
Proposed Subdivision
Brush Creek Estate -
Precinct 2, Stage 4
Site Classification

Kenakan Street,
Edgeworth

NEW18P-0170G-AB
9 June 2022



9 June 2022

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

Attention: Mr Harry Thomson

Dear Sir

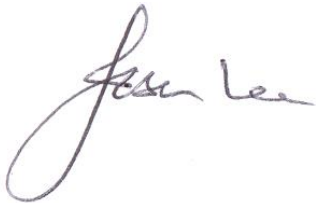
**RE: PROPOSED SUBDIVISION - BRUSH CREEK ESTATE – PRECINCT 2, STAGE 4
KENAKAN STREET, EDGEWORTH
SITE CLASSIFICATION (LOTS 401 TO 430)**

Please find enclosed our geotechnical report for Lots 401 to 430 within Precinct 2, Stage 4 of the Brush Creek Estate residential subdivision, located at Kenakan Street, Edgeworth.

The report includes recommendations for 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 Edwards, Shannon Kelly or the undersigned.

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

A handwritten signature in dark ink, appearing to read 'Jason Lee', with a large loop at the end of the last name.

Jason Lee
Principal Geotechnical Engineer

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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 4, of the Brush Creek Estate residential subdivision, located at Kenakan Street, Edgeworth.

Based on the brief and drawings provided by the client, Stage 4 is understood to include 30 residential allotments (Lots 401 to 430), as shown on the attached sales plan provided by McCloy.

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 4, Edgeworth (KCE No. 20100)', (Report Reference: NEW20P-0011D-AA.Rev1, dated 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);
- Site Classification, 'Proposed Subdivision, Brush Creek Estate – Precinct 2, Stage 3, Tarkalong Street, Edgeworth', (Report Reference: NEW17P-0170E-AB, dated 29 October 2021); and,
- 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 were carried out on 12 and 29 April, 2022 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;
- Excavation of 31 boreholes (BH401 to BH430, and BH423A) using a 2.7 tonne excavator equipped with a 300mm diameter auger attachment. Boreholes were terminated at depths of between 0.31m and 2.00m;
- Undisturbed samples (U50 tubes) and small disturbed samples were taken for subsequent laboratory testing; and,

- Boreholes were backfilled with the excavation spoil and compacted using the excavator auger and tracks, or hand tools.

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.

Engineering logs of the boreholes are presented in Appendix A.

Approximate borehole locations are shown on the attached Figure AB1. Boreholes were located in the field by handheld GPS and relative to existing site features including topographic features, lot boundaries, existing developments and trees.

4.0 Site Description

4.1 Site Regrade Works

Site re-grading filling works within Stage 4 of the development was conducted between 9 August 2021 and 17 February 2022. Re-grade works included filling within all or portions of Lots 401 to 418 and 419 to 427, along with portions of Kenakan Street and Taralong Street.

Further regrade works were performed on Lot 430 between 3 and 6 June 2022, which included the removal of unsuitable and deleterious material to expose the underlying Residual Clay / Weathered Rock profiles, prior to filling within an isolated portion of the lot.

Refer to attached Figure AB1 for the approximate 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 4.5m, with the deepest areas being within the Tarkalong and Kenakan Street intersection and embankment, adjacent Lots 402, 403, and within Lots 416 to 418 behind retaining walls and adjoining Stage 3 allotments.

The approximate maximum depth of fill placed within the re-grade areas excluding topsoil was in the order of:

- 401 to 403 – 0.1m to 4.5m;
- 404 to 407 – 0.6m to 1.2m;
- 408 to 409 – 0.6m to 0.9m;
- 410 to 413 – 0.1m to 0.6m;
- 414 to 418 – 0.1m to 2.1m;

- 419 to 420 – 0.1m to 1.5m;
- 421 to 427 – 0.1m to 0.6m;
- 430 – 0.1m to 0.6m;
- Kenakan Street and Tarkalong Street Intersection / Embankment – 1.5m to 4.5m.

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 filling performed for the re-grade fill areas within Precinct 2 Stage 4 (as shown on Figure AA1), 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.

At the time of the field investigations on 12 and 29 April 2022, several small fill stockpiles were remaining on a number of lots, including Lot 409 and Lots 415 to 417. It is understood and expected that the fill stockpiles will be removed prior to development on the lots.

4.2 Surface Conditions

The site comprises Precinct 2, Stage 4 of the proposed residential subdivision known as Brush Creek Estate, located at Kenakan Street, Edgeworth, as shown on Figure AB1 attached.

The site is bounded by bushland, rural housing and Minmi Road to the west, to the north and south by bushland, and to the east by existing Stages 2 & 3.

Trafficability was judged to be good by way of 4WD vehicle along the existing sealed roads.

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



Photograph 1: From intersection of Kenakan and Koyikaling Street, facing southeast towards Lot 418.



Photograph 2: From near western boundary of Lot 418, facing northwest towards Lot 417.



Photograph 3: From near northern corner of Lots 416 and 417, facing southeast.



Photograph 4: From near northern corner of Lots 416 and 417, facing south.



Photograph 5: From near BH412, facing northeast.



Photograph 6: From near BH12, facing east.



Photograph 7: From BH410, facing northwest.



Photograph 8: From BH410, facing north.



Photograph 9: From near BH406, facing southwest.



Photograph 10: From near BH406, facing northwest (towards Kenakan Street).



Photograph 11: From near BH401, facing northwest.



Photograph 12: From near BH401, facing north.



Photograph 13: From near BH423A, facing southeast.



Photograph 14: From near BH423A, facing south.



Photograph 15: From near centre of Lot 430, facing east, following removal of additional unsuitable material to underlying residual clay / weathered rock material. Photograph taken on 03/06/22.



Photograph 16: From near north-western corner of Lot 430, showing placement and compaction of backfilled area under level 1 supervision. Photograph taken on 03/06/22.

4.3 Subsurface Conditions

Reference to the 1:100,000 Newcastle Coalfield Regional Geology Sheet indicates the site to be underlain by the Adamstown and Boolaroo Subgroups of the Newcastle Coal Measures, which are characterised by Sandstone, Conglomerate, 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 borehole locations.

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

Unit	Soil Type	Description
1A	FILL – TOPSOIL / TOPSOIL	<p>Sandy CLAY – medium plasticity, dark grey, fine to coarse grained sand, with some fine to medium grained angular to sub-angular gravel.</p> <p>Clayey SAND – fine grained, grey, fines of low plasticity, root affected.</p>

Unit	Soil Type	Description
1B	FILL – CONTROLLED	Gravelly Sandy CLAY – low to medium plasticity, dark grey-brown with some orange to red-brown in places, fine to coarse grained sand, fine to coarse grained angular gravel, trace cobbles in places. In places: Sandy CLAY, Gravelly Sandy CLAY / Clayey Sandy GRAVEL, Gravelly Sandy CLAY / Clayey Gravelly SAND.
1C	FILL – OTHER	Gravelly SAND – fine to coarse grained, dark grey, fine to medium grained sub-angular gravel. Sandy GRAVEL – fine to medium grained, angular, brown, fine to coarse grained sand.
2	SLOPEWASH / COLLUVIUM	Sandy CLAY – low plasticity, brown, fine grained sand, trace rootlets. Sandy Gravelly CLAY – low plasticity, brown, fine to medium grained angular to sub-angular gravel, fine to coarse grained (mostly fine grained) sand.
3	ALLUVIUM	Not encountered within this investigation.
4	RESIDUAL SOIL	CLAY – medium to high plasticity, pale grey to white with some pale orange to red-brown and brown. Sandy CLAY – medium plasticity, dark grey-brown trace pale grey, fine to coarse grained sand, trace fine to medium grained sub-angular gravel. Gravelly Sandy CLAY – low plasticity, medium plasticity in places, pale brown / pale grey, fine to coarse grained sand, fine to medium grained sub-angular gravel. Clayey GRAVEL – fine to coarse grained, sub-angular to angular, grey-brown, fines of medium plasticity, trace fine to coarse grained sand. SAND – fine to medium grained, pale orange and pale grey to white, trace fines of low plasticity.
5	EXTREMELY WEATHERED (XW) ROCK with soil properties	Silty Sandstone / Sandstone; breaks down into SAND – fine to medium grained, pale brown. Sandstone; breaks down into Sandy CLAY – low to medium plasticity, pale grey to white and orange, fine grained sand, trace highly weathered rock pockets.
6	HIGHLY WEATHERED (HW) TO SLIGHTLY WEATHERED (SW) ROCK	SANDSTONE – fine to medium grained, pale grey with some pale orange, estimated very low to medium strength. SILTSTONE – pale grey and orange-brown, estimated very low to low strength. Sandy SILTSTONE – pale grey to white, estimated very low to low strength.

TABLE 2 – SUMMARY OF GEOTECHNICAL UNITS ENCOUNTERED AT BOREHOLE LOCATIONS

Location	UNIT 1A FILL-TOPSOIL / TOPSOIL	UNIT 1B FILL - CONTROLLED	UNIT 1C FILL - OTHER	UNIT 2 SLOPEWASH / COLLUVIUM	UNIT 3 ALLUVIUM	UNIT 4 RESIDUAL SOIL	UNIT 5 XW ROCK	UNIT 6 HW TO SW ROCK
	Depth (m)							
Current Investigation (April 2022)								
BH401	0.00 - 0.10	0.10 - 1.00	-	-	-	1.00 - 1.30	-	1.30 - 1.40*
BH402	-	0.00 - 1.40	-	-	-	1.40 - 2.00	-	-
BH403	0.00 - 0.10	0.10 - 1.95	-	-	-	1.95 - 2.00	-	-
BH404	0.00 - 0.15	0.15 - 1.20	-	-	-	1.20 - 2.00	-	-
BH405	0.00 - 0.20	0.20 - 0.80	-	-	-	0.80 - 1.90		1.90 - 2.00*
BH406	0.00 - 0.15	0.15 - 1.05	-	-	-	-	-	1.05 - 1.10*
BH407	0.00 - 0.15	0.15 - 0.60	-	-	-	0.60 - 0.80	-	0.80*
BH408	0.00 - 0.15	0.15 - 0.80	-	-	-	0.80 - 2.00	-	-
BH409	0.00 - 0.15	-	-	-	-	-	0.15 - 0.60	0.60*
BH410	0.00 - 0.25	-	-	-	-	0.25 - 0.80	-	0.80*
BH411	-	0.00 - 0.40	-	-	-	-	0.40 - 0.80	0.80*
BH412	0.00 - 0.25	-	-	-	-	0.25 - 0.40	0.40 - 0.60	0.60*
BH413	0.00 - 0.35	-	-	-	-	0.35 - 0.90	0.90 - 1.10	1.10*
BH414	0.00 - 0.10	0.10 - 0.70	-	-	-	0.70 - 1.10	-	1.10*
BH415	-	0.00 - 1.50	-	-	-	1.50 - 1.90	-	1.90 - 2.00
BH416	-	0.00 - 1.50	-	-	-	1.50 - 2.00	-	-
BH417	-	0.00 - 2.00	-	-	-	-	-	-
BH418	-	0.00 - 1.45	-	-	-	-	-	1.45 - 1.47*

Location	UNIT 1A FILL-TOPSOIL / TOPSOIL	UNIT 1B FILL - CONTROLLED	UNIT 1C FILL - OTHER	UNIT 2 SLOPEWASH / COLLUVIUM	UNIT 3 ALLUVIUM	UNIT 4 RESIDUAL SOIL	UNIT 5 XW ROCK	UNIT 6 HW TO SW ROCK
	Depth (m)							
BH419	-	0.00 - 1.40	-	-	-	1.40 - 2.00	-	-
BH420	-	0.00 - 1.30	-	1.30 - 1.40	-	-	-	1.40 - 1.42*
BH421	-	0.00 - 0.60	-	0.60 - 0.95	-	-	-	0.95 - 0.97*
BH422	-	0.00 - 0.50	-	-	-	-	-	0.50 - 0.51*
BH423	-	0.00 - 0.40	-	-	-	-	-	0.40 - 0.42*
BH23A	-	0.00 - 0.15	-	0.15 - 0.30	-	-	-	0.30 - 0.31*
BH424	-	-	-	-	-	-	0.00 - 0.35	0.35 - 0.36*
BH425	-	-	-	-	-	-	0.00 - 0.35	0.36 - 0.36*
BH426	-	0.00 - 0.10	-	-	-	0.10 - 0.35	-	0.35 - 0.36*
BH427	-	-	-	-	-	-	0.00 - 1.10	1.10 - 1.12*
BH428	0.00 - 0.15	-	-	-	-	0.15 - 0.75	-	0.75 - 0.76*
BH429	0.00 - 0.20	-	-	0.20 - 0.50	-	-	-	0.50 - 0.51*
BH430	-	-	0.00 - 0.60 +	-	-	0.60 - 0.65	-	0.65 - 0.66*
Previous Investigation (Ref: NEW18P-0170F-AB, 17 January 2022)								
BH208	-	0.00 - 0.90	-	-	-	-	-	0.90 - 0.91*
BH209	-	0.00 - 1.15	-	-	-	-	-	1.15 - 1.20*
Previous Investigation (NEW18P-0170E-AB, dated 29 October 2021)								
BH303	0.00 - 0.10	0.10 - 1.30	-	-	-	1.30 - 2.00	-	-
BH312	-	0.00 - 1.40	-	-	-	1.40 - 2.00	-	-
BH313	-	0.00 - 1.20	-	-	-	1.20 - 1.50	-	1.50 - 1.55*
BH318	-	-	-	-	-	0.00 - 0.20	-	0.20 - 2.00

Location	UNIT 1A FILL-TOPSOIL / TOPSOIL	UNIT 1B FILL - CONTROLLED	UNIT 1C FILL - OTHER	UNIT 2 SLOPEWASH / COLLUVIUM	UNIT 3 ALLUVIUM	UNIT 4 RESIDUAL SOIL	UNIT 5 XW ROCK	UNIT 6 HW TO SW ROCK
	Depth (m)							
BH319	-	-	-	-	-	1.20 - 1.30	0.00 - 0.20 1.30 - 2.45	0.20 - 1.20
BH320	-	-	-	-	-	0.00 - 1.60	-	1.60 - 2.00
BH321	0.00 - 0.05	-	-	-	-	0.05 - 0.50	-	0.50 - 1.60^
BH322	-	-	-	-	-	0.00 - 0.30#	0.30#	-
BH323	-	-	-	-	-	0.00 - 0.30#	0.30#	-
BH324	-	0.00 - 0.50	-	-	-	-	-	0.50 - 0.55*
Previous Investigation (Ref: NEW18P-0170A-AA.Rev1, 4 March 2020) – Prior to site regrade works								
TPP01	0.00 - 0.20	-		0.20 - 0.45		-	0.45 - 1.40	1.40 - 1.90*
TPP02	0.00 - 0.25	-		-		-	-	0.25 - 0.50*
TPP03	0.00 - 0.20	-	-	-		-	0.20 - 1.80	1.80 - 2.10
TPP04	0.00 - 0.20	-	-	-		0.20 - 0.50	-	0.50 - 0.90*
TPP09	0.00 - 0.20	-	-	-		0.20 - 1.20	1.20 - 2.65	-
NOTES: <ul style="list-style-type: none"> * = Practical refusal or refusal of 2.7 tonne excavator with auger drill attachment met on Highly Weathered Rock. ^ = Very slow progress of 2.7 tonne excavator with auger drill attachment met on Extremely to Highly Weathered Rock. # = Practical refusal of hand auger met on Extremely to Highly Weathered Rock. + = BH430 (Fill Other from 0.0m to 0.6m depth) was removed and replaced as Controlled Fill between 3 & 6 June 2022. 								

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:

- (18 no.) Shrink / Swell tests; and
- (10 no.) Atterberg Limits tests.

Several shrink/swell tests were replaced by Atterberg Limits classification tests due to the friable nature of the soils.

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 include results from previous testing in the area.

TABLE 3 – SUMMARY OF SHRINK/SWELL TESTING RESULTS

Location	Depth (m)	Material Description	I _{ss} (%)
Current Investigation (April 2022)			
BH401	1.10 - 1.30	(CH) CLAY	1.9
BH404	0.40 - 0.60	FILL: (CL) Gravelly Sandy CLAY	0.2
BH405	0.50 - 0.65	FILL: (CL) Gravelly Sandy CLAY	0.1
BH406	0.30 - 0.45	FILL: (CL) Gravelly Sandy CLAY	1.0
BH406	0.60 - 0.75	FILL: (CL) Gravelly Sandy CLAY	1.2
BH407	0.40 - 0.55	FILL: (CL) Gravelly Sandy CLAY	0.3
BH408	0.30 - 0.45	FILL: (CL) Gravelly Sandy CLAY	0.1
BH408	0.90 - 1.15	(CI) CLAY	1.2
BH411	0.20 - 0.35	FILL - TOPSOIL: (CL) Sandy CLAY	0.4
BH416	0.40 - 0.60	FILL: (CI) Gravelly Sandy CLAY	0.4
BH417	0.50 - 0.70	FILL: (CI) Gravelly Sandy CLAY	1.2
BH418	0.50 - 0.65	FILL: (CL) Gravelly Sandy CLAY	0.6
BH418	1.00 - 1.15	FILL: (CI) Gravelly Sandy CLAY	0.4
BH419	0.20 - 0.35	FILL: (CI) Gravelly Sandy CLAY	0.8
BH420	0.30 - 0.45	FILL: (CI) Gravelly Sandy CLAY	0.6
BH422	0.30 - 0.45	FILL: (CI) Gravelly Sandy CLAY	0.8
BH423	0.20 - 0.35	FILL: (CI) Gravelly Sandy CLAY	2.0
BH428	0.30 - 0.42	(CL) Sandy CLAY	0.3
Previous Investigation (Ref: NEW18P-0170F-AB, 17 January 2022)			
BH208	0.60 - 0.80	FILL: (CH) Sandy CLAY	0.5

Previous Investigation (NEW18P-0170E-AB, dated 29 October 2021)			
BH312	0.50 - 0.65	FILL: (CL) Gravelly Sandy CLAY	0.7
BH313	0.70 - 0.80	FILL: (CL) Gravelly Sandy CLAY	0.4
BH320	0.70 - 1.00	(CH) CLAY	3.2
BH321	0.35 - 0.50	(CH) CLAY	1.5
Previous Investigation (Ref: NEW18P-0170A-AA.Rev1, 4 March 2020)			
TTP04	0.30 - 0.50	(CI) Sandy CLAY	1.0
TTP09	0.40 - 0.50	(CH) CLAY	5.1

TABLE 4 – SUMMARY OF ATTERBERG LIMITS TESTING RESULTS

Location	Depth (m)	Material Description	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Linear Shrinkage (%)
BH401	0.50 - 0.65	FILL: (CL) Gravelly Sandy CLAY	33	19	14	7.0
BH402	0.40 - 0.80	FILL: (CL) Gravelly Sandy CLAY	41	22	19	8.5
BH402	1.50 - 1.70	(CH) CLAY	46	20	26	11.0
BH403	0.50 - 1.00	FILL: (CL) Gravelly Sandy CLAY	32	16	16	7.0
BH405	1.50 - 1.70	(CI) CLAY	37	18	19	9.0
BH414	0.30 - 0.60	FILL: (CI) Gravelly Sandy CLAY	34	16	18	8.5
BH415	0.30 - 0.45	FILL: (CI) Gravelly Sandy CLAY	19	14	5	2.5
BH419	1.50 - 1.70	(CH) CLAY	73	26	47	15.5
BH421	0.40 - 0.55	FILL: (CI) Gravelly Sandy CLAY	34	18	16	9.0
BH426	0.10 - 0.22	(CH) CLAY	48	19	29	10.0
Previous Investigation (Ref: NEW18P-0170F-AB, 17 January 2022)						
BH209	0.60 - 0.75	FILL: (CI) Gravelly Sandy CLAY	46	17	29	-
Previous Investigation (NEW18P-0170E-AB, dated 29 October 2021)						
BH303	1.10 - 1.25	FILL: (CI) Gravelly Sandy CLAY	32	17	15	6.5

The results of the Shrink/Swell and Atterberg Limits laboratory testing indicate that the fill and residual soils tested from the site mostly contain fines of low to 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 4 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
409 to 413, and 422 to 426		M
401 to 408, 414 to 421, and 427 to 430		H1
Notes:	<p>Localised fill stockpiles remained on some lots at the time of the field investigations.</p> <p>Site classifications provided herein are made on the understanding that the fill stockpiles will be removed prior to sales / development of the lots, such that remaining topsoil and/or uncontrolled fill depths on lots is less than 0.4m.</p> <p>If any localised areas of topsoil and/or 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.</p>	

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 Shannon Kelly, Ben Edwards, or the undersigned.

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



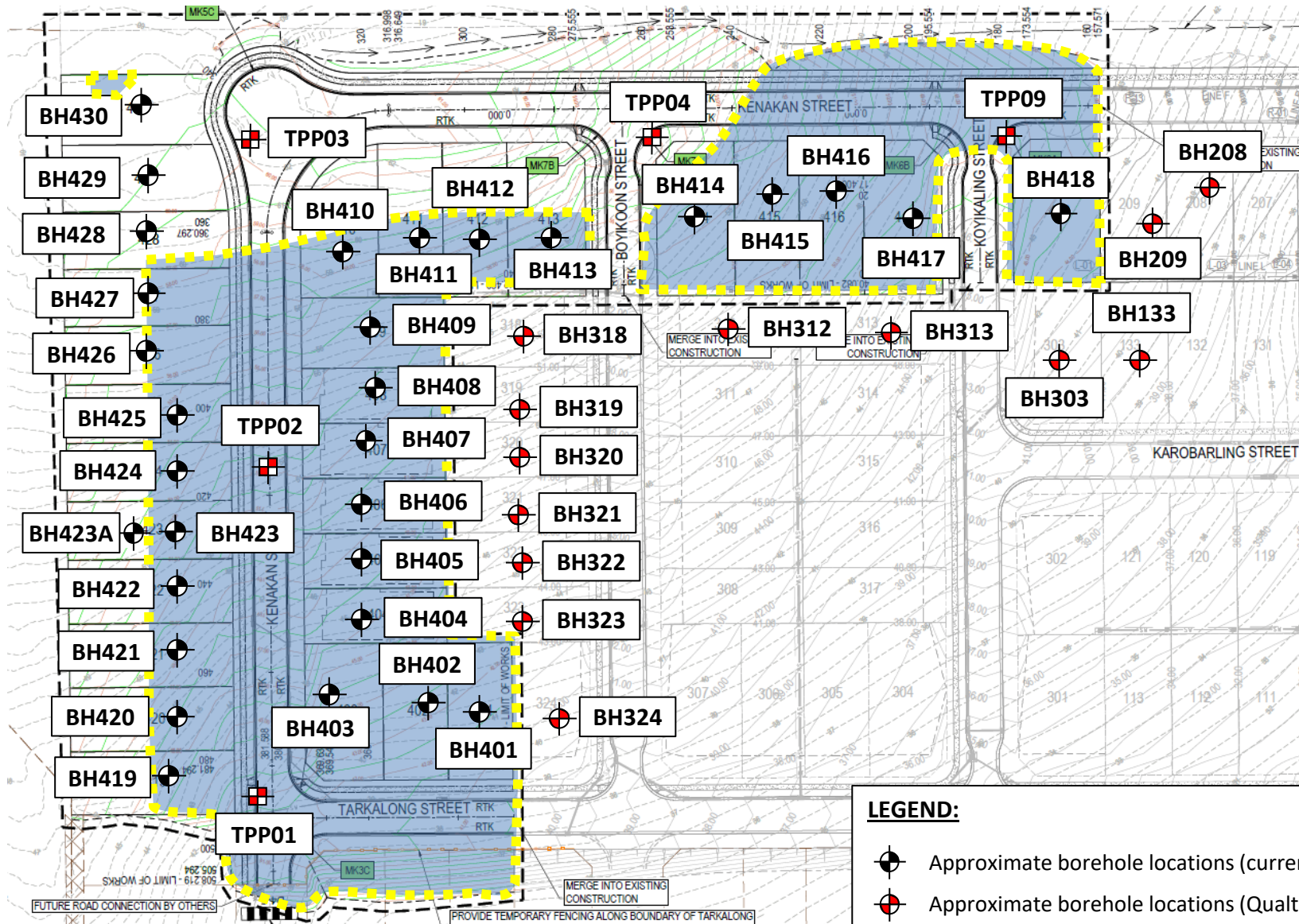
Jason Lee
Principal Geotechnical Engineer

FIGURE AB1:

Site Plan and Approximate Test Locations

SALE PLAN:

Sale Plan for Brush Creek Stage 4



LEGEND:

- Approximate borehole locations (current investigation).
- Approximate borehole locations (Qualtest, 2021 - 2022).
- Approximate test pit locations (Qualtest, 2019).
- Approximate extent of re-grade works (fill).

Figure based on ACOR Consultants drawing (Ref: Project No: NSW201402, DWG No: C403.01, Issue: B, dated: 18.06.21).

Client:	MCCLOY EDGEWORTH PTY LTD	Drawing No:	FIGURE AB1
Project:	BRUSH CREEK ESTATE - PRECINCT 2, STAGE 4	Project No:	NEW18P-0170G
Location:	KENAKAN STREET, EDGEWORTH	Scale:	NOT TO SCALE
Title:	SITE PLAN & APPROXIMATE TEST LOCATIONS	Date:	7/06/2022

APPENDIX A:

Results of Field Investigations

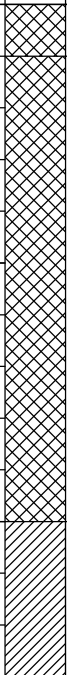
ENGINEERING LOG - BOREHOLE

CLIENT: MCCLOY EDGEWORTH PTY LTD
PROJECT: BRUSH CREEK - PRECINCT 2, STAGE 4
LOCATION: KENAKAN STREET, EDGEWORTH

BOREHOLE NO: BH401
PAGE: 1 OF 1
JOB NO: NEW18P-0170G
LOGGED BY: BE
DATE: 29/4/22

DRILL TYPE: 2.7 TONNE EXCAVATOR
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					CI	FILL-TOPSOIL: Sandy CLAY - medium plasticity, dark grey, fine to coarse grained sand, with some fine to medium grained angular to sub-angular gravel. FILL: Gravelly Sandy CLAY - low to medium plasticity, dark grey-brown, fine to coarse grained sand, fine to coarse grained angular gravel. CLAY - medium to high plasticity, pale grey-white, with some pale orange. SANDSTONE - fine to medium grained, pale grey with pale orange, estimated very low to low strength. Hole Terminated at 1.40 m Practical Refusal	M > w _p		VSt	HP	340	FILL - TOPSOIL
				FILL - CONTROLLED									
		0.50m											
		U50											
		0.65m											
		1.10m		1.0		CH				HP	150	RESIDUAL SOIL	
		U50											
		1.30m		1.30m				D - M					SLIGHTLY WEATHERED ROCK
				1.5									
				2.0									

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

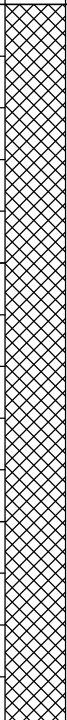
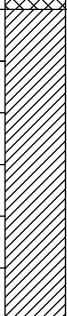
ENGINEERING LOG - BOREHOLE






CLIENT: MCCLOY EDGEWORTH PTY LTD
PROJECT: BRUSH CREEK - PRECINCT 2, STAGE 4
LOCATION: KENAKAN STREET, EDGEWORTH

BOREHOLE NO: BH402
PAGE: 1 OF 1
JOB NO: NEW18P-0170G
LOGGED BY: BE
DATE: 29/4/22

DRILL TYPE: 2.7 TONNE EXCAVATOR
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	FILL: Gravelly Sandy CLAY - low plasticity, dark grey trace pale grey and orange, fine to coarse grained sand, fine to coarse grained angular gravel.	M < w _p	H / Fb	HP	500	FILL - CONTROLLED				
		U50									HP		500			
		0.80m								1.0						
		1.50m		1.5			CH	CLAY - medium to high plasticity, pale grey, with pale brown to brown, trace orange.	M > w _p	VSt	HP		300	RESIDUAL SOIL / POSSIBLE FILL-CONTROLLED		
		D													HP	300
		1.70m											2.0		HP	280
						Hole Terminated at 2.00 m										

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

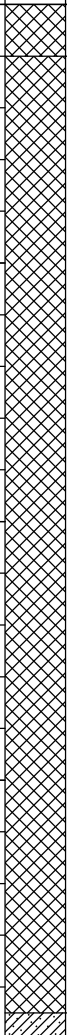
ENGINEERING LOG - BOREHOLE






CLIENT: MCCLOY EDGEWORTH PTY LTD
PROJECT: BRUSH CREEK - PRECINCT 2, STAGE 4
LOCATION: KENAKAN STREET, EDGEWORTH

BOREHOLE NO: BH403
PAGE: 1 OF 1
JOB NO: NEW18P-0170G
LOGGED BY: BE
DATE: 29/4/22

DRILL TYPE: 2.7 TONNE EXCAVATOR
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					CI	FILL-TOPSOIL: Sandy CLAY - medium plasticity, dark grey, fine to coarse grained sand, with some fine to medium grained angular to sub-angular gravel.	M < w _p	H / Fb			FILL - TOPSOIL
							HP			480	FILL - CONTROLLED	
		0.50m					HP			450		
		1.00m					HP			480		
				2.0		CL						
						CI	Sandy CLAY - medium plasticity, dark grey-brown trace pale grey, fine to coarse grained sand, trace fine to medium grained sub-angular gravel.	M > w _p	VSt	HP	280	RESIDUAL SOIL
							Hole Terminated at 2.00 m					

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

SURFACE RL:
DATUM:

QCT LIB 1.1.GLB Log NON-CORED BOREHOLE - TEST PIT NEW18P-0170G-AB LOGS.GPJ <<DrawingFile>> 07/06/2022 18:10 10.0.000 Datgeol Lab and In Situ Tool

Density Index <15%
Density Index 15 - 35%
Density Index 35 - 65%
Density Index 65 - 85%
Density Index 85 - 100%


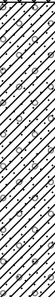



ENGINEERING LOG - BOREHOLE

CLIENT: MCCLOY EDGEWORTH PTY LTD
PROJECT: BRUSH CREEK - PRECINCT 2, STAGE 4
LOCATION: KENAKAN STREET, EDGEWORTH

BOREHOLE NO: BH405
PAGE: 1 OF 1
JOB NO: NEW18P-0170G
LOGGED BY: BE
DATE: 29/4/22

DRILL TYPE: 2.7 TONNE EXCAVATOR
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					CI	FILL-TOPSOIL: Sandy CLAY - medium plasticity, dark grey, fine to coarse grained sand, with some fine to medium grained angular to sub-angular gravel.	M < w _p	VSt - H			FILL - TOPSOIL	
		0.50m		0.5									
		U50 0.65m											
		1.50m		1.5									
		D 1.70m											
						CL	Gravelly Sandy CLAY - low plasticity, pale brown, fine to coarse grained sand, fine to medium grained sub-angular gravel.	M > w _p	VSt	HP	400	RESIDUAL SOIL	
						CI	CLAY - medium plasticity, pale brown to grey-brown trace pale grey and orange.			HP	230		
										HP	210		
							SILTSTONE - pale grey and orange-brown, estimated very low to low strength.	D				HIGHLY TO MODERATELY WEATHERED ROCK	
							Hole Terminated at 2.00 m Practical Refusal						

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

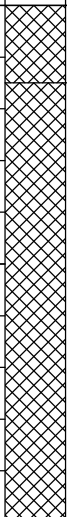
ENGINEERING LOG - BOREHOLE

CLIENT: MCCLOY EDGEWORTH PTY LTD
PROJECT: BRUSH CREEK - PRECINCT 2, STAGE 4
LOCATION: KENAKAN STREET, EDGEWORTH

BOREHOLE NO: BH406
PAGE: 1 OF 1
JOB NO: NEW18P-0170G
LOGGED BY: BE
DATE: 29/4/22

DRILL TYPE: 2.7 TONNE EXCAVATOR
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					CI	FILL-TOPSOIL: Sandy CLAY - medium plasticity, dark grey, fine to coarse grained sand, with some fine to medium grained angular to sub-angular gravel.	M > w _p	St	HP		FILL - TOPSOIL
		0.30m					FILL: Gravelly Sandy CLAY - low plasticity, pale brown, trace orange and pale grey, fine to coarse grained sand, fine to medium grained sub-angular to angular gravel.				150	FILL - CONTROLLED
		U50 0.45m									120	
		0.60m				CL					120	
		U50 0.75m									180	
				1.0			Pale brown to grey-brown with pale grey and orange.					
							SILTSTONE - pale grey and orange-brown, estimated very low to low strength.	D				HIGHLY TO MODERATELY WEATHERED ROCK
							Hole Terminated at 1.10 m Refusal					
				1.5								
				2.0								

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

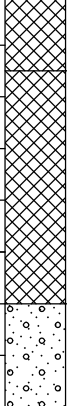
ENGINEERING LOG - BOREHOLE






CLIENT: MCCLOY EDGEWORTH PTY LTD
PROJECT: BRUSH CREEK - PRECINCT 2, STAGE 4
LOCATION: KENAKAN STREET, EDGEWORTH

BOREHOLE NO: BH407
PAGE: 1 OF 1
JOB NO: NEW18P-0170G
LOGGED BY: BE
DATE: 29/4/22

DRILL TYPE: 2.7 TONNE EXCAVATOR
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	U50 0.55m	0.5		CI	FILL-TOPSOIL: Sandy CLAY - medium plasticity, dark grey, fine to coarse grained sand, with some fine to medium grained angular to sub-angular gravel.	M > w _p	VSt	HP	220	FILL - TOPSOIL
		CL				FILL: Gravelly Sandy CLAY - low plasticity, pale brown trace orange and pale grey, fine to coarse grained sand, fine to medium grained sub-angular to angular gravel.					FILL - CONTROLLED	
		GC				Clayey GRAVEL - fine to coarse grained, sub-angular to angular, grey-brown, fines of medium plasticity, trace fine to coarse grained sand.	300				RESIDUAL SOIL / POSSIBLE FILL-CONTROLLED	
				1.0			Hole Terminated at 0.80 m Refusal on weathered rock					
				1.5								
				2.0								

LEGEND:		Notes, Samples and Tests		Consistency		UCS (kPa)	Moisture Condition
Water		U ₅₀	50mm Diameter tube sample	VS	Very Soft	<25	D Dry
 Water Level (Date and time shown)		CBR	Bulk sample for CBR testing	S	Soft	25 - 50	M Moist
 Water Inflow		E	Environmental sample (Glass jar, sealed and chilled on site)	F	Firm	50 - 100	W Wet
 Water Outflow		ASS	Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled)	St	Stiff	100 - 200	W _p Plastic Limit
Strata Changes		B	Bulk Sample	VSt	Very Stiff	200 - 400	W _L Liquid Limit
 Gradational or transitional strata		Field Tests		H	Hard	>400	
 Definitive or distinct strata change		PID	Photoionisation detector reading (ppm)	Fb	Friable		
		DCP(x-y)	Dynamic penetrometer test (test depth interval shown)	V	Very Loose	Density Index <15%	
		HP	Hand Penetrometer test (UCS kPa)	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 - PRECINCT 2, STAGE 4
LOCATION: KENAKAN STREET, EDGEWORTH

BOREHOLE NO: BH408
PAGE: 1 OF 1
JOB NO: NEW18P-0170G
LOGGED BY: BE
DATE: 29/4/22

DRILL TYPE: 2.7 TONNE EXCAVATOR
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				CI	FILL-TOPSOIL: Sandy CLAY - medium plasticity, dark grey, fine to coarse grained sand, with some fine to medium grained angular to sub-angular gravel.	M ~ w _p				FILL - TOPSOIL
		U50 0.45m								HP	450	FILL - CONTROLLED
				0.5	CL	FILL: Gravelly Sandy CLAY - low plasticity, pale brown trace orange and pale grey, fine to coarse grained sand, fine to medium grained sub-angular to angular gravel.	VSt - H		HP	410		
		0.90m							HP	280	RESIDUAL SOIL	
		U50 1.15m		1.0					HP	280		
				1.5		CI	CLAY - medium plasticity, pale grey to white with orange to red-brown.		VSt	HP	320	
				2.0						HP	320	
							Hole Terminated at 2.00 m					

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



ENGINEERING LOG - BOREHOLE






CLIENT: MCCLOY EDGEWORTH PTY LTD
PROJECT: BRUSH CREEK - PRECINCT 2, STAGE 4
LOCATION: KENAKAN STREET, EDGEWORTH

BOREHOLE NO: BH409
PAGE: 1 OF 1
JOB NO: NEW18P-0170G
LOGGED BY: BE
DATE: 29/4/22

DRILL TYPE: 2.7 TONNE EXCAVATOR
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	D	0.5		CI	FILL-TOPSOIL: Sandy CLAY - medium plasticity, dark grey, fine to coarse grained sand, with some fine to medium grained angular to sub-angular gravel.	M > w _p				FILL - TOPSOIL
					SP	Extremely Weathered Silty Sandstone with soil properties; breaks down into SAND - fine to medium grained, pale brown.	D - M	VD	EXTREMELY WEATHERED ROCK			
		0.50m										
							Hole Terminated at 0.60 m Practical Refusal on weathered rock					

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

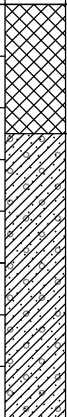
ENGINEERING LOG - BOREHOLE






CLIENT: MCCLOY EDGEWORTH PTY LTD
PROJECT: BRUSH CREEK - PRECINCT 2, STAGE 4
LOCATION: KENAKAN STREET, EDGEWORTH

BOREHOLE NO: BH410
PAGE: 1 OF 1
JOB NO: NEW18P-0170G
LOGGED BY: BE
DATE: 29/4/22

DRILL TYPE: 2.7 TONNE EXCAVATOR
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	D	0.5		CI	FILL-TOPSOIL: Sandy CLAY - medium plasticity, dark grey, fine to coarse grained sand, with some fine to medium grained angular to sub-angular gravel.	M > w _p		HP	520	RESIDUAL SOIL
		CL				Gravelly Sandy CLAY - low to medium plasticity, pale brown to grey-brown trace pale grey, fine to coarse grained sand, fine to medium grained sub-angular gravel.	M < w _p	H	500			
				1.0			Hole Terminated at 0.80 m Practical Refusal on weathered rock					
				1.5								
				2.0								

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

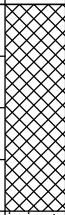

ENGINEERING LOG - BOREHOLE






CLIENT: MCCLOY EDGEWORTH PTY LTD
PROJECT: BRUSH CREEK - PRECINCT 2, STAGE 4
LOCATION: KENAKAN STREET, EDGEWORTH

BOREHOLE NO: BH411
PAGE: 1 OF 1
JOB NO: NEW18P-0170G
LOGGED BY: BE
DATE: 29/4/22

DRILL TYPE: 2.7 TONNE EXCAVATOR
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		0.5		CI	FILL-TOPSOIL: Sandy CLAY - low to medium plasticity, dark grey-brown, fine to coarse grained sand, with some fine to medium grained angular to sub-angular gravel.	M ~ w _p	VSt	HP	350	FILL - CONTROLLED
		U50 0.35m								HP	380	
						SP	Extremely Weathered Silty Sandstone with soil properties; breaks down into SAND - fine to medium grained, pale brown.	D - M	VD			EXTREMELY WEATHERED ROCK
							0.80m Hole Terminated at 0.80 m Practical Refusal on weathered rock					
				1.0								
				1.5								
				2.0								

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

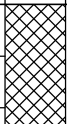


ENGINEERING LOG - BOREHOLE






CLIENT: MCCLOY EDGEWORTH PTY LTD
PROJECT: BRUSH CREEK - PRECINCT 2, STAGE 4
LOCATION: KENAKAN STREET, EDGEWORTH

BOREHOLE NO: BH412
PAGE: 1 OF 1
JOB NO: NEW18P-0170G
LOGGED BY: BE
DATE: 29/4/22

DRILL TYPE: 2.7 TONNE EXCAVATOR
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	0.25m		0.5		CI	FILL-TOPSOIL: Sandy CLAY - medium plasticity, dark grey, fine to coarse grained sand, with some fine to medium grained angular to sub-angular gravel.	M > w _p				FILL - TOPSOIL
					SP	SAND - fine to medium grained, pale orange and pale grey to white, trace grey, trace fines of low plasticity.	M	MD - D	RESIDUAL SOIL			
		0.45m				SP	Extremely Weathered Silty Sandstone with soil properties; breaks down into SAND - fine to medium grained, pale brown.	D				EXTREMELY WEATHERED ROCK
							Hole Terminated at 0.60 m Practical Refusal on weathered rock					
				1.0								
				1.5								
				2.0								

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




ENGINEERING LOG - BOREHOLE

CLIENT: MCCLOY EDGEWORTH PTY LTD
PROJECT: BRUSH CREEK - PRECINCT 2, STAGE 4
LOCATION: KENAKAN STREET, EDGEWORTH

BOREHOLE NO: BH413
PAGE: 1 OF 1
JOB NO: NEW18P-0170G
LOGGED BY: BE
DATE: 29/4/22

DRILL TYPE: 2.7 TONNE EXCAVATOR
BOREHOLE DIAMETER: 300 mm


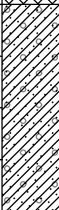
SURFACE RL:
DATUM:

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		CI	FILL-TOPSOIL: Sandy CLAY - medium plasticity, dark grey, fine to coarse grained sand, with some fine to medium grained angular to sub-angular gravel.	M ~ w _p				FILL - TOPSOIL
		D				SP	SAND - fine to medium grained, pale orange and pale grey to white, trace fines of low plasticity.	M	MD - D			RESIDUAL SOIL
		0.60m										
				1.0		SP	Extremely Weathered Silty Sandstone with soil properties; breaks down into SAND - fine to medium grained, pale brown.	D - M	D			EXTREMELY WEATHERED ROCK
				1.10m			Hole Terminated at 1.10 m Practical Refusal on weathered rock					
				1.5								
				2.0								

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




DRILL TYPE: 2.7 TONNE EXCAVATOR
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	D	0.5		CI	FILL-TOPSOIL: Sandy CLAY - medium plasticity, dark grey, fine to coarse grained sand, with some fine to medium grained angular to sub-angular gravel. FILL: Gravelly Sandy CLAY / Clayey Sandy GRAVEL - medium plasticity, pale grey-brown, with some orange to red-brown, fine to coarse grained sand, fine to coarse grained angular gravel, trace angular cobbles.	M > w _p	VSt	HP	320	FILL - TOPSOIL	
		CI				300					FILL - CONTROLLED		
		CI				350					RESIDUAL SOIL / POSSIBLE FILL-CONTROLLED		
		350											
				1.0		CI	Gravelly Sandy CLAY - medium plasticity, pale brown to grey, with some red-brown, fine to coarse grained sand, fine to medium grained angular gravel.			HP	350		
				1.10m			Hole Terminated at 1.10 m Practical Refusal on weathered rock						
				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 ₅₀ | 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) |

[illegible]

- | | | |
|-----|------------|-----------|
| 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 | |

UCS (kPa)

- | | | |
|-----|------------|-----------|
| 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 | |

Moisture Condition

- | | |
|-------|---------------|
| D | Dry |
| M | Moist |
| W | Wet |
| W_p | Plastic Limit |
| W_l | Liquid Limit |

Density

- | | | | |
|----------------|----|--------------|-------------------------|
| 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% |

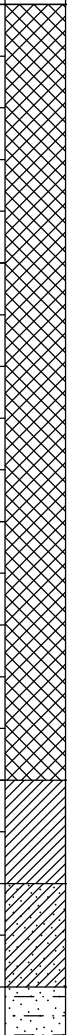

ENGINEERING LOG - BOREHOLE




CLIENT: MCCLOY EDGEWORTH PTY LTD
PROJECT: BRUSH CREEK - PRECINCT 2, STAGE 4
LOCATION: KENAKAN STREET, EDGEWORTH

BOREHOLE NO: BH415
PAGE: 1 OF 1
JOB NO: NEW18P-0170G
LOGGED BY: BE
DATE: 29/4/22

DRILL TYPE: 2.7 TONNE EXCAVATOR
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				CI	FILL: Gravelly Sandy CLAY - medium plasticity, pale grey to pale brown trace pale orange, fine to coarse grained sand, fine to medium grained angular gravel.	M > w _p	VSt	HP	380	FILL - CONTROLLED
		U50 0.45m		0.5						HP	350	
				1.0						HP	350	
				1.5						HP	230	
				1.70m						HP	230	
				1.90m			Sandy SILTSTONE - pale grey to white, estimated very low to low strength.	D				HIGHLY WEATHERED ROCK
				2.0		2.00m	Hole Terminated at 2.00 m					

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

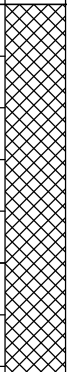
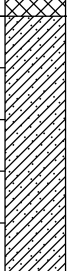
ENGINEERING LOG - BOREHOLE






CLIENT: MCCLOY EDGEWORTH PTY LTD
PROJECT: BRUSH CREEK - PRECINCT 2, STAGE 4
LOCATION: KENAKAN STREET, EDGEWORTH

BOREHOLE NO: BH416
PAGE: 1 OF 1
JOB NO: NEW18P-0170G
LOGGED BY: BE
DATE: 29/4/22

DRILL TYPE: 2.7 TONNE EXCAVATOR
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				CI	FILL: Gravelly Sandy CLAY - medium plasticity, pale grey to pale brown trace pale orange, fine to coarse grained sand, fine to medium grained angular gravel.	M > w _p	VSt	HP	380	FILL - CONTROLLED	
		U50		0.5									
		0.60m									HP		360
				1.0									
				1.5		CI	Sandy CLAY - medium plasticity, dark grey-brown, fine to coarse grained sand, trace rootlets.			HP	340	RESIDUAL SOIL	
				2.0			Hole Terminated at 2.00 m						

LEGEND:		Notes, Samples and Tests		Consistency		UCS (kPa)		Moisture Condition	
Water		U ₅₀ 50mm Diameter tube sample		VS	Very Soft	<25		D	Dry
 Water Level (Date and time shown)		CBR Bulk sample for CBR testing		S	Soft	25 - 50		M	Moist
 Water Inflow		E Environmental sample (Glass jar, sealed and chilled on site)		F	Firm	50 - 100		W	Wet
 Water Outflow		ASS Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled)		St	Stiff	100 - 200		W _p	Plastic Limit
Strata Changes		B Bulk Sample		VSt	Very Stiff	200 - 400		W _L	Liquid Limit
 Gradational or transitional strata		Field Tests		H	Hard	>400			
 Definitive or distinct strata change		PID Photoionisation detector reading (ppm)		Fb	Friable				
		DCP(x-y) Dynamic penetrometer test (test depth interval shown)		Density	V	Very Loose	Density Index <15%		
		HP Hand Penetrometer test (UCS kPa)			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 - PRECINCT 2, STAGE 4
LOCATION: KENAKAN STREET, EDGEWORTH

BOREHOLE NO: BH417
PAGE: 1 OF 1
JOB NO: NEW18P-0170G
LOGGED BY: BE
DATE: 29/4/22

DRILL TYPE: 2.7 TONNE EXCAVATOR
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					CI	FILL: Gravelly Sandy CLAY - medium plasticity, grey to brown, trace pale orange and pale grey to white, fine to coarse grained sand, fine to coarse grained angular gravel.	M > w _p	St - VSt			FILL - CONTROLLED
		0.50m		0.5						HP	220	
		U50								HP	190	
		0.70m		1.0						HP	200	
				1.5						HP	180	
				2.0					HP	200		
							Hole Terminated at 2.00 m					

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

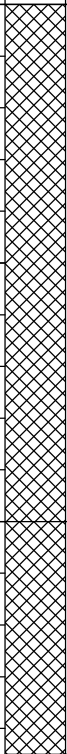
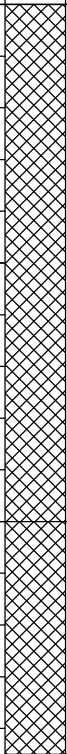
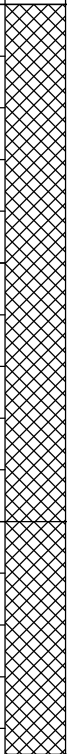
ENGINEERING LOG - BOREHOLE






CLIENT: MCCLOY EDGEWORTH PTY LTD
PROJECT: BRUSH CREEK - PRECINCT 2, STAGE 4
LOCATION: KENAKAN STREET, EDGEWORTH

BOREHOLE NO: BH418
PAGE: 1 OF 1
JOB NO: NEW18P-0170G
LOGGED BY: BE
DATE: 29/4/22

DRILL TYPE: 2.7 TONNE EXCAVATOR
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	0.50m		0.5		CL	FILL: Gravelly Sandy CLAY / Clayey Gravelly SAND - low plasticity, dark grey-brown, trace pale grey and pale orange, fine to coarse grained sand, fine to coarse grained angular gravel, trace CLAY pockets, trace angular cobbles.	M < w _p	Fb	HP	550	FILL - CONTROLLED
		U50										
		0.65m										
		1.00m										
		U50		1.0		CI	FILL: Sandy Gravelly CLAY - medium plasticity, pale brown to grey-brown, fine to coarse grained sand, fine to medium grained rounded to sub-angular gravel.	M > w _p	VSt	HP	220	
1.15m												
				1.5			SANDSTONE - fine grained, pale orange-brown, with some pale grey to white, estimated low to medium strength. Hole Terminated at 1.47 m Refusal	D				HIGHLY TO MODERATELY WEATHERED ROCK
				2.0								

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

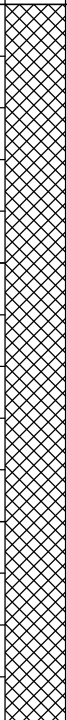
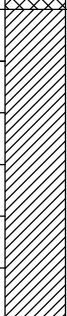
ENGINEERING LOG - BOREHOLE






CLIENT: MCCLOY EDGEWORTH PTY LTD
PROJECT: BRUSH CREEK - PRECINCT 2, STAGE 4
LOCATION: KENAKAN STREET, EDGEWORTH

BOREHOLE NO: BH419
PAGE: 1 OF 1
JOB NO: NEW18P-0170G
LOGGED BY: BE
DATE: 12/4/22

DRILL TYPE: 2.7 TONNE EXCAVATOR
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		0.5		CI	FILL: Gravelly Sandy CLAY - medium plasticity, grey to brown, trace pale orange and pale grey to white, fine to coarse grained sand, fine to coarse grained angular gravel.	M > w _p	St	HP	180 - 220	FILL - CONTROLLED
		U50 0.35m										
										HP	180	
										HP	150	
		1.50m	1.5		CH	CLAY - medium to high plasticity, pale grey and pale brown, trace orange.		VSt	HP	300	RESIDUAL SOIL	
	D 1.70m		HP						180			
				2.0			Hole Terminated at 2.00 m					

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

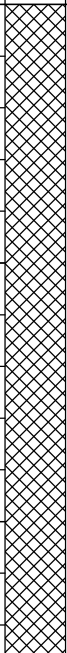
ENGINEERING LOG - BOREHOLE






CLIENT: MCCLOY EDGEWORTH PTY LTD
PROJECT: BRUSH CREEK - PRECINCT 2, STAGE 4
LOCATION: KENAKAN STREET, EDGEWORTH

BOREHOLE NO: BH420
PAGE: 1 OF 1
JOB NO: NEW18P-0170G
LOGGED BY: BE
DATE: 12/4/22

DRILL TYPE: 2.7 TONNE EXCAVATOR
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				CI	FILL: Gravelly Sandy CLAY - medium plasticity, grey to brown trace pale orange and pale grey to white, fine to coarse grained sand, fine to coarse grained angular gravel.	M > w _p	St	HP	220	FILL - CONTROLLED
		U50										
		0.45m										
				0.5								
				1.0						HP	180	
				1.5						HP	150	
				1.30m		CL	Sandy CLAY - low plasticity, brown, fine grained sand, trace rootlets.	M < w _p	Fb			COLLUVIUM
				1.40m			SANDSTONE - fine grained, pale orange-brown with some pale grey to white, estimated low to medium strength.					HIGHLY TO MODERATELY WEATHERED ROCK
				1.42m			Hole Terminated at 1.42 m Refusal					
				2.0								

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

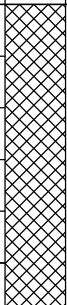
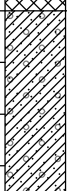
ENGINEERING LOG - BOREHOLE






CLIENT: MCCLOY EDGEWORTH PTY LTD
PROJECT: BRUSH CREEK - PRECINCT 2, STAGE 4
LOCATION: KENAKAN STREET, EDGEWORTH

BOREHOLE NO: BH421
PAGE: 1 OF 1
JOB NO: NEW18P-0170G
LOGGED BY: BE
DATE: 12/4/22

DRILL TYPE: 2.7 TONNE EXCAVATOR
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					CI	FILL: Gravelly Sandy CLAY - medium plasticity, grey to brown trace pale orange and pale grey to white, fine to coarse grained sand, fine to coarse grained angular gravel.	M > w _p	St	HP	200	FILL - CONTROLLED
		0.40m		HP						180		
		U50		HP						180		
		0.55m										
				0.60m		CL	Sandy Gravelly CLAY - low plasticity, brown, fine to medium grained angular to sub-angular gravel, fine to coarse grained (mostly fine grained) sand.	M < w _p	H / Fb			COLLUVIUM
				0.95m								
				0.97m			SANDSTONE - fine grained, pale orange-brown with some pale grey to white, estimated low to medium strength. Hole Terminated at 0.97 m Refusal					HIGHLY TO MODERATELY WEATHERED ROCK

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

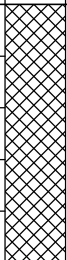
ENGINEERING LOG - BOREHOLE






CLIENT: MCCLOY EDGEWORTH PTY LTD
PROJECT: BRUSH CREEK - PRECINCT 2, STAGE 4
LOCATION: KENAKAN STREET, EDGEWORTH

BOREHOLE NO: BH422
PAGE: 1 OF 1
JOB NO: NEW18P-0170G
LOGGED BY: BE
DATE: 12/4/22

DRILL TYPE: 2.7 TONNE EXCAVATOR
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		0.5		CI	FILL: Gravelly Sandy CLAY - medium plasticity, grey to brown trace pale orange and pale grey to white, fine to coarse grained sand, fine to coarse grained angular gravel.	M > w _p	St			FILL - CONTROLLED
		U50										
		0.45m										
							SANDSTONE - fine grained, pale orange-brown with some pale grey to white, estimated low to medium strength. Hole Terminated at 0.51 m Refusal					HIGHLY TO MODERATELY WEATHERED ROCK
				1.0								
				1.5								
				2.0								

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

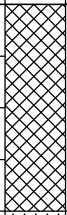
ENGINEERING LOG - BOREHOLE






CLIENT: MCCLOY EDGEWORTH PTY LTD
PROJECT: BRUSH CREEK - PRECINCT 2, STAGE 4
LOCATION: KENAKAN STREET, EDGEWORTH

BOREHOLE NO: BH423
PAGE: 1 OF 1
JOB NO: NEW18P-0170G
LOGGED BY: BE
DATE: 12/4/22

DRILL TYPE: 2.7 TONNE EXCAVATOR
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				CI	FILL: Gravelly Sandy CLAY - medium plasticity, grey to brown trace pale orange and pale grey to white, fine to coarse grained sand, fine to coarse grained angular gravel.	M > w _p	St			FILL - CONTROLLED
		U50										
		0.35m										
				0.5			SANDSTONE - fine grained, pale orange-brown with some pale grey to white, estimated low to medium strength. Hole Terminated at 0.42 m Refusal	D				HIGHLY TO MODERATELY WEATHERED ROCK
				1.0								
				1.5								
				2.0								

LEGEND:		Notes, Samples and Tests		Consistency		UCS (kPa)	Moisture Condition
Water		U ₅₀	50mm Diameter tube sample	VS	Very Soft	<25	D Dry
 Water Level (Date and time shown)		CBR	Bulk sample for CBR testing	S	Soft	25 - 50	M Moist
 Water Inflow		E	Environmental sample (Glass jar, sealed and chilled on site)	F	Firm	50 - 100	W Wet
 Water Outflow		ASS	Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled)	St	Stiff	100 - 200	W _p Plastic Limit
Strata Changes		B	Bulk Sample	VSt	Very Stiff	200 - 400	W _L Liquid Limit
 Gradational or transitional strata		Field Tests		H	Hard	>400	
 Definitive or distinct strata change		PID	Photoionisation detector reading (ppm)	Fb	Friable		
		DCP(x-y)	Dynamic penetrometer test (test depth interval shown)	V	Very Loose	Density Index <15%	
		HP	Hand Penetrometer test (UCS kPa)	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 - PRECINCT 2, STAGE 4
LOCATION: KENAKAN STREET, EDGEWORTH

BOREHOLE NO: BH423A
PAGE: 1 OF 1
JOB NO: NEW18P-0170G
LOGGED BY: BE
DATE: 12/4/22

DRILL TYPE: 2.7 TONNE EXCAVATOR
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					CI	FILL-TOPSOIL: Gravelly Sandy CLAY - low plasticity, dark grey-brown, fine to coarse grained sand, fine grained angular to sub-angular gravel.	M > w _p		HP	150	
						CL	Sandy Gravelly CLAY - low plasticity, brown, fine to medium grained angular to sub-angular gravel, fine to coarse grained (mostly fine grained) sand.		VSt			
				0.5								
				1.0								
				1.5								
				2.0								

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


ENGINEERING LOG - BOREHOLE






CLIENT: MCCLOY EDGEWORTH PTY LTD
PROJECT: BRUSH CREEK - PRECINCT 2, STAGE 4
LOCATION: KENAKAN STREET, EDGEWORTH

BOREHOLE NO: BH424
PAGE: 1 OF 1
JOB NO: NEW18P-0170G
LOGGED BY: BE
DATE: 12/4/22

DRILL TYPE: 2.7 TONNE EXCAVATOR
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					SP	Extremely Weathered Sandstone with soil properties; breaks down into SAND - fine to coarse grained, pale orange and pale grey-brown.	D - M	VD			EXTREMELY WEATHERED ROCK
				0.5			SANDSTONE - fine grained, pale orange-brown with some pale grey to white, estimated low to medium strength. Hole Terminated at 0.36 m Refusal	D				HIGHLY TO MODERATELY WEATHERED ROCK
				1.0								
				1.5								
				2.0								
									</			

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

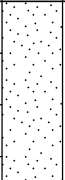
ENGINEERING LOG - BOREHOLE






CLIENT: MCCLOY EDGEWORTH PTY LTD
PROJECT: BRUSH CREEK - PRECINCT 2, STAGE 4
LOCATION: KENAKAN STREET, EDGEWORTH

BOREHOLE NO: BH425
PAGE: 1 OF 1
JOB NO: NEW18P-0170G
LOGGED BY: BE
DATE: 12/4/22

DRILL TYPE: 2.7 TONNE EXCAVATOR
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					SP	Extremely Weathered Sandstone with soil properties; breaks down into SAND - fine to coarse grained, pale orange and pale grey-brown.	D - M	VD			EXTREMELY WEATHERED ROCK
				0.5			SANDSTONE - fine grained, pale orange-brown with some pale grey to white, estimated low to medium strength. Hole Terminated at 0.36 m Refusal	D				HIGHLY TO MODERATELY WEATHERED ROCK
				1.0								
				1.5								
				2.0								

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

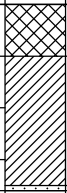
ENGINEERING LOG - BOREHOLE

CLIENT: MCCLOY EDGEWORTH PTY LTD
PROJECT: BRUSH CREEK - PRECINCT 2, STAGE 4
LOCATION: KENAKAN STREET, EDGEWORTH

BOREHOLE NO: BH426
PAGE: 1 OF 1
JOB NO: NEW18P-0170G
LOGGED BY: BE
DATE: 12/4/22

DRILL TYPE: 2.7 TONNE EXCAVATOR
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	0.10m				CI	FILL: Gravelly Sandy CLAY - medium plasticity, pale grey-brown and orange, fine to coarse grained sand, fine to coarse grained angular gravel. / CLAY - medium to high plasticity, grey and orange.	M > w _p		HP	220	FILL - CONTROLLED
		U50 0.22m				CH					300	RESIDUAL SOIL
				0.5			SANDSTONE - fine grained, pale orange-brown with some pale grey to white, estimated low to medium strength. Hole Terminated at 0.36 m Refusal					HIGHLY TO MODERATELY WEATHERED ROCK
				1.0								
				1.5								
				2.0								

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

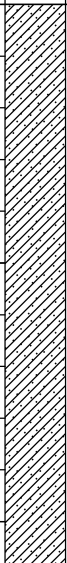
ENGINEERING LOG - BOREHOLE

CLIENT: MCCLOY EDGEWORTH PTY LTD
PROJECT: BRUSH CREEK - PRECINCT 2, STAGE 4
LOCATION: KENAKAN STREET, EDGEWORTH

BOREHOLE NO: BH427
PAGE: 1 OF 1
JOB NO: NEW18P-0170G
LOGGED BY: BE
DATE: 12/4/22

DRILL TYPE: 2.7 TONNE EXCAVATOR
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	0.50m		0.5		CL	Extremely Weathered Sandstone with soil properties; breaks down into Sandy CLAY - low to medium plasticity, pale grey to white and orange, fine grained sand, trace highly weathered rock pockets.	M < w _p	H	HP	>600	EXTREMELY WEATHERED ROCK
		D		HP						>600		
		0.80m		1.0						HP	>600	
				1.10m 1.12m			SANDSTONE - fine grained, pale orange-brown with some pale grey to white, estimated low to medium strength. Hole Terminated at 1.12 m Refusal	D				HIGHLY TO MODERATELY WEATHERED ROCK
				1.5								
				2.0								

LEGEND:		Notes, Samples and Tests		Consistency		UCS (kPa)	Moisture Condition
Water		U ₅₀	50mm Diameter tube sample	VS	Very Soft	<25	D Dry
Water Level (Date and time shown)		CBR	Bulk sample for CBR testing	S	Soft	25 - 50	M Moist
Water Inflow		E	Environmental sample (Glass jar, sealed and chilled on site)	F	Firm	50 - 100	W Wet
Water Outflow		ASS	Acid Sulfate Soil Sample (Plastic bag, air expelled, chilled)	St	Stiff	100 - 200	W _p Plastic Limit
Strata Changes		B	Bulk Sample	VSt	Very Stiff	200 - 400	W _L Liquid Limit
Gradational or transitional strata		Field Tests		H	Hard	>400	
Definitive or distinct strata change		PID	Photoionisation detector reading (ppm)	Fb	Friable		
		DCP(x-y)	Dynamic penetrometer test (test depth interval shown)	V	Very Loose	Density Index <15%	
		HP	Hand Penetrometer test (UCS kPa)	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 - PRECINCT 2, STAGE 4
LOCATION: KENAKAN STREET, EDGEWORTH

BOREHOLE NO: BH428
PAGE: 1 OF 1
JOB NO: NEW18P-0170G
LOGGED BY: BE
DATE: 12/4/22

DRILL TYPE: 2.7 TONNE EXCAVATOR
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	
AD/T	Not Encountered	0.30m				CL	TOPSOIL: Sandy CLAY - low plasticity, dark grey-brown, fine to medium grained sand, root affected.			TOPSOIL
		U50 0.42m				CL	Sandy CLAY - low plasticity, pale grey with pale orange, fine to medium grained sand.			RESIDUAL SOIL
				0.5		CL				
				1.0			SANDSTONE - fine grained, pale orange-brown with some pale grey to white, estimated low to medium strength. Hole Terminated at 0.76 m Refusal			HIGHLY TO MODERATELY WEATHERED ROCK
				1.5						
				2.0						

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


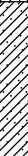
ENGINEERING LOG - BOREHOLE

CLIENT: MCCLOY EDGEWORTH PTY LTD
PROJECT: BRUSH CREEK - PRECINCT 2, STAGE 4
LOCATION: KENAKAN STREET, EDGEWORTH

BOREHOLE NO: BH429
PAGE: 1 OF 1
JOB NO: NEW18P-0170G
LOGGED BY: BE
DATE: 12/4/22

DRILL TYPE: 2.7 TONNE EXCAVATOR
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				SC	TOPSOIL: Clayey SAND - fine grained, grey, fines of low plasticity, root affected.					TOPSOIL
		D				CL	Sandy CLAY - low plasticity, pale grey, trace orange to red-brown, fine to coarse grained sand, trace fine to medium grained angular to sub-angular gravel.	M ~ w _p	H			COLLUVIUM / RESIDUAL SOIL
		0.50m		0.5			SANDSTONE - fine grained, pale orange-brown with some pale grey to white, estimated low to medium strength. Hole Terminated at 0.51 m Refusal	D				HIGHLY TO MODERATELY WEATHERED ROCK
				1.0								
				1.5								
				2.0								

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

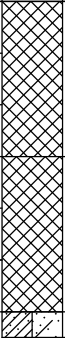
ENGINEERING LOG - BOREHOLE






CLIENT: MCCLOY EDGEWORTH PTY LTD
PROJECT: BRUSH CREEK - PRECINCT 2, STAGE 4
LOCATION: KENAKAN STREET, EDGEWORTH

BOREHOLE NO: BH430
PAGE: 1 OF 1
JOB NO: NEW18P-0170G
LOGGED BY: BE
DATE: 12/4/22

DRILL TYPE: 2.7 TONNE EXCAVATOR
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					SP	FILL: Gravelly SAND - fine to coarse grained, dark grey, fine to medium grained sub-angular gravel.	M				FILL - UNCONTROLLED
		0.60m				GP	FILL: Sandy GRAVEL - fine to medium grained angular, brown, fine to coarse grained sand.					
		0.65m				CL	Sandy CLAY / Clayey SAND - low plasticity, pale grey, trace orange to red-brown, fine to coarse grained sand, fine to medium grained angular to sub-angular gravel.					
		D					SANDSTONE - fine to medium grained, pale grey with pale orange, estimated low to medium strength. Hole Terminated at 0.66 m Refusal		H	HP	420	RESIDUAL SOIL / POSSIBLE COLLUVIUM SLIGHTLY WEATHERED ROCK

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

APPENDIX B:

Results of Laboratory Testing

Report No: SSI:NEW22W-1294-S02
Issue No: 1

Shrink Swell Index Report

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

Project No.: NEW18P-0170G

Project Name: Brush Creek Subdivision - Precinct 2, Stage 4

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: 31/05/2022

Sample Details

Sample ID: NEW22W-1294-S02

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

Material: Clay

Date Sampled: 12/04/2022

Source: On-Site Insitu

Date Submitted: 5/05/2022

Specification: No Specification

Sample Location: BH401 - (1.10 - 1.30m)

Date Tested: 24/05/2022

Swell Test

AS 1289.7.1.1

Swell on Saturation (%): 0.3

Moisture Content before (%): 21.7

Moisture Content after (%): 25.8

Est. Unc. Comp. Strength before (kPa): 400

Est. Unc. Comp. Strength after (kPa): 220

Shrink Test

AS 1289.7.1.1

Shrink on drying (%): 3.3

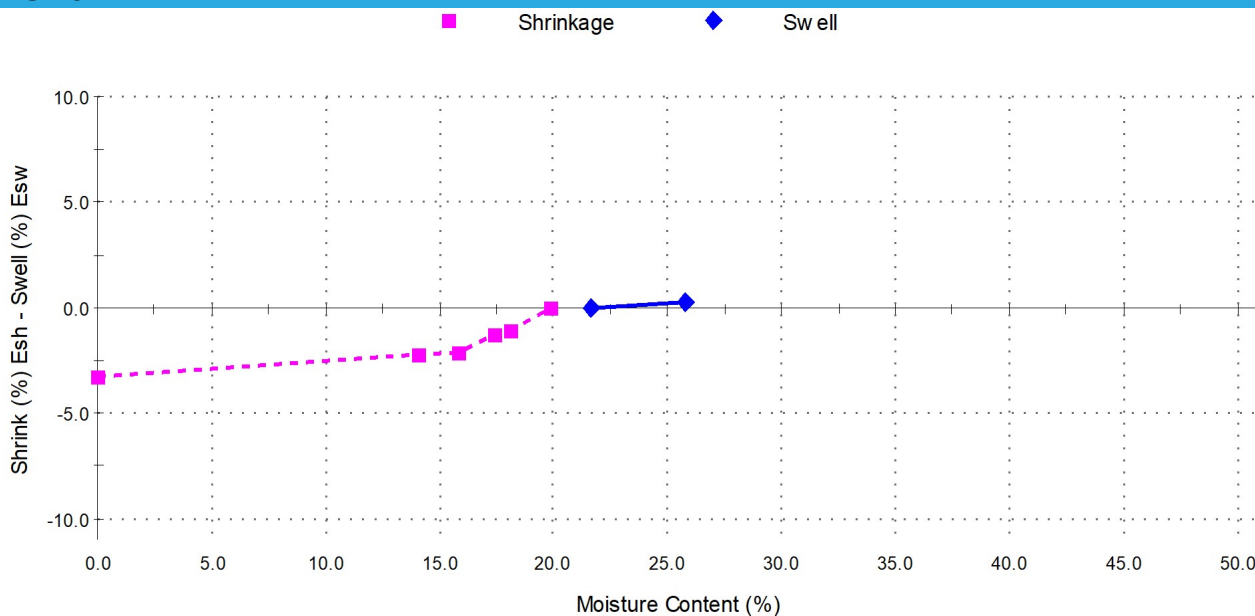
Shrinkage Moisture Content (%): 19.9

Est. inert material (%): 3%

Crumbling during shrinkage: Nil

Cracking during shrinkage: Major

Shrink Swell



Shrink Swell Index - Iss (%): 1.9

Comments

Report No: SSI:NEW22W-1294-S03
Issue No: 1

Shrink Swell Index Report

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

Project No.: NEW18P-0170G

Project Name: Brush Creek Subdivision - Precinct 2, Stage 4

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: 31/05/2022

Sample Details

Sample ID: NEW22W-1294-S03

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

Material: Gravelly Sandy Clay

Date Sampled: 12/04/2022

Source: On-Site Insitu

Date Submitted: 5/05/2022

Specification: No Specification

Sample Location: BH404 - (0.40 - 0.60m)

Date Tested: 23/05/2022

Swell Test

AS 1289.7.1.1

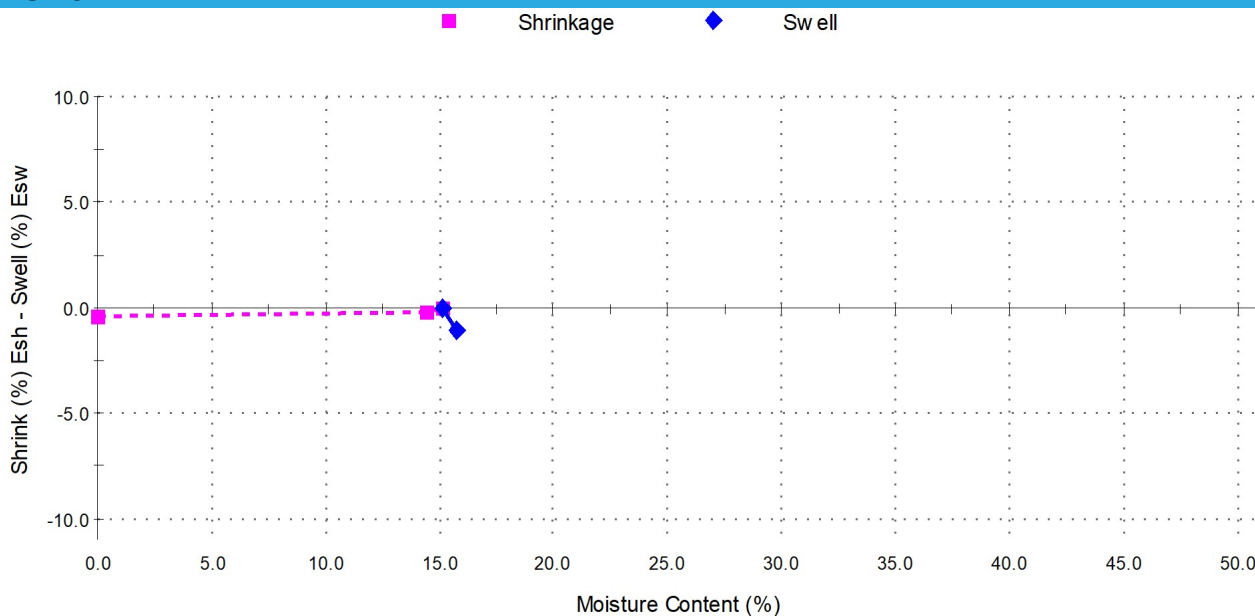
Swell on Saturation (%): -1.0
Moisture Content before (%): 15.1
Moisture Content after (%): 15.7
Est. Unc. Comp. Strength before (kPa): 500
Est. Unc. Comp. Strength after (kPa): >600

Shrink Test

AS 1289.7.1.1

Shrink on drying (%): 0.4
Shrinkage Moisture Content (%): 15.1
Est. inert material (%): 2%
Crumbling during shrinkage: Nil
Cracking during shrinkage: Minor

Shrink Swell



Shrink Swell Index - Iss (%): 0.2

Comments

Report No: SSI:NEW22W-1294-S04
Issue No: 1

Shrink Swell Index Report

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

Project No.: NEW18P-0170G

Project Name: Brush Creek Subdivision - Precinct 2, Stage 4

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: 31/05/2022

Sample Details

Sample ID: NEW22W-1294-S04

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

Material: Gravelly Sandy Clay

Date Sampled: 12/04/2022

Source: On-Site Insitu

Date Submitted: 5/05/2022

Specification: No Specification

Sample Location: BH405 - (0.50 - 0.65m)

Date Tested: 23/05/2022

Swell Test

AS 1289.7.1.1

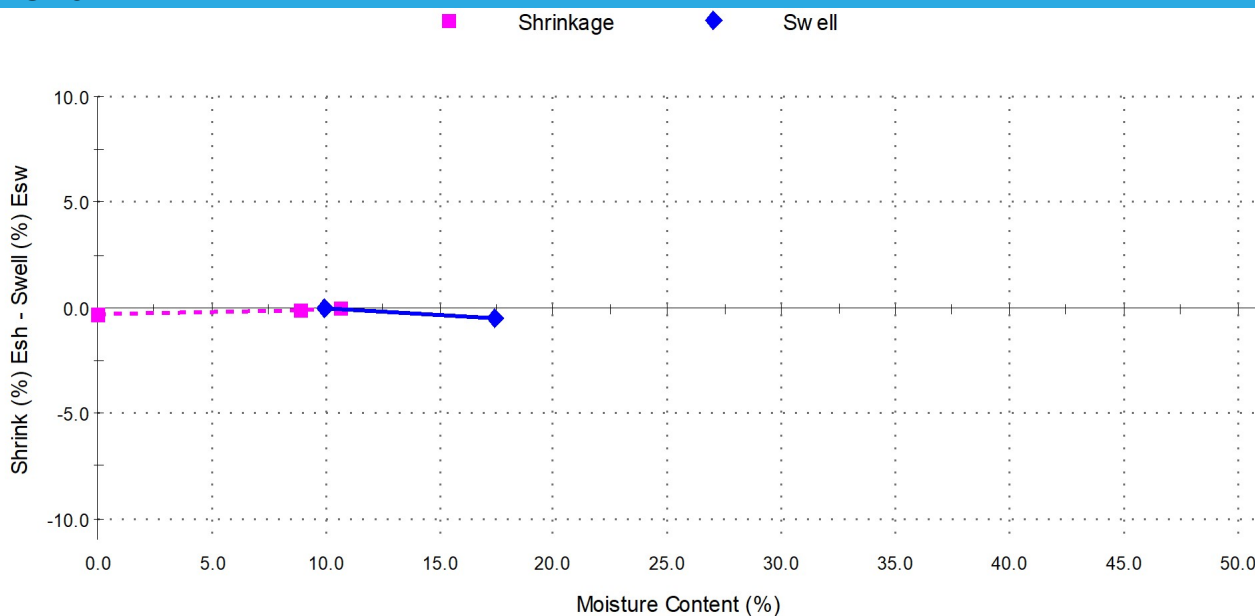
Swell on Saturation (%): -0.5
Moisture Content before (%): 9.9
Moisture Content after (%): 17.4
Est. Unc. Comp. Strength before (kPa): 450
Est. Unc. Comp. Strength after (kPa): 340

Shrink Test

AS 1289.7.1.1

Shrink on drying (%): 0.3
Shrinkage Moisture Content (%): 10.7
Est. inert material (%): 3%
Crumbling during shrinkage: Nil
Cracking during shrinkage: Nil

Shrink Swell



Shrink Swell Index - Iss (%): 0.1

Comments

Report No: SSI:NEW22W-1294-S05
Issue No: 1

Shrink Swell Index Report

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

Project No.: NEW18P-0170G

Project Name: Brush Creek Subdivision - Precinct 2, Stage 4

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: 31/05/2022

Sample Details

Sample ID: NEW22W-1294-S05

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

Material: Gravelly Sandy Clay

Date Sampled: 12/04/2022

Source: On-Site Insitu

Date Submitted: 5/05/2022

Specification: No Specification

Sample Location: BH406 - (0.30 - 0.45m)

Date Tested: 24/05/2022

Swell Test

AS 1289.7.1.1

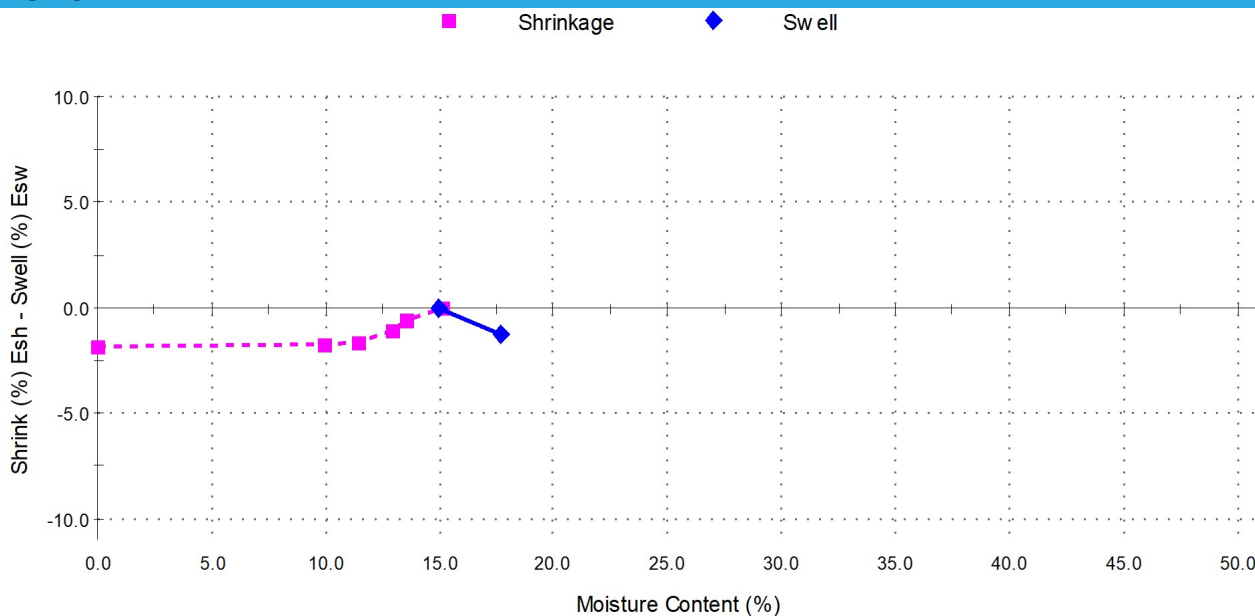
Swell on Saturation (%): -1.3
Moisture Content before (%): 14.9
Moisture Content after (%): 17.7
Est. Unc. Comp. Strength before (kPa): 400
Est. Unc. Comp. Strength after (kPa): 170

Shrink Test

AS 1289.7.1.1

Shrink on drying (%): 1.8
Shrinkage Moisture Content (%): 15.1
Est. inert material (%): 3%
Crumbling during shrinkage: Nil
Cracking during shrinkage: Moderate

Shrink Swell



Shrink Swell Index - Iss (%): 1.0

Comments

Report No: SSI:NEW22W-1294-S06
Issue No: 1

Shrink Swell Index Report

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

Project No.: NEW18P-0170G

Project Name: Brush Creek Subdivision - Precinct 2, Stage 4

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: 31/05/2022

Sample Details

Sample ID: NEW22W-1294-S06

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

Material: Gravelly Sandy Clay

Date Sampled: 12/04/2022

Source: On-Site Insitu

Date Submitted: 5/05/2022

Specification: No Specification

Sample Location: BH406 - (0.60 - 0.75m)

Date Tested: 24/05/2022

Swell Test

AS 1289.7.1.1

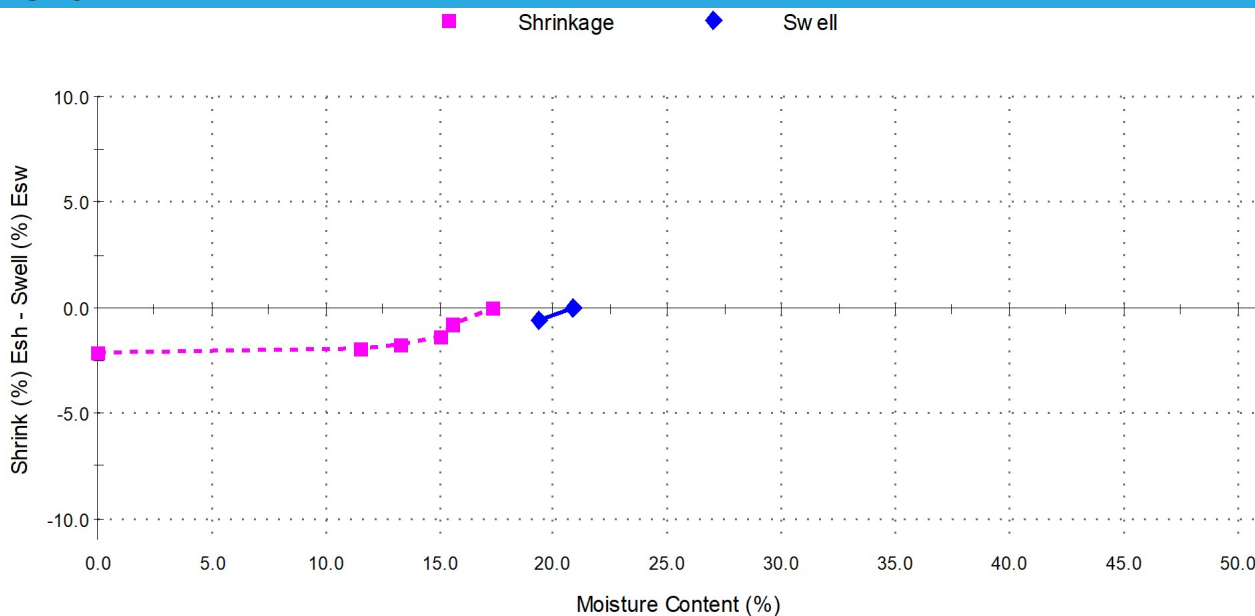
Swell on Saturation (%): -0.6
Moisture Content before (%): 20.8
Moisture Content after (%): 19.3
Est. Unc. Comp. Strength before (kPa): 250
Est. Unc. Comp. Strength after (kPa): 250

Shrink Test

AS 1289.7.1.1

Shrink on drying (%): 2.1
Shrinkage Moisture Content (%): 17.3
Est. inert material (%): 2%
Crumbling during shrinkage: Nil
Cracking during shrinkage: Moderate

Shrink Swell



Shrink Swell Index - Iss (%): 1.2

Comments

Report No: SSI:NEW22W-1294-S07
Issue No: 1

Shrink Swell Index Report

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

Project No.: NEW18P-0170G

Project Name: Brush Creek Subdivision - Precinct 2, Stage 4

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: 31/05/2022

Sample Details

Sample ID: NEW22W-1294-S07

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

Material: Gravelly Sandy Clay

Date Sampled: 12/04/2022

Source: On-Site Insitu

Date Submitted: 5/05/2022

Specification: No Specification

Sample Location: BH407 - (0.40 - 0.55m)

Date Tested: 24/05/2022

Swell Test

AS 1289.7.1.1

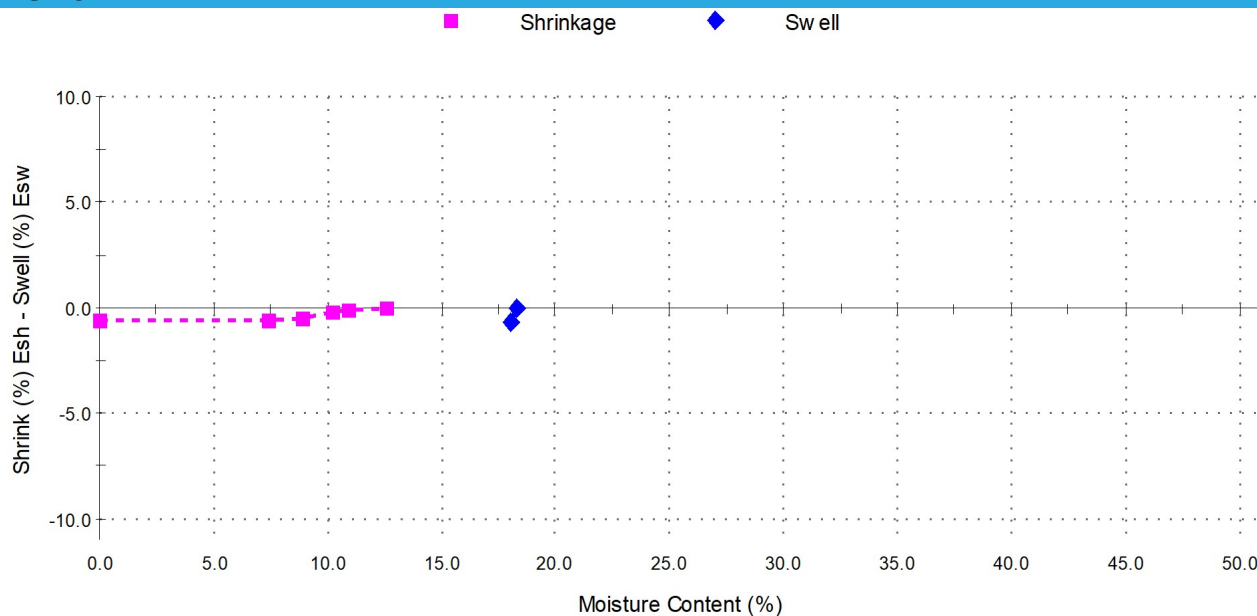
Swell on Saturation (%): -0.7
Moisture Content before (%): 18.3
Moisture Content after (%): 18.1
Est. Unc. Comp. Strength before (kPa): 280
Est. Unc. Comp. Strength after (kPa): 150

Shrink Test

AS 1289.7.1.1

Shrink on drying (%): 0.6
Shrinkage Moisture Content (%): 12.6
Est. inert material (%): 4%
Crumbling during shrinkage: Nil
Cracking during shrinkage: Minor

Shrink Swell



Shrink Swell Index - Iss (%): 0.3

Comments

Report No: SSI:NEW22W-1294-S08
Issue No: 1

Shrink Swell Index Report

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

Project No.: NEW18P-0170G

Project Name: Brush Creek Subdivision - Precinct 2, Stage 4

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: 31/05/2022

Sample Details

Sample ID: NEW22W-1294-S08

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

Material: Gravelly Sandy Clay

Date Sampled: 12/04/2022

Source: On-Site Insitu

Date Submitted: 5/05/2022

Specification: No Specification

Sample Location: BH408 - (0.30 - 0.45m)

Date Tested: 23/05/2022

Swell Test

AS 1289.7.1.1

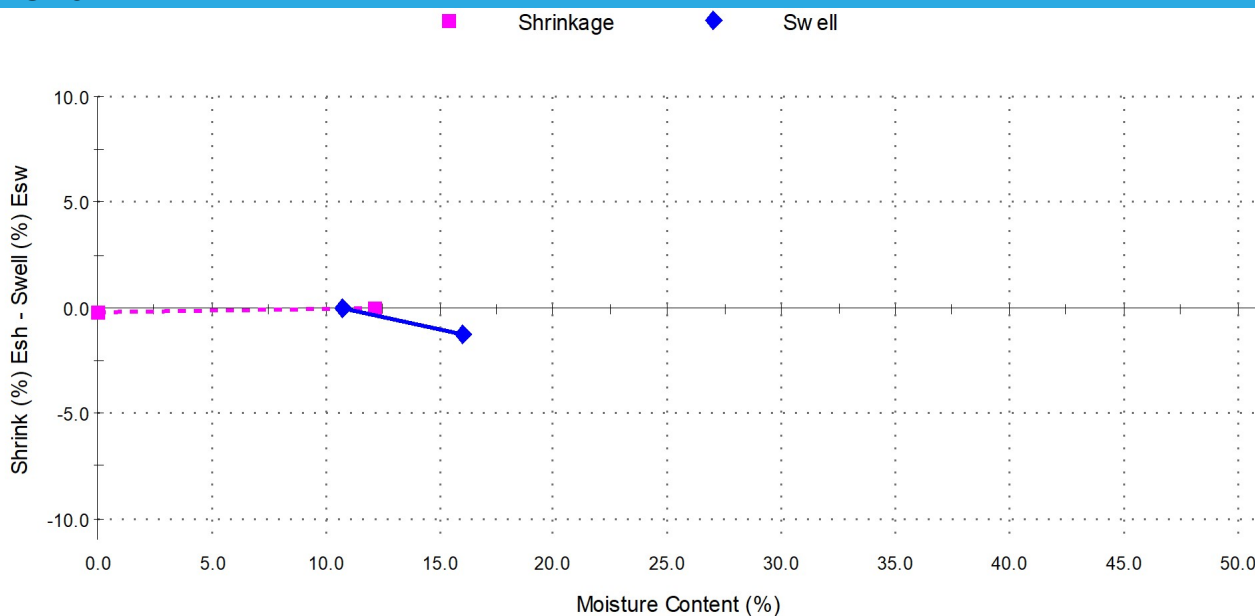
Swell on Saturation (%): -1.3
Moisture Content before (%): 10.7
Moisture Content after (%): 16.0
Est. Unc. Comp. Strength before (kPa): 400
Est. Unc. Comp. Strength after (kPa): 150

Shrink Test

AS 1289.7.1.1

Shrink on drying (%): 0.2
Shrinkage Moisture Content (%): 12.1
Est. inert material (%): 1%
Crumbling during shrinkage: Nil
Cracking during shrinkage: Minor

Shrink Swell



Shrink Swell Index - Iss (%): 0.1

Comments

Report No: SSI:NEW22W-1294-S09
Issue No: 1

Shrink Swell Index Report

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

Project No.: NEW18P-0170G

Project Name: Brush Creek Subdivision - Precinct 2, Stage 4

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: 31/05/2022

Sample Details

Sample ID: NEW22W-1294-S09

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

Material: Clay

Date Sampled: 12/04/2022

Source: On-Site Insitu

Date Submitted: 5/05/2022

Specification: No Specification

Sample Location: BH408 - (0.90 - 1.15m)

Date Tested: 23/05/2022

Swell Test

AS 1289.7.1.1

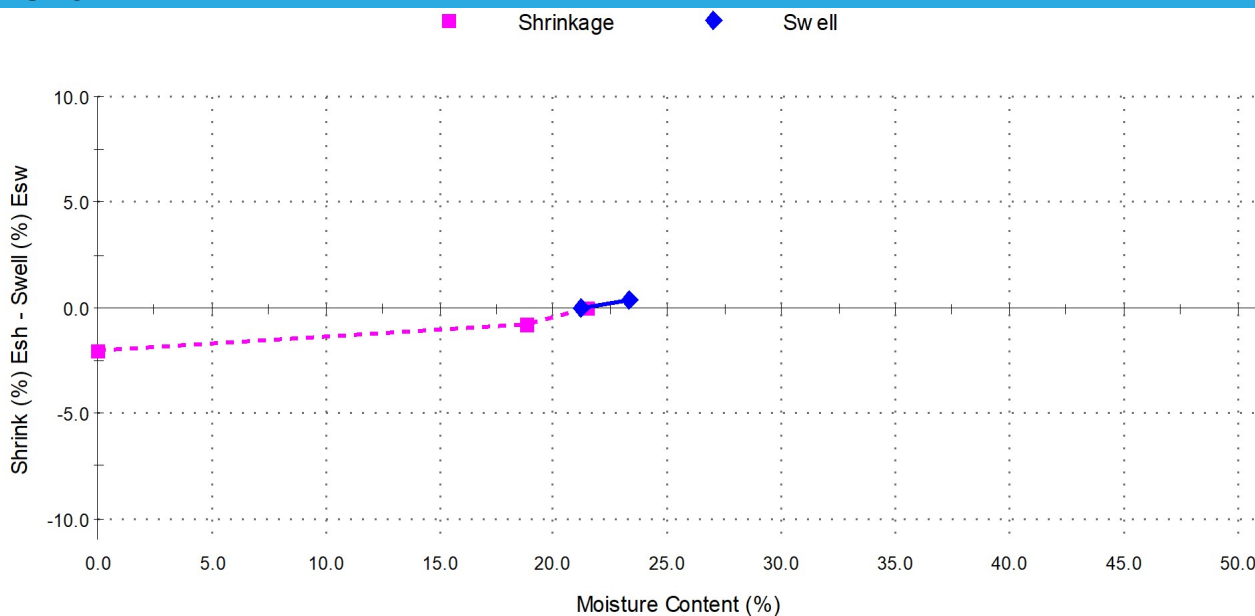
Swell on Saturation (%): 0.4
Moisture Content before (%): 21.2
Moisture Content after (%): 23.3
Est. Unc. Comp. Strength before (kPa): 450
Est. Unc. Comp. Strength after (kPa): 500

Shrink Test

AS 1289.7.1.1

Shrink on drying (%): 2.0
Shrinkage Moisture Content (%): 21.5
Est. inert material (%): 1%
Crumbling during shrinkage: Nil
Cracking during shrinkage: Moderate

Shrink Swell


Shrink Swell Index - Iss (%): 1.2

Comments

Report No: SSI:NEW22W-1294-S10
Issue No: 1

Shrink Swell Index Report

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

Project No.: NEW18P-0170G

Project Name: Brush Creek Subdivision - Precinct 2, Stage 4

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: 31/05/2022

Sample Details

Sample ID: NEW22W-1294-S10

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

Material: Sandy Clay

Date Sampled: 12/04/2022

Source: On-Site Insitu

Date Submitted: 5/05/2022

Specification: No Specification

Sample Location: BH411 - (0.20 - 0.35m)

Date Tested: 23/05/2022

Swell Test

AS 1289.7.1.1

Swell on Saturation (%): -1.2

Moisture Content before (%): 17.1

Moisture Content after (%): 25.7

Est. Unc. Comp. Strength before (kPa): 400

Est. Unc. Comp. Strength after (kPa): 560

Shrink Test

AS 1289.7.1.1

Shrink on drying (%): 0.7

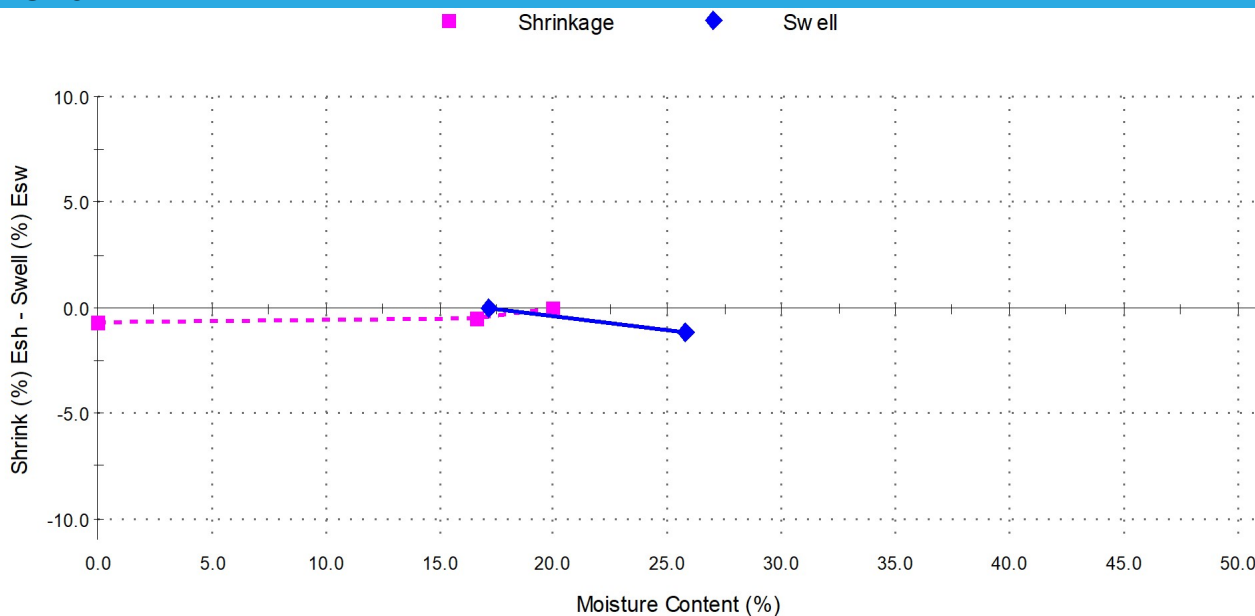
Shrinkage Moisture Content (%): 20.0

Est. inert material (%): 2%

Crumbling during shrinkage: Nil

Cracking during shrinkage: Minor

Shrink Swell



Shrink Swell Index - Iss (%): 0.4

Comments

Report No: SSI:NEW22W-1294-S12
Issue No: 1

Shrink Swell Index Report

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

Project No.: NEW18P-0170G

Project Name: Brush Creek Subdivision - Precinct 2, Stage 4

Project Location: Bootaring Boulevard, Edgeworth



Accredited for compliance with ISO/IEC 17025-Testing.
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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: 31/05/2022

Sample Details

Sample ID: NEW22W-1294-S12

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

Material: Gravelly Sandy Clay

Date Sampled: 12/04/2022

Source: On-Site Insitu

Date Submitted: 5/05/2022

Specification: No Specification

Sample Location: BH416 - (0.40 - 0.60m)

Date Tested: 23/05/2022

Swell Test

AS 1289.7.1.1

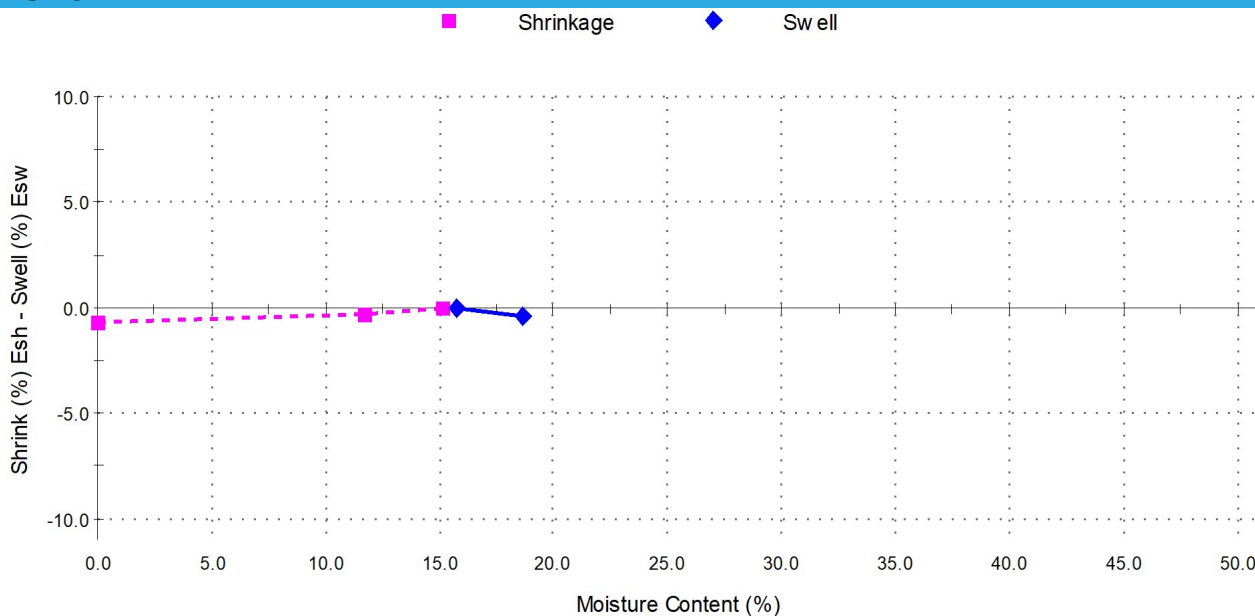
Swell on Saturation (%): -0.4
Moisture Content before (%): 15.8
Moisture Content after (%): 18.7
Est. Unc. Comp. Strength before (kPa): 300
Est. Unc. Comp. Strength after (kPa): 220

Shrink Test

AS 1289.7.1.1

Shrink on drying (%): 0.7
Shrinkage Moisture Content (%): 15.1
Est. inert material (%): 2%
Crumbling during shrinkage: Nil
Cracking during shrinkage: Minor

Shrink Swell



Shrink Swell Index - Iss (%): 0.4

Comments

Report No: SSI:NEW22W-1294-S13
Issue No: 1

Shrink Swell Index Report

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

Project No.: NEW18P-0170G

Project Name: Brush Creek Subdivision - Precinct 2, Stage 4

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: 31/05/2022

Sample Details

Sample ID: NEW22W-1294-S13

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

Material: Gravelly Sandy Clay

Date Sampled: 12/04/2022

Source: On-Site Insitu

Date Submitted: 5/05/2022

Specification: No Specification

Sample Location: BH417 - (0.50 - 0.70m)

Date Tested: 24/05/2022

Swell Test

AS 1289.7.1.1

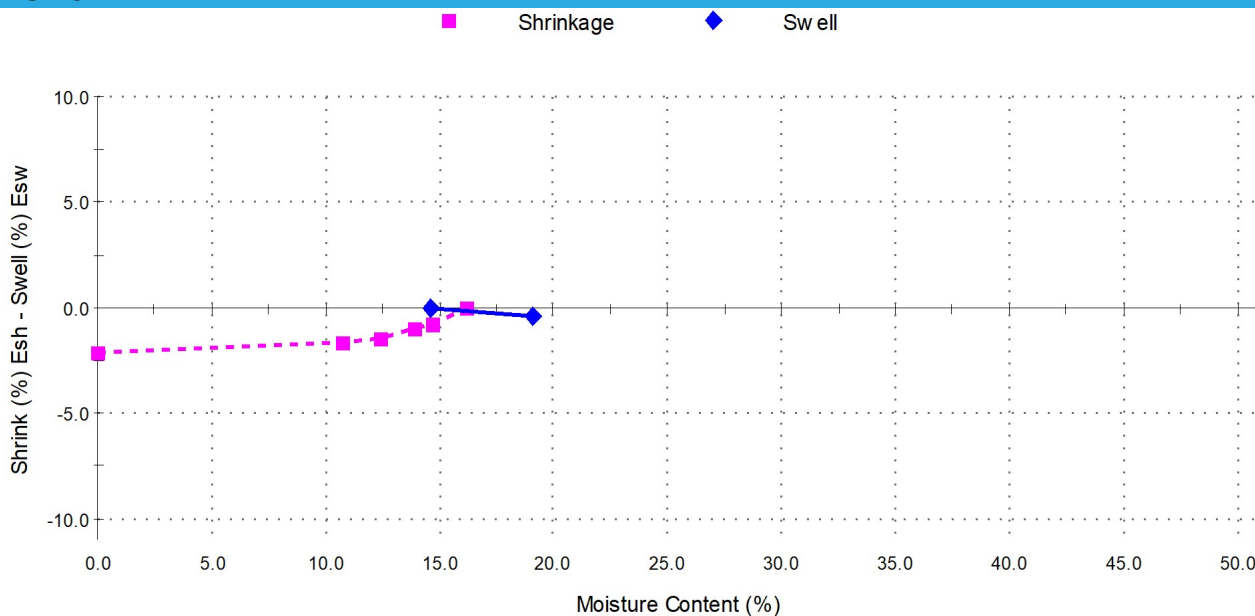
Swell on Saturation (%): -0.4
Moisture Content before (%): 14.6
Moisture Content after (%): 19.1
Est. Unc. Comp. Strength before (kPa): 540
Est. Unc. Comp. Strength after (kPa): 350

Shrink Test

AS 1289.7.1.1

Shrink on drying (%): 2.1
Shrinkage Moisture Content (%): 16.2
Est. inert material (%): 5%
Crumbling during shrinkage: Nil
Cracking during shrinkage: Minor

Shrink Swell



Shrink Swell Index - Iss (%): 1.2

Comments

Report No: SSI:NEW22W-1294-S14
Issue No: 1

Shrink Swell Index Report

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

Project No.: NEW18P-0170G

Project Name: Brush Creek Subdivision - Precinct 2, Stage 4

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: 31/05/2022

Sample Details

Sample ID: NEW22W-1294-S14

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

Material: Gravelly Sandy Clay

Date Sampled: 12/04/2022

Source: On-Site Insitu

Date Submitted: 5/05/2022

Specification: No Specification

Sample Location: BH418 - (0.50 - 0.65m)

Date Tested: 24/05/2022

Swell Test AS 1289.7.1.1

Swell on Saturation (%): -0.2

Moisture Content before (%): 15.1

Moisture Content after (%): 21.0

Est. Unc. Comp. Strength before (kPa): 480

Est. Unc. Comp. Strength after (kPa): 200

Shrink Test AS 1289.7.1.1

Shrink on drying (%): 1.1

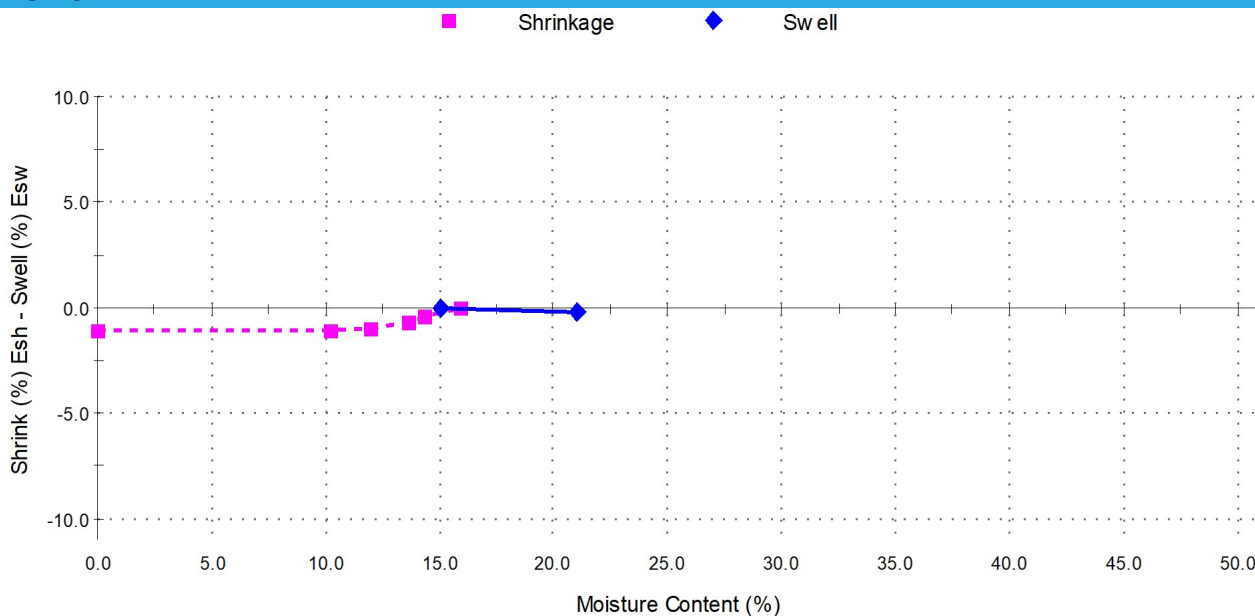
Shrinkage Moisture Content (%): 15.9

Est. inert material (%): 5%

Crumbling during shrinkage: Nil

Cracking during shrinkage: Minor

Shrink Swell



Shrink Swell Index - Iss (%): 0.6

Comments

Report No: SSI:NEW22W-1294-S15
Issue No: 1

Shrink Swell Index Report

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

Project No.: NEW18P-0170G

Project Name: Brush Creek Subdivision - Precinct 2, Stage 4

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: 31/05/2022

Sample Details

Sample ID: NEW22W-1294-S15

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

Material: Gravelly Sandy Clay

Date Sampled: 12/04/2022

Source: On-Site Insitu

Date Submitted: 5/05/2022

Specification: No Specification

Sample Location: BH418 - (1.00 - 1.15m)

Date Tested: 24/05/2022

Swell Test

AS 1289.7.1.1

Swell on Saturation (%): -0.3

Moisture Content before (%): 13.2

Moisture Content after (%): 19.3

Est. Unc. Comp. Strength before (kPa): 500

Est. Unc. Comp. Strength after (kPa): 340

Shrink Test

AS 1289.7.1.1

Shrink on drying (%): 0.7

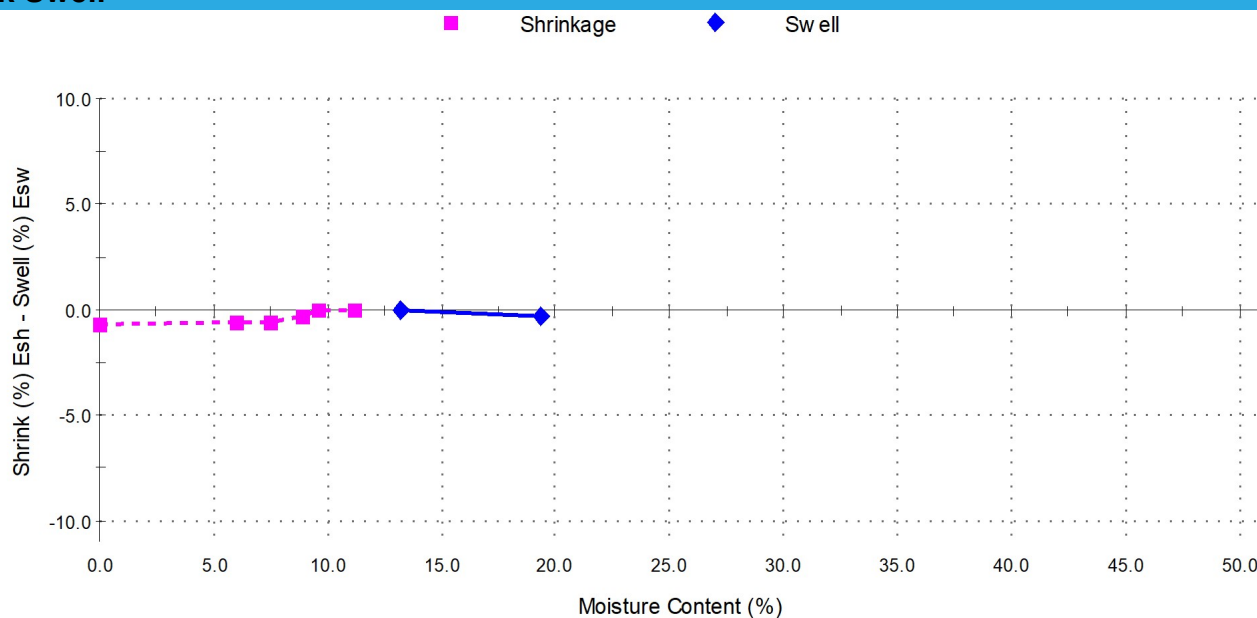
Shrinkage Moisture Content (%): 11.2

Est. inert material (%): 3%

Crumbling during shrinkage: Nil

Cracking during shrinkage: Nil

Shrink Swell



Shrink Swell Index - Iss (%): 0.4

Comments

Report No: SSI:NEW22W-1294-S16
Issue No: 1

Shrink Swell Index Report

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

Project No.: NEW18P-0170G

Project Name: Brush Creek Subdivision - Precinct 2, Stage 4

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: 31/05/2022

Sample Details

Sample ID: NEW22W-1294-S16

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

Material: Gravelly Sandy Clay

Date Sampled: 12/04/2022

Source: On-Site Insitu

Date Submitted: 5/05/2022

Specification: No Specification

Sample Location: BH419 - (0.20 - 0.35m)

Date Tested: 23/05/2022

Swell Test

AS 1289.7.1.1

Swell on Saturation (%): 0.0

Moisture Content before (%): 12.9

Moisture Content after (%): 16.1

Est. Unc. Comp. Strength before (kPa):

Est. Unc. Comp. Strength after (kPa):

Shrink Test

AS 1289.7.1.1

Shrink on drying (%): 1.5

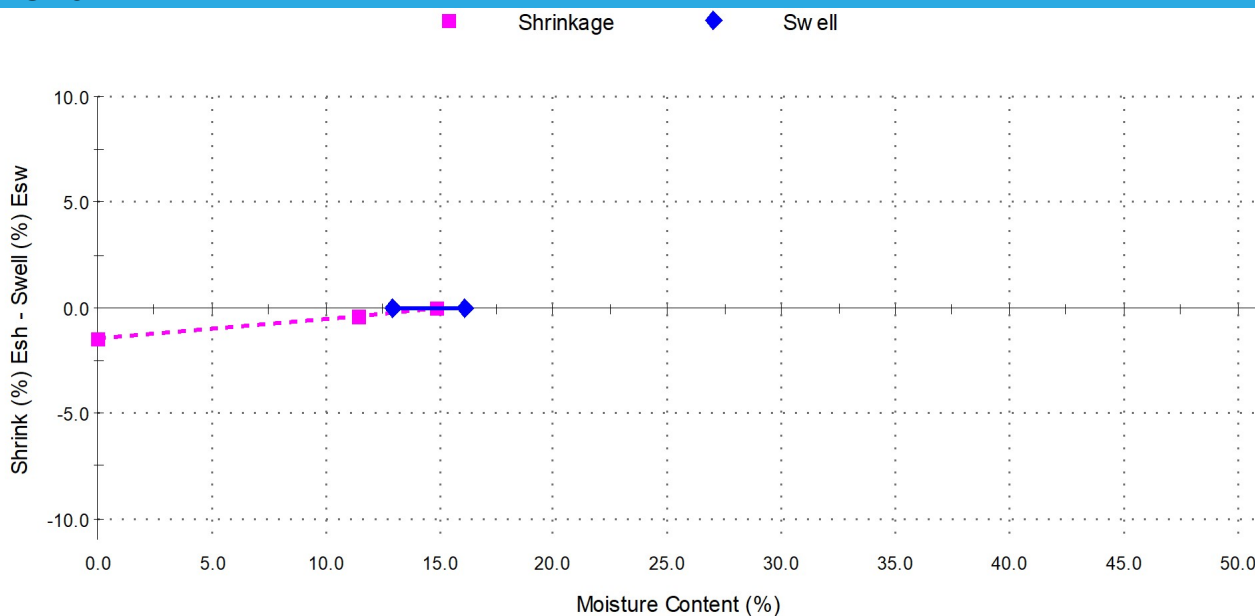
Shrinkage Moisture Content (%): 14.9

Est. inert material (%):

Crumbling during shrinkage: Nil

Cracking during shrinkage: Nil

Shrink Swell



Shrink Swell Index - Iss (%): 0.8

Comments

Report No: SSI:NEW22W-1294-S17
Issue No: 1

Shrink Swell Index Report

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

Project No.: NEW18P-0170G

Project Name: Brush Creek Subdivision - Precinct 2, Stage 4

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: 31/05/2022

Sample Details

Sample ID: NEW22W-1294-S17

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

Material: Gravelly Sandy Clay

Date Sampled: 12/04/2022

Source: On-Site Insitu

Date Submitted: 5/05/2022

Specification: No Specification

Sample Location: BH420 - (0.30 - 0.45m)

Date Tested: 23/05/2022

Swell Test

AS 1289.7.1.1

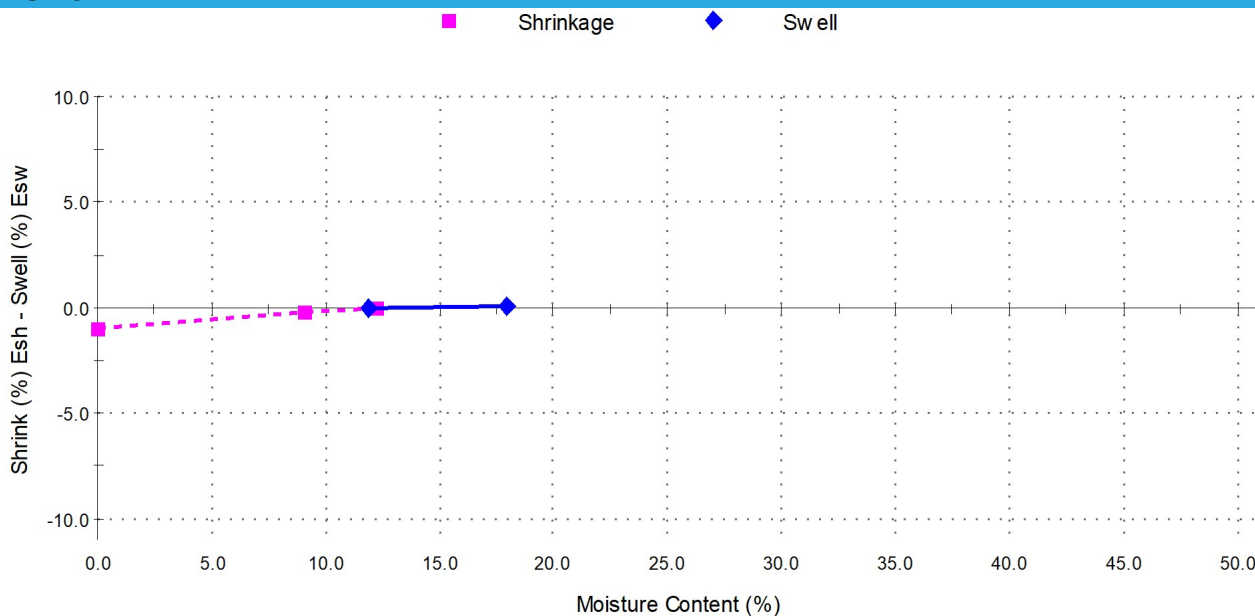
Swell on Saturation (%): 0.1
Moisture Content before (%): 11.9
Moisture Content after (%): 17.9
Est. Unc. Comp. Strength before (kPa): 500
Est. Unc. Comp. Strength after (kPa): >600

Shrink Test

AS 1289.7.1.1

Shrink on drying (%): 1.0
Shrinkage Moisture Content (%): 12.3
Est. inert material (%): 2%
Crumbling during shrinkage: Nil
Cracking during shrinkage: Minor

Shrink Swell



Shrink Swell Index - Iss (%): 0.6

Comments

Report No: SSI:NEW22W-1294-S19
Issue No: 1

Shrink Swell Index Report

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

Project No.: NEW18P-0170G

Project Name: Brush Creek Subdivision - Precinct 2, Stage 4

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: 31/05/2022

Sample Details

Sample ID: NEW22W-1294-S19

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

Material: Gravelly Sandy Clay

Date Sampled: 12/04/2022

Source: On-Site Insitu

Date Submitted: 5/05/2022

Specification: No Specification

Sample Location: BH422 - (0.30 - 0.45m)

Date Tested: 23/05/2022

Swell Test

AS 1289.7.1.1

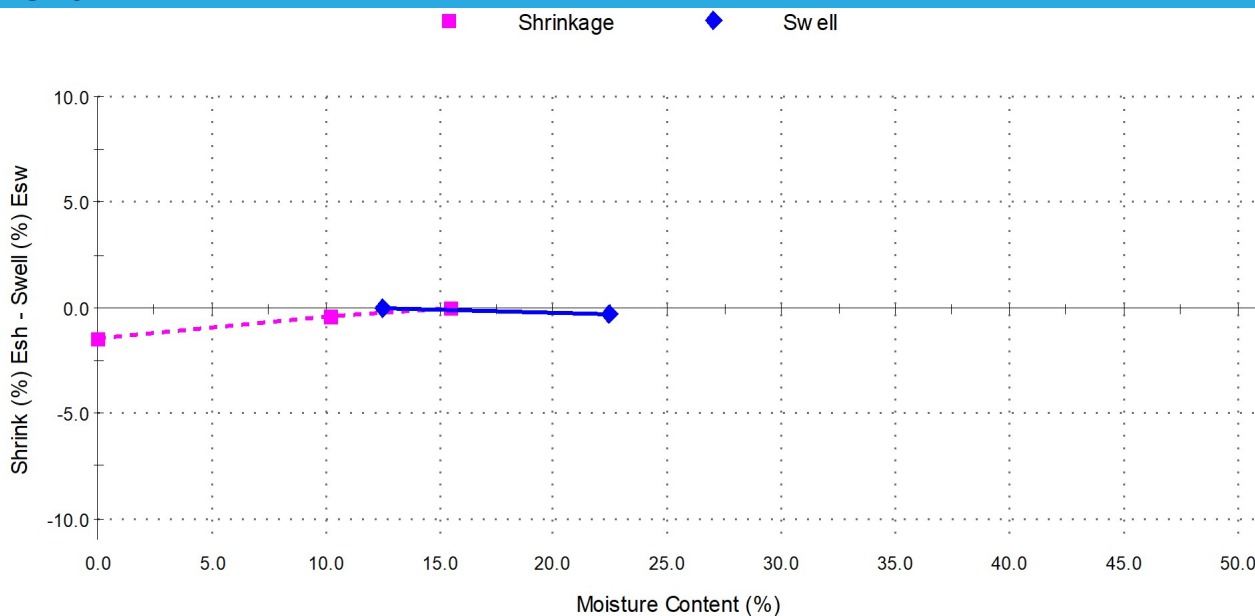
Swell on Saturation (%): -0.3
Moisture Content before (%): 12.5
Moisture Content after (%): 22.4
Est. Unc. Comp. Strength before (kPa): 500
Est. Unc. Comp. Strength after (kPa): 500

Shrink Test

AS 1289.7.1.1

Shrink on drying (%): 1.5
Shrinkage Moisture Content (%): 15.5
Est. inert material (%): 2%
Crumbling during shrinkage: Nil
Cracking during shrinkage: Major

Shrink Swell



Shrink Swell Index - Iss (%): 0.8

Comments

Report No: SSI:NEW22W-1294-S20
Issue No: 1

Shrink Swell Index Report

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

Project No.: NEW18P-0170G

Project Name: Brush Creek Subdivision - Precinct 2, Stage 4

Project Location: Bootaring Boulevard, Edgeworth



Accredited for compliance with ISO/IEC 17025-Testing.
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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: 31/05/2022

Sample Details

Sample ID: NEW22W-1294-S20

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

Material: Gravelly Sandy Clay

Date Sampled: 12/04/2022

Source: On-Site Insitu

Date Submitted: 5/05/2022

Specification: No Specification

Sample Location: BH423 - (0.20 - 0.35m)

Date Tested: 23/05/2022

Swell Test

AS 1289.7.1.1

Swell on Saturation (%): -0.7

Moisture Content before (%): 18.2

Moisture Content after (%): 21.2

Est. Unc. Comp. Strength before (kPa): 450

Est. Unc. Comp. Strength after (kPa): 520

Shrink Test

AS 1289.7.1.1

Shrink on drying (%): 3.6

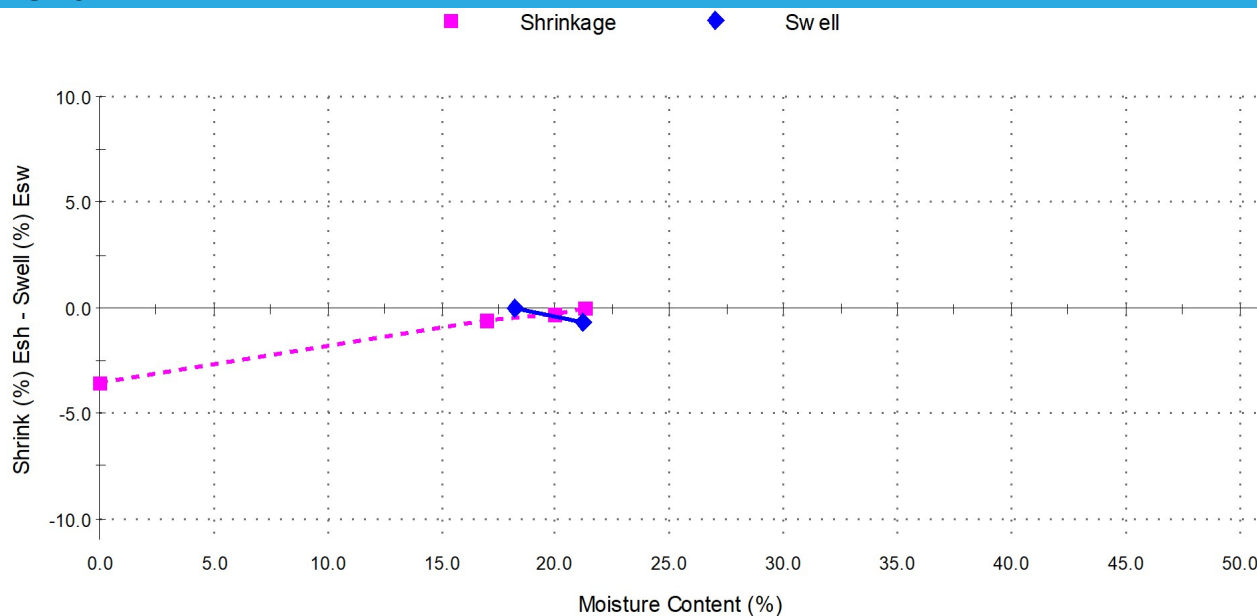
Shrinkage Moisture Content (%): 21.3

Est. inert material (%): 2%

Crumbling during shrinkage: Nil

Cracking during shrinkage: Major

Shrink Swell



Shrink Swell Index - Iss (%): 2.0

Comments

Report No: SSI:NEW22W-1294-S22

Issue No: 1

Shrink Swell Index Report

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

Project No.: NEW18P-0170G
Project Name: Brush Creek Subdivision - Precinct 2, Stage 4
Project Location: Bootaring Boulevard, Edgeworth



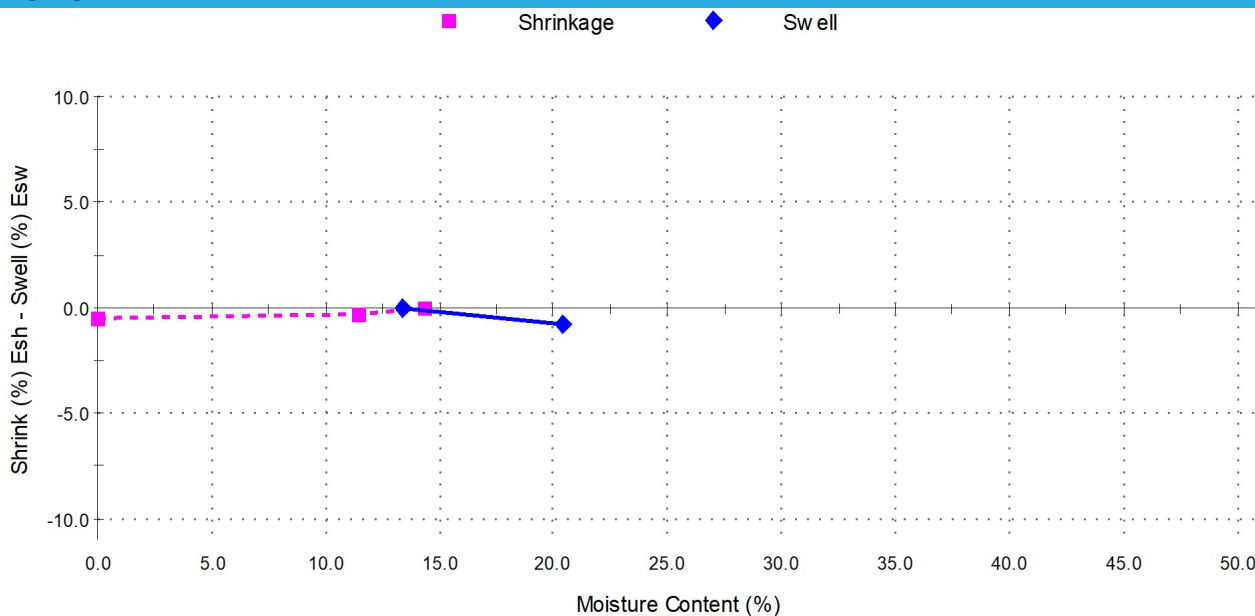
Accredited for compliance with ISO/IEC 17025-Testing.
 The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.
 Results provided relate only to the items tested or sampled.
B. Cullen
 Approved Signatory: Brent Cullen
 (Engineering Geologist)
 NATA Accredited Laboratory Number: 18686
 Date of Issue: 31/05/2022

Sample Details

Sample ID: NEW22W-1294-S22
Sampling Method: The results outlined below apply to the sample as received
Material: Sandy Clay
Source: On-Site Insitu
Specification: No Specification
Sample Location: BH428 - (0.30 - 0.42m)
Date Tested: 23/05/2022
Date Sampled: 12/04/2022
Date Submitted: 5/05/2022

Swell Test AS 1289.7.1.1		Shrink Test AS 1289.7.1.1	
Swell on Saturation (%):	-0.8	Shrink on drying (%):	0.5
Moisture Content before (%):	13.4	Shrinkage Moisture Content (%):	14.3
Moisture Content after (%):	20.4	Est. inert material (%):	1%
Est. Unc. Comp. Strength before (kPa):	500	Crumbling during shrinkage:	Nil
Est. Unc. Comp. Strength after (kPa):	520	Cracking during shrinkage:	Minor

Shrink Swell



Shrink Swell Index - Iss (%): 0.3

Comments

Material Test Report

Report No: MAT:NEW22W-1294-S01
Issue No: 1

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

Project No.: NEW18P-0170G

Project Name: Brush Creek Subdivision - Precinct 2, Stage 4

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: 30/05/2022

Sample Details

Sample ID: NEW22W-1294-S01
Date Sampled: 12/04/2022
Date Received: 05/05/2022
Source: On-Site Insitu
Material: Gravelly Sandy Clay
Specification: No Specification
Sample Location: The results outlined below apply to the sample as received
BH401 - (0.50 - 0.65m)

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	7.0	
Mould Length (mm)		250	
Crumbling		No	
Curling		No	
Cracking		No	
Liquid Limit (%)	AS 1289.3.1.1	33	
Method		Four Point	
Plastic Limit (%)	AS 1289.3.2.1	19	
Plasticity Index (%)	AS 1289.3.3.1	14	
Date Tested		27/05/2022	

Comments

N/A

Material Test Report

Report No: MAT:NEW22W-1294-S11
Issue No: 1

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

Project No.: NEW18P-0170G

Project Name: Brush Creek Subdivision - Precinct 2, Stage 4

Project Location: Bootaring Boulevard, Edgeworth



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B. Cullen

Approved Signatory: Brent Cullen
(Engineering Geologist)

NATA Accredited Laboratory Number: 18686

Date of Issue: 30/05/2022

Sample Details

Sample ID: NEW22W-1294-S11
Date Sampled: 12/04/2022
Date Received: 05/05/2022
Source: On-Site Insitu
Material: Gravelly Sandy Clay
Specification: No Specification
Sample Location: The results outlined below apply to the sample as received
BH415 - (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	2.5	
Mould Length (mm)		250	
Crumbling		No	
Curling		No	
Cracking		No	
Liquid Limit (%)	AS 1289.3.1.1	19	
Method		Four Point	
Plastic Limit (%)	AS 1289.3.2.1	14	
Plasticity Index (%)	AS 1289.3.3.1	5	
Date Tested		27/05/2022	

Comments

N/A

Report No: MAT:NEW22W-1294-S18
Issue No: 1

Material Test Report

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

Project No.: NEW18P-0170G

Project Name: Brush Creek Subdivision - Precinct 2, Stage 4

Project Location: Bootaring Boulevard, Edgeworth



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B. Cullen

Approved Signatory: Brent Cullen
(Engineering Geologist)

NATA Accredited Laboratory Number: 18686

Date of Issue: 26/05/2022

Sample Details

Sample ID: NEW22W-1294-S18
Date Sampled: 12/04/2022
Date Received: 05/05/2022
Source: On-Site Insitu
Material: Gravelly Sandy Clay
Specification: No Specification
Sample Location: The results outlined below apply to the sample as received
BH421 - (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	9.0	
Mould Length (mm)		250	
Crumbling		No	
Curling		No	
Cracking		No	
Liquid Limit (%)	AS 1289.3.1.1	34	
Method		Four Point	
Plastic Limit (%)	AS 1289.3.2.1	18	
Plasticity Index (%)	AS 1289.3.3.1	16	
Date Tested		25/05/2022	

Comments

N/A

Material Test Report

Report No: MAT:NEW22W-1294-S21
Issue No: 1

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

Project No.: NEW18P-0170G

Project Name: Brush Creek Subdivision - Precinct 2, Stage 4

Project Location: Bootaring Boulevard, Edgeworth



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B. Cullen

Approved Signatory: Brent Cullen
(Engineering Geologist)

NATA Accredited Laboratory Number: 18686

Date of Issue: 26/05/2022

Sample Details

Sample ID: NEW22W-1294-S21
Date Sampled: 12/04/2022
Date Received: 05/05/2022
Source: On-Site Insitu
Material: Clay
Specification: No Specification
The results outlined below apply to the sample as received
Sample Location: BH426 - (0.10 - 0.22m)

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	10.0	
Mould Length (mm)		250	
Crumbling		No	
Curling		Yes	
Cracking		No	
Liquid Limit (%)	AS 1289.3.1.1	48	
Method		Four Point	
Plastic Limit (%)	AS 1289.3.2.1	19	
Plasticity Index (%)	AS 1289.3.3.1	29	
Date Tested		25/05/2022	

Comments

N/A

Report No: MAT:NEW22W-1294-S23
Issue No: 1

Material Test Report

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

Project No.: NEW18P-0170G

Project Name: Brush Creek Subdivision - Precinct 2, Stage 4

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.

B. Cullen

Approved Signatory: Brent Cullen
(Engineering Geologist)

NATA Accredited Laboratory Number: 18686

Date of Issue: 30/05/2022

Sample Details

Sample ID: NEW22W-1294-S23
Date Sampled: 12/04/2022
Date Received: 05/05/2022
Source: On-Site Insitu
Material: Gravelly Sandy Clay
Specification: No Specification
Sample Location: The results outlined below apply to the sample as received
BH402 - (0.40 - 0.80m)

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	8.5	
Mould Length (mm)		250	
Crumbling		No	
Curling		No	
Cracking		No	
Liquid Limit (%)	AS 1289.3.1.1	41	
Method		Four Point	
Plastic Limit (%)	AS 1289.3.2.1	22	
Plasticity Index (%)	AS 1289.3.3.1	19	
Date Tested		27/05/2022	

Comments

N/A

Report No: MAT:NEW22W-1294-S24
Issue No: 1

Material Test Report

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

Project No.: NEW18P-0170G

Project Name: Brush Creek Subdivision - Precinct 2, Stage 4

Project Location: Bootaring Boulevard, Edgeworth



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B. Cullen

Approved Signatory: Brent Cullen
(Engineering Geologist)

NATA Accredited Laboratory Number: 18686

Date of Issue: 30/05/2022

Sample Details

Sample ID: NEW22W-1294-S24
Date Sampled: 12/04/2022
Date Received: 05/05/2022
Source: On-Site Insitu
Material: Clay
Specification: No Specification
The results outlined below apply to the sample as received
Sample Location: BH402 - (1.50 - 1.70m)

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	11.0	
Mould Length (mm)		250	
Crumbling		No	
Curling		No	
Cracking		No	
Liquid Limit (%)	AS 1289.3.1.1	46	
Method		Four Point	
Plastic Limit (%)	AS 1289.3.2.1	20	
Plasticity Index (%)	AS 1289.3.3.1	26	
Date Tested		27/05/2022	

Comments

N/A

Report No: MAT:NEW22W-1294-S25
Issue No: 1

Material Test Report

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

Project No.: NEW18P-0170G

Project Name: Brush Creek Subdivision - Precinct 2, Stage 4

Project Location: Bootaring Boulevard, Edgeworth



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B. Cullen

Approved Signatory: Brent Cullen
(Engineering Geologist)

NATA Accredited Laboratory Number: 18686

Date of Issue: 27/05/2022

Sample Details

Sample ID: NEW22W-1294-S25
Date Sampled: 12/04/2022
Date Received: 05/05/2022
Source: On-Site Insitu
Material: Gravelly Sandy Clay
Specification: No Specification
Sample Location: The results outlined below apply to the sample as received
BH403 - (0.50 - 1.00m)

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	7.0	
Mould Length (mm)		250	
Crumbling		No	
Curling		No	
Cracking		No	
Liquid Limit (%)	AS 1289.3.1.1	32	
Method		Four Point	
Plastic Limit (%)	AS 1289.3.2.1	16	
Plasticity Index (%)	AS 1289.3.3.1	16	
Date Tested		26/05/2022	

Comments

N/A

Report No: MAT:NEW22W-1294-S26
Issue No: 1

Material Test Report

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

Project No.: NEW18P-0170G

Project Name: Brush Creek Subdivision - Precinct 2, Stage 4

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: 30/05/2022

Sample Details

Sample ID: NEW22W-1294-S26
Date Sampled: 12/04/2022
Date Received: 05/05/2022
Source: On-Site Insitu
Material: Clay
Specification: No Specification
The results outlined below apply to the sample as received
Sample Location: BH405 - (1.50 - 1.70m)

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	9.0	
Mould Length (mm)		250	
Crumbling		No	
Curling		No	
Cracking		No	
Liquid Limit (%)	AS 1289.3.1.1	37	
Method		Four Point	
Plastic Limit (%)	AS 1289.3.2.1	18	
Plasticity Index (%)	AS 1289.3.3.1	19	
Date Tested		27/05/2022	

Comments

N/A

Material Test Report

Report No: MAT:NEW22W-1294-S27
Issue No: 1

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

Project No.: NEW18P-0170G

Project Name: Brush Creek Subdivision - Precinct 2, Stage 4

Project Location: Bootaring Boulevard, Edgeworth



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Approved Signatory: Brent Cullen
(Engineering Geologist)

NATA Accredited Laboratory Number: 18686
Date of Issue: 30/05/2022

Sample Details

Sample ID: NEW22W-1294-S27
Date Sampled: 12/04/2022
Date Received: 05/05/2022
Source: On-Site Insitu
Material: Gravelly Sandy Clay
Specification: No Specification
Sample Location: The results outlined below apply to the sample as received
BH414 - (0.30 - 0.60m)

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	8.5	
Mould Length (mm)		250	
Crumbling		No	
Curling		No	
Cracking		No	
Liquid Limit (%)	AS 1289.3.1.1	34	
Method		Four Point	
Plastic Limit (%)	AS 1289.3.2.1	16	
Plasticity Index (%)	AS 1289.3.3.1	18	
Date Tested		27/05/2022	

Comments

N/A

Report No: MAT:NEW22W-1294-S28
Issue No: 1

Material Test Report

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

Project No.: NEW18P-0170G

Project Name: Brush Creek Subdivision - Precinct 2, Stage 4

Project Location: Bootaring Boulevard, Edgeworth



Accredited for compliance with ISO/IEC 17025-Testing.
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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: 30/05/2022

Sample Details

Sample ID: NEW22W-1294-S28
Date Sampled: 12/04/2022
Date Received: 05/05/2022
Source: On-Site Insitu
Material: Clay
Specification: No Specification
The results outlined below apply to the sample as received
Sample Location: BH419 - (1.50 - 1.70m)

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	15.5	
Mould Length (mm)		250	
Crumbling		No	
Curling		No	
Cracking		No	
Liquid Limit (%)	AS 1289.3.1.1	73	
Method		Four Point	
Plastic Limit (%)	AS 1289.3.2.1	26	
Plasticity Index (%)	AS 1289.3.3.1	47	
Date Tested		27/05/2022	

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.

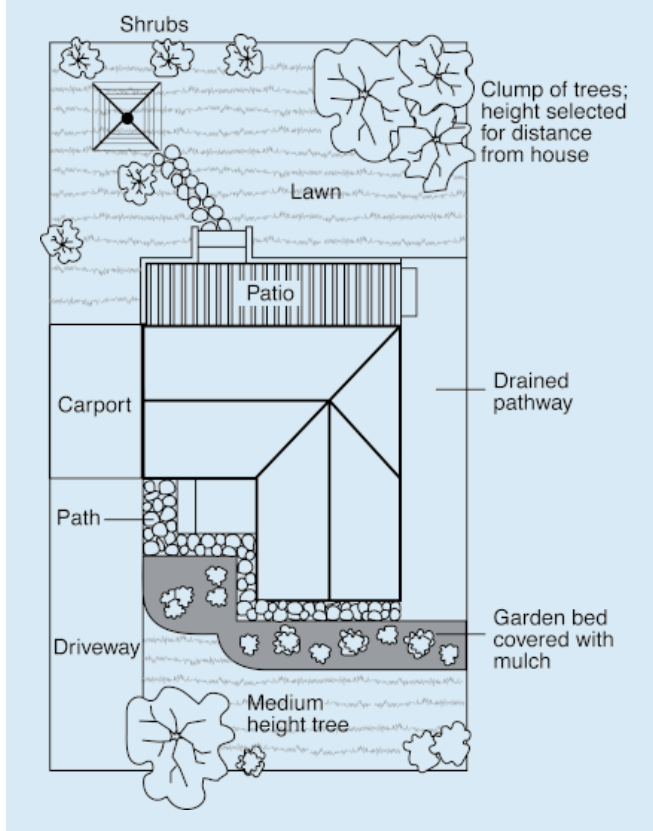
It is, however, sometimes necessary when attempting to prevent water migration that testing be carried out to establish watertable height and subsoil water flows. This subject is referred to in BTF 19 and may properly be regarded as an area for an expert consultant.

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



- 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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