Places Victoria

Taylors Lakes Development
Geotechnical Investigation Report

April 2016

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1. Introduction

1.1 General

GHD has been engaged by Places Victoria to provide Geotechnical Engineering Services as part of a phased approach for the proposed sub-division of the property known as 18-24 Robertsons Road.

Places Victoria is planning to sub-divide the afore mentioned parcel of land for residential purposes. It is understood residential development will comprise low to medium density residential housing (up to three storeys in height), flexible pavements and associated civil infrastructure.

As a part of the development, a site-specific geotechnical investigation was required to assess the sub-surface conditions to inform the design of foundations and pavements associated with the proposed sub-division. This geotechnical investigation report presents the results of the field investigation and laboratory testing undertaken, along with recommendations for the CBR subgrade strength in the design of pavements.

1.2 Purpose of this report

The purpose of this report is to present an appreciation of the depth to rock and variability across the site, site classification in accordance with AS2870 (2011), and to inform the design of pavements in relation to the design CBR subgrade strength.

1.3 Scope of Work

The scope of geotechnical investigation comprised the following;

- Management investigative field work including arranging subcontractors and preparation of site specific safety documentation
- Excavate ten (10) no of test pits to a target depth of 3.0 m from existing ground level or refusal.
- Undertaking Dynamic Cone Penetration (DCP) testing adjacent to each test pit to a target depth of 1.5 m from existing ground level or refusal.
- Visual logging of test pits in accordance with GHD Logging Procedures, which are based on the Australian Standard AS 1726-1993*("Geotechnical Site Investigation").* Logging. Field-testing to be performed and overseen by a GHD Geotechnical Engineer.
- Carrying out a suite of laboratory testing to determine the characteristics of soil index properties, soaked CBR, Shrink swell index and standard compaction.
- A limited suite of environment testing, and
- Preparation of a geotechnical investigation report including:
    - Description of work competed.
    - Test pits logs
    - Test pit location plan
    - Discussion of the findings of the investigation relevant to shallow foundation design, including subsurface conditions, site classification, excavatibility, allowable bearing capacity of in-situ soils and design CBR for pavement construction.

1.4 Reliance

This report: has been prepared by GHD for Places Victoria and may only be used and relied on by Places Victoria for the purpose agreed between GHD and the Places Victoria as set out in section 1.2 of this report.

GHD otherwise disclaims responsibility to any person other than Places Victoria arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

The opinions, conclusions and any recommendations in this report are based on information obtained from, and testing undertaken at or in connection with, specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points.

Investigations undertaken in respect of this report are constrained by the particular site conditions, such as the location of buildings, services and vegetation. As a result, not all relevant site features and conditions may have been identified in this report.

Site conditions (including the presence of hazardous substances and/or site contamination) may change after the date of this Report. GHD does not accept responsibility arising from, or in connection with, any change to the site conditions. GHD is also not responsible for updating this report if the site conditions change.

2. Investigation Methodology

2.1 Service Clearance

Prior to the site works taking place, 'Dial-Before-You-Dig' was contacted by GHD and plans of all utility services within proximity of the proposed borehole locations were obtained. An underground service location subcontractor (Radio Detection Pty Ltd) was engaged to clear all test pit locations prior to excavation works taking place. The test locations were cleared using radio detector methods in conjunction with the DBYD plans.

2.2 Test Pitting

Ten (10) test pits (labelled as TP01 to TP10) were excavated on 9th March 2016 within the footprint of proposed development. The test pits were excavated with the aid of 8-ton track mounted excavator supplied by southern plant hire.

Soil samples recovered from the excavated pits were logged in accordance with GHD logging Reference Sheets/Guidelines, which are based on Australian Standard AS 1726-1993 (Site Geotechnical Investigation). A GHD Geotechnical Engineer supervised and logged the intrusive geotechnical investigation.

Test pits locations were recorded with a hand held GPS with a typical horizontal accuracy of +/- 5 A plan showing excavated test pits is presented in Figure 1.

A summary of excavated test pit information is presented in Table 1 and logs along with GHD logging reference sheets are presented in Appendix A.

Table 1 Summary of Excavated Test Pits

Test Pit ID	MGA94(Z55)		Effective Refusal Depth(bgl)m	Comment
	Easting	Northing		
TP01	303723	5826002	0.90	Effective Refusal
TP02	303768	5826056	0.55	Effective Refusal
TP03	303812	5826114	1.50	Effective Refusal
TP04	303816	5825936	1.90	Effective Refusal
TP05	303858	582599	3.00	Target Depth
TP06	303902	5826048	3.00	Target Depth
TP07	303912	5825892	3.00	Target Depth
TP08	303945	582594	3.00	Target Depth
TP09	303985	5825992	3.00	Target Depth
TP10	304008	5825898	3.00	Target Depth

2.3 Dynamic Cone Penetration Testing (DCP)

DCP probing was undertaken adjacent to each test pit to determine the insitu strength of the native sub-surface profile. DCP probing could not be undertaken at TP02 due to the presence of shallow cobbles and boulders.

The results of DCP probing are presented in Appendix B.

2.4 Geotechnical Laboratory Testing

A suite of geotechnical laboratory testing was carried out on representative samples recovered from test pits to determine the soil geotechnical properties. Laboratory testing was undertaken at GHD's NATA accredited laboratory at Traralgon.

The following tests were scheduled;

- Field Moisture Content
- Atterberg Limits
- Soaked CBR
- Shrink Swell Index and
- Standard Compaction.

The laboratory test certificates are included in Appendix C and a summary of the results is presented in section 3.4.

2.5 Environment laboratory Testing

A limited suite of environment testing was scheduled on selected samples recovered from test pits excavation. Environment testing conducted to assess the soil aggressively for buried structures. Environment testing results are summarised in section 3.5 while the test certificates are included in Appendix D.

3. Results of Investigation

3.1 Site Description

The site is located near the corner of Roberstons Road and McCubbin Drive in Taylors Lakes and is approximately 9 hectares in size. The site is opposite the Overnewton Anglican Community College for its Robertsons Road frontage, with all other frontages to the site opposite existing residential development. The site is bounded by Robertsons Road to the northwest, McCubbin Drive to the southwest and residential development along the remaining perimeter of the site.

At the time of the investigation, the proposed development site was vacant land. The site is relatively flat apart from a previous canter-trotting track which appears to have incised the pre-existing ground profile.

A pocket of medium to large trees was observed towards the eastern portion of the site.

No significant signs of basalt outcrops were observed, however some localised area of corestone were observed towards northern-western site.

3.2 Regional Geology

The geological map sheet of Sunbury (Scale, 1:63,360), published by the Geological Survey of Victoria indicates the project site geology. The site is underlain with Quaternary sediments of associated with the Newer Volcanic unit, comprising basaltic clay and basalt. This description is consistent with the material encountered in the field investigation.

3.3 Sub-surface Profile

The sub-surface profile is based on the ten test pits excavated as part of the scope of the current investigation. The general profile can be described as follows;

SILT(ML): pale grey brown, rootlets, dry, firm to stiff consistency, this unit typically characterised as topsoil and found to be generally 0.05 m thick.

Overlying

CLAY / CLAY with Cobbles: yellow brown, grey brown, closely spaced fissured clay, fissure content decreased with depth, dry to moist, firm to stiff consistency, trace tree roots up to 100 mm in size, occasional angular basalt cobbles encountered, trace nodules of calcium carbonate up to 10-20 mm in size. This unit typically encountered from 0.05 m to a depth of 0.55 to 1.9 m, although extends to target depth of 3 m in the majority of excavated test pits (TP05 to TP10).

Overlying

Cobbles/Boulders with clay/CLAY with Cobbles(GP/CH): yellow brown, dry to moist, sub angular to angular, moderately vesicular basalt cobbles up to 800 mm in size, with stiff/ medium dense to dense insitu strength. This layer typically encountered from 0.25 to 1.0 m from existing ground level and only encountered in TP01 to TP04.

Apart from the general sub soil profile described above a clay with sand layer was encountered between a depth of 0.3 to 1.0 m in test pits TP01, TP03, TP05, and TP06. In addition, the sand content of the sample recovered from TP05 at a depth of 0.3 m was sufficient to classify the sample as a clayey sand, however, the fines content and tactile observations in the field suggests that this layer is likely to exhibit cohesive behaviour.

3.4 Laboratory Testing

3.4.1 Soil Index Properties

Soil samples recovered from selected test pit locations were tested for geotechnical properties. A summary of soil index properties is presented in Table 1 with the laboratory test certificates included in Appendix C.

Table 2 Summary of Soil Index Properties

Sample Location and Depth(m)	Material and Group Symbol	Liquid Limit (%)	Plastic Index (%)	Fines (%)	Linear Shrinkage (%)
TP01 (0.3m)	CLAY(CH)	89	65	95	25.0
TP04 (0.65m)	CLAY with sand(CH)	82	63	83	19.5
TP05 (0.3m)	Clayey SAND(SC) #	73	53	41	20.5
TP07 (0.35m)	CLAY(CH)	71	53	95	20.5
TP08 (0.85m)	CLAY(CH)	79	62	95	21.0
TP10 (0.4m)	CLAY(CH)	80	58	96	23.5

Note: tactile observation determined the sample to behave as a cohesive material.

3.4.2 Standard Compaction and Soaked CBR Testing

Standard compaction and soaked CBR testing was undertaken on selected soil samples recovered from the site. The results of these tests are summarised in Table 3 and laboratory test certificates are presented in Appendix C.

Table 3 Summary of Soaked CBR and Standard Compaction

Sample Location and Depth(m)	Soil Type	Field Moisture Content (%)	Maximum Dry Density (t/m^3)	Optimum Moisture Content OMC (%)	Soaked California Bearing Ratio CBR (%)	Swell (%)
TP01 (0.3m)	CLAY(CH)	28.9	1.41	30.9	1.5	5.5
TP05 (0.3m)	Clayey SAND(SC) #	22.2	1.48	24.8	1.5	5.5
TP07 (0.35m)	CLAY(CH)	21.9	1.51	23.7	1.0	6.0

Note: tactile observation determined the sample to behave as a cohesive material.

3.4.3 Shrink Swell Index

Shrink swell index testing was undertaken on selected soil samples recovered from the test pit investigation to determine the potential reactivity of the soil. The result of this testing is presented in Table 4 below with the geotechnical laboratory test certificates included in Appendix C.

Table 4 Summary of Shink Swell Index

Sample Location and Depth(m)	Soil Type	Moisture Content (%)	Shrinkage (Esh) (%)	Swell (Esw) (%)	Shrink - Swell Index (ISS) (%)
TP05 (0.3m)	Clayey SAND(SC) #	28.5	7.2	4.8	5.3
TP07 (0.35m)	CLAY(CH)	26.1	6.2	5.8	5.0
TP10 (0.4m)	CLAY(CH)	33.0	10.8	1.8	6.5

Note: tactile observation determined the sample to behave as a cohesive material.

3.5 Environment Testing

Environment testing was undertaken on selected soil samples to assess the durability of buried concrete and steel structures. Table 5 presents the summary of the environment testing and laboratory test certificates are included in Appendix D.

Table 5 Summary of Environment Testing

Sample Location and Depth(m)	Sample Depth	Moisture Content (%)	Chloride (mg/kg)	Sulphate (S) (mg/kg)	Electrical Conductivity EC (uS/cm)
TP04	0.4m	15	620	42	510
TP08	0.4m	20	880	110	1100

3.6 Groundwater

No groundwater table was encountered in any of the test pit excavated. Notwithstanding, it must be noted that groundwater levels can fluctuate seasonally and perched or higher ground water levels may occur during the wetter periods of the year.

4. Discussion

4.1 Subsurface Conditions

The subsurface conditions encountered during the investigation were relatively consistent in the nature of material observed, however, the depth to hard strata resulting in refusal to penetration with 8-ton excavator and presence of cobbles and boulders varied across the site. The majority of the site contains a variable thickness of cohesive soil of basaltic origin along with the inclusion of cobbles and boulders up to a depth of 3 m (target depth of investigation), however, over the western portion of the site the soil cover to hard strata was thinner. Over the western portion of the site hard strata characterised by dense basaltic cobbles and boulders were encountered at a depth in the 0.55 m to 1.0 m (TP01 to TP04).

No bedrock or weathered basalt was encountered in any of the excavated test pits. Based on previous experience with basaltic rock geology; the basalt rock contact can be highly irregular in the soil profile and exhibit significant lateral and vertical variation. The presence of shallow rock, and or large cobbles and boulders, may impact on the excavation rates achieved for installing foundations and sub surface services.

4.2 Excavatability

In general, majority of the test pits were advanced to target depth except in the case of test pits TP01 to TP04, where these locations were met refusal on dense cobbles/ boulders at a depth ranging from 0.55 to 1.90 m.

It is expected that basaltic clay can be excavated with conventional earthworks plant of suitable capacity and reach, however, in the presence of dense cobbles/boulders excavation rates may be impacted and may/will require **significant** effort in the form of ripping and / or hydraulic hammering to advance excavations.

The above comments on excavatability are provided as a guide only, and an experienced contractor should make their own assessment of the excavatability and plant capacity required to complete any earthworks.

5. Recommendation

5.1 Soil Reactivity and Site Classification

Soil reactivity described in this section relates to potential volume change (shrink/swell) and associated ground movement in clay due to seasonal moisture variation.

Based on the guidelines provided in Australian Standard for Residential Slabs and Footings (AS 2870), the site consists of highly to extremely reactive soils with a class designation of **CLASS H2 to E** with respect to shallow foundation construction.

Note that the above class designation is based on Group 2 soils, for clay horizons >1.5 m and climate zone of 3. Where the clay horizon is thinner, as noted over the western portion of the site, a lower class designation of **Class M to H1** may be adopted.

Notwithstanding the above site classification it is recommended that site specific investigation would be required for individual sites to arriving at the appropriate class for which to design foundations.

5.2 Exposure Classification

Soil aggressivity is assessed for potential to adversely impact on concrete and steel components that are in contact with the ground. Selected samples were assessed for aggressivity (pH, chloride, sulphate and electrical conductivity) to aid in the exposure classification for the durability of concrete and steel foundation systems.

Based on the results of environment testing as summarised in Table 5 and AS 3600-2009 (Table 4.3), it is recommended that the buried concrete structures adopt an exposure classification of **A1.**

5.3 Foundation Types and Allowable Bearing Capacity

Based on the subsurface conditions encountered, shallow isolated pad footing; slab on ground or strip footing are considered appropriate foundation types for proposed development, provided these are designed in accordance with the site classification and recommendations contained herein.

In general, an allowable bearing capacity of **75 kPa** can be adopted for isolated pad foundations and edge beams / internal load bearing beams for slab foundations when founded in firm cohesive soil. An allowable bearing capacity of **125 kPa** can be adopted for isolated pad foundations and edge beams / internal load bearing beams for slab foundations when founded in firm stiff or better cohesive soils.

Note that higher bearing capacities may be feasible where the depth to hard strata is nominal or where higher capacities can be demonstrated following site specific investigation.

5.4 Earthworks

All earthworks required for filling / cutting works should be undertaken in accordance with AS 3798 – “Guidelines on Earthworks for commercial and residential developments.

5.5 Pavements

The laboratory test results estimated a four day soaked CBR value in the range from 1.0 to 1.5% for the samples tested. The highly reactive nature of the clay subgrade and high swell following soaking indicates poor subgrade material, which is commonly associated with basaltic clays.

It is recommended that in the absence of any subgrade treatment or improvement, a Design CBR value of **1.0%** should be adopted for the design of the road pavement.

Considering a design CBR of 1.0% would substantially thicken the pavement layerworks, which may in turn require further boxing out to match final earthworks platforms, an alternate approach may be to consider subgrade replacement or treatment to arrive at an efficient pavement design. This may include ground replacement to remove a portion of the subgrade that is subject to volume change with moisture content fluctuations, or alternatively stabilisation with lime or a mixture of lime and cement.

In addition the following consideration should be made in the preparation of the subgrade:

- Strip off all top soil or deleterious material to expose clay subgrade.
- Any discrete core stone / boulders protruding from the stripped surface should be removed and replaced with compacted crushed rock
- Adequate provision of surface and subsurface drainage.

6. Information about this Report

The report contains the results of a geotechnical investigation conducted for a specific purpose and client. The results should not be used by other parties, or for other purposes, as they may contain neither adequate nor appropriate information. In particular, the investigation does not cover contamination issues unless specifically required to do so by the client.

6.1 Test Hole Logging

The information on the test hole logs (boreholes, test pits, exposures etc.) is based on a visual and tactile assessment, except at the discrete locations where test information is available (field and/or laboratory results). The test hole logs include both factual data and inferred information. Reference should be made to the relevant sheets for the explanation of logging procedures (Soil and Rock Descriptions, Core Log Sheet Notes etc.).

6.2 Groundwater

Unless otherwise indicated, the water levels presented on the test hole logs are the levels of free water or seepage in the test hole recorded at the given time of measuring. The actual groundwater level may differ from this recorded level depending on material permeabilities (i.e. depending on response time of the measuring instrument). Further, variations of this level could occur with time due to such effects as seasonal, environmental and tidal fluctuations or construction activities. Confirmation of groundwater levels, phreatic surfaces or piezometric pressures can only be made by appropriate instrumentation techniques and monitoring programmes.

6.3 Interpretation of Results

The discussion or recommendations contained within this report normally are based on a site evaluation from discrete test hole data. Generalised, idealised or inferred subsurface conditions (including any geotechnical cross-sections) have been assumed or prepared by interpolation and/or extrapolation of these data. As such these conditions are an interpretation and must be considered as a guide only.

6.4 Change in Conditions

Local variations or anomalies in the generalised ground conditions do occur in the natural environment, particularly between discrete test hole locations. Additionally, certain design or construction procedures may have been assumed in assessing the soil-structure interaction behaviour of the site. Furthermore, conditions may change at the site from those encountered at the time of the geotechnical investigation through construction activities and constantly changing natural forces.

Any change in design, in construction methods, or in ground conditions as noted during construction, from those assumed or reported should be referred to GHD for appropriate assessment and comment.

6.5 Geotechnical Verification

Verification of the geotechnical assumptions and/or model is an integral part of the design process - investigation, construction verification, and performance monitoring. Variability is a feature of the natural environment and, in many instances, verification of soil or rock quality, or foundation levels, is required. There may be a requirement to extend foundation depths, to modify a foundation system or to conduct monitoring as a result of this natural variability. Allowance for verification by geotechnical personnel accordingly should be recognised and programmed during construction.

6.6 Foundations

Where referred to in the report, the soil or rock quality, or the recommended depth of any foundation (piles, caissons, footings etc.) is an engineering estimate. The estimate is influenced, and perhaps limited, by the fieldwork method and testing carried out in connection with the site investigation, and other pertinent information as has been made available. The material quality and/or foundation depth remains, however, an estimate and therefore liable to variation. Foundation drawings, designs and specifications should provide for variations in the final depth, depending upon the ground conditions at each point of support, and allow for geotechnical verification.

6.7 Reproduction of Reports

Where it is desired to reproduce the information contained in our geotechnical report, or other technical information, for the inclusion in contract documents or engineering specification of the subject development, such reproductions should include at least all of the relevant test hole and test data, together with the appropriate standard description sheets and remarks made in the written report of a factual or descriptive nature.

Reports are the subject of copyright and shall not be reproduced either totally or in part without the express permission of GHD.

Figure 1 Test Pit Location Plan

Paper Size A4

0 12.5 25 50 75 100

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

Legend

Testpit location

Places Victoria
Taylors Lake Development

Job Number 31-33682
Revision A
Date 18 Mar 2016

Testpit Location Plan

Figure 1

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Appendices

Appendix A - (Test Pit Logs)

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SOIL AND ROCK DESCRIPTION SHEET 1 - GENERAL

Soil and rock descriptions are generally in accordance with the recommendations of Australian Standard 1726-1993 and cover the following properties:

SOIL: Soil Name (Classification Group Symbol), Plasticity or Particle Characteristics, Colour, Secondary Components, Other Minor Components, Moisture Condition, Consistency, Structure.

ROCK: Rock Type, Grain Size, Texture and Fabric, Colour, Strength, Material, Weathering, Structure, Defects.

Notes: Field tests have been used to assess soil consistency, rock strength and grain size. Unless specifically stated otherwise, these assessments have been transferred directly to the bore logs and not modified to coincide with laboratory test results. Descriptive terms used on the bore logs are explained on the following pages.

1. Individual assessment of colour has been used and no reference made to standard colour charts unless specifically stated.
2. AS 1726-1993 generally follows ASTM D2487 (Unified Soil Classification System) except that it adopts different particle size limits.
3. For Classification Group Symbol, refer Table A1 of AS 1726-1993.
4. For drilling method, correct drilling terms are used if known (eg. NMLC, HQ3 etc). Alternatively generic descriptors for basic method and flushing medium are used as appropriate from list below.

DRILLING/EXCAVATION METHOD

RW	Rotary wash boring
RT	Rotary triple tube coring
PC	Percussion Cable Tool Boring
PT	Percussion Top Hammer Boring
PD	Percussion Down Hole Hammer Boring
PSC	Percussion Hammer with Casing Advance
AS	Augering Solid Flight
AH	Augering Hollow Flight
CC	Continuous Coring
HA	Hand Augering
CT	Continuous Tube Sampler
HE	Hand Excavation (shovel/pick etc)
BE	Bucket Excavation
BL	Blade Excavation
HH	Hydraulic Hammer
NDD	Non-Destructive Digging (Vacuum Excavation)
T	Tyne/Rock Pick
Rp	Bulldozer Ripper/Tyne

SUPPORT

M	Mud
C	Casing
N	Nil

RUN

———	Indicated depth at end of Drill Run (x metres)
C	Depth at end of Casing (x metres)

WATER

▼	Water level
▸	Water inflow
◂	Water outflow
GNE	Groundwater not Encountered
GNO	Groundwater not Observed

SAMPLING AND TESTING

Piston	Piston tube sampler
D	Disturbed sample/Grab sample (Symbol shown at sample depth)
U (x)	Undisturbed sample (x mm diameter)
CS	Core sample
SPT	Standard penetration test (blows per 150 mm)
SS	Split Spoon Samples
GP	Direct Push Geoprobe Sample
N=R	Standard penetration test, Refusal
N	SPT N value for final 300 mm
HB	SPT hammer bouncing
IV	Insitu vane shear test (kPa)
HV	Hand vane test on sample (kPa)
PP	Pocket penetrometer test on sample.
PM	Pressure meter test
Is(50)	Corrected Is(50) result of point load test on rock core
(D)	Point load test conducted in the diametral orientation
(A)	Point load test conducted in the axial orientation
UCS	Unconfined compressive strength (MPa)
PK	Packer test (kPa)
CH	Constant head test
FH	Falling head test
PT	Pump test
AL	Air lift (water inflow test)
W	Water sample
UU	Unconsolidated Undrained Compressive Strength (kPa)
uL	Lugeon Value

ORIENTATION OF FEATURES

VT	Vertical
HZ	Horizontal
NI	Non intact

OTHER ABBREVIATIONS

DN	Driller note

NOTE: Based on Classification System AS1726 – 1993
Field classification is an estimate and is therefore not precise

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SOIL AND ROCK DESCRIPTION SHEET 2 - SOILS

DESCRIPTION

The basic soil types (material finer than 63 mm) are coarse-grained soils consisting of sands and gravels and fine-grained soils consisting of silts and clays

GROUP		SYMBOL	DESCRIPTION
COARSE GRAINED SOILS (<50% passing 0.075 mm sieve)	Gravels	GW	Well-graded gravels and gravel-sand mixtures - little or no fines.
		GP	Poorly graded gravels and gravel-sand mixtures - little or no fines.
	Gravelly Soils	GM	Silty gravels, gravel-sand-silt mixtures.
		GC	Clayey gravels, gravel-sand-clay mixtures.
	Sands	SW	Well graded sands and gravelly sands - little or no fines.
		SP	Poorly graded sands and gravelly sands - little or no fines.
	Sandy Soils	SM	Silty sand, sand-silt mixtures.
		SC	Clayey sands, sand-clay mixtures.
		-	Fill

GROUP	SYMBOL	DESCRIPTION
FINE GRAINED SOILS (>50% passing 0.075 mm sieve)	ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands.
	CL	Inorganic low plasticity, gravelly clays, sandy clays, clays.
	CI	Inorganic medium plasticity clays, gravelly clays, clays.
	OL	Organic silts and organic clays of low plasticity.
	MH	Inorganic silts, micaceous or diatomaceous fine sands or silts.
	CH	Inorganic high plasticity gravelly clays, sandy clays and clays.
	OH	Organic clays of medium to high plasticity.
	PT	Peat and other highly organic soils. Inferior coal (e.g. lignite)

DESCRIPTIVE TERMS FOR SECONDARY / MINOR COMPONENT

COARSE GRAINED SOILS		FINE GRAINED SOILS	
% FINES	**MODIFIER**	**% COARSE**	**MODIFIER**
≤ 5	Omit, or use 'trace'	≤ 15	Omit, or use 'trace'
> 5 ≤ 12	Describe as 'with clay/silt' as applicable	>15 ≤ 30	Describe as 'with sand/gravel' as applicable
>12	Prefix soil as 'silty/clayey' as applicable	> 30	Prefix soil as 'sandy/gravelly' as applicable

MOISTURE CONDITION

TERM	SYMBOL	DESCRIPTION
Dry	D	Looks and feels dry; cohesive soils usually hard, powdery or friable, granular soils run freely through hands.
Moist	M	Soil feels cool, darkened in colour; cohesive soils usually weakened by moisture; granular soils tend to cohere, but no free water collects on hands on remoulding.
Wet	W	As above free water collects on hands when remoulding.

GRAIN SIZE

DESIGNATION	CLAY	SILT	SAND			GRAVEL			COBBLES	BOULDERS
			Fine (f)	Medium (m)	Coarse (c)	Fine (f)	Medium (m)	Coarse (c)		
GRAIN SIZE	2	75	200	600	2.36	6	20	63	200	
	Microns					Millimetres				

GRAIN SHAPE

Described as flaky, elongate or one of the following: angular, sub-angular, sub-rounded or rounded.

NOTE: Based on Classification System AS1726 – 1993
Field classification is an estimate and is therefore not precise

SOIL STRUCTURE

ZONING	*Separate zones of soil which differ in colour, grain size or other property.*
Layer	continuous across exposure.
Lens	discontinuous layer with lenticular shape across exposure.
Pocket	irregular inclusion within exposure.

CEMENTING	
Weakly Cemented	sample shows a degree of cementing, but can be remoulded when saturated
Strongly Cemented	a cemented soil that can not be remoulded by hand when saturated

DEFECTS	*These may include fissures, cracks, root-holes.*
Bedding	layering of grains formed by deposition.
Foliation	layering of grains caused by pressure.
Joint	crack or discontinuity. Fissures are irregular joints of < 200 mm extent
Sheared zone	zone of sub-parallel smooth or slickensided joints, caused by shearing.
Wetted zone	zone wetter than adjacent soil.
Tube	tubular cavity (eg: from decomposed root)
Tube-cast	tubes infilled by material with rock strength.
Infilled seam	substance infilling defects.

CONSISTENCY - COHESIVE SOILS

TERM	SYMBOL	Undrained shear strength Su (kPa)	SPT blows per 300mm	FIELD GUIDE
Very Soft	VS	≤ 12	<2	Exudes between the fingers when squeezed in hand
Soft	S	> 12 ≤ 25	2 - 4	Can be moulded by light finger pressure
Firm	F	> 25 ≤ 50	4 - 8	Can be moulded by strong finger pressure
Stiff	St	> 50 ≤ 100	8 - 15	Cannot be moulded by fingers. Can be indented by thumb
Very Stiff	VSt	> 100 ≤ 200	15 - 30	Can be indented by thumb nail
Hard	H	> 200	> 30	Can be indented with difficulty by thumb nail

CONSISTENCY - NON-COHESIVE SOILS

TERM	SYMBOL	RELATIVE DENSITY %	SPT blows per 300mm
Very Loose	VL	≤ 15	0 - 4
Loose	L	> 15 ≤ 35	4 - 10
Medium dense	MD	> 35 ≤ 65	10 - 30
Dense	D	> 65 ≤ 85	30 - 50
Very Dense	VD	> 85	> 50

GRAPHIC SYMBOLS FOR SOILS

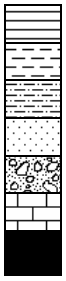
NOTE: Based on Classification System AS1726 – 1993
Field classification is an estimate and is therefore not precise

GHD CLIENTS | PEOPLE | PERFORMANCE

SOIL AND ROCK DESCRIPTION SHEET 3 – ROCKS

DESCRIPTION

SEDIMENTARY

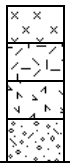


Mudstone
Shale
Siltstone
Sandstone
Conglomerate
Limestone
Coal

METAMORPHIC

Low grade: slate, phyllite, schist etc
High grade: quartzite, gneiss, marble etc

IGNEOUS



Plutonic (generally coarse grained): granite gabbro etc
Hypabyssal (generally medium grained): micro-granite, dolerite
Volcanic (generally fine grained): rhyolite andesite, basalt etc
Pyroclastic: pumice, tuff etc

STRENGTH

TERM	SYMBOL	POINT LOAD INDEX (MPa) I_s50	FIELD GUIDE TO STRENGTH
Extremely low	EL	≤ 0.03	Easily remoulded by hand to a material with soil properties
Very low	VL	> 0.03 ≤ 0.1	Material crumbles under firm blows with sharp end of pick; can be peeled with knife; too hard to cut a triaxial sample by hand. Pieces up to 30 mm thick can be broken by finger pressure
Low	L	> 0.1 ≤ 0.3	Easily scored with a knife; indentations 1 mm to 3 mm show in the specimen with firm blows of the pick point; has dull sound under hammer. A piece of core 150 mm long by 50 mm diameter may be broken by hand. Sharp edges of core may be friable and break during handling
Medium	M	> 0.3 ≤ 1	Readily scored with a knife; a piece of core 150 mm long by 50 mm diameter can be broken by hand with difficulty
High	H	> 1 ≤ 3	A piece of core 150 mm long by 50 mm diameter cannot be broken by hand but can be broken by a pick with a single firm blow; rock rings under hammer
Very high	VH	> 3 ≤ 10	Hand specimen breaks with pick after more than one blow; rock rings under hammer
Extremely high	EH	> 10	Specimen requires many blows with geological pick to break through intact material; rock rings under hammer

GRAIN SIZE (METAMORPHIC AND IGNEOUS ROCKS) (AS1726 – 1993 Table A6[b])

DESIGNATION	Very Fine Grained	Fine Grained	Medium Grained	Coarse Grained	Very Coarse Grained
GRAIN SIZE	2 – 75 Microns		2 – 60 Millimetres		

BLOCK SIZE AND SHAPE

Block size may be described in millimetres.

Block shape may be described as:

Massive	- few defects or very widely spaced defects.
Blocky	- approximately equi-dimensional
Tabular	- one dimension considerably smaller than the other two.
Columnar	- two dimension considerably smaller than the other one.
Irregular	- wide variation in block size and shape.

GRAIN SIZE (SANDSTONE)

(AS1726 – 1993 Table A6[a])

Fine	0.06 – 0.2 mm
Medium	0.2 mm – 0.6 mm
Coarse	0.6 mm – 2.0 mm

STRUCTURE

The structure of the rock 'mass', as distinct from the rock 'material' should be described in the following terms:

Sedimentary rocks - Bedded, laminated (laminae are less than 20 mm thick).
Metamorphic rocks - Foliated, banded, cleaved.
Igneous rocks - Massive, flow banded.

NOTE: Based on Classification System AS1726 – 1993
Field classification is an estimate and is therefore not precise

BEDDING	SPACING (MM)	JOINTING
Very thickly bedded	> 2000	Very widely (VW) jointed
Thickly bedded	600 - 2000	Widely (W) jointed
Medium bedded	200 - 600	Medium (M) jointed
Thinly bedded	60 - 200	Closely (C) jointed
Very thinly bedded	20 - 60	Very closely (VC) jointed
Laminated	6 - 20	Extremely closely (EC) jointed
Thinly laminated	< 6	Extremely closely (EC) jointed

COLOUR
Individual assessment of colour. Standard colour charts used only where specifically stated.

RQD - ROCK QUALITY DESIGNATION

RQD is calculated by core run. Note that when estimating RQD from drill core it is necessary to discount artificial breaks clearly caused by the drilling process or when fitting core into the tray. It should also be noted that the degree of fracturing of the core during the drilling process might be partly a function of core diameter in weaker rocks. RQD should not be determined on extremely weathered rocks.

$$\frac{\textit{Sum of length of sound core pieces > 100 mm x 100}}{\textit{Total length of core run (m)}} = \textit{RQD (\%)}$$

CORE RECOVERY

The end of a core run is shown by a horizontal line at the appropriate depth. Core recovery represents the ratio of core recovered to the length drilled expressed as a percentage of each run.

WATER PRESSURE TEST RESULTS

The results of the water pressure tests are from 5 stage, single or double packer tests and analysed using the methods outline by Houlsby 1990.

FRACTURE FREQUENCY

Fracture Frequency is calculated for like intervals of rock or by core run.

$$\frac{\textit{Number of Fractures}}{\textit{Length of core interval (m)}} = \textit{Fracture Frequency}$$

WEATHERING

Weathering is the chemical alteration of the individual grains, the grain bonds or the groundmass materials and generally results in one or more of: loss of lustre, staining, cementing, leaching, disintegration, loss of strength. Classification of rock substance weathering is based on visual classification.

DEGREE OF WEATHERING		SYMBOL		WEATHERING DESCRIPTION
Residual Soil		RS		Soil developed on extremely weathered rock; the mass structure and substance fabric are no longer evident; there is a large change in volume but the soil has not been significantly transported
Extremely Weathered Rock		XW		Rock is weathered to such an extent that it has 'soil' properties, i.e. it either disintegrates or can be remoulded in water
Distinctly Weathered Rock[1]	Highly Weathered Rock	DW	HW	Secondary minerals often weathered to clay. Staining of most grain boundaries and some disintegration due to weakening of grain bonds. Often significant loss of strength.
	Moderately Weathered Rock		MW	Staining and pitting of most secondary minerals and other grain boundaries. The loss of strength depends upon the weathering and extent of secondary minerals in the rock matrix. The rock substance may be highly discoloured, usually by iron staining.
Slightly Weathered Rock		SW		Rock is slightly discoloured but shows little or no change of strength from fresh rock
Fresh Rock		FR		Rock shows no sign of decomposition or staining

[1] AS1726 suggests the term "Distinctly Weathered" (DW) to cover the range of substance weathering conditions between XW and SW. For projects where it is not practical to delineate between HW and MW or it is judged that there is no advantage in making such a decision, DW may be used with the definition given in AS1726.

DISCONTINUITY DESCRIPTION

TYPE

SS	Shear Surface
FZ	Fracture Zone
CS	Crushed Seam
BP	Bedding Plane
JT	Joint
VN	Vein
DB	Drill Break
SM	Seam

SHAPE & ROUGHNESS

PLN	Planar
UN	Undulose
CU	Curved
ST	Stepped
SLK	Slickensided
RF	Rough
SO	Smooth
POL	Polished

NATURE OF INFILLING

X	Carbonaceous
CLAY	Clay
FE	Iron Oxide
MU	Unidentified Mineral
Mn	Manganese
QZ	Quartz
KT	Chlorite
CN	Clean
CA	Calcite/Carbonate
Py	Pyrite

NOTE: Based on Classification System AS1726 – 1993
Field classification is an estimate and is therefore not precise

TEST PIT LOG SHEET

Client : Places Victoria
Project : Taylors Lakes Development
Location : Taylors Lakes

TEST PIT No. TP01

SHEET 1 **OF** 1

Position :	303723.0 E,5826002.0 N MGA	**Surface RL:**	NA	**Pit Width:** 2.6	**Processed:** PS
Excavator :	Cat-8 ton Excavator	**Contractor :**	Southern Plant Hire	**Pit Length:** 0.45	**Checked:** JB
Date :	9/03/2015			**Logged by :** PS	**Date:** 16/3/16

EXCAVATION			MATERIAL						
Scale (m)	Water	Samples & Tests	Depth (m)	Graphic Log	Group Symbol	Description SOIL TYPE, colour, structure, minor components (origin) and ROCK TYPE, colour, grain size, structure, weathering, strength	Moisture Condition	Consistency / Relative Density	Comments Observations
	GNE	B(0.3m)	0.05		ML	SILT, pale grey brown, rootelts	D	F-St	Top soil
					CH	CLAY, yellow brown	D- M		Residual soil
			0.50			becoming yellow brown	M		
			0.70						
			0.75		CH	CLAY with sand, grey, pale grey, fine grained sand			
			0.80			occasional boulders up to 350mm in size			
			0.90			boulders density increasing			
1						Testpit terminated at 0.9m upon refusal on boulders Testpit backfiled with spoil upon completion			1
2									2
3									3
4									4

See standard sheets for details of abbreviations & basis of descriptions

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Job No. 31/33682

TEST PIT LOG SHEET

Client : Places Victoria
Project : Taylors Lakes Development
Location : Taylors Lakes

TEST PIT No. TP02

SHEET 1 **OF** 1

Position :	303768.0 E,5826056.0 N	MGA	**Surface RL:** NA	**Pit Width:** 2.2	**Processed:** PS
Excavator :	Cat-8 ton Excavator		**Contractor :** Southern Plant Hire	**Pit Length:** 1.8	**Checked:** JB
Date :	9/03/2015			**Logged by :** PS	**Date:** 16/3/16

EXCAVATION			MATERIAL						
Scale (m)	Water	Samples & Tests	Depth (m)	Graphic Log	Group Symbol	Description SOIL TYPE, colour, structure, minor components (origin) and ROCK TYPE, colour, grain size, structure, weathering, strength	Moisture Condition	Consistency / Relative Density	Comments Observations
	GNE		0.05		ML	SILT, pale yellow brown, rootlets	D	F-St	Top soil
			0.25		CI-CH	CLAY with Cobble/Boulders, yellow brown, angular basalt boulders up to 600-800 mm in size	D-M		Residual soil
						cobble and boulders density increasing			No DCP test was undertaking due to presence of cobbles
			0.55			Test pit terminated at 0.55 upon refusal on dense cobbles and boulders Testpit backfilled with spoil upon completion			

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TEST PIT LOG SHEET

Client : Places Victoria
Project : Taylors Lakes Development
Location : Taylors Lakes

TEST PIT No. TP03

SHEET 1 **OF** 1

Position : 303812.0 E,5826114.0 N	MGA	**Surface RL:** NA	**Pit Width:** 2.6	**Processed:** PS
Excavator : Cat-8 ton Excavator		**Contractor :** Southern Plant Hire	**Pit Length:** 1.3	**Checked:** JB
Date : 9/03/2015			**Logged by :** PS	**Date:** 16/3/16

EXCAVATION			MATERIAL						
Scale (m)	Water	Samples & Tests	Depth (m)	Graphic Log	Group Symbol	Description SOIL TYPE, colour, structure, minor components (origin) and ROCK TYPE, colour, grain size, structure, weathering, strength	Moisture Condition	Consistency / Relative Density	Comments Observations
1	GNE		0.05		ML	SILT, brown and pale yellow brown, rootlets	D	St	Topsoil
					CI-CH	CLAY with Cobbles, grey and brown, closely spaced fissure clay, trace tree roots up to 100mm in size, angular basalt cobble up to 110mm in size			Residual soil
			0.45			occasional/trace boulders up to 0.4m in size			
			0.60						
			0.70		CH	CLAY with sand, brown and pale grey, fine grained sand, pockets of calcium carbonate nodule up to 50mm in size, boulders density increasing, boulder up to 0.8m in size inclusions			
			1.50			Testpit terminated at 1.5m upon refusal on dense boulders Testpit backfilled with spoil upon completion			
2									
3									
4									

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TEST PIT LOG SHEET

Client : Places Victoria
Project : Taylors Lakes Development
Location : Taylors Lakes

TEST PIT No. TP04

SHEET 1 **OF** 1

Position : 303816.0 E,5825936.0 N	MGA	**Surface RL:** NA	**Pit Width:** 2.4	**Processed:** PS
Excavator : Cat-8 ton Excavator		**Contractor :** Southern Plant Hire	**Pit Length:** 0.65	**Checked:** JB
Date : 9/03/2015			**Logged by :** PS	**Date:** 16/3/16

EXCAVATION			MATERIAL						
Scale (m)	Water	Samples & Tests	Depth (m)	Graphic Log	Group Symbol	Description SOIL TYPE, colour, structure, minor components (origin) and ROCK TYPE, colour, grain size, structure, weathering, strength	Moisture Condition	Consistency / Relative Density	Comments Observations
1	GNE	Env(0.40m) D(0.65m)	0.05		ML	SILT,yellow brown,rootlets	D	St	Topsoil
					CI	CLAY, pale yellow brown to yellow brown, closely spaced fissure clay, trace fine tree roots up to 300mm in size			Residual soil
			0.50						
			0.60			fissure content decreasing			
					CH	CLAY with sand , pale yellow, grey orange, fine grained sand, calcium carbonate nodules up to 10mm in size			
			0.90						
			1.00			significant medium to coarse sized, moderately vesicular angular basalt gravel/cobbles inclusions, cobble up to 180mm in size		MD-D	
					GP	Cobble with clay, pale yellow grey, sub rounded to angular basalt cobbles up to 180-190mm in size			
			1.90						
2						Testpit terminated at 1.9m upon refusal on dense cobbles Testpit backfilled with spoil upon completion			
3									
4									

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TEST PIT LOG SHEET

Client : Places Victoria
Project : Taylors Lakes Development
Location : Taylors Lakes

TEST PIT No. TP05

SHEET 1 **OF** 1

Position : 303858.0 E,5825991.0 N	MGA	**Surface RL:** NA	**Pit Width:** 3.5	**Processed:** PS
Excavator : Cat-8 ton Excavator		**Contractor :** Southern Plant Hire	**Pit Length:** 0.6	**Checked:** JB
Date : 9/03/2015			**Logged by :** PS	**Date:** 16/3/16

EXCAVATION			MATERIAL						
Scale (m)	Water	Samples & Tests	Depth (m)	Graphic Log	Group Symbol	Description SOIL TYPE, colour, structure, minor components (origin) and ROCK TYPE, colour, grain size, structure, weathering, strength	Moisture Condition	Consistency / Relative Density	Comments Observations
1	GNE	B(0.3m)	0.05		ML	SILT, pale yellow brown, rootlets	D	St	Top soil
			0.30		CI-CL	CLAY, yellow brown to dark yellow brown, trace fine tree roots, closely spaced fissure clay	D- M		Residual soil
						significant sandy lens up to 70mm in size	M		
			0.60		CH	CLAY with sand, brown and grey, fine grained sand, trace calcium carbonate nodule up to 10-20mm in size		F-St	
			0.90			sand content decreased			
2			1.40			occasional/trace cobble up to 300 mm in size			
3			3.00			Testpit terminated at 3.0m Testpit backfilled with spoil upon completion			
4									

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TEST PIT LOG SHEET

Client : Places Victoria
Project : Taylors Lakes Development
Location : Taylors Lakes

TEST PIT No. TP06

SHEET 1 **OF** 1

Position :	303902.0 E,5826048.0 N MGA	**Surface RL:**	NA	**Pit Width:** 2.7	**Processed:** PS
Excavator :	Cat-8 ton Excavator	**Contractor :**	Southern Plant Hire	**Pit Length:** 0.55	**Checked:** JB
Date :	9/03/2015			**Logged by :** PS	**Date:** 16/3/16

EXCAVATION			MATERIAL						
Scale (m)	Water	Samples & Tests	Depth (m)	Graphic Log	Group Symbol	Description SOIL TYPE, colour, structure, minor components (origin) and ROCK TYPE, colour, grain size, structure, weathering, strength	Moisture Condition	Consistency / Relative Density	Comments Observations
		D(Env:0.3m)	0.05		ML	SILT, pale yellow brown, roolets	D	St	Topsoil
					CI	CLAY, pale yellow brown to yellow brown, closely spaced fissure clay, trace tree roots up to 80mm in size	D-M		Residual soil
			0.50		CH	fissure content decreasing, becoming highly plastic	M		
		D(Env:0.8m)	0.80						
			0.90		CH	CLAY with sand, pale yellow grey to grey, fine grained sand		F-St	
1			1.10			trace pockets of calcium carbonate nodule up to 40 mm in size			1
	GNE					becoming grey			
2									2
		PP:2.5m PP2.8/2.7/2.8 kg/cm^2						St	
3			3.00			Testpit terminated at 3.0m Testpit backfilled with spoil upon completion			3
4									4

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TEST PIT LOG SHEET

Client : Places Victoria
Project : Taylors Lakes Development
Location : Taylors Lakes

TEST PIT No. TP07

SHEET 1 **OF** 1

Position : 303912.0 E,5825892.0 N	MGA	**Surface RL:** NA	**Pit Width:** 2.7	**Processed:** PS
Excavator : Cat-8 ton Excavator		**Contractor :** Southern Plant Hire	**Pit Length:** 0.45	**Checked:** JB
Date : 9/03/2015			**Logged by :** PS	**Date:** 16/3/16

EXCAVATION			MATERIAL						
Scale (m)	Water	Samples & Tests	Depth (m)	Graphic Log	Group Symbol	Description SOIL TYPE, colour, structure, minor components (origin) and ROCK TYPE, colour, grain size, structure, weathering, strength	Moisture Condition	Consistency / Relative Density	Comments Observations
		B(0.35m)	0.05		ML	SILT, pale yellow brown, roolets	D	St	Topsoil
					CI-CH	CLAY, pale yellow brown to yellow brown, trace tree roots up to 70mm in size, closely spaced fissure	D-M		Residual soil
			0.80						
			0.90		CH	trace calcium carbonate nodule up to 20mm in size, fissure content decreased becoming highly plastic clay	M	F-St	
1	GNE	D(1.5m)							1
2			2.50			trace angular basalt cobbles up to 120mm in size			2
3			3.00			Testpit terminated at 3.0m Testpit backfilled with spoil upon completion			3
4									4

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TEST PIT LOG SHEET

Client : Places Victoria
Project : Taylors Lakes Development
Location : Taylors Lakes

TEST PIT No. TP08

SHEET 1 **OF** 1

Position : 303945.0 E,5825941.0 N	MGA	**Surface RL:** NA	**Pit Width:** 3.4	**Processed:** PS
Excavator : Cat-8 ton Excavator		**Contractor :** Southern Plant Hire	**Pit Length:** 0.45	**Checked:** JB
Date : 9/03/2015			**Logged by :** PS	**Date:** 16/3/16

EXCAVATION			MATERIAL						
Scale (m)	Water	Samples & Tests	Depth (m)	Graphic Log	Group Symbol	Description SOIL TYPE, colour, structure, minor components (origin) and ROCK TYPE, colour, grain size, structure, weathering, strength	Moisture Condition	Consistency / Relative Density	Comments Observations
			0.05		ML	SILT, pale yellow brown, rootlets	D	F-St	Topsoil
					CI	CLAY, pale yellow brown to yellow brown, trace fine tree roots up to 100mm in size, closely spaced fissure clay	D- M	St	
		D(Env:0.4m)	0.45			becoming yellow brown to brown, fissure content decreased			Residual soil
			0.80						
		D(0.85m)	0.85		CH	becoming highly plasticity clay			
1	GNE					becoming grey brown			
2									
3			3.00			Testpit terminated at 3.0m Testpit backfilled with spoil upon completion			
4									

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TEST PIT LOG SHEET

Client : Places Victoria
Project : Taylors Lakes Development
Location : Taylors Lakes

TEST PIT No. TP09

SHEET 1 **OF** 1

Position : 303985.0 E,5825992.0 N	MGA	**Surface RL:** NA	**Pit Width:** 3.2	**Processed:** PS
Excavator : Cat-8 ton Excavator		**Contractor :** Southern Plant Hire	**Pit Length:** 0.45	**Checked:** JB
Date : 9/03/2015			**Logged by :** PS	**Date:** 16/3/16

EXCAVATION			MATERIAL						
Scale (m)	Water	Samples & Tests	Depth (m)	Graphic Log	Group Symbol	Description SOIL TYPE, colour, structure, minor components (origin) and ROCK TYPE, colour, grain size, structure, weathering, strength	Moisture Condition	Consistency / Relative Density	Comments Observations
			0.05		ML	SILT, pale yellow brown, rootlets	D	St	Topsoil
					CI-CH	CLAY, yellow brown, trace tree roots up to 80mm in size, closely spaced fissure clay	D-M		
			0.50						
			0.60		CH	trace/occasional angular basalt, highly vesicular cobble up to 350mm in size			Residual soil
1	GNE	D(1.0m)				becoming highly plastic clay, grey brown, trace calcium carbonate nodule up to 50mm in size			1
2									2
3			3.00			Testpit terminated at 3.0m Testpit backfilled with spoil upon completion			3
4									4

See standard sheets for details of abbreviations & basis of descriptions

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Job No. **31/33682**

TEST PIT LOG SHEET

Client : Places Victoria
Project : Taylors Lakes Development
Location : Taylors Lakes

TEST PIT No. TP10

SHEET 1 **OF** 1

Position :	304008.0 E,5825898.0 N MGA	**Surface RL:**	NR	**Pit Width:** 2.6	**Processed:** PS
Excavator :	Cat-8 ton Excavator	**Contractor :**	Southern Plant Hire	**Pit Length:** 0.45	**Checked:** JB
Date :	9/03/2015			**Logged by :** PS	**Date:** 16/3/16

EXCAVATION			MATERIAL						
Scale (m)	Water	Samples & Tests	Depth (m)	Graphic Log	Group Symbol	Description SOIL TYPE, colour, structure, minor components (origin) and ROCK TYPE, colour, grain size, structure, weathering, strength	Moisture Condition	Consistency / Relative Density	Comments Observations
			0.05		ML	SILT, pale grey, rootlets	D	F-St	Top soil
					CH	CLAY, pale yellow brown to yellow brown, closely spaced fissure clay, trace tree roots up to 80mm in size	D-M	St	Residual soil
		B(0.4m)							
		D(0.6m)	0.50						
			0.60			occasional/ trace slightly vesicular angular basalt boulder up to 0.45m in size, fissured content decreased, trace nodule of calcium carbonate up to 20mm in size			
						becoming pale grey brown			
1			1.00			trace boulders up to 250mm in size			1
	GNE								
2									2
3			3.00			Testpit terminated at 3.0m Testpit backfiled with spoil upon completion			3
4									4

See standard sheets for details of abbreviations & basis of descriptions

GHD GEOTECHNICS
Lvl 8, 180 Lonsdale Street, Melbourne VIC 3000
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CONSULTING GEOTECHNICAL ENGINEERS AND GEOLOGISTS

Job No. 31/33682

GEO_TEST PIT 3133682_LOGS.GPJ GHD_GEO_TEMPLATE.GDT 26/3/16

Appendix B - (DCP Results)

DYNAMIC CONE PENETROMETER - RESULT SHEET AS1289.6.3.2

Client Places Victoria
Project Taylors Lakes Developemnt
Location Taylors Lakes
Operator PS
Date 9/03/2016
Job # 31/33682

Site # TP01
Location adjacent to TP01

Depth mm	Blows / 50 mm	Est CBR	Su kPa	Est q(all)
50	1	3.5	56	70
100	1	3.5	56	70
150	1.5	6	64	80
200	1.5	6	64	80
250	2.5	10	120	150
300	2.5	10	120	150
350	2	8	92	115
400	2	8	92	115
450	1.5	6	64	80
500	1.5	6	64	80
550	1.5	6	64	80
600	1.5	6	64	80
650	2	8	92	115
700	2	8	92	115
750	3	12	144	180
800	3	12	144	180
850	2.5	10	120	150
900	2.5	10	120	150
950	8	35	380	475
1000	Refusal	#N/A		
1050				
1100				
1150				
1200				
1250				
1300				
1350				
1400				
1450				
1500				

Site # TP03
Location adjacent to TP03

Depth mm	Blows / 50 mm	Est CBR	Su kPa	Est q(all)
50	2.5	10	120	150
100	2.5	10	120	150
150	3	12	144	180
200	3	12	144	180
250	15	50	480	600
300	Refusal	#N/A	#N/A	#N/A
350				
400				
450				
500				
550				
600				
650				
700				
750				
800				
850				
900				
950				
1000				
1050				
1100				
1150				
1200				
1250				
1300				
1350				
1400				
1450				
1500				

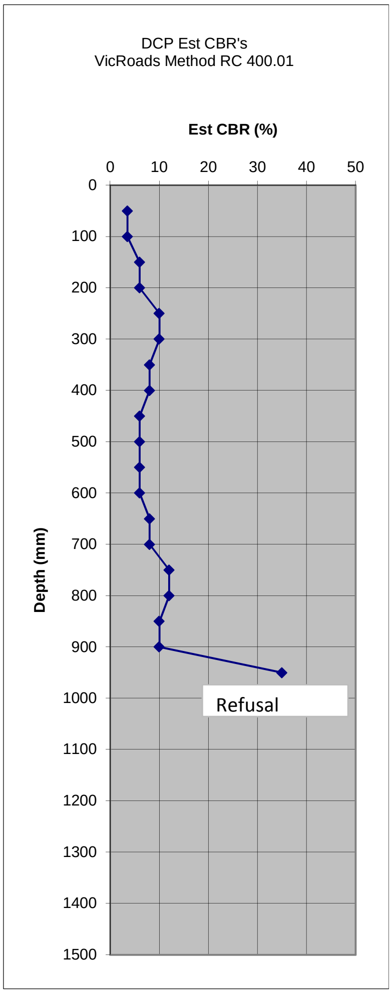
Site # TP04
Location adjacent to TP04

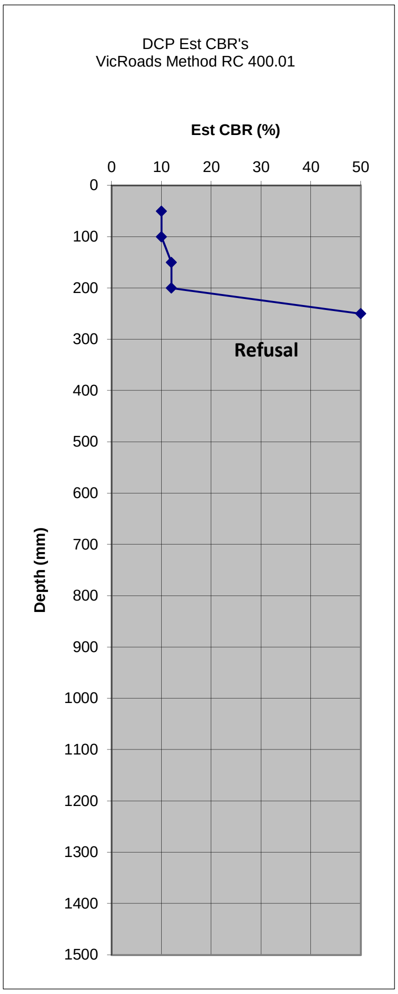
Depth mm	Blows / 50 mm	Est CBR	Su kPa	Est q(all)
50	2.5	10	120	150
100	2.5	10	120	150
150	7.5	30	360	450
200	7.5	30	360	450
250	5.5	20	264	330
300	5.5	20	264	330
350	6	25	288	360
400	6	25	288	360
450	3	12	144	180
500	3	12	144	180
550	3.5	12	176	220
600	3.5	12	176	220
650	3	12	144	180
700	3	12	144	180
750	3	12	144	180
800	3	12	144	180
850	15	50	480	600
900	Refusal			
950				
1000				
1050				
1100				
1150				
1200				
1250				
1300				
1350				
1400				
1450				
1500				

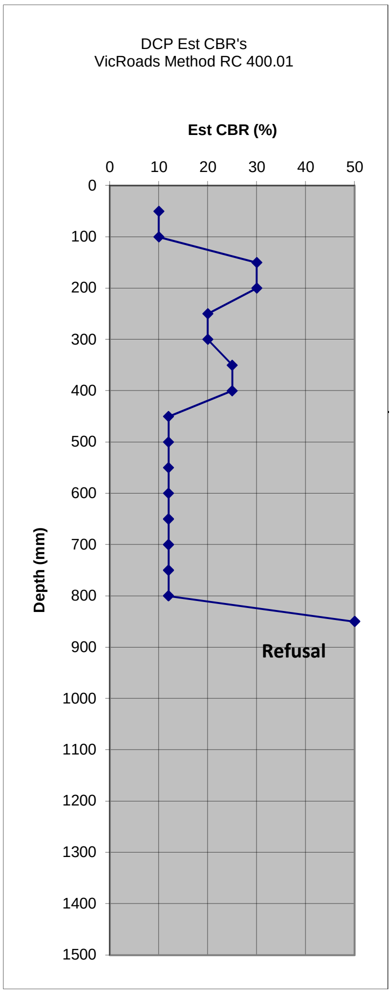
DYNAMIC CONE PENETROMETER - RESULT SHEET AS1289.6.3.2

Client	Places Victoria
Project	Taylors Lakes Developemnt
Location	Taylors Lakes
Operator	PS
Date	9/03/2016
Job #	31/33682

Site #	TP01	Site #	TP03	Site #	TP04
Location	adjacent to TP01	Location	adjacent to TP03	Location	adjacent to TP04







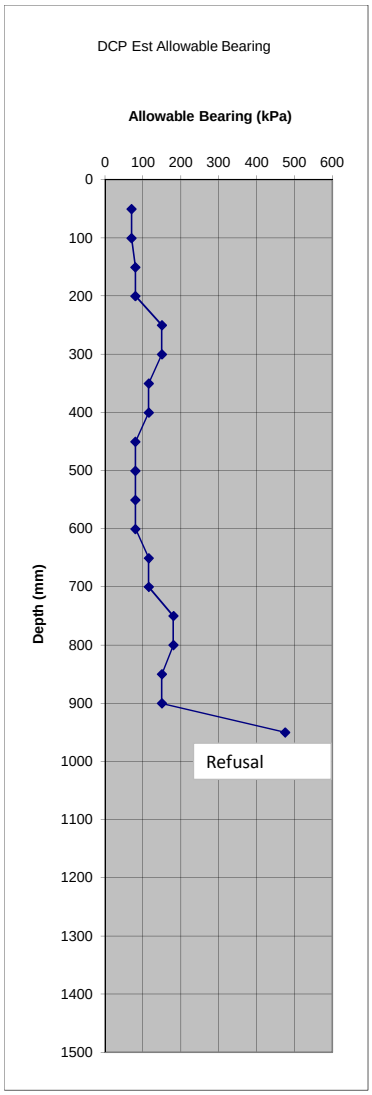
This method covers the calculation of the estimated California Bearing Ratio (CBR) of cohesive soils from the penetration results obtained using the dynamic cone penetrometer described in AS 1289.6.3.2

Caution: The CBR data derived using this method should be used with care and due consideration should be made of soil moisture condition at the time of the test in relation to that expected during service life of the pavement.

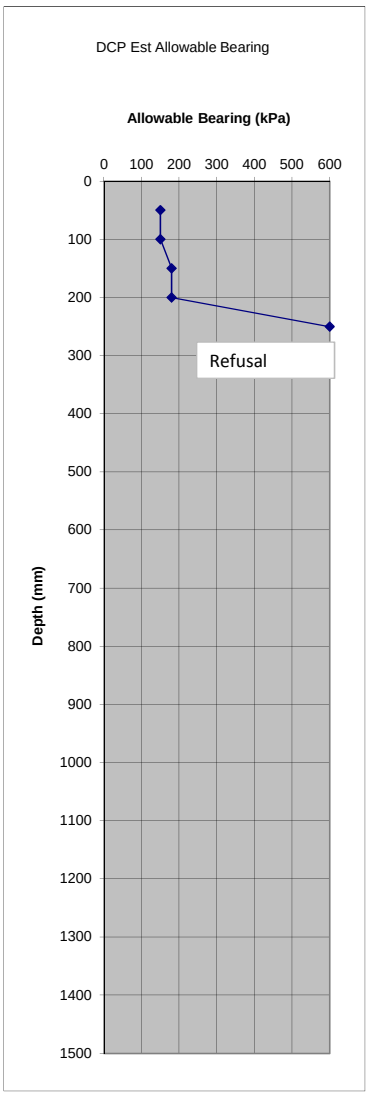
DYNAMIC CONE PENETROMETER - RESULT SHEET AS1289.6.3.2

Client	Places Victoria
Project	Taylors Lakes Developemnt
Location	Taylors Lakes
Operator	PS
Date	9/03/2016
Job #	31/33682

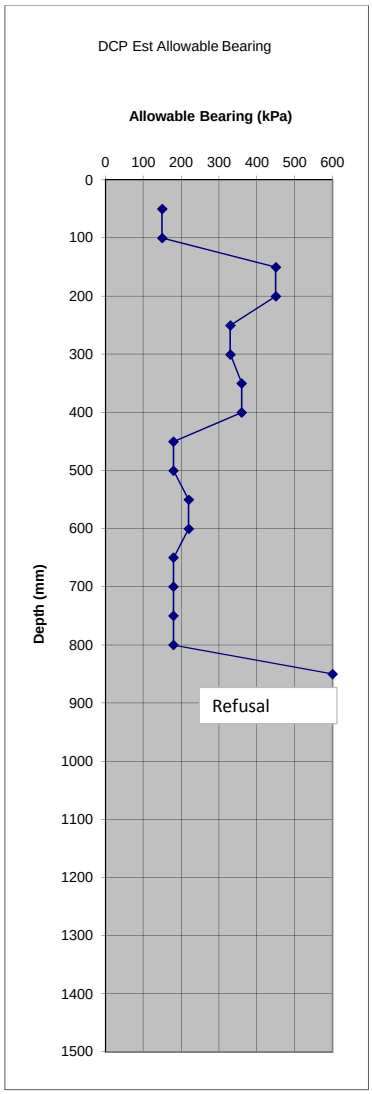
Site # TP01
Location adjacent to TP01



Site # TP03
Location adjacent to TP03



Site # TP04
Location adjacent to TP04



Approximate Cu = 0.8 x allowable bearing capacity.

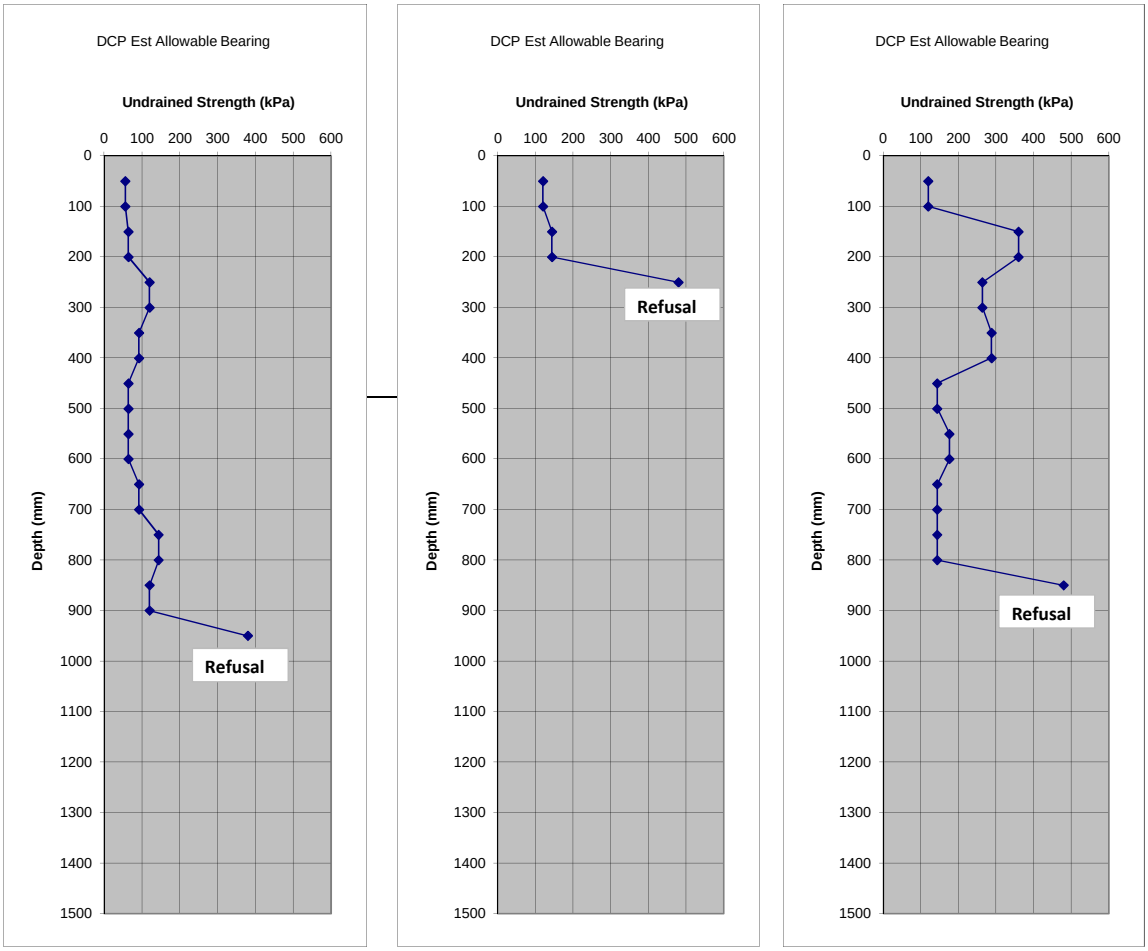
Caution: The Allowable Bearing derived using this method should be used with care and consideration should be made of soil moisture condition at the time of the test in relation to that expected during service life of the foundation.

Using DCP tests for determining soil strength and allowable bearing capacity is generally considered to be of limited applicability (Ref Campanella & Robertson, 1983).

DYNAMIC CONE PENETROMETER - RESULT SHEET AS1289.6.3.2

Client	Places Victoria
Project	Taylors Lakes Developemnt
Location	Taylors Lakes
Operator	PS
Date	9/03/2016
Job #	31/33682

Site #	TP01	Site #	TP03	Site #	TP04
Location	adjacent to TP01	Location	adjacent to TP03	Location	adjacent to TP04



Note: The Allowable Bearing Capacity data applies to cohesive soils only and is based on bearing capacity factor Nc = 5 and FOS = 4
Approximate Cu = 0.8 x allowable bearing capacity.

Caution: The Allowable Bearing derived using this method should be used with care and consideration should be made of soil moisture condition at the time of the test in relation to that expected during service life of the foundation.

Using DCP tests for determining soil strength and allowable bearing capacity is generally considered to be of limited applicability (Ref Campanella & Robertson, 1983).

DYNAMIC CONE PENETROMETER - RESULT SHEET AS1289.6.3.2

Client Places Victoria
Project Taylors Lakes Developemnt
Location Taylors Lakes
Operator PS
Date 9/03/2016
Job # 31/33682

Site # TP05
Location adjacent to TP05

Depth mm	Blows / 50 mm	Est CBR	Su kPa	Est q(all)
50	5	20	240	300
100	5	20	240	300
150	2	8	92	115
200	2	8	92	115
250	5	20	240	300
300	5	20	240	300
350	4	15	192	240
400	4	15	192	240
450	3	12	144	180
500	3	12	144	180
550	2.5	10	120	150
600	2.5	10	120	150
650	2	8	92	115
700	2	8	92	115
750	2	8	92	115
800	2	8	92	115
850	1.5	6	64	80
900	1.5	6	64	80
950	1.5	6	64	80
1000	1.5	6	64	80
1050	2	8	92	115
1100	2	8	92	115
1150	1.5	6	64	80
1200	1.5	6	64	80
1250	2	8	92	115
1300	2	8	92	115
1350	2	8	92	115
1400	2	8	92	115
1450	2	8	92	115
1500	2	8	92	115

Site # TP06
Location adjacent to TP06

Depth mm	Blows / 50 mm	Est CBR	Su kPa	Est q(all)
50	2.5	10	120	150
100	2.5	10	120	150
150	2	8	92	115
200	2	8	92	115
250	2.5	10	120	150
300	2.5	10	120	150
350	3	12	144	180
400	3	12	144	180
450	2.5	10	120	150
500	2.5	10	120	150
550	2.5	10	120	150
600	2.5	10	120	150
650	2.5	10	120	150
700	2.5	10	120	150
750	2.5	10	120	150
800	2.5	10	120	150
850	2.5	10	120	150
900	2.5	10	120	150
950	1.5	6	64	80
1000	1.5	6	64	80
1050	1.5	6	64	80
1100	1.5	6	64	80
1150	2	8	92	115
1200	2	8	92	115
1250	2	8	92	115
1300	2	8	92	115
1350	2	8	92	115
1400	2	8	92	115
1450	2	8	92	115
1500	2	8	92	115

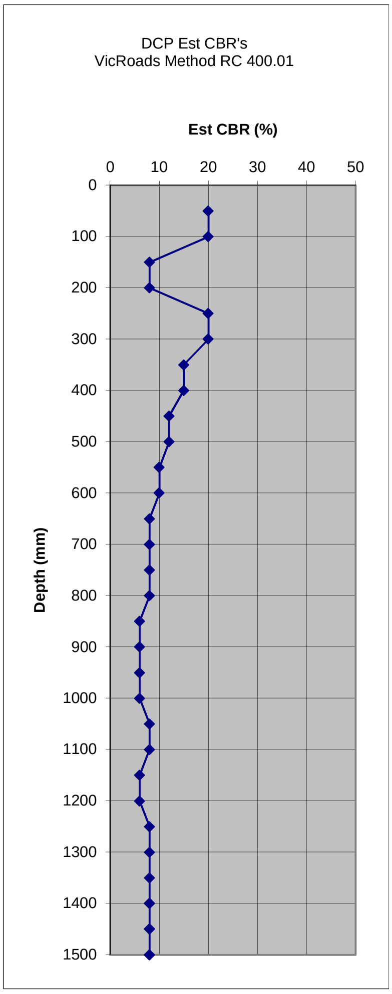
Site # TP07
Location adjacent to TP07

Depth mm	Blows / 50 mm	Est CBR	Su kPa	Est q(all)
50	4.5	15	216	270
100	4.5	15	216	270
150	4	15	192	240
200	4	15	192	240
250	5.5	20	264	330
300	5.5	20	264	330
350	5.5	20	264	330
400	5.5	20	264	330
450	4	15	192	240
500	4	15	192	240
550	3	12	144	180
600	3	12	144	180
650	2.5	10	120	150
700	2.5	10	120	150
750	2.5	10	120	150
800	2.5	10	120	150
850	1.5	6	64	80
900	1.5	6	64	80
950	2	8	92	115
1000	2	8	92	115
1050	2	8	92	115
1100	2	8	92	115
1150	2	8	92	115
1200	2	8	92	115
1250	2	8	92	115
1300	2	8	92	115
1350	2	8	92	115
1400	2	8	92	115
1450	2	8	92	115
1500	2	8	92	115

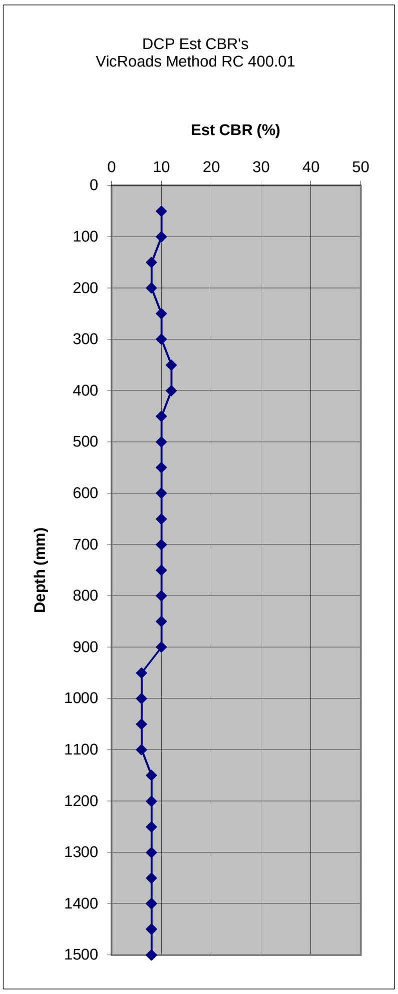
DYNAMIC CONE PENETROMETER - RESULT SHEET AS1289.6.3.2

Client	Places Victoria
Project	Taylors Lakes Developemnt
Location	Taylors Lakes
Operator	PS
Date	9/03/2016
Job #	31/33682

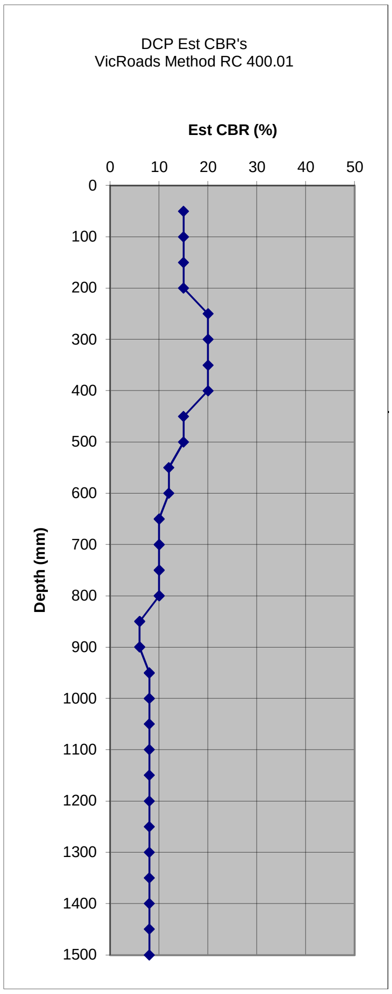
Site # TP05
Location adjacent to TP05



Site # TP06
Location adjacent to TP06



Site # TP07
Location adjacent to TP07



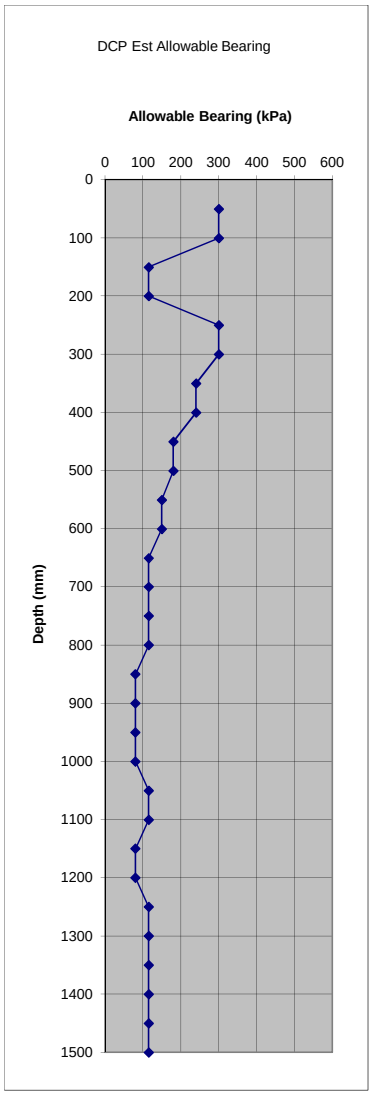
This method covers the calculation of the estimated California Bearing Ratio (CBR) of cohesive soils from the penetration results obtained using the dynamic cone penetrometer described in AS 1289.6.3.2

Caution: The CBR data derived using this method should be used with care and due consideration should be made of soil moisture condition at the time of the test in relation to that expected during service life of the pavement.

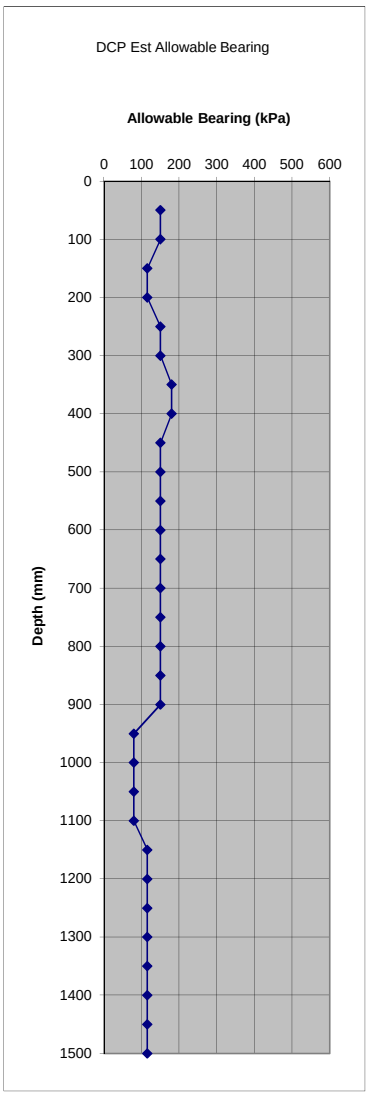
DYNAMIC CONE PENETROMETER - RESULT SHEET AS1289.6.3.2

Client	Places Victoria
Project	Taylors Lakes Developemnt
Location	Taylors Lakes
Operator	PS
Date	9/03/2016
Job #	31/33682

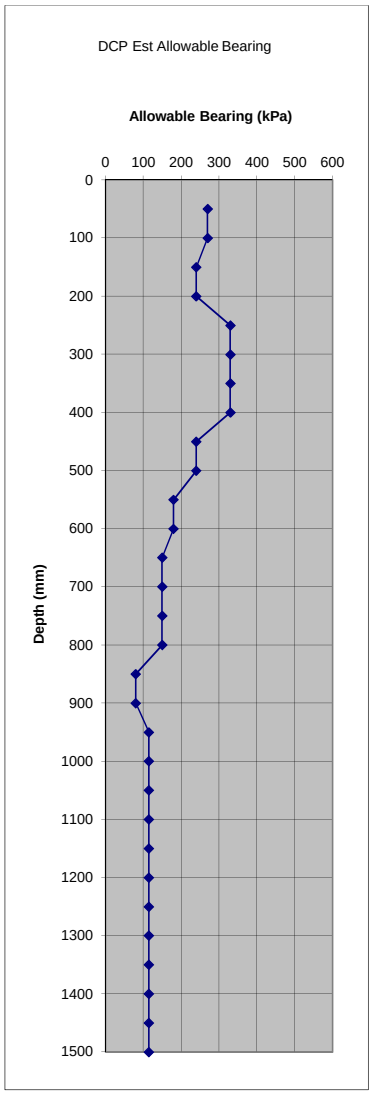
Site # TP05
Location adjacent to TP05



Site # TP06
Location adjacent to TP06



Site # TP07
Location adjacent to TP07



Approximate Cu = 0.8 x allowable bearing capacity.

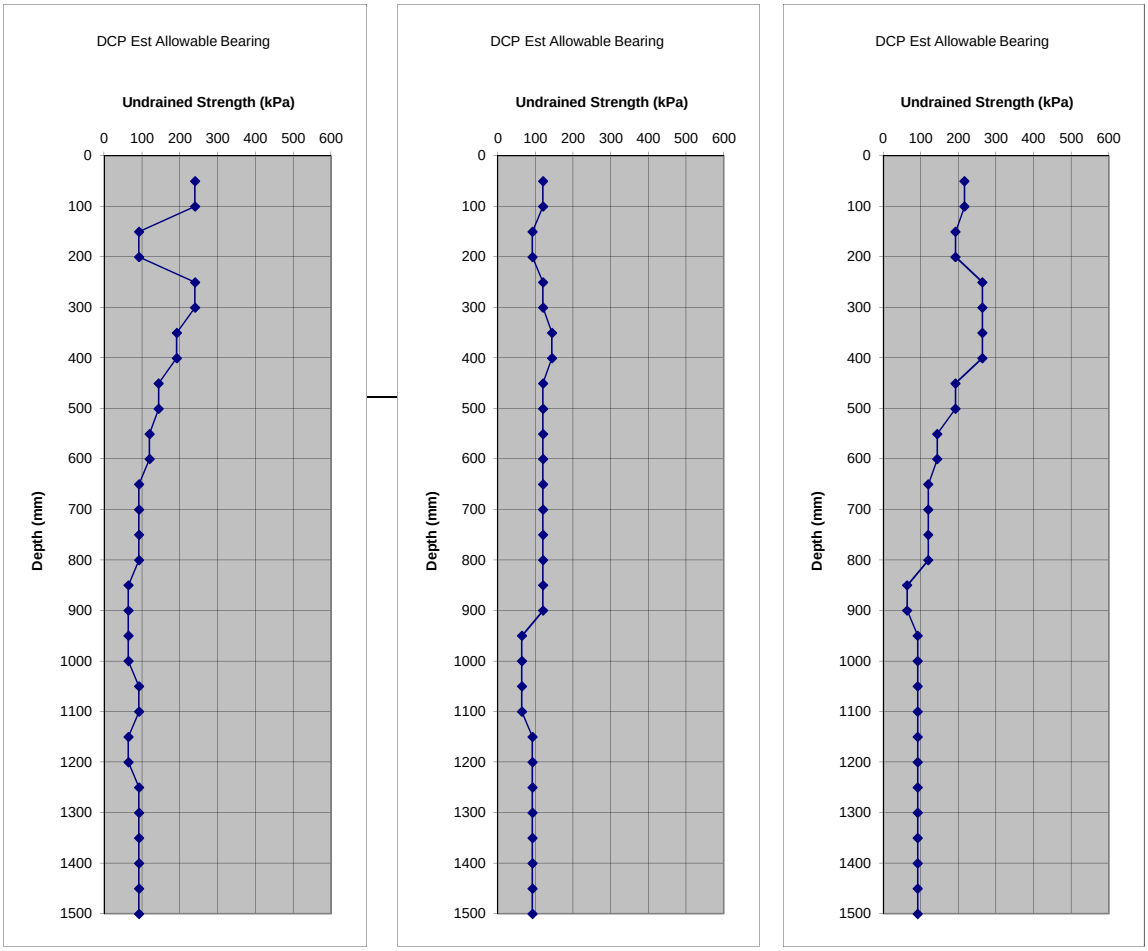
Caution: The Allowable Bearing derived using this method should be used with care and consideration should be made of soil moisture condition at the time of the test in relation to that expected during service life of the foundation.

Using DCP tests for determining soil strength and allowable bearing capacity is generally considered to be of limited applicability (Ref Campanella & Robertson, 1983).

DYNAMIC CONE PENETROMETER - RESULT SHEET AS1289.6.3.2

Client	Places Victoria
Project	Taylors Lakes Developemnt
Location	Taylors Lakes
Operator	PS
Date	9/03/2016
Job #	31/33682

Site #	TP05	Site #	TP06	Site #	TP07
Location	adjacent to TP05	Location	adjacent to TP06	Location	adjacent to TP07



Note: The Allowable Bearing Capacity data applies to cohesive soils only and is based on bearing capacity factor Nc = 5 and FOS = 4
Approximate Cu = 0.8 x allowable bearing capacity.

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DYNAMIC CONE PENETROMETER - RESULT SHEET AS1289.6.3.2

Client Places Victoria
Project Taylors Lakes Developemnt
Location Taylors Lakes
Operator PS
Date 9/03/2016
Job # 31/33682

Site # TP08
Location adjacent to TP08

Depth mm	Blows / 50 mm	Est CBR	Su kPa	Est q(all)
50	4	15	192	240
100	4	15	192	240
150	4.5	15	216	270
200	4.5	15	216	270
250	4	15	192	240
300	4	15	192	240
350	3.5	12	176	220
400	3.5	12	176	220
450	1.5	6	64	80
500	1.5	6	64	80
550	1.5	6	64	80
600	1.5	6	64	80
650	1.5	6	64	80
700	1.5	6	64	80
750	1.5	6	64	80
800	1.5	6	64	80
850	1.5	6	64	80
900	1.5	6	64	80
950	1.5	6	64	80
1000	1.5	6	64	80
1050	1.5	6	64	80
1100	1.5	6	64	80
1150	2	8	92	115
1200	2	8	92	115
1250	1.5	6	64	80
1300	1.5	6	64	80
1350	1.5	6	64	80
1400	1.5	6	64	80
1450	2	8	92	115
1500	2	8	92	115

Site # TP09
Location adjacent to TP09

Depth mm	Blows / 50 mm	Est CBR	Su kPa	Est q(all)
50	5	20	240	300
100	5	20	240	300
150	2.5	10	120	150
200	2.5	10	120	150
250	2	8	92	115
300	2	8	92	115
350	1.5	6	64	80
400	1.5	6	64	80
450	1	3.5	56	70
500	1	3.5	56	70
550	1	3.5	56	70
600	1	3.5	56	70
650	1.5	6	64	80
700	1.5	6	64	80
750	1.5	6	64	80
800	1.5	6	64	80
850	1.5	6	64	80
900	1.5	6	64	80
950	1	3.5	56	70
1000	1	3.5	56	70
1050	1.5	6	64	80
1100	1.5	6	64	80
1150	1.5	6	64	80
1200	1.5	6	64	80
1250	1.5	6	64	80
1300	1.5	6	64	80
1350	1.5	6	64	80
1400	1.5	6	64	80
1450	1.5	6	64	80
1500	1.5	6	64	80

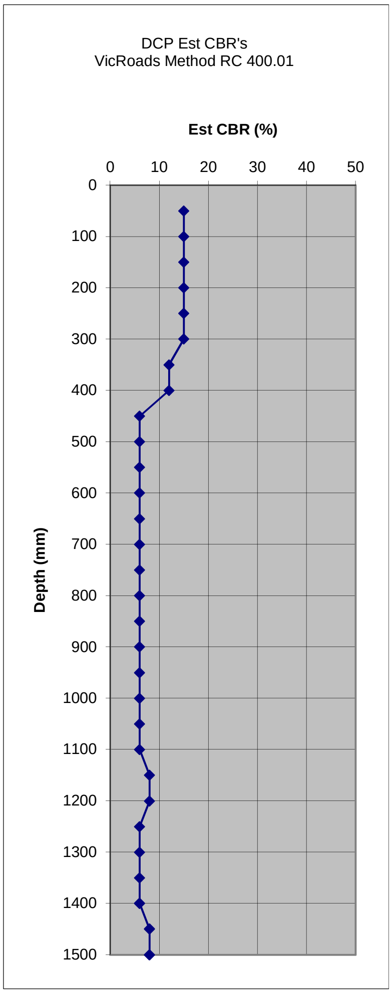
Site # TP10
Location adjacent to TP10

Depth mm	Blows / 50 mm	Est CBR	Su kPa	Est q(all)
50	6.5	25	312	390
100	6.5	25	312	390
150	4	15	192	240
200	4	15	192	240
250	5	20	240	300
300	5	20	240	300
350	3.5	12	176	220
400	3.5	12	176	220
450	3	12	144	180
500	3	12	144	180
550	2	8	92	115
600	2	8	92	115
650	2	8	92	115
700	2	8	92	115
750	2	8	92	115
800	2	8	92	115
850	2	8	92	115
900	2	8	92	115
950	2	8	92	115
1000	2	8	92	115
1050	2	8	92	115
1100	2	8	92	115
1150	1.5	6	64	80
1200	1.5	6	64	80
1250	1.5	6	64	80
1300	1.5	6	64	80
1350	1.5	6	64	80
1400	1.5	6	64	80
1450	2	8	92	115
1500	2	8	92	115

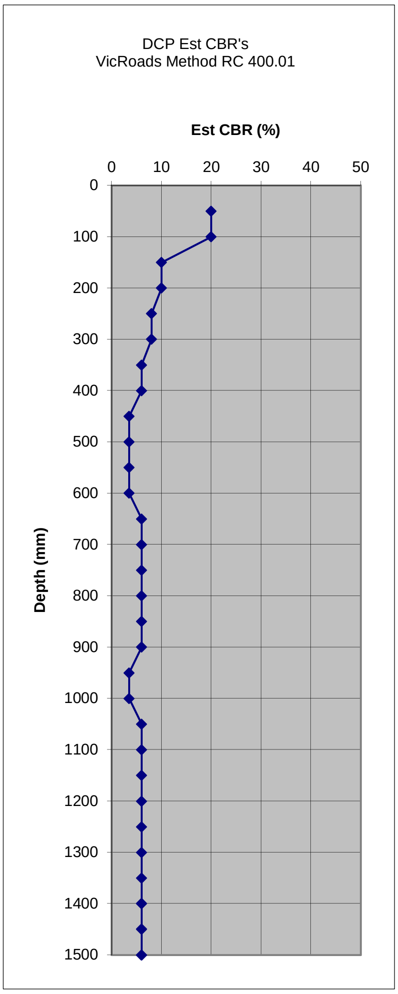
DYNAMIC CONE PENETROMETER - RESULT SHEET AS1289.6.3.2

Client	Places Victoria
Project	Taylors Lakes Developemnt
Location	Taylors Lakes
Operator	PS
Date	9/03/2016
Job #	31/33682

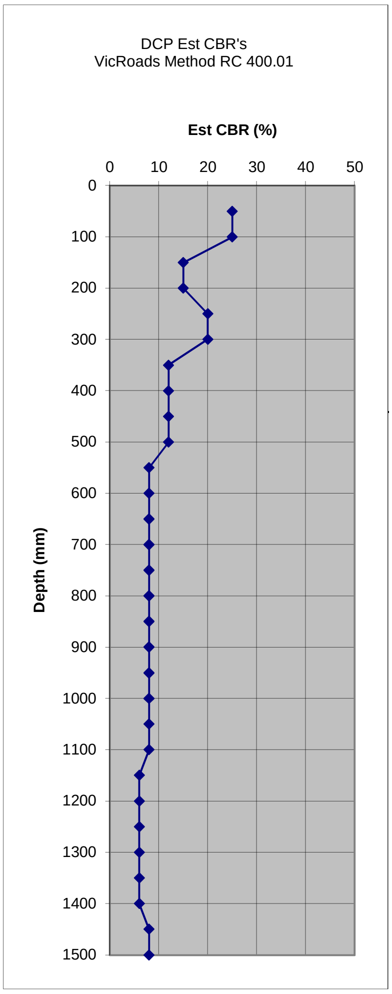
Site # TP08
Location adjacent to TP08



Site # TP09
Location adjacent to TP09



Site # TP10
Location adjacent to TP10



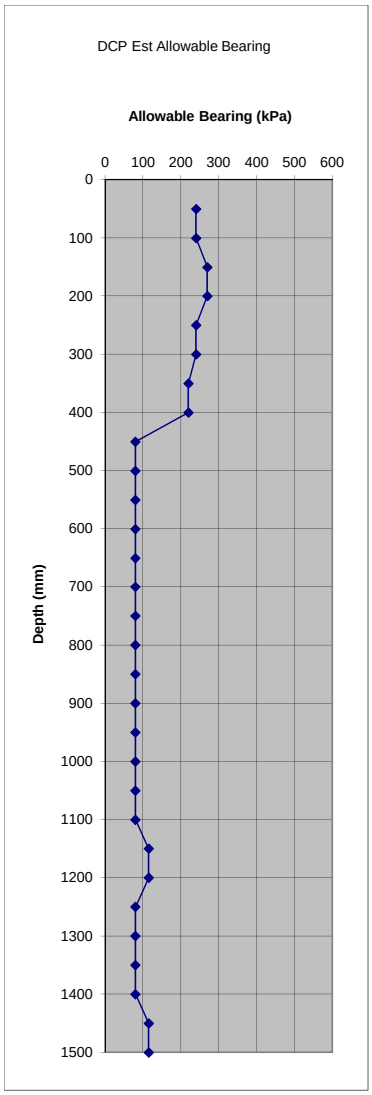
This method covers the calculation of the estimated California Bearing Ratio (CBR) of cohesive soils from the penetration results obtained using the dynamic cone penetrometer described in AS 1289.6.3.2

Caution: The CBR data derived using this method should be used with care and due consideration should be made of soil moisture condition at the time of the test in relation to that expected during service life of the pavement.

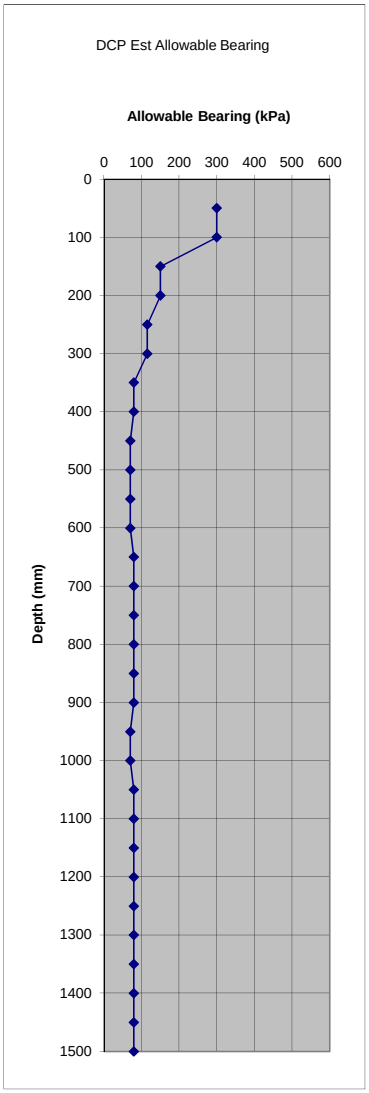
DYNAMIC CONE PENETROMETER - RESULT SHEET AS1289.6.3.2

Client	Places Victoria
Project	Taylors Lakes Developemnt
Location	Taylors Lakes
Operator	PS
Date	9/03/2016
Job #	31/33682

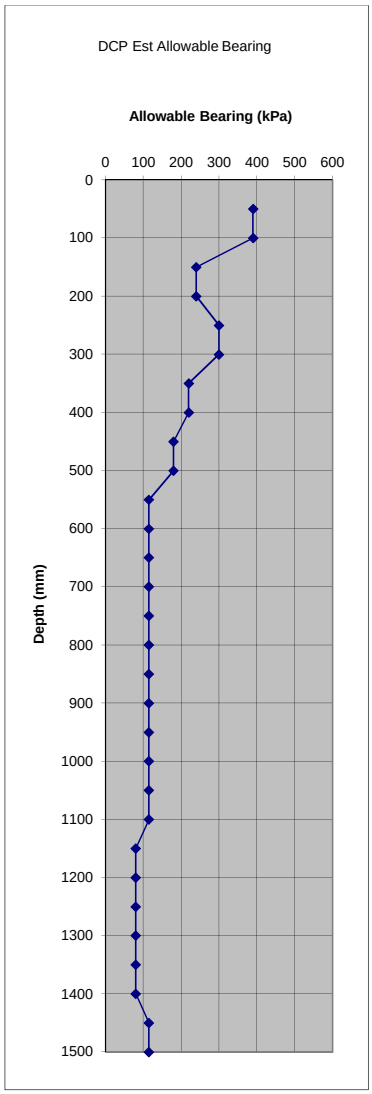
Site # TP08
Location adjacent to TP08



Site # TP09
Location adjacent to TP09



Site # TP10
Location adjacent to TP10



Approximate Cu = 0.8 x allowable bearing capacity.

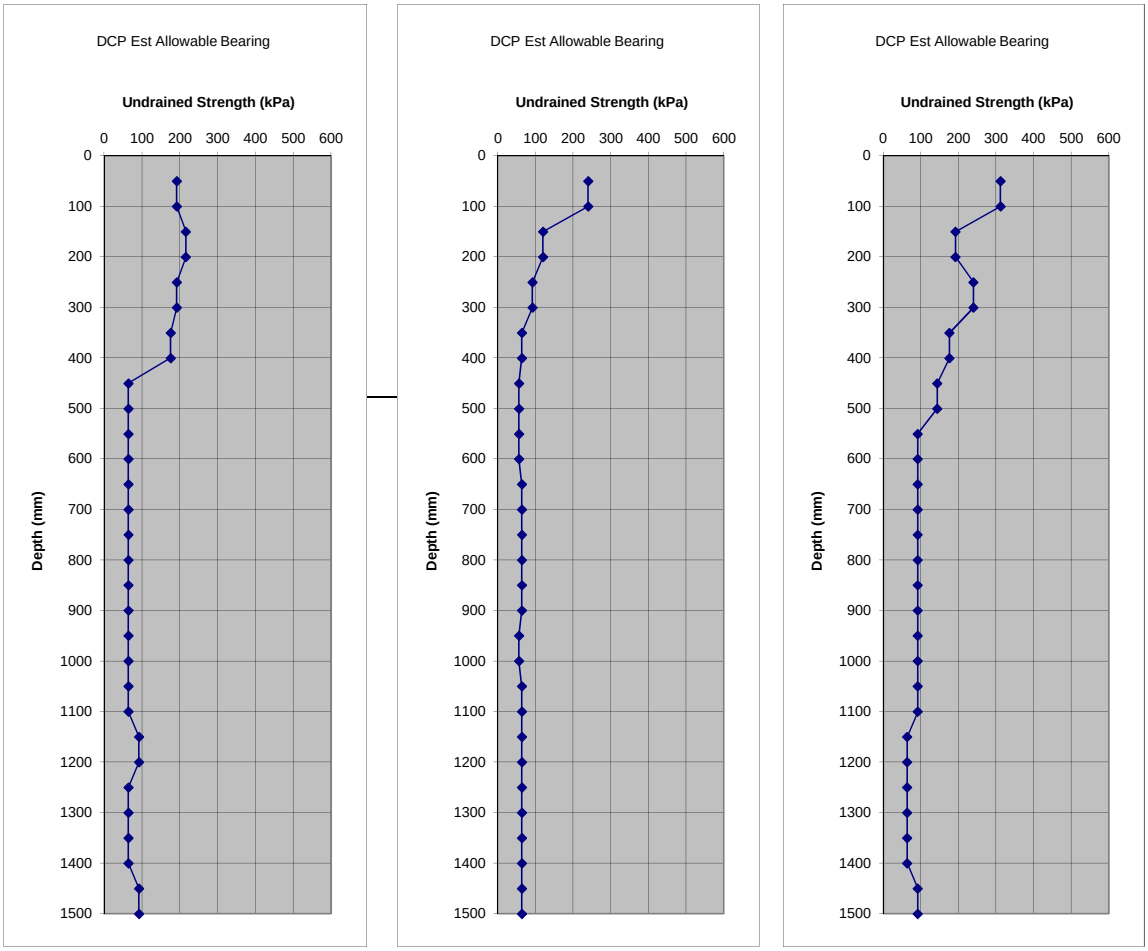
Caution: The Allowable Bearing derived using this method should be used with care and consideration should be made of soil moisture condition at the time of the test in relation to that expected during service life of the foundation.

Using DCP tests for determining soil strength and allowable bearing capacity is generally considered to be of limited applicability (Ref Campanella & Robertson, 1983).

DYNAMIC CONE PENETROMETER - RESULT SHEET AS1289.6.3.2

Client	Places Victoria
Project	Taylors Lakes Developemnt
Location	Taylors Lakes
Operator	PS
Date	9/03/2016
Job #	31/33682

Site #	TP08	Site #	TP09	Site #	TP10
Location	adjacent to TP08	Location	adjacent to TP09	Location	adjacent to TP10



Note: The Allowable Bearing Capacity data applies to cohesive soils only and is based on bearing capacity factor Nc = 5 and FOS = 4
Approximate Cu = 0.8 x allowable bearing capacity.

Caution: The Allowable Bearing derived using this method should be used with care and consideration should be made of soil moisture condition at the time of the test in relation to that expected during service life of the foundation.

Using DCP tests for determining soil strength and allowable bearing capacity is generally considered to be of limited applicability (Ref Campanella & Robertson, 1983).

Appendix C - (Geotechnical Laboratory Testing Certificates)

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Aggregate/Soil Test Report

Report No: TRA1600400
Issue No: 1
This report replaces all previous issues of report no 'TRA1600400'.

Client: Places Victoria

Project: Taylors Lakes Development

Accredited for compliance with ISO / IEC 17025

NATA Accredited Laboratory Number: 4092

Approved Signatory: Matt Smith (Assistant Laboratory Manager)

Date of Issue: 24/03/2016

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Sample Details

GHD Sample No	TRA16-0339-01
Date Sampled	11/03/2016
Sampled By	Sampled by GHD
BH / TP No.	TP01
Depth (m)	0.3m
Soil Description	CLAY (CH)

Test Results

Description	Method	Result	Limits
Finer 75µm (%)	AS 1141.12	95	
Drying Method		Oven	
Moisture Content (%)	AS 1289.2.1.1	28.9	
Sample History	AS 1289.1.1	Oven-dried	
Preparation	AS 1289.1.1	Dry Sieved	
Linear Shrinkage (%)	AS 1289.3.4.1	25.0	
Mould Length (mm)		249.9	
Crumbling		No	
Curling		Yes	
Cracking		No	
Liquid Limit (%)	AS 1289.3.1.2	89	
Method		One Point	
Plastic Limit (%)	AS 1289.3.2.1	24	
Plasticity Index (%)	AS 1289.3.3.1	65	
Standard Maximum Dry Density (t/m³)	AS 1289.5.1.1	1.41	
Standard Optimum Moisture Content (%)		31.0	
Oversize Sieve (mm)			
Oversize Material (%)			
Compactive Effort		Standard	
CBR At 2.5mm (%)	AS 1289.6.1.1	**1.5**	
Maximum Dry Density (t/m³)		1.41	
Optimum Moisture Content (%)		30.9	
Dry Density before Soaking (t/m³)		1.34	
Density Ratio before Soaking (%)		95	
Moisture Content before Soaking (%)		31.3	
Moisture Ratio before Soaking (%)		101	
Dry Density after Soaking (t/m³)		1.27	
Density Ratio after Soaking (%)		90	
Swell (%)		5.5	

Comments

N/A

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Aggregate/Soil Test Report

Report No: TRA1600400
Issue No: 1
This report replaces all previous issues of report no 'TRA1600400'.

Client: Places Victoria

Project: Taylors Lakes Development

Accredited for compliance with ISO / IEC 17025

NATA Accredited Laboratory Number: 4092

Approved Signatory: Matt Smith (Assistant Laboratory Manager)

Date of Issue: 24/03/2016

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Sample Details

GHD Sample No	TRA16-0339-01
Date Sampled	11/03/2016
Sampled By	Sampled by GHD
BH / TP No.	TP01
Depth (m)	0.3m
Soil Description	CLAY (CH)

Test Results

Description	Method	Result	Limits
Moisture Content of Top 30mm (%)		53.9	
Moisture Content of Remaining Depth (%)		36.0	
Compactive Effort		Standard	
Surcharge Mass (kg)		5.50	
Period of Soaking (Days)		4	
Oversize Material (%)		0.0	

Comments

N/A

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Aggregate/Soil Test Report

Report No: TRA1600399
Issue No: 1
This report replaces all previous issues of report no 'TRA1600399'.

Client: Places Victoria

Project: Taylors Lakes Development

Accredited for compliance with ISO / IEC 17025

NATA Accredited Laboratory Number: 4092

Approved Signatory: Matt Smith (Assistant Laboratory Manager)

Date of Issue: 24/03/2016

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Sample Details

GHD Sample No	TRA16-0339-06
Date Sampled	11/03/2016
Sampled By	Sampled by GHD
BH / TP No.	TP10
Depth (m)	0.4m
Soil Description	CLAY (CH)

Test Results

Description	Method	Result	Limits
Finer 75µm (%)	AS 1141.12	96	
Drying Method		Oven	
Moisture Content (%)	AS 1289.2.1.1	23.4	
Sample History	AS 1289.1.1	Oven-dried	
Preparation	AS 1289.1.1	Dry Sieved	
Linear Shrinkage (%)	AS 1289.3.4.1	23.5	
Mould Length (mm)		249.5	
Crumbling		No	
Curling		Yes	
Cracking		No	
Liquid Limit (%)	AS 1289.3.1.2	80	
Method		One Point	
Plastic Limit (%)	AS 1289.3.2.1	22	
Plasticity Index (%)	AS 1289.3.3.1	58	
Standard Maximum Dry Density (t/m³)	AS 1289.5.1.1	1.44	
Standard Optimum Moisture Content (%)		28.0	
Oversize Sieve (mm)			
Oversize Material (%)			
Compactive Effort		Standard	

Comments

N/A

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Aggregate/Soil Test Report

Report No: TRA1600398
Issue No: 1
This report replaces all previous issues of report no 'TRA1600398'.

Client: Places Victoria

Project: Taylors Lakes Development

Accredited for compliance with ISO / IEC 17025

NATA Accredited Laboratory Number: 4092

Approved Signatory: Matt Smith (Assistant Laboratory Manager)

Date of Issue: 24/03/2016

THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL

Sample Details

GHD Sample No	TRA16-0339-05
Date Sampled	11/03/2016
Sampled By	Sampled by GHD
BH / TP No.	TP08
Depth (m)	0.85m
Soil Description	CLAY (CH)

Test Results

Description	Method	Result	Limits
Finer 75µm (%)	AS 1141.12	95	
Drying Method		Oven	
Moisture Content (%)	AS 1289.2.1.1	25.5	
Sample History	AS 1289.1.1	Oven-dried	
Preparation	AS 1289.1.1	Dry Sieved	
Linear Shrinkage (%)	AS 1289.3.4.1	21.0	
Mould Length (mm)		250	
Crumbling		No	
Curling		No	
Cracking		Yes	
Liquid Limit (%)	AS 1289.3.1.2	79	
Method		One Point	
Plastic Limit (%)	AS 1289.3.2.1	17	
Plasticity Index (%)	AS 1289.3.3.1	62	

Comments

N/A

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Aggregate/Soil Test Report

Report No: TRA1600397
Issue No: 1
This report replaces all previous issues of report no 'TRA1600397'.

Client: Places Victoria

Project: Taylors Lakes Development

Accredited for compliance with ISO / IEC 17025

NATA Accredited Laboratory Number: 4092

Approved Signatory: Matt Smith (Assistant Laboratory Manager)

Date of Issue: 24/03/2016

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Sample Details

GHD Sample No	TRA16-0339-04
Date Sampled	11/03/2016
Sampled By	Sampled by GHD
BH / TP No.	TP07
Depth (m)	0.35m
Soil Description	CLAY (CH)

Test Results

Description	Method	Result	Limits
Finer 75µm (%)	AS 1141.12	95	
Drying Method		Oven	
Moisture Content (%)	AS 1289.2.1.1	21.9	
Sample History	AS 1289.1.1	Oven-dried	
Preparation	AS 1289.1.1	Dry Sieved	
Linear Shrinkage (%)	AS 1289.3.4.1	20.5	
Mould Length (mm)		254.2	
Crumbling		No	
Curling		Yes	
Cracking		No	
Liquid Limit (%)	AS 1289.3.1.2	71	
Method		One Point	
Plastic Limit (%)	AS 1289.3.2.1	18	
Plasticity Index (%)	AS 1289.3.3.1	53	
Standard Maximum Dry Density (t/m³)	AS 1289.5.1.1	1.51	
Standard Optimum Moisture Content (%)		23.5	
Oversize Sieve (mm)			
Oversize Material (%)			
Compactive Effort		Standard	
CBR At 2.5mm (%)	AS 1289.6.1.1	1.0	
Maximum Dry Density (t/m³)		1.51	
Optimum Moisture Content (%)		23.7	
Dry Density before Soaking (t/m³)		1.42	
Density Ratio before Soaking (%)		94	
Moisture Content before Soaking (%)		24.5	
Moisture Ratio before Soaking (%)		103	
Dry Density after Soaking (t/m³)		1.34	
Density Ratio after Soaking (%)		89	
Swell (%)		6.0	

Comments

N/A

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Aggregate/Soil Test Report

Report No: TRA1600397
Issue No: 1
This report replaces all previous issues of report no 'TRA1600397'.

Client: Places Victoria

Project: Taylors Lakes Development

Accredited for compliance with ISO / IEC 17025

NATA Accredited Laboratory Number: 4092

Approved Signatory: Matt Smith (Assistant Laboratory Manager)

Date of Issue: 24/03/2016

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Sample Details

GHD Sample No	TRA16-0339-04
Date Sampled	11/03/2016
Sampled By	Sampled by GHD
BH / TP No.	TP07
Depth (m)	0.35m
Soil Description	CLAY (CH)

Test Results

Description	Method	Result	Limits
Moisture Content of Top 30mm (%)		50.1	
Moisture Content of Remaining Depth (%)		31.2	
Compactive Effort		Standard	
Surcharge Mass (kg)		5.50	
Period of Soaking (Days)		4	
Oversize Material (%)		0.0	

Comments

N/A

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Aggregate/Soil Test Report

Report No: TRA1600396
Issue No: 1
This report replaces all previous issues of report no 'TRA1600396'.

Client: Places Victoria

Project: Taylors Lakes Development

Accredited for compliance with ISO / IEC 17025

NATA Accredited Laboratory Number: 4092

Approved Signatory: Matt Smith (Assistant Laboratory Manager)

Date of Issue: 24/03/2016

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Sample Details

GHD Sample No	TRA16-0339-03
Date Sampled	11/03/2016
Sampled By	Sampled by GHD
BH / TP No.	TP05
Depth (m)	0.3m
Soil Description	Clayey SAND (SC)

Test Results

Description	Method	Result	Limits
Finer 75µm (%)	AS 1141.12	41	
Drying Method		Oven	
Moisture Content (%)	AS 1289.2.1.1	22.2	
Sample History	AS 1289.1.1	Oven-dried	
Preparation	AS 1289.1.1	Dry Sieved	
Linear Shrinkage (%)	AS 1289.3.4.1	20.5	
Mould Length (mm)		250	
Crumbling		No	
Curling		Yes	
Cracking		No	
Liquid Limit (%)	AS 1289.3.1.2	73	
Method		One Point	
Plastic Limit (%)	AS 1289.3.2.1	20	
Plasticity Index (%)	AS 1289.3.3.1	53	
Standard Maximum Dry Density (t/m³)	AS 1289.5.1.1	1.48	
Standard Optimum Moisture Content (%)		25.0	
Oversize Sieve (mm)			
Oversize Material (%)			
Compactive Effort		Standard	
CBR At 2.5mm (%)	AS 1289.6.1.1	1.5	
Maximum Dry Density (t/m³)		1.48	
Optimum Moisture Content (%)		24.8	
Dry Density before Soaking (t/m³)		1.40	
Density Ratio before Soaking (%)		95	
Moisture Content before Soaking (%)		25.3	
Moisture Ratio before Soaking (%)		102	
Dry Density after Soaking (t/m³)		1.32	
Density Ratio after Soaking (%)		90	
Swell (%)		5.5	

Comments

N/A

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Aggregate/Soil Test Report

Report No: TRA1600396
Issue No: 1
This report replaces all previous issues of report no 'TRA1600396'.

Client: Places Victoria

Project: Taylors Lakes Development

Accredited for compliance with ISO / IEC 17025

NATA Accredited Laboratory Number: 4092

Approved Signatory: Matt Smith (Assistant Laboratory Manager)

Date of Issue: 24/03/2016

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Sample Details

GHD Sample No	TRA16-0339-03
Date Sampled	11/03/2016
Sampled By	Sampled by GHD
BH / TP No.	TP05
Depth (m)	0.3m
Soil Description	Clayey SAND (SC)

Test Results

Description	Method	Result	Limits
Moisture Content of Top 30mm (%)		50.5	
Moisture Content of Remaining Depth (%)		28.9	
Compactive Effort		Standard	
Surcharge Mass (kg)		5.50	
Period of Soaking (Days)		4	
Oversize Material (%)		0.0	

Comments

N/A

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Aggregate/Soil Test Report

Report No: TRA1600395
Issue No: 1
This report replaces all previous issues of report no 'TRA1600395'.

Client: Places Victoria

Project: Taylors Lakes Development

Accredited for compliance with ISO / IEC 17025

NATA Accredited Laboratory Number: 4092

Approved Signatory: Matt Smith (Assistant Laboratory Manager)

Date of Issue: 24/03/2016

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Sample Details

GHD Sample No	TRA16-0339-02
Date Sampled	11/03/2016
Sampled By	Sampled by GHD
BH / TP No.	TP04
Depth (m)	0.65m
Soil Description	CLAY with Sand (CH)

Test Results

Description	Method	Result	Limits
Finer 75µm (%)	AS 1141.12	83	
Drying Method		Oven	
Moisture Content (%)	AS 1289.2.1.1	21.9	
Sample History	AS 1289.1.1	Air	
Preparation	AS 1289.1.1	Dry Sieved	
Linear Shrinkage (%)	AS 1289.3.4.1	19.5	
Mould Length (mm)		249.9	
Crumbling		No	
Curling		No	
Cracking		Yes	
Liquid Limit (%)	AS 1289.3.1.2	82	
Method		One Point	
Plastic Limit (%)	AS 1289.3.2.1	19	
Plasticity Index (%)	AS 1289.3.3.1	63	

Comments

N/A

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California Bearing Ratio Test Report

Report No: CBR:TRA16-0339-04
Issue No: 1
This report replaces all previous issues of report no 'CBR:TRA16-0339-04'.

Client: Places Victoria

Project: Taylors Lakes Development

Accredited for compliance with ISO / IEC 17025

NATA Accredited Laboratory Number: 4092

Approved Signatory: Matt Smith (Assistant Laboratory Manager)

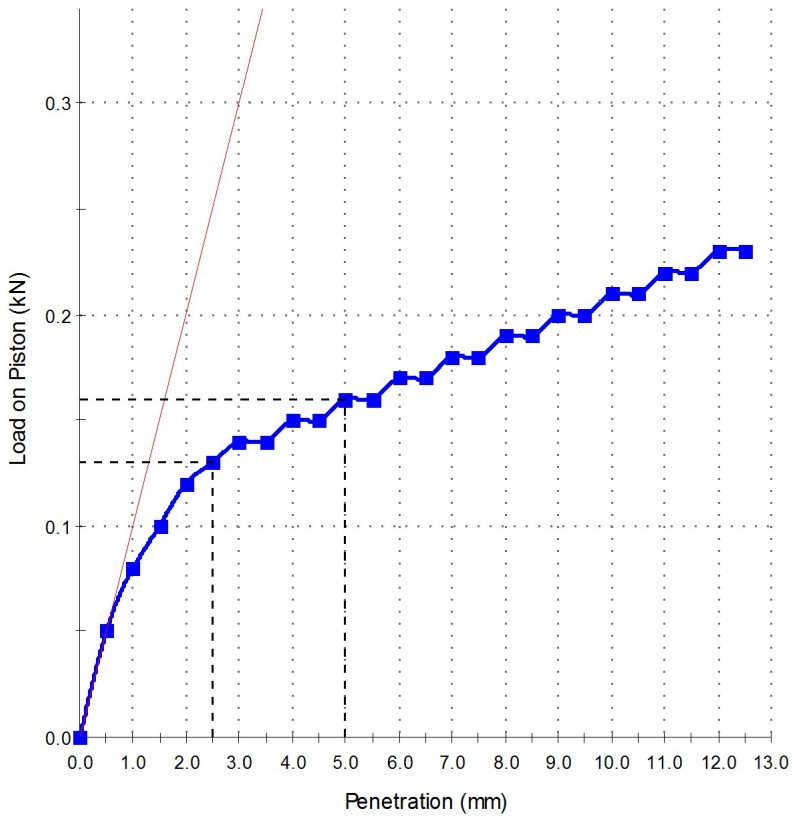
Date of Issue: 24/03/2016

THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL

Sample Details

GHD Sample No:	TRA16-0339-04	Client Sample ID:	
Date Sampled:	11/03/2016	Sampled By:	Sampled by GHD
Location:		BH /TP No:	TP07
Date Tested:		Depth (m):	0.35m
Sample Description:	CLAY (CH)		

Load vs Penetration



Test Results

AS 1289.6.1.1

CBR At 2.5mm (%):	1.0
Maximum Dry Density (t/m³):	1.51
Optimum Moisture Content (%):	23.7
Dry Density before Soaking (t/m³):	1.42
Density Ratio before Soaking (%):	94
Moisture Content before Soaking (%):	24.5
Moisture Ratio before Soaking (%):	103
Dry Density after Soaking (t/m³):	1.34
Density Ratio after Soaking (%):	89
Swell (%):	6.0
Moisture Content of Top 30mm (%):	50.1
Moisture Content of Remaining Depth (%):	31.2
Compactive Effort:	Standard
Surcharge Mass (kg):	5.50
Period of Soaking (Days):	4
Oversize Material (%):	0.0

Comments

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California Bearing Ratio Test Report

Report No: CBR:TRA16-0339-03
Issue No: 1
This report replaces all previous issues of report no 'CBR:TRA16-0339-03'.

Client: Places Victoria

Project: Taylors Lakes Development

Accredited for compliance with ISO / IEC 17025

NATA Accredited Laboratory Number: 4092

Approved Signatory: Matt Smith (Assistant Laboratory Manager)

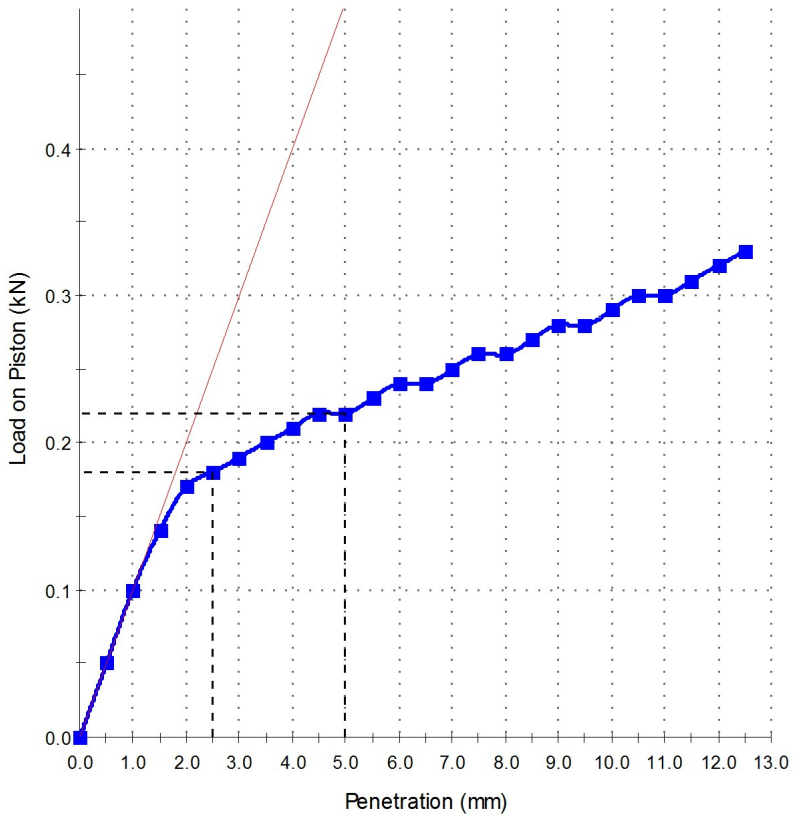
Date of Issue: 24/03/2016

THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL

Sample Details

GHD Sample No:	TRA16-0339-03	Client Sample ID:	
Date Sampled:	11/03/2016	Sampled By:	Sampled by GHD
Location:		BH /TP No:	TP05
Date Tested:		Depth (m):	0.3m
Sample Description:	Clayey SAND (SC)		

Load vs Penetration



Test Results

AS 1289.6.1.1

CBR At 2.5mm (%):	1.5
Maximum Dry Density (t/m³):	1.48
Optimum Moisture Content (%):	24.8
Dry Density before Soaking (t/m³):	1.40
Density Ratio before Soaking (%):	95
Moisture Content before Soaking (%):	25.3
Moisture Ratio before Soaking (%):	102
Dry Density after Soaking (t/m³):	1.32
Density Ratio after Soaking (%):	90
Swell (%):	5.5
Moisture Content of Top 30mm (%):	50.5
Moisture Content of Remaining Depth (%):	28.9
Compactive Effort:	Standard
Surcharge Mass (kg):	5.50
Period of Soaking (Days):	4
Oversize Material (%):	0.0

Comments

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California Bearing Ratio Test Report

Report No: CBR:TRA16-0339-01
Issue No: 1
This report replaces all previous issues of report no 'CBR:TRA16-0339-01'.

Client: Places Victoria

Project: Taylors Lakes Development

Accredited for compliance with ISO / IEC 17025

NATA Accredited Laboratory Number: 4092

Approved Signatory: Matt Smith (Assistant Laboratory Manager)

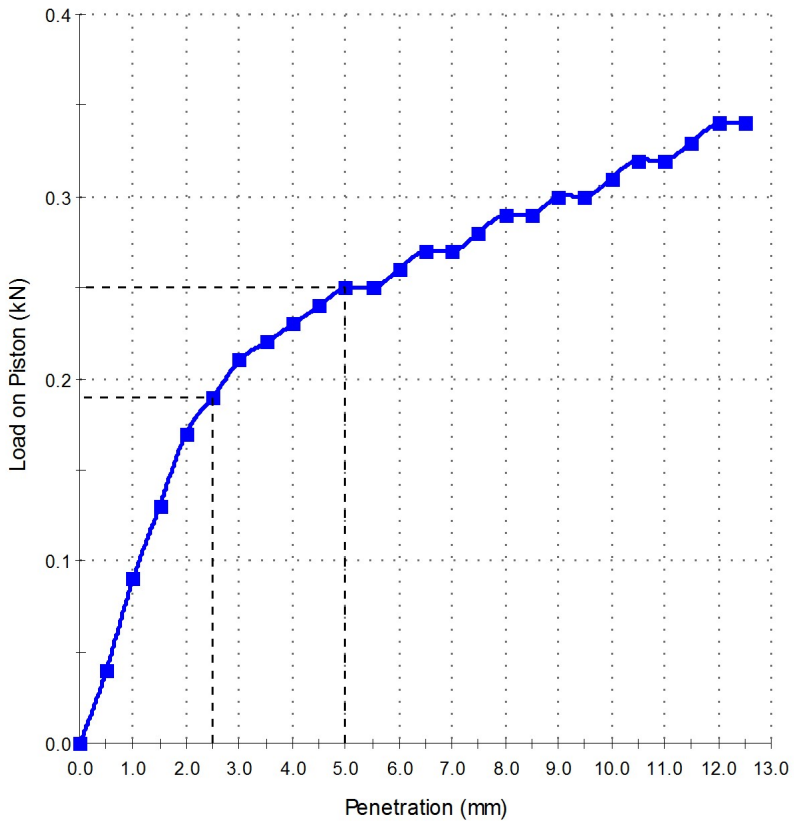
Date of Issue: 24/03/2016

THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL

Sample Details

GHD Sample No:	TRA16-0339-01	Client Sample ID:	
Date Sampled:	11/03/2016	Sampled By:	Sampled by GHD
Location:		BH /TP No:	TP01
Date Tested:		Depth (m):	0.3m
Sample Description:	CLAY (CH)		

Load vs Penetration



Test Results

AS 1289.6.1.1

CBR At 2.5mm (%):	1.5
Maximum Dry Density (t/m³):	1.41
Optimum Moisture Content (%):	30.9
Dry Density before Soaking (t/m³):	1.34
Density Ratio before Soaking (%):	95
Moisture Content before Soaking (%):	31.3
Moisture Ratio before Soaking (%):	101
Dry Density after Soaking (t/m³):	1.27
Density Ratio after Soaking (%):	90
Swell (%):	5.5
Moisture Content of Top 30mm (%):	53.9
Moisture Content of Remaining Depth (%):	36.0
Compactive Effort:	Standard
Surcharge Mass (kg):	5.50
Period of Soaking (Days):	4
Oversize Material (%):	0.0

Comments

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NATA REPORT # TRA16-0339-03

Report page 1 of 1

Lab. No:	3	Client:	Places Victoria	Sampled:	GHD
Operator:	MS	Project:	Taylors Lake Development	Material:	Clayey SAND (SC)
Started:	24/3/2016	Location:	TP05 - 0.3m		

Issued By: R Smith

Date: 30.3.16.

TEST SUMMARY

Shrink-Swell Index (Iss) %	Shrinkage (Esh) %	Swell (Esw) %	Shrink Moisture Content %	Swell Moisture Content %	Estimated % of Significant inert inclusions %
5.3	7.2	4.8	28.5	28.5	0%

TEST METHODS

AS 1289.7.1.1
AS 1289.2.1.1

NATA Accredited for compliance with ISO/IEC 17025. Accreditation No 4092
ACCREDITED FOR TECHNICAL COMPETENCE

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NATA REPORT # TRA16-0339-04

Lab. No:	4	Client:	Places Victoria	Sampled:	GHD
Operator:	MS	Project:	Taylors Lake Development	Material:	CLAY (CH)
Started:	24/3/2016	Location:	TP07 - 0.35m		

Issued By: R Smith

Date: 30.3.16

TEST SUMMARY

Shrink-Swell Index (Iss) %	Shrinkage (Esh) %	Swell (Esw) %	Shrink Moisture Content %	Swell Moisture Content %	Estimated % of Significant inert inclusions %
5.0	6.2	5.8	26.1	26.1	0%

TEST METHODS

AS 1289.7.1.1
AS 1289.2.1.1

NATA Accredited for compliance with ISO/IEC 17025. Accreditation No 4092
ACCREDITED FOR TECHNICAL COMPETENCE

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NATA REPORT # TRA16-0339-06

Lab. No:	6	Client:	Places Victoria	Sampled:	GHD
Operator:	MS	Project:	Taylors Lake Development	Material:	CLAY (CH)
Started:	24/3/2016	Location:	TP10 - 0.4m		

Issued By: R Smith

Date: 30.3.16.

TEST SUMMARY

Shrink-Swell Index (Iss) %	Shrinkage (Esh) %	Swell (Esw) %	Shrink Moisture Content %	Swell Moisture Content %	Estimated % of Significant inert inclusions %
6.5	10.8	1.8	33.0	33.0	0%

TEST METHODS

AS 1289.7.1.1
AS 1289.2.1.1

NATA Accredited for compliance with ISO/IEC 17025. Accreditation № 4092
ACCREDITED FOR TECHNICAL COMPETENCE

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Appendix D - (Environment Laboratory Testing Certificates)

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Certificate of Analysis

GHD Melbourne
Level 8, 180 Lonsdale St
Melbourne
VIC 3000

NATA Accredited
Accreditation Number 1261
Site Number 1254

Accredited for compliance with ISO/IEC 17025.
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

Attention: **Pushpinder Singh**

Report **492579-S**
Project name TAYLORS LAKES DEVELOPMENT
Project ID 31/33682
Received Date Mar 10, 2016

Client Sample ID			**TP04@0.4M**	**TP08@0.4M**
Sample Matrix			**Soil**	**Soil**
Eurofins | mgt Sample No.			**M16-Ma11186**	**M16-Ma11187**
Date Sampled			**Mar 09, 2016**	**Mar 09, 2016**
Test/Reference	LOR	Unit		
Chloride	5	mg/kg	620	880
Conductivity (1:5 aqueous extract at 25°C)	10	uS/cm	510	1100
pH (1:5 Aqueous extract)	0.1	pH Units	7.9	8.4
Sulphate (as S)	10	mg/kg	42	110
% Moisture	1	%	15	20

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.
A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results (regarding both quality and NATA accreditation).

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Chloride	Melbourne	Mar 11, 2016	28 Day
- Method: MGT 1100A			
Conductivity (1:5 aqueous extract at 25°C)	Melbourne	Mar 15, 2016	7 Day
- Method: LTM-INO-4030			
pH (1:5 Aqueous extract)	Melbourne	Mar 15, 2016	7 Day
- Method: LTM-GEN-7090 pH in soil by ISE			
Sulphate (as S)	Melbourne	Mar 11, 2016	28 Day
- Method: In house MGT1110A (SO4 by Discrete Analyser)			
% Moisture	Melbourne	Mar 11, 2016	14 Day
- Method: LTM-GEN-7080 Moisture			

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Site # 1254 & 14271

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NATA # 1261 Site # 20794

Company Name: GHD Pty Ltd VIC
Address: Level 8, 180 Lonsdale St
Melbourne
VIC 3000

Project Name: TAYLORS LAKES DEVELOPMENT
Project ID: 31/33682

Order No.:
Report #: 492579
Phone: 8687 8000
Fax: 8687 8111

Received: Mar 10, 2016 4:03 PM
Due: Mar 18, 2016
Priority: 5 Day
Contact Name: Pushpinder Singh

Eurofins | mgt Client Manager: Mary Makarios

Sample Detail					Chloride	Conductivity (1:5 aqueous extract at 25°C)	pH (1:5 Aqueous extract)	Sulphate (as S)	Moisture Set
Laboratory where analysis is conducted									
Melbourne Laboratory - NATA Site # 1254 & 14271					X	X	X	X	X
Sydney Laboratory - NATA Site # 18217									
Brisbane Laboratory - NATA Site # 20794									
External Laboratory									
Sample ID	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**					
TP04@0.4M	Mar 09, 2016		Soil	M16-Ma11186	X	X	X	X	X
TP08@0.4M	Mar 09, 2016		Soil	M16-Ma11187	X	X	X	X	X

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil results are reported on a dry basis, unless otherwise stated.
3. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
4. Results are uncorrected for matrix spikes or surrogate recoveries.
5. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
6. Samples were analysed on an 'as received' basis. 7. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the Sample Receipt Advice.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per Kilogram

ug/l: micrograms per litre

ppb: Parts per billion

org/100ml: Organisms per 100 millilitres

MPN/100mL: Most Probable Number of organisms per 100 millilitres

mg/l: milligrams per litre

ppm: Parts per million

%: Percentage

NTU: Nephelometric Turbidity Units

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery
CRM	Certified Reference Material - reported as percent recovery
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands. In the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
Batch Duplicate	A second piece of analysis from a sample outside of the clients batch of samples but run within the laboratory batch of analysis.
Batch SPIKE	Spike recovery reported on a sample from outside of the clients batch of samples but run within the laboratory batch of analysis.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
ASLP	Australian Standard Leaching Procedure (Eurofins | mgt uses NATA accredited in-house method LTM-GEN-7010)
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries : Recoveries must lie between 50-150% - Phenols 20-130%.

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling.Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " -" in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Chloride	mg/kg	< 5			5	Pass	
Conductivity (1:5 aqueous extract at 25°C)	uS/cm	< 10			10	Pass	
Sulphate (as S)	mg/kg	< 10			10	Pass	
LCS - % Recovery							
Chloride	%	97			70-130	Pass	
Sulphate (as S)	%	113			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
				Result 1					
Sulphate (as S)	M16-Ma12404	NCP	%	102			70-130	Pass	
Spike - % Recovery									
				Result 1					
Chloride	M16-Ma11187	CP	%	81			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1	Result 2	RPD	Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
				Result 1	Result 2	RPD			
Chloride	M16-Ma11186	CP	mg/kg	620	650	4.3	30%	Pass	
Conductivity (1:5 aqueous extract at 25°C)	S16-Ma10039	NCP	uS/cm	73	78	6.0	30%	Pass	
pH (1:5 Aqueous extract)	M16-Ma11016	NCP	pH Units	7.7	7.8	pass	30%	Pass	
Sulphate (as S)	M16-Ma11059	NCP	mg/kg	65	92	34	30%	Fail	Q15
% Moisture	M16-Ma11067	NCP	%	11	11	1.0	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	No
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
Q15	The RPD reported passes Eurofins | mgt's QC - Acceptance Criteria as defined in the Internal Quality Control Review and Glossary page of this report.

Authorised By

Mary Makarios	Analytical Services Manager
Emily Rosenberg	Senior Analyst-Metal (VIC)
Huong Le	Senior Analyst-Inorganic (VIC)

Glenn Jackson
National Operations Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Uncertainty data is available on request

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Document Status

Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	P Singh	C Eldridge		C Eldridge		01/04/16

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