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Proposed Subdivision  
Brush Creek Estate -  
Precinct 2, Stage 7  
Site Classification

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Kenakan Street,  
Edgeworth

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NEW18P-0170I-AB  
7 February 2023

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**Qualitest**

LABORATORY (NSW) PTY LTD

7 February 2023

McCloy Edgeworth Pty Ltd  
Suite 2, Ground Floor, 317 Hunter Street  
NEWCASTLE NSW 2300

**Attention: Mr Bryson Cox**

Dear Sir

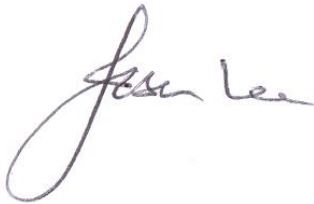
**RE: PROPOSED SUBDIVISION - BRUSH CREEK ESTATE – PRECINCT 2, STAGE 7  
KENAKAN STREET, EDGEWORTH  
SITE CLASSIFICATION TO AS2870-2011 (LOTS 701 TO 724)**

Please find enclosed our Geotechnical Assessment report for Lots 701 to 724 within Precinct 2, Stage 7 of the Brush Creek Estate, located off Kenakan, Edgeworth.

The report includes recommendations on site classification in accordance with AS2870-2011, 'Residential Slabs and Footings' following the completion of site regrading earthworks.

If you have any questions regarding this report, please do not hesitate to contact Ben Bunting, Shannon Kelly or the undersigned.

For and on behalf of Qualtest Laboratory (NSW) Pty Ltd



Jason Lee  
Principal Geotechnical Engineer

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## Attachments:

Figure AB1:	Site Plan and Approximate Test Locations
Sales Plan:	Sales Plan for Stage 7 Brush Creek
Appendix A:	Results of Field Investigations
Appendix B:	Results of Laboratory Testing
Appendix C:	CSIRO Sheet BTF 18

## 1.0 Introduction

Qualtest Laboratory NSW Pty Ltd (Qualtest) is pleased to present this geotechnical report on behalf of McCloy Edgeworth Pty Ltd (McCloy), for Precinct 2, Stage 7, of the Brush Creek Estate, located off Kenakan Street, Edgeworth.

Based on the brief and drawings provided by the client, Stage 6B is understood to include 24 residential allotments (Lots 701 to 724), as shown on the attached Figure AB1.

The scope of work for the geotechnical investigation included providing site classification with respect to reactive soils, in accordance with the requirements of AS2870-2011 '*Residential Slabs and Footings*', following completion of site regrade works.

This report presents the results of the field work investigations and laboratory testing, and provides recommendations for the scope outlined above.

## 2.0 Desktop Study

The scope of work has included a review of the following reports completed by Qualtest:

- Level 1 Site Re-grade Assessment Report, 'Brush Creek Estate – Precinct 2 Stage 7, Edgeworth (KCE No. 20100)', (Report Reference: NEW20P-0011I-AB, dated February 2023);
- Site Classification, 'Proposed Subdivision, Brush Creek Estate – Precinct 2, Stage 4, Kenakan Street, Edgeworth', (Report Reference: NEW17P-0170G-AB, dated 9 June 2022);
- Site Classification, 'Proposed Subdivision, Brush Creek Estate – Precinct 2, Stage 2, Kenakan Street, Edgeworth', (Report Reference: NEW17P-0170F-AB, dated 17 January 2022);
- Geotechnical Assessment, 'Proposed Subdivision, Brush Creek Estate – Precinct 2, Transfield Avenue, Edgeworth, (Report Reference: NEW18P-0170A-AA.Rev1, dated 4 March 2020).

This report includes a summary of selected results from the previous reports. Reference should be made to the reports outlined above for further details of site description, subsurface conditions, field work conducted, engineering logs of test pits / boreholes, laboratory testing results, site supervision and density testing carried out.

## 3.0 Field Work

Field work investigations was carried out on 17 January 2023 and comprised of:

- DBYD search, review of plans, and visual check of proposed test locations for the presence of underground services;
- Site walkover to make observations of surface features at the property and in the immediate surrounding area;
- Drilling of twenty-seven (27 no.) boreholes (BH701 to BH710, BH711A, BH711B, BH712 to BH720, BH721A, BH721B, BH722A, BH722B, and BH723 to BH724) using a 2.7 tonne excavator equipped with a 300mm diameter auger attachment. Boreholes were terminated at depths of between 0.25m and 2.50m;
- Undisturbed samples (U50 tubes) were taken for subsequent laboratory testing; and,
- Boreholes were backfilled with the excavation spoil and compacted using the excavator auger and tracks.

Investigations were carried out by an experienced Geotechnical Engineer from Qualtest who located the boreholes, carried out the sampling and testing, produced field logs of the boreholes, and made observations of the site surface conditions.

Boreholes were located in the field by handheld GPS and relative to existing site features including topographic features, lot boundaries, existing developments and trees.

Engineering logs of the boreholes are presented in Appendix A. Approximate borehole locations are shown on the attached Figure AB1. A copy of the Sales Plan is also attached for reference to lot numbers and lot layout.

## 4.0 Site Description

### 4.1 Site Regrade Works

Following an initial site visit, stripping assessment and recommendations performed on 25 August 2022 (Qualtest ref. NEW20P-0011I-SR01, dated 09/09/2022), site re-grading filling works within Stage 7 of the development was conducted between 25 August 2022 and 2 September 2022.

Re-grade works included filling within all or portions of Lots 708 to 713 and 721 to 723.

Refer to attached Figure AB1 for the approximate total extent of re-grade filling works for this portion of the development.

Prior to filling, re-grade areas were stripped of topsoil and unsuitable material to expose the suitable natural foundation profile. Preparation works were then performed, which consisted of tyning, re-conditioning and re-compaction of the stripped surface, prior to filling with approved site fill to design finish levels.

Filling was performed using either site stockpiled material won from excavations cut from around the site, and/or with approved VENM classified imported material. The fill material could generally be described as mixtures of Residual (CI-CH) Sandy CLAY, medium to high plasticity, brown / red / grey in colour, with fine to coarse grained Sand and Gravel, along with Extremely Weathered (EW) Siltstone / Sandstone, pale yellow / brown / white in colour, blended with minor quantities of on-site pale brown Colluvium.

The approximate depth of fill placed ranged in the order of 0.1m to about 2.1m, with the deepest areas being within Lots 723, along the northern boundary.

The approximate depth of fill placed within the re-grade areas (excluding topsoil), ranged in the order of:

- 708 to 713 – 0.1m to 1.0m;
- 721 to 722 – 0.1m to 0.9m;
- 723 – 0.1m to 2.1m.

The fill was compacted in maximum lifts of 0.3m thickness. Any unsuitable or deleterious material within the fill was removed by hand or mechanical means prior to final compaction of the material.

As the geotechnical testing authority engaged for the project, Qualtest state that the re-grading works performed within Stage 7 (as shown on attached Figure AB1), was carried out to Level 1 criteria as defined in Clause 8.2 – Section 8, of AS3798-2007, “*Guidelines on Earthworks for Commercial and Residential Developments*”.

The recommendations of this report are based on the understanding that any existing lot re-grade works are limited to the controlled earthworks supervised by Qualtest, and placement of low reactivity topsoil material such that total depth of topsoil and uncontrolled fill does not exceed 0.4m. Qualtest should be informed without delay if additional earthworks are known to have been carried out.

## 4.2 Surface Conditions

The site comprises Precinct 2, Stage 7 of the proposed residential subdivision known as Brush Creek Estate, located off Kenakan Street, as shown on Figure AB1 attached.

The site is bounded to the south by Kenakan Street and Stages 2 & 4 of the subdivision, to the east by Bootaring Boulevard, and undeveloped bushland to the north and west.

Photographs of the site taken on the day of the site investigations are shown below.



**Photograph 1:** From southern boundary of Lot 701, facing west.



**Photograph 2:** From southern boundary of Lot 701, facing northwest.



**Photograph 3:** From south-eastern corner of Lot 713, facing west.



**Photograph 4:** From south-eastern corner of Lot 713, facing northwest.



**Photograph 5:** From south-eastern corner of Lot 713, facing northeast.



**Photograph 6:** From south-eastern corner of Lot 713, facing east.



**Photograph 7:** From north-eastern corner of Lot 716, facing east.



**Photograph 8:** From north-eastern corner of Lot 716, facing south.



**Photograph 9:** From south-eastern corner of Lot 719, facing northeast.



**Photograph 10:** From south-eastern corner of Lot 719, facing east.



**Photograph 11:** From north-eastern corner of Lot 719, facing east.



**Photograph 12:** From north-eastern corner of Lot 719, facing northeast.



**Photograph 13:** From north-eastern corner of Lot 719, facing southwest.



**Photograph 14:** From north-eastern corner of Lot 719, facing west.



**Photograph 15:** From south-western corner of Lot 722, facing north.



**Photograph 16:** From south-western corner of Lot 722, facing east.



**Photograph 17:** From south-western corner of Lot 722, facing west.



**Photograph 18:** From near north-western corner of Lot 617, facing northwest.

### 4.3 Subsurface Conditions

Reference to the 1:100,000 Newcastle Coalfield Regional Geology Series Sheet 9231 indicates the site to be underlain by the Adamstown Subgroup of the Newcastle Coal Measures, which are characterised by Conglomerate, Sandstone, Siltstone, Coal and Tuff rock types.

Table 1 presents a summary of the typical soil and rock types encountered at borehole locations during the field investigation, divided into representative geotechnical units.

Table 2 contains a summary of the distribution of the geotechnical units at the test locations.

**TABLE 1 – SUMMARY OF GEOTECHNICAL UNITS AND SOIL / ROCK TYPES**

Unit	Soil Type	Description
1A	FILL – MULCH AND TOPSOIL	Sandy CLAY - low plasticity, pale brown, fine to coarse grained sand, trace fine to medium grained angular to sub-angular gravel, with significant (~40%) mulch inclusions.
1B	FILL – TOPSOIL	Gravelly Sandy CLAY - low to medium plasticity, fine to coarse grained sand, fine to medium grained angular gravel, with some sticks.
1C	FILL – CONTROLLED	Gravelly Sandy CLAY / Gravelly Clayey SAND – low to medium plasticity, grey-brown to brown and dark brown, fine to coarse grained sand, fine to coarse grained (mostly fine to medium grained) angular to sub-angular gravel, trace cobbles in places.
2	SLOPEWASH	Not Encountered during this investigation.



3	ALLUVIUM	Not Encountered during this investigation.
4	RESIDUAL SOIL	<p>Clayey SAND / Sandy GRAVEL - fine to coarse grained sand, pale brown, clay fines of low plasticity, fine to coarse grained sub-rounded to sub-angular and angular gravel.</p> <p>CLAY / Silty CLAY - medium to high plasticity, grey and red-brown / dark brown / grey-brown and yellow-brown, trace fine to medium grained angular gravel, with some fine to coarse grained sand and relict rock structure in places.</p> <p>Sandy CLAY / Gravelly Sandy CLAY / Gravelly CLAY – low to medium and medium to high plasticity, grey to pale grey, brown and pale yellow-brown to red-brown, fine grained sand, fine to medium grained angular gravel.</p>
5	EXTREMELY WEATHERED (XW) ROCK with soil properties	<p>Silty Sandstone / Pebbly Sandstone / Sandstone; breaks down into Gravelly Clayey SAND / SAND / Gravelly Sandy CLAY / Sandy CLAY - fine to coarse grained (mostly fine to medium grained) sand, low to medium plasticity clay, pale grey to white / pale brown to orange-brown, fine to medium grained angular and sub-rounded to rounded gravel.</p> <p>Siltstone; breaks down into Gravelly CLAY / CLAY – low to medium plasticity, pale brown to brown, pale orange-brown and pale grey to white, fine to coarse grained angular gravel, with some fine grained sand.</p> <p>Coal; breaks down into Clayey SAND - fine to medium grained (mostly fine grained), black, fines of low plasticity.</p>
6	HIGHLY WEATHERED (HW) ROCK	<p>Silty SANDSTONE / SANDSTONE - fine to medium grained, pale orange-brown, pale grey to white, and pale yellow-brown, estimated medium to high strength.</p> <p>Pebbly SANDSTONE - fine to coarse grained, pale brown to brown and pale orange-brown, estimated low to medium strength.</p> <p>SILTSTONE / Sandy SILTSTONE – fine grained, pale grey to white and pale yellow-brown, estimated very low to high strength (generally medium strength).</p>

**TABLE 2 – SUMMARY OF GEOTECHNICAL UNITS ENCOUNTERED AT TEST LOCATIONS**

Location	Unit 1A Fill: Mulch and Topsoil	Unit 1B Fill: Topsoil	Unit 1C Fill: -Controlled	Unit 2 Slopewash / Colluvium	Unit 4 Residual Soil	Unit 5 XW Rock	Unit 6 HW Rock
	Depth (m)						
BH701	0.00 – 0.30	-	-	-	-	-	0.30 – 0.40*
BH702	0.00 - 0.30	-	-	-	-	0.30 – 0.50	0.50 – 0.55*
BH703	0.00 – 0.20	-	-	-	0.20 – 0.90		0.90 – 1.20*
BH704	0.00 – 0.15	-	-	-	-	-	0.15 – 1.45^
BH705	0.00 – 0.30	-	-	-	0.30 – 1.30^		-
BH706	0.00 – 0.30	-	-	-	0.30 – 0.40	0.40 – 1.00	1.00 – 1.50*
BH707	0.00 – 0.30	-	-	-	0.30 – 0.50		0.50 – 0.55*
BH708	0.00 – 0.25	-	-	-	0.25 – 0.75	0.75 – 0.90	0.90 – 1.00*
BH709	0.00 – 0.15	-	-	-	0.15 – 1.90	-	1.90 – 2.10
BH710	0.00 – 0.15	-	0.15 – 1.00	-	1.00 – 2.00	-	-
BH711A	0.00 – 0.20	-	0.20 – 1.20	-	1.20 – 1.90*	-	-
BH711B	0.00 – 0.20	-	0.20 – 1.00	-	1.00 – 1.25	-	1.25 – 1.30*
BH712	0.00 – 0.20	-	0.20 – 0.50	-	0.80 – 1.10	0.50 – 0.80 1.50 – 2.00	1.10 – 1.50
BH713	0.00 – 0.20	-	-	-	0.20 – 0.90	-	0.90 – 2.00
BH714	0.00 – 0.30	-	-	-	0.30 – 0.70	1.00 – 2.00	0.70 – 1.00
BH715	0.00 – 0.20	-	-	-	-	-	0.20 – 0.30*

Location	Unit 1A Fill: Mulch and Topsoil	Unit 1B Fill: Topsoil	Unit 1C Fill: -Controlled	Unit 2 Slopewash / Colluvium	Unit 4 Residual Soil	Unit 5 XW Rock	Unit 6 HW Rock
	Depth (m)						
BH716	0.00 – 0.20	-	-	-	-	-	0.20 – 0.30*
BH717	0.00 – 0.15	-	-	-	0.15 – 0.50		0.50 – 0.70*
BH718	0.00 – 0.20	-	-	-	-	-	0.20 – 0.30*
BH719	0.00 – 0.20	-	-	-	-	-	0.20 – 0.25*
BH720	0.00 – 0.25	-	-	-	-	-	0.25 – 0.35*
BH721A	0.00 – 0.20	-	-	-	-	-	0.20 – 0.40*
BH721B	0.00 – 0.20	-	-	-	-	-	0.20 – 0.30*
BH722A	0.00 – 0.10	-	-	-	-	-	0.10 – 0.45*
BH722B	-	0.00 – 0.20	0.20 – 1.40	-	-	-	1.40 – 1.50*
BH723	-	0.00 – 0.15	0.15 – 2.40	-	-	-	2.40 – 2.50
BH724	-	0.00 – 0.30	-	-	0.30 – 0.70	-	0.70 – 0.80*
Notes:	* = Practical refusal to refusal of 2.7 tonne excavator with auger attachment met on weathered rock. ^ = Very slow progress of 2.7 tonne excavator with auger attachment met on weathered rock.						

Groundwater levels or inflows were not encountered in boreholes during the limited time that they remained open on the day of the field investigations.

It should be noted that groundwater conditions can vary due to rainfall and other influences including regional groundwater flow, temperature, permeability, recharge areas, surface condition, and subsoil drainage.

## 5.0 Laboratory Testing

Samples collected during the field investigations were returned to our NATA accredited Newcastle Laboratory for testing which comprised of:

- (9 no.) Shrink / Swell tests; and,
- (4 no.) Atterberg Limits tests.

Results of the laboratory testing are presented in Appendix B, with a summary of the Shrink/Swell and Atterberg Limits test results presented in Table 3 and Table 4, respectively, which also includes results from previous testing on adjacent lots.

**TABLE 3 – SUMMARY OF SHRINK/SWELL TESTING RESULTS**

Location	Depth (m)	Material Description	I <sub>ss</sub> (%)
BH708	0.30 - 0.50	(CH) CLAY	0.9
BH709	0.20 - 0.40	(CH) CLAY	1.2
BH710	0.40 - 0.60	FILL: (CI) Gravelly Sandy CLAY	0.8
BH710	1.00 - 1.20	(CH) CLAY	2.2
BH711A	0.40 - 0.60	FILL: (CI) Gravelly Sandy CLAY	0.4
BH711B	1.10 - 1.25	FILL: (CI) Gravelly Sandy CLAY	1.1
BH712	0.30 - 0.45	FILL: (CI) Gravelly Sandy CLAY	0.6
BH714	0.30 - 0.45	(CL) Sandy CLAY	0.6
BH724	0.45 - 0.65	(CH) Sandy CLAY	0.4

**TABLE 4 – SUMMARY OF ATTERBERG LIMITS TESTING RESULTS**

Location	Depth (m)	Material Description	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Linear Shrinkage (%)
BH706	0.50 - 0.70	(SC) Clayey SAND	27	16	11	5.0
BH713	0.30 - 0.45	(CH) Sandy CLAY	50	20	30	14.0
BH722B	0.40 - 0.55	FILL: (CL) Gravelly Sandy CLAY	28	17	11	3.0
BH723	0.70 – 0.90	FILL: (CL) Gravelly Sandy CLAY	25	14	11	4.5

The results of the Shrink/Swell and Atterberg Limits laboratory testing indicate that the residual soils tested from the site generally contain fines of medium plasticity.

## 6.0 Site Classification to AS2870-2011

Based on the results of the field work, laboratory testing and site regrade works conducted, residential lots located within Precinct 2, Stage 7 of the Brush Creek Estate residential subdivision, as shown on the attached Figure AB1, are classified in their current condition in accordance with AS2870-2011 '*Residential Slabs and Footings*', as shown in Table 5.

**TABLE 5 – SITE CLASSIFICATION TO AS2870-2011**

Lot Numbers	Site Classification
701 to 707, 714 to 721 & 724	<b>M</b>
708 to 713, 722 & 723	<b>H1</b>

A characteristic free surface movement of 20mm to 40mm is estimated for the lots classified as **Class 'M'** in their existing condition.

A characteristic free surface movement of 40mm to 60mm is estimated for the lots classified as **Class 'H1'** in their existing condition.

The effects of changes to the soil profile by additional cutting and filling and the effects of past and future trees should be considered in selection of the design value for differential movement.

If site re-grading works involving cutting or filling are performed after the date of this assessment, the classification may change and further advice should be sought.

Footings for the proposed development should be designed and constructed in accordance with the requirements of AS2870-2011.

The classification presented above assumes that:

- All footings are founded in controlled fill (if applicable) or in the residual clayey soils or rock below all non-controlled fill, topsoil material and root zones, and fill under slab panels meets the requirements of AS2870-2011, in particular, the root zone must be removed prior to the placement of fill materials beneath slabs;
- The performance expectations set out in Appendix B of AS2870-2011 are acceptable, and that site foundation maintenance is undertaken to avoid extremes of wetting and drying;
- Footings are to be founded outside of or below all zones of influence resulting from existing or future service trenches;
- The constructional and architectural requirements for reactive clay sites set out in AS2870-2011 are followed;
- Adherence to the detailing requirement outlined in Section 5 of AS2870-2011 '*Residential Slabs and Footings*' is essential, in particular Section 5.6, '*Additional requirements for Classes M, H1, H2 and E sites*' including architectural restrictions, plumbing and drainage requirements; and,
- Site maintenance complies with the provisions of CSIRO Sheet BTF 18, "*Foundation Maintenance and Footing Performance: A Homeowner's Guide*", a copy of which is attached in Appendix C.

All structural elements on all lots should be supported on footings founded beneath all uncontrolled fill, layers of inadequate bearing capacity, soft/loose, wet or other potentially deleterious material.

If any localised areas of uncontrolled fill of depths greater than 0.4m are encountered during construction, footings should be designed in accordance with engineering principles for Class 'P' sites.

## 7.0 Limitations

The findings presented in the report and used as the basis for recommendations presented herein were obtained using normal, industry accepted geotechnical design practices and standards. To our knowledge, they represent a reasonable interpretation of the general conditions of the site.

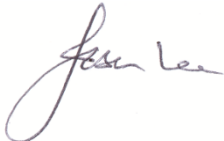
The extent of testing associated with this assessment is limited to discrete test locations. It should be noted that subsurface conditions between and away from the test locations may be different to those observed during the field work and used as the basis of the recommendations contained in this report.

If subsurface conditions encountered during construction differ from those given in this report, further advice should be sought without delay.

Data and opinions contained within the report may not be used in other contexts or for any other purposes without prior review and agreement by Qualtest. If this report is reproduced, it must be in full.

If you have any further questions regarding this report, please do not hesitate to contact Ben Bunting, Shannon Kelly or the undersigned.

For and on behalf of Qualtest Laboratory (NSW) Pty Ltd.



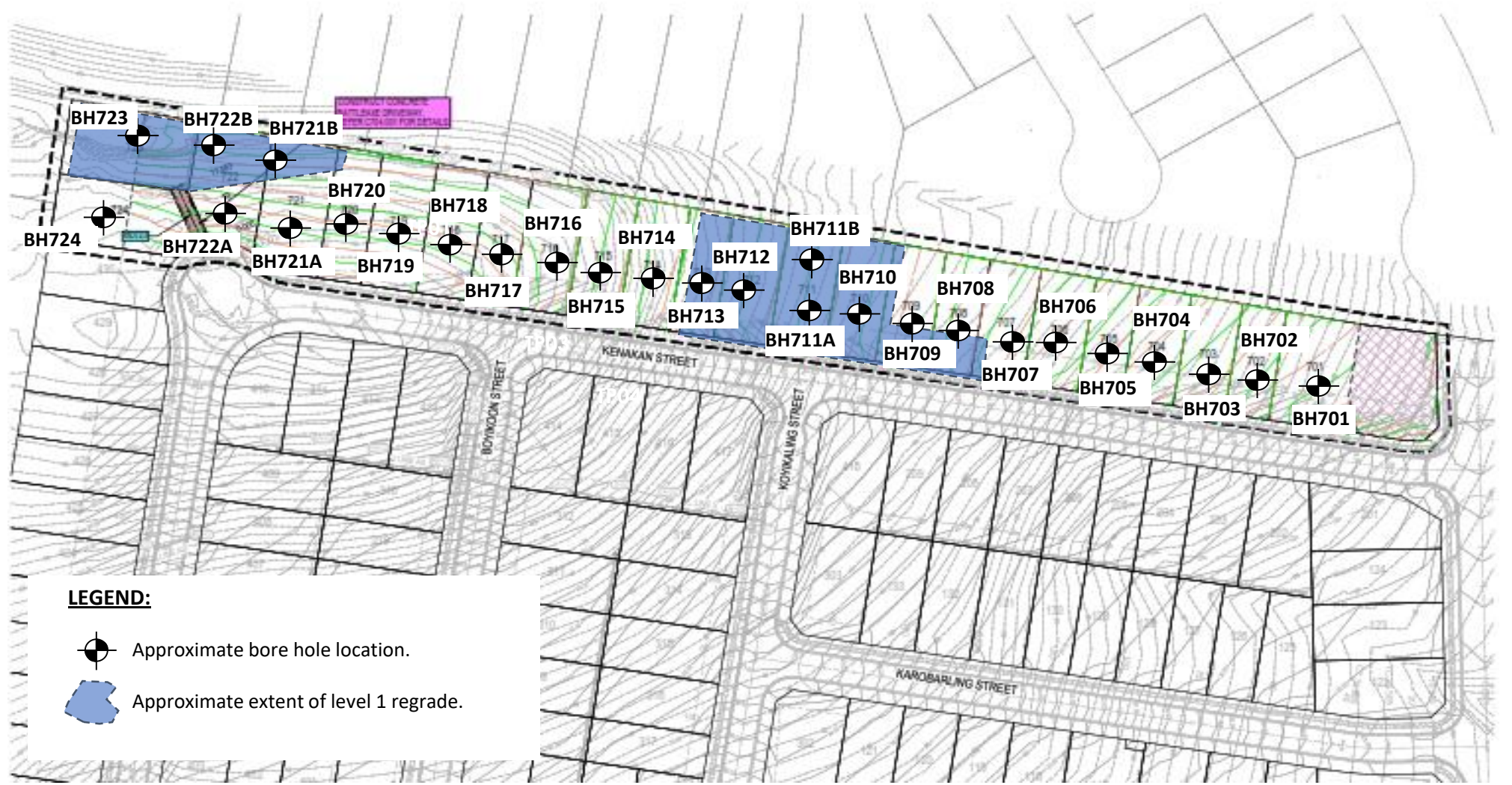
Jason Lee  
Principal Geotechnical Engineer

## **FIGURE AB1:**



**Site Plan and Approximate Test Locations**

## **Sales Plan:**

**Sales Plan for Stage 7 Brush Creek**



**LEGEND:**

-  Approximate bore hole location.
-  Approximate extent of level 1 regrade.



Client:	MCCLOY EDGEWORTH PTY LTD	Drawing No:	FIGURE AB
Project:	BRUSH CREEK SUBDIVISION – PRECINCT 2, STAGE 7	Project No:	NEW18P-0170I
Location:	KENAKAN STREET, EDGEWORTH, NSW, 2285	Scale:	N.T.S.
Title:	SITE PLAN AND APPROXIMATE TEST LOCATIONS	Date:	6/02/2023





# **APPENDIX A:**

## **Results of Field Investigations**



# ENGINEERING LOG - BOREHOLE

**CLIENT:** MCCLOY EDGEWORTH PTY LTD  
**PROJECT:** BRUSH CREEK ESTATE - PRECINCT 2, STAGE 7  
**LOCATION:** BOOTARING BOULEVARDE, EDGEWORTH

**BOREHOLE NO:** BH701  
**PAGE:** 1 OF 1  
**JOB NO:** NEW18P-01701  
**LOGGED BY:** BB  
**DATE:** 17/1/23

**DRILL TYPE:** 2.7 TONNE EXCAVATOR WITH AUGER  
**BOREHOLE DIAMETER:** 300 mm

**SURFACE RL:**  
**DATUM:**

Drilling and Sampling				Material description and profile information					Field Test		Structure and additional observations	
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics, colour, minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type		Result
AD/T	Not Encountered					CL	FILL-TOPSOIL: Sandy CLAY - low plasticity, pale brown, fine to coarse grained sand, trace fine to medium grained angular to sub-angular gravel, with significant (~40%) mulch inclusions.	M < w <sub>p</sub>				FILL - TOPSOIL / MULCH
							Silty SANDSTONE - fine to medium grained, pale orange-brown, estimated medium strength.	D				HIGHLY TO MODERATELY WEATHERED ROCK
				0.5			Hole Terminated at 0.40 m Practical Refusal					
				1.0								
				1.5								
				2.0								

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<b>LEGEND:</b> <b>Water</b> Water Level (Date and time shown) Water Inflow Water Outflow <b>Strata Changes</b> Gradational or transitional strata Definitive or distinct strata change	<b>Notes, Samples and Tests</b> U <sub>30</sub> 50mm Diameter tube sample CBR Bulk sample for CBR testing E Environmental sample (Glass jar, sealed and chilled on site) ASS Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled) B Bulk Sample	<b>Consistency</b> VS Very Soft <25 S Soft 25 - 50 F Firm 50 - 100 St Stiff 100 - 200 VSt Very Stiff 200 - 400 H Hard >400 Fb Friable	<b>UCS (kPa)</b> <25 25 - 50 50 - 100 100 - 200 200 - 400 >400	<b>Moisture Condition</b> D Dry M Moist W Wet W <sub>p</sub> Plastic Limit W <sub>L</sub> Liquid Limit
	<b>Field Tests</b> PID Photoionisation detector reading (ppm) DCP(x-y) Dynamic penetrometer test (test depth interval shown) HP Hand Penetrometer test (UCS kPa)	<b>Density</b> V Very Loose L Loose MD Medium Dense D Dense VD Very Dense	Density Index <15% Density Index 15 - 35% Density Index 35 - 65% Density Index 65 - 85% Density Index 85 - 100%	



# ENGINEERING LOG - BOREHOLE

**CLIENT:** MCCLOY EDGEWORTH PTY LTD  
**PROJECT:** BRUSH CREEK ESTATE - PRECINCT 2, STAGE 7  
**LOCATION:** BOOTARING BOULEVARDE, EDGEWORTH

**BOREHOLE NO:** BH702  
**PAGE:** 1 OF 1  
**JOB NO:** NEW18P-01701  
**LOGGED BY:** BB  
**DATE:** 17/1/23

**DRILL TYPE:** 2.7 TONNE EXCAVATOR WITH AUGER  
**BOREHOLE DIAMETER:** 300 mm

**SURFACE RL:**  
**DATUM:**

Drilling and Sampling				Material description and profile information					Field Test		Structure and additional observations	
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics, colour, minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type		Result
AD/T	Not Encountered			0.5		CL	FILL-TOPSOIL: Sandy CLAY - low plasticity, pale brown, fine to coarse grained sand, trace fine to medium grained angular to sub-angular gravel, with significant (~40%) mulch inclusions.	M < w <sub>p</sub>				FILL - TOPSOIL / MULCH
						SC	Extremely Weathered Silty Sandstone with soil properties; breaks down into Gravelly Clayey SAND - fine to medium grained, pale grey to white, fine to medium grained angular gravel, fines of low plasticity.	D	VD		EXTREMELY WEATHERED ROCK	
							Silty SANDSTONE - fine to medium grained, pale orange-brown, estimated medium strength.				HIGHLY TO MODERATELY WEATHERED ROCK	
							Hole Terminated at 0.55 m Practical Refusal					

OT.LIB.1.1.GLB.Log\_NON-CORED BOREHOLE - TEST PIT\_NEW18P-01701-AB DRAFT LOGS.GPJ -<DrawingFile> 07/02/2023, 12:06:10.01.00.01 Datagel Lab and In Situ Tool

<b>LEGEND:</b> <b>Water</b> Water Level (Date and time shown) Water Inflow Water Outflow <b>Strata Changes</b> Gradational or transitional strata Definitive or distinct strata change	<b>Notes, Samples and Tests</b> U <sub>30</sub> 50mm Diameter tube sample CBR Bulk sample for CBR testing E Environmental sample (Glass jar, sealed and chilled on site) ASS Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled) B Bulk Sample	<b>Consistency</b> VS Very Soft <25 S Soft 25 - 50 F Firm 50 - 100 St Stiff 100 - 200 VSt Very Stiff 200 - 400 H Hard >400 Fb Friable	<b>UCS (kPa)</b> <25 25 - 50 50 - 100 100 - 200 200 - 400 >400	<b>Moisture Condition</b> D Dry M Moist W Wet W <sub>p</sub> Plastic Limit W <sub>L</sub> Liquid Limit
	<b>Field Tests</b> PID Photoionisation detector reading (ppm) DCP(x-y) Dynamic penetrometer test (test depth interval shown) HP Hand Penetrometer test (UCS kPa)	<b>Density</b> V Very Loose L Loose MD Medium Dense D Dense VD Very Dense	Density Index <15% Density Index 15 - 35% Density Index 35 - 65% Density Index 65 - 85% Density Index 85 - 100%	



# ENGINEERING LOG - BOREHOLE

**CLIENT:** MCCLOY EDGEWORTH PTY LTD  
**PROJECT:** BRUSH CREEK ESTATE - PRECINCT 2, STAGE 7  
**LOCATION:** BOOTARING BOULEVARDE, EDGEWORTH

**BOREHOLE NO:** BH703  
**PAGE:** 1 OF 1  
**JOB NO:** NEW18P-01701  
**LOGGED BY:** BB  
**DATE:** 17/1/23

**DRILL TYPE:** 2.7 TONNE EXCAVATOR WITH AUGER  
**BOREHOLE DIAMETER:** 300 mm

**SURFACE RL:**  
**DATUM:**

Drilling and Sampling				Material description and profile information					Field Test		Structure and additional observations	
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics, colour, minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type		Result
AD/T	Not Encountered					CL	FILL-TOPSOIL: Sandy CLAY - low plasticity, pale brown, fine to coarse grained sand, trace fine to medium grained angular to sub-angular gravel, with significant (~40%) mulch inclusions.	M < Wp				FILL - TOPSOIL / MULCH
				0.20m		SC	Clayey SAND - fine to coarse grained, pale brown, fines of low plasticity, with some fine grained sub-rounded to sub-angular gravel.	D - M D - VD				RESIDUAL SOIL / EXTREMELY WEATHERED ROCK
				0.90m			Pebbly SANDSTONE - fine to coarse grained, pale brown to pale orange-brown, estimated low to medium strength.	D				HIGHLY WEATHERED ROCK
				1.15m			SILTSTONE - pale grey to white, estimated medium to high strength.					
				1.20m			Hole Terminated at 1.20 m Practical Refusal					

OT LIB 1.1.GLB Log NON-CORED BOREHOLE - TEST PIT NEW18P-01701-AB DRAFT LOGS.GPJ <<DrawingFile>> 07/02/2023 12:06 10.01.00.01 Datgell Lab and In Situ Tool

<b>LEGEND:</b> <b>Water</b> Water Level (Date and time shown) Water Inflow Water Outflow <b>Strata Changes</b> Gradational or transitional strata Definitive or distinct strata change	<b>Notes, Samples and Tests</b> U <sub>30</sub> 50mm Diameter tube sample CBR Bulk sample for CBR testing E Environmental sample (Glass jar, sealed and chilled on site) ASS Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled) B Bulk Sample <b>Field Tests</b> PID Photoionisation detector reading (ppm) DCP(x-y) Dynamic penetrometer test (test depth interval shown) HP Hand Penetrometer test (UCS kPa)	<b>Consistency</b> VS Very Soft S Soft F Firm St Stiff VSt Very Stiff H Hard Fb Friable	<b>UCS (kPa)</b> <25 25 - 50 50 - 100 100 - 200 200 - 400 >400	<b>Moisture Condition</b> D Dry M Moist W Wet W <sub>p</sub> Plastic Limit W <sub>L</sub> Liquid Limit
		<b>Density</b> V Very Loose L Loose MD Medium Dense D Dense VD Very Dense	Density Index <15% Density Index 15 - 35% Density Index 35 - 65% Density Index 65 - 85% Density Index 85 - 100%	



# ENGINEERING LOG - BOREHOLE

**CLIENT:** MCCLOY EDGEWORTH PTY LTD  
**PROJECT:** BRUSH CREEK ESTATE - PRECINCT 2, STAGE 7  
**LOCATION:** BOOTARING BOULEVARDE, EDGEWORTH

**BOREHOLE NO:** BH704  
**PAGE:** 1 OF 1  
**JOB NO:** NEW18P-01701  
**LOGGED BY:** BB  
**DATE:** 17/1/23

**DRILL TYPE:** 2.7 TONNE EXCAVATOR WITH AUGER  
**BOREHOLE DIAMETER:** 300 mm

**SURFACE RL:**  
**DATUM:**

Drilling and Sampling				Material description and profile information					Field Test		Structure and additional observations	
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics, colour, minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type		Result
AD/T	Not Encountered			0.5		CL	FILL-TOPSOIL: Sandy CLAY - low plasticity, pale brown, fine to coarse grained sand, trace fine to medium grained angular to sub-angular gravel, with significant (~40%) mulch inclusions.	M < Wp				FILL - TOPSOIL / MULCH
							Silty SANDSTONE - fine to medium grained, pale orange-brown, estimated low strength.					D
				1.0			Pockets of Extremely Weathered rock.					
				1.45m			Hole Terminated at 1.45 m Very slow progress					
				1.5								
				2.0								

**LEGEND:**

**Water**

- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

**Strata Changes**

- Gradational or transitional strata
- Definitive or distinct strata change

**Notes, Samples and Tests**

- U<sub>30</sub> 50mm Diameter tube sample
- CBR Bulk sample for CBR testing
- E Environmental sample (Glass jar, sealed and chilled on site)
- ASS Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled)
- B Bulk Sample

**Field Tests**

- PID Photoionisation detector reading (ppm)
- DCP(x-y) Dynamic penetrometer test (test depth interval shown)
- HP Hand Penetrometer test (UCS kPa)

<b>Consistency</b>		<b>UCS (kPa)</b>	<b>Moisture Condition</b>	
VS	Very Soft	<25	D	Dry
S	Soft	25 - 50	M	Moist
F	Firm	50 - 100	W	Wet
St	Stiff	100 - 200	W <sub>p</sub>	Plastic Limit
VSt	Very Stiff	200 - 400	W <sub>L</sub>	Liquid Limit
H	Hard	>400		
Fb	Friable			
<b>Density</b>				
V	Very Loose		Density Index <15%	
L	Loose		Density Index 15 - 35%	
MD	Medium Dense		Density Index 35 - 65%	
D	Dense		Density Index 65 - 85%	
VD	Very Dense		Density Index 85 - 100%	

OT LIB 1.1.GLB Log NON-CORED BOREHOLE - TEST PIT\_NEW18P-01701-AB DRAFT LOGS.GPJ <<DrawingFile>> 07/02/2023, 12:06 10.01.00.01 Datgell Lab and In Situ Tool



# ENGINEERING LOG - BOREHOLE

**CLIENT:** MCCLOY EDGEWORTH PTY LTD  
**PROJECT:** BRUSH CREEK ESTATE - PRECINCT 2, STAGE 7  
**LOCATION:** BOOTARING BOULEVARDE, EDGEWORTH

**BOREHOLE NO:** BH705  
**PAGE:** 1 OF 1  
**JOB NO:** NEW18P-01701  
**LOGGED BY:** BB  
**DATE:** 17/1/23

**DRILL TYPE:** 2.7 TONNE EXCAVATOR WITH AUGER  
**BOREHOLE DIAMETER:** 300 mm

**SURFACE RL:**  
**DATUM:**

Drilling and Sampling				Material description and profile information					Field Test		Structure and additional observations	
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics, colour, minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type		Result
AD/T	Not Encountered			0.5		CL	FILL-TOPSOIL: Sandy CLAY - low plasticity, pale brown, fine to coarse grained sand, trace fine to medium grained angular to sub-angular gravel, with significant (~40%) mulch inclusions.	M < w <sub>p</sub>				FILL - TOPSOIL / MULCH
							0.30m	Extremely Weathered Pebbly Sandstone with soil properties; breaks down into SAND - fine to coarse grained, pale brown, with some fine grained sub-rounded to rounded gravel, trace fines of low plasticity.	D	VD		EXTREMELY WEATHERED ROCK / RESIDUAL SOIL
				1.0		SP						
				1.30m			Hole Terminated at 1.30 m Very slow progress					
				1.5								
				2.0								

OT LIB 1.1.GLB Log\_NON-CORED BOREHOLE - TEST PIT\_NEW18P-01701-AB DRAFT LOGS.GPJ -<DrawingFile> 07/02/2023 12:06 10.01.00.01 Datagel Lab and In Situ Tool

<b>LEGEND:</b> <b>Water</b> Water Level (Date and time shown) Water Inflow Water Outflow <b>Strata Changes</b> Gradational or transitional strata Definitive or distinct strata change	<b>Notes, Samples and Tests</b> U <sub>30</sub> 50mm Diameter tube sample CBR Bulk sample for CBR testing E Environmental sample (Glass jar, sealed and chilled on site) ASS Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled) B Bulk Sample	<b>Consistency</b> VS Very Soft S Soft F Firm St Stiff VSt Very Stiff H Hard Fb Friable	<b>UCS (kPa)</b> <25 25 - 50 50 - 100 100 - 200 200 - 400 >400	<b>Moisture Condition</b> D Dry M Moist W Wet W <sub>p</sub> Plastic Limit W <sub>L</sub> Liquid Limit
	<b>Field Tests</b> PID Photoionisation detector reading (ppm) DCP(x-y) Dynamic penetrometer test (test depth interval shown) HP Hand Penetrometer test (UCS kPa)	<b>Density</b> V Very Loose L Loose MD Medium Dense D Dense VD Very Dense	Density Index <15% Density Index 15 - 35% Density Index 35 - 65% Density Index 65 - 85% Density Index 85 - 100%	



# ENGINEERING LOG - BOREHOLE

**CLIENT:** MCCLOY EDGEWORTH PTY LTD  
**PROJECT:** BRUSH CREEK ESTATE - PRECINCT 2, STAGE 7  
**LOCATION:** BOOTARING BOULEVARDE, EDGEWORTH

**BOREHOLE NO:** BH706  
**PAGE:** 1 OF 1  
**JOB NO:** NEW18P-01701  
**LOGGED BY:** BB  
**DATE:** 17/1/23

**DRILL TYPE:** 2.7 TONNE EXCAVATOR WITH AUGER  
**BOREHOLE DIAMETER:** 300 mm

**SURFACE RL:**  
**DATUM:**

Drilling and Sampling				Material description and profile information					Field Test		Structure and additional observations
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics, colour, minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	
AD/T	Not Encountered	U50		0.5		CL	FILL-TOPSOIL: Sandy CLAY - low plasticity, pale brown, fine to coarse grained sand, trace fine to medium grained angular to sub-angular gravel, with significant (~40%) mulch inclusions.	M < w <sub>p</sub>			FILL - TOPSOIL / MULCH
						SP	Extremely Weathered Pebbly Sandstone with soil properties; breaks down into SAND - fine to coarse grained, pale brown, with some fine grained sub-rounded to rounded gravel, trace fines of low plasticity.			EXTREMELY WEATHERED ROCK / RESIDUAL SOIL	
						SC	Extremely Weathered Silty Sandstone with soil properties; breaks down into Gravelly Clayey SAND - fine to medium grained, pale grey to white, fine to medium grained angular gravel, fines of low plasticity.	D - M	VD	EXTREMELY WEATHERED ROCK	
							Pebbly SANDSTONE - fine to coarse grained, pale brown to brown, estimated low to medium strength.	D		HIGHLY WEATHERED ROCK	
				1.5			Hole Terminated at 1.50 m Practical Refusal				

**LEGEND:**  
**Water**  
 Water Level (Date and time shown)  
 Water Inflow  
 Water Outflow  
**Strata Changes**  
 Gradational or transitional strata  
 Definitive or distinct strata change

**Notes, Samples and Tests**  
U<sub>30</sub> 50mm Diameter tube sample  
CBR Bulk sample for CBR testing  
E Environmental sample (Glass jar, sealed and chilled on site)  
ASS Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled)  
B Bulk Sample  
**Field Tests**  
PID Photoionisation detector reading (ppm)  
DCP(x-y) Dynamic penetrometer test (test depth interval shown)  
HP Hand Penetrometer test (UCS kPa)

<b>Consistency</b>		<b>UCS (kPa)</b>	<b>Moisture Condition</b>	
VS	Very Soft	<25	D	Dry
S	Soft	25 - 50	M	Moist
F	Firm	50 - 100	W	Wet
St	Stiff	100 - 200	W <sub>p</sub>	Plastic Limit
VSt	Very Stiff	200 - 400	W <sub>L</sub>	Liquid Limit
H	Hard	>400		
Fb	Friable			
<b>Density</b>				
V	Very Loose		Density Index <15%	
L	Loose		Density Index 15 - 35%	
MD	Medium Dense		Density Index 35 - 65%	
D	Dense		Density Index 65 - 85%	
VD	Very Dense		Density Index 85 - 100%	





# ENGINEERING LOG - BOREHOLE

**CLIENT:** MCCLOY EDGEWORTH PTY LTD  
**PROJECT:** BRUSH CREEK ESTATE - PRECINCT 2, STAGE 7  
**LOCATION:** BOOTARING BOULEVARDE, EDGEWORTH

**BOREHOLE NO:** BH707  
**PAGE:** 1 OF 1  
**JOB NO:** NEW18P-01701  
**LOGGED BY:** BB  
**DATE:** 17/1/23

**DRILL TYPE:** 2.7 TONNE EXCAVATOR WITH AUGER  
**BOREHOLE DIAMETER:** 300 mm

**SURFACE RL:**  
**DATUM:**

Drilling and Sampling				Material description and profile information					Field Test		Structure and additional observations
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics, colour, minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	
AD/T	Not Encountered			0.5		CL	FILL-TOPSOIL: Sandy CLAY - low plasticity, pale brown, fine to coarse grained sand, trace fine to medium grained angular to sub-angular gravel, with significant (~40%) mulch inclusions, trace cobbles.	M < w <sub>p</sub>			FILL - TOPSOIL / MULCH
						SP	Sandy GRAVEL - fine to coarse grained, angular, brown, fine to coarse grained sand, with some fines of low plasticity.	D - M		RESIDUAL SOIL / EXTREMELY WEATHERED ROCK	
							Pebble SANDSTONE - fine to coarse grained, pale brown to pale orange-brown, estimated low to medium strength.	D		HIGHLY WEATHERED ROCK	
							Hole Terminated at 0.55 m Practical Refusal				

OT.LIB.1.1.GLB.Log\_NON-CORED BOREHOLE - TEST.PIT\_NEW18P-01701-AB DRAFT LOGS.GPJ - <<DrawingFile>> 07/02/2023, 12:06:10.01.00.01 Datagel Lab and In Situ Tool

<b>LEGEND:</b> <b>Water</b> Water Level (Date and time shown) Water Inflow Water Outflow <b>Strata Changes</b> Gradational or transitional strata Definitive or distinct strata change	<b>Notes, Samples and Tests</b> U <sub>30</sub> 50mm Diameter tube sample CBR Bulk sample for CBR testing E Environmental sample (Glass jar, sealed and chilled on site) ASS Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled) B Bulk Sample	<b>Consistency</b> VS Very Soft <25 S Soft 25 - 50 F Firm 50 - 100 St Stiff 100 - 200 VSt Very Stiff 200 - 400 H Hard >400 Fb Friable	<b>UCS (kPa)</b> <25 25 - 50 50 - 100 100 - 200 200 - 400 >400	<b>Moisture Condition</b> D Dry M Moist W Wet W <sub>p</sub> Plastic Limit W <sub>L</sub> Liquid Limit
	<b>Field Tests</b> PID Photoionisation detector reading (ppm) DCP(x-y) Dynamic penetrometer test (test depth interval shown) HP Hand Penetrometer test (UCS kPa)	<b>Density</b> V Very Loose L Loose MD Medium Dense D Dense VD Very Dense	Density Index <15% Density Index 15 - 35% Density Index 35 - 65% Density Index 65 - 85% Density Index 85 - 100%	



# ENGINEERING LOG - BOREHOLE

**CLIENT:** MCCLOY EDGEWORTH PTY LTD  
**PROJECT:** BRUSH CREEK ESTATE - PRECINCT 2, STAGE 7  
**LOCATION:** BOOTARING BOULEVARDE, EDGEWORTH

**BOREHOLE NO:** BH708  
**PAGE:** 1 OF 1  
**JOB NO:** NEW18P-01701  
**LOGGED BY:** BB  
**DATE:** 17/1/23

**DRILL TYPE:** 2.7 TONNE EXCAVATOR WITH AUGER  
**BOREHOLE DIAMETER:** 300 mm

**SURFACE RL:**  
**DATUM:**

Drilling and Sampling				Material description and profile information					Field Test		Structure and additional observations	
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics, colour, minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type		Result
AD/T	Not Encountered	0.30m				CL	FILL-TOPSOIL: Sandy CLAY - low plasticity, pale brown, fine to coarse grained sand, trace fine to medium grained angular to sub-angular gravel, with significant (~40%) mulch inclusions.	M ~ W <sub>p</sub>				FILL - TOPSOIL / MULCH
		U50				CH	CLAY - medium to high plasticity, grey and red-brown, trace fine to medium grained angular gravel.	M > W <sub>p</sub>	VSt	HP	250	RESIDUAL SOIL / POSSIBLE FILL
		0.50m				CI	Extremely Weathered Sandstone with soil properties; breaks down into Gravelly Sandy CLAY - medium plasticity, grey to grey-brown, fine to medium grained angular gravel, fine grained sand.	M < W <sub>p</sub>	H			EXTREMELY WEATHERED ROCK
						SILTSTONE	SILTSTONE - pale grey to white, estimated medium to high strength.	D				
				1.0			Hole Terminated at 1.00 m Practical Refusal					

OT.LIB.1.1.GLB.Log.NON-CORED.BOREHOLE - TEST.PIT.NEW18P-01701-AB.DRAFT.LOGS.GPJ - <<DrawingFile>> 07/02/2023.12:06 10.01.00.01 Datagel.Lab.and.In.Situ.Tool

<b>LEGEND:</b> <b>Water</b> Water Level (Date and time shown) Water Inflow Water Outflow <b>Strata Changes</b> Gradational or transitional strata Definitive or distinct strata change	<b>Notes, Samples and Tests</b> U <sub>30</sub> 50mm Diameter tube sample CBR Bulk sample for CBR testing E Environmental sample (Glass jar, sealed and chilled on site) ASS Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled) B Bulk Sample	<b>Consistency</b> VS Very Soft <25 S Soft 25 - 50 F Firm 50 - 100 St Stiff 100 - 200 VSt Very Stiff 200 - 400 H Hard >400 Fb Friable	<b>UCS (kPa)</b> <25 25 - 50 50 - 100 100 - 200 200 - 400 >400	<b>Moisture Condition</b> D Dry M Moist W Wet W <sub>p</sub> Plastic Limit W <sub>L</sub> Liquid Limit
	<b>Field Tests</b> PID Photoionisation detector reading (ppm) DCP(x-y) Dynamic penetrometer test (test depth interval shown) HP Hand Penetrometer test (UCS kPa)	<b>Density</b> V Very Loose L Loose MD Medium Dense D Dense VD Very Dense	Density Index <15% Density Index 15 - 35% Density Index 35 - 65% Density Index 65 - 85% Density Index 85 - 100%	



# ENGINEERING LOG - BOREHOLE

**CLIENT:** MCCLOY EDGEWORTH PTY LTD  
**PROJECT:** BRUSH CREEK ESTATE - PRECINCT 2, STAGE 7  
**LOCATION:** BOOTARING BOULEVARDE, EDGEWORTH

**BOREHOLE NO:** BH709  
**PAGE:** 1 OF 1  
**JOB NO:** NEW18P-01701  
**LOGGED BY:** BB  
**DATE:** 17/1/23

**DRILL TYPE:** 2.7 TONNE EXCAVATOR WITH AUGER  
**BOREHOLE DIAMETER:** 300 mm

**SURFACE RL:**  
**DATUM:**

Drilling and Sampling				Material description and profile information					Field Test		Structure and additional observations	
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics, colour, minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type		Result
AD/T	Not Encountered	0.20m				CL	FILL-TOPSOIL: Sandy CLAY - low plasticity, pale brown, fine to coarse grained sand, trace fine to medium grained angular to sub-angular gravel, with significant (~40%) mulch inclusions.	M < w <sub>p</sub>		HP	350	FILL - TOPSOIL / MULCH
		U50				CLAY - medium to high plasticity, grey and red-brown, trace fine to medium grained angular gravel.						
		0.40m				CH		M ~ w <sub>p</sub>	VSt	HP	380	
						CH		VSt / Fb	HP	310		
			CH		VSt	HP	300					
						CH	Silty CLAY - medium to high plasticity, grey-brown and yellow-brown, fine grained sand, with some relict rock structure.	M > w <sub>p</sub>	VSt	HP	250	RESIDUAL SOIL
						D	CLAY - high plasticity, dark brown.					
							SILTSTONE - pale grey to white, estimated medium to high strength.					
							Hole Terminated at 2.10 m					

**LEGEND:**

**Water**

- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

**Strata Changes**

- Gradational or transitional strata
- Definitive or distinct strata change

**Notes, Samples and Tests**

- U<sub>30</sub> 50mm Diameter tube sample
- CBR Bulk sample for CBR testing
- E Environmental sample (Glass jar, sealed and chilled on site)
- ASS Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled)
- B Bulk Sample

**Field Tests**

- PID Photoionisation detector reading (ppm)
- DCP(x-y) Dynamic penetrometer test (test depth interval shown)
- HP Hand Penetrometer test (UCS kPa)

Consistency	UCS (kPa)	Moisture Condition
VS Very Soft	<25	D Dry
S Soft	25 - 50	M Moist
F Firm	50 - 100	W Wet
St Stiff	100 - 200	W <sub>p</sub> Plastic Limit
VSt Very Stiff	200 - 400	W <sub>L</sub> Liquid Limit
H Hard	>400	
Fb Friable		
Density		
V Very Loose		Density Index <15%
L Loose		Density Index 15 - 35%
MD Medium Dense		Density Index 35 - 65%
D Dense		Density Index 65 - 85%
VD Very Dense		Density Index 85 - 100%

OT.LIB.1.1.GLB.Log\_NON-CORED BOREHOLE - TEST PIT\_NEW18P-01701-AB DRAFT LOGS.GPJ -<<DrawingFile>> 07/02/2023, 12:06 10.01.00.01 Datigel Lab and In Situ Tool





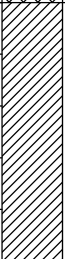
# ENGINEERING LOG - BOREHOLE

**CLIENT:** MCCLOY EDGEWORTH PTY LTD  
**PROJECT:** BRUSH CREEK ESTATE - PRECINCT 2, STAGE 7  
**LOCATION:** BOOTARING BOULEVARDE, EDGEWORTH

**BOREHOLE NO:** BH710  
**PAGE:** 1 OF 1  
**JOB NO:** NEW18P-01701  
**LOGGED BY:** BB  
**DATE:** 17/1/23

**DRILL TYPE:** 2.7 TONNE EXCAVATOR WITH AUGER  
**BOREHOLE DIAMETER:** 300 mm

**SURFACE RL:**  
**DATUM:**

Drilling and Sampling				Material description and profile information					Field Test		Structure and additional observations	
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics, colour, minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type		Result
AD/T	Not Encountered	0.40m		0.5		CL	0.15m FILL-TOPSOIL: Sandy CLAY - low plasticity, pale brown, fine to coarse grained sand, trace fine to medium grained angular to sub-angular gravel, with significant (~40%) mulch inclusions. FILL: Gravelly Sandy CLAY - medium plasticity, grey-brown to brown, fine to coarse grained sand, fine to coarse grained (mostly fine to medium grained) angular to sub-angular gravel.	M ~ W <sub>p</sub>	VSt / Fb	HP	210	FILL - TOPSOIL / MULCH
		U50										
		0.60m		1.0		CI	CLAY - medium to high plasticity, grey, with some fine to medium grained sand.	M > W <sub>p</sub>	VSt	HP	230	RESIDUAL SOIL / POSSIBLE FILL
		U50										
1.00m		1.5		CH	With some fine to coarse grained sand, and with some fine grained angular gravel.	M > W <sub>p</sub>	VSt	HP	250	RESIDUAL SOIL		
1.20m												
				2.0		CH	1.50m CLAY - high plasticity, dark brown. With some fine to coarse grained sand. Orange-brown. 2.00m					
							Hole Terminated at 2.00 m					

**LEGEND:**

**Water**

- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

**Strata Changes**

- Gradational or transitional strata
- Definitive or distinct strata change

**Notes, Samples and Tests**

- U<sub>30</sub> 50mm Diameter tube sample
- CBR Bulk sample for CBR testing
- E Environmental sample (Glass jar, sealed and chilled on site)
- ASS Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled)
- B Bulk Sample

**Field Tests**

- PID Photoionisation detector reading (ppm)
- DCP(x-y) Dynamic penetrometer test (test depth interval shown)
- HP Hand Penetrometer test (UCS kPa)

Consistency		UCS (kPa)	Moisture Condition
VS	Very Soft	<25	D Dry
S	Soft	25 - 50	M Moist
F	Firm	50 - 100	W Wet
St	Stiff	100 - 200	W <sub>p</sub> Plastic Limit
VSt	Very Stiff	200 - 400	W <sub>L</sub> Liquid Limit
H	Hard	>400	
Fb	Friable		
Density			
V	Very Loose		Density Index <15%
L	Loose		Density Index 15 - 35%
MD	Medium Dense		Density Index 35 - 65%
D	Dense		Density Index 65 - 85%
VD	Very Dense		Density Index 85 - 100%

OT.LIB.1.1.GLB.Log\_NON-CORED BOREHOLE - TEST PIT\_NEW18P-01701-AB DRAFT LOGS.GPJ - <<DrawingFile>> 07/02/2023, 12:06 10.01.00.01 Datggl.Lab and In Situ Tool



# ENGINEERING LOG - BOREHOLE

**CLIENT:** MCCLOY EDGEWORTH PTY LTD  
**PROJECT:** BRUSH CREEK ESTATE - PRECINCT 2, STAGE 7  
**LOCATION:** BOOTARING BOULEVARDE, EDGEWORTH

**BOREHOLE NO:** BH711A  
**PAGE:** 1 OF 1  
**JOB NO:** NEW18P-01701  
**LOGGED BY:** BB  
**DATE:** 17/1/23

**DRILL TYPE:** 2.7 TONNE EXCAVATOR WITH AUGER  
**BOREHOLE DIAMETER:** 300 mm

**SURFACE RL:**  
**DATUM:**

Drilling and Sampling				Material description and profile information					Field Test		Structure and additional observations		
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics, colour, minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type		Result	
AD/T	Not Encountered	U50		0.40m		CL	FILL-TOPSOIL: Sandy CLAY - low plasticity, pale brown, fine to coarse grained sand, trace fine to medium grained angular to sub-angular gravel, with significant (~40%) mulch inclusions.	M < w <sub>p</sub>				FILL - TOPSOIL / MULCH	
				0.60m		CI	FILL: Gravelly Sandy CLAY - medium plasticity, dark brown, trace pale brown, fine to coarse grained sand, fine to coarse grained (mostly fine to medium grained) angular to sub-angular gravel.	M > w <sub>p</sub>	VSt / Fb	HP	280	FILL - CONTROLLED	
						CI	FILL: Gravelly Sandy CLAY - medium plasticity, pale brown to dark brown, fine to coarse grained sand, fine to coarse grained (mostly fine to medium grained) angular to sub-angular gravel.						
						CH	Sandy CLAY - high plasticity, grey and pale orange-brown, fine grained sand.	VSt	HP	300	RESIDUAL SOIL / POSSIBLE FILL		
						CH	Gravelly Sandy CLAY - medium to high plasticity, brown and pale yellow-brown with some grey, fine to coarse grained sand, fine to medium grained angular gravel.	VSt / Fb					
				2.0			Hole Terminated at 1.90 m Practical Refusal						

**LEGEND:**

**Water**

- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

**Strata Changes**

- Gradational or transitional strata
- Definitive or distinct strata change

**Notes, Samples and Tests**

- U<sub>30</sub> 50mm Diameter tube sample
- CBR Bulk sample for CBR testing
- E Environmental sample (Glass jar, sealed and chilled on site)
- ASS Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled)
- B Bulk Sample

**Field Tests**

- PID Photoionisation detector reading (ppm)
- DCP(x-y) Dynamic penetrometer test (test depth interval shown)
- HP Hand Penetrometer test (UCS kPa)

<b>Consistency</b>		<b>UCS (kPa)</b>	<b>Moisture Condition</b>
VS	Very Soft	<25	D Dry
S	Soft	25 - 50	M Moist
F	Firm	50 - 100	W Wet
St	Stiff	100 - 200	W <sub>p</sub> Plastic Limit
VSt	Very Stiff	200 - 400	W <sub>L</sub> Liquid Limit
H	Hard	>400	
Fb	Friable		
<b>Density</b>			
V	Very Loose		Density Index <15%
L	Loose		Density Index 15 - 35%
MD	Medium Dense		Density Index 35 - 65%
D	Dense		Density Index 65 - 85%
VD	Very Dense		Density Index 85 - 100%

OT.LIB.1.1.GLB.Log\_NON-CORED BOREHOLE - TEST PIT\_NEW18P-01701-AB DRAFT LOGS.GPJ -<DrawingFile> 07/02/2023, 12:06:10.01.00.01 Datagel Lab and In Situ Tool





# ENGINEERING LOG - BOREHOLE

**CLIENT:** MCCLOY EDGEWORTH PTY LTD  
**PROJECT:** BRUSH CREEK ESTATE - PRECINCT 2, STAGE 7  
**LOCATION:** BOOTARING BOULEVARDE, EDGEWORTH

**BOREHOLE NO:** BH712  
**PAGE:** 1 OF 1  
**JOB NO:** NEW18P-01701  
**LOGGED BY:** BB  
**DATE:** 17/1/23

**DRILL TYPE:** 2.7 TONNE EXCAVATOR WITH AUGER  
**BOREHOLE DIAMETER:** 300 mm

**SURFACE RL:**  
**DATUM:**

Drilling and Sampling				Material description and profile information					Field Test		Structure and additional observations	
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics, colour, minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type		Result
AD/T	Not Encountered	U50 0.45m		0.30m	0.5	CL	FILL-TOPSOIL: Sandy CLAY - low plasticity, pale brown, fine to coarse grained sand, trace fine to medium grained angular to sub-angular gravel, with significant (~40%) mulch inclusions.	M < W <sub>p</sub>				FILL - TOPSOIL / MULCH
						CI	FILL: Gravelly Sandy CLAY - medium plasticity, grey-brown to brown, fine to coarse grained sand, fine to coarse grained (mostly fine to medium grained) angular to sub-angular gravel.	M ~ W <sub>p</sub>	VSt / Fb		FILL - CONTROLLED	
							SILTSTONE - pale grey and red-brown, estimated low to medium strength, fractured, with some medium to high plasticity CLAY seams.				EXTREMELY TO HIGHLY WEATHERED ROCK	
						CH	Gravelly CLAY - medium to high plasticity, pale grey to white with some pale red-brown, fine to coarse grained angular gravel.		VSt	HP 380	RESIDUAL SOIL / EXTREMELY WEATHERED ROCK	
							SILTSTONE - pale grey and red-brown, estimated low to medium strength, fractured, with some medium to high plasticity CLAY seams.	M > W <sub>p</sub>			EXTREMELY WEATHERED ROCK - HIGHLY WEATHERED ROCK	
						CL	Extremely Weathered Siltstone with soil properties; breaks down into Gravelly CLAY - low to medium plasticity, pale brown to pale orange-brown, fine to coarse grained (mostly fine to medium grained) angular gravel.	M < W <sub>p</sub>	H		EXTREMELY WEATHERED ROCK	
						CL	Extremely Weathered Silty Sandstone with soil properties; breaks down into Gravelly Sandy CLAY / Gravelly Clayey SAND - low to medium plasticity, pale brown, fine to coarse grained sand, fine to coarse grained (mostly fine to medium grained) angular gravel.					
				2.0								Hole Terminated at 2.00 m

**LEGEND:**  
**Water**  
 Water Level (Date and time shown)  
 Water Inflow  
 Water Outflow  
**Strata Changes**  
 Gradational or transitional strata  
 Definitive or distinct strata change

**Notes, Samples and Tests**  
U<sub>30</sub> 50mm Diameter tube sample  
CBR Bulk sample for CBR testing  
E Environmental sample (Glass jar, sealed and chilled on site)  
ASS Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled)  
B Bulk Sample  
**Field Tests**  
PID Photoionisation detector reading (ppm)  
DCP(x-y) Dynamic penetrometer test (test depth interval shown)  
HP Hand Penetrometer test (UCS kPa)

<b>Consistency</b>		<b>UCS (kPa)</b>	<b>Moisture Condition</b>	
VS	Very Soft	<25	D	Dry
S	Soft	25 - 50	M	Moist
F	Firm	50 - 100	W	Wet
St	Stiff	100 - 200	W <sub>p</sub>	Plastic Limit
VSt	Very Stiff	200 - 400	W <sub>L</sub>	Liquid Limit
H	Hard	>400		
Fb	Friable			
<b>Density</b>				
V	Very Loose		Density Index <15%	
L	Loose		Density Index 15 - 35%	
MD	Medium Dense		Density Index 35 - 65%	
D	Dense		Density Index 65 - 85%	
VD	Very Dense		Density Index 85 - 100%	



# ENGINEERING LOG - BOREHOLE

**CLIENT:** MCCLOY EDGEWORTH PTY LTD  
**PROJECT:** BRUSH CREEK ESTATE - PRECINCT 2, STAGE 7  
**LOCATION:** BOOTARING BOULEVARDE, EDGEWORTH

**BOREHOLE NO:** BH713  
**PAGE:** 1 OF 1  
**JOB NO:** NEW18P-01701  
**LOGGED BY:** BB  
**DATE:** 17/1/23

**DRILL TYPE:** 2.7 TONNE EXCAVATOR WITH AUGER  
**BOREHOLE DIAMETER:** 300 mm

**SURFACE RL:**  
**DATUM:**

Drilling and Sampling				Material description and profile information					Field Test		Structure and additional observations		
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics, colour, minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type		Result	
AD/T	Not Encountered	0.30m				CL	FILL-TOPSOIL: Sandy CLAY - low plasticity, pale brown, fine to coarse grained sand, trace fine to medium grained angular to sub-angular gravel, with significant (~40%) mulch inclusions.	M ~ W <sub>p</sub>	VSt	HP	350	FILL - TOPSOIL / MULCH	
		U50				CH	Sandy CLAY - medium to high plasticity, grey to pale grey, fine grained sand, with some fine to coarse grained angular gravel.					RESIDUAL SOIL	
		0.45m			0.5		CL	Sandy CLAY - low plasticity, pale grey to white, fine grained sand, trace fine grained angular gravel.	M < W <sub>p</sub>	H / Fb	HP	>600	RESIDUAL SOIL / EXTREMELY WEATHERED ROCK
					1.0		SILTSTONE - pale grey to white, estimated very low to low strength.	HIGHLY WEATHERED ROCK					
						1.5		Sandy SILTSTONE - fine grained, pale grey to pale yellow-brown, estimated very low to low strength.	D				
				2.0		Orange-brown.							
							Hole Terminated at 2.00 m						

**LEGEND:**  
**Water**  
 Water Level (Date and time shown)  
 Water Inflow  
 Water Outflow  
**Strata Changes**  
 Gradational or transitional strata  
 Definitive or distinct strata change

**Notes, Samples and Tests**  
U<sub>30</sub> 50mm Diameter tube sample  
CBR Bulk sample for CBR testing  
E Environmental sample (Glass jar, sealed and chilled on site)  
ASS Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled)  
B Bulk Sample  
**Field Tests**  
PID Photoionisation detector reading (ppm)  
DCP(x-y) Dynamic penetrometer test (test depth interval shown)  
HP Hand Penetrometer test (UCS kPa)

<b>Consistency</b>		<b>UCS (kPa)</b>	<b>Moisture Condition</b>
VS	Very Soft	<25	D Dry
S	Soft	25 - 50	M Moist
F	Firm	50 - 100	W Wet
St	Stiff	100 - 200	W <sub>p</sub> Plastic Limit
VSt	Very Stiff	200 - 400	W <sub>L</sub> Liquid Limit
H	Hard	>400	
Fb	Friable		
<b>Density</b>			
V	Very Loose		Density Index <15%
L	Loose		Density Index 15 - 35%
MD	Medium Dense		Density Index 35 - 65%
D	Dense		Density Index 65 - 85%
VD	Very Dense		Density Index 85 - 100%





# ENGINEERING LOG - BOREHOLE

**CLIENT:** MCCLOY EDGEWORTH PTY LTD  
**PROJECT:** BRUSH CREEK ESTATE - PRECINCT 2, STAGE 7  
**LOCATION:** BOOTARING BOULEVARDE, EDGEWORTH

**BOREHOLE NO:** BH714  
**PAGE:** 1 OF 1  
**JOB NO:** NEW18P-01701  
**LOGGED BY:** BB  
**DATE:** 17/1/23

**DRILL TYPE:** 2.7 TONNE EXCAVATOR WITH AUGER  
**BOREHOLE DIAMETER:** 300 mm

**SURFACE RL:**  
**DATUM:**

Drilling and Sampling				Material description and profile information					Field Test		Structure and additional observations		
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics, colour, minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type		Result	
AD/T	Not Encountered	0.30m		0.30m		CL	FILL-TOPSOIL: Sandy CLAY - low plasticity, pale brown, fine to coarse grained sand, trace fine to medium grained angular to sub-angular gravel, with significant (~40%) mulch inclusions.	M < Wp	H	HP	>600	FILL - TOPSOIL / MULCH	
		U50 0.45m		0.5		CL	Sandy CLAY - low to medium plasticity, pale grey to white, fine to coarse grained sand, with some fine to medium grained sub-angular gravel.				HP	>600	RESIDUAL SOIL
				0.70m			SILTSTONE - pale grey to white, estimated medium to high strength.	D				HIGHLY WEATHERED ROCK	
				1.00m			Extremely Weathered Coal with soil properties; breaks down into Clayey SAND - fine to medium grained (mostly fine grained), black, fines of low plasticity.						EXTREMELY WEATHERED ROCK / RESIDUAL SOIL
				1.20m			Extremely Weathered Siltstone with soil properties; breaks down into CLAY - low to medium plasticity, pale brown to brown, with some fine grained sand.						EXTREMELY WEATHERED ROCK
				1.40m			Extremely Weathered Coal with soil properties; breaks down into Clayey SAND - fine to medium grained (mostly fine grained), black, fines of low plasticity.	M					EXTREMELY WEATHERED ROCK / RESIDUAL SOIL
				2.00m		SC							
							Hole Terminated at 2.00 m						

**LEGEND:**  
**Water**  
 Water Level (Date and time shown)  
 Water Inflow  
 Water Outflow  
**Strata Changes**  
 Gradational or transitional strata  
 Definitive or distinct strata change

**Notes, Samples and Tests**  
U<sub>30</sub> 50mm Diameter tube sample  
CBR Bulk sample for CBR testing  
E Environmental sample (Glass jar, sealed and chilled on site)  
ASS Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled)  
B Bulk Sample  
**Field Tests**  
PID Photoionisation detector reading (ppm)  
DCP(x-y) Dynamic penetrometer test (test depth interval shown)  
HP Hand Penetrometer test (UCS kPa)

Consistency		UCS (kPa)	Moisture Condition	
VS	Very Soft	<25	D	Dry
S	Soft	25 - 50	M	Moist
F	Firm	50 - 100	W	Wet
St	Stiff	100 - 200	W <sub>p</sub>	Plastic Limit
VSt	Very Stiff	200 - 400	W <sub>L</sub>	Liquid Limit
H	Hard	>400		
Fb	Friable			
Density		V	Very Loose	Density Index <15%
L	Loose			Density Index 15 - 35%
MD	Medium Dense			Density Index 35 - 65%
D	Dense			Density Index 65 - 85%
VD	Very Dense			Density Index 85 - 100%



# ENGINEERING LOG - BOREHOLE

**CLIENT:** MCCLOY EDGEWORTH PTY LTD  
**PROJECT:** BRUSH CREEK ESTATE - PRECINCT 2, STAGE 7  
**LOCATION:** BOOTARING BOULEVARDE, EDGEWORTH

**BOREHOLE NO:** BH715  
**PAGE:** 1 OF 1  
**JOB NO:** NEW18P-01701  
**LOGGED BY:** BB  
**DATE:** 17/1/23

**DRILL TYPE:** 2.7 TONNE EXCAVATOR WITH AUGER  
**BOREHOLE DIAMETER:** 300 mm

**SURFACE RL:**  
**DATUM:**

Drilling and Sampling				Material description and profile information					Field Test		Structure and additional observations	
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics, colour, minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type		Result
ADT	Not Encountered					CL	0.20m FILL-TOPSOIL: Sandy CLAY - low plasticity, pale brown, fine to coarse grained sand, trace fine to medium grained angular to sub-angular gravel, with significant (~40%) mulch inclusions.	M < W <sub>p</sub>				FILL - TOPSOIL / MULCH
							0.30m Silty SANDSTONE - fine to medium grained, pale orange-brown, estimated medium strength.					D
				0.5			Hole Terminated at 0.30 m Practical Refusal					
				1.0								
				1.5								
				2.0								

**LEGEND:**  
**Water**  
 Water Level (Date and time shown)  
 Water Inflow  
 Water Outflow  
**Strata Changes**  
 Gradational or transitional strata  
 Definitive or distinct strata change

**Notes, Samples and Tests**  
U<sub>30</sub> 50mm Diameter tube sample  
CBR Bulk sample for CBR testing  
E Environmental sample (Glass jar, sealed and chilled on site)  
ASS Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled)  
B Bulk Sample  
**Field Tests**  
PID Photoionisation detector reading (ppm)  
DCP(x-y) Dynamic penetrometer test (test depth interval shown)  
HP Hand Penetrometer test (UCS kPa)

<b>Consistency</b>		<b>UCS (kPa)</b>	<b>Moisture Condition</b>	
VS	Very Soft	<25	D	Dry
S	Soft	25 - 50	M	Moist
F	Firm	50 - 100	W	Wet
St	Stiff	100 - 200	W <sub>p</sub>	Plastic Limit
VSt	Very Stiff	200 - 400	W <sub>L</sub>	Liquid Limit
H	Hard	>400		
Fb	Friable			
<b>Density</b>				
V	Very Loose		Density Index <15%	
L	Loose		Density Index 15 - 35%	
MD	Medium Dense		Density Index 35 - 65%	
D	Dense		Density Index 65 - 85%	
VD	Very Dense		Density Index 85 - 100%	



# ENGINEERING LOG - BOREHOLE

**CLIENT:** MCCLOY EDGEWORTH PTY LTD  
**PROJECT:** BRUSH CREEK ESTATE - PRECINCT 2, STAGE 7  
**LOCATION:** BOOTARING BOULEVARDE, EDGEWORTH

**BOREHOLE NO:** BH716  
**PAGE:** 1 OF 1  
**JOB NO:** NEW18P-01701  
**LOGGED BY:** BB  
**DATE:** 17/1/23

**DRILL TYPE:** 2.7 TONNE EXCAVATOR WITH AUGER  
**BOREHOLE DIAMETER:** 300 mm

**SURFACE RL:**  
**DATUM:**

Drilling and Sampling				Material description and profile information					Field Test		Structure and additional observations	
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics, colour, minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type		Result
ADT	Not Encountered					CL	FILL-TOPSOIL: Gravelly Sandy CLAY - low to medium plasticity, fine to coarse grained sand, fine to medium grained angular gravel, with some sticks.	M ~ W <sub>p</sub>				FILL - TOPSOIL
							Silty SANDSTONE - fine to medium grained, pale orange-brown, estimated medium strength.	D				HIGHLY TO MODERATELY WEATHERED ROCK
				0.5			Hole Terminated at 0.30 m Practical Refusal					
				1.0								
				1.5								
				2.0								

**LEGEND:**

**Water**

- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

**Strata Changes**

- Gradational or transitional strata
- Definitive or distinct strata change

**Notes, Samples and Tests**

- U<sub>50</sub> 50mm Diameter tube sample
- CBR Bulk sample for CBR testing
- E Environmental sample (Glass jar, sealed and chilled on site)
- ASS Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled)
- B Bulk Sample

**Field Tests**

- PID Photoionisation detector reading (ppm)
- DCP(x-y) Dynamic penetrometer test (test depth interval shown)
- HP Hand Penetrometer test (UCS kPa)

<b>Consistency</b>		<b>UCS (kPa)</b>	<b>Moisture Condition</b>	
VS	Very Soft	<25	D	Dry
S	Soft	25 - 50	M	Moist
F	Firm	50 - 100	W	Wet
St	Stiff	100 - 200	W <sub>p</sub>	Plastic Limit
VSt	Very Stiff	200 - 400	W <sub>L</sub>	Liquid Limit
H	Hard	>400		
Fb	Friable			
<b>Density</b>				
V	Very Loose		Density Index <15%	
L	Loose		Density Index 15 - 35%	
MD	Medium Dense		Density Index 35 - 65%	
D	Dense		Density Index 65 - 85%	
VD	Very Dense		Density Index 85 - 100%	



# ENGINEERING LOG - BOREHOLE

**CLIENT:** MCCLOY EDGEWORTH PTY LTD  
**PROJECT:** BRUSH CREEK ESTATE - PRECINCT 2, STAGE 7  
**LOCATION:** BOOTARING BOULEVARDE, EDGEWORTH

**BOREHOLE NO:** BH717  
**PAGE:** 1 OF 1  
**JOB NO:** NEW18P-01701  
**LOGGED BY:** BB  
**DATE:** 17/1/23

**DRILL TYPE:** 2.7 TONNE EXCAVATOR WITH AUGER  
**BOREHOLE DIAMETER:** 300 mm

**SURFACE RL:**  
**DATUM:**

Drilling and Sampling				Material description and profile information					Field Test		Structure and additional observations	
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics, colour, minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type		Result
AD/T	Not Encountered					CL	FILL-TOPSOIL: Gravelly Sandy CLAY - low to medium plasticity, fine to coarse grained sand, fine to medium grained angular gravel, with some sticks.	M < Wp				FILL - TOPSOIL
				0.15m		SP	Extremely Weathered Sandstone with soil properties; breaks down into SAND - fine to medium grained, pale grey to white and pale orange-brown to brown, trace fines of low plasticity.		VD			EXTREMELY WEATHERED ROCK / RESIDUAL SOIL
				0.5	0.50m		SANDSTONE - fine to medium grained, pale grey to white and pale orange-brown, estimated low to medium strength.	D				HIGHLY WEATHERED ROCK
				0.70m			Hole Terminated at 0.70 m Practical Refusal					
				1.0								
				1.5								
				2.0								

**LEGEND:**

**Water**

- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

**Strata Changes**

- Gradational or transitional strata
- Definitive or distinct strata change

**Notes, Samples and Tests**

- U<sub>30</sub> 50mm Diameter tube sample
- CBR Bulk sample for CBR testing
- E Environmental sample (Glass jar, sealed and chilled on site)
- ASS Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled)
- B Bulk Sample

**Field Tests**

- PID Photoionisation detector reading (ppm)
- DCP(x-y) Dynamic penetrometer test (test depth interval shown)
- HP Hand Penetrometer test (UCS kPa)

Consistency		UCS (kPa)	Moisture Condition	
VS	Very Soft	<25	D	Dry
S	Soft	25 - 50	M	Moist
F	Firm	50 - 100	W	Wet
St	Stiff	100 - 200	W <sub>p</sub>	Plastic Limit
VSt	Very Stiff	200 - 400	W <sub>L</sub>	Liquid Limit
H	Hard	>400		
Fb	Friable			
Density				
V	Very Loose		Density Index <15%	
L	Loose		Density Index 15 - 35%	
MD	Medium Dense		Density Index 35 - 65%	
D	Dense		Density Index 65 - 85%	
VD	Very Dense		Density Index 85 - 100%	

OT LIB 1.1.GLB Log NON-CORED BOREHOLE - TEST PIT\_NEW18P-01701-AB DRAFT LOGS.GPJ <<DrawingFile>> 07/02/2023 12:06 10.01.00.01 Datggl Lab and In Situ Tool



# ENGINEERING LOG - BOREHOLE

**CLIENT:** MCCLOY EDGEWORTH PTY LTD  
**PROJECT:** BRUSH CREEK ESTATE - PRECINCT 2, STAGE 7  
**LOCATION:** BOOTARING BOULEVARDE, EDGEWORTH

**BOREHOLE NO:** BH718  
**PAGE:** 1 OF 1  
**JOB NO:** NEW18P-01701  
**LOGGED BY:** BB  
**DATE:** 17/1/23

**DRILL TYPE:** 2.7 TONNE EXCAVATOR WITH AUGER  
**BOREHOLE DIAMETER:** 300 mm

**SURFACE RL:**  
**DATUM:**

Drilling and Sampling				Material description and profile information					Field Test		Structure and additional observations	
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics, colour, minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type		Result
ADT	Not Encountered					CL	FILL-TOPSOIL: Gravelly Sandy CLAY - low to medium plasticity, fine to coarse grained sand, fine to medium grained angular gravel, with some sticks.	M < W <sub>p</sub>				FILL - TOPSOIL
							SANDSTONE - fine to medium grained, pale yellow-brown, estimated medium strength.	D				HIGHLY WEATHERED ROCK
				0.5			Hole Terminated at 0.30 m Practical Refusal					
				1.0								
				1.5								
				2.0								

**LEGEND:**  
**Water**  
 Water Level (Date and time shown)  
 Water Inflow  
 Water Outflow  
**Strata Changes**  
 Gradational or transitional strata  
 Definitive or distinct strata change

**Notes, Samples and Tests**  
U<sub>30</sub> 50mm Diameter tube sample  
CBR Bulk sample for CBR testing  
E Environmental sample (Glass jar, sealed and chilled on site)  
ASS Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled)  
B Bulk Sample  
**Field Tests**  
PID Photoionisation detector reading (ppm)  
DCP(x-y) Dynamic penetrometer test (test depth interval shown)  
HP Hand Penetrometer test (UCS kPa)

<b>Consistency</b>		<b>UCS (kPa)</b>	<b>Moisture Condition</b>	
VS	Very Soft	<25	D	Dry
S	Soft	25 - 50	M	Moist
F	Firm	50 - 100	W	Wet
St	Stiff	100 - 200	W <sub>p</sub>	Plastic Limit
VSt	Very Stiff	200 - 400	W <sub>L</sub>	Liquid Limit
H	Hard	>400		
Fb	Friable			
<b>Density</b>				
V	Very Loose		Density Index <15%	
L	Loose		Density Index 15 - 35%	
MD	Medium Dense		Density Index 35 - 65%	
D	Dense		Density Index 65 - 85%	
VD	Very Dense		Density Index 85 - 100%	



# ENGINEERING LOG - BOREHOLE

**CLIENT:** MCCLOY EDGEWORTH PTY LTD  
**PROJECT:** BRUSH CREEK ESTATE - PRECINCT 2, STAGE 7  
**LOCATION:** BOOTARING BOULEVARDE, EDGEWORTH

**BOREHOLE NO:** BH719  
**PAGE:** 1 OF 1  
**JOB NO:** NEW18P-01701  
**LOGGED BY:** BB  
**DATE:** 17/1/23

**DRILL TYPE:** 2.7 TONNE EXCAVATOR WITH AUGER  
**BOREHOLE DIAMETER:** 300 mm

**SURFACE RL:**  
**DATUM:**

Drilling and Sampling				Material description and profile information					Field Test		Structure and additional observations	
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics, colour, minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type		Result
AD/T	Not Encountered					CL	FILL-TOPSOIL: Gravelly Sandy CLAY - low to medium plasticity, fine to coarse grained sand, fine to medium grained angular gravel, with some sticks.	M ~ W <sub>p</sub>				FILL - TOPSOIL
							SANDSTONE - fine to medium grained, pale yellow-brown, estimated medium to high strength.	D				HIGHLY WEATHERED ROCK
				0.5			Hole Terminated at 0.25 m Practical Refusal					
				1.0								
				1.5								
				2.0								

**LEGEND:**  
**Water**  
 Water Level (Date and time shown)  
 Water Inflow  
 Water Outflow  
**Strata Changes**  
 Gradational or transitional strata  
 Definitive or distinct strata change

**Notes, Samples and Tests**  
U<sub>30</sub> 50mm Diameter tube sample  
CBR Bulk sample for CBR testing  
E Environmental sample (Glass jar, sealed and chilled on site)  
ASS Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled)  
B Bulk Sample  
**Field Tests**  
PID Photoionisation detector reading (ppm)  
DCP(x-y) Dynamic penetrometer test (test depth interval shown)  
HP Hand Penetrometer test (UCS kPa)

<b>Consistency</b>		<b>UCS (kPa)</b>	<b>Moisture Condition</b>	
VS	Very Soft	<25	D	Dry
S	Soft	25 - 50	M	Moist
F	Firm	50 - 100	W	Wet
St	Stiff	100 - 200	W <sub>p</sub>	Plastic Limit
VSt	Very Stiff	200 - 400	W <sub>L</sub>	Liquid Limit
H	Hard	>400		
Fb	Friable			
<b>Density</b>				
V	Very Loose		Density Index <15%	
L	Loose		Density Index 15 - 35%	
MD	Medium Dense		Density Index 35 - 65%	
D	Dense		Density Index 65 - 85%	
VD	Very Dense		Density Index 85 - 100%	



# ENGINEERING LOG - BOREHOLE

**CLIENT:** MCCLOY EDGEWORTH PTY LTD  
**PROJECT:** BRUSH CREEK ESTATE - PRECINCT 2, STAGE 7  
**LOCATION:** BOOTARING BOULEVARDE, EDGEWORTH

**BOREHOLE NO:** BH720  
**PAGE:** 1 OF 1  
**JOB NO:** NEW18P-01701  
**LOGGED BY:** BB  
**DATE:** 17/1/23

**DRILL TYPE:** 2.7 TONNE EXCAVATOR WITH AUGER  
**BOREHOLE DIAMETER:** 300 mm

**SURFACE RL:**  
**DATUM:**

Drilling and Sampling				Material description and profile information					Field Test		Structure and additional observations	
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics, colour, minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type		Result
AD/T	Not Encountered					CL	FILL-TOPSOIL: Gravelly Sandy CLAY - low to medium plasticity, fine to coarse grained sand, fine to medium grained angular gravel, with some sticks.	M ~ W <sub>p</sub>				FILL - TOPSOIL
							SILTSTONE - pale grey to white with some pale orange-brown, estimated medium to high strength.	D				HIGHLY WEATHERED ROCK
				0.5			Hole Terminated at 0.35 m Practical Refusal					
				1.0								
				1.5								
				2.0								

**LEGEND:**

**Water**

- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

**Strata Changes**

- Gradational or transitional strata
- Definitive or distinct strata change

**Notes, Samples and Tests**

- U<sub>30</sub> 50mm Diameter tube sample
- CBR Bulk sample for CBR testing
- E Environmental sample (Glass jar, sealed and chilled on site)
- ASS Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled)
- B Bulk Sample

**Field Tests**

- PID Photoionisation detector reading (ppm)
- DCP(x-y) Dynamic penetrometer test (test depth interval shown)
- HP Hand Penetrometer test (UCS kPa)

<b>Consistency</b>		<b>UCS (kPa)</b>	<b>Moisture Condition</b>	
VS	Very Soft	<25	D	Dry
S	Soft	25 - 50	M	Moist
F	Firm	50 - 100	W	Wet
St	Stiff	100 - 200	W <sub>p</sub>	Plastic Limit
VSt	Very Stiff	200 - 400	W <sub>L</sub>	Liquid Limit
H	Hard	>400		
Fb	Friable			
<b>Density</b>				
V	Very Loose		Density Index <15%	
L	Loose		Density Index 15 - 35%	
MD	Medium Dense		Density Index 35 - 65%	
D	Dense		Density Index 65 - 85%	
VD	Very Dense		Density Index 85 - 100%	



# ENGINEERING LOG - BOREHOLE

**CLIENT:** MCCLOY EDGEWORTH PTY LTD  
**PROJECT:** BRUSH CREEK ESTATE - PRECINCT 2, STAGE 7  
**LOCATION:** BOOTARING BOULEVARDE, EDGEWORTH

**BOREHOLE NO:** BH721A  
**PAGE:** 1 OF 1  
**JOB NO:** NEW18P-01701  
**LOGGED BY:** BB  
**DATE:** 17/1/23

**DRILL TYPE:** 2.7 TONNE EXCAVATOR WITH AUGER  
**BOREHOLE DIAMETER:** 300 mm

**SURFACE RL:**  
**DATUM:**

Drilling and Sampling				Material description and profile information					Field Test		Structure and additional observations	
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics, colour, minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type		Result
AD/T	Not Encountered					CL	FILL-TOPSOIL: Gravelly Sandy CLAY - low to medium plasticity, fine to coarse grained sand, fine to medium grained angular gravel, with some sticks.	M ~ W <sub>p</sub>				FILL - TOPSOIL
							Sandy SILTSTONE - fine grained, pale grey to pale yellow-brown, estimated medium strength.	D				HIGHLY WEATHERED ROCK
				0.5			Hole Terminated at 0.40 m Practical Refusal					
				1.0								
				1.5								
				2.0								

**LEGEND:**

**Water**

- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

**Strata Changes**

- Gradational or transitional strata
- Definitive or distinct strata change

**Notes, Samples and Tests**

- U<sub>30</sub> 50mm Diameter tube sample
- CBR Bulk sample for CBR testing
- E Environmental sample (Glass jar, sealed and chilled on site)
- ASS Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled)
- B Bulk Sample

**Field Tests**

- PID Photoionisation detector reading (ppm)
- DCP(x-y) Dynamic penetrometer test (test depth interval shown)
- HP Hand Penetrometer test (UCS kPa)

<b>Consistency</b>		<b>UCS (kPa)</b>	<b>Moisture Condition</b>	
VS	Very Soft	<25	D	Dry
S	Soft	25 - 50	M	Moist
F	Firm	50 - 100	W	Wet
St	Stiff	100 - 200	W <sub>p</sub>	Plastic Limit
VSt	Very Stiff	200 - 400	W <sub>L</sub>	Liquid Limit
H	Hard	>400		
Fb	Friable			
<b>Density</b>				
V	Very Loose		Density Index <15%	
L	Loose		Density Index 15 - 35%	
MD	Medium Dense		Density Index 35 - 65%	
D	Dense		Density Index 65 - 85%	
VD	Very Dense		Density Index 85 - 100%	





# ENGINEERING LOG - BOREHOLE

**CLIENT:** MCCLOY EDGEWORTH PTY LTD  
**PROJECT:** BRUSH CREEK ESTATE - PRECINCT 2, STAGE 7  
**LOCATION:** BOOTARING BOULEVARDE, EDGEWORTH

**BOREHOLE NO:** BH721B  
**PAGE:** 1 OF 1  
**JOB NO:** NEW18P-01701  
**LOGGED BY:** BB  
**DATE:** 17/1/23

**DRILL TYPE:** 2.7 TONNE EXCAVATOR WITH AUGER  
**BOREHOLE DIAMETER:** 300 mm

**SURFACE RL:**  
**DATUM:**

Drilling and Sampling				Material description and profile information					Field Test		Structure and additional observations	
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics, colour, minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type		Result
ADT	Not Encountered					CL	FILL-TOPSOIL: Gravelly Sandy CLAY - low to medium plasticity, fine to coarse grained sand, fine to medium grained angular gravel, with some sticks.	M ~ W <sub>p</sub>				FILL - TOPSOIL
							Sandy SILTSTONE - fine grained, pale grey to pale yellow-brown, estimated medium strength.	D				HIGHLY WEATHERED ROCK
				0.5			Hole Terminated at 0.30 m Practical Refusal					
				1.0								
				1.5								
				2.0								

**LEGEND:**  
**Water**  
 Water Level (Date and time shown)  
 Water Inflow  
 Water Outflow  
**Strata Changes**  
 Gradational or transitional strata  
 Definitive or distinct strata change

**Notes, Samples and Tests**  
U<sub>30</sub> 50mm Diameter tube sample  
CBR Bulk sample for CBR testing  
E Environmental sample (Glass jar, sealed and chilled on site)  
ASS Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled)  
B Bulk Sample  
**Field Tests**  
PID Photoionisation detector reading (ppm)  
DCP(x-y) Dynamic penetrometer test (test depth interval shown)  
HP Hand Penetrometer test (UCS kPa)

<b>Consistency</b>		<b>UCS (kPa)</b>	<b>Moisture Condition</b>	
VS	Very Soft	<25	D	Dry
S	Soft	25 - 50	M	Moist
F	Firm	50 - 100	W	Wet
St	Stiff	100 - 200	W <sub>p</sub>	Plastic Limit
VSt	Very Stiff	200 - 400	W <sub>L</sub>	Liquid Limit
H	Hard	>400		
Fb	Friable			
<b>Density</b>				
V	Very Loose		Density Index <15%	
L	Loose		Density Index 15 - 35%	
MD	Medium Dense		Density Index 35 - 65%	
D	Dense		Density Index 65 - 85%	
VD	Very Dense		Density Index 85 - 100%	



# ENGINEERING LOG - BOREHOLE

**BOREHOLE NO:** BH722A

**CLIENT:** MCCLOY EDGEWORTH PTY LTD

**PAGE:** 1 OF 1

**PROJECT:** BRUSH CREEK ESTATE - PRECINCT 2, STAGE 7

**JOB NO:** NEW18P-01701

**LOCATION:** BOOTARING BOULEVARDE, EDGEWORTH

**LOGGED BY:** BB

**DATE:** 17/1/23

**DRILL TYPE:** 2.7 TONNE EXCAVATOR WITH AUGER  
**BOREHOLE DIAMETER:** 300 mm

**SURFACE RL:**  
**DATUM:**

Drilling and Sampling				Material description and profile information					Field Test		Structure and additional observations
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics, colour, minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	
AD/T	Not Encountered					CL	0.10m FILL-TOPSOIL: Gravelly Sandy CLAY - low to medium plasticity, fine to coarse grained sand, fine to medium grained angular gravel, with some sticks.	M < w <sub>p</sub>			FILL - TOPSOIL
		0.40m						D			HIGHLY WEATHERED ROCK
		U50 0.55m		0.5			0.45m Hole Terminated at 0.45 m Practical Refusal				

OT.LIB.1.1.GLB.Log\_NON-CORED BOREHOLE - TEST PIT\_NEW18P-01701-AB DRAFT LOGS.GPJ - <<DrawingFile>> 07/02/2023, 12:06 10.01.00.01 Datigel Lab and In Situ Tool

<b>LEGEND:</b> <b>Water</b> Water Level (Date and time shown) Water Inflow Water Outflow <b>Strata Changes</b> Gradational or transitional strata Definitive or distinct strata change	<b>Notes, Samples and Tests</b> U <sub>30</sub> 50mm Diameter tube sample CBR Bulk sample for CBR testing E Environmental sample (Glass jar, sealed and chilled on site) ASS Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled) B Bulk Sample	<b>Consistency</b> VS Very Soft <25 S Soft 25 - 50 F Firm 50 - 100 St Stiff 100 - 200 VSt Very Stiff 200 - 400 H Hard >400 Fb Friable	<b>UCS (kPa)</b> <25 25 - 50 50 - 100 100 - 200 200 - 400 >400	<b>Moisture Condition</b> D Dry M Moist W Wet W <sub>p</sub> Plastic Limit W <sub>L</sub> Liquid Limit
	<b>Field Tests</b> PID Photoionisation detector reading (ppm) DCP(x-y) Dynamic penetrometer test (test depth interval shown) HP Hand Penetrometer test (UCS kPa)	<b>Density</b> V Very Loose L Loose MD Medium Dense D Dense VD Very Dense	Density Index <15% Density Index 15 - 35% Density Index 35 - 65% Density Index 65 - 85% Density Index 85 - 100%	



# ENGINEERING LOG - BOREHOLE

**CLIENT:** MCCLOY EDGEWORTH PTY LTD  
**PROJECT:** BRUSH CREEK ESTATE - PRECINCT 2, STAGE 7  
**LOCATION:** BOOTARING BOULEVARDE, EDGEWORTH

**BOREHOLE NO:** BH722B  
**PAGE:** 1 OF 1  
**JOB NO:** NEW18P-01701  
**LOGGED BY:** BB  
**DATE:** 17/1/23

**DRILL TYPE:** 2.7 TONNE EXCAVATOR WITH AUGER  
**BOREHOLE DIAMETER:** 300 mm

**SURFACE RL:**  
**DATUM:**

Drilling and Sampling				Material description and profile information					Field Test		Structure and additional observations	
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics, colour, minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type		Result
AD/T	Not Encountered					CL	FILL-TOPSOIL: Gravelly Sandy CLAY - low to medium plasticity, fine to coarse grained sand, fine to medium grained angular gravel, with some sticks.	M ~ W <sub>p</sub>				FILL - TOPSOIL
					0.20m	CL	FILL: Gravelly Sandy CLAY / Gravelly Clayey SAND - low plasticity, brown, fine to coarse grained (mostly fine to medium grained) sand, fine to medium grained angular gravel.	M < W <sub>p</sub>	H / Fb			FILL - CONTROLLED
					1.40m		Silty SANDSTONE - fine to medium grained, pale orange-brown, estimated medium strength.	D				HIGHLY TO MODERATELY WEATHERED ROCK
				1.50m			Hole Terminated at 1.50 m Practical Refusal					

**LEGEND:**

**Water**

- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

**Strata Changes**

- Gradational or transitional strata
- Definitive or distinct strata change

**Notes, Samples and Tests**

- U<sub>30</sub> 50mm Diameter tube sample
- CBR Bulk sample for CBR testing
- E Environmental sample (Glass jar, sealed and chilled on site)
- ASS Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled)
- B Bulk Sample

**Field Tests**

- PID Photoionisation detector reading (ppm)
- DCP(x-y) Dynamic penetrometer test (test depth interval shown)
- HP Hand Penetrometer test (UCS kPa)

<b>Consistency</b>		<b>UCS (kPa)</b>	<b>Moisture Condition</b>
VS	Very Soft	<25	D Dry
S	Soft	25 - 50	M Moist
F	Firm	50 - 100	W Wet
St	Stiff	100 - 200	W <sub>p</sub> Plastic Limit
VSt	Very Stiff	200 - 400	W <sub>L</sub> Liquid Limit
H	Hard	>400	
Fb	Friable		
<b>Density</b>			
V	Very Loose		Density Index <15%
L	Loose		Density Index 15 - 35%
MD	Medium Dense		Density Index 35 - 65%
D	Dense		Density Index 65 - 85%
VD	Very Dense		Density Index 85 - 100%

OT LIB 1.1.GLB Log NON-CORED BOREHOLE - TEST PIT\_NEW18P-01701-AB DRAFT LOGS.GPJ -<DrawingFile> 07/02/2023, 12:06 10.01.00.01 Datggl Lab and In Situ Tool



# ENGINEERING LOG - BOREHOLE

**CLIENT:** MCCLOY EDGEWORTH PTY LTD  
**PROJECT:** BRUSH CREEK ESTATE - PRECINCT 2, STAGE 7  
**LOCATION:** BOOTARING BOULEVARDE, EDGEWORTH

**BOREHOLE NO:** BH723  
**PAGE:** 1 OF 1  
**JOB NO:** NEW18P-01701  
**LOGGED BY:** BB  
**DATE:** 17/1/23

**DRILL TYPE:** 2.7 TONNE EXCAVATOR WITH AUGER  
**BOREHOLE DIAMETER:** 300 mm

**SURFACE RL:**  
**DATUM:**

Drilling and Sampling				Material description and profile information					Field Test		Structure and additional observations
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics, colour, minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	
AD/T	Not Encountered	U50	0.70m	0.5	[Cross-hatched pattern]	CL	FILL-TOPSOIL: Gravelly Sandy CLAY - low to medium plasticity, fine to coarse grained sand, fine to medium grained angular gravel, with some sticks.	M < W <sub>p</sub>	H / Fb		FILL - TOPSOIL
			0.90m								FILL: Gravelly Sandy CLAY / Gravelly Clayey SAND - low plasticity, brown, fine to coarse grained (mostly fine to medium grained) sand, fine to medium grained angular gravel.
				1.0							
				1.5							
				2.0							
				2.40m							
				2.50m			Silty SANDSTONE - fine to medium grained, pale orange-brown, estimated medium strength.	D			HIGHLY TO MODERATELY WEATHERED ROCK

**LEGEND:**

**Water**

- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

**Strata Changes**

- Gradational or transitional strata
- Definitive or distinct strata change

**Notes, Samples and Tests**

Hole Terminated at 2.50 m

- U<sub>30</sub> 50mm Diameter tube sample
- CBR Bulk sample for CBR testing
- E Environmental sample (Glass jar, sealed and chilled on site)
- ASS Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled)
- B Bulk Sample

**Field Tests**

- PID Photoionisation detector reading (ppm)
- DCP(x-y) Dynamic penetrometer test (test depth interval shown)
- HP Hand Penetrometer test (UCS kPa)

Consistency		UCS (kPa)	Moisture Condition	
VS	Very Soft	<25	D	Dry
S	Soft	25 - 50	M	Moist
F	Firm	50 - 100	W	Wet
St	Stiff	100 - 200	W <sub>p</sub>	Plastic Limit
VSt	Very Stiff	200 - 400	W <sub>L</sub>	Liquid Limit
H	Hard	>400		
Fb	Friable			
Density			Density Index <15%	
V	Very Loose		Density Index 15 - 35%	
L	Loose		Density Index 35 - 65%	
MD	Medium Dense		Density Index 65 - 85%	
D	Dense		Density Index 85 - 100%	
VD	Very Dense			

OT LIB 1.1.GLB Log NON-CORED BOREHOLE - TEST PIT NEW18P-01701-AB DRAFT LOGS.GPJ <-DrawingFile> 07/02/2023 12:06 10.01.00.01 Datggl Lab and In Situ Tool



# ENGINEERING LOG - BOREHOLE

**CLIENT:** MCCLOY EDGEWORTH PTY LTD  
**PROJECT:** BRUSH CREEK ESTATE - PRECINCT 2, STAGE 7  
**LOCATION:** BOOTARING BOULEVARDE, EDGEWORTH

**BOREHOLE NO:** BH724  
**PAGE:** 1 OF 1  
**JOB NO:** NEW18P-01701  
**LOGGED BY:** BB  
**DATE:** 17/1/23

**DRILL TYPE:** 2.7 TONNE EXCAVATOR WITH AUGER  
**BOREHOLE DIAMETER:** 300 mm

**SURFACE RL:**  
**DATUM:**

Drilling and Sampling				Material description and profile information					Field Test		Structure and additional observations	
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics, colour, minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type		Result
AD/T	Not Encountered	U50		0.5		CL	FILL-TOPSOIL: Gravelly Sandy CLAY - low to medium plasticity, fine to coarse grained sand, fine to medium grained angular gravel, with some sticks.	M ~ Wp				FILL - TOPSOIL
						CH	Sandy CLAY - medium to high plasticity, brown, fine to medium grained sand.					H / Fb
							Silty SANDSTONE - fine grained, pale grey and pale orange-brown, estimated low to medium strength.	D		HIGHLY TO MODERATELY WEATHERED ROCK		
							Hole Terminated at 0.80 m Practical Refusal					

OT LIB 1.1.GLB Log\_NON-CORED BOREHOLE - TEST PIT\_NEW18P-01701-AB DRAFT LOGS.GPJ - <<DrawingFile>> 07/02/2023 12:06 10.01.00.01 Datgell Lab and In Situ Tool

<b>LEGEND:</b> <b>Water</b> Water Level (Date and time shown) Water Inflow Water Outflow <b>Strata Changes</b> Gradational or transitional strata Definitive or distinct strata change	<b>Notes, Samples and Tests</b> U <sub>50</sub> 50mm Diameter tube sample CBR Bulk sample for CBR testing E Environmental sample (Glass jar, sealed and chilled on site) ASS Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled) B Bulk Sample	<b>Consistency</b> VS Very Soft <25 S Soft 25 - 50 F Firm 50 - 100 St Stiff 100 - 200 VSt Very Stiff 200 - 400 H Hard >400 Fb Friable	<b>UCS (kPa)</b> <25 25 - 50 50 - 100 100 - 200 200 - 400 >400	<b>Moisture Condition</b> D Dry M Moist W Wet W <sub>p</sub> Plastic Limit W <sub>L</sub> Liquid Limit
	<b>Field Tests</b> PID Photoionisation detector reading (ppm) DCP(x-y) Dynamic penetrometer test (test depth interval shown) HP Hand Penetrometer test (UCS kPa)	<b>Density</b> V Very Loose L Loose MD Medium Dense D Dense VD Very Dense	Density Index <15% Density Index 15 - 35% Density Index 35 - 65% Density Index 65 - 85% Density Index 85 - 100%	

## **APPENDIX B:**

### **Results of Laboratory Testing**

**Report No: SSI:NEW23W-0240-S02**

**Issue No: 1**


# Shrink Swell Index Report

**Client:** McCloy Project Management Pty Ltd  
 PO Box 2214  
 Dangar NSW 2309

**Project No.:** NEW18P-01701

**Project Name:** Brush Creek Subdivision - Precinct 2, Stage 7

**Project Location:** Bootaring Boulevard, Edgeworth



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

Results provided relate only to the items tested or sampled.

*B. Cullen*  
 Approved Signatory: Brent Cullen  
 (Engineering Geologist)  
 NATA Accredited Laboratory Number: 18686  
 Date of Issue: 30/01/2023

## Sample Details

**Sample ID:** NEW23W-0240-S02

**Sampling Method:** The results outlined below apply to the sample as received

**Material:** Clay **Date Sampled:** 17/01/2023

**Source:** On-Site Insitu **Date Submitted:** 19/01/2023

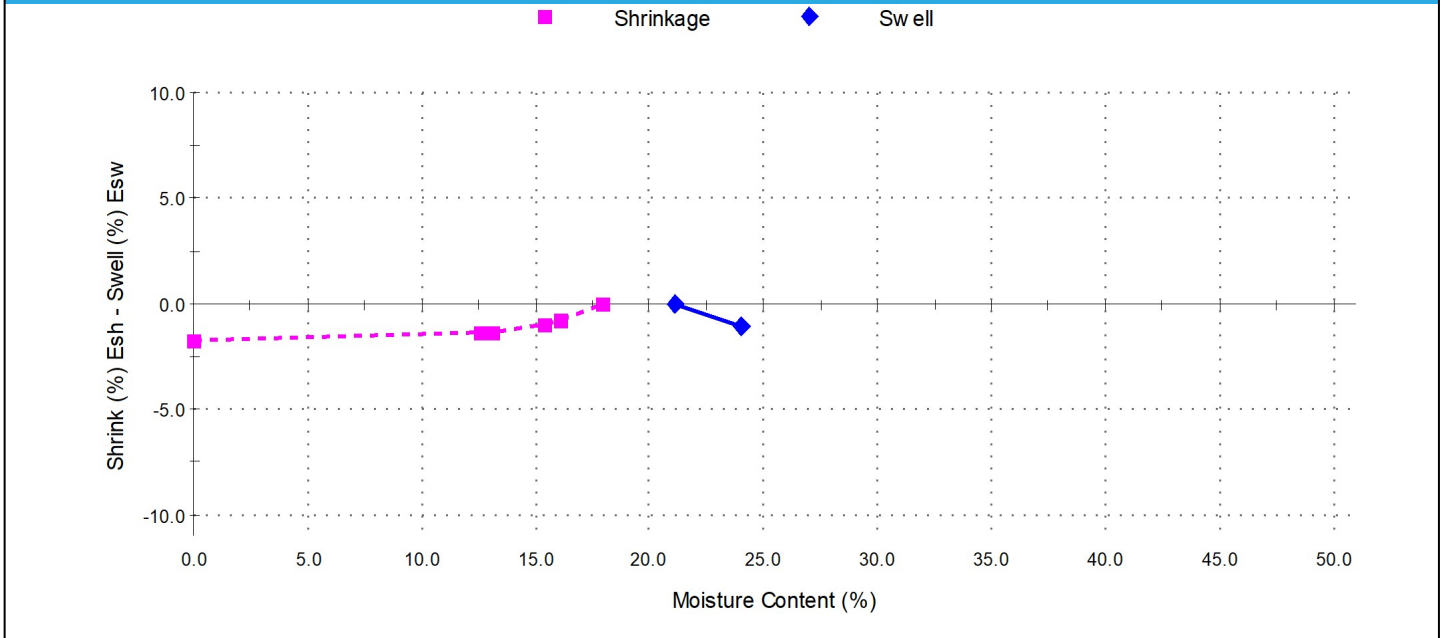
**Specification:** No Specification

**Sample Location:** BH708 - (0.30 - 0.50m)

**Date Tested:** 24/01/2023

Swell Test AS 1289.7.1.1		Shrink Test AS 1289.7.1.1	
<b>Swell on Saturation (%):</b>	-1.1	<b>Shrink on drying (%):</b>	1.7
<b>Moisture Content before (%):</b>	21.1	<b>Shrinkage Moisture Content (%):</b>	17.9
<b>Moisture Content after (%):</b>	24.0	<b>Est. inert material (%):</b>	2%
<b>Est. Unc. Comp. Strength before (kPa):</b>	450	<b>Crumbling during shrinkage:</b>	Nil
<b>Est. Unc. Comp. Strength after (kPa):</b>	240	<b>Cracking during shrinkage:</b>	Moderate

## Shrink Swell



**Shrink Swell Index - Iss (%): 0.9**

## Comments

**Report No: SSI:NEW23W-0240-S03**

**Issue No: 1**


# Shrink Swell Index Report

**Client:** McCloy Project Management Pty Ltd  
 PO Box 2214  
 Dangar NSW 2309

**Project No.:** NEW18P-01701

**Project Name:** Brush Creek Subdivision - Precinct 2, Stage 7

**Project Location:** Bootaring Boulevard, Edgeworth



Accredited for compliance with ISO/IEC 17025-Testing. The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.  
 Results provided relate only to the items tested or sampled.

*B. Cullen*  
 Approved Signatory: Brent Cullen  
 (Engineering Geologist)  
 NATA Accredited Laboratory Number: 18686  
 Date of Issue: 30/01/2023

## Sample Details

**Sample ID:** NEW23W-0240-S03

**Sampling Method:** The results outlined below apply to the sample as received

**Material:** Clay **Date Sampled:** 17/01/2023

**Source:** On-Site Insitu **Date Submitted:** 19/01/2023

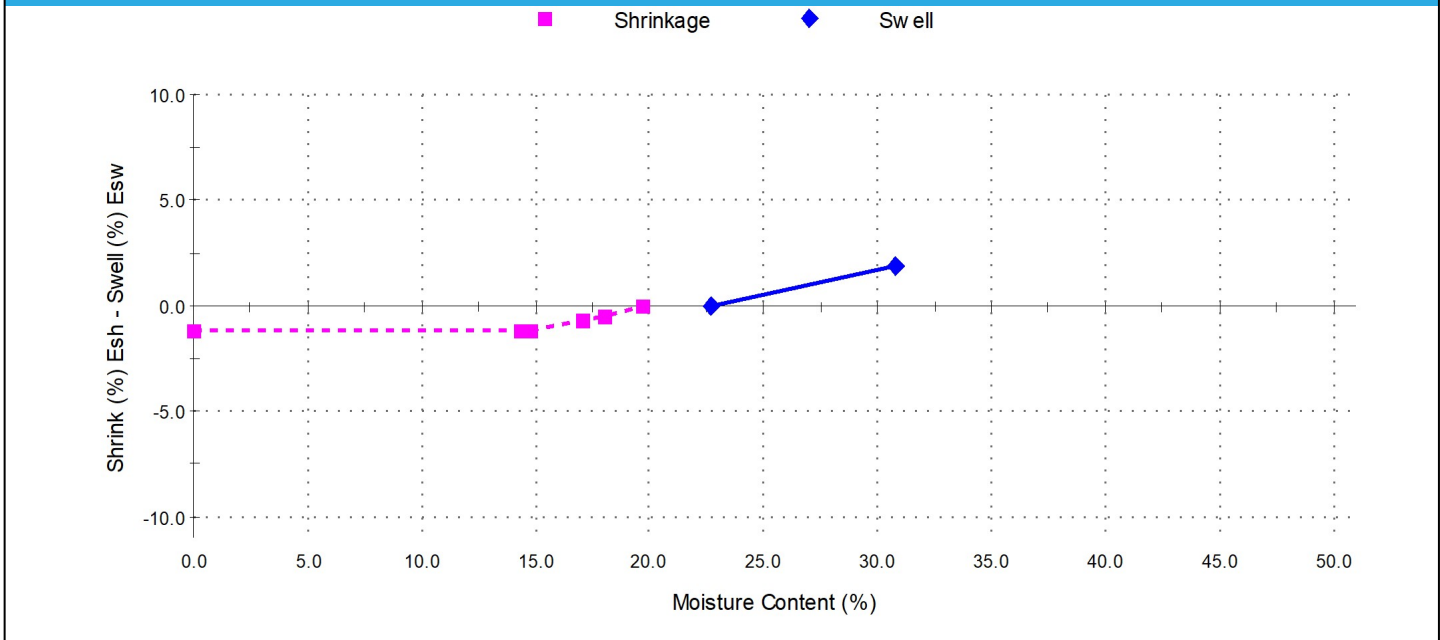
**Specification:** No Specification

**Sample Location:** BH709 - (0.20 - 0.40m)

**Date Tested:** 24/01/2023

Swell Test AS 1289.7.1.1		Shrink Test AS 1289.7.1.1	
<b>Swell on Saturation (%):</b>	1.9	<b>Shrink on drying (%):</b>	1.2
<b>Moisture Content before (%):</b>	22.7	<b>Shrinkage Moisture Content (%):</b>	19.7
<b>Moisture Content after (%):</b>	30.8	<b>Est. inert material (%):</b>	2%
<b>Est. Unc. Comp. Strength before (kPa):</b>	570	<b>Crumbling during shrinkage:</b>	Nil
<b>Est. Unc. Comp. Strength after (kPa):</b>	300	<b>Cracking during shrinkage:</b>	Major

## Shrink Swell



**Shrink Swell Index - Iss (%): 1.2**

## Comments



**Report No: SSI:NEW23W-0240-S04**

**Issue No: 1**


# Shrink Swell Index Report

**Client:** McCloy Project Management Pty Ltd  
 PO Box 2214  
 Dangar NSW 2309

**Project No.:** NEW18P-01701

**Project Name:** Brush Creek Subdivision - Precinct 2, Stage 7

**Project Location:** Bootaring Boulevard, Edgeworth



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Results provided relate only to the items tested or sampled.

*B. Cullen*  
 Approved Signatory: Brent Cullen  
 (Engineering Geologist)  
 NATA Accredited Laboratory Number: 18686  
 Date of Issue: 30/01/2023

## Sample Details

**Sample ID:** NEW23W-0240-S04

**Sampling Method:** The results outlined below apply to the sample as received

**Material:** Gravelly Sandy Clay

**Source:** On-Site Insitu

**Specification:** No Specification

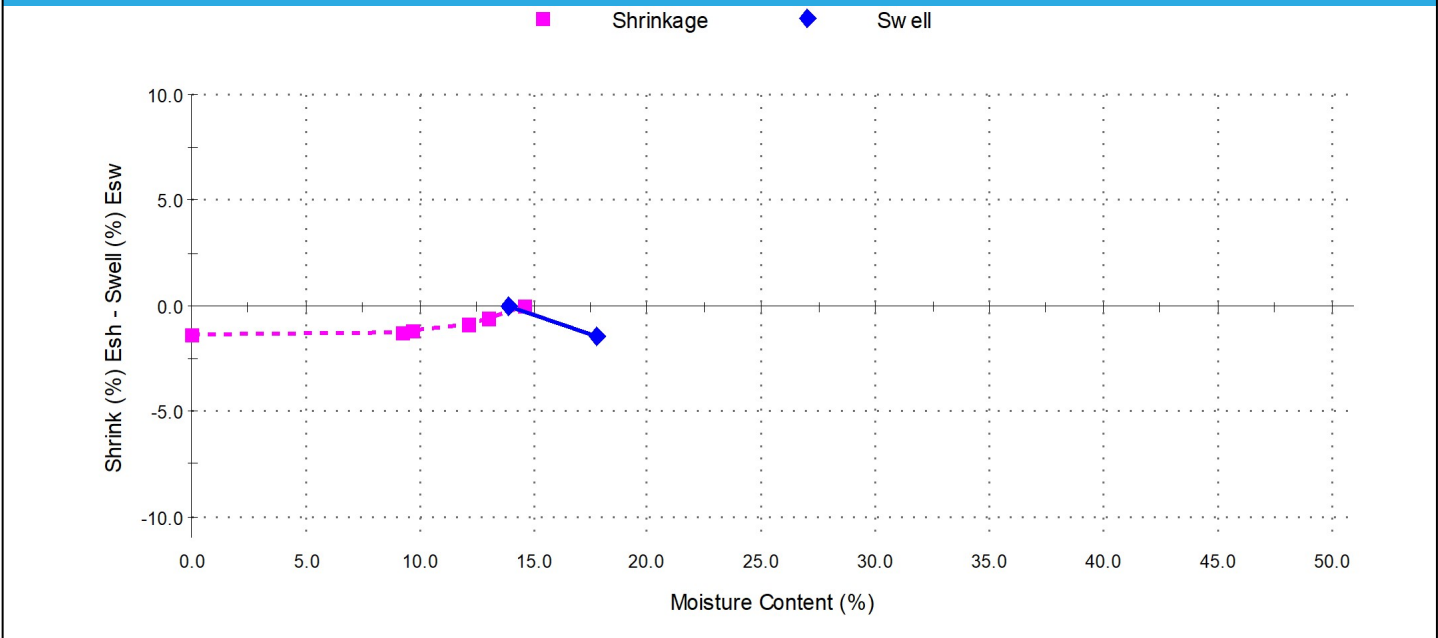
**Sample Location:** BH710 - (0.40 - 0.60m)

**Date Tested:** 24/01/2023

**Date Sampled:** 17/01/2023  
**Date Submitted:** 19/01/2023

Swell Test AS 1289.7.1.1		Shrink Test AS 1289.7.1.1	
<b>Swell on Saturation (%):</b>	-1.4	<b>Shrink on drying (%):</b>	1.4
<b>Moisture Content before (%):</b>	13.9	<b>Shrinkage Moisture Content (%):</b>	14.6
<b>Moisture Content after (%):</b>	17.7	<b>Est. inert material (%):</b>	3%
<b>Est. Unc. Comp. Strength before (kPa):</b>	>600	<b>Crumbling during shrinkage:</b>	Nil
<b>Est. Unc. Comp. Strength after (kPa):</b>	>600	<b>Cracking during shrinkage:</b>	Minor

## Shrink Swell



**Shrink Swell Index - Iss (%): 0.8**

## Comments

**Report No: SSI:NEW23W-0240-S05**

**Issue No: 1**


# Shrink Swell Index Report

**Client:** McCloy Project Management Pty Ltd  
 PO Box 2214  
 Dangar NSW 2309

**Project No.:** NEW18P-01701

**Project Name:** Brush Creek Subdivision - Precinct 2, Stage 7

**Project Location:** Bootaring Boulevard, Edgeworth



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Results provided relate only to the items tested or sampled.

*B. Cullen*  
 Approved Signatory: Brent Cullen  
 (Engineering Geologist)  
 NATA Accredited Laboratory Number: 18686  
 Date of Issue: 30/01/2023

## Sample Details

**Sample ID:** NEW23W-0240-S05

**Sampling Method:** The results outlined below apply to the sample as received

**Material:** Clay **Date Sampled:** 17/01/2023

**Source:** On-Site Insitu **Date Submitted:** 19/01/2023

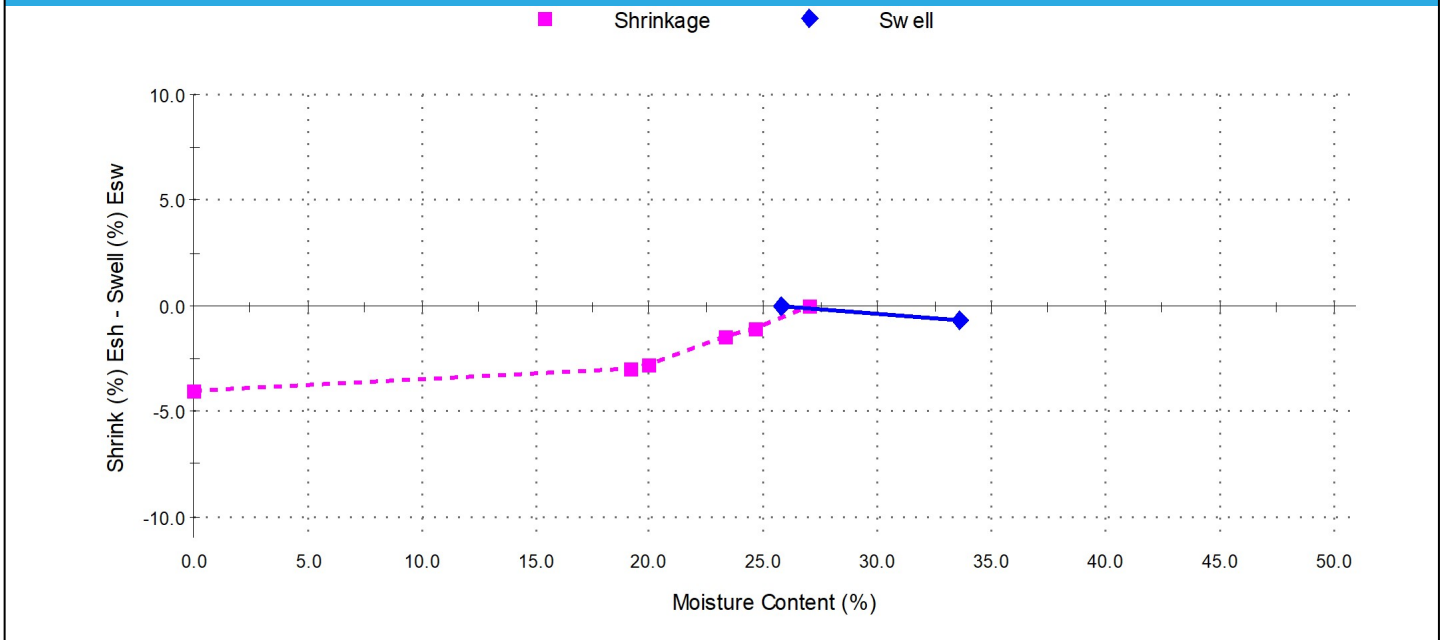
**Specification:** No Specification

**Sample Location:** BH710 - (1.00 - 1.20m)

**Date Tested:** 24/01/2023

Swell Test AS 1289.7.1.1		Shrink Test AS 1289.7.1.1	
<b>Swell on Saturation (%):</b>	-0.7	<b>Shrink on drying (%):</b>	4.0
<b>Moisture Content before (%):</b>	25.8	<b>Shrinkage Moisture Content (%):</b>	27.0
<b>Moisture Content after (%):</b>	33.6	<b>Est. inert material (%):</b>	4%
<b>Est. Unc. Comp. Strength before (kPa):</b>	340	<b>Crumbling during shrinkage:</b>	Nil
<b>Est. Unc. Comp. Strength after (kPa):</b>	370	<b>Cracking during shrinkage:</b>	Minor

## Shrink Swell



**Shrink Swell Index - Iss (%): 2.2**

## Comments

**Report No: SSI:NEW23W-0240-S06**

**Issue No: 1**


# Shrink Swell Index Report

**Client:** McCloy Project Management Pty Ltd  
 PO Box 2214  
 Dangar NSW 2309

**Project No.:** NEW18P-01701

**Project Name:** Brush Creek Subdivision - Precinct 2, Stage 7

**Project Location:** Bootaring Boulevard, Edgeworth



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Results provided relate only to the items tested or sampled.

*B. Cullen*  
 Approved Signatory: Brent Cullen  
 (Engineering Geologist)  
 NATA Accredited Laboratory Number: 18686  
 Date of Issue: 30/01/2023

## Sample Details

**Sample ID:** NEW23W-0240-S06

**Sampling Method:** The results outlined below apply to the sample as received

**Material:** Gravelly Sandy Clay

**Source:** On-Site Insitu

**Specification:** No Specification

**Sample Location:** BH711A - (0.40 - 0.60m)

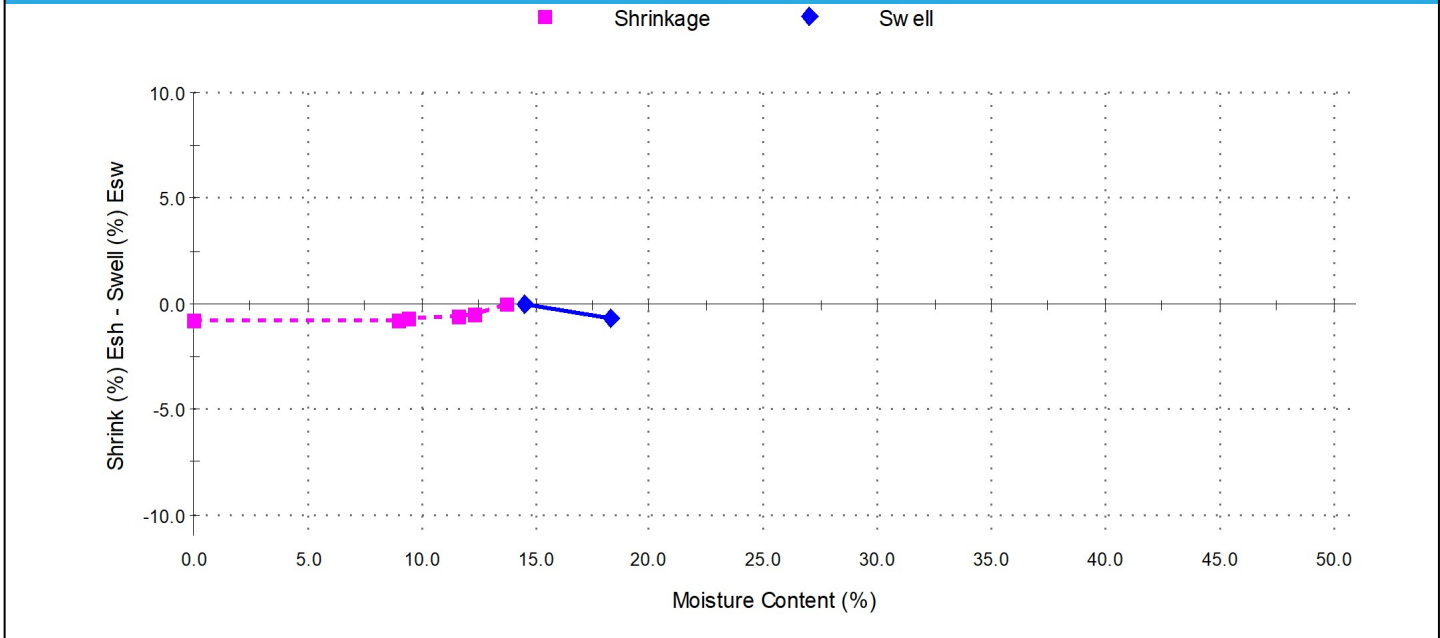
**Date Tested:** 24/01/2023

**Date Sampled:** 17/01/2023

**Date Submitted:** 19/01/2023

Swell Test AS 1289.7.1.1		Shrink Test AS 1289.7.1.1	
<b>Swell on Saturation (%):</b>	-0.7	<b>Shrink on drying (%):</b>	0.8
<b>Moisture Content before (%):</b>	14.6	<b>Shrinkage Moisture Content (%):</b>	13.7
<b>Moisture Content after (%):</b>	18.3	<b>Est. inert material (%):</b>	3%
<b>Est. Unc. Comp. Strength before (kPa):</b>	560	<b>Crumbling during shrinkage:</b>	Nil
<b>Est. Unc. Comp. Strength after (kPa):</b>	280	<b>Cracking during shrinkage:</b>	Minor

## Shrink Swell



**Shrink Swell Index - Iss (%): 0.4**

## Comments

**Report No: SSI:NEW23W-0240-S07**

**Issue No: 1**


# Shrink Swell Index Report

**Client:** McCloy Project Management Pty Ltd  
 PO Box 2214  
 Dangar NSW 2309

**Project No.:** NEW18P-01701

**Project Name:** Brush Creek Subdivision - Precinct 2, Stage 7

**Project Location:** Bootaring Boulevard, Edgeworth



Accredited for compliance with ISO/IEC 17025-Testing.  
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*B. Cullen*  
 Approved Signatory: Brent Cullen  
 (Engineering Geologist)  
 NATA Accredited Laboratory Number: 18686  
 Date of Issue: 30/01/2023

## Sample Details

**Sample ID:** NEW23W-0240-S07

**Sampling Method:** The results outlined below apply to the sample as received

**Material:** Gravelly Sandy Clay

**Source:** On-Site Insitu

**Specification:** No Specification

**Sample Location:** BH711B - (1.10 - 1.25m)

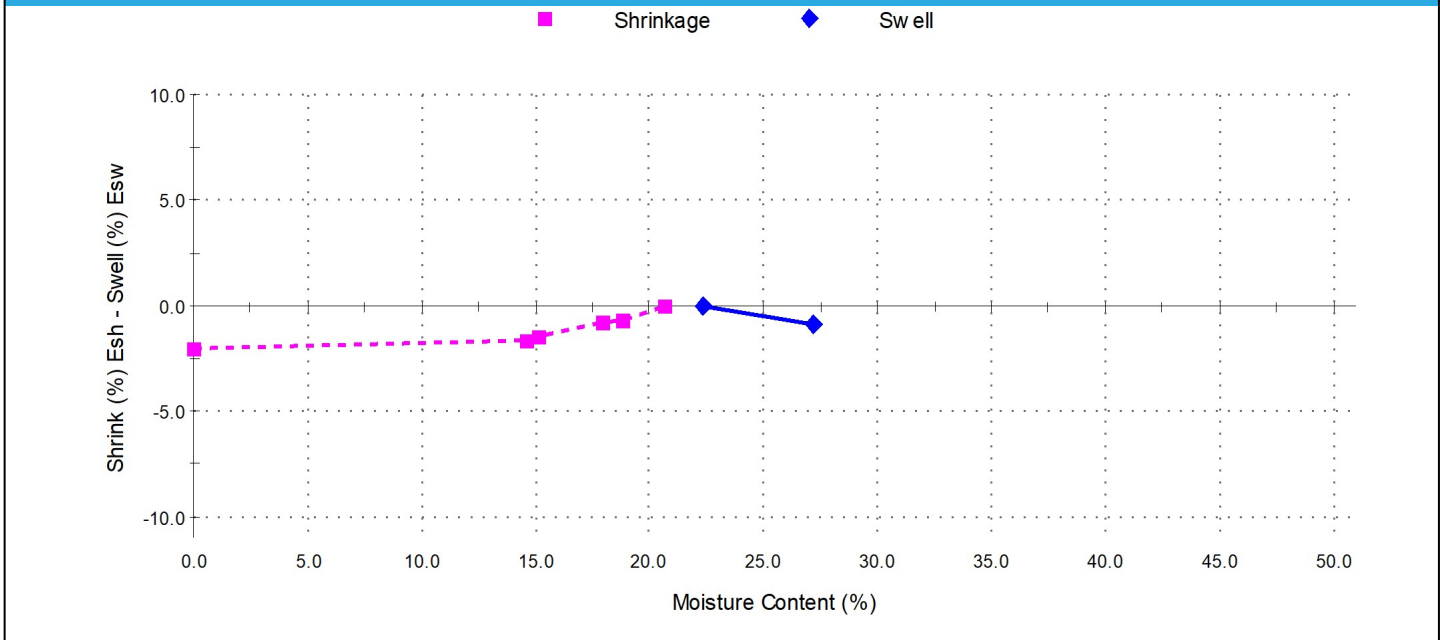
**Date Tested:** 24/01/2023

**Date Sampled:** 17/01/2023

**Date Submitted:** 19/01/2023

Swell Test AS 1289.7.1.1		Shrink Test AS 1289.7.1.1	
<b>Swell on Saturation (%):</b>	-0.9	<b>Shrink on drying (%):</b>	2.0
<b>Moisture Content before (%):</b>	22.3	<b>Shrinkage Moisture Content (%):</b>	20.7
<b>Moisture Content after (%):</b>	27.2	<b>Est. inert material (%):</b>	3%
<b>Est. Unc. Comp. Strength before (kPa):</b>	260	<b>Crumbling during shrinkage:</b>	Nil
<b>Est. Unc. Comp. Strength after (kPa):</b>	270	<b>Cracking during shrinkage:</b>	Moderate

## Shrink Swell




**Shrink Swell Index - Iss (%): 1.1**

## Comments

# Shrink Swell Index Report

**Client:** McCloy Project Management Pty Ltd  
 PO Box 2214  
 Dangar NSW 2309  
  
**Project No.:** NEW18P-01701  
**Project Name:** Brush Creek Subdivision - Precinct 2, Stage 7  
**Project Location:** Bootaring Boulevard, Edgeworth



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 The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.  
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*B. Cullen*  
 Approved Signatory: Brent Cullen  
 (Engineering Geologist)  
 NATA Accredited Laboratory Number: 18686  
 Date of Issue: 30/01/2023

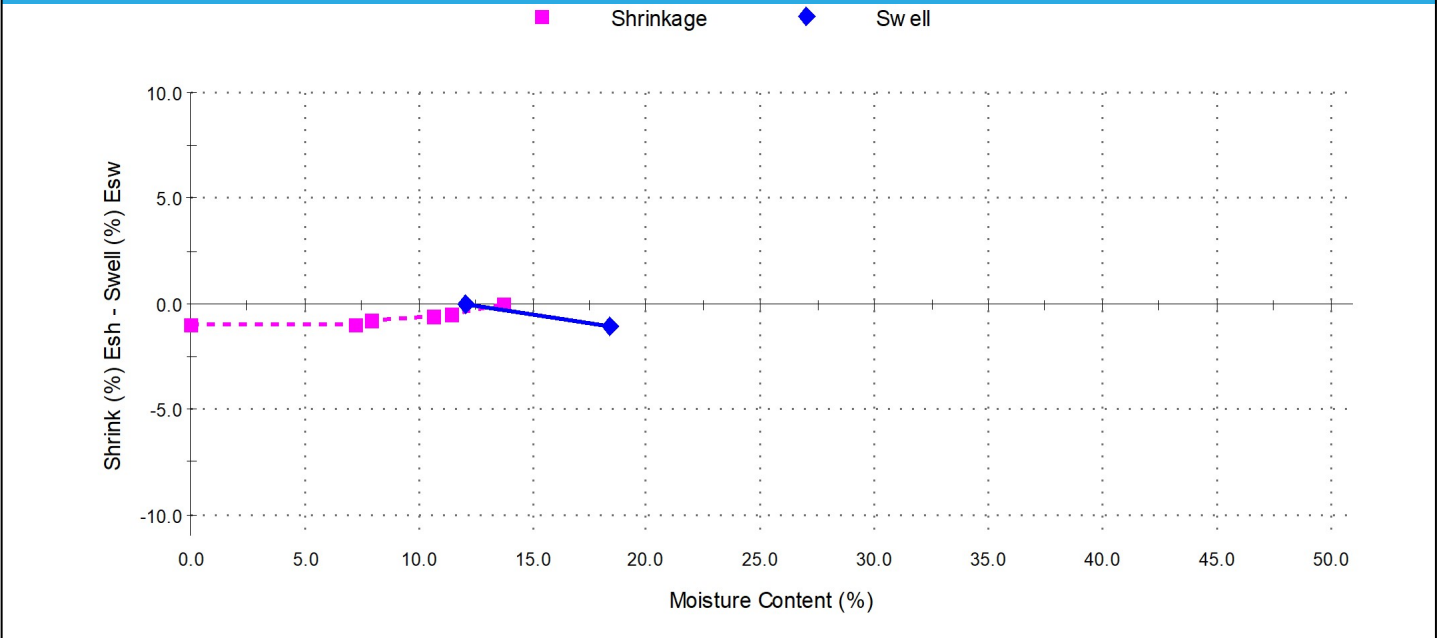
## Sample Details

**Sample ID:** NEW23W-0240-S08  
**Sampling Method:** The results outlined below apply to the sample as received  
**Material:** Gravelly Sandy Clay  
**Source:** On-Site Insitu  
**Specification:** No Specification  
**Sample Location:** BH712 - (0.30 - 0.45m)  
**Date Tested:** 24/01/2023

**Date Sampled:** 17/01/2023  
**Date Submitted:** 19/01/2023

Swell Test AS 1289.7.1.1		Shrink Test AS 1289.7.1.1	
<b>Swell on Saturation (%):</b>	-1.0	<b>Shrink on drying (%):</b>	1.0
<b>Moisture Content before (%):</b>	12.1	<b>Shrinkage Moisture Content (%):</b>	13.7
<b>Moisture Content after (%):</b>	18.4	<b>Est. inert material (%):</b>	2%
<b>Est. Unc. Comp. Strength before (kPa):</b>	490	<b>Crumbling during shrinkage:</b>	Nil
<b>Est. Unc. Comp. Strength after (kPa):</b>	500	<b>Cracking during shrinkage:</b>	Minor

## Shrink Swell



**Shrink Swell Index - Iss (%): 0.6**

## Comments

**Report No: SSI:NEW23W-0240-S10**

**Issue No: 1**


# Shrink Swell Index Report

**Client:** McCloy Project Management Pty Ltd  
 PO Box 2214  
 Dangar NSW 2309

**Project No.:** NEW18P-01701

**Project Name:** Brush Creek Subdivision - Precinct 2, Stage 7

**Project Location:** Bootaring Boulevard, Edgeworth



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

Results provided relate only to the items tested or sampled.

*B. Cullen*  
 Approved Signatory: Brent Cullen  
 (Engineering Geologist)  
 NATA Accredited Laboratory Number: 18686  
 Date of Issue: 30/01/2023

## Sample Details

**Sample ID:** NEW23W-0240-S10

**Sampling Method:** The results outlined below apply to the sample as received

**Material:** Sandy Clay

**Source:** On-Site Insitu

**Specification:** No Specification

**Sample Location:** BH714 - (0.30 - 0.45m)

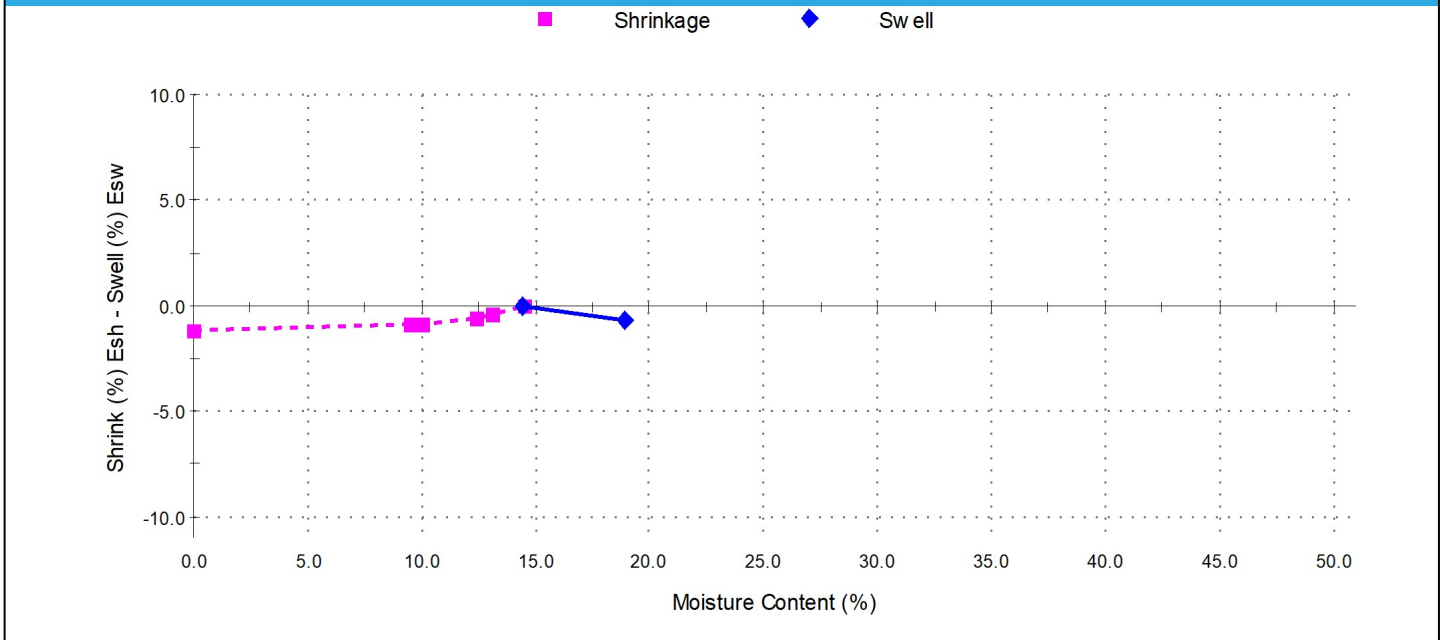
**Date Tested:** 24/01/2023

**Date Sampled:** 17/01/2023

**Date Submitted:** 19/01/2023

Swell Test AS 1289.7.1.1		Shrink Test AS 1289.7.1.1	
<b>Swell on Saturation (%):</b>	-0.7	<b>Shrink on drying (%):</b>	1.2
<b>Moisture Content before (%):</b>	14.4	<b>Shrinkage Moisture Content (%):</b>	14.5
<b>Moisture Content after (%):</b>	18.9	<b>Est. inert material (%):</b>	1%
<b>Est. Unc. Comp. Strength before (kPa):</b>	>600	<b>Crumbling during shrinkage:</b>	Nil
<b>Est. Unc. Comp. Strength after (kPa):</b>	>600	<b>Cracking during shrinkage:</b>	Minor

## Shrink Swell



**Shrink Swell Index - Iss (%): 0.6**

## Comments

**Report No: SSI:NEW23W-0240-S13**

**Issue No: 1**


# Shrink Swell Index Report

**Client:** McCloy Project Management Pty Ltd  
 PO Box 2214  
 Dangar NSW 2309

**Project No.:** NEW18P-01701

**Project Name:** Brush Creek Subdivision - Precinct 2, Stage 7

**Project Location:** Bootaring Boulevard, Edgeworth



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

Results provided relate only to the items tested or sampled.

*B. Cullen*  
 Approved Signatory: Brent Cullen  
 (Engineering Geologist)  
 NATA Accredited Laboratory Number: 18686  
 Date of Issue: 30/01/2023

## Sample Details

**Sample ID:** NEW23W-0240-S13

**Sampling Method:** The results outlined below apply to the sample as received

**Material:** Gravelly Sandy Clay

**Source:** On-Site Insitu

**Specification:** No Specification

**Sample Location:** BH724 - (0.45 - 0.65m)

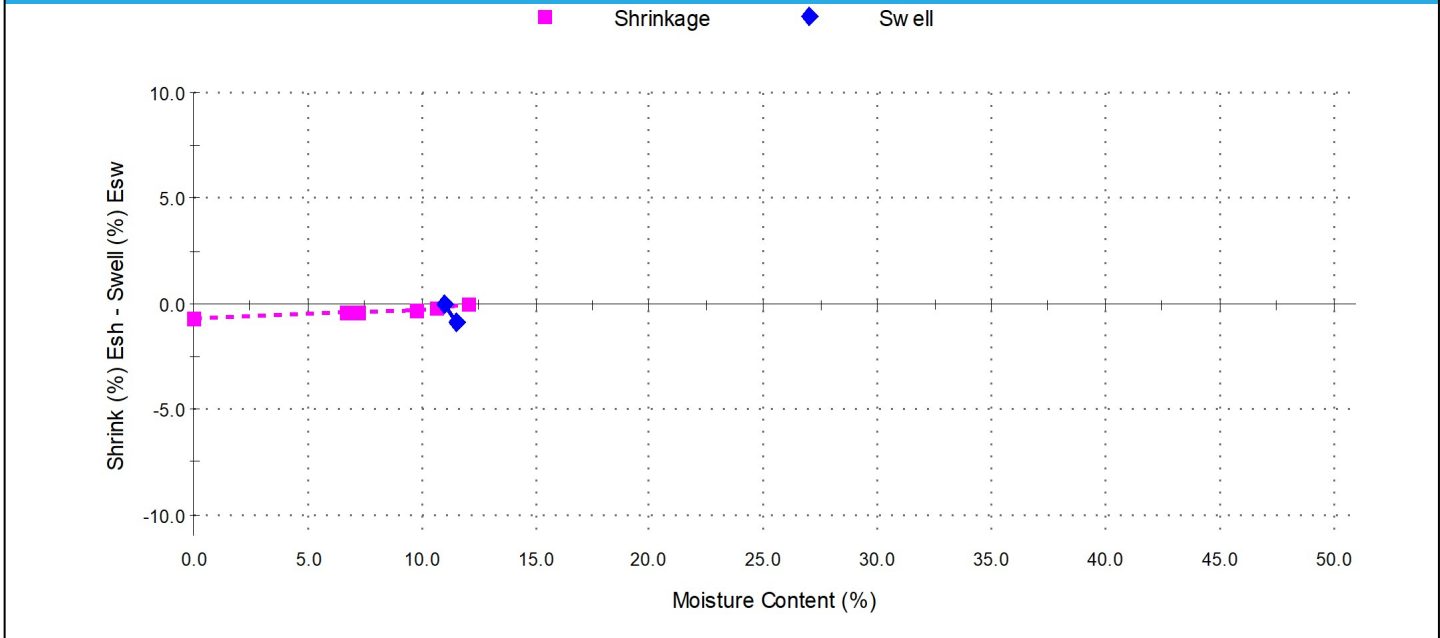
**Date Tested:** 24/01/2023

**Date Sampled:** 17/01/2023

**Date Submitted:** 19/01/2023

Swell Test AS 1289.7.1.1		Shrink Test AS 1289.7.1.1	
<b>Swell on Saturation (%):</b>	-0.8	<b>Shrink on drying (%):</b>	0.7
<b>Moisture Content before (%):</b>	11.0	<b>Shrinkage Moisture Content (%):</b>	12.1
<b>Moisture Content after (%):</b>	11.5	<b>Est. inert material (%):</b>	2%
<b>Est. Unc. Comp. Strength before (kPa):</b>	160	<b>Crumbling during shrinkage:</b>	Nil
<b>Est. Unc. Comp. Strength after (kPa):</b>	>600	<b>Cracking during shrinkage:</b>	Nil

## Shrink Swell



**Shrink Swell Index - Iss (%): 0.4**

## Comments

**Report No: MAT:NEW23W-0240-S01**
**Issue No: 1**


# Material Test Report

**Client:** McCloy Project Management Pty Ltd  
 PO Box 2214  
 Dangar NSW 2309

**Project No.:** NEW18P-01701

**Project Name:** Brush Creek Subdivision - Precinct 2, Stage 7

**Project Location:** Bootaring Boulevard, Edgeworth



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 The results of the tests, calibrations and/or measurements  
 included in this document are traceable to Australian/national  
 standards.  
 Results provided relate only to the items tested or sampled.

  
 Approved Signatory: Dane Cullen  
 (Materials Manager)  
 NATA Accredited Laboratory Number: 18686  
 Date of Issue: 6/02/2023

## Sample Details

**Sample ID:** NEW23W-0240-S01  
**Date Sampled:** 17/01/2023  
**Date Received:** 19/01/2023  
**Source:** On-Site Insitu  
**Material:** Clayey Sand  
**Specification:** No Specification

The results outlined below apply to the sample as received

**Sample Location:** BH706 - (0.50 - 0.70m)

## Test Results

Description	Method	Result	Limits
Sample History	AS 1289.1.1	Oven-dried	
Preparation	AS 1289.1.1	Dry Sieved	
Linear Shrinkage (%)	AS 1289.3.4.1	5.0	
Mould Length (mm)		250	
Crumbling		No	
Curling		No	
Cracking		No	
Liquid Limit (%)	AS 1289.3.1.1	27	
Method		Four Point	
Plastic Limit (%)	AS 1289.3.2.1	16	
Plasticity Index (%)	AS 1289.3.3.1	11	
Date Tested		3/02/2023	

## Comments

N/A




**Report No: MAT:NEW23W-0240-S09**
**Issue No: 1**

# Material Test Report

**Client:** McCloy Project Management Pty Ltd  
 PO Box 2214  
 Dangar NSW 2309

**Project No.:** NEW18P-01701  
**Project Name:** Brush Creek Subdivision - Precinct 2, Stage 7  
**Project Location:** Bootaring Boulevard, Edgeworth



Accredited for compliance with ISO/IEC 17025-Testing.  
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 included in this document are traceable to Australian/national  
 standards.  
 Results provided relate only to the items tested or sampled.

  
 Approved Signatory: Dane Cullen  
 (Materials Manager)  
 NATA Accredited Laboratory Number: 18686  
 Date of Issue: 6/02/2023

## Sample Details

**Sample ID:** NEW23W-0240-S09  
**Date Sampled:** 17/01/2023  
**Date Received:** 19/01/2023  
**Source:** On-Site Insitu  
**Material:** Sandy Clay  
**Specification:** No Specification  
 The results outlined below apply to the sample as received  
**Sample Location:** BH713 - (0.30 - 0.45m)

## Test Results

Description	Method	Result	Limits
Sample History	AS 1289.1.1	Oven-dried	
Preparation	AS 1289.1.1	Dry Sieved	
Linear Shrinkage (%)	AS 1289.3.4.1	14.0	
Mould Length (mm)		250	
Crumbling		No	
Curling		No	
Cracking		No	
Liquid Limit (%)	AS 1289.3.1.1	50	
Method		Four Point	
Plastic Limit (%)	AS 1289.3.2.1	20	
Plasticity Index (%)	AS 1289.3.3.1	30	
Date Tested		6/02/2023	

## Comments

N/A

**Report No: MAT:NEW23W-0240-S11**
**Issue No: 1**

# Material Test Report

**Client:** McCloy Project Management Pty Ltd  
 PO Box 2214  
 Dangar NSW 2309

**Project No.:** NEW18P-01701  
**Project Name:** Brush Creek Subdivision - Precinct 2, Stage 7  
**Project Location:** Bootaring Boulevard, Edgeworth



Accredited for compliance with ISO/IEC 17025-Testing.  
 The results of the tests, calibrations and/or measurements  
 included in this document are traceable to Australian/national  
 standards.  
 Results provided relate only to the items tested or sampled.

  
 Approved Signatory: Dane Cullen  
 (Materials Manager)  
 NATA Accredited Laboratory Number: 18686  
 Date of Issue: 6/02/2023

## Sample Details

**Sample ID:** NEW23W-0240-S11  
**Date Sampled:** 17/01/2023  
**Date Received:** 19/01/2023  
**Source:** On-Site Insitu  
**Material:** Gravelly Sandy Clay  
**Specification:** No Specification

The results outlined below apply to the sample as received  
**Sample Location:** BH722B - (0.40 - 0.55m)

## Test Results

Description	Method	Result	Limits
Sample History	AS 1289.1.1	Oven-dried	
Preparation	AS 1289.1.1	Dry Sieved	
Linear Shrinkage (%)	AS 1289.3.4.1	3.0	
Mould Length (mm)		250	
Crumbling		No	
Curling		No	
Cracking		No	
Liquid Limit (%)	AS 1289.3.1.1	28	
Method		Four Point	
Plastic Limit (%)	AS 1289.3.2.1	17	
Plasticity Index (%)	AS 1289.3.3.1	11	
Date Tested		3/02/2023	

## Comments

N/A

**Report No: MAT:NEW23W-0240-S12**
**Issue No: 1**

# Material Test Report

**Client:** McCloy Project Management Pty Ltd  
 PO Box 2214  
 Dangar NSW 2309

**Project No.:** NEW18P-01701

**Project Name:** Brush Creek Subdivision - Precinct 2, Stage 7

**Project Location:** Bootaring Boulevard, Edgeworth



Accredited for compliance with ISO/IEC 17025-Testing.  
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 standards.

Results provided relate only to the items tested or sampled.



Approved Signatory: Dane Cullen  
 (Materials Manager)

NATA Accredited Laboratory Number: 18686

Date of Issue: 6/02/2023

## Sample Details

**Sample ID:** NEW23W-0240-S12  
**Date Sampled:** 17/01/2023  
**Date Received:** 19/01/2023  
**Source:** On-Site Insitu  
**Material:** Gravelly Sandy Clay  
**Specification:** No Specification  
 The results outlined below apply to the sample as received  
**Sample Location:** BH723 - (0.70 - 0.90m)

## Test Results

Description	Method	Result	Limits
Sample History	AS 1289.1.1	Oven-dried	
Preparation	AS 1289.1.1	Dry Sieved	
Linear Shrinkage (%)	AS 1289.3.4.1	4.5	
Mould Length (mm)		250	
Crumbling		No	
Curling		No	
Cracking		No	
Liquid Limit (%)	AS 1289.3.1.1	25	
Method		Four Point	
Plastic Limit (%)	AS 1289.3.2.1	14	
Plasticity Index (%)	AS 1289.3.3.1	11	
Date Tested		3/02/2023	

## Comments

N/A

# **APPENDIX C:**

**CSIRO Sheet BTF 18**

**Foundation Maintenance and Footing  
Performance: A Homeowner's Guide**

# 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 perpend).

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

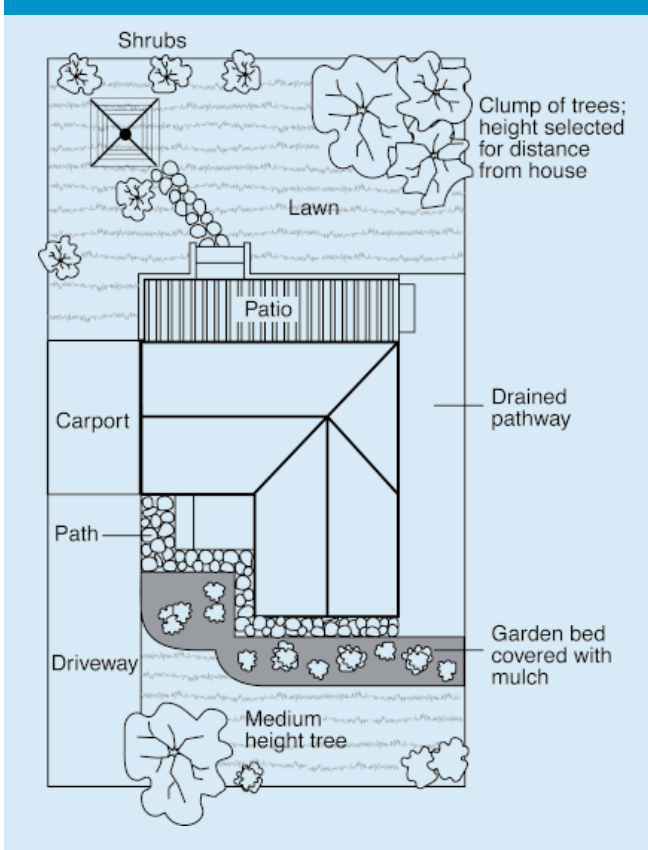
It is essential to remember that the soil that affects footings extends well beyond the actual building line. Watering of garden plants, shrubs and trees causes some of the most serious water problems.

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

### Gardens for a reactive site



- 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.

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:

The information in this and other issues in the series was derived from various sources and was believed to be correct when published.

The information is advisory. It is provided in good faith and not claimed to be an exhaustive treatment of the relevant subject.

Further professional advice needs to be obtained before taking any action based on the information provided.

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