate
LOCATION: Fairlight Road, Mulgoa

SURFACE LEVEL: --
EASTING: 278090
NORTHING: 6253320
DIP/AZIMUTH: 90°/--

BORE No: BH2
PROJECT No: 71706.01
DATE: 18/6/2013
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
	0.2	TOPSOIL - brown silty sandy clay topsoil with some grass rootlets							
		SILTY CLAY - very stiff orange brown silty clay with a trace of fine ironstone gravel		A	0.3				
					0.5				
		-from 0.7m: grey mottled orange brown		A	0.8				
1	1.0	SHALE - extremely low to very low strength brown shale			1.0				1
	1.3	Bore discontinued at 1.3m-practical refusal on low to medium strength shale							
2									2
3									3
4									4

Dynamic Penetrometer Test (blows per 150mm): 5, 10, 15, 20

RIG: DT100 **DRILLER:** SS **LOGGED:** SB **CASING:** Uncased

TYPE OF BORING: Solid flight auger (TC bit) to 1.3m

WATER OBSERVATIONS: No free groudwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U,	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Cubelic Holdings Pty Ltd
PROJECT: Fernhill Estate
LOCATION: Fairlight Road, Mulgoa

SURFACE LEVEL: --
EASTING: 278360
NORTHING: 6253390
DIP/AZIMUTH: 90°/--

BORE No: BH3
PROJECT No: 71706.01
DATE: 18/6/2013
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
	0.2	TOPSOIL - brown silty clayey sand topsoil with a trace of grass rootlets							
		SILTY CLAY - very stiff then hard orange brown silty clay with a trace of ironstone gravel		A	0.3				
					0.5				
		-from 0.7m: orange brown mottled light grey/brown		A	0.8				
	1				1.1				1
	1.4	SHALY CLAY - orange brown and grey brown shaly clay							
	2								2
	2.2	SHALE - extremely low strength grey shale							
		-from 2.6m: very low to low strength brown shale							
	2.9	Bore discontinued at 2.9m-target depth reached							
	3								3
	4								4

RIG: DT100 **DRILLER:** SS **LOGGED:** SB **CASING:** Uncased

TYPE OF BORING: Solid flight auger (TC bit) to 2.9m

WATER OBSERVATIONS: No free groudwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U,	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Cubelic Holdings Pty Ltd
PROJECT: Fernhill Estate
LOCATION: Fairlight Road, Mulgoa

SURFACE LEVEL: --
EASTING: 278520
NORTHING: 6253550
DIP/AZIMUTH: 90°/--

BORE No: BH4
PROJECT No: 71706.01
DATE: 18/6/2013
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
	0.1	TOPSOIL - brown silty sandy clay topsoil with a trace of grass rootlets							
		SANDY CLAY - firm light red brown sandy clay, moist							
	0.4	SILTY CLAY - stiff red brown silty clay with some sand and a trace of ironstone gravel		A	0.4				
					0.6				
				A	0.9				
	1.1	SANDSTONE - extremely low strength grey and brown sandstone with some medium strength ironstone bands			1.1				
	1.6	Bore discontinued at 1.6m- refusal on ironstone band							

Dynamic Penetrometer Test (blows per 150mm): 5, 10, 15, 20

RIG: DT100 **DRILLER:** SS **LOGGED:** SB **CASING:** Uncased

TYPE OF BORING: Solid flight auger (TC bit) to 1.6m

WATER OBSERVATIONS: No free groudwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U,	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Cubelic Holdings Pty Ltd
PROJECT: Fernhill Estate
LOCATION: Fairlight Road, Mulgoa

SURFACE LEVEL: --
EASTING: 279079
NORTHING: 6254326
DIP/AZIMUTH: 90°/--

BORE No: BH5
PROJECT No: 71706.01
DATE: 18/6/2013
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
	0.1	TOPSOIL - brown silty clayey sand topsoil with some grass rootlets							
		SANDY CLAY - firm light brown sandy clay		A	0.2				
	0.5	SILTY SANDY CLAY -very stiff then hard red brown and light brown silty sandy clay with some ironstone gravel			0.5				
				A	0.6				
	1.0	SANDSTONE - very low to low strength light brown and orange brown sandstone			0.8				
	1.3	Bore discontinued at 1.3m							

RIG: DT100 **DRILLER:** SS **LOGGED:** SB **CASING:** Uncased

TYPE OF BORING: Solid flight auger (TC bit) to 1.3m

WATER OBSERVATIONS: No free groudwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U,	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Cubelic Holdings Pty Ltd
PROJECT: Fernhill Estate
LOCATION: Fairlight Road, Mulgoa

SURFACE LEVEL: --
EASTING: 279260
NORTHING: 6254480
DIP/AZIMUTH: 90°--

BORE No: BH6
PROJECT No: 71706.01
DATE: 18/6/2013
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
	0.0	SANDY CLAY - very stiff light brown and orange brown sandy clay with a trace of grass rootlets		A	0.3				
	0.7	SANDSTONE - extremely weathered orange and red brown sandstone		A	0.5				
	1	-from 1.1m: low strength grey/orange brown sandstone			0.8				
	1.4	Bore discontinued at 1.4m-target depth reached			1.0				
	2								
	3								
	4								

Dynamic Penetrometer Test (blows per 150mm): 5, 10, 15, 20

RIG: DT100 **DRILLER:** SS **LOGGED:** SB **CASING:** Uncased

TYPE OF BORING: Solid flight auger (TC bit) to 1.4m

WATER OBSERVATIONS: No free groudwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U,	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Cubelic Holdings Pty Ltd
PROJECT: Fernhill Estate
LOCATION: Fairlight Road, Mulgoa

SURFACE LEVEL: --
EASTING: 279530
NORTHING: 6254350
DIP/AZIMUTH: 90°/--

BORE No: BH7
PROJECT No: 71706.01
DATE: 18/6/2013
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
	0.2	SILTY CLAY - firm then stiff to very stiff light brown silty clay with a trace of grass rootlets		A	0.2				
	0.5	-from 0.6m: orange brown mottled gey brown with a trace of ironstone gravel		A	0.5				
	0.7				0.7				
	1.0				1.0				
	1.2	SHALY CLAY - grey and orange brown shaly clay (extremely low strength shale)							
	1.3	SHALE - very low to low strength grey brown shale							
	1.7	Bore discontinued at 1.7m- practical refusal							

RIG: DT100 **DRILLER:** SS **LOGGED:** SB **CASING:** Uncased

TYPE OF BORING: Solid flight auger (TC bit) to 1.7m

WATER OBSERVATIONS: No free groudwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U,	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	⧗	Water level	V	Shear vane (kPa)

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Appendix E

Laboratory Test Results (2010)

Douglas Partners
Geotechnics · Environment · Groundwater

Douglas Partners Pty Ltd
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AUSTRALIA

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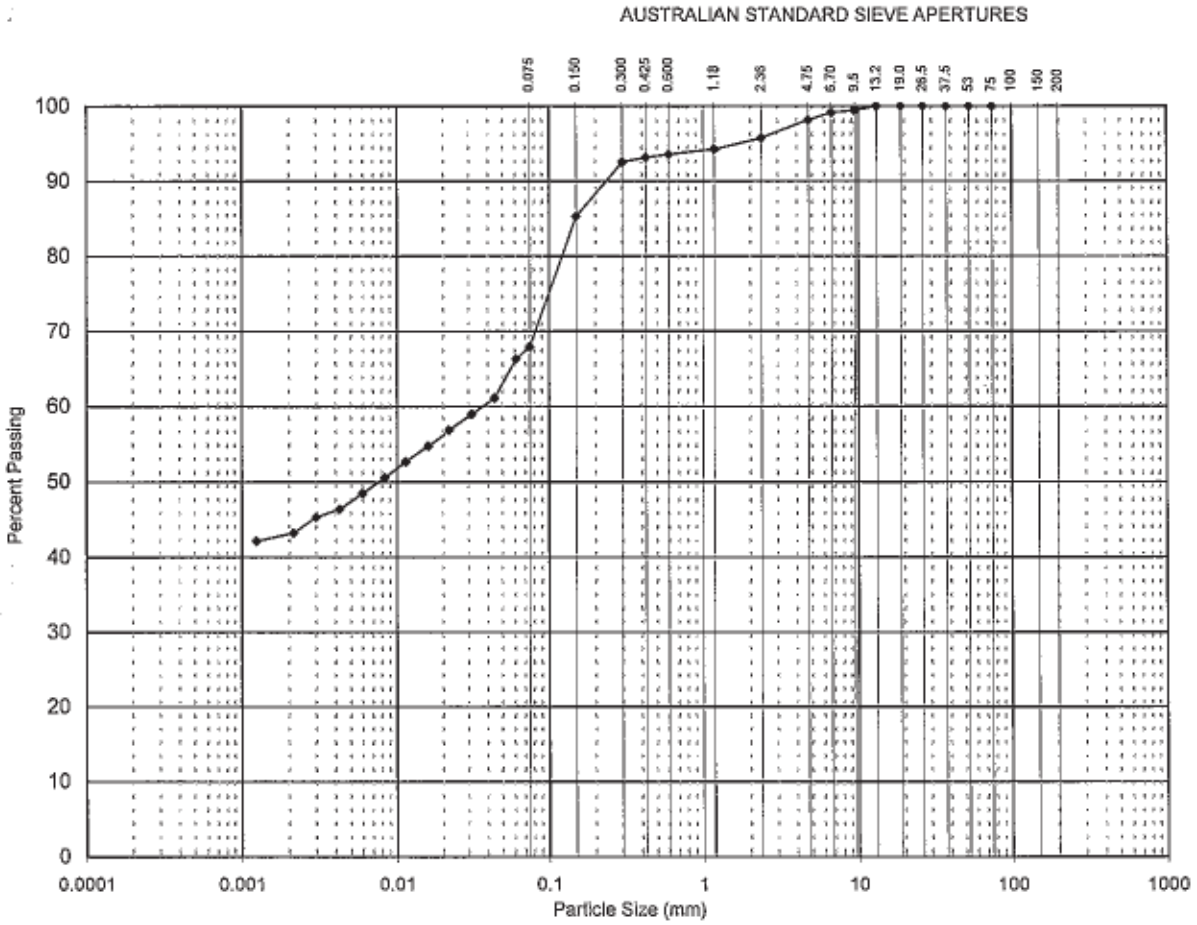
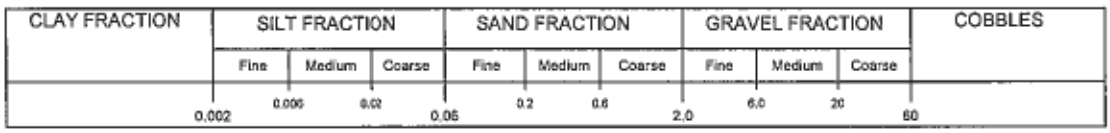
sydney@douglaspartners.com.au

RESULTS OF PARTICLE SIZE DISTRIBUTION

Client :	OWSTON NOMINEES NO.2 PTY LTD			**Project No. :**	71706
				Report No. :	S10-095 J
Principal :	LAND CAPABILITY ASSESSMENT			**Report Date :**	27-May-10
				Date Sampled:	19-23/04/10
Location :	MULGOA (WESTERN PRECINCT)			**Date of Test:**	13-May-10
Road No:	-	**Sample / Pit No:**	TP 9	**Depth / Layer:**	1.0m
Chainage:	-	**Section / Lot No:**	-	**Test Request No**	-
				Page:	1 of 1



Sieve Size (mm)	% Passing
75.0	100%
53.0	100%
37.5	100%
26.5	100%
19.0	100%
13.2	100%
9.5	99%
6.7	99%
4.75	98%
2.36	96%
1.18	94%
0.600	94%
0.425	93%
0.300	93%
0.150	85%
0.075	68%



Description: SANDY SILTY CLAY - Orange brown sandy silty clay with a trace of gravel

Test Method(s): AS 1289.3.6.1, AS 1289.3.6.3

Sampling Method(s): Sampled by Engineering Department

Remarks: -

NATA
ACCREDITED FOR TECHNICAL COMPETENCE

NATA Accredited Laboratory Number: 828
This Document is issued in accordance with NATA's accreditation requirements.
Accredited for compliance with ISO/IEC 17025

Approved Signatory:

Tested:	LW
Checked:	NW

Norman Weimann
Laboratory Manager

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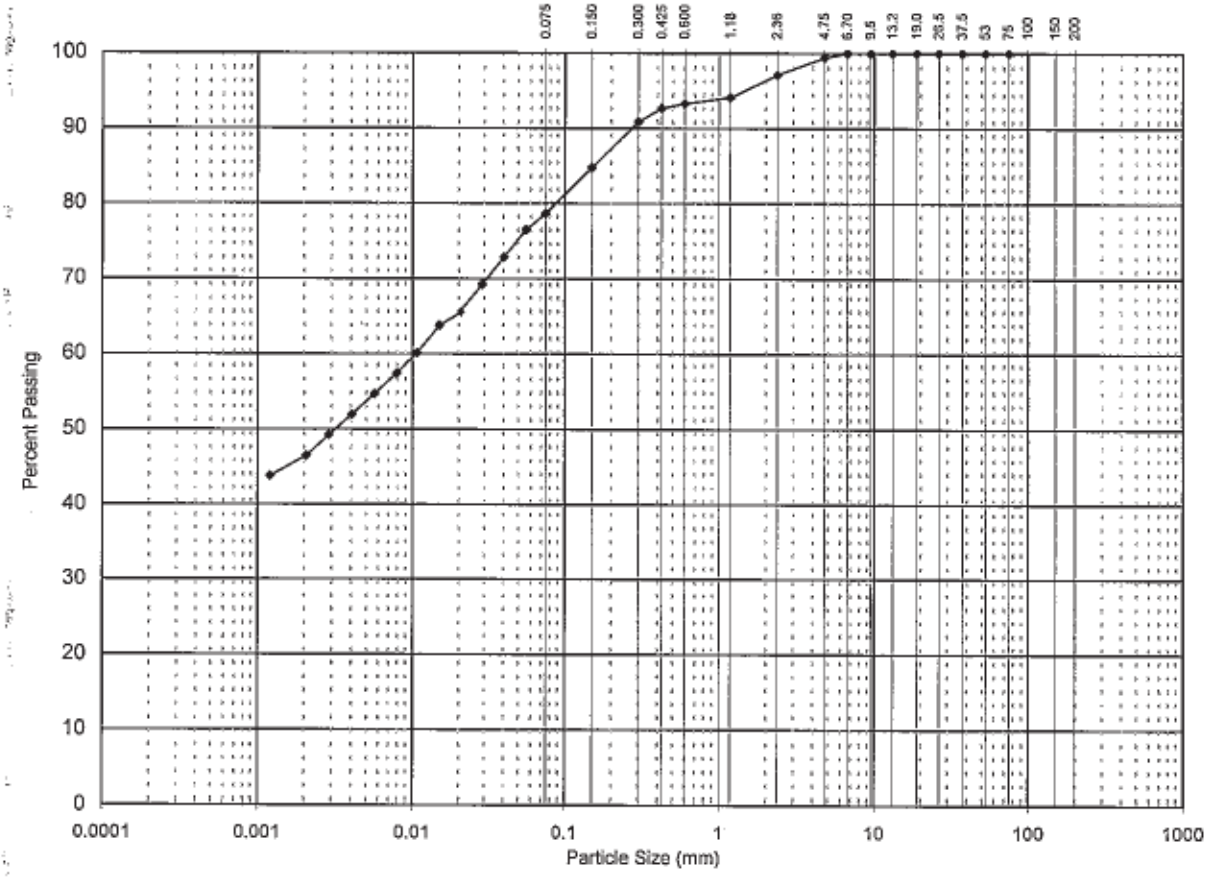
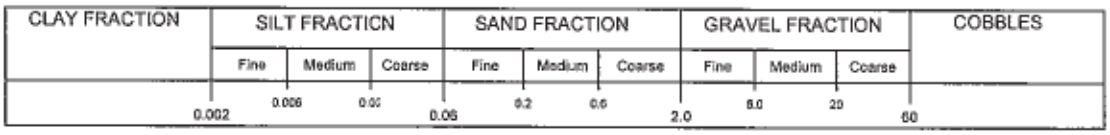
RESULTS OF PARTICLE SIZE DISTRIBUTION

Client :	OWSTON NCMINEES NO.2 PTY LTD	**Project No. :**	71706
		Report No. :	S10-095 K
Project :	LAND CAPABILITY ASSESSMENT	**Report Date :**	27-May-10
		Date Sampled:	19-23/04/10
Location :	MULGOA (WESTERN PRECINCT)	**Date of Test:**	13-May-10
Road No:	- **Sample / Pit No:** TP 24	**Depth / Layer:**	0.5m
Chainage:	- **Section / Lot No:** -	**Test Request No**	-
		Page:	1 of 1

AUSTRALIAN STANDARD SIEVE APERTURES



Sieve Size (mm)	% Passing
75.0	100%
53.0	100%
37.5	100%
26.5	100%
19.0	100%
13.2	100%
9.5	100%
6.7	100%
4.75	99%
2.36	97%
1.18	94%
0.600	93%
0.425	93%
0.300	91%
0.150	85%
0.075	79%



Description: SILTY CLAY - Mottled orange brown and grey slightly sandy silty clay with a trace of gravel

Test Method(s): AS 1289.3.6.1, AS 1289.3.6.3

Sampling Method(s): Sampled by Engineering Department

Remarks: -

NATA
ACCREDITED FOR TECHNICAL COMPETENCE

NATA Accredited Laboratory Number: 828
This Document is issued in accordance with NATA's accreditation requirements.
Accredited for compliance with ISO/IEC 17025

Approved Signatory:

Tested:	LW
Checked:	NW

Norman Weimann
Laboratory Manager

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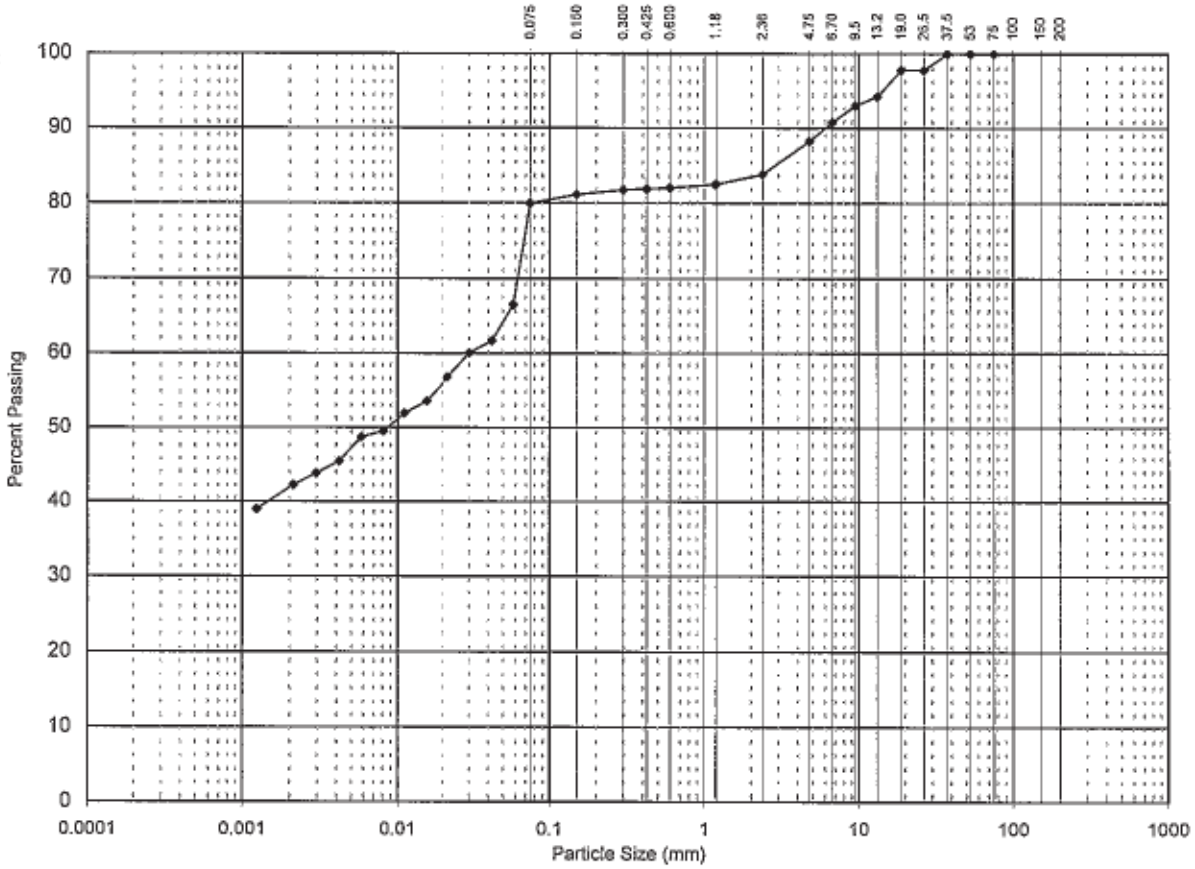
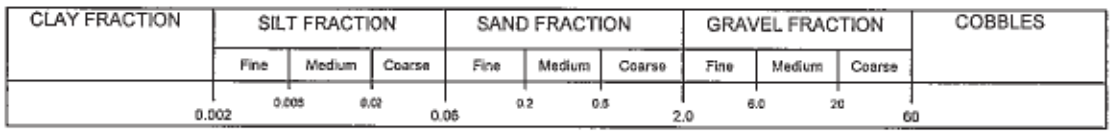
RESULTS OF PARTICLE SIZE DISTRIBUTION

Client :	OWSTON NOMINEES NO.2 PTY LTD			**Project No. :**	71706
				Report No. :	S10-095 H
Principal :	LAND CAPABILITY ASSESSMENT			**Report Date :**	27-May-10
				Date Sampled:	19-23/04/10
Location :	MULGOA (WESTERN PRECINCT)			**Date of Test:**	13-May-10
Road No:	-	**Sample / Pit No:**	TP 25	**Depth / Layer:**	0.5m
Chainage:	-	**Section / Lot No:**	-	**Test Request No**	-
				Page:	1 of 1

AUSTRALIAN STANDARD SIEVE APERTURES



Sieve Size (mm)	% Passing
75.0	100%
53.0	100%
37.5	100%
26.5	98%
19.0	98%
13.2	94%
9.5	93%
6.7	91%
4.75	88%
2.36	84%
1.18	83%
0.600	82%
0.425	82%
0.300	82%
0.150	81%
0.075	80%



Description: SILTY CLAY- Mottled red brown and grey silty clay with a trace of roolets

Test Method(s): AS 1289.3.6.1, AS 1289.3.6.3

Sampling Method(s): Sampled by Engineering Department

Remarks: -

NATA Accredited Laboratory Number: 828
This Document is issued in accordance with NATA's accreditation requirements.
Accredited for compliance with ISO/IEC 17025

Approved Signatory:

Tested:	LW
Checked:	NW

Norman Weimann
Laboratory Manager

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DETERMINATION OF EMERSON CLASS NUMBER OF SOIL

Client: **OWSTON NOMINEES NO.2 PTY LTD**
Project No: 71706
Report No: S10-095 N1
Project: LAND CAPABILITY ASSESSMENT
Report Date: 27/05/10

Location: MULGOA (WESTERN PRECINCT)
Date of Test: 24/05/10
Page: 1 of 1

SAMPLE NO	DEPTH (m)	DESCRIPTION	WATER TYPE	WATER TEMP	CLASS NO.
TP 5	0.5	SILTY CLAY – Mottled red brown and grey silty clay	Distilled	22	5
TP 9	1.0	SANDY SILTY CLAY - Orange brown sandy silty clay with a trace of gravel	Distilled	22	6
TP 11	0.5	SITLY CLAY – Orange brown silty clay with a trace of ironstone gravel	Distilled	22	6
TP 14	0.5	SILTY CLAY - Orange brown silty clay with some ironstone gravel and cobbles	Distilled	22	5
TP 24	1.0	SILTY CLAY – Mottled orange brown and grey silty clay with a trace sand	Distilled	22	6
TP 28	1.0	SANDY CLAY - Orange brown sandy clay with some ironstone gravel and cobbles	Distilled	22	6

Test Method(s): AS 1289 3.8.1
Sampling Method(s): Sampled by Engineering Department

Remarks:

NATA
ACCREDITED FOR TECHNICAL COMPETENCE

NATA Accredited Laboratory Number: 828

This Document is issued in accordance with NATA's accreditation requirements.
Accredited for compliance with ISO/IEC 17025

Approved Signatory:

Tested: LW
Checked: NW

Norman Weimann
Laboratory Manager

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CERTIFICATE OF ANALYSIS 40947

Client:
Douglas Partners
96 Hermitage Rd
West Ryde
NSW 2114

Attention: Adam Podnar

Sample log in details:

Your Reference:	**71706, Mulgoa**
No. of samples:	63 Soils
Date samples received:	13/05/10
Date completed instructions received:	13/05/10

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:	20/05/10
Date of Preliminary Report:	Not Issued
Issue Date:	21/05/10

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Tests not covered by NATA are denoted with *.

Results Approved By:

Rhian Morgan
Metals Supervisor

Jacinta Hurst
Laboratory Manager

Envirolab Reference: 40947
Revision No: R 00

NATA
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Miscellaneous Inorg - soil						
Our Reference:	UNITS	40947-1	40947-2	40947-3	40947-4	40947-5
Your Reference	----------	TP3/0.25	TP3/0.5	TP3/1	TP3/1.5	TP3/2
Date Sampled	----------	19/04/2010	19/04/2010	19/04/2010	19/04/2010	19/04/2010
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	14/5/2010	14/5/2010	14/5/2010	14/5/2010	14/5/2010
Date analysed	-	17/05/10	17/05/10	17/05/10	17/05/10	17/05/10
pH 1:5 soil:water	pH Units	7.6	6.1	6.8	4.8	4.6
Electrical Conductivity 1:5 soil:water	µS/cm	44	37	39	58	38
Resistivity in soil*	ohm m	230	270	250	170	260
Chloride, Cl 1:5 soil:water	mg/kg	17	20	18	31	16
Sulphate, SO4 1:5 soil:water	mg/kg	3.8	2.5	3.3	<2.0	3.7

Miscellaneous Inorg - soil						
Our Reference:	UNITS	40947-6	40947-7	40947-8	40947-9	40947-10
Your Reference	----------	TP3/2.5	TP6/0.25	TP6/0.5	TP9/0.25	TP9/0.5
Date Sampled	----------	19/04/2010	19/04/2010	19/04/2010	19/04/2010	19/04/2010
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	14/5/2010	14/5/2010	14/5/2010	14/5/2010	14/5/2010
Date analysed	-	17/05/10	17/05/10	17/05/10	17/05/10	17/05/10
pH 1:5 soil:water	pH Units	7.6	5.9	5.9	6.0	6.0
Electrical Conductivity 1:5 soil:water	µS/cm	41	12	16	7.0	14
Resistivity in soil*	ohm m	240	770	630	1,100	710
Chloride, Cl 1:5 soil:water	mg/kg	15	[NA]	[NA]	[NA]	[NA]
Sulphate, SO4 1:5 soil:water	mg/kg	3.1	[NA]	[NA]	[NA]	[NA]

Miscellaneous Inorg - soil						
Our Reference:	UNITS	40947-11	40947-13	40947-14	40947-15	40947-16
Your Reference	----------	TP9/1.0	TP12/0.25	TP12/0.5	TP14/0.25	TP14/0.5
Date Sampled	----------	19/04/2010	19/04/2010	19/04/2010	19/04/2010	19/04/2010
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	14/5/2010	14/5/2010	14/5/2010	14/5/2010	14/5/2010
Date analysed	-	17/05/10	17/05/10	17/05/10	17/05/10	17/05/10
pH 1:5 soil:water	pH Units	5.4	4.9	4.9	6.2	6.0
Electrical Conductivity 1:5 soil:water	µS/cm	13	56	45	10	5.0
Resistivity in soil*	ohm m	770	180	220	1,100	1,900
Chloride, Cl 1:5 soil:water	mg/kg	[NA]	<20	6.0	[NA]	[NA]
Sulphate, SO4 1:5 soil:water	mg/kg	[NA]	<20	6.9	[NA]	[NA]

Miscellaneous Inorg - soil						
Our Reference:	UNITS	40947-17	40947-18	40947-19	40947-20	40947-21
Your Reference	----------	TP14/1.0	TP14/1.5	TP16/0.25	TP16/0.5	TP18/0.25
Date Sampled	----------	19/04/2010	19/04/2010	19/04/2010	19/04/2010	19/04/2010
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	14/5/2010	14/5/2010	14/5/2010	14/5/2010	14/5/2010
Date analysed	-	17/05/10	17/05/10	17/05/10	17/05/10	17/05/10
pH 1:5 soil:water	pH Units	5.9	5.4	5.0	7.8	5.9
Electrical Conductivity 1:5 soil:water	µS/cm	14	15	38	43	13
Resistivity in soil*	ohm m	710	670	260	230	770
Chloride, Cl 1:5 soil:water	mg/kg	[NA]	[NA]	2.2	2.1	[NA]
Sulphate, SO4 1:5 soil:water	mg/kg	[NA]	[NA]	7.2	6.6	[NA]

Miscellaneous Inorg - soil						
Our Reference:	UNITS	40947-22	40947-23	40947-24	40947-25	40947-26
Your Reference	----------	TP18/0.5	TP20/0.25	TP20/0.5	TP22/0.25	TP22/0.5
Date Sampled	----------	19/04/2010	19/04/2010	19/04/2010	19/04/2010	19/04/2010
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	14/5/2010	14/5/2010	14/5/2010	14/5/2010	14/5/2010
Date analysed	-	17/05/10	17/05/10	17/05/10	17/05/10	17/05/10
pH 1:5 soil:water	pH Units	8.4	5.1	5.1	5.8	6.3
Electrical Conductivity 1:5 soil:water	µS/cm	29	24	31	11	8.0
Resistivity in soil*	ohm m	340	420	320	910	1,300
Chloride, Cl 1:5 soil:water	mg/kg	5.6	2.8	6.2	[NA]	[NA]
Sulphate, SO4 1:5 soil:water	mg/kg	<2.0	<2.0	2.0	[NA]	[NA]

Miscellaneous Inorg - soil						
Our Reference:	UNITS	40947-27	40947-28	40947-29	40947-30	40947-31
Your Reference	----------	TP26/0.25	TP26/0.5	TP28/0.25	TP28/0.5	TP24/0.25
Date Sampled	----------	19/04/2010	19/04/2010	19/04/2010	19/04/2010	19/04/2010
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	14/5/2010	14/5/2010	14/5/2010	14/5/2010	14/5/2010
Date analysed	-	17/05/10	17/05/10	17/05/10	17/05/10	17/05/10
pH 1:5 soil:water	pH Units	5.8	5.1	6.0	6.2	6.1
Electrical Conductivity 1:5 soil:water	µS/cm	13	45	9.0	13	9.0
Resistivity in soil*	ohm m	760	220	1,200	790	1,100
Chloride, Cl 1:5 soil:water	mg/kg	[NA]	12	[NA]	[NA]	[NA]
Sulphate, SO4 1:5 soil:water	mg/kg	[NA]	<2.0	[NA]	[NA]	[NA]

Miscellaneous Inorg - soil						
Our Reference:	UNITS	40947-32	40947-33	40947-34	40947-35	40947-36
Your Reference	----------	TP24/0.5	TP24/1.0	TP106/0.25	TP106/0.5	TP106/1.0
Date Sampled	----------	19/04/2010	19/04/2010	19/04/2010	19/04/2010	19/04/2010
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	14/5/2010	14/5/2010	14/5/2010	14/5/2010	14/5/2010
Date analysed	-	17/05/10	17/05/10	17/05/10	17/05/10	17/05/10
pH 1:5 soil:water	pH Units	6.1	5.4	6.3	6.1	5.2
Electrical Conductivity 1:5 soil:water	µS/cm	13	12	20	110	100
Resistivity in soil*	ohm m	770	830	500	91	100
Chloride, Cl 1:5 soil:water	mg/kg	[NA]	[NA]	[NA]	6.1	[NA]
Sulphate, SO4 1:5 soil:water	mg/kg	[NA]	[NA]	[NA]	70	[NA]

Miscellaneous Inorg - soil						
Our Reference:	UNITS	40947-37	40947-38	40947-39	40947-40	40947-41
Your Reference	----------	TP106/1.5	TP106/2.0	TP111/0.25	TP111/0.5	TP111/1.0
Date Sampled	----------	19/04/2010	19/04/2010	19/04/2010	19/04/2010	19/04/2010
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	14/5/2010	14/5/2010	14/5/2010	14/5/2010	14/5/2010
Date analysed	-	17/05/10	17/05/10	17/05/10	17/05/10	17/05/10
pH 1:5 soil:water	pH Units	5.5	5.4	6.7	5.0	5.5
Electrical Conductivity 1:5 soil:water	µS/cm	88	150	82	97	88
Resistivity in soil*	ohm m	110	67	120	100	110
Chloride, Cl 1:5 soil:water	mg/kg	[NA]	[NA]	<20	46	50
Sulphate, SO4 1:5 soil:water	mg/kg	[NA]	[NA]	<20	<20	<20

Miscellaneous Inorg - soil						
Our Reference:	UNITS	40947-42	40947-43	40947-44	40947-45	40947-46
Your Reference	----------	TP111/1.5	TP111/1.8	TP114/0.25	TP114/0.5	TP114/1.0
Date Sampled	----------	19/04/2010	19/04/2010	19/04/2010	19/04/2010	19/04/2010
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	14/5/2010	14/5/2010	14/5/2010	14/5/2010	14/5/2010
Date analysed	-	17/05/10	17/05/10	17/05/10	17/05/10	17/05/10
pH 1:5 soil:water	pH Units	6.5	6.4	6.2	4.6	5.3
Electrical Conductivity 1:5 soil:water	µS/cm	100	140	21	100	71
Resistivity in soil*	ohm m	99	71	480	100	140
Chloride, Cl 1:5 soil:water	mg/kg	20	77	[NA]	8.5	[NA]
Sulphate, SO4 1:5 soil:water	mg/kg	<2.0	<20	[NA]	66	[NA]

Miscellaneous Inorg - soil						
Our Reference:	UNITS	40947-47	40947-48	40947-49	40947-50	40947-51
Your Reference	----------	TP114/1.5	TP114/2.0	TP114/2.5	TP120/0.25	TP120/0.5
Date Sampled	----------	19/04/2010	19/04/2010	19/04/2010	19/04/2010	19/04/2010
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	14/5/2010	14/5/2010	14/5/2010	14/5/2010	14/5/2010
Date analysed	-	17/05/10	17/05/10	17/05/10	17/05/10	17/05/10
pH 1:5 soil:water	pH Units	5.3	5.1	5.4	5.7	5.7
Electrical Conductivity 1:5 soil:water	µS/cm	110	100	200	50	53
Resistivity in soil*	ohm m	91	100	50	200	190
Chloride, Cl 1:5 soil:water	mg/kg	[NA]	[NA]	[NA]	980	<20
Sulphate, SO4 1:5 soil:water	mg/kg	[NA]	[NA]	[NA]	840	<20

Miscellaneous Inorg - soil						
Our Reference:	UNITS	40947-52	40947-53	40947-54	40947-55	40947-56
Your Reference	----------	TP120/1.0	TP120/1.5	TP120/2.0	TP127/0.25	TP127/0.5
Date Sampled	----------	19/04/2010	19/04/2010	19/04/2010	19/04/2010	19/04/2010
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	14/5/2010	14/5/2010	14/5/2010	14/5/2010	14/5/2010
Date analysed	-	17/05/10	17/05/10	17/05/10	17/05/10	17/05/10
pH 1:5 soil:water	pH Units	5.5	5.2	5.1	5.4	5.2
Electrical Conductivity 1:5 soil:water	µS/cm	67	200	230	61	45
Resistivity in soil*	ohm m	150	51	43	160	220
Chloride, Cl 1:5 soil:water	mg/kg	[NA]	[NA]	[NA]	<20	<20
Sulphate, SO4 1:5 soil:water	mg/kg	[NA]	[NA]	[NA]	<20	21

Miscellaneous Inorg - soil						
Our Reference:	UNITS	40947-57	40947-58	40947-59	40947-60	40947-61
Your Reference	----------	TP127/1.0	TP127/1.5	TP127/2.0	TP131/0.25	TP131/1.0
Date Sampled	----------	19/04/2010	19/04/2010	19/04/2010	19/04/2010	19/04/2010
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	14/5/2010	14/5/2010	14/5/2010	14/5/2010	14/5/2010
Date analysed	-	17/05/10	17/05/10	17/05/10	17/05/10	17/05/10
pH 1:5 soil:water	pH Units	6.1	5.8	5.8	5.5	6.3
Electrical Conductivity 1:5 soil:water	µS/cm	23	32	23	54	21
Resistivity in soil*	ohm m	430	310	430	190	480
Chloride, Cl 1:5 soil:water	mg/kg	[NA]	[NA]	[NA]	<20	[NA]
Sulphate, SO4 1:5 soil:water	mg/kg	[NA]	[NA]	[NA]	<20	[NA]

Miscellaneous Inorg - soil			
Our Reference:	UNITS	40947-62	40947-63
Your Reference	----------	TP131/1.5	TP131/2.0
Date Sampled	----------	19/04/2010	19/04/2010
Type of sample		Soil	Soil
Date prepared	-	14/5/2010	14/5/2010
Date analysed	-	17/05/10	17/05/10
pH 1:5 soil:water	pH Units	5.8	6.4
Electrical Conductivity 1:5 soil:water	µS/cm	24	12
Resistivity in soil*	ohm m	420	830

ESP/CEC Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	40947-2 TP3/0.5 19/04/2010 Soil	40947-8 TP6/0.5 19/04/2010 Soil	40947-14 TP12/0.5 19/04/2010 Soil	40947-19 TP16/0.25 19/04/2010 Soil	40947-20 TP16/0.5 19/04/2010 Soil
Exchangeable Ca*	meq/100g	0.050	0.17	0.090	0.24	0.13
Exchangeable K*	meq/100g	0.13	0.16	0.19	0.060	0.080
Exchangeable Mg*	meq/100g	9.5	4.1	4.0	0.81	3.6
Exchangeable Na*	meq/100g	0.77	0.65	0.50	0.25	0.39
Cation Exchange Capacity*	meq/100g	11	5.1	4.8	1.4	4.2
ESP*	%	7.4	12.8	10.5	18.1	9.4

ESP/CEC Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	40947-26 TP22/0.5 19/04/2010 Soil	40947-35 TP106/0.5 19/04/2010 Soil	40947-40 TP111/0.5 19/04/2010 Soil	40947-51 TP120/0.5 19/04/2010 Soil	40947-57 TP127/1.0 19/04/2010 Soil
Exchangeable Ca*	meq/100g	0.16	0.28	1.1	2.9	2.0
Exchangeable K*	meq/100g	0.14	0.29	0.33	0.12	0.16
Exchangeable Mg*	meq/100g	4.9	6.4	8.6	3.4	6.1
Exchangeable Na*	meq/100g	0.37	1.2	1.4	0.47	0.52
Cation Exchange Capacity*	meq/100g	5.5	8.2	11	6.9	8.7
ESP*	%	6.6	14.9	11.9	6.9	5.9

Method ID	Methodology Summary
LAB.1	pH - Measured using pH meter and electrode in accordance with APHA 20th ED, 4500-H+.
LAB.2	Conductivity and Salinity - measured using a conductivity cell and dedicated meter, in accordance with APHA2510 20th ED and Rayment & Higginson.
LAB.81	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA 21st ED, 4110-B.
Metals.23	Determination of exchangeable cations and cation exchange capacity in soil.

QUALITY CONTROL Miscellaneous Inorg - soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ǁ Duplicate ǁ %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			14/05/2010	40947-1	14/5/2010 ǁ 14/5/2010	LCS-1	14/05/2010
Date analysed	-			19/05/2010	40947-1	17/05/10 ǁ 17/05/10	LCS-1	14/05/2010
pH 1:5 soil:water	pH Units		LAB.1	[NT]	40947-1	7.6 ǁ 7.6 ǁ RPD: 0	LCS-1	99%
Electrical Conductivity 1:5 soil:water	µS/cm	1	LAB.2	<1.0	40947-1	44 ǁ 44 ǁ RPD: 0	LCS-1	100%
Resistivity in soil*	ohm m	1	LAB.2	<1.0	40947-1	230 ǁ 230 ǁ RPD: 0	LCS-1	100%
Chloride, Cl 1:5 soil:water	mg/kg	2	LAB.81	<2.0	40947-1	17 ǁ 17 ǁ RPD: 0	LCS-1	99%
Sulphate, SO4 1:5 soil:water	mg/kg	2	LAB.81	<2.0	40947-1	3.8 ǁ 3.9 ǁ RPD: 3	LCS-1	103%

QUALITY CONTROL ESP/CEC	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ǁ Duplicate ǁ %RPD	Spike Sm#	Spike % Recovery
Exchangeable Ca*	meq/100g	0.01	Metals.23	<0.01	40947-2	0.050 ǁ 0.060 ǁ RPD: 18	LCS-1	108%
Exchangeable K*	meq/100g	0.01	Metals.23	<0.01	40947-2	0.13 ǁ 0.14 ǁ RPD: 7	LCS-1	105%
Exchangeable Mg*	meq/100g	0.01	Metals.23	<0.01	40947-2	9.5 ǁ 9.9 ǁ RPD: 4	LCS-1	104%
Exchangeable Na*	meq/100g	0.01	Metals.23	<0.01	40947-2	0.77 ǁ 0.82 ǁ RPD: 6	LCS-1	108%
Cation Exchange Capacity*	meq/100g	1	Metals.23	<1.0	40947-2	11 ǁ 11 ǁ RPD: 0	[NR]	[NR]
ESP*	%	1	Metals.23	<1.0	40947-2	7.4 ǁ 7.5 ǁ RPD: 1	[NR]	[NR]

QUALITY CONTROL Miscellaneous Inorg - soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	40947-11	14/5/2010 ǁ 14/5/2010	LCS-2	14/05/2010
Date analysed	-	40947-11	17/05/10 ǁ 17/05/10	LCS-2	19/05/2010
pH 1:5 soil:water	pH Units	40947-11	5.4 ǁ 5.7 ǁ RPD: 5	LCS-2	99%
Electrical Conductivity 1:5 soil:water	µS/cm	40947-11	13 ǁ 13 ǁ RPD: 0	LCS-2	100%
Resistivity in soil*	ohm m	40947-11	770 ǁ 770 ǁ RPD: 0	LCS-2	100%
Chloride, Cl 1:5 soil:water	mg/kg	[NT]	[NT]	LCS-2	98%
Sulphate, SO4 1:5 soil:water	mg/kg	[NT]	[NT]	LCS-2	98%

Client Reference: 71706, Mulgoa

QUALITY CONTROL Miscellaneous Inorg - soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	40947-22	14/5/2010 || 14/5/2010	40947-2	14/05/2010
Date analysed	-	40947-22	17/05/10 || 17/05/10	40947-2	19/05/2010
pH 1:5 soil:water	pH Units	40947-22	8.4 || 8.4 || RPD: 0	[NR]	[NR]
Resistivity in soil*	ohm m	40947-22	340 || 350 || RPD: 3	[NR]	[NR]
Chloride, Cl 1:5 soil:water	mg/kg	40947-22	5.6 || 5.6 || RPD: 0	40947-2	110%
Sulphate, SO4 1:5 soil:water	mg/kg	40947-22	<2.0 || <2.0	40947-2	102%

QUALITY CONTROL Miscellaneous Inorg - soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	40947-33	14/5/2010 || 14/5/2010	40947-56	14/5/2010
Date analysed	-	40947-33	17/05/10 || 17/05/10	40947-56	19/5/2010
pH 1:5 soil:water	pH Units	40947-33	5.4 || 5.6 || RPD: 4	[NR]	[NR]
Electrical Conductivity 1:5 soil:water	µS/cm	40947-33	12 || 12 || RPD: 0	[NR]	[NR]
Resistivity in soil*	ohm m	40947-33	830 || 830 || RPD: 0	[NR]	[NR]
Chloride, Cl 1:5 soil:water	mg/kg	[NT]	[NT]	40947-56	96%
Sulphate, SO4 1:5 soil:water	mg/kg	[NT]	[NT]	40947-56	80%

QUALITY CONTROL Miscellaneous Inorg - soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD
Date prepared	-	40947-44	14/5/2010 || 14/5/2010
Date analysed	-	40947-44	17/05/10 || 17/05/10
pH 1:5 soil:water	pH Units	40947-44	6.2 || 6.3 || RPD: 2
Electrical Conductivity 1:5 soil:water	µS/cm	40947-44	21 || 19 || RPD: 10
Resistivity in soil*	ohm m	40947-44	480 || 530 || RPD: 10
Chloride, Cl 1:5 soil:water	mg/kg	[NT]	[NT]
Sulphate, SO4 1:5 soil:water	mg/kg	[NT]	[NT]

QUALITY CONTROL Miscellaneous Inorg - soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD
Date prepared	-	40947-55	14/5/2010 || 14/5/2010
Date analysed	-	40947-55	17/05/10 || 17/05/10
pH 1:5 soil:water	pH Units	40947-55	5.4 || 5.5 || RPD: 2
Electrical Conductivity 1:5 soil:water	µS/cm	40947-55	61 || 59 || RPD: 3
Resistivity in soil*	ohm m	40947-55	160 || 160 || RPD: 0
Chloride, Cl 1:5 soil:water	mg/kg	40947-55	<20 || <20
Sulphate, SO4 1:5 soil:water	mg/kg	40947-55	<20 || <20

Report Comments:

Sulphate\Chloride: PQL raised by a factor of X10 sor samples 13,39,40,41,43,51,55,56,60 due to sample matrix.
Asbestos was analysed by Approved Identifier: Not applicable for this job
Asbestos was authorised by Approved Signatory: 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

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9958 5801 fax 02 9958 5803 mob 0400 88 5292
email: tnotaras@envirolabservices.com.au

Douglas Partners
96 Hermitage Rd
West Ryde 2114

Att: Adam Podnar

Re: 71706, Mulgoa

Soil Texture was determined based on the Australian Governments Department of the Environment & Heritage, Australian Greenhouse Office Guide to Field Measurements.

ECe (Extract Electrical Conductivity) is determined by analysing a 1:5 soil water extract for conductivity then multiplying this result by the soil texture conversion factor based on 'Site Investigations for Urban Salinity', DIPNR 2002.

ID	Envirolab ID	EC dS/m	Texture	ECe dS/m	Class
TP3/0.25	40947-1	0.044	Light Clay	0.37	Non Saline
TP3/0.5	40947-2	0.037	Light Medium Clay	0.30	Non Saline
TP3/1	40947-3	0.039	Light Medium Clay	0.31	Non Saline
TP3/1.5	40947-4	0.058	Light Medium Clay	0.46	Non Saline
TP3/2	40947-5	0.038	Light Medium Clay	0.30	Non Saline
TP3/2.5	40947-6	0.041	Medium Clay	0.29	Non Saline
TP6/0.25	40947-7	0.012	Loam	0.12	Non Saline
TP6/0.5	40947-8	0.016	Light Medium Clay	0.13	Non Saline
TP9/0.25	40947-9	0.009	Light Clay	0.08	Non Saline
TP9/0.5	40947-10	0.014	Light Clay	0.12	Non Saline
TP9/1.0	40947-11	0.013	Medium Clay	0.09	Non Saline
TP12/0.25	40947-13	0.056	Clay Loam	0.50	Non Saline
TP12/0.5	40947-14	0.045	Light Medium Clay	0.36	Non Saline
TP14/0.25	40947-15	0.010	Clay Loam	0.09	Non Saline
TP14/0.5	40947-16	0.005	Light Medium Clay	0.04	Non Saline
TP14/1.0	40947-17	0.014	Medium Clay	0.10	Non Saline
TP14/1.5	40947-18	0.015	Medium Clay	0.11	Non Saline
TP16/0.25	40947-19	0.038	Light Medium Clay	0.30	Non Saline
TP16/0.5	40947-20	0.043	Light Medium Clay	0.34	Non Saline
TP18/0.25	40947-21	0.013	Light Medium Clay	0.10	Non Saline
TP18/0.5	40947-22	0.029	Light Medium Clay	0.23	Non Saline
TP20/0.25	40947-23	0.024	Light Medium Clay	0.19	Non Saline
TP20/0.5	40947-24	0.031	Medium Clay	0.22	Non Saline
TP22/0.25	40947-25	0.011	Medium Clay	0.08	Non Saline
TP22/0.5	40947-26	0.008	Medium Clay	0.06	Non Saline
TP26/0.25	40947-27	0.013	Light Medium Clay	0.10	Non Saline
TP26/0.5	40947-28	0.045	Light Medium Clay	.36	Non Saline

TP28/0.25	40947-29	0.009	Clay Loam	0.08	Non Saline
TP28/0.5	40947-30	0.013	Medium Clay	0.09	Non Saline
ID	Envirolab ID	EC dS/m	Texture	ECe dS/m	Class
TP24/0.25	40947-31	0.009	Light Medium Clay	0.07	Non Saline
TP24/0.5	40947-32	0.013	Light Medium Clay	.10	Non Saline
TP24/1.0	40947-33	0.012	Medium Clay	0.08	Non Saline
TP106/0.25	40947-34	0.020	Heavy Clay	0.12	Non Saline
TP106/0.5	40947-35	0.110	Light Medium Clay	0.88	Non Saline
TP106/1.0	40947-36	.100	Medium Clay	0.80	Non Saline
TP106/1.5	40947-37	.088	Light Medium Clay	0.70	Non Saline
TP106/2.0	40947-38	.150	Medium Clay	1.05	Non Saline
TP111/0.25	40947-39	0.082	Medium Clay	0.57	Non Saline
TP111/0.5	40947-40	0.097	Medium Clay	0.68	Non Saline
TP111/1.0	40947-41	0.088	Heavy Clay	0.53	Non Saline
TP111/1.5	40947-42	0.100	Heavy Clay	0.60	Non Saline
TP111/1.8	40947-43	0.140	Heavy Clay	0.84	Non Saline
TP114/02.5	40947-44	0.021	Loam	0.21	Non Saline
TP114/0.5	40947-45	.100	Medium Clay	0.70	Non Saline
TP114/1.0	40947-46	0.07	Heavy Clay	0.42	Non Saline
TP114/1.5	40947-47	0.110	Light Medium Clay	0.88	Non Saline
TP114/2.0	40947-48	0.10	Medium Clay	.70	Non Saline
TP114/2.5	40947-49	0.20	Medium Clay	1.6	Non Saline
TP120/0.25	40947-50	0.05	Loam	0.50	Non Saline
TP120/0.5	40947-51	0.053	Clay Loam	0.48	Non Saline
TP120/1.0	40947-52	0.067	Medium Clay	0.47	Non Saline
TP120/1.5	40947-53	0.20	Heavy Clay	1.2	Non Saline
TP120/2.0	40947-54	0.23	Heavy Clay	1.4	Non Saline
TP127/0.25	40947-55	0.061	Loam	0.61	Non Saline
TP127/0.5	40947-56	0.045	Loam	0.45	Non Saline
TP127/1.0	40947-57	0.023	Light Medium Clay	0.18	Non Saline
TP127/1.5	40947-58	0.032	Light Medium Clay	0.26	Non Saline
TP127/2.0	40947-59	0.023	Medium Clay	0.16	Non Saline
TP131/0.25	40947-60	0.054	Loam	0.54	Non Saline
TP131/1.0	40947-61	0.021	Medium Clay	0.15	Non Saline
TP131/1.5	40947-62	0.024	Medium Clay	0.17	Non Saline
TP131/2.0	40947-63	0.012	Sandy Loams	0.17	Non Saline

DIPNR gives the following definitions:
'Non-Saline' as 'Salinity effects mostly negligible'.
'Slightly Saline' as 'yields of very sensitive crops may be affected'.
'Moderately Saline' as 'yields of many crops affected'.
'Very Saline' as 'Only tolerant crops yield satisfactorily'.
'Highly Saline' as 'Only a few very tolerant crops yield satisfactorily'.

Appendix F

Laboratory Test Results (Current)

Douglas Partners
Geotechnics / Environment / Groundwater

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www.douglaspartners.com.au
96 Hermitage Road
West Ryde NSW 2114
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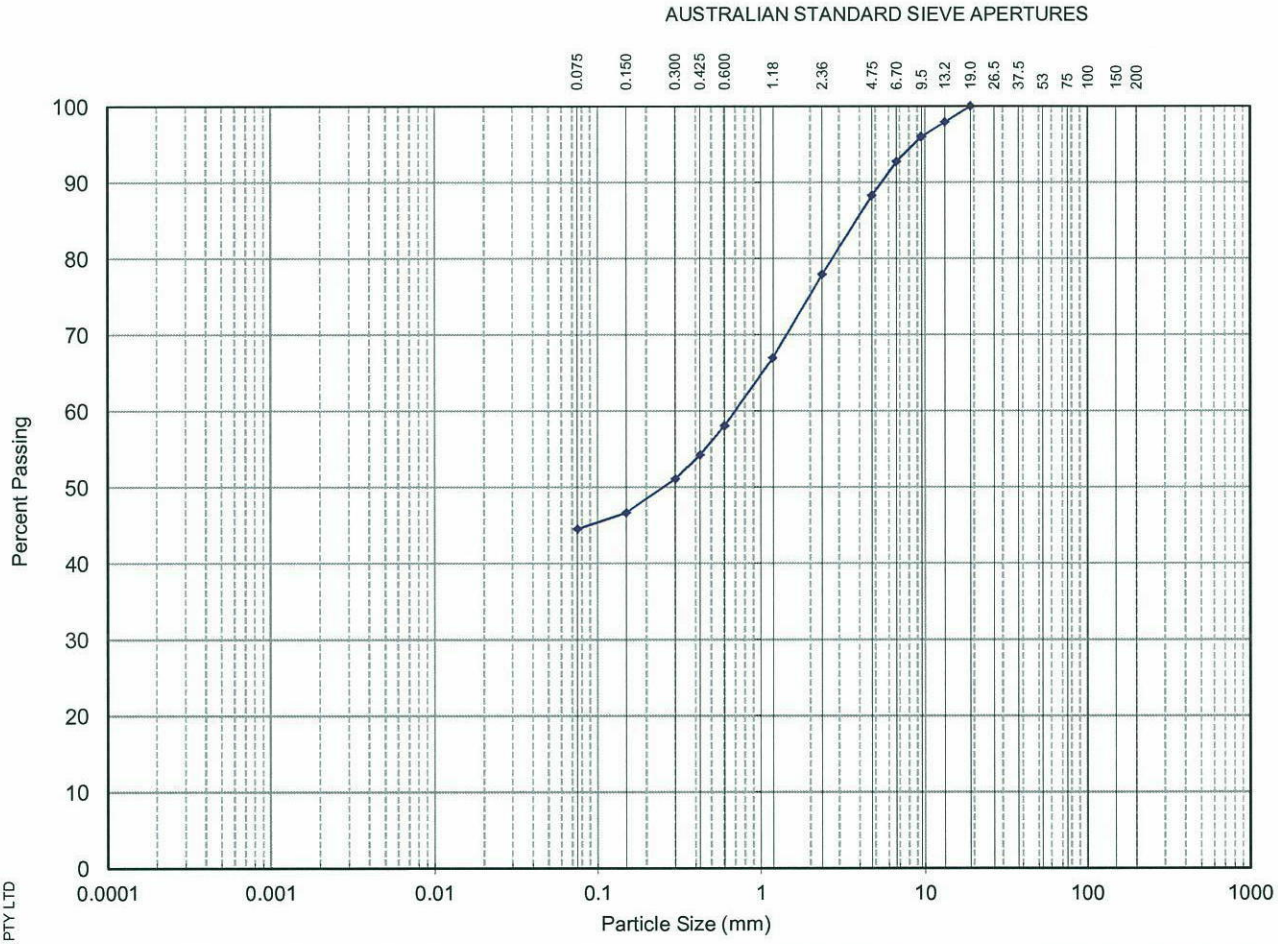
West Ryde NSW 1685
Phone (02) 9809 0666
Fax (02) 9809 4095

Results of Particle Size Distribution

Client :	CUBELIC HOLDINGS PTY LTD			**Project No. :**	71706.01
				Report No. :	2
Project :	FERNHILL ESTATE			**Report Date :**	25-Jun-13
				Date Sampled:	18-Jun-13
Location :	MULOGA			**Date of Test:**	20-Jun-13
Road No:	-	**Sample / Pit No:**	BH 1	**Depth / Layer:**	0.3-0.6m
Chainage:	-	**Section / Lot No:**	-	**Test Request No:**	-
				Page:	1 of 1



Sieve Size (mm)	% Passing
75.0	~
53.0	~
37.5	~
26.5	~
19.0	100%
13.2	98%
9.5	96%
6.7	93%
4.75	88%
2.36	78%
1.18	67%
0.600	58%
0.425	54%
0.300	51%
0.150	47%
0.075	45%

CLAY FRACTION	SILT FRACTION			SAND FRACTION			GRAVEL FRACTION			COBBLES
	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	
	0.002	0.006	0.02	0.06	0.2	0.6	2.0	6.0	20	60

Description: SILTY CLAYEY SHALE - Grey brown silty clayey shale

Test Method(s): AS 1289.3.6.1

Sampling Method(s): Sampled by Engineering Department

Remarks: -

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NATA Accredited Laboratory Number: 828
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Tested: LW
Checked: BH

Brett Hughes
Laboratory Supervisor

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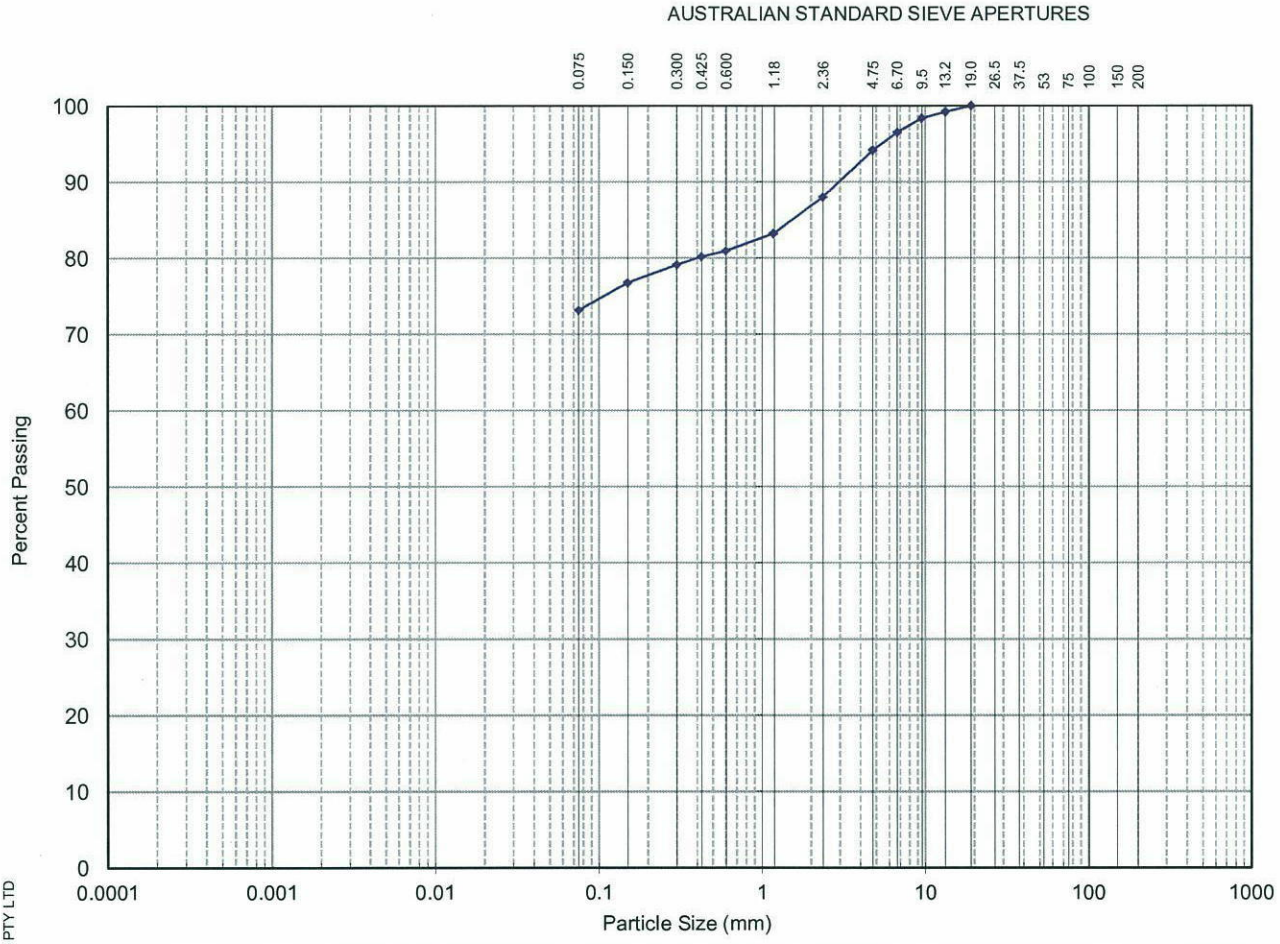
Results of Particle Size Distribution

Client :	CUBELIC HOLDINGS PTY LTD			**Project No. :**	71706.01
				Report No. :	3
Project :	FERNHILL ESTATE			**Report Date :**	25-Jun-13
				Date Sampled:	18-Jun-13
Location :	MULOGA			**Date of Test:**	20-Jun-13
Road No:	-	**Sample / Pit No:**	BH 2	**Depth / Layer:**	0.3-0.5m
Chainage:	-	**Section / Lot No:**	-	**Test Request No:**	-
				Page:	1 of 1



Sieve Size (mm)	% Passing
75.0	~
53.0	~
37.5	~
26.5	~
19.0	100%
13.2	99%
9.5	98%
6.7	96%
4.75	94%
2.36	88%
1.18	83%
0.600	81%
0.425	80%
0.300	79%
0.150	77%
0.075	73%

CLAY FRACTION	SILT FRACTION			SAND FRACTION			GRAVEL FRACTION			COBBLES
	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	
	0.002	0.006	0.02	0.06	0.2	0.6	2.0	6.0	20	60

Description: SILTY CLAY - Brown and red brown slightly gravelly sandy silty clay

Test Method(s): AS 1289.3.6.1

Sampling Method(s): Sampled by Engineering Department

Remarks: -

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Tested:	LW
Checked:	BH

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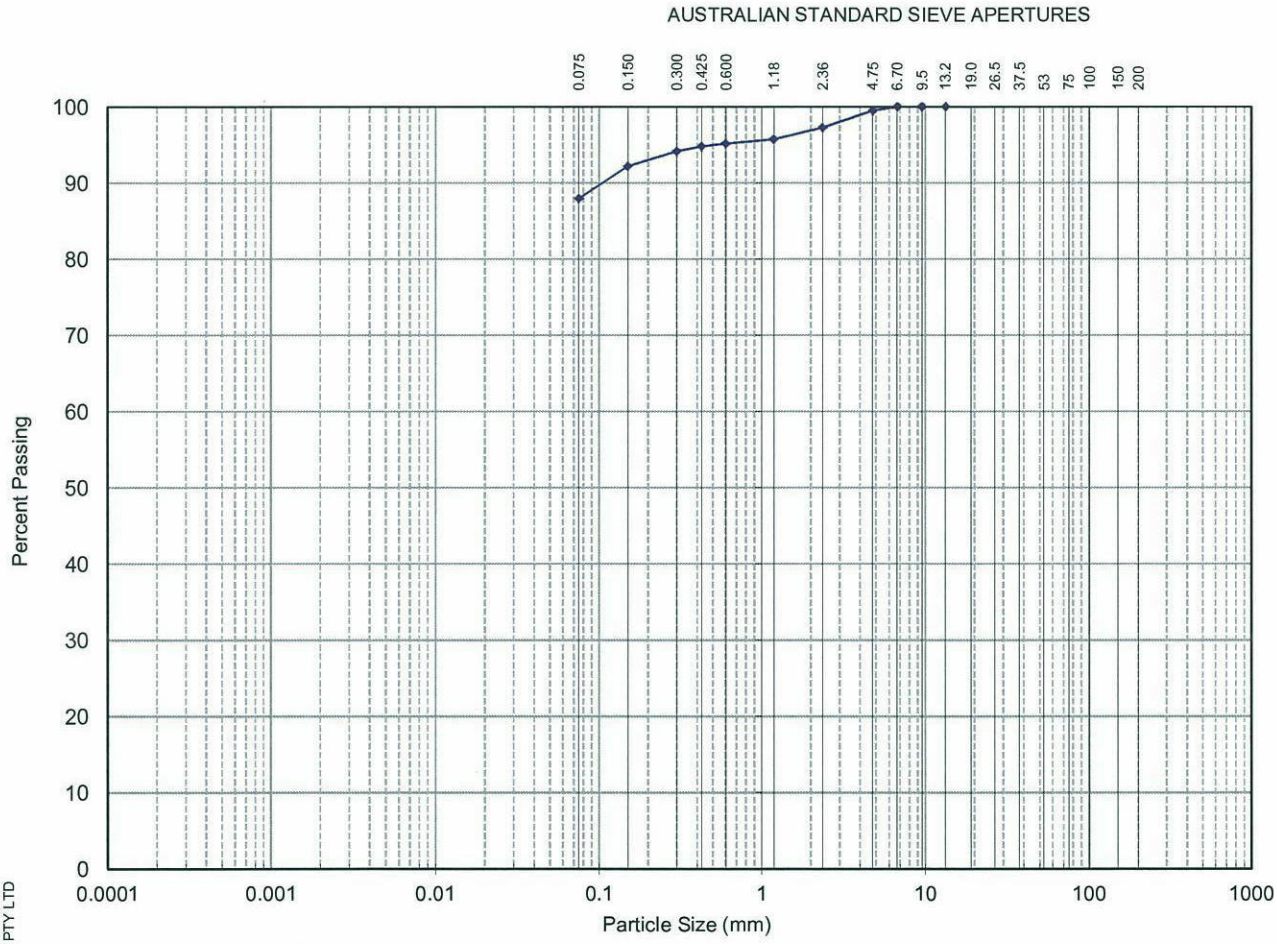
Results of Particle Size Distribution

Client :	CUBELIC HOLDINGS PTY LTD			**Project No. :**	71706.01
				Report No. :	4
Project :	FERNHILL ESTATE			**Report Date :**	25-Jun-13
				Date Sampled:	18-Jun-13
Location :	MULOGA			**Date of Test:**	20-Jun-13
Road No:	-	**Sample / Pit No:**	BH 3	**Depth / Layer:**	0.8-1.1m
Chainage:	-	**Section / Lot No:**	-	**Test Request No:**	-
				Page:	1 of 1



Sieve Size (mm)	% Passing
75.0	~
53.0	~
37.5	~
26.5	~
19.0	~
13.2	100%
9.5	100%
6.7	100%
4.75	99%
2.36	97%
1.18	96%
0.600	95%
0.425	95%
0.300	94%
0.150	92%
0.075	88%

CLAY FRACTION	SILT FRACTION			SAND FRACTION			GRAVEL FRACTION			COBBLES
	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	
	0.002	0.006	0.02	0.06	0.2	0.6	2.0	6.0	20	60

Description: SILTY CLAY - Orange Brown silty clay with some sand and trace of ironstone gravel

Test Method(s): AS 1289.3.6.1

Sampling Method(s): Sampled by Engineering Department

Remarks: -

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Tested:	LW
Checked:	BH

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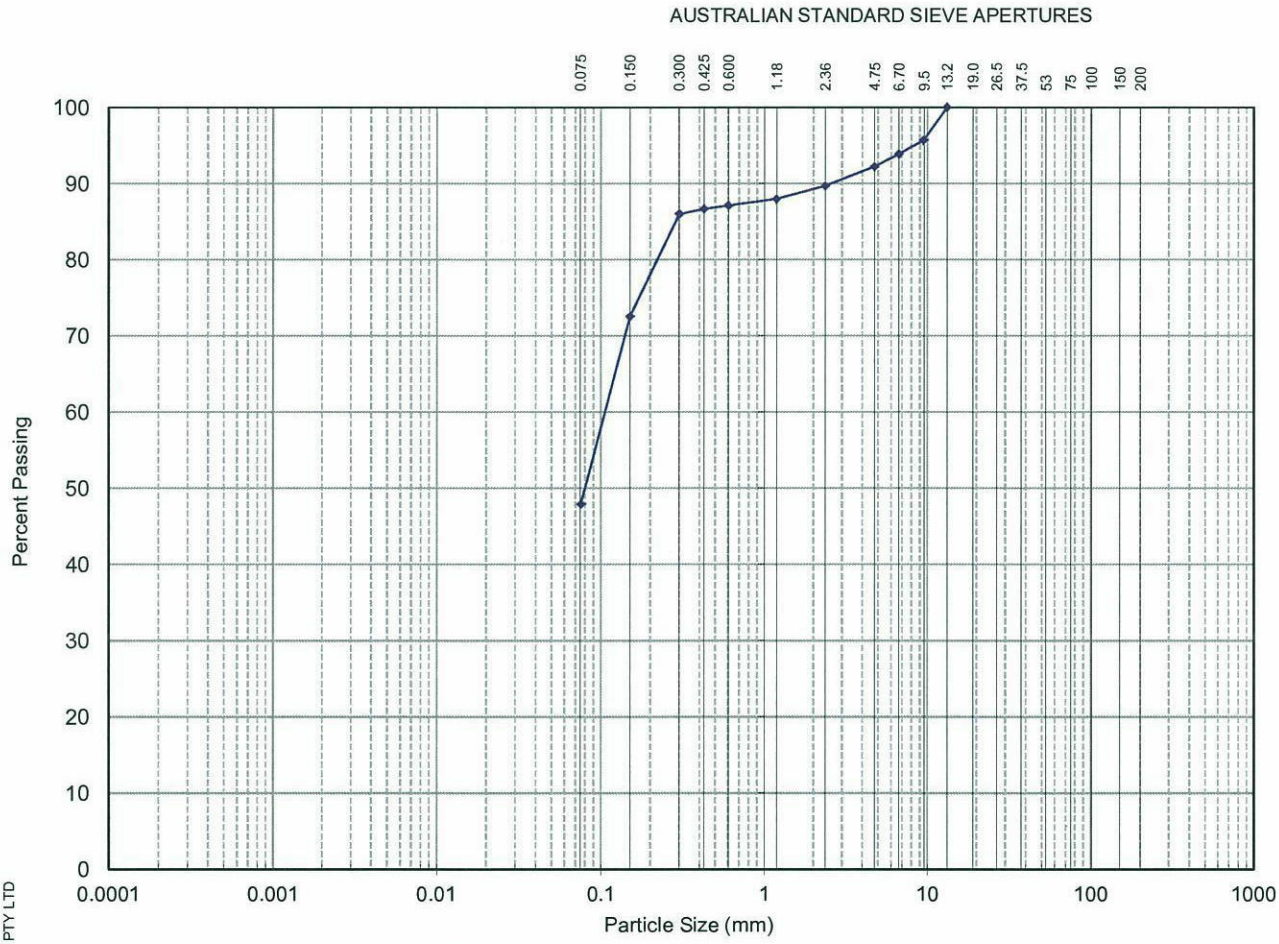
Results of Particle Size Distribution

Client :	CUBELIC HOLDINGS PTY LTD			**Project No. :**	71706.01
				Report No. :	5
Project :	FERNHILL ESTATE			**Report Date :**	25-Jun-13
				Date Sampled:	18-Jun-13
Location :	MULOGA			**Date of Test:**	20-Jun-13
Road No:	-	**Sample / Pit No:**	BH 4	**Depth / Layer:**	0.4-0.6m
Chainage:	-	**Section / Lot No:**	-	**Test Request No:**	-
				Page:	1 of 1



Sieve Size (mm)	% Passing
75.0	~
53.0	~
37.5	~
26.5	~
19.0	~
13.2	100%
9.5	96%
6.7	94%
4.75	92%
2.36	90%
1.18	88%
0.600	87%
0.425	87%
0.300	86%
0.150	73%
0.075	48%

CLAY FRACTION	SILT FRACTION			SAND FRACTION			GRAVEL FRACTION			COBBLES
	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	
0.002	0.006	0.02	0.06	0.2	0.6	2.0	6.0	20	60	

Description: SAND AND SILT/CLAY - Brown and yellow brown sand and silt/clay with some gravel

Test Method(s): AS 1289.3.6.1

Sampling Method(s): Sampled by Engineering Department

Remarks: -

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Tested:	LW
Checked:	BH

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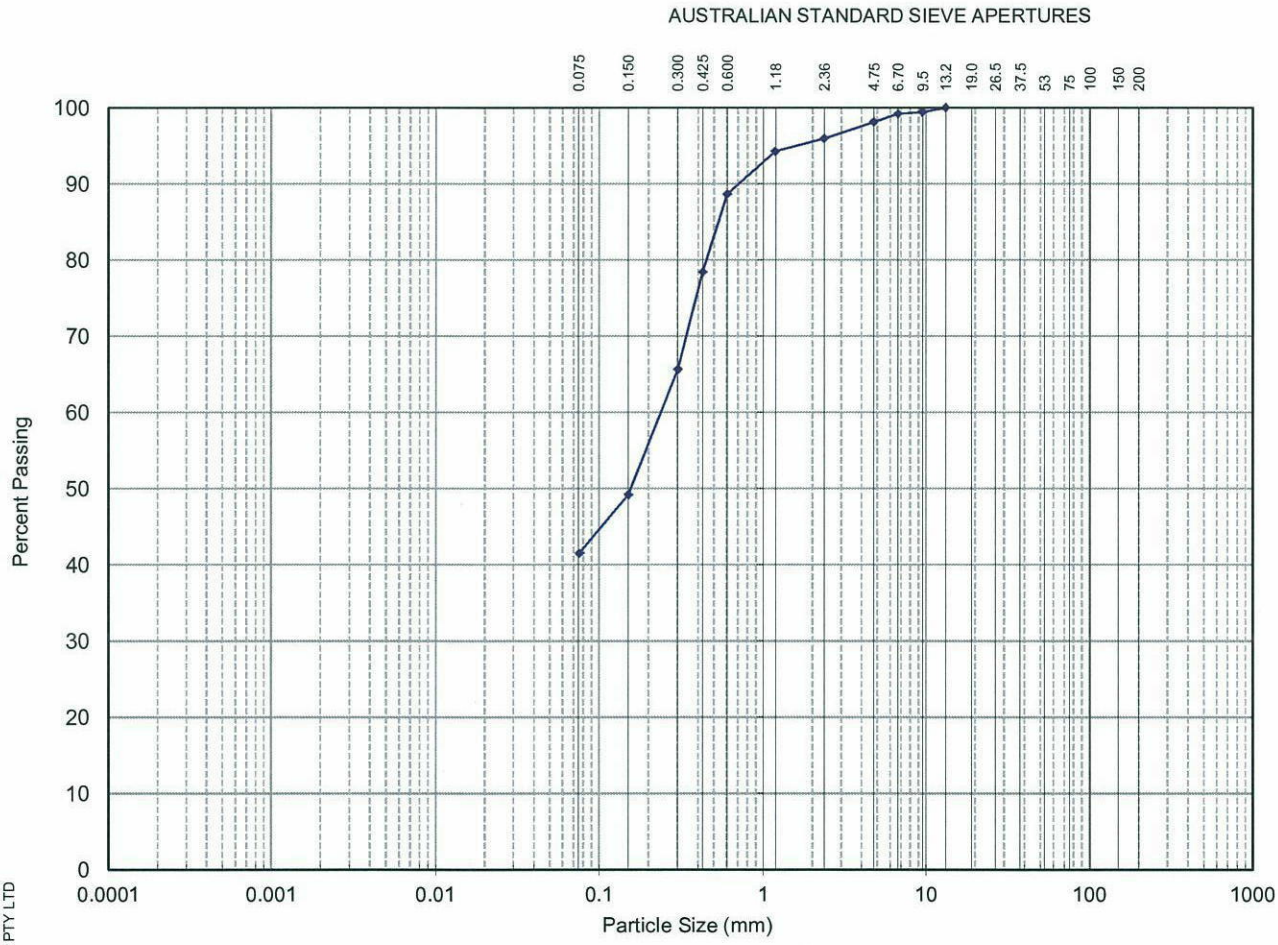
Results of Particle Size Distribution

Client :	CUBELIC HOLDINGS PTY LTD			**Project No. :**	71706.01
				Report No. :	6
Project :	FERNHILL ESTATE			**Report Date :**	25-Jun-13
				Date Sampled:	18-Jun-13
Location :	MULOGA			**Date of Test:**	20-Jun-13
Road No:	-	**Sample / Pit No:**	BH 5	**Depth / Layer:**	0.6-0.8m
Chainage:	-	**Section / Lot No:**	-	**Test Request No:**	-
				Page:	1 of 1



Sieve Size (mm)	% Passing
75.0	~
53.0	~
37.5	~
26.5	~
19.0	~
13.2	100%
9.5	99%
6.7	99%
4.75	98%
2.36	96%
1.18	94%
0.600	89%
0.425	78%
0.300	66%
0.150	49%
0.075	42%

CLAY FRACTION	SILT FRACTION			SAND FRACTION			GRAVEL FRACTION			COBBLES
	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	
0.002	0.006	0.02	0.06	0.2	0.6	2.0	6.0	20	60	

Description: SILTY CLAYEY SAND - Light orange brown silty clayey sand with trace of gravel

Test Method(s): AS 1289.3.6.1

Sampling Method(s): Sampled by Engineering Department

Remarks: -

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NATA Accredited Laboratory Number: 828
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Tested:	LW
Checked:	BH

Brett Hughes
Laboratory Supervisor

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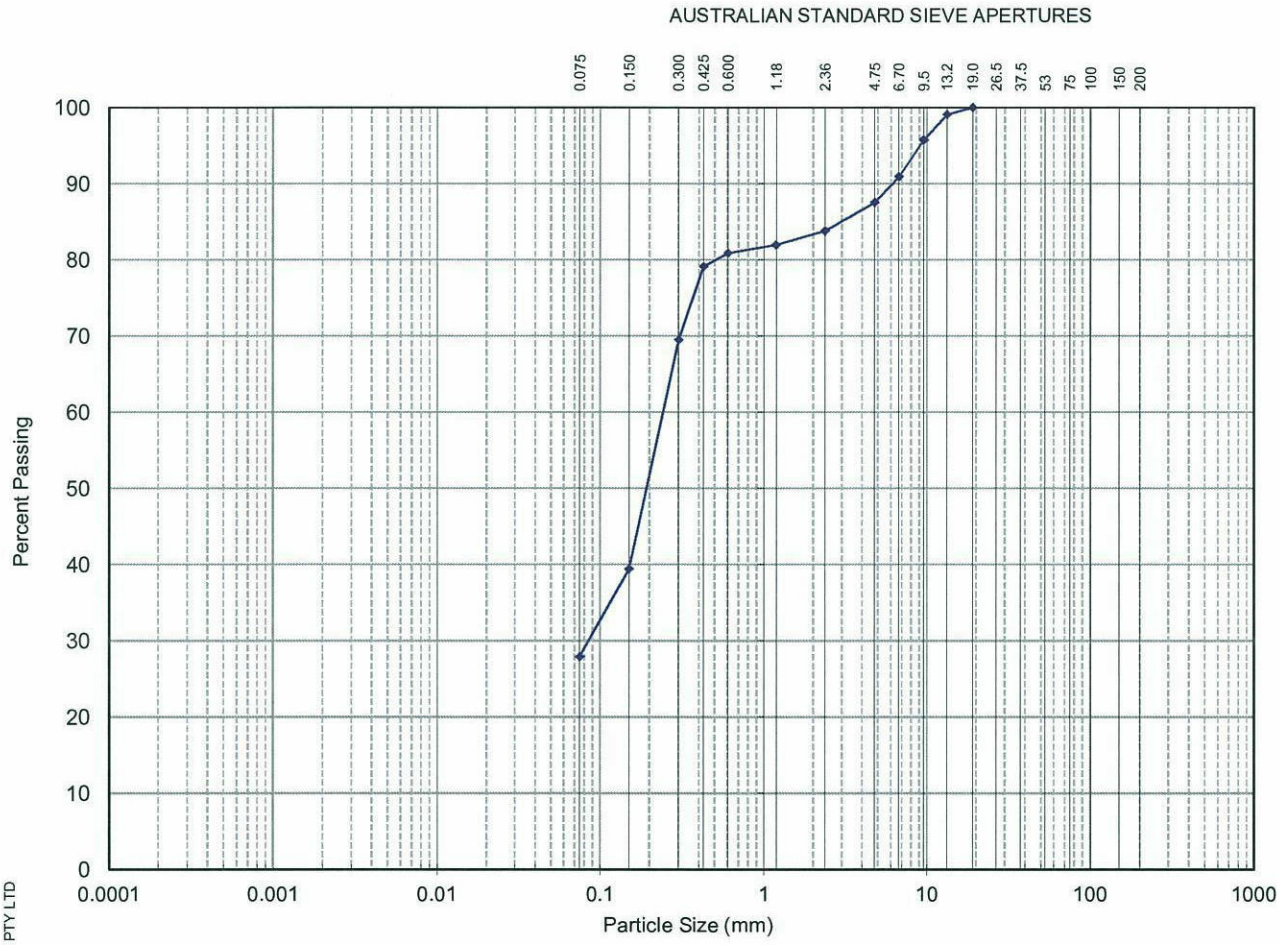
Results of Particle Size Distribution

Client :	CUBELIC HOLDINGS PTY LTD			**Project No. :**	71706.01
				Report No. :	7
Project :	FERNHILL ESTATE			**Report Date :**	25-Jun-13
				Date Sampled:	18-Jun-13
Location :	MULOGA			**Date of Test:**	20-Jun-13
Road No:	-	**Sample / Pit No:**	BH 6	**Depth / Layer:**	0.3-0.5m
Chainage:	-	**Section / Lot No:**	-	**Test Request No:**	-
				Page:	1 of 1



Sieve Size (mm)	% Passing
75.0	~
53.0	~
37.5	~
26.5	~
19.0	100%
13.2	99%
9.5	96%
6.7	91%
4.75	87%
2.36	84%
1.18	82%
0.600	81%
0.425	79%
0.300	69%
0.150	39%
0.075	28%

CLAY FRACTION	SILT FRACTION			SAND FRACTION			GRAVEL FRACTION			COBBLES
	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	
0.002	0.006	0.02	0.06	0.2	0.6	2.0	6.0	20	60	

Description: SILTY/CLAYEY SAND - Brown and yellow brown slightly gravelly silty/clayey sand

Test Method(s): AS 1289.3.6.1

Sampling Method(s): Sampled by Engineering Department

Remarks: -

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NATA Accredited Laboratory Number: 828
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Accredited for compliance with ISO/IEC 17025

Tested: LW
Checked: BH

Brett Hughes
Laboratory Supervisor

Douglas Partners
Geotechnics / Environment / Groundwater

Douglas Partners Pty Ltd
ABN 75 053 980 117
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96 Hermitage Road
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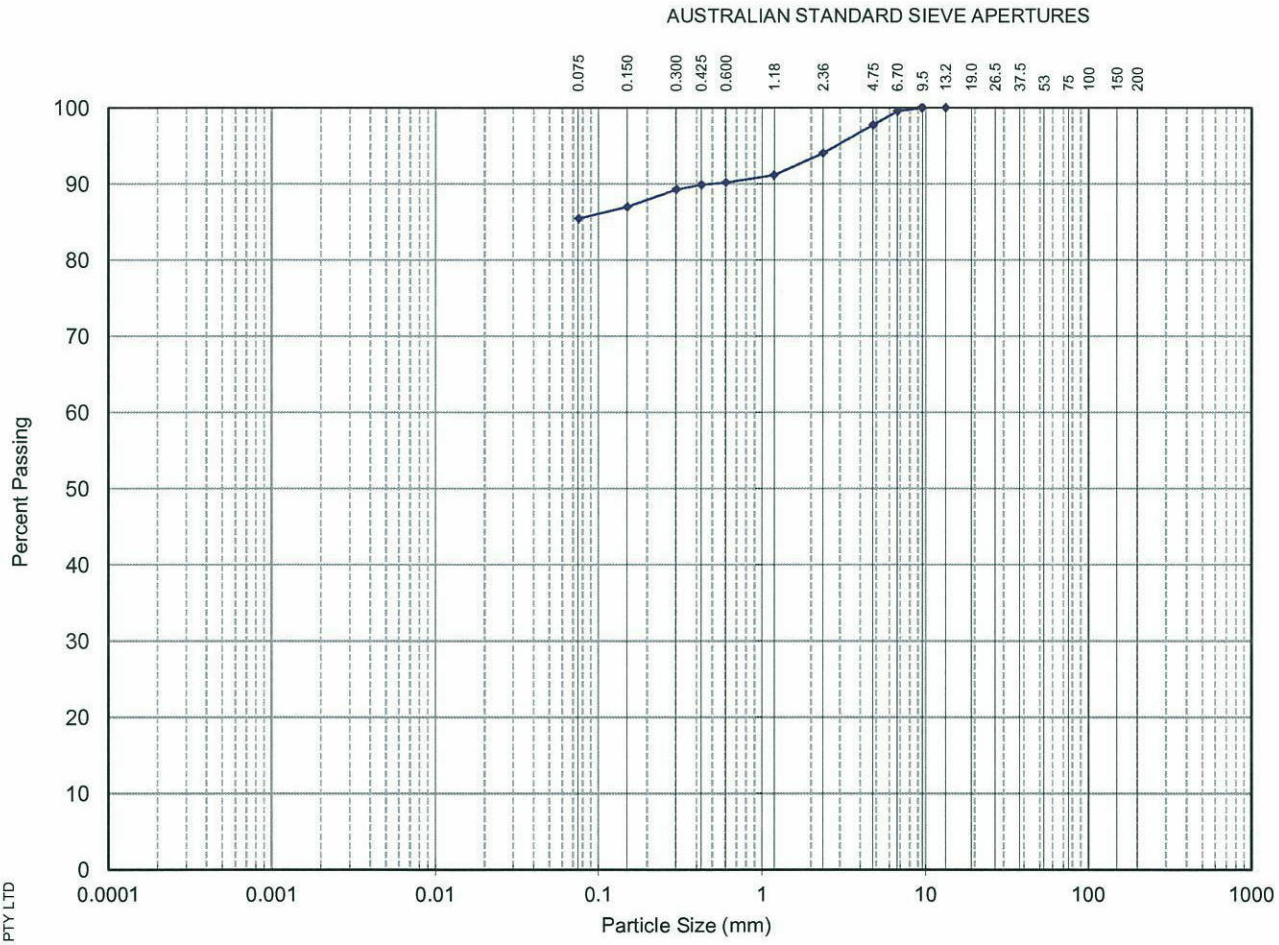
Results of Particle Size Distribution

Client :	CUBELIC HOLDINGS PTY LTD			**Project No. :**	71706.01
				Report No. :	8
Project :	FERNHILL ESTATE			**Report Date :**	25-Jun-13
				Date Sampled:	18-Jun-13
Location :	MULOGA			**Date of Test:**	20-Jun-13
Road No:	-	**Sample / Pit No:**	BH 7	**Depth / Layer:**	0.7-1.0m
Chainage:	-	**Section / Lot No:**	-	**Test Request No:**	-
				Page:	1 of 1



Sieve Size (mm)	% Passing
75.0	~
53.0	~
37.5	~
26.5	~
19.0	~
13.2	100%
9.5	100%
6.7	100%
4.75	98%
2.36	94%
1.18	91%
0.600	90%
0.425	90%
0.300	89%
0.150	87%
0.075	85%

CLAY FRACTION	SILT FRACTION			SAND FRACTION			GRAVEL FRACTION			COBBLES
	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	
0.002	0.006	0.02	0.06	0.2	0.6	2.0	6.0	20	60	

Description: SILTY CLAY - Light brown silty clay with some sand and gravel

Test Method(s): AS 1289.3.6.1

Sampling Method(s): Sampled by Engineering Department

Remarks: -

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Tested:	LW
Checked:	BH

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Determination of Emerson Class Number of Soil

Client:	**CUBELIC HOLDINGS PTY LTD**	**Project No:**	71706.01
		Report No:	1
Project:	FERNHILL ESTATE	**Report Date:**	25/06/2013
Location:	MULOGA	**Date of Test:**	24-25/06/2013
		Page:	1 of 1

Sample No.	Depth (m)	Description	Water Type	Water Temp	Class No.
BH 1	0.3-0.6	SILTY CLAYEY SHALE - Grey brown silty clayey shale	Distilled	22	2
BH 2	0.3-0.5	SILTY CLAY - Brown and red brown slightly gravelly sandy silty clay	Distilled	22	6
BH 3	0.8-1.1	SILTY CLAY - Orange Brown silty clay with some sand and trace of gravel	Distilled	20	6
BH 4	0.4-0.6	SANDY SILT/CLAY - Brown and yellow brown sandy silt/clay with some gravel	Distilled	22	6
BH 5	0.6-0.8	SILTY CLAYEY SAND - Light orange brown silty clayey sand with trace of gravel	Distilled	22	6
BH 6	0.3-0.5	SILTY/CLAYEY SAND - Brown and yellow brown slightly gravelly silty/clayey sand	Distilled	22	6
BH 7	0.7-1.0	SILTY CLAY - Light brown silty clay with some sand and gravel	Distilled	22	6

Test Methods: AS 1289 3.8.1

Sampling Methods: Sampled by Engineering Department

Remarks:

NATA Accredited Laboratory Number: 828

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ACCREDITED FOR TECHNICAL COMPETENCE

Tested: LW
Checked: BH

Norman Weimann
Senior Soil Technician

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INSITU DENSITY

CLIENT: CUBELIC HOLDINGS PTY LTD

PROJECT: FERNHILL ESTATE
LOCATION: MULOGA

PROJECT NO: 71706.01

DATE REPORT: 25-06-13
DATE OF TESTING: 20-06-13

PAGE: 1 of 1

	BH 4 0.4-0.6m
Description	SAND AND SILT/CLAY - Brown and yellow brown sand and silt/clay with some gravel
Density (t/m^3)	1.97

Method: Density = Mass/ Volume

Report No. 9

Tested: MBG
Checked: BH

Signed: Brett Hughes
Laboratory Supervisor

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 92564

Client:
Douglas Partners
96 Hermitage Rd
West Ryde
NSW 2114

Attention: Ray Blinman

Sample log in details:

Your Reference:	**71706, Mulgoa**		
No. of samples:	7 soils		
Date samples received / completed instructions received	19/06/13	/	19/06/13

PHOSPHORUS analysed by EAST WEST report number EW130499

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: / Issue Date:	26/06/13	/	27/06/13
Date of Preliminary Report:	27/06/2013		

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

Results Approved By:

Jacinta Hurst
Laboratory Manager

Miscellaneous Inorg - soil						
Our Reference:	UNITS	92564-1	92564-2	92564-3	92564-4	92564-5
Your Reference	----------	BH1	BH2	BH3	BH4	BH5
Depth	----------	0.3-0.6	0.3-0.5	0.8-1.1	0.4-0.6	0.6-0.8
Date Sampled		18/06/2013	18/06/2013	18/06/2013	18/06/2013	18/06/2013
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	20/06/2013	20/06/2013	20/06/2013	20/06/2013	20/06/2013
Date analysed	-	20/06/2013	20/06/2013	20/06/2013	20/06/2013	20/06/2013
pH 1:5 soil:water	pH Units	5.5	5.8	5.8	6.1	6.5
Electrical Conductivity 1:5 soil:water	µS/cm	16	20	34	13	13

Miscellaneous Inorg - soil			
Our Reference:	UNITS	92564-6	92564-7
Your Reference	----------	BH6	BH7
Depth	----------	0.3-0.5	0.7-1.0
Date Sampled		18/06/2013	18/06/2013
Type of sample		Soil	Soil
Date prepared	-	20/06/2013	20/06/2013
Date analysed	-	20/06/2013	20/06/2013
pH 1:5 soil:water	pH Units	6.1	5.6
Electrical Conductivity 1:5 soil:water	µS/cm	11	20

ESP/CEC						
Our Reference:	UNITS	92564-1	92564-2	92564-3	92564-4	92564-5
Your Reference	----------	BH1	BH2	BH3	BH4	BH5
Depth	----------	0.3-0.6	0.3-0.5	0.8-1.1	0.4-0.6	0.6-0.8
Date Sampled		18/06/2013	18/06/2013	18/06/2013	18/06/2013	18/06/2013
Type of sample		Soil	Soil	Soil	Soil	Soil
Exchangeable Ca	meq/100g	0.2	0.5	0.8	1.2	<0.1
Exchangeable K	meq/100g	0.3	0.2	0.2	0.2	<0.1
Exchangeable Mg	meq/100g	1.8	2.6	6.7	2.2	2.8
Exchangeable Na	meq/100g	0.12	0.13	0.27	<0.1	<0.1
Cation Exchange Capacity	meq/100g	2.5	3.3	8.1	3.7	3.1
ESP	%	4.7	4.0	3.3	1.7	2.9

ESP/CEC			
Our Reference:	UNITS	92564-6	92564-7
Your Reference	----------	BH6	BH7
Depth	----------	0.3-0.5	0.7-1.0
Date Sampled		18/06/2013	18/06/2013
Type of sample		Soil	Soil
Exchangeable Ca	meq/100g	<0.1	0.3
Exchangeable K	meq/100g	<0.1	0.2
Exchangeable Mg	meq/100g	1.4	2.7
Exchangeable Na	meq/100g	<0.1	0.16
Cation Exchange Capacity	meq/100g	1.6	3.3
ESP	%	2.5	4.7

Phosphorus Sorption						
Our Reference:	UNITS	92564-1	92564-2	92564-3	92564-4	92564-5
Your Reference	----------	BH1	BH2	BH3	BH4	BH5
Depth	----------	0.3-0.6	0.3-0.5	0.8-1.1	0.4-0.6	0.6-0.8
Date Sampled		18/06/2013	18/06/2013	18/06/2013	18/06/2013	18/06/2013
Type of sample		Soil	Soil	Soil	Soil	Soil
Phosphorus Capacity	mg/kg	950	990	930	1,000	870
Phosphorus Buffer Index	mg/kg	430	800	390	1,000	300
Phosphorus Sorption	kg/ha	9,500	9,900	9,300	10,000	8,700

Phosphorus Sorption			
Our Reference:	UNITS	92564-6	92564-7
Your Reference	----------	BH6	BH7
Depth	----------	0.3-0.5	0.7-1.0
Date Sampled		18/06/2013	18/06/2013
Type of sample		Soil	Soil
Phosphorus Capacity	mg/kg	740	990
Phosphorus Buffer Index	mg/kg	190	840
Phosphorus Sorption	kg/ha	7,400	9,900

MethodID	Methodology Summary
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA 22nd ED , 4500-H+.
Inorg-002	Conductivity and Salinity - measured using a conductivity cell and dedicated meter, in accordance with APHA 22nd ED 2510 and Rayment & Lyons.
Metals-009	Determination of exchangeable cations and cation exchange capacity in soil based on Rayment and Lyons 2011.
Ext-062	Analysed by East West Enviroag

QUALITYCONTROL Miscellaneous Inorg - soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			20/06/2013	92564-1	20/06/2013 II 20/06/2013	LCS-1	20/06/2013
Date analysed	-			20/06/2013	92564-1	20/06/2013 II 20/06/2013	LCS-1	20/06/2013
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	92564-1	5.5 II 5.5 II RPD:0	LCS-1	101%
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	<1	92564-1	16 II 15 II RPD:6	LCS-1	100%

QUALITYCONTROL ESP/CEC	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Exchangeable Ca	meq/100g	0.1	Metals-009	<0.1	92564-6	<0.1 II <0.1	LCS-1	98%
Exchangeable K	meq/100g	0.1	Metals-009	<0.1	92564-6	<0.1 II <0.1	LCS-1	104%
Exchangeable Mg	meq/100g	0.1	Metals-009	<0.1	92564-6	1.4 II 1.4 II RPD:0	LCS-1	97%
Exchangeable Na	meq/100g	0.1	Metals-009	<0.1	92564-6	<0.1 II <0.1	LCS-1	90%
Cation Exchange Capacity	meq/100g	1	Metals-009	<1.0	92564-6	1.6 II 1.6 II RPD:0	[NR]	[NR]
ESP	%	1	Metals-009	<1.0	92564-6	2.5 II 2.1 II RPD:17	[NR]	[NR]

QUALITYCONTROL Phosphorus Sorption	UNITS	PQL	METHOD	Blank
Phosphorus Capacity	mg/kg	2	Ext-062	<2.0
Phosphorus Buffer Index	mg/kg	2	Ext-062	<2.0
Phosphorus Sorption	kg/ha	2	Ext-062	<2.0

Report Comments:
P-sorp's in soil: analysed by EASTWEST, report no EW130499.

Asbestos ID was analysed by Approved Identifier:	Not applicable for this job
Asbestos ID was authorised by Approved Signatory:	Not applicable for this job

INS: Insufficient sample for this test	PQL: Practical Quantitation Limit	NT: Not tested
NA: Test not required	RPD: Relative Percent Difference	NA: Test not required
<: Less than	>: Greater than	LCS: Laboratory Control Sample

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 batch were within the laboratory acceptance criteria.
Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.
Spikes for Physical and Aggregate Tests are not applicable.
For VOCs in water samples, three vials are required for duplicate or spike analysis.

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