Sam Geotechnics Pty Ltd
PO Box 219 Capalaba QLD 4157
ABN: 88 616 366 048
Emails: samgeotechnics@gmail.com
sjeyan@samgeotechnics.com.au
Web: https://www.samgeotechnics.com.au

Celebrating 5 Years in Business

REPORT ON GEOTECHNICAL INVESTIGATION AND SLOPE STABILITY

Prepared for

Quality Control Testing Services (QCTS)

Project Name

Proposed Subdivisional Development

Site Address

248 Woolmer Road, Highfields QLD 4352

Job Number

SGT230004

Report Number

SGT230004-R1

Report Date

4 March 2023

Sam Geotechnics Pty Ltd
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ABN: 88 616 366 048
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1. Introduction

Sam Geotechnics (SGT) was commissioned by Quality Control Testing Services (QCTS) to provide geotechnical investigation reporting for the proposed subdivisional development is to be located at 248 Woolmer Road, Highfields QLD 4352. The purpose of this geotechnical investigation was to provide information on subsurface ground conditions and the report presents the results of fieldwork, laboratory testing, slope stability, comments and recommendations as required by the design and construction for the proposed subdivisional development.

2. Site Description and Field Work

On the relevant 1:100,000 Geological map, the site plots within Eocene-Miocene Aged Olivine Basalt Volcanic Rock Formation. Fieldwork work was carried out between 14 September 2022 and 19 September 2022 and comprised drilling of thirteen (13) boreholes carried out within the site premises. Dynamic Cone Penetrometer (DCP) tests were carried out adjacent to each borehole in order to assess the strength consistency. Borehole logs are attached at the end of this report.

The subsurface ground conditions interpreted from boreholes are summarised in Table below.

Material	Borehole Point A (mbgl)	Borehole Point B (mbgl)	Borehole Point C (mbgl)	Borehole Point D (mbgl)	Borehole Point E (mbgl)
Topsoil/Grass	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1
Natural: Loose to Medium Dense Sandy Silt	-	-	-	0.1-1.2	0.1-2.5
Natural: Dense Sandy Silt	-	-	-	-	2.5-3.0
Natural: Soft to Firm Sandy/Silty Clay	0.1-1.0	0.1-0.8	0.1-0.9	-	-
Natural: Stiff Sandy/Silty Clay	1.0-1.4	0.8-3.8	0.9-1.7	1.2-1.8	-
Natural: Very Stiff Sandy/Silty Clay	1.4-2.9	3.8-4.0	1.7-3.6	1.8-4.0	-
Natural: Hard Sandy/Silty Clay	2.9-4.0	-	3.6-4.0	-	3.0-4.0

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Material	Borehole Point F (mbgl)	Borehole Point G (mbgl)	Borehole Point H (mbgl)	Borehole Point I (mbgl)	Borehole Point J (mbgl)
Topsoil/Grass	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1	0.0-0.1
Natural: Loose to Medium Dense Sandy Silt	0.1-0.9	-	-	-	-
Natural: Soft to Firm Sandy/Silty Clay	-	-	-	0.1-1.0	0.1-0.8
Natural: Stiff Sandy/Silty Clay	0.9-2.0	0.1-2.2	0.1-1.0	1.0-2.0	0.8-1.3
Natural: Very Stiff Sandy/Silty Clay	2.0-4.0	2.2-3.8	1.0-1.7	2.0-3.0	1.3-2.0
Natural: Hard Sandy/Silty Clay	-	3.8-4.0	1.7-3.0	3.0-4.0	-
Natural: Very Dense Silty/Sandy Gravel	-	-			2.0-4.0
Very Low Strength Extremely Weathered (XW) Rock	-	-	3.0-3.5	-	-

Material	Borehole Point K (mbgl)	Borehole Point L (mbgl)	Borehole Point M (mbgl)
Topsoil/Grass	0.0-0.1	0.0-0.1	0.0-0.1
Natural: Soft to Firm Sandy/Silty Clay	0.1-0.4	-	-
Natural: Stiff Sandy/Silty Clay	0.4-0.7	0.1-1.7	0.1-1.0
Natural: Very Stiff Sandy/Silty Clay	0.7-1.0	1.7-4.0	1.0-4.0
Natural: Hard Sandy/Silty Clay	1.0-1.2*	-	-

Notes:

mbgl = metres below ground level

* = Borehole terminated due to tungsten carbide drill bit refusal in possible rock or boulders.

Groundwater table/seepage was not recorded during the testing programme. The presence of groundwater table/seepage depends on rainfall, ground conditions, permeability, adjacent creek/river/sea/canal water levels (if any exists) and differ with time.

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3. Lab Testing

The following laboratory tests were carried out as part of this geotechnical investigation:

- Fifty-two (52) Natural Moisture Content Tests.
- Twelve (12) Shrink-Swell Index (I_{ss}) Tests.
- Twelve (12) California Bearing Ratio (CBR) Tests.
- Thirteen (13) Atterberg Limits, Moisture Content and Linear Shrinkage Tests and
- Thirteen (13) Particle Size Distribution (PSD) Tests and

Laboratory test results are summarised next to each borehole log. Test reports showing more detailed results and the methods used are attached at the end of this report. .

4. Site Classification

Based on subsurface conditions encountered and considering current environmental conditions (such as trees), the site is classified as follows:

- Class 'P' – Problem Site. This is due to existing trees within the site premises and natural soft to firm clayey soils were encountered within the site as per AS2870-2011.
- Class 'H1 – Highly Reactive' – This is due to the estimated surface movement (Y_s) in the order between 6 mm to 50 mm. This was based on twelve (12) Shrink Swell Index (I_{ss}) test results varies between 0.3% and 2.7%

NOTE: Highly reactive clay sites may require stiffened raft, pier and slab, pier and beam, piled method and waffle raft which may be appropriate for clad frame and masonry/articulated masonry veneer structures. Stiffened raft, pier and slab, pier and beam and piled method may be appropriate for articulated masonry structures.

The above classifications are in line with AS2870-2011 – Residential Slabs and Footings.

The effect of past and future vegetation and additional cutting and filling should be considered in the selection of a design value for differential movements.

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The classifications above are defined based on the conditions encountered at the time of geotechnical investigation. The above site classifications are related to residential developments up to two storeys. The applicability of this classification to the present/proposed project should be confirmed by the designer.

The classification presented above is provided on the basis that the performance expectations set out in AS2870-2011 are acceptable and that site maintenance complies with the provisions of CSIRO Sheet No. 10/91, A Guide to Home Owners on Foundations Maintenance and Footing Performance, a copy of which is attached. It is important that the CSIRO documents passed on to the homeowners so that they are aware of its guidelines.

5. Earthquake Site Classification

Australian Standard AS 1170.4 – 2007, 'Structural Design Actions, Part 4: 'Earthquake Actions in Australia' outlines the methods for assigning the site's Sub-Soil class.

Based on the subsurface conditions encountered at the subject site, and the requirements of Australian Standard AS 1170.4 – 2007, it is recommended that the following Hazard Factor and Sub-Soil Class be adopted:

- Sub-Soil Class: Class Ce – Shallow Soil Site.
- Hazard Factor (Z) for Toowoomba: 0.06.

6. Drainage

It is appropriate to maintain surface drainage conditions during earthworks and ensure that runoff water is discharged away from the construction area to prevent any water ponding. Generally, clayey and silty materials are susceptible to moisture changes.

It is appropriate that adequate drainage should be maintained for the life of the structure. Poor drainage will create abnormal moisture conditions within the soil profile causing adverse effects on the performance of the foundations. Stormwater, rainwater and overflow is to be properly diverted and be piped away from foundations. All drainage is to be maintained in good working condition and regular inspections and maintenance are essential.

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7. Foundation Options

Geotechnical design parameters were estimated using the available borehole records, published correlations & typical values and our experience with similar materials together with the applied engineering judgement.

Given the expected foundation conditions, high level strip/pad, driven or bored pier foundations are expected to be suitable to support the proposed development. Any elements (including footings and slabs) that require support at ground level will need to be founded through natural stiff or stronger clayey soils, very dense silty/sandy gravel and/or weathered rock.

The following allowable end bearing pressures are applicable for high-level strip/pad and raft footings.

Material Type	Allowable End Bearing Pressure (kPa)
Natural: Stiff Sandy/Silty Clay	100
Natural: Very Stiff Sandy/Silty Clay	200
Natural: Hard Sandy/Silty Clay	300
Natural: Very Dense Silty/Sandy Gravel	300
Very Low Strength Extremely Weathered (XW) Rock	400

Footings proportioned in accordance with the above recommendations should have load induced settlements of no greater than about 1%-2% of the footing width.

Footings should be founded wholly in soil or rock and not partially on soil and rock to reduce potential for differential settlement.

The following allowable pile end bearing pressures and skin friction values are applicable for driven/bored piled foundations/footings.

Material Type	Allowable End Bearing Pressure (kPa)	Allowable Skin Friction (kPa)
Natural: Stiff Sandy/Silty Clay	200	30
Natural: Very Stiff Sandy/Silty Clay	400	40
Natural: Hard Sandy/Silty Clay	500	80
Natural: Very Dense Silty/Sandy Gravel	500	80
Very Low Strength Extremely Weathered (XW) Rock	600	100

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Note: It is appropriate to ignore 1.0 m of skin friction contributions in soils. Reference can be made to AS2159-2009 for detail pile design and construction procedures.

The selection of suitable foundation option is to be at the discussion of the structural engineer.

8. Piles/Retaining Wall Design Parameters

The following parameters are applicable for the design of retaining structures.

Material Type	Effective Friction Angle, Φ' (^{0})	Unit Weight, γ kN/m^3	Drained Cohesion, C' (kPa)	Undrained Cohesion, C_u (kPa)
Natural: Loose to Medium Dense Sandy Silt	24	17	1	-
Natural: Soft to Firm Sandy/Silty Clay	24	17	1	30
Natural: Stiff Sandy/Silty Clay	25	19	5	50
Natural: Very Stiff Sandy/Silty Clay	26	19	7	100
Natural: Hard Sandy/Silty Clay	27	20	10	150
Natural: Dense Sandy Silt	26	19	2	-
Natural: Very Dense Silty/Sandy Gravel	32	20	-	-
Very Low Strength Extremely Weathered (XW) Rock	32	20	15	200

For design of retaining walls, the following points are noted:

- It is appropriate to install drainage layer for the retaining wall height and slotted drainage pipe arrangements can be installed to remove excess water into storm-water arrangement.
- It is appropriate to consider any imposed surcharges and/or lateral stress from adjacent structures, batter slopes, plant operation and any backfill should be considered within the design.
- Reference can be made to AS4678-2002 "Earth Retaining Structures" for the detail retaining wall design and construction procedures.

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9. Site Inspection and Slope Stability

Based on Toowoomba Regional Council (TRC) interacting database, the site is not located within landslide/slope instability hazard mapping area. A copy of the map extract is attached to this report for further confirmation.

A site inspection was carried out by SGT on 10 January 2023. Access to the site was limited during the site inspection due to dense vegetation. Based on the site inspection, there are no indication of unstable condition within the site, evidence of up to 12^0 slope geometry and moderate to dense vegetation were observed during the site inspection. Site photographs were taken by ASCT are presented below.

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Figures 1 - 6: Typical Site Conditions During the Geotechnical Investigation.

Based on a flat to gentle sloping geometry (less than 1V:4H slope within the site), it is our opinion that the proposed subdivisional development will not be subject to landslip or subsidence or slope instability issues.

Based on the above, it is our opinion that the risk to life from geotechnical hazards is within normally accepted community standards.

If significant excavation or filling or retaining walls (generally over 1.0 m high) are to be expected within the site premises, further landslip hazard or subsidence risk or slope stability assessment/analysis are recommended and need to be carried out by a suitably qualified geotechnical engineer. QCTS is happy to assist on this regard where required.

10. Excavation Conditions

Excavations in the strata encountered within the depth of testing can be carried out using backhoes or tracked excavators. However, should excavations be required in concrete, below the depth of tungsten carbide drill bit refusal and/or in stronger rock, then provision may be allowed for the use of large excavator fitted with ripping tyne and/or rock hammer.

If bored piles be adopted as the foundation option drilling within the depth of testing should be able to be carried out using medium sized auger drilling rigs (i.e. large excavators fitted with drilling arms or small truck mounted rigs). However, depths be required below the depth of tungsten carbide dril bit refusal and/or in

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stronger rock, then provision may be required for the use of large track/truck mounted drilling rig capable of providing significant down force and lateral restraint.

11. Safe Batters

For the strata encountered, we recommend the following safe temporary and permanent batter angles for cut and fill batters up to 3.0 m high:

Strata	Temporary	Permanent
Natural Silts and Gravels	30^0	18^0
Natural Stiff to Hard Sandy/Silty Clay and Very Low Strength Extremely Weathered (XW) Rock	45^0	27^0

Notes:

- Permanent batter slopes require adequate crest, toe drainages and batter slope protection against erosion.
- If steeper than recommended batters are proposed, they may require structural support or stabilisation. It is also appropriate to engage a suitably qualified geotechnical engineer for further advice.
- It is recommended that no surcharge loadings, including construction equipment, to be placed within distance of 3.0 m from the crest of a temporary cut/fill batter.
- Good site drainage is required in order to achieve the above angles, including the use of spoon drains etc to divert water away from the batters and to stop water cascading over the batters.

12. Temporary/Permanent Excavation – Support Options

The common types of supports for these types of excavation are soil nails/rock anchors with shotcrete, soldier piles with shotcrete panels and contiguous pile walls. There are many combinations of these methods available. Further advice can be obtained from a suitably qualified geotechnical/structural engineer.

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13. Earthworks, Re-Use of Site Soils, Site Preparation, Fill Construction and Trafficability

All site earthworks should be carried out in accordance with AS3798-2007 'Guidelines on Earthworks for Commercial and Residential Developments'.

Prior to the placement of any structural fill across the site, any topsoil, unsuitable, deleterious and organically contaminated surface soils should be stripped to depths exposing competent ground. In addition, any tree roots remaining from any clearing operations should be completely removed.

Earthworks should be carried out in a responsible manner in accordance with the relevant parts of AS3798 – 2007. It is recommended that all earthworks be carried out under Level 1 inspection and testing arrangements as detailed in clause 8.2 of AS3798-2007.

Excluding any organic and deleterious materials, it is considered that the majority of materials won from excavation on site will generally be suitable for reuse as bulk filling provided that moisture content of the soils on placement approximates to the Optimum Moisture Content (OMC).

Where natural soils comprising medium to high plasticity clays should be preferably be excluded from the re-use as engineered fill or thoroughly mixed with the less plastic or more granular materials.

Where medium to high plasticity clays are proposed to be re-used as new structural filling materials in building or pavement areas, it is recommended that the cohesive material be placed at depth and granular material or weathered rock be placed close to the subgrade level. This will reduce the effects of seasonal moisture changes and foundations soil reactivity and improve surface trafficability.

14. Construction Inspections

It is appropriate that footing excavations be inspected by suitably qualified geotechnical personnel.

15. Report Limitations

This report is purely based on geotechnical investigation and laboratory testing carried out by Quality Control Testing Services (QCTS). Sam Geotechnics (SGT) doesn't take any responsible for the accuracy of the

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geotechnical investigation and laboratory test results. The accuracy of the geotechnical investigation and laboratory test results are subject to the responsibility of QCTS.

The statements presented in this document are intended to advise the reader of recommendations in line with stated assumptions. This report has been prepared for the particular brief given to us and the data and opinions included in this report should not be used in other contexts or for any other purpose without our prior review and agreement.

This report has been prepared for the sole use of the client for the purpose described and no extended duty of care to any third party is implied or offered. Third parties using any information contained within this report do so at their own risk.

The comments given in this report and the opinions expressed herein are based on the information received from the client, the conditions encountered during the widely spaced geotechnical investigation & laboratory test results by QCTS and associated assessment of ground conditions. Ground conditions can vary over relatively short distances. However, there may be conditions prevailing at the site which have not been disclosed by the geotechnical investigation and which have not been taken into account in the report.

This report has been reasonably reviewed to eliminate human errors, inappropriateness, and omissions.

On Behalf of Sam Geotechnics Pty Ltd,

Sam Jeyan
Principal Geotechnical Engineer
RPEQ – 13339 in Civil and Geotechnical,
RPEng – 0969 in Civil
MIEAust - 3439772

Attachments:

Test Location Plan

Borehole Records with Site Photos

Laboratory Test Reports

CSIRO Sheet 10/91

TRC Landslide/Slope Instability Interacting Map Extract

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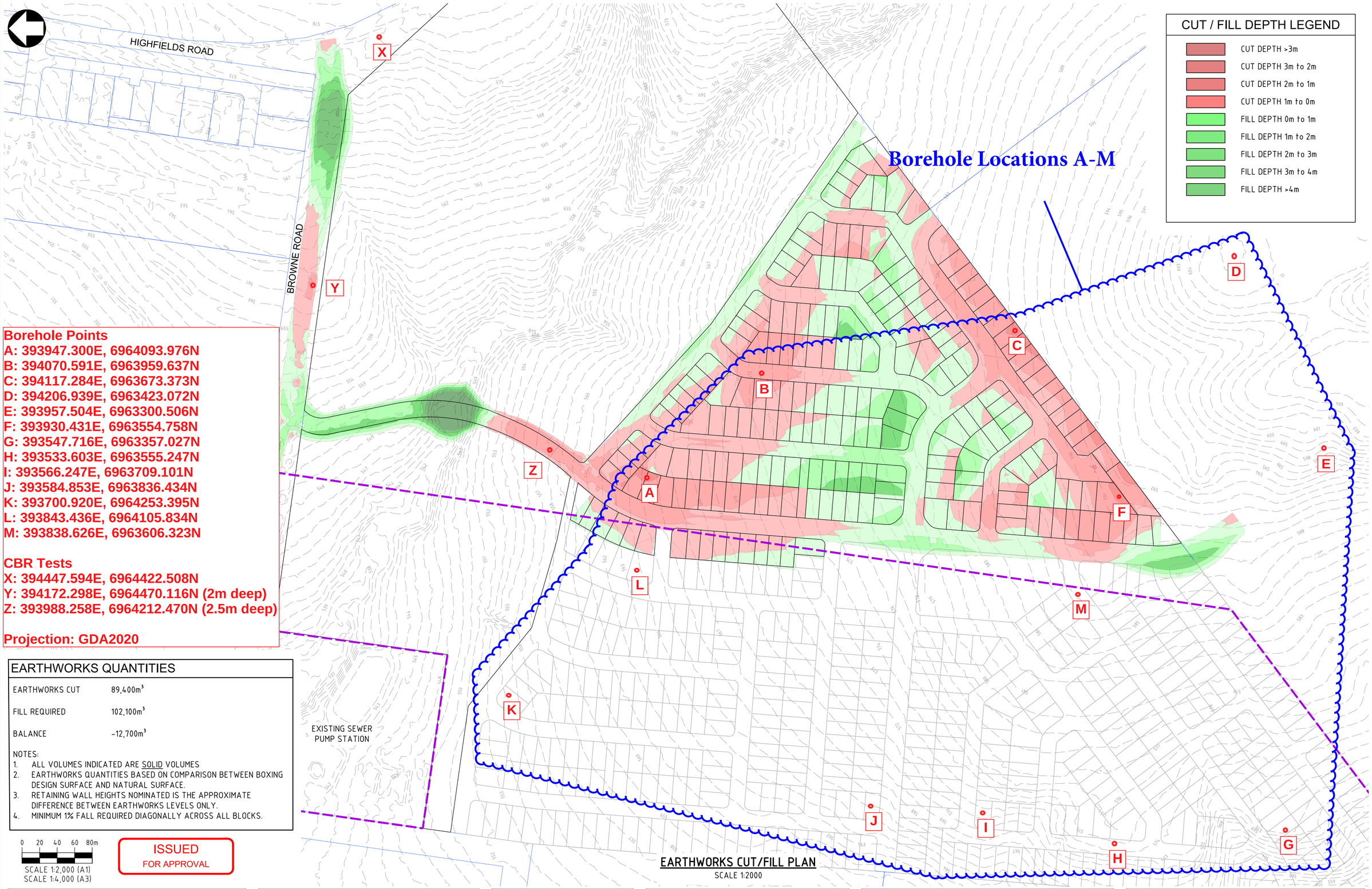
16. Reference Documents

The following published information have been referenced in this report:

- Geotechnical Site Investigations – Australian Standard AS1726 – 2017.
- Residential Slabs & Footings – Australian Standard AS2870-2011.
- Guidelines on Earthworks for Commercial and Residential Developments" by Standards Australia – AS3798-2007.
- Earth-Retaining Structures by Standards Australia – AS4678-2002.
- Piling–Design and Construction by Standards Australia – AS2159-2009.
- Handbook of Geotechnical Investigation and Design Tables" by Taylor & Francis Group, London – Burt Look (2007).



Borehole Points
A: 393947.300E, 6964093.976N
B: 394070.591E, 6963959.637N
C: 394117.284E, 6963673.373N
D: 394206.939E, 6963423.072N
E: 393957.504E, 6963300.506N
F: 393930.431E, 6963554.758N
G: 393547.716E, 6963357.027N
H: 393533.603E, 6963555.247N
I: 393566.247E, 6963709.101N
J: 393584.853E, 6963836.434N
K: 393700.920E, 6964253.395N
L: 393843.436E, 6964105.834N
M: 393838.626E, 6963606.323N

CBR Tests
X: 394447.594E, 6964422.508N
Y: 394172.298E, 6964470.116N (2m deep)
Z: 393988.258E, 6964212.470N (2.5m deep)

Projection: GDA2020

EARTHWORKS QUANTITIES

EARTHWORKS CUT	89,400m³
FILL REQUIRED	102,100m³
BALANCE	-12,700m³

NOTES:
1. ALL VOLUMES INDICATED ARE SOLID VOLUMES
2. EARTHWORKS QUANTITIES BASED ON COMPARISON BETWEEN BOXING DESIGN SURFACE AND NATURAL SURFACE.
3. RETAINING WALL HEIGHTS NOMINATED IS THE APPROXIMATE DIFFERENCE BETWEEN EARTHWORKS LEVELS ONLY.
4. MINIMUM 1% FALL REQUIRED DIAGONALLY ACROSS ALL BLOCKS.

0 20 40 60 80m
SCALE 1:2,000 (A1)
SCALE 1:4,000 (A3)

ISSUED
FOR APPROVAL

EARTHWORKS CUT/FILL PLAN
SCALE 1:2000

REV.	DATE	DRAWN	APP'D	DRAWING REVISION
B	20/07/22	DET	BGL	RFI RESPONSE
A	10/12/21	DET	BGL	ISSUED FOR APPROVAL

RPEQ Certification			
Engineer	BEN LUSK	RPEQ Number	13132
Signature		Date	17/12/2021
Project Number	GS562 - 248 WOOLMER RD DEVELOPMENT		

GenEng Solutions Pty Ltd
ABN 81 150 773 961
PO Box 300
Crows Nest QLD 4355
Ph: (07) 4698 2100
www.genengsolutions.com.au

CLIENT: BIRD IN HAND 3 PTY LTD
PROJECT: 248 WOOLMER RD DEVELOPMENT

DRAWN	CHECKED	ENGINEER	SURVEYOR
D TAYLOR	B LUSK	B LUSK	SAUNDERS HAVILL
DESIGNED			HORIZ. DATUM / VERT. DATUM
B ENRIGHT			GDA2020 / AHD

TITLE: EARTHWORKS CUT FILL PLAN

SHEET	SCALE	JOB No	SHEET No	REVISION
A1	AS SHOWN	GS562-00	SK05	B

QUALITY CONTROL TESTING SERVICES PTY LTD
ABN: 84 604 328 172
23/8 Riverlands Drive, Loganholme 4129
Email: info@qcts.net.au
Phone: (07) 4633 0816
www.qcts.net.au

BORELOG REPORT

CLIENT	Geneng Solutions
CLIENT'S ADDRESS	2/10486 New England Highway, Highfields
PROJECT	248 Woolmer Rd Development, Highfields
MATERIAL SOURCE	Insitu

JOB No.	P22253
REPORT No.	P22253-1
SAMPLED BY	JDW
DATE SAMPLED	19/09/2022

Borehole: Point A **Location:** 39394 .300 E, 6964093.9 6 N

Depth (mm)	Material Description	Moisture Condition	DCP
0 - 100	TOPSOIL/GRASS	-	-
200	Sandy Silty CLAY, NATURAL (CH): soft to firm, low plasticity, brown, fine to coarse sand, trace of extremely weathered fine gravel		1
300			2
400			2
500			1
600		M w PL	2
700			2
800			3
900			2
1000			4
1100	Sandy Silty CLAY, NATURAL (CI): stiff, low plasticity, brown, fine to coarse sand, trace of highly weathered fine to medium gravel		3
1200			4
1300			4
1400	becoming very stiff		6
1500			5
1600			5
1700			5
1800			5
1900			6
2000			5
2100			5
2200			7
2300			6
2400			6
2500		M w ≈ PL	5
2600			6
2700			6
2800			7
2900	becoming hard		9
3000			9
3100			7
3200			9
3300			8
3400			8
3500			8
3600			9
3700			7
3800			7
3900			9
4000			9

Laboratory Testing Summary

Sample No.	Test Method	Sample Depth (m)	Results
Moisture Content			
P22-3312A	AS 1289.2.1.1	0.2-0.4	38.2%
P22-3312B	AS 1289.2.1.1	1.0-1.2	22.1%
P22-3312C	AS 1289.2.1.1	2.0-2.2	18.3%
P22-3312D	AS 1289.2.1.1	3.0-3.2	20.2%
Shrink Swell Index			
P22-3312E	AS 1289.7.1.1	1.0	Iss 2.6%
California Bearing Ratio			
P22-3312F	AS 1289.6.1.1	1.0 - 1.4	10%
Atterberg Limits			
P22-3312F	AS 1289.3.1.2	1.0 - 1.4	38%
P22-3312F	AS 1289.3.2.1	1.0 - 1.4	22%
P22-3312F	AS 1289.3.3.1	1.0 - 1.4	16%
P22-3312F	AS 1289.3.4.1	1.0 - 1.4	6.0%
Particle Size Distribution			
P22-3312F	AS 1289.3.6.1	1.0 - 1.4	

AS sieve size (mm)	% passing
19.0	100
13.2	100
9.5	99
6.7	99
4.75	97
2.36	94
1.18	87
0.6	77
0.425	72
0.3	67
0.15	60
0.075	52

Site Photos

QUALITY CONTROL TESTING SERVICES PTY LTD
ABN: 84 604 328 172
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BORELOG REPORT

CLIENT	Geneng Solutions
CLIENT'S ADDRESS	2/10486 New England Highway, Highfields
PROJECT	248 Woolmer Rd Development, Highfields
MATERIAL SOURCE	Insitu

JOB No.	P22253
REPORT No.	P22253-2
SAMPLED BY	JDW
DATE SAMPLED	14/09/2022

Borehole: Point B **Location:** 3940 0. 91 E, 69639 9.63 N

Depth (mm)	Material Description	Moisture Condition	DCP
0 - 100	TOPSOIL/GRASS	-	-
200	Sandy Silty CLAY, NATURAL (CH): soft to firm, high plasticity, red brown, fine to coarse sand, trace of extremely weathered fine gravel	M w PL	2
300			1
400			2
500			1
600			2
700			2
800			2
900	Sandy Silty CLAY NATURAL (CH): stiff, high Plasticity, mottled light brown & red-brown, fine to coarse sand, some extremely weathered fine gravel	M w ≈ PL	3
1000			2
1100			4
1200			4
1300			4
1400			3
1500			4
1600			6
1700			4
1800			4
1900			5
2000			4
2100	Sandy Silty CLAY, NATURAL (CH): stiff, high Plasticity, red brown, fine to coarse sand, trace of highly weathered fine gravel		4
2200			4
2300			3
2400			3
2500			3
2600			4
2700			4
2800			4
2900			3
3000			4
3100	Sandy Silty CLAY, NATURAL (CL): stiff, low plasticity, light red brown, fine to coarse sand, trace of highly weathered fine gravel	M w PL	5
3200			5
3300			4
3400			5
3500			4
3600			4
3700			4
3800	becoming very stiff		5
3900			5
4000			7

Laboratory Testing Summary

Sample No.	Test Method	Sample Depth (m)	Results
Moisture Content			
P22-3313A	AS 1289.2.1.1	0.2 - 0.4	34.2%
P22-3313B	AS 1289.2.1.1	1.0 - 1.2	25.8%
P22-3313C	AS 1289.2.1.1	2.0 - 2.2	30.0%
P22-3313D	AS 1289.2.1.1	3.0 - 3.2	33.6%
Shrink Swell Index			
P22-3313E	AS 1289.7.1.1	1.0	Iss 2.7%
California Bearing Ratio			
P22-3313F	AS 1289.6.1.1	1.0 - 1.4	2.5%
Atterberg Limits			
P22-3313F	AS 1289.3.1.2	1.0 - 1.4	70%
P22-3313F	AS 1289.3.2.1	1.0 - 1.4	32%
P22-3313F	AS 1289.3.3.1	1.0 - 1.4	38%
P22-3313F	AS 1289.3.4.1	1.0 - 1.4	16.0%
Particle Size Distribution			
P22-3313F	AS 1289.3.6.1	1.0 - 1.4	

AS sieve size (mm)	% passing
9.5	100
6.7	99
4.75	97
2.36	92
1.18	85
0.6	80
0.425	77
0.3	74
0.15	67
0.075	59

Site Photos

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BORELOG REPORT

CLIENT	Geneng Solutions
CLIENT'S ADDRESS	2/10486 New England Highway, Highfields
PROJECT	248 Woolmer Rd Development, Highfields
MATERIAL SOURCE	Insitu

JOB No.	P22253
REPORT No.	P22253-3
SAMPLED BY	JDW
DATE SAMPLED	14/09/2022

Borehole: Point C **Location:** 39411 .284 E, 69636 3.3 3 N

Depth (mm)	Material Description	Moisture Condition	DCP
0 - 100	TOPSOIL/GRASS	-	-
200	Silty CLAY, NATURAL (CH): soft to firm, high Plasticity, mottled brown & red brown, some fine to coarse sand, trace of extremely weathered fine gravel		1
300			2
400			1
500			1
600			2
700			3
800			2
900	becoming stiff		4
1000			3
1100	Silty CLAY, NATURAL (CH): stiff, high plasticity, light brown, some fine to coarse sand, trace of extremely weathered fine gravel	M w ≈ PL	3
1200			5
1300			4
1400			4
1500			5
1600			4
1700	becoming very stiff		5
1800			7
1900			7
2000			5
2100	Silty CLAY, NATURAL (CH): very stiff, high plasticity, light brown with trace of mottled grey, some fine to coarse sand, trace of highly weathered fine gravel		6
2200			6
2300			5
2400			6
2500			6
2600			8
2700			6
2800			7
2900			6
3000			6
3100	Silty CLAY, NATURAL (CH): very stiff, high plasticity, mottled grey & light brown, some fine to coarse sand, trace of highly weathered fine gravel	M w < PL	8
3200			6
3300			7
3400			6
3500			6
3600	becoming hard		8
3700			7
3800			7
3900			7
4000			7
4100			8
4200			7
4300			8
4400			9
4500			7

Laboratory Testing Summary

Sample No.	Test Method	Sample Depth (m)	Results
Moisture Content			
P22-3314A	AS 1289.2.1.1	0.2 - 0.4	35.7%
P22-3314B	AS 1289.2.1.1	1.0 - 1.2	29.4%
P22-3314C	AS 1289.2.1.1	2.0 - 2.2	27.7%
P22-3314D	AS 1289.2.1.1	3.0 - 3.2	29.2%
P22-3314E	AS 1289.2.1.1	3.5 - 3.7	29.1%
Shrink Swell Index			
P22-3314F	AS 1289.7.1.1	1.5	Iss 1.0%
California Bearing Ratio			
P22-3314G	AS 1289.6.1.1	2.0 - 2.4	1.0%
Atterberg Limits			
P22-3314G	AS 1289.3.1.2	1.0 - 1.4	94%
P22-3314G	AS 1289.3.2.1	1.0 - 1.4	43%
P22-3314G	AS 1289.3.3.1	1.0 - 1.4	51%
P22-3314G	AS 1289.3.4.1	1.0 - 1.4	14.5%
Particle Size Distribution			
P22-3314G	AS 1289.3.6.1	1.0 - 1.4	

AS sieve size (mm)	% passing
19.0	100
13.2	99
9.5	98
6.7	98
4.75	97
2.36	95
1.18	94
0.6	92
0.425	91
0.3	89
0.15	85
0.075	81

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BORELOG REPORT

CLIENT	Geneng Solutions
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MATERIAL SOURCE	Insitu

JOB No.	P22253
REPORT No.	P22253-4
SAMPLED BY	JDW
DATE SAMPLED	19/09/2022

Borehole: Point **D** **Location:** 394206.939 E, 6963423.0 2 N

Depth (mm)	Material Description	Moisture Condition	DCP
0 - 100	TOPSOIL/GRASS	-	-
200	Sandy SILT, NATURAL (ML): loose to medium dense, low plasticity, red, fine to coarse sand, trace of highly weathered fine to medium gravel		1
300			3
400			2
500	becoming medium dense		3
600			3
700		moist	4
800			4
900			4
1000			3
1100			4
1200			6
1300	Sandy Silty CLAY, NATURAL (CL): stiff, low plasticity, mottled brown and red, fine to coarse sand, trace of highly weathered fine gravel		4
1400			4
1500		M	4
1600		w ≈ PL	4
1700			6
1800			6
1900	Sandy Silty CLAY, NATURAL (CL): very stiff, low plasticity, brown, fine to coarse sand, trace of extremely weathered fine gravel		5
2000			5
2100			5
2200			5
2300			7
2400			7
2500			6
2600			5
2700			7
2800			7
2900		M	6
3000		w PL	6
3100	Sandy Silty CLAY, NATURAL (CL): very stiff, low Plasticity, mottled brown and red, fine to coarse sand, trace of extremely weathered fine gravel		5
3200			5
3300			6
3400			7
3500			6
3600			6
3700			6
3800			7
3900			8
4000			8

Laboratory Testing Summary

Sample No.	Test Method	Sample Depth (m)	Results
Moisture Content			
P22-3315A	AS 1289.2.1.1	0.2 - 0.4	16.7%
P22-3315B	AS 1289.2.1.1	1.0 - 1.2	27.9%
P22-3315C	AS 1289.2.1.1	2.0 - 2.2	28.8%
P22-3315D	AS 1289.2.1.1	3.0 - 3.2	28.4%
Shrink Swell Index			
P22-3315E	AS 1289.7.1.1	2.5	Iss 0.3%
California Bearing Ratio			
P22-3315F	AS 1289.6.1.1	1.0 - 1.4	11%
Atterberg Limits			
P22-3315F	AS 1289.3.1.2	1.0 - 1.4	47%
P22-3315F	AS 1289.3.2.1	1.0 - 1.4	23%
P22-3315F	AS 1289.3.3.1	1.0 - 1.4	24%
P22-3315F	AS 1289.3.4.1	1.0 - 1.4	9.0%
Particle Size Distribution			
P22-3315F	AS 1289.3.6.1	1.0 - 1.4	

AS sieve size (mm)	% passing
19.0	100
13.2	100
9.5	99
6.7	98
4.75	97
2.36	92
1.18	86
0.6	80
0.425	77
0.3	75
0.15	70
0.075	64

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BORELOG REPORT

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MATERIAL SOURCE	Insitu

JOB No.	P22253
REPORT No.	P22253-5
SAMPLED BY	JDW
DATE SAMPLED	15/09/2022

Borehole: Point E **Location:** 3939 . 04 E, 6963300. 06 N

Depth (mm)	Material Description	Moisture Condition	DCP
0 - 100	TOPSOIL/GRASS	-	-
200	Sandy SILT NATURAL (ML): medium dense, low Plasticity, red, fine to coarse sand, some highly weathered fine to medium gravel		2
300			3
400			3
500			3
600			2
700			4
800			4
900			5
1000			5
1100		moist	4
1200			6
1300			6
1400			5
1500			5
1600			6
1700			6
1800			6
1900			7
2000			6
2100	Sandy SILT NATURAL (ML): medium dense, low plasticity, red brown, fine to coarse sand, with trace of brown clay, some highly weathered fine to medium gravel ,		5
2200			5
2300			5
2400			8
2500		M	6
2600	Sandy SILT, NATURAL (ML): dense, low plasticity, red brown, fine to coarse sand, with trace of light brown clay, trace of highly weathered fine to medium gravel	w ≈ PL	7
2700			7
2800			7
2900			6
3000			7
3100	Sandy Silty CLAY, NATURAL (CL): hard, low plasticity, light red brown, fine to coarse sand, trace of highly weathered fine to medium gravel		8
3200			7
3300			8
3400			8
3500		M	8
3600		w PL	7
3700			7
3800			6
3900			6
4000			6

Laboratory Testing Summary

Sample No.	Test Method	Sample Depth (m)	Results
	Moisture Content		
P22-3316A	AS 1289.2.1.1	0.2 - 0.4	19.2%
P22-3316B	AS 1289.2.1.1	1.0 - 1.2	17.6%
P22-3316C	AS 1289.2.1.1	1.5 - 1.7	21.3%
P22-3316D	AS 1289.2.1.1	2.0 - 2.5	25.4%
P22-3316E	AS 1289.2.1.1	2.5 - 2.7	27.9%
P22-3316F	AS 1289.2.1.1	3.0 - 3.2	29.2%
	Shrink Swell Index		
P22-3316G	AS 1289.7.1.1	3.0	lss 0.4%
	California Bearing Ratio		
P22-3316H	AS 1289.6.1.1	1.0 - 1.4	16%
	Atterberg Limits		
P22-3316H	AS 1289.3.1.2	1.0 - 1.4	44%
P22-3316H	AS 1289.3.2.1	1.0 - 1.4	22%
P22-3316H	AS 1289.3.3.1	1.0 - 1.4	22%
P22-3316H	AS 1289.3.4.1	1.0 - 1.4	7.0%
	Particle Size Distribution		
P22-3316H	AS 1289.3.6.1	1.0 - 1.4	

AS sieve size (mm)	% passing
26.5	100
19.0	100
13.2	99
9.5	98
6.7	94
4.75	90
2.36	80
1.18	71
0.6	63
0.425	60
0.3	57
0.15	51
0.075	46

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JOB No.	P22253
REPORT No.	P22253-6
SAMPLED BY	JDW
DATE SAMPLED	14/09/2022

Borehole: Point F **Location:** 393930.431 E, 6963 4. 8 N

Depth (mm)	Material Description	Moisture Condition	DCP
0 - 100	TOPSOIL/GRASS	-	-
200	Sandy Silty CLAY, NATURAL (CH): loose to medium dense, high plasticity, red brown, fine to coarse sand, trace of extremely weathered fine gravel		2
300			1
400			2
500			2
600			2
700			3
800			2
900			3
1000	Sandy Silty CLAY, NATURAL (CH): stiff, high plasticity, brown, fine to coarse sand, trace of extremely weathered fine gravel	M w PL	3
1100			4
1200			4
1300			5
1400			4
1500			5
1600			5
1700			5
1800			7
1900			7
2000			6
2100	Sandy Silty CLAY, NATURAL (CH): very stiff, high plasticity, brown, fine to coarse sand, trace of extremely weathered fine gravel	M w ≈ PL	5
2200			6
2300			7
2400			7
2500			6
2600			6
2700			5
2800			5
2900			5
3000			6
3100			6
3200			5
3300			6
3400			7
3500			6
3600			6
3700			6
3800			8
3900			7
4000			7

Laboratory Testing Summary

Sample No.	Test Method	Sample Depth (m)	Results
Moisture Content			
P22-3317A	AS 1289.2.1.1	0.2 - 0.4	31.8%
P22-3317B	AS 1289.2.1.1	1.0 - 1.2	30.1%
P22-3317C	AS 1289.2.1.1	2.0 - 2.2	31.7%
P22-3317D	AS 1289.2.1.1	3.0 - 3.2	31.1%
Shrink Swell Index			
P22-3317E	AS 1289.7.1.1	2.5	Iss 1.6%
California Bearing Ratio			
P22-3317F	AS 1289.6.1.1	1.0 - 1.4	6%
Atterberg Limits			
P22-3317F	AS 1289.3.1.2	1.0 - 1.4	76%
P22-3317F	AS 1289.3.2.1	1.0 - 1.4	41%
P22-3317F	AS 1289.3.3.1	1.0 - 1.4	35%
P22-3317F	AS 1289.3.4.1	1.0 - 1.4	10.0%
Particle Size Distribution			
P22-3317F	AS 1289.3.6.1	1.0 - 1.4	

AS sieve size (mm)	% passing
9.5	100
6.7	99
4.75	98
2.36	96
1.18	95
0.6	93
0.425	91
0.3	90
0.15	84
0.075	77

Site Photos

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BORELOG REPORT

CLIENT	Geneng Solutions
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MATERIAL SOURCE	Insitu

JOB No.	P22253
REPORT No.	P22253-7
SAMPLED BY	JDW
DATE SAMPLED	15/09/2022

Borehole: Point G **Location:** 393 4 . 16 E, 69633 .02 N

Depth (mm)	Material Description	Moisture Condition	DCP
0 - 100	TOPSOIL/GRASS	-	-
200	Sandy Silty CLAY, NATURAL (CH): stiff, high plasticity, brown, fine to coarse sand, trace of extremely weathered fine to medium gravel	M w < PL	2
300			2
400			3
500			3
600			4
700			4
800			3
900			5
1000			4
1100	Sandy Silty CLAY, NATURAL (CH): stiff, high plasticity, grey brown, fine to coarse sand, trace of extremely weathered fine to medium gravel	M w ≈ PL	3
1200			3
1300			4
1400			4
1500			3
1600			4
1700			4
1800			4
1900			4
2000			4
2100			4
2200	becoming very stiff		5
2300			5
2400			5
2500			7
2600			6
2700			7
2800			7
2900			6
3000			6
3100	Sandy Silty CLAY, NATURAL (CL): very stiff, low plasticity, red brown, fine to coarse sand, trace of extremely weathered fine gravel		5
3200			5
3300			6
3400			7
3500			6
3600			6
3700			6
3800	becoming hard		8
3900			9
4000			9

Laboratory Testing Summary

Sample No.	Test Method	Sample Depth (m)	Results
Moisture Content			
P22-3318A	AS 1289.2.1.1	0.2 - 0.4	26.8%
P22-3318B	AS 1289.2.1.1	1.0 - 1.2	31.6%
P22-3318C	AS 1289.2.1.1	2.0 - 2.2	28.3%
P22-3318D	AS 1289.2.1.1	3.0 - 3.2	32.0%
Shrink Swell Index			
P22-3318E	AS 1289.7.1.1	2.5	lss 2.1%
California Bearing Ratio			
P22-3318F	AS 1289.6.1.1	1.0 - 1.4	3.0%
Atterberg Limits			
P22-3318F	AS 1289.3.1.2	1.0 - 1.4	80%
P22-3318F	AS 1289.3.2.1	1.0 - 1.4	31%
P22-3318F	AS 1289.3.3.1	1.0 - 1.4	49%
P22-3318F	AS 1289.3.4.1	1.0 - 1.4	21.0%
Particle Size Distribution			
P22-3318F	AS 1289.3.6.1	1.0 - 1.4	

AS sieve size (mm)	% passing
26.5	100
19.0	99
13.2	99
9.5	99
6.7	99
4.75	97
2.36	94
1.18	90
0.6	86
0.425	83
0.3	80
0.15	73
0.075	67

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MATERIAL SOURCE	Insitu

JOB No.	P22253
REPORT No.	P22253-8
SAMPLED BY	JDW
DATE SAMPLED	15/09/2022

Borehole: Point **Location:** 393 33.663 E, 6963 .24 N

Depth (mm)	Material Description	Moisture Condition	DCP
0 - 100	TOPSOIL/GRASS	-	-
200	Sandy Silty CLAY, NATURAL (CL): stiff, low plasticity, mottled red brown & brown, fine to coarse sand, trace of highly weathered fine gravel	M w PL	1
300			3
400			2
500			3
600			3
700			4
800			3
900			4
1000			4
1100	Gravelly Sandy Silty CLAY, NATURAL (CH): very stiff, high plasticity, light brown, Fine to Coarse Sand, extremely weathered fine to medium gravel	M w ≈ PL	3
1200			5
1300			7
1400			5
1500			6
1600			6
1700	becoming hard		7
1800			6
1900			9
2000			11
2100			10
2200			13
2300			11
2400			14
2500			12
2600			15
2700			18
2800			26
2900			R
3000			
3100	Silty Sandy GRAVEL, NATURAL (GM)/Extremely Weathered (XW) Rock: very low strength, extremely weathered fine to medium gravel, grey brown, fine to coarse sand, low plasticity	Moist	
3200			
3300			
3400			
3500			

Laboratory Testing Summary

Sample No.	Test Method	Sample Depth (m)	Results
Moisture Content			
P22-3319A	AS 1289.2.1.1	0.2 - 0.4	36.2%
P22-3319B	AS 1289.2.1.1	1.0 - 1.2	22.6%
P22-3319C	AS 1289.2.1.1	2.0 - 2.2	21.1%
P22-3319D	AS 1289.2.1.1	3.0 - 3.2	9.2%
California Bearing Ratio			
P22-3319E	AS 1289.6.1.1	1.0 - 1.4	10%
Atterberg Limits			
P22-3319E	AS 1289.3.1.2	1.0 - 1.4	55%
P22-3319E	AS 1289.3.2.1	1.0 - 1.4	22%
P22-3319E	AS 1289.3.3.1	1.0 - 1.4	33%
P22-3319E	AS 1289.3.4.1	1.0 - 1.4	13.0%
Particle Size Distribution			
P22-3319E	AS 1289.3.6.1	1.0 - 1.4	

AS sieve size (mm)	% passing
26.5	100
19.0	99
13.2	97
9.5	92
6.7	80
4.75	68
2.36	52
1.18	46
0.6	42
0.425	41
0.3	39
0.15	36
0.075	34

Site Photos

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BORELOG REPORT

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MATERIAL SOURCE	Insitu

JOB No.	P22253
REPORT No.	P22253-9
SAMPLED BY	JDW
DATE SAMPLED	19/09/2022

Borehole: Point I **Location:** 393 66.24 E, 6963 09.101 N

Depth (mm)	Material Description	Moisture Condition	DCP
0 - 100	TOPSOIL/GRASS	-	-
200	Sandy Silty CLAY, NATURAL (CH): soft to firm, high plasticity, light red brown, fine to corse sand, trace of extremely weathered fine gravel		1
300			2
400			1
500			3
600			1
700			2
800			2
900			2
1000			3
1100	Sandy Silty CLAY, NATURAL (CH): stiff, high plasticity, light red brown, fine to coarse sand, some highly weathered fine to medium gravel,		4
1200			3
1300			3
1400			3
1500			5
1600			4
1700			4
1800			4
1900			4
2000			5
2100	Sandy Silty CLAY, NATURAL (CL): very stiff, low plasticity, light red brown, fine to coarse sand, with some extremely weathered fine to medium gravel	M w PL	4
2200			6
2300			5
2400			5
2500			6
2600			6
2700			8
2800			6
2900			6
3000			7
3100	Sandy Silty CLAY, NATURAL (CL): hard, low plasticity, grey brown, fine to coarse sand, with some extremely weathered fine to medium gravel		7
3200			7
3300			9
3400			12
3500			10
3600			13
3700			11
3800			12
3900			10
4000			8

Laboratory Testing Summary

Sample No.	Test Method	Sample Depth (m)	Results
Moisture Content			
P22-3320A	AS 1289.2.1.1	0.2 - 0.4	40.6%
P22-3320B	AS 1289.2.1.1	1.0 - 1.2	31.2%
P22-3320C	AS 1289.2.1.1	2.0 - 2.2	29.4%
P22-3320D	AS 1289.2.1.1	3.0 - 3.2	28.9%
Shrink Swell Index			
P22-3320E	AS 1289.7.1.1	1.0	Iss 2.1%
California Bearing Ratio			
P22-3320F	AS 1289.6.1.1	0.2 - 0.6	2.0%
Atterberg Limits			
P22-3320F	AS 1289.3.1.2	0.2 - 0.6	73%
P22-3320F	AS 1289.3.2.1	0.2 - 0.6	25%
P22-3320F	AS 1289.3.3.1	0.2 - 0.6	48%
P22-3320F	AS 1289.3.4.1	0.2 - 0.6	18.5%
Particle Size Distribution			
P22-3320F	AS 1289.3.6.1	0.2 - 0.6	

AS sieve size (mm)	% passing
13.2	100
9.5	100
6.7	99
4.75	99
2.36	98
1.18	97
0.6	94
0.425	92
0.3	88
0.15	81
0.075	76

Site Photos

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Phone: (07) 4633 0816
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BORELOG REPORT

CLIENT	Geneng Solutions
CLIENT'S ADDRESS	2/10486 New England Highway, Highfields
PROJECT	248 Woolmer Rd Development, Highfields
MATERIAL SOURCE	Insitu

JOB No.	P22253
REPORT No.	P22253-10
SAMPLED BY	JDW
DATE SAMPLED	19/09/2022

Borehole: Point J **Location:** 393 84.8 3 E, 6963836.434 N

Depth (mm)	Material Description	Moisture Condition	DCP
0 - 100	TOPSOIL/GRASS	-	-
200	Sandy Silty CLAY, NATURAL (CH): soft to firm, high plasticity, mottled grey-yellow brown, fine to coarse sand, trace of extremely weathered fine gravel		1
300			2
400			2
500			1
600			3
700			2
800	becoming stiff		3
900			4
1000			4
1100	Sandy Silty CLAY, NATURAL (CH): stiff, high plasticity, brown, fine to coarse sand, some extremely weathered fine gravel	M w PL	4
1200			4
1300	becoming very stiff		6
1400			7
1500			7
1600			5
1700			6
1800			6
1900			6
2000			6
2100	Silty Sandy GRAVEL, NATURAL (GM): very dense, extremely weathered fine gravel, brown red brown, fine to coarse sand, low plasticityy	M w ≈ PL	8
2200			6
2300			8
2400			10
2500			9
2600			11
2700			8
2800			11
2900			12
3000			12
3100			10
3200			13
3300			10
3400			12
3500			12
3600			13
3700			12
3800			11
3900			11
4000			9

Laboratory Testing Summary

Sample No.	Test Method	Sample Depth (m)	Results
Moisture Content			
P22-3321A	AS 1289.2.1.1	0.2 - 0.4	38.2%
P22-3321B	AS 1289.2.1.1	1.0 - 1.2	32.0%
P22-3321C	AS 1289.2.1.1	2.0 - 2.2	21.2%
P22-3321D	AS 1289.2.1.1	3.0 - 3.2	21.0%
Shrink Swell Index			
P22-3321E	AS 1289.7.1.1	1.0	Iss 2.3%
California Bearing Ratio			
P22-3321F	AS 1289.6.1.1	0.2 - 0.6	1.5%
Atterberg Limits			
P22-3321F	AS 1289.3.1.2	0.2 - 0.6	73%
P22-3321F	AS 1289.3.2.1	0.2 - 0.6	25%
P22-3321F	AS 1289.3.3.1	0.2 - 0.6	48%
P22-3321F	AS 1289.3.4.1	0.2 - 0.6	18.0%
Particle Size Distribution			
P22-3321F	AS 1289.3.6.1	0.2 - 0.6	

AS sieve size (mm)	% passing
6.7	100
4.75	99
2.36	98
1.18	96
0.6	93
0.425	90
0.3	86
0.15	78
0.075	71

Site Photos

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www.qcts.net.au

BORELOG REPORT

CLIENT	Geneng Solutions
CLIENT'S ADDRESS	2/10486 New England Highway, Highfields
PROJECT	248 Woolmer Rd Development, Highfields
MATERIAL SOURCE	Insitu

JOB No.	P22253
REPORT No.	P22253-11
SAMPLED BY	JDW
DATE SAMPLED	15/09/2022

Borehole: Point **Location:** 393 00.920 E, 69642 3.39 N

Depth (mm)	Material Description	Moisture Condition	DCP
0 - 100	TOPSOIL/GRASS	-	-
200	Silty CLAY, NATURAL (CH): soft to firm, high plasticity, yellow brown & red, some fine to coarse sand, trace of moderately weathered fine gravel		2
300			1
400	becoming stiff		4
500			3
600			3
700	becoming very stiff	M w PL	6
800			8
900			7
1000	becoming hard		10
1100			19
1200			R
1300	Power Auger refusal at 1.2m		
1400	in possible weathered rock		
1500			
1600			
1700			
1800			
1900			
2000			
2100			
2200			
2300			
2400			
2500			
2600			
2700			
2800			
2900			
3000			
3100			
3200			
3300			
3400			
3500			
3600			
3700			
3800			
3900			
4000			

Laboratory Testing Summary

Sample No.	Test Method	Sample Depth (m)	Results
Moisture Content			
P22-3322A	AS 1289.2.1.1	0.2 - 0.4	36.4%
Shrink Swell Index			
P22-3322B	AS 1289.7.1.1	1.0	Iss 1.6%
Atterberg Limits			
P22-3322C	AS 1289.3.1.2	0.2 - 0.6	70%
P22-3322C	AS 1289.3.2.1	0.2 - 0.6	26%
P22-3322C	AS 1289.3.3.1	0.2 - 0.6	44%
P22-3322C	AS 1289.3.4.1	0.2 - 0.6	17.0%
Particle Size Distribution			
P22-3322C	AS 1289.3.6.1	0.2 - 0.6	

AS sieve size (mm)	% passing
19.0	100
13.2	99
9.5	98
6.7	96
4.75	95
2.36	92
1.18	89
0.6	87
0.425	86
0.3	85
0.15	83
0.075	81

Site Photos

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BORELOG REPORT

CLIENT	Geneng Solutions
CLIENT'S ADDRESS	2/10486 New England Highway, Highfields
PROJECT	248 Woolmer Rd Development, Highfields
MATERIAL SOURCE	Insitu

JOB No.	P22253
REPORT No.	P22253-12
SAMPLED BY	JDW
DATE SAMPLED	15/09/2022

Borehole: Point L **Location:** 393843.436 E, 696410 .834 N

Depth (mm)	Material Description	Moisture Condition	DCP
0 - 100	TOPSOIL/GRASS	-	-
200	Sandy Silty CLAY, NATURAL (CH): stiff, high plasticity, red brown, fine to coarse sand, trace of extremely weathered fine gravel		2
300			3
400			2
500			2
600			4
700			3
800			4
900			3
1000			3
1100			5
1200			4
1300			4
1400			4
1500			5
1600			4
1700	becoming very stiff		5
1800			5
1900			7
2000			5
2100	Sandy Silty CLAY, NATURAL (CH): very stiff, High plasticity, mottled grey & red brown, fine to coarse sand, trace of extremely weathered fine gravel	M w PL	6
2200			7
2300			6
2400			6
2500			5
2600			6
2700			7
2800			7
2900			6
3000			5
3100			5
3200			5
3300			5
3400			6
3500			5
3600			5
3700			7
3800			6
3900			5
4000			4

Laboratory Testing Summary

Sample No.	Test Method	Sample Depth (m)	Results
Moisture Content			
P22-3323A	AS 1289.2.1.1	0.2 - 0.4	34.9%
P22-3323B	AS 1289.2.1.1	1.0 - 1.2	35.9%
P22-3323C	AS 1289.2.1.1	2.0 - 2.2	35.8%
P22-3323D	AS 1289.2.1.1	3.0 - 3.2	35.2%
Shrink Swell Index			
P22-3323E	AS 1289.7.1.1	2.0	Iss 1.3%
California Bearing Ratio			
P22-3323F	AS 1289.6.1.1	2.0 - 2.4	2.5%
Atterberg Limits			
P22-3323F	AS 1289.3.1.2	2.0 - 2.4	77%
P22-3323F	AS 1289.3.2.1	2.0 - 2.4	25%
P22-3323F	AS 1289.3.3.1	2.0 - 2.4	52%
P22-3323F	AS 1289.3.4.1	2.0 - 2.4	18.5%
Particle Size Distribution			
P22-3323F	AS 1289.3.6.1	2.0 - 2.4	

AS sieve size (mm)	% passing
6.7	100
4.75	100
2.36	99
1.18	98
0.6	97
0.425	95
0.3	92
0.15	86
0.075	79

Site Photos

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BORELOG REPORT

CLIENT	Geneng Solutions
CLIENT'S ADDRESS	2/10486 New England Highway, Highfields
PROJECT	248 Woolmer Rd Development, Highfields
MATERIAL SOURCE	Insitu

JOB No.	P22253
REPORT No.	P22253-13
SAMPLED BY	JDW
DATE SAMPLED	15/09/2022

Borehole: Point M **Location:** 393838.626 E, 6963606.323 N

Depth (mm)	Material Description	Moisture Condition	DCP
0 - 100	TOPSOIL/GRASS	-	-
200	Silty CLAY, NATURAL (CH): stiff, highy plasticity, mottled grey-red & red-brown, some fine to coarse sand, trace of extremely weathered fine gravel	M w < PL	2
300			3
400			3
500			3
600			4
700			4
800			4
900			6
1000			5
1100	Silty CLAY, NATURAL (CH): very stiff, high plasticity, mottled grey & light brown, some fine to coarse sand, some extremely weathered fine to medium gravel	M w ≈ PL	6
1200			5
1300			5
1400			5
1500			6
1600			7
1700			6
1800			7
1900			7
2000			6
2100	Silty CLAY, NATURAL (CH): very stiff, high plasticity, mottled grey & light red-brown, some fine to coarse sand, some extremely weathered fine to medium gravel		6
2200			5
2300			6
2400			6
2500			6
2600			5
2700			6
2800			8
2900			7
3000			5
3100			6
3200			6
3300			5
3400			5
3500			5
3600			6
3700			5
3800			5
3900			5
4000			6

Laboratory Testing Summary

Sample No.	Test Method	Sample Depth (m)	Results
Moisture Content			
P22-3324A	AS 1289.2.1.1	0.2 - 0.4	24.7%
P22-3324B	AS 1289.2.1.1	1.0 - 1.2	32.3%
P22-3324C	AS 1289.2.1.1	2.0 - 2.2	30.3%
P22-3324D	AS 1289.2.1.1	3.0 - 3.2	30.1%
Shrink Swell Index			
P22-3324E	AS 1289.7.1.1	2.0	Iss 2.5%
California Bearing Ratio			
P22-3324F	AS 1289.6.1.1	1.0 - 1.4	1.5%
Atterberg Limits			
P22-3324F	AS 1289.3.1.2	1.0 - 1.4	96%
P22-3324F	AS 1289.3.2.1	1.0 - 1.4	32%
P22-3324F	AS 1289.3.3.1	1.0 - 1.4	64%
P22-3324F	AS 1289.3.4.1	1.0 - 1.4	16.0%
Particle Size Distribution			
P22-3324F	AS 1289.3.6.1	1.0 - 1.4	

AS sieve size (mm)	% passing
19.0	100
13.2	98
9.5	97
6.7	94
4.75	92
2.36	90
1.18	88
0.6	87
0.425	86
0.3	85
0.15	82
0.075	80

Site Photos

Material Test Report

Report Number:	**P22253-1B**
Issue Number:	3 - *This version supersedes all previous issues*
Reissue Reason:	*Description Amended*
Date Issued:	30/01/2023
Client:	Geneng Solutions Pty Ltd PO Box 300, Crows Nest QLD 4355
Contact:	David Taylor
Project Number:	P22253
Project Name:	248 Woolmer Road Development
Project Location:	Browne & Woolmer Rd, Highfields
Work Request:	3312
Sample Number:	P22-3312F
Client Sample #:	A
Date Sampled:	19/09/2022
Dates Tested:	26/09/2022 - 08/10/2022
Sampling Method:	AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method:	AS 1289.1.1 - Sampling and preparation of soils
Site Selection:	Selected by Client
Sample Location:	**Borehole Point A E: 393947.300, N: 6964093.976, Depth: 1.0 - 1.4**
Material:	Natural
Material Source:	Insitu

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QCTS Toowoomba
4 Stradbroke Street Rockville QLD 4350
Phone: (07) 4633 0816
Email: mark@qcts.net.au

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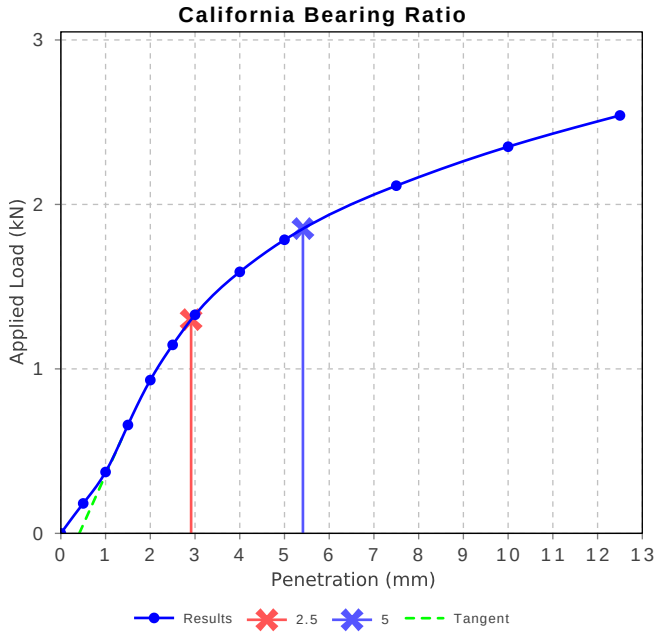
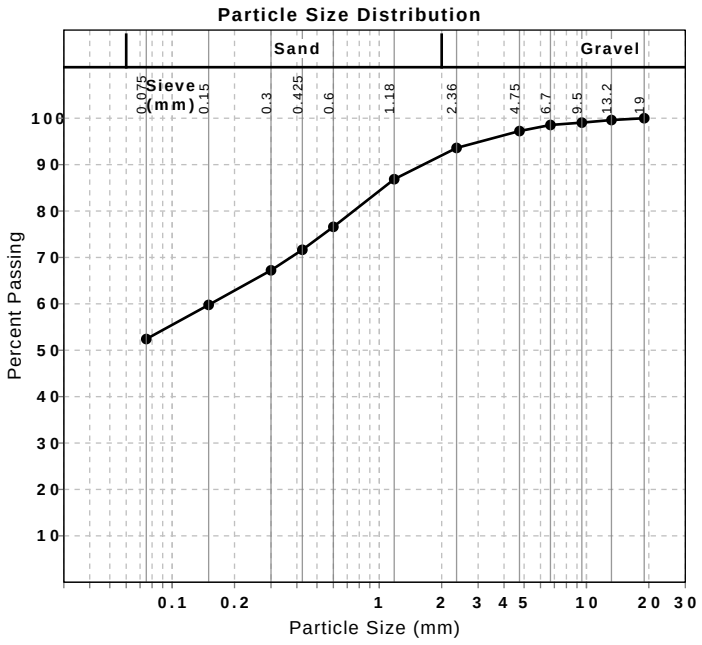
Approved Signatory: Mark Jackman
Technical Services Manager

NATA Accredited Laboratory Number: 19673

California Bearing Ratio (AS 1289 6.1.1 & 2.1.1)		Min	Max
CBR taken at	2.5 mm		
CBR %	**10**		
Method of Compactive Effort	Standard		
Method used to Determine MDD	AS 1289 5.1.1 & 2.1.1		
Method used to Determine Plasticity	Visually		
Maximum Dry Density (t/m^3)	1.68		
Optimum Moisture Content (%)	20.5		
Laboratory Density Ratio (%)	97.0		
Laboratory Moisture Ratio (%)	101.5		
Dry Density after Soaking (t/m^3)	1.61		
Field Moisture Content (%)	20.9		
Moisture Content at Placement (%)	20.6		
Moisture Content Top 30mm (%)	28.5		
Moisture Content Rest of Sample (%)	25.5		
Mass Surcharge (kg)	4.5		
Soaking Period (days)	4		
Curing Hours	96.1		
Swell (%)	1.0		
Oversize Material (mm)	19		
Oversize Material Included	Excluded		
Oversize Material (%)	0		



Particle Size Distribution (AS1289 3.6.1)						
Sieve	Passed %	Passing Limits		Retained %	Retained Limits	
19 mm	**100**			0		
13.2 mm	**100**			0		
9.5 mm	**99**			1		
6.7 mm	**99**			1		
4.75 mm	**97**			1		
2.36 mm	**94**			4		
1.18 mm	**87**			7		
0.6 mm	**77**			10		
0.425 mm	**72**			5		
0.3 mm	**67**			4		
0.15 mm	**60**			7		
0.075 mm	**52**			7		



Material Test Report

Report Number:	**P22253-1B**
Issue Number:	3 - *This version supersedes all previous issues*
Reissue Reason:	*Description Amended*
Date Issued:	30/01/2023
Client:	Geneng Solutions Pty Ltd PO Box 300, Crows Nest QLD 4355
Contact:	David Taylor
Project Number:	P22253
Project Name:	248 Woolmer Road Development
Project Location:	Browne & Woolmer Rd, Highfields
Work Request:	3312
Sample Number:	P22-3312F
Client Sample #:	A
Date Sampled:	19/09/2022
Dates Tested:	26/09/2022 - 08/10/2022
Sampling Method:	AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method:	AS 1289.1.1 - Sampling and preparation of soils
Site Selection:	Selected by Client
Sample Location:	**Borehole Point A E: 393947.300, N: 6964093.976, Depth: 1.0 - 1.4**
Material:	Natural
Material Source:	Insitu

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	38		
Plastic Limit (%)	22		
Plasticity Index (%)	**16**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)	**6.0**		
Cracking Crumbling Curling	Cracking & Curling		

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QCTS Toowoomba
4 Stradbroke Street Rockville QLD 4350
Phone: (07) 4633 0816
Email: mark@qcts.net.au

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Approved Signatory: Mark Jackman
Technical Services Manager
NATA Accredited Laboratory Number: 19673

Material Test Report

Report Number:	**P22253-1B**
Issue Number:	3 - *This version supersedes all previous issues*
Reissue Reason:	*Description Amended*
Date Issued:	30/01/2023
Client:	Geneng Solutions Pty Ltd PO Box 300, Crows Nest QLD 4355
Contact:	David Taylor
Project Number:	P22253
Project Name:	248 Woolmer Road Development
Project Location:	Browne & Woolmer Rd, Highfields
Work Request:	3312
Date Sampled:	19/09/2022
Dates Tested:	26/09/2022 - 28/09/2022
Sampling Method:	AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method:	AS 1289.1.1 - Sampling and preparation of soils
Site Selection:	Selected by Client
Location:	Borehole Point A
Material:	Natural
Material Source:	Insitu

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QCTS Toowoomba
4 Stradbroke Street Rockville QLD 4350
Phone: (07) 4633 0816
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Approved Signatory: Mark Jackman
Technical Services Manager

NATA Accredited Laboratory Number: 19673

Moisture Content AS 1289 2.1.1

Sample Number	Sample Location	Moisture Content	Material
P22-3312A	Borehole Point A E: 393947.300, N: 6964093.976, Depth: 0.2 - 0.4	38.2 %	Natural
P22-3312B	Borehole Point A E: 393947.300, N: 6964093.976, Depth: 1.0 - 1.2	22.1 %	Natural
P22-3312C	Borehole Point A E: 393947.300, N: 6964093.976, Depth: 2.0 - 2.2	18.3 %	Natural
P22-3312D	Borehole Point A E: 393947.300, N: 6964093.976, Depth: 3.0 - 3.2	20.2 %	Natural

Material Test Report

Report Number:	**P22253-1B**
Issue Number:	3 - *This version supersedes all previous issues*
Reissue Reason:	*Description Amended*
Date Issued:	30/01/2023
Client:	Geneng Solutions Pty Ltd PO Box 300, Crows Nest QLD 4355
Contact:	David Taylor
Project Number:	P22253
Project Name:	248 Woolmer Road Development
Project Location:	Browne & Woolmer Rd, Highfields
Work Request:	3312
Date Sampled:	19/09/2022
Dates Tested:	26/09/2022 - 27/09/2022
Sampling Method:	AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method:	AS 1289.1.1 - Sampling and preparation of soils
Site Selection:	Selected by Client
Location:	Borehole Point A
Material:	Natural
Material Source:	Insitu

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QCTS Toowoomba
4 Stradbroke Street Rockville QLD 4350
Phone: (07) 4633 0816
Email: mark@qcts.net.au

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Approved Signatory: Mark Jackman
Technical Services Manager
NATA Accredited Laboratory Number: 19673

Shrink Swell Index AS 1289 7.1.1 & 2.1.1					
Sample Number	P22-3312E				
Date Sampled	19/09/2022				
Date Tested	27/09/2022				
Material Source	insitu				
Sample Location	Borehole Point A E: 393947.300, N: 6964093.976 (1000)				
Inert Material Estimate (%)	20				
Pocket Penetrometer before (kPa)	40				
Pocket Penetrometer after (kPa)	30				
Shrinkage Moisture Content (%)	30.6				
Shrinkage (%)	**4.5**				
Swell Moisture Content Before (%)	40.7				
Swell Moisture Content After (%)	44.7				
Swell (%)	**0.4**				
Shrink Swell Index Iss (%)	**2.6**				
Visual Description	mottled orange weathered gravel and brown Silty clay				
Cracking	MC				
Crumbling	Yes				
Remarks	**				

Shrink Swell Index (Iss) reported as the percentage vertical strain per pF change in suction.
Cracking Terminology: UC Uncracked, SC Slightly Cracked, MC Moderately Cracked, HC Highly Cracked, FR Fragmented.
NATA Accreditation does not cover the performance of pocket penetrometer readings.

Material Test Report

Report Number:	**P22253-2B**
Issue Number:	*2 - This version supersedes all previous issues*
Reissue Reason:	*Description Amended*
Date Issued:	30/01/2023
Client:	Geneng Solutions Pty Ltd PO Box 300, Crows Nest QLD 4355
Contact:	David Taylor
Project Number:	P22253
Project Name:	248 Woolmer Road Development
Project Location:	Browne & Woolmer Rd, Highfields
Work Request:	3313
Sample Number:	P22-3313F
Client Sample #:	B
Date Sampled:	14/09/2022
Dates Tested:	26/09/2022 - 08/10/2022
Sampling Method:	AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method:	AS 1289.1.1 - Sampling and preparation of soils
Site Selection:	Selected by Client
Sample Location:	**Borehole Point B E: 394070.591, N: 6963959.637, Depth: 1.0 - 1.4**
Material:	Natural
Material Source:	Insitu

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QCTS Toowoomba
4 Stradbroke Street Rockville QLD 4350
Phone: (07) 4633 0816
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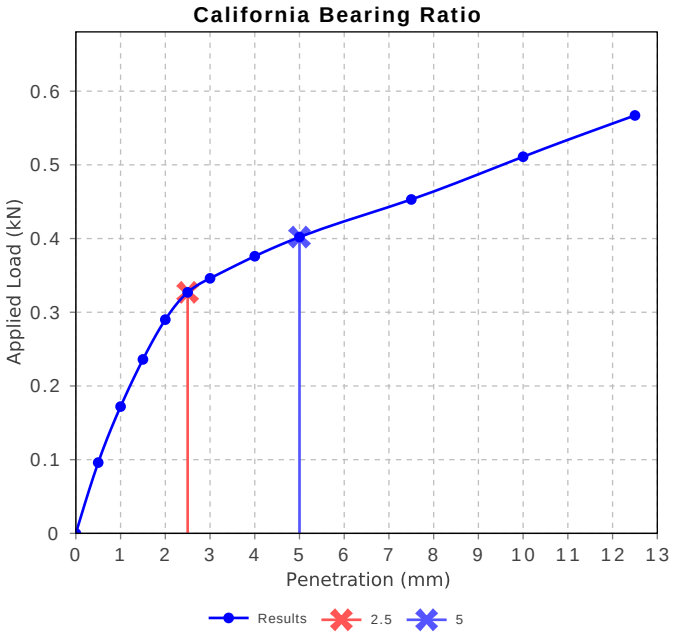
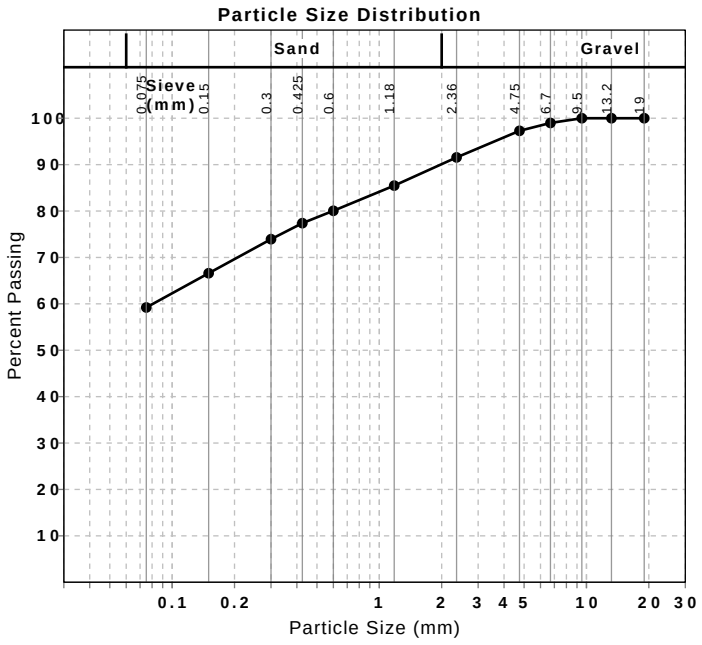
Approved Signatory: Mark Jackman
Technical Services Manager

NATA Accredited Laboratory Number: 19673

California Bearing Ratio (AS 1289 6.1.1 & 2.1.1)		Min	Max
CBR taken at	2.5 mm		
CBR %	**2.5**		
Method of Compactive Effort	Standard		
Method used to Determine MDD	AS 1289 5.1.1 & 2.1.1		
Method used to Determine Plasticity	Visually		
Maximum Dry Density (t/m^3)	1.44		
Optimum Moisture Content (%)	31.5		
Laboratory Density Ratio (%)	97.0		
Laboratory Moisture Ratio (%)	99.5		
Dry Density after Soaking (t/m^3)	1.35		
Field Moisture Content (%)	30.6		
Moisture Content at Placement (%)	31.3		
Moisture Content Top 30mm (%)	45.5		
Moisture Content Rest of Sample (%)	36.6		
Mass Surcharge (kg)	4.5		
Soaking Period (days)	4		
Curing Hours	123.2		
Swell (%)	3.5		
Oversize Material (mm)	19		
Oversize Material Included	Excluded		
Oversize Material (%)	0		



Particle Size Distribution (AS1289 3.6.1)						
Sieve	Passed %	Passing Limits		Retained %	Retained Limits	
19 mm	**100**			0		
13.2 mm	**100**			0		
9.5 mm	**100**			0		
6.7 mm	**99**			1		
4.75 mm	**97**			2		
2.36 mm	**92**			6		
1.18 mm	**85**			6		
0.6 mm	**80**			5		
0.425 mm	**77**			3		
0.3 mm	**74**			3		
0.15 mm	**67**			7		
0.075 mm	**59**			7		



Material Test Report

Quality Control Testing Services Pty Ltd
QCTS Toowoomba
4 Stradbroke Street Rockville QLD 4350
Phone: (07) 4633 0816
Email: mark@qcts.net.au

Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Mark Jackman
Technical Services Manager
NATA Accredited Laboratory Number: 19673

Report Number:	**P22253-2B**
Issue Number:	*2 - This version supersedes all previous issues*
Reissue Reason:	*Description Amended*
Date Issued:	30/01/2023
Client:	Geneng Solutions Pty Ltd PO Box 300, Crows Nest QLD 4355
Contact:	David Taylor
Project Number:	P22253
Project Name:	248 Woolmer Road Development
Project Location:	Browne & Woolmer Rd, Highfields
Work Request:	3313
Sample Number:	P22-3313F
Client Sample #:	B
Date Sampled:	14/09/2022
Dates Tested:	26/09/2022 - 08/10/2022
Sampling Method:	AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method:	AS 1289.1.1 - Sampling and preparation of soils
Site Selection:	Selected by Client
Sample Location:	**Borehole Point B E: 394070.591, N: 6963959.637, Depth: 1.0 - 1.4**
Material:	Natural
Material Source:	Insitu

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	70		
Plastic Limit (%)	32		
Plasticity Index (%)	**38**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)	**16.0**		
Cracking Crumbling Curling	Cracking & Curling		

Material Test Report

Report Number:	**P22253-2B**
Issue Number:	*2 - This version supersedes all previous issues*
Reissue Reason:	*Description Amended*
Date Issued:	30/01/2023
Client:	Geneng Solutions Pty Ltd PO Box 300, Crows Nest QLD 4355
Contact:	David Taylor
Project Number:	P22253
Project Name:	248 Woolmer Road Development
Project Location:	Browne & Woolmer Rd, Highfields
Work Request:	3313
Date Sampled:	14/09/2022
Dates Tested:	26/09/2022 - 28/09/2022
Sampling Method:	AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method:	AS 1289.1.1 - Sampling and preparation of soils
Site Selection:	Selected by Client
Location:	Borehole Point B
Material:	Natural
Material Source:	Insitu

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QCTS Toowoomba
4 Stradbroke Street Rockville QLD 4350
Phone: (07) 4633 0816
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Technical Services Manager

NATA Accredited Laboratory Number: 19673

Moisture Content AS 1289 2.1.1			
Sample Number	Sample Location	Moisture Content	Material
P22-3313A	Borehole Point B Ch: 394070.591m, Off: 6963959.637m, Depth: 0.2 - 1.0	34.2 %	Natural
P22-3313B	Borehole Point B Ch: 394070.591m, Off: 6963959.637m, Depth: 1.0 - 1.2	25.8 %	Natural
P22-3313C	Borehole Point B Ch: 394070.591m, Off: 6963959.637m, Depth: 2.0 - 2.2	30.0 %	Natural
P22-3313D	Borehole Point B Ch: 394070.591m, Off: 6963959.637m, Depth: 3.0 - 3.2	33.6 %	Natural

Material Test Report

Report Number:	**P22253-2B**
Issue Number:	*2 - This version supersedes all previous issues*
Reissue Reason:	*Description Amended*
Date Issued:	30/01/2023
Client:	Geneng Solutions Pty Ltd PO Box 300, Crows Nest QLD 4355
Contact:	David Taylor
Project Number:	P22253
Project Name:	248 Woolmer Road Development
Project Location:	Browne & Woolmer Rd, Highfields
Work Request:	3313
Date Sampled:	14/09/2022
Dates Tested:	26/09/2022 - 28/09/2022
Sampling Method:	AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method:	AS 1289.1.1 - Sampling and preparation of soils
Site Selection:	Selected by Client
Location:	Borehole Point B
Material:	Natural
Material Source:	Insitu

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QCTS Toowoomba
4 Stradbroke Street Rockville QLD 4350
Phone: (07) 4633 0816
Email: mark@qcts.net.au

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Technical Services Manager

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Shrink Swell Index AS 1289 7.1.1 & 2.1.1					
Sample Number	P22-3313E				
Date Sampled	14/09/2022				
Date Tested	28/09/2022				
Material Source	insitu				
Sample Location	Borehole Point B (1000)				
Inert Material Estimate (%)	10				
Pocket Penetrometer before (kPa)	130				
Pocket Penetrometer after (kPa)	60				
Shrinkage Moisture Content (%)	25.6				
Shrinkage (%)	**2.3**				
Swell Moisture Content Before (%)	30.7				
Swell Moisture Content After (%)	34.5				
Swell (%)	**5.0**				
Shrink Swell Index Iss (%)	**2.7**				
Visual Description	grey-red/brown silty clay with some fine gravel				
Cracking	SC				
Crumbling	No				
Remarks	**				

Shrink Swell Index (Iss) reported as the percentage vertical strain per pF change in suction.
Cracking Terminology: UC Uncracked, SC Slightly Cracked, MC Moderately Cracked, HC Highly Cracked, FR Fragmented.
NATA Accreditation does not cover the performance of pocket penetrometer readings.

Material Test Report

Report Number:	**P22253-3C**
Issue Number:	3 - *This version supersedes all previous issues*
Reissue Reason:	*Description Amended*
Date Issued:	30/01/2023
Client:	Geneng Solutions Pty Ltd PO Box 300, Crows Nest QLD 4355
Contact:	David Taylor
Project Number:	P22253
Project Name:	248 Woolmer Road Development
Project Location:	Browne & Woolmer Rd, Highfields
Work Request:	3314
Sample Number:	P22-3314G
Client Sample #:	C
Date Sampled:	14/09/2022
Dates Tested:	26/09/2022 - 10/10/2022
Sampling Method:	AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method:	AS 1289.1.1 - Sampling and preparation of soils
Site Selection:	Selected by Client
Sample Location:	**Borehole Point C E: 394117.284, N: 6963673.373, Depth: 1.0 - 1.4**
Material:	Natural
Material Source:	Insitu

Quality Control Testing Services Pty Ltd
QCTS Toowoomba
4 Stradbroke Street Rockville QLD 4350
Phone: (07) 4633 0816
Email: mark@qcts.net.au

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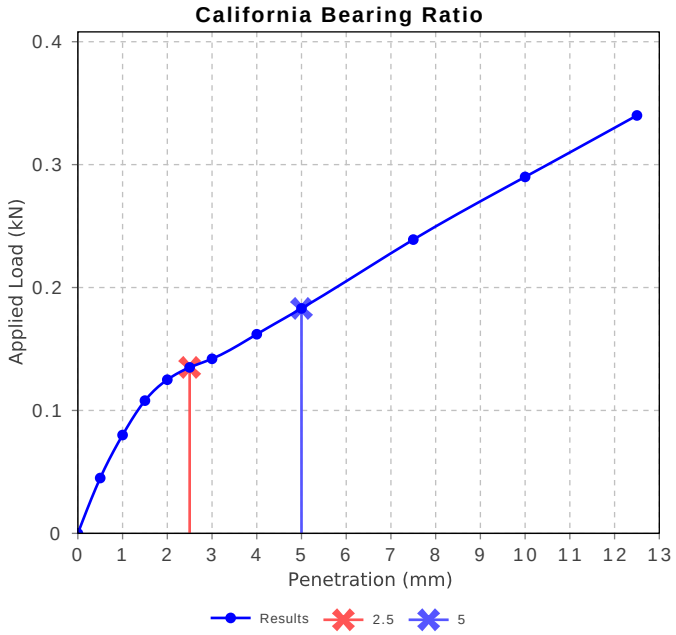
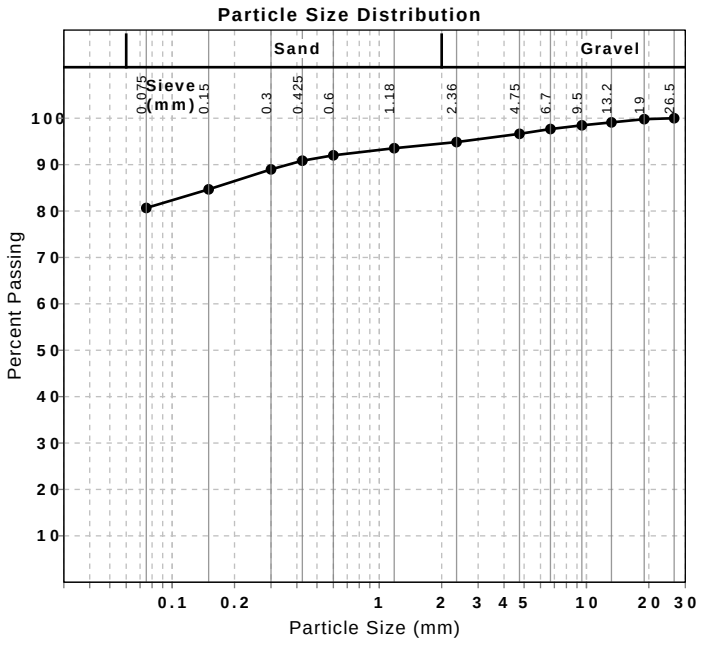
Approved Signatory: Mark Jackman
Technical Services Manager

NATA Accredited Laboratory Number: 19673

California Bearing Ratio (AS 1289 6.1.1 & 2.1.1)		Min	Max
CBR taken at	2.5 mm		
CBR %	**1.0**		
Method of Compactive Effort	Standard		
Method used to Determine MDD	AS 1289 5.1.1 & 2.1.1		
Method used to Determine Plasticity	Visually		
Maximum Dry Density (t/m^3)	1.51		
Optimum Moisture Content (%)	28.5		
Laboratory Density Ratio (%)	97.0		
Laboratory Moisture Ratio (%)	100.0		
Dry Density after Soaking (t/m^3)	1.39		
Field Moisture Content (%)	28.9		
Moisture Content at Placement (%)	28.5		
Moisture Content Top 30mm (%)	42.1		
Moisture Content Rest of Sample (%)	34.7		
Mass Surcharge (kg)	4.5		
Soaking Period (days)	4		
Curing Hours	122.5		
Swell (%)	6.0		
Oversize Material (mm)	19		
Oversize Material Included	Excluded		
Oversize Material (%)	0		



Particle Size Distribution (AS1289 3.6.1)						
Sieve	Passed %	Passing Limits		Retained %	Retained Limits	
26.5 mm	**100**			0		
19 mm	**100**			0		
13.2 mm	**99**			1		
9.5 mm	**98**			1		
6.7 mm	**98**			1		
4.75 mm	**97**			1		
2.36 mm	**95**			2		
1.18 mm	**94**			1		
0.6 mm	**92**			2		
0.425 mm	**91**			1		
0.3 mm	**89**			2		
0.15 mm	**85**			4		
0.075 mm	**81**			4		



Moisture Content (AS1289.2.1.1)		Min	Max
Moisture Content (%)	28.9		

Material Test Report

Report Number:	**P22253-3C**
Issue Number:	3 - *This version supersedes all previous issues*
Reissue Reason:	*Description Amended*
Date Issued:	30/01/2023
Client:	Geneng Solutions Pty Ltd PO Box 300, Crows Nest QLD 4355
Contact:	David Taylor
Project Number:	P22253
Project Name:	248 Woolmer Road Development
Project Location:	Browne & Woolmer Rd, Highfields
Work Request:	3314
Sample Number:	P22-3314G
Client Sample #:	C
Date Sampled:	14/09/2022
Dates Tested:	26/09/2022 - 10/10/2022
Sampling Method:	AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method:	AS 1289.1.1 - Sampling and preparation of soils
Site Selection:	Selected by Client
Sample Location:	**Borehole Point C E: 394117.284, N: 6963673.373, Depth: 1.0 - 1.4**
Material:	Natural
Material Source:	Insitu

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	94		
Plastic Limit (%)	43		
Plasticity Index (%)	**51**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)	**14.5**		
Cracking Crumbling Curling	None		

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QCTS Toowoomba
4 Stradbroke Street Rockville QLD 4350
Phone: (07) 4633 0816
Email: mark@qcts.net.au

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Approved Signatory: Mark Jackman
Technical Services Manager

NATA Accredited Laboratory Number: 19673

Material Test Report

Report Number:	**P22253-3C**
Issue Number:	3 - *This version supersedes all previous issues*
Reissue Reason:	*Description Amended*
Date Issued:	30/01/2023
Client:	Geneng Solutions Pty Ltd PO Box 300, Crows Nest QLD 4355
Contact:	David Taylor
Project Number:	P22253
Project Name:	248 Woolmer Road Development
Project Location:	Browne & Woolmer Rd, Highfields
Work Request:	3314
Date Sampled:	14/09/2022
Dates Tested:	26/09/2022 - 28/09/2022
Sampling Method:	AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method:	AS 1289.1.1 - Sampling and preparation of soils
Site Selection:	Selected by Client
Location:	Borehole Point C
Material:	Natural
Material Source:	Insitu

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QCTS Toowoomba
4 Stradbroke Street Rockville QLD 4350
Phone: (07) 4633 0816
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Technical Services Manager
NATA Accredited Laboratory Number: 19673

Moisture Content AS 1289 2.1.1

Sample Number	Sample Location	Moisture Content	Material
P22-3314A	Borehole Point C E: 394117.284, N: 6963673.373, Depth: 0.2 - 0.4	35.7 %	Natural
P22-3314B	Borehole Point C E: 394117.284, N: 6963673.373, Depth: 1.0 - 1.2	29.4 %	Natural
P22-3314C	Borehole Point C E: 394117.284, N: 6963673.373, Depth: 2.0 - 2.2	27.7 %	Natural
P22-3314D	Borehole Point C E: 394117.284, N: 6963673.373, Depth: 3.0 - 3.2	29.2 %	Natural
P22-3314E	Borehole Point C E: 394117.284, N: 6963673.373, Depth: 3.5 - 3.7	29.1 %	Natural

Material Test Report

Report Number:	**P22253-3C**
Issue Number:	3 - *This version supersedes all previous issues*
Reissue Reason:	*Description Amended*
Date Issued:	30/01/2023
Client:	Geneng Solutions Pty Ltd PO Box 300, Crows Nest QLD 4355
Contact:	David Taylor
Project Number:	P22253
Project Name:	248 Woolmer Road Development
Project Location:	Browne & Woolmer Rd, Highfields
Work Request:	3314
Date Sampled:	14/09/2022
Dates Tested:	26/09/2022 - 28/09/2022
Sampling Method:	AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method:	AS 1289.1.1 - Sampling and preparation of soils
Site Selection:	Selected by Client
Location:	Borehole Point C
Material:	Natural
Material Source:	Insitu

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QCTS Toowoomba
4 Stradbroke Street Rockville QLD 4350
Phone: (07) 4633 0816
Email: mark@qcts.net.au

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Approved Signatory: Mark Jackman
Technical Services Manager

NATA Accredited Laboratory Number: 19673

Shrink Swell Index AS 1289 7.1.1 & 2.1.1					
Sample Number	P22-3314F				
Date Sampled	14/09/2022				
Date Tested	28/09/2022				
Material Source	insitu				
Sample Location	Borehole Point C E: 394117.284, N: 6963673.373 (1.5)				
Inert Material Estimate (%)	5				
Pocket Penetrometer before (kPa)	100				
Pocket Penetrometer after (kPa)	40				
Shrinkage Moisture Content (%)	29.6				
Shrinkage (%)	**1.6**				
Swell Moisture Content Before (%)	31.0				
Swell Moisture Content After (%)	32.3				
Swell (%)	**0.5**				
Shrink Swell Index Iss (%)	**1.0**				
Visual Description	mottled yellow/brown & red/brown silty clay with some weathered gravel				
Cracking	MC				
Crumbling	No				
Remarks	**				

Shrink Swell Index (Iss) reported as the percentage vertical strain per pF change in suction.
Cracking Terminology: UC Uncracked, SC Slightly Cracked, MC Moderately Cracked, HC Highly Cracked, FR Fragmented.
NATA Accreditation does not cover the performance of pocket penetrometer readings.

Material Test Report

Report Number:	**P22253-4C**
Issue Number:	3 - *This version supersedes all previous issues*
Reissue Reason:	*Description Amended*
Date Issued:	30/01/2023
Client:	Geneng Solutions Pty Ltd PO Box 300, Crows Nest QLD 4355
Contact:	David Taylor
Project Number:	P22253
Project Name:	248 Woolmer Road Development
Project Location:	Browne & Woolmer Rd, Highfields
Work Request:	3315
Sample Number:	P22-3315F
Client Sample #:	D
Date Sampled:	19/09/2022
Dates Tested:	26/09/2022 - 10/10/2022
Sampling Method:	AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method:	AS 1289.1.1 - Sampling and preparation of soils
Site Selection:	Selected by Client
Sample Location:	**Borehole Point D E: 394206.939, N: 6963423.072, Depth: 1.0 - 1.4**
Material:	Natural
Material Source:	Insitu

Quality Control Testing Services Pty Ltd
QCTS Toowoomba
4 Stradbroke Street Rockville QLD 4350
Phone: (07) 4633 0816
Email: mark@qcts.net.au

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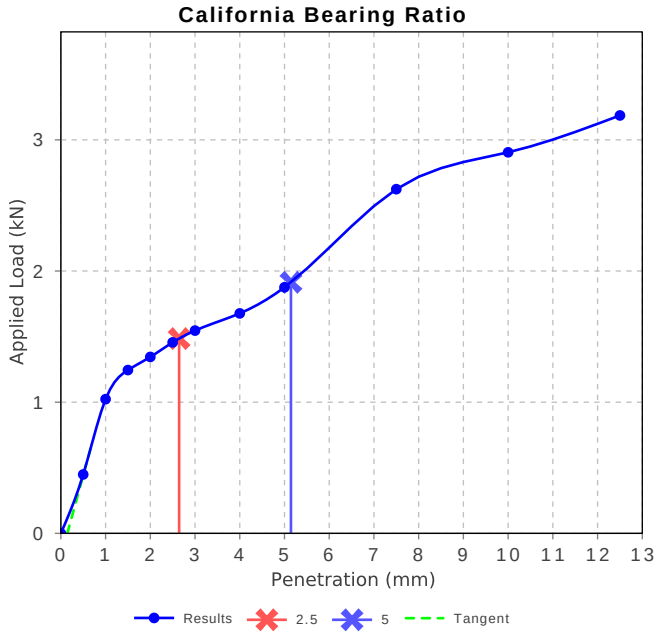
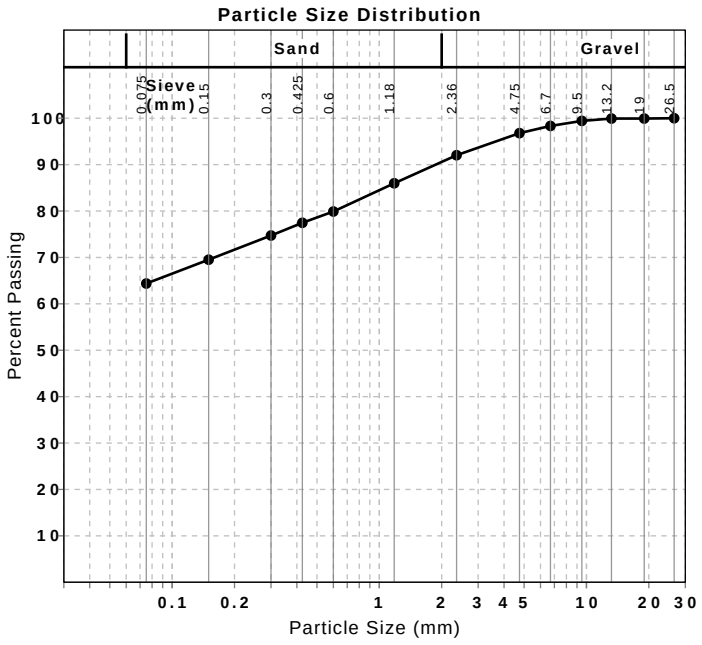
Technical Services Manager

NATA Accredited Laboratory Number: 19673

California Bearing Ratio (AS 1289 6.1.1 & 2.1.1)		Min	Max
CBR taken at	2.5 mm		
CBR %	**11**		
Method of Compactive Effort	Standard		
Method used to Determine MDD	AS 1289 5.1.1 & 2.1.1		
Method used to Determine Plasticity	Visually		
Maximum Dry Density (t/m^3)	1.61		
Optimum Moisture Content (%)	26.0		
Laboratory Density Ratio (%)	97.0		
Laboratory Moisture Ratio (%)	99.0		
Dry Density after Soaking (t/m^3)	1.56		
Field Moisture Content (%)	28.1		
Moisture Content at Placement (%)	25.6		
Moisture Content Top 30mm (%)	28.8		
Moisture Content Rest of Sample (%)	26.0		
Mass Surcharge (kg)	4.5		
Soaking Period (days)	4		
Curing Hours	123.6		
Swell (%)	0.5		
Oversize Material (mm)	19		
Oversize Material Included	Excluded		
Oversize Material (%)	0		



Particle Size Distribution (AS1289 3.6.1)						
Sieve	Passed %	Passing Limits		Retained %	Retained Limits	
26.5 mm	**100**			0		
19 mm	**100**			0		
13.2 mm	**100**			0		
9.5 mm	**99**			1		
6.7 mm	**98**			1		
4.75 mm	**97**			2		
2.36 mm	**92**			5		
1.18 mm	**86**			6		
0.6 mm	**80**			6		
0.425 mm	**77**			2		
0.3 mm	**75**			3		
0.15 mm	**70**			5		
0.075 mm	**64**			5		



Material Test Report

Report Number:	**P22253-4C**
Issue Number:	3 - *This version supersedes all previous issues*
Reissue Reason:	*Description Amended*
Date Issued:	30/01/2023
Client:	Geneng Solutions Pty Ltd PO Box 300, Crows Nest QLD 4355
Contact:	David Taylor
Project Number:	P22253
Project Name:	248 Woolmer Road Development
Project Location:	Browne & Woolmer Rd, Highfields
Work Request:	3315
Sample Number:	P22-3315F
Client Sample #:	D
Date Sampled:	19/09/2022
Dates Tested:	26/09/2022 - 10/10/2022
Sampling Method:	AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method:	AS 1289.1.1 - Sampling and preparation of soils
Site Selection:	Selected by Client
Sample Location:	**Borehole Point D E: 394206.939, N: 6963423.072, Depth: 1.0 - 1.4**
Material:	Natural
Material Source:	Insitu

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	47		
Plastic Limit (%)	23		
Plasticity Index (%)	**24**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)	**9.0**		
Cracking Crumbling Curling	None		

Quality Control Testing Services Pty Ltd
QCTS Toowoomba
4 Stradbroke Street Rockville QLD 4350
Phone: (07) 4633 0816
Email: mark@qcts.net.au

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Approved Signatory: Mark Jackman
Technical Services Manager

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Material Test Report

Report Number:	**P22253-4C**
Issue Number:	3 - *This version supersedes all previous issues*
Reissue Reason:	*Description Amended*
Date Issued:	30/01/2023
Client:	Geneng Solutions Pty Ltd PO Box 300, Crows Nest QLD 4355
Contact:	David Taylor
Project Number:	P22253
Project Name:	248 Woolmer Road Development
Project Location:	Browne & Woolmer Rd, Highfields
Work Request:	3315
Date Sampled:	19/09/2022
Dates Tested:	26/09/2022 - 28/09/2022
Sampling Method:	AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method:	AS 1289.1.1 - Sampling and preparation of soils
Site Selection:	Selected by Client
Location:	Borehole Point D
Material:	Natural
Material Source:	Insitu

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QCTS Toowoomba
4 Stradbroke Street Rockville QLD 4350
Phone: (07) 4633 0816
Email: mark@qcts.net.au

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Approved Signatory: Mark Jackman
Technical Services Manager
NATA Accredited Laboratory Number: 19673

Moisture Content AS 1289 2.1.1

Sample Number	Sample Location	Moisture Content	Material
P22-3315A	Borehole Point D Ch: 394206.939m, Off: 6963423.072m, Depth: 0.2 - 0.4	16.7 %	Natural
P22-3315B	Borehole Point D Ch: 394206.939m, Off: 6963423.072m, Depth: 1.0 - 1.2	27.9 %	Natural
P22-3315C	Borehole Point D Ch: 394206.939m, Off: 6963423.072m, Depth: 2.0 - 2.2	28.8 %	Natural
P22-3315D	Borehole Point D Ch: 394206.939m, Off: 6963423.072m, Depth: 3.0 - 3.2	28.4 %	Natural

Material Test Report

Report Number:	**P22253-4C**
Issue Number:	3 - *This version supersedes all previous issues*
Reissue Reason:	*Description Amended*
Date Issued:	30/01/2023
Client:	Geneng Solutions Pty Ltd PO Box 300, Crows Nest QLD 4355
Contact:	David Taylor
Project Number:	P22253
Project Name:	248 Woolmer Road Development
Project Location:	Browne & Woolmer Rd, Highfields
Work Request:	3315
Date Sampled:	19/09/2022
Dates Tested:	26/09/2022 - 29/09/2022
Sampling Method:	AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method:	AS 1289.1.1 - Sampling and preparation of soils
Site Selection:	Selected by Client
Location:	Borehole Point D
Material:	Natural
Material Source:	Insitu

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4 Stradbroke Street Rockville QLD 4350
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Email: mark@qcts.net.au

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Approved Signatory: Mark Jackman
Technical Services Manager

NATA Accredited Laboratory Number: 19673

Shrink Swell Index AS 1289 7.1.1 & 2.1.1					
Sample Number	P22-3315E				
Date Sampled	19/09/2022				
Date Tested	29/09/2022				
Material Source	insitu				
Sample Location	Borehole Point D E: 394206.939, N: 6963423.072 (2.5)				
Inert Material Estimate (%)	15				
Pocket Penetrometer before (kPa)	60				
Pocket Penetrometer after (kPa)	40				
Shrinkage Moisture Content (%)	31.5				
Shrinkage (%)	**0.6**				
Swell Moisture Content Before (%)	32.3				
Swell Moisture Content After (%)	34.8				
Swell (%)	**-0.0**				
Shrink Swell Index Iss (%)	**0.3**				
Visual Description	yellow-red/brown silty clay with some weathered gravel				
Cracking	SC				
Crumbling	No				
Remarks	**				

Shrink Swell Index (Iss) reported as the percentage vertical strain per pF change in suction.
Cracking Terminology: UC Uncracked, SC Slightly Cracked, MC Moderately Cracked, HC Highly Cracked, FR Fragmented.
NATA Accreditation does not cover the performance of pocket penetrometer readings.

Material Test Report

Report Number:	**P22253-5A**
Issue Number:	3 - *This version supersedes all previous issues*
Reissue Reason:	*Description Amended*
Date Issued:	30/01/2023
Client:	Geneng Solutions Pty Ltd PO Box 300, Crows Nest QLD 4355
Contact:	David Taylor
Project Number:	P22253
Project Name:	248 Woolmer Road Development
Project Location:	Browne & Woolmer Rd, Highfields
Work Request:	3316
Sample Number:	P22-3316H
Client Sample #:	E
Date Sampled:	15/09/2022
Dates Tested:	26/09/2022 - 11/10/2022
Sampling Method:	AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method:	AS 1289.1.1 - Sampling and preparation of soils
Site Selection:	Selected by Client
Sample Location:	**Borehole Point E E: 393957.504, N: 6963300.506, Depth: 1.0 - 1.4**
Material:	Natural
Material Source:	Insitu

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QCTS Toowoomba
4 Stradbroke Street Rockville QLD 4350
Phone: (07) 4633 0816
Email: mark@qcts.net.au

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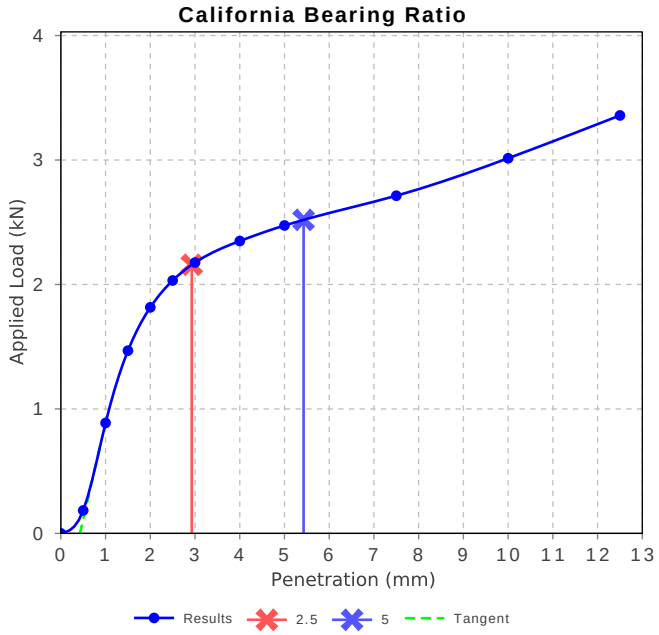
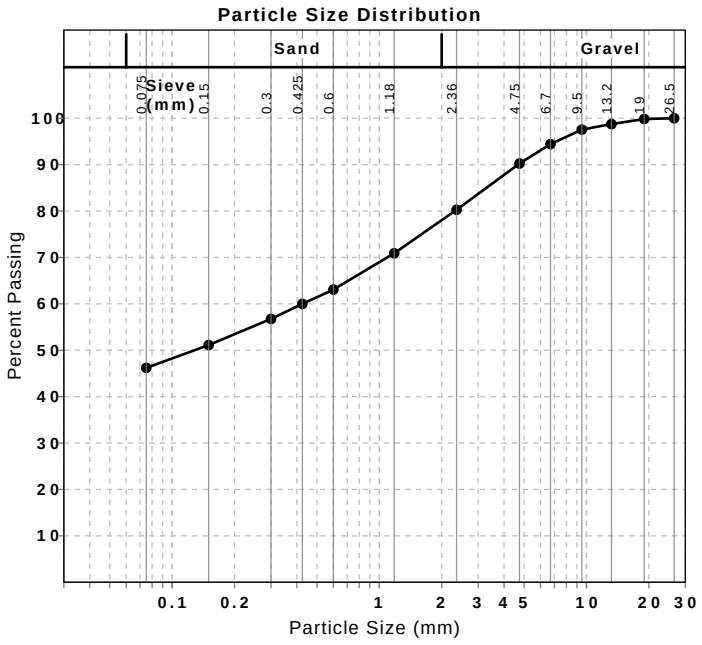
Approved Signatory: Mark Jackman
Technical Services Manager

NATA Accredited Laboratory Number: 19673

California Bearing Ratio (AS 1289 6.1.1 & 2.1.1)		Min	Max
CBR taken at	2.5 mm		
CBR %	**16**		
Method of Compactive Effort	Standard		
Method used to Determine MDD	AS 1289 5.1.1 & 2.1.1		
Method used to Determine Plasticity	Visually		
Maximum Dry Density (t/m^3)	1.66		
Optimum Moisture Content (%)	24.0		
Laboratory Density Ratio (%)	97.0		
Laboratory Moisture Ratio (%)	100.0		
Dry Density after Soaking (t/m^3)	1.61		
Field Moisture Content (%)	26.6		
Moisture Content at Placement (%)	23.8		
Moisture Content Top 30mm (%)	25.0		
Moisture Content Rest of Sample (%)	25.6		
Mass Surcharge (kg)	4.5		
Soaking Period (days)	4		
Curing Hours	123.8		
Swell (%)	0.0		
Oversize Material (mm)	19		
Oversize Material Included	Excluded		
Oversize Material (%)	0		



Particle Size Distribution (AS1289 3.6.1)						
Sieve	Passed %	Passing Limits		Retained %	Retained Limits	
26.5 mm	**100**			0		
19 mm	**100**			0		
13.2 mm	**99**			1		
9.5 mm	**98**			1		
6.7 mm	**94**			3		
4.75 mm	**90**			4		
2.36 mm	**80**			10		
1.18 mm	**71**			9		
0.6 mm	**63**			8		
0.425 mm	**60**			3		
0.3 mm	**57**			3		
0.15 mm	**51**			6		
0.075 mm	**46**			5		



Material Test Report

Report Number:	**P22253-5A**
Issue Number:	3 - *This version supersedes all previous issues*
Reissue Reason:	*Description Amended*
Date Issued:	30/01/2023
Client:	Geneng Solutions Pty Ltd PO Box 300, Crows Nest QLD 4355
Contact:	David Taylor
Project Number:	P22253
Project Name:	248 Woolmer Road Development
Project Location:	Browne & Woolmer Rd, Highfields
Work Request:	3316
Sample Number:	P22-3316H
Client Sample #:	E
Date Sampled:	15/09/2022
Dates Tested:	26/09/2022 - 11/10/2022
Sampling Method:	AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method:	AS 1289.1.1 - Sampling and preparation of soils
Site Selection:	Selected by Client
Sample Location:	**Borehole Point E E: 393957.504, N: 6963300.506, Depth: 1.0 - 1.4**
Material:	Natural
Material Source:	Insitu

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	44		
Plastic Limit (%)	22		
Plasticity Index (%)	**22**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)	**7.0**		
Cracking Crumbling Curling	Cracking & Curling		

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QCTS Toowoomba
4 Stradbroke Street Rockville QLD 4350
Phone: (07) 4633 0816
Email: mark@qcts.net.au

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Approved Signatory: Mark Jackman
Technical Services Manager

NATA Accredited Laboratory Number: 19673

Material Test Report

Report Number:	**P22253-5A**
Issue Number:	3 - *This version supersedes all previous issues*
Reissue Reason:	*Description Amended*
Date Issued:	30/01/2023
Client:	Geneng Solutions Pty Ltd PO Box 300, Crows Nest QLD 4355
Contact:	David Taylor
Project Number:	P22253
Project Name:	248 Woolmer Road Development
Project Location:	Browne & Woolmer Rd, Highfields
Work Request:	3316
Date Sampled:	15/09/2022
Dates Tested:	26/09/2022 - 28/09/2022
Sampling Method:	AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method:	AS 1289.1.1 - Sampling and preparation of soils
Site Selection:	Selected by Client
Location:	Borehole Point E
Material:	Natural
Material Source:	Insitu

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QCTS Toowoomba
4 Stradbroke Street Rockville QLD 4350
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Moisture Content AS 1289 2.1.1

Sample Number	Sample Location	Moisture Content	Material
P22-3316A	Borehole Point E Ch: 393957.504m, Off: 6963300.506m, Depth: 0.2 - 0.4	19.2 %	Natural
P22-3316B	Borehole Point E Ch: 393957.504m, Off: 6963300.506m, Depth: 1.0 - 1.2	17.6 %	Natural
P22-3316C	Borehole Point E Ch: 393957.504m, Off: 6963300.506m, Depth: 1.5 - 1.7	21.3 %	Natural
P22-3316D	Borehole Point E Ch: 393957.504m, Off: 6963300.506m, Depth: 2.0 - 2.2	25.4 %	Natural
P22-3316E	Borehole Point E Ch: 393957.504m, Off: 6963300.506m, Depth: 2.5 - 2.7	27.9 %	Natural
P22-3316F	Borehole Point E Ch: 393957.504m, Off: 6963300.506m, Depth: 3.0 - 3.2	29.2 %	Natural

Material Test Report

Report Number:	**P22253-5A**
Issue Number:	3 - *This version supersedes all previous issues*
Reissue Reason:	*Description Amended*
Date Issued:	30/01/2023
Client:	Geneng Solutions Pty Ltd PO Box 300, Crows Nest QLD 4355
Contact:	David Taylor
Project Number:	P22253
Project Name:	248 Woolmer Road Development
Project Location:	Browne & Woolmer Rd, Highfields
Work Request:	3316
Date Sampled:	15/09/2022
Dates Tested:	26/09/2022 - 29/09/2022
Sampling Method:	AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method:	AS 1289.1.1 - Sampling and preparation of soils
Site Selection:	Selected by Client
Location:	Borehole Point E
Material:	Natural
Material Source:	Insitu

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QCTS Toowoomba
4 Stradbroke Street Rockville QLD 4350
Phone: (07) 4633 0816
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Technical Services Manager
NATA Accredited Laboratory Number: 19673

Shrink Swell Index AS 1289 7.1.1 & 2.1.1					
Sample Number	P22-3316G				
Date Sampled	15/09/2022				
Date Tested	29/09/2022				
Material Source	insitu				
Sample Location	Borehole Point E E: 393957.504, N: 6963300.506 (3.0)				
Inert Material Estimate (%)	20				
Pocket Penetrometer before (kPa)	70				
Pocket Penetrometer after (kPa)	60				
Shrinkage Moisture Content (%)	34.8				
Shrinkage (%)	**0.8**				
Swell Moisture Content Before (%)	27.4				
Swell Moisture Content After (%)	33.4				
Swell (%)	**-0.0**				
Shrink Swell Index Iss (%)	**0.4**				
Visual Description	mottled light brown and red brown silty clay, trace of fine weathered gravel				
Cracking	MC				
Crumbling	Yes				
Remarks	**				

Shrink Swell Index (Iss) reported as the percentage vertical strain per pF change in suction.
Cracking Terminology: UC Uncracked, SC Slightly Cracked, MC Moderately Cracked, HC Highly Cracked, FR Fragmented.
NATA Accreditation does not cover the performance of pocket penetrometer readings.

Material Test Report

Report Number:	**P22253-6A**
Issue Number:	3 - *This version supersedes all previous issues*
Reissue Reason:	*Description Amended*
Date Issued:	30/01/2023
Client:	Geneng Solutions Pty Ltd PO Box 300, Crows Nest QLD 4355
Contact:	David Taylor
Project Number:	P22253
Project Name:	248 Woolmer Road Development
Project Location:	Browne & Woolmer Rd, Highfields
Work Request:	3317
Sample Number:	P22-3317F
Client Sample #:	F
Date Sampled:	14/09/2022
Dates Tested:	26/09/2022 - 11/10/2022
Sampling Method:	AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method:	AS 1289.1.1 - Sampling and preparation of soils
Site Selection:	Selected by Client
Sample Location:	**Borehole Point F E: 393930.431, N: 6963554.758, Depth: 1.0 - 1.4**
Material:	Natural
Material Source:	Insitu

Quality Control Testing Services Pty Ltd
QCTS Toowoomba
4 Stradbroke Street Rockville QLD 4350
Phone: (07) 4633 0816
Email: mark@qcts.net.au

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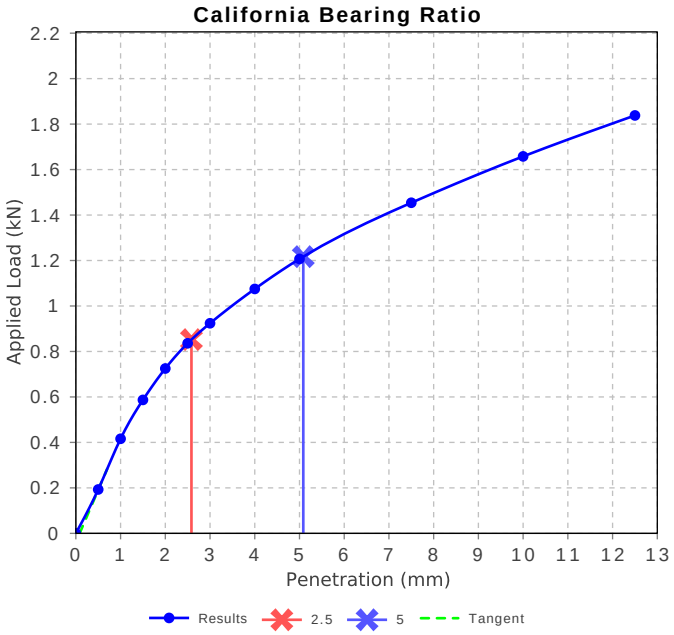
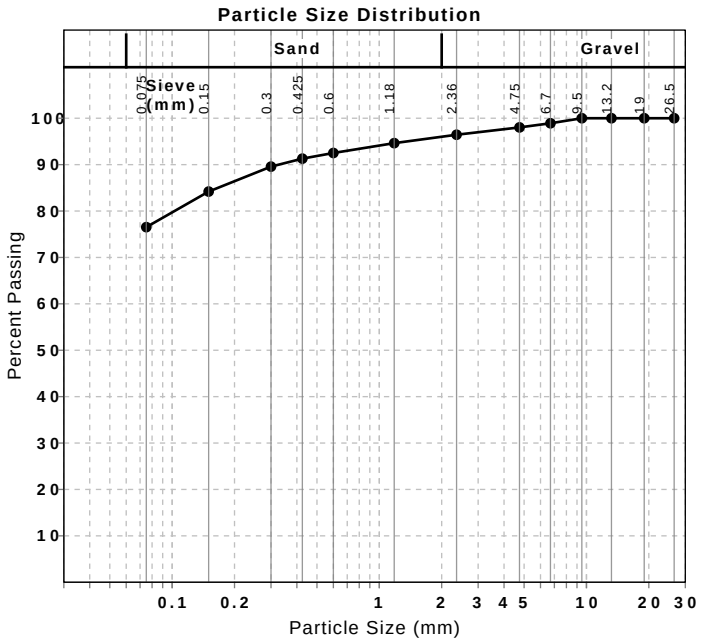
Technical Services Manager

NATA Accredited Laboratory Number: 19673

California Bearing Ratio (AS 1289 6.1.1 & 2.1.1)		Min	Max
CBR taken at	2.5 mm		
CBR %	**6**		
Method of Compactive Effort	Standard		
Method used to Determine MDD	AS 1289 5.1.1 & 2.1.1		
Method used to Determine Plasticity	Visually		
Maximum Dry Density (t/m^3)	1.47		
Optimum Moisture Content (%)	31.0		
Laboratory Density Ratio (%)	97.0		
Laboratory Moisture Ratio (%)	100.0		
Dry Density after Soaking (t/m^3)	1.41		
Field Moisture Content (%)	30.9		
Moisture Content at Placement (%)	31.0		
Moisture Content Top 30mm (%)	35.7		
Moisture Content Rest of Sample (%)	33.2		
Mass Surcharge (kg)	4.5		
Soaking Period (days)	4		
Curing Hours	124.9		
Swell (%)	1.0		
Oversize Material (mm)	19		
Oversize Material Included	Excluded		
Oversize Material (%)	0		



Particle Size Distribution (AS1289 3.6.1)						
Sieve	Passed %	Passing Limits		Retained %	Retained Limits	
26.5 mm	**100**			0		
19 mm	**100**			0		
13.2 mm	**100**			0		
9.5 mm	**100**			0		
6.7 mm	**99**			1		
4.75 mm	**98**			1		
2.36 mm	**96**			2		
1.18 mm	**95**			2		
0.6 mm	**93**			2		
0.425 mm	**91**			1		
0.3 mm	**90**			2		
0.15 mm	**84**			5		
0.075 mm	**77**			8		



Material Test Report

Report Number:	**P22253-6A**
Issue Number:	3 - *This version supersedes all previous issues*
Reissue Reason:	*Description Amended*
Date Issued:	30/01/2023
Client:	Geneng Solutions Pty Ltd PO Box 300, Crows Nest QLD 4355
Contact:	David Taylor
Project Number:	P22253
Project Name:	248 Woolmer Road Development
Project Location:	Browne & Woolmer Rd, Highfields
Work Request:	3317
Sample Number:	P22-3317F
Client Sample #:	F
Date Sampled:	14/09/2022
Dates Tested:	26/09/2022 - 11/10/2022
Sampling Method:	AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method:	AS 1289.1.1 - Sampling and preparation of soils
Site Selection:	Selected by Client
Sample Location:	**Borehole Point F E: 393930.431, N: 6963554.758, Depth: 1.0 - 1.4**
Material:	Natural
Material Source:	Insitu

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	76		
Plastic Limit (%)	41		
Plasticity Index (%)	**35**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)	**10.0**		
Cracking Crumbling Curling	None		

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QCTS Toowoomba
4 Stradbroke Street Rockville QLD 4350
Phone: (07) 4633 0816
Email: mark@qcts.net.au

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Technical Services Manager

NATA Accredited Laboratory Number: 19673

Material Test Report

Report Number:	**P22253-6A**
Issue Number:	3 - *This version supersedes all previous issues*
Reissue Reason:	*Description Amended*
Date Issued:	30/01/2023
Client:	Geneng Solutions Pty Ltd PO Box 300, Crows Nest QLD 4355
Contact:	David Taylor
Project Number:	P22253
Project Name:	248 Woolmer Road Development
Project Location:	Browne & Woolmer Rd, Highfields
Work Request:	3317
Date Sampled:	14/09/2022
Dates Tested:	26/09/2022 - 28/09/2022
Sampling Method:	AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method:	AS 1289.1.1 - Sampling and preparation of soils
Site Selection:	Selected by Client
Location:	Borehole Point F
Material:	Natural
Material Source:	Insitu

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QCTS Toowoomba
4 Stradbroke Street Rockville QLD 4350
Phone: (07) 4633 0816
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NATA Accredited Laboratory Number: 19673

Moisture Content AS 1289 2.1.1			
Sample Number	Sample Location	Moisture Content	Material
P22-3317A	Borehole Point F Ch: 393930.431m, Off: 6963554.758m, Depth: 0.2 - 0.4	31.8 %	Natural
P22-3317B	Borehole Point F Ch: 393930.431m, Off: 6963554.758m, Depth: 1.0 - 1.2	30.1 %	Natural
P22-3317C	Borehole Point F Ch: 393930.431m, Off: 6963554.758m, Depth: 2.0 - 2.2	31.7 %	Natural
P22-3317D	Borehole Point F Ch: 393930.431m, Off: 6963554.758m, Depth: 3.0 - 3.2	31.1 %	Natural

Material Test Report

Report Number:	**P22253-6A**
Issue Number:	3 - *This version supersedes all previous issues*
Reissue Reason:	*Description Amended*
Date Issued:	30/01/2023
Client:	Geneng Solutions Pty Ltd PO Box 300, Crows Nest QLD 4355
Contact:	David Taylor
Project Number:	P22253
Project Name:	248 Woolmer Road Development
Project Location:	Browne & Woolmer Rd, Highfields
Work Request:	3317
Date Sampled:	14/09/2022
Dates Tested:	26/09/2022 - 01/10/2022
Sampling Method:	AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method:	AS 1289.1.1 - Sampling and preparation of soils
Site Selection:	Selected by Client
Location:	Borehole Point F
Material:	Natural
Material Source:	Insitu

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QCTS Toowoomba
4 Stradbroke Street Rockville QLD 4350
Phone: (07) 4633 0816
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NATA Accredited Laboratory Number: 19673

Shrink Swell Index AS 1289 7.1.1 & 2.1.1					
Sample Number	P22-3317E				
Date Sampled	14/09/2022				
Date Tested	01/10/2022				
Material Source	insitu				
Sample Location	Borehole Point F E: 393930.431, N: 6963554.758 (2.5)				
Inert Material Estimate (%)	10				
Pocket Penetrometer before (kPa)	50				
Pocket Penetrometer after (kPa)	50				
Shrinkage Moisture Content (%)	32.1				
Shrinkage (%)	**2.8**				
Swell Moisture Content Before (%)	30.9				
Swell Moisture Content After (%)	34.2				
Swell (%)	**0.0**				
Shrink Swell Index Iss (%)	**1.6**				
Visual Description	mottled grey and red/brown silty clay				
Cracking	SC				
Crumbling	No				
Remarks	**				

Shrink Swell Index (Iss) reported as the percentage vertical strain per pF change in suction.
Cracking Terminology: UC Uncracked, SC Slightly Cracked, MC Moderately Cracked, HC Highly Cracked, FR Fragmented.
NATA Accreditation does not cover the performance of pocket penetrometer readings.

Material Test Report

Report Number:	**P22253-7A**
Issue Number:	3 - *This version supersedes all previous issues*
Reissue Reason:	*Description Amended*
Date Issued:	30/01/2023
Client:	Geneng Solutions Pty Ltd PO Box 300, Crows Nest QLD 4355
Contact:	David Taylor
Project Number:	P22253
Project Name:	248 Woolmer Road Development
Project Location:	Browne & Woolmer Rd, Highfields
Work Request:	3318
Sample Number:	P22-3318F
Client Sample #:	G
Date Sampled:	15/09/2022
Dates Tested:	26/09/2022 - 11/10/2022
Sampling Method:	AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method:	AS 1289.1.1 - Sampling and preparation of soils
Site Selection:	Selected by Client
Sample Location:	**Borehole Point G E: 393547.716, N: 6963357.027, Depth: 1.0 - 1.4**
Material:	Natural
Material Source:	Insitu

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QCTS Toowoomba
4 Stradbroke Street Rockville QLD 4350
Phone: (07) 4633 0816
Email: mark@qcts.net.au

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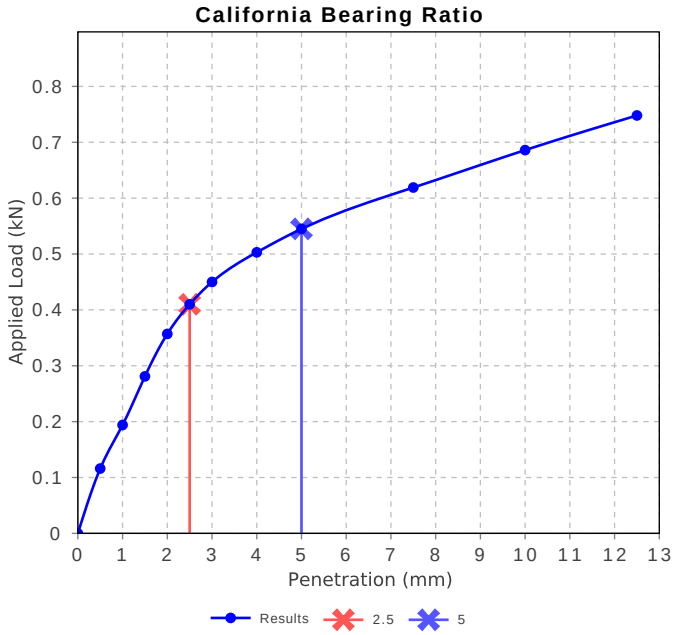
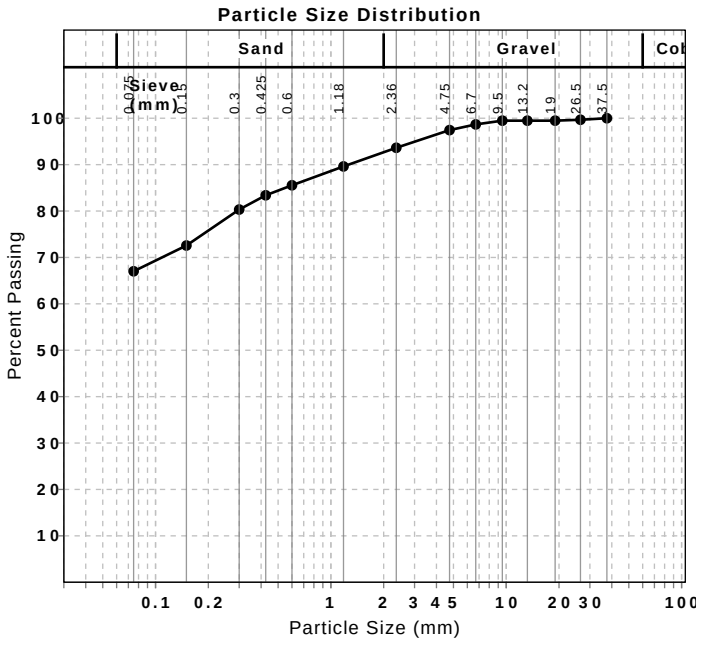
Approved Signatory: Mark Jackman
Technical Services Manager

NATA Accredited Laboratory Number: 19673

California Bearing Ratio (AS 1289 6.1.1 & 2.1.1)		Min	Max
CBR taken at	2.5 mm		
CBR %	**3.0**		
Method of Compactive Effort	Standard		
Method used to Determine MDD	AS 1289 5.1.1 & 2.1.1		
Method used to Determine Plasticity	Visually		
Maximum Dry Density (t/m^3)	1.43		
Optimum Moisture Content (%)	31.5		
Laboratory Density Ratio (%)	97.0		
Laboratory Moisture Ratio (%)	100.0		
Moisture Content at Placement (%)	31.3		
Moisture Content Top 30mm (%)	44.2		
Mass Surcharge (kg)	4.5		
Soaking Period (days)	4		
Curing Hours	126.5		
Oversize Material (mm)	19		
Oversize Material Included	Excluded		
Oversize Material (%)	0		



Particle Size Distribution (AS1289 3.6.1)						
Sieve	Passed %	Passing Limits		Retained %	Retained Limits	
37.5 mm	**100**			0		
26.5 mm	**100**			0		
19 mm	**99**			0		
13.2 mm	**99**			0		
9.5 mm	**99**			0		
6.7 mm	**99**			1		
4.75 mm	**97**			1		
2.36 mm	**94**			4		
1.18 mm	**90**			4		
0.6 mm	**86**			4		
0.425 mm	**83**			2		
0.3 mm	**80**			3		
0.15 mm	**73**			8		
0.075 mm	**67**			6		



Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	80		
Plastic Limit (%)	31		
Plasticity Index (%)	**49**		

Material Test Report

Report Number:	**P22253-7A**
Issue Number:	3 - *This version supersedes all previous issues*
Reissue Reason:	*Description Amended*
Date Issued:	30/01/2023
Client:	Geneng Solutions Pty Ltd PO Box 300, Crows Nest QLD 4355
Contact:	David Taylor
Project Number:	P22253
Project Name:	248 Woolmer Road Development
Project Location:	Browne & Woolmer Rd, Highfields
Work Request:	3318
Sample Number:	P22-3318F
Client Sample #:	G
Date Sampled:	15/09/2022
Dates Tested:	26/09/2022 - 11/10/2022
Sampling Method:	AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method:	AS 1289.1.1 - Sampling and preparation of soils
Site Selection:	Selected by Client
Sample Location:	**Borehole Point G E: 393547.716, N: 6963357.027, Depth: 1.0 - 1.4**
Material:	Natural
Material Source:	Insitu

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)	**21.0**		
Cracking Crumbling Curling	Cracking & Curling		

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NATA Accredited Laboratory Number: 19673

Material Test Report

Report Number:	**P22253-7A**
Issue Number:	3 - *This version supersedes all previous issues*
Reissue Reason:	*Description Amended*
Date Issued:	30/01/2023
Client:	Geneng Solutions Pty Ltd PO Box 300, Crows Nest QLD 4355
Contact:	David Taylor
Project Number:	P22253
Project Name:	248 Woolmer Road Development
Project Location:	Browne & Woolmer Rd, Highfields
Work Request:	3318
Date Sampled:	15/09/2022
Dates Tested:	26/09/2022 - 28/09/2022
Sampling Method:	AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method:	AS 1289.1.1 - Sampling and preparation of soils
Site Selection:	Selected by Client
Location:	Borehole Point G
Material:	Natural
Material Source:	Insitu

Quality Control Testing Services Pty Ltd
QCTS Toowoomba
4 Stradbroke Street Rockville QLD 4350
Phone: (07) 4633 0816
Email: mark@qcts.net.au

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Approved Signatory: Mark Jackman
Technical Services Manager
NATA Accredited Laboratory Number: 19673

Moisture Content AS 1289 2.1.1

Sample Number	Sample Location	Moisture Content	Material
P22-3318A	Borehole Point G Ch: 393547.716m, Off: 6963357.027m, Depth: 0.2 - 0.4	26.8 %	Natural
P22-3318B	Borehole Point G Ch: 393547.716m, Off: 6963357.027m, Depth: 1.0 - 1.2	31.6 %	Natural
P22-3318C	Borehole Point G Ch: 393547.716m, Off: 6963357.027m, Depth: 2.0 - 2.2	28.3 %	Natural
P22-3318D	Borehole Point G Ch: 393547.716m, Off: 6963357.027m, Depth: 3.0 - 3.2	32.0 %	Natural

Material Test Report

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Contact:	David Taylor
Project Number:	P22253
Project Name:	248 Woolmer Road Development
Project Location:	Browne & Woolmer Rd, Highfields
Work Request:	3318
Date Sampled:	15/09/2022
Dates Tested:	26/09/2022 - 01/10/2022
Sampling Method:	AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method:	AS 1289.1.1 - Sampling and preparation of soils
Site Selection:	Selected by Client
Location:	Borehole Point G
Material:	Natural
Material Source:	Insitu

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Shrink Swell Index AS 1289 7.1.1 & 2.1.1					
Sample Number	P22-3318E				
Date Sampled	15/09/2022				
Date Tested	01/10/2022				
Material Source	insitu				
Sample Location	Borehole Point G E: 393547.716, N: 6963357.027 (2.0)				
Inert Material Estimate (%)	15				
Pocket Penetrometer before (kPa)	50				
Pocket Penetrometer after (kPa)	30				
Shrinkage Moisture Content (%)	33.5				
Shrinkage (%)	**3.6**				
Swell Moisture Content Before (%)	33.5				
Swell Moisture Content After (%)	37.6				
Swell (%)	**0.5**				
Shrink Swell Index Iss (%)	**2.1**				
Visual Description	grey/brown silty clay and weathered gravel				
Cracking	MC				
Crumbling	Yes				
Remarks	**				

Shrink Swell Index (Iss) reported as the percentage vertical strain per pF change in suction.
Cracking Terminology: UC Uncracked, SC Slightly Cracked, MC Moderately Cracked, HC Highly Cracked, FR Fragmented.
NATA Accreditation does not cover the performance of pocket penetrometer readings.

Material Test Report

Report Number:	**P22253-8**
Issue Number:	3 - *This version supersedes all previous issues*
Reissue Reason:	*Description Amended*
Date Issued:	30/01/2023
Client:	Geneng Solutions Pty Ltd PO Box 300, Crows Nest QLD 4355
Contact:	David Taylor
Project Number:	P22253
Project Name:	248 Woolmer Road Development
Project Location:	Browne & Woolmer Rd, Highfields
Work Request:	3319
Sample Number:	P22-3319E
Client Sample #:	H
Date Sampled:	15/09/2022
Dates Tested:	26/09/2022 - 11/10/2022
Sampling Method:	AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method:	AS 1289.1.1 - Sampling and preparation of soils
Site Selection:	Selected by Client
Sample Location:	**Borehole Point H E: 393533.603, N: 6963555.247, Depth: 1.0 - 1.4**
Material:	Natural
Material Source:	Insitu

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QCTS Toowoomba
4 Stradbroke Street Rockville QLD 4350
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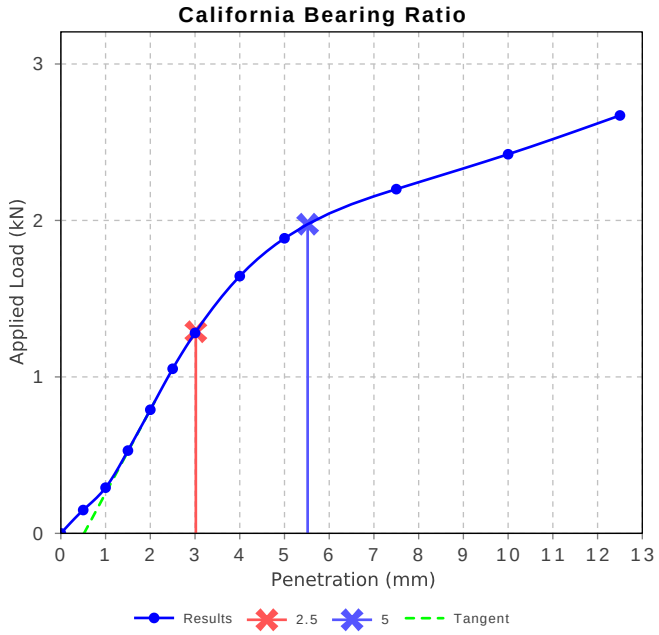
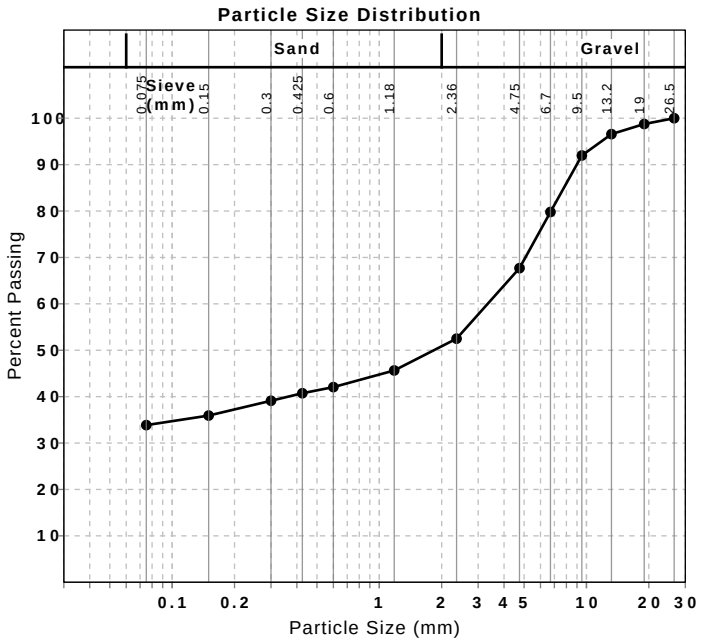
California Bearing Ratio (AS 1289 6.1.1 & 2.1.1)		Min	Max
CBR taken at	5 mm		
CBR %	**10**		
Method of Compactive Effort	Standard		
Method used to Determine MDD	AS 1289 5.1.1 & 2.1.1		
Method used to Determine Plasticity	Visually		
Maximum Dry Density (t/m^3)	1.72		
Optimum Moisture Content (%)	20.5		
Laboratory Density Ratio (%)	97.0		
Laboratory Moisture Ratio (%)	99.5		
Dry Density after Soaking (t/m^3)	1.65		
Field Moisture Content (%)	19.0		
Moisture Content at Placement (%)	20.2		
Moisture Content Top 30mm (%)	26.9		
Moisture Content Rest of Sample (%)	23.8		
Mass Surcharge (kg)	4.5		
Soaking Period (days)	4		
Curing Hours	168.3		
Swell (%)	1.5		
Oversize Material (mm)	19		
Oversize Material Included	Excluded		
Oversize Material (%)	1		



Particle Size Distribution (AS1289 3.6.1)						
Sieve	Passed %	Passing Limits		Retained %	Retained Limits	
26.5 mm	**100**			0		
19 mm	**99**			1		
13.2 mm	**97**			2		
9.5 mm	**92**			5		
6.7 mm	**80**			12		
4.75 mm	**68**			12		
2.36 mm	**52**			15		
1.18 mm	**46**			7		
0.6 mm	**42**			4		
0.425 mm	**41**			1		
0.3 mm	**39**			2		
0.15 mm	**36**			3		
0.075 mm	**34**			2		



Material Test Report

Report Number:	**P22253-8**
Issue Number:	3 - *This version supersedes all previous issues*
Reissue Reason:	*Description Amended*
Date Issued:	30/01/2023
Client:	Geneng Solutions Pty Ltd PO Box 300, Crows Nest QLD 4355
Contact:	David Taylor
Project Number:	P22253
Project Name:	248 Woolmer Road Development
Project Location:	Browne & Woolmer Rd, Highfields
Work Request:	3319
Sample Number:	P22-3319E
Client Sample #:	H
Date Sampled:	15/09/2022
Dates Tested:	26/09/2022 - 11/10/2022
Sampling Method:	AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method:	AS 1289.1.1 - Sampling and preparation of soils
Site Selection:	Selected by Client
Sample Location:	**Borehole Point H E: 393533.603, N: 6963555.247, Depth: 1.0 - 1.4**
Material:	Natural
Material Source:	Insitu

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	55		
Plastic Limit (%)	22		
Plasticity Index (%)	**33**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)	**13.0**		
Cracking Crumbling Curling	Curling		

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QCTS Toowoomba
4 Stradbroke Street Rockville QLD 4350
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Email: mark@qcts.net.au

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Technical Services Manager

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Material Test Report

Report Number:	**P22253-8**
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Date Issued:	30/01/2023
Client:	Geneng Solutions Pty Ltd PO Box 300, Crows Nest QLD 4355
Contact:	David Taylor
Project Number:	P22253
Project Name:	248 Woolmer Road Development
Project Location:	Browne & Woolmer Rd, Highfields
Work Request:	3319
Date Sampled:	15/09/2022
Dates Tested:	26/09/2022 - 28/09/2022
Sampling Method:	AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method:	AS 1289.1.1 - Sampling and preparation of soils
Site Selection:	Selected by Client
Location:	Borehole Point H
Material:	Natural
Material Source:	Insitu

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Moisture Content AS 1289 2.1.1

Sample Number	Sample Location	Moisture Content	Material
P22-3319A	Borehole Point H Ch: 393533.663m, Off: 6963555.247m, Depth: 0.2 - 0.4	36.2 %	Natural
P22-3319B	Borehole Point H Ch: 393533.663m, Off: 6963555.247m, Depth: 1.0 - 1.2	22.6 %	Natural
P22-3319C	Borehole Point H Ch: 393533.663m, Off: 6963555.247m, Depth: 2.0 - 2.2	21.1 %	Natural
P22-3319D	Borehole Point H Ch: 393533.663m, Off: 6963555.247m, Depth: 3.0 - 3.2	9.2 %	Natural

Material Test Report

Report Number:	**P22253-9A**
Issue Number:	3 - *This version supersedes all previous issues*
Reissue Reason:	*Description Amended*
Date Issued:	30/01/2023
Client:	Geneng Solutions Pty Ltd PO Box 300, Crows Nest QLD 4355
Contact:	David Taylor
Project Number:	P22253
Project Name:	248 Woolmer Road Development
Project Location:	Browne & Woolmer Rd, Highfields
Work Request:	3320
Sample Number:	P22-3320F
Client Sample #:	I
Date Sampled:	19/09/2022
Dates Tested:	26/09/2022 - 11/10/2022
Sampling Method:	AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method:	AS 1289.1.1 - Sampling and preparation of soils
Site Selection:	Selected by Client
Sample Location:	**Borehole Point I E: 393566.247, N: 6963709.101, Depth: 0.2 - 0.6**
Material:	Natural
Material Source:	Insitu

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QCTS Toowoomba
4 Stradbroke Street Rockville QLD 4350
Phone: (07) 4633 0816
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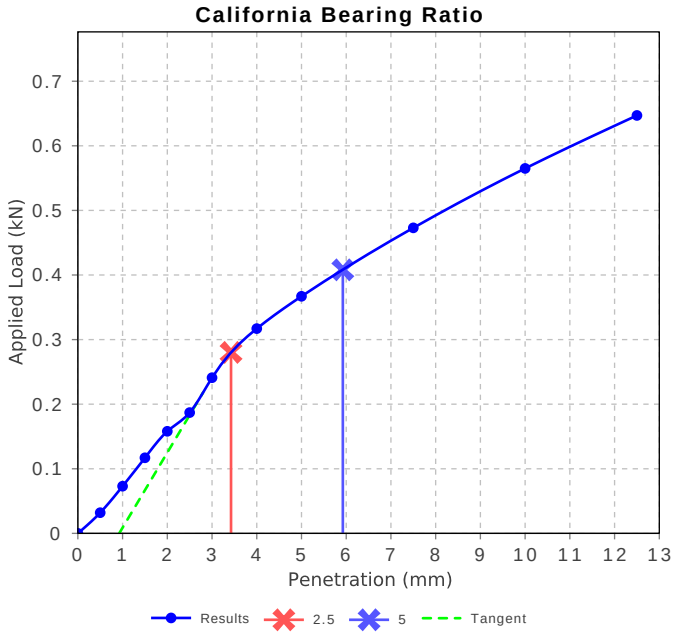
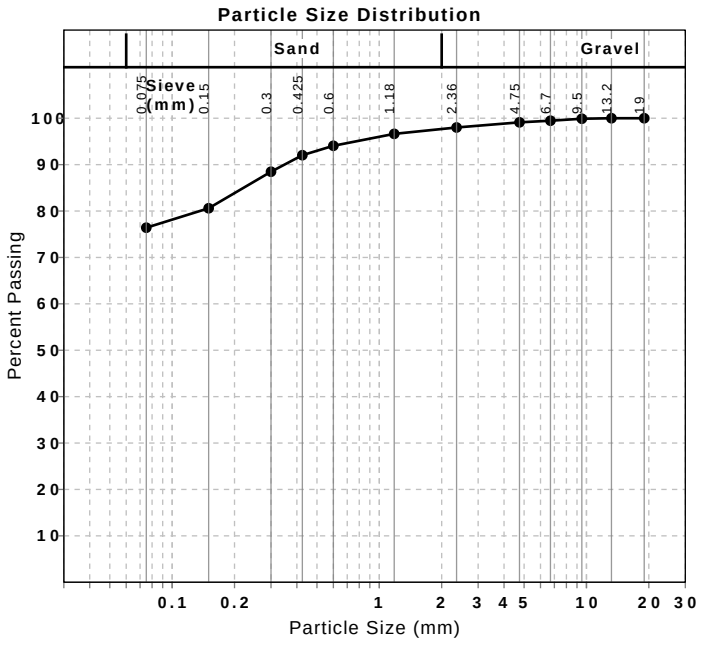
California Bearing Ratio (AS 1289 6.1.1 & 2.1.1)		Min	Max
CBR taken at	2.5 mm		
CBR %	**2.0**		
Method of Compactive Effort	Standard		
Method used to Determine MDD	AS 1289 5.1.1 & 2.1.1		
Method used to Determine Plasticity	Visually		
Maximum Dry Density (t/m^3)	1.39		
Optimum Moisture Content (%)	34.0		
Laboratory Density Ratio (%)	96.5		
Laboratory Moisture Ratio (%)	100.0		
Dry Density after Soaking (t/m^3)	1.31		
Field Moisture Content (%)	35.7		
Moisture Content at Placement (%)	34.0		
Moisture Content Top 30mm (%)	44.6		
Moisture Content Rest of Sample (%)	37.4		
Mass Surcharge (kg)	4.5		
Soaking Period (days)	4		
Curing Hours	171.8		
Swell (%)	2.5		
Oversize Material (mm)	19		
Oversize Material Included	Excluded		
Oversize Material (%)	0		

Particle Size Distribution (AS1289 3.6.1)						
Sieve	Passed %	Passing Limits		Retained %	Retained Limits	
19 mm	**100**			0		
13.2 mm	**100**			0		
9.5 mm	**100**			0		
6.7 mm	**99**			0		
4.75 mm	**99**			0		
2.36 mm	**98**			1		
1.18 mm	**97**			1		
0.6 mm	**94**			3		
0.425 mm	**92**			2		
0.3 mm	**88**			4		
0.15 mm	**81**			8		
0.075 mm	**76**			4		





Material Test Report

Report Number:	**P22253-9A**
Issue Number:	3 - *This version supersedes all previous issues*
Reissue Reason:	*Description Amended*
Date Issued:	30/01/2023
Client:	Geneng Solutions Pty Ltd PO Box 300, Crows Nest QLD 4355
Contact:	David Taylor
Project Number:	P22253
Project Name:	248 Woolmer Road Development
Project Location:	Browne & Woolmer Rd, Highfields
Work Request:	3320
Sample Number:	P22-3320F
Client Sample #:	I
Date Sampled:	19/09/2022
Dates Tested:	26/09/2022 - 11/10/2022
Sampling Method:	AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method:	AS 1289.1.1 - Sampling and preparation of soils
Site Selection:	Selected by Client
Sample Location:	**Borehole Point I E: 393566.247, N: 6963709.101, Depth: 0.2 - 0.6**
Material:	Natural
Material Source:	Insitu

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	73		
Plastic Limit (%)	25		
Plasticity Index (%)	**48**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)	**18.5**		
Cracking Crumbling Curling	Curling		

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Material Test Report

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Reissue Reason:	*Description Amended*
Date Issued:	30/01/2023
Client:	Geneng Solutions Pty Ltd PO Box 300, Crows Nest QLD 4355
Contact:	David Taylor
Project Number:	P22253
Project Name:	248 Woolmer Road Development
Project Location:	Browne & Woolmer Rd, Highfields
Work Request:	3320
Date Sampled:	19/09/2022
Dates Tested:	26/09/2022 - 28/09/2022
Sampling Method:	AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method:	AS 1289.1.1 - Sampling and preparation of soils
Site Selection:	Selected by Client
Location:	Borehole Point I
Material:	Natural
Material Source:	Insitu

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Moisture Content AS 1289 2.1.1			
Sample Number	Sample Location	Moisture Content	Material
P22-3320A	Borehole Point I Ch: 393566.247m, Off: 6963709.101m, Depth: 0.2 - 0.4	40.6 %	Natural
P22-3320B	Borehole Point I Ch: 393566.247m, Off: 6963709.101m, Depth: 1.0 - 1.2	31.2 %	Natural
P22-3320C	Borehole Point I Ch: 393566.247m, Off: 6963709.101m, Depth: 2.0 - 2.2	29.4 %	Natural
P22-3320D	Borehole Point I Ch: 393566.247m, Off: 6963709.101m, Depth: 3.0 - 3.2	28.9 %	Natural

Material Test Report

Report Number:	**P22253-9A**
Issue Number:	3 - *This version supersedes all previous issues*
Reissue Reason:	*Description Amended*
Date Issued:	30/01/2023
Client:	Geneng Solutions Pty Ltd PO Box 300, Crows Nest QLD 4355
Contact:	David Taylor
Project Number:	P22253
Project Name:	248 Woolmer Road Development
Project Location:	Browne & Woolmer Rd, Highfields
Work Request:	3320
Date Sampled:	19/09/2022
Dates Tested:	26/09/2022 - 04/10/2022
Sampling Method:	AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method:	AS 1289.1.1 - Sampling and preparation of soils
Site Selection:	Selected by Client
Location:	Borehole Point I
Material:	Natural
Material Source:	Insitu

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Shrink Swell Index AS 1289 7.1.1 & 2.1.1					
Sample Number	P22-3320E				
Date Sampled	19/09/2022				
Date Tested	04/10/2022				
Material Source	insitu				
Sample Location	Borehole Point I E: 393566.247, N: 6963709.101 (1.0)				
Inert Material Estimate (%)	50				
Pocket Penetrometer before (kPa)	60				
Pocket Penetrometer after (kPa)	50				
Shrinkage Moisture Content (%)	35.0				
Shrinkage (%)	**3.7**				
Swell Moisture Content Before (%)	36.1				
Swell Moisture Content After (%)	39.8				
Swell (%)	**-0.1**				
Shrink Swell Index Iss (%)	**2.1**				
Visual Description	brown weathered gravel and silty clay				
Cracking	HC				
Crumbling	Yes				
Remarks	**				

Shrink Swell Index (Iss) reported as the percentage vertical strain per pF change in suction.
Cracking Terminology: UC Uncracked, SC Slightly Cracked, MC Moderately Cracked, HC Highly Cracked, FR Fragmented.
NATA Accreditation does not cover the performance of pocket penetrometer readings.

Material Test Report

Report Number:	**P22253-10A**
Issue Number:	3 - *This version supersedes all previous issues*
Reissue Reason:	*Description Amended*
Date Issued:	30/01/2023
Client:	Geneng Solutions Pty Ltd PO Box 300, Crows Nest QLD 4355
Contact:	David Taylor
Project Number:	P22253
Project Name:	248 Woolmer Road Development
Project Location:	Browne & Woolmer Rd, Highfields
Work Request:	3321
Sample Number:	P22-3321F
Client Sample #:	J
Date Sampled:	19/09/2022
Dates Tested:	26/09/2022 - 11/10/2022
Sampling Method:	AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method:	AS 1289.1.1 - Sampling and preparation of soils
Site Selection:	Selected by Client
Sample Location:	**Borehole Point J E: 393584.853, N: 6963836.434, Depth: 0.2 - 0.6**
Material:	Natural
Material Source:	Insitu

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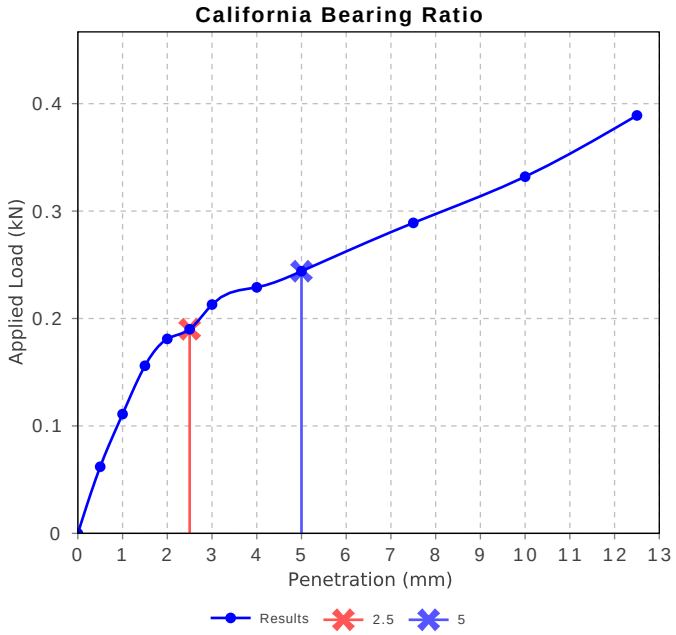
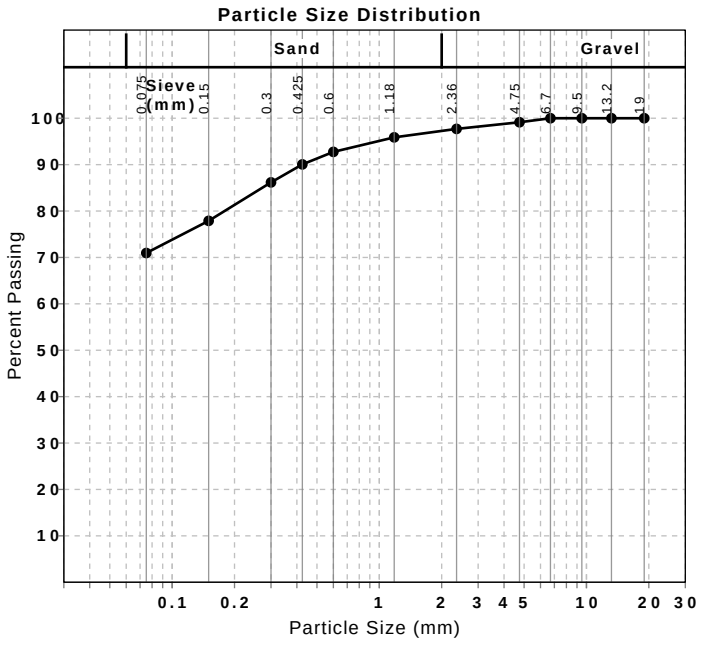
Technical Services Manager

NATA Accredited Laboratory Number: 19673

California Bearing Ratio (AS 1289 6.1.1 & 2.1.1)		Min	Max
CBR taken at	2.5 mm		
CBR %	**1.5**		
Method of Compactive Effort	Standard		
Method used to Determine MDD	AS 1289 5.1.1 & 2.1.1		
Method used to Determine Plasticity	Visually		
Maximum Dry Density (t/m^3)	1.42		
Optimum Moisture Content (%)	31.5		
Laboratory Density Ratio (%)	97.0		
Laboratory Moisture Ratio (%)	100.0		
Dry Density after Soaking (t/m^3)	1.34		
Field Moisture Content (%)	35.1		
Moisture Content at Placement (%)	31.3		
Moisture Content Top 30mm (%)	44.0		
Moisture Content Rest of Sample (%)	33.4		
Mass Surcharge (kg)	4.5		
Soaking Period (days)	4		
Curing Hours	147.8		
Swell (%)	3.0		
Oversize Material (mm)	19		
Oversize Material Included	Excluded		
Oversize Material (%)	0		

Particle Size Distribution (AS1289 3.6.1)						
Sieve	Passed %	Passing Limits		Retained %	Retained Limits	
19 mm	**100**			0		
13.2 mm	**100**			0		
9.5 mm	**100**			0		
6.7 mm	**100**			0		
4.75 mm	**99**			1		
2.36 mm	**98**			1		
1.18 mm	**96**			2		
0.6 mm	**93**			3		
0.425 mm	**90**			3		
0.3 mm	**86**			4		
0.15 mm	**78**			8		
0.075 mm	**71**			7		





Material Test Report

Report Number:	**P22253-10A**
Issue Number:	3 - *This version supersedes all previous issues*
Reissue Reason:	*Description Amended*
Date Issued:	30/01/2023
Client:	Geneng Solutions Pty Ltd PO Box 300, Crows Nest QLD 4355
Contact:	David Taylor
Project Number:	P22253
Project Name:	248 Woolmer Road Development
Project Location:	Browne & Woolmer Rd, Highfields
Work Request:	3321
Sample Number:	P22-3321F
Client Sample #:	J
Date Sampled:	19/09/2022
Dates Tested:	26/09/2022 - 11/10/2022
Sampling Method:	AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method:	AS 1289.1.1 - Sampling and preparation of soils
Site Selection:	Selected by Client
Sample Location:	**Borehole Point J E: 393584.853, N: 6963836.434, Depth: 0.2 - 0.6**
Material:	Natural
Material Source:	Insitu

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	73		
Plastic Limit (%)	25		
Plasticity Index (%)	**48**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)	**18.0**		
Cracking Crumbling Curling	Curling		

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QCTS Toowoomba
4 Stradbroke Street Rockville QLD 4350
Phone: (07) 4633 0816
Email: mark@qcts.net.au

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Approved Signatory: Mark Jackman
Technical Services Manager

NATA Accredited Laboratory Number: 19673

Material Test Report

Report Number:	**P22253-10A**
Issue Number:	3 - *This version supersedes all previous issues*
Reissue Reason:	*Description Amended*
Date Issued:	30/01/2023
Client:	Geneng Solutions Pty Ltd PO Box 300, Crows Nest QLD 4355
Contact:	David Taylor
Project Number:	P22253
Project Name:	248 Woolmer Road Development
Project Location:	Browne & Woolmer Rd, Highfields
Work Request:	3321
Date Sampled:	19/09/2022
Dates Tested:	26/09/2022 - 28/09/2022
Sampling Method:	AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method:	AS 1289.1.1 - Sampling and preparation of soils
Site Selection:	Selected by Client
Location:	Borehole Point J
Material:	Natural
Material Source:	Insitu

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4 Stradbroke Street Rockville QLD 4350
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NATA Accredited Laboratory Number: 19673

Moisture Content AS 1289 2.1.1

Sample Number	Sample Location	Moisture Content	Material
P22-3321A	Borehole Point J Ch: 393584.853m, Off: 6963836.434m, Depth: 0.2 - 0.4	38.2 %	Natural
P22-3321B	Borehole Point J Ch: 393584.853m, Off: 6963836.434m, Depth: 1.0 - 1.2	32.0 %	Natural
P22-3321C	Borehole Point J Ch: 393584.853m, Off: 6963836.434m, Depth: 2.0 - 2.2	21.2 %	Natural
P22-3321D	Borehole Point J Ch: 393584.853m, Off: 6963836.434m, Depth: 3.0 - 3.2	21.0 %	Natural

Material Test Report

Report Number:	**P22253-10A**
Issue Number:	3 - *This version supersedes all previous issues*
Reissue Reason:	*Description Amended*
Date Issued:	30/01/2023
Client:	Geneng Solutions Pty Ltd PO Box 300, Crows Nest QLD 4355
Contact:	David Taylor
Project Number:	P22253
Project Name:	248 Woolmer Road Development
Project Location:	Browne & Woolmer Rd, Highfields
Work Request:	3321
Date Sampled:	19/09/2022
Dates Tested:	26/09/2022 - 04/10/2022
Sampling Method:	AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method:	AS 1289.1.1 - Sampling and preparation of soils
Site Selection:	Selected by Client
Location:	Borehole Point J
Material:	Natural
Material Source:	Insitu

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4 Stradbroke Street Rockville QLD 4350
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Shrink Swell Index AS 1289 7.1.1 & 2.1.1					
Sample Number	P22-3321E				
Date Sampled	19/09/2022				
Date Tested	04/10/2022				
Material Source	insitu				
Sample Location	Borehole Point J E: 393584.853, N: 6963836.434 (1.0)				
Inert Material Estimate (%)	15				
Pocket Penetrometer before (kPa)	40				
Pocket Penetrometer after (kPa)	20				
Shrinkage Moisture Content (%)	35.5				
Shrinkage (%)	**4.0**				
Swell Moisture Content Before (%)	36.2				
Swell Moisture Content After (%)	39.2				
Swell (%)	**0.3**				
Shrink Swell Index Iss (%)	**2.3**				
Visual Description	mottled grey/brown and red/brown weathered gravelly clay				
Cracking	MC				
Crumbling	Yes				
Remarks	**				

Shrink Swell Index (Iss) reported as the percentage vertical strain per pF change in suction.
Cracking Terminology: UC Uncracked, SC Slightly Cracked, MC Moderately Cracked, HC Highly Cracked, FR Fragmented.
NATA Accreditation does not cover the performance of pocket penetrometer readings.

Material Test Report

Report Number:	**P22253-11A**
Issue Number:	3 - *This version supersedes all previous issues*
Reissue Reason:	*Description Amended*
Date Issued:	30/01/2023
Client:	Geneng Solutions Pty Ltd PO Box 300, Crows Nest QLD 4355
Contact:	David Taylor
Project Number:	P22253
Project Name:	248 Woolmer Road Development
Project Location:	Browne & Woolmer Rd, Highfields
Work Request:	3322
Sample Number:	P22-3322C
Client Sample #:	K
Date Sampled:	15/09/2022
Dates Tested:	26/09/2022 - 11/10/2022
Sampling Method:	AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method:	AS 1289.1.1 - Sampling and preparation of soils
Site Selection:	Selected by Client
Sample Location:	**Borehole Point K E: 393700.920, N: 6964253.395, Depth: 0.2 - 0.6**
Material:	Natural
Material Source:	Insitu

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4 Stradbroke Street Rockville QLD 4350
Phone: (07) 4633 0816
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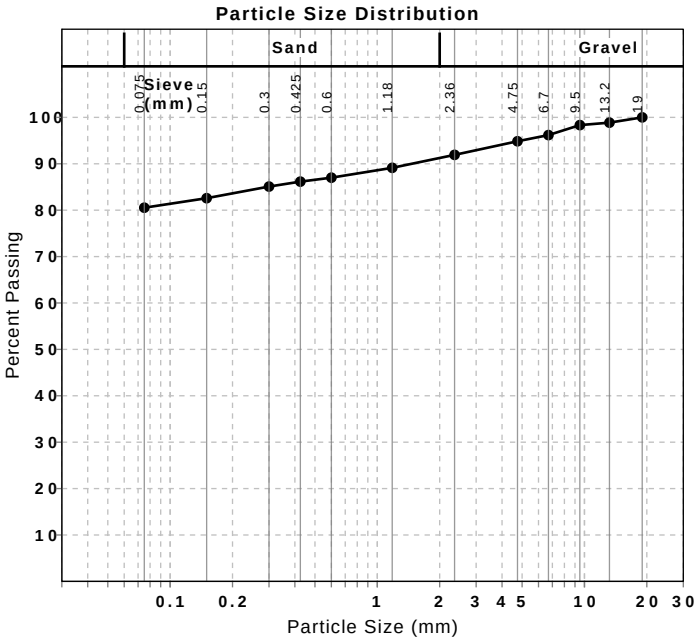
NATA Accredited Laboratory Number: 19673

Particle Size Distribution (AS1289 3.6.1)						
Sieve	Passed %	Passing Limits		Retained %	Retained Limits	
19 mm	**100**			0		
13.2 mm	**99**			1		
9.5 mm	**98**			1		
6.7 mm	**96**			2		
4.75 mm	**95**			1		
2.36 mm	**92**			3		
1.18 mm	**89**			3		
0.6 mm	**87**			2		
0.425 mm	**86**			1		
0.3 mm	**85**			1		
0.15 mm	**83**			3		
0.075 mm	**81**			2		

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	70		
Plastic Limit (%)	26		
Plasticity Index (%)	**44**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)	**17.0**		
Cracking Crumbling Curling	Cracking & Curling		



Material Test Report

Report Number:	**P22253-11A**
Issue Number:	3 - *This version supersedes all previous issues*
Reissue Reason:	*Description Amended*
Date Issued:	30/01/2023
Client:	Geneng Solutions Pty Ltd PO Box 300, Crows Nest QLD 4355
Contact:	David Taylor
Project Number:	P22253
Project Name:	248 Woolmer Road Development
Project Location:	Browne & Woolmer Rd, Highfields
Work Request:	3322
Date Sampled:	15/09/2022
Dates Tested:	26/09/2022 - 28/09/2022
Sampling Method:	AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method:	AS 1289.1.1 - Sampling and preparation of soils
Site Selection:	Selected by Client
Location:	Borehole Point K
Material:	Natural
Material Source:	Insitu

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4 Stradbroke Street Rockville QLD 4350
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Moisture Content AS 1289 2.1.1			
Sample Number	Sample Location	Moisture Content	Material
P22-3322A	Borehole Point K E: 393700.920, N: 6964253.395, Depth: 0.2 - 0.4	36.4 %	Natural

Material Test Report

Report Number:	**P22253-11A**
Issue Number:	3 - *This version supersedes all previous issues*
Reissue Reason:	*Description Amended*
Date Issued:	30/01/2023
Client:	Geneng Solutions Pty Ltd PO Box 300, Crows Nest QLD 4355
Contact:	David Taylor
Project Number:	P22253
Project Name:	248 Woolmer Road Development
Project Location:	Browne & Woolmer Rd, Highfields
Work Request:	3322
Date Sampled:	15/09/2022
Dates Tested:	26/09/2022 - 04/10/2022
Sampling Method:	AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method:	AS 1289.1.1 - Sampling and preparation of soils
Site Selection:	Selected by Client
Location:	Borehole Point K
Material:	Natural
Material Source:	Insitu

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4 Stradbroke Street Rockville QLD 4350
Phone: (07) 4633 0816
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Shrink Swell Index AS 1289 7.1.1 & 2.1.1					
Sample Number	P22-3322B				
Date Sampled	15/09/2022				
Date Tested	04/10/2022				
Material Source	insitu				
Sample Location	Borehole Point K E: 393700.920, N: 6964253.395 (1.0)				
Inert Material Estimate (%)	50				
Pocket Penetrometer before (kPa)	30				
Pocket Penetrometer after (kPa)	30				
Shrinkage Moisture Content (%)	24.2				
Shrinkage (%)	**2.8**				
Swell Moisture Content Before (%)	20.2				
Swell Moisture Content After (%)	22.9				
Swell (%)	**-0.2**				
Shrink Swell Index Iss (%)	**1.6**				
Visual Description	weathered gravel and red brown silty clay				
Cracking	FR				
Crumbling	Yes				
Remarks	**				

Shrink Swell Index (Iss) reported as the percentage vertical strain per pF change in suction.
Cracking Terminology: UC Uncracked, SC Slightly Cracked, MC Moderately Cracked, HC Highly Cracked, FR Fragmented.
NATA Accreditation does not cover the performance of pocket penetrometer readings.

Material Test Report

Report Number:	**P22253-12A**
Issue Number:	3 - *This version supersedes all previous issues*
Reissue Reason:	*Description Amended*
Date Issued:	30/01/2023
Client:	Geneng Solutions Pty Ltd PO Box 300, Crows Nest QLD 4355
Contact:	David Taylor
Project Number:	P22253
Project Name:	248 Woolmer Road Development
Project Location:	Browne & Woolmer Rd, Highfields
Work Request:	3323
Sample Number:	P22-3323F
Client Sample #:	L
Date Sampled:	15/09/2022
Dates Tested:	26/09/2022 - 11/10/2022
Sampling Method:	AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method:	AS 1289.1.1 - Sampling and preparation of soils
Site Selection:	Selected by Client
Sample Location:	**Borehole Point L E: 393843.436, N: 6964105.834, Depth: 2.0 - 2.4**
Material:	Natural
Material Source:	Insitu

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4 Stradbroke Street Rockville QLD 4350
Phone: (07) 4633 0816
Email: mark@qcts.net.au

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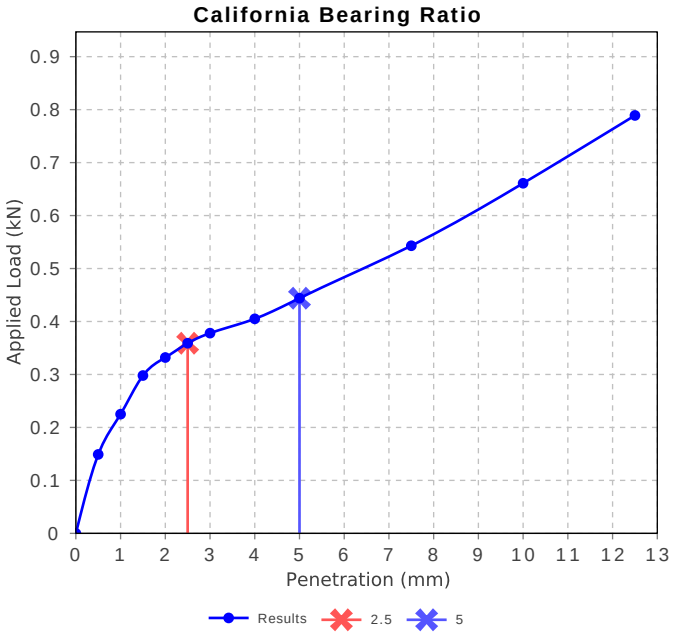
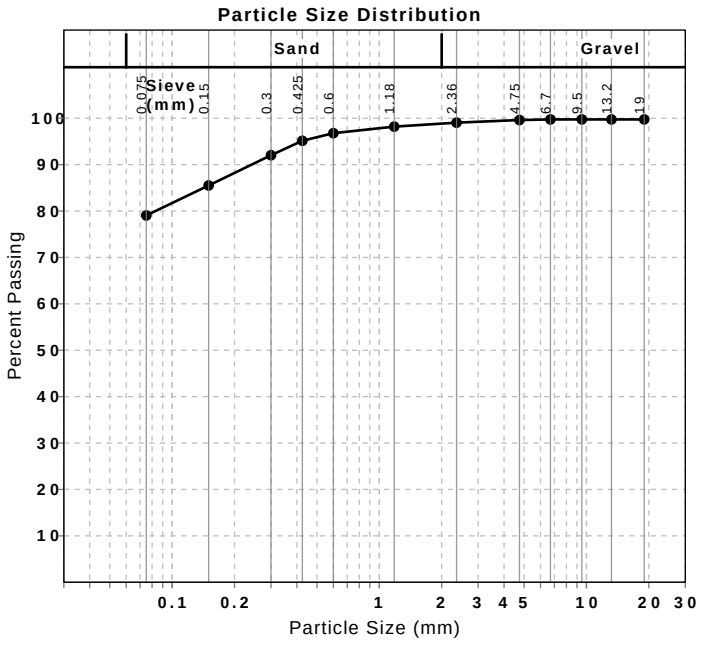
California Bearing Ratio (AS 1289 6.1.1 & 2.1.1)		Min	Max
CBR taken at	2.5 mm		
CBR %	**2.5**		
Method of Compactive Effort	Standard		
Method used to Determine MDD	AS 1289 5.1.1 & 2.1.1		
Method used to Determine Plasticity	Visually		
Maximum Dry Density (t/m^3)	1.41		
Optimum Moisture Content (%)	32.5		
Laboratory Density Ratio (%)	97.0		
Laboratory Moisture Ratio (%)	100.0		
Dry Density after Soaking (t/m^3)	1.34		
Field Moisture Content (%)	35.5		
Moisture Content at Placement (%)	32.4		
Moisture Content Top 30mm (%)	41.9		
Moisture Content Rest of Sample (%)	34.0		
Mass Surcharge (kg)	4.5		
Soaking Period (days)	4		
Curing Hours	148.9		
Swell (%)	2.0		
Oversize Material (mm)	19		
Oversize Material Included	Excluded		
Oversize Material (%)	0		



Particle Size Distribution (AS1289 3.6.1)						
Sieve	Passed %	Passing Limits		Retained %	Retained Limits	
19 mm	**100**			0		
13.2 mm	**100**			0		
9.5 mm	**100**			0		
6.7 mm	**100**			0		
4.75 mm	**100**			0		
2.36 mm	**99**			1		
1.18 mm	**98**			1		
0.6 mm	**97**			1		
0.425 mm	**95**			2		
0.3 mm	**92**			3		
0.15 mm	**86**			7		
0.075 mm	**79**			6		



Material Test Report

Report Number:	**P22253-12A**
Issue Number:	3 - *This version supersedes all previous issues*
Reissue Reason:	*Description Amended*
Date Issued:	30/01/2023
Client:	Geneng Solutions Pty Ltd PO Box 300, Crows Nest QLD 4355
Contact:	David Taylor
Project Number:	P22253
Project Name:	248 Woolmer Road Development
Project Location:	Browne & Woolmer Rd, Highfields
Work Request:	3323
Sample Number:	P22-3323F
Client Sample #:	L
Date Sampled:	15/09/2022
Dates Tested:	26/09/2022 - 11/10/2022
Sampling Method:	AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method:	AS 1289.1.1 - Sampling and preparation of soils
Site Selection:	Selected by Client
Sample Location:	**Borehole Point L E: 393843.436, N: 6964105.834, Depth: 2.0 - 2.4**
Material:	Natural
Material Source:	Insitu

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	77		
Plastic Limit (%)	25		
Plasticity Index (%)	**52**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)	**18.5**		
Cracking Crumbling Curling	Curling		

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QCTS Toowoomba
4 Stradbroke Street Rockville QLD 4350
Phone: (07) 4633 0816
Email: mark@qcts.net.au

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Technical Services Manager

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Material Test Report

Report Number:	**P22253-12A**
Issue Number:	3 - *This version supersedes all previous issues*
Reissue Reason:	*Description Amended*
Date Issued:	30/01/2023
Client:	Geneng Solutions Pty Ltd PO Box 300, Crows Nest QLD 4355
Contact:	David Taylor
Project Number:	P22253
Project Name:	248 Woolmer Road Development
Project Location:	Browne & Woolmer Rd, Highfields
Work Request:	3323
Date Sampled:	15/09/2022
Dates Tested:	26/09/2022 - 28/09/2022
Sampling Method:	AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method:	AS 1289.1.1 - Sampling and preparation of soils
Site Selection:	Selected by Client
Location:	Borehole Point L
Material:	Natural
Material Source:	Insitu

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4 Stradbroke Street Rockville QLD 4350
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NATA Accredited Laboratory Number: 19673

Moisture Content AS 1289 2.1.1			
Sample Number	Sample Location	Moisture Content	Material
P22-3323A	Borehole Point L Ch: 393843.436m, Off: 6964105.834m, Depth: 0.2 - 0.4	34.9 %	Natural
P22-3323B	Borehole Point L Ch: 393843.436m, Off: 6964105.834m, Depth: 1.0 - 1.2	35.9 %	Natural
P22-3323C	Borehole Point L Ch: 393843.436m, Off: 6964105.834m, Depth: 2.0 - 2.2	35.8 %	Natural
P22-3323D	Borehole Point L Ch: 393843.436m, Off: 6964105.834m, Depth: 3.0 - 3.2	35.2 %	Natural

Material Test Report

Report Number:	**P22253-12A**
Issue Number:	3 - *This version supersedes all previous issues*
Reissue Reason:	*Description Amended*
Date Issued:	30/01/2023
Client:	Geneng Solutions Pty Ltd PO Box 300, Crows Nest QLD 4355
Contact:	David Taylor
Project Number:	P22253
Project Name:	248 Woolmer Road Development
Project Location:	Browne & Woolmer Rd, Highfields
Work Request:	3323
Date Sampled:	15/09/2022
Dates Tested:	26/09/2022 - 05/10/2022
Sampling Method:	AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method:	AS 1289.1.1 - Sampling and preparation of soils
Site Selection:	Selected by Client
Location:	Borehole Point L
Material:	Natural
Material Source:	Insitu

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QCTS Toowoomba
4 Stradbroke Street Rockville QLD 4350
Phone: (07) 4633 0816
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Shrink Swell Index AS 1289 7.1.1 & 2.1.1					
Sample Number	P22-3323E				
Date Sampled	15/09/2022				
Date Tested	05/10/2022				
Material Source	insitu				
Sample Location	Borehole Point L E: 393843.436, N: 6964105.834 (2.0)				
Inert Material Estimate (%)	15				
Pocket Penetrometer before (kPa)	50				
Pocket Penetrometer after (kPa)	30				
Shrinkage Moisture Content (%)	38.4				
Shrinkage (%)	**2.3**				
Swell Moisture Content Before (%)	39.9				
Swell Moisture Content After (%)	43.0				
Swell (%)	**-0.2**				
Shrink Swell Index Iss (%)	**1.3**				
Visual Description	grey brown weathered gravel and brown Silty clay				
Cracking	SC				
Crumbling	Yes				
Remarks	**				

Shrink Swell Index (Iss) reported as the percentage vertical strain per pF change in suction.
Cracking Terminology: UC Uncracked, SC Slightly Cracked, MC Moderately Cracked, HC Highly Cracked, FR Fragmented.
NATA Accreditation does not cover the performance of pocket penetrometer readings.

Material Test Report

Report Number:	**P22253-13A**
Issue Number:	3 - *This version supersedes all previous issues*
Reissue Reason:	*Description Amended*
Date Issued:	30/01/2023
Client:	Geneng Solutions Pty Ltd PO Box 300, Crows Nest QLD 4355
Contact:	David Taylor
Project Number:	P22253
Project Name:	248 Woolmer Road Development
Project Location:	Browne & Woolmer Rd, Highfields
Work Request:	3324
Sample Number:	P22-3324F
Client Sample #:	M
Date Sampled:	15/09/2022
Dates Tested:	26/09/2022 - 11/10/2022
Sampling Method:	AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method:	AS 1289.1.1 - Sampling and preparation of soils
Site Selection:	Selected by Client
Sample Location:	**Borehole Point M E: 393838.626, N: 6963606.323, Depth: 1.0 - 1.4**
Material:	Natural
Material Source:	Insitu

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QCTS Toowoomba
4 Stradbroke Street Rockville QLD 4350
Phone: (07) 4633 0816
Email: mark@qcts.net.au

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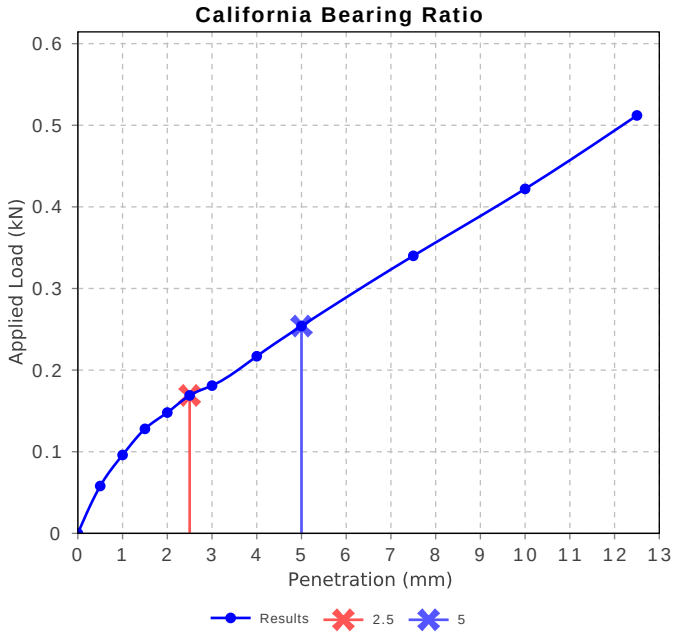
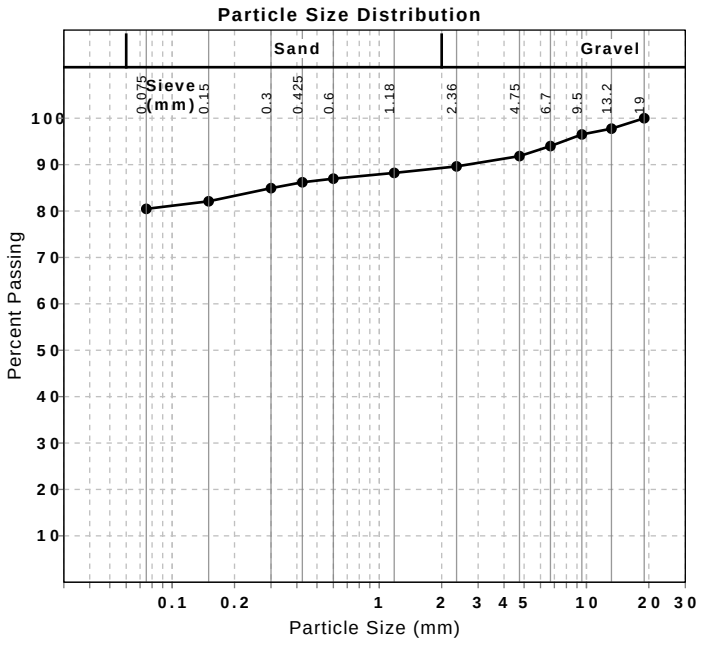
California Bearing Ratio (AS 1289 6.1.1 & 2.1.1)		Min	Max
CBR taken at	5 mm		
CBR %	**1.5**		
Method of Compactive Effort	Standard		
Method used to Determine MDD	AS 1289 5.1.1 & 2.1.1		
Method used to Determine Plasticity	Visually		
Maximum Dry Density (t/m^3)	1.43		
Optimum Moisture Content (%)	31.5		
Laboratory Density Ratio (%)	97.0		
Laboratory Moisture Ratio (%)	100.0		
Dry Density after Soaking (t/m^3)	1.31		
Field Moisture Content (%)	30.6		
Moisture Content at Placement (%)	31.4		
Moisture Content Top 30mm (%)	42.3		
Moisture Content Rest of Sample (%)	35.8		
Mass Surcharge (kg)	4.5		
Soaking Period (days)	4		
Curing Hours	173.4		
Swell (%)	5.5		
Oversize Material (mm)	19		
Oversize Material Included	Excluded		
Oversize Material (%)	0		



Particle Size Distribution (AS1289 3.6.1)						
Sieve	Passed %	Passing Limits		Retained %	Retained Limits	
19 mm	**100**			0		
13.2 mm	**98**			2		
9.5 mm	**97**			1		
6.7 mm	**94**			3		
4.75 mm	**92**			2		
2.36 mm	**90**			2		
1.18 mm	**88**			1		
0.6 mm	**87**			1		
0.425 mm	**86**			1		
0.3 mm	**85**			1		
0.15 mm	**82**			3		
0.075 mm	**80**			2		



Material Test Report

Report Number:	**P22253-13A**
Issue Number:	3 - *This version supersedes all previous issues*
Reissue Reason:	*Description Amended*
Date Issued:	30/01/2023
Client:	Geneng Solutions Pty Ltd PO Box 300, Crows Nest QLD 4355
Contact:	David Taylor
Project Number:	P22253
Project Name:	248 Woolmer Road Development
Project Location:	Browne & Woolmer Rd, Highfields
Work Request:	3324
Sample Number:	P22-3324F
Client Sample #:	M
Date Sampled:	15/09/2022
Dates Tested:	26/09/2022 - 11/10/2022
Sampling Method:	AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method:	AS 1289.1.1 - Sampling and preparation of soils
Site Selection:	Selected by Client
Sample Location:	**Borehole Point M E: 393838.626, N: 6963606.323, Depth: 1.0 - 1.4**
Material:	Natural
Material Source:	Insitu

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QCTS Toowoomba
4 Stradbroke Street Rockville QLD 4350
Phone: (07) 4633 0816
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Technical Services Manager

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Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	96		
Plastic Limit (%)	32		
Plasticity Index (%)	**64**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)	**16.0**		
Cracking Crumbling Curling	Curling		

Material Test Report

Report Number:	**P22253-13A**
Issue Number:	3 - *This version supersedes all previous issues*
Reissue Reason:	*Description Amended*
Date Issued:	30/01/2023
Client:	Geneng Solutions Pty Ltd PO Box 300, Crows Nest QLD 4355
Contact:	David Taylor
Project Number:	P22253
Project Name:	248 Woolmer Road Development
Project Location:	Browne & Woolmer Rd, Highfields
Work Request:	3324
Date Sampled:	15/09/2022
Dates Tested:	26/09/2022 - 28/09/2022
Sampling Method:	AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method:	AS 1289.1.1 - Sampling and preparation of soils
Site Selection:	Selected by Client
Location:	Borehole Point M
Material:	Natural
Material Source:	Insitu

Quality Control Testing Services Pty Ltd
QCTS Toowoomba
4 Stradbroke Street Rockville QLD 4350
Phone: (07) 4633 0816
Email: mark@qcts.net.au

Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Mark Jackman
Technical Services Manager

NATA Accredited Laboratory Number: 19673

Moisture Content AS 1289 2.1.1			
Sample Number	Sample Location	Moisture Content	Material
P22-3324A	Borehole Point M Ch: 393838.626m, Off: 6963606.323m, Depth: 0.2 - 0.4	24.7 %	Natural
P22-3324B	Borehole Point M Ch: 393838.626m, Off: 6963606.323m, Depth: 1.0 - 1.2	32.3 %	Natural
P22-3324C	Borehole Point M Ch: 393838.626m, Off: 6963606.323m, Depth: 2.0 - 2.2	30.3 %	Natural
P22-3324D	Borehole Point M Ch: 393838.626m, Off: 6963606.323m, Depth: 3.0 - 3.2	30.1 %	Natural

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Shrink Swell Index AS 1289 7.1.1 & 2.1.1					
Sample Number	P22-3324E				
Date Sampled	15/09/2022				
Date Tested	06/10/2022				
Material Source	insitu				
Sample Location	Borehole Point M E: 393838.626, N: 6963606.323 (2.0)				
Inert Material Estimate (%)	10				
Pocket Penetrometer before (kPa)	55				
Pocket Penetrometer after (kPa)	40				
Shrinkage Moisture Content (%)	37.1				
Shrinkage (%)	**2.7**				
Swell Moisture Content Before (%)	37.6				
Swell Moisture Content After (%)	43.2				
Swell (%)	**3.5**				
Shrink Swell Index Iss (%)	**2.5**				
Visual Description	weathered gravel and grey silty clay				
Cracking	SC				
Crumbling	No				
Remarks	**				

Shrink Swell Index (Iss) reported as the percentage vertical strain per pF change in suction.
Cracking Terminology: UC Uncracked, SC Slightly Cracked, MC Moderately Cracked, HC Highly Cracked, FR Fragmented.
NATA Accreditation does not cover the performance of pocket penetrometer readings.

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).

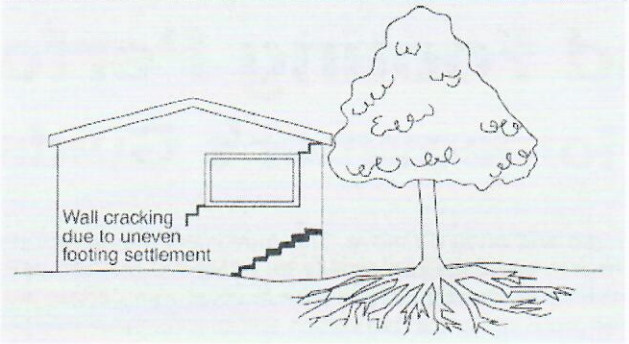
Isolated piers affected by erosion or saturation of foundations will eventually lose contact with the bearers they support and may tilt or fall over. The floors that have lost this support will become bouncy, sometimes rattling ornaments etc.

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.

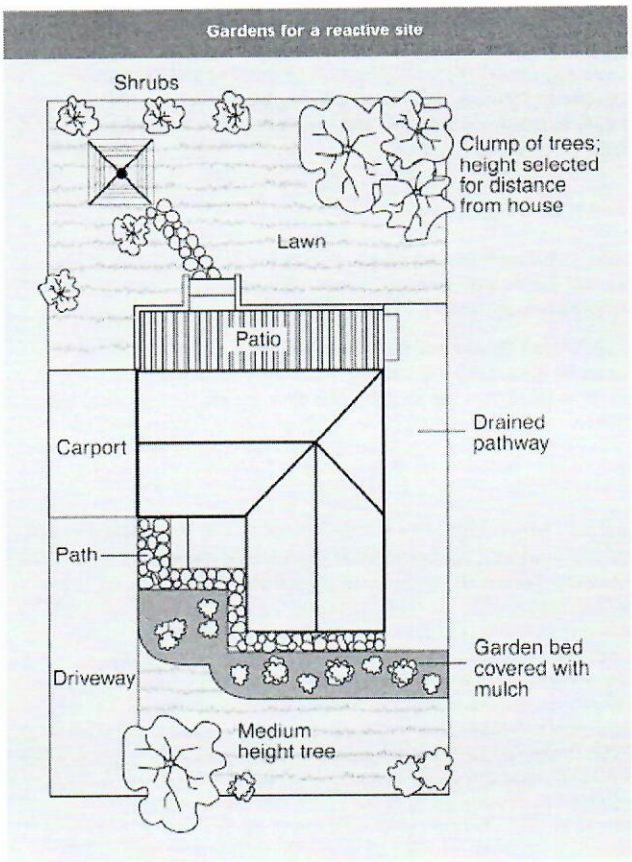
It is, however, sometimes necessary when attempting to prevent water migration that testing be carried out to establish watertable height and subsoil water flows. This subject is referred to in BTF 19 and may properly be regarded as an area for an expert consultant.

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.

This BTF was prepared by John Lewer FAIB, MIAMA, Partner, Construction Diagnosis.

Distributed by

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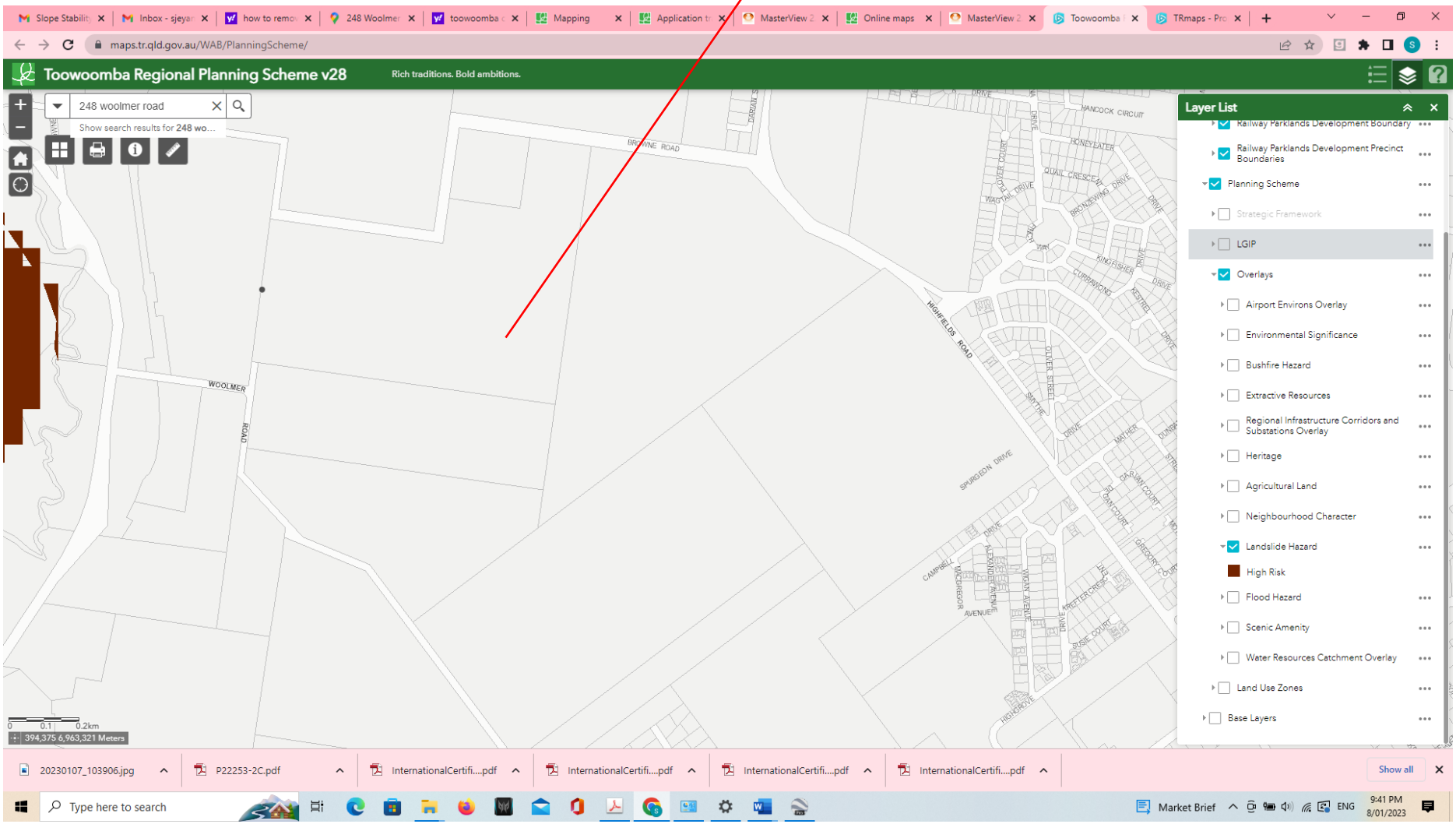
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Rich traditions. Bold ambitions.
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248 woolmer road
Layer List
Railway Parklands Development Precinct Boundaries
Planning Scheme
Strategic Framework
LGIP
Overlays
Airport Environs Overlay
Environmental Significance
Bushfire Hazard
Extractive Resources
Regional Infrastructure Corridors and Substations Overlay
Heritage
Agricultural Land
Neighbourhood Character
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