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REPORT
on
PRELIMINARY GEOTECHNICAL INVESTIGATION

PROPOSED INDUSTRIAL DEVELOPMENT
HOXTON PARK AIRPORT

Prepared for
MIRVAC GROUP

Project 71500.01
January 2010

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The Association of Consulting Engineers Australia

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GSY:aj
Project 71500.01
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REPORT ON PRELIMINARY GEOTECHNICAL INVESTIGATION
PROPOSED INDUSTRIAL DEVELOPMENT
HOXTON PARK AIRPORT

1. INTRODUCTION

This report presents the results of a preliminary geotechnical investigation undertaken by Douglas Partners Pty Ltd (DP) for the construction of two bulky goods warehouse with associated infrastructure, at Hoxton Park Airport.

The geotechnical investigation was carried out to provide preliminary information on subsurface conditions for conceptual design and planning of earthworks, foundations and pavements. The field work for the investigation included site inspection and the drilling of ten bores. Details are given in the report together with comments relating to geotechnical design and construction practice.

DP also undertook a contamination assessment concurrently with this geotechnical investigation. Results of the assessment are reported separately.

A geotechnical report covering the site was prepared by URS Australia Pty Ltd in May 2005 to assess the geotechnical characteristics of the existing soils for overall development planning purposes. This involved the excavation of 18 test pits and drilling of six boreholes. Reference was made to this previous report in preparation of the present report.

2. SITE DESCRIPTION AND GEOLOGY

The Hoxton Park Airport is located off Cowpasture Road, West Hoxton, NSW. The entire airport covers approximately 816 ha. The currently proposed development covers the southern portion of the West Hoxton Airport, with a land area of approximately 40 ha. The general extent of the site is presented in Drawing 1 in Appendix A.

The site comprises the entrance road, taxiway and runway, all sealed with asphalt pavement; aircraft hangar buildings and office buildings and a service station. The portion of the site located to the east of the runway, i.e. the riparian zone along the Hinchinbrook Creek alignment, comprises heavily vegetated land and is not intended to be developed.

In the proposed area of development, surface levels fall to the south by about 5 m over a length of approximately 800 m.

The site, located to the east of M7 motorway, is surrounded by residential developments to the north, east and south. On the other side of M7 are agricultural lands.

Reference to the Penrith 1:100 000 Geological Series Sheet indicates that the site is underlain by Tertiary fluvial deposits comprising medium grained sand, clay and silt. The site is close to a geological boundary with Bringelly Shale which typically comprises shale, carbonaceous claystone, laminite, fine to medium grained lithic sandstone.

3. FIELD WORK

3.1 Methods

The field work for the geotechnical assessment included the drilling of ten boreholes (Bores GW2A, GW3A, GW4A, GW5A, GW6, GW7, GW8, 20, 21 and 22) within the subject site. The bores were originally to be drilled for contamination assessment purposes and were extended to rock for geotechnical purposes. Consequently, the numbering of the bores is unusual for geotechnical bores.

The bores were initially drilled using a 110 mm diameter spiral flight auger or rotary wash boring to depths of between 7.1 m and 8.8 m, with Standard penetration tests (SPTs) carried out in the soils at regular depth intervals. The bores were subsequently cased then extended into the underlying bedrock to depths of between 9.4 m and 10.6 m using NMLC diamond coring.

Diamond core drilling recovered 50 mm diameter samples of rock strata. The strength of the cored bedrock was assessed by examination of the recovered rock cores and laboratory Point Load Strength Index ($Is_{(50)}$) tests. Further details of the methods and procedures employed in the investigation are presented in the Notes Relating to this Report, included in Appendix B.

The locations of the bores are shown on Drawing 1 in Appendix A.

The ground surface levels at each test location were interpolated from the survey plan of the site (Reference: Lean & Haywood Pty Ltd, Hoxton Park Airport Redevelopment, Drawing No. 77221.01M05).

3.2 Results

The results of field work are included in Appendix B of this report. The ground conditions encountered at the bores at the site were relatively consistent and are summarised as follows:

FILLING grey and brown silty clay and shale filling was encountered up to depths between 0.3 m and 0.9 m. This material was underlain by

SILTY CLAY Stiff to very stiff brown silty clay to depths between 3.5 m to 7.0 m; underlain by

GRAVELLY CLAY very stiff brown gravelly clay in Bores GW2A, GW3A, GW4A, GW6, GW7, GW8, 20, 21 and 22 to depths between 6.8 m to 8.4 m; underlain by

SILTSTONE extremely low to very low strength shale/siltstone. In most bores, there was an increase in strength with depth with the siltstone becoming medium or high strength at depths of between 7.1 m and 9.6 m. In three bores, (Bores GW2A, GW4A and 21) the recovered cores did not

indicate any significant uniform increase in rock strength with depth over the 2 m length of core.

Schematic cross-sections through the bores are shown on Drawings 2 and 3. Test bores and cross-sections locations are shown on Drawing 1.

Subsurface conditions encountered in the bores and detailed above were similar to those described in the URS report, except that the silty clay layer was described as filling in the URS report.

Free groundwater was observed in most bores at depths ranging from 2.0 m to 6.0 m or between RL 32.8 to RL 38.0. This is similar to the URS investigation in 2005 which generally encountered groundwater at depths between 2.0 m and 3.0 m.

4. COMMENTS

4.1 Proposed Development

It is understood that the proposed development will comprise the construction of a two large warehouses with associated infrastructure. Preliminary column working loads are estimated by the engineer to be of the order of 150 - 250 kN. The proposed warehouses are to be located near the centre of the site which is currently occupied by the runway and taxiways.

In order to construct the warehouses, the site levels generally have to be raised by up to 2.5 m above existing levels to provide level platforms for each warehouse. The warehouses are proposed to be constructed on different pad levels of RL 41.1 and RL 39.4. There will be some minor cut in the north western corners of each platform.

The client has expressed a preference to use shallow footings as the foundations.

4.2 Geological Model

Below the existing airfield, the geological profile on the site is expected to generally comprise some filling over stiff and very stiff silty clay and gravely clay overlying siltstone at approximately RL 29.0 to RL 37.5 or 5.0 m to 8.4 m depths. Groundwater is located at a relatively shallow depth of about 2 m depth or deeper. During periods of rain, water levels could be expected to rise.

4.3 Earthworks

The proposed earthworks would involve some cut in the north-western corners of the building platforms and raising levels by up to 2.5 m to provide level building platforms for the development. The investigation suggests that there is up to about 1 m of existing filling over the site.

In areas of cut, which are expected to be of the order of about 1 m, the material should be easily removed by conventional earthmoving equipment.

In areas of filling, site preparation would include the following steps:

- strip the surface of any vegetation and remove existing sealed pavement, stockpile or dispose of material as appropriate;
- remove the existing filling to natural clays or to a depth of about 500 mm, whichever is less;
- proof roll the exposed surface with six passes of a 10-12 tonne roller, with the final pass carried out under observation by a geotechnical engineer to check for any soft or compressible zones. Any such zones should be over-excavated to a maximum depth of 300 mm and replaced with compacted granular material;
- the filling materials removed be replaced but could require some sorting to remove oversize or unsuitable material before it can be considered for use as an “engineered” filling. New filling brought to site should be approved by either the civil or geotechnical engineer before use. Moderately to highly reactive clay filling should be avoided;

- filling should be placed in horizontal layers of 300 mm maximum loose thickness, with each layer placed and compacted to a minimum dry density ratio of 98% Standard at levels more than 500 mm below the proposed subgrade level; increasing to 100% Standard in the upper 500 mm of filling. Overcompaction of clayey filling should be avoided. The moisture content during filling should be controlled so that it is always within 2% of Standard optimum moisture content (SOMC) test.

Compaction testing of all engineered filling and prepared subgrade surfaces should be carried out in accordance with AS 3798. Filling should be placed under Level 1 supervision as defined in AS 3798.

A consequence of placing filling on the site is that the filling acts as a surcharge and will cause settlement of the underlying material. An initial estimate is that there would be approximately 5 - 10 mm of settlement of the underlying soils for every metre of filling added to the site. In addition, there may be some consolidation of the filling under its own weight over time, depending on the quality of the filling. For properly compacted filling, the upper bound of settlement of the filling could be about 0.5% of the filling depth per log cycle. That is, up to 5 mm per metre of filling over the first 10 years and another 5 mm over the next 90 years could be expected. Therefore, for a 30 year life, adding 1 m of filling over the site could result in settlements up to 15 - 20 mm. For 2 m of filling, it would be 25 - 35 mm. Some of this settlement would occur during the placement of the filling before construction of the buildings commences.

4.4 Foundations

Following the earthworks, the near surface profile will comprise stiff silty clay or compacted filling over stiff silty clay.

Provided the filling is properly compacted as described above, the filling and the natural clays would provide an appropriate bearing layer for conventional strip and pad footings. It is suggested that the footings be founded with at least 0.6 m embedment and be proportioned for a maximum allowable bearing pressure of 150 kPa.

Settlements resulting from the use of shallow footings bearing in well compacted filling and stiff clays would be expected to be generally of the order of 1% of the footing width. For example, the estimated settlement of a 1 m square pad footing has been calculated to be of the order of 10 mm while the calculated settlement for a 2 m square pad would be of the order of 15 - 20 mm.

If required, discussion on alternative foundation systems can be provided.

4.5 Earthquake Loading

The site's sub-soil class for earthquake loading as given in AS 1170.4 -2007 would be Class C_e – shallow soil site.

4.6 Slabs and Pavements

Following earthworks, it is expected that most of the exposed subgrade will comprise filling which has been compacted in accordance with the recommendations given in Section 4.3. Therefore, the CBR value for pavement and slab design will depend on the type of filling material brought to site to form the subgrade. Typical CBR values for silty or sandy clay are 4 – 5% while CBR values for ripped sandstone are generally better than 15%.

Warehouse loads of 25 – 30 kPa on the slab are estimated to be of the order of 10 – 15 mm.

5. LIMITATIONS

DP has prepared this report for this project at Hoxton Park Airport. This report is provided for the exclusive use of the Mirvac Group for due diligence purposes and the concept design of two warehouses. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party.

The results provided in the report are considered to be indicative of the sub-surface conditions on the site only to the depths investigated at the specific sampling and/or testing locations, and only at the time the work was carried out. DP's advice may be based on observations, measurements, tests or derived interpretations. The accuracy of the advice provided by DP in this report is limited by unobserved features and variations in ground conditions across the site in areas between test locations and beyond the site boundaries or by variations with time. The advice may be limited by restrictions in the sampling and testing which was able to be carried out, as well as by the amount of data that could be collected given the project and site constraints. Actual ground conditions and materials behaviour observed or inferred at the test locations may differ from those which may be encountered elsewhere on the site. Should variations in subsurface conditions be encountered, then additional advice should be sought from DP and, if required, amendments made.

This report must be read in conjunction with the attached "Notes Relating to This Report" and any other attached explanatory notes and should be kept in its entirety without separation of individual pages or sections. DP cannot be held responsible for interpretations or conclusions from review by others of this report or test data, which are not otherwise supported by an expressed statement, interpretation, outcome or conclusion stated in this report. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

DOUGLAS PARTNERS PTY LTD

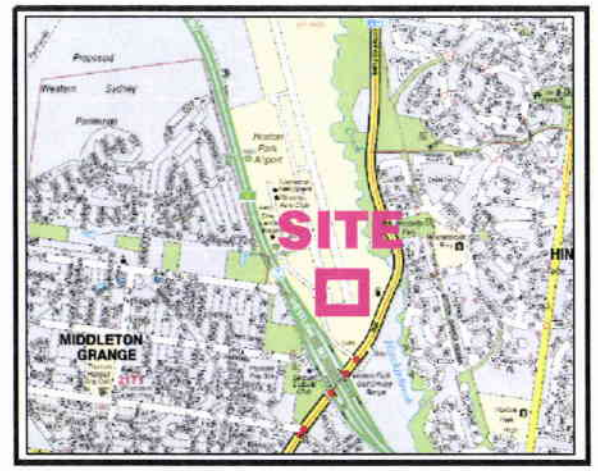
Reviewed by

Geoff Young
Principal

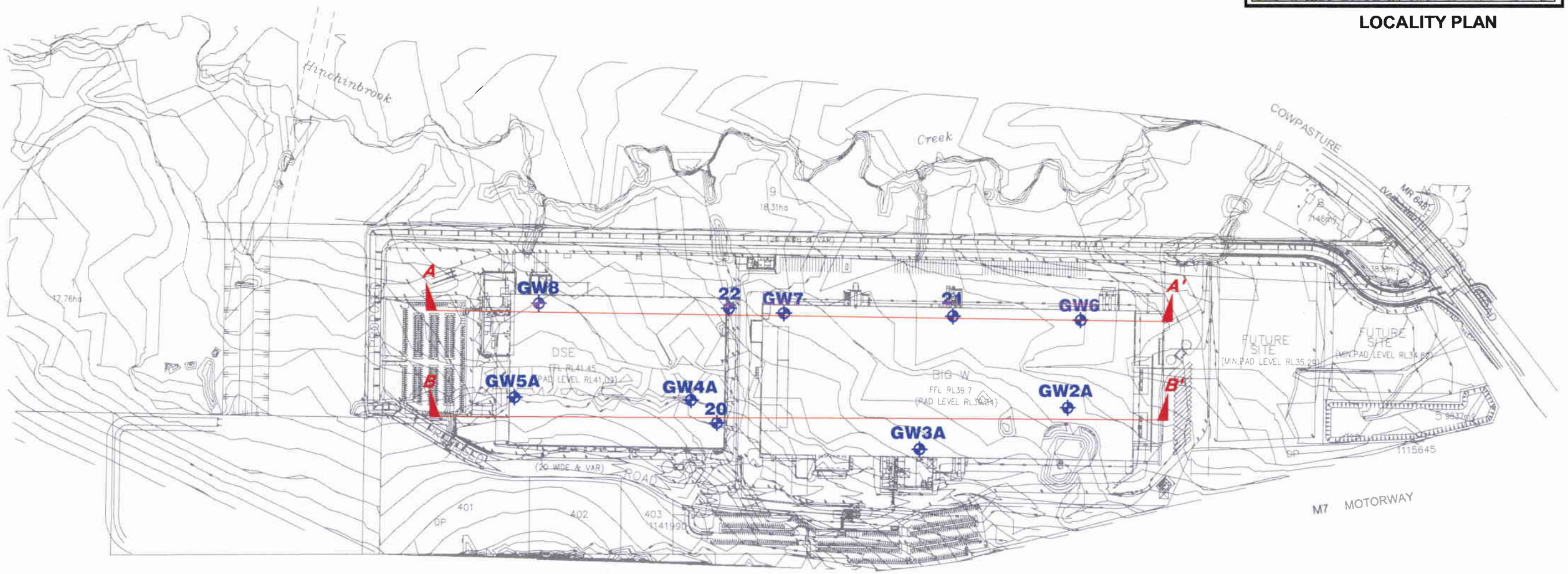
Terry Wiesner
Principal

APPENDIX A

Drawing 1 – Location of Test Bores
Drawing 2 – Cross Section A-A'
Drawing 3 – Cross Section B-B'



LOCALITY PLAN



M7 MOTORWAY

LEGEND

TEST BORE LOCATION

SCALE
0 100 200 300 400 500m
1:5000

Douglas Partners *Geotechnics · Environment · Groundwater*	CLIENT: Mirvac Group		TITLE: **Location of Test Bores** **Hoxton Park Airport** **HOXTON PARK**	PROJECT No: 71500.01
	DRAWN BY: PSCH	SCALE: As shown	OFFICE: Sydney	DRAWING No: 1
	APPROVED BY: GST		DATE: 17.12.2009	REVISION: A

P:\71500.01 HOXTON PARK airport geotech GSY\Drawings\71500.01-1.dwg, 12/17/2009 11:53:19 AM

A

A'

ELEVATION (m)

DISTANCE ALONG PROFILE (m)

GW8
Offset 6.3m
st-vst
f-st
st
VL
L
M
L
M
Bottom Depth 9.75 m

22
Offset - 8.4m
st N = 12
vst N = 16
vst-h N = 29
N = 37
h
N = 48
h
VL refusal
L,VL-L
M
Bottom Depth 11.45 m

GW7
Offset - 1.2m
f-st N = 9
vst N = 19
h N = 32
N = 37
EL
EL-VL
L-M,M
Bottom Depth 9.7 m

21
Offset 5.1m
st N = 12
N = 12
vst N = 16
h N = 36
VL refusal
EL-VL
Bottom Depth 9.4 m

GW6
Offset 1.4m
st N = 10 PID<1ppm
f N = 4 PID<1ppm
vst N = 25
vst-h N = 30
EL-VL
VL
M
Bottom Depth 11.1 m

LEGEND

- CORE LOSS
- Clay
- Filling
- Gravelly Silty Clay
- Gravelly Silty Clay
- Roadbase
- Sandy Clay
- Shale
- Shaly Clay
- Siltstone
- Silty Clay
- Silty Sandy Clay

ROCK STRENGTH
EL - Extremely Low
VL - Very Low
L - Low
M - Medium
H - High
VH - Very High

SOIL CONSISTENCY
vs - very soft
s - soft
f - firm
st - stiff
vst - very stiff
h - hard
vl - very loose
l - loose
md - medium dense
d - dense
vd - very dense

TESTS / OTHER
N - Standard penetration test value
- Water level

SITE MAP

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CLIENT: Mirvac Group			TITLE: **CROSS SECTION A-A'** Hoxton Park Airport Cowpasture Road, Hoxton Park
DRAWN BY: LD	SCALE: 1: 2250 (H)	OFFICE:	PROJECT No: 71500.01
APPROVED BY: GSY GSY		DATE: 19.01.2010	DRAWING No: 2
			REVISION: 1

B

B'

ELEVATION (m)

48
46
44
42
40
38
36
34
32
30
28

GW5A
Offset 3.9m

st
N = 12
PID<1ppm
st
N = 12
PID<1ppm
N = 7
PID<1ppm
EL-VL
N = 43
PID<1ppm
refusal
PID<1ppm
H,H-VH
Bottom Depth
10 m

GW4A
Offset - 6.1m

N = 18
PID<1ppm
vst
N = 18
PID<1ppm
N = 15
PID<1ppm
st-vst
N = 19
PID<1ppm
EL
refusal
PID<1ppm
EL-VL
L-M&M
VH=
L-M&M-
VL
Bottom Depth
10.2 m

20
Offset - 26.1m

st
st
N = 14
st-vst
N = 24
vst
N = 21
vst
N = 26
st-vst
N = 15
st
VL&L
M
EL&L-M
M,M-H
Bottom Depth
10.6 m

GW3A
Offset - 56.8m

st
N = 15
PID<1ppm
st-vst
N = 17
PID<1ppm
vst
N = 20
PID<1ppm
N = 20
PID<1ppm
refusal
PID<1ppm
VL-L
L-M
EL
M
Bottom Depth
10 m

GW2A
Offset 2.7m

st
N = 13
PID<1ppm
st
N = 14
PID<1ppm
N = 9
PID<1ppm
vst
N = 18
PID<1ppm
vst
N = 18
PID<1ppm
VL-L
M
EL-VL
Bottom Depth
10.15 m

0
100
200
300
400
500
600
700
800

DISTANCE ALONG PROFILE (m)

LEGEND

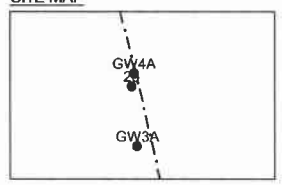
- Topsoil
- Silty Clay
- Clay
- Gravelly Silty Clay
- Siltstone
- Shale
- Filling
- Sandstone fine grained
- Bituminous Concrete
- Roadbase
- Sandy Clay
- Clayey Sand

ROCK STRENGTH
EL - Extremely Low
VL - Very Low
L - Low
M - Medium
H - High
VH - Very High

SOIL CONSISTENCY
vs - very soft
s - soft
f - firm
st - stiff
vst - very stiff
h - hard
vl - very loose
l - loose
md - medium dense
d - dense
vd - very dense

TESTS / OTHER
N - Standard penetration test value
- Water level

SITE MAP



DP A3 STANDARD CROSS SECTION 71500.01-CROSS SECTIONS.GPJ DP_RTACOMPATI.AB.GDT 19/01/10

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CLIENT: Mirvac Group			TITLE: **CROSS SECTION B-B'** Hoxton Park Airport Cowpasture Road, Hoxton Park
DRAWN BY: LD	SCALE: 1: 2250 (H)	OFFICE:	
APPROVED BY: GSY GSY		DATE: 19.01.2010	

PROJECT No:	71500.01
DRAWING No:	3
REVISION:	1

APPENDIX B
Notes Relating to this Report
Results of Previous Field Work

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NOTES RELATING TO THIS REPORT

Introduction

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

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

Description and Classification Methods

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

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

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

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

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

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

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

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

Sampling

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

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

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

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

Drilling Methods.

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

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

Large Diameter Auger (eg. Pengo) — the hole is advanced by a rotating plate or short spiral auger, generally 300 mm or larger in diameter. The cuttings are returned to the surface at intervals (generally of not more than 0.5 m) and are disturbed but usually unchanged in moisture content. Identification of soil strata is generally much more reliable than with continuous spiral flight augers, and is usually supplemented by occasional undisturbed tube sampling.

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

Continuous Spiral Flight Augers — the hole is advanced using 90—115 mm diameter continuous spiral flight augers which are withdrawn at intervals to allow

sampling or in-situ testing. This is a relatively economical means of drilling in clays and in sands above the water table. Samples are returned to the surface, or may be collected after withdrawal of the auger flights, but they are very disturbed and may be contaminated. Information from the drilling (as distinct from specific sampling by SPTs or undisturbed samples) is of relatively lower reliability, due to remoulding, contamination or softening of samples by ground water.

Non-core Rotary Drilling — the hole is advanced by a rotary bit, with water being pumped down the drill rods and returned up the annulus, carrying the drill cuttings. Only major changes in stratification can be determined from the cuttings, together with some information from 'feel' and rate of penetration.

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

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

Standard Penetration Tests

Standard penetration tests (abbreviated as SPT) are used mainly in non-cohesive soils, but occasionally also in cohesive soils as a means of determining density or strength and also of obtaining a relatively undisturbed sample. The test procedure is described in Australian Standard 1289, "Methods of Testing Soils for Engineering Purposes" — Test 6.3.1.

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

The test results are reported in the following form.

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

  as 4, 6, 7
  N = 13

- In the case where the test is discontinued short of full penetration, say after 15 blows for the first 150 mm and 30 blows for the next 40 mm

  as 15, 30/40 mm.

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

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

Cone Penetrometer Testing and Interpretation

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

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

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

The information provided on the plotted results comprises: —

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

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

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

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

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

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

q_c = (12 to 18) c_u

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

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

soil classification is required, direct drilling and sampling may be preferable.

Hand Penetrometers

Hand penetrometer tests are carried out by driving a rod into the ground with a falling weight hammer and measuring the blows for successive 150 mm increments of penetration. Normally, there is a depth limitation of 1.2 m but this may be extended in certain conditions by the use of extension rods.

Two relatively similar tests are used.

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

Laboratory Testing

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

Bore Logs

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

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

Ground Water

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

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

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

Engineering Reports

Engineering reports are prepared by qualified personnel and are based on the information obtained and on current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal (eg. a three storey building), the information and interpretation may not be relevant if the design proposal is changed (eg. to a twenty storey building). If this happens, the Company will be pleased to review the report and the sufficiency of the investigation work.

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

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

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

Site Anomalies

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

Reproduction of Information for Contractual Purposes

Attention is drawn to the document "Guidelines for the Provision of Geotechnical Information in Tender Documents", published by the Institution of Engineers,

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

Site Inspection

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

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DESCRIPTION AND CLASSIFICATION OF ROCKS FOR ENGINEERING PURPOSES

DEGREE OF WEATHERING

Term	Symbol	Definition
Extremely Weathered	EW	Rock substance affected by weathering to the extent that the rock exhibits soil properties - i.e. it can be remoulded and can be classified according to the Unified Classification System, but the texture of the original rock is still evident.
Highly Weathered	HW	Rock substance affected by weathering to the extent that limonite staining or bleaching affects the whole of the rock substance and other signs of chemical or physical decomposition are evident. Porosity and strength may be increased or decreased compared to the fresh rock usually as a result of iron leaching or deposition. The colour and strength of the original fresh rock substance is no longer recognisable.
Moderately Weathered	MW	Rock substance affected by weathering to the extent that staining or discolouration of the rock substance usually by limonite has taken place. The colour of the fresh rock is no longer recognisable.
Slightly Weathered	SW	Rock substance affected by weathering to the extent that partial staining or discolouration of the rock substance usually by limonite has taken place. The colour and texture of the fresh rock is recognisable.
Fresh Stained	Fs	Rock substance unaffected by weathering, but showing limonite staining along joints.
Fresh	Fr	Rock substance unaffected by weathering.

ROCK STRENGTH

Rock strength is defined by the Point Load Strength Index ($I_{S(50)}$) and refers to the strength of the rock substance in the direction normal to the bedding. The test procedure is described by Australian Standard 4133.4.1 - 1993.

Term	Symbol	Field Guide*	Point Load Index $I_{S(50)}$ MPa	Approx Unconfined Compressive Strength q_u ** MPa
Extremely low	EL	Easily remoulded by hand to a material with soil properties	<0.03	< 0.6
Very low	VL	Material crumbles under firm blows with sharp end of pick; can be peeled with a knife; too hard to cut a triaxial sample by hand. SPT will refuse. Pieces up to 3 cm thick can be broken by finger pressure.	0.03-0.1	0.6-2
Low	L	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 40 mm diameter may be broken by hand. Sharp edges of core may be friable and break during handling.	0.1-0.3	2-6
Medium	M	Readily scored with a knife; a piece of core 150 mm long by 50 mm diameter can be broken by hand with difficulty.	0.3-1.0	6-20
High	H	Can be slightly scratched with a knife. A piece of core 150 mm long by 50 mm diameter cannot be broken by hand but can be broken with pick with a single firm blow, rock rings under hammer.	1 - 3	20-60
Very high	VH	Cannot be scratched with a knife. Hand specimen breaks with pick after more than one blow, rock rings under hammer.	3 - 10	60-200
Extremely high	EH	Specimen requires many blows with geological pick to break through intact material, rock rings under hammer.	>10	> 200

Note that these terms refer to strength of rock material and not to the strength of the rock mass, which may be considerably weaker due to rock defects.

* The field guide assessment of rock strength may be used for preliminary assessment or when point load testing is not able to be done.

** The approximate unconfined compressive strength (q_u) shown in the table is based on an assumed ratio to the point load index of 20:1. This ratio may vary widely.

STRATIFICATION SPACING

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

DEGREE OF FRACTURING

This classification applies to diamond drill cores and refers to the spacing of all types of natural fractures along which the core is discontinuous. These include bedding plane partings, joints and other rock defects, but exclude known artificial fractures such as drilling breaks. The orientation of rock defects is measured as an angle relative to a plane perpendicular to the core axis. Note that where possible, recordings of the actual defect spacing or range of spacings is preferred to the general terms given below.

Term	Description
Fragmented	The core consists mainly of fragments with dimensions less than 20 mm.
Highly Fractured	Core lengths are generally less than 20 mm - 40 mm with occasional fragments.
Fractured	Core lengths are mainly 40 mm - 200 mm with occasional shorter and longer sections.
Slightly Fractured	Core lengths are generally 200 mm - 1000 mm with occasional shorter and longer sections.
Unbroken	The core does not contain any fracture.

ROCK QUALITY DESIGNATION (RQD)

This is defined as the ratio of sound (i.e. low strength or better) core in lengths of greater than 100 mm to the total length of the core, expressed in percent. If the core is broken by handling or by the drilling process (i.e. the fracture surfaces are fresh, irregular breaks rather than joint surfaces) the fresh broken pieces are fitted together and counted as one piece.

SEDIMENTARY ROCK TYPES

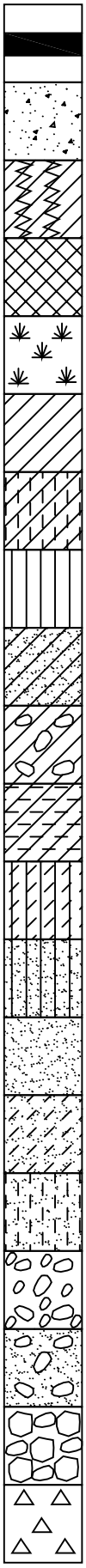
This classification system provides a standardised terminology for the engineering description of sandstone and shales, particularly in the Sydney area, but the terms and definitions may be used elsewhere when applicable.

Rock Type	Definition
Conglomerate	More than 50% of the rock consists of gravel-sized (greater than 2 mm) fragments
Sandstone:	More than 50% of the rock consists of sand-sized (0.06 to 2 mm) grains
Siltstone:	More than 50% of the rock consists of silt-sized (less than 0.06 mm) granular particles and the rock is not laminated.
Claystone:	More than 50% of the rock consists of clay or sericitic material and the rock is not laminated.
Shale:	More than 50% of the rock consists of silt or clay-sized particles and the rock is laminated.

Rocks possessing characteristics of two groups are described by their predominant particle size with reference also to the minor constituents, eg. clayey sandstone, sandy shale.

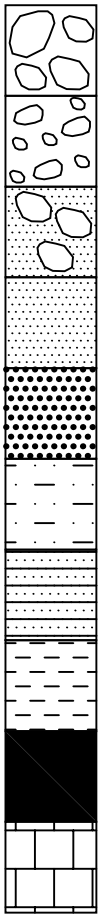
GRAPHIC SYMBOLS FOR SOIL & ROCK

SOIL



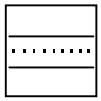
BITUMINOUS CONCRETE
CONCRETE
TOPSOIL
FILLING
PEAT
CLAY
SILTY CLAY
SILT
SANDY CLAY
GRAVELLY CLAY
SHALY CLAY
CLAYEY SILT
SANDY SILT
SAND
CLAYEY SAND
SILTY SAND
GRAVEL
SANDY GRAVEL
COBBLES/BOULDER
TALUS

SEDIMENTARY ROCK

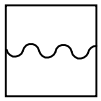


BOULDER CONGLOMERATE
CONGLOMERATE
CONGLOMERATIC SANDSTONE
SANDSTONE FINE GRAINED
SANDSTONE COARSE GRAINED
SILTSTONE
LAMINITE
MUDSTONE, CLAYSTONE, SHALE
COAL
LIMESTONE

SEAMS

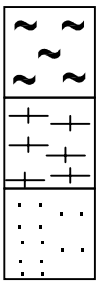


SEAM >10mm



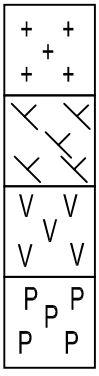
SEAM <10mm

METAMORPHIC ROCK



SLATE, PHYLLITE, SCHIST
GNEISS
QUARTZITE

IGNEOUS ROCK



GRANITE
DOLERITE, BASALT
TUFF
PORPHYRY

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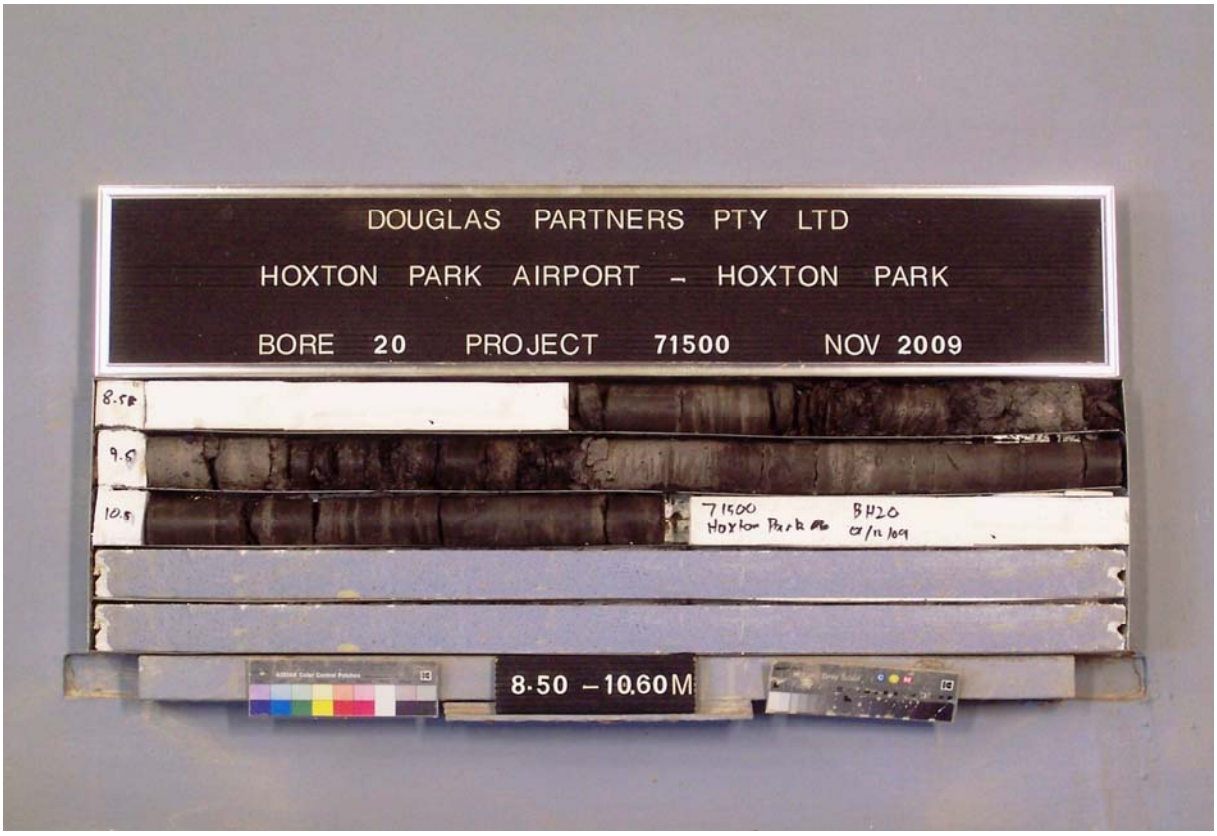
DOUGLAS PARTNERS PTY LTD
HOXTON PARK AIRPORT - HOXTON PARK
BORE 20 PROJECT 71500 NOV 2009
8.5
9.5
10.5
71500
Hoxton Park
BH20
8.50 - 10.60M

BOREHOLE LOG

CLIENT: Mirvac Group
PROJECT: Hoxton Park Airport
LOCATION: Cowpasture Road, Hoxton Park

SURFACE LEVEL: 43.7
EASTING: 301270
NORTHING: 6245732
DIP/AZIMUTH: 90°/--

BORE No: 20
PROJECT No: 71500.01
DATE: 01 Dec 09
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
43	0.05	TOPSOIL - grey brown, silty clay topsoil with some fine gravel and grass rootlets, moist							A/E			PID<1ppm
	0.4	SILTY CLAY - stiff, brown, silty clay, damp to moist							A/E			PID<1ppm
1	1.0	CLAY - stiff, orange brown and light grey, clay with trace of silt, moist							A/E			PID<1ppm
		SILTY CLAY - stiff to very stiff, mottled orange light grey, silty clay, moist							S			4,6,8 N = 14
42	2.0	CLAY - very stiff, mottled orange light grey clay, moist							S			6,11,13 N = 24
41	3											
40	4.0	SILTY CLAY - very stiff, light grey and orange brown, silty clay with trace of fine grained sand and ironstone gravel							S			7,9,12 N = 21
39	5											
38	5.5	GRAVELLY SILTY CLAY - stiff to very stiff, brown, gravelly (ironstone) silty clay, wet							S			5,8,12 N = 20
37	7	- becoming stiff at 7.0m							S			6,6,9 N = 15
36	8							Note: Unless otherwise stated, rock is fractured along rough planar bedding dipping at 0°-10° or joints				
	8.3	SILTSTONE - very low and low strength, grey brown siltstone										
35	8.5	SILTSTONE - medium strength, slightly weathered, fragmented to fractured, grey siltstone						8.6m: B0°, 2mm clay 8.6-8.75m: fragmented 8.9m: B0°, clay band				PL(A) = 0.8MPa
	8.7	CARBONACEOUS SHALE - extremely low and low to medium strength, highly and slightly weathered, fragmented to fractured, dark grey to black, carbonaceous shale. some very						9m: B0°, clay band 9.13-9.43m: fragmented	C	100	65	PL(A) = 0.3MPa
34	9.57							9.7m: B0°, 5mm clay				PL(A) = 0.4MPa

RIG: Hydropower **DRILLER:** Macquarie Drilling **LOGGED:** SI **CASING:** HW to 4.0m

TYPE OF BORING: Solid flight auger to 4.0m; Rotary to 8.5m; NMLC-Coring to 10.6m

WATER OBSERVATIONS:

REMARKS: E = Environmental sample. *Level relative to AHD, SSM167133

SAMPLING & IN SITU TESTING LEGEND

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

CHECKED
Initials: GSY
Date: 18-1-10

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BOREHOLE LOG

CLIENT: Mirvac Group
PROJECT: Hoxton Park Airport
LOCATION: Cowpasture Road, Hoxton Park

SURFACE LEVEL: 43.7
EASTING: 301270
NORTHING: 6245732
DIP/AZIMUTH: 90°/--

BORE No: 20
PROJECT No: 71500.01
DATE: 01 Dec 09
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
33		low strength bands										
		SILTSTONE - medium then medium to high strength, slightly weathered, fractured to slightly fractured, light grey to grey siltstone *(continued)*						10.12m: B5°, 10mm clay 10.18-10.25m: fragmented	C	100	65	PL(A) = 1.1MPa
	10.6	Bore discontinued at 10.6m										
32	11											
	12											
31	13											
30	14											
29	15											
28	16											
27	17											
26	18											
25	19											
24												

RIG: Hydropower **DRILLER:** Macquarie Drilling **LOGGED:** SI **CASING:** HW to 4.0m

TYPE OF BORING: Solid flight auger to 4.0m; Rotary to 8.5m; NMLC-Coring to 10.6m

WATER OBSERVATIONS:

REMARKS: E = Environmental sample. *Level relative to AHD, SSM167133

SAMPLING & IN SITU TESTING LEGEND

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

CHECKED
Initials: GSY
Date: 18·1·10

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DOUGLAS PARTNERS PTY LTD
HOXTON PARK AIRPORT - HOXTON PARK
BORE 21 PROJECT 71500 NOV 2009
HOXTON-PARK. 71500
26-11-09
B/H-21 START-7.2
8
9
FIN 9.4 m.
7·20 – 9.40M

BOREHOLE LOG

CLIENT: Mirvac Group
PROJECT: Hoxton Park Airport
LOCATION: Cowpasture Road, Hoxton Park

SURFACE LEVEL: 40.8
EASTING: 301435
NORTHING: 6245495
DIP/AZIMUTH: 90°/--

BORE No: 21
PROJECT No: 71500.01
DATE: 25 Nov 09
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
40	0.2	FILLING - red brown, crushed sandstone filling							E/A			PID<1ppm
		FILLING - grey brown, sandy clay filling with some silt and concrete gravel, moist							E/A			PID<1ppm
	0.8	CLAY - stiff, brown clay with some silt and trace of ironstone gravel, moist to wet							E/A			PID<1ppm
39	1								E/A			PID<1ppm
									S			4,5,7 N = 12
38	2											
									S			3,6,6 N = 12
37	3					▼						
	3.8	GRAVELLY CLAY - very stiff, brown, gravelly (ironstone) clay, wet							S			3,8,8 N = 16
36	4											
	4.7	SHALY CLAY - hard, orange/yellow brown, shaly clay with ironstone bands										
35	5								S			8,15,21 N = 36
	6							Note: Unless otherwise stated, rock is fractured along rough planar bedding, dipping at 0°-10° or joints				
34	6.8	SHALE/SILTSTONE - very low strength, grey brown shale/siltstone							S			22,25/50mm refusal
	7											
	7.2	SHALE/SILTSTONE - extremely low to very low strength, extremely to highly weathered, light grey brown, shale/siltstone. Some low to medium strength bands						7.27-7.42m: (x2) B0°, ironstained 7.55m: J85°, ironstained 7.63m: B0°, 2mm clay				PL(A) = 0.3MPa
33	8								C	100	0	
								8.4m: J80°, ironstained				
32	9											
								9.1m: J90°, rough 9.22m: J70°, clayey				
31	9.4	Bore discontinued at 9.4m										

RIG: Bobcat **DRILLER:** Steve S **LOGGED:** SI **CASING:** HW to 4.0m

TYPE OF BORING: Solid flight auger to 4.0m; Rotary to 7.2m; NMLC-Coring to 9.4m

WATER OBSERVATIONS: Free groundwater observed at 3.8m whilst augering

REMARKS: E = Environmental sample. *Level relative to AHD, SSM167133

SAMPLING & IN SITU TESTING LEGEND

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

CHECKED
Initials: GSY
Date: 18.1.10

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DOUGLAS PARTNERS PTY LTD
HOXTON PARK AIRPORT - HOXTON PARK
BORE 22 PROJECT 71500 NOV 2009
HOXTON-PARK-71500
26-11-09
C/N-22
START
8.8.M
9
10
11
FINISH 11.45M
8.80 – 11.45M

BOREHOLE LOG

CLIENT: Mirvac Group
PROJECT: Hoxton Park Airport
LOCATION: Cowpasture Road, Hoxton Park

SURFACE LEVEL: 42.2
EASTING: 301355
NORTHING: 6245748
DIP/AZIMUTH: 90°/--

BORE No: 22
PROJECT No: 71500.01
DATE: 26 Nov 09
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
42	0.0	FILLING - brown, fine grained, sand filling with some roadbase gravel, humid							A			PID<1ppm
									A			PID<1ppm
	0.7	SILTY CLAY - stiff, orange brown, silty clay with trace of fine grained sand, moist							A			
41	1								S			3,4,8 N = 12
									A			PID<1ppm
40	2											
	2.4	SANDY CLAY - very stiff, brown, fine grained, sandy clay, moist							A			
39	3								S			3,7,9 N = 16
	3.5	SANDY SILTY CLAY - very stiff then hard, mottled orange brown and light grey, fine grained, sandy silty clay, moist				▼						
38	4								S			4,10,16 N = 26
37	5											
		5.5m: becoming hard							S			6,14,23 N = 37
36	6											
35	7								S			11,20,28 N = 48
	7.0	GRAVELLY CLAY - hard, brown, gravelly (ironstone) clay, moist						Note: Unless otherwise stated, rock is fractured along rough planar bedding, dipping at 0°-10° or joints				
34	8											
	8.4	SHALE - very low strength, light grey brown shale							S			24,25/90mm refusal
	8.8	SHALE/SILTSTONE - low then very low to low strength, highly to moderately weathered, light grey brown shale/siltstone						9.05m: J45°, smooth with clay band 9.6m: J35°, smooth, clay band 9.69m: J55°, clay smear 9.78m: J, subvertical, rough	C	100	19	
33	9											
	9.6	SHALE - medium strength, fresh, slightly fractured, grey shale							C	100	99	PL(A) = 0.4MPa

RIG: Bobcat **DRILLER:** Steve S **LOGGED:** SI **CASING:** HW to 4.0m

TYPE OF BORING: Solid flight auger to 4.0m; Rotary to 8.8m; NMLC-Coring to 11.45m

WATER OBSERVATIONS: Free groundwater observed at 4.0m whilst augering

REMARKS: *Level relative to AHD, SSM167133

SAMPLING & IN SITU TESTING LEGEND

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

CHECKED
Initials: GSY
Date: 18-1-10

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BOREHOLE LOG

CLIENT: Mirvac Group
PROJECT: Hoxton Park Airport
LOCATION: Cowpasture Road, Hoxton Park

SURFACE LEVEL: 42.2
EASTING: 301355
NORTHING: 6245748
DIP/AZIMUTH: 90°/--

BORE No: 22
PROJECT No: 71500.01
DATE: 26 Nov 09
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
32		SHALE - medium strength, fresh, slightly fractured, grey shale *(continued)*										PL(A) = 0.4MPa
	11							10.68m: B0°, clay smear	C	100	99	PL(A) = 0.4MPa
31	11.45	Bore discontinued at 11.45m										
	12											
30												
	13											
29												
	14											
28												
	15											
27												
	16											
26												
	17											
25												
	18											
24												
	19											
23												

RIG: Bobcat **DRILLER:** Steve S **LOGGED:** SI **CASING:** HW to 4.0m

TYPE OF BORING: Solid flight auger to 4.0m; Rotary to 8.8m; NMLC-Coring to 11.45m

WATER OBSERVATIONS: Free groundwater observed at 4.0m whilst augering

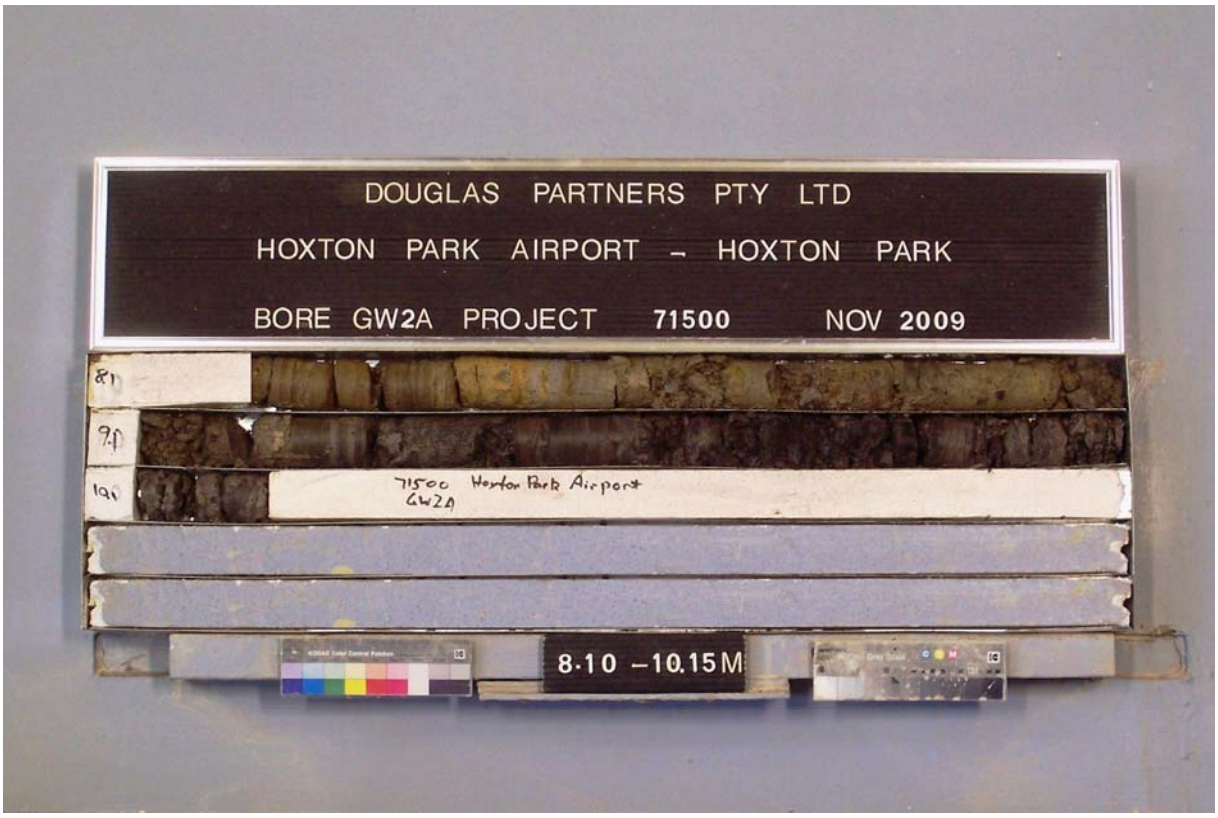
REMARKS: *Level relative to AHD, SSM167133

SAMPLING & IN SITU TESTING LEGEND

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

CHECKED
Initials: GSY
Date: 18.1.10

Douglas Partners
Geotechnics · Environment · Groundwater


DOUGLAS PARTNERS PTY LTD
HOXTON PARK AIRPORT - HOXTON PARK
BORE GW2A PROJECT 71500 NOV 2009
8
9
10
71500 Hoxton Park Airport
GW2A
8·10 –10.15M

BOREHOLE LOG

CLIENT: Mirvac Group
PROJECT: Hoxton Park Airport
LOCATION: Cowpasture Road, Hoxton Park

SURFACE LEVEL: 40.1
EASTING: 301398
NORTHING: 6245325
DIP/AZIMUTH: 90°/--

BORE No: GW2A
PROJECT No: 71500.01
DATE: 02 Dec 09
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
40	0.05	FILLING - grey brown, silty clay topsoil with trace of fine grained sand and grass rootlets (possible topsoil)							A			PID<1ppm
									A			PID<1ppm
	0.6	FILLING - grey brown, silty clay filling with some gravel, humid										
39	1	SILTY CLAY - stiff, light brown to red brown, silty clay with some ironstone gravel, damp to moist 1.0-1.5m: gravelly (ironstone) silty clay							A			PID<1ppm
									S			6,6,7 N = 13 PID<1ppm
38	2											
	2.1	SILTY CLAY - stiff, light grey, silty clay, moist										
37	3								S			3,7,7 N = 14 PID<1ppm
	3.5	GRAVELLY SILTY CLAY - very stiff, brown, gravelly (ironstone) silty clay, moist to wet										
36	4					▼			S			5,8,11 N = 19 PID<1ppm
35	5											
	5.4	SILTY CLAY - very stiff, brown, silty clay with trace of fine grained sand and ironstone gravel, wet							S			6,9,9 N = 18 PID<1ppm
34	6											
33	7								S			7,8,10 N = 18 PID<1ppm
32	8											
	8.0	SANDSTONE - very low to low strength, brown, fine grained sandstone						8.16-8.23m: (x3) B0°-10°, ironstained 8.3m: B10°, ironstained 8.3-9.15m: numerous drilling breaks	C	100	0	PL(A) = 0.8MPa
	8.1											
	8.3	SANDSTONE - medium strength, moderately weathered, fractured, brown, fine grained sandstone										
31	9	SILTSTONE - extremely low to very low strength, extremely to highly then slightly weathered, grey siltstone. Some low to medium strength bands 9.5-9.8m: carbonaceous shale band						Note: Unless otherwise stated, rock is fractured along planar bedding planes dipping at 0°- 10° or joints 9.23m: B5°, clay band				PL(A) = 0.3MPa
									C	100	0	PL(A) = 0.1MPa

RIG: Bobcat **DRILLER:** Steve S **LOGGED:** SI **CASING:** to 8.0m

TYPE OF BORING: Solid flight auger to 8.1m; NMLC-Coring to 10.15m

WATER OBSERVATIONS: Free groundwater observed at 4.5m whilst augering

REMARKS: *Level relative to AHD, SSM167133

SAMPLING & IN SITU TESTING LEGEND

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

CHECKED
Initials: GSY
Date: 18.1.10

Douglas Partners
Geotechnics · Environment · Groundwater

BOREHOLE LOG

CLIENT: Mirvac Group
PROJECT: Hoxton Park Airport
LOCATION: Cowpasture Road, Hoxton Park

SURFACE LEVEL: 40.1
EASTING: 301398
NORTHING: 6245325
DIP/AZIMUTH: 90°/--

BORE No: GW2A
PROJECT No: 71500.01
DATE: 02 Dec 09
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
30	10.15	Bore discontinued at 10.15m		—				9.5-9.8m: carbonaceous shale band 9.8-10.10m: fragmented in 0.02mm intervals	C	100	0	
29	11											
28	12											
27	13											
26	14											
25	15											
24	16											
23	17											
22	18											
21	19											

RIG: Bobcat **DRILLER:** Steve S **LOGGED:** SI **CASING:** to 8.0m

TYPE OF BORING: Solid flight auger to 8.1m; NMLC-Coring to 10.15m

WATER OBSERVATIONS: Free groundwater observed at 4.5m whilst augering

REMARKS: *Level relative to AHD, SSM167133

SAMPLING & IN SITU TESTING LEGEND

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

CHECKED
Initials: GSY
Date: 18-1-10

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DOUGLAS PARTNERS PTY LTD
HOXTON PARK AIRPORT – HOXTON PARK
BORE GW3A PROJECT 71500 NOV 2009
71500 Stent 7.24m
GW3A
8m
9m
7·24 – 10.00M

BOREHOLE LOG

CLIENT: Mirvac Group
PROJECT: Hoxton Park Airport
LOCATION: Cowpasture Road, Hoxton Park

SURFACE LEVEL: 42.0
EASTING: 301290
NORTHING: 6245510
DIP/AZIMUTH: 90°/--

BORE No: GW3A
PROJECT No: 71500.01
DATE: 01 Dec 09
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
42	0.05	BITUMINOUS CONCRETE							A			PID<1ppm
	0.1	ROADBASE GRAVEL										
		SILTY CLAY - stiff, brown silty clay, moist										
41	1								A			
									S			5,6,9 N = 15 PID<1ppm
	1.5	GRAVELLY SILTY CLAY - stiff to very stiff, brown, gravelly (ironstone) silty clay with some fine grained sand, moist										
40	2											
	2.5	SILTY CLAY - very stiff, light grey and orange brown, silty clay with some fine grained sand and ironstone gravel, moist							S			6,7,10 N = 17 PID<1ppm
39	3											
38	4								S			7,9,11 N = 20 PID<1ppm
37	5											
									S			6,9,11 N = 20 PID<1ppm
36	6					▼						
								Note: Unless otherwise stated, rock is fractured along rough planar bedding dipping at 0°0 19° or joints				
35	7								S			60/30mm refusal PID<1ppm
	7.0	SILTSTONE - very low to low strength, grey siltstone										
	7.24	SILTSTONE - low to medium strength, highly and highly to moderately weathered, fractured to slightly fractured, grey brown siltstone. Some extremely low strength bands						7.28m: B0°, ironstained, 10mm clay 7.28-7.64m: fragmented (D) in 0.01-0.05mm 7.64m: J, subvertical 7.9m: B0°, fragmented 8m: J50°, rough 8.21m: B20°, ironstained 8.21-8.73m: D, fragmented into 0.01 to 0.05mm 8.73-8.8m: (x2) B0°, clay smear	C	100	38	PL(A) = 0.4MPa
34	8											PL(A) = 0.3MPa
33	8.95	SILTSTONE - extremely low strength, highly weathered, light grey siltstone							C	100	28	PL(A) = 0.4MPa
	9.6	SILTSTONE - medium strength, slightly weathered, slightly fractured, grey siltstone						9.6m: B0°, ironstained & clay band				
32	10 10.0											

Bore discontinued at 10.0m

RIG: Hydropower **DRILLER:** Macquarie Drilling **LOGGED:** SI **CASING:**

TYPE OF BORING: Solid flight auger to 7.24m; NMLC-Coring to 10.0m

WATER OBSERVATIONS: Free groundwater observed at 6.0m

REMARKS: *Level relative to AHD, SSM167133

SAMPLING & IN SITU TESTING LEGEND

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

CHECKED
Initials: GSY
Date: 18-1-10

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DOUGLAS PARTNERS PTY LTD
HOXTON PARK AIRPORT – HOXTON PARK
BORE GW4A PROJECT 71500 NOV 2009
7 START CORE AT 7.3m
71500
8
9
10
7.30 – 10.20M

BOREHOLE LOG

CLIENT: Mirvac Group
PROJECT: Hoxton Park Airport
LOCATION: Cowpasture Road, Hoxton Park

SURFACE LEVEL: 43.8
EASTING: 301279
NORTHING: 6245780
DIP/AZIMUTH: 90°/--

BORE No: GW4A
PROJECT No: 71500.01
DATE: 30 Nov 09
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering	Graphic Log	Rock Strength	Water	Fracture Spacing (m)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
43.7	0.1	FILLING - grey brown, silty clay topsoil with trace of gravel and grass rootlets, humid (possible topsoil)							A			PID<1ppm
									A			PID<1ppm
43.1	0.7	FILLING - grey brown, silty clay and shale fragments filling, humid										
	1	SILTY CLAY - very stiff, mottled orange, grey and brown, silty clay with trace of ironstone gravel, moist							A			PID<1ppm
									S			8,8,10 N = 18
42	2											PID<1ppm
									S			5,8,10 N = 18
41	3											PID<1ppm
40.3	3.5	SANDY CLAY - stiff to very stiff, light grey and orange brown, fine grained sandy clay, moist to wet										
40	4								S			5,7,8 N = 15
												PID<1ppm
39	5											
38	6								S			5,8,11 N = 19
												PID<1ppm
37.5	6.3	SHALE/SILTSTONE - extremely low to very low strength, grey shale/siltstone						Note: Unless otherwise stated, rock is fractured along rough planar bedding dipping at 0°-10° or joints				
37	7								S			12,20/80mm refusal
36.5	7.3	SHALE/SILTSTONE - extremely low to very low strength, extremely to highly weathered, light grey brown, shale/siltstone						7.5m: J85°, smooth 7.5-7.57m: fragmented in 0.01mm intervals 7.73m: B0°, clay band	C	100	0	PID<1ppm
35.8	8.53	SHALE - low to medium and medium strength, slightly weathered, slightly fractured, grey shale with extremely low strength bands						8.65m: B0°, 10mm clay 8.9m: B0°, 20mm clay & J70° smooth 9.05m: B0°, 50mm crushed rock 9.41m: B5°, 120mm crushed rock 9.65m: B0°, 5mm clay 9.83m: B0°, clay smear	C	100	90	PL(A) = 0.3MPa
35	9											
		9.55-9.60m: very high strength siltstone band							C	100	43	PL(A) = 0.4MPa
34	9.8											

RIG: Hydropower **DRILLER:** Macquarie Drilling **LOGGED:** SI **CASING:**
TYPE OF BORING: Solid flight auger to 7.3m; NMLC-Coring to 10.2m
WATER OBSERVATIONS:
REMARKS: *Level relative to AHD, SSM167133

SAMPLING & IN SITU TESTING LEGEND

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

CHECKED
Initials: GSY
Date: 18.1.10

Douglas Partners
Geotechnics · Environment · Groundwater

BOREHOLE LOG

CLIENT: Mirvac Group
PROJECT: Hoxton Park Airport
LOCATION: Cowpasture Road, Hoxton Park

SURFACE LEVEL: 43.8
EASTING: 301279
NORTHING: 6245780
DIP/AZIMUTH: 90°/--

BORE No: GW4A
PROJECT No: 71500.01
DATE: 30 Nov 09
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
	10.2	SHALE - very low strength, slightly weathered, light grey shale *(continued)*							C	100	43	
		Bore discontinued at 10.2m										

RIG: Hydropower **DRILLER:** Macquarie Drilling **LOGGED:** SI **CASING:**
TYPE OF BORING: Solid flight auger to 7.3m; NMLC-Coring to 10.2m
WATER OBSERVATIONS:
REMARKS: *Level relative to AHD, SSM167133

SAMPLING & IN SITU TESTING LEGEND

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

CHECKED
Initials: GSY
Date: 18.1.10

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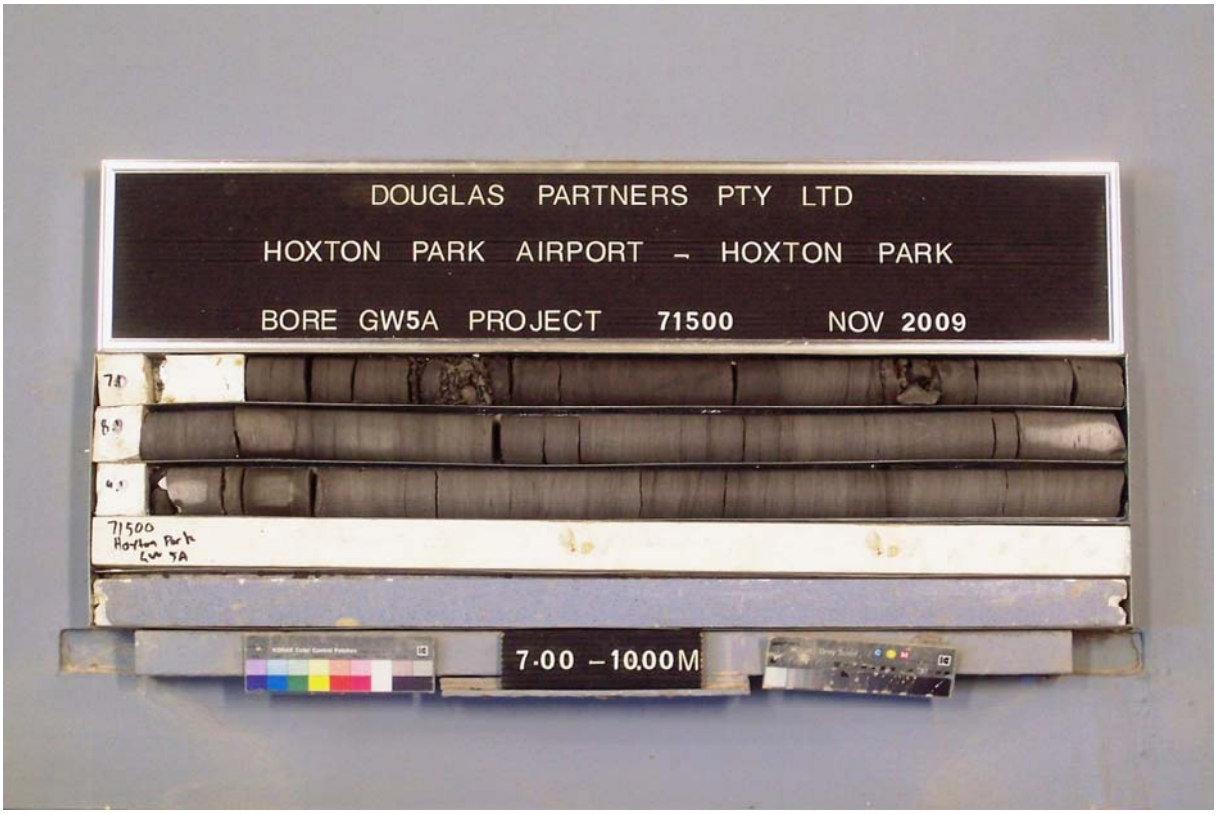
DOUGLAS PARTNERS PTY LTD
HOXTON PARK AIRPORT - HOXTON PARK
BORE GW5A PROJECT 71500 NOV 2009
71500
Hoxton Park
GW 5A
7·00 – 10.00M

BOREHOLE LOG

CLIENT: Mirvac Group
PROJECT: Hoxton Park Airport
LOCATION: Cowpasture Road, Hoxton Park

SURFACE LEVEL: 45.0
EASTING: 301218
NORTHING: 6246075
DIP/AZIMUTH: 90°/--

BORE No: GW5A
PROJECT No: 71500.01
DATE: 30 Nov 09
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
45												
	0.3	FILLING - grey brown, silty clay and shale fragments filling, with some grass rootlets							A			PID<1ppm
		SILTY CLAY - stiff, brown to red brown, silty clay with trace of fine grained sand, moist							A			PID<1ppm
44	1								A			PID<1ppm
									S			4,5,7 N = 12 PID<1ppm
43	2											
	2.0	SILTY CLAY - stiff, grey silty clay, moist to wet							S			5,6,6 N = 12 PID<1ppm
42	3											
	3.7	CLAYEY SAND - loose, brown, fine grained, clayey sand, wet							S			2,3,4 N = 7 PID<1ppm
41	4					▼						
40	5											
	5.0	SILTSTONE - extremely low to very low strength, grey brown siltstone							S			12,17,26 N = 43 PID<1ppm
39	6							Note: Unless otherwise stated, rock is fractured along rough planar bedding dipping at 0°-10° or joints				
38	7											
	7.1	SANDSTONE - high then high to very high strength, fresh, slightly fractured and unbroken, light grey, fine grained sandstone with some siltstone laminations and bands						7.27m: B0°, 10mm crushed rock 7.3m: B0°, 50mm crushed rock 7.76m: B0°, clay veneer 7.78m: J, subvertical	S			30/100mm refusal PID<1ppm PL(A) = 2.5MPa
37	8											PL(A) = 3.2MPa
									C			
36	9							9.08m: B0°, 10mm clay 9.18m: B0°, clay veneer				PL(A) = 5.5MPa
35	10	10.0										

Bore discontinued at 10.0m

RIG: Hydropower **DRILLER:** Macquarie Drilling **LOGGED:** SI **CASING:**

TYPE OF BORING: Solid flight auger to 7.1m; NMLC-Coring to 10.0m

WATER OBSERVATIONS: Free groundwater observed at 4.5m whilst augering

REMARKS: *Level relative to AHD, SSM167133

SAMPLING & IN SITU TESTING LEGEND

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

CHECKED
Initials: GSY
Date: 18.1.10

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DOUGLAS PARTNERS PTY LTD
HOXTON PARK AIRPORT - HOXTON PARK
BORE GW6 PROJECT 71500 NOV 2009
HOXTON - PARK. - 71500
25-11-09
B/H GW-6.
START 7.5M
8.
9.
10.
11.
FINAL 11.10M.
7.50 - 11.10M

BOREHOLE LOG

CLIENT: Mirvac Group
PROJECT: Hoxton Park Airport
LOCATION: Cowpasture Road, Hoxton Park

SURFACE LEVEL: 38.4
EASTING: 301469
NORTHING: 6245350
DIP/AZIMUTH: 90°/--

BORE No: GW6
PROJECT No: 71500.01
DATE: 25 Nov 09
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
38	0.02	ROADBASE GRAVEL - with some sand and clay							E/A			PID<1ppm
		FILLING - brown and red brown, silty clay filling, humid to damp							E/A			PID<1ppm
	0.9											
37	1	SILTY CLAY - stiff, grey brown and brown, silty clay, damp to moist							E/A			PID<1ppm
									S			3,4,6 N = 10
	2											PID<1ppm
36	2.1	CLAY - firm, brown clay, wet							E			PID<1ppm
									S			2,2,2 N = 4
	3					▼						PID<1ppm
35	3.1	CLAY - very stiff, light brown clay with some ironstone gravel, wet										
	4								E			
34									S			2,9,16 N = 25
	4.7	GRAVELLY CLAY - very stiff to hard, red brown, gravelly (ironstone) clay, moist										
	5											
33									S			9,13,17 N = 30
	6											
32								Note: Unless otherwise stated, rock is fractured along rough planar bedding dipping at 0°-10° or joints				
	7											
31	7.5	SILTSTONE - extremely low to very low strength, extremely to highly weathered, light grey, orange brown siltstone with a low to medium strength band at 7.85 to 8.0m						7.75m: B0°, ironstained	C	100	0	PL(A) = 0.3MPa
	8											
30	8.7	SHALE - very low strength, highly weathered, grey to dark grey, shale with a carbonaceous shale band from 9.02m to 9.3m						9.02m: J75°, rough 9.3m: J, subvertical	C	100	66	PL(A) = 0.1MPa
	9											
29	9.7	SHALE - description next page						9.7-10.10m: J85°, rough				

RIG: Bobcat **DRILLER:** Steve S **LOGGED:** SI **CASING:** HW to 4.0m
TYPE OF BORING: Solid flight auger to 4.0m; Rotary to 7.5m; NMLC-Coring to 11.1m
WATER OBSERVATIONS: Free groundwater observed at 3.1m whilst augering
REMARKS: *Level relative to AHD, SSM167133

SAMPLING & IN SITU TESTING LEGEND

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

CHECKED
Initials: GSY
Date: 18.1.10

Douglas Partners
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BOREHOLE LOG

CLIENT: Mirvac Group
PROJECT: Hoxton Park Airport
LOCATION: Cowpasture Road, Hoxton Park

SURFACE LEVEL: 38.4
EASTING: 301469
NORTHING: 6245350
DIP/AZIMUTH: 90°/--

BORE No: GW6
PROJECT No: 71500.01
DATE: 25 Nov 09
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
28	11	SHALE - medium strength, slightly weathered, slightly fractured, grey shale *(continued)*						10.18m: J65°, curved, rough 10.45-10.70m: J, subvertical 10.75m: J75°, rough	C	100	66	PL(A) = 0.5MPa PL(A) = 0.6MPa
27	11.1	Bore discontinued at 11.1m										
26	12											
25	13											
24	14											
23	15											
22	16											
21	17											
20	18											
19	19											

RIG: Bobcat **DRILLER:** Steve S **LOGGED:** SI **CASING:** HW to 4.0m
TYPE OF BORING: Solid flight auger to 4.0m; Rotary to 7.5m; NMLC-Coring to 11.1m
WATER OBSERVATIONS: Free groundwater observed at 3.1m whilst augering
REMARKS: *Level relative to AHD, SSM167133

SAMPLING & IN SITU TESTING LEGEND

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

CHECKED
Initials: GSY
Date: 18.1.10

Douglas Partners
Geotechnics · Environment · Groundwater


DOUGLAS PARTNERS PTY LTD
HOXTON PARK AIRPORT – HOXTON PARK
BORE GW7 PROJECT 71500 NOV 2009
HOXTON PARK 71500
24-11-09
B/H-GW7.
7.3M
8
9
FIN 9.7M.
7.30 – 9.70M

BOREHOLE LOG

CLIENT: Mirvac Group
PROJECT: Hoxton Park Airport
LOCATION: Cowpasture Road, Hoxton Park

SURFACE LEVEL: 41.6
EASTING: 301380
NORTHING: 6245681
DIP/AZIMUTH: 90°/--

BORE No: GW7
PROJECT No: 71500.01
DATE: 24 Nov 09
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
41	0.3	FILLING - light brown, gravelly clay filling with trace of grass rootlets							A/E			PID<1ppm
		CLAY - firm to stiff, light grey clay, humid							A/E			PID<1ppm
1									A/E			PID<1ppm
									S			3,5,4 N = 9
40	1.5	CLAY - very stiff, red brown then light grey brown, clay with some fine ironstone gravel, wet				▼						
2									A			PID<1ppm
39									S			4,8,11 N = 19
3												
38	3.8	GRAVELLY CLAY - hard, red brown and brown, gravelly (ironstone) clay, wet							S			8,12,20 N = 32
4												
37												
5												
36									S			15,17,20 N = 37
6												
35								Note: Unless otherwise stated, rock is fractured along rough planar bedding dipping at 0°-10° or joints				
7	6.8	SILTSTONE - extremely low strength, light grey brown siltstone										
34	7.3	SILTSTONE - extremely low to very low strength, highly to moderately weathered, light grey, yellow brown, siltstone with a low strength band from 7.6m to 7.9m						7.6m: B0°, ironstained 7.6-7.9m: (x3) B0°- 10°, ironstained 7.9m: CORE LOSS: 100mm	C	96	71	PL(A) = 0.2MPa
8	7.9											
33	8.3	SHALE - low to medium then medium strength, slightly weathered, slightly fractured, light grey to dark grey shale						8.31-8.44m: (x2) B0°, clay smear 8.66m: J45°, smooth				PL(A) = 0.3MPa
9								9.28m: B0°, clay veneer				PL(A) = 0.3MPa
32	9.7	Bore discontinued at 9.7m										PL(A) = 0.7MPa

RIG: Bobcat **DRILLER:** Steve S **LOGGED:** SI **CASING:** HW to 4.0m
TYPE OF BORING: Solid flight auger to 4.0m; Rotary to 7.3m; NMLC-Coring to 9.7m
WATER OBSERVATIONS: Free groundwater observed at 2.0m whilst augering
REMARKS: *Level relative to AHD, SSM167133

SAMPLING & IN SITU TESTING LEGEND

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

CHECKED
Initials: GSY
Date: 18.1.10

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DOUGLAS PARTNERS PTY LTD
HOXTON PARK AIRPORT – HOXTON PARK
BORE GW8 PROJECT 71500 NOV 2009
Hoxton Park 27-11-09
71500 RH
START 7 | GW8
8
9
END 9.75
7.10 – 9.75 M

BOREHOLE LOG

CLIENT: Mirvac Group
PROJECT: Hoxton Park Airport
LOCATION: Cowpasture Road, Hoxton Park

SURFACE LEVEL: 43.7
EASTING: 301305
NORTHING: 6245998
DIP/AZIMUTH: 90°/--

BORE No: GW8
PROJECT No: 71500.01
DATE: 27 Nov 09
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Degree of Weathering	Graphic Log	Rock Strength	Water	Fracture Spacing (m)	Discontinuities (B - Bedding, J - Joint, S - Shear, D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
43	0.0	SILTY CLAY - grey brown, silty clay with some gravel and trace of grass rootlets, humid (possible topsoil)							A			PID<1ppm
									A*			PID<1ppm
	0.8	SILTY CLAY - stiff to very stiff, mottled orange, light grey, silty clay with some ironstone gravel, moist							S			
42	2.5	SANDY CLAY - firm to stiff, orange brown and light grey, fine grained sandy clay with trace of silt and ironstone gravel, wet							S			
41	4.5	GRAVELLY SILTY CLAY - stiff, brown, gravelly (ironstone) silty clay, wet							S			
40									A			PID<1ppm
39									S			
38								Note: Unless otherwise stated, rock is fractured along rough planar bedding dipping 0°- 10° or joints				
37	7.0	SHALE - very low strength, grey shale							S			
36	7.1	SHALE - low strength, moderately to slightly weathered, slightly fractured, grey brown shale						7.48m: B0°, clay smear				PL(A) = 0.2MPa
35	7.85	SILTSTONE - medium strength, slightly weathered and fresh, fractured to slightly fractured, grey siltstone						8.05m: B0°, slightly ironstained 8.29m: B0°, 2mm carbonaceous laminations 8.48m: B0°- 5°, 50mm clay band 8.55m: J70°, smooth 8.7m: B0°, clay smear 8.76-9.0m: B (numerous) 0°, clay smear 9.33m: B0°, clayey 9.4-9.55m: (x2) J25°-30°, rough	C	100	81	PL(A) = 0.5MPa PL(A) = 0.6MPa
34	8.75-9.0m: low strength band											PL(A) = 0.4MPa
	9.75	Bore discontinued at 9.75m										

RIG: Bobcat **DRILLER:** Steve S **LOGGED:** SI **CASING:** HW to 7.1m

TYPE OF BORING: Solid flight auger to 7.1m; NMLC-Coring to 9.75m

WATER OBSERVATIONS: Free groundwater observed at 4.0m whilst augering

REMARKS: *Denotes field replicate sample BD2/261109 collected. *Level relative to AHD, SSM167133

SAMPLING & IN SITU TESTING LEGEND

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

CHECKED
Initials: GSY
Date: 18.1.10

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