GEOTECHNICAL

SITE CLASSIFICATION REPORT

Zuccoli 3 & 4 Stage 1A

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Table of Contents

1		**Introduction**	**4**
	1.1	Background	4
	1.2	Scope of Works	4
2		**Site Conditions**	**6**
	2.1	Regional Geological Description	6
	2.2	Site Description	6
	2.3	Subsurface Conditions	6
3		**Site Classification**	**7**
	3.1	Allowable Bearing Capacity	7
	3.2	Site Classification	7
	3.3	Moisture Control	8
4		**Comments**	**8**
5		**Important Information about your Site Investigation & Classification Report**	**9**
6		**General Notes & Limitations of Geotechnical Site Investigation**	**11**

Appendices

Appendix A	Site Plan
Appendix B	Visual & Tactile Classification - Test Pits
Appendix C	Laboratory Test Reports
Appendix D	CSIRO Information Sheet BTF 18

Tables

Table 3.1	Classification Based off Site Reactivity	7
Table 3.2	Summary of Site Classifications	7

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1. Introduction

HiQA Geotechnical (HiQA) have been commissioned by the Ostojic Group Pty Ltd (OST GRP) to undertake the site classification report for Zuccoli 3 & 4 Stage 1A. An investigation was undertaken on Stage 1A to ascertain the site classifications for each of the lots.

1.1 Background

Zuccoli 3 & 4 Stage 1A is located in Palmerston, a satellite city of Darwin located approximately 21km south east of Darwin. (refer **Figure 1**) Stage 1A is centred approximately at; Zone 52 L, Easting 718 149m & Northing 8616 230m.

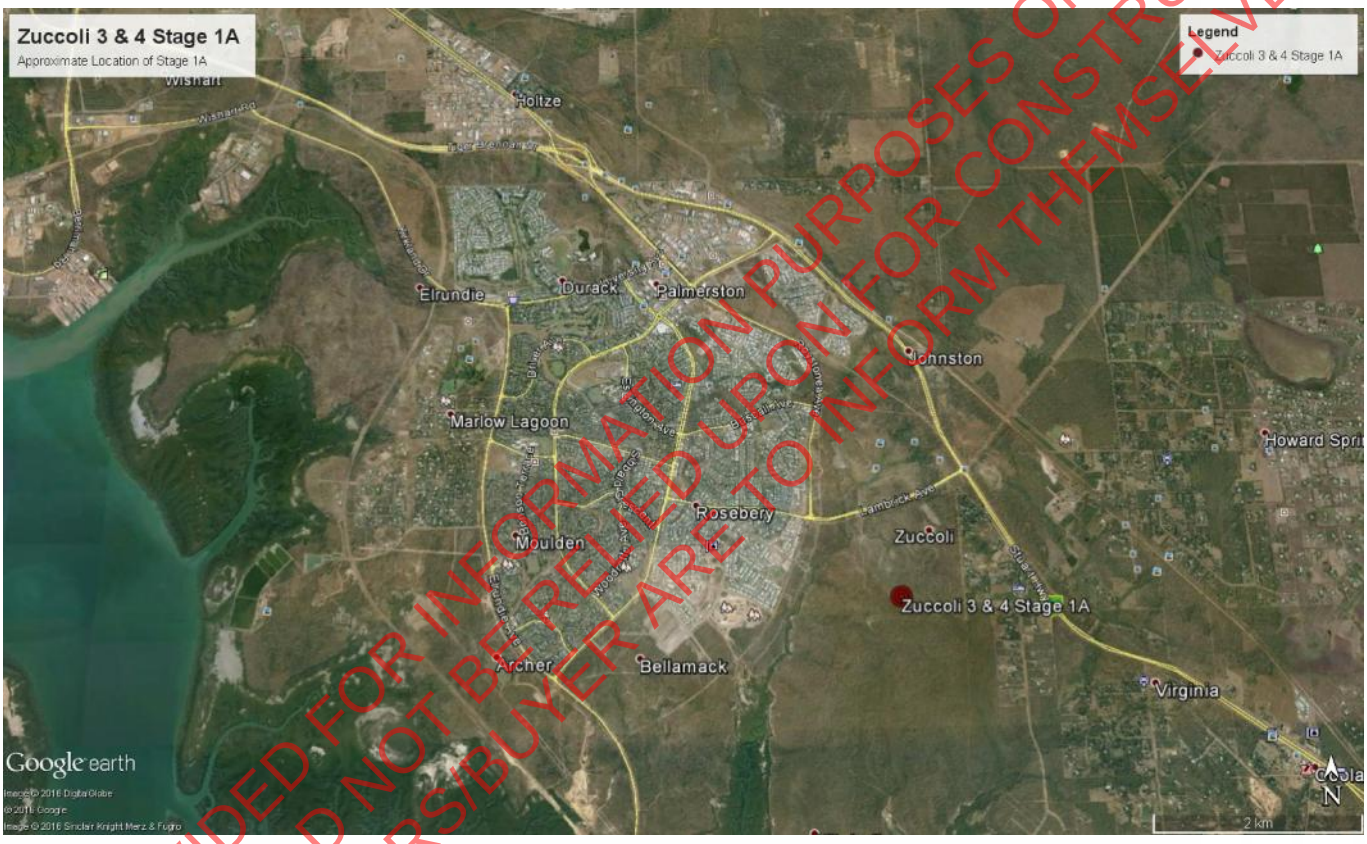

Figure 1 – Approximate Location of Stage 1A

1.2 Scope of Works

The primary objective of the investigation was to assess the lots for their classification according to *AS2870-2011*. This is to aid the purchasers when building a home. OST GRP completed all filling operations on the site as per the requirements of *AS3798-2007*. The report covering the Level 1 Statement of Compliance indicates that all filling on the site is **Controlled** as per the requirements. The test pits undertaken are presented in **Appendix A.**

The scope of works were as follows;

- Undertake test pitting as per the requirements of AS2870-2011
- Log each test pit to AS1726
- DCP testing was undertaken adjacent to each test pit

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- Summarise all of the findings into a final report outlining the classifications

The site investigation, laboratory testing & reporting requirements were conducted with reference to the following publications;

- AS 1726 – Geotechnical Site Investigations
- AS 2870-2011 – Residential Slabs & Footings
- AS 3798-2007 – Guidelines on Earthworks for Commercial & Residential Developments
- Northern Territory Geological Survey, Geological Map Series

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2. Site Conditions

2.1 Regional Geological Description

The project site area is best described by the published maps & information provided by the Northern Territory Geological Survey. The particular map referenced is the 1:250,000 Geological Map Series (Sheet SD 52-4, Second Edition).

The map indicates that the site is underlain by Quaternary age deposits comprising unconsolidated sands and pisolitic and mottled laterite. The unconsolidated sands consist of ferruginous and clayey, sandy and gravelly soils commonly containing limonite pisolites, while the lateritic soils consist of both in-situ and re-worked remnants of standard lateritic profiles. The Quaternary deposits are indicated to be underlain by the Early Proterozoic Age Finnis River Group and the Mount Partridge Group.

2.2 Site Description

When the investigation took place the earthworks had been completed for Stage 1A. Stage 1A has a general slope from the northeast to the southeast. The blocks are flat and well graded with no vegetation on the site.

No groundwater or seepage was observed during the site works.

2.3 Subsurface Conditions

The subsurface material was assessed by undertaking test pits (TP 1 – TP 96) with a 20t Komatsu Excavator. An image of the site is attached in **Appendix A**. Detailed descriptive visual & tactile observations are presented in **Appendix B**.

The material encountered on site can be predominately described as a Sandy Silty GRAVEL or a Silty Sandy GRAVEL. The test pits that were undertaken in the cut areas predominately refused on an extremely weathered Sandstone/Siltstone. This layer of extremely weathered rock is consistent throughout the test pits and follows a typical pattern.

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3. Site Classification

Australian Standard *AS2870-2011* establishes performance requirements and specific designs for common foundation conditions.
Site Classifications as defined in *AS2870-2011 – 2.1 - General – Table 2.1 – Classification Based on Site Reactivity* are summarised in **Table 3.1**.

Table 3.1 – Classification Based on Site Reactivity

Class	Foundation
A	Most sand and rock sites with little or no ground movement from moisture change
S	Slightly reactive clay sites, which may experience only slight ground movement from moisture changes
M	Moderately reactive clay or silt sites, which may experience moderate ground movement from moisture change
H1	Highly reactive clay sites, which may experience high ground movement from moisture change
H2	Highly reactive clay sites, which may experience very high ground movement from moisture change
E	Extremely reactive sites, which may experience extreme ground movement from moisture change

3.1 Allowable Bearing Capacity

Allowable bearing capacity assessments were undertaken via the use of DCP testing adjacent to select test pit. These results are presented in **Appendix C.**

The results of the fieldwork indicate the near surface foundation strata of the site **should** provide an allowable bearing capacity of at least 100 kpa**.**

3.2 Site Classifications

In accordance with *AS2870-2011 Residential Slabs & Footings* the sites have been classified in **Table 3.2 – Summary of Site Classifications.**

Table 3.2 – Summary of Site Classifications

Lot Numbers	Site Classification
001,002,005,006,007,008,021,030,031,032,033,034,035,036, 037,038,039,040,041,042,043,044,047,048,049,050,051,052, 053,054,055,056,057,058,059,060,061 and 182	**Class S** – Slightly Reactive
004,009,010,011,012,013,014,015,016,017,018,019,020,022, 023,024,025,026,027,028,029,045 and 046	**Class P = S** - Reclassified due to **Controlled Fill** on the site. Slightly Reactive
003	**Class M**

Detailed visual & tactile test pit logs are presented in **Appendix B.**

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3.3 Moisture Control

In order to minimize the potential for unnatural or extreme moisture variation and subsequent soil volume changes within the foundation strata, the recommendations given in the CSIRO "Guide to home owners on foundation maintenance and footing performance" should be adopted.

4. Comments

Should you have any queries in relation to this report, please do not hesitate to contact HiQA.

Approved By;

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5. Important Information about your Site Investigation & Classification Report

More construction problems are caused by site subsurface conditions than any other factor. As troublesome as subsurface problems can be, their frequency and extent have been lessoned considerably in recent years, due in large measure to programs and publications of ASFE / The Association of Engineering Firms Practicing in Geosciences.

The following suggestions and observations are offered to help you reduce the geotechnical - related delays, costs – overruns and other costly headaches that can occur during a construction project.

SITE INVESTIGATION & CLASSIFICATION REPORT IS BASED ON A UNIQUE SET OF PROJECT – SPECIFIC FACTORS

A Site Investigation & Classification Report is based on a surface exploration plan designed to incorporate a unique set of project-specific factors. These typically include: the general nature of the structure involved; it's size and configuration; location of the structure on the site and it's orientation; physical contaminants such as access roads, parking lots and underground utilities, and the level of additional risk which the client assumed by the virtue of limitations imposed upon the exploratory program. To help avoid costly problems, consult the geotechnical engineer to determine how any factors which change subsequent to the date of the report may affect its recommendations.

Unless your consulting geotechnical engineer indicates otherwise, your Geotechnical Engineering Report should not be used:

- When the nature of the proposed structure is changed, for example, if an office building will be erected instead of a parking garage, or if a refrigerated warehouse will be built instead of an un-refrigerated one;
- When the size or configuration of the proposed structure is altered;
- When the location or orientation of the proposed structure is modified;
- When there is a change of ownership;
- For an application to an adjacent site

Geotechnical professionals cannot accept responsibility for problems which may develop if they are not consulted after the factors considered in the report have changed.

MOST GEOTECHNICAL "FINDINGS" ARE PROFESSIONAL ESTIMATES

Site exploration identifies actual subsurface conditions only at those points where samples are taken, when they are taken, data derived through sampling and subsequent laboratory testing are extrapolated by geotechnical engineers who then render an opinion about overall subsurface conditions, their likely reaction to proposed construction activity, and appropriate foundation design. Even under optimal circumstances actual conditions may differ from those inferred to exist, because no geotechnical engineer, no matter how qualified, and no subsurface exploration program, no matter how comprehensive can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than a report indicates. Actual conditions in areas not sampled may differ from predictions. Nothing can be done to prevent the unanticipated, but steps can be taken to help minimize their impact. For this reason, most experienced owners retain their geotechnical consultants through the construction stage, to identify variances, conduct additional tests which may be needed, and to recommend solutions to problems encountered onsite.

SUBSURFACE CONDITIONS CAN CHANGE

Subsurface conditions may be modified by constantly changing natural forces. Because a geotechnical report is based on conditions which existed at the time of subsurface exploration, construction decisions should not be based on a geotechnical engineering report whose adequacy may have been affected by time. Speak with the geotechnical consultant to learn if additional tests are advisable before construction starts.

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Construction operations at or adjacent to the site and natural events such as floods, earthquakes or ground water fluctuations may also effect subsurface conditions and, thus continuing adequacy of a geotechnical report. The geotechnical engineer should be kept apprised of any such events, and should be consulted to determine if additional tests are necessary.

GEOTECHNICAL SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES AND PERSONS

Geotechnical engineer's reports are prepared to meet the specific needs of specific individuals. A report prepared for a consulting civil engineer may not be adequate for a construction contractor, or even some other consulting civil engineer. Unless indicated otherwise, this report was prepared expressly for the client involved and expressly for purposes indicated by the client. Use by any other persons for any purpose, may result in problems. No individual other than the client should apply this report for its intended purpose without first conferring with the geotechnical engineer. No person should apply this report for any purpose other than that originally contemplated without first conferring with the geotechnical engineer.

A GEOTECHNICAL ENGINEERING REPORT IS SUBJECT TO MISINTERPRETATION

Costly problems can occur when other design professionals develop their plans based on misinterpretations of a geotechnical report. To help avoid these problems, the geotechnical engineer should be retained to work with other appropriate design professionals to explain relevant geotechnical findings and review adequacy of the plans and specifications relevant to geotechnical issues.

BORING LOGS SHOULD NOT BE SEPARATED FROM THE ENGINEERING REPORT

Further boring logs are developed based upon interpretation of field logs assembled by site personnel and laboratory evaluation of field samples. Only final boring logs customarily are included in Site Investigation & Classification Reports. These logs should not under any circumstance be redrawn for inclusion in architectural or other design drawings, because drafters may commit errors or omissions in the transfer process. Although photographic reproduction eliminates this problem, it does nothing to minimize the possibility of contractors misinterpreting the logs during bid preparation. When this occurs delays, disputes and unanticipated results are the all too frequent result.

To minimize the likelihood of boring log misinterpretation, give contractors ready access to the complete geotechnical engineering report prepared or authorized for their use. Those who do not provide such access may proceed under the mistaken impression that simply disclaiming responsibility for the accuracy of subsurface information always insulates them from attendant liability. Providing the best available information to contractors helps prevent costly construction problems and adversarial attitudes which aggravate them to disproportionate scale.

READ RESPONSIBILITY CLAUSES CLOSELY

Because geotechnical engineering is based extensively on judgment and opinion, it is far less exact than other design disciplines.

This situation has resulted in wholly unwarranted claims being lodged against geotechnical consultants. To help prevent this problem, geotechnical engineers have developed model clauses for use in written transmittals. These are not exculpatory clauses designed to foist geotechnical engineer's responsibilities and take appropriate action. Some of these definitive clauses are likely to appear in your report, and you are encouraged to read them closely.

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6. General Notes & Limitations of Geotechnical Site Investigation

GENERAL

This report comprises the results of an investigation carried out for a specific purpose and client as defined in the introduction section(s) of the document. The report should not be used by other parties or for other purposes as it may not contain adequate or appropriate information.

TEST PIT / BOREHOLE LOGGING

The information on the Logs (Borehole, Backhoe Pits, and Exposures etc.) has been based on a visual and tactile assessment except at the discrete locations where test information is available (field and/or laboratory results).

Reference should be made to our standard sheets for the definition of our logging procedures (Soils and Rock Description).

GROUNDWATER

Unless otherwise indicated the water levels given 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 permeability. Further variations of this level could occur with time due to such effects as seasonal and tidal fluctuations or construction activities. Final confirmation of levels can only be made by appropriate instrumentation and techniques and programs.

INTERPRETATION OF RESULTS

The discussions and recommendations contained in this report are normally based on site evaluation from discrete test hole data. Generalized or idealized subsurface conditions (including any cross-sections contained in the report) have been assumed or prepared by interpolation/extrapolation of these data. As such these conditions are interpretation and must be considered as a guide only.

CHANGE IN CONDITIONS

Local variations or anomalies in the generalized ground conditions used for this report can occur, particularly between discrete test hole locations. Furthermore, certain design or construction procedures may have been assumed in assessing the soil-structure interaction behaviour of the site.

FOUNDATION DEPTH

Where referred to in this report, the recommended depth of any foundation (piles, caissons, footings, etc.) is an engineering estimate of the depth to which they should be constructed. 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 depth remains, however, an estimate and therefore liable to variation. Foundation drawings, designs and specifications based on this report should provide for variations in the final depth depending upon the ground conditions at each point of support.

REPRODUCTION OF REPORTS

Where it is desired to reproduce the information contained in this report for the inclusion in the contract documents or engineering specifications of the subject development, such reproduction should include at least the entire relevant trial hole and test data, together with the appropriate standard description sheets and remarks in the written report of a factual or descriptive nature.

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SCOPE OF SERVICES

This geotechnical site assessment report ("The Report") has been prepared in accordance with the scope of services set out in the contract, or as otherwise agreed between the Client and HiQA ("Scope of Services"). In some circumstances the Scope of Services may have been limited by a range of factors such as time, budget, access and/or site disturbance constraints.

RELIANCE ON DATA

In preparing the report, HiQA has relied upon data, surveys, analyses, designs, plans and other information provided by the Client and other individuals and organisations, most of which are referred to in the report ("The Data"). Except as otherwise stated in the report, HiQA has not verified the accuracy or completeness of The Data to the extent that the statements, opinions, facts, information, conclusions and/or recommendations in the report ("Conclusions") are based in whole or part on The Data, those conclusions are contingent upon the accuracy and completeness of The Data. HiQA will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed to HiQA.

GEOTECHNICAL INVESTIGATION

Geotechnical engineering is based extensively on judgment and opinion. It is far less exact than other engineering disciplines. Geotechnical engineering reports are prepared to meet the specific needs of individuals. A report prepared for a consulting civil engineer may not be adequate for a construction contractor or even some other consulting civil engineer. This report was prepared expressly for the Client and expressly for purposes indicated by the Client or his/her representative. Use by any other persons for any purpose or by the Client for a different purpose, might result in problems. The Client should not use this report for other than its intended purpose without seeking additional geotechnical advice.

THIS GEOTECHNICAL REPORT IS BASED ON PROJECT•SPECIFIC FACTORS

This report is based on a subsurface investigation which was designed for project-specification factors, including the nature of any development, its size and configuration, the location of any development on the site and its orientation, and the location of access roads and parking areas. Unless further geotechnical advice is obtained this report cannot be used when the nature of any proposed development is changed, or when the size, configuration location or orientation of any proposed development is modified.

This report cannot be applied to an adjacent site. The Limitations of Site Investigation in making an assessment of a site from a limited number of boreholes or test pits there is the possibility that variations may occur between test locations. Site exploration identifies specific subsurface conditions only at those points from which samples have been taken. The risk that variations will not be detected can be reduced by increasing the frequency of test locations; however this often does not result in any overall cost savings for the project. The investigation programme undertaken is a professional estimate of the scope of investigation required to provide a general profile of the subsurface conditions. The data derived from the site investigation programme and subsequent laboratory testing are extrapolated across the site to form an inferred geological model and an engineering opinion is rendered about overall subsurface conditions and their likely behaviour with regard to the proposed development. Despite investigations the actual conditions at the site might differ from those inferred to exist, since no subsurface exploration programme, no matter how comprehensive, can reveal all subsurface details and anomalies. The borehole logs are the subjective interpretation of subsurface conditions at a particular location, made by trained personnel the interpretation may be limited by the method of investigation, and cannot always be definitive. For example, inspection of an excavation or test pit allows a greater area of the subsurface profile to be inspected than borehole investigation; however, such methods are limited by depth and site disturbance restrictions. In borehole investigation the actual interface between materials may be more gradual or abrupt than a report indicates.

SUBSURFACE CONDITIONS ARE TIME DEPENDENT

Subsurface conditions may be modified by changing natural forces or man-made influences. This report is based on conditions which existed at the time of subsurface exploration. Construction operations at, or adjacent to the site and natural

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events such as floods, or groundwater fluctuations, may also affect subsurface conditions and thus the continuing adequacy of a report. The geotechnical engineer should be kept appraised of any such events, and should be consulted to determine if additional tests are necessary.

AVOID MISINTERPRETATION

A geotechnical engineer should be retained to work with other appropriate design professionals explaining relevant geotechnical findings and in reviewing the adequacy of their plans and specifications relative to geotechnical issues.

BORE PROFILE LOGS SHOULD NOT BE SEPARATED FROM THE ENGINEERING REPORT

Bore/profile logs are developed by geotechnical engineers based upon their interpretation of field logs and laboratory evaluation of field samples. Customarily, only the final bore/profile logs are included in geotechnical engineering reports. These logs should not under any circumstances be redrawn for inclusion in architectural or other design drawings. To minimise the likelihood of bore/profile log misinterpretation, contractors should be given access to the complete geotechnical engineering report prepared or authorised for their use. Providing the best available information to contractors helps prevent costly construction problems. For further information on this matter reference should be made to Guidelines for the Provision of Geotechnical Information in Construction Contracts• published by the Institution of Engineers Australia, National Headquarters. Canberra 1987.

GEOTECHNICAL INVOLVEMENT DURING CONSTRUCTION

During construction, excavation is frequently undertaken which exposes the actual subsurface conditions. For this reason geotechnical consultants should be retained through the construction stage, to identify variations if they are exposed and to conduct additional tests which may be required and to deal quickly with geotechnical problems if they arise

REPORT FOR BENEFIT OF CLIENT

The report has been prepared for the benefit of the Client and no other party. HiQA assumes no responsibility and will not be liable to any other person or organisation for, or in relation to, any matter dealt with or conclusions expressed in the report or for any loss or damage suffered by any other person or organisation arising from matters dealt with or conclusions expressed in the report (including, without limitation, matters arising from any negligent act or omission of HiQA or to any loss or damage suffered by any other party relying upon the matters dealt with or conclusions expressed in the report). Other parties should not rely upon the report or the accuracy or completeness of any conclusions and should make their own enquiries and obtain independent advice in relation to such matters.

OTHER LIMITATIONS

HiQA will not be liable to update or revise the report to take into account any events or emergent circumstances or facts occurring or becoming apparent after the date of the report.

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APPENDIX A

Site Plan

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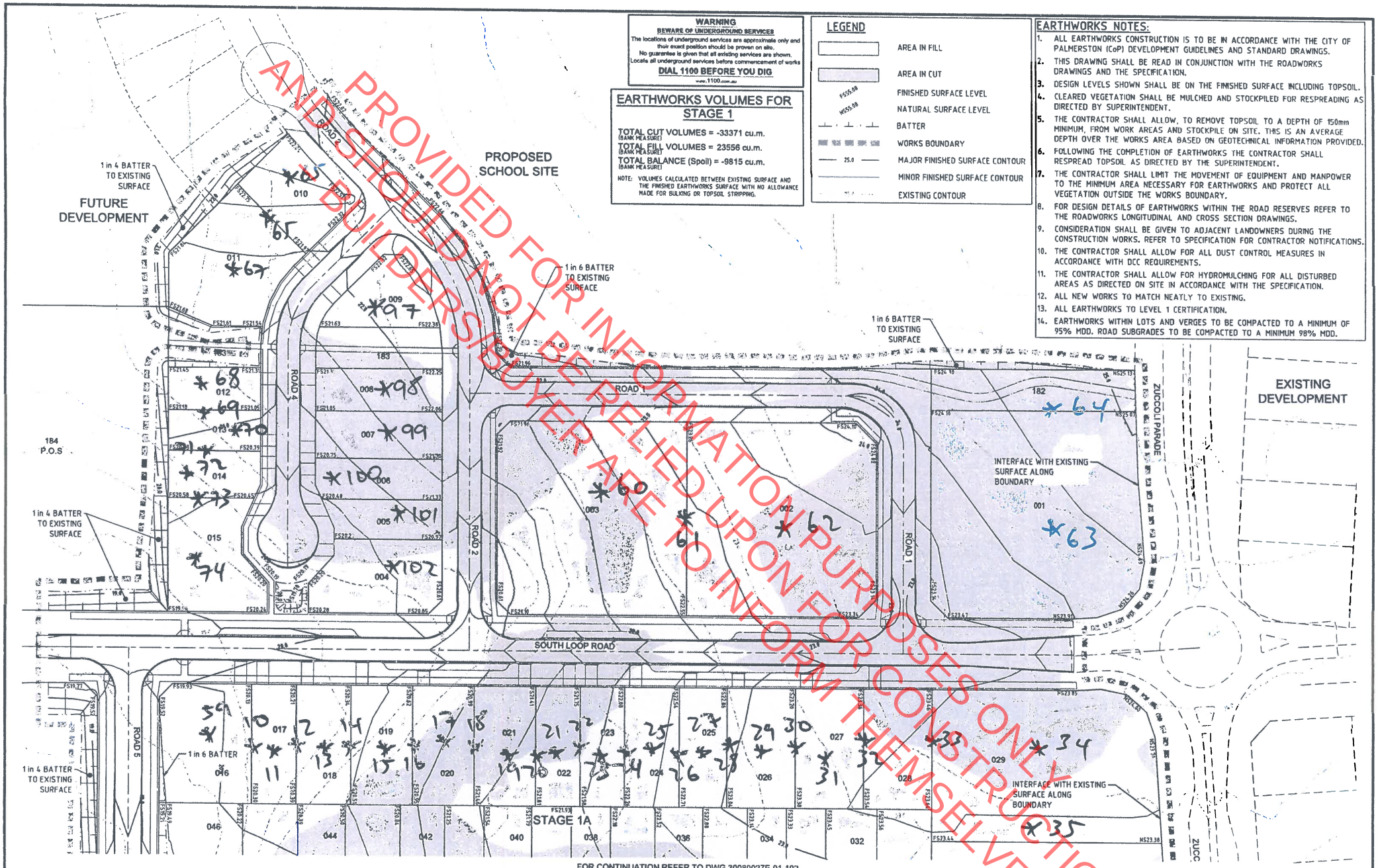

WARNING
BEWARE OF UNDERGROUND SERVICES
The locations of underground services are approximate only and their exact position should be proven on site.
No guarantee is given that all existing services are shown.
Locate all underground services before commencement of works
DIAL 1100 BEFORE YOU DIG
www.1100.com.au

EARTHWORKS VOLUMES FOR STAGE 1

TOTAL CUT VOLUMES = -33371 cu.m. (BANK MEASURE)
TOTAL FILL VOLUMES = 23556 cu.m. (BANK MEASURE)
TOTAL BALANCE (Spoil) = -9815 cu.m. (BANK MEASURE)

NOTE: VOLUMES CALCULATED BETWEEN EXISTING SURFACE AND THE FINISHED EARTHWORKS SURFACE WITH NO ALLOWANCE MADE FOR BULKING OR TOPSOIL STRIPPING.

LEGEND

- AREA IN FILL
- AREA IN CUT
- FS59.00 — FINISHED SURFACE LEVEL
- NS55.00 — NATURAL SURFACE LEVEL
- BATTER
- WORKS BOUNDARY
- 25.0 — MAJOR FINISHED SURFACE CONTOUR
- MINOR FINISHED SURFACE CONTOUR
- EXISTING CONTOUR

EARTHWORKS NOTES:

1. ALL EARTHWORKS CONSTRUCTION IS TO BE IN ACCORDANCE WITH THE CITY OF PALMERSTON (CoP) DEVELOPMENT GUIDELINES AND STANDARD DRAWINGS.
2. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH THE ROADWORKS DRAWINGS AND THE SPECIFICATION.
3. DESIGN LEVELS SHOWN SHALL BE ON THE FINISHED SURFACE INCLUDING TOPSOIL.
4. CLEARED VEGETATION SHALL BE MULCHED AND STOCKPILED FOR RESPREADING AS DIRECTED BY SUPERINTENDENT.
5. THE CONTRACTOR SHALL ALLOW, TO REMOVE TOPSOIL TO A DEPTH OF 150mm MINIMUM, FROM WORK AREAS AND STOCKPILE ON SITE. THIS IS AN AVERAGE DEPTH OVER THE WORKS AREA BASED ON GEOTECHNICAL INFORMATION PROVIDED.
6. FOLLOWING THE COMPLETION OF EARTHWORKS THE CONTRACTOR SHALL RESPREAD TOPSOIL AS DIRECTED BY THE SUPERINTENDENT.
7. THE CONTRACTOR SHALL LIMIT THE MOVEMENT OF EQUIPMENT AND MANPOWER TO THE MINIMUM AREA NECESSARY FOR EARTHWORKS AND PROTECT ALL VEGETATION OUTSIDE THE WORKS BOUNDARY.
8. FOR DESIGN DETAILS OF EARTHWORKS WITHIN THE ROAD RESERVES REFER TO THE ROADWORKS LONGITUDINAL AND CROSS SECTION DRAWINGS.
9. CONSIDERATION SHALL BE GIVEN TO ADJACENT LANDOWNERS DURING THE CONSTRUCTION WORKS. REFER TO SPECIFICATION FOR CONTRACTOR NOTIFICATIONS.
10. THE CONTRACTOR SHALL ALLOW FOR ALL DUST CONTROL MEASURES IN ACCORDANCE WITH DCC REQUIREMENTS.
11. THE CONTRACTOR SHALL ALLOW FOR HYDROMULCHING FOR ALL DISTURBED AREAS AS DIRECTED ON SITE IN ACCORDANCE WITH THE SPECIFICATION.
12. ALL NEW WORKS TO MATCH NEATLY TO EXISTING.
13. ALL EARTHWORKS TO LEVEL 1 CERTIFICATION.
14. EARTHWORKS WITHIN LOTS AND VERGES TO BE COMPACTED TO A MINIMUM OF 95% MDD. ROAD SUBGRADES TO BE COMPACTED TO A MINIMUM 98% MDD.

REVISION		DATE	DES-DFT	APPD
1	Issued for DWA	08/05/15	GW/DK	SF

Principal
Costajic Pty Ltd

PERMISSION TO USE FOR CONSTRUCTION PURPOSES ROADWORKS AND STORMWATER DRAINAGE
SIGNED ..... DATE .....
DIRECTOR OF TECHNICAL SERVICES
CITY OF PALMERSTON
This permission to use is given on the basis that the Developer and/or Consultant is not absolved from full responsibility for the correctness and accuracy of the design and/or associated documents.
This permission is valid for a period of two years from the date of signed approval

Project Leader
S. Fraser
Designed
G Wilkin
Drawn
G. Wilkin
Checked
G. Wilkin
Authorised
S.Fraser
Date
April 2015

Scale @ A1
1:500
0 5 10 20

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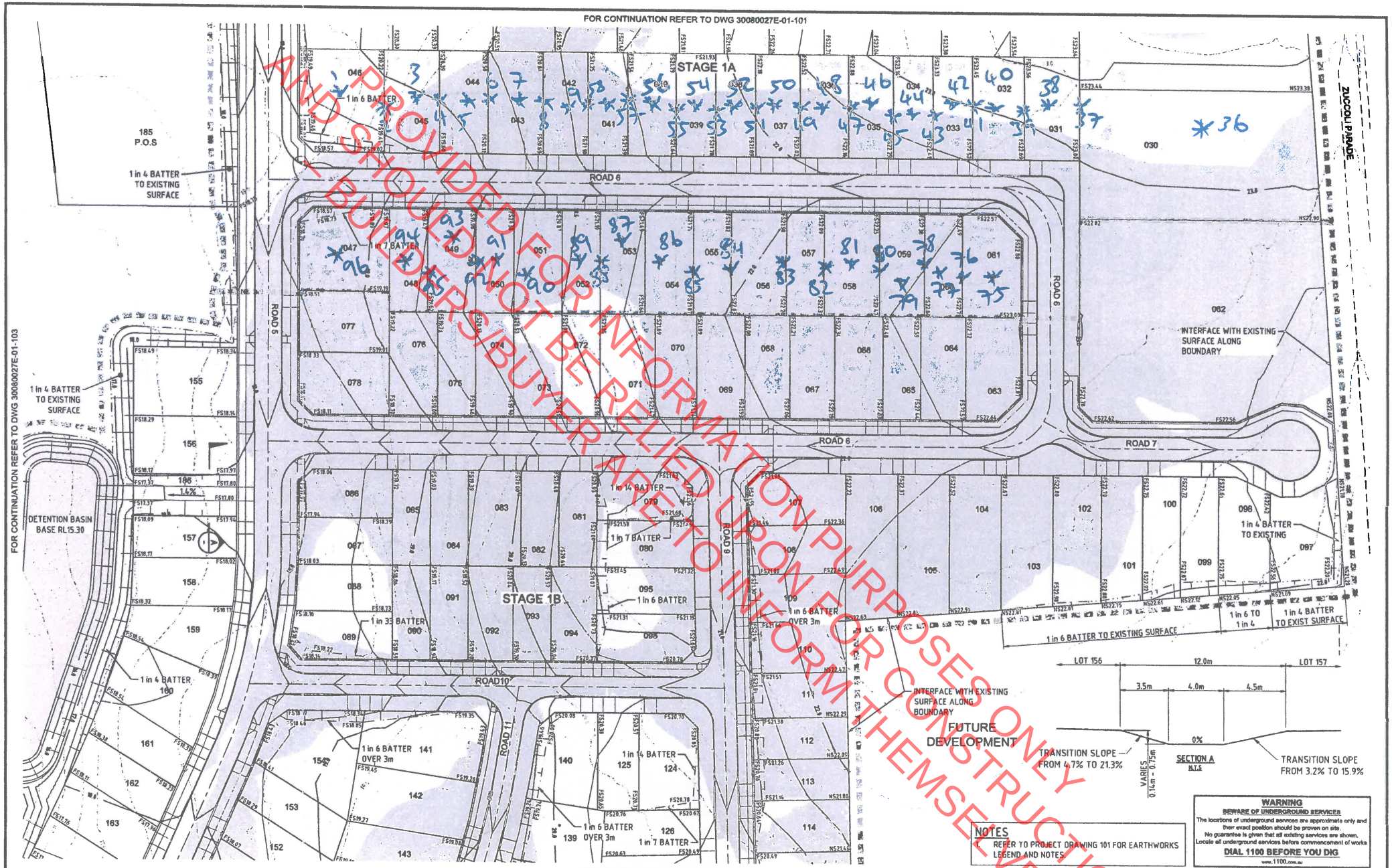
Zuccoli 3 and 4
Stage 1
City of Palmerston
Earthworks
Earthworks Layout Plan
Drawing No. 30080027E-01-101 **Rev** 1
Dev. App. No. DP15/0096
Sheet No. 1 of 3

Issued for Approval



NOTES

1. REFER TO PROJECT DRAWING 101 FOR EARTHWORKS LEGEND AND NOTES

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REVISION		DATE	DES/DFT	APP'D
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Zuccoli 3 and 4
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Drawing No. 30080027E-01-102 **Rev** 1
Dev. App. No. DP15/0096
Sheet No. 2 of 3

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APPENDIX B

Visual & Tactile Classification - Test Pits

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
1	0.0 – 0.2	Dry	GM	Dark Brown – Silty Sandy GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	14 25 20	Fine to Course	Fine to Medium	Sub Angular-Sub Rounded	FILL
1	0.2 – 0.6	Moist	GM	Dark Grey – Silty Sand GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	14 30 30	Fine to Course	Fine to Medium	Sub Angular-Sub Rounded	FILL
1	0.6 – 1.3	Moist	GM	Dark Grey – Silty Sandy GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	14 25 25	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	FILL

**MPS – Maximum Particle Size ***LL = Liquid Limit ****Pass. 0.075 = Passing the 0.075mm Sieve

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TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
2	0.0 – 0.25	Dry	GM	Dark Brown – Silty Sandy GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	14 20 25	Fine to Course	Fine to Medium	Angular-Sub Angular	-
2	0.25 – 0.60	Moist	GM	Dark Brown – Silty Sandy GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	25 30 30	Fine to Course	Fine to Medium	Angular-Sub Angular	-
2	0.60 – 1.5	Moist	GM	Dark Orange/Brown – Sandy Silty GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	25 30 30	Fine to Course	Fine to Medium	Angular-Sub Angular	-

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TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
3	0.0 – 0.3	Dry	GM	Dark Brown – Silty Sandy GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	10 20 20	Fine to Course	Fine to Medium	Sub Angular-Sub Rounded	-
3	0.3 – 1.0	Moist	GM	Dark Orange/Brown – Sandy Silty GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	20 30 35	Fine to Course	Fine to Medium	Sub Angular-Sub Rounded	-
3	1.0 – 1.5	Moist	GM	Pale Brown – Sandy Silty GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	20 30 30	Fine to Course	Fine to Medium	Sub Angular-Sub Rounded	-

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TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
4	0.0 – 0.35	Moist	GM	Pale Brown – Silty Sandy GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	10 20 20	Fine to Course	Fine to Medium	Sub Angular-Sub Rounded	-
4	0.35 – 0.70	Moist	GM	Pale Brown – Silty Sandy GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	10 25 20	Fine to Course	Fine to Medium	Sub Angular-Sub Rounded	-
4	@ 0.7	-	XW	Extremely Weathered Rock - Laterite	-	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**		-	-	-	EXTREMLEY WEATHERD ROCK

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TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
5	0.0 – 0.40	Dry	GM	Pale Brown – Silty Sand GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	10 20 20	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	-
5	0.40 – 0.60	Moist	GM	Pale Brown – Silty Sandy GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	50 20 20	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	-
5	@ 0.6	-	XW	Refusal on Extremely Weathered Rock - Laterite	-	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**		-	-	-	EXTREMLEY WEATHERD ROCK

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TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
6	0.0 – 0.40	Dry	GM	Pale Brown – Silty Sandy GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	14 15 20	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	-
6	0.40 – 0.60	Moist	GM	Pale Red/Brown – Sandy Silty GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	30 25 20	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	-
6	@ 0.60	-	XW	Refusal on Extremely Weathered Rock	-	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**		-	-	-	EXTREMLEY WEATHERD ROCK

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TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
7	0.0 – 0.50	Moist	GM	Pale Brown – Silty Sandy GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	14 20 25	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	-
7	0.5 – 1.0	Moist	GM	Pale Brown – Sandy Silty GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	20 20 20	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	-
7	@ 1.0	-	XW		-	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**		-	-	-	EXTREMLEY WEATHERD ROCK

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TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
8	0.0 – 0.5	Moist	GM	Dark Brown – Sandy Silty GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	40 20 25	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	-
8	0.5 – 1.0	Moist	GM	Dark Brown – Sandy Silty GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	50 25 25	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	-
8	@ 1.0	-	XW		-	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**		-	-	-	EXTREMLEY WEATHERD ROCK

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TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
9	0.0 – 0.5	Dry	GM	Dark Brown – Silty Sandy GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	20 25 25	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	-
9	0.5 – 0.7	Moist	GM	Pale Brown – Silty Sandy GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	20 20 20	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	-
9	0.7 – 1.0	Moist	GM	Pale Brown – Silty Sandy GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	20 25 20	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	-
9	1.0 – 1.3	Moist	GM	Pale Orange/Brown - Silty Sandy GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	20 25 20	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	-

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TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	-	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
10	0.0 – 0.5	Dry	GM	Pale Brown – Silty Sandy BROWN	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	40 25 25	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	-
10	0.5 – 1.3	Moist	GM	Dark Brown – Silty Sandy GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	20 25 20	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	-

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
11	0.0 – 0.5	Moist	GM	Dark Brown – Sandy Silty GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	40 30 25	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	-
11	0.5 – 1.2	Moist	GM	Dark Brown – Clayey Sandy GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	40 35 30	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	-
11	1.2 – 1.5	Moist	GM	Dark Brown – Silty Sandy GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	15 25 20	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	RESIDUAL SOIL

**MPS – Maximum Particle Size ***LL = Liquid Limit ****Pass. 0.075 = Passing the 0.075mm Sieve

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
12	0.0 – 0.2	Dry	GC	Dark Brown – Clayey Sandy GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	30 30 25	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	-
12	0.2 – 0.5	Moist	GM	Dark Brown – Silty Sandy GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	30 25 25	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	-
12	0.5 – 1.1	Moist	GM	Dark Brown – Silty Sandy GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	20 25 20	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	-
12	1.1 – 1.4	Moist	GC	Dark Brown – Clayey Sandy GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	10 35 30	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	-

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	-	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
13	0.0 – 0.4	Dry	GM	Dark Brown – Silty Sandy GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	50 25 25	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	-
13	0.4 – 0.8	Moist	GM	Dark Brown – Silty Sandy GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	40 20 25	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	-
13	0.8 – 1.2	Moist	GC	Dark Brown – Clayey Sandy GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	40 30 25	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	-
13	1.2 – 1.5	Moist	GM	Dark Brown – Silty Sandy GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	30 25 20	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	-

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	-	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
14	0.0 – 0.8	Dry	GM	Dark Brown – Silty Sandy GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	20 25 25	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	-
14	0.8 – 1.2	Moist	GM	Dark Brown – Silty Sandy GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	30 25 25	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	-

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
15	0.0 – 0.7	Dry	GM	Pale Brown – Silty Sandy GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	40 25 30	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	-
15	0.7 – 1.2	Moist	GM	Dark Brown – Silty Sandy GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	40 25 30	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	-
15	1.2 – 1.4	Moist	GC	Dark Brown – Clayey Sandy GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	30 30 35	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	-
15	1.4 – 1.6	Moist	GC	Dark Brown – Clayey Sandy GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	20 40 35	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	-

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
16	0.0 – 0.40	Dry	GM	Dark Brown – Silty Sandy GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	30 25 25	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	-
16	0.40 – 0.90	Moist	GC	Dark Brown – Clayey Sandy GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	30 30 35	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	-
16	0.90 – 1.2	Moist	GC	Dark Brown – Clayey Sandy GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	60 25 30	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	-
16	1.2 – 1.5	Moist	GC	Dark Brown – Clayey Sandy GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	75 30 35	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	-

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	-	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
17	0.0 – 0.3	Dry	GC	Dark Brown – Clayey Sandy GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	30 30 30	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	-
17	0.3 – 0.6	Moist	GC	Dark Brown – Clayey Sandy GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	30 35 30	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	-

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
18	0.0 – 0.4	Dry	GM	Dark Brown – Silty Sandy GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	20 20 20	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	-
18	@ 0.4	-	XW	Refusal on Extremely Weathered Rock	-	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**		-	-	-	EXTREMLEY WEATHERD ROCK

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
19	0.0 – 0.3	Moist	GM	Dark Brown – Silty Sandy GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	80 25 20	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	-
19	@ 0.3	-	XW	Refusal on Extremely Weathered Rock	-	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**		-	-	-	EXTREMLEY WEATHERD ROCK

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
20	0.00 – 0.15	Dry	GM	Dark Brown – Silty Sandy GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	30 25 20	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	-
20	0.15 – 0.30	Moist	GM	Dark Brown – Silty Sandy GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	30 25 20	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	-
20	@ 0.3	-	XW	Refusal on Extremely Weathered Rock	-	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**		-	-	-	EXTREMLEY WEATHERD ROCK

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
21	0.0 – 0.25	Moist	GM	Dark Brown – Silty Sandy GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	40 25 20	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	-
21	@ 0.25	-	XW	Refusal	-	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**		-	-	-	EXTREMLEY WEATHERD ROCK

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
22	0.0 – 0.3	Moist	GM	Dark Brown – Silty Sandy GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	50 25 20	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	-
22	0.3 – 0.6	Moist	GM	Dark Brown – Silty Sandy GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	70 25 20	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	-
22	0.6 – 1.6	Moist	GM	Dark Brown – Silty Sandy GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	70 25 20	Fine to Course	Medium to Course	Sub Rounded	-

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
23	0.0 – 0.3	Dry	GM	Dark Brown – Silty Sandy GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	60 25 20	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	-
23	0.3 – 0.5	Dry	GM	Dark Brown – Silty Sandy GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	60 25 25	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	-
23	0.5 – 0.6	Dry	RS	Dark Red/Brown – Silty Sandy GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	60 30 25	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	RESIDUAL SOIL

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
24	0.00 – 0.25	Dry	GM	Dark Brown - Silty Sandy GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	60 25 20	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	-
24	0.25 – 0.45	Moist	RS	Dark Brown - Silty Sandy GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	80 25 20	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	RESIDUAL SOIL
24	0.45 – 0.55	Moist	RS	Dark Red/Brown – Silty Sandy GRAVEL – Refusal on Extremely Weather Rock	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	60 30 20	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	RESIDUAL SOIL

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
25	0.0 – 0.5	Dry	GM	Dark Brown – Clayey Sandy GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	70 30 25	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	-
25	0.5 – 0.6	Moist	GM	Dark Grey/Brown – Silty Sandy GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	30 30 25	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	-
25	0.6 – 0.7	Moist	GM	Dark Red/Brown – Silty Sandy GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	60 30 25	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	-
25	0.7 – 1.0	Moist	GM	Dark Red/Brown – Silty Sandy GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	40 30 30	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	-
25	1.0 – 1.5	Moist	GC	Dark Brown – Clayey Sandy GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	70 30 30	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	-

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
26	0.00 – 0.25	Dry	GC	Pale Brown – Clayey Sandy GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	60 30 25	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	FILL
26	0.25 – 0.45	Moist	GC	Dark Brown – Clayey Sandy GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	60 30 25	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	FILL
26	0.45 – 0.75	Moist	RS	Pale Brown – Silty Sandy GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	60 25 25	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	RESIDUAL SOIL
26	0.75 – 1.75	Moist	RS	Dark Brown – Clayey Sandy GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	60 30 25	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	RESIDUAL SOIL

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	–	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
27	0.00 – 0.25	Moist	GC	Dark Brown – Clayey Sandy GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	60 30 25	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	FILL
27	0.25 – 0.55	Moist	GC	Dark Brown - Clayey Sandy GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	60 30 25	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	FILL
27	0.55 – 0.75	Moist	GM	Dark Black – Sandy Silty GRAVEL – Refusal on Extremely Weathered Rock	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	10 25 20	Fine to Course	Fine	Sub Angular-Sub Rounded	TOPSOIL

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
28	0.0 – 0.4	Dry	GM	Dark Brown – Silty Sandy GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	70 25 25	Fine to Course	Fine to Course	Sub Angular-Sub Rounded	FILL
28	0.4 – 0.8	Moist	GM	Dark Brown – Silty Sandy GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	60 25 25	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	-
28	@ 0.8	Moist	XW	Refusal on Extremely Weathered Rock	-	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**		-	-	-	EXTREMLEY WEATHERD ROCK

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
29	0.0 – 0.4	Moist	GM	Pale Brown – Silty Sandy GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	70 25 25	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	FILL
29	0.4 – 0.7	-	XW	Dark Yellow	-	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**		-	-	-	EXTREMLEY WEATHERD ROCK
29	@ 0.7	-	XW	Refusal on Extremely Weathered Rock	-	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**		-	-	-	EXTREMLEY WEATHERD ROCK

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
30	0.00 – 0.45	Dry	GM	Dark Brown – Silty Sandy GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	20 25 20	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	FILL
30	0.45 – 0.75	Moist	GC	Dark Brown – Clayey Sandy GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	30 30 25	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	TOPSOIL
30	0.75 – 1.5	Moist	RS	Pale Brown – Clayey Sandy GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	70 30 25	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	RESIDUAL SOIL

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
31	0.00 – 0.45	Dry	GC	Pale Brown – Sandy Clayey GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	40 35 20	Fine to Medium	Fine to Course	Sub Angular-Sub Rounded	FILL
31	0.45 – 0.55	Moist	GM	Pale Black – Sandy Silty GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	20 25 20	Fine to Medium	Fine to Medium	Sub Rounded-Rounded	TOPSOIL
31	0.55 – 0.65	-	XW	Pale Red/Brown – Refusal on Extremely Weathered Rock	-	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**		-	-	-	EXTREMLEY WEATHERD ROCK

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
32	0.0 – 0.2	Dry	GM	Pale Brown – Sandy Silty GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	40 30 20	Fine to Course	Fine to Course	Sub Angular-Sub Rounded	FILL
32	0.2 – 0.3	Dry	GM	Pale Black – Sandy Silty GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	20 25 20	Fine to Medium	Fine to Medium	Sub Rounded-Rounded	TOPSOIL
32	0.3 – 0.8	Moist	RS	Pale Brown – Sandy Silty GRAVEL – Refusal on Extremely Weathered Rock	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	30 30 20	Fine to Course	Fine to Course	Sub Angular-Sub Rounded	RESIDUAL SOIL

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
33	0.00 – 0.45	Dry	GM	Pale Brown – Sandy Silty GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	30 25 20	Fine to Medium	Fine to Course	Sub Angular-Sub Rounded	FILL
33	0.45 – 1.7	Dry	GM	Dark Brown – Sandy Silty GRAVEL – Refusal on Extremely Weathered Rock	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	30 25 30	Fine to Medium	Fine to Course	Sub Angular-Sub Rounded	FILL

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
34	0.0 – 0.3	Dry	GM	Dark Brown – Sandy Silty GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	40 30 20	Fine to Medium	Fine to Course	Sub Angular-Sub Rounded	FILL
34	0.3 – 0.5	Dry	GM	Pale Black – Sandy Silty GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	20 25 20	Fine to Medium	Fine to Medium	Sub Rounded-Rounded	TOPSOIL
34	0.50 – 1.35	Dry	RS	Pale Brown – Sandy Silty GRAVEL – Refusal on Extremely Weathered Rock	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	150 25 20	Fine to Medium	Fine to Course	Sub Angular-Sub Rounded	RESIDUAL SOIL

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TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
35	0.0 – 0.2	Dry	GM	Dark Brown – Sandy Silty GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	50 35 20	Fine to Medium	Fine to Course	Sub Angular-Sub Rounded	FILL
35	0.2 – 0.4	Dry	GM	Pale Black – Sandy Silty GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	20 25 20	Fine to Medium	Fine to Medium	Sub Rounded-Rounded	TOPSOIL
35	0.4 – 1.5	Dry	RS	Dark Brown – Sandy Silty GRAVEL – Refusal on Extremely Weathered Rock	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	150 35 25	Fine to Medium	Fine to Course	Sub Angular-Sub Rounded	RESIDUAL SOIL

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
37	0.00 – 0.55	Dry	GM	Dark Brown – Sandy Silty GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	25 30 20	Fine to Medium	Fine to Course	Sub Angular-Sub Rounded	FILL
37	0.55 – 1.55	Moist	RS	Dark Brown – Sandy Silty GRAVEL – Refusal on Extremely Weathered Rock	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	40 35 25	Fine to Medium	Fine to Course	Sub Angular-Sub Rounded	RESIDUAL SOIL

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TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
38	0.00 – 0.25	Dry	GM	Dark Brown – Sandy Silty GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	30 25 20	Fine to Course	Fine to Course	Sub Angular-Sub Rounded	FILL
38	0.25 – 0.40	Dry	GM	Pale Yellow/Black – Sandy Silty GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	15 20 15	Fine to Medium	Fine to Medium	Sub Angular-Sub Rounded	TOPSOIL
38	0.40 – 1.65	Moist	RS	Dark Brown – Sandy Silty GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	150 35 20	Fine to Medium	Fine to Course	Angular-Sub Angular	RESIDUAL SOIL

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TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
39	0.00 – 0.15	Dry	GM	Dark Brown – Sandy Silty GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	60 25 20	Fine to Medium	Fine to Course	Sub Angular-Sub Rounded	FILL
39	0.15 – 0.35	Dry	GM	Pale Black - Sandy Silty GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	16 25 15	Fine to Medium	Fine to Medium	Sub Angular-Sub Rounded	TOPSOIL
39	0.35 – 1.5	Moist	RS	Pale Brown – Sandy Silty GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	60 35 25	Fine to Course	Fine to Course	Sub Angular-Sub Rounded	RESIDUAL SOIL

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
40	0.0 – 0.2	Dry	GC	Dark Brown – Sandy Silty GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	30 35 20	Fine to Course	Fine to Course	Sub Angular-Sub Rounded	FILL
40	0.2 – 0.3	Moist	GC	Dark Yellow/Black – Sandy Clayey GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	20 35 25	Fine to Course	Fine to Medium	Sub Angular-Sub Rounded	TOPSOIL
40	0.3 – 0.6	Moist	RS	Dark Red/Brown - Sandy Clayey GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	15 30 20	Fine	Fine to Medium	Angular-Sub Angular	RESIDUAL SOIL

**MPS – Maximum Particle Size ***LL = Liquid Limit ****Pass. 0.075 = Passing the 0.075mm Sieve

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
36	0.0 – 0.5	Dry	GC	Dark Brown – Sandy Clayey GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	20 30 20	Fine to Medium	Fine to Course	Sub Angular-Sub Rounded	FILL
36	0.5 – 1.6	Moist	RS	Dark Brown - Sandy Clayey GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	150 35 20	Fine to Medium	Fine to Course	Sub Angular-Sub Rounded	RESIDUAL SOIL

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
41	0.0 – 0.2	Dry	GM	Dark Brown – Sandy Silty GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	20 30 25	Fine to Course	Fine to Medium	Sub Angular-Sub Rounded	FILL
41	0.2 – 0.3	Moist	GM	Dark Black – Sandy Silty GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	16 20 20	Fine to Medium	Fine to Medium	Sub Angular-Sub Rounded	TOPSOIL
41	0.3 – 1.6	Moist	RS	Dark Red/Brown – Sandy Silty GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	60 35 25	Fine to Course	Fine to Course	Angular-Sub Angular	RESIDUAL SOIL

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
42	0.0 – 0.2	Dry	GM	Dark Brown – Sandy Silty GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	20 30 25	Fine to Course	Fine to Medium	Sub Angular-Sub Rounded	FILL
42	0.2 – 0.4	Moist	GC	Pale Black - Sandy Clayey GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	16 30 20	Fine to Medium	Fine to Medium	Sub Angular-Sub Rounded	TOPSOIL
42	0.4 – 1.0	Moist	RS	Dark Red/Brown – Sandy Clayey GRAVEL – Refusal on Extremely Weathered Rock	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	60 35 20	Fine to Course	Fine to Course	Angular-Sub Angular	RESIDUAL SOIL

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
43	0.0 – 0.3	Dry	GM	Dark Brown – Sandy Silty GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	30 30 20	Fine to Course	Fine to Course	Sub Angular-Sub Rounded	FILL
43	0.30 – 0.55	Moist	GM	Pale Black – Sandy Silty GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	40 25 15	Fine to Medium	Fine to Course	Sub Angular-Sub Rounded	TOPSOIL
43	0.55 – 0.9	Moist	RS	Dark Red/Brown – Sandy Silty GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	150 35 25	Fine to Course	Fine to Course	Angular-Sub Angular	RESIDUAL SOIL

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
44	0.0 – 0.2	Dry	GM	Dark Brown – Sandy Silty GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	40 30 20	Fine to Medium	Fine to Course	Sub Angular-Sub Rounded	FILL
44	0.2 – 0.6	Moist	GM	Pale Black – Sandy Silty GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	25 30 25	Fine to Medium	Fine to Course	Sub Angular-Sub Rounded	TOPSOIL
44	0.6 – 1.5	Moist	RS	Dark Red/Brown – Sandy Silty GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	100 35 25	Fine to Course	Fine to Course	Angular-Sub Angular	RESIDUAL SOIL

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
45	0.0 – 0.2	Dry	GM	Dark Brown - Sandy Silty GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	40 30 20	Fine to Medium	Fine to Course	Sub Angular-Sub Rounded	FILL
45	0.20 – 0.45	Moist	GM	Pale Black – Sandy Silty GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	25 30 25	Fine to Medium	Fine to Course	Sub Angular-Sub Rounded	TOPSOIL
45	@ 0.45	-	XW	Refusal	-	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**		-	-	-	EXTREMLEY WEATHERD ROCK

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
46	0.00 – 0.15	Dry	GM	Dark Brown - Sandy Silty GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	40 35 20	Fine to Medium	Fine to Course	Sub Angular-Sub Rounded	FILL
46	0.15 – 0.25	Moist	GC	Pale Black - Sandy Clayey GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	20 25 25	Fine to Medium	Fine to Medium	Sub Angular-Sub Rounded	TOPSOIL
46	0.25 – 1.50	Moist	RS	Dark Red/Brown – Sandy Clayey GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	100 35 20	Fine	Fine to Course	Angular-Sub Angular	RESIDUAL SOIL

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
47	0.00 – 0.15	Dry	GM	Dark Brown – Sandy Silty GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	40 35 20	Fine to Medium	Fine to Course	Sub Angular-Sub Rounded	FILL
47	0.15 – 0.35	Moist	GC	Pale Black – Sandy Clayey GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	20 25 25	Fine to Medium	Fine to Medium	Sub Angular-Sub Rounded	TOPSOIL
47	0.35 – 0.60	Moist	RS	Dark Red/Brown – Sandy Clayey GRAVEL – Refusal on Extremely Weathered Rock	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	100 35 20	Fine	Fine to Course	Angular-Sub Angular	RESIDUAL SOIL

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
48	0.00 – 0.15	Dry	GM	Dark Brown – Sandy Silty GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	40 35 20	Fine to Medium	Fine to Course	Sub Angular-Sub Rounded	FILL
48	0.15 – 0.35	Moist	GC	Dark Black – Sandy Clayey GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	20 25 25	Fine to Medium	Fine to Medium	Sub Angular-Sub Rounded	TOPSOIL
48	@ 0.35	-	XW	Dark Red/Brown - Refusal	-	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**		-	-	-	EXTREMLEY WEATHERD ROCK
		-	-		-	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**		-	-	-	-

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
49	0.00 – 0.15	Dry	GM	Dark Brown – Sandy Silty GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	40 35 20	Fine to Medium	Fine to Course	Sub Angular-Sub Rounded	FILL
49	0.15 – 0.35	Moist	GC	Pale Black – Sandy Clayey GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	20 25 25	Fine to Medium	Fine to Medium	Sub Angular-Sub Rounded	TOPSOIL
49	@ 0.35	-	XW	Dark Red/Brown - Refusal	-	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**		-	-	-	EXTREMLEY WEATHERD ROCK

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
50	0.0 – 0.1	Dry	GM	Dark Brown – Sandy Silty GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	40 35 20	Fine to Medium	Fine to Course	Sub Angular-Sub Rounded	FILL
50	0.1 – 0.3	Moist	GC	Pale Black – Sandy Clayey GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	20 25 25	Fine to Medium	Fine to Medium	Sub Angular-Sub Rounded	TOPSOIL
50	0.3 – 0.4	-	XW	Dark Red/Brown - Refusal	-	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**		-	-	-	EXTREMLEY WEATHERD ROCK

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
51	0.0 – 0.1	Moist	GM	Dark Brown – Sandy Silty GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	40 35 20	Fine to Medium	Fine to Course	Sub Angular-Sub Rounded	FILL
51	0.1 – 0.3	-	XW	Dark Red/Brown	-	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**		-	-	-	EXTREMLEY WEATHERD ROCK
Test Pit terminated @ 0.30m on Extremely Weathered Rock											

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
52	0.0 – 0.1	Dry	GM	Dark Brown – Sandy Silty GRAVEL	-	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	40 35 20	Fine to Medium	Fine to Course	Sub Angular-Sub Rounded	FILL
52	0.1 – 0.3	Moist	RS	Dark Red/Brown – Sandy Clayey GRAVEL	-	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	150 35 20	Fine	Fine to Course	Angular-Sub Angular	RESIDUAL SOIL
Test Pit terminated @ 0.3m on Extremely Weathered Rock											

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
53	0.00 – 0.25	Dry	GM	Pale Black – Sandy Silty GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	16 25 20	Fine to Course	Fine to Medium	Sub Angular-Sub Rounded	FILL
53	0.25 – 0.40	Moist	RS	Dark Red/Brown – Sandy Silty GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	300 30 25	Fine to Course	Fine to Course	Sub Angular-Sub Rounded	RESIDUAL SOIL
Test Pit terminated @ 0.40m on Extremely Weathered Rock 0.25m – 0.40m progress from Residual Soil to Extremely Weathered throughout layer											

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
54	0.00 – 0.20	Dry	GM	Dark Brown – Sandy Silty GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	30 30 25	Fine to Course	Fine to Course	Sub Angular-Sub Rounded	FILL
54	0.20 – 0.40	Moist	GM	Pale Black – Sandy Silty GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	20 25 25	Fine to Medium	Fine to Medium	Sub Angular-Sub Rounded	TOPSOIL
54	0.40 – 0.65	Moist	RS	Dark Red/Brown – Sandy Silty GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	300 30 25	Fine to Course	Fine to Course	Sub Angular-Sub Rounded	RESIDUAL SOIL
Test Pit terminated @ 0.65m on Extremely Weathered Rock 0.40m – 0.65m progress from Residual Soil to Extremely Weathered Rock											

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
55	0.0 – 0.1	Dry	GM	Dark Brown – Sandy Silty GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	30 30 25	Fine to Course	Fine to Course	Sub Angular-Sub Rounded	FILL
55	0.1 – 0.3	Moist	GM	Pale Black – Sandy Silty GRAVEL Minimal Organics present	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	20 25 25	Fine to Medium	Fine to Medium	Sub Angular-Sub Rounded	TOPSOIL
55	0.3 – 0.5	Moist	RS	Dark Red/Brown – Sandy Silty GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	150 30 25	Fine to Course	Fine to Course	Sub Angular-Sub Rounded	RESIDUAL SOIL
Test Pit terminated on Extremely Weathered Rock @ 0.5m											

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
56	0.0 – 0.1	Dry	GM	Dark Brown – Sandy Silty GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	30 30 25	Fine to Course	Fine to Course	Sub Angular-Sub Rounded	FILL
56	0.1 – 0.3	Moist	GM	Pale Black – Sandy Silty GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	20 25 25	Fine to Medium	Fine to Medium	Sub Angular-Sub Rounded	TOPSOIL
56	0.3 – 0.6	Moist	RS	Dark Red/Brown – Sandy Silty GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	150 30 25	Fine to Course	Fine to Course	Sub Angular-Sub Rounded	RESIDUAL SOIL
Test Pit terminated @ 0.6m on Extremely Weathered Rock											

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
57	0.0 – 0.1	Dry	GM	Dark Brown – Sandy Silty GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	30 30 25	Fine to Course	Fine to Course	Sub Angular-Sub Rounded	FILL
57	0.1 – 0.3	Moist	GM	Pale Black – Sandy Silty GRAVEL Organics present	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	20 25 25	Fine to Medium	Fine to Medium	Sub Angular-Sub Rounded	TOPSOIL
57	0.3 – 1.4	Moist	RS	Dark Red/Brown – Sandy Silty GRAVEL	-	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	200 30 25	Fine to Course	Fine to Course	Sub Angular-Sub Rounded	RESIDUAL SOIL
Test Pit terminated @ 1.4m on Extremely Weathered Rock 0.3m – 1.4m – Materials progress from Residual Soil to Extremely Weathered Rock throughout											

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
58	0.0 – 0.1	Dry	GM	Dark Brown – Sandy Silty GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	30 30 25	Fine to Course	Fine to Course	Sub Angular-Sub Rounded	FILL
58	0.1 – 0.3	Moist	GM	Pale Black – Sandy Silty GRAVEL Organics present	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	60 25 25	Fine to Medium	Fine to Medium	Sub Angular-Sub Rounded	TOPSOIL
58	0.3 – 1.6	Moist	RS	Dark Red/Brown – Sandy Silty GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	200 30 25	Fine to Course	Fine to Course	Sub Angular-Sub Rounded	RESIDUAL SOIL
Test Pit terminated @ 1.6m on Extremely Weathered Rock 0.3m – 1.6m – Layer progress from Residual Soil to Extremely Weathered Rock											

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
59	0.0 – 1.0	Moist	GM	Dark Brown – Sandy Silty GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	60 30 20	Fine to Medium	Fine to Course	Sub Angular-Sub Rounded	FILL
59	1.0 – 1.4	Moist	GM	Dark Brown/Black – Sandy Silty GRAVEL Minor organic matter present	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	50 35 25	Fine to Medium	Fine to Course	Sub Angular-Sub Rounded	FILL
Test Pit terminated @ 1.4m											

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
60	0.0 – 0.2	Moist	GC	Dark Orange/Brown – Sandy Clayey GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	50 40 20	Fine to Medium	Fine to Course	Sub Angular-Sub Rounded	FILL
60	0.2 – 0.4	Moist	GM	Pale Black – Sandy Silty GRAVEL Organics present	-	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	20 25 15	Fine to Medium	Fine to Medium	Sub Angular-Sub Rounded	TOPSOIL
60	0.4 – 1.5	Moist	RS	Dark Orange/Brown – Sandy Silty GRAVEL Extremely Weathered Rock	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	200 40 25	Fine to Course	Fine to Course	Sub Angular-Sub Rounded	RESIDUAL SOIL
Test Pit terminated @ 1.5m on Extremely Weathered Rock 0.4m – 1.5m – Layer progress from Residual Soil to Extremely Weathered Rock											

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
61	0.00 – 0.15	Moist	GM	Very Dark Brown – Sandy Silty GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	60 30 20	Fine	Fine to Course	Sub Angular-Sub Rounded	FILL
61	0.15 – 0.20	Moist	GM	Pale Black – Sandy Silty GRAVEL Organics present	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	20 25 15	Fine to Medium	Fine to Medium	Sub Angular-Sub Rounded	TOPSOIL
61	0.20 – 0.90	Moist	RS	Very Dark Orange/Brown – SAND Extremely Weathered Rock	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	150 35 25	Fine	Fine to Course	Angular-Sub Angular	RESIDUAL SOIL
Test Pit terminated @ 0.9m on Extremely Weathered Rock											

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
62	0.0 – 0.2	Dry	GM	Pale Black – Sandy Silty GRAVEL Organics present	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	50 25 15	Fine to Medium	Fine to Course	Angular-Sub Angular	TOPSOIL
62	0.2 – 1.4	Moist	RS	Dark Orange/Brown – Sandy Clayey GRAVEL Extremely Weathered Rock	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	120 35 20	Fine to Course	Fine to Course	Angular-Sub Angular	RESIDUAL SOIL
Test Pit terminated @ 1.4m on Extremely Weathered Rock											

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
63	0.0 – 0.2	Moist	GM	Pale Black – Sandy Silty GRAVEL Organics present	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	50 25 15	Fine to Medium	Fine to Course	Sub Angular-Sub Rounded	TOPSOIL
63	0.2 – 1.2	Moist	RS	Dark Orange/Brown – Sandy Silty Gravel	-	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	140 35 20	Fine to Course	Fine to Course	Angular-Sub Angular	RESIDUAL SOIL
Test Pit terminated @ 1.2m on Extremely Weathered Rock											

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
64	0.00 – 0.15	Dry	-	Dark Brown - Sandy Clayey GRAVEL	-	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	20 30 20	Fine to Medium	Fine to Course	Sub Angular-Sub Rounded	FILL
64	0.15 – 0.35	Moist	-	Pale Black – Sandy Silty GRAVEL Organics present	-	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	30 25 20	Fine to Medium	Fine to Medium	Sub Angular-Sub Rounded	TOPSOIL
64	0.35 – 1.80	Moist	RS	Dark Orange/Brown	-	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	60 30 20	Fine to Course	Fine to Course	Sub Angular-Sub Rounded	RESIDUAL SOIL

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
65	0.0 – 1.2	Moist	GM	Dark Brown – Sandy Silty GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	75 35 20	Fine to Medium	Fine to Course	Sub Angular-Sub Rounded	FILL
Test Pit refused on Extremely Weathered Rock – Whole layer controlled fill											

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
66	0.0 – 1.2	Moist	GM	Dark Brown – Sandy Silty GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	100 35 20	Fine to Course	Fine to Course	Sub Angular-Sub Rounded	FILL
Test Pit terminated @ 1.2m on Extremely Weathered Rock											

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
67	0.00 – 1.25	Moist	GM	Dark Brown – Sandy Silty GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	80 35 25	Fine to Medium	Fine to Course	Sub Angular-Sub Rounded	FILL
Test Pit refused on Extremely Weathered Rock											

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
68	0.0 – 1.3	Moist	GM	Dark Brown – Sandy Silty GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	100 30 20	Fine to Medium	Fine to Course	Sub Angular-Sub Rounded	FILL
68	@1.3	-	XW	Pale Yellow/Brown – Extremely Weathered Rock	-	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**		-	-	-	-
Test Pit terminated on Extremely Weathered Rock Progress from Fill to Extremely Weathered Rock from about 1.0m onwards											

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
69	0.0 – 1.1	Moist	GM	Dark Brown – Sandy Silty GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	60 30 20	Fine to Medium	Fine to Course	Sub Angular-Sub Rounded	FILL
69	1.1 – 1.3	Moist	RS	Dark Yellow/Red – Sandy Clayey GRAVEL Cemented Soil	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	120 35 20	Fine to Medium	Fine to Course	Angular-Sub Angular	RESIDUAL SOIL
Test Pit terminated on Extremely Weathered Rock											

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
70	0.0 – 1.0	Moist	GM	Dark Brown – Sandy Silty GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	50 30 20	Fine to Medium	Fine to Course	Sub Angular-Sub Rounded	FILL
70	1.0 – 1.2	Moist	RS	Dark Yellow/Brown – Sandy Silty GRAVEL Cemented Soil	-	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	120 30 20	Fine to Medium	Fine to Course	Sub Angular-Sub Rounded	RESIDUAL SOIL
70	@1.2	-	-	Dark Yellow/Brown Extremely Weathered Rock	-	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**		-	-	-	EXTREMLEY WEATHERD ROCK
Test Pit terminated on Extremely Weathered Rock											

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
71	0.0 – 0.65	Moist	GM	Dark Brown – Sandy Silty GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	60 35 20	Fine to Medium	Fine to Course	Sub Angular-Sub Rounded	FILL
71	0.65 – 0.85	Moist	GC	Pale Black - Sandy Clayey GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	18 30 25	Fine to Course	Fine to Medium	Sub Angular-Sub Rounded	TOPSOIL
71	0.85 -1.15	Moist	RS	Dark Brown - Silty Sandy GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	25 35 30	Fine	Fine to Course	Sub Angular-Sub Rounded	RESIDUAL SOIL
Test pit terminated on Extremely Weathered Rock											

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	-	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
72	0.0 – 0.5	Dry	GC	Pale Orange/Brown – Sandy Clayey GRAVEL	Very Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	40 30 25	Fine to Medium	Fine to Course	Sub Angular	-
72	0.5 – 0.8	Moist	GC	Pale Brown - Sandy Clayey GRAVEL	Very Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	30 27 22	Fine to Course	Fine to Medium	Sub Angular	-
72	0.8 – 1.2	Moist	XW	Dark Orange/Brown – Gravel Clayey SAND – Terminated on Extremely Weathered Rock	Very Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	40 25 30	Fine to Medium	Medium to Course	Sub Angular	-

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
73	0.0 – 0.7	Moist	GC	Pale Yellow/Brown – Sandy Clayey GRAVEL	Very Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	30 30 25	Fine to Medium	Fine to Medium	Sub Angular	-
73	0.7- 1.2	Moist	GM	Dark Brown – Sandy Silty GRAVEL – Refusal at 1.2m	Very Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	30 25 20	Fine to Medium	Fine to Medium	Sub Angular-Sub Rounded	-

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
74	0.0 – 1.2	Moist	GC	Pale Orange/Brown – Clayey Sandy GRAVEL	Very Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	40 30 25	Fine to Medium	Fine to Medium	Sub Angular-Sub Rounded	FILL
Test pit refused at 1.2m											

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
75	0.0 – 1.3	Moist	GC	Very Pale White/Grey – Sandy Clayey GRAVEL	Very Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	100 25 15	Fine to Medium	Course	Sub Angular	FILL
Test pit refused at 1.3m.											

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
76	0.0 – 0.4	Moist	GM	Very Pale Yellow/Brown – Silty Sandy GRAVEL	Very Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	40 20 20	Fine to Medium	Fine to Medium	Sub Angular	-
76	0.40 – 0.85	Dry	XW	Very Pale White/Grey	-	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**		-	-	-	EXTREMLEY WEATHERD ROCK
Test pit refused on Extremely Weathered Rock at 0.85m.											

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
77	0.0 – 0.4	Moist	GM	Very Pale Yellow/Brown – Sandy Silty GRAVEL	Very Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	100 20 20	Fine to Medium	Medium to Course	Sub Angular	-
77	0.40 – 0.85	Dry	XW	Very Pale White/Grey	-	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**		-	-	-	EXTREMLEY WEATHERD ROCK
Test pit refused ay 0.85m on Extremely Weathered Rock											

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
78	0.0 – 0.4	Moist	GC	Pale Yellow/Brown – Sandy Clayey GRAVEL	Very Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	40 27 22	Fine to Medium	Medium to Course	Sub Angular	-
78	0.40 – 0.85	Moist	GC	Very Pale White/Grey – Sandy Clayey GRAVEL	Very Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	80 30 35	Fine to Medium	Medium to Course	Sub Angular	-
Test pit terminated on Extremely Weathered Rock											

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
79	0.0 – 0.9	Moist	GC	Very Pale Yellow/Brown – Sandy Clayey GRAVEL	Very Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	20 30 25	Fine to Medium	Medium to Course	Sub Angular-Sub Rounded	-
79	0.9 – 1.0	Dry	XW	Very Pale White/Grey	-	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**		-	-	-	EXTREMLEY WEATHERD ROCK
Test pit terminated at 1.0m on Extremely Weathered Rock											

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
80	0.0 – 0.6	Moist	RS	Pale Yellow/Brown – Sandy Silty GRAVEL	Very Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	90 20 20	Fine to Course	Fine to Course	Sub Angular	RESIDUAL SOIL
80	0.6 – 1.2	Dry	XW	Very Pale White/Grey	-	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**		-	-	-	EXTREMLEY WEATHERD ROCK
Test pit refused on Extremely Weathered Rock											

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TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
81	0.0 – 0.8	-	XW	Very Pale Yellow	-	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	-	-	-	-	EXTREMLEY WEATHERD ROCK
Refusal at 0.8m											

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TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
82	0.00 – 0.65	Moist	GC	Very Pale Yellow/Brown – Sandy Clayey GRAVEL	Very Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	40 27 25	Fine to Medium	Fine to Medium	Sub Angular-Sub Rounded	-
82	0.65 – 0.80	-	XW	Very Pale White/Grey	-	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**		-	-	-	EXTREMLEY WEATHERD ROCK
Refusal at 0.8m											

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TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
83	0.0 – 0.6	Moist	GC	Pale Yellow/Brown - Sandy Clayey GRAVEL	Very Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	40 30 25	Fine to Medium	Medium to Course	Sub Angular	-
83	0.6 – 0.9	-	XW	Very Dark White/Grey	-	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**		-	-	-	EXTREMLEY WEATHERD ROCK

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
84	0.0 – 0.5	Moist	GM	Very Pale Yellow/Brown – Silty Sandy GRAVEL	Very Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	120 20 18	Fine to Course	Fine to Course	Sub Angular	-
84	0.5 – 1.2	-	XW	Very Pale Yellow/Brown	Very Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**		-	-	-	-
Refusal at 1.2m											

**MPS – Maximum Particle Size ***LL = Liquid Limit ****Pass. 0.075 = Passing the 0.075mm Sieve

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
85	0.00 – 0.55	Moist	GC	Very Pale Yellow/Brown – Sandy Clayey GRAVEL	Very Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	40 25 20	Fine to Medium	Fine to Course	Sub Angular-Sub Rounded	-
85	0.55 – 1.10	-	XW	Very Pale Yellow/Brown	Very Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**		-	-	-	EXTREMLEY WEATHERD ROCK
Refusal at 1.1m											

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
86	0.0 – 0.6	Moist	GC	Pale Yellow/Brown – Sandy Clayey GRAVEL	Very Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	60 27 22	Fine	Fine to Course	Sub Angular	-
86	0.60 – 0.85	Dry	XW	Very Pale White/Grey	-	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**		-	-	-	EXTREMLEY WEATHERD ROCK
Refusal at 0.85m.											

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
87	0.0 – 1.1	Moist	GC	Dark Yellow/Brown – Sandy Clayey GRAVEL	Very Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	50 30 25	Fine to Medium	Fine to Course	Sub Angular	-
87	1.1 – 1.2	Dry	XW	Very Pale White/Grey	-	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**		-	-	-	EXTREMLEY WEATHERD ROCK
Refusal at 1.1m.											

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
88	0.00 – 0.35	Dry	GM	Pale Brown – Sandy Silty GRAVEL	Very Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	20 18 18	Fine to Medium	Medium	Sub Rounded	-
88	0.35 – 0.80	Moist	GC	Pale Yellow/Brown – Silty Sandy GRAVEL	Very Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	40 20 20	Fine to Medium	Medium to Course	Sub Angular-Sub Rounded	-
88	0.80 – 0.85	Dry	XW	Very Pale White/Grey	-	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**		-	-	-	EXTREMLEY WEATHERD ROCK
Refusal at 0.85m											

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
89	0.0 – 0.25	Dry	GM	Pale Brown – Sandy Silty GRAVEL	Very Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	20 18 18	Fine to Medium	Medium	Sub Rounded	-
89	0.2 – 1.3	Moist	GC	Dark Yellow/Brown - Sandy Clayey GRAVEL	Very Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	40 25 25	Fine to Medium	Fine to Course	Sub Angular-Sub Rounded	-
89	1.3 – 1.5	Dry	XW		-	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**		-	-	-	EXTREMLEY WEATHERD ROCK

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
90	0.0 – 0.7	Moist	GC	Pale Yellow/Brown – Sandy Clayey GRAVEL	Very Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	40 27 25	Fine	Fine to Course	Angular-Sub Angular	-
90	0.7 – 1.2	Dry	GC	Very Pale White/Grey – Sandy Clayey GRAVEL	Very Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	60 28 20	Fine to Course	Medium to Course	Angular	-
Refusal at 1.2m on Extremely Weathered Rock.											

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
91	0.0 – 0.8	Moist	GC	Pale Yellow/Brown – Sandy Clayey GRAVEL	Very Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	40 25 25	Fine to Medium	Fine to Course	Sub Angular-Sub Rounded	-
91	0.8 – 1.1	Dry	XW	Very Pale Yellow/Brown	-	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**		-	-	-	EXTREMLEY WEATHERD ROCK
Refusal at 1.1m.											

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
92	0.0 – 0.5	Moist	GM	Pale Brown – Sandy Silty GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	45 25 20	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	-
92	0.5 – 1.2	Moist	GM	Pale Brown - Sandy Silty GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	55 25 20	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	-
92	1.2 – 1.5	-	XW		-	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**		-	-	-	EXTREMLEY WEATHERD ROCK

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
93	0.0 – 0.6	Moist	GM	Pale Brown – Sandy Silty GRAVEL	Very Stiff	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	60 25 25	Fine to Medium	Fine to Course	Sub Angular-Sub Rounded	-
Refusal at 0.6m											

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
94	0.0 – 0.1	Dry	GM	Pale Brown – Sandy Silty GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	50 20 20	Fine to Medium	Medium to Course	Sub Angular-Sub Rounded	-
94	0.1 – 0.8	Moist	RS	Pale Brown – Sandy Silty GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	70 25 30	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	RESIDUAL SOIL
Refusal at 0.8m.											

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
95	0.0 – 0.8	Moist	RS	Dark Brown – Silty Sandy GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	120 20 20	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	RESIDUAL SOIL
95	@ 0.8	-	XW		-	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**		-	-	-	EXTREMLEY WEATHERD ROCK
Refusal at 0.8m on Extremely Weathered Rock											

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Drill Rig/Excavator :		20t Komatsu Excavator			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
96	0.0 – 0.4	Moist	GM	Pale Brown – Sandy Silty GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	30 25 20	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	RESIDUAL SOIL
96	0.4 – 0.8	Moist	GM	Pale Brown - Sandy Silty GRAVEL	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	90 25 20	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	RESIDUAL SOIL
96	@ 0.8m	-	XW		-	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**		-	-	-	EXTREMLEY WEATHERD ROCK
Refusal on Extremely Weathered Rock at 0.8m.											

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Drill Rig/Excavator :		Ruggerini Drilling Rig			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
97	0.0 – 0.75	Moist	GM	Pale Brown - Sandy GRAVEL with Silt	Very Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	15 10 10	Fine to Course	Fine to Medium	Sub Angular-Sub Rounded	FILL
97	0.75 – 1.0	Moist	GP	Dark Brown - Sandy GRAVEL with Silt	Very Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	10 10 5	Fine to Course	Fine to Medium	Sub Angular-Sub Rounded	-
97	1.0 – 1.5	Moist	XW	Pale Orange - Silty Sandy GRAVEL	Very Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	5 20 15	Fine to Course	Fine to Medium	Sub Angular-Sub Rounded	EXTREMLEY WEATHERD ROCK
Lot 009											

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Drill Rig/Excavator :		Ruggerini Drilling Rig			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
98	0.0 – 0.25	Moist	GP	Dark Brown - Sandy GRAVEL with Silt	Very Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	10 NP 5	Fine to Course	Fine to Medium	Sub Angular-Sub Rounded	-
98	0.25 – 0.75	Dry	SM	Pale Yellow Brown – Silty Gravelly SAND	Medium Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	5 20 15	Fine to Course	Fine to Medium	Sub Angular-Sub Rounded	-
Lot 008											

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Drill Rig/Excavator :		Ruggerini Drilling Rig			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
99	0.0 – 0.15	Moist	GP	Dark Brown – Sandy GRAVEL with Silt	Very Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	10 10 5	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	-
99	0.15 – 1.0	Dry	GM	Dark Orange - Silty Sandy GRAVEL	Medium Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	5 20 15	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	EXTREMLEY WEATHERD ROCK

**MPS – Maximum Particle Size ***LL = Liquid Limit ****Pass. 0.075 = Passing the 0.075mm Sieve

DARWIN
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POSTAL: PO BOX 712, KATHERINE NT 0851

ALICE SPRINGS
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EMAIL: ALICE@HIQA.COM.AU
OFFICE: 2/70 LOVEGROVE DRIVE, ARALUEN NT 0870
POSTAL: PO BOX 3569, ALICE SPRINGS NT 0871

Drill Rig/Excavator :		Ruggerini Drilling Rig			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
100	0.0 – 0.2	Moist	GP	Pale Brown – Sandy GRAVEL with Silt	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	10 10 5	Fine to Course	Fine to Medium	Sub Angular-Sub Rounded	-
100	0.2 – 0.5	Dry	GP	Dark Orange - Silty Sandy GRAVEL	Medium Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	5 25 20	Fine to Course	Fine to Medium	Sub Angular-Sub Rounded	EXTREMLEY WEATHERD ROCK
100	0.50 – 0.75	Dry	XW	Dark Orange – Gravelly Silty SAND	Very Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	5 20 15	Fine to Course	Fine to Medium	Sub Angular-Sub Rounded	EXTREMLEY WEATHERD ROCK
Lot 006											

**MPS – Maximum Particle Size ***LL = Liquid Limit ****Pass. 0.075 = Passing the 0.075mm Sieve

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Drill Rig/Excavator :		Ruggerini Drilling Rig			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
101	0.0 – 0.2	Moist	GP	Pale Brown – Sandy GRAVEL with Silt	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	10 10 5	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	-
101	0.2 – 0.7	Dry	XW	Dark Orange - Silty Sandy GRAVEL	Medium Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	5 20 15	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	EXTREMLEY WEATHERD ROCK
Lot 005											

**MPS – Maximum Particle Size ***LL = Liquid Limit ****Pass. 0.075 = Passing the 0.075mm Sieve

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POSTAL: PO BOX 3569, ALICE SPRINGS NT 0871

Drill Rig/Excavator :		Ruggerini Drilling Rig			Surface Elevation :			Finished Surface			
TP/BH (No.)	**Depth (m)**	**Estimated Moisture Condition**	**USC**	**Colour & Visual Description**	**Estimated Consistency**	**Estimated Properties**	**-**	**Estimated Sand Grain Size**	**Estimated Gravel Grain Size**	**Estimated Gravel Shape**	**Estimated Material Origin**
102	0.0 – 0.5	Moist	SP	Dark Brown – Gravelly SAND with Silt	Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	5 10 5	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	FILL
102	0.5 – 0.75	Moist	GM	Dark Brown - Sandy GRAVEL with Silt	Very Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	10 10 10	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	-
102	0.75 – 1.2	Dry	GM	Dark Orange – Silty Sandy GRAVEL	Very Dense	**MPS (mm)** **LL (%)** **Pass. 0.075 (%)**	5 15 5	Fine to Course	Medium to Course	Sub Angular-Sub Rounded	EXTREMLEY WEATHERD ROCK
Lot 004											

**MPS – Maximum Particle Size ***LL = Liquid Limit ****Pass. 0.075 = Passing the 0.075mm Sieve

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APPENDIX C

Laboratory Test Reports

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OFFICE: 2/70 LOVEGROVE DRIVE, ARALUEN NT 0870
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HiQA GEOTECHNICAL

DYNAMIC CONE PENETROMETER REPORT

ACN: 130669493
Shed 1 No. 6 Wedding Road Tivendale, NT 0822
Postal Address : PO Box 35964 Winnellie, NT 0821
Telephone : (08) 8947 4802
Email: darwin@higa.com.au

Client : **Ostojic Group Pty Ltd**
Contractor: -
Project : **Zuccoli 3 & 4 Stage 1A - Site Classifications**
Location : Stage 1A - Various Test Pit

Job No.: D658 Sample No.: 6694
Test Date: 5/11/2015 By: K.Jordaan
Check Date: 22/01/2016 By: A.Bravo
Client Ref.: -

Test Procedure : As 1289. 6.3.2	**Dynamic Cone Penetrometer Test Results.**									
Test Number:	6694/ 1		6694/ 2		6694/ 3		6694/ 4		6694/ 5	
Location:	Test Pit 26		Test Pit 27		Test Pit 28		Test Pit 29		Test Pit 30	
Starting Depth (m):	0.0m		0.0m		0.0m		0.0m		0.0m	
Soil Description:	Refer Logs		Refer Logs		Refer Logs		Refer Logs		Refer Logs	
Moisture Condition:	Dry		Moist		Dry		Dry		Dry	
Ground Water Depth:	N/A		N/A		N/A		N/A		N/A	
Depth Below Start (mm)	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow
0-100	25	4	25	4	25	4	25	4	25	4
100-200										
200-300										
300-400										
400-500										
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1600-1700										
1700-1800										
1800-1900										
1900-2000										
Remarks:	**All test stopped at refusal.**									

NATA
Accredited No. 13121
Report No. D658 6694
Date of Issue: 22/01/2016
Accredited for compliance with ISO/IEC 17025

Authorised Signatory .....
A.Bravo

HiQA GEOTECHNICAL

DYNAMIC CONE PENETROMETER REPORT

ACN: 130669493
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Postal Address : PO Box 35964 Winnellie, NT 0821
Telephone : (08) 8947 4802
Email: darwin@higa.com.au

Client : **Ostojic Group Pty Ltd**
Contractor: -
Project : **Zuccoli 3 & 4 Stage 1A - Site Classifications**
Location : Stage 1A - Various Test Pit

Job No.: D658 Sample No.: 6694
Test Date: 5/11/2015 By: K.Jordaan
Check Date: 22/01/2016 By: A.Bravo
Client Ref.: -

Test Procedure : As 1289. 6.3.2	**Dynamic Cone Penetrometer Test Results.**									
Test Number:	6694/ 6		6694/ 7		6694/ 8		6694/ 9		6694/ 10	
Location:	Test Pit 31		Test Pit 32		Test Pit 33		Test Pit 34		Test Pit 35	
Starting Depth (m):	0.0m		0.0m		0.0m		0.0m		0.0m	
Soil Description:	Refer Logs		Refer Logs		Refer Logs		Refer Logs		Refer Logs	
Moisture Condition:	Dry		Dry		Dry		Dry		Dry	
Ground Water Depth:	N/A		N/A		N/A		N/A		N/A	
Depth Below Start (mm)	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow
0-100	25	4	25	4	25	4	25	4	25	4
100-200										
200-300										
300-400										
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1600-1700										
1700-1800										
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1900-2000										
Remarks:	**All test stopped at refusal.**									

NATA
Accredited No. 13121
Report No. D658 6694
Date of Issue: 22/01/2016
Accredited for compliance with ISO/IEC 17025

Authorised Signatory .....
A.Bravo

HiQA GEOTECHNICAL

DYNAMIC CONE PENETROMETER REPORT

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Telephone : (08) 8947 4802
Email: darwin@hiqa.com.au

Client : **Ostojic Group Pty Ltd**
Contractor: -
Project : **Zuccoli 3 & 4 Stage 1A - Site Classifications**
Location : Stage 1A - Various Test Pit

Job No.: D658 Sample No.: 6694
Test Date: 5/11/2015 By: K.Jordaan
Check Date: 22/01/2016 By: A.Bravo
Client Ref.: -

Test Procedure : As 1289. 6.3.2	**Dynamic Cone Penetrometer Test Results.**									
Test Number:	6694/ 11		6694/ 12		6694/ 13		6694/ 14		6694/ 15	
Location:	Test Pit 36		Test Pit 37		Test Pit 38		Test Pit 39		Test Pit 40	
Starting Depth (m):	0.0m		0.0m		0.0m		0.0m		0.0m	
Soil Description:	Refer Logs		Refer Logs		Refer Logs		Refer Logs		Refer Logs	
Moisture Condition:	Dry		Dry		Dry		Dry		Dry	
Ground Water Depth:	N/A		N/A		N/A		N/A		N/A	
Depth Below Start (mm)	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow
0-100	25	4	25	4	25	4	25	4	25	4
100-200										
200-300										
300-400										
400-500										
500-600										
600-700										
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1400-1500										
1500-1600										
1600-1700										
1700-1800										
1800-1900										
1900-2000										
Remarks:	**All test stopped at refusal.**									

NATA
Accredited No. 13121
Report No. D658 6694
Date of Issue: 22/01/2016
Accredited for compliance with ISO/IEC 17025

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Telephone : (08) 8947 4802
Email: darwin@higa.com.au

Client : **Ostojic Group Pty Ltd**
Contractor: -
Project : **Zuccoli 3 & 4 Stage 1A - Site Classifications**
Location : Stage 1A - Various Test Pit

Job No.: D658 Sample No.: 6694
Test Date: 5/11/2015 By: K.Jordaan
Check Date: 22/01/2016 By: A.Bravo
Client Ref.: -

Test Procedure : As 1289. 6.3.2	**Dynamic Cone Penetrometer Test Results.**									
Test Number:	6694/ 16		6694/ 17		6694/ 18		6694/ 19		6694/ 20	
Location:	Test Pit 41		Test Pit 42		Test Pit 43		Test Pit 44		Test Pit 45	
Starting Depth (m):	0.0m		0.0m		0.0m		0.0m		0.0m	
Soil Description:	Refer Logs		Refer Logs		Refer Logs		Refer Logs		Refer Logs	
Moisture Condition:	Dry		Dry		Dry		Dry		Dry	
Ground Water Depth:	N/A		N/A		N/A		N/A		N/A	
Depth Below Start (mm)	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow
0-100	25	4	25	4	25	4	25	4	25	4
100-200										
200-300										
300-400										
400-500										
500-600										
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1600-1700										
1700-1800										
1800-1900										
1900-2000										
Remarks:	**All test stopped at refusal.**									

NATA
Accredited No. 13121
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Date of Issue: 22/01/2016
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Email: darwin@higa.com.au

Client : **Ostojic Group Pty Ltd**
Contractor: -
Project : **Zuccoli 3 & 4 Stage 1A - Site Classifications**
Location : Stage 1A - Various Test Pit

Job No.: D658 Sample No.: 6694
Test Date: 5/11/2015 By: K.Jordaan
Check Date: 22/01/2016 By: A.Bravo
Client Ref.: -

Test Procedure : As 1289. 6.3.2	**Dynamic Cone Penetrometer Test Results.**									
Test Number:	6694/ 21		6694/ 22		6694/ 23		6694/ 24		6694/ 25	
Location:	Test Pit 46		Test Pit 47		Test Pit 48		Test Pit 49		Test Pit 50	
Starting Depth (m):	0.0m		0.0m		0.0m		0.0m		0.0m	
Soil Description:	Refer Logs		Refer Logs		Refer Logs		Refer Logs		Refer Logs	
Moisture Condition:	Dry		Dry		Dry		Dry		Dry	
Ground Water Depth:	N/A		N/A		N/A		N/A		N/A	
Depth Below Start (mm)	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow
0-100	25	4	25	4	25	4	25	4	25	4
100-200										
200-300										
300-400										
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1600-1700										
1700-1800										
1800-1900										
1900-2000										
Remarks:	**All test stopped at refusal.**									

NATA
Accredited No. 13121
Report No. D658 6694
Date of Issue: 22/01/2016
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Email: darwin@hiqa.com.au

Client : **Ostojic Group Pty Ltd**
Contractor: -
Project : **Zuccoli 3 & 4 Stage 1A - Site Classifications**
Location : Stage 1A - Various Test Pit

Job No.: D658 Sample No.: 6694
Test Date: 5/11/2015 By: K.Jordaan
Check Date: 22/01/2016 By: A.Bravo
Client Ref.: -

Test Procedure : As 1289. 6.3.2	**Dynamic Cone Penetrometer Test Results.**									
Test Number:	6694/ 26		6694/ 27		6694/ 28		6694/ 29		6694/ 30	
Location:	Test Pit 51		Test Pit 52		Test Pit 53		Test Pit 54		Test Pit 55	
Starting Depth (m):	0.0m		0.0m		0.0m		0.0m		0.0m	
Soil Description:	Refer Logs		Refer Logs		Refer Logs		Refer Logs		Refer Logs	
Moisture Condition:	Dry		Dry		Dry		Dry		Dry	
Ground Water Depth:	N/A		N/A		N/A		N/A		N/A	
Depth Below Start (mm)	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow
0-100	25	4	25	4	25	4	25	4	25	4
100-200										
200-300										
300-400										
400-500										
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1600-1700										
1700-1800										
1800-1900										
1900-2000										
Remarks:	**All test stopped at refusal.**									

NATA
Accredited No. 13121
Report No. D658 6694
Date of Issue: 22/01/2016
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Email: darwin@hiqa.com.au

Client : **Ostojic Group Pty Ltd**
Contractor: -
Project : **Zuccoli 3 & 4 Stage 1A - Site Classifications**
Location : Stage 1A - Various Test Pit

Job No.: D658 Sample No.: 6694
Test Date: 5/11/2015 By: K.Jordaan
Check Date: 22/01/2016 By: A.Bravo
Client Ref.: -

Test Procedure : As 1289. 6.3.2	**Dynamic Cone Penetrometer Test Results.**									
Test Number:	6694/ 31		6694/ 32		6694/ 33		6694/ 34		6694/ 35	
Location:	Test Pit 56		Test Pit 57		Test Pit 58		Test Pit 59		Test Pit 60	
Starting Depth (m):	0.0m		0.0m		0.0m		0.0m		0.0m	
Soil Description:	Refer Logs		Refer Logs		Refer Logs		Refer Logs		Refer Logs	
Moisture Condition:	Dry		Dry		Dry		Dry		Dry	
Ground Water Depth:	N/A		N/A		N/A		N/A		N/A	
Depth Below Start (mm)	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow
0-100	25	4	25	4	25	4	25	4	25	4
100-200										
200-300										
300-400										
400-500										
500-600										
600-700										
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1400-1500										
1500-1600										
1600-1700										
1700-1800										
1800-1900										
1900-2000										
Remarks:	**All test stopped at refusal.**									

NATA
Accredited No. 13121
Report No. D658 6694
Date of Issue: 22/01/2016
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Authorised Signatory .....
A.Bravo

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Telephone : (08) 8947 4802
Email: darwin@hiqa.com.au

Client : **Ostojic Group Pty Ltd**
Contractor: -
Project : **Zuccoli 3 & 4 Stage 1A - Site Classifications**
Location : Stage 1A - Various Test Pit

Job No.: D658 Sample No.: 6694
Test Date: 5/11/2015 By: K.Jordaan
Check Date: 22/01/2016 By: A.Bravo
Client Ref.: -

Test Procedure : As 1289. 6.3.2	**Dynamic Cone Penetrometer Test Results.**									
Test Number:	6694/ 36		6694/ 37		6694/ 38		6694/ 39		6694/ 40	
Location:	Test Pit 61		Test Pit 62		Test Pit 63		Test Pit 64		Test Pit 65	
Starting Depth (m):	0.0m		0.0m		0.0m		0.0m		0.0m	
Soil Description:	Refer Logs		Refer Logs		Refer Logs		Refer Logs		Refer Logs	
Moisture Condition:	Dry		Dry		Dry		Dry		Dry	
Ground Water Depth:	N/A		N/A		N/A		N/A		N/A	
Depth Below Start (mm)	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow
0-100	25	4	25	4	25	4	25	4	25	4
100-200										
200-300										
300-400										
400-500										
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1600-1700										
1700-1800										
1800-1900										
1900-2000										
Remarks:	**All test stopped at refusal.**									

NATA
Accredited No. 13121
Report No. D658 6694
Date of Issue: 22/01/2016
Accredited for compliance with ISO/IEC 17025

Authorised Signatory .....
A.Bravo

HiQA GEOTECHNICAL

DYNAMIC CONE PENETROMETER REPORT

ACN: 130669493
Shed 1 No. 6 Wedding Road Tivendale, NT 0822
Postal Address : PO Box 35964 Winnellie, NT 0821
Telephone : (08) 8947 4802
Email: darwin@hiqa.com.au

Client : **Ostojic Group Pty Ltd**
Contractor: -
Project : **Zuccoli 3 & 4 Stage 1A - Site Classifications**
Location : Stage 1A - Various Test Pit

Job No.: D658 Sample No.: 6694
Test Date: 5/11/2015 By: K.Jordaan
Check Date: 22/01/2016 By: A.Bravo
Client Ref.: -

Test Procedure : As 1289. 6.3.2	**Dynamic Cone Penetrometer Test Results.**									
Test Number:	6694/ 41		6694/ 42		6694/ 43		6694/ 44		6694/ 45	
Location:	Test Pit 66		Test Pit 67		Test Pit 68		Test Pit 69		Test Pit 70	
Starting Depth (m):	0.0m		0.0m		0.0m		0.0m		0.0m	
Soil Description:	Refer Logs		Refer Logs		Refer Logs		Refer Logs		Refer Logs	
Moisture Condition:	Moist		Moist		Moist		Moist		Moist	
Ground Water Depth:	N/A		N/A		N/A		N/A		N/A	
Depth Below Start (mm)	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow
0-100	25	4	25	4	25	4	25	4	25	4
100-200										
200-300										
300-400										
400-500										
500-600										
600-700										
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1200-1300										
1300-1400										
1400-1500										
1500-1600										
1600-1700										
1700-1800										
1800-1900										
1900-2000										
Remarks:	**All test stopped at refusal.**									

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Email: darwin@hiqa.com.au

Client : **Ostojic Group Pty Ltd**
Contractor: -
Project : **Zuccoli 3 & 4 Stage 1A - Site Classifications**
Location : Stage 1A - Various Test Pit

Job No.: D658 Sample No.: 6694
Test Date: 5/11/2015 By: K.Jordaan
Check Date: 22/01/2016 By: A.Bravo
Client Ref.: -

Test Procedure : As 1289. 6.3.2	**Dynamic Cone Penetrometer Test Results.**									
Test Number:	6694/ 46									
Location:	Test Pit 71									
Starting Depth (m):	0.0m									
Soil Description:	Refer Logs									
Moisture Condition:	Moist									
Ground Water Depth:	N/A									
Depth Below Start (mm)	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow
0-100	25	4								
100-200										
200-300										
300-400										
400-500										
500-600										
600-700										
700-800										
800-900										
900-1000										
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1200-1300										
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1400-1500										
1500-1600										
1600-1700										
1700-1800										
1800-1900										
1900-2000										
Remarks:	**All test stopped at refusal.**									

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Telephone : (08) 8947 4802
Email: darwin@hiqa.com.au

Client : **Ostojic Group Pty Ltd**
Contractor: -
Project : **Zuccoli 3 & 4 Stage 1A - Site Classifications**
Location : Stage 1A - Various Test Pit

Job No.: D658 Sample No.: 6695
Test Date: 20/11/2015 By: L.Myall
Check Date: 22/01/2016 By: A.Bravo
Client Ref.: -

Test Procedure : As 1289. 6.3.2	**Dynamic Cone Penetrometer Test Results.**									
Test Number:	6695/ 1		6695/ 2		6695/ 3		6695/ 4		6695/ 5	
Location:	Test Pit 72		Test Pit 73		Test Pit 74		Test Pit 75		Test Pit 76	
Starting Depth (m):	0.0m		0.0m		0.0m		0.0m		0.0m	
Soil Description:	Refer Logs		Refer Logs		Refer Logs		Refer Logs		Refer Logs	
Moisture Condition:	Dry / Moist		Dry / Moist		Dry / Moist		Dry / Moist		Dry / Moist	
Ground Water Depth:	N/A		N/A		N/A		N/A		N/A	
Depth Below Start (mm)	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow
0-100	25	4	25	4	25	4	25	4	25	4
100-200										
200-300										
300-400										
400-500										
500-600										
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1400-1500										
1500-1600										
1600-1700										
1700-1800										
1800-1900										
1900-2000										
Remarks:	**All test stopped at refusal.**									

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Telephone : (08) 8947 4802
Email: darwin@hiqa.com.au

Client : **Ostojic Group Pty Ltd**
Contractor: -
Project : **Zuccoli 3 & 4 Stage 1A - Site Classifications**
Location : Stage 1A - Various Test Pit

Job No.: D658 Sample No.: 6695
Test Date: 20/11/2015 By: L.Myall
Check Date: 22/01/2016 By: A.Bravo
Client Ref.: -

Test Procedure : As 1289. 6.3.2	**Dynamic Cone Penetrometer Test Results.**									
Test Number:	6695/ 6		6695/ 7		6695/ 8		6695/ 9		6695/ 10	
Location:	Test Pit 77		Test Pit 78		Test Pit 79		Test Pit 80		Test Pit 81	
Starting Depth (m):	0.0m		0.0m		0.0m		0.0m		0.0m	
Soil Description:	Refer Logs		Refer Logs		Refer Logs		Refer Logs		Refer Logs	
Moisture Condition:	Dry / Moist		Dry / Moist		Dry / Moist		Dry / Moist		Dry / Moist	
Ground Water Depth:	N/A		N/A		N/A		N/A		N/A	
Depth Below Start (mm)	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow
0-100	25	4	25	4	25	4	25	4	25	4
100-200										
200-300										
300-400										
400-500										
500-600										
600-700										
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1200-1300										
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1500-1600										
1600-1700										
1700-1800										
1800-1900										
1900-2000										
Remarks:	**All test stopped at refusal.**									

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Postal Address : PO Box 35964 Winnellie, NT 0821
Telephone : (08) 8947 4802
Email: darwin@hiqa.com.au

Client : **Ostojic Group Pty Ltd**
Contractor: -
Project : **Zuccoli 3 & 4 Stage 1A - Site Classifications**
Location : Stage 1A - Various Test Pit

Job No.: D658 Sample No.: 6695
Test Date: 20/11/2015 By: L.Myall
Check Date: 22/01/2016 By: A.Bravo
Client Ref.: -

Test Procedure : As 1289. 6.3.2	**Dynamic Cone Penetrometer Test Results.**									
Test Number:	6695/ 11		6695/ 12							
Location:	Test Pit 82		Test Pit 83							
Starting Depth (m):	0.0m		0.0m							
Soil Description:	Refer Logs		Refer Logs							
Moisture Condition:	Dry		Dry							
Ground Water Depth:	N/A		N/A							
Depth Below Start (mm)	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow
0-100	25	4	25	4						
100-200										
200-300										
300-400										
400-500										
500-600										
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1200-1300										
1300-1400										
1400-1500										
1500-1600										
1600-1700										
1700-1800										
1800-1900										
1900-2000										
Remarks:	**All test stopped at refusal.**									

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Shed 1 No. 6 Wedding Road Tivendale, NT 0822
Postal Address : PO Box 35964 Winnellie, NT 0821
Telephone : (08) 8947 4802
Email: darwin@hiqa.com.au

Client : **Ostojic Group Pty Ltd**
Contractor: -
Project : **Zuccoli 3 & 4 Stage 1A - Site Classifications**
Location : Stage 1A - Various Test Pit

Job No.: D658 Sample No.: 6696
Test Date: 23/11/2015 By: L.Myall
Check Date: 22/01/2016 By: A.Bravo
Client Ref.: -

Test Procedure : As 1289. 6.3.2	**Dynamic Cone Penetrometer Test Results.**									
Test Number:	6696/ 1		6696/ 2		6696/ 3		6696/ 4		6696/ 5	
Location:	Test Pit 84		Test Pit 85		Test Pit 86		Test Pit 87		Test Pit 88	
Starting Depth (m):	0.0m		0.0m		0.0m		0.0m		0.0m	
Soil Description:	Refer Logs		Refer Logs		Refer Logs		Refer Logs		Refer Logs	
Moisture Condition:	Dry		Dry		Dry		Dry		Dry	
Ground Water Depth:	N/A		N/A		N/A		N/A		N/A	
Depth Below Start (mm)	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow
0-100	25	4	25	4	25	4	25	4	25	4
100-200										
200-300										
300-400										
400-500										
500-600										
600-700										
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1500-1600										
1600-1700										
1700-1800										
1800-1900										
1900-2000										
Remarks:	**All test stopped at refusal.**									

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Telephone : (08) 8947 4802
Email: darwin@hiqa.com.au

Client : **Ostojic Group Pty Ltd**
Contractor: -
Project : **Zuccoli 3 & 4 Stage 1A - Site Classifications**
Location : Stage 1A - Various Test Pit

Job No.: D658 Sample No.: 6696
Test Date: 23/11/2015 By: L.Myall
Check Date: 22/01/2016 By: A.Bravo
Client Ref.: -

Test Procedure : As 1289. 6.3.2	**Dynamic Cone Penetrometer Test Results.**									
Test Number:	6696/ 6		6696/ 7		6696/ 8					
Location:	Test Pit 89		Test Pit 90		Test Pit 91					
Starting Depth (m):	0.0m		0.0m		0.0m					
Soil Description:	Refer Logs		Refer Logs		Refer Logs					
Moisture Condition:	Dry		Dry		Dry					
Ground Water Depth:	N/A		N/A		N/A					
Depth Below Start (mm)	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow
0-100	25	4	25	4	25	4				
100-200										
200-300										
300-400										
400-500										
500-600										
600-700										
700-800										
800-900										
900-1000										
1000-1100										
1100-1200										
1200-1300										
1300-1400										
1400-1500										
1500-1600										
1600-1700										
1700-1800										
1800-1900										
1900-2000										
Remarks:	**All test stopped at refusal.**									

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Postal Address : PO Box 35964 Winnellie, NT 0821
Telephone : (08) 8947 4802
Email: darwin@hiqa.com.au

Client : **Ostojic Group Pty Ltd**
Contractor: -
Project : **Zuccoli 3 & 4 Stage 1A - Site Classifications**
Location : Boreholes 97 through to 102

Job No.: D658 Sample No.: 7077
Test Date: 23/03/2016 By: D.Gaunt
Check Date: 23/03/2016 By: D.Gaunt
Client Ref.: -

Test Procedure : As 1289. 6.3.2	**Dynamic Cone Penetrometer Test Results.**									
Test Number:	7077/ 1		7077/ 2		7077/ 3		7077/ 4		7077/ 5	
Location:	BH 97		BH 98		BH 99		BH 100		BH 101	
Starting Depth (m):	0.00		0.00		0.00		0.00		0.00	
Soil Description:	Refer Logs		Refer Logs		Refer Logs		Refer Logs		Refer Logs	
Moisture Condition:	Moist		Moist		Moist		Moist		Moist	
Ground Water Depth:	NE		NE		NE		NE		NE	
Depth Below Start (mm)	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow
0-100	12	8	15	7	9	11	9	11	16	6
100-200	21	5	10	10	9	11	7	14	17	6
200-300	25	4	9	11	5	20	3	33	25	4
300-400			4	25	3	33				
400-500			12	8	2	50				
500-600			25	4	4	25				
600-700					25	4				
700-800										
800-900										
900-1000										
1000-1100										
1100-1200										
1200-1300										
1300-1400										
1400-1500										
1500-1600										
1600-1700										
1700-1800										
1800-1900										
1900-2000										
Remarks:	All tests stopped on Refusal.									

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D.Gaunt

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Postal Address : PO Box 35964 Winnellie, NT 0821
Telephone : (08) 8947 4802
Email: darwin@hiqa.com.au

Client : **Ostojic Group Pty Ltd**
Contractor: -
Project : **Zuccoli 3 & 4 Stage 1A - Site Classifications**
Location : Boreholes 97 through to 102

Job No.: D658 Sample No.: 7077
Test Date: 23/03/2016 By: D.Gaunt
Check Date: 23/03/2016 By: D.Gaunt
Client Ref.: -

Test Procedure : As 1289. 6.3.2	**Dynamic Cone Penetrometer Test Results.**									
Test Number:	7077/ 6									
Location:	BH 102									
Starting Depth (m):	0.00									
Soil Description:	Refer Logs									
Moisture Condition:	Moist									
Ground Water Depth:	NE									
Depth Below Start (mm)	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow	Blows per 100mm	mm per Blow
0-100	15	7								
100-200	25	4								
200-300										
300-400										
400-500										
500-600										
600-700										
700-800										
800-900										
900-1000										
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1100-1200										
1200-1300										
1300-1400										
1400-1500										
1500-1600										
1600-1700										
1700-1800										
1800-1900										
1900-2000										
Remarks:	All tests stopped on Refusal.									

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Authorised Signatory .....
D.Gaunt

APPENDIX D

CSIRO Information Sheet BTF 18

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POSTAL: PO BOX 35964, WINNELLIE NT 0821

KATHERINE
PHONE: (08) 8947 4802
EMAIL: KATHERINE@HIQA.COM.AU
OFFICE: 5/7 CRAWFORD STREET, KATHERINE NT 0850
POSTAL: PO BOX 712, KATHERINE NT 0851

ALICE SPRINGS
PHONE: (08) 8947 4802
EMAIL: ALICE@HIQA.COM.AU
OFFICE: 2/70 LOVEGROVE DRIVE, ARALUEN NT 0870
POSTAL: PO BOX 3569, ALICE SPRINGS NT 0871

Foundation Maintenance and Footing Performance:

A Homeowner's Guide

CSIRO

BTF 18
replaces
Information
Sheet 10/91

Buildings can and often do move. This movement can be up, down, lateral or rotational. The fundamental cause of movement in buildings can usually be related to one or more problems in the foundation soil. It is important for the homeowner to identify the soil type in order to ascertain the measures that should be put in place in order to ensure that problems in the foundation soil can be prevented, thus protecting against building movement.

This Building Technology File is designed to identify causes of soil-related building movement, and to suggest methods of prevention of resultant cracking in buildings.

Soil Types

The types of soils usually present under the topsoil in land zoned for residential buildings can be split into two approximate groups – granular and clay. Quite often, foundation soil is a mixture of both types. The general problems associated with soils having granular content are usually caused by erosion. Clay soils are subject to saturation and swell/shrink problems.

Classifications for a given area can generally be obtained by application to the local authority, but these are sometimes unreliable and if there is doubt, a geotechnical report should be commissioned. As most buildings suffering movement problems are founded on clay soils, there is an emphasis on classification of soils according to the amount of swell and shrinkage they experience with variations of water content. The table below is Table 2.1 from AS 2870, the Residential Slab and Footing Code.

Causes of Movement

Settlement due to construction

There are two types of settlement that occur as a result of construction:

- Immediate settlement occurs when a building is first placed on its foundation soil, as a result of compaction of the soil under the weight of the structure. The cohesive quality of clay soil mitigates against this, but granular (particularly sandy) soil is susceptible.
- Consolidation settlement is a feature of clay soil and may take place because of the expulsion of moisture from the soil or because of the soil's lack of resistance to local compressive or shear stresses. This will usually take place during the first few months after construction, but has been known to take many years in exceptional cases.

These problems are the province of the builder and should be taken into consideration as part of the preparation of the site for construction. Building Technology File 19 (BTF 19) deals with these problems.

Erosion

All soils are prone to erosion, but sandy soil is particularly susceptible to being washed away. Even clay with a sand component of say 10% or more can suffer from erosion.

Saturation

This is particularly a problem in clay soils. Saturation creates a bog-like suspension of the soil that causes it to lose virtually all of its bearing capacity. To a lesser degree, sand is affected by saturation because saturated sand may undergo a reduction in volume – particularly imported sand fill for bedding and blinding layers. However, this usually occurs as immediate settlement and should normally be the province of the builder.

Seasonal swelling and shrinkage of soil

All clays react to the presence of water by slowly absorbing it, making the soil increase in volume (see table below). The degree of increase varies considerably between different clays, as does the degree of decrease during the subsequent drying out caused by fair weather periods. Because of the low absorption and expulsion rate, this phenomenon will not usually be noticeable unless there are prolonged rainy or dry periods, usually of weeks or months, depending on the land and soil characteristics.

The swelling of soil creates an upward force on the footings of the building, and shrinkage creates subsidence that takes away the support needed by the footing to retain equilibrium.

Shear failure

This phenomenon occurs when the foundation soil does not have sufficient strength to support the weight of the footing. There are two major post-construction causes:

- Significant load increase.
- Reduction of lateral support of the soil under the footing due to erosion or excavation.
- In clay soil, shear failure can be caused by saturation of the soil adjacent to or under the footing.

GENERAL DEFINITIONS OF SITE CLASSES

Class	Foundation
A	Most sand and rock sites with little or no ground movement from moisture changes
S	Slightly reactive clay sites with only slight ground movement from moisture changes
M	Moderately reactive clay or silt sites, which can experience moderate ground movement from moisture changes
H	Highly reactive clay sites, which can experience high ground movement from moisture changes
E	Extremely reactive sites, which can experience extreme ground movement from moisture changes
A to P	Filled sites
P	Sites which include soft soils, such as soft clay or silt or loose sands; landslip; mine subsidence; collapsing soils; soils subject to erosion; reactive sites subject to abnormal moisture conditions or sites which cannot be classified otherwise

Tree root growth

Trees and shrubs that are allowed to grow in the vicinity of footings can cause foundation soil movement in two ways:

- Roots that grow under footings may increase in cross-sectional size, exerting upward pressure on footings.
- Roots in the vicinity of footings will absorb much of the moisture in the foundation soil, causing shrinkage or subsidence.

Unevenness of Movement

The types of ground movement described above usually occur unevenly throughout the building's foundation soil. Settlement due to construction tends to be uneven because of:

- Differing compaction of foundation soil prior to construction.
- Differing moisture content of foundation soil prior to construction.

Movement due to non-construction causes is usually more uneven still. Erosion can undermine a footing that traverses the flow or can create the conditions for shear failure by eroding soil adjacent to a footing that runs in the same direction as the flow.

Saturation of clay foundation soil may occur where subfloor walls create a dam that makes water pond. It can also occur wherever there is a source of water near footings in clay soil. This leads to a severe reduction in the strength of the soil which may create local shear failure.

Seasonal swelling and shrinkage of clay soil affects the perimeter of the building first, then gradually spreads to the interior. The swelling process will usually begin at the uphill extreme of the building, or on the weather side where the land is flat. Swelling gradually reaches the interior soil as absorption continues. Shrinkage usually begins where the sun's heat is greatest.

Effects of Uneven Soil Movement on Structures

Erosion and saturation

Erosion removes the support from under footings, tending to create subsidence of the part of the structure under which it occurs. Brickwork walls will resist the stress created by this removal of support by bridging the gap or cantilevering until the bricks or the mortar bedding fail. Older masonry has little resistance. Evidence of failure varies according to circumstances and symptoms may include:

- Step cracking in the mortar beds in the body of the wall or above/below openings such as doors or windows.
- Vertical cracking in the bricks (usually but not necessarily in line with the vertical beds or perpends).

Isolated piers affected by erosion or saturation of foundations will eventually lose contact with the bearers they support and may tilt or fall over. The floors that have lost this support will become bouncy, sometimes rattling ornaments etc.

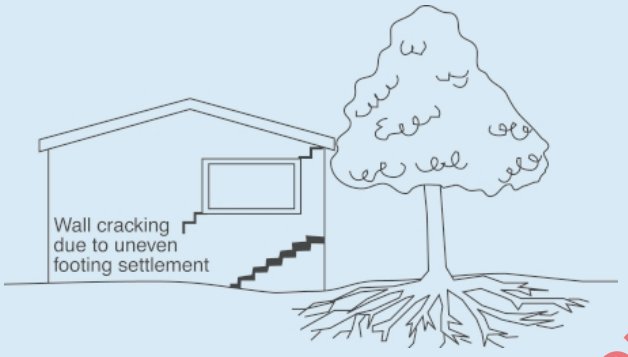
Seasonal swelling/shrinkage in clay

Swelling foundation soil due to rainy periods first lifts the most exposed extremities of the footing system, then the remainder of the perimeter footings while gradually permeating inside the building footprint to lift internal footings. This swelling first tends to create a dish effect, because the external footings are pushed higher than the internal ones.

The first noticeable symptom may be that the floor appears slightly dished. This is often accompanied by some doors binding on the floor or the door head, together with some cracking of cornice mitres. In buildings with timber flooring supported by bearers and joists, the floor can be bouncy. Externally there may be visible dishing of the hip or ridge lines.

As the moisture absorption process completes its journey to the innermost areas of the building, the internal footings will rise. If the spread of moisture is roughly even, it may be that the symptoms will temporarily disappear, but it is more likely that swelling will be uneven, creating a difference rather than a disappearance in symptoms. In buildings with timber flooring supported by bearers and joists, the isolated piers will rise more easily than the strip footings or piers under walls, creating noticeable doming of flooring.

Trees can cause shrinkage and damage



As the weather pattern changes and the soil begins to dry out, the external footings will be first affected, beginning with the locations where the sun's effect is strongest. This has the effect of lowering the external footings. The doming is accentuated and cracking reduces or disappears where it occurred because of dishing, but other cracks open up. The roof lines may become convex.

Doming and dishing are also affected by weather in other ways. In areas where warm, wet summers and cooler dry winters prevail, water migration tends to be toward the interior and doming will be accentuated, whereas where summers are dry and winters are cold and wet, migration tends to be toward the exterior and the underlying propensity is toward dishing.

Movement caused by tree roots

In general, growing roots will exert an upward pressure on footings, whereas soil subject to drying because of tree or shrub roots will tend to remove support from under footings by inducing shrinkage.

Complications caused by the structure itself

Most forces that the soil causes to be exerted on structures are vertical – i.e. either up or down. However, because these forces are seldom spread evenly around the footings, and because the building resists uneven movement because of its rigidity, forces are exerted from one part of the building to another. The net result of all these forces is usually rotational. This resultant force often complicates the diagnosis because the visible symptoms do not simply reflect the original cause. A common symptom is binding of doors on the vertical member of the frame.

Effects on full masonry structures

Brickwork will resist cracking where it can. It will attempt to span areas that lose support because of subsided foundations or raised points. It is therefore usual to see cracking at weak points, such as openings for windows or doors.

In the event of construction settlement, cracking will usually remain unchanged after the process of settlement has ceased.

With local shear or erosion, cracking will usually continue to develop until the original cause has been remedied, or until the subsidence has completely neutralised the affected portion of footing and the structure has stabilised on other footings that remain effective.

In the case of swell/shrink effects, the brickwork will in some cases return to its original position after completion of a cycle, however it is more likely that the rotational effect will not be exactly reversed, and it is also usual that brickwork will settle in its new position and will resist the forces trying to return it to its original position. This means that in a case where swelling takes place after construction and cracking occurs, the cracking is likely to at least partly remain after the shrink segment of the cycle is complete. Thus, each time the cycle is repeated, the likelihood is that the cracking will become wider until the sections of brickwork become virtually independent.

With repeated cycles, once the cracking is established, if there is no other complication, it is normal for the incidence of cracking to stabilise, as the building has the articulation it needs to cope with the problem. This is by no means always the case, however, and monitoring of cracks in walls and floors should always be treated seriously.

Upheaval caused by growth of tree roots under footings is not a simple vertical shear stress. There is a tendency for the root to also exert lateral forces that attempt to separate sections of brickwork after initial cracking has occurred.

The normal structural arrangement is that the inner leaf of brickwork in the external walls and at least some of the internal walls (depending on the roof type) comprise the load-bearing structure on which any upper floors, ceilings and the roof are supported. In these cases, it is internally visible cracking that should be the main focus of attention, however there are a few examples of dwellings whose external leaf of masonry plays some supporting role, so this should be checked if there is any doubt. In any case, externally visible cracking is important as a guide to stresses on the structure generally, and it should also be remembered that the external walls must be capable of supporting themselves.

Effects on framed structures

Timber or steel framed buildings are less likely to exhibit cracking due to swell/shrink than masonry buildings because of their flexibility. Also, the doming/dishing effects tend to be lower because of the lighter weight of walls. The main risks to framed buildings are encountered because of the isolated pier footings used under walls. Where erosion or saturation cause a footing to fall away, this can double the span which a wall must bridge. This additional stress can create cracking in wall linings, particularly where there is a weak point in the structure caused by a door or window opening. It is, however, unlikely that framed structures will be so stressed as to suffer serious damage without first exhibiting some or all of the above symptoms for a considerable period. The same warning period should apply in the case of upheaval. It should be noted, however, that where framed buildings are supported by strip footings there is only one leaf of brickwork and therefore the externally visible walls are the supporting structure for the building. In this case, the subfloor masonry walls can be expected to behave as full brickwork walls.

Effects on brick veneer structures

Because the load-bearing structure of a brick veneer building is the frame that makes up the interior leaf of the external walls plus perhaps the internal walls, depending on the type of roof, the building can be expected to behave as a framed structure, except that the external masonry will behave in a similar way to the external leaf of a full masonry structure.

Water Service and Drainage

Where a water service pipe, a sewer or stormwater drainage pipe is in the vicinity of a building, a water leak can cause erosion, swelling or saturation of susceptible soil. Even a minuscule leak can be enough to saturate a clay foundation. A leaking tap near a building can have the same effect. In addition, trenches containing pipes can become watercourses even though backfilled, particularly where broken rubble is used as fill. Water that runs along these trenches can be responsible for serious erosion, interstrata seepage into subfloor areas and saturation.

Pipe leakage and trench water flows also encourage tree and shrub roots to the source of water, complicating and exacerbating the problem.
Poor roof plumbing can result in large volumes of rainwater being concentrated in a small area of soil:

- Incorrect falls in roof guttering may result in overflows, as may gutters blocked with leaves etc.
- Corroded guttering or downpipes can spill water to ground.
- Downpipes not positively connected to a proper stormwater collection system will direct a concentration of water to soil that is directly adjacent to footings, sometimes causing large-scale problems such as erosion, saturation and migration of water under the building.

Seriousness of Cracking

In general, most cracking found in masonry walls is a cosmetic nuisance only and can be kept in repair or even ignored. The table below is a reproduction of Table C1 of AS 2870.

AS 2870 also publishes figures relating to cracking in concrete floors, however because wall cracking will usually reach the critical point significantly earlier than cracking in slabs, this table is not reproduced here.

Prevention/Cure

Plumbing

Where building movement is caused by water service, roof plumbing, sewer or stormwater failure, the remedy is to repair the problem. It is prudent, however, to consider also rerouting pipes away from the building where possible, and relocating taps to positions where any leakage will not direct water to the building vicinity. Even where gully traps are present, there is sometimes sufficient spill to create erosion or saturation, particularly in modern installations using smaller diameter PVC fixtures. Indeed, some gully traps are not situated directly under the taps that are installed to charge them, with the result that water from the tap may enter the backfilled trench that houses the sewer piping. If the trench has been poorly backfilled, the water will either pond or flow along the bottom of the trench. As these trenches usually run alongside the footings and can be at a similar depth, it is not hard to see how any water that is thus directed into a trench can easily affect the foundation's ability to support footings or even gain entry to the subfloor area.

Ground drainage

In all soils there is the capacity for water to travel on the surface and below it. Surface water flows can be established by inspection during and after heavy or prolonged rain. If necessary, a grated drain system connected to the stormwater collection system is usually an easy solution.

It is, however, sometimes necessary when attempting to prevent water migration that testing be carried out to establish watertable height and subsoil water flows. This subject is referred to in BTF 19 and may properly be regarded as an area for an expert consultant.

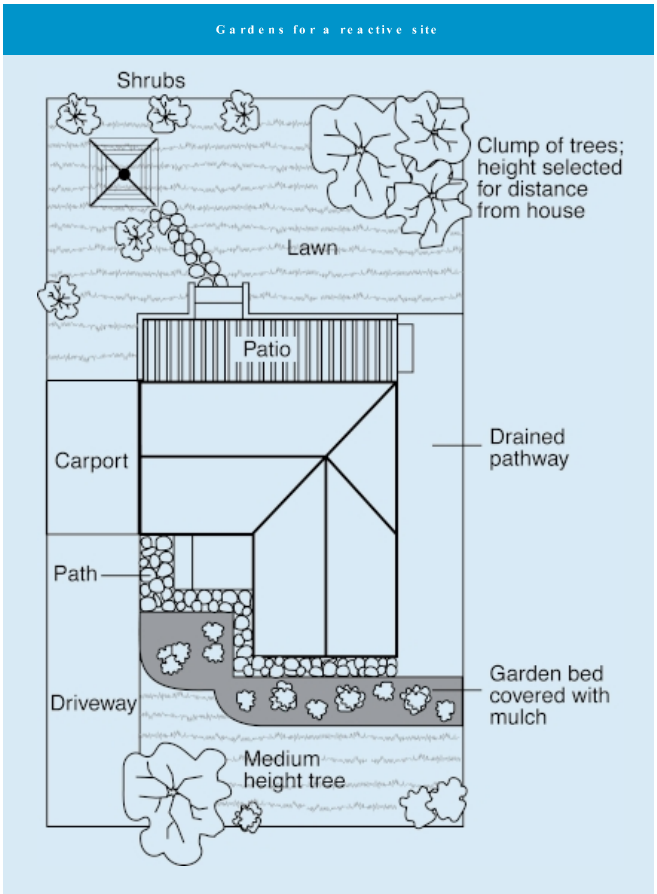
Protection of the building perimeter

It is essential to remember that the soil that affects footings extends well beyond the actual building line. Watering of garden plants, shrubs and trees causes some of the most serious water problems.

For this reason, particularly where problems exist or are likely to occur, it is recommended that an apron of paving be installed around as much of the building perimeter as necessary. This paving

CLASSIFICATION OF DAMAGE WITH REFERENCE TO WALLS

Description of typical damage and required repair	Approximate crack width limit (see Note 3)	Damage category
Hairline cracks	<0.1 mm	0
Fine cracks which do not need repair	<1 mm	1
Cracks noticeable but easily filled. Doors and windows stick slightly	<5 mm	2
Cracks can be repaired and possibly a small amount of wall will need to be replaced. Doors and windows stick. Service pipes can fracture. Weathertightness often impaired	5–15 mm (or a number of cracks 3 mm or more in one group)	3
Extensive repair work involving breaking-out and replacing sections of walls, especially over doors and windows. Window and door frames distort. Walls lean or bulge noticeably, some loss of bearing in beams. Service pipes disrupted	15–25 mm but also depend on number of cracks	4



should extend outwards a minimum of 900 mm (more in highly reactive soil) and should have a minimum fall away from the building of 1:60. The finished paving should be no less than 100 mm below brick vent bases.

It is prudent to relocate drainage pipes away from this paving, if possible, to avoid complications from future leakage. If this is not practical, earthenware pipes should be replaced by PVC and backfilling should be of the same soil type as the surrounding soil and compacted to the same density.

Except in areas where freezing of water is an issue, it is wise to remove taps in the building area and relocate them well away from the building – preferably not uphill from it (see BTF 19).

It may be desirable to install a grated drain at the outside edge of the paving on the uphill side of the building. If subsoil drainage is needed this can be installed under the surface drain.

Condensation

In buildings with a subfloor void such as where bearers and joists support flooring, insufficient ventilation creates ideal conditions for condensation, particularly where there is little clearance between the floor and the ground. Condensation adds to the moisture already present in the subfloor and significantly slows the process of drying out. Installation of an adequate subfloor ventilation system, either natural or mechanical, is desirable.

Warning: Although this Building Technology File deals with cracking in buildings, it should be said that subfloor moisture can result in the development of other problems, notably:

- Water that is transmitted into masonry, metal or timber building elements causes damage and/or decay to those elements.
- High subfloor humidity and moisture content create an ideal environment for various pests, including termites and spiders.
- Where high moisture levels are transmitted to the flooring and walls, an increase in the dust mite count can ensue within the living areas. Dust mites, as well as dampness in general, can be a health hazard to inhabitants, particularly those who are abnormally susceptible to respiratory ailments.

The garden

The ideal vegetation layout is to have lawn or plants that require only light watering immediately adjacent to the drainage or paving edge, then more demanding plants, shrubs and trees spread out in that order.

Overwatering due to misuse of automatic watering systems is a common cause of saturation and water migration under footings. If it is necessary to use these systems, it is important to remove garden beds to a completely safe distance from buildings.

Existing trees

Where a tree is causing a problem of soil drying or there is the existence or threat of upheaval of footings, if the offending roots are subsidiary and their removal will not significantly damage the tree, they should be severed and a concrete or metal barrier placed vertically in the soil to prevent future root growth in the direction of the building. If it is not possible to remove the relevant roots without damage to the tree, an application to remove the tree should be made to the local authority. A prudent plan is to transplant likely offenders before they become a problem.

Information on trees, plants and shrubs

State departments overseeing agriculture can give information regarding root patterns, volume of water needed and safe distance from buildings of most species. Botanic gardens are also sources of information. For information on plant roots and drains, see Building Technology File 17.

Excavation

Excavation around footings must be properly engineered. Soil supporting footings can only be safely excavated at an angle that allows the soil under the footing to remain stable. This angle is called the angle of repose (or friction) and varies significantly between soil types and conditions. Removal of soil within the angle of repose will cause subsidence.

Remediation

Where erosion has occurred that has washed away soil adjacent to footings, soil of the same classification should be introduced and compacted to the same density. Where footings have been undermined, augmentation or other specialist work may be required. Remediation of footings and foundations is generally the realm of a specialist consultant.

Where isolated footings rise and fall because of swell/shrink effect, the homeowner may be tempted to alleviate floor bounce by filling the gap that has appeared between the bearer and the pier with blocking. The danger here is that when the next swell segment of the cycle occurs, the extra blocking will push the floor up into an accentuated dome and may also cause local shear failure in the soil. If it is necessary to use blocking, it should be by a pair of fine wedges and monitoring should be carried out fortnightly.

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