Appendix Seven: Geotechnical Investigation

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Integrated Practical Solutions

REPORT
ON
PRELIMINARY GEOTECHNICAL INVESTIGATION

PROPOSED RESIDENTIAL SUBDIVISION
LOTS 19 – 21 OLD COAST ROAD
LAKE CLIFTON, WA

Prepared for
TONY SCOLARO FAMILY TRUST

Project 76038
August 2010

Douglas Partners
Geotechnics • Environment • Groundwater

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ACEA
The Association of Consulting Engineers Australia

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RDS:DR
Project: 76038
18 August 2010

REPORT ON PRELIMINARY GEOTECHNICAL INVESTIGATION
PROPOSED RESIDENTIAL SUBDIVISION
LOTS 19 – 21 OLD COAST ROAD, LAKE CLIFTON, WA

1. INTRODUCTION

This report presents the results of a geotechnical investigation undertaken for a proposed residential subdivision at Lots 19 - 21 Old Coast Road, Lake Clifton. This investigation was commissioned in a fax dated 18 June 2010 by Hamish Beck of Beck Advisory on behalf of Tony Scolaro Family Trust and was undertaken in accordance with Douglas Partners' proposal dated 12 May 2010.

The purpose of the investigation is to assess the sub surface conditions beneath the site and thus provide factual information on:

- the ground conditions encountered during the investigation;
- depth to groundwater, if encountered at the time of the investigation;
- depth to limestone, if encountered; and
- the nutrient retention capacity of the soils.

Details of the field work and laboratory testing are presented in this report.

2. SITE DESCRIPTION

The site comprises a rectangular shaped area of approximately 17.3 ha. It is bounded by Old Coast Road to the east, vacant land to the north and south and Lake Clifton to the west of the (Refer to Drawing 1, Appendix A).

At the time of the investigation the site generally comprised vacant land covered with grass, small shrubs and large trees. A small caravan park, a petrol station and a few residential houses occupy the central portion of the site. Limestone outcrop was observed in many locations.

The site is generally flat with surface levels of between RL 2 m and 5 m AHD, and two high points at around RL 8 m to 10 m AHD in the north-western and south-western corners.

The Lake Clifton–Hamel 1:50 000 Environmental Geology sheet indicates that shallow sub surface conditions beneath the site comprise sand derived from Tamala Limestone overlying limestone, possibly at shallow depth.

3. FIELD WORK METHODS

Field work was carried out on 16 July 2010 and comprised the excavation of eight test pits (TP1 to TP8) and 5 boreholes (BH9 to BH13).

The test pits were excavated using a Komatsu 5 tonne excavator equipped with a 600 mm toothed bucket. The boreholes were drilled using a 110 mm diameter hand auger. Each test location was logged in general accordance with AS1726 – 1993 by a suitably experienced representative from Douglas Partners. Representative soil samples were recovered from selected locations for subsequent laboratory testing. Perth Sand Penetrometer (PSP) tests were carried out adjacent to selected test locations in accordance with AS1289.6.3.3 to assess the *in situ* conditions of the shallow soils.

All test locations were determined using existing site features and are shown on Drawing 1, Appendix A. Surface elevations at each test location were interpolated from a contour plan provided by the client and are quoted in metres above Australian Height Datum (AHD).

4. FIELD WORK RESULTS

4.1 Ground Conditions

Detailed logs of the ground conditions and results of the field testing are presented in Appendix B, together with notes defining descriptive terms and classification methods.

The ground conditions encountered at the test locations generally comprise topsoil overlying sand and limestone. A summary of the conditions encountered is provided below:

TOPSOIL - dark grey silty sandy topsoil with rootlets to depths of between 0.1 m and 0.2 m;

SAND - generally medium dense, orange-brown sand with a trace of silt to depths of between 0.3 m and 1.1 m; and

LIMESTONE - low to medium strength, light yellowish brown limestone underlying the sand at all test locations to the depth of investigation.

The depths below existing surface level and relative levels of the top of the limestone at each test location are summarised in Table 1, below.

Table 1 – Summary of Limestone Depths and Levels

Test Location	Interpolated Surface Level (m AHD)	Depth to Top of Limestone (m)	Interpolated Level of Top of Limestone (m AHD)
TP1	6.0	0.6	5.4
TP2	2.8	0.6	2.2
TP3	5.0	0.4	4.6
TP4	3.2	0.3	2.9
TP5	2.4	1.1	1.3
TP6	5.9	0.8	5.1
TP7	4.8	0.4	4.4
TP8	3.0	0.4	2.6
BH9	3.2	0.4	2.8
BH10	2.6	0.4	2.2
BH11	3.2	0.6	2.6
BH12	3.5	0.7	2.8
BH13	2.7	0.5	2.2

4.2 Groundwater

No free groundwater was observed within any of the test pits or boreholes on 16 July 2010 to RL 0.9 m AHD.

5. LABORATORY TESTING RESULTS

A geotechnical laboratory testing programme was carried out by a NATA registered laboratory and comprised the determination of the particle size distribution on two sand samples and the point load index on five irregular lump samples of limestone.

The results of the testing are summarised in Table 2 and test certificates are presented in Appendix C.

Table 2 – Summary of Geotechnical Laboratory Test Results

Test	Depth (m)	Soil Type	% fines	d_{10} (mm)	d_{60} (mm)	Is50 (MPa)
TP1	0.7	LIMESTONE – light yellow-brown	-	-	-	1.23
TP2	0.8	LIMESTONE – light yellow-brown	-	-	-	0.24
TP4	0.4	LIMESTONE – light yellow-brown	-	-	-	0.74
TP5	1.2	LIMESTONE – light yellow-brown	-	-	-	0.32
TP8	0.8	LIMESTONE – light yellow-brown	-	-	-	0.35
BH9	0.3	SAND – orange-brown	3	0.08	0.22	-
BH12	0.5	SAND – orange-brown	4	0.08	0.19	-

Notes:
- The %Fines is the amount of particles smaller than 75 µm;
- A d_{10} of 0.10 mm means that 10 % of the sample particles are finer than 0.10 mm;
- A d_{60} of 0.38 mm means that 60 % of the sample particles are finer than 0.38 mm;
- Is50: Point load index; and
- '-' means not tested.

A suite of chemical analyses was also undertaken on five selected samples by a NATA registered laboratory and comprised the determination of:

- pH;
- electrical conductivity;
- cation exchange capacitys; and
- phosphorus retention indexs.

The results of the testing are summarised in Table 3 and test certificates are presented in Appendix C.

Table 3 – Summary of Chemical Laboratory Test Results

Test	Depth (m)	Soil Type	pH	EC (µS/cm)	PRI (mL/g)	CEC (meq/100g)
TP1	0.5	SAND – orange-brown	6.4	1,400	11	2.9
TP4	0.2	SAND – orange-brown	7.3	1,500	18	4.3
TP7	0.3	SAND – orange-brown	7.4	1,600	9.2	2.4
BH11	0.2	SAND – orange-brown	7.2	1,500	7.8	9.5
BH13	0.5	SAND – orange-brown	7.4	1,200	19	7.7

Notes:
- EC: Electrical conductivity;
- PRI: Phosphorus retention index;
- CEC: Cation exchange capacity.

6. LIMITATIONS

Douglas Partners (DP) has prepared the factual report for this project at Lots 19 – 21 Old Coast Road, Lake Clifton in accordance with DP's proposal dated 12 May 2010 and acceptance received from Tony Scolaro Family Trust dated 18 June 2010. This report is provided for the exclusive use of Tony Scolaro Family Trust for the specific project and purpose 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.

The results provided in the report are considered to be indicative of the sub-surface conditions on the site only to the depths investigated at the specific sampling and/or testing locations, and only at the time the work was carried out. Actual ground conditions and materials behaviour observed or inferred at the test locations may differ from those which may be encountered elsewhere on the site.

This report must be read in conjunction with the attached "Notes Relating to This Report" and any other attached explanatory notes and should be kept in its entirety without separation of

individual pages or sections. DP cannot be held re sponsible for interpretations or conclusions made by others which are not supported by an expressed statement, interpretation, outcome or conclusion stated in this report. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

7. REFERENCES

Australian Standard AS 1289-2000, Methods of Testing Soils for Engineering Purposes

Australian Standard AS 1289.6.3.3-1999, Soil Strength and Consolidation Tests-Determination of the Penetration Resistance of a Soil – Perth Sand Penetrometer Test.

Australian Standard AS 1726-1996, Geotechnical Site Investigation.

DOUGLAS PARTNERS PTY LTD

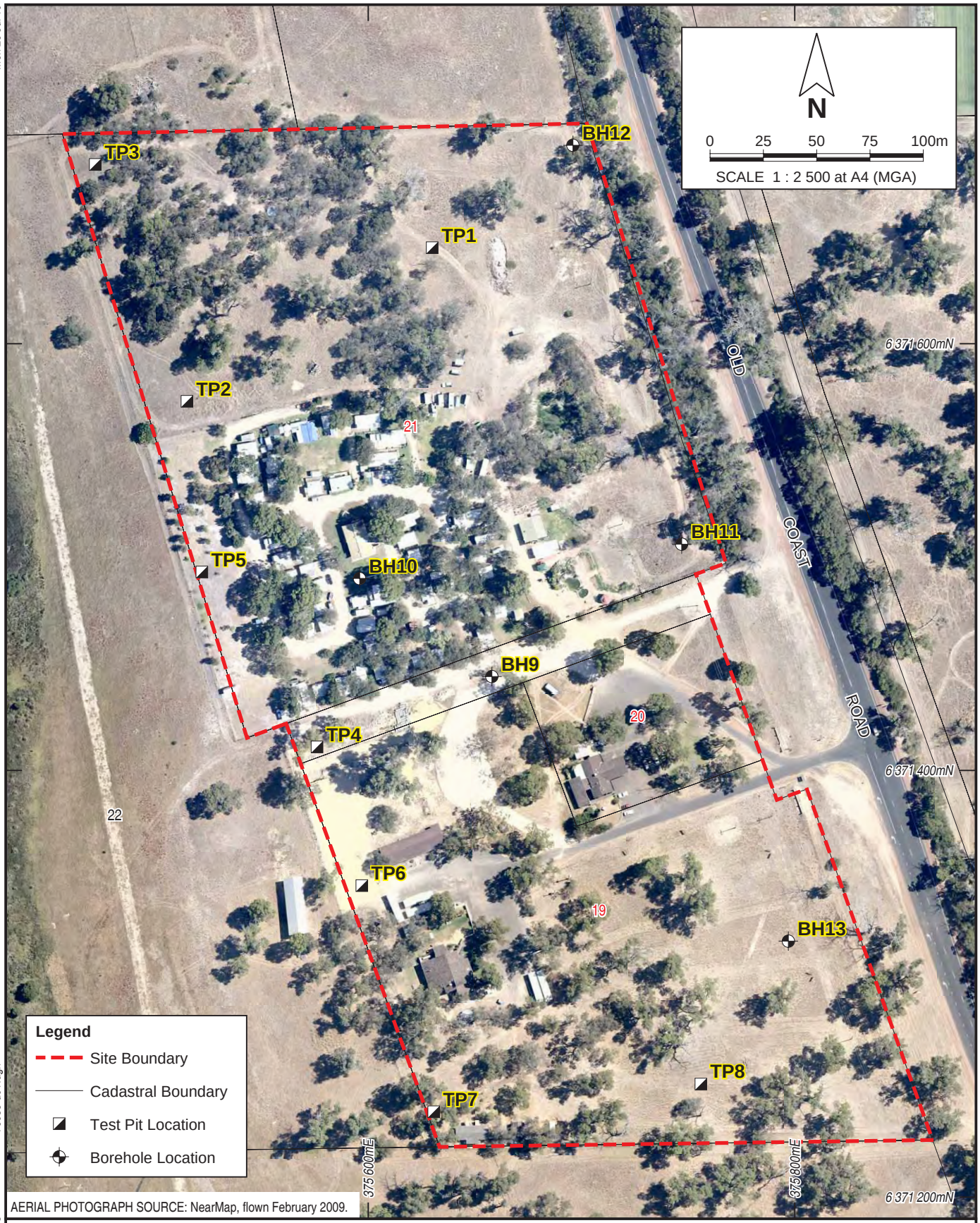
Reviewed by:

Daniel Reaveley
Geo-Environmental Scientist

pp Michael J Thom
Principal

APPENDIX A

Site Plan and Test Locations



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Brisbane, Cairns, Canberra, Darwin, Gold Coast, Melbourne, Minto

Newcastle, Perth, Sydney Sunshine Coast, Townsville, Wollongong, Wyong

Title: LOTS 19-21 OLD COAST ROAD, LAKE CLIFTON

TEST LOCATION PLAN

Client:	TONY SCOLARO FAMILY TRUST			Office: PERTH	
Drawn By:	R. DA SILVA	Scale: 1 : 2 500	Project No: 76038	DRAWING 1	Revision: A
Approved By:	--		Date: 26-07-10		

APPENDIX B

Results of Field Work

Notes Relating to this Report

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NOTES RELATING TO THIS REPORT

Introduction

These notes have been provided to amplify the geotechnical report in regard to classification methods, specialist field procedures and certain matters relating to the Discussion and Comments section. Not all, of course, are necessarily relevant to all reports.

Geotechnical reports are based on information gained from limited subsurface test boring 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.

Description and Classification Methods

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

Soil types are described according to the predominating particle size, qualified by the grading of other particles present (eg. sandy clay) on the following bases:

Soil Classification	Particle Size
Clay	less than 0.002 mm
Silt	0.002 to 0.06 mm
Sand	0.06 to 2.00 mm
Gravel	2.00 to 60.00 mm

Cohesive soils are classified on the basis of strength either by laboratory testing or engineering examination. The strength terms are defined as follows.

Classification	Undrained Shear Strength kPa
Very soft	less than 12
Soft	12—25
Firm	25—50
Stiff	50—100
Very stiff	100—200
Hard	Greater than 200

Non-cohesive soils are classified on the basis of relative density, generally from the results of standard penetration tests (SPT) or Dutch cone penetrometer tests (CPT) as below:

Relative Density	SPT "N" Value (blows/300 mm)	CPT Cone Value (q_c — MPa)
Very loose	less than 5	less than 2
Loose	5—10	2—5
Medium dense	10—30	5—15
Dense	30—50	15—25
Very dense	greater than 50	greater than 25

Rock types are classified by their geological names. Where relevant, further information regarding rock classification is given on the following sheet.

Sampling

Sampling is carried out during drilling 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 with 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.

Details of the type and method of sampling are given in the report.

Drilling Methods.

The following is a brief summary of drilling methods currently adopted by the Company and some comments on their use and application.

Test Pits — these are excavated with a backhoe or a tracked excavator, allowing close examination of the in-situ soils if it is safe to descent into the pit. The depth of penetration is limited to about 3 m for a backhoe and up to 6 m for an excavator. A potential disadvantage is the disturbance caused by the excavation.

Large Diameter Auger (eg. Pengo) — the hole is advanced by a rotating plate or short spiral auger, generally 300 mm or larger in diameter. The cuttings are returned to the surface at intervals (generally of 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 sampling.

Continuous Sample Drilling — the hole is advanced by pushing a 100 mm diameter socket into the ground and withdrawing it at intervals to extrude the sample. This is the most reliable method of drilling in soils, since moisture content is unchanged and soil structure, strength, etc. is only marginally affected.

Continuous Spiral Flight Augers — the hole 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 in sands above the water table. Samples are returned to the surface, or may be collected after withdrawal of the auger flights, but they are very disturbed and may be contaminated. Information from the drilling (as distinct from specific sampling by SPTs or undisturbed samples) is of relatively lower reliability, due to remoulding, contamination or softening of samples by ground water.

Non-core Rotary Drilling — the hole is advanced by a rotary bit, with water 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 'feel' and rate of penetration.

Rotary Mud Drilling — similar to rotary drilling, but using drilling mud as a circulating fluid. The mud tends to mask the cuttings and reliable identification is again only possible from separate intact sampling (eg. from SPT).

Continuous Core Drilling — a continuous core sample is obtained using a diamond-tipped core barrel, usually 50 mm internal diameter. Provided full core recovery is achieved (which is not always possible in very weak rocks and granular soils), this technique provides a very reliable (but relatively expensive) method of investigation.

Standard Penetration Tests

Standard penetration tests (abbreviated as SPT) are used mainly in non-cohesive soils, but occasionally also in cohesive soils as a means of determining density or strength 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 short of full penetration, 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 tests can be related empirically to the engineering properties of the soil.

Occasionally, the test method is used to obtain samples in 50 mm diameter thin walled sample tubes in clays. In such circumstances, the test results are shown on the borelogs in brackets.

Cone Penetrometer Testing and Interpretation

Cone penetrometer testing (sometimes referred to as Dutch cone — abbreviated as CPT) described in this report has been carried out using an electrical friction cone penetrometer. The test is described in Australian Standard 1289, Test 6.4.1.

In the tests, a 35 mm diameter rod with a cone-tipped end is pushed continuously into the soil, the reaction being provided by a specially designed truck or rig which is fitted with an hydraulic ram system. Measurements are made of the end bearing resistance on the cone and the friction resistance on a separate 130 mm long sleeve, immediately behind the cone. Transducers in the tip of the assembly are connected by electrical wires passing through the centre of the push rods to an amplifier and recorder unit mounted on the control truck.

As penetration occurs (at a rate of approximately 20 mm per second) the information is plotted on a computer screen and at the end of the test is stored on the computer for later plotting of the results.

The information provided on the plotted results comprises: —

- Cone resistance — the actual end bearing force divided by the cross sectional area of the cone — expressed in MPa.
- Sleeve friction — the frictional force on the sleeve divided by the surface area — expressed in kPa.
- Friction ratio — the ratio of sleeve friction to cone resistance, expressed in percent.

There are two scales available for measurement of cone resistance. The lower scale (0—5 MPa) is used in very soft soils where increased sensitivity is required and is shown in the graphs as a dotted line. The main scale (0—50 MPa) is less sensitive and is shown as a full line.

The ratios of the sleeve friction to cone resistance will vary with the type of soil encountered, with higher relative friction in clays than in sands. Friction ratios of 1%—2% are commonly encountered in sands and very soft clays rising to 4%—10% in stiff clays.

In sands, the relationship between cone resistance and SPT value is commonly in the range:—

q_c (MPa) = (0.4 to 0.6) N (blows per 300 mm)

In clays, the relationship between undrained shear strength and cone resistance is commonly in the range:—

q_c = (12 to 18) c_u

Interpretation of CPT values can also be made to allow estimation of modulus or compressibility values to allow calculation of foundation settlements.

Inferred stratification as shown on the attached reports is assessed from the cone and friction traces and from experience and information from nearby boreholes, etc. This information is presented for general guidance, but must be regarded as being to some extent interpretive. The test method provides a continuous profile of engineering properties, and where precise information on soil classification is required, direct drilling and sampling may be preferable.

Hand Penetrometers

Hand penetrometer tests are carried out by driving a rod into the ground with a falling weight hammer and measuring the blows for successive 150 mm increments of penetration. 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 relatively similar tests are used.

- Perth sand penetrometer — a 16 mm diameter flat-ended rod is driven with a 9 kg hammer, dropping 600 mm (AS 1289, Test 6.3.3). This test was developed for testing the density of sands (originating in Perth) and is mainly used in granular soils and filling.
- Cone penetrometer (sometimes known as the Scala Penetrometer) — a 16 mm rod with a 20 mm diameter cone end is driven with a 9 kg hammer dropping 510 mm (AS 1289, Test 6.3.2). The test was developed initially for pavement subgrade investigations, and published correlations of the test results with California bearing ratio have been published by various Road Authorities.

Laboratory Testing

Laboratory testing is carried out in accordance with Australian Standard 1289 "Methods of Testing Soil for Engineering Purposes". Details of the test procedure used are given on the individual report forms.

Bore Logs

The bore logs presented herein 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. 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 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, the frequency of sampling and the possibility of other than 'straight line' variations between the boreholes.

Ground Water

Where ground water levels are measured in boreholes, there are several potential problems;

- In low permeability soils, ground water although present, may enter the hole slowly or perhaps not at all during the time it 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.
- The use of water or mud as a drilling fluid will mask any ground water inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water observations 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.

Engineering Reports

Engineering reports are prepared by qualified personnel and are based on the information obtained and on current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal (eg. a three storey building), the information and interpretation may not be relevant if the design proposal is changed (eg. to a twenty storey building). If this happens, the Company 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 condition, discussion of geotechnical aspects and recommendations or suggestions for design and construction. However, the Company cannot always anticipate or assume responsibility for:

- unexpected variations in ground conditions — the potential for this will depend partly on bore spacing and sampling frequency
- changes in policy or interpretation of policy by statutory authorities
- the actions of contractors responding to commercial pressures.

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

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, the Company requests that it immediately be notified. Most problems are much more readily resolved when conditions are exposed than at some later stage, well after the event.

Reproduction of Information for Contractual Purposes

Attention is drawn to the document "Guidelines for the Provision of Geotechnical Information in Tender Documents", published by the Institution of Engineers, Australia. Where information obtained from this investigation 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. The Company 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 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.

TEST PIT LOG

CLIENT: Tony Scolaro Family Trust
PROJECT: Lots 19-21 Old Coast Road
LOCATION: Lake Clifton, WA

SURFACE LEVEL: 2.8 m AHD *
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

PIT No: TP 2
PROJECT No: 76038
DATE: 16 Jul 10
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 - dark brown, silty sandy topsoil.							
	0.6	SAND - medium dense, orange-brown, fine to medium grained, humid sand with some silt.							
2	0.9	LIMESTONE - low strength, light yellow-brown limestone.		D	0.8				
1		Pit discontinued at 0.9m (due to slow progress)							1

RIG: 5 Tonne Komatsu Excavator (600mm toothed bucket)
LOGGED: R Da Silva

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☒ 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:
Date: 19.8.10

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TEST PIT LOG

CLIENT: Tony Scolaro Family Trust
PROJECT: Lots 19-21 Old Coast Road
LOCATION: Lake Clifton, WA

SURFACE LEVEL: 5.0 m AHD *
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

PIT No: TP 3
PROJECT No: 76038
DATE: 16 Jul 10
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)
		TOPSOIL - dark brown, silty sandy topsoil.							
	0.2	SAND - medium dense, orange-brown, fine to medium grained, humid sand with some silt.							
	0.4	LIMESTONE - low to medium strength, light yellow-brown limestone.		D	0.6				
	0.9	Pit discontinued at 0.9m (due to refusal)							
4	1								1

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

RIG: 5 Tonne Komatsu Excavator (600mm toothed bucket)
LOGGED: R Da Silva

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☒ 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:	
Date:	19.8.10

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TEST PIT LOG

CLIENT: Tony Scolaro Family Trust
PROJECT: Lots 19-21 Old Coast Road
LOCATION: Lake Clifton, WA

SURFACE LEVEL: 3.2 m AHD *
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

PIT No: TP 4
PROJECT No: 76038
DATE: 16 Jul 10
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) 5 10 15 20
		TOPSOIL - dark brown, silty sandy topsoil.							
	0.15	SAND - medium dense, orange-brown, fine to medium grained, humid sand with some silt.		D	0.2				
	0.3	LIMESTONE - low to medium strength, light yellow-brown limestone.		D	0.4				
	0.5	Pit discontinued at 0.5m (due to refusal)							

RIG: 5 Tonne Komatsu Excavator (600mm toothed bucket)
LOGGED: R Da Silva

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☒ 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:
Date: 15.8.10

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TEST PIT LOG

CLIENT: Tony Scolaro Family Trust
PROJECT: Lots 19-21 Old Coast Road
LOCATION: Lake Clifton, WA

SURFACE LEVEL: 2.4 m AHD *
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

PIT No: TP 5
PROJECT No: 76038
DATE: 16 Jul 10
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)
		TOPSOIL - dark brown, silty sandy topsoil.							
	0.15	SAND - medium dense, grey mottled dark grey, fine to medium grained, humid sand with some silt.							
		- becoming light grey with some shells from 0.6m.							
		- becoming light grey from 0.9m.		D	1.0				1
	1.1	LIMESTONE - low to medium strength, very light yellow-brown limestone.		D	1.2				
	1.5	Pit discontinued at 1.5m (due to slow progress)							

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

RIG: 5 Tonne Komatsu Excavator (600mm toothed bucket)
LOGGED: R Da Silva

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☒ 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:
Date: 19.8.10

Douglas Partners
Geotechnics · Environment · Groundwater

TEST PIT LOG

CLIENT: Tony Scolaro Family Trust
PROJECT: Lots 19-21 Old Coast Road
LOCATION: Lake Clifton, WA

SURFACE LEVEL: 5.9 m AHD *
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

PIT No: TP 6
PROJECT No: 76038
DATE: 16 Jul 10
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)
5	0.0	FILLING (SAND) - medium dense, light orange-brown, fine to medium grained, humid sand with trace of silt.							1
	0.8	LIMESTONE - low strength, light yellow-brown limestone.							
4	1.4	Pit discontinued at 1.4m (due to slow progress)							

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

RIG: 5 Tonne Komatsu Excavator (600mm toothed bucket)
LOGGED: R Da Silva

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☒ 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: R
Date: 14.8.10

Douglas Partners
Geotechnics · Environment · Groundwater

TEST PIT LOG

CLIENT: Tony Scolaro Family Trust
PROJECT: Lots 19-21 Old Coast Road
LOCATION: Lake Clifton, WA

SURFACE LEVEL: 4.8 m AHD *
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

PIT No: TP 7
PROJECT No: 76038
DATE: 16 Jul 10
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)
		TOPSOIL - dark brown, silty sandy topsoil.							
	0.2	SAND - medium dense, orange-brown, fine to medium grained, humid sand with some silt.		D	0.3				
	0.4	LIMESTONE - low to medium strength, light yellow-brown limestone with some sand infill to 1.8m.							
4									
	1			D	1.2				1
3	1.8	Pit discontinued at 1.8m (due to slow progress)							

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

RIG: 5 Tonne Komatsu Excavator (600mm toothed bucket)
LOGGED: R Da Silva

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☒ 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:
Date: 19.8.10

Douglas Partners
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TEST PIT LOG

CLIENT: Tony Scolaro Family Trust
PROJECT: Lots 19-21 Old Coast Road
LOCATION: Lake Clifton, WA

SURFACE LEVEL: 3.0 m AHD *
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

PIT No: TP 8
PROJECT No: 76038
DATE: 16 Jul 10
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 mm) 5 10 15 20
		TOPSOIL - dark brown, silty sandy topsoil.							
	0.2	SAND - medium dense, orange-brown, fine to medium grained, humid sand with some silt.							
	0.4	LIMESTONE - low to medium strength, light yellow-brown limestone with some sand infill to 1.0m.		D	0.8				
~1	1.0	Pit discontinued at 1.0m (due to slow progress)							1

RIG: 5 Tonne Komatsu Excavator (600mm toothed bucket)
LOGGED: R Da Silva

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☒ 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:
Date: 19.8.10

Douglas Partners
Geotechnics · Environment · Groundwater

BOREHOLE LOG

CLIENT: Tony Scolaro Family Trust
PROJECT: Lots 19-21 Old Coast Road
LOCATION: Lake Clifton, WA

SURFACE LEVEL: 2.6 m AHD *
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: BH 10
PROJECT No: 76038
DATE: 16 Jul 10
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.05	TOPSOIL - dark grey, silty sandy topsoil.							
		SAND - orange-brown, fine to medium grained, humid sand with some silt.		D	0.3				
	0.4	Bore discontinued at 0.4m (due to refusal on limestone)							

RIG: 110mm Hand Auger **DRILLER:** R Da Silva **LOGGED:** R Da Silva **CASING:**
TYPE OF BORING:
WATER OBSERVATIONS: No free groundwater observed
REMARKS:

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:
Date: 19.8.10

Douglas Partners
Geotechnics · Environment · Groundwater

BOREHOLE LOG

CLIENT: Tony Scolaro Family Trust
PROJECT: Lots 19-21 Old Coast Road
LOCATION: Lake Clifton, WA

SURFACE LEVEL: 3.2 m AHD *
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: BH 11
PROJECT No: 76038
DATE: 16 Jul 10
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) 5 10 15 20
3	0.1	TOPSOIL - dark grey, silty sandy topsoil.							
		SAND - medium dense, orange-brown, fine to medium grained, humid sand with some silt and charcoal fragments.		D	0.2				1
2	0.6	Bore discontinued at 0.6m (due to refusal on limestone)							
1									

RIG: 110mm Hand Auger
DRILLER: R Da Silva
LOGGED: R Da Silva
CASING:

TYPE OF BORING:
WATER OBSERVATIONS: No free groundwater observed
REMARKS:

☒ 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:
Date: 16.7.10

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BOREHOLE LOG

CLIENT: Tony Scolaro Family Trust
PROJECT: Lots 19-21 Old Coast Road
LOCATION: Lake Clifton, WA

SURFACE LEVEL: 3.5 m AHD *
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: BH 12
PROJECT No: 76038
DATE: 16 Jul 10
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) 5 10 15 20
3	0.1	TOPSOIL - dark grey, silty sandy topsoil.							
		SAND - medium dense, orange-brown, fine to medium grained, humid sand with some silt.		D	0.5				
	0.7	Bore discontinued at 0.7m (due to refusal on limestone)							
2	1								1

RIG: 110mm Hand Auger **DRILLER:** R Da Silva **LOGGED:** R Da Silva **CASING:**

TYPE OF BORING:

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☒ 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: M
Date: 19.8.10

Douglas Partners
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BOREHOLE LOG

CLIENT: Tony Scolaro Family Trust
PROJECT: Lots 19-21 Old Coast Road
LOCATION: Lake Clifton, WA

SURFACE LEVEL: 2.7 m AHD *
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: BH 13
PROJECT No: 76038
DATE: 16 Jul 10
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 - dark grey, silty sandy topsoil.							
		SAND - medium dense, orange-brown, fine to medium grained, humid sand with some silt.							
	0.5	Bore discontinued at 0.5m (due to refusal on limestone)		D	0.5				

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

RIG: 110mm Hand Auger **DRILLER:** R Da Silva **LOGGED:** R Da Silva **CASING:**

TYPE OF BORING:

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☒ 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:
Date: 19.8.10

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BOREHOLE LOG

CLIENT: Tony Scolaro Family Trust
PROJECT: Lots 19-21 Old Coast Road
LOCATION: Lake Clifton, WA

SURFACE LEVEL: 3.2 m AHD *
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: BH 9
PROJECT No: 76038
DATE: 16 Jul 10
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
3	0.2	TOPSOIL - dark grey, silty sandy topsoil.							
		SAND - orange-brown, fine to medium grained, humid sand with some silt.		D	0.3				
	0.4	Bore discontinued at 0.4m (due to refusal on limestone)							
2	1								1

RIG: 110mm Hand Auger **DRILLER:** R Da Silva **LOGGED:** R Da Silva **CASING:**
TYPE OF BORING:
WATER OBSERVATIONS: No free groundwater observed
REMARKS:

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:
Date: 19.7.10

Douglas Partners
Geotechnics · Environment · Groundwater

TEST PIT LOG

CLIENT: Tony Scolaro Family Trust
PROJECT: Lots 19-21 Old Coast Road
LOCATION: Lake Clifton, WA

SURFACE LEVEL: 6.0 m AHD *
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

PIT No: TP 1
PROJECT No: 76038
DATE: 16 Jul 10
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)
									5 10 15 20
		TOPSOIL - dark brown, silty sandy topsoil.							
	0.15	SAND - medium dense, orange-brown, fine to medium grained, humid sand with some silt.		D	0.5				
	0.6	LIMESTONE - medium strength, light yellow-brown limestone.		D	0.7				
	0.9	Pit discontinued at 0.9m (due to refusal)							
5	1								1

RIG: 5 Tonne Komatsu Excavator (600mm toothed bucket)
LOGGED: R Da Silva

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☒ 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: AL
Date: 19.8.10

Douglas Partners
Geotechnics · Environment · Groundwater

APPENDIX C

Laboratory Testing Results

Point Load Strength Index
AS 4133.4.1

Mining and Civil Geotest Pty Ltd
Unit 1, No. 1 Pusey Road
Jandakot WA 6164

Client:	Tony Scalaro Family Trust	Report No.	60017-P10/1838-1842
Project:	Lots 19-21 Old Coast Road	Date Tested:	30/07/2010
Location:	Lake Clifton	Tested By:	S Sandilands
Date of Sampling and Sampling Method:	Tested as received	Client No.:	60017

Sample No. P10/	Sample	Rock Type	Moisture	Test Type	L (mm)	W (mm)	D (mm)	P (kN)	Is (MPa)	Is50 (MPa)	Remarks
1838	TP 1, 0.7m	Limestone	M	L	70	85	40	4.69	1.08	1.23	
1839	TP 2, 0.8m	Limestone	M	L	60	100	41	1.05	0.20	0.24	
1840	TP 4, 0.4m	Limestone	M	L	80	140	46	4.67	0.57	0.74	
1841	TP 5, 1.2m	Limestone	M	L	90	100	50	1.63	0.26	0.32	
1842	TP 8, 0.8m	Limestone	M	L	100	100	48	1.73	0.28	0.35	

Comments

KEY:

Moisture	**Test Type**
D - Dry	L - Lump
M - Moist	A - Axial
W - Wet	D - Diametral

Approved Signatory :

Kevin M Jones

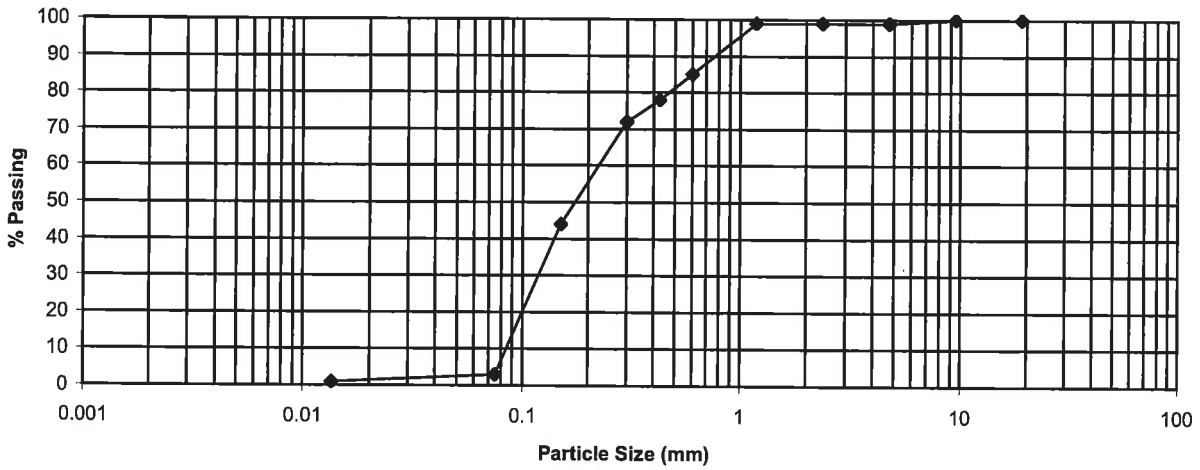
C:\Laboratory\Reports\Douglas 60017\60017-P10.1838-1842 PLI.xls

Particle Size Distribution & Plasticity Index tests

Mining & Civil
Geotest Pty Ltd
unit1/1 Pusey Road, Jandakot, WA 6164
Ph (08) 9414 8022 Fax (08) 9414 8011
Email: kevin@mcgeotest.com.au

Job No:	**60017**
Report No:	**60017-P10/1843**
Sample No:	**P10/1843**
Issue Date:	**30 July 2010**
Sample Location:	**BH 9**
Depth (m):	**0.3**

Client: **Tony Scolaro Family Trust**
Project: **Lots 19 - 21 Old Coast Road**
Location: **Lake Clifton**



SIEVE ANALYSIS WA 115.1

Sieve Size (mm)	% Passing
75.0	
37.5	
19.0	100
9.5	100
4.75	99
2.36	99
1.18	99
0.600	85
0.425	78
0.300	72
0.150	44
0.075	3
0.0135	1

Plasticity index tests
Australian Standard 1289.

Liquid limit 3.1.1	na	%
Plastic limit 3.2.1		%
Plasticity index 3.3.1		%
Linear shrinkage 3.4.1		%
Cracked	☐	
Curled	☐	

Client address: 36 O'Malley Street, Osborne Park

Sampling Procedure: Tested as received

NATA WORLD RECOGNISED ACCREDITATION

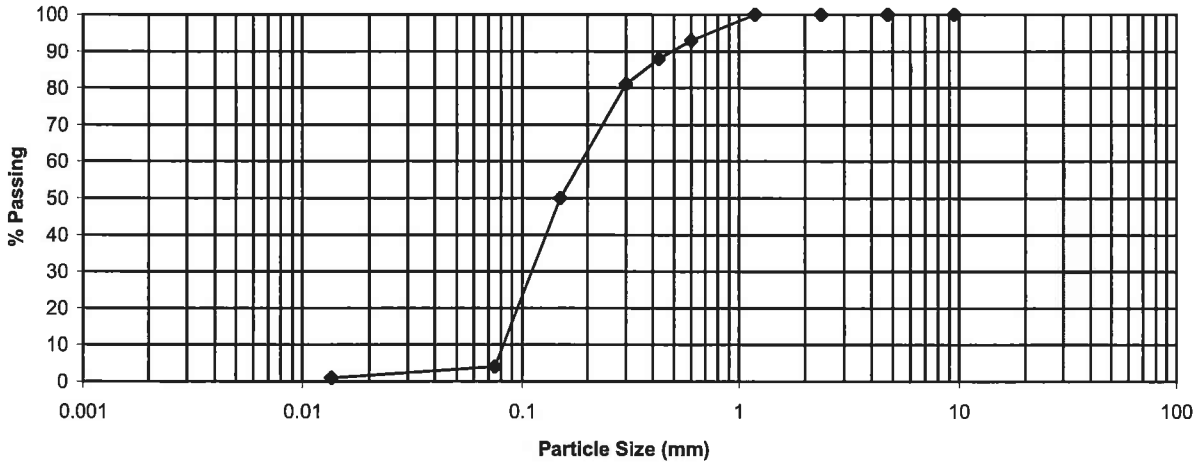
Approved signature

Kevin M Jones

Particle Size Distribution & Plasticity Index tests

Mining & Civil
Geotest Pty Ltd
unit1/1 Pusey Road, Jandakot, WA 6164
Ph (08) 9414 8022 Fax (08) 9414 8011
Email: kevin@mcgeotest.com.au

		Job No:	**60017**
		Report No:	**60017-P10/1844**
		Sample No:	**P10/1844**
		Issue Date:	**30 July 2010**
Client:	**Tony Scolaro Family Trust**	Sample Location:	**BH 12**
Project:	**Lots 19 - 21 Old Coast Road**	Depth (m):	**0.5**
Location:	**Lake Clifton**		



SIEVE ANALYSIS WA 115.1

Sieve Size (mm)	% Passing
75.0	
37.5	
19.0	
9.5	100
4.75	100
2.36	100
1.18	100
0.600	93
0.425	88
0.300	81
0.150	50
0.075	4
0.0135	1

Plasticity index tests
Australian Standard 1289.

Liquid limit 3.1.1	na	%
Plastic limit 3.2.1		%
Plasticity index 3.3.1		%
Linear shrinkage 3.4.1		%
Cracked	☐	
Curled	☐	

Client address: 36 O'Malley Street, Osborne Park

Sampling Procedure: Tested as received

NATA
WORLD RECOGNISED ACCREDITATION

Approved signature

Kevin M Jones

mpl Laboratories
Part of the Envirolab Group ENVIROLAB GROUP

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www.envirolabservices.com.au
Envirolab Services (WA) Pty Ltd ABN 53 140 099 207

CERTIFICATE OF ANALYSIS 104222

Client:
Douglas Partners Perth
36 O'Malley St
Osbourne Park
WA 6017

Attention: Rob Shapland

Sample log in details:

Your Reference:	**76038, Lot 19-21 Old Coast Rd**
No. of samples:	5 Soils
Date samples received:	21/7/10
Date completed instructions received:	21/7/10
Location:	Lake Clifton

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:	2/08/10
Date of Preliminary Report:	Not issued
Issue Date:	2/08/10

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

Results Approved By:

Joshua Lim
Reporting Supervisor

MPL Reference: 104222
Revision No: R 00

NATA ACCREDITED FOR TECHNICAL COMPETENCE

Miscellaneous Inorg - soil						
Our Reference:	UNITS	104222-1	104222-2	104222-3	104222-4	104222-5
Your Reference	----------	TP1	TP4	TP7	BH11	BH13
Depth	----------	0.5	0.2	0.3	0.2	0.5
Date Sampled		16/07/2010	16/07/2010	16/07/2010	16/07/2010	16/07/2010
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	27/7/10	27/7/10	27/7/10	27/7/10	27/7/10
Date analysed	-	27/7/10	27/7/10	27/7/10	27/7/10	27/7/10
pH 1:5 soil:water	pH Units	6.4	7.3	7.4	7.2	7.4
Electrical Conductivity soil	µS/cm	1,400	1,500	1,600	1,500	1,200
Phosphorus Retention Index	mL/g	11	18	9.2	7.8	19

ESP/CEC Our Reference: Your Reference Depth Date Sampled Type of sample	UNITS ---------- ----------	104222-1 TP1 0.5 16/07/2010 Soil	104222-2 TP4 0.2 16/07/2010 Soil	104222-3 TP7 0.3 16/07/2010 Soil	104222-4 BH11 0.2 16/07/2010 Soil	104222-5 BH13 0.5 16/07/2010 Soil
Exchangeable Ca*	meq/100g	2.6	4.0	1.8	8.9	7.1
Exchangeable K*	meq/100g	0.08	0.05	0.09	0.08	0.03
Exchangeable Mg*	meq/100g	0.21	0.20	0.33	0.40	0.43
Exchangeable Na*	meq/100g	0.05	0.06	0.18	0.06	0.08
Cation Exchange Capacity*	meq/100g	2.9	4.3	2.4	9.5	7.7

Method ID	Methodology Summary
WILAB.5A	pH - Measured using pH meter and electrode in accordance with APHA 21st ED, 4500-H+.
WILAB.5A	Conductivity and Salinity - measured using a conductivity cell and dedicated meter, in accordance with APHA2510 21st ED and Rayment & Higginson.
Ext-028	Subcontracted to Chemistry Centre (WA)
Ext-054	Analysed by Envirolab Services Sydney, accreditation number 2901

Client Reference: 76038, Lot 19-21 Old Coast Rd

QUALITY CONTROL Miscellaneous Inorg - soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			27/7/10	104222-1	27/7/10 || 27/7/10	LCS	27/7/10
Date analysed	-			27/7/10	104222-1	27/7/10 || 27/7/10	LCS	27/7/10
pH 1:5 soil:water	pH Units		WILAB.5A	[NT]	104222-1	6.4 || 6.4 || RPD: 0	LCS	99%
Electrical Conductivity soil	µS/cm	1	WILAB.5A	<1.0	104222-1	1400 || [N/T]	LCS	96%
Phosphorus Retention Index	mL/g		Ext-028	[NT]	104222-1	11 || [N/T]	[NR]	[NR]
QUALITY CONTROL ESP/CEC	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Exchangeable Ca*	meq/100 g	0.01	Ext-054	<0.01	104222-1	2.6 || 2.6 || RPD: 0	LCS	95%
Exchangeable K*	meq/100 g	0.01	Ext-054	<0.01	104222-1	0.08 || 0.07 || RPD: 13	LCS	96%
Exchangeable Mg*	meq/100 g	0.01	Ext-054	<0.01	104222-1	0.21 || 0.21 || RPD: 0	LCS	92%
Exchangeable Na*	meq/100 g	0.01	Ext-054	<0.01	104222-1	0.05 || 0.06 || RPD: 18	LCS	86%
Cation Exchange Capacity*	meq/100 g	1	Ext-054	<1.0	104222-1	2.9 || 2.9 || RPD: 0	[NR]	[NR]

Report Comments:

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform & E.coli levels are less than 1cfu/100mL.
The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC& ARMC 2004.

Asbestos was analysed by Approved Identifier: Not applicable for this job
Airborne fibres were analysed by Approved Counter: 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
NS: Not specified; NEPM: National Environmental Protection Measure
DOL: Sample rejected due to particulate overload

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 of exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD a 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 Spike and LCS: Generally 70-130% for inorganics/metals; 60-140% for organics and 10-140% for SVOC and Speciated Phenols is acceptable.
Surrogates: 60-140% is acceptable for general organics and 10-140% for SVOC and Speciated Phenols.