Technical report G1

Factual report on geotechnical investigation

Douglas Partners
Geotechnics / Environment / Groundwater

Integrated Practical Solutions

Factual Report on Geotechnical Investigation

Green Waratah
339 Wallgrove Road, Eastern Creek

Prepared for
Cleanaway Operations Pty Ltd

Project 84822.04
June 2020

Douglas Partners
Geotechnics / Environment / Groundwater

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The undersigned, on behalf of Douglas Partners Pty Ltd, confirm that this document and all attached drawings, logs and test results have been checked and reviewed for errors, omissions and inaccuracies.

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1. Introduction

This interim factual report presents the results of a geotechnical investigation undertaken by Douglas Partners Pty Ltd (DP) for the Green Waratah site at 339 Wallgrove Road, Eastern Creek. The investigation was commissioned by ARUP in an email dated 17 January 2020 by Mr Attila Gubicak on behalf of Cleanaway Operations Pty Ltd and was undertaken in accordance with DPs proposal NWS190206 dated 4 December 2019.

The site located at 339 Wallgrove Road in Eastern Creek and covers an area of approximately 8.23 ha and is proposed for the proposed Western Sydney Energy and Resource Recovery Facility, a waste processing facility with possible incineration capability ('Green Waratah'). Site investigation was carried out to provide factual information on subsurface conditions.

The investigation included the drilling of nine boreholes, five push tubes, the excavation of four test pits, five seismic dilatometers and laboratory testing of samples selected by ARUP. The details of the field and laboratory work are presented in this report.

A detailed site (contamination) investigation (DSI) was carried out in conjunction with the field work described above, the results of which are reported separately dated 1 June 2020 (Project Reference 84822.03.R.00.Rev0).

2. Site Description

The site is located at 339 Wallgrove Road, Eastern Creek and comprises Lot 1 in Deposited Plan DP 1059698. The site is located immediately to the east of the M7 Motorway and approximately 2 km west of the Prospect Reservoir. The site is situated within the local government area of Blacktown City Council.

The site is rectangular and covers an area of approximately 8.23 hectares. It is currently occupied by a chicken farm, which includes a number of large sheds, ancillary buildings, with a large grassed area and a dam at the eastern boundary.

Figure 1 (following page) shows the approximate site boundaries and an east-west oriented easement running through the site.

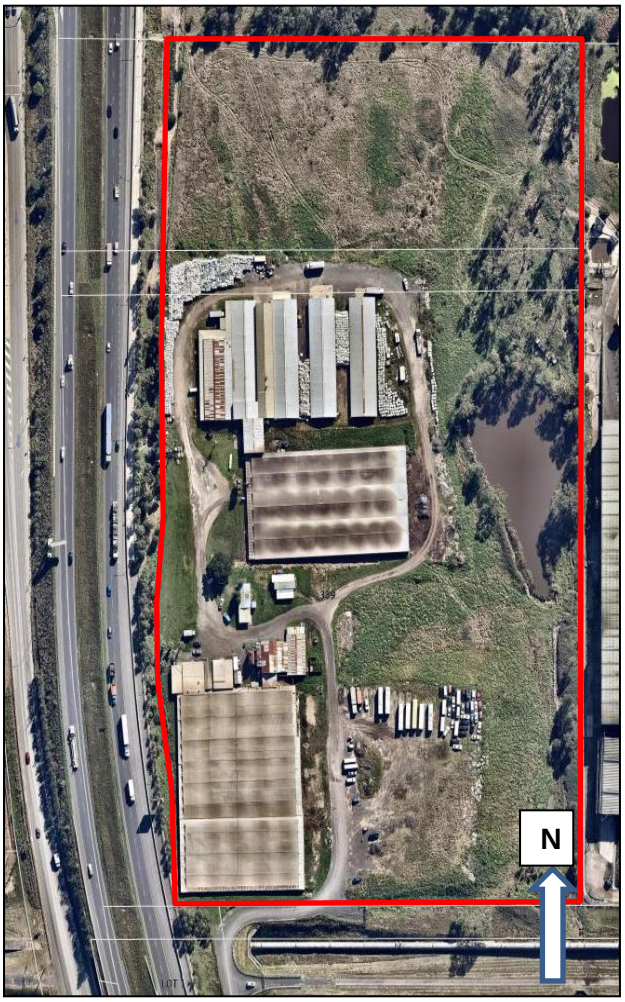


Figure 1 – Subject site location and approximate site boundary (red)

The site slopes from a high point at the south west boundary of approximately RL 61 m to the north of the site between RL 51 m and RL 52 m. A steep embankment separates higher ground at the western hardstand areas and lower ground covered by the eastern grassed areas of the site and dam at the east.

A dam is located at the eastern boundary of the site. A tributary of the Eastern Creek is located to the north and west of the site and the Prospect Reservoir is located to the east.

Surrounding land uses adjacent to the site are identified as:

North: Primarily grassed and sparsely vegetated areas with two ponds located to the north east, including one potential treatment pond associated with the adjoining site to the east.

East: The Global Renewal Resources Centre at Eastern Creek, including landfill.

South: Warragamba Pipeline which traverses an approximate east-west alignment. The pipeline is partially located within a cutting and is covered at its western end as it head beneath the Westlink M7. Further to the south is primarily grassed areas including the Austral Bricks site.

West: Westlink M7 and then an industrial business park, including Vawdrey (truck bodies sales and repair) and Bridgestone Select Tyres.

3. Geology and Soil Landscape

Reference to the Penrith 1:100 000 Geological Series Sheet indicates that the site is underlain by the Bringelly Shale Formation which comprises shale, carbonaceous claystone, claystone, laminite, fine to medium-grained lithic sandstone, rare coal and tuff.

Reference to the Penrith 1:100 000 Soil Landscape indicates that the site is underlain by soils of the Blacktown group. The soil is described as shallow to moderately deep, red and brown podzolic soils on crests, upper slopes and well drained areas and yellow podzolic soils and soloths on lower slopes and areas of poor drainage.

The soils are generally moderately reactive, have low to very low fertility and have moderate erodibility.

This soil landscape generally occurs on gently undulating rises on the Wianamatta Shales, of which Bringelly Shale is a subgroup, with local relief of 10 m to 30 m. Crests are broad and rounded with convex upper slopes grading into concave lower slope. Rock outcrops are generally absent.

Reference to the Acid Sulfate Soil (ASS) risk mapping for the area indicates that the site is located in an area of no known occurrence. ASS normally occurs at elevations less than RL 5 m AHD in alluvial and estuarine soils.

4. Field Work Methods

The field work involved the following:

- Test bores (Bore ABH01 to ABH04, ABH04A and ABH05 to ABH08) were drilled at nine locations with a track mounted auger/sonic drilling and sampling rig. Initially, the bores were either sonic or auger drilled to depths of 2.2 m to 5.5 m, followed by the installation of casing. Standard penetration tests (SPTs) were carried out within soils at regular depth intervals. Undisturbed samples (U75 tubes) were sampled at regular depth intervals. Disturbed soil samples retrieved from the cuttings returned by the auger blade or sonic tube were used for identification and classification purposes;
- A second bore was drilled immediately adjacent to ABH01 and ABH02 for the purpose of obtaining additional sample for laboratory testing. These samples, obtained from the same depth intervals, have been labelled with an “A” suffix.
- Three bores (ABH01, ABH02 and ABH08) were extended using PQ rock coring techniques to depths of 16.6 m to 25.5 m.
- Four test pits (ATP01 to ATP04) were excavated using an 8 tonne excavator to depths of 2.5 m to 2.9 m. Disturbed and undisturbed samples (U50 tubes) were sampled within the fill and natural soils.

- Five push tube boreholes (PT101 to PT105) to practical refusal at depths of 1.5 m to 2.6 m. Push tube rigs were pushed using a Geoprobe rig.
- Five seismic dilatometers (SDMT-01 to SDMT-05) were carried out by DP's nominated subcontractor, In-Situ Geotechnical Services. The seismic dilatometers involved pushing a cone above the dilatometer blade using hydraulic thrust from a truck-mounted testing rig. Measurements of cone resistance and sleeve friction are made at regular depth intervals and stored on a portable computer for subsequent interpretation.

  Shear (S) waves were generated at the surface by horizontal hammer blows on each end of a \ traction beam. The vertically propagating wavefront was detected by sensors a triaxial geophone receiver in the cone tip, which was attached to steel rods pushed hydraulically to each test depth by the rig. Waveforms detected at each geophone were recorded. Direct compressional (P) waves were generated at each test depth by vertical sledgehammer blows onto a steel ground plate.
- Standpipes were installed in four Boreholes (ABH01, ABH02, ABH03 and ABH08) to depths between 4 m and 15 m. Construction details for the standpipes are shown on the relevant logs in the "remarks" section. The standpipes were initially measured and then purged of water.
- Following the initial purge of water, the recovery of the water in the standpipes was recorded using data-loggers at one minute intervals as part of a rising head permeability test. These results were recorded over a 48 hour period following the purge of water. The rising head permeability was subsequently calculated
- Downhole Rugged Troll data loggers have been placed within the standpipes and recording water level fluctuations at hourly intervals. A barometric troll has also been placed near the surface of ABH01 to allow for atmospheric pressure adjustments.

All field work was carried out under the direction of a Senior Geotechnical Engineer.

The ground surface levels (measured in 'metres above Australian Height Datum' -m AHD') together with the Eastings and Northings at the test locations were determined by using a High Precision Differential GPS which is accurate to approximately 0.1 m. The test locations are shown on Drawing 1 in Appendix B.

5. Field Work Results

5.1 Subsurface Conditions

Details of the conditions encountered in the boreholes and pit are presented in Appendix C. Explanatory Notes defining classification methods and descriptive terms used in logging the bores and pits are also given in Appendix C.

The typical material strata encountered within the bores and pits are described below:

FILL	Variable fill materials comprising surficial layers of topsoil, ripped sandstone gravel, cobbles and boulders, roadbase gravel, sand, building waste, to depths of 0.1 m to 1.5 m, except at ABH05 where fill to 3.5 m depth was encountered; overlying,
NATURAL SOILS	typically medium to high plasticity, stiff to hard, orange brown mottled grey silty clays with ironstone gravel. The lower portions of this unit were logged as extremely weathered shale in some boreholes; overlying,
VERY LOW AND LOW STRENGTH SILTSTONE	very low and low strength, moderately to slightly weathered, highly fractured to fractured, siltstone at depths of 1.6 m to 4.5 m depth in the boreholes; overlying,
MEDIUM AND HIGH STRENGTH SILTSTONE AND LAMINITY	Typically low and medium strength with some low high strength bands, highly weathered to fresh, slightly fractured to unbroken, grey siltstone and laminite (interbedded siltstone and sandstone) at depths of 3.5 m to 6.6 m. A very high strength layer was encountered in ABH01 at 19.2 m to 20.2 m depth.

The results of seismic dilatometers are included in Appendix D.

5.2 Groundwater

Groundwater levels were recorded using an electronic dip meter during DPs site visits. The results of these groundwater measurements are outlined in Table 1 (following page).

Water quality readings are included in DP's DSI report.

Table 1: Results of Groundwater Measurements in Groundwater Wells

Bore	Depth (m)	Surface level (R.L.)	Reading / date							
			20 February 2020		27 February 2020		28 February 2020*		6 March 2020	
			Water level (m b.g.l.)	Water level (R.L.)	Water level (m b.g.l.)	Water level (R.L.)	Water level (m b.g.l.)	Water level (R.L.)	Water level (m b.g.l.)	Water level (R.L.)
ABH01	15	58.3	3.8	54.5	3.6	54.7	3.8	54.5	3.7	54.6
ABH02	15	57.6	4.2	53.4	4.3	53.3	4.8	52.8	4.1	53.5
ABH03	5	54.4	3.1	53.3	2.6	51.8	1.3	53.1	3.2	53.6
ABH08	15	60.3	NA	NA	5.7	54.8	NR	NR	5.5	54.8

Notes:

- ABH01 Installed on 3/2/2020
- ABH02 installed on 10/2/2020
- ABH03 installed on 4/2/2020
- ABH08 installed on 21/2/2020
- All wells purged on 20/2/2020
- * Heavy Rainfall preceded measurement and falling Head Tests carried out on 27 February 2020. Accordingly, given the variability in site and sampling conditions these results may not be indicative of actual groundwater measurements. An anomalous readings, particularly for ABH03 on this date, is not considered reflective of actual site groundwater levels.
- NR = Not Recorded

The results of data-logger monitoring are presented in Figure 2 (following page) and repeated in Appendix E.

The results of the rising head permeability tests indicated the following permeability's outlined in Table 2.

Table 2: Permeability Estimates from Rising Head Permeability Tests

Well	Depth Range of Screen in (m)	Material	Estimated Permeability (m/sec)
ABH01	4.5 – 15.0	Siltstone	2.6×10^{-9}
ABH02	6.0 - 15.0	Siltstone	6.5×10^{-9}
ABH03	0.5 – 4.0	Clay	7.1×10^{-10}
ABH08	7.0 – 14.8	Siltstone	2.3×10^{-9}

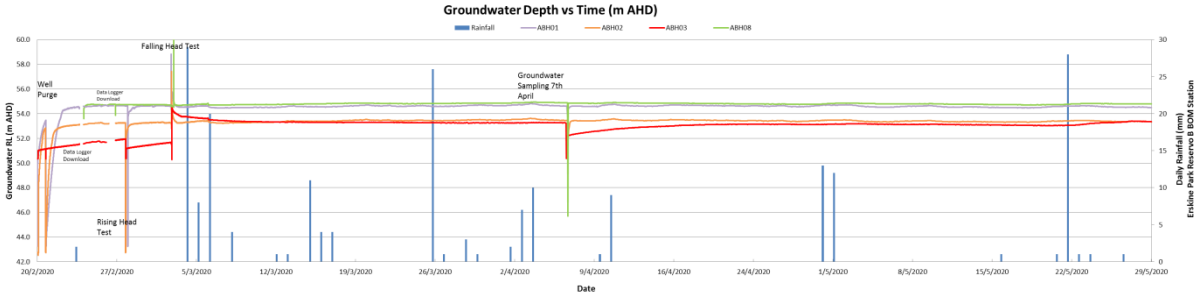


Figure 2: Results of Groundwater Measurements between 20 February 2020 and 29 May 2020 (Note: better Resolution of this graph provided in Appendix E)

6. Laboratory Testing

6.1 Chemical Testing

Selected samples collected from boreholes were tested in the laboratory to determine pH, sulfate and chloride ion concentrations as well as the electrical conductivity and textural classification for assessment of aggressivity potential of the soil. The detailed results are given in Appendix E and are summarised in Tables 3 and 4.

Table 3: Results of Laboratory Testing

Sample Location	Sample Depth (m)	Material	pH	Chloride (mg/kg)	Sulfate (mg/kg)	Electrical Conductivity (µS/cm)	Textural Classification
ABH01	1.6 – 2.0	Silty Clay	5.6	350	230	440	7
ABH02	2.0 – 2.45	Silty Clay	6.7	970	350	830	7
ABH02	3.0 – 3.09	Silty Clay	6.8	730	330	720	8
ABH03	0.9 – 1.0	Silty Clay	5.5	1600	300	110	8
ABH04	1.6 – 2.0	Silty Clay	6.3	110	260	250	8.5
ABH05	0.5 – 1.6	Silty Clay	5.3	1700	380	1300	8
ABH06	1.41 – 2.0	Silty Clay	6.1	77	58	95	8
ATP02	0.3-0.4	Silty Clay	8.1	290	130	320	9

Note: All samples mixed at a ratio of 1(soil):5(water) prior to testing.

Table 4: Results of Laboratory Testing

Sample Location	Sample Depth (m)	Material	Magnesium (mg/kg)	CEC (meq/100g)	ESP (%)
ABH01	1.6 – 2.0	Silty Clay	2300	7.1	27
ABH02	2.0 – 2.45	Silty Clay	2300	15	26
ABH02	3.0 – 3.09	Silty Clay	2500	13	25
ABH03	0.9 – 1.0	Silty Clay	2500	15	21
ABH04	1.6 – 2.0	Silty Clay	1800	13	10
ABH05	0.5 – 1.6	Silty Clay	1700	11	24
ABH06	1.41 – 2.0	Silty Clay	2500	9.7	18
ATP02	0.3-0.4	Silty Clay	1400	12	8

Notes: CEC = Cation Exchange Capacity
ESP = Sodicity

6.2 Acid Sulfate Soil Screening

Selected soil samples were tested for indicators of acid sulfate soil conditions using a calibrated pH meter to measure pH in water (H_2O) and in hydrogen peroxide (H_2O_2) in accordance with the NSW Acid Sulfate Soil Management Advisory Committee, *Acid Sulfate Soil Manual*, August 1998 (ASSMAC). The detailed results are given in Appendix E and are summarised in Table 5.

Table 5: Results of ASS Field Screening Tests

Sample Location	Sample Depth (m)	Material	Screening Test Results			
			pH			Strength of Reaction
			pH_F	pH_{FOX} (avg)	pH_F-pH_{FOX}	
ATP04	0.5 – 0.6	Silty Clay	6.4	4.6	1.8	Volcanic
ABH05	0.5 – 0.6	Silty Clay	5.4	3.4	2.0	Low Reaction

The results of the screening tests for pH in H_2O (pH_F) were in the range of 5.4 to 6.4 pH units. This usually indicates that actual acid sulfate soil conditions (AAS) are not present. This interpretation is based on the ASSMAC guidelines which suggests that oxidation of pyrite would be likely to have already occurred if pH_F is less than 4 pH units.

The results of the initial screening tests for pH following addition of hydrogen peroxide (pH_{FOX}) were in the range of 3.4 to 4.6 pH units. The ASSMAC guidelines suggest that potential acid sulfate soil (PASS) conditions may be present where pH in hydrogen peroxide solution (pH_{FOX}) is less than 3.5 pH units.

The ASSMAC guidelines also suggest that potential acid sulfate soil conditions may be present where the difference between pH in H_2O (pH_F) and pH in H_2O_2 (pH_{FOX}) is at least 1 pH unit.

Further indications of the presence of acid sulfate soils include change in colour after oxidation, and effervescence. Low and volcanic reaction rates were observed.

Based on the initial screening results, detailed ASS testing comprising the Chromium suite was carried out on the two samples collected from the boreholes.

The action criterion on which the presence of ASS is made based on detailed testing and which may trigger a requirement for an acid sulfate management plan is based on the *Soil Management Guidelines* and the Laboratory Methods Guidelines. Based on the above results, Chromium Reducible testing was carried out. The detailed results are given in Appendix E and are summarised in Table 6.

Table 6: Results of Chromium Suite Testing

Sample Location	Sample Depth (m)	pH_{KCL}	S_{CR} (%S)	Titratable Actual Acidity (TAA)	Acid Neutralising Capacity (ANC)	s-S_{NAS} (% Sulfur)	Net Acidity Sulfur
		pH Units	% w/w S	% w/w S	% w/w S	% w/w S	% w/w S
ATP04	0.5 – 0.6	5.9	<0.005	<0.01	NA	NA	0.007
ABH05	0.5 – 0.6	4.6	<0.005	0.003	NA	NA	0.035

6.3 Thermal Resistivity

Soil samples recovered from test bores were re-compacted to a maximum dry density of 98% relative to standard compaction at optimum moisture content and then tested for Thermal Resistivity. The samples were tested by Geotherm Australasia Pty Ltd (Geotherm) in accordance with ASTM D5334 to obtain Thermal Resistivity (TR) values from the field moisture content to the fully dried out state (zero moisture content).

The results of the laboratory testing are provided in Table 8 below. Detailed results of laboratory TR testing by Geotherm are attached in Appendix E.

Table 8: Thermal Resistivity Results

Borehole	Sample Depth (m)	Material	FMC (%)	MDD (t/m^3)	TR (FMC) (°Km/W)	TR (0%) (°Km/W)
ABH01	1.3 – 1.6	Silty Clay	17.3	1.73	0.75	1.96
ABH02	2.4 – 2.8	Silty Clay	22.9	1.62	0.63	1.64

Where FMC = Field Moisture Content TR (FMC) = Pre-Dry out TR value at Field Moisture Content
TR (0%) = Fully Dried out TR value at 0% Moisture Content
MDD = Approximate Maximum Dry Density (t/m^3)

6.4 Mechanical Testing

Selected samples from the test pits were tested in the laboratory for measurement of plasticity, dispersion potential, shrink-swell, moisture content, compaction properties and CBR. The detailed results are given in Appendix E and summarised in Table 9.

Table 9: Results of Laboratory Testing – Physical

Sample Location	Depth (m)	Material	FMC (%)	OMC (%)	MDD (t/m^3)	CBR (%)	W_L (%)	W_P (%)	PI (%)	LS (%)	I_{ss} (%/ Δpf)	ECN
ABH01	1.0 – 1.28	Clay	15.6	-	-	-	-	-	-	-	2.2	-
ABH01	1.6 – 2.0	Siltstone	8.8	11.0	1.93	-	38	17	21	10.5	2.2	2
ABH01A	1.3 – 1.6	Clayey Silt	17.0	17.5	1.73	1.0	60	23	37	14.5	-	2
ABH02	1.5 – 2.0	Silty Clay	25.7	-	-	-	-	-	-	-	3.6	-
ABH02A	1.5- 2.0	Silty Clay	28.1	25.7	1.55	6.0	-	-	-	-	-	-
ABH02A	2.4 – 2.8	Silty Clay	26.3	23.5	1.62	-	49	21	28	12.5		-
ABH03	1.0 – 1.25	Silty Clay	22.5	-	-	-	-	-	-	-	2.9	-
ABH04	1.0 – 2.0	Clay	21.0	-	-	-	-	-	-	-	3.9	-
ABH04	1.0 – 2.0	Silty Clay	23.9	21.0	1.65	-	47	20	27	12.5	-	2

Sample Location	Depth (m)	Material	FMC (%)	OMC (%)	MDD (t/m^3)	CBR (%)	W_L (%)	W_P (%)	PI (%)	LS (%)	I_{ss} (%/ Δpf)	ECN
ABH05	0.5 – 1.5	Silty Clay	22.0	21.5	1.63	-	-	-	-	-	-	-
ABH05	1.0 – 1.31	Clay	-	-	-	-	76	17	59	17.5	3.1	-
ABH06	1.0-1.41	Silty Clay	-	-	-	-	46	17	29	13.5	-	-
ABH07	1.0 – 1.27	Silty Clay	-	-	-	-	72	25	47	19.5	-	-
ABH07	1.6 – 2.4	Silty Clay	9.1	12.0	1.92	-	-	-	-	-	-	-
ATP01	2.5 – 2.6	Siltstone	13.8	15.0	1.85	1.0	47	19	28	13.0	-	2
ATP02	0.5 – 0.6	Silty Clay	12.1	14.3	1.80	8.0	-	-	-	-	-	-
ATP02	1.5 – 1.76	Silty Clay	-	-	-	-	48	17	31	15.5	-	2
ATP03	0.9 – 1.0	Silty Clay	20.0	19.9	1.69	2.5	56	18	38	17.0	-	2
ATP04	2.4 – 2.5	Siltstone	15.5	13.9	1.78	1.0	45	21	24	12.0	-	2

Notes: FMC = Field Moisture Content; OMC = Standard Optimum Moisture Content; MDD = Maximum Dry Density; CBR = California bearing ratio; W_L = Liquid Limit; W_P = Plastic Limit; PI = Plasticity Index; I_{SS} = Shrink Swell Index; ECN = Emerson Crumb number; LS = Linear Shrinkage

The results of the laboratory testing indicate the following:

- The Atterberg Limit results indicate that the silty clay samples were generally of medium or high plasticity.
- The shrink-swell results indicate the silty clays are typically highly reactive and therefore susceptible to shrink and swell movements due to changes in soil moisture content.
- The CBR values were of low remoulded strength and ranged from 1.0 % to 6.0 % for the natural silty clay samples tested.
- The field moisture contents ranged from 8.8 % to 28.1 % for the silty clay samples tested.
- The Emerson Crumb Numbers were 2, indicating the clays were highly dispersive.

Particle Size Distribution and Hydrometer tests were also carried out. The results are provided in Appendix E.

6.5 Petrographic and X-Ray Diffraction Test

A petrographic analysis was carried out on the sample obtained from ABH02 from 2.5 – 2.88m by Geochempet Services, Brisbane. The method of analysis was adapted from ASTM C295 Standard Guide for Petrographic Assessment of Aggegrates for Concrete and AS2758.1 – 2014 Aggregates and rock for engineering purposes part 1: Concrete aggregates (Appendix B). The sample was identified as a silty claystone (residual soil) with the following

The Hard, Durable Components had the following breakdown:

- 10% quartz grains
- 3 % feldspar grains
- 1% intermediate volcanic clasts
- 3% acid tuff clasts
- 3% quartzite clasts
- 5% hematite/goethite
- 1% hematized, leucoxenized of finely rutilated clasts of former detrital opaqual oxides.

The soft, weak and/or deleterious components had the following breakdown:

- 54% illitie-smecitite clay cement variably stained by secondary iron oxide and intermingled very fine quartz
- 4% kaolinite clay
- 17% earthy secondary iron oxide
- <1% carbonaceous matter
- <1% pores

The X-Ray diffraction analysis indicated the following minerals

- Quartz 28.2 %
- Goethite 3.4 %
- Smectite 8.6%
- Illite/Smectite 17.3 %
- Kaolinite 25.7%
- Amorphous/unidentified content 16.9 %

The fine faction analysis indicated the illite-smectite mixed layer and kaolinite were the major components of the sample analysed. Comments from the laboratory, Geochmept, have been included in Appendix E.

6.6 Rock Testing

Uniaxial Point Load Strength Index (Is_{50}) testing and Unconfined Compressive Strength Testing was carried out on selected rock core specimens. The results of the tests are given on the borehole logs at the appropriate depths. Figure 3 (following page) shows the range of Is_{50} results at the various depths (shown as Reduced Levels relative to AHD). The results of Unconfined Compressive Strength Testing is summarised in Table 10 and the test report sheets are provided in Appendix E.

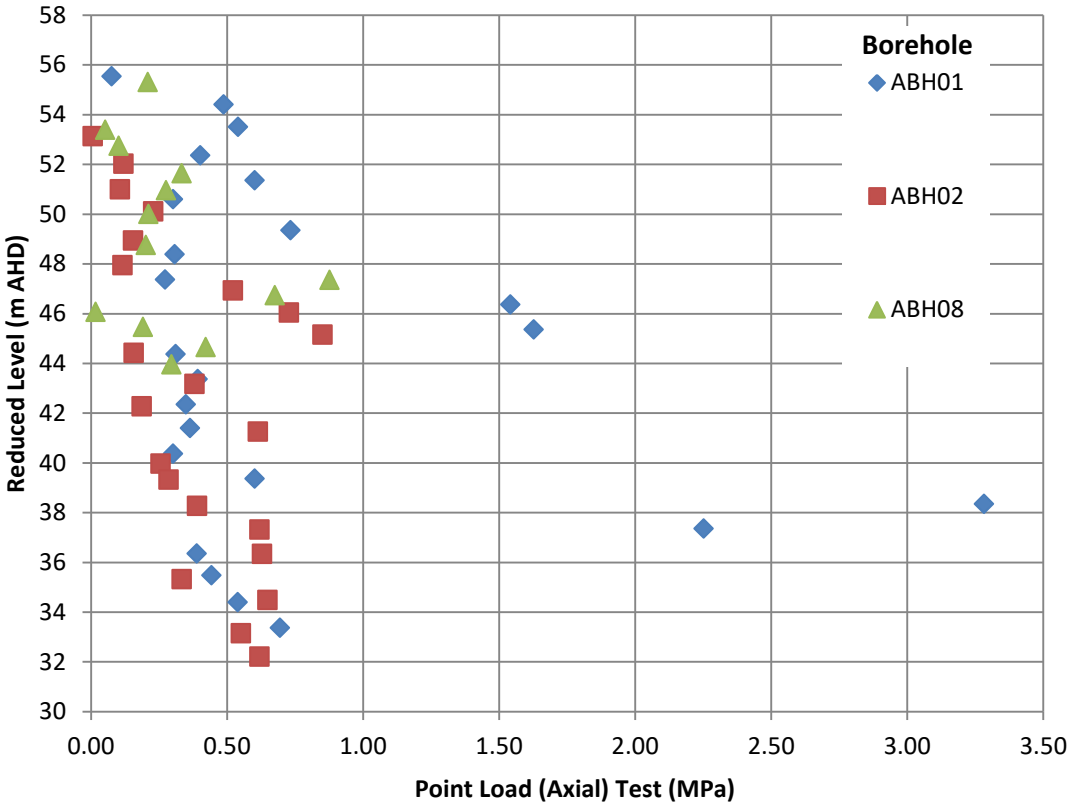


Figure 3: Point Load Test Results relative to Reduced Level (m AHD)

Diametrical Point loads were carried out at regular intervals within the rock core. The results are included on the test bore log reports. Some samples fractured along bedding planes within the siltstone bedrock and may not reflect the diametrical strength of the rock.

Table 10: Summary of UCS Test Results

Bore	Depth (m)	Material Description	UCS (MPa)	Bore	Depth (m)	Material Description	UCS (MPa)
ABH01	4.24 – 4.59	Siltstone	9.5	ABH02	17.32 – 17.62	Siltstone	6.1
ABH01	9.54 – 9.94	Siltstone	4.8	ABH02	20.09 - 20.36	Siltstone	5.4
ABH01	13.42 – 13.85	Siltstone	12.3	ABH02	24.0 – 24.45	Siltstone	7.3
ABH01	18.56 – 18.91	Siltstone	6.8	ABH08	6.41 – 6.65	Siltstone	4.2
ABH01	22.13 – 22.42	Siltstone	5.8	ABH08	9.02 – 9.3	Siltstone	2.8
ABH01	23.54 – 23.78	Siltstone	8.1	ABH08	10.55 – 10.8	Siltstone	2.1

ABH02	7.6 – 7.91	Siltstone	10.4	ABH08	12.56 - 12.89	Siltstone	6.9
ABH02	14.09 – 14.45	Siltstone	7.3	ABH08	13.2 – 13.5	Siltstone	2.6
ABH02	15.57 - 16.0	Siltstone	9.2	ABH08	15.7 – 16.0	Siltstone	3.6

7. Limitations

Douglas Partners (DP) has prepared this report for this project at 339 Wallgrove Road, Eastern Creek in accordance with DP's proposal NWS190206 dated 4 December 2019. The work was carried out under DP's Conditions of Engagement. This report is provided for the exclusive use of Cleanaway Operations Pty Ltd and Macquarie c/- Arup Pty Ltd for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of DP, does so entirely at its own risk and without recourse to DP for any loss or damage. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

The results provided in the report are indicative of the sub-surface conditions on the site only at the specific sampling and/or testing locations, and then only to the depths investigated and at the time the work was carried out. Sub-surface conditions can change abruptly due to variable geological processes and also as a result of human influences. Such changes may occur after DP's field testing has been completed.

This report must be read in conjunction with all of the attached notes and should be kept in its entirety without separation of individual pages or sections. DP cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report.

This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by DP. This is because this report has been written as advice and opinion rather than instructions for construction.

The scope for work for this investigation/report did not include the assessment of surface or sub-surface materials or groundwater for contaminants, within or adjacent to the site. Should evidence of filling of unknown origin be noted in the report, and in particular the presence of building demolition materials, it should be recognised that there may be some risk that such filling may contain contaminants and hazardous building materials.

The contents of this report do not constitute formal design components such as are required, by the Health and Safety Legislation and Regulations, to be included in a Safety Report specifying the hazards likely to be encountered during construction and the controls required to mitigate risk. This design process requires risk assessment to be undertaken, with such assessment being dependent upon factors relating to likelihood of occurrence and consequences of damage to property and to life. This, in turn, requires project data and analysis presently beyond the knowledge and project role

respectively of DP. DP may be able, however, to assist the client in carrying out a risk assessment of potential hazards contained in the Comments section of this report, as an extension to the current scope of works, if so requested, and provided that suitable additional information is made available to DP. Any such risk assessment would, however, be necessarily restricted to the geotechnical components set out in this report and to their application by the project designers to project design, construction, maintenance and demolition.

Douglas Partners Pty Ltd

Appendix A

About This Report

About this Report

Douglas Partners

Introduction

These notes have been provided to amplify DP's report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

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

Copyright

Borehole and Test Pit Logs

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

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

Groundwater

Where groundwater levels are measured in boreholes there are several potential problems, namely:

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

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

Reports

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, DP will be pleased to review the report and the sufficiency of the investigation work.

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

- Unexpected variations in ground conditions. The potential for this will depend partly on borehole or pit spacing and sampling frequency;
- Changes in policy or interpretations of policy by statutory authorities; or
- The actions of contractors responding to commercial pressures.

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

About this Report

Site Anomalies

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

Information for Contractual Purposes

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

Site Inspection

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

DATA FOR DESCRIPTION AND CLASSIFICATION OF SOILS – Page 1

Major Divisions				Description		Field Identification			
				Group Symbol*	Typical Name	Grading		Nature of Fines	Dry Strength
COARSE-GRAINED SOILS	More than 65% by dry mass, (excluding that larger than 63 mm) is greater than 0.075 mm	GRAVEL	More than 50% of coarse grains are greater than 2.36 mm	GW	Well graded gravels and gravel-sand mixtures, little or no fines.	Good	Wide range in grain size	'Clean' materials (not enough fines to bind grains)	None
				GP	Poorly graded gravels and gravel-sand mixtures, little or no fines.	Poor	Predominantly one size or gap graded		
		GRAVELLY SOILS		GM	Silty gravels, gravel-sand-silt mixtures.	Good to Fair	'Dirty' materials with excess of fines	Fines are non-plastic	None to medium
				GC	Clay gravels, gravel-sand-clay mixtures.			Fines are plastic	Medium to high
		SAND	More than 50% of coarse grains are less than 2.36 mm	SW	Well graded sands and gravelly sands, little or no fines.	Good	Wide range in grain size	'Clean' materials (not enough fines to bind grains)	None
				SP	Poorly graded sands and gravelly sands, little or no fines.	Poor	Predominantly one size or gap graded		
		SANDY SOILS		SM	Silty sand, sand-silt mixtures.	Good to Fair	'Dirty' materials with excess of fines	Fines are non-plastic	None to medium
				SC	Clayey sands, sand-clay mixtures.			Fines are plastic	Medium to high
* For coarse grained soils where the fines content is between 5% and 12%, the soil shall be given a dual classification eg GP-GM.						Dry Strength		Dilatancy	Toughness
FINE-GRAINED SOILS	More than 35% by dry mass, (excluding that larger than 63 mm) is less than 0.075 mm	Liquid Limit less than 35%		ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands.	None to low		Slow to rapid	Low
				CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.	Medium to high		None to slow	Medium
				OL	Organic silts and organic silty clays of low plasticity	Low to medium		Slow	Low
		35% <LL< 50%		CI	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.	Medium to high		None to slow	Medium
		Liquid Limit greater than 50%		MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts.	Low to medium		None to slow	Low to medium
				CH	Inorganic clays of high plasticity, fat clays.	High to very high		None	High
				OH	Organic clays of medium to high plasticity.	Medium to high		None to very slow	Low to medium
				Pt	Peat muck and other highly organic soils.	Readily identified by colour, odour, spongy feel and generally fibrous texture			

ORDER OF DESCRIPTION

In the soil description the terms should be given in the following order:

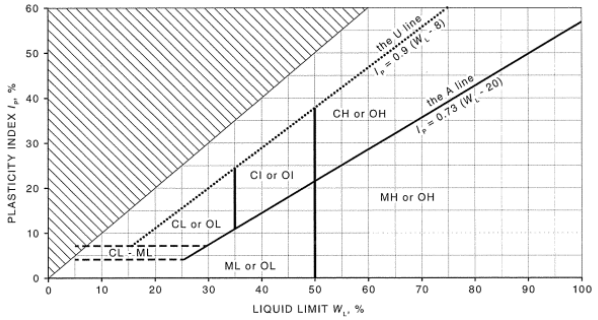
- SOIL NAME & UNIFIED CLASSIFICATION SYMBOL.
- Plasticity, behavioural or particle characteristics of the primary soil component
- Colour
- Secondary soil components' name(s), estimated proportion(s), plasticity, behavioural or particle characteristics, colour and where practical, its plasticity
- Moisture Condition (disturbed or undisturbed state)
- Consistency of fine-grained soils (undisturbed state only)
- Relative density of coarse-grained soils (determined by in situ tests)
- Structure of soil (in undisturbed state)
  - Zoning
  - Defects
  - Cementing
- Origin of soil
- Additional observations

EXAMPLES:

Silty SAND SM: fine to coarse grained, light brown, 15% non-plastic fines, with gravel, 20% angular particles, moist, apparently dense in place, alluvial.

SILT ML: low plasticity, brown, trace fine sand, w > PL, firm, estuarine.

PLASTICITY CHART (after AS 1726:2017)



The classification system excludes the boulder and cobble fractions of the soil and classifies only the materials less than 63 mm in size.

PARTICLE SIZES

Boulders	> 200 mm
Cobbles	63 mm to 200 mm
Gravel	2.36 mm to 63 mm
Sand	0.075 mm to 2.36 mm
Silt and Clay	< 0.075 mm

SAND			SILT
COARSE	MEDIUM	FINE	SILT
2.36-0.6 mm	0.6-0.2 mm	0.2-0.075 mm	0.075-0.002 mm
			

DATA FOR DESCRIPTION AND CLASSIFICATION OF SOILS – Page 2

GRAVEL

Density	Field Test
LOOSE	By inspection of voids and particle packing.
DENSE	

SAND

Density	Field Test	DPT Blows per 300 mm[1]		SPT N Blows	CPT q_c MPa	Relative Density %	Estimated Friction Angle
		Dry[2]	Wet[3]				
VERY LOOSE	Easily penetrated with 13 mm reinforcing rod pushed by hand.	< 1	0	0 – 4	0 – 2	0 – 15	25 - 30
LOOSE	Easily penetrated with 13 mm reinforcing rod pushed by hand. Can be excavated with a spade; 50 mm wooden peg can be easily driven.	1 - 3	< 1	4 – 10	2 – 5	15 – 35	27 - 32
MEDIUM DENSE	Penetrated 300 mm with 13 mm reinforcing rod driven by 2 kg hammer – hard shovelling.	3 - 8	1 - 6	10 – 30	5 – 15	35 – 65	30 - 35
DENSE	Penetrated 300 mm with 13 mm reinforcing rod driven with 2 kg hammer, requires pick for excavation; 50 mm wooden peg hard to drive	8 – 15	6 - 10	30 – 50	15 – 25	65 – 85	35 - 40
VERY DENSE	Penetrated only 25 – 50 mm with 13 mm reinforcing rod driven by 2 kg hammer.	> 15	> 10	> 50	> 25	85 – 100	38 - 43

[1]Valid for depths up to approx 1m bgl; [2]At a mc of approx. 3%-5%; [3]At a mc of approx. 15%.

SILT & CLAY

Consistency	Field Test		DCP Blows per 150 mm	SPT N Blows	Undrained Shear Strength C_u Shear Vane (kPa)	Unconfined Compressive Strength q_u PP* (kPa)	CPT q_c kPa
VERY SOFT	Easily penetrated > 40 mm by thumb. Exudes between thumb and fingers when squeezed in hand	Shear Vane Preferred	< 1	< 2	< 12	< 25	0 - 180
SOFT	Easily penetrated 10 mm by thumb. Moulded by light finger pressure.		1 – 1.5	2 – 4	12 – 25	25 – 50	180 - 375
FIRM	Impression by thumb with moderate effort. Moulded by strong finger pressure		1.5 – 3	4 – 8	25 – 50	50 – 100	375 - 750
STIFF	Slight impression by thumb cannot be moulded with finger		3 – 6	8 – 16	50 – 100	100 – 200	750 - 1500
VERY STIFF	Very tough. Readily indented by thumbnail.		6 – 12	16 – 32	100 – 200	200 – 400	1500 - 3000
HARD	Brittle. Indented with difficulty by thumbnail.		> 12	> 32	> 200	> 400	> 3000
FRIABLE	Easily crumbled or broken into small pieces by hand.						

* Pocket Penetrometer (**PP**) may overestimate q_u by a factor of 1.5 to 2.0.

Note: Visual-tactile assessment is indicative only. Use in-situ testing for logging

MOISTURE OF FINE GRAINED SOILS

Moist, dry of plastic limit	w < PL	Wet, near liquid limit	w ≈ LL
Moist, near plastic limit	w ≈ PL	Wet, wet of liquid limit	w > LL
Moist, wet of plastic limit	w > PL		

DEGREE OF SATURATION OF SANDS

Condition of Sand	Criteria	Degree of Saturation (%)
Dry	Non-cohesive and free-running	0 – 25%
Moist	Feels cool, darker colour, grains tend to adhere to one another	25 – 75%
Wet	Feels cold, makes hands wet, should be close to water table	75 – 99%

FIELD IDENTIFICATION PROCEDURE FOR FINE GRAINED SOILS OR FRACTIONS

These procedures are to be performed on the minus 0.4 mm sieve size particles. For field classification purposes, screening is not intended, simply remove by hand the coarse particles that interfere with the tests.

Dilatancy (Reaction to shaking):

After removing particles larger than 0.4 mm sieve size, prepare a pat of moist soil with a volume of about 8000 mm^3. Add enough water if necessary to make the soil soft but not sticky. Place the pat in the open palm of one hand and shake horizontally, striking vigorously against the other hand several times. A positive reaction consists of the appearance of water on the surface of the pat which changes to a livery consistency and becomes glossy. When the sample is squeezed between the fingers, the water and gloss disappear from the surface, the pat stiffens and finally it cracks or crumbles. The rapidity of appearance of water during shaking and of its disappearance during squeezing assist in identifying the character of the fines in a soil. Very fine clean sands give the quickest and most distinct reaction whereas a plastic clay has no reaction. Inorganic silts, such as a typical rock flour, show a moderately quick reaction.

Dry Strength (Crushing characteristics):

After removing particles larger than 0.4 mm sieve size, mould a pat of soil to the consistency of putty, adding water if necessary. Allow the pat to dry completely by oven sun or air drying, and then test its strength by breaking and crumbling between the fingers. This strength is a measure of the character and quantity of the colloidal fraction contained in the soil. The dry strength increases with increasing plasticity.

High dry strength is characteristic for clays of the CH group. A typical inorganic silt possesses only very slight dry strength. Silty fine sands and silts have about the same dry strength but can be distinguished by the feel when powdering the dried specimen. Fine sand feels gritty whereas a typical silt has the smooth feel of flour.

Toughness (Consistency near plastic limit):

After removing particles larger than the 0.4 mm sieve size, a specimen of soil about 12 mm cube in size, is moulded to the consistency of putty. If too dry, water must be added and if sticky, the specimen should be spread out in a thin layer and allowed to lose some moisture by evaporation. Then the specimen is rolled out by hand on a smooth surface or between the palms into a thread about 3 mm in diameter. The thread is then folded and re-rolled repeatedly. During this manipulation the moisture content is gradually reduced, and the specimen stiffens, finally loses its plasticity, and crumbles when the plastic limit is reached. After the thread crumbles, the pieces should be lumped together, and a slight kneading action continued until the lump crumbles.

The tougher the thread near the plastic limit and the stiffer the lump when it finally crumbles, the more potent is the colloidal clay fraction in the soil. Weakness of the thread at the plastic limit and quick loss of coherence of the lump below the plastic limit indicate either inorganic clay or low plasticity, or materials such as kaolin-type clays and organic clays which occur below the A-line.

Highly organic clays have a very weak and spongy feel at the plastic limit.

PROPORTION OF MINOR AND SECONDARY COMPONENTS

Term	Meaning	Approximate Proportion	
		Coarse Soils	Fine Soils
Trace	Just detectable by feel or eye. Soil properties of main component virtually unaffected.	< 5% fines < 15 % coarse fraction	< 15% sand / gravel
With	Easily detectable by feel or eye. Soil properties only slightly affected by minor components.	5% – 12% fines 15% – 30% coarse fraction	15% – 30% sand / gravel
Prefix	Easily detected by feel or eye. Soil properties significantly affected by secondary components.	> 12% fines > 30% coarse fraction	> 30% sand / gravel

PROPORTIONS OF SECONDARY COMPONENTS

5%	12%	35%
		

DATA FOR DESCRIPTION AND CLASSIFICATION OF ROCK

SEDIMENTARY ROCK TYPE DEFINITIONS

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

Rocks possessing characteristics of two groups are described by their predominant particle size with reference also to the minor constituents, e.g. Clayey SANDSTONE, Sandy SHALE.

DEGREE OF WEATHERING

Term	Abbreviation	Definition
Residual soil	RS	Material is weathered to such an extent that it has soil properties. Mass structure, material texture and fabric of original rock are no longer visible, but the soil has not been significantly transported.
Extremely Weathered	XW	Material is weathered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are still visible.
Highly Weathered	HW	The whole of the rock is discoloured, usually by iron staining or bleaching to the extent that the colour of the original rock is not recognisable. Rock strength is significantly changed by weathering. Some primary minerals have weathered to clay minerals. Porosity may be increased by leaching or may be decreased due to deposition of weathering products in pores.
Moderately Weathered	MW	The whole of the rock material is discoloured, usually by iron staining or bleaching to the extent that the colour of the original rock is not recognisable but shows little or no change of strength from fresh rock.
Slightly Weathered	SW	Rock is partially discoloured with staining or bleaching along joints but shows little or no change of strength from fresh rock.
Fresh	FR	Rock shows no sign of decomposition of individual minerals or colour changes.

DW* (spans HW and MW)

*If highly and moderately weathered rock cannot be differentiated use the term, 'Distinctly Weathered (DW)'.

ORDER OF DESCRIPTION

In the rock description the terms should be given in the following order:
ROCK NAME
Grain size and type
Colour
Fabric and texture
Inclusions and minor components
Moisture content
Durability
Strength
Weathering and/or alteration
Defects – type, orientation, spacing, roughness
Stratigraphic unit
Geological structure

STRATIFICATION

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

DEGREE OF FRACTURING

This classification applies to diamond drill cores and refers to the spacing of all types of natural fractures along which the core discontinuous. These include bedding plane partings, joints and other rock defects, **but exclude artificial fractures such as drilling breaks.**

Term	Description
Fragmented	The core is comprised primarily of fragments of length less than 20 mm, and mostly of width less than the core diameter
Highly Fractured	Core lengths are generally less than 20 mm to 40 mm with occasional fragments
Fractured	Core lengths are mainly 30 mm to 100 mm with occasional shorter and longer sections
Slightly Fractured	Core lengths are generally 300 mm or longer with occasional sections of 100 mm to 300 mm
Unbroken	The core contains very few fractures

ROCK STRENGTH

Rock strength is classified using the unconfined compressive strength (UCS). Where adequate UCS data are not available then the classification may be based on the Point Load Strength ($I_{S(50)}$) and refers to the strength of the rock substance in the direction normal to the bedding.

Strength Term	UCS MPa	Field Guide	Approx $I_{S(50)}$ MPa
Material less than very low strength is to be described using soil properties			
Very Low	2	Material crumbles under firm blows with sharp end of pick; can be peeled with knife. Pieces up to 30 mm thick can be broken by finger pressure.	0.1
Low	6	Easily scored with a knife; indentations 1 mm to 3 mm show in the specimen with firm blows of the pick point; has dull sound under hammer. A piece of core 150 mm long by 50 mm diameter may be broken by hand. Sharp edges of core may be friable and break during handling.	0.3
Medium	20	Readily scored with a knife; a piece of core 150 mm long by 50 mm diameter can be broken by hand with difficulty.	1.0
High	60	A piece of core 150 mm long by 50 mm diameter cannot be broken by hand but can be broken by a pick with a single firm blow; rock rings under hammer.	3.0
Very High	200	Hand specimen breaks with pick after more than one blow; rock rings under hammer.	10.0
Extremely High		Specimen requires many blows with geological pick to break through intact material; rock rings under hammer.	

The approximate point load strength ($I_{S(50)}$) is based on an assumed ratio to UCS of 1:20. This ratio may vary widely and should be determined for each site and rock type.

DISCONTINUITIES / DEFECTS

The actual defect is described not the process which formed or may have formed it, e.g. 'sheared zone', not 'zone of shearing'; the latter suggests a currently active process.

Spacing*:

A measure of the spacing of discontinuities. Measure mean and range of spacings for each set where possible (do not use descriptive terms).

Thickness, openness:

Measured in millimetres normal to plane of the discontinuity.

Persistence*:

The areal extent of a discontinuity. Give trace lengths in metres.

Roughness and Shape*:

A measure of the inherent surface unevenness and waviness of the defect relative to its mean plane.

Coating or Infilling:

Clean: no visible coating or infilling.

Stained: no visible coating or infilling but surfaces are discoloured by mineral staining.

Veneer: a visible coating or infilling of soil or mineral substance but usually unable to be measured (less than 1 mm).

Patchy Veneer: if discontinuous over the plane.

Coating: a visible coating or infilling of soil or mineral substance, greater than 1 mm thick. Describe composition and thickness.

* Usually determined in field exposures

Roughness:

Very Rough
Rough
Smooth
Polished
Slickensided

Shape*:

Planar
Curved
Undulating
Stepped
Irregular

Discontinuity Spacing in Three Dimensions:

The spacing of discontinuities in exposures may be described with reference to the size and shape of rock bounded by the discontinuities.

Equidimensional	Same size in all directions
Tabular	Thickness much less than length or width
Columnar	Height much greater than cross section
Polyhedral	Irregular defects without obvious pattern

Sampling

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

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

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

Test Pits

Test pits are usually excavated with a backhoe or an excavator, allowing close examination of the in-situ soil if it is safe to enter into the pit. The depth of excavation is limited to about 3 m for a backhoe and up to 6 m for a large excavator. A potential disadvantage of this investigation method is the larger area of disturbance to the site.

Large Diameter Augers

Boreholes can be drilled using a rotating plate or short spiral auger, generally 300 mm or larger in diameter commonly mounted on a standard piling rig. The cuttings are returned to the surface at intervals (generally not more than 0.5 m) and are disturbed but usually unchanged in moisture content. Identification of soil strata is generally much more reliable than with continuous spiral flight augers, and is usually supplemented by occasional undisturbed tube samples.

Continuous Spiral Flight Augers

The borehole is advanced using 90-115 mm diameter continuous spiral flight augers which are withdrawn at intervals to allow sampling or in-situ testing. This is a relatively economical means of drilling in clays and sands above the water table. Samples are returned to the surface, or may be collected after withdrawal of the auger flights, but they are disturbed and may be mixed with soils from the sides of the hole. Information from the drilling (as distinct from specific sampling by SPTs or undisturbed samples) is of relatively low reliability, due to the remoulding, possible mixing or softening of samples by groundwater.

Non-core Rotary Drilling

The borehole is advanced using a rotary bit, with water or drilling mud being pumped down the drill rods and returned up the annulus, carrying the drill cuttings. Only major changes in stratification can be determined from the cuttings, together with some information from the rate of penetration. Where drilling mud is used this can mask the cuttings and reliable identification is only possible from separate sampling such as SPTs.

Continuous Core Drilling

A continuous core sample can be obtained using a diamond tipped core barrel, usually with a 50 mm internal diameter. Provided full core recovery is achieved (which is not always possible in weak rocks and granular soils), this technique provides a very reliable method of investigation.

Standard Penetration Tests

Standard penetration tests (SPT) are used as a means of estimating the density or strength of soils and also of obtaining a relatively undisturbed sample. The test procedure is described in Australian Standard 1289, Methods of Testing Soils for Engineering Purposes - Test 6.3.1.

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

The test results are reported in the following form.

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

  4,6,7
  N=13

- In the case where the test is discontinued before the full penetration depth, say after 15 blows for the first 150 mm and 30 blows for the next 40 mm as:

  15, 30/40 mm

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

Dynamic Cone Penetrometer Tests / Perth Sand Penetrometer Tests

Dynamic penetrometer tests (DCP or PSP) are carried out by driving a steel rod into the ground using a standard weight of hammer falling a specified distance. As the rod penetrates the soil the number of blows required to penetrate each successive 150 mm depth are recorded. Normally there is a depth limitation of 1.2 m, but this may be extended in certain conditions by the use of extension rods. Two types of penetrometer are commonly used.

- Perth sand penetrometer - a 16 mm diameter flat ended rod is driven using a 9 kg hammer dropping 600 mm (AS 1289, Test 6.3.3). This test was developed for testing the density of sands and is mainly used in granular soils and filling.
- Cone penetrometer - a 16 mm diameter rod with a 20 mm diameter cone end is driven using a 9 kg hammer dropping 510 mm (AS 1289, Test 6.3.2). This test was developed initially for pavement subgrade investigations, and correlations of the test results with California Bearing Ratio have been published by various road authorities.

Symbols & Abbreviations

Douglas Partners

Introduction

These notes summarise abbreviations commonly used on borehole logs and test pit reports.

Drilling or Excavation Methods

C	Core Drilling
R	Rotary drilling
SFA	Spiral flight augers
NMLC	Diamond core - 52 mm dia
NQ	Diamond core - 47 mm dia
HQ	Diamond core - 63 mm dia
PQ	Diamond core - 81 mm dia

Water

▷	Water seep
▽	Water level

Sampling and Testing

A	Auger sample
B	Bulk sample
D	Disturbed sample
E	Environmental sample
U_{50}	Undisturbed tube sample (50mm)
W	Water sample
pp	pocket penetrometer (kPa)
PID	Photo ionisation detector
PL	Point load strength Is(50) MPa
S	Standard Penetration Test
V	Shear vane (kPa)

Description of Defects in Rock

The abbreviated descriptions of the defects should be in the following order: Depth, Type, Orientation, Coating, Shape, Roughness and Other. Drilling and handling breaks are not usually included on the logs.

Defect Type

B	Bedding plane
Cs	Clay seam
Cv	Cleavage
Cz	Crushed zone
Ds	Decomposed seam
F	Fault
J	Joint
Lam	lamination
Pt	Parting
Sz	Sheared Zone
V	Vein

Orientation

The inclination of defects is always measured from the perpendicular to the core axis.

h	horizontal
v	vertical
sh	sub-horizontal
sv	sub-vertical

Coating or Infilling Term

cln	clean
co	coating
he	healed
inf	infilled
stn	stained
ti	tight
vn	veneer

Coating Descriptor

ca	calcite
cbs	carbonaceous
cly	clay
fe	iron oxide
mn	manganese
slt	silty

Shape

cu	curved
ir	irregular
pl	planar
st	stepped
un	undulating

Roughness

po	polished
ro	rough
sl	slickensided
sm	smooth
vr	very rough

Other

fg	fragmented
bnd	band
qtz	quartz

Symbols & Abbreviations

Graphic Symbols for Soil and Rock

General


Asphalt


Road base


Concrete


Filling

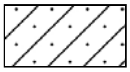
Soils


Topsoil

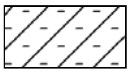

Peat


Clay

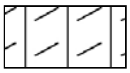

Silty clay

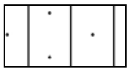

Sandy clay

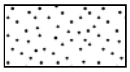

Gravelly clay

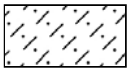

Shaly clay

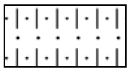

Silt


Clayey silt


Sandy silt


Sand

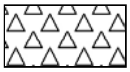

Clayey sand


Silty sand


Gravel


Sandy gravel


Cobbles, boulders

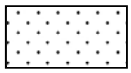

Talus

Sedimentary Rocks

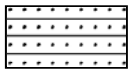

Boulder conglomerate

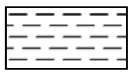

Conglomerate


Conglomeratic sandstone

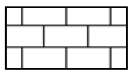

Sandstone


Siltstone


Laminite

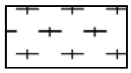

Mudstone, claystone, shale

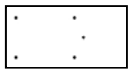

Coal


Limestone

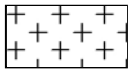
Metamorphic Rocks

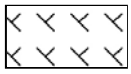

Slate, phyllite, schist

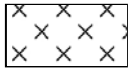

Gneiss

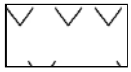

Quartzite

Igneous Rocks


Granite


Dolerite, basalt, andesite

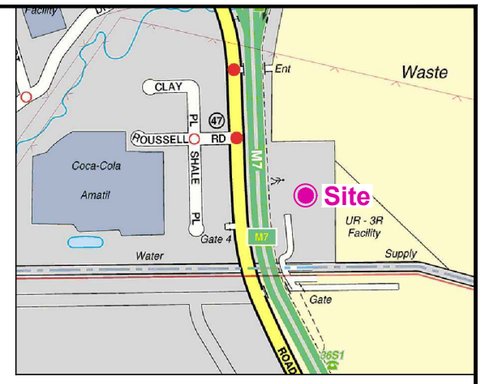

Dacite, epidote


Tuff, breccia


Porphyry

Appendix B

Drawing 1



Location Plan

N

0 10 20 30 40 50

SCALE 1:1,500 (A3)

LEGEND:-

- Push to be borehole
- Borehole with Groundwater Well Locations
- Borehole Locations
- Seismic Dilatometer Locations
- Test Pit Locations

NOTE:-

1. Test locations are approximate only and are shown with reference to existing site features.
2. Image obtained from Google Earth Pro. and Near Map. Date of imagery 24-10-2019.

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CLIENT: Cleanaway Operations Pty Ltd		TITLE: **Site and Test Location Plan**	PROJECT No: 84822.04
OFFICE: Riverstone	DRAWN BY: JST	**Green Waratah**	DRAWING No: 1
SCALE: As shown	DATE: 6 March 2020	**339 Wallgrove Road, Eastern Creek**	REVISION: 1

P:\NSW\84822.04\84822.04.D.001.Rev1.dwg

Appendix C

Results of Field Work

BOREHOLE LOG

CLIENT: Cleanaway Operations Pty Ltd
PROJECT: Green Waratah
LOCATION: 339 Wallgrove Road, Eastern Creek

SURFACE LEVEL: 58.3 AHD
EASTING: 301270.3
NORTHING: 6255858
DIP/AZIMUTH: 90°/--

BORE No: ABH01
PROJECT No: 84822.04
DATE: 3/2/2020
SHEET 1 OF 6

RL	Depth (m)	Description of Strata	Degree of Weathering	Graphic Log	Rock Strength	Water	Fracture Spacing (m)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Type	Core Rec. %	RQD %	Test Results & Comments
58	0.0	FILL/ Sandy and Clayey GRAVEL: fine to coarse, grey, ripped siltstone, dry							D			
	0.4	Silty CLAY: medium to high plasticity, grey mottled orange and red, trace fine to medium ironstone gravel, w<PL, very stiff, residual soil							B			
									S			4,11,13 N = 24
57	1.0	Clayey SILT: high plasticity, grey mottled red, trace sand and gravel, w<PL, residual soil							B			
									U75			
									D			
	1.6	SILTSTONE: grey-brown, very low and low strength, moderately to slightly weathered, with extremely weathered bands, highly fractured to fractured, Bringelly Shale (Note: Extremely weathered, extremely low stength bands consistent with very stiff to hard clay)						Unless specified otherwise all defects are healed joints dipping 20° or bedding planes dipping 0-10°, pl, sm, cly ct or fe stn	B			
									S			25/120 R refusal
56								2.15m: Cs, 100mm				
								2.36m: Cs,10mm				
								2.47m: Cs, 40mm				
								2.56m: Cs, 50mm				
									C	100	14	PL(A) = 0.08
55								3.07m: Cs, 30mm				
								3.15m: J, 10-25°, cu, sm, he				
								3.33m: Cs, 20mm				
								3.41m: J, 80°, un, ro, fe stn				
	3.56	SILTSTONE: grey-brown, medium strength, slightly weathered, with extremely weathered bands, slightly fractured, Bringelly Shale						3.55m: J, 70-90°, un, ro, he				
								3.84m: 85°, pl, sm, fe stn, he				PL(A) = 0.5
54								4m: J, 70°, cu, sm, fe stn				
								4.23m: J, 30°, un, ro, cln	C	100	66	
								4.56m: J, 45°, pl, sm, cln				PL(A) = 0.5
	4.95								C	100	87	

RIG: MCT 450 **DRILLER:** Terratest **LOGGED:** JY **CASING:** 0.0 - 2.15m

TYPE OF BORING: Sonic to 2.15 m depth then PQ Coring to 25.22 m

WATER OBSERVATIONS: No free groundwater observed whilst drilling

REMARKS: Well Construction: Monument with stickup, blank PVC 0-4.5m, screen PVC 4.5-15m, with end cap. Backfill: grout 0-2.5m, bentonite 2.5-3.5m, 5mm gravel 3.5-15m, bentonite 15-16m, 5mm gravel 16-25m.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Cleanaway Operations Pty Ltd
PROJECT: Green Waratah
LOCATION: 339 Wallgrove Road, Eastern Creek

SURFACE LEVEL: 58.3 AHD
EASTING: 301270.3
NORTHING: 6255858
DIP/AZIMUTH: 90°/--

BORE No: ABH01
PROJECT No: 84822.04
DATE: 3/2/2020
SHEET 2 OF 6

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Type	Core Rec. %	RQD %	Test Results & Comments
53		SILTSTONE: dark grey and grey, low to medium and medium strength, moderately to slightly weathered then fresh, slightly fractured, Bringelly Shale *(continued)*						5.12m: J, 45°, ir, he 5.31m: J, 30°, ir, ro, cly vn 5.48m: J, 10-50°, cu, sm, cln				
									C	100	87	
	6							5.86m: J, 45°, ir, he				PL(A) = 0.4
52								6.08m: J, 25°, pl, sm, fe stn 6.3m: J, 25°, pl, ro fe stn 6.4m: B, 5°, ir, ro, fe stn				PL(D) = 0.25
								6.7m: Cs, 5mm				PL(A) = 0.6
51	7							7.22m: B, 0°, pl, sm, cly, inf 10mm	C	100	95	PL(A) = 0.3
	8								C	100	100	PL(A) = 0.7
49	9	- trace sandstone laminations from 9.50 m - 9.88 m							C	100	94	PL(A) = 0.31

RIG: MCT 450 **DRILLER:** Terratest **LOGGED:** JY **CASING:** 0.0 - 2.15m

TYPE OF BORING: Sonic to 2.15 m depth then PQ Coring to 25.22 m

WATER OBSERVATIONS: No free groundwater observed whilst drilling

REMARKS: Well Construction: Monument with stickup, blank PVC 0-4.5m, screen PVC 4.5-15m, with end cap. Backfill: grout 0-2.5m, bentonite 2.5-3.5m, 5mm gravel 3.5-15m, bentonite 15-16m, 5mm gravel 16-25m.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Cleanaway Operations Pty Ltd
PROJECT: Green Waratah
LOCATION: 339 Wallgrove Road, Eastern Creek

SURFACE LEVEL: 58.3 AHD
EASTING: 301270.3
NORTHING: 6255858
DIP/AZIMUTH: 90°/--

BORE No: ABH01
PROJECT No: 84822.04
DATE: 3/2/2020
SHEET 3 OF 6

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
48		SILTSTONE: dark grey and grey, low to medium and medium strength, moderately to slightly weathered then fresh, slightly fractured, Bringelly Shale *(continued)*										
		- trace sandstone laminations from 10.03 m - 10.45 m										
		- low strength band from 10.45 m - 10.7 m										
		- low strength band from 10.77 m - 10.95 m						10.69m: J, 35°, pl, sm, cly ct	C	100	94	
	11											PL(A) = 0.27
47	11.32	INTERBEDDED SILTSTONE AND SANDSTONE: siltstone (70%) interbedded with pale grey, fine grained sandstone (30%), high strength, fresh, slightly fractured, Bringelly Shale							C	100	100	
	12								C	100	100	PL(A) = 1.5
46												
	13								C	100	100	PL(A) = 1.6 PL(D) = 0.4
45												
	13.85	SILTSTONE: dark grey and grey, medium strength, fresh, slightly fractured, trace sandstone laminations, Bringelly Shale							C	100	100	PL(A) = 0.31
	14											
44												PL(A) = 0.4

RIG: MCT 450 **DRILLER:** Terratest **LOGGED:** JY **CASING:** 0.0 - 2.15m

TYPE OF BORING: Sonic to 2.15 m depth then PQ Coring to 25.22 m

WATER OBSERVATIONS: No free groundwater observed whilst drilling

REMARKS: Well Construction: Monument with stickup, blank PVC 0-4.5m, screen PVC 4.5-15m, with end cap. Backfill: grout 0-2.5m, bentonite 2.5-3.5m, 5mm gravel 3.5-15m, bentonite 15-16m, 5mm gravel 16-25m.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Cleanaway Operations Pty Ltd
PROJECT: Green Waratah
LOCATION: 339 Wallgrove Road, Eastern Creek

SURFACE LEVEL: 58.3 AHD
EASTING: 301270.3
NORTHING: 6255858
DIP/AZIMUTH: 90°/--

BORE No: ABH01
PROJECT No: 84822.04
DATE: 3/2/2020
SHEET 4 OF 6

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Type	Core Rec. %	RQD %	Test Results & Comments
43		SILTSTONE: dark grey and grey, medium strength, fresh, slightly fractured, trace sandstone laminations, Bringelly Shale *(continued)*						15m: J, 90°, ir, sm, cln 15.12m: Ds, 20mm 15.2m: J, 45°, pl, sm, cly vn 15.27m: J, 30°, cu, sm, cln	C	100	100	
	16											PL(A) = 0.4
42								16.17m: J, 30-45°, cu, he	C	100	100	
												PL(D) = 0.2 PL(A) = 0.4
	17											
41									C	100	81	
								17.8m: J, 60-90°, pl, ro, cln				PL(A) = 0.3
	18							18.11m: J, 45°, pl, sm, cly vn 18.25m: J, 40°, pl, he				
40												
	19											PL(A) = 0.6
	19.2	INTERBEDDED SILTSTONE AND SANDSTONE: siltstone (70%) interbedded with pale grey, fine grained sandstone (30%), high and very high strength, fresh, slightly fractured, Bringelly Shale							C	100	56	
39								19.63-20m: J, 80-90°, cu, ro, cln				

RIG: MCT 450 **DRILLER:** Terratest **LOGGED:** JY **CASING:** 0.0 - 2.15m

TYPE OF BORING: Sonic to 2.15 m depth then PQ Coring to 25.22 m

WATER OBSERVATIONS: No free groundwater observed whilst drilling

REMARKS: Well Construction: Monument with stickup, blank PVC 0-4.5m, screen PVC 4.5-15m, with end cap. Backfill: grout 0-2.5m, bentonite 2.5-3.5m, 5mm gravel 3.5-15m, bentonite 15-16m, 5mm gravel 16-25m.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Cleanaway Operations Pty Ltd
PROJECT: Green Waratah
LOCATION: 339 Wallgrove Road, Eastern Creek

SURFACE LEVEL: 58.3 AHD
EASTING: 301270.3
NORTHING: 6255858
DIP/AZIMUTH: 90°/--

BORE No: ABH01
PROJECT No: 84822.04
DATE: 3/2/2020
SHEET 5 OF 6

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Type	Core Rec. %	RQD %	Test Results & Comments
38		INTERBEDDED SILTSTONE AND SANDSTONE: siltstone (70%) interbedded with pale grey, fine grained sandstone (30%), high and very high strength, fresh, slightly fractured, Bringelly Shale *(continued)*						20.16m: J 20.47m: J (2x), 70-90°, cu, ro, cln	C	100	56	PL(A) = 3.3
37	21								C	100	48	PL(A) = 2.3
	21.57	SILTSTONE: dark grey and grey, medium strength, fresh, slightly fractured, trace sandstone laminations, Bringelly Shale						21.47m: J, 70°, he 21.87m: J, 70°, pl, sl, cln				
36	22								C	100	100	PL(A) = 0.4 PL(A) = 0.4
35	23								C	100	100	PL(A) = 0.5 PL(D) = 0.25
34	24							24.22m: B, 5°, pl, sm, cbs inf 5mm				
									C	100	100	PL(A) = 0.7

RIG: MCT 450 **DRILLER:** Terratest **LOGGED:** JY **CASING:** 0.0 - 2.15m

TYPE OF BORING: Sonic to 2.15 m depth then PQ Coring to 25.22 m

WATER OBSERVATIONS: No free groundwater observed whilst drilling

REMARKS: Well Construction: Monument with stickup, blank PVC 0-4.5m, screen PVC 4.5-15m, with end cap. Backfill: grout 0-2.5m, bentonite 2.5-3.5m, 5mm gravel 3.5-15m, bentonite 15-16m, 5mm gravel 16-25m.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Cleanaway Operations Pty Ltd
PROJECT: Green Waratah
LOCATION: 339 Wallgrove Road, Eastern Creek

SURFACE LEVEL: 58.3 AHD
EASTING: 301270.3
NORTHING: 6255858
DIP/AZIMUTH: 90°/--

BORE No: ABH01
PROJECT No: 84822.04
DATE: 3/2/2020
SHEET 6 OF 6

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
									C	100	100	
	25.22	Bore discontinued at 25.22m										
33												
	26											
32												
	27											
31												
	28											
30												
	29											
29												

RIG: MCT 450 **DRILLER:** Terratest **LOGGED:** JY **CASING:** 0.0 - 2.15m

TYPE OF BORING: Sonic to 2.15 m depth then PQ Coring to 25.22 m

WATER OBSERVATIONS: No free groundwater observed whilst drilling

REMARKS: Well Construction: Monument with stickup, blank PVC 0-4.5m, screen PVC 4.5-15m, with end cap. Backfill: grout 0-2.5m, bentonite 2.5-3.5m, 5mm gravel 3.5-15m, bentonite 15-16m, 5mm gravel 16-25m.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BORE: ABH01 PROJECT: 84822.04 14 Feb 2020

2.1 – 5.0 m

BORE: ABH01 PROJECT: 84822.04 14 Feb 2020

5.0 – 8.0 m

BORE: ABH01 PROJECT: 84822.04 14 Feb 2020

8.0 – 11.0 m

BORE: ABH01 PROJECT: 84822.04 14 Feb 2020

11.0 – 14.0 m

BORE: ABH01 PROJECT: 84822.04 14 Feb 2020

14.0 – 17.0 m

BORE: ABH01 PROJECT: 84822.04 14 Feb 2020

17.0 – 20.0 m

BORE: ABH01 PROJECT: 84822.04 14 Feb 2020

20.0 – 23.0 m

BORE: ABH01 PROJECT: 84822.04 14 Feb 2020

23.0 – 25.22 m

BOREHOLE LOG

CLIENT: Cleanaway Operations Pty Ltd
PROJECT: Green Waratah
LOCATION: 339 Wallgrove Road, Eastern Creek

SURFACE LEVEL: 57.6 AHD
EASTING: 301375.8
NORTHING: 6255870.5
DIP/AZIMUTH: 90°/--

BORE No: ABH02
PROJECT No: 84822.04
DATE: 10/2/2020
SHEET 1 OF 6

RL	Depth (m)	Description of Strata	Degree of Weathering	Graphic Log	Rock Strength	Water	Fracture Spacing (m)	Discontinuities	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
			EW HW MW SW FS FR		Ex Low / Very Low / Low / Medium / High / Very High / Ex High		0.01 / 0.05 / 0.10 / 0.50 / 1.00	B - Bedding J - Joint S - Shear F - Fault				
57	0.2	FILL / Sandy GRAVEL: dark grey, with clay, fine to coarse igneous and siltstone gravel, moist							D			
		FILL / Silty CLAY: grey-brown, with fine to medium sand and fine to coarse sandstone gravel, dry							D			
	0.8								S			4,7,9 N = 16
	1	FILL / Silty CLAY: dark grey, trace ironstone gravel, trace vegetation, dry							D			
	1.2								D			
56		Silty CLAY: medium to high plasticity, pale brown mottled red-brown, trace ironstone gravel, w>PL stiff to very stiff, residual soil							B			
	2											
	2.0	CLAYEY SILT: medium to high plasticity, grey mottled pale brown, with sand and trace gravel, w>PL, stiff to very stiff, residual soil							D			
									S			5,7,9 N = 16
55									B U75			
	2.8	Silty CLAY: medium to high plasticity, pale grey mottled orange, very stiff, with clay seams and very low strength siltstone bands, residual soil							U75			
	3								S			8,8,12 N = 20
54		- possibly extremely weathered siltstone from 3.6 m						Unless stated otherwise all defects are bedding planes dipping 0-10°, ro, pl				
	4											
	4.0	SILTY CLAY: medium to high plasticity, pale grey mottled red and orange, hard, with ironstone banding, residual soil (extremely low strength siltstone)							C	100	0	PL(A) = 0.01
	4.45	SILTSTONE: grey-brown, very low and low strength, moderately to slightly weathered, with extremely weathered bands, fractured, Bringelly Shale						4.47m: fg, 10-30mm 4.7m: Cs, 10mm 4.91m: Cs, 90mm	C	100	0	
53												

RIG: MCT 450 **DRILLER:** Terratest **LOGGED:** JY **CASING:** 0.0 - 3.55m

TYPE OF BORING: Sonic to 4.0 m depth then PQ Coring to 25.5 m

WATER OBSERVATIONS: No free groundwater observed whilst drilling

REMARKS: Well Construction: gattic cover, blank PVC 0-6m, screen PVC 6-15m, with end cap. Backfill: grout 0-4m, bentonite 4-5m, 5mm gravel 5-15m, bentonite 15-16m, 5mm gravel 16-25m.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Cleanaway Operations Pty Ltd
PROJECT: Green Waratah
LOCATION: 339 Wallgrove Road, Eastern Creek

SURFACE LEVEL: 57.6 AHD
EASTING: 301375.8
NORTHING: 6255870.5
DIP/AZIMUTH: 90°/--

BORE No: ABH02
PROJECT No: 84822.04
DATE: 10/2/2020
SHEET 2 OF 6

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
52	6	SILTSTONE: grey-brown, very low and low strength, moderately to slightly weathered, with extremely weathered bands, fractured, Bringelly Shale *(continued)*						5.01m: Cs, 50mm 5.1m: Cs, 10mm 5.25m: Cs, 20mm 5.8m: B, 0-10°, cu, he 5.85m: J, 80°, pl, he	C	100	0	PL(A) = 0.12
51	6.63	SILTSTONE: dark grey and grey, low strength, fresh, slightly fractured, Bringelly Shale						6.03m: J, 80°, pl, sm, fe, stn 6.5m: B, 5-10°, ir, he	C	100	76	PL(A) = 0.11
50	7							7.42m: B, 0-10°, pl, sm, cly vn				PL(A) = 0.23
49	8							8.16m: J 30°, pl, ro, cly vnr 8.67m: B, 0°, pl, ro, cln 8.83m: B, 0°, pl, ro, cly vnr	C	100	96	PL(D) = 0.13 PL(A) = 0.15
48	9							9.20-9.45m: J, 80-90°, ir, rf, cly vnr 9.90-10.08m: J, 80-90°,	C	100	37	PL(A) = 0.12

RIG: MCT 450 **DRILLER:** Terratest **LOGGED:** JY **CASING:** 0.0 - 3.55m

TYPE OF BORING: Sonic to 4.0 m depth then PQ Coring to 25.5 m

WATER OBSERVATIONS: No free groundwater observed whilst drilling

REMARKS: Well Construction: gattic cover, blank PVC 0-6m, screen PVC 6-15m, with end cap. Backfill: grout 0-4m, bentonite 4-5m, 5mm gravel 5-15m, bentonite 15-16m, 5mm gravel 16-25m.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Cleanaway Operations Pty Ltd
PROJECT: Green Waratah
LOCATION: 339 Wallgrove Road, Eastern Creek

SURFACE LEVEL: 57.6 AHD
EASTING: 301375.8
NORTHING: 6255870.5
DIP/AZIMUTH: 90°/--

BORE No: ABH02
PROJECT No: 84822.04
DATE: 10/2/2020
SHEET 3 OF 6

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
	10.08	SILTSTONE: dark grey and grey, medium strength, fresh, slightly fractured, Bringelly Shale						rf, ir, cly 5mm 10.10-10.55m: J(x5), 80-90°, rf, ir, cly 5mm	C	100	37	PL(A) = 0.5
47												
	11							11.17m: B, 0-5°, cu, rf, cly vnr				PL(A) = 0.7
46	11.7	Interbedded SANDSTONE and SILTSTONE: pale grey, fine to medium grained, sandstone (60 - 80%) interbedded with siltstone (20 - 40%), medium strength, fresh, slightly fractured to unbroken, Bringelly Shale										PL(A) = 0.9 PL(D) = 0.75
	12											
45												
	13											PL(A) = 0.16
44								13.40-13.73m: J, 70°, pl, rf, cln				
	13.8	SILTSTONE: dark grey and grey, low and medium strength, fresh, slightly fractured to unbroken, with trace sandstone laminations, Bringelly Shale										PL(A) = 0.4
	14											
43								14.7m: Cs 30mm				

RIG: MCT 450 **DRILLER:** Terratest **LOGGED:** JY **CASING:** 0.0 - 3.55m

TYPE OF BORING: Sonic to 4.0 m depth then PQ Coring to 25.5 m

WATER OBSERVATIONS: No free groundwater observed whilst drilling

REMARKS: Well Construction: gattic cover, blank PVC 0-6m, screen PVC 6-15m, with end cap. Backfill: grout 0-4m, bentonite 4-5m, 5mm gravel 5-15m, bentonite 15-16m, 5mm gravel 16-25m.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Cleanaway Operations Pty Ltd
PROJECT: Green Waratah
LOCATION: 339 Wallgrove Road, Eastern Creek

SURFACE LEVEL: 57.6 AHD
EASTING: 301375.8
NORTHING: 6255870.5
DIP/AZIMUTH: 90°/--

BORE No: ABH02
PROJECT No: 84822.04
DATE: 10/2/2020
SHEET 4 OF 6

RL	Depth (m)	Description of Strata	Degree of Weathering	Graphic Log	Rock Strength	Water	Fracture Spacing (m)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Type	Core Rec. %	RQD %	Test Results & Comments
		SILTSTONE: dark grey and grey, low and medium strength, fresh, slightly fractured to unbroken, with trace sandstone laminations, Bringelly Shale *(continued)*	EW HW MW SW FS FR		Ex Low, Very Low, Low, Medium, High, Very High, Ex High		0.01, 0.05, 0.10, 0.50, 1.00	15.28m: Ds, 60mm	C	100	0	PL(A) = 0.19
42	16								C	100	94	PL(D) = 0.32 PL(A) = 0.6
41	17							17.23m: J, 30°, cu, sm, cln	C	100	100	PL(A) = 0.26
40	18											PL(A) = 0.29
39	19								C	100	73	PL(A) = 0.4
38								19.45m: J, 10-45°, cu, sm, cln	C	100	100	

RIG: MCT 450 **DRILLER:** Terratest **LOGGED:** JY **CASING:** 0.0 - 3.55m

TYPE OF BORING: Sonic to 4.0 m depth then PQ Coring to 25.5 m

WATER OBSERVATIONS: No free groundwater observed whilst drilling

REMARKS: Well Construction: gattic cover, blank PVC 0-6m, screen PVC 6-15m, with end cap. Backfill: grout 0-4m, bentonite 4-5m, 5mm gravel 5-15m, bentonite 15-16m, 5mm gravel 16-25m.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Cleanaway Operations Pty Ltd
PROJECT: Green Waratah
LOCATION: 339 Wallgrove Road, Eastern Creek

SURFACE LEVEL: 57.6 AHD
EASTING: 301375.8
NORTHING: 6255870.5
DIP/AZIMUTH: 90°/--

BORE No: ABH02
PROJECT No: 84822.04
DATE: 10/2/2020
SHEET 5 OF 6

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
		SILTSTONE: dark grey and grey, low and medium strength, fresh, slightly fractured to unbroken, with trace sandstone laminations, Bringelly Shale *(continued)*							C	100	100	PL(A) = 0.6 PL(D) = 0.4
37												
	21											
									C	100	100	PL(A) = 0.6
36												
	22											
								22.34m: J, 80-90°, pl, sm, cln				PL(A) = 0.33
35								22.66m: J, 45°, cu, he				
	23								C	100	87	PL(A) = 0.7
34												
	24											
									C	100	100	PL(A) = 0.6 PL(A) = 0.6
33												

RIG: MCT 450 **DRILLER:** Terratest **LOGGED:** JY **CASING:** 0.0 - 3.55m

TYPE OF BORING: Sonic to 4.0 m depth then PQ Coring to 25.5 m

WATER OBSERVATIONS: No free groundwater observed whilst drilling

REMARKS: Well Construction: gattic cover, blank PVC 0-6m, screen PVC 6-15m, with end cap. Backfill: grout 0-4m, bentonite 4-5m, 5mm gravel 5-15m, bentonite 15-16m, 5mm gravel 16-25m.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Cleanaway Operations Pty Ltd
PROJECT: Green Waratah
LOCATION: 339 Wallgrove Road, Eastern Creek

SURFACE LEVEL: 57.6 AHD
EASTING: 301375.8
NORTHING: 6255870.5
DIP/AZIMUTH: 90°/--

BORE No: ABH02
PROJECT No: 84822.04
DATE: 10/2/2020
SHEET 6 OF 6

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
		SILTSTONE: dark grey and grey, low and medium strength, fresh, slightly fractured to unbroken, with trace sandstone laminations, Bringelly Shale *(continued)*							C	100	100	
	25.5	Bore discontinued at 25.5m										

RIG: MCT 450 **DRILLER:** Terratest **LOGGED:** JY **CASING:** 0.0 - 3.55m

TYPE OF BORING: Sonic to 4.0 m depth then PQ Coring to 25.5 m

WATER OBSERVATIONS: No free groundwater observed whilst drilling

REMARKS: Well Construction: gattic cover, blank PVC 0-6m, screen PVC 6-15m, with end cap. Backfill: grout 0-4m, bentonite 4-5m, 5mm gravel 5-15m, bentonite 15-16m, 5mm gravel 16-25m.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BORE: ABH02 PROJECT: 84822.04 14 Feb 2020

4.0 – 6.0 m

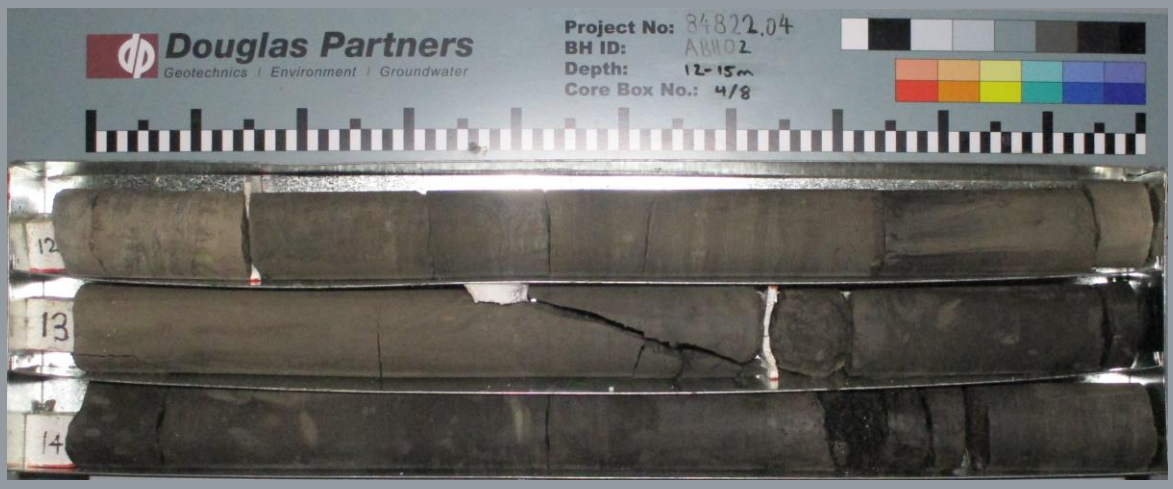
BORE: ABH02 PROJECT: 84822.04 14 Feb 2020

6.0 – 9.0 m

BORE: ABH02 PROJECT: 84822.04 14 Feb 2020

9.0 – 12.0 m

BORE: ABH02 PROJECT: 84822.04 14 Feb 2020



12.0 – 15.0 m

BORE: ABH02 PROJECT: 84822.04 14 Feb 2020

15.0 – 18.0 m

BORE: ABH02 PROJECT: 84822.04 14 Feb 2020

18.0 – 21.0 m

BORE: ABH02 PROJECT: 84822.04 14 Feb 2020

21.0 – 24.0 m

BORE: ABH02 PROJECT: 84822.04 14 Feb 2020

24.0 – 24.5 m

BOREHOLE LOG

CLIENT: Cleanaway Operations Pty Ltd
PROJECT: Green Waratah
LOCATION: 339 Wallgrove Road, Eastern Creek

SURFACE LEVEL: 54.4 AHD
EASTING: 301405.8
NORTHING: 6255849
DIP/AZIMUTH: 90°/--

BORE No: ABH03
PROJECT No: 84822.04
DATE: 4/2/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
54	0.2	Topsoil/ Silty CLAY: brown, trace rootlets, surficial vegetation		D	0.1				
		Silty CLAY: medium to high plasticity, orange-brown mottled grey, w<PL, stiff to very stiff, residual soil		D	0.2				
					0.3				
					0.5				
				S			5,7,8 N = 15		
		- becoming pale grey mottled orange from 0.8m							
	1			D	0.9				1
					0.95				
					1.0				
53				U75					
					1.25				
		- becoming pale grey mottled red-brown from 1.5m							
				D	1.9				
	2 2.0	Silty CLAY: medium to high plasticity, pale grey mottled red, w<PL, very stiff, with very low strength siltstone bands, residual soil (possibly extremely weathered siltstone)			2.0				2
				S			7,12,19 N = 31		
52				B					
					2.45				
	2.8	SILTSTONE: grey, very low strength siltstone with extremely weathered bands, Bringelly Shale			2.8				
					2.9				
	3			D	3.0				3
				S			30/100 (Bouncing)		
51					3.1				
	3.5	SILTSTONE: grey, low strength siltstone with very low strength bands, Bringelly Shale		B					
	4 4.0	Bore discontinued at 4.0m			4.0				4
50									

RIG: MCT 450 **DRILLER:** Terratest **LOGGED:** JY **CASING:** Uncased

TYPE OF BORING: Sonic

WATER OBSERVATIONS: No free groundwater observed whilst drilling

REMARKS: Well Construction: Monument with stickup, 0-0.5m blank PVC 0-0.5m, screen PVC 0.5-4m, with end cap. Backfill: grout 0-0.3m, bentonite 0.3-0.5m, 5mm gravel 0.5-3.9m, bentonite 3.9-4m

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▽	Water level	V	Shear vane (kPa)

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Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Cleanaway Operations Pty Ltd
PROJECT: Green Waratah
LOCATION: 339 Wallgrove Road, Eastern Creek

SURFACE LEVEL: 60.8 AHD
EASTING: 301341
NORTHING: 6255740
DIP/AZIMUTH: 90°/--

BORE No: ABH04
PROJECT No: 84822.04
DATE: 4/2/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
60	0.05	FILL/ Sandy GRAVEL: fine to coarse, grey, igneous gravel (roadbase), dry		D	0.1				
		FILL/ SAND: fine to medium, dark grey,with fine to coarse sandstone gravel, moist			0.2				
					0.5				
				S			14,8,6 N = 14		
	1.0				0.95				
		Silty CLAY: medium plasticity, pale grey mottled red, w<PL, stiff, residual soil			1.0				1
59				D					
	2				2.0				2
				U75	2.2				
	2.5				2.5				
		Silty CLAY: medium to high plasticity, pale brown, w<PL, hard, with very low strength siltstone and ironstone bands, residual soil (extremely weathered siltstone)		D	2.6				
58									
	3				3.0				3
				S	3.1		15/100 (Bouncing)		
	3.8				3.8				
57		SILTSTONE: grey-brown, very low strength, highly to moderately weathered, with extremely weathered bands and clay seams, Bringelly Shale		D					
	4.0				4.0				4
		Bore discontinued at 4.0m							
56									

RIG: MCT 450 **DRILLER:** Terratest **LOGGED:** JY **CASING:** Uncased
TYPE OF BORING: Sonic
WATER OBSERVATIONS: Sample saturated between 2-2.5m depth
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Cleanaway Operations Pty Ltd
PROJECT: Green Waratah
LOCATION: 339 Wallgrove Road, Eastern Creek

SURFACE LEVEL: 60.8 AHD
EASTING: 301341.2
NORTHING: 6255739.1
DIP/AZIMUTH: 90°/--

BORE No: ABH04A
PROJECT No: 84822.04
DATE: 13/2/2020
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
60	0.05	FILL/ Sandy GRAVEL: fine to coarse, grey, igneous gravel (roadbase), dry							
		FILL/ SAND: fine to medium, dark grey,with fine to coarse sandstone gravel, moist							
	1.0	Silty CLAY: medium plasticity, pale grey mottled red, w<PL, stiff, residual soil							
59									
	2.5	Silty CLAY: medium to high plasticity, pale brown, w<PL, hard, with very low strength siltstone and ironstone bands, residual soil (extremely weathered siltstone)							
58									
57	3.8	SILTSTONE: grey-brown, very low strength, with extremely weathered bands and clay seams, Bringelly Shale		B	3.8				
		- extremely weathered from 4.3m and can be remoulded into clay.			4.3				
56									

RIG: MCT 450 **DRILLER:** Terratest **LOGGED:** JY **CASING:** Uncased
TYPE OF BORING: Sonic
WATER OBSERVATIONS: No free groundwater observed whilst drilling
REMARKS: Located approximately 1m south-east of ABH04

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Cleanaway Operations Pty Ltd
PROJECT: Green Waratah
LOCATION: 339 Wallgrove Road, Eastern Creek

SURFACE LEVEL: 60.8 AHD
EASTING: 301341.2
NORTHING: 6255739.1
DIP/AZIMUTH: 90°/--

BORE No: ABH04A
PROJECT No: 84822.04
DATE: 13/2/2020
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	5.2	SILTSTONE: grey-brown, very low strength, highly to moderately weathered, with extremely weathered bands and clay seams, Bringelly Shale							
	5.5	Bore discontinued at 5.5m							

RIG: MCT 450 **DRILLER:** Terratest **LOGGED:** JY **CASING:** Uncased

TYPE OF BORING: Sonic

WATER OBSERVATIONS: No free groundwater observed whilst drilling

REMARKS: Located approximately 1m south-east of ABH04

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Cleanaway Operations Pty Ltd
PROJECT: Green Waratah
LOCATION: 339 Wallgrove Road, Eastern Creek

SURFACE LEVEL: 55.1 AHD
EASTING: 301425
NORTHING: 6255731
DIP/AZIMUTH: 90°/--

BORE No: ABH05
PROJECT No: 84822.04
DATE: 3/2/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
55	0.1	FILL/ Silty CLAY: pale-brown, stiff, trace rootlets, surficial vegetation, topsoil		D	0.1 0.2				
		Silty CLAY: medium to high plasticity, pale brown, stiff, w<PL, residual soil							
	0.5	Silty CLAY: high plasticity, pale grey mottled orange, w>PL, stiff, residual soil		S	0.5		5,6,8 N = 14		
54	1			B U75	0.95 1.0		B: 0.5-1.5m		1
					1.31				
		- becoming very stiff from 1.5m (possible extremely weathered siltstone)			1.5				
	2				2.0				2
53	2.1	SILTSTONE: grey-brown, very low strength, highly to moderately weathered, siltstone with clay seams and extremely weathered bands, Bringelly Shale		S	2.3		10, 25, Bouncing		
52	3								3
	4			D	4.0				4
51	4.3	Bore discontinued at 4.3m			4.3				

RIG: MCT 450 **DRILLER:** Terratest **LOGGED:** JY **CASING:** Uncased
TYPE OF BORING: Sonic
WATER OBSERVATIONS: No free groundwater observed whilst drilling
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Cleanaway Operations Pty Ltd
PROJECT: Green Waratah
LOCATION: 339 Wallgrove Road, Eastern Creek

SURFACE LEVEL: 56.4 AHD
EASTING: 301264
NORTHING: 6255953.2
DIP/AZIMUTH: 90°/--

BORE No: ABH06
PROJECT No: 84822.04
DATE: 3/2/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
56	0.0			D	0.0				
	0.1	FILL/ Sandy GRAVEL: fine to coarse, grey, siltstone gravel with igneous gravel (possible recycled roadbase), dry			0.1				
		FILL/ Silty CLAY: low to medium plasticity, brown, trace burnt timber, w>PL		B					
	0.5	Silty CLAY: medium plasticity, brown mottled grey, w<PL, firm to stiff, trace rootlets, residual soil		S	0.5		1,2,3 N = 5		
55	1				0.95				1
				U75	1.0				
					1.41				
	1.7	Silty CLAY: medium plasticity, brown mottled grey, very stiff to hard, w<PL, residual soil (possible extremely weathered siltstone)		B					
	2 2.0	SILTSTONE: grey-brown, very low strength, with extremely weathered bands and clay seams, Bringelly Shale		S	2.0 2.09		30/90 (Bouncing)		2
54	2.4	SILTSTONE: grey, low strength, Bringelly Shale		B	2.4				
	3 3.0	Bore discontinued at 3.0m			3.0				3
53	4								4
52									

RIG: MCT 450 **DRILLER:** Terratest **LOGGED:** JY **CASING:** Uncased
TYPE OF BORING: Sonic
WATER OBSERVATIONS: No free groundwater observed whilst drilling
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Cleanaway Operations Pty Ltd
PROJECT: Green Waratah
LOCATION: 339 Wallgrove Road, Eastern Creek

SURFACE LEVEL: 54.7 AHD
EASTING: 301315.3
NORTHING: 6256027.6
DIP/AZIMUTH: 90°/--

BORE No: ABH07
PROJECT No: 84822.04
DATE: 3/2/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
54	0.02	ASPHALT - aggregate up to 20mm							
		FILL/ Clayey and Sandy GRAVEL: fine to coarse, grey brown, ripped siltstone, dry		D	0.1 0.2				
	0.4	FILL / Clayey GRAVEL: fine to coarse, pale grey and dark grey, ripped siltstone, dry			0.5				
	0.7	Silty CLAY: high plasticity, orange-brown, trace sand, w<PL, stiff, residual soil		S			17,7,5 N = 12		
	1			D	0.95 1.0				1
				U75					
					1.27				
53	1.6	Silty CLAY: high plasticity, pale-brown, with very low strength siltstone bands and extremely weathered siltstone bands, w<PL, hard, residual soil (possibly extremely weathered siltstone)			1.6				
	2			B S	2.0 2.1		25/100 (Bouncing)		2
				D	2.2				
52	2.4	SILTSTONE: grey, very low strength, with extremely weathered silstone bands and clay seams, Bringelly Shale			2.4				
	2.9	Bore discontinued at 2.9m							
	3								3
51									
	4								4
50									

RIG: MCT 450 **DRILLER:** Terratest **LOGGED:** JY **CASING:** Uncased

TYPE OF BORING: Sonic

WATER OBSERVATIONS: No free groundwater observed whilst drilling

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Cleanaway Operations Pty Ltd
PROJECT: Green Waratah
LOCATION: 339 Wallgrove Road, Eastern Creek

SURFACE LEVEL: 60.3 AHD
EASTING: 301387.4
NORTHING: 6255699.1
DIP/AZIMUTH: 90°/--

BORE No: ABH08
PROJECT No: 84822.04
DATE: 21/2/2020
SHEET 2 OF 4

RL	Depth (m)	Description of Strata	Degree of Weathering	Graphic Log	Rock Strength	Water	Fracture Spacing (m)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Type	Core Rec. %	RQD %	Test Results & Comments
55		SILTSTONE: grey-brown, low strength with very low and medium strength bands, highly weathered with extremely weathered bands, highly fractured to fractured, trace sandstone laminations, Bringelly Shale *(continued)*						partially healed, fe 4.98 - 5.2m: B (x4), 0°, pl, cly, fe 5.33 - 5.35m & 5.55 - 5.60 m : cs, 20mm to 50 mm, fe	C	100	60	PL(A) = 0.21
54	6	(Note: Extremely weathered, extremely low stength bands consistent with very stiff to hard clay)						5.89m: J, 20° - 45°, cu, fe, tight 6.091m: J, 60°, pl, fe 6.1m: J, 60°, st, fe				
53	7							6.65 - 7.0 m, J (x4), 35-45°, pl	C	100	76	PL(A) = 0.05 PL(A) = 0.1
52	8							7.76m: J, 45°, st, fe 7.95 - 8.04m: cs, 90mm, fe 8.09m: J, 45° & 0°, st, cly vn	C	100	93	PL(D) = 0.08 PL(A) = 0.33
51	8.14 9	SILTSTONE: grey, low and medium strength with extremely and very low strength bands, fresh, slightly fractured to fractured, with sandstone laminations, Bringelly Shale						9.59 - 10.99 m J (x7), 60-70°, pl	C	100	47	PL(A) = 0.28

RIG: MCT 450 **DRILLER:** Terratest **LOGGED:** RB **CASING:** 0.0 - 4.94m

TYPE OF BORING: Sonic to 4.94 m depth then PQ coring to 16.62 m

WATER OBSERVATIONS: No free groundwater observed whilst drilling

REMARKS: Well Construction: Monument with stickup, blank PVC 0-7m, screen PVC 7-14.8m, with end cap. Backfill: grout 0-5m, bentonite 5-6m, 5mm gravel 6-14.8m, 14.8-16m bentonite, 16-17m backfill

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Cleanaway Operations Pty Ltd
PROJECT: Green Waratah
LOCATION: 339 Wallgrove Road, Eastern Creek

SURFACE LEVEL: 60.3 AHD
EASTING: 301387.4
NORTHING: 6255699.1
DIP/AZIMUTH: 90°/--

BORE No: ABH08
PROJECT No: 84822.04
DATE: 21/2/2020
SHEET 3 OF 4

RL	Depth (m)	Description of Strata	Degree of Weathering	Graphic Log	Rock Strength	Water	Fracture Spacing (m)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Type	Core Rec. %	RQD %	Test Results & Comments
50		SILTSTONE: grey, low and medium strength with extremely and very low strength bands, fresh, slightly fractured to fractured, with sandstone laminations, Bringelly Shale *(continued)*							C	100	47	PL(A) = 0.21
49	11							10.79m: J, 85 - 90°, pl	C	100	44	PL(A) = 0.2
48	12	CORE LOSS						11.85 - 11.84m: cs, 20mm, fe 12m: CORE LOSS: 350mm	C	0	0	
47	12.35 13								C	100	90	PL(A) = 0.88 PL(A) = 0.68
46	13.82 14	SILTSTONE: grey, low, low to medium and medium strength, fresh, slightly fractured, with sandstone laminations, Bringelly Shale 13.99 - 14.08 m extremely weathered band 14.1 m - sandstone laminations from 14.07 m to 14.28 m approximately 40%						13.99 - 14.09m: cs, 100mm 14.44m: J, 60°, pl	C	100	31	PL(A) = 0.02 PL(A) = 0.19

RIG: MCT 450 **DRILLER:** Terratest **LOGGED:** RB **CASING:** 0.0 - 4.94m

TYPE OF BORING: Sonic to 4.94 m depth then PQ coring to 16.62 m

WATER OBSERVATIONS: No free groundwater observed whilst drilling

REMARKS: Well Construction: Monument with stickup, blank PVC 0-7m, screen PVC 7-14.8m, with end cap. Backfill: grout 0-5m, bentonite 5-6m, 5mm gravel 6-14.8m, 14.8-16m bentonite, 16-17m backfill

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Cleanaway Operations Pty Ltd
PROJECT: Green Waratah
LOCATION: 339 Wallgrove Road, Eastern Creek

SURFACE LEVEL: 60.3 AHD
EASTING: 301387.4
NORTHING: 6255699.1
DIP/AZIMUTH: 90°/--

BORE No: ABH08
PROJECT No: 84822.04
DATE: 21/2/2020
SHEET 4 OF 4

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
45		SILTSTONE: grey, low, low to medium and medium strength, fresh, slightly fractured, with sandstone laminations, Bringelly Shale *(continued)*							C	100	31	
												PL(A) = 0.42
												PL(D) = 0.15
44	16								C	100	53	
												PL(A) = 0.3
	16.62	Bore discontinued at 16.62m										
43	17											
42	18											
41	19											

RIG: MCT 450 **DRILLER:** Terratest **LOGGED:** RB **CASING:** 0.0 - 4.94m

TYPE OF BORING: Sonic to 4.94 m depth then PQ coring to 16.62 m

WATER OBSERVATIONS: No free groundwater observed whilst drilling

REMARKS: Well Construction: Monument with stickup, blank PVC 0-7m, screen PVC 7-14.8m, with end cap. Backfill: grout 0-5m, bentonite 5-6m, 5mm gravel 6-14.8m, 14.8-16m bentonite, 16-17m backfill

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BORE: ABH08 PROJECT: 84822.04 March 2020

4.94m – 6.0 m

BORE: ABH08 PROJECT: 84822.04 March 2020

7.0 – 9.0 m

BORE: ABH08 PROJECT: 84822.04 March 2020

10.0 – 12.0 m

BORE: ABH08 PROJECT: 84822.04 March 2020

13.0 – 16.0 m

BORE: ABH08 **PROJECT: 84822.04** **March 2020**

13.0m – 16.67 m

BOREHOLE LOG

CLIENT: Cleanaway Operations Pty Ltd
PROJECT: Green Waratah
LOCATION: 339 Wallgrove Rd, Eastern Creek

SURFACE LEVEL: 56.0 AHD
EASTING: 301360
NORTHING: 6255945
DIP/AZIMUTH: 90°/--

BORE No: PT101
PROJECT No: 84822.04
DATE: 17/2/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
56		FILL / CLAY CH: medium to high plasticity, brown and red-brown and grey, with fine to medium, sub-angular gravel, w < PL, firm							
		0.50m: w = PL, apparently stiff							
55	1	1.0m: slag							1
	1.45	SILTY CLAY CH: medium to high plasticity, grey and orange-brown,w<PL, stiff to very stiff, residual soil							
54	2								2
	2.14	Bore discontinued at 2.14m Practical refusal on Siltstone of at least very low strength							
53	3								3
52	4								4

RIG: Geoprobe **DRILLER:** Terratest **LOGGED:** SLB **CASING:** uncased
TYPE OF BORING: SFA to 0.7m, push tube to 2.14m
WATER OBSERVATIONS: No Free Groundwater Observed
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BORE: PT101 **PROJECT: 84822.04** **17 FEB 2020**

0.70 – 2.14 m

BOREHOLE LOG

CLIENT: Cleanaway Operations Pty Ltd
PROJECT: Green Waratah
LOCATION: 339 Wallgrove Rd, Eastern Creek

SURFACE LEVEL: 57.1 AHD
EASTING: 301329
NORTHING: 6255893
DIP/AZIMUTH: 90°/--

BORE No: PT102
PROJECT No: 84822.04
DATE: 17/2/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
57	0.18	FILL / CLAY CH: medium plasticity, brown mottled orange-grey, with fine to medium sandstone gravel, w> PL, apparently poorly compacted (soft)							
		Silty CLAY CH: medium to high plasticity, orange and yellow-brown, trace of fine sand, w < PL, with ironstone bands and gravel, firm, residual soil							
	0.57	Silty CLAY CH: medium to high plasticity, orange and yellow brown, trace fine sand, w<PL, with ironstone bands and gravel, very stiff to hard, residual soil							
56	1								1
	1.4	SILTSTONE: very low strength, highly weathered, siltstone, Bringelly Shale							
	1.53	Bore discontinued at 1.53m Practical refusal on Siltstone of at least very low strength							
55	2								2
54	3								3
53	4								4

RIG: Geoprobe **DRILLER:** Terratest **LOGGED:** SLB **CASING:** uncased
TYPE OF BORING: Push Tube to 1.53m
WATER OBSERVATIONS: No Free Groundwater Observed
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BORE: PT102 **PROJECT: 84822.04** **17 FEB 2020**

0.00 – 1.53 m

BOREHOLE LOG

CLIENT: Cleanaway Operations Pty Ltd
PROJECT: Green Waratah
LOCATION: 339 Wallgrove Rd, Eastern Creek

SURFACE LEVEL: 55.0 AHD
EASTING: 301425
NORTHING: 6255718
DIP/AZIMUTH: 90°/--

BORE No: PT103
PROJECT No: 84822.04
DATE: 17/2/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
55		FILL/CLAY CH: medium to high plasticity, brown and grey orange brown gravelly clay with siltstone gravel, variably compacted, dry							
	0.6	FILL / CLAY: low to medium plasticity, brown mottled dark-brown and grey, trace of firm gravel, poorly compacted, dry							
	0.79	SILTY CLAY CH: medium to high plasticity, pale grey mottled orange-red, bands of siltstone and ironstone, w<PL, stiff to very stiff, residual							
54	1								1
53	2								2
	2.2	Bore discontinued at 2.2m Practical refusal on Siltstone of at least very low strength							
52	3								3
51	4								4

RIG: Geoprobe **DRILLER:** Terratest **LOGGED:** SLB **CASING:** uncased
TYPE OF BORING: Push tube to 2.20m
WATER OBSERVATIONS: No Free Groundwater Observed
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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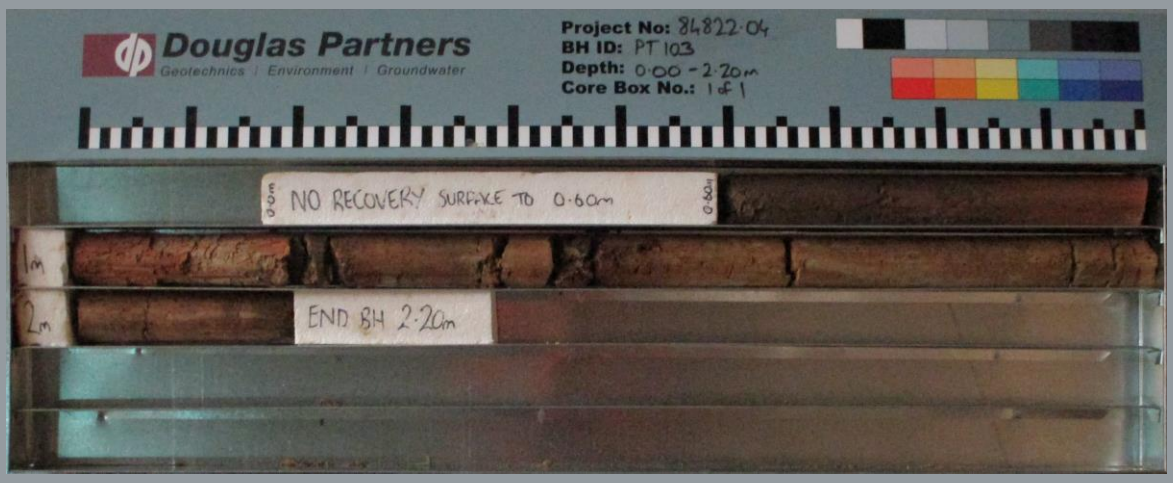
Geotechnics / Environment / Groundwater

BORE: PT103 **PROJECT: 84822.04** **17 FEB 2020**



0.00 – 2.20 m

BOREHOLE LOG

CLIENT: Cleanaway Operations Pty Ltd
PROJECT: Green Waratah
LOCATION: 339 Wallgrove Rd, Eastern Creek

SURFACE LEVEL: 54.7 AHD
EASTING: 301405
NORTHING: 6255842
DIP/AZIMUTH: 90°/--

BORE No: PT104
PROJECT No: 84822.04
DATE: 17/2/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
54	0.25	FILL / Sandy CLAY: low plasticity, dark-brown, sand is fine, trace of rootlets							
		Silty CLAY CH: medium to high plasticity, red-brown and orange, trace of silt, w < PL, stiff to very stiff, residual soil							
53	0.95	Silty CLAY CH: medium to high plasticity, pale grey mottled red-brown, w = PL, stiff to very stiff, residual soil							
	1.8	Silty CLAY CH: medium plasticity, orange and pale grey, trace of fine sand, ironstone bands, w<PL, very stiff to hard, residual soil							
52	2.57	Bore discontinued at 2.57m							
51									
50									

RIG: Geoprobe **DRILLER:** Terratest **LOGGED:** SLB **CASING:** uncased
TYPE OF BORING: Push tube to 2.51m
WATER OBSERVATIONS: No Free Groundwater Observed
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BORE: PT104 **PROJECT: 84822.04** **17 FEB 2020**

0.00 – 2.57 m

BOREHOLE LOG

CLIENT: Cleanaway Operations Pty Ltd
PROJECT: Green Waratah
LOCATION: 339 Wallgrove Rd, Eastern Creek

SURFACE LEVEL: 60.7 AHD
EASTING: 301340
NORTHING: 6255741
DIP/AZIMUTH: 90°/--

BORE No: PT105
PROJECT No: 84822.04
DATE: 17/2/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
60	0.06	FILL / Sandy CLAY CL: low plasticity, orange-brown mottled red, trace of ironstone gravel, w < PL, poorly compacted							
	0.23	FILL / SAND: well graded, fine to medium sand, grey and plae grey, trace of gravel, glass and sandstone cobbles,w<PL, poorly compacted							
		FILL / CLAY CL: medium to high plasticity, orange and red-brown, with sandstone gravel, w<PL, poorly compacted							
	0.67	Silty CLAY CH: medium to high plasticity, pale grey and red-brown mottled red, w<PL, residual soil							
	1								1
59	1.38	Silty CLAY CH: medium to high plasticity, pale grey and red-brown mottled red, w<PL, residual soil							
	1.85	SILTSTONE: very low strength, highly weathered, grey, Bringelly Shale							
	2								2
	2.13	Bore discontinued at 2.13m							
58	3								3
57	4								4
56									

RIG: Geoprobe **DRILLER:** Terratest **LOGGED:** SLB **CASING:** uncased
TYPE OF BORING: Push tube to 2.13m
WATER OBSERVATIONS: No Free Groundwater Observed
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Geotechnics / Environment / Groundwater

BORE: PT105 **PROJECT: 84822.04** **17 FEB 2020**

0.00 – 2.13 m

TEST PIT LOG

CLIENT: Cleanaway Operations Pty Ltd
PROJECT: Green Waratah
LOCATION: 339 Wallgrove Rd, Eastern Creek

SURFACE LEVEL: 55.3 AHD
EASTING: 301319.6
NORTHING: 6256008.8

PIT No: ATP01
PROJECT No: 84822.04
DATE: 4/2/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
55	0.05	FILL/ Sandy GRAVEL: grey, fine to medium igneous gravel with sand, dry			0.1				
		FILL/SILTSTONE: grey, fine to coarse ripped siltstone, with boulders up to 400mm diameter, with sand, dry		E/B	0.2				
				D/B	0.5				
	0.8	Silty CLAY : medium to high plasticity, orange-brown, trace rootlets, w<PL, very stiff, residual soil			0.8				
				D/B	0.9				
54	1				1.0		pp = 300		1
				E	1.2				
	1.6	Silty CLAY: medium to high plasticity, pale brown, w<PL, very stiff, with low strength siltstone bands and extremely weathered siltstone bands, dry, residual (possibly extremely weathered siltstone)							
	2			D	2.0		pp = 350		2
53	2.5	SILTSTONE: grey-brown, very low to low strength, with clay seams, Bringelly Shale		D	2.5				
					2.6				
	2.9	Pit discontinued at 2.9m Practical refusal on Siltstone of at least low strength							
52	3								3
	4								4
51									

RIG: 8 Tonne Excavator

LOGGED: JY

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No Free Groundwater Observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Test Pit ATP01

Douglas Partners Geotechnics / Environment / Groundwater	**Site Photographs**	PROJECT: 84822.04
	Green Waratah	DWG No: 1
	339 Wallgrove Road, Eastern Creek	REV: 0
	CLIENT: Cleanaway Operations Pty Ltd	DATE: Feb-20

TEST PIT LOG

CLIENT: Cleanaway Operations Pty Ltd
PROJECT: Green Waratah
LOCATION: 339 Wallgrove Rd, Eastern Creek

SURFACE LEVEL: 52.5 AHD
EASTING: 301427.5
NORTHING: 6256015

PIT No: ATP02
PROJECT No: 84822.04
DATE: 4/2/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
52	0.1	Topsoil FILL/ Silty CLAY: low to medium plasticity, brown, trace charcoal, trace rootlets and roots, surficial vegetation,		D E/B	0.1 – 0.2				
	0.3	FILL/ Silty CLAY: low to medium plasticity, brown, trace plastic, rubber, charcoal, and rootlets		D E	0.3 – 0.4				
	0.5	Silty CLAY: low to medium plasticity, pale brown, w<PL, stiff, residual soil		D/B	0.5 – 0.6		pp >400		
		Silty CLAY: medium to high plasticity, pale grey, trace of sand, w<PL, hard, residual soil - becoming very stiff from 0.8m			1.0		pp = 300-350		
	1.2	Silty CLAY: medium to high plasticity, orange-brown mottled grey, w<PL, very stiff, residual soil							
51	1.5	Silty CLAY: medium to high plasticity, pale grey mottled orange, w<PL, very stiff, residual soil		D U50	1.5 – 1.6 – 1.75		pp = 350		
	2.9	Pit discontinued at 2.9m							
50									
49									
48									

RIG: 8 Tonne Excavator
LOGGED: JY
SURVEY DATUM: MGA94

WATER OBSERVATIONS: No Free Groundwater Observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Test Pit ATP02

Douglas Partners Geotechnics / Environment / Groundwater	**Site Photographs** Green Waratah 339 Wallgrove Road, Eastern Creek	PROJECT: 84822.04 DWG No: 2 REV: 0
	CLIENT: Cleanaway Operations Pty Ltd	DATE: Feb-20

TEST PIT LOG

CLIENT: Cleanaway Operations Pty Ltd
PROJECT: Green Waratah
LOCATION: 339 Wallgrove Rd, Eastern Creek

SURFACE LEVEL: 55.6 AHD
EASTING: 301421.9
NORTHING: 6255740.8

PIT No: ATP03
PROJECT No: 84822.04
DATE: 4/2/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
	0.0				0.0				
	0.1	Topsoil FILL/ Silty CLAY: low to medium plasticity, brown, trace rootlets, surficial vegetation, dry			0.1				
		FILL/ Silty CLAY: low to medium plasticity, brown, trace charcoal, tile, asphaltic concrete, wood, fibre cement sheeting (possible asbestos containing materials), dry		E/B D/B					
	0.4				0.4				
55		Silty CLAY: medium to high plasticity, orange-brown mottled grey, with sand, very stiff, w<PL, residual soil		E	0.6				
	1				0.9				1
				D/B	1.0		pp = 300-350		
				U50	1.13				
	1.5								
54		Silty CLAY: medium to high plasticity, pale grey mottled orange and red, with ironstone bands, w<PL, very stiff to hard, residual soil							
	2			D	1.9		pp = 300-400		2
					2.0				
	2.5								
53		Pit discontinued at 2.5m							
	3								3
52									
	4								4
51									

RIG: 8 Tonne Excavator

LOGGED: JY

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No Free Groundwater Observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Geotechnics / Environment / Groundwater

Test Pit ATP03

Douglas Partners Geotechnics / Environment / Groundwater	**Site Photographs** Green Waratah 339 Wallgrove Road, Eastern Creek	PROJECT: 84822.04 DWG No: 3 REV: 0
	CLIENT: Cleanaway Operations Pty Ltd	DATE: Feb-20

TEST PIT LOG

CLIENT: Cleanaway Operations Pty Ltd
PROJECT: Green Waratah
LOCATION: 339 Wallgrove Rd, Eastern Creek

SURFACE LEVEL: 55.2 AHD
EASTING: 301412.2
NORTHING: 6255806.8

PIT No: ATP04
PROJECT No: 84822.04
DATE: 4/2/2020
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
55	0.1	Topsoil FILL/ Silty CLAY: low to medium plasticity, brown, trace rootlets, surficial vegetation,		D	0.0				
		FILL/ Silty CLAY: low to medium plasticity, brown, trace rootlets, trace coarse ripped sandstone and brick fragments, dry		E/B	0.1				
	0.4	Silty CLAY: medium to high plasticity, orange-brown mottled grey, w<PL, very stiff to hard, trace rootlets, residual soil			0.4				
				B	0.5		pp = 300-400		
				U50	0.6				
	1				0.84				1
54	1.2	Silty CLAY: medium to high plasticity, pale grey mottled orange, w<PL, stiff to very stiff, residual soil							
				D	1.4		pp = 200-300		
					1.5				
	2	- hard from 1.9 m (possibly extremely weathered siltstone)		D	2.0		pp >400		2
53	2.2	SILTSTONE: grey, very low to low strength, with clay seams, Bringelly Shale							
				D	2.4				
	2.5	Pit discontinued at 2.5m			2.5				
	3								3
52									
	4								4
51									

RIG: 8 Tonne Excavator

LOGGED: JY

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No Free Groundwater Observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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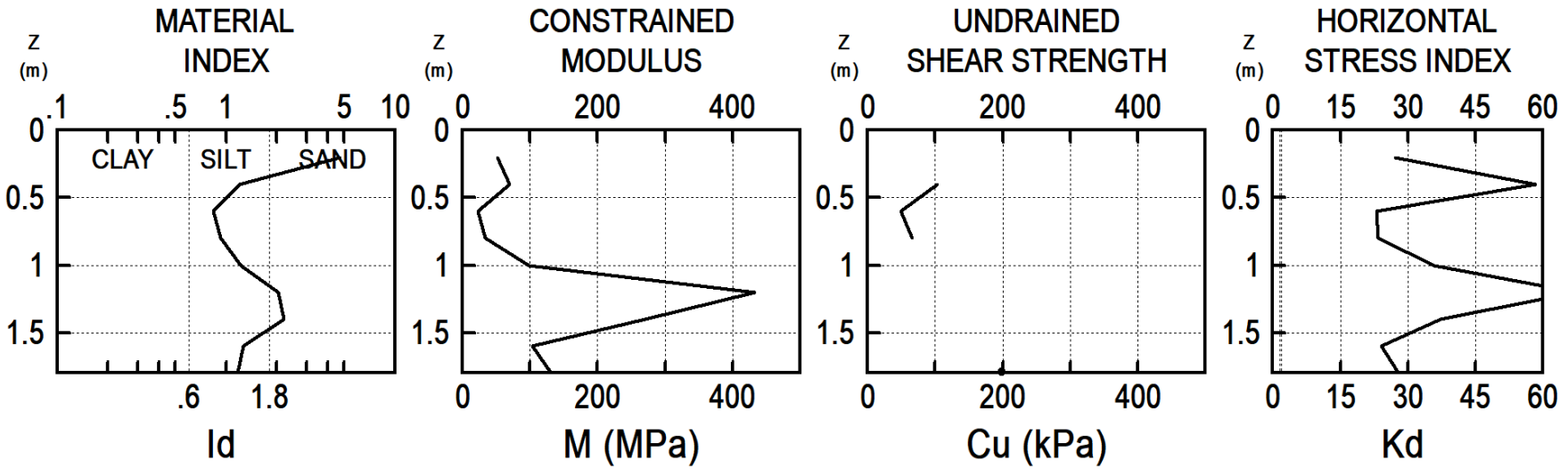
Test Pit ATP04

Douglas Partners Geotechnics / Environment / Groundwater	**Site Photographs** Green Waratah 339 Wallgrove Road, Eastern Creek	PROJECT: 84822.04 DWG No: 4 REV: 0
	CLIENT: Cleanaway Operations Pty Ltd	DATE: Feb-20

Appendix D

Results of Seismic Dilatometer

DILATOMETER TEST (D M T)



Insitu Geotech Services

Douglas Partners

Green Waratah

Eastern Creek NSW

INTERPRETED GEOTECHNICAL PARAMETERS

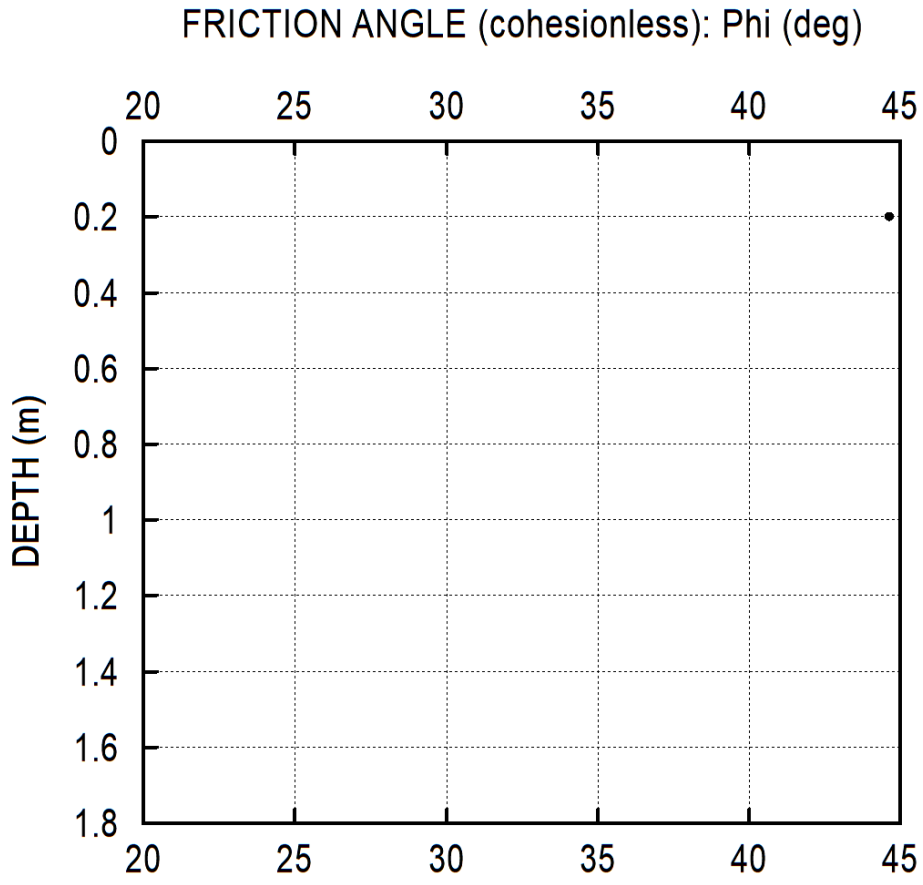
TEST

SDMT-01

10 FEB 2020

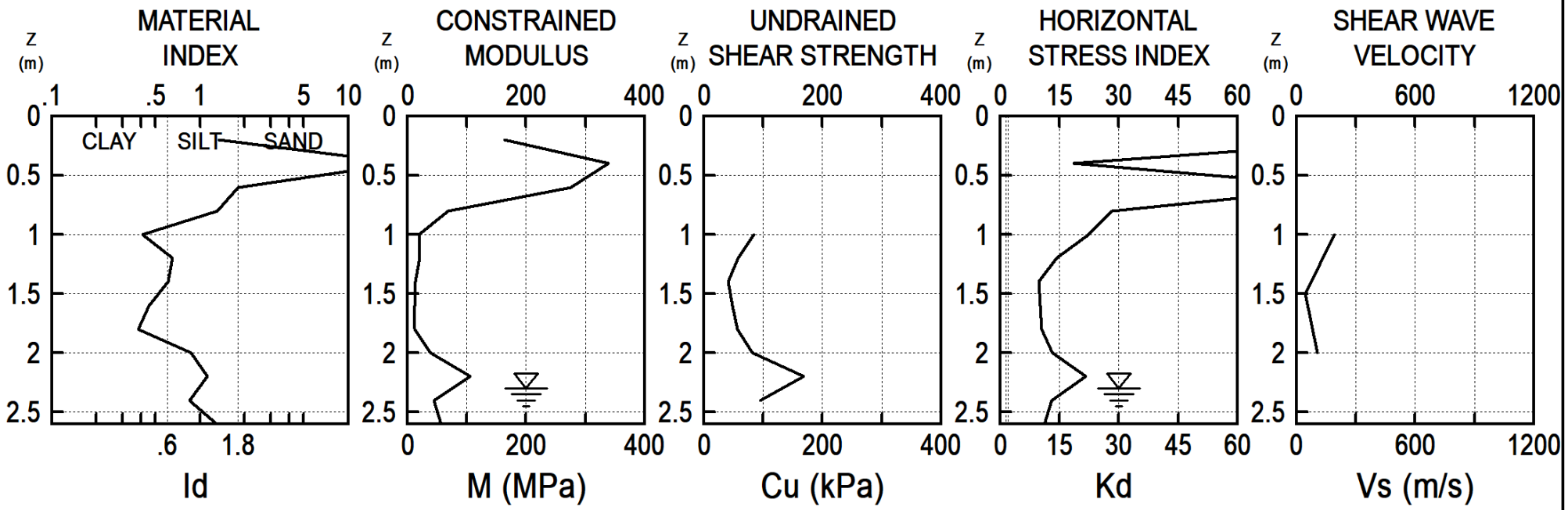
DILATOMETER TEST (D M T)

Insitu Geotech Services	Douglas Partners	TEST
Green Waratah	Eastern Creek NSW	SDMT-01
INTERPRETED GEOTECHNICAL PARAMETERS		10 FEB 2020



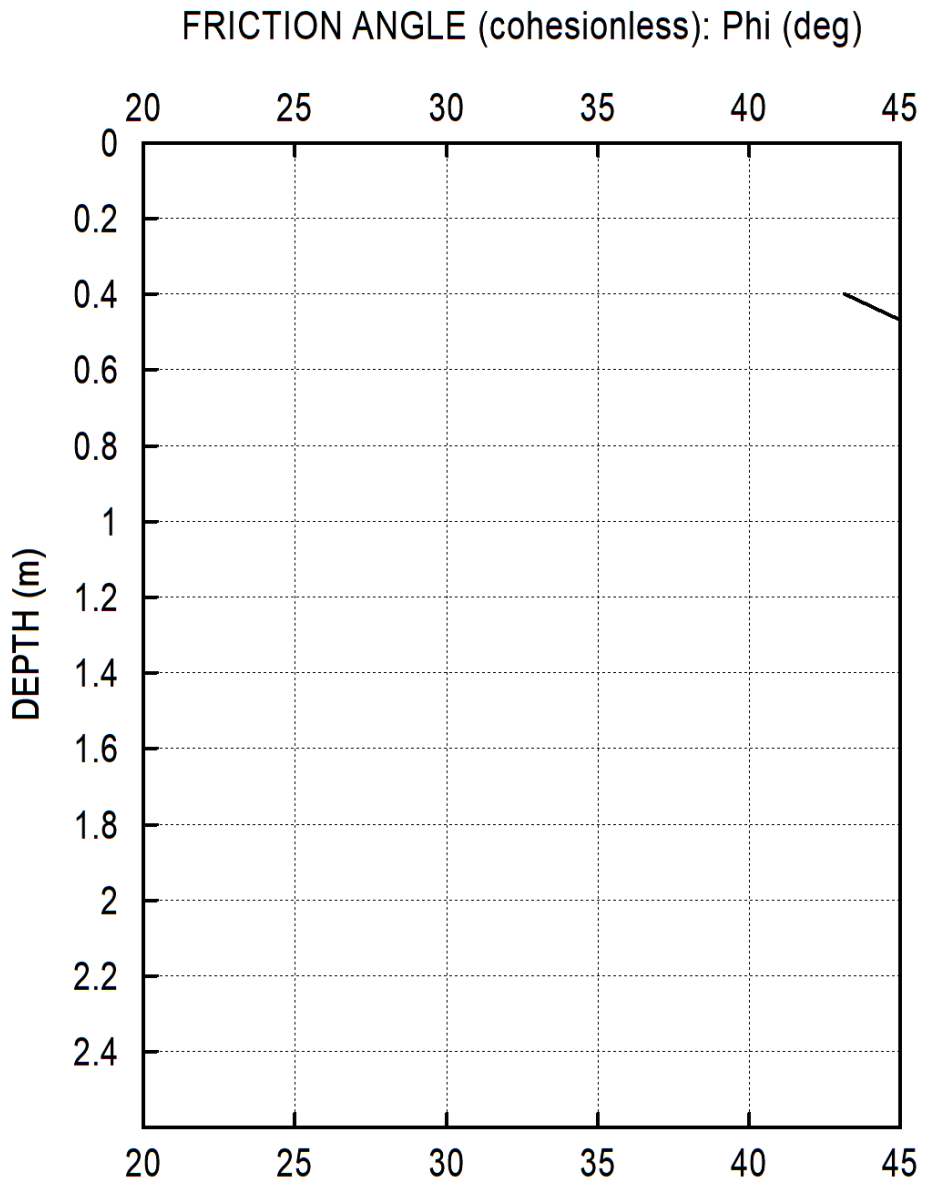
SEISMIC DILATOMETER TEST (S D M T)

Insitu Geotech Services	Douglas Partners	TEST
Green Waratah	Eastern Creek NSW	SDMT-03
		10 FEB 2020



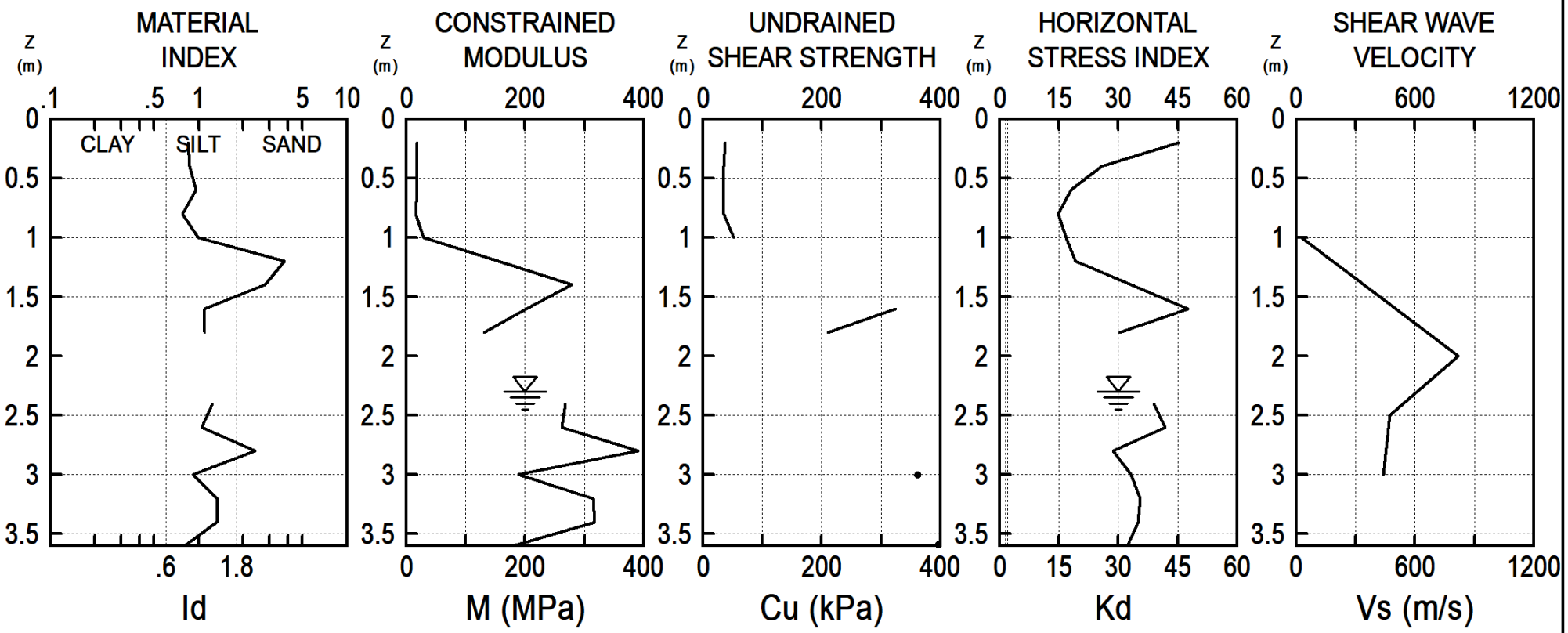
DILATOMETER TEST (D M T)

Insitu Geotech Services	Douglas Partners	TEST
Green Waratah	Eastern Creek NSW	SDMT-03
INTERPRETED GEOTECHNICAL PARAMETERS		10 FEB 2020



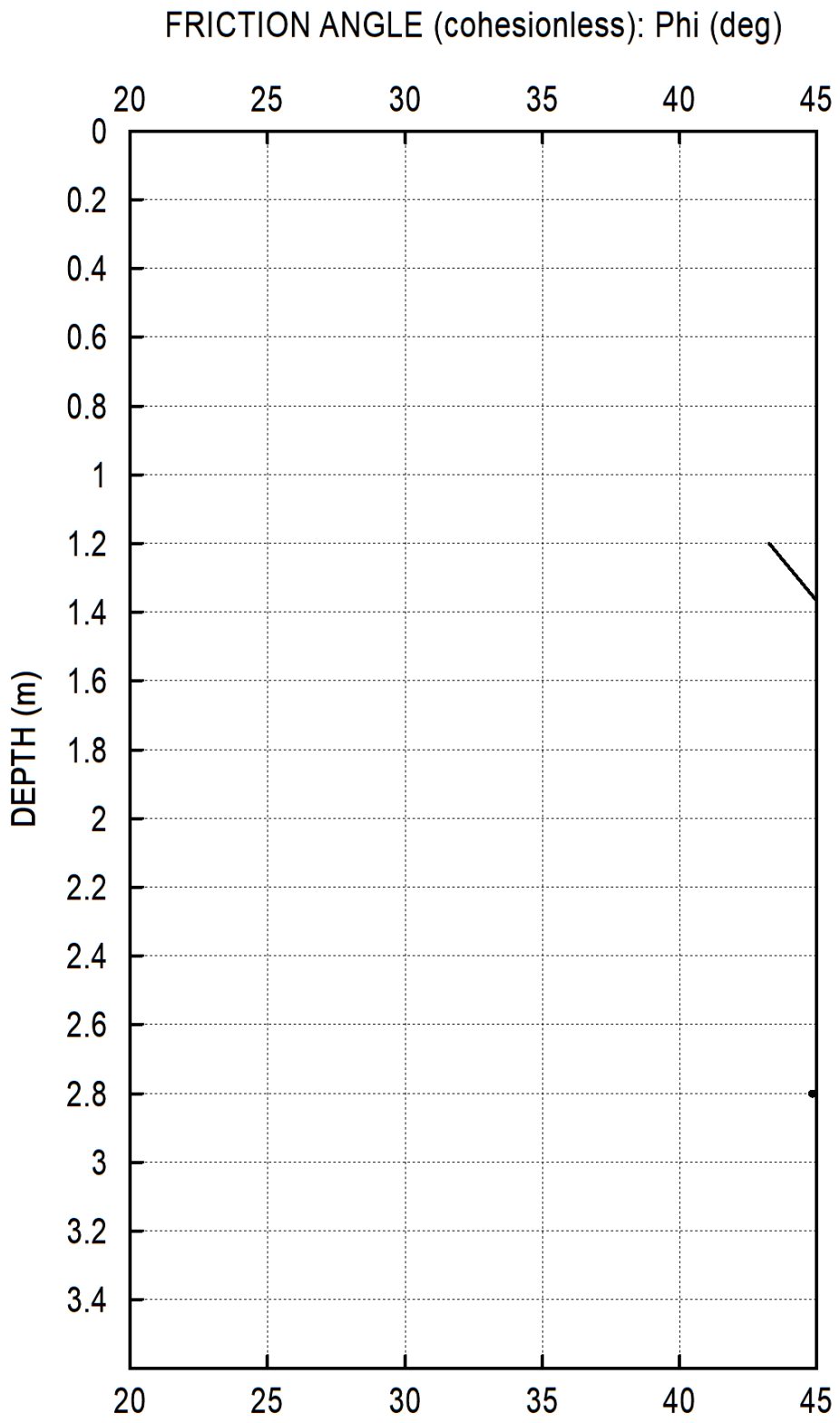
SEISMIC DILATOMETER TEST (S D M T)

Insitu Geotech Services	Douglas Partners	TEST
Green Waratah	Eastern Creek NSW	SDMT-05
		11 FEB 2020



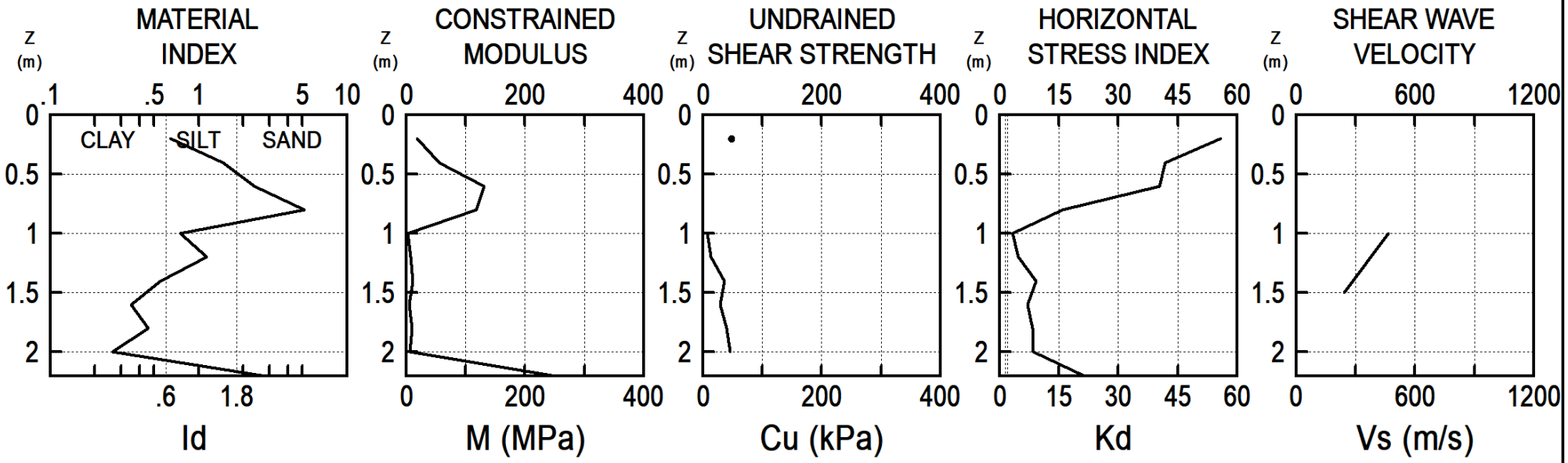
DILATOMETER TEST (D M T)

Insitu Geotech Services	Douglas Partners	TEST
Green Waratah	Eastern Creek NSW	SDMT-05
INTERPRETED GEOTECHNICAL PARAMETERS		11 FEB 2020



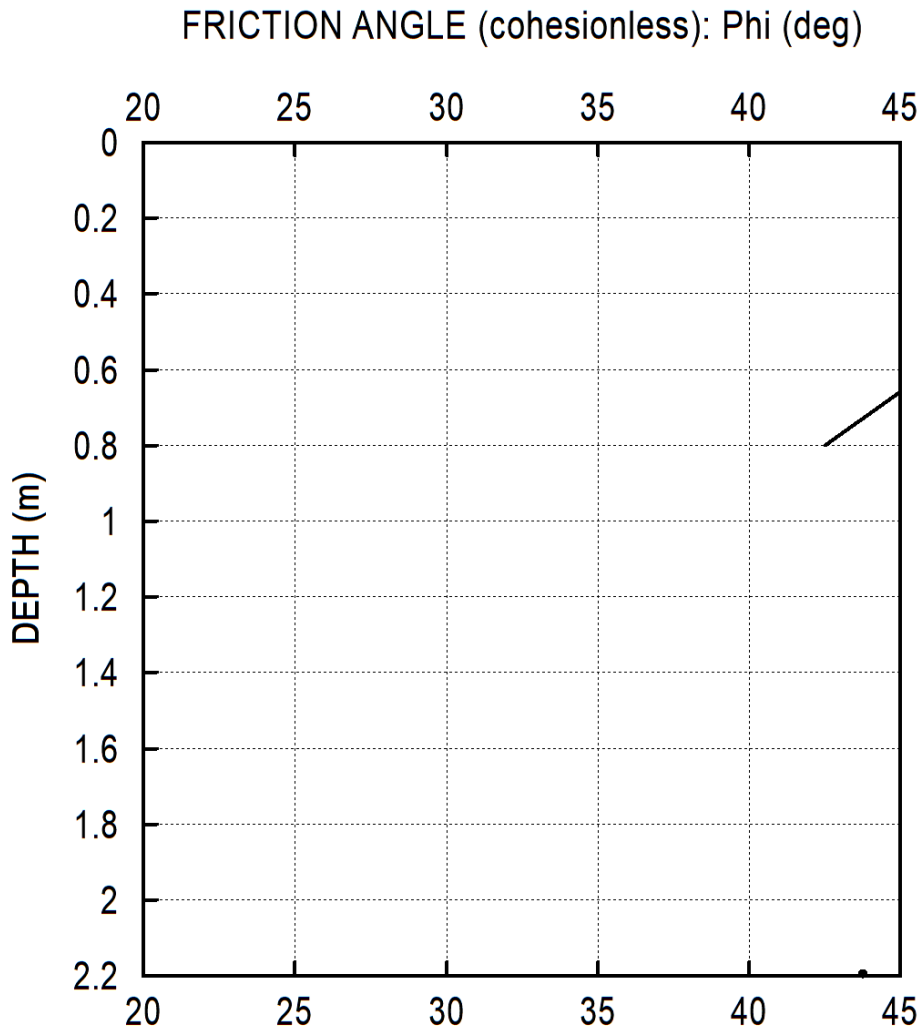
SEISMIC DILATOMETER TEST (S D M T)

Insitu Geotech Services	Douglas Partners	TEST
Green Waratah	Eastern Creek NSW	SDMT-06
		11 FEB 2020



DILATOMETER TEST (D M T)

Insitu Geotech Services	Douglas Partners	TEST
Green Waratah	Eastern Creek NSW	SDMT-06
INTERPRETED GEOTECHNICAL PARAMETERS		11 FEB 2020



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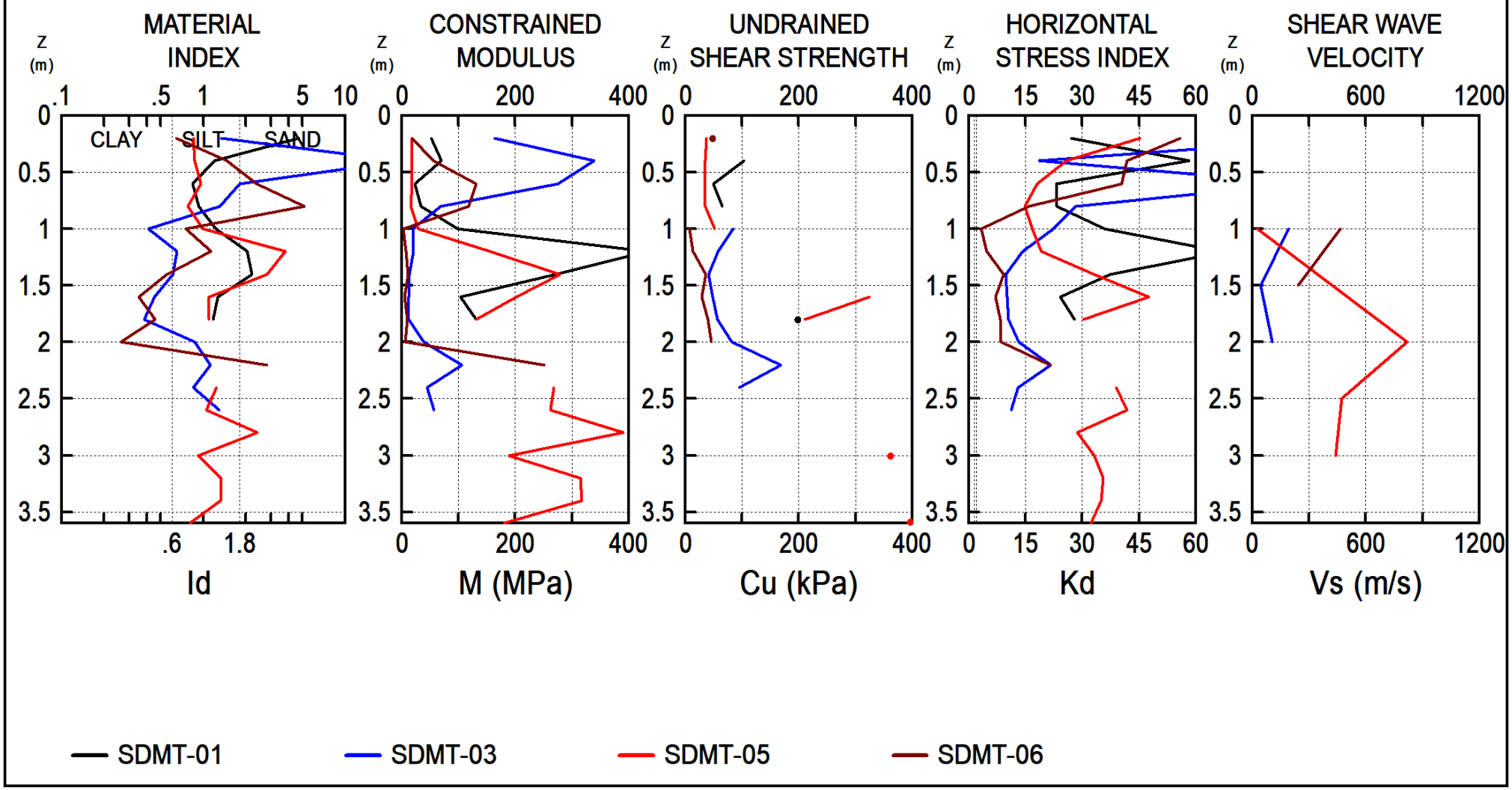
Green Waratah | Eastern Creek NSW



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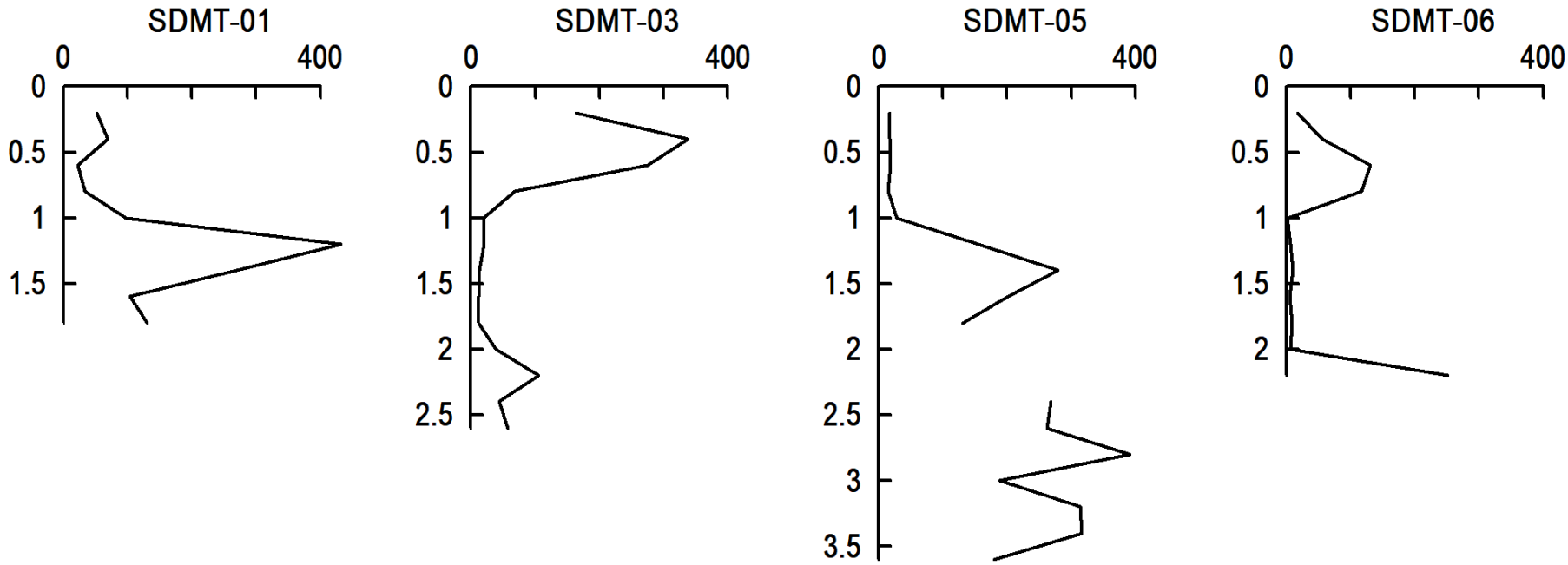
Green Waratah | Eastern Creek NSW

CROSS SECTION OF CONSTRAINED MODULUS M (MPa)



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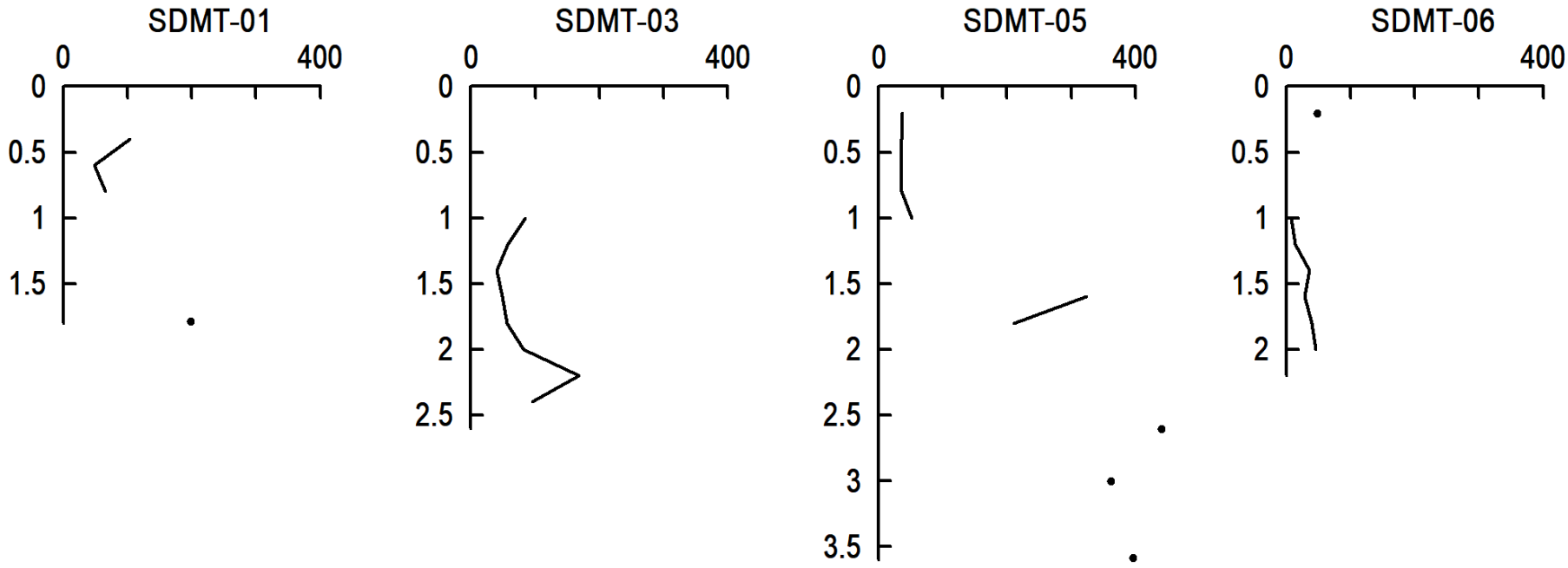
Green Waratah | Eastern Creek NSW

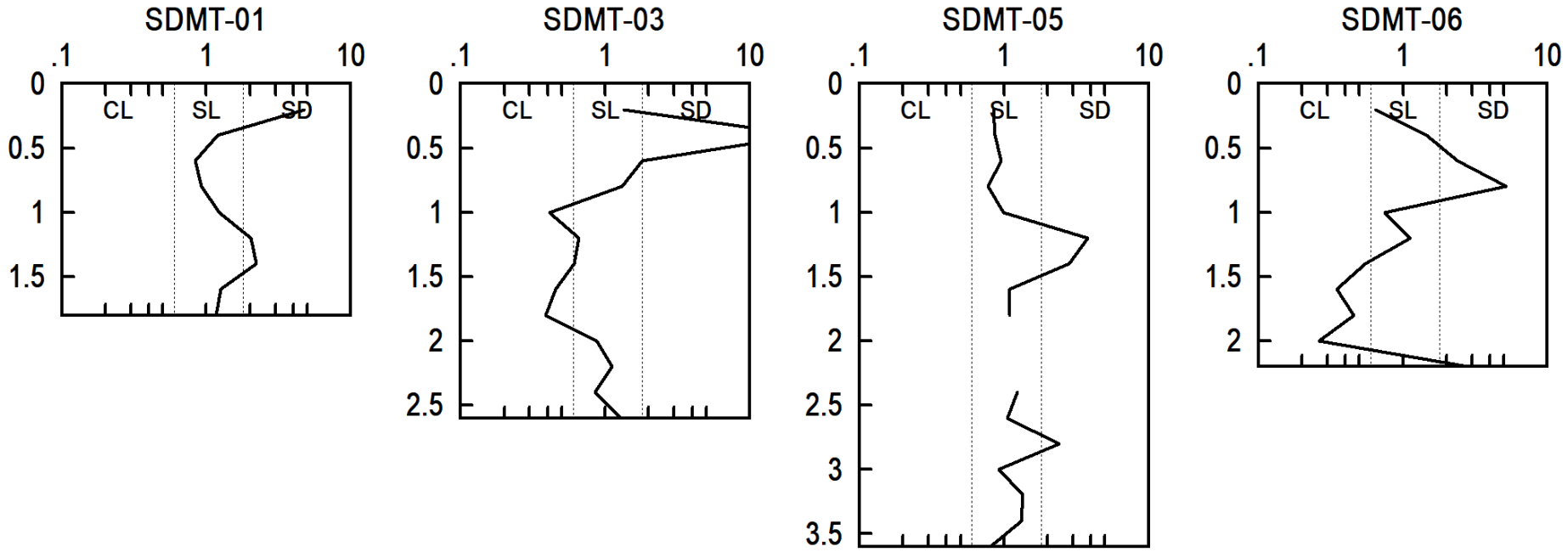
CROSS SECTION OF UNDRAINED SHEAR STRENGTH Cu (kPa)



Insitu Geotech Services | Douglas Partners

Green Waratah | Eastern Creek NSW

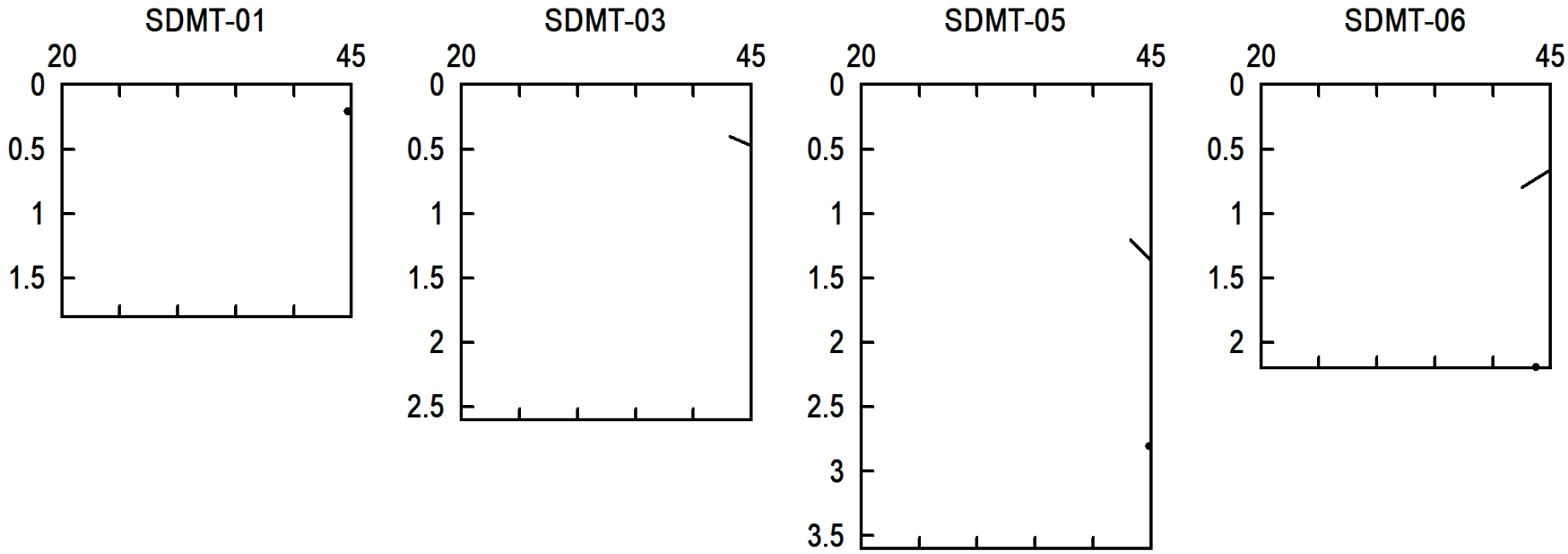
CROSS SECTION OF MATERIAL INDEX Id



Insitu Geotech Services
Green Waratah

Douglas Partners
Eastern Creek NSW

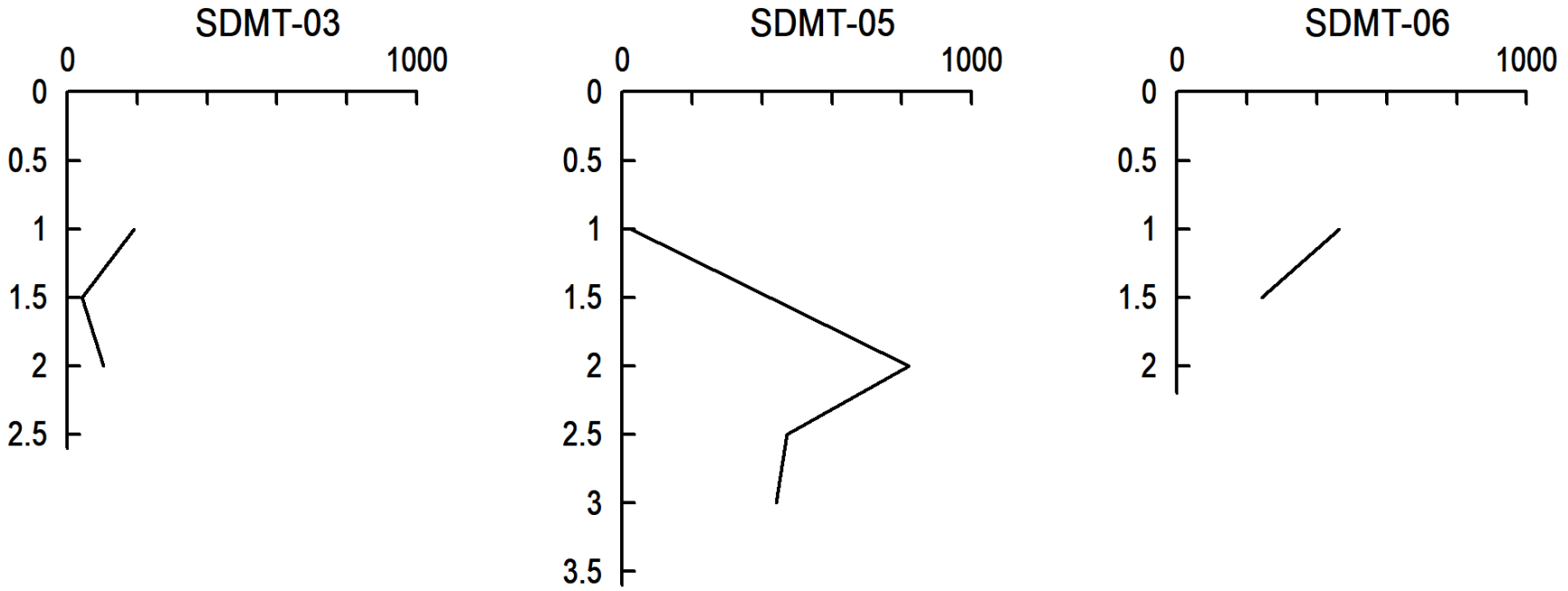
CROSS SECTION OF FRICTION ANGLE (cohesionless) Phi (deg)



Insitu Geotech Services
Green Waratah

Douglas Partners
Eastern Creek NSW

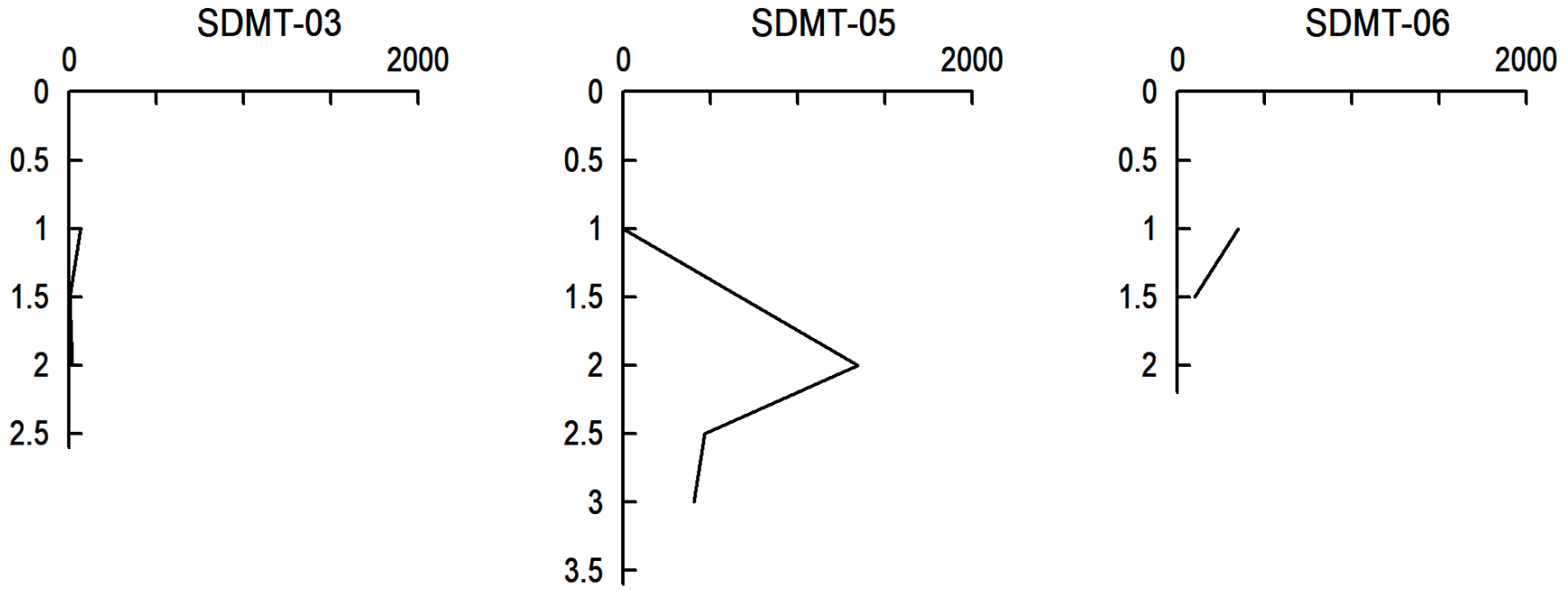
CROSS SECTION OF SHEAR WAVE VELOCITY Vs (m/s)



Insitu Geotech Services | Douglas Partners

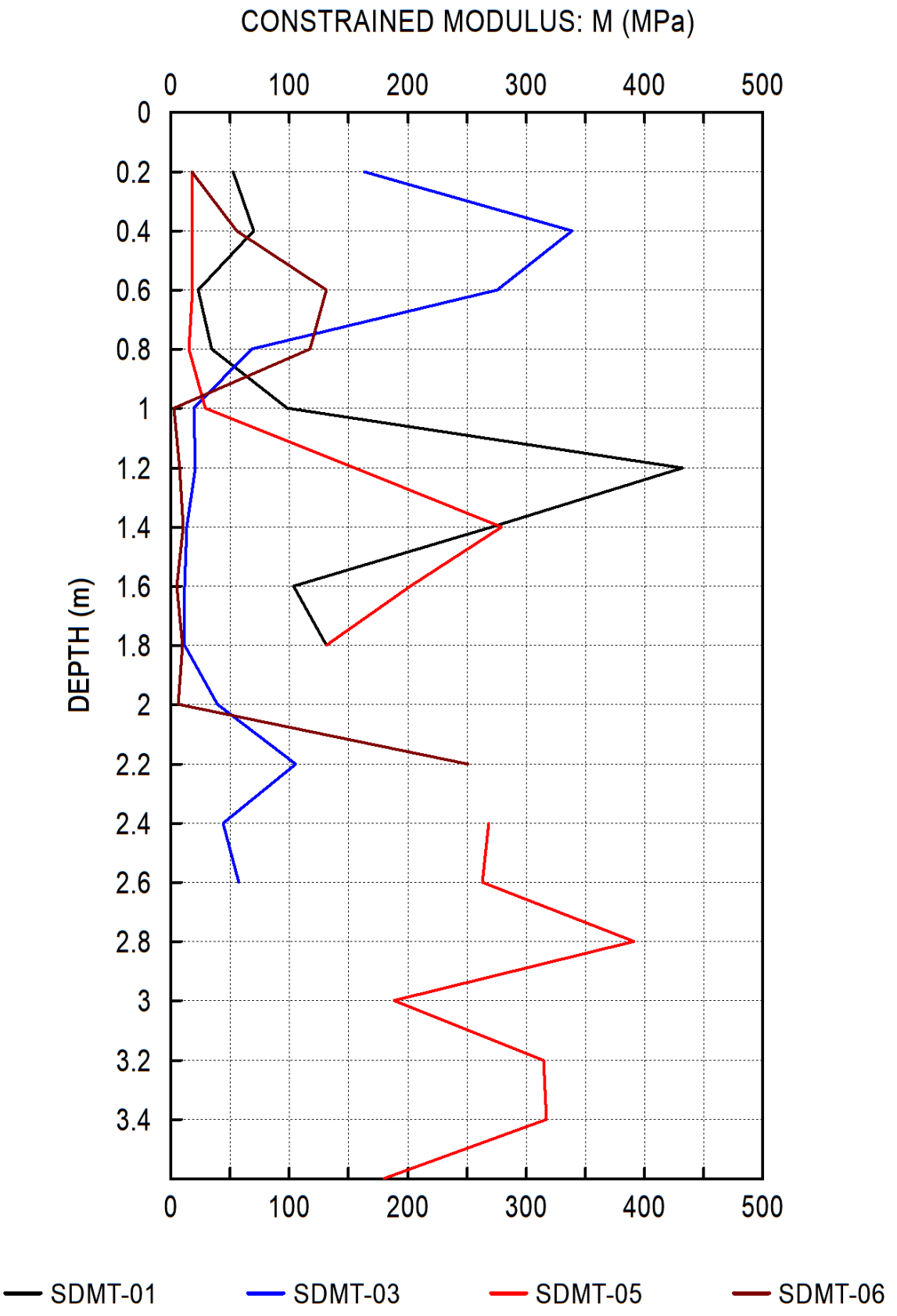
Green Waratah | Eastern Creek NSW

CROSS SECTION OF MAX SHEAR MODULUS Go (MPa)



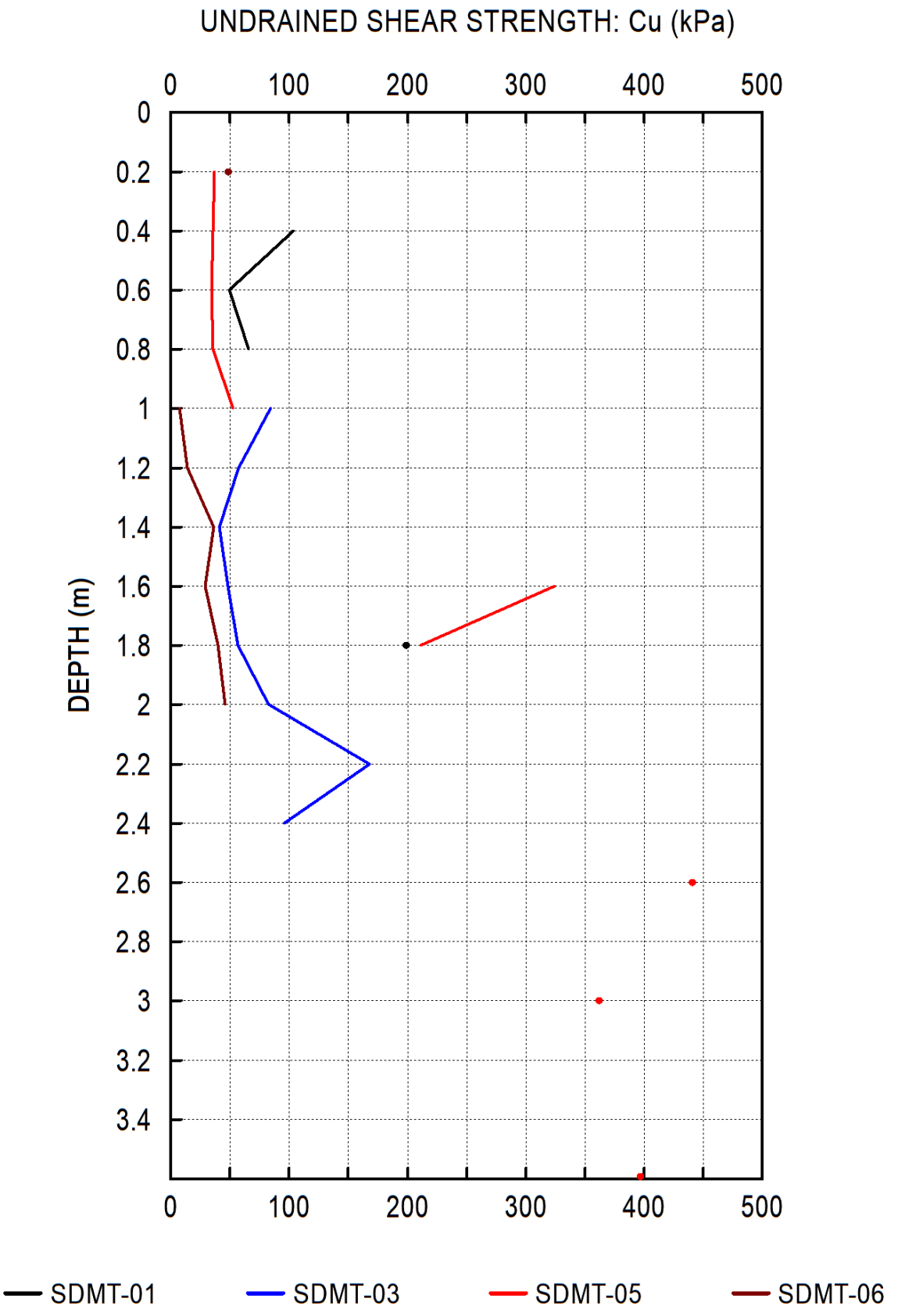
Insitu Geotech Services	Douglas Partners
Green Waratah	Eastern Creek NSW

SUPERIMPOSED TEST RESULTS



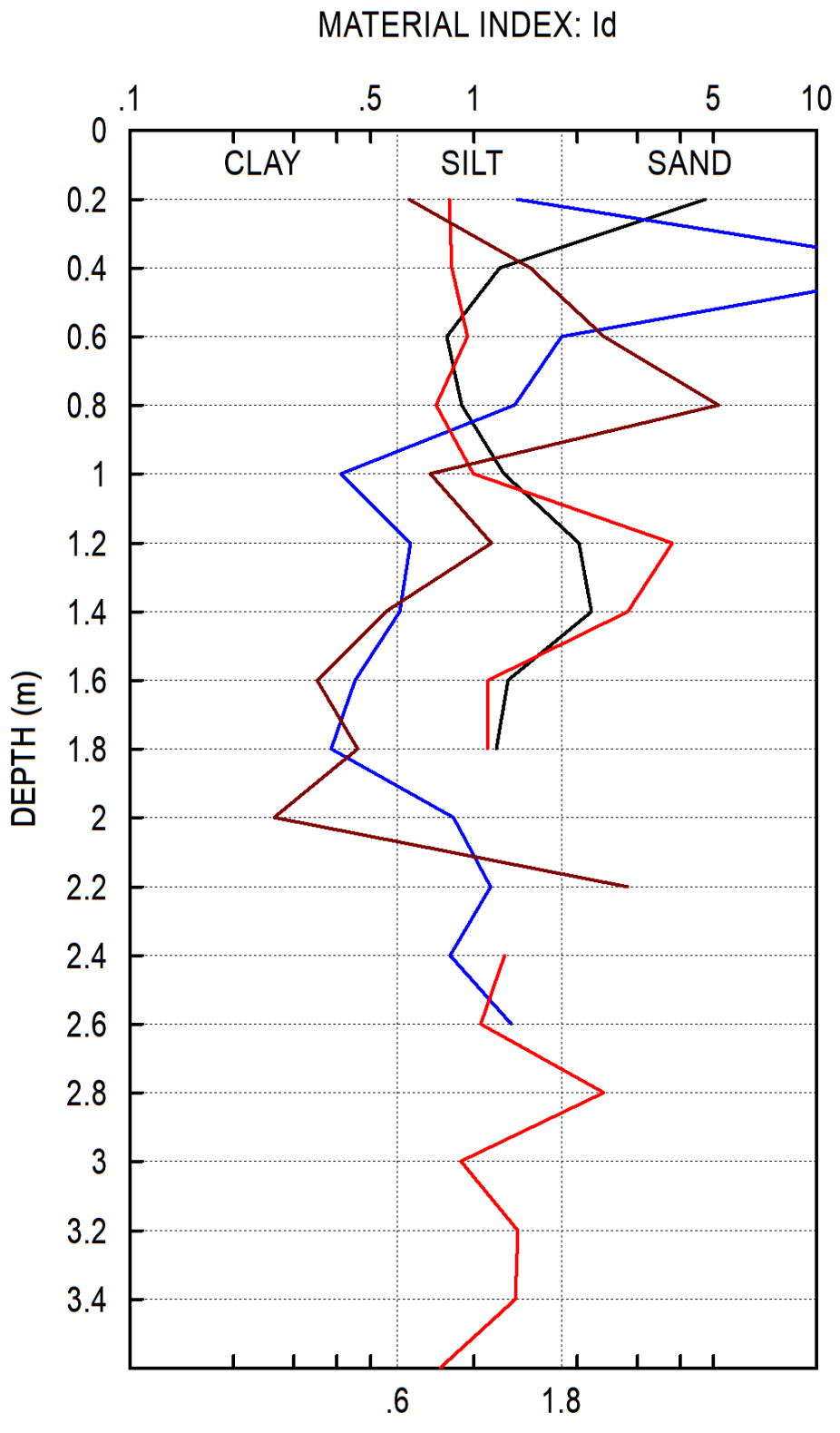
Insitu Geotech Services	Douglas Partners
Green Waratah	Eastern Creek NSW

SUPERIMPOSED TEST RESULTS



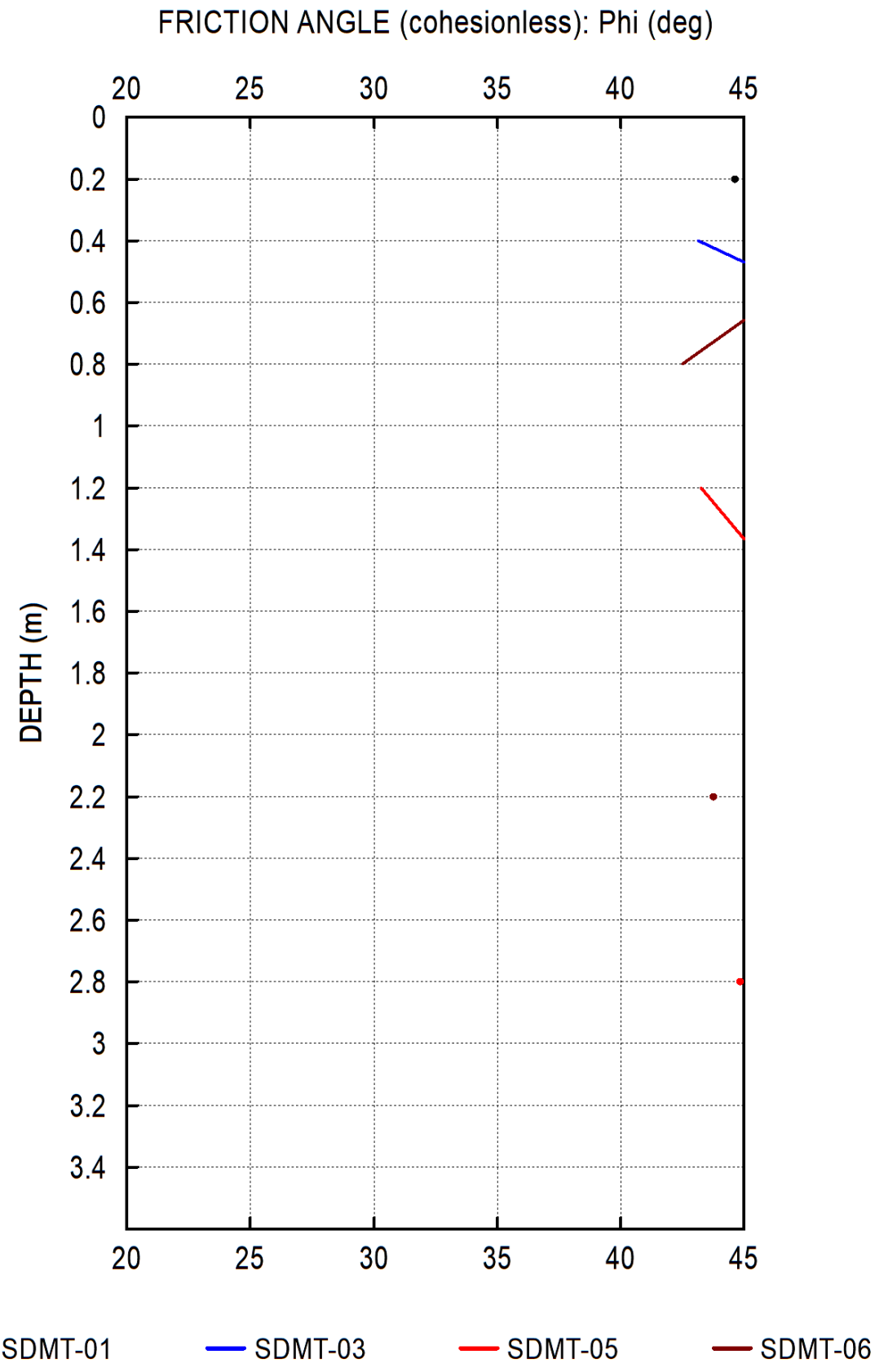
Insitu Geotech Services	Douglas Partners
Green Waratah	Eastern Creek NSW

SUPERIMPOSED TEST RESULTS



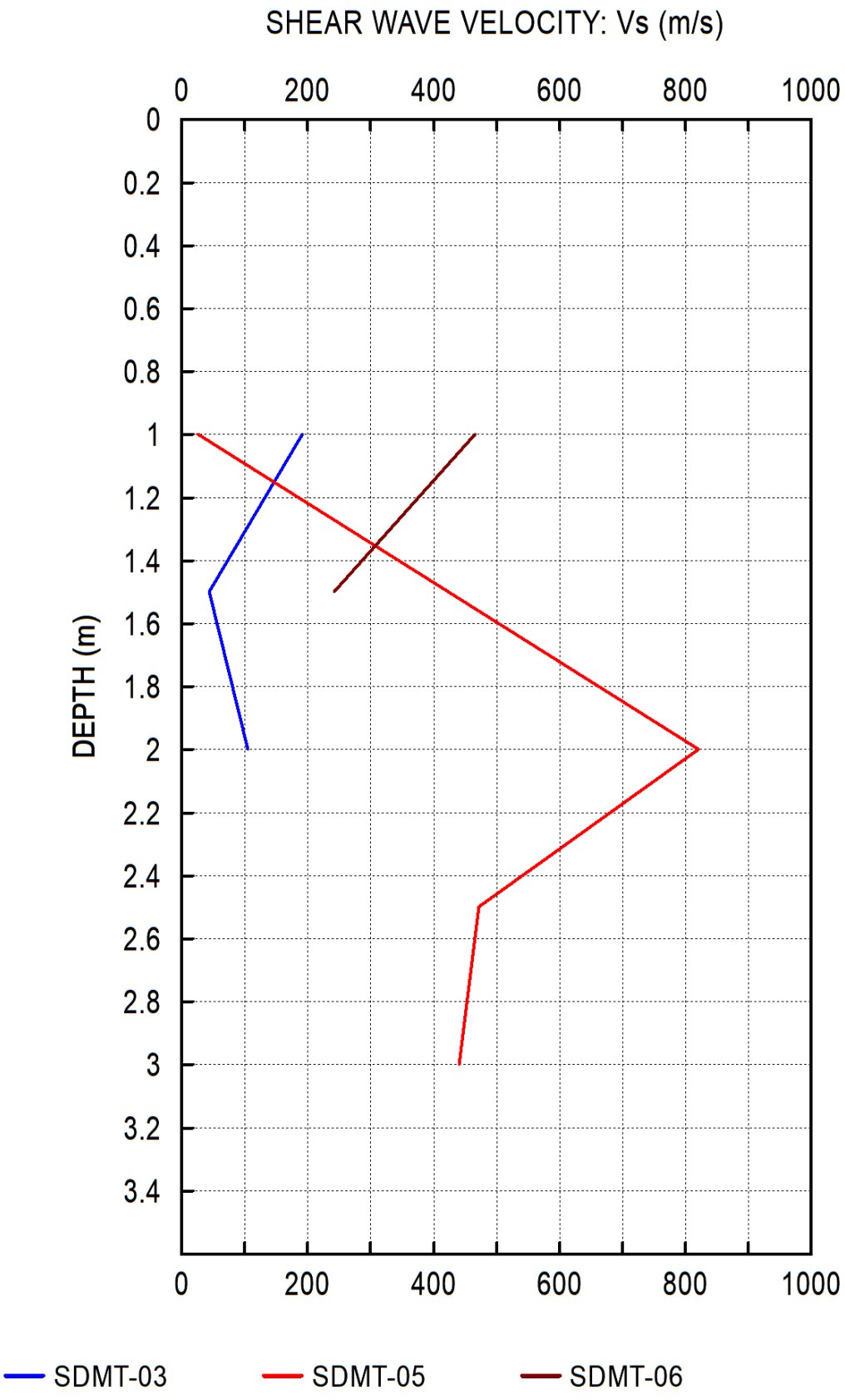
Insitu Geotech Services	Douglas Partners
Green Waratah	Eastern Creek NSW

SUPERIMPOSED TEST RESULTS



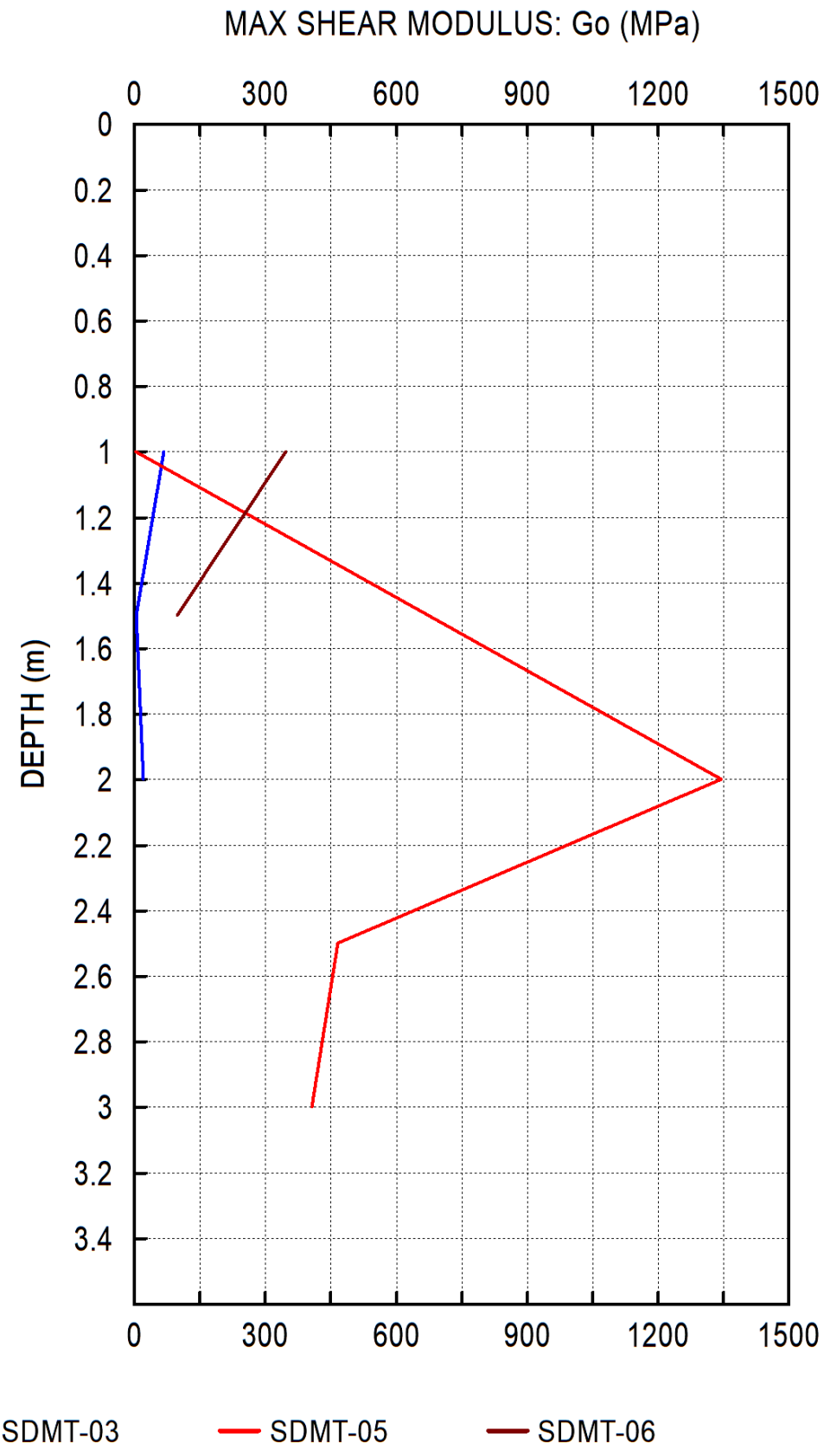
Insitu Geotech Services	Douglas Partners
Green Waratah	Eastern Creek NSW

SUPERIMPOSED TEST RESULTS



Insitu Geotech Services	Douglas Partners
Green Waratah	Eastern Creek NSW

SUPERIMPOSED TEST RESULTS



SDMT-01	LEGEND	INTERPRETED PARAMETERS	GENERAL PARAMETERS
10 FEB 2020	Z = Depth Below Ground Level Po,P1,P2 = Corrected A,B,C readings Id = Material Index Ed = Dilatometer Modulus Ud = Pore Press. Index = (P2-Uo)/(Po-Uo) Gamma = Bulk unit weight Sigma' = Effective overb. stress Uo = Pore pressure	Phi = Safe floor value of Friction Angle Ko = In situ earth press. coeff. M = Constrained modulus (at Sigma') Cu = Undrained shear strength Ocr = Overconsolidation ratio (OCR = 'relative OCR'- generally realistic. If accurate independent OCR available, apply suitable factor)	DeltaA = 14 kPa DeltaB = 26 kPa GammaTop = 17.0 kN/m^3 FactorEd = 34.7 Zm = 0.0 kPa Zabs = 0.0 m Zw > Zfinal
Insitu Geotech Services Douglas Partners Green Waratah Eastern Creek NSW			

Water Level below end of sounding
Reduction formulae according to Marchetti, ASCE Geot.Jnl.Mar. 1980, Vol.109, 299-321; Phi according to TC16 ISSMGE, 2001

Z (m)	A (kPa)	B (kPa)	C (kPa)	Po (kPa)	P1 (kPa)	P2 (kPa)	Gamma (kN/m^3)	Sigma' (kPa)	Uo (kPa)	Id	Kd	Ed (MPa)	Ud	Ko	Ocr	Phi (Deg)	M (MPa)	Cu (kPa)	SDMT-01 DESCRIPTION
0.2	99	555		92	529		17.7	3	0	4.74	27.1	15.2				45	52.2		SAND
0.4	413	912		404	886		17.7	7	0	1.19	58.3	16.7		5.0	>99.9		69.7	103	SILT
0.6	237	469		241	443		16.7	10	0	0.84	23.1	7.0		3.0	45.5		23.0	49	SILT
0.8	322	645		322	619		17.7	14	0	0.92	23.3	10.3		3.0	46.3		34.0	65	SILT
1.0	644	1409		622	1383		19.1	17	0	1.22	35.9	26.4					98.0		SANDY SILT
1.2	1550	4344		1426	4318		21.1	21	0	2.03	67.4	100.3				48	432.2		SILTY SAND
1.4	1030	3052		945	3026		21.1	25	0	2.20	37.2	72.2				46	270.4		SILTY SAND
1.6	741	1634		712	1608		19.1	30	0	1.26	24.1	31.1					103.5		SANDY SILT
1.8	971	2046		933	2020		19.1	33	0	1.16	27.9	37.7		3.4	61.3		130.9	198	SILT

SDMT-03	LEGEND	INTERPRETED PARAMETERS	GENERAL PARAMETERS
10 FEB 2020	Z = Depth Below Ground Level Po,P1,P2 = Corrected A,B,C readings Id = Material Index Ed = Dilatometer Modulus Ud = Pore Press. Index = (P2-Uo)/(Po-Uo) Gamma = Bulk unit weight Sigma' = Effective overb. stress Uo = Pore pressure	Phi = Safe floor value of Friction Angle Ko = In situ earth press. coeff. M = Constrained modulus (at Sigma') Cu = Undrained shear strength Ocr = Overconsolidation ratio (OCR = 'relative OCR'- generally realistic. If accurate independent OCR available, apply suitable factor)	DeltaA = 10 kPa DeltaB = 26 kPa GammaTop = 17.0 kN/m^3 FactorEd = 34.7 Zm = 0.0 kPa Zabs = 0.0 m Zw = 2.3 m
Insitu Geotech Services Douglas Partners Green Waratah Eastern Creek NSW			

WaterTable at 2.30 m
Reduction formulae according to Marchetti, ASCE Geot.Jnl.Mar. 1980, Vol.109, 299-321; Phi according to TC16 ISSMGE, 2001

Z (m)	A (kPa)	B (kPa)	C (kPa)	Po (kPa)	P1 (kPa)	P2 (kPa)	Gamma (kN/m^3)	Sigma' (kPa)	Uo (kPa)	Id	Kd	Ed (MPa)	Ud	Ko	Ocr	Phi (Deg)	M (MPa)	Cu (kPa)	SDMT-03 DESCRIPTION
0.2	790	1782		752	1756		19.1	3	0	1.33	>99.9	34.8					163.0		SANDY SILT
0.4	213	3325		134	3299		18.6	7	0	23.66	18.5	109.8				43	338.6		SAND
0.6	1040	2734		967	2708		21.1	11	0	1.80	88.3	60.4				48	275.6		SILTY SAND
0.8	446	1019		429	993		17.7	15	0	1.31	28.3	19.6					68.2		SANDY SILT
1.0	416	615		418	589		17.7	19	0	0.41	22.3	5.9		3.0	43.3		19.4	84	SILTY CLAY
1.2	318	552		318	526		16.7	22	0	0.65	14.3	7.2		2.3	21.6		20.5	57	CLAYEY SILT
1.4	246	426		249	400		16.7	26	0	0.61	9.7	5.2		1.8	11.8		13.0	41	CLAYEY SILT
1.6	289	451		293	425		16.7	29	0	0.45	10.1	4.6		1.9	12.6		11.5	48	SILTY CLAY
1.8	335	495		339	469		16.7	32	0	0.38	10.5	4.5		1.9	13.3		11.5	56	SILTY CLAY
2.0	476	899		467	873		17.7	36	0	0.87	13.1	14.1		2.2	18.8		38.9	82	SILT
2.2	878	1811		843	1785		19.1	39	0	1.12	21.6	32.7		2.9	40.9		105.5	168	SILT
2.4	556	1032		544	1006		17.7	42	1	0.85	12.9	16.0		2.2	18.5		44.0	95	SILT
2.6	511	1146		491	1120		17.7	44	3	1.29	11.2	21.8					56.9		SANDY SILT

SDMT-05	LEGEND	INTERPRETED PARAMETERS	GENERAL PARAMETERS
11 FEB 2020	Z = Depth Below Ground Level Po,P1,P2 = Corrected A,B,C readings Id = Material Index Ed = Dilatometer Modulus Ud = Pore Press. Index = (P2-Uo)/(Po-Uo) Gamma = Bulk unit weight Sigma' = Effective overb. stress Uo = Pore pressure	Phi = Safe floor value of Friction Angle Ko = In situ earth press. coeff. M = Constrained modulus (at Sigma') Cu = Undrained shear strength Ocr = Overconsolidation ratio (OCR = 'relative OCR'- generally realistic. If accurate independent OCR available, apply suitable factor)	DeltaA = 10 kPa DeltaB = 20 kPa GammaTop = 17.0 kN/m^3 FactorEd = 34.7 Zm = 0.0 kPa Zabs = 0.0 m Zw = 2.3 m
Insitu Geotech Services Douglas Partners Green Waratah Eastern Creek NSW			

WaterTable at 2.30 m
Reduction formulae according to Marchetti, ASCE Geot.Jnl.Mar. 1980, Vol.109, 299-321; Phi according to TC16 ISSMGE, 2001

Z (m)	A (kPa)	B (kPa)	C (kPa)	Po (kPa)	P1 (kPa)	P2 (kPa)	Gamma (kN/m^3)	Sigma' (kPa)	Uo (kPa)	Id	Kd	Ed (MPa)	Ud	Ko	Ocr	Phi (Deg)	M (MPa)	Cu (kPa)	SDMT-05 DESCRIPTION
0.2	150	304		154	284		15.7	3	0	0.85	45.2	4.5		4.4	>99.9		17.8	37	SILT
0.4	166	335		169	315		16.7	7	0	0.86	25.9	5.1		3.2	54.3		17.2	35	SILT
0.6	176	368		178	348		16.7	10	0	0.96	18.0	5.9		2.6	30.9		18.0	34	SILT
0.8	192	366		195	346		16.7	13	0	0.78	14.7	5.2		2.3	22.6		15.0	35	CLAYEY SILT
1.0	281	574		278	554		16.7	17	0	0.99	16.8	9.6		2.5	27.7		28.7	52	SILT
1.2	437	1834		379	1814		19.6	20	0	3.79	19.0	49.8				43	154.9		SAND
1.4	884	3022		789	3002		21.1	24	0	2.81	33.1	76.8				45	279.1		SILTY SAND
1.6	1394	2819		1334	2799		20.6	28	0	1.10	47.6	50.8		4.5	>99.9		202.2	324	SILT
1.8	1013	2057		972	2037		19.1	32	0	1.10	30.2	36.9		3.5	69.4		131.1	211	SILT
2.4	1747	3720		1660	3700		20.6	43	1	1.23	38.9	70.8					268.0		SANDY SILT
2.6	1958	3858		1875	3838		20.6	45	3	1.05	41.8	68.1		4.2	>99.9		262.6	440	SILT
2.8	1496	4593		1353	4573		21.1	47	5	2.39	28.7	111.7				45	390.9		SILTY SAND
3.0	1697	3149		1636	3129		20.6	49	7	0.92	33.1	51.8		3.7	79.9		188.2	361	SILT
3.2	1942	4304		1835	4284		20.6	51	9	1.34	35.6	85.0					314.5		SANDY SILT
3.4	1993	4382		1885	4362		20.6	54	11	1.32	35.0	86.0					316.9		SANDY SILT
3.6	1870	3268		1812	3248		20.6	56	13	0.80	32.3	49.8		3.6	76.9		179.9	397	CLAYEY SILT

SDMT-06	LEGEND	INTERPRETED PARAMETERS	GENERAL PARAMETERS
11 FEB 2020	Z = Depth Below Ground Level Po,P1,P2 = Corrected A,B,C readings Id = Material Index Ed = Dilatometer Modulus Ud = Pore Press. Index = (P2-Uo)/(Po-Uo) Gamma = Bulk unit weight Sigma' = Effective overb. stress Uo = Pore pressure	Phi = Safe floor value of Friction Angle Ko = In situ earth press. coeff. M = Constrained modulus (at Sigma') Cu = Undrained shear strength Ocr = Overconsolidation ratio (OCR = 'relative OCR'- generally realistic. If accurate independent OCR available, apply suitable factor)	DeltaA = 10 kPa DeltaB = 70 kPa GammaTop = 17.0 kN/m^3 FactorEd = 34.7 Zm = 0.0 kPa Zabs = 0.0 m Zw > Zfinal
Insitu Geotech Services Douglas Partners Green Waratah Eastern Creek NSW			

Water Level below end of sounding
Reduction formulae according to Marchetti, ASCE Geot.Jnl.Mar. 1980, Vol.109, 299-321; Phi according to TC16 ISSMGE, 2001

Z (m)	A (kPa)	B (kPa)	C (kPa)	Po (kPa)	P1 (kPa)	P2 (kPa)	Gamma (kN/m^3)	Sigma' (kPa)	Uo (kPa)	Id	Kd	Ed (MPa)	Ud	Ko	Ocr	Phi (Deg)	M (MPa)	Cu (kPa)	SDMT-06 DESCRIPTION
0.2	186	383		190	313		16.7	3	0	0.65	55.9	4.3		4.9	>99.9		17.6	48	CLAYEY SILT
0.4	292	765		282	695		17.7	7	0	1.46	41.9	14.3					55.2		SANDY SILT
0.6	451	1472		414	1402		18.6	10	0	2.39	40.3	34.3				46	131.0		SILTY SAND
0.8	267	1443		222	1373		18.6	14	0	5.18	15.9	39.9				43	117.3		SAND
1.0	51	173		59	103		15.7	18	0	0.75	3.3	1.5		0.85	2.2		2.1	7	CLAYEY SILT
1.2	95	282		100	212		15.7	21	0	1.13	4.8	3.9		1.1	3.9		6.9	14	SILT
1.4	218	415		222	345		16.7	24	0	0.55	9.3	4.3		1.8	10.9		10.3	36	SILTY CLAY
1.6	185	329		192	259		15.7	27	0	0.35	7.0	2.3		1.5	7.1		5.0	29	SILTY CLAY
1.8	248	438		253	368		16.7	30	0	0.46	8.3	4.0		1.6	9.2		9.2	40	SILTY CLAY
2.0	282	434		288	364		16.7	34	0	0.26	8.5	2.6		1.7	9.6		6.1	46	CLAY
2.2	895	3111		798	3041		21.1	37	0	2.81	21.5	77.8				44	250.9		SILTY SAND

SDMT-03 - Tabular data: Vs, Go, Vs Repeatability

Each Vs value in the 'Vs Repeatability' column corresponds to a distinct energization.

Z	Vs	Go	Rho	Vs Repeatability	Var Coeff.
[m]	[m/s]	[MPa]	[kg/m^3]	[m/s]	[%]
1.00	191	65.7	1800	189,191,193	1.05
1.50	43	3.1	1700	44,42,42	2.85
2.00	104	19.5	1800	105,102,105	1.67

SDMT-05 - Tabular data: Vs, Go, Vs Repeatability

Each Vs value in the 'Vs Repeatability' column corresponds to a distinct energization.

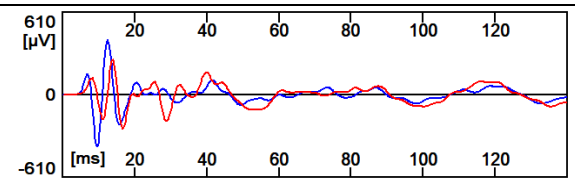
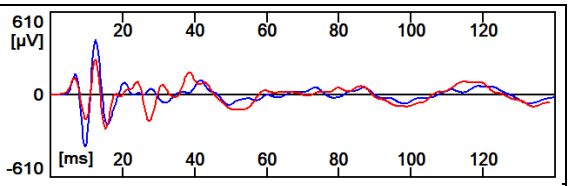
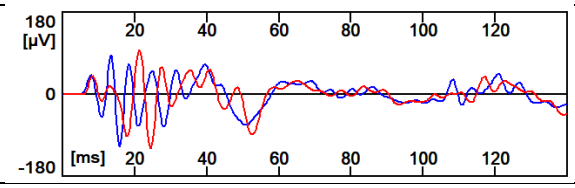
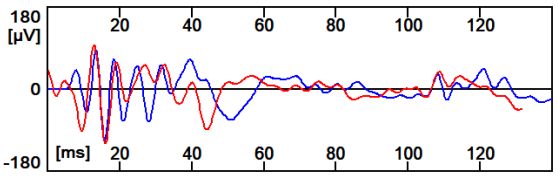
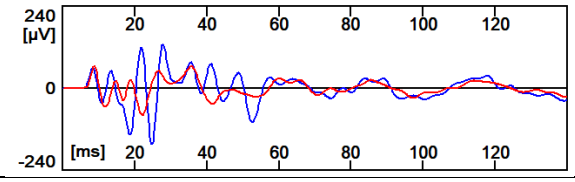
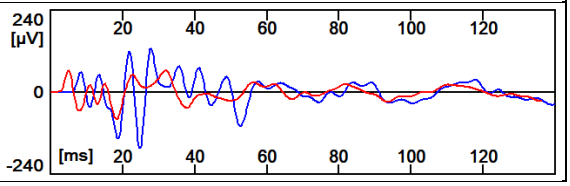
Z	Vs	Go	Rho	Vs Repeatability	Var Coeff.
[m]	[m/s]	[MPa]	[kg/m^3]	[m/s]	[%]
1.00	25	1.1	1700	26,25,25	2.83
2.00	820	1345	2000	823,817,820	0.37
2.50	471	466	2100	474,472,466	0.89
3.00	440	407	2100	438,442,440	0.45

SDMT-06 - Tabular data: Vs, Go, Vs Repeatability

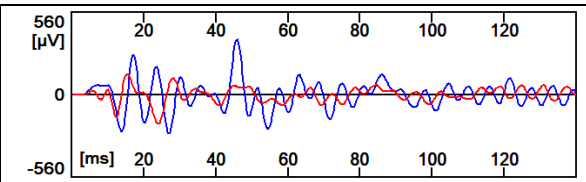
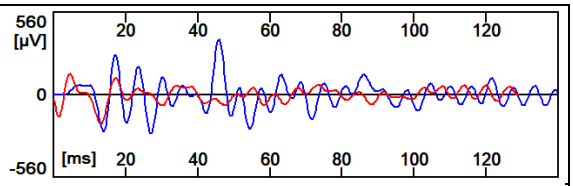
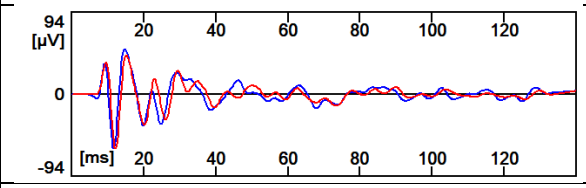
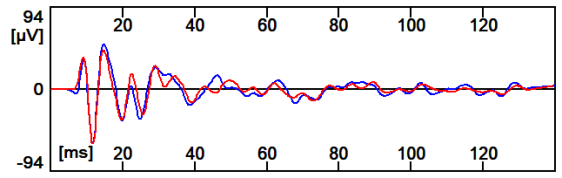
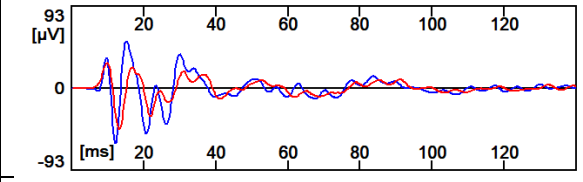
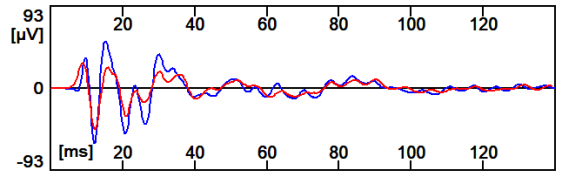
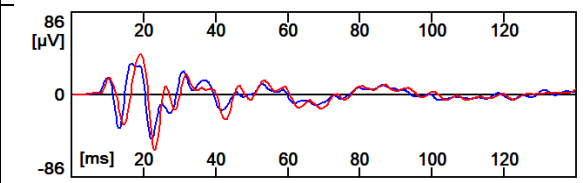
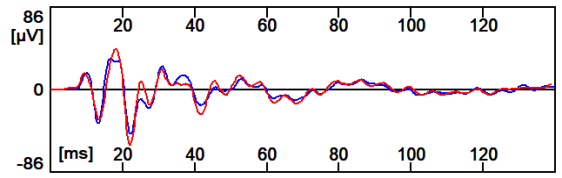
Each Vs value in the 'Vs Repeatability' column corresponds to a distinct energization.

Z	Vs	Go	Rho	Vs Repeatability	Var Coeff.
[m]	[m/s]	[MPa]	[kg/m^3]	[m/s]	[%]
1.00	465	346	1600	469,465,462	0.76
1.50	242	96.6	1650	237,247,241	2.09

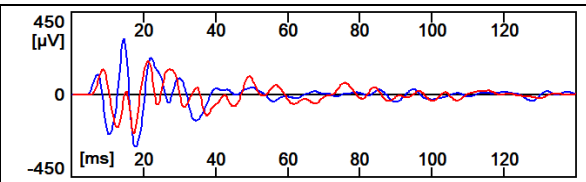
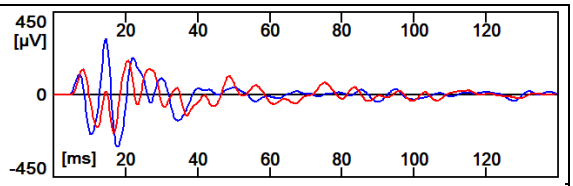
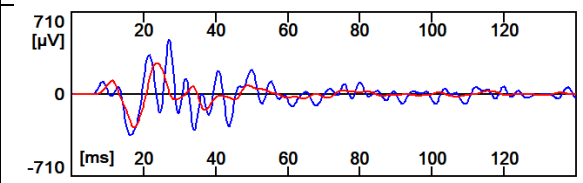
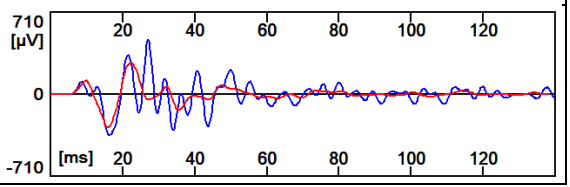
SDMT-03 - Vs

	RECORDED	RE-PHASED
Z = 1.00 m Ds = 0.28 m Dt = 1.44 ms Vs = 191 m/s 10 FEB 2020 14:26:07		
Z = 1.50 m Ds = 0.35 m Dt = 8.38 ms Vs = 42 m/s 10 FEB 2020 14:31:09		
Z = 2.00 m Ds = 0.40 m Dt = 3.81 ms Vs = 105 m/s 10 FEB 2020 14:38:30		

SDMT-05 - Vs

	RECORDED	RE-PHASED
Z = 1.00 m Ds = 0.28 m Dt = 10.94 ms Vs = 25 m/s 11 FEB 2020 7:24:54		
Z = 2.00 m Ds = 0.40 m Dt = 0.49 ms Vs = 820 m/s 11 FEB 2020 8:48:44		
Z = 2.50 m Ds = 0.43 m Dt = 0.91 ms Vs = 472 m/s 11 FEB 2020 8:56:34		
Z = 3.00 m Ds = 0.45 m Dt = 1.02 ms Vs = 440 m/s 11 FEB 2020 9:04:11		

SDMT-06 - Vs

	RECORDED	RE-PHASED
Z = 1.00 m Ds = 0.28 m Dt = 0.59 ms Vs = 465 m/s 11 FEB 2020 11:06:14		
Z = 1.50 m Ds = 0.35 m Dt = 1.46 ms Vs = 241 m/s 11 FEB 2020 11:12:13		

Appendix E

Results of Groundwater Testing

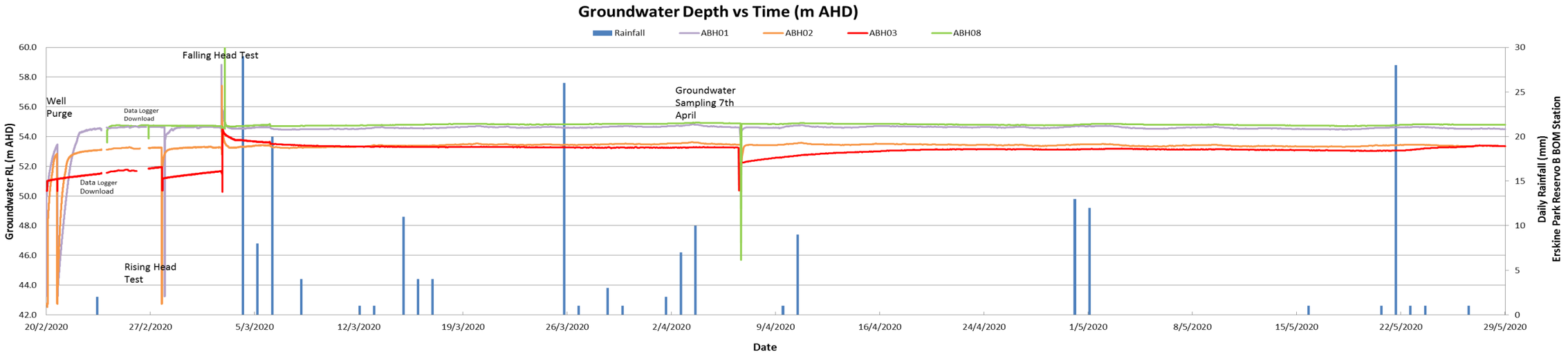


Figure 2:

Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: Cleanaway		TITLE: **Figure 2: Groundwater Depth vs Time** **Report on Geotechnical Investigation** **339 Wallgrove Road, Eastern Creek**	PROJECT No: 84822,04
	OFFICE: Riverston	DRAWN BY: GRB		Figure 2
	SCALE: NTS	DATE: 29 May 2020		REVISION: A

Appendix F

Laboratory Test Results

Uniaxial Compressive Strength

Douglas Partners Pty Ltd
Newcastle Laboratory
15 Callistemon Close Warabrook Newcastle NSW 2310
Phone: (02) 4960 9600
Email: peter.gorseski@douglaspartners.com.au

Report Number:	84822.04_1
Issue Number:	1
Date Issued:	26.02.2020
Client:	Cleanaway Operations Pty Ltd
	Level 4, 441 St Kilda Road, Melbourne 3004
Project Number:	84822.04
Project Name:	Green Waratah
Project Location:	339 Wallgrove Rd, Eastern Creek NSW 2766
Work Request:	4598
Date Sampled:	20.02.2020
Sampling Method:	Sampled by Others

Accredited for Compliance with ISOIEC 17025 - Testing

Approved Signatory: Peter Gorseski

NATA Accredited Laboratory Number: 828

Uniaxial Compressive Strength of Rock Core AS 4133.4.2, AS 4133.1.1.1

Sample Number	NC-4598A
Sample Location	ABH01
Depth (m)	4.24 - 4.59
Rock Description	Siltstone
Storage History and Environment	Tested as Received
Orientation to Bedding	-
Compression Machine	Automax Multitest
Date of Testing	24.02.2020
Duration of Test (seconds)	136
Average Diameter (mm)	82.8
Average Height (mm)	209
Height to Diameter Ratio	2.5 : 1
Moisture Content (%)	4.7
Wet Mass / Unit Volume (t/m^3)	2.47
Dry Mass / Unit Volume (t/m^3)	2.36
Uniaxial Compressive Strength (MPa)	**9.5**
Comments	

Uniaxial Compressive Strength

Douglas Partners
Geotechnics / Environment / Groundwater

Douglas Partners Pty Ltd
Newcastle Laboratory
15 Callistemon Close Warabrook Newcastle NSW 2310
Phone: (02) 4960 9600
Email: peter.gorseski@douglaspartners.com.au

Report Number:	84822.04_1
Issue Number:	1
Date Issued:	26.02.2020
Client:	Cleanaway Operations Pty Ltd
	Level 4, 441 St Kilda Road, Melbourne 3004
Project Number:	84822.04
Project Name:	Green Waratah
Project Location:	339 Wallgrove Rd, Eastern Creek NSW 2766
Work Request:	4598
Date Sampled:	20.02.2020
Sampling Method:	Sampled by Others

Accredited for Compliance with ISOIEC 17025 - Testing

Approved Signatory: Peter Gorseski

NATA Accredited Laboratory Number: 828

Uniaxial Compressive Strength of Rock Core AS 4133.4.2, AS 4133.1.1.1

Sample Number	NC-4598B
Sample Location	ABH01
Depth (m)	9.54 - 9.94
Rock Description	Siltstone
Storage History and Environment	Tested as Received
Orientation to Bedding	-
Compression Machine	Automax Multitest
Date of Testing	24.02.2020
Duration of Test (seconds)	64
Average Diameter (mm)	82.8
Average Height (mm)	211
Height to Diameter Ratio	2.5 : 1
Moisture Content (%)	5.2
Wet Mass / Unit Volume (t/m^3)	2.49
Dry Mass / Unit Volume (t/m^3)	2.37
Uniaxial Compressive Strength (MPa)	**4.8**
Comments	

Uniaxial Compressive Strength

Douglas Partners Pty Ltd
Newcastle Laboratory
15 Callistemon Close Warabrook Newcastle NSW 2310
Phone: (02) 4960 9600
Email: peter.gorseski@douglaspartners.com.au

Report Number:	84822.04_1
Issue Number:	1
Date Issued:	26.02.2020
Client:	Cleanaway Operations Pty Ltd
	Level 4, 441 St Kilda Road, Melbourne 3004
Project Number:	84822.04
Project Name:	Green Waratah
Project Location:	339 Wallgrove Rd, Eastern Creek NSW 2766
Work Request:	4598
Date Sampled:	20.02.2020
Sampling Method:	Sampled by Others

Accredited for Compliance with ISOIEC 17025 - Testing

Approved Signatory: Peter Gorseski

NATA Accredited Laboratory Number: 828

Uniaxial Compressive Strength of Rock Core AS 4133.4.2, AS 4133.1.1.1

Sample Number	NC-4598C
Sample Location	ABH01
Depth (m)	13.42 - 13.85
Rock Description	Siltstone
Storage History and Environment	Tested as Received
Orientation to Bedding	-
Compression Machine	Automax Multitest
Date of Testing	24.02.2020
Duration of Test (seconds)	194
Average Diameter (mm)	82.8
Average Height (mm)	210
Height to Diameter Ratio	2.5 : 1
Moisture Content (%)	3.0
Wet Mass / Unit Volume (t/m^3)	2.54
Dry Mass / Unit Volume (t/m^3)	2.47
Uniaxial Compressive Strength (MPa)	**12.3**
Comments	

Uniaxial Compressive Strength

Douglas Partners
Geotechnics / Environment / Groundwater

Douglas Partners Pty Ltd
Newcastle Laboratory
15 Callistemon Close Warabrook Newcastle NSW 2310
Phone: (02) 4960 9600
Email: peter.gorseski@douglaspartners.com.au

Report Number:	84822.04_1
Issue Number:	1
Date Issued:	26.02.2020
Client:	Cleanaway Operations Pty Ltd
	Level 4, 441 St Kilda Road, Melbourne 3004
Project Number:	84822.04
Project Name:	Green Waratah
Project Location:	339 Wallgrove Rd, Eastern Creek NSW 2766
Work Request:	4598
Date Sampled:	20.02.2020
Sampling Method:	Sampled by Others

Accredited for Compliance with ISOIEC 17025 - Testing

Approved Signatory: Peter Gorseski

NATA Accredited Laboratory Number: 828

Uniaxial Compressive Strength of Rock Core AS 4133.4.2, AS 4133.1.1.1

Sample Number	NC-4598D
Sample Location	ABH01
Depth (m)	18.56 - 18.91
Rock Description	Siltstone
Storage History and Environment	Tested as Received
Orientation to Bedding	-
Compression Machine	Automax Multitest
Date of Testing	24.02.2020
Duration of Test (seconds)	91
Average Diameter (mm)	82.8
Average Height (mm)	207
Height to Diameter Ratio	2.5 : 1
Moisture Content (%)	3.4
Wet Mass / Unit Volume (t/m^3)	2.59
Dry Mass / Unit Volume (t/m^3)	2.51
Uniaxial Compressive Strength (MPa)	**6.8**
Comments	

Uniaxial Compressive Strength

Douglas Partners
Geotechnics / Environment / Groundwater

Douglas Partners Pty Ltd
Newcastle Laboratory
15 Callistemon Close Warabrook Newcastle NSW 2310
Phone: (02) 4960 9600
Email: peter.gorseski@douglaspartners.com.au

Report Number:	84822.04_1
Issue Number:	1
Date Issued:	26.02.2020
Client:	Cleanaway Operations Pty Ltd
	Level 4, 441 St Kilda Road, Melbourne 3004
Project Number:	84822.04
Project Name:	Green Waratah
Project Location:	339 Wallgrove Rd, Eastern Creek NSW 2766
Work Request:	4598
Date Sampled:	20.02.2020
Sampling Method:	Sampled by Others

Accredited for Compliance with ISOIEC 17025 - Testing

Approved Signatory: Peter Gorseski
NATA Accredited Laboratory Number: 828

Uniaxial Compressive Strength of Rock Core AS 4133.4.2, AS 4133.1.1.1

Sample Number	NC-4598E
Sample Location	ABH01
Depth (m)	22.13 - 22.42
Rock Description	Siltstone
Storage History and Environment	Tested as Received
Orientation to Bedding	-
Compression Machine	Automax Multitest
Date of Testing	24.02.2020
Duration of Test (seconds)	78
Average Diameter (mm)	207.0
Average Height (mm)	82.8
Height to Diameter Ratio	2.5 : 1
Moisture Content (%)	6.7
Wet Mass / Unit Volume (t/m^3)	2.55
Dry Mass / Unit Volume (t/m^3)	2.38
Uniaxial Compressive Strength (MPa)	**5.8**
Comments	

Uniaxial Compressive Strength

Douglas Partners Pty Ltd
Newcastle Laboratory
15 Callistemon Close Warabrook Newcastle NSW 2310
Phone: (02) 4960 9600
Email: peter.gorseski@douglaspartners.com.au

Report Number:	84822.04_1
Issue Number:	1
Date Issued:	26.02.2020
Client:	Cleanaway Operations Pty Ltd
	Level 4, 441 St Kilda Road, Melbourne 3004
Project Number:	84822.04
Project Name:	Green Waratah
Project Location:	339 Wallgrove Rd, Eastern Creek NSW 2766
Work Request:	4598
Date Sampled:	20.02.2020
Sampling Method:	Sampled by Others

Accredited for Compliance with ISOIEC 17025 - Testing

Approved Signatory: Peter Gorseski

NATA Accredited Laboratory Number: 828

Uniaxial Compressive Strength of Rock Core AS 4133.4.2, AS 4133.1.1.1

Sample Number	NC-4598F
Sample Location	ABH01
Depth (m)	23.54 - 23.78
Rock Description	Siltstone
Storage History and Environment	Tested as Received
Orientation to Bedding	-
Compression Machine	Automax Multitest
Date of Testing	24.02.2020
Duration of Test (seconds)	126
Average Diameter (mm)	82.8
Average Height (mm)	210
Height to Diameter Ratio	2.5 : 1
Moisture Content (%)	3.1
Wet Mass / Unit Volume (t/m^3)	2.54
Dry Mass / Unit Volume (t/m^3)	2.46
Uniaxial Compressive Strength (MPa)	**8.1**
Comments	

Uniaxial Compressive Strength

Douglas Partners
Geotechnics / Environment / Groundwater

Douglas Partners Pty Ltd
Newcastle Laboratory
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Report Number:	84822.04_3
Issue Number:	1
Date Issued:	28.02.2020
Client:	Cleanaway Operations Pty Ltd
	Level 4, 441 St Kilda Road, Melbourne 3004
Project Number:	84822.04
Project Name:	Green Waratah
Project Location:	339 Wallgrove Rd, Eastern Creek NSW 2766
Work Request:	4599
Date Sampled:	20.02.2020
Sampling Method:	Sampled by Others

Accredited for Compliance with ISOIEC 17025 - Testing

Approved Signatory: Peter Gorseski

NATA Accredited Laboratory Number: 828

Uniaxial Compressive Strength of Rock Core AS 4133.4.2, AS 4133.1.1.1

Sample Number	NC-4633A
Sample Location	ABH08
Depth (m)	6.41 - 6.65
Rock Description	Siltstone
Storage History and Environment	Tested as Received
Orientation to Bedding	-
Compression Machine	Automax Multitest
Date of Testing	28.02.2020
Duration of Test (seconds)	27
Average Diameter (mm)	82.3
Average Height (mm)	178
Height to Diameter Ratio	2.2 : 1
Moisture Content (%)	6.0
Wet Mass / Unit Volume (t/m^3)	2.44
Dry Mass / Unit Volume (t/m^3)	2.30
Uniaxial Compressive Strength (MPa)	**4.2**
Comments	

Uniaxial Compressive Strength

Douglas Partners
Geotechnics / Environment / Groundwater

Douglas Partners Pty Ltd
Newcastle Laboratory
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Report Number:	84822.04_3
Issue Number:	1
Date Issued:	28.02.2020
Client:	Cleanaway Operations Pty Ltd
	Level 4, 441 St Kilda Road, Melbourne 3004
Project Number:	84822.04
Project Name:	Green Waratah
Project Location:	339 Wallgrove Rd, Eastern Creek NSW 2766
Work Request:	4599
Date Sampled:	20.02.2020
Sampling Method:	Sampled by Others

Accredited for Compliance with ISOIEC 17025 - Testing

Approved Signatory: Peter Gorseski

NATA Accredited Laboratory Number: 828

Uniaxial Compressive Strength of Rock Core AS 4133.4.2, AS 4133.1.1.1

Sample Number	NC-4633B
Sample Location	ABH08
Depth (m)	9.02 - 9.3
Rock Description	Siltstone
Storage History and Environment	Tested as Received
Orientation to Bedding	-
Compression Machine	Automax Multitest
Date of Testing	28.02.2020
Duration of Test (seconds)	28
Average Diameter (mm)	82.5
Average Height (mm)	213
Height to Diameter Ratio	2.6 : 1
Moisture Content (%)	3.8
Wet Mass / Unit Volume (t/m^3)	2.48
Dry Mass / Unit Volume (t/m^3)	2.39
Uniaxial Compressive Strength (MPa)	**2.8**
Comments	

Uniaxial Compressive Strength

Douglas Partners
Geotechnics / Environment / Groundwater

Douglas Partners Pty Ltd
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Report Number:	84822.04_3
Issue Number:	1
Date Issued:	28.02.2020
Client:	Cleanaway Operations Pty Ltd
	Level 4, 441 St Kilda Road, Melbourne 3004
Project Number:	84822.04
Project Name:	Green Waratah
Project Location:	339 Wallgrove Rd, Eastern Creek NSW 2766
Work Request:	4599
Date Sampled:	20.02.2020
Sampling Method:	Sampled by Others

Accredited for Compliance with ISOIEC 17025 - Testing

Approved Signatory: Peter Gorseski

NATA Accredited Laboratory Number: 828

Uniaxial Compressive Strength of Rock Core AS 4133.4.2, AS 4133.1.1.1

Sample Number	NC-4633C
Sample Location	ABH08
Depth (m)	10.55 - 10.8
Rock Description	Siltstone
Storage History and Environment	Tested as Received
Orientation to Bedding	-
Compression Machine	Automax Multitest
Date of Testing	28.02.2020
Duration of Test (seconds)	17
Average Diameter (mm)	82.0
Average Height (mm)	217
Height to Diameter Ratio	2.6 : 1
Moisture Content (%)	3.4
Wet Mass / Unit Volume (t/m^3)	2.48
Dry Mass / Unit Volume (t/m^3)	2.39
Uniaxial Compressive Strength (MPa)	**2.1**
Comments	

Uniaxial Compressive Strength

Douglas Partners
Geotechnics / Environment / Groundwater

Douglas Partners Pty Ltd
Newcastle Laboratory
15 Callistemon Close Warabrook Newcastle NSW 2310
Phone: (02) 4960 9600
Email: peter.gorseski@douglaspartners.com.au

Report Number:	84822.04_3
Issue Number:	1
Date Issued:	28.02.2020
Client:	Cleanaway Operations Pty Ltd
	Level 4, 441 St Kilda Road, Melbourne 3004
Project Number:	84822.04
Project Name:	Green Waratah
Project Location:	339 Wallgrove Rd, Eastern Creek NSW 2766
Work Request:	4599
Date Sampled:	20.02.2020
Sampling Method:	Sampled by Others

Accredited for Compliance with ISOIEC 17025 - Testing

Approved Signatory: Peter Gorseski

NATA Accredited Laboratory Number: 828

Uniaxial Compressive Strength of Rock Core AS 4133.4.2, AS 4133.1.1.1

Sample Number	NC-4633D
Sample Location	ABH08
Depth (m)	12.56 - 12.89
Rock Description	Siltstone
Storage History and Environment	Tested as Received
Orientation to Bedding	-
Compression Machine	Automax Multitest
Date of Testing	28.02.2020
Duration of Test (seconds)	76
Average Diameter (mm)	82.7
Average Height (mm)	212
Height to Diameter Ratio	2.6 : 1
Moisture Content (%)	3.1
Wet Mass / Unit Volume (t/m^3)	2.61
Dry Mass / Unit Volume (t/m^3)	2.53
Uniaxial Compressive Strength (MPa)	**6.9**
Comments	

Uniaxial Compressive Strength

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Report Number:	84822.04_3
Issue Number:	1
Date Issued:	28.02.2020
Client:	Cleanaway Operations Pty Ltd
	Level 4, 441 St Kilda Road, Melbourne 3004
Project Number:	84822.04
Project Name:	Green Waratah
Project Location:	339 Wallgrove Rd, Eastern Creek NSW 2766
Work Request:	4599
Date Sampled:	20.02.2020
Sampling Method:	Sampled by Others

Accredited for Compliance with ISOIEC 17025 - Testing

Approved Signatory: Peter Gorseski

NATA Accredited Laboratory Number: 828

Uniaxial Compressive Strength of Rock Core AS 4133.4.2, AS 4133.1.1.1

Sample Number	NC-4633E
Sample Location	ABH08
Depth (m)	13.2 - 13.5
Rock Description	Siltstone
Storage History and Environment	Tested as Received
Orientation to Bedding	-
Compression Machine	Automax Multitest
Date of Testing	28.02.2020
Duration of Test (seconds)	29
Average Diameter (mm)	82.6
Average Height (mm)	198
Height to Diameter Ratio	2.4 : 1
Moisture Content (%)	3.0
Wet Mass / Unit Volume (t/m^3)	2.53
Dry Mass / Unit Volume (t/m^3)	2.45
Uniaxial Compressive Strength (MPa)	**2.6**
Comments	

Uniaxial Compressive Strength

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Report Number:	84822.04_3
Issue Number:	1
Date Issued:	28.02.2020
Client:	Cleanaway Operations Pty Ltd
	Level 4, 441 St Kilda Road, Melbourne 3004
Project Number:	84822.04
Project Name:	Green Waratah
Project Location:	339 Wallgrove Rd, Eastern Creek NSW 2766
Work Request:	4599
Date Sampled:	20.02.2020
Sampling Method:	Sampled by Others

Accredited for Compliance with ISOIEC 17025 - Testing

Approved Signatory: Peter Gorseski

NATA Accredited Laboratory Number: 828

Uniaxial Compressive Strength of Rock Core AS 4133.4.2, AS 4133.1.1.1

Sample Number	NC-4633F
Sample Location	ABH08
Depth (m)	15.7 - 16.0
Rock Description	Siltstone
Storage History and Environment	Tested as Received
Orientation to Bedding	-
Compression Machine	Automax Multitest
Date of Testing	28.02.2020
Duration of Test (seconds)	34
Average Diameter (mm)	82.6
Average Height (mm)	207
Height to Diameter Ratio	2.5 : 1
Moisture Content (%)	3.1
Wet Mass / Unit Volume (t/m^3)	2.52
Dry Mass / Unit Volume (t/m^3)	2.45
Uniaxial Compressive Strength (MPa)	**3.6**
Comments	

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 238561

Client Details

Client	Douglas Partners Pty Ltd (Riverstone)
Attention	Gavin Boyd
Address	43 Hobart St, Riverstone, NSW, 2765

Sample Details

Your Reference	**84822.04, Eastern Creek**
Number of Samples	10 Soil
Date samples received	10/03/2020
Date completed instructions received	10/03/2020

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date results requested by	17/03/2020
Date of Issue	17/03/2020

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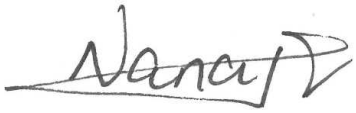
Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Results Approved By
Diego Bigolin, Team Leader, Inorganics
Ken Nguyen, Reporting Supervisor
Loren Bardwell, Senior Chemist
Priya Samarawickrama, Senior Chemist
Ridwan Wijaya, Lab Team Leader

Authorised By



Nancy Zhang, Laboratory Manager

Acid Extractable Cations in Soil						
Our Reference		238561-3	238561-4	238561-5	238561-6	238561-7
Your Reference	UNITS	ABH01/1.6-2m	ABH02/2-2.45m	ABH02/3-3.09m	ABH03/0.9-1.0m	ABH04/1.6-2m
Depth		1.6-2	2-2.45	3-3.09	0.9-1.0	1.6-2
Date Sampled		03/02/2020	10/02/2020	10/02/2020	04/02/2020	03/03/2020
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	16/03/2020	16/03/2020	16/03/2020	16/03/2020	16/03/2020
Date analysed	-	17/03/2020	17/03/2020	17/03/2020	17/03/2020	17/03/2020
Magnesium	mg/kg	2,300	2,300	2,500	2,500	1,800

Acid Extractable Cations in Soil				
Our Reference		238561-8	238561-9	238561-10
Your Reference	UNITS	ABH05/0.5-1.5m	ABH06/1.41-2m	ATP02/0.3-0.4m
Depth		0.5-1.5	1.41-2	0.3-0.4
Date Sampled		03/02/2020	03/02/2020	04/02/2020
Type of sample		Soil	Soil	Soil
Date prepared	-	16/03/2020	16/03/2020	16/03/2020
Date analysed	-	17/03/2020	17/03/2020	17/03/2020
Magnesium	mg/kg	1,700	2,500	1,400

Moisture						
Our Reference		238561-3	238561-4	238561-5	238561-6	238561-7
Your Reference	UNITS	ABH01/1.6-2m	ABH02/2-2.45m	ABH02/3-3.09m	ABH03/0.9-1.0m	ABH04/1.6-2m
Depth		1.6-2	2-2.45	3-3.09	0.9-1.0	1.6-2
Date Sampled		03/02/2020	10/02/2020	10/02/2020	04/02/2020	03/03/2020
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	12/03/2020	12/03/2020	12/03/2020	12/03/2020	12/03/2020
Date analysed	-	13/03/2020	13/03/2020	13/03/2020	13/03/2020	13/03/2020
Moisture	%	8.6	15	14	19	23

Moisture				
Our Reference		238561-8	238561-9	238561-10
Your Reference	UNITS	ABH05/0.5-1.5m	ABH06/1.41-2m	ATP02/0.3-0.4m
Depth		0.5-1.5	1.41-2	0.3-0.4
Date Sampled		03/02/2020	03/02/2020	04/02/2020
Type of sample		Soil	Soil	Soil
Date prepared	-	12/03/2020	12/03/2020	12/03/2020
Date analysed	-	13/03/2020	13/03/2020	13/03/2020
Moisture	%	18	15	16

Soil Aggressivity						
Our Reference		238561-3	238561-4	238561-5	238561-6	238561-7
Your Reference	UNITS	ABH01/1.6-2m	ABH02/2-2.45m	ABH02/3-3.09m	ABH03/0.9-1.0m	ABH04/1.6-2m
Depth		1.6-2	2-2.45	3-3.09	0.9-1.0	1.6-2
Date Sampled		03/02/2020	10/02/2020	10/02/2020	04/02/2020	03/03/2020
Type of sample		Soil	Soil	Soil	Soil	Soil
pH 1:5 soil:water	pH Units	5.6	6.7	6.8	5.5	6.3
Chloride, Cl 1:5 soil:water	mg/kg	350	970	730	1,600	110
Sulphate, SO4 1:5 soil:water	mg/kg	230	350	330	300	260

Soil Aggressivity				
Our Reference		238561-8	238561-9	238561-10
Your Reference	UNITS	ABH05/0.5-1.5m	ABH06/1.41-2m	ATP02/0.3-0.4m
Depth		0.5-1.5	1.41-2	0.3-0.4
Date Sampled		03/02/2020	03/02/2020	04/02/2020
Type of sample		Soil	Soil	Soil
pH 1:5 soil:water	pH Units	5.3	6.1	8.1
Chloride, Cl 1:5 soil:water	mg/kg	1,700	77	290
Sulphate, SO4 1:5 soil:water	mg/kg	380	58	130

Texture and Salinity*						
Our Reference		238561-3	238561-4	238561-5	238561-6	238561-7
Your Reference	UNITS	ABH01/1.6-2m	ABH02/2-2.45m	ABH02/3-3.09m	ABH03/0.9-1.0m	ABH04/1.6-2m
Depth		1.6-2	2-2.45	3-3.09	0.9-1.0	1.6-2
Date Sampled		03/02/2020	10/02/2020	10/02/2020	04/02/2020	03/03/2020
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	13/03/2020	13/03/2020	13/03/2020	13/03/2020	13/03/2020
Date analysed	-	13/03/2020	13/03/2020	13/03/2020	13/03/2020	13/03/2020
Electrical Conductivity 1:5 soil:water	µS/cm	440	830	720	1,100	250
Texture Value	-	7.0	7.0	8.0	8.0	8.5
Texture		MEDIUM CLAY	MEDIUM CLAY	LIGHT MEDIUM CLAY	LIGHT MEDIUM CLAY	LIGHT CLAY
ECe	dS/m	3.1	5.8	5.7	9.1	2.1
Class		SLIGHTLY SALINE	MODERATELY SALINE	MODERATELY SALINE	VERY SALINE	SLIGHTLY SALINE

Texture and Salinity*				
Our Reference		238561-8	238561-9	238561-10
Your Reference	UNITS	ABH05/0.5-1.5m	ABH06/1.41-2m	ATP02/0.3-0.4m
Depth		0.5-1.5	1.41-2	0.3-0.4
Date Sampled		03/02/2020	03/02/2020	04/02/2020
Type of sample		Soil	Soil	Soil
Date prepared	-	13/03/2020	13/03/2020	13/03/2020
Date analysed	-	13/03/2020	13/03/2020	13/03/2020
Electrical Conductivity 1:5 soil:water	µS/cm	1,300	95	320
Texture Value	-	8.0	8.0	9.0
Texture		LIGHT MEDIUM CLAY	LIGHT MEDIUM CLAY	CLAY LOAM
ECe	dS/m	10	<2	2.9
Class		VERY SALINE	NON SALINE	SLIGHTLY SALINE

ESP/CEC						
Our Reference		238561-3	238561-4	238561-5	238561-6	238561-7
Your Reference	UNITS	ABH01/1.6-2m	ABH02/2-2.45m	ABH02/3-3.09m	ABH03/0.9-1.0m	ABH04/1.6-2m
Depth		1.6-2	2-2.45	3-3.09	0.9-1.0	1.6-2
Date Sampled		03/02/2020	10/02/2020	10/02/2020	04/02/2020	03/03/2020
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	13/03/2020	13/03/2020	13/03/2020	13/03/2020	13/03/2020
Date analysed	-	13/03/2020	13/03/2020	13/03/2020	13/03/2020	13/03/2020
Exchangeable Ca	meq/100g	0.1	0.1	0.1	0.3	3.0
Exchangeable K	meq/100g	0.2	0.1	<0.1	<0.1	0.2
Exchangeable Mg	meq/100g	4.9	11	9.6	12	8.5
Exchangeable Na	meq/100g	1.9	4.0	3.2	3.3	1.2
Cation Exchange Capacity	meq/100g	7.1	15	13	15	13
ESP	%	27	26	25	21	10

ESP/CEC				
Our Reference		238561-8	238561-9	238561-10
Your Reference	UNITS	ABH05/0.5-1.5m	ABH06/1.41-2m	ATP02/0.3-0.4m
Depth		0.5-1.5	1.41-2	0.3-0.4
Date Sampled		03/02/2020	03/02/2020	04/02/2020
Type of sample		Soil	Soil	Soil
Date prepared	-	13/03/2020	13/03/2020	13/03/2020
Date analysed	-	13/03/2020	13/03/2020	13/03/2020
Exchangeable Ca	meq/100g	<0.1	0.1	4.6
Exchangeable K	meq/100g	0.1	0.1	<0.1
Exchangeable Mg	meq/100g	8.1	7.7	5.9
Exchangeable Na	meq/100g	2.6	1.7	0.97
Cation Exchange Capacity	meq/100g	11	9.7	12
ESP	%	24	18	8

sPOCAS field test			
Our Reference		238561-1	238561-2
Your Reference	UNITS	ABH05/0.5-0.6m	ATP04/0.5-0.6m
Depth		0.5-0.6	0.5-0.6
Date Sampled		03/03/2020	03/03/2020
Type of sample		Soil	Soil
Date prepared	-	11/03/2020	11/03/2020
Date analysed	-	11/03/2020	11/03/2020
pH_F (field pH test)*	pH Units	5.4	6.4
pH_{FOX} (field peroxide test)*	pH Units	3.4	4.6
Reaction Rate*	-	Low reaction	Volcanic reaction

Method ID	Methodology Summary
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA latest edition, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-002	Conductivity and Salinity - measured using a conductivity cell at 25°C in accordance with APHA latest edition 2510 and Rayment & Lyons.
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Inorg-063	pH- measured using pH meter and electrode. Soil is oxidised with Hydrogen Peroxide or extracted with water. Based on section H, Acid Sulfate Soils Laboratory Methods Guidelines, Version 2.1 - June 2004. To ensure accurate results these tests are recommended to be done in the field as pH may change with time thus these results may not be representative of true field conditions.
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA latest edition, 4110-B. Waters samples are filtered on receipt prior to analysis. Alternatively determined by colourimetry/turbidity using Discrete Analyser.
INORG-123	Determined using a "Texture by Feel" method.
Metals-009	Determination of exchangeable cations and cation exchange capacity in soils using 1M Ammonium Chloride exchange and ICP-AES analytical finish.
Metals-020	Determination of various metals by ICP-AES.

QUALITY CONTROL: Acid Extractable Cations in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			16/03/2020	5	16/03/2020	16/03/2020		16/03/2020	[NT]
Date analysed	-			17/03/2020	5	17/03/2020	17/03/2020		17/03/2020	[NT]
Magnesium	mg/kg	10	Metals-020	<10	5	2500	2600	4	107	[NT]

QUALITY CONTROL: Soil Aggressivity					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	[NT]	[NT]	[NT]	[NT]	101	[NT]
Chloride, Cl 1:5 soil:water	mg/kg	10	Inorg-081	<10	[NT]	[NT]	[NT]	[NT]	105	[NT]
Sulphate, SO4 1:5 soil:water	mg/kg	10	Inorg-081	<10	[NT]	[NT]	[NT]	[NT]	112	[NT]

QUALITY CONTROL: Texture and Salinity*					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			13/03/2020	[NT]	[NT]	[NT]	[NT]	13/03/2020	[NT]
Date analysed	-			13/03/2020	[NT]	[NT]	[NT]	[NT]	13/03/2020	[NT]
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	<1	[NT]	[NT]	[NT]	[NT]	105	[NT]

QUALITY CONTROL: ESP/CEC						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			13/03/2020	3	13/03/2020	13/03/2020		13/03/2020	[NT]
Date analysed	-			13/03/2020	3	13/03/2020	13/03/2020		13/03/2020	[NT]
Exchangeable Ca	meq/100g	0.1	Metals-009	<0.1	3	0.1	0.1	0	98	[NT]
Exchangeable K	meq/100g	0.1	Metals-009	<0.1	3	0.2	0.3	40	101	[NT]
Exchangeable Mg	meq/100g	0.1	Metals-009	<0.1	3	4.9	6.0	20	94	[NT]
Exchangeable Na	meq/100g	0.1	Metals-009	<0.1	3	1.9	1.9	0	93	[NT]
ESP	%	1	Metals-009	[NT]	3	27	23	16	[NT]	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

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CERTIFICATE OF ANALYSIS 238561-A

Client Details

Client	Douglas Partners Pty Ltd (Riverstone)
Attention	Gavin Boyd
Address	43 Hobart St, Riverstone, NSW, 2765

Sample Details

Your Reference	**84822.04, Eastern Creek**
Number of Samples	10 Soil
Date samples received	10/03/2020
Date completed instructions received	17/03/2020

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date results requested by	24/03/2020
Date of Issue	19/03/2020

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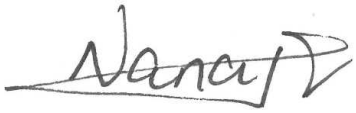
Results Approved By
Priya Samarawickrama, Senior Chemist

Authorised By



Nancy Zhang, Laboratory Manager

Chromium Suite			
Our Reference		238561-A-1	238561-A-2
Your Reference	UNITS	ABH05/0.5-0.6m	ATP04/0.5-0.6m
Depth		0.5-0.6	0.5-0.6
Date Sampled		03/03/2020	03/03/2020
Type of sample		Soil	Soil
Date prepared	-	18/03/2020	18/03/2020
Date analysed	-	18/03/2020	18/03/2020
pH $_{kcl}$	pH units	4.6	5.9
s-TAA pH 6.5	%w/w S	0.03	<0.01
TAA pH 6.5	moles H^+ /t	20	<5
Chromium Reducible Sulfur	%w/w	<0.005	<0.005
a-Chromium Reducible Sulfur	moles H^+ /t	<3	<3
S_{HCl}	%w/w S	NA	NA
S_{KCl}	%w/w S	0.023	0.014
S_{NAS}	%w/w S	NA	NA
ANC_{BT}	% $CaCO_3$	NA	NA
s-ANC_{BT}	%w/w S	NA	NA
s-Net Acidity	%w/w S	0.035	0.0070
a-Net Acidity	moles H^+ /t	22	<5
Liming rate	kg $CaCO_3$ /t	2	<0.75
a-Net Acidity without ANCE	moles H^+ /t	22	<5
Liming rate without ANCE	kg $CaCO_3$ /t	1.7	<0.75
s-Net Acidity without ANCE	%w/w S	0.035	0.0070

Method ID	Methodology Summary
Inorg-068	Chromium Reducible Sulfur - Hydrogen Sulfide is quantified by iodometric titration after distillation to determine potential acidity. Based on Acid Sulfate Soils Laboratory Methods Guidelines, Version 2.1 - June 2004.

QUALITY CONTROL: Chromium Suite						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			18/03/2020	[NT]	[NT]	[NT]	[NT]	18/03/2020	[NT]
Date analysed	-			18/03/2020	[NT]	[NT]	[NT]	[NT]	18/03/2020	[NT]
pH $_{kcl}$	pH units		Inorg-068	[NT]	[NT]	[NT]	[NT]	[NT]	92	[NT]
s-TAA pH 6.5	%w/w S	0.01	Inorg-068	<0.01	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
TAA pH 6.5	moles H^+ /t	5	Inorg-068	<5	[NT]	[NT]	[NT]	[NT]	85	[NT]
Chromium Reducible Sulfur	%w/w	0.005	Inorg-068	<0.005	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
a-Chromium Reducible Sulfur	moles H^+ /t	3	Inorg-068	<3	[NT]	[NT]	[NT]	[NT]	115	[NT]
S_{HCl}	%w/w S	0.005	Inorg-068	<0.005	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
S_{KCl}	%w/w S	0.005	Inorg-068	<0.005	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
S_{NAS}	%w/w S	0.005	Inorg-068	<0.005	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
ANC_{BT}	% $CaCO_3$	0.05	Inorg-068	<0.05	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
s-ANC_{BT}	%w/w S	0.05	Inorg-068	<0.05	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
s-Net Acidity	%w/w S	0.005	Inorg-068	<0.005	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
a-Net Acidity	moles H^+ /t	5	Inorg-068	<5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Liming rate	kg $CaCO_3$ /t	0.75	Inorg-068	<0.75	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
a-Net Acidity without ANCE	moles H^+ /t	5	Inorg-068	<5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Liming rate without ANCE	kg $CaCO_3$ /t	0.75	Inorg-068	<0.75	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
s-Net Acidity without ANCE	%w/w S	0.005	Inorg-068	<0.005	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]

Result Definitions

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NA	Test not required
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RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
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Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

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Spikes for Physical and Aggregate Tests are not applicable.

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Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

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CERTIFICATE OF ANALYSIS 238561

Client Details

Client	Douglas Partners Pty Ltd (Riverstone)
Attention	Gavin Boyd
Address	43 Hobart St, Riverstone, NSW, 2765

Sample Details

Your Reference	**84822.04, Eastern Creek**
Number of Samples	10 Soil
Date samples received	10/03/2020
Date completed instructions received	10/03/2020

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date results requested by	17/03/2020
Date of Issue	17/03/2020

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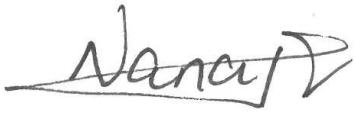
Ken Nguyen, Reporting Supervisor
Loren Bardwell, Senior Chemist
Priya Samarawickrama, Senior Chemist
Ridwan Wijaya, Lab Team Leader

Authorised By



Nancy Zhang, Laboratory Manager

Acid Extractable Cations in Soil						
Our Reference		238561-3	238561-4	238561-5	238561-6	238561-7
Your Reference	UNITS	ABH01/1.6-2m	ABH02/2-2.45m	ABH02/3-3.09m	ABH03/0.9-1.0m	ABH04/1.6-2m
Depth		1.6-2	2-2.45	3-3.09	0.9-1.0	1.6-2
Date Sampled		03/02/2020	10/02/2020	10/02/2020	04/02/2020	03/03/2020
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	16/03/2020	16/03/2020	16/03/2020	16/03/2020	16/03/2020
Date analysed	-	17/03/2020	17/03/2020	17/03/2020	17/03/2020	17/03/2020
Magnesium	mg/kg	2,300	2,300	2,500	2,500	1,800

Acid Extractable Cations in Soil				
Our Reference		238561-8	238561-9	238561-10
Your Reference	UNITS	ABH05/0.5-1.5m	ABH06/1.41-2m	ATP02/0.3-0.4m
Depth		0.5-1.5	1.41-2	0.3-0.4
Date Sampled		03/02/2020	03/02/2020	04/02/2020
Type of sample		Soil	Soil	Soil
Date prepared	-	16/03/2020	16/03/2020	16/03/2020
Date analysed	-	17/03/2020	17/03/2020	17/03/2020
Magnesium	mg/kg	1,700	2,500	1,400

Moisture						
Our Reference		238561-3	238561-4	238561-5	238561-6	238561-7
Your Reference	UNITS	ABH01/1.6-2m	ABH02/2-2.45m	ABH02/3-3.09m	ABH03/0.9-1.0m	ABH04/1.6-2m
Depth		1.6-2	2-2.45	3-3.09	0.9-1.0	1.6-2
Date Sampled		03/02/2020	10/02/2020	10/02/2020	04/02/2020	03/03/2020
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	12/03/2020	12/03/2020	12/03/2020	12/03/2020	12/03/2020
Date analysed	-	13/03/2020	13/03/2020	13/03/2020	13/03/2020	13/03/2020
Moisture	%	8.6	15	14	19	23

Moisture				
Our Reference		238561-8	238561-9	238561-10
Your Reference	UNITS	ABH05/0.5-1.5m	ABH06/1.41-2m	ATP02/0.3-0.4m
Depth		0.5-1.5	1.41-2	0.3-0.4
Date Sampled		03/02/2020	03/02/2020	04/02/2020
Type of sample		Soil	Soil	Soil
Date prepared	-	12/03/2020	12/03/2020	12/03/2020
Date analysed	-	13/03/2020	13/03/2020	13/03/2020
Moisture	%	18	15	16

Soil Aggressivity						
Our Reference		238561-3	238561-4	238561-5	238561-6	238561-7
Your Reference	UNITS	ABH01/1.6-2m	ABH02/2-2.45m	ABH02/3-3.09m	ABH03/0.9-1.0m	ABH04/1.6-2m
Depth		1.6-2	2-2.45	3-3.09	0.9-1.0	1.6-2
Date Sampled		03/02/2020	10/02/2020	10/02/2020	04/02/2020	03/03/2020
Type of sample		Soil	Soil	Soil	Soil	Soil
pH 1:5 soil:water	pH Units	5.6	6.7	6.8	5.5	6.3
Chloride, Cl 1:5 soil:water	mg/kg	350	970	730	1,600	110
Sulphate, SO4 1:5 soil:water	mg/kg	230	350	330	300	260

Soil Aggressivity				
Our Reference		238561-8	238561-9	238561-10
Your Reference	UNITS	ABH05/0.5-1.5m	ABH06/1.41-2m	ATP02/0.3-0.4m
Depth		0.5-1.5	1.41-2	0.3-0.4
Date Sampled		03/02/2020	03/02/2020	04/02/2020
Type of sample		Soil	Soil	Soil
pH 1:5 soil:water	pH Units	5.3	6.1	8.1
Chloride, Cl 1:5 soil:water	mg/kg	1,700	77	290
Sulphate, SO4 1:5 soil:water	mg/kg	380	58	130

Texture and Salinity*						
Our Reference		238561-3	238561-4	238561-5	238561-6	238561-7
Your Reference	UNITS	ABH01/1.6-2m	ABH02/2-2.45m	ABH02/3-3.09m	ABH03/0.9-1.0m	ABH04/1.6-2m
Depth		1.6-2	2-2.45	3-3.09	0.9-1.0	1.6-2
Date Sampled		03/02/2020	10/02/2020	10/02/2020	04/02/2020	03/03/2020
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	13/03/2020	13/03/2020	13/03/2020	13/03/2020	13/03/2020
Date analysed	-	13/03/2020	13/03/2020	13/03/2020	13/03/2020	13/03/2020
Electrical Conductivity 1:5 soil:water	µS/cm	440	830	720	1,100	250
Texture Value	-	7.0	7.0	8.0	8.0	8.5
Texture		MEDIUM CLAY	MEDIUM CLAY	LIGHT MEDIUM CLAY	LIGHT MEDIUM CLAY	LIGHT CLAY
ECe	dS/m	3.1	5.8	5.7	9.1	2.1
Class		SLIGHTLY SALINE	MODERATELY SALINE	MODERATELY SALINE	VERY SALINE	SLIGHTLY SALINE

Texture and Salinity*				
Our Reference		238561-8	238561-9	238561-10
Your Reference	UNITS	ABH05/0.5-1.5m	ABH06/1.41-2m	ATP02/0.3-0.4m
Depth		0.5-1.5	1.41-2	0.3-0.4
Date Sampled		03/02/2020	03/02/2020	04/02/2020
Type of sample		Soil	Soil	Soil
Date prepared	-	13/03/2020	13/03/2020	13/03/2020
Date analysed	-	13/03/2020	13/03/2020	13/03/2020
Electrical Conductivity 1:5 soil:water	µS/cm	1,300	95	320
Texture Value	-	8.0	8.0	9.0
Texture		LIGHT MEDIUM CLAY	LIGHT MEDIUM CLAY	CLAY LOAM
ECe	dS/m	10	<2	2.9
Class		VERY SALINE	NON SALINE	SLIGHTLY SALINE

ESP/CEC						
Our Reference		238561-3	238561-4	238561-5	238561-6	238561-7
Your Reference	UNITS	ABH01/1.6-2m	ABH02/2-2.45m	ABH02/3-3.09m	ABH03/0.9-1.0m	ABH04/1.6-2m
Depth		1.6-2	2-2.45	3-3.09	0.9-1.0	1.6-2
Date Sampled		03/02/2020	10/02/2020	10/02/2020	04/02/2020	03/03/2020
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	13/03/2020	13/03/2020	13/03/2020	13/03/2020	13/03/2020
Date analysed	-	13/03/2020	13/03/2020	13/03/2020	13/03/2020	13/03/2020
Exchangeable Ca	meq/100g	0.1	0.1	0.1	0.3	3.0
Exchangeable K	meq/100g	0.2	0.1	<0.1	<0.1	0.2
Exchangeable Mg	meq/100g	4.9	11	9.6	12	8.5
Exchangeable Na	meq/100g	1.9	4.0	3.2	3.3	1.2
Cation Exchange Capacity	meq/100g	7.1	15	13	15	13
ESP	%	27	26	25	21	10

ESP/CEC				
Our Reference		238561-8	238561-9	238561-10
Your Reference	UNITS	ABH05/0.5-1.5m	ABH06/1.41-2m	ATP02/0.3-0.4m
Depth		0.5-1.5	1.41-2	0.3-0.4
Date Sampled		03/02/2020	03/02/2020	04/02/2020
Type of sample		Soil	Soil	Soil
Date prepared	-	13/03/2020	13/03/2020	13/03/2020
Date analysed	-	13/03/2020	13/03/2020	13/03/2020
Exchangeable Ca	meq/100g	<0.1	0.1	4.6
Exchangeable K	meq/100g	0.1	0.1	<0.1
Exchangeable Mg	meq/100g	8.1	7.7	5.9
Exchangeable Na	meq/100g	2.6	1.7	0.97
Cation Exchange Capacity	meq/100g	11	9.7	12
ESP	%	24	18	8

sPOCAS field test			
Our Reference		238561-1	238561-2
Your Reference	UNITS	ABH05/0.5-0.6m	ATP04/0.5-0.6m
Depth		0.5-0.6	0.5-0.6
Date Sampled		03/03/2020	03/03/2020
Type of sample		Soil	Soil
Date prepared	-	11/03/2020	11/03/2020
Date analysed	-	11/03/2020	11/03/2020
pH_F (field pH test)*	pH Units	5.4	6.4
pH_{FOX} (field peroxide test)*	pH Units	3.4	4.6
Reaction Rate*	-	Low reaction	Volcanic reaction

Method ID	Methodology Summary
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA latest edition, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-002	Conductivity and Salinity - measured using a conductivity cell at 25°C in accordance with APHA latest edition 2510 and Rayment & Lyons.
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Inorg-063	pH- measured using pH meter and electrode. Soil is oxidised with Hydrogen Peroxide or extracted with water. Based on section H, Acid Sulfate Soils Laboratory Methods Guidelines, Version 2.1 - June 2004. To ensure accurate results these tests are recommended to be done in the field as pH may change with time thus these results may not be representative of true field conditions.
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA latest edition, 4110-B. Waters samples are filtered on receipt prior to analysis. Alternatively determined by colourimetry/turbidity using Discrete Analyser.
INORG-123	Determined using a "Texture by Feel" method.
Metals-009	Determination of exchangeable cations and cation exchange capacity in soils using 1M Ammonium Chloride exchange and ICP-AES analytical finish.
Metals-020	Determination of various metals by ICP-AES.

QUALITY CONTROL: Acid Extractable Cations in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			16/03/2020	5	16/03/2020	16/03/2020		16/03/2020	[NT]
Date analysed	-			17/03/2020	5	17/03/2020	17/03/2020		17/03/2020	[NT]
Magnesium	mg/kg	10	Metals-020	<10	5	2500	2600	4	107	[NT]

QUALITY CONTROL: Soil Aggressivity					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	[NT]	[NT]	[NT]	[NT]	101	[NT]
Chloride, Cl 1:5 soil:water	mg/kg	10	Inorg-081	<10	[NT]	[NT]	[NT]	[NT]	105	[NT]
Sulphate, SO4 1:5 soil:water	mg/kg	10	Inorg-081	<10	[NT]	[NT]	[NT]	[NT]	112	[NT]

QUALITY CONTROL: Texture and Salinity*					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			13/03/2020	[NT]	[NT]	[NT]	[NT]	13/03/2020	[NT]
Date analysed	-			13/03/2020	[NT]	[NT]	[NT]	[NT]	13/03/2020	[NT]
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	<1	[NT]	[NT]	[NT]	[NT]	105	[NT]

QUALITY CONTROL: ESP/CEC						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			13/03/2020	3	13/03/2020	13/03/2020		13/03/2020	[NT]
Date analysed	-			13/03/2020	3	13/03/2020	13/03/2020		13/03/2020	[NT]
Exchangeable Ca	meq/100g	0.1	Metals-009	<0.1	3	0.1	0.1	0	98	[NT]
Exchangeable K	meq/100g	0.1	Metals-009	<0.1	3	0.2	0.3	40	101	[NT]
Exchangeable Mg	meq/100g	0.1	Metals-009	<0.1	3	4.9	6.0	20	94	[NT]
Exchangeable Na	meq/100g	0.1	Metals-009	<0.1	3	1.9	1.9	0	93	[NT]
ESP	%	1	Metals-009	[NT]	3	27	23	16	[NT]	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

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PETROGRAPHIC REPORT ON A DRILL CORE SAMPLE (20040496) FROM EASTERN CREEK PROJECT

prepared for

DOUGLAS PARTNERS PTY LTD
RIVERSTONE, NSW

Order Number:

Invoice Number:

Client Ref: Gavin Boyd

Issued by

K. E. Spring
B.Sc.(Hons), MAppSc
15 May 2020

GEOCHEMPET SERVICES, BRISBANE

TriLab #:	20040496	**Date Sampled**:	Unknown
Sample Type:	Drill Core	**Date Received**:	23/04/2020
Borehole No.:	ABH02	**Depth**:	2.5 – 2.88 m
Project:	Eastern Creek		
Work Requested	Petrographic analysis		
Methods	Adapted from ASTM C295 Standard Guide for *Petrographic Assessment of Aggregates for Concrete* and the AS2758.1 – 2014 *Aggregates and rock for engineering purposes part 1; Concrete aggregates (Appendix B)*		
Identification	Silty claystone (residual soil)		

Description

The drill core specimen consists of light reddish to light yellowish-grey, soft, stiff, argillic material interpreted to be silty claystone. The rock carries disrupted lenses of reddish secondary iron oxides along undulating bedding surfaces and small disrupted patches of carbonaceous matter.

Plate 1: Photograph of the supplied drill core.

In order to permit detailed microscopic examination in transmitted polarised light, a thin section was prepared using impregnation with a blue dyed epoxy to stabilise existing clays. An approximate composition of the claystone, expressed in volume percent and based on a brief count of 100 widely spaced points in thin section, is:

Hard, Durable Components

10%	quartz grains
3%	feldspar grains
1%	intermediate volcanic clasts
3%	acid tuff clasts
3%	quartzite clasts
5%	hematite/goethite
1%	hematized, leucoxenized or finely rutilated clasts of former detrital opaque oxides

Soft, Weak &/Or Deleterious Components

53%	illite-smectite clay cement variably stained by secondary iron oxide and intermingled very fine quartz
4%	kaolinite clay
17%	earthy secondary iron oxide
<1%	carbonaceous matter
<1%	pores

In thin section the rock displays primary textures of silty to finely sandy claystone style. It consists of scattered sub-rounded to angular sand grains which are mainly from to 0.05 mm to 0.2 mm in size.

A tenth of the rock consists of simple quartz along with 3% feldspar grains. Other robust mineral grains comprise lithic clasts of acid and intermediate tuffaceous/volcanic clasts, quartzite, hematized, leucoxenized or finely rutilated clasts of former detrital opaque oxides) and hematite/goethite in minor amounts.

The cement matrix is dominated by illite/smectite and earthy secondary iron oxide finely intermingled with quartz along with minor kaolinite. Carbonaceous material occurs as thin streaks scattered along bedding planes.

Comments and Interpretations

The rock represented by supplied drill core sample (labelled 20040496) from ABH02 at 2.5 – 2.88 m depth is interpreted to have originated as a claystone; carrying about 21% silt and fine sand grains as quartz, feldspar and lithic clasts of quartzite and volcanics, with some secondary iron oxide and carbonaceous matter in the clayey matrix. It is apparent that the material has experienced weathering, resulting in the development of pigmentation by secondary iron oxides (goethite and hematite).

For engineering purposes, the rock in the supplied drill core sample may be summarised as:

- **silty claystone** (a sedimentary rock type)
- apparently quite weathered
- containing about 36% of robust, durable components (various mineral grains)
- containing about 64% of weak, soft or otherwise non-durable components (clay as well as earthy secondary iron oxide)
- **soft**
- **weak**

The rock is predicted to be **non-durable**.

Free silica content

About 24% in the form of quartz grains and in lithic clasts of acid tuff and quartzite and finely intermingled with clayey matrix.

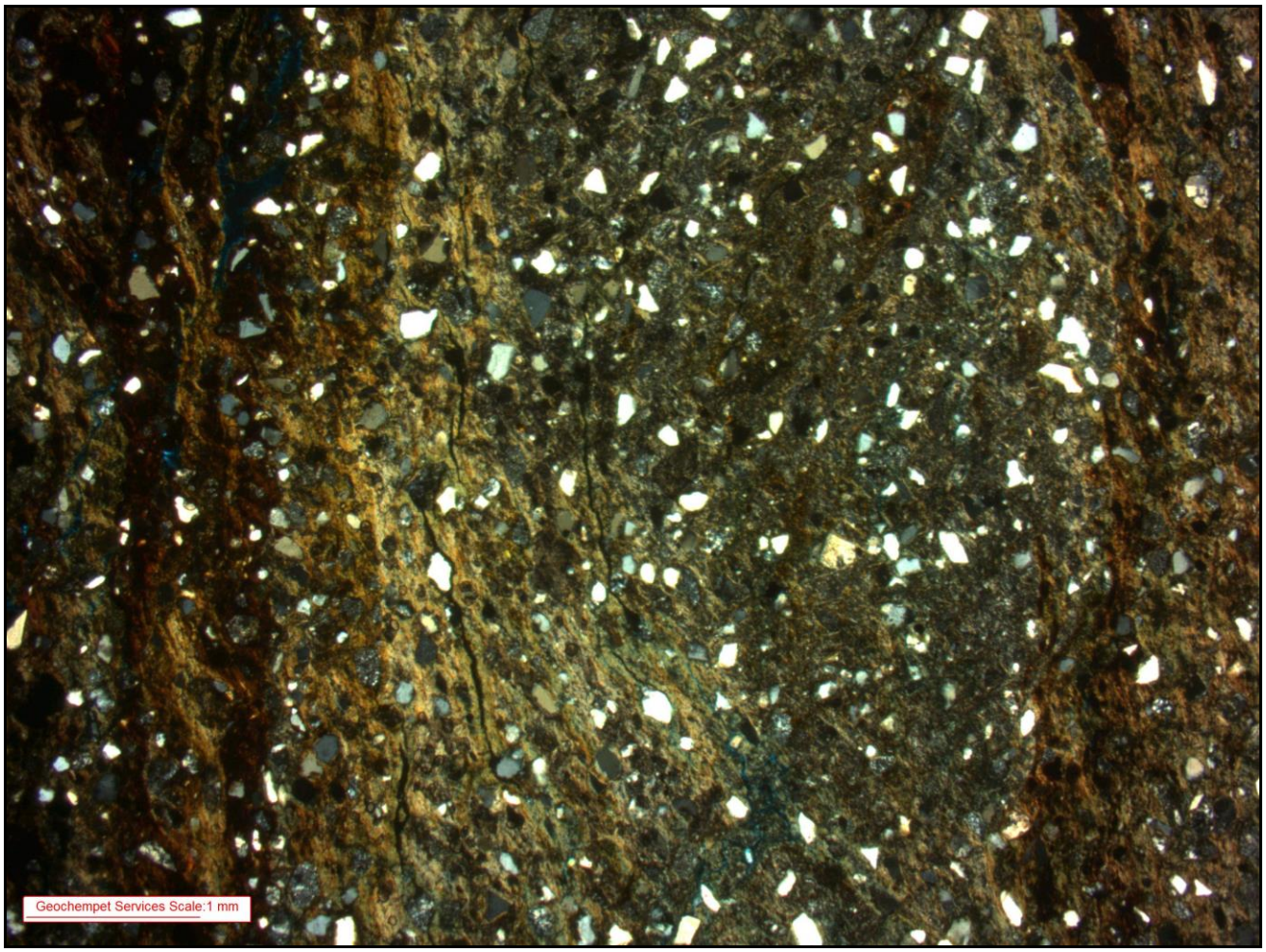

Plate 2: Micrograph taken at low magnification in transmitted, cross polarised light of part of the silty claystone, showing minor quartz grains, along with minor secondary iron oxide replacement of the matrix and thin streaks of carbonaceous matter along bedding.

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XRD ANALYSIS
ON A DRILL CORE SAMPLE (20040496)
FROM EASTERN CREEK PROJECT

prepared for

DOUGLAS PARTNERS PTY LTD
RIVERSTONE, NSW

Order Number:
Invoice Number:
Client Ref: Gavin Boyd

Issued by

K. E. Spring B.Sc.(Hons), MAppSc
15 May 2020

GEOCHEMPET SERVICES, BRISBANE

QUANTITATIVE XRD ANALYSIS ON A DRILL CORE SAMPLE (20040496) FROM EASTERN CREEK PROJECT

TriLab #:	20040496	**Date Sampled**:	Unknown
Sample Type:	Drill Core	**Date Received**:	23/04/2020
Borehole No.:	ABH02	**Depth**:	2.5 – 2.88 m
Project:	Eastern Creek		
Work Requested	Qualitative X-ray diffraction analysis of the drill core sample for mineralogy.		

Plate 1: Photograph of the supplied drill core.

Method

A sub-sample of the drill core sample was despatched to QUT. The sample was crushed in a RockLabs Swing Mill in repeated short bursts until the entirety of the sample passed a 355 micron

sieve. A sub-sample of the crushed material were accurately weighed and a specimen prepared for X-ray diffraction analysis by the addition of a corundum (Al_2O_3) internal standard at 20wt%. The specimen was micronised in a McCrone mill using zirconia beads and ethanol, then dried in an oven overnight at 40°C. The resultant homogenous powder was back-pressed into a sample holder.

A small portion of the sample was disaggregated by hand and dispersed in water. After sonication (5 min) and settling for 5 min, the fine fraction (nominally < 5 µm in suspension) was transferred via pipette to a low background plate and allowed to settle and dry (these samples have the label N in this report). This preparation is used to concentrate the fine (clay dominant) fraction and aids identification of the clays present. This means ratios of the clays and other phases present in this extract may vary from the bulk sample: the fine fraction results are qualitative. The air-dried slide was further treated in an ethylene glycol atmosphere (60 °C) for several hours, then immediately re-examined.

Step scanned X-ray diffraction pattern was collected for half an hour using a PANalytical X'Pert Pro powder diffractometer and cobalt Kα radiation operating in Bragg-Brentano geometry. The collected data was analysed using JADE (V2010, Materials Data Inc.) and X'Pert Highscore Plus (V4, PANalytical) with various reference databases (PDF4+, AMCSD, COD) for phase identification. Rietveld refinement was performed using TOPAS (V5, Bruker) for quantitative phase analysis. The known concentration of added corundum facilitates reporting of absolute phase concentrations for the modelled phases. The sum of the absolute concentrations is subtracted from 100wt% to obtain a residual (called non-diffracting/unidentified, also known as "amorphous"). The residual represents the unexplained portion of the pattern: it may be non-diffracting content but will also contain unidentified phases or poorly modelled phases. It is not an accurate measure as its error is the sum of the errors of the modelled phases. An absorption contrast correction (Brindley) was made on the basis that the average size of the particles in the specimens is approximately 5 µm. The more absorbing phases will be under estimated if their actual average particle size is greater than 5 µm. The estimated uncertainties in the reported phase abundances are 20wt% relative or better for every modelled phase. Due to propagation of errors the uncertainty in the amorphous (non-diffracting/unidentified) content is higher at approximately 30wt% relative. The detection limit and limit of quantification using our method is approximately 1wt% or less depending on the phase in question and sample matrix.

Powder X-ray diffraction analysis is phase analysis, it is not chemical analysis. Phase concentrations may be poorly estimated if an incorrect chemical formula is assigned to a phase. Therefore, the closest matches in the reference phase identification database were used for modelling in the quantitative phase analysis, but other members of the identified mineral groups may be present.

Results

The powder X-ray diffraction pattern show the presence of crystalline phases. Graphics of the collected diffraction patterns along with the phases identified are included at the end of this report. Below is a table of phase concentration estimates. The estimated normalised concentration of the corundum internal standard in the sample is higher than 20wt%. This means there is an unaccounted component in the sample (i.e., the sample contain non-diffracting/unidentified material).

Two expandable clay phases are required for accurate modelling in the bulk sample, but the clay specific analysis patterns are not definitive for either smectite or illite-smectite based on the glycol peak position shifts. Nevertheless, there is an expandable clay present in this sample, which was modelled as smectite and illite-smectite.

The minerals identified by XRD analysis (in weight percent) are:

quartz	28.2%
goethite	3.4%
smectite	8.6%
illite/smectite	17.3%
kaolinite	25.7%
amorphous/unidentified content	16.9%

The fine fraction analysis results indicated:

illite-smectite mixed layer	major
kaolinite	major

Comments

The quartz content (as quartz grains) of the drill core sample (20040496) is 28.2% along with 3.4% goethite. The remainder of the rock is composed of a clay cement totalling 51.6% containing 17.3% illite-smectite, 25.7% kaolinite and 8.6% smectite. The 16.9% amorphous content is interpreted to be largely composed of disordered clays of mixed type (probably illite-smectite from fine fraction analysis) mingled with carbonaceous matter along with unidentified mineral and component in minor amounts.

The rock type in the supplied drill core sample is interpreted to be a silty claystone (residual soil) containing an abundance of moderate to high swelling illite-smectite clay types. The claystone is most likely from an acid igneous source due to the reasonably high quartz content identified.

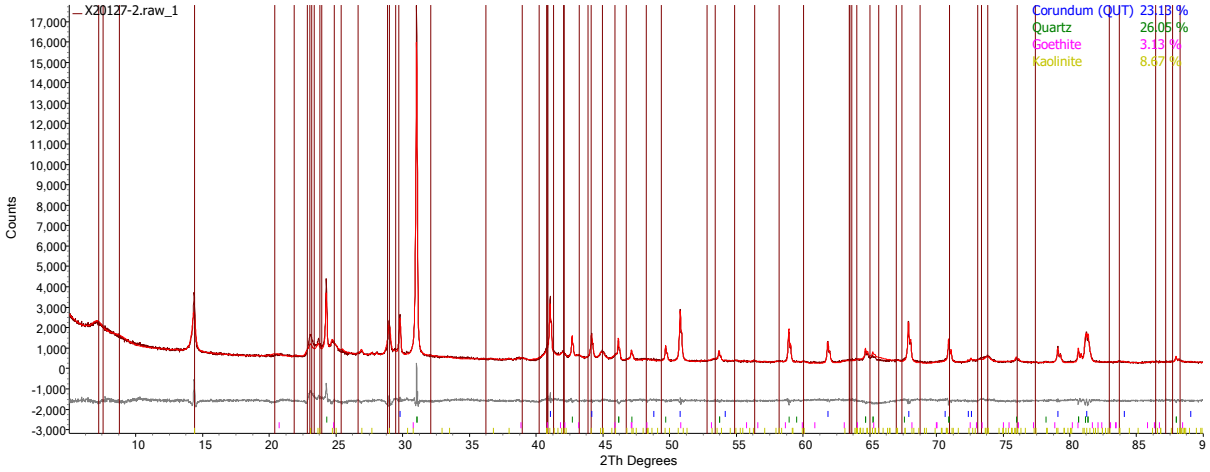

Figure 1. Powder XRD pattern.

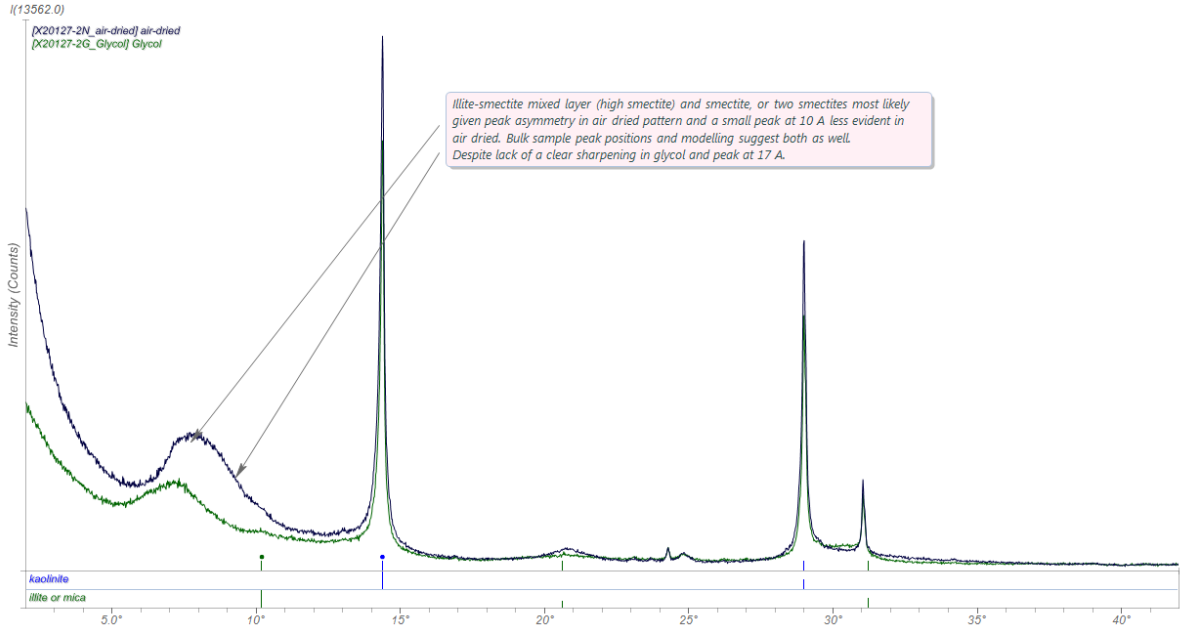

Figure 2. Clay XRD pattern.

Gavin Boyd

From: thom@geochempet.com
Sent: Thursday, 18 June 2020 8:14 AM
To: Gavin Boyd
Cc: 'Chris Park'
Subject: RE: Eastern Creek

Hey Gavin,

Sorry this slipped passed me.

Your spot on with you description.

Regards
Thomas Spring
Petrologist and Geologist
BAppSc MAppSc MAusIMM

28 Cameron Street
Clontarf QLD 4019
P (07) 3284 0020
W www.geochempet.com

Please note that there will be a price increase effective from 1st July 2020.

Please contact myself or your regular Geochempet Services contact for a new price list.

Keep up with Geochempet Services by following us on social media

From: Gavin Boyd <Gavin.Boyd@douglaspartners.com.au>
Sent: Monday, 15 June 2020 3:55 PM
To: thom@geochempet.com
Cc: Chris Park <chris.park@trilab.com.au>
Subject: FW: Eastern Creek

Hi Thom,

Thanks for your time before. As discussed, the client has made the following comment with respect to the XRD

- The X-ray diffraction test report states that smectite/illite-smectite clay behaviour was not definitive but nevertheless they have analysed assuming this anyway. Can you please explain why they have proceeded this way.

My understanding is as follows (from discussions with yourself and review of the report):

1. The smectite/illite-smectite minerals are intermingled or mixed.
2. An attempt by the laboratory technician was made to determine the smectite/illite-smectite using the glycol peak position shift method was made but it was unsuccessful due to the inter-mingled nature of the clays as the glycol treatment shifts both peaks to a common position making it difficult to delineate.
3. There was enough evidence through the peak asymmetry in air dried pattern together with an associated graph (small peak at 10A less evident in air dried position) of the expandable clay to estimate the smectite/illite-smectite mineral proportions. These positions are likely despite the lack of clarity in the glycol peak position. Figure 2 of your report.
4. The above is relatively common scenario for clay soils.

If you could confirm and/or clarify the above so I can respond to my client with the correct terminology that would be helpful. Any references would be helpful.

Gavin Boyd | Senior Associate / Geotechnical Engineer
Douglas Partners Pty Ltd | ABN 75 053 980 117 | www.douglaspartners.com.au
43 Hobart Street Riverstone NSW 2765 | PO Box 267 Riverstone NSW 2765
P: 02 4666 0450 | M: 0431 496 721 | E: Gavin.Boyd@douglaspartners.com.au

To find information on our COVID-19 measures, please visit douglaspartners.com.au/news/covid-19

From: Chris Park [mailto:chris.park@trilab.com.au]
Sent: Friday, 15 May 2020 10:25 AM
To: Gavin Boyd
Subject: RE: Eastern Creek

Good Morning Gavin

Sorry for the slight delay and please see attached XRD and Petrographic test results just in from Geochempet

Have a good weekend

Regards

Chris Park
Laboratory Manager

For & on behalf of
Trilab Pty Ltd
346A Bilsen Road
GEEBUNG QLD 4034

p 07 3265 5656
e chris.park@trilab.com.au
w www.trilab.com.au

Please take the time to complete our feedback form below so you can help us improve our service.

Trilab
Soil Rock Calibration

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Geebung
QLD 4034
Ph: +61 7 3265 5656

Perth
2 Kimmer Place,
Queens Park
WA 6107
Ph: +61 8 9258 8323

SHRINK SWELL INDEX TEST REPORT

Test Method AS 1289 7.1.1

Client	Douglas Partners Pty Ltd	**Report No.**	20040495-ISS
		Workorder No.	0007231
Address	43 Hobart Street, Riverstone NSW 2765	**Test Date**	22/4/20-8/5/20
		Report Date	11/05/2020
Project	Eastern Creek		
Description	CLAY - red / brown / grey		

Sample No.	20040495
Client ID	ABH01
Depth (m)	1.00-1.28

RESULTS OF TESTING

SWELL SPECIMEN

Swell Pressure (kPa) *	-
Wet Density (t/m^3)	2.20
Initial Moisture Content (%)	15.6
Final Moisture Content (%)	19.5
Swell (%)	**3.2**

SHRINKAGE SPECIMEN

Estimated Inert Inclusions (%)	0
Extent of Crumbling	Nil
Extent of Cracking	Nil
Moisture (%)	16.5
Shrinkage (%)	**2.4**

SHRINK SWELL INDEX (Iss) (%)	**2.2**

Notes/Remarks:

Sample/s supplied by client Tested as received

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.

Tested at Trilab Brisbane Laboratory

Authorised Signatory

C. Park

NATA ACCREDITED FOR TECHNICAL COMPETENCE

Laboratory No. 9926

Material Test Report

Douglas Partners
Geotechnics / Environment / Groundwater
Douglas Partners Pty Ltd
Sydney Laboratory
96 Hermitage Road West Ryde NSW 2114
Phone: (02) 9809 0666
Fax: (02) 9809 0666
Email: andrew.hutchings@douglaspartners.com.au

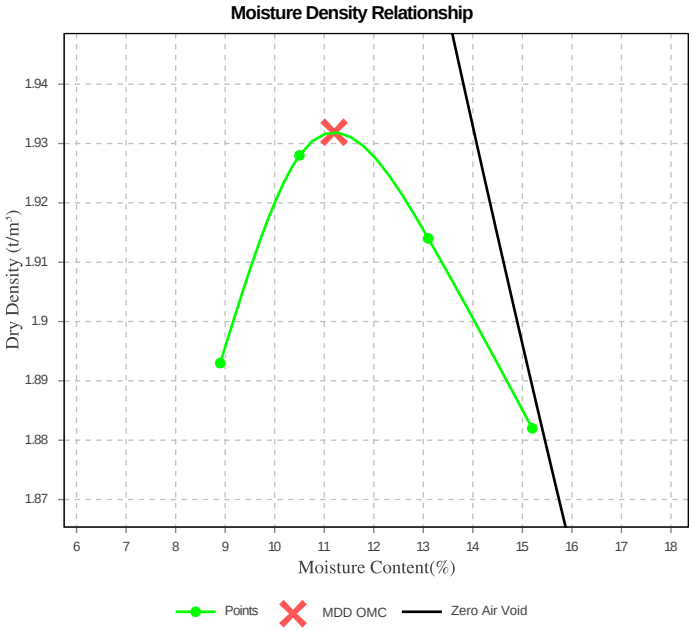
Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Andrew Hutchings
Laboratory Manager
NATA Accredited Laboratory Number: 828

Report Number: **84822.04-4B**
Issue Number: 1
Date Issued: 17/04/2020
Client: Cleanaway Operations Pty Ltd
Level 4, 441 St Kilda Road, Melbourne 3004
Contact: Nick Schutt
Project Number: 84822.04
Project Name: Green Waratah
Project Location: 339 Wallgrove Road, Eastern Creek
Work Request: 5759
Sample Number: SY-5759B
Date Sampled: 21/02/2020
Dates Tested: 18/03/2020 - 25/03/2020
Sampling Method: Sampled by Engineering Department
The results apply to the sample as received
Sample Location: **ABH01 (1.6-2m)**
Material: SILTSTONE

Dry Density - Moisture Relationship (AS 1289 5.1.1 & 2.1.1)	
Mould Type	1 LITRE MOULD A
Compaction	Standard
Maximum Dry Density (t/m^3)	1.93
Optimum Moisture Content (%)	11.0
Oversize Sieve (mm)	19
Oversize Material Wet (%)	8
Method used to Determine Plasticity	Visual Assessment
Curing Hours	2

Moisture Content (AS 1289 2.1.1)	
Moisture Content (%)	8.8



Material Test Report

Douglas Partners
Geotechnics / Environment / Groundwater
Douglas Partners Pty Ltd
Central Coast Laboratory
Unit 5/3 Teamster Close Tuggerah NSW 2259
Phone: (02) 4351 1422
Fax: (02) 4351 1422
Email: dan.byrnes@douglaspartners.com.au

Accredited for compliance with ISO/IEC 17025 - Testing

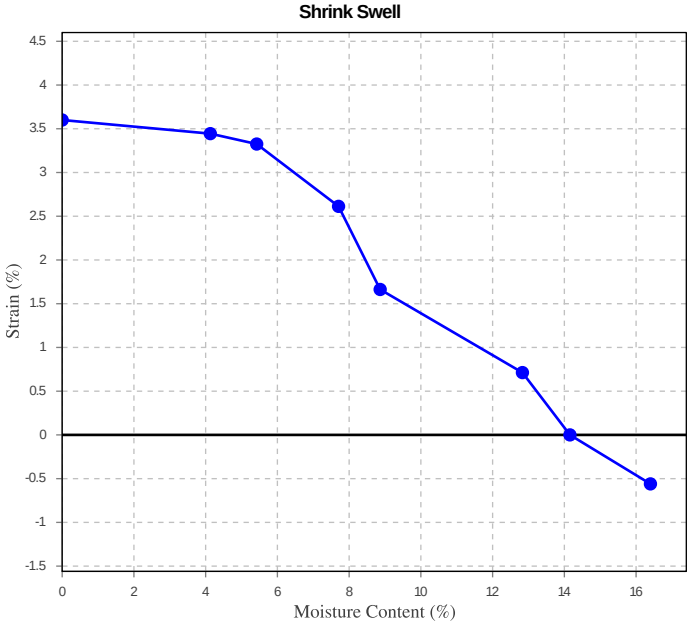
Approved Signatory: Dan Byrnes
Laboratory Manager
NATA Accredited Laboratory Number: 828

Report Number: **84822.04-5a**
Issue Number: 1
Date Issued: 21/04/2020
Client: Cleanaway Operations Pty Ltd
Level 4, 441 St Kilda Road, Melbourne 3004
Contact: Nick Schutt
Project Number: 84822.04
Project Name: Green Waratah
Project Location: 339 Wallgrove Road, Eastern Creek
Work Request: 2429
Sample Number: CC-2429A
Date Sampled: 21/02/2020
Dates Tested: 06/04/2020 - 14/04/2020
Sampling Method: Sampled by Engineering Department
The results apply to the sample as received
Sample Location: **ABH01, Depth: 1.6-2.0m**

Shrink Swell Index (AS 1289 7.1.1 & 2.1.1)	
Iss (%)	**2.2**
Visual Description	Silty clay with trace gravel
* Shrink Swell Index (Iss) reported as the percentage vertical strain per pF change in suction.	

Core Shrinkage Test	
Shrinkage Strain - Oven Dried (%)	**3.6**
Estimated % by volume of significant inert inclusions	10
Cracking	Slightly Cracked
Crumbling	No
Moisture Content (%)	14.2

Swell Test	
Initial Pocket Penetrometer (kPa)	300
Final Pocket Penetrometer (kPa)	280
Initial Moisture Content (%)	14.2
Final Moisture Content (%)	16.4
Swell (%)	**0.6**
* NATA Accreditation does not cover the performance of pocket penetrometer readings.	



Material Test Report

Douglas Partners
Geotechnics / Environment / Groundwater
Douglas Partners Pty Ltd
Sydney Laboratory
96 Hermitage Road West Ryde NSW 2114
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Fax: (02) 9809 0666
Email: andrew.hutchings@douglaspartners.com.au

Accredited for compliance with ISO/IEC 17025 - Testing

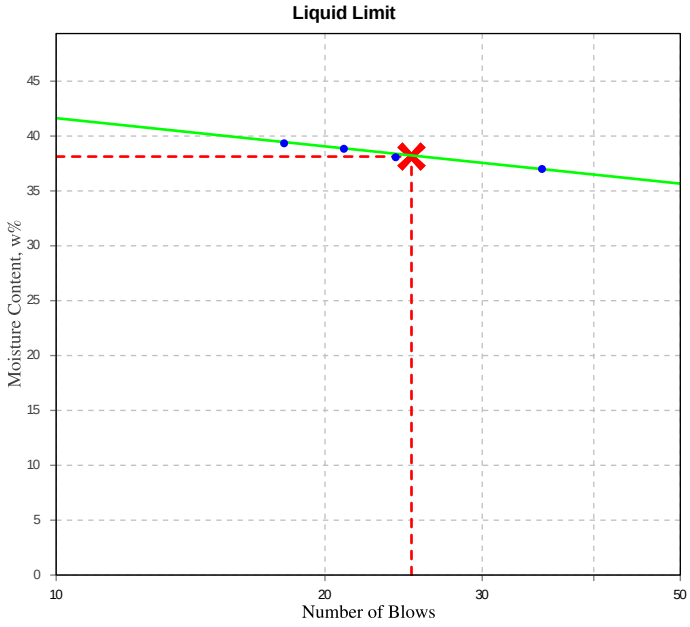
Approved Signatory: Andrew Hutchings
Laboratory Manager
NATA Accredited Laboratory Number: 828

Report Number: **84822.04-4**
Issue Number: 1
Date Issued: 27/04/2020
Client: Cleanaway Operations Pty Ltd
Level 4, 441 St Kilda Road, Melbourne 3004
Contact: Nick Schutt
Project Number: 84822.04
Project Name: Green Waratah
Project Location: 339 Wallgrove Road, Eastern Creek
Work Request: 5759
Sample Number: SY-5759B
Date Sampled: 21/02/2020
Dates Tested: 18/03/2020 - 21/04/2020
Sampling Method: Sampled by Client
The results apply to the sample as received
Sample Location: **ABH01 (1.6-2m)**
Material: SILTSTONE

Atterberg Limit (AS1289 3.1.1 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried / Air Dried / Natural / Unknown		
Preparation Method	Wet Sieve / Dry Sieve / Both Sieves		
Liquid Limit (%)	38		
Plastic Limit (%)	17		
Plasticity Index (%)	**21**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Linear Shrinkage (%)	10.5		
Cracking Crumbling Curling	None		

Emerson Class Number of a Soil (AS 1289 3.8.1)		Min	Max
Emerson Class	**2**		
Soil Description	SILTSTONE		
Nature of Water	Distilled		
Temperature of Water (^{o}C)	23		



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Accredited for compliance with ISO/IEC 17025 - Testing

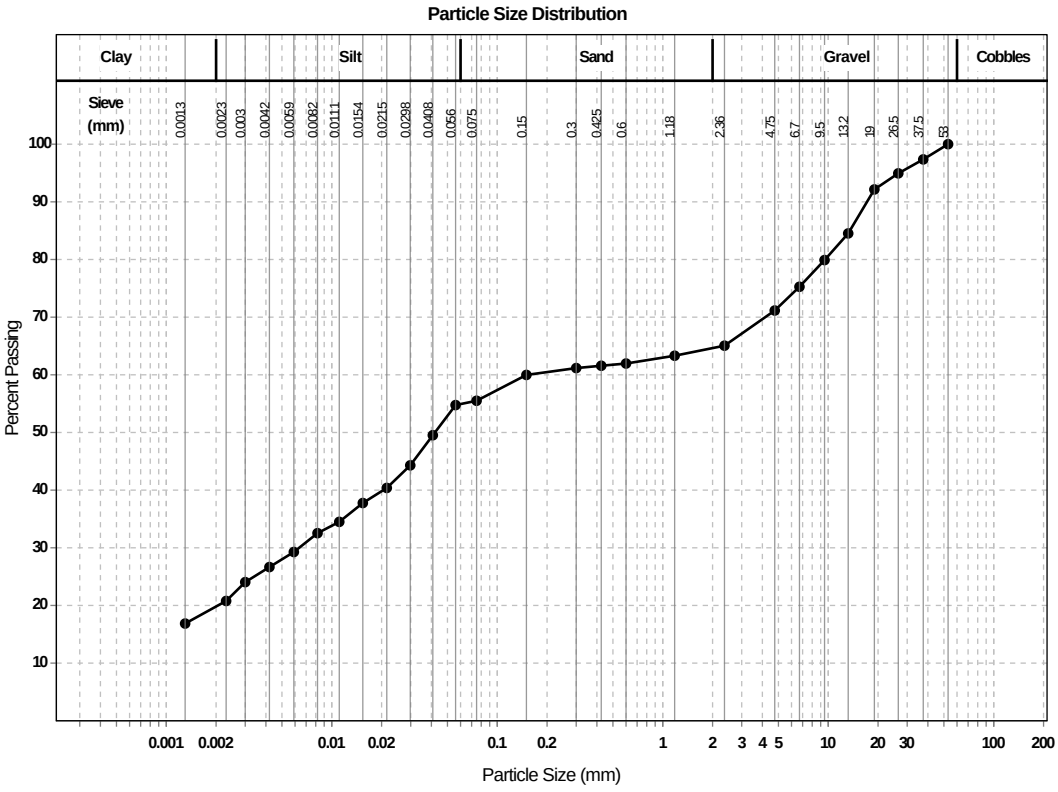
Approved Signatory: Andrew Hutchings
Laboratory Manager
NATA Accredited Laboratory Number: 828

Report Number: **84822.04-4B**
Issue Number: 1
Date Issued: 17/04/2020
Client: Cleanaway Operations Pty Ltd
Level 4, 441 St Kilda Road, Melbourne 3004
Contact: Nick Schutt
Project Number: 84822.04
Project Name: Green Waratah
Project Location: 339 Wallgrove Road, Eastern Creek
Work Request: 5759
Sample Number: SY-5759B
Date Sampled: 21/02/2020
Dates Tested: 18/03/2020 - 25/03/2020
Sampling Method: Sampled by Engineering Department
The results apply to the sample as received
Sample Location: **ABH01 (1.6-2m)**
Material: SILTSTONE

Fine Analysis using a Hydrometer (AS 1289 3.6.3)	
Method of Dispersion	Mechanical Device
Loss in Pretreatment	

Particle Size Distribution (AS 1289 3.6.1)			
Sieve	Passed %	Passing Limits	
53 mm	**100**		
37.5 mm	**97**		
26.5 mm	**95**		
19 mm	**92**		
13.2 mm	**85**		
9.5 mm	**80**		
6.7 mm	**75**		
4.75 mm	**71**		
2.36 mm	**65**		
1.18 mm	**63**		
0.6 mm	**62**		
0.425 mm	**62**		
0.3 mm	**61**		
0.15 mm	**60**		
0.075 mm	**56**		

Fine Analysis Using a Hydrometer (AS 1289 3.6.3)	
Particle Size (mm)	Passed %
0.0560	**54.7**
0.0408	**49.5**
0.0298	**44.3**
0.0215	**40.4**
0.0154	**37.8**
0.0111	**34.5**
0.0082	**32.5**
0.0059	**29.3**
0.0042	**26.7**
0.0030	**24.0**
0.0023	**20.8**
0.0013	**16.9**



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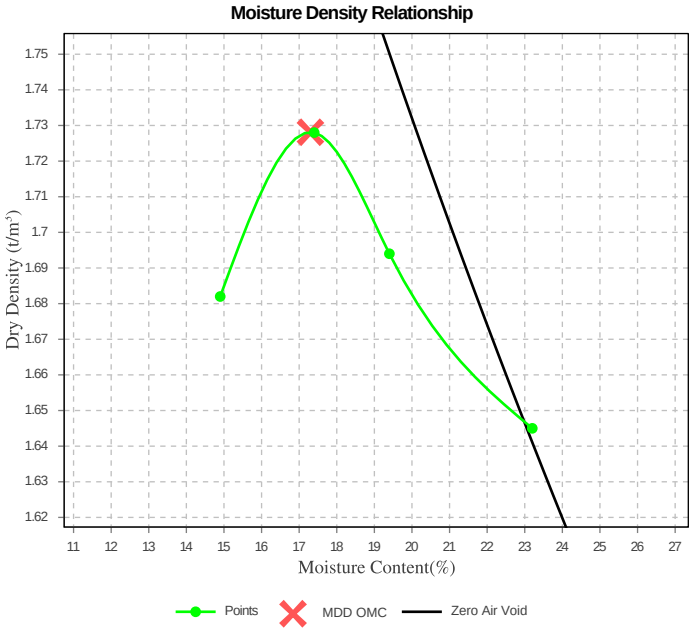
NATA Accredited Laboratory Number: 828

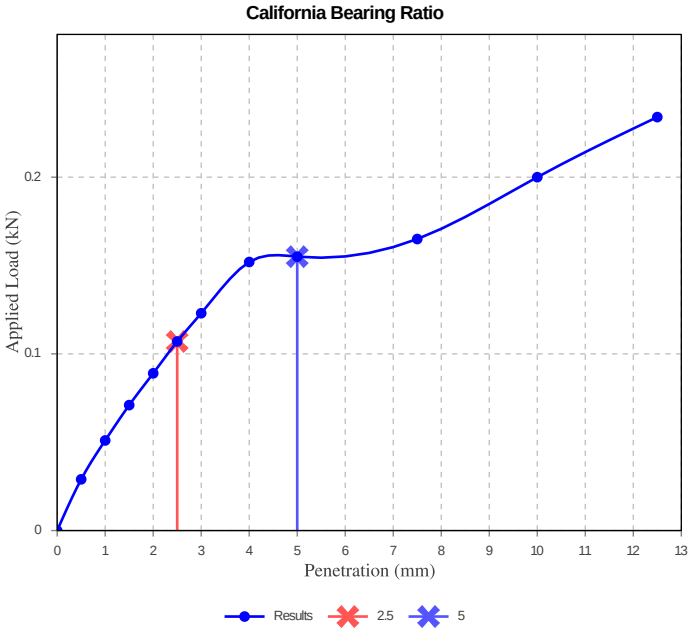
Report Number: **84822.04-4B**
Issue Number: 1
Date Issued: 17/04/2020
Client: Cleanaway Operations Pty Ltd
Level 4, 441 St Kilda Road, Melbourne 3004
Contact: Nick Schutt
Project Number: 84822.04
Project Name: Green Waratah
Project Location: 339 Wallgrove Road, Eastern Creek
Work Request: 5759
Sample Number: SY-5759A
Date Sampled: 21/02/2020
Dates Tested: 18/03/2020 - 16/04/2020
Sampling Method: Sampled by Engineering Department
The results apply to the sample as received
Sample Location: **ABH01A (1.3-1.6m)**
Material: SILTY CLAY trace ironstone gravel

Dry Density - Moisture Relationship (AS 1289 5.1.1 & 2.1.1)	
Mould Type	1 LITRE MOULD A
Compaction	Standard
Maximum Dry Density (t/m^3)	1.73
Optimum Moisture Content (%)	17.5
Oversize Sieve (mm)	19
Oversize Material Wet (%)	0
Method used to Determine Plasticity	Visual Assessment
Curing Hours	48

Moisture Content (AS 1289 2.1.1)	
Moisture Content (%)	17.0

California Bearing Ratio (RMS T117 & T120)		Min	Max
CBR taken at	2.5 mm		
CBR %	**1.0**		
Method of Compactive Effort	Standard		
Method used to Determine MDD	AS 1289 5.1.1 & 2.1.1		
Maximum Dry Density (t/m^3)	1.728		
Optimum Moisture Content (%)	17.3		
Target Laboratory Density Ratio (%)	100		
Laboratory Density Ratio (%)	100		
Target Laboratory Moisture Ratio (%)	100		
Laboratory Moisture Ratio (%)	98		
Dry Density after Soaking (t/m^3)	1.590		
Field Moisture Content (%)	17.0		
Moisture Content Top 30mm (%)	29.1		
Moisture Content Full Depth (%)	25.7		
Mass Surcharge (kg)	4.5		
Soaking Period (days)	10		
Swell (%)	8.4		
Material Retained on 19mm (%)	1		
Oversize Material (mm)	19		
Oversize Material Included	Excluded		
Oversize Material (%)	0		





Material Test Report

Douglas Partners
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96 Hermitage Road West Ryde NSW 2114
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Accredited for compliance with ISO/IEC 17025 - Testing

NATA
WORLD RECOGNISED ACCREDITATION

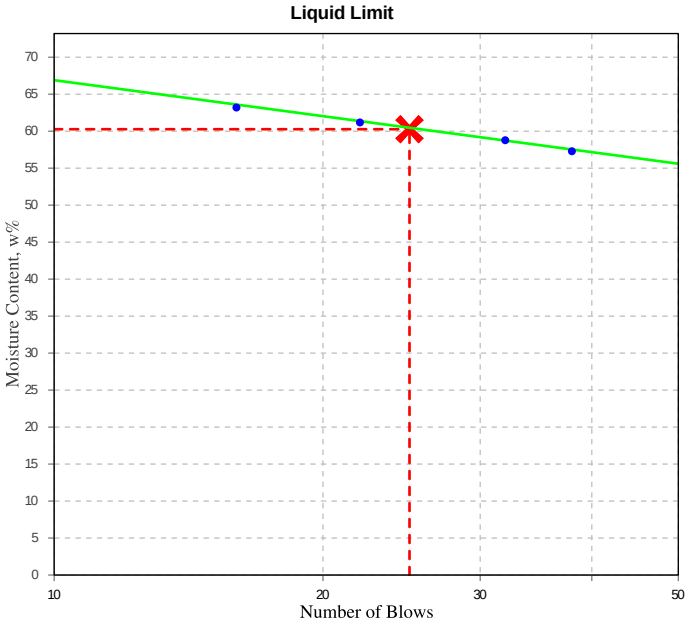
Approved Signatory: Andrew Hutchings
Laboratory Manager
NATA Accredited Laboratory Number: 828

Report Number: **84822.04-4B**
Issue Number: 1
Date Issued: 17/04/2020
Client: Cleanaway Operations Pty Ltd
Level 4, 441 St Kilda Road, Melbourne 3004
Contact: Nick Schutt
Project Number: 84822.04
Project Name: Green Waratah
Project Location: 339 Wallgrove Road, Eastern Creek
Work Request: 5759
Sample Number: SY-5759A
Date Sampled: 21/02/2020
Dates Tested: 18/03/2020 - 07/04/2020
Sampling Method: Sampled by Engineering Department
The results apply to the sample as received
Sample Location: **ABH01A (1.3-1.6m)**
Material: SILTY CLAY trace ironstone gravel

Atterberg Limit (AS1289 3.1.1 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	60		
Plastic Limit (%)	23		
Plasticity Index (%)	**37**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Linear Shrinkage (%)	14.5		
Cracking Crumbling Curling	Curling		

Emerson Class Number of a Soil (AS 1289 3.8.1)		Min	Max
Emerson Class	**2**		
Soil Description	SILTY CLAY trace ironstone gravel		
Nature of Water	Distilled		
Temperature of Water (^{o}C)	20		



Material Test Report

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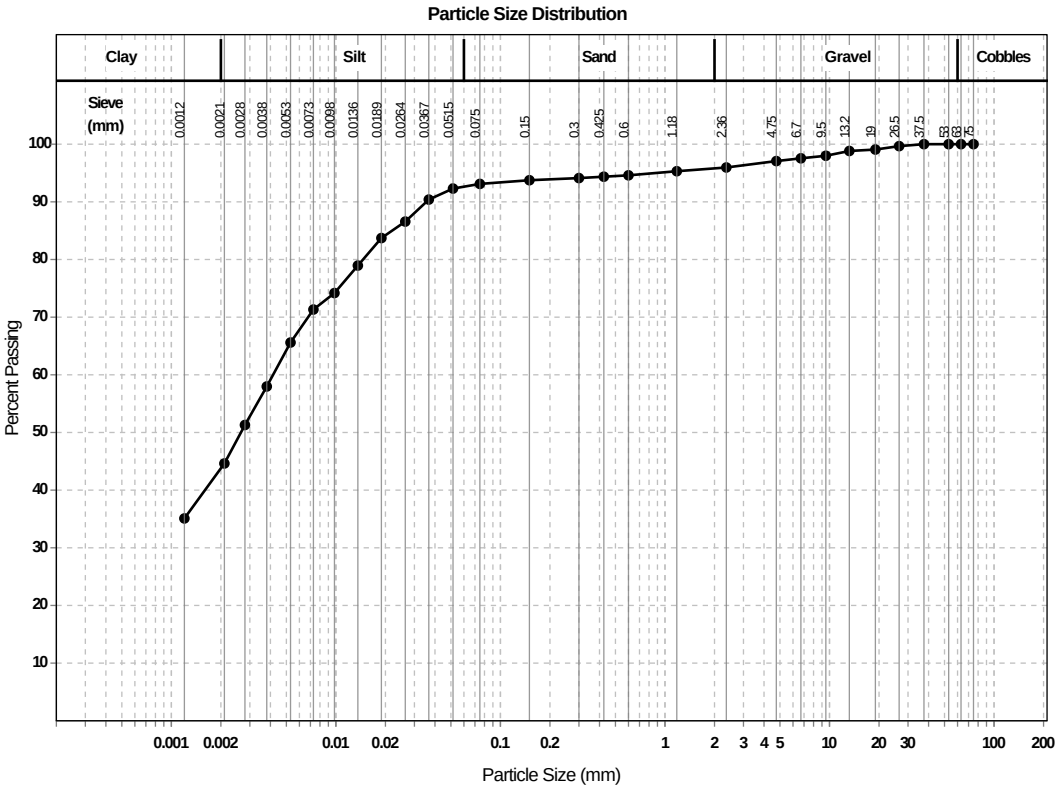
Approved Signatory: Andrew Hutchings
Laboratory Manager
NATA Accredited Laboratory Number: 828

Report Number: **84822.04-4B**
Issue Number: 1
Date Issued: 17/04/2020
Client: Cleanaway Operations Pty Ltd
Level 4, 441 St Kilda Road, Melbourne 3004
Contact: Nick Schutt
Project Number: 84822.04
Project Name: Green Waratah
Project Location: 339 Wallgrove Road, Eastern Creek
Work Request: 5759
Sample Number: SY-5759A
Date Sampled: 21/02/2020
Dates Tested: 18/03/2020 - 26/03/2020
Sampling Method: Sampled by Engineering Department
The results apply to the sample as received
Sample Location: **ABH01A (1.3-1.6m)**
Material: SILTY CLAY trace ironstone gravel

Fine Analysis using a Hydrometer (AS 1289 3.6.3)	
Method of Dispersion	Mechanical Device
Loss in Pretreatment	

Particle Size Distribution (AS 1289 3.6.1)			
Sieve	Passed %	Passing Limits	
37.5 mm	**100**		
26.5 mm	**100**		
19 mm	**99**		
13.2 mm	**99**		
9.5 mm	**98**		
6.7 mm	**98**		
4.75 mm	**97**		
2.36 mm	**96**		
1.18 mm	**95**		
0.6 mm	**95**		
0.425 mm	**94**		
0.3 mm	**94**		
0.15 mm	**94**		
0.075 mm	**93**		

Fine Analysis Using a Hydrometer (AS 1289 3.6.3)	
Particle Size (mm)	Passed %
0.0515	**92.3**
0.0367	**90.4**
0.0264	**86.6**
0.0189	**83.7**
0.0136	**79.0**
0.0098	**74.2**
0.0073	**71.3**
0.0053	**65.6**
0.0038	**58.0**
0.0028	**51.3**
0.0021	**44.6**
0.0012	**35.1**



Material Test Report

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Central Coast Laboratory
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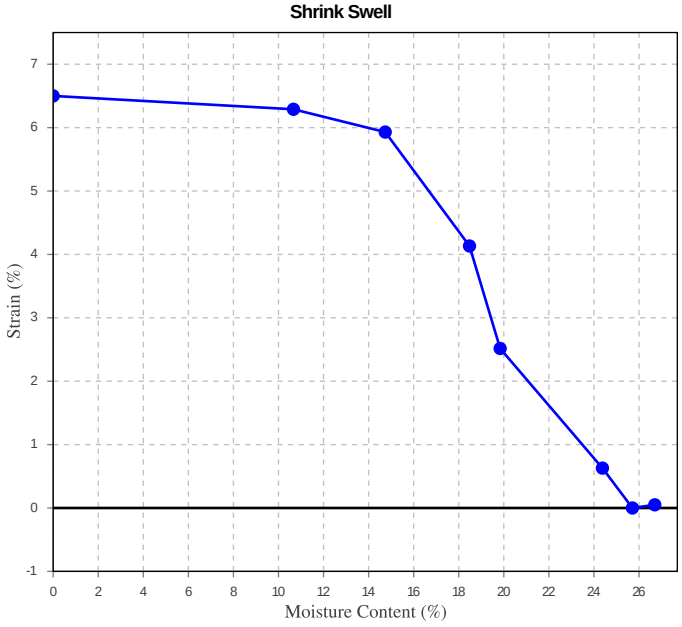
Approved Signatory: Dan Byrnes
Laboratory Manager
NATA Accredited Laboratory Number: 828

Report Number: **84822.04-5a**
Issue Number: 1
Date Issued: 21/04/2020
Client: Cleanaway Operations Pty Ltd
Level 4, 441 St Kilda Road, Melbourne 3004
Contact: Nick Schutt
Project Number: 84822.04
Project Name: Green Waratah
Project Location: 339 Wallgrove Road, Eastern Creek
Work Request: 2429
Sample Number: CC-2429B
Date Sampled: 21/02/2020
Dates Tested: 06/04/2020 - 14/04/2020
Sampling Method: Sampled by Engineering Department
The results apply to the sample as received
Sample Location: **ABH02, Depth: 1.5-2.0m**

Shrink Swell Index (AS 1289 7.1.1 & 2.1.1)	
Iss (%)	**3.6**
Visual Description	Silty clay with trace gravel
* Shrink Swell Index (Iss) reported as the percentage vertical strain per pF change in suction.	

Core Shrinkage Test	
Shrinkage Strain - Oven Dried (%)	**6.5**
Estimated % by volume of significant inert inclusions	0
Cracking	Slightly Cracked
Crumbling	No
Moisture Content (%)	25.7

Swell Test	
Initial Pocket Penetrometer (kPa)	170
Final Pocket Penetrometer (kPa)	160
Initial Moisture Content (%)	26.0
Final Moisture Content (%)	26.7
Swell (%)	**-0.0**
* NATA Accreditation does not cover the performance of pocket penetrometer readings.	



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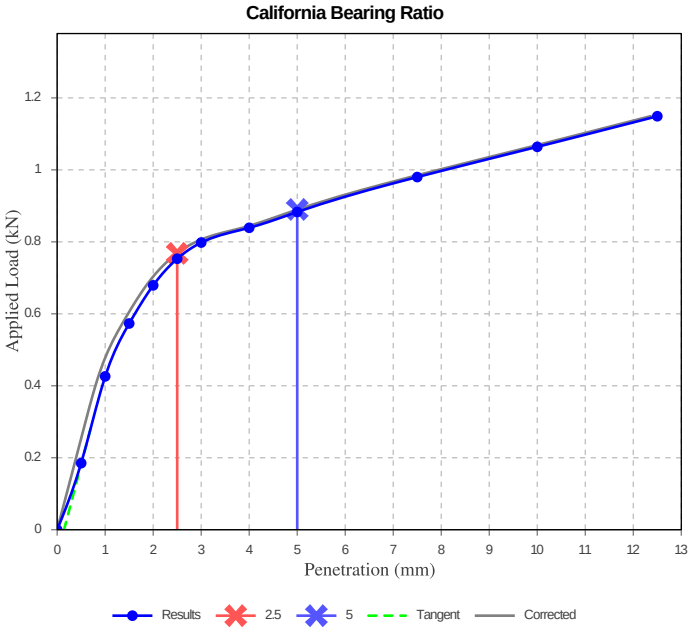
Report Number: **84822.04-4B**
Issue Number: 1
Date Issued: 17/04/2020
Client: Cleanaway Operations Pty Ltd
Level 4, 441 St Kilda Road, Melbourne 3004
Contact: Nick Schutt
Project Number: 84822.04
Project Name: Green Waratah
Project Location: 339 Wallgrove Road, Eastern Creek
Work Request: 5759
Sample Number: SY-5759C
Date Sampled: 21/02/2020
Dates Tested: 18/03/2020 - 16/04/2020
Sampling Method: Sampled by Engineering Department
The results apply to the sample as received
Sample Location: **ABH02A (1.5-2m)**
Material: SILTY CLAY trace ironstone gravel

California Bearing Ratio (RMS T117 & T120)		Min	Max
CBR taken at	2.5 mm		
CBR %	**6**		
Method of Compactive Effort	Standard		
Method used to Determine MDD	AS 1289 5.1.1 & 2.1.1		
Maximum Dry Density (t/m^3)	1.551		
Optimum Moisture Content (%)	25.7		
Target Laboratory Density Ratio (%)	100		
Laboratory Density Ratio (%)	100		
Target Laboratory Moisture Ratio (%)	100		
Laboratory Moisture Ratio (%)	99		
Dry Density after Soaking (t/m^3)	1.547		
Field Moisture Content (%)	28.1		
Moisture Content Top 30mm (%)	27.1		
Moisture Content Full Depth (%)	27.4		
Mass Surcharge (kg)	4.5		
Soaking Period (days)	10		
Swell (%)	0.2		
Material Retained on 19mm (%)	0		
Oversize Material (mm)	19		
Oversize Material Included	Excluded		
Oversize Material (%)	0		



Material Test Report

Douglas Partners
Geotechnics / Environment / Groundwater
Douglas Partners Pty Ltd
Sydney Laboratory
96 Hermitage Road West Ryde NSW 2114
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Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Andrew Hutchings
Laboratory Manager
NATA Accredited Laboratory Number: 828

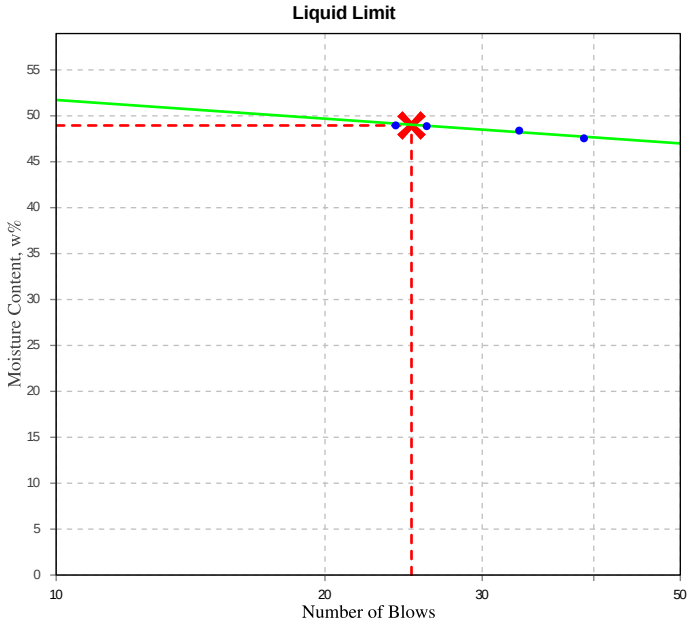
Report Number: **84822.04-4B**
Issue Number: 1
Date Issued: 17/04/2020
Client: Cleanaway Operations Pty Ltd
Level 4, 441 St Kilda Road, Melbourne 3004
Contact: Nick Schutt
Project Number: 84822.04
Project Name: Green Waratah
Project Location: 339 Wallgrove Road, Eastern Creek
Work Request: 5759
Sample Number: SY-5759D
Date Sampled: 21/02/2020
Dates Tested: 18/03/2020 - 14/04/2020
Sampling Method: Sampled by Engineering Department
The results apply to the sample as received
Sample Location: **ABH02A (2.4-2.8m)**
Material: SILTY CLAY

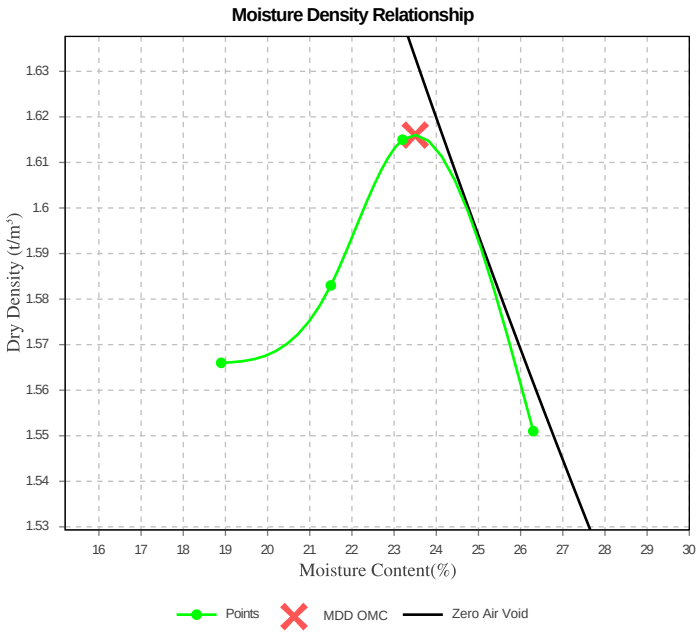
Atterberg Limit (AS1289 3.1.1 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	49		
Plastic Limit (%)	21		
Plasticity Index (%)	**28**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Linear Shrinkage (%)	12.5		
Cracking Crumbling Curling	None		

Dry Density - Moisture Relationship (AS 1289 5.1.1 & 2.1.1)	
Mould Type	1 LITRE MOULD A
Compaction	Standard
Maximum Dry Density (t/m^3)	1.62
Optimum Moisture Content (%)	23.5
Oversize Sieve (mm)	19
Oversize Material Wet (%)	0
Method used to Determine Plasticity	Visual Assessment
Curing Hours	96

Moisture Content (AS 1289 2.1.1)	
Moisture Content (%)	26.3





Material Test Report

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Accredited for compliance with ISO/IEC 17025 - Testing

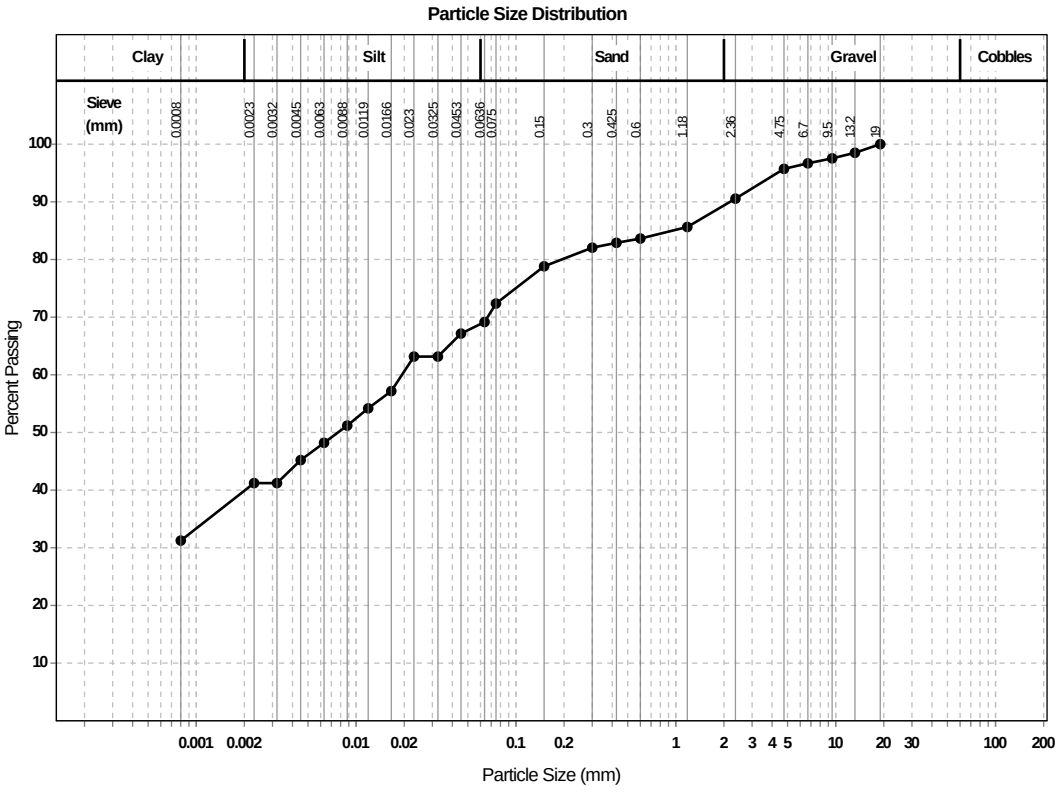
Approved Signatory: Andrew Hutchings
Laboratory Manager
NATA Accredited Laboratory Number: 828

Report Number: **84822.04-4**
Issue Number: 1
Date Issued: 27/04/2020
Client: Cleanaway Operations Pty Ltd
Level 4, 441 St Kilda Road, Melbourne 3004
Contact: Nick Schutt
Project Number: 84822.04
Project Name: Green Waratah
Project Location: 339 Wallgrove Road, Eastern Creek
Work Request: 5759
Sample Number: SY-5759D
Date Sampled: 21/02/2020
Dates Tested: 18/03/2020 - 26/03/2020
Sampling Method: Sampled by Client
The results apply to the sample as received
Sample Location: **ABH02A (2.4-2.8m)**
Material: SILTY CLAY

Fine Analysis using a Hydrometer (AS 1289 3.6.3)	
Method of Dispersion	Mechanical Device
Loss in Pretreatment	

Particle Size Distribution (AS 1289 3.6.1)			
Sieve	Passed %	Passing Limits	
19 mm	**100**		
13.2 mm	**99**		
9.5 mm	**98**		
6.7 mm	**97**		
4.75 mm	**96**		
2.36 mm	**91**		
1.18 mm	**86**		
0.6 mm	**84**		
0.425 mm	**83**		
0.3 mm	**82**		
0.15 mm	**79**		
0.075 mm	**72**		

Fine Analysis Using a Hydrometer (AS 1289 3.6.3)	
Particle Size (mm)	Passed %
0.0636	**69.1**
0.0453	**67.2**
0.0325	**63.2**
0.0230	**63.2**
0.0166	**57.2**
0.0119	**54.2**
0.0088	**51.2**
0.0063	**48.2**
0.0045	**45.2**
0.0032	**41.2**
0.0023	**41.2**
0.0008	**31.2**



Material Test Report

Douglas Partners
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Accredited for compliance with ISO/IEC 17025 - Testing

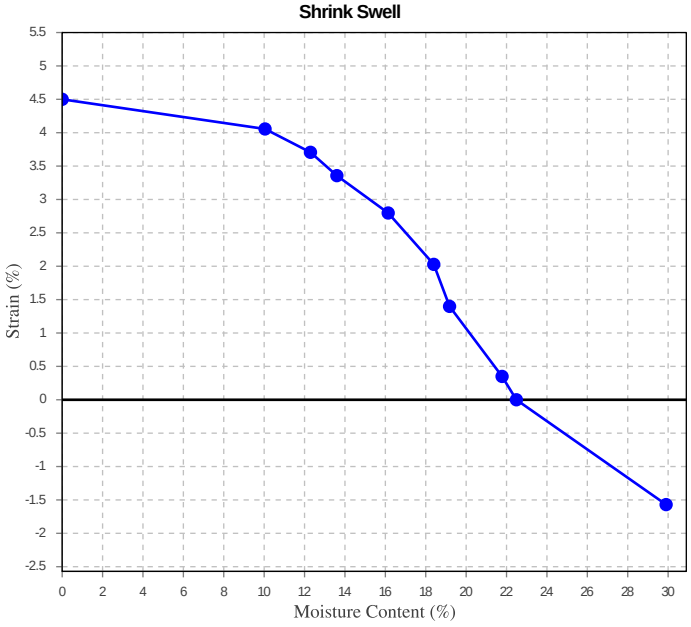
Approved Signatory: Dan Byrnes
Laboratory Manager
NATA Accredited Laboratory Number: 828

Report Number:	**84822.04-5a**
Issue Number:	1
Date Issued:	21/04/2020
Client:	Cleanaway Operations Pty Ltd
	Level 4, 441 St Kilda Road, Melbourne 3004
Contact:	Nick Schutt
Project Number:	84822.04
Project Name:	Green Waratah
Project Location:	339 Wallgrove Road, Eastern Creek
Work Request:	2429
Sample Number:	CC-2429C
Date Sampled:	21/02/2020
Dates Tested:	06/04/2020 - 14/04/2020
Sampling Method:	Sampled by Engineering Department
	The results apply to the sample as received
Sample Location:	**ABH03, Depth: 1.0-1.25m**

Shrink Swell Index (AS 1289 7.1.1 & 2.1.1)	
Iss (%)	**2.9**
Visual Description	Silty clay
* Shrink Swell Index (Iss) reported as the percentage vertical strain per pF change in suction.	

Core Shrinkage Test	
Shrinkage Strain - Oven Dried (%)	**4.5**
Estimated % by volume of significant inert inclusions	5
Cracking	Slightly Cracked
Crumbling	No
Moisture Content (%)	22.5

Swell Test	
Initial Pocket Penetrometer (kPa)	360
Final Pocket Penetrometer (kPa)	200
Initial Moisture Content (%)	24.4
Final Moisture Content (%)	29.9
Swell (%)	**1.6**
* NATA Accreditation does not cover the performance of pocket penetrometer readings.	



Material Test Report

Douglas Partners
Geotechnics / Environment / Groundwater
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Accredited for compliance with ISO/IEC 17025 - Testing

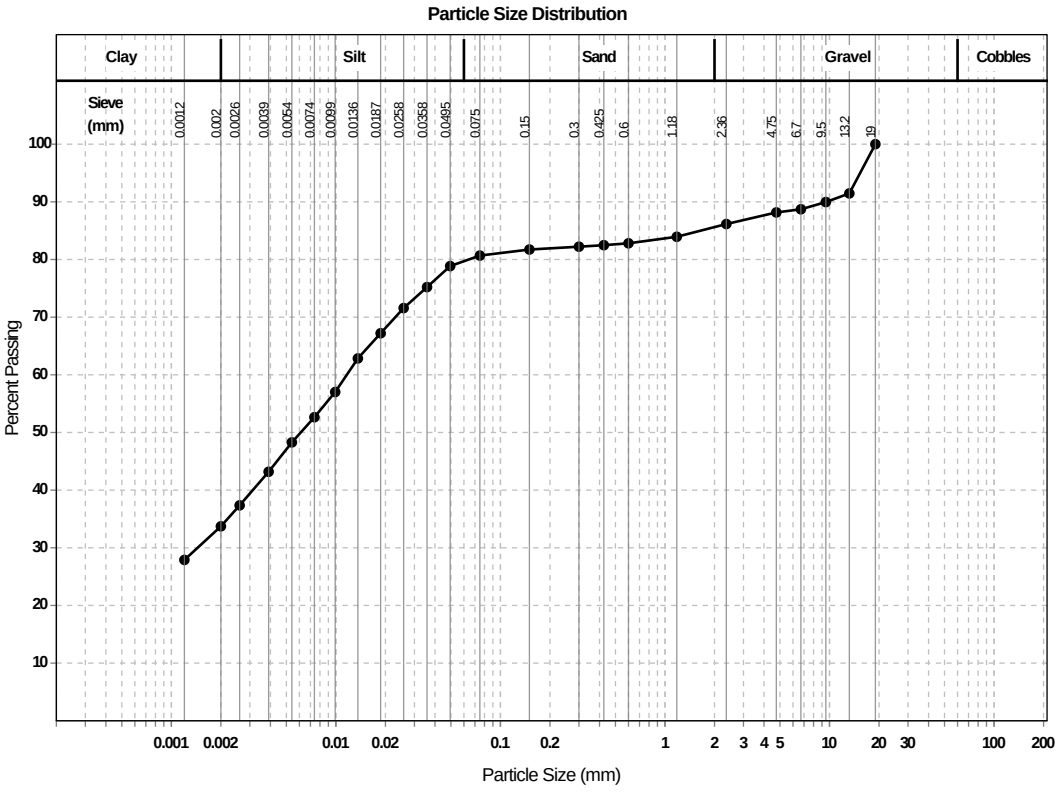
Approved Signatory: Andrew Hutchings
Laboratory Manager
NATA Accredited Laboratory Number: 828

Report Number: **84822.04-4**
Issue Number: 1
Date Issued: 27/04/2020
Client: Cleanaway Operations Pty Ltd
Level 4, 441 St Kilda Road, Melbourne 3004
Contact: Nick Schutt
Project Number: 84822.04
Project Name: Green Waratah
Project Location: 339 Wallgrove Road, Eastern Creek
Work Request: 5759
Sample Number: SY-5759G
Date Sampled: 21/02/2020
Dates Tested: 18/03/2020 - 08/04/2020
Sampling Method: Sampled by Client
The results apply to the sample as received
Sample Location: **ABH04 (2.0-2.2m)**
Material: SILTY CLAY

Fine Analysis using a Hydrometer (AS 1289 3.6.3)	
Method of Dispersion	Mechanical Device
Loss in Pretreatment	

Particle Size Distribution (AS 1289 3.6.1)			
Sieve	Passed %	Passing Limits	
19 mm	**100**		
13.2 mm	**91**		
9.5 mm	**90**		
6.7 mm	**89**		
4.75 mm	**88**		
2.36 mm	**86**		
1.18 mm	**84**		
0.6 mm	**83**		
0.425 mm	**82**		
0.3 mm	**82**		
0.15 mm	**82**		
0.075 mm	**81**		

Fine Analysis Using a Hydrometer (AS 1289 3.6.3)	
Particle Size (mm)	Passed %
0.0495	**78.9**
0.0358	**75.2**
0.0258	**71.6**
0.0187	**67.2**
0.0136	**62.8**
0.0099	**57.0**
0.0074	**52.6**
0.0054	**48.3**
0.0039	**43.2**
0.0026	**37.4**
0.0020	**33.7**
0.0012	**27.9**



Material Test Report

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Accredited for compliance with ISO/IEC 17025 - Testing

NATA
WORLD RECOGNISED ACCREDITATION

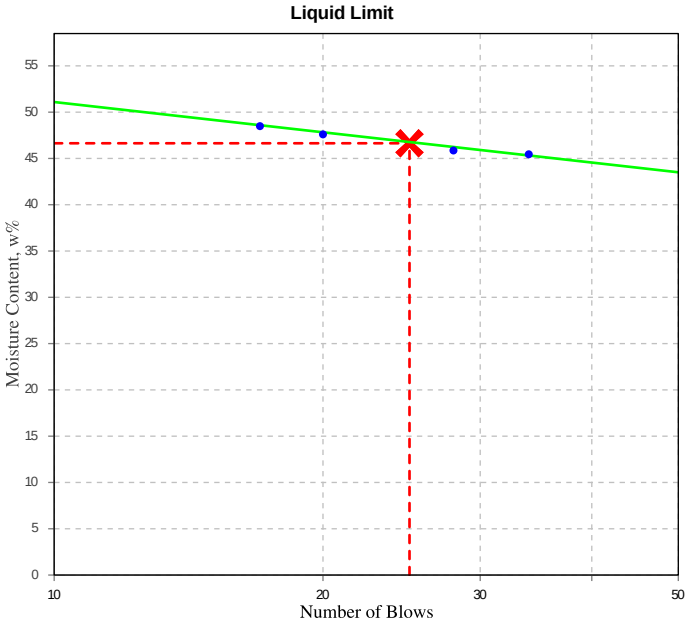
Approved Signatory: Andrew Hutchings
Laboratory Manager
NATA Accredited Laboratory Number: 828

Report Number: **84822.04-4**
Issue Number: 1
Date Issued: 27/04/2020
Client: Cleanaway Operations Pty Ltd
Level 4, 441 St Kilda Road, Melbourne 3004
Contact: Nick Schutt
Project Number: 84822.04
Project Name: Green Waratah
Project Location: 339 Wallgrove Road, Eastern Creek
Work Request: 5759
Sample Number: SY-5759G
Date Sampled: 21/02/2020
Dates Tested: 18/03/2020 - 22/04/2020
Sampling Method: Sampled by Client
The results apply to the sample as received
Sample Location: **ABH04 (2.0-2.2m)**
Material: SILTY CLAY

Atterberg Limit (AS1289 3.1.1 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	47		
Plastic Limit (%)	20		
Plasticity Index (%)	**27**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Linear Shrinkage (%)	12.5		
Cracking Crumbling Curling	None		

Emerson Class Number of a Soil (AS 1289 3.8.1)		Min	Max
Emerson Class	**2**		
Soil Description	Silty CLAY		
Nature of Water	Distilled		
Temperature of Water (^{o}C)	23		



Material Test Report

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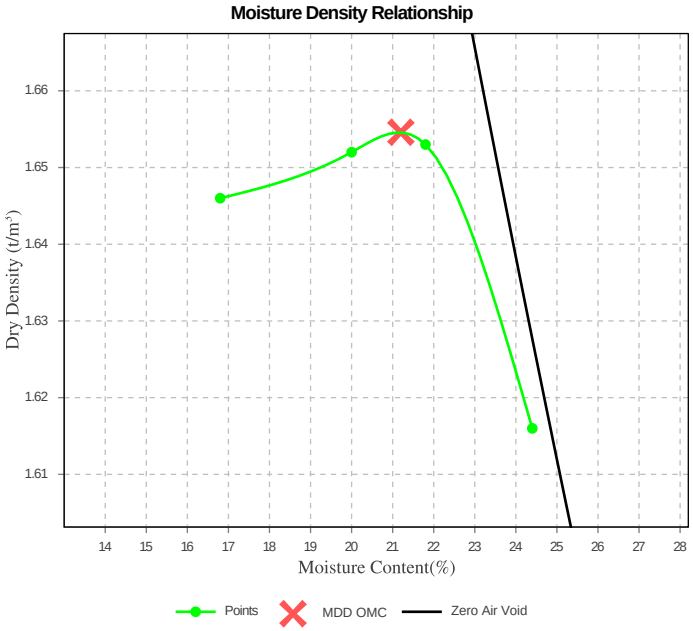
Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Andrew Hutchings
Laboratory Manager
NATA Accredited Laboratory Number: 828

Report Number: **84822.04-4B**
Issue Number: 1
Date Issued: 17/04/2020
Client: Cleanaway Operations Pty Ltd
Level 4, 441 St Kilda Road, Melbourne 3004
Contact: Nick Schutt
Project Number: 84822.04
Project Name: Green Waratah
Project Location: 339 Wallgrove Road, Eastern Creek
Work Request: 5759
Sample Number: SY-5759F
Date Sampled: 21/02/2020
Dates Tested: 18/03/2020 - 30/03/2020
Sampling Method: Sampled by Engineering Department
The results apply to the sample as received
Sample Location: **ABH04 (1-2m)**
Material: SILTY CLAY

Dry Density - Moisture Relationship (AS 1289 5.1.1 & 2.1.1)	
Mould Type	1 LITRE MOULD A
Compaction	Standard
Maximum Dry Density (t/m^3)	1.65
Optimum Moisture Content (%)	21.0
Oversize Sieve (mm)	19
Oversize Material Wet (%)	0
Method used to Determine Plasticity	Visual Assessment
Curing Hours	120

Moisture Content (AS 1289 2.1.1)	
Moisture Content (%)	23.9



Material Test Report

Douglas Partners
Geotechnics / Environment / Groundwater
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Central Coast Laboratory
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Accredited for compliance with ISO/IEC 17025 - Testing

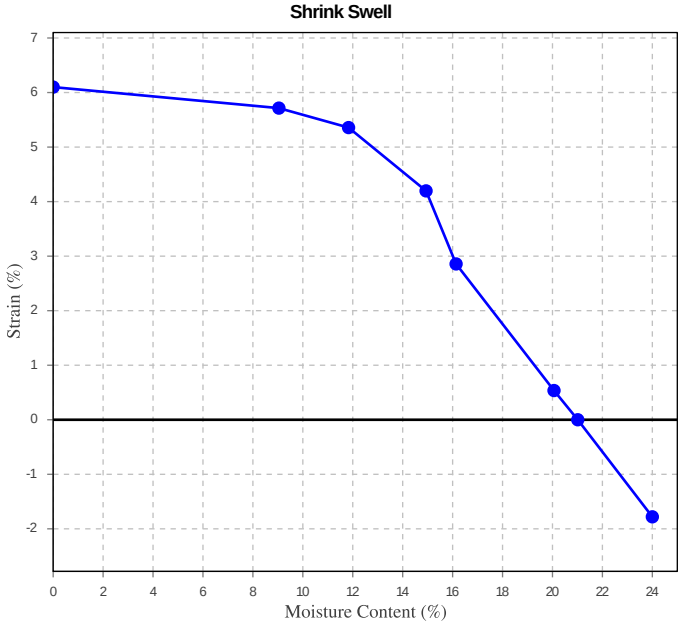
Approved Signatory: Dan Byrnes
Laboratory Manager
NATA Accredited Laboratory Number: 828

Report Number:	**84822.04-5a**
Issue Number:	1
Date Issued:	21/04/2020
Client:	Cleanaway Operations Pty Ltd
	Level 4, 441 St Kilda Road, Melbourne 3004
Contact:	Nick Schutt
Project Number:	84822.04
Project Name:	Green Waratah
Project Location:	339 Wallgrove Road, Eastern Creek
Work Request:	2429
Sample Number:	CC-2429D
Date Sampled:	21/02/2020
Dates Tested:	06/04/2020 - 14/04/2020
Sampling Method:	Sampled by Engineering Department
	The results apply to the sample as received
Sample Location:	**ABH04, Depth: 1.0-2.0m**

Shrink Swell Index (AS 1289 7.1.1 & 2.1.1)	
Iss (%)	**3.9**
Visual Description	Clay
* Shrink Swell Index (Iss) reported as the percentage vertical strain per pF change in suction.	

Core Shrinkage Test	
Shrinkage Strain - Oven Dried (%)	**6.1**
Estimated % by volume of significant inert inclusions	0
Cracking	Slightly Cracked
Crumbling	No
Moisture Content (%)	21.0

Swell Test	
Initial Pocket Penetrometer (kPa)	240
Final Pocket Penetrometer (kPa)	150
Initial Moisture Content (%)	22.2
Final Moisture Content (%)	24.0
Swell (%)	**1.8**
* NATA Accreditation does not cover the performance of pocket penetrometer readings.	



Material Test Report

Douglas Partners
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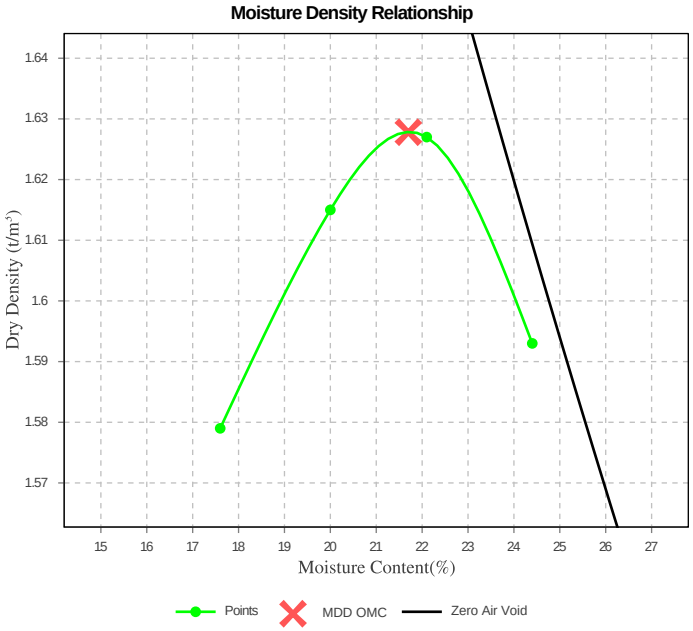
Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Andrew Hutchings
Laboratory Manager
NATA Accredited Laboratory Number: 828

Report Number: **84822.04-4B**
Issue Number: 1
Date Issued: 17/04/2020
Client: Cleanaway Operations Pty Ltd
Level 4, 441 St Kilda Road, Melbourne 3004
Contact: Nick Schutt
Project Number: 84822.04
Project Name: Green Waratah
Project Location: 339 Wallgrove Road, Eastern Creek
Work Request: 5759
Sample Number: SY-5759H
Date Sampled: 21/02/2020
Dates Tested: 18/03/2020 - 25/03/2020
Sampling Method: Sampled by Engineering Department
The results apply to the sample as received
Sample Location: **ABH05 (0.5-1.5m)**
Material: SILTY CLAY

Dry Density - Moisture Relationship (AS 1289 5.1.1 & 2.1.1)	
Mould Type	1 LITRE MOULD A
Compaction	Standard
Maximum Dry Density (t/m^3)	1.63
Optimum Moisture Content (%)	21.5
Oversize Sieve (mm)	19
Oversize Material Wet (%)	0
Method used to Determine Plasticity	Visual Assessment
Curing Hours	2

Moisture Content (AS 1289 2.1.1)	
Moisture Content (%)	22.0



Material Test Report

Report Number: **84822.04-5B**
Issue Number: 1
Date Issued: 24/04/2020
Client: Cleanaway Operations Pty Ltd
Level 4, 441 St Kilda Road, Melbourne 3004
Contact: Nick Schutt
Project Number: 84822.04
Project Name: Green Waratah
Project Location: 339 Wallgrove Road, Eastern Creek
Work Request: 2429
Sample Number: CC-2429E
Date Sampled: 21/02/2020
Dates Tested: 06/04/2020 - 15/04/2020
Sampling Method: Sampled by Engineering Department
The results apply to the sample as received
Sample Location: **ABH05, Depth: 1.0-1.31m**

Douglas Partners
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Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Peter Gorseski
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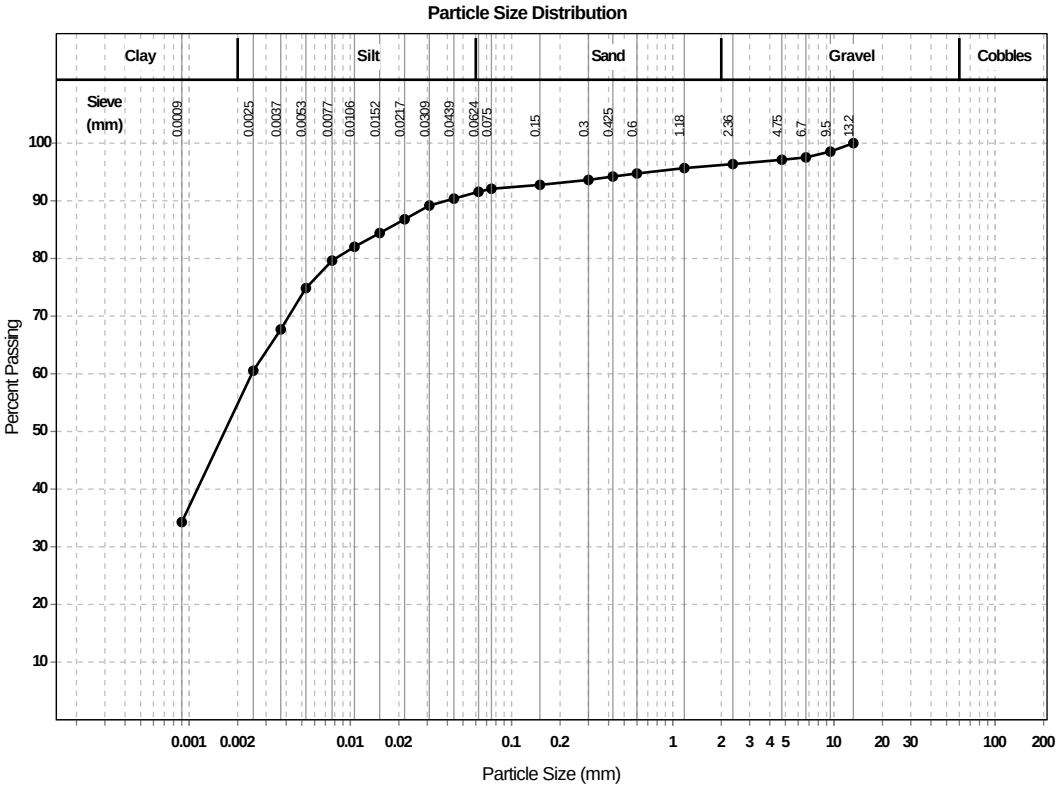
NATA Accredited Laboratory Number: 828

Fine Analysis using a Hydrometer (AS 1289 3.6.3)	
Method of Dispersion	Mortar and Pestle
Loss in Pretreatment	0

Particle Size Distribution (AS 1289 3.6.1)			
Sieve	Passed %	Passing Limits	
13.2 mm	**100**		
9.5 mm	**99**		
6.7 mm	**98**		
4.75 mm	**97**		
2.36 mm	**96**		
1.18 mm	**96**		
0.6 mm	**95**		
0.425 mm	**94**		
0.3 mm	**94**		
0.15 mm	**93**		
0.075 mm	**92**		

Fine Analysis Using a Hydrometer (AS 1289 3.6.3)	
Particle Size (mm)	Passed %
0.0624	**91.6**
0.0439	**90.4**
0.0309	**89.2**
0.0217	**86.8**
0.0152	**84.4**
0.0106	**82.0**
0.0077	**79.6**
0.0053	**74.9**
0.0037	**67.7**
0.0025	**60.5**
0.0009	**34.3**



Material Test Report

Douglas Partners
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Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Dan Byrnes
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NATA Accredited Laboratory Number: 828

Report Number: **84822.04-5a**
Issue Number: 1
Date Issued: 21/04/2020
Client: Cleanaway Operations Pty Ltd
Level 4, 441 St Kilda Road, Melbourne 3004
Contact: Nick Schutt
Project Number: 84822.04
Project Name: Green Waratah
Project Location: 339 Wallgrove Road, Eastern Creek
Work Request: 2429
Sample Number: CC-2429E
Date Sampled: 21/02/2020
Dates Tested: 06/04/2020 - 15/04/2020
Sampling Method: Sampled by Engineering Department
The results apply to the sample as received
Sample Location: **ABH05, Depth: 1.0-1.31m**

Atterberg Limit (AS1289 3.1.1 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	76		
Plastic Limit (%)	17		
Plasticity Index (%)	**59**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Linear Shrinkage (%)	17.5		
Cracking Crumbling Curling	None		

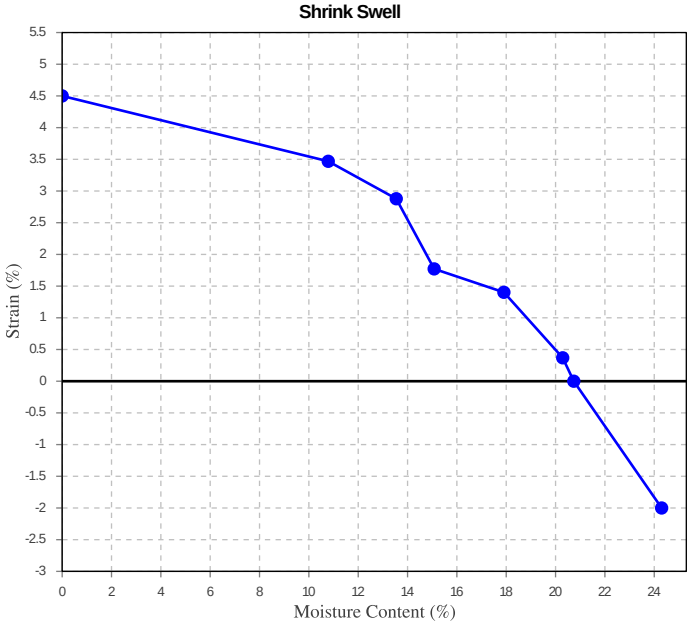
Shrink Swell Index (AS 1289 7.1.1 & 2.1.1)	
Iss (%)	**3.1**
Visual Description	Clay

* Shrink Swell Index (Iss) reported as the percentage vertical strain per pF change in suction.

Core Shrinkage Test	
Shrinkage Strain - Oven Dried (%)	**4.5**
Estimated % by volume of significant inert inclusions	0
Cracking	Slightly Cracked
Crumbling	No
Moisture Content (%)	20.7

Swell Test	
Initial Pocket Penetrometer (kPa)	380
Final Pocket Penetrometer (kPa)	180
Initial Moisture Content (%)	21.3
Final Moisture Content (%)	24.3
Swell (%)	**2.0**

* NATA Accreditation does not cover the performance of pocket penetrometer readings.



Material Test Report

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Laboratory Manager
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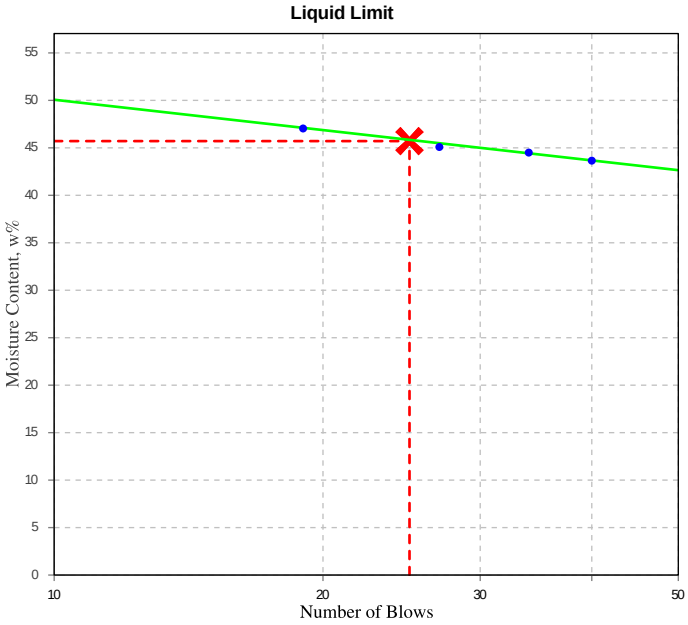
Report Number: **84822.04-4**
Issue Number: 1
Date Issued: 27/04/2020
Client: Cleanaway Operations Pty Ltd
Level 4, 441 St Kilda Road, Melbourne 3004
Contact: Nick Schutt
Project Number: 84822.04
Project Name: Green Waratah
Project Location: 339 Wallgrove Road, Eastern Creek
Work Request: 5759
Sample Number: SY-5759J
Date Sampled: 21/02/2020
Dates Tested: 18/03/2020 - 20/04/2020
Sampling Method: Sampled by Client
The results apply to the sample as received
Sample Location: **ABH06 (1-1.41m)**
Material: SILTY CLAY

Atterberg Limit (AS1289 3.1.1 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	46		
Plastic Limit (%)	17		
Plasticity Index (%)	**29**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Linear Shrinkage (%)	13.5		
Cracking Crumbling Curling	Curling		



Material Test Report

Douglas Partners
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Accredited for compliance with ISO/IEC 17025 - Testing

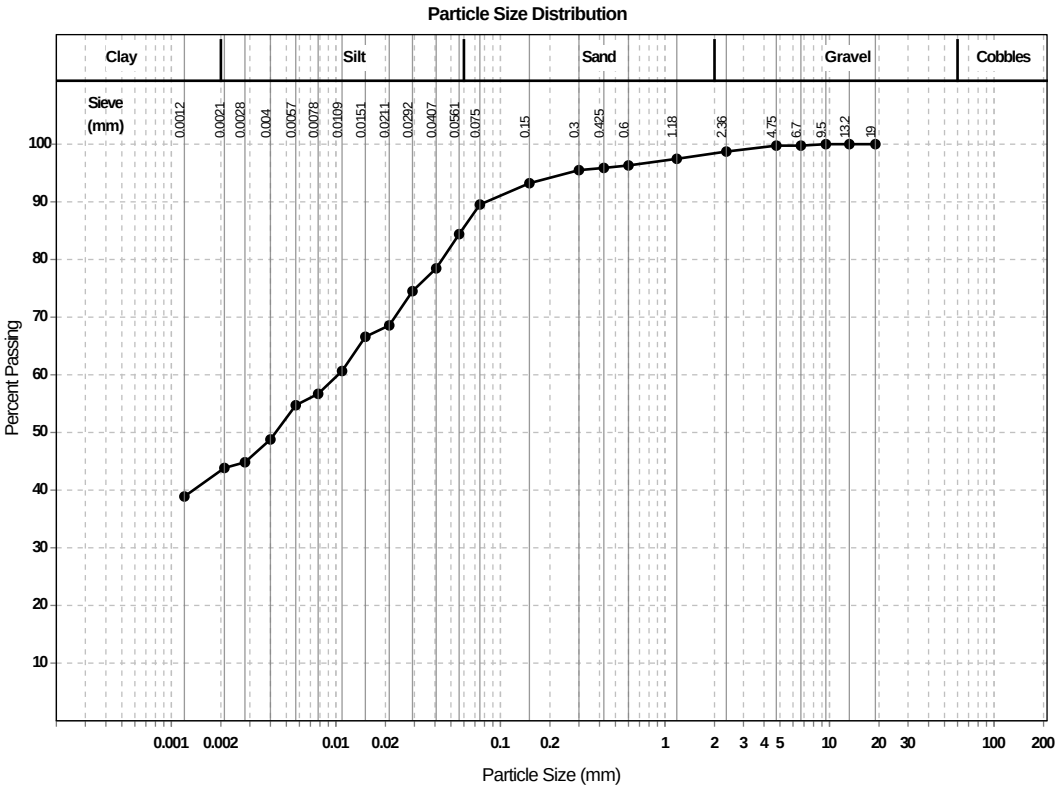
Approved Signatory: Andrew Hutchings
Laboratory Manager
NATA Accredited Laboratory Number: 828

Report Number: **84822.04-4**
Issue Number: 1
Date Issued: 27/04/2020
Client: Cleanaway Operations Pty Ltd
Level 4, 441 St Kilda Road, Melbourne 3004
Contact: Nick Schutt
Project Number: 84822.04
Project Name: Green Waratah
Project Location: 339 Wallgrove Road, Eastern Creek
Work Request: 5759
Sample Number: SY-5759J
Date Sampled: 21/02/2020
Dates Tested: 18/03/2020 - 08/04/2020
Sampling Method: Sampled by Client
The results apply to the sample as received
Sample Location: **ABH06 (1-1.41m)**
Material: SILTY CLAY

Fine Analysis using a Hydrometer (AS 1289 3.6.3)	
Method of Dispersion	Mechanical Device
Loss in Pretreatment	

Particle Size Distribution (AS 1289 3.6.1)			
Sieve	Passed %	Passing Limits	
19 mm	**100**		
13.2 mm	**100**		
9.5 mm	**100**		
6.7 mm	**100**		
4.75 mm	**100**		
2.36 mm	**99**		
1.18 mm	**97**		
0.6 mm	**96**		
0.425 mm	**96**		
0.3 mm	**96**		
0.15 mm	**93**		
0.075 mm	**90**		

Fine Analysis Using a Hydrometer (AS 1289 3.6.3)	
Particle Size (mm)	Passed %
0.0561	**84.4**
0.0407	**78.5**
0.0292	**74.5**
0.0211	**68.6**
0.0151	**66.6**
0.0109	**60.7**
0.0078	**56.7**
0.0057	**54.7**
0.0040	**48.8**
0.0028	**44.8**
0.0021	**43.8**
0.0012	**38.9**



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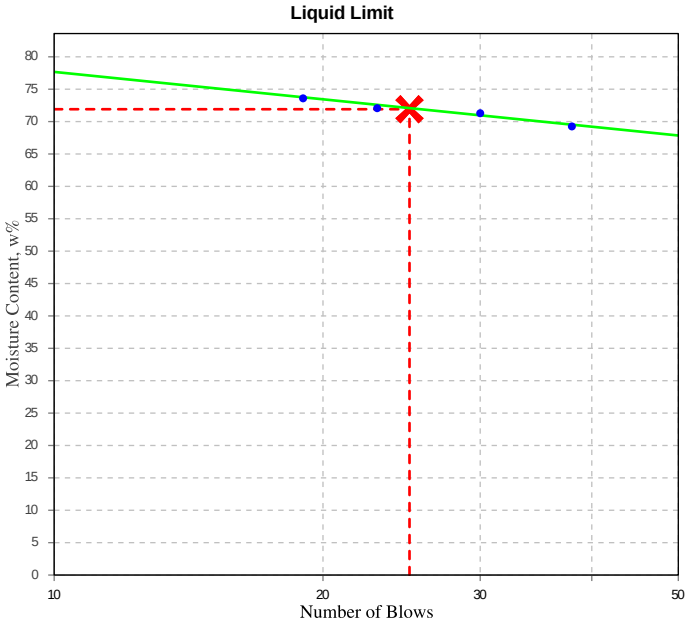
Report Number: **84822.04-4**
Issue Number: 1
Date Issued: 27/04/2020
Client: Cleanaway Operations Pty Ltd
Level 4, 441 St Kilda Road, Melbourne 3004
Contact: Nick Schutt
Project Number: 84822.04
Project Name: Green Waratah
Project Location: 339 Wallgrove Road, Eastern Creek
Work Request: 5759
Sample Number: SY-5759K
Date Sampled: 21/02/2020
Dates Tested: 18/03/2020 - 21/04/2020
Sampling Method: Sampled by Client
The results apply to the sample as received
Sample Location: **ABH07 (1-1.27m)**
Material: SILTY CLAY with trace of sand

Atterberg Limit (AS1289 3.1.1 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	72		
Plastic Limit (%)	25		
Plasticity Index (%)	**47**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Linear Shrinkage (%)	19.5		
Cracking Crumbling Curling	Curling		

Emerson Class Number of a Soil (AS 1289 3.8.1)		Min	Max
Emerson Class	**2**		
Soil Description	silty CLAY		
Nature of Water	Distilled		
Temperature of Water (^{o}C)	23		



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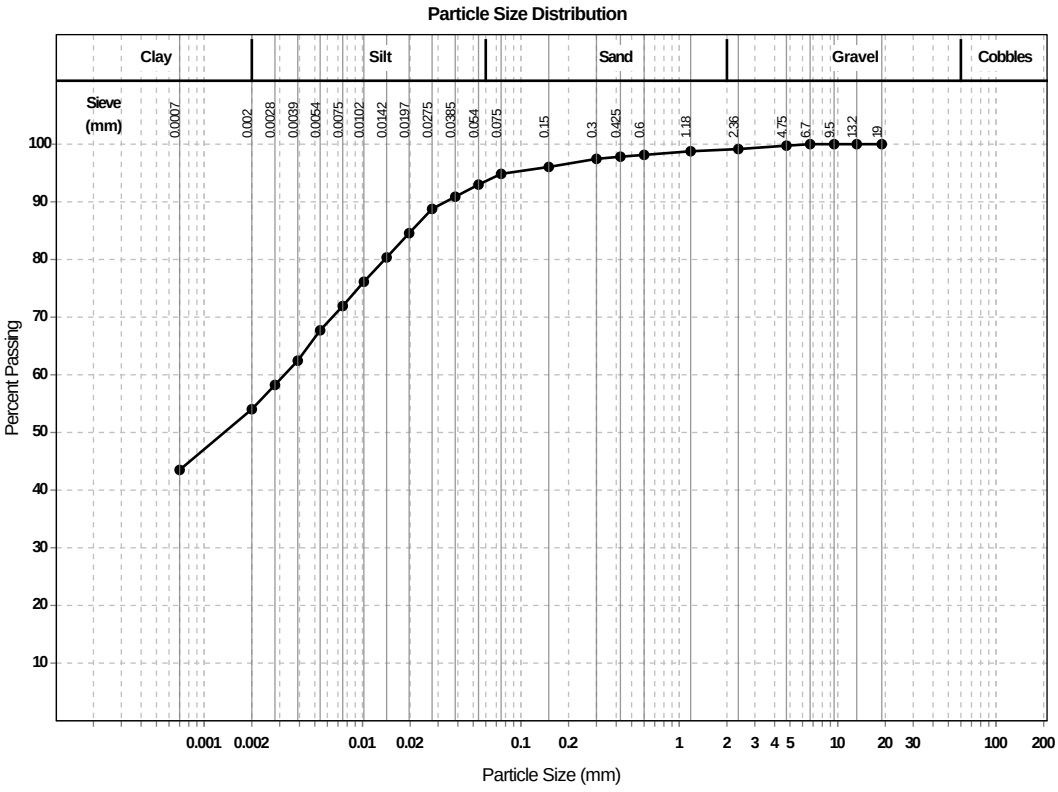
NATA Accredited Laboratory Number: 828

Report Number: **84822.04-4**
Issue Number: 1
Date Issued: 27/04/2020
Client: Cleanaway Operations Pty Ltd
Level 4, 441 St Kilda Road, Melbourne 3004
Contact: Nick Schutt
Project Number: 84822.04
Project Name: Green Waratah
Project Location: 339 Wallgrove Road, Eastern Creek
Work Request: 5759
Sample Number: SY-5759K
Date Sampled: 21/02/2020
Dates Tested: 18/03/2020 - 08/04/2020
Sampling Method: Sampled by Client
The results apply to the sample as received
Sample Location: **ABH07 (1-1.27m)**
Material: SILTY CLAY with trace of sand

Fine Analysis using a Hydrometer (AS 1289 3.6.3)	
Method of Dispersion	Mechanical Device
Loss in Pretreatment	

Particle Size Distribution (AS 1289 3.6.1)			
Sieve	Passed %	Passing Limits	
19 mm	**100**		
13.2 mm	**100**		
9.5 mm	**100**		
6.7 mm	**100**		
4.75 mm	**100**		
2.36 mm	**99**		
1.18 mm	**99**		
0.6 mm	**98**		
0.425 mm	**98**		
0.3 mm	**97**		
0.15 mm	**96**		
0.075 mm	**95**		

Fine Analysis Using a Hydrometer (AS 1289 3.6.3)	
Particle Size (mm)	Passed %
0.0540	**93.0**
0.0385	**90.9**
0.0275	**88.8**
0.0197	**84.6**
0.0142	**80.4**
0.0102	**76.1**
0.0075	**71.9**
0.0054	**67.7**
0.0039	**62.5**
0.0028	**58.2**
0.0020	**54.0**
0.0007	**43.5**



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Approved Signatory: Andrew Hutchings
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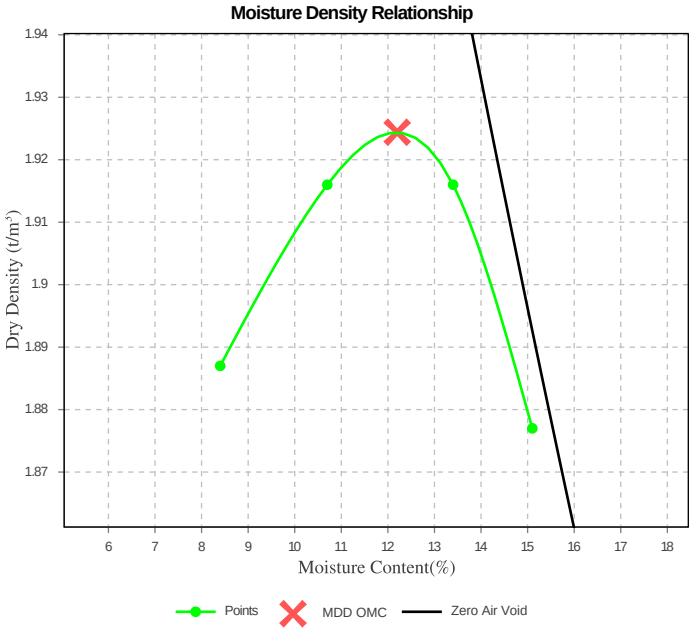
Report Number: **84822.04-4B**
Issue Number: 1
Date Issued: 17/04/2020
Client: Cleanaway Operations Pty Ltd
Level 4, 441 St Kilda Road, Melbourne 3004
Contact: Nick Schutt
Project Number: 84822.04
Project Name: Green Waratah
Project Location: 339 Wallgrove Road, Eastern Creek
Work Request: 5759
Sample Number: SY-5759L
Date Sampled: 21/02/2020
Dates Tested: 18/03/2020 - 30/03/2020
Sampling Method: Sampled by Engineering Department
The results apply to the sample as received
Sample Location: **ABH07 (1.6-2.4m)**
Material: SILTY CLAY (EW SILTSTONE)

Dry Density - Moisture Relationship (AS 1289 5.1.1 & 2.1.1)	
Mould Type	1 LITRE MOULD A
Compaction	Standard
Maximum Dry Density (t/m^3)	1.92
Optimum Moisture Content (%)	12.0
Oversize Sieve (mm)	19
Oversize Material Wet (%)	11
Method used to Determine Plasticity	Visual Assessment
Curing Hours	96

Moisture Content (AS 1289 2.1.1)	
Moisture Content (%)	9.1



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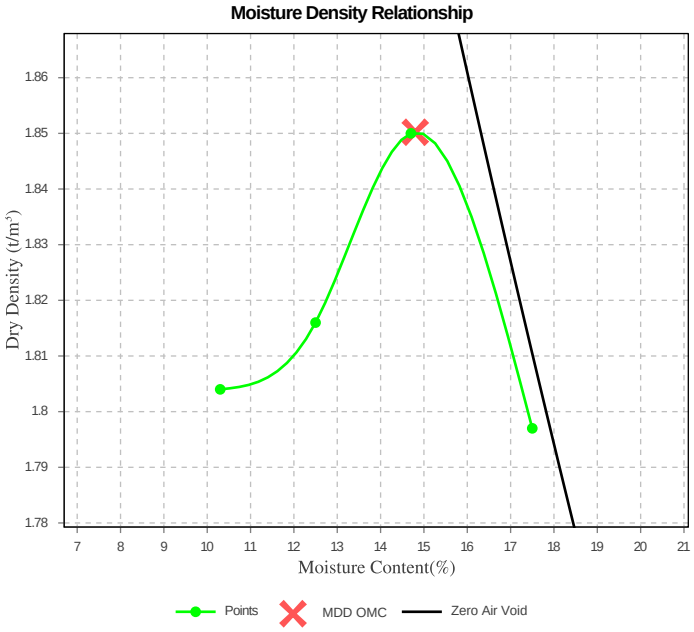
Laboratory Manager
NATA Accredited Laboratory Number: 828

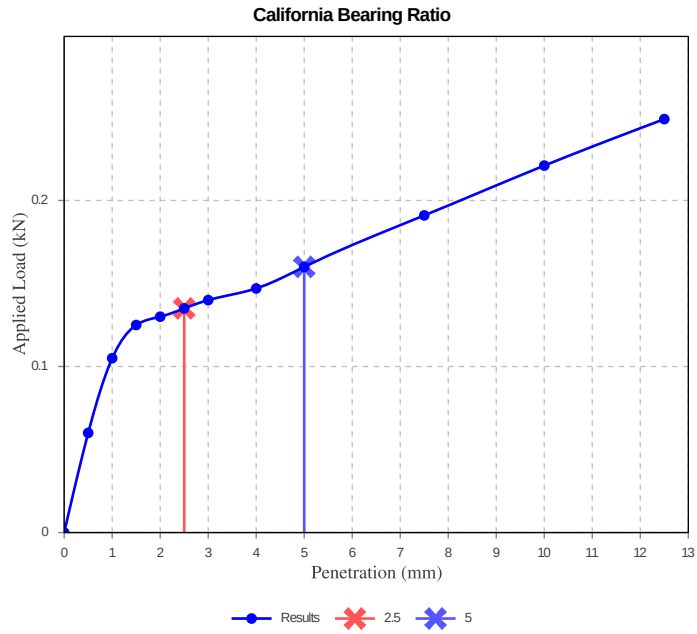
Report Number: **84822.04-4B**
Issue Number: 1
Date Issued: 17/04/2020
Client: Cleanaway Operations Pty Ltd
Level 4, 441 St Kilda Road, Melbourne 3004
Contact: Nick Schutt
Project Number: 84822.04
Project Name: Green Waratah
Project Location: 339 Wallgrove Road, Eastern Creek
Work Request: 5759
Sample Number: SY-5759M
Date Sampled: 21/02/2020
Dates Tested: 18/03/2020 - 16/04/2020
Sampling Method: Sampled by Engineering Department
The results apply to the sample as received
Sample Location: **ATP01 (2.5-2.6m)**
Material: SILTSTONE

Dry Density - Moisture Relationship (AS 1289 5.1.1 & 2.1.1)	
Mould Type	1 LITRE MOULD A
Compaction	Standard
Maximum Dry Density (t/m^3)	1.85
Optimum Moisture Content (%)	15.0
Oversize Sieve (mm)	19
Oversize Material Wet (%)	1
Method used to Determine Plasticity	Visual Assessment
Curing Hours	2

Moisture Content (AS 1289 2.1.1)	
Moisture Content (%)	13.8

California Bearing Ratio (RMS T117 & T120)		Min	Max
CBR taken at	2.5 mm		
CBR %	**1.0**		
Method of Compactive Effort	Standard		
Method used to Determine MDD	AS 1289 5.1.1 & 2.1.1		
Maximum Dry Density (t/m^3)	1.850		
Optimum Moisture Content (%)	14.8		
Target Laboratory Density Ratio (%)	100		
Laboratory Density Ratio (%)	100		
Target Laboratory Moisture Ratio (%)	100		
Laboratory Moisture Ratio (%)	98		
Dry Density after Soaking (t/m^3)	1.738		
Field Moisture Content (%)	13.8		
Moisture Content Top 30mm (%)	25.2		
Moisture Content Full Depth (%)	22.4		
Mass Surcharge (kg)	4.5		
Soaking Period (days)	10		
Swell (%)	6.5		
Material Retained on 19mm (%)	1		
Oversize Material (mm)	19		
Oversize Material Included	Excluded		
Oversize Material (%)	1.3		





Material Test Report

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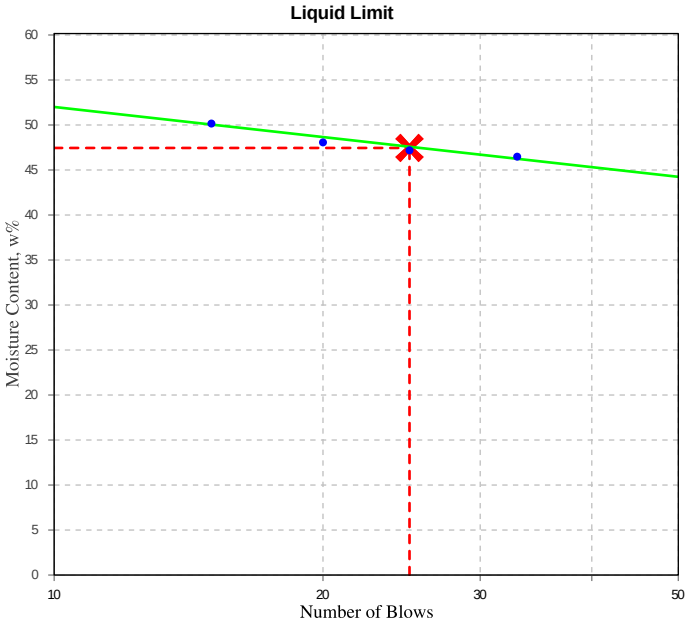
Laboratory Manager
NATA Accredited Laboratory Number: 828

Report Number: **84822.04-4B**
Issue Number: 1
Date Issued: 17/04/2020
Client: Cleanaway Operations Pty Ltd
Level 4, 441 St Kilda Road, Melbourne 3004
Contact: Nick Schutt
Project Number: 84822.04
Project Name: Green Waratah
Project Location: 339 Wallgrove Road, Eastern Creek
Work Request: 5759
Sample Number: SY-5759M
Date Sampled: 21/02/2020
Dates Tested: 18/03/2020 - 07/04/2020
Sampling Method: Sampled by Engineering Department
The results apply to the sample as received
Sample Location: **ATP01 (2.5-2.6m)**
Material: SILTSTONE

Atterberg Limit (AS1289 3.1.1 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	47		
Plastic Limit (%)	19		
Plasticity Index (%)	**28**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Linear Shrinkage (%)	13.0		
Cracking Crumbling Curling	Curling		



Material Test Report

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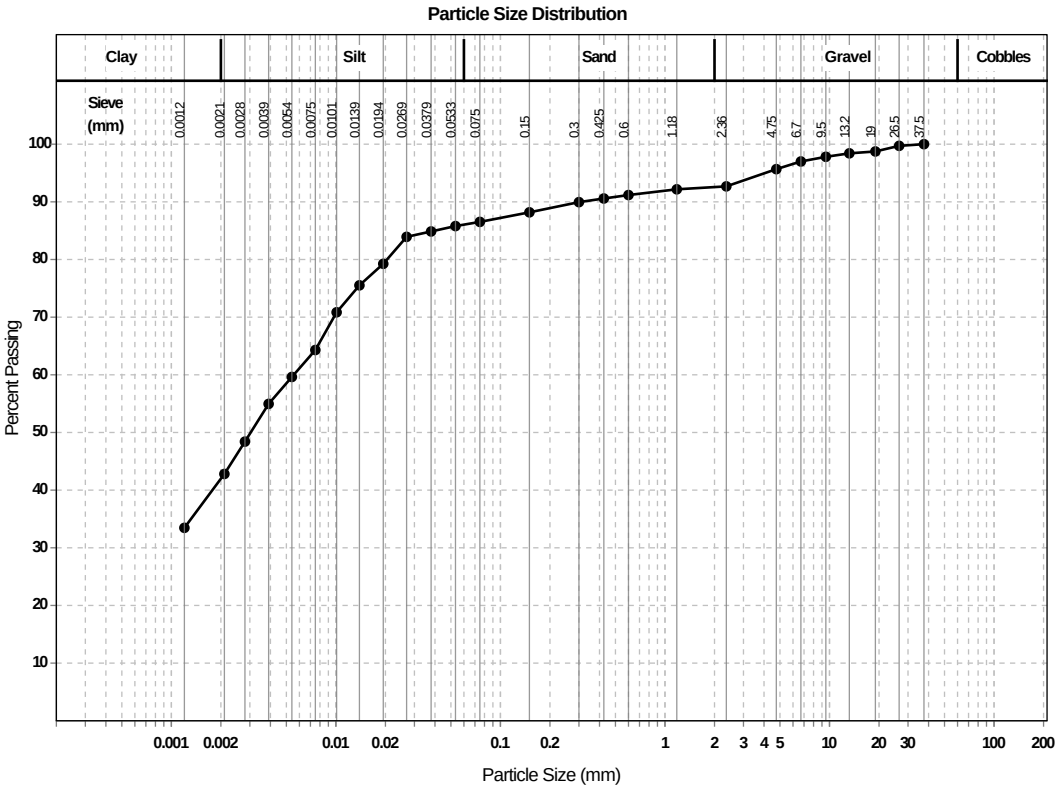
NATA Accredited Laboratory Number: 828

Report Number: **84822.04-4B**
Issue Number: 1
Date Issued: 17/04/2020
Client: Cleanaway Operations Pty Ltd
Level 4, 441 St Kilda Road, Melbourne 3004
Contact: Nick Schutt
Project Number: 84822.04
Project Name: Green Waratah
Project Location: 339 Wallgrove Road, Eastern Creek
Work Request: 5759
Sample Number: SY-5759M
Date Sampled: 21/02/2020
Dates Tested: 18/03/2020 - 31/03/2020
Sampling Method: Sampled by Engineering Department
The results apply to the sample as received
Sample Location: **ATP01 (2.5-2.6m)**
Material: SILTSTONE

Fine Analysis using a Hydrometer (AS 1289 3.6.3)	
Method of Dispersion	Mechanical Device
Loss in Pretreatment	

Particle Size Distribution (AS 1289 3.6.1)			
Sieve	Passed %	Passing Limits	
37.5 mm	**100**		
26.5 mm	**100**		
19 mm	**99**		
13.2 mm	**98**		
9.5 mm	**98**		
6.7 mm	**97**		
4.75 mm	**96**		
2.36 mm	**93**		
1.18 mm	**92**		
0.6 mm	**91**		
0.425 mm	**91**		
0.3 mm	**90**		
0.15 mm	**88**		
0.075 mm	**87**		

Fine Analysis Using a Hydrometer (AS 1289 3.6.3)	
Particle Size (mm)	Passed %
0.0533	**85.8**
0.0379	**84.9**
0.0269	**83.9**
0.0194	**79.3**
0.0139	**75.5**
0.0101	**70.8**
0.0075	**64.3**
0.0054	**59.6**
0.0039	**55.0**
0.0028	**48.4**
0.0021	**42.8**
0.0012	**33.5**



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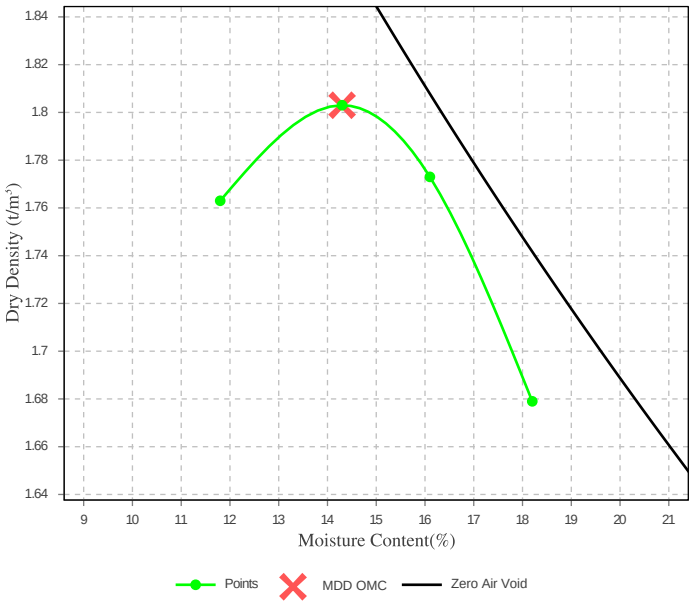
Report Number: **84822.04-4B**
Issue Number: 1
Date Issued: 17/04/2020
Client: Cleanaway Operations Pty Ltd
Level 4, 441 St Kilda Road, Melbourne 3004
Contact: Nick Schutt
Project Number: 84822.04
Project Name: Green Waratah
Project Location: 339 Wallgrove Road, Eastern Creek
Work Request: 5759
Sample Number: SY-5759N
Date Sampled: 21/02/2020
Dates Tested: 18/03/2020 - 16/04/2020
Sampling Method: Sampled by Engineering Department
The results apply to the sample as received
Sample Location: **ATP02 (0.5-0.6m)**
Material: SILTY CLAY

Dry Density - Moisture Relationship (AS 1289 5.1.1 & 2.1.1)	
Mould Type	1 LITRE MOULD A
Compaction	Standard
Maximum Dry Density (t/m^3)	1.80
Optimum Moisture Content (%)	14.5
Oversize Sieve (mm)	19
Oversize Material Wet (%)	0
Method used to Determine Plasticity	Visual Assessment
Curing Hours	120

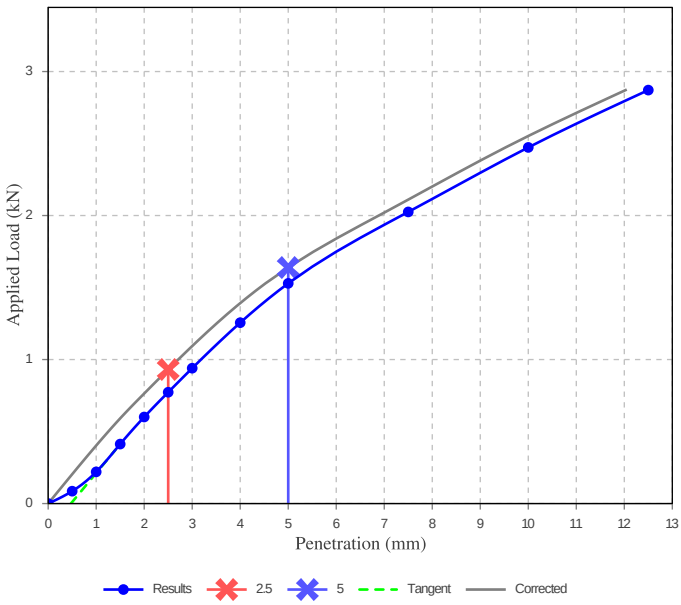
Moisture Content (AS 1289 2.1.1)	
Moisture Content (%)	12.1

California Bearing Ratio (RMS T117 & T120)		Min	Max
CBR taken at	5 mm		
CBR %	**8**		
Method of Compactive Effort	Standard		
Method used to Determine MDD	AS 1289 5.1.1 & 2.1.1		
Maximum Dry Density (t/m^3)	1.803		
Optimum Moisture Content (%)	14.3		
Target Laboratory Density Ratio (%)	100		
Laboratory Density Ratio (%)	101		
Target Laboratory Moisture Ratio (%)	100		
Laboratory Moisture Ratio (%)	101		
Dry Density after Soaking (t/m^3)	1.813		
Field Moisture Content (%)	12.1		
Moisture Content Top 30mm (%)	16.3		
Moisture Content Full Depth (%)	16.2		
Mass Surcharge (kg)	4.5		
Soaking Period (days)	10		
Swell (%)	0.2		
Material Retained on 19mm (%)	0		
Oversize Material (mm)	19		
Oversize Material Included	Excluded		
Oversize Material (%)	0		

Moisture Density Relationship



California Bearing Ratio



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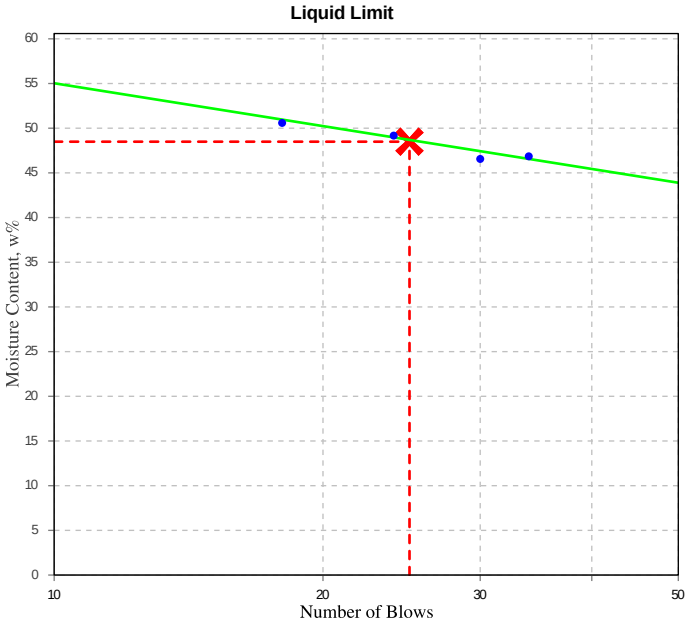
Laboratory Manager
NATA Accredited Laboratory Number: 828

Report Number: **84822.04-4**
Issue Number: 1
Date Issued: 27/04/2020
Client: Cleanaway Operations Pty Ltd
Level 4, 441 St Kilda Road, Melbourne 3004
Contact: Nick Schutt
Project Number: 84822.04
Project Name: Green Waratah
Project Location: 339 Wallgrove Road, Eastern Creek
Work Request: 5759
Sample Number: SY-5759O
Date Sampled: 21/02/2020
Dates Tested: 18/03/2020 - 21/04/2020
Sampling Method: Sampled by Client
The results apply to the sample as received
Sample Location: **ATP02 (1.5-1.75m)**
Material: SILTY CLAY

Atterberg Limit (AS1289 3.1.1 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	48		
Plastic Limit (%)	17		
Plasticity Index (%)	**31**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Linear Shrinkage (%)	15.5		
Cracking Crumbling Curling	Curling		

Emerson Class Number of a Soil (AS 1289 3.8.1)		Min	Max
Emerson Class	**2**		
Soil Description	Silty CLAY		
Nature of Water	Distilled		
Temperature of Water (^{o}C)	23		



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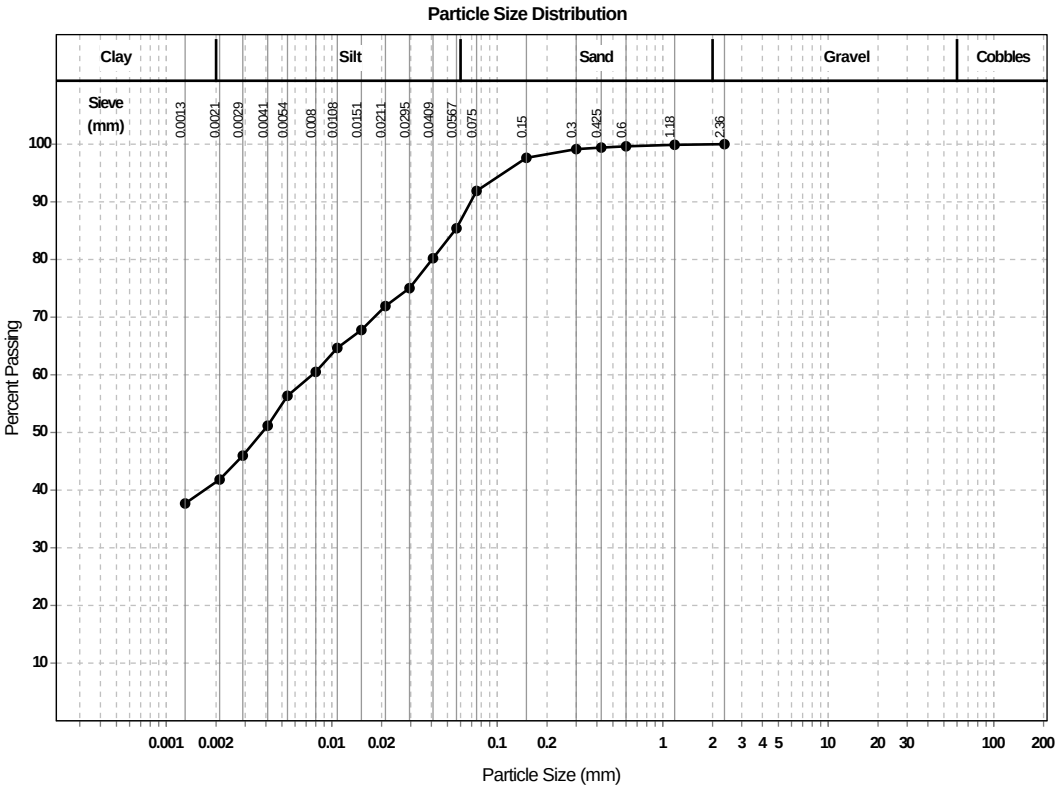
NATA Accredited Laboratory Number: 828

Report Number: **84822.04-4**
Issue Number: 1
Date Issued: 27/04/2020
Client: Cleanaway Operations Pty Ltd
Level 4, 441 St Kilda Road, Melbourne 3004
Contact: Nick Schutt
Project Number: 84822.04
Project Name: Green Waratah
Project Location: 339 Wallgrove Road, Eastern Creek
Work Request: 5759
Sample Number: SY-5759O
Date Sampled: 21/02/2020
Dates Tested: 18/03/2020 - 16/04/2020
Sampling Method: Sampled by Client
The results apply to the sample as received
Sample Location: **ATP02 (1.5-1.75m)**
Material: SILTY CLAY

Fine Analysis using a Hydrometer (AS 1289 3.6.3)	
Method of Dispersion	Mechanical Device
Loss in Pretreatment	

Particle Size Distribution (AS 1289 3.6.1)			
Sieve	Passed %	Passing Limits	
2.36 mm	**100**		
1.18 mm	**100**		
0.6 mm	**100**		
0.425 mm	**99**		
0.3 mm	**99**		
0.15 mm	**98**		
0.075 mm	**92**		

Fine Analysis Using a Hydrometer (AS 1289 3.6.3)	
Particle Size (mm)	Passed %
0.0567	**85.4**
0.0409	**80.2**
0.0295	**75.0**
0.0211	**71.9**
0.0151	**67.8**
0.0108	**64.7**
0.0080	**60.5**
0.0054	**56.4**
0.0041	**51.2**
0.0029	**46.0**
0.0021	**41.8**
0.0013	**37.7**



Material Test Report

Douglas Partners
Geotechnics / Environment / Groundwater
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Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Andrew Hutchings
Laboratory Manager
NATA Accredited Laboratory Number: 828

Report Number: **84822.04-4B**
Issue Number: 1
Date Issued: 17/04/2020
Client: Cleanaway Operations Pty Ltd
Level 4, 441 St Kilda Road, Melbourne 3004
Contact: Nick Schutt
Project Number: 84822.04
Project Name: Green Waratah
Project Location: 339 Wallgrove Road, Eastern Creek
Work Request: 5759
Sample Number: SY-5759P
Date Sampled: 21/02/2020
Dates Tested: 18/03/2020 - 16/04/2020
Sampling Method: Sampled by Engineering Department
The results apply to the sample as received
Sample Location: **ATP03 (0.9-1m)**
Material: SILTY CLAY

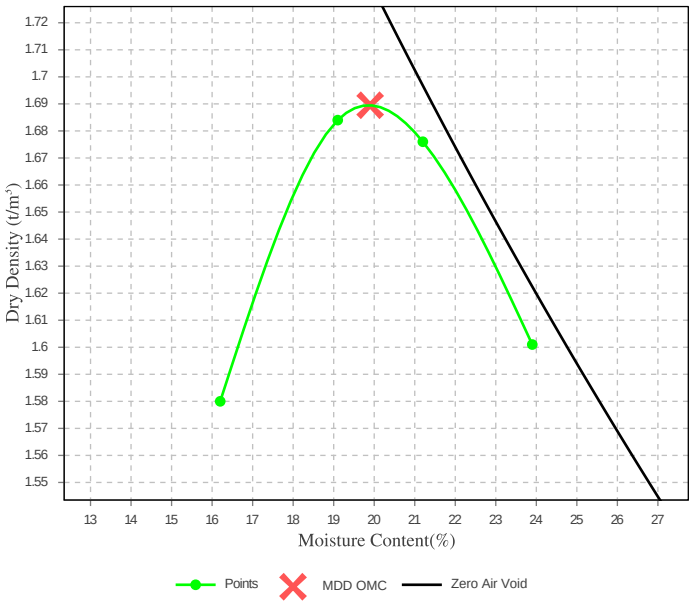
Dry Density - Moisture Relationship (AS 1289 5.1.1 & 2.1.1)	
Mould Type	1 LITRE MOULD A
Compaction	Standard
Maximum Dry Density (t/m^3)	1.69
Optimum Moisture Content (%)	20.0
Oversize Sieve (mm)	19
Oversize Material Wet (%)	0
Method used to Determine Plasticity	Visual Assessment
Curing Hours	48

Moisture Content (AS 1289 2.1.1)	
Moisture Content (%)	19.1

Emerson Class Number of a Soil (AS 1289 3.8.1)		Min	Max
Emerson Class	**2**		
Soil Description	SILTY CLAY		
Nature of Water	Distilled		
Temperature of Water (^{o}C)			

California Bearing Ratio (RMS T117 & T120)		Min	Max
CBR taken at	5 mm		
CBR %	**2.5**		
Method of Compactive Effort	Standard		
Method used to Determine MDD	AS 1289 5.1.1 & 2.1.1		
Maximum Dry Density (t/m^3)	1.690		
Optimum Moisture Content (%)	19.9		
Target Laboratory Density Ratio (%)	100		
Laboratory Density Ratio (%)	100		
Target Laboratory Moisture Ratio (%)	100		
Laboratory Moisture Ratio (%)	98		
Moisture Content Top 30mm (%)	21.1		
Moisture Content Full Depth (%)	20.0		
Mass Surcharge (kg)	4.5		
Soaking Period (days)	10		
Swell (%)	0.5		
Material Retained on 19mm (%)	0		
Oversize Material (mm)	19		
Oversize Material Included	Excluded		
Oversize Material (%)	0		

Moisture Density Relationship



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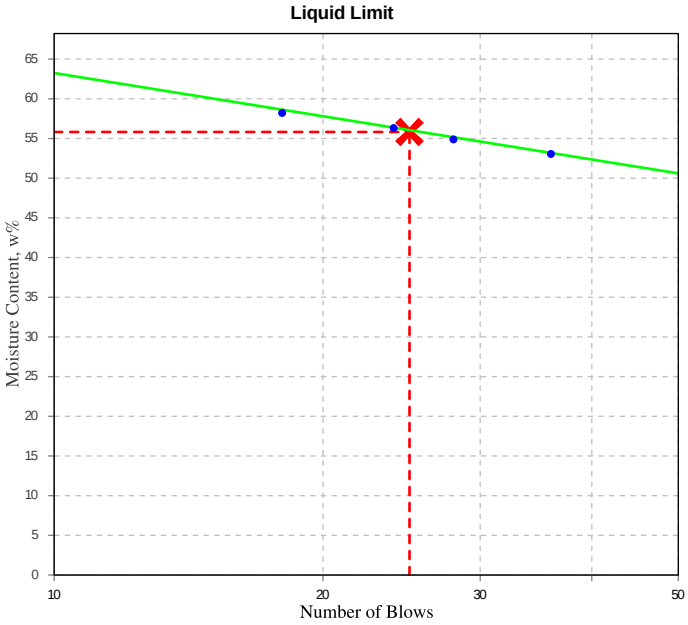
Approved Signatory: Andrew Hutchings
Laboratory Manager
NATA Accredited Laboratory Number: 828

Report Number: **84822.04-4**
Issue Number: 1
Date Issued: 27/04/2020
Client: Cleanaway Operations Pty Ltd
Level 4, 441 St Kilda Road, Melbourne 3004
Contact: Nick Schutt
Project Number: 84822.04
Project Name: Green Waratah
Project Location: 339 Wallgrove Road, Eastern Creek
Work Request: 5759
Sample Number: SY-5759P
Date Sampled: 21/02/2020
Dates Tested: 18/03/2020 - 16/04/2020
Sampling Method: Sampled by Client
The results apply to the sample as received
Sample Location: **ATP03 (0.9-1m)**
Material: SILTY CLAY with some sand and trace of gravel

Atterberg Limit (AS1289 3.1.1 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	56		
Plastic Limit (%)	18		
Plasticity Index (%)	**38**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Linear Shrinkage (%)	17.0		
Cracking Crumbling Curling	Curling		

Emerson Class Number of a Soil (AS 1289 3.8.1)		Min	Max
Emerson Class	**2**		
Soil Description	SILTY CLAY		
Nature of Water	Distilled		
Temperature of Water (^{o}C)	22		



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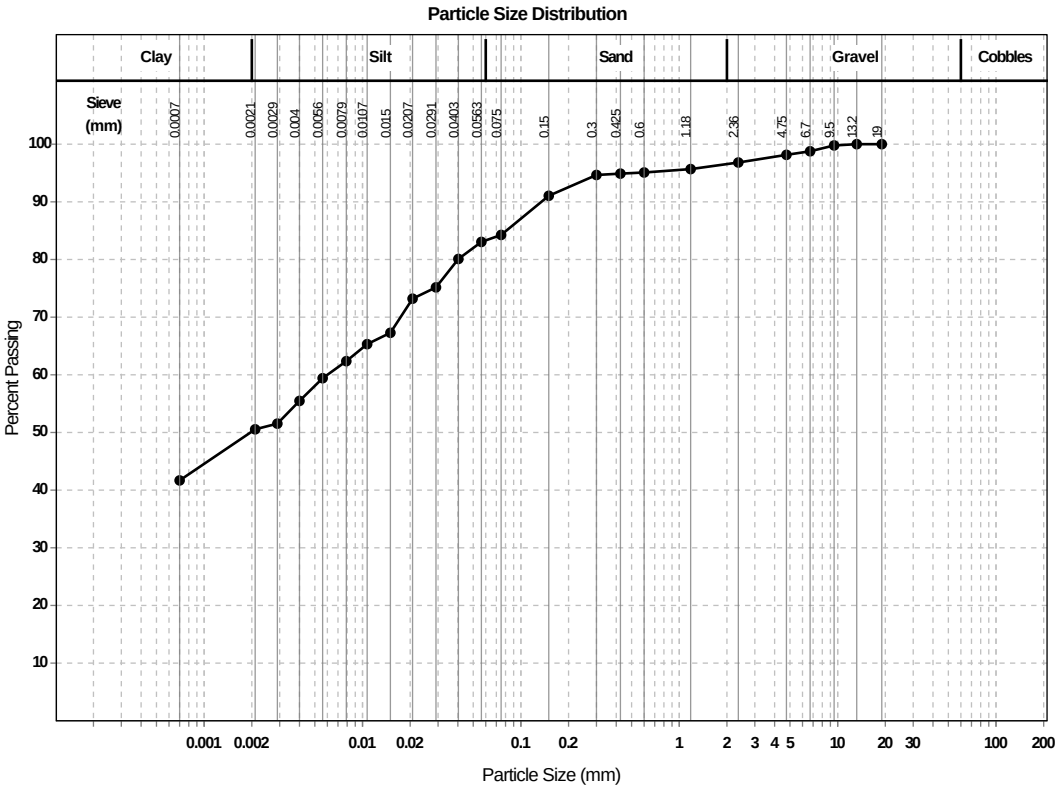
Approved Signatory: Andrew Hutchings
Laboratory Manager
NATA Accredited Laboratory Number: 828

Report Number: **84822.04-4**
Issue Number: 1
Date Issued: 27/04/2020
Client: Cleanaway Operations Pty Ltd
Level 4, 441 St Kilda Road, Melbourne 3004
Contact: Nick Schutt
Project Number: 84822.04
Project Name: Green Waratah
Project Location: 339 Wallgrove Road, Eastern Creek
Work Request: 5759
Sample Number: SY-5759P
Date Sampled: 21/02/2020
Dates Tested: 18/03/2020 - 01/04/2020
Sampling Method: Sampled by Client
The results apply to the sample as received
Sample Location: **ATP03 (0.9-1m)**
Material: SILTY CLAY with some sand and trace of gravel

Fine Analysis using a Hydrometer (AS 1289 3.6.3)	
Method of Dispersion	Mechanical Device
Loss in Pretreatment	

Particle Size Distribution (AS 1289 3.6.1)			
Sieve	Passed %	Passing Limits	
19 mm	**100**		
13.2 mm	**100**		
9.5 mm	**100**		
6.7 mm	**99**		
4.75 mm	**98**		
2.36 mm	**97**		
1.18 mm	**96**		
0.6 mm	**95**		
0.425 mm	**95**		
0.3 mm	**95**		
0.15 mm	**91**		
0.075 mm	**84**		

Fine Analysis Using a Hydrometer (AS 1289 3.6.3)	
Particle Size (mm)	Passed %
0.0563	**83.0**
0.0403	**80.1**
0.0291	**75.2**
0.0207	**73.2**
0.0150	**67.3**
0.0107	**65.3**
0.0079	**62.4**
0.0056	**59.4**
0.0040	**55.5**
0.0029	**51.5**
0.0021	**50.5**
0.0007	**41.7**



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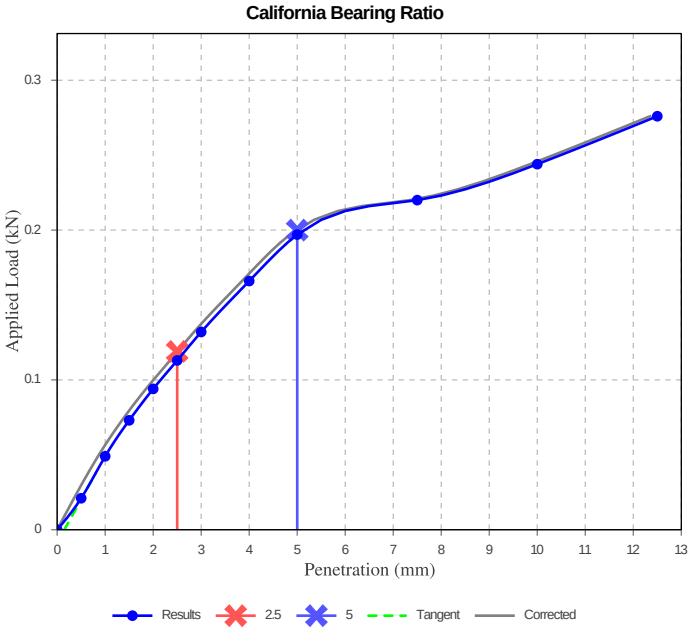
Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Andrew Hutchings
Laboratory Manager
NATA Accredited Laboratory Number: 828

Report Number: **84822.04-4B**
Issue Number: 1
Date Issued: 17/04/2020
Client: Cleanaway Operations Pty Ltd
Level 4, 441 St Kilda Road, Melbourne 3004
Contact: Nick Schutt
Project Number: 84822.04
Project Name: Green Waratah
Project Location: 339 Wallgrove Road, Eastern Creek
Work Request: 5759
Sample Number: SY-5759R
Date Sampled: 21/02/2020
Dates Tested: 18/03/2020 - 16/04/2020
Sampling Method: Sampled by Engineering Department
The results apply to the sample as received
Sample Location: **ATP04 (2.4-2.5m)**
Material: SILTSTONE

California Bearing Ratio (RMS T117 & T120)		Min	Max
CBR taken at	5 mm		
CBR %	**1.0**		
Method of Compactive Effort	Standard		
Method used to Determine MDD	AS 1289 5.1.1 & 2.1.1		
Maximum Dry Density (t/m^3)	1.784		
Optimum Moisture Content (%)	13.9		
Target Laboratory Density Ratio (%)	100		
Laboratory Density Ratio (%)	100		
Target Laboratory Moisture Ratio (%)	100		
Laboratory Moisture Ratio (%)	100		
Dry Density after Soaking (t/m^3)	1.683		
Field Moisture Content (%)	15.5		
Moisture Content Top 30mm (%)	27.0		
Moisture Content Full Depth (%)	22.2		
Mass Surcharge (kg)	4.5		
Soaking Period (days)	10		
Swell (%)	6.6		
Material Retained on 19mm (%)	0		
Oversize Material (mm)	19		
Oversize Material Included	Excluded		
Oversize Material (%)	0		



Material Test Report

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NATA
WORLD RECOGNISED ACCREDITATION

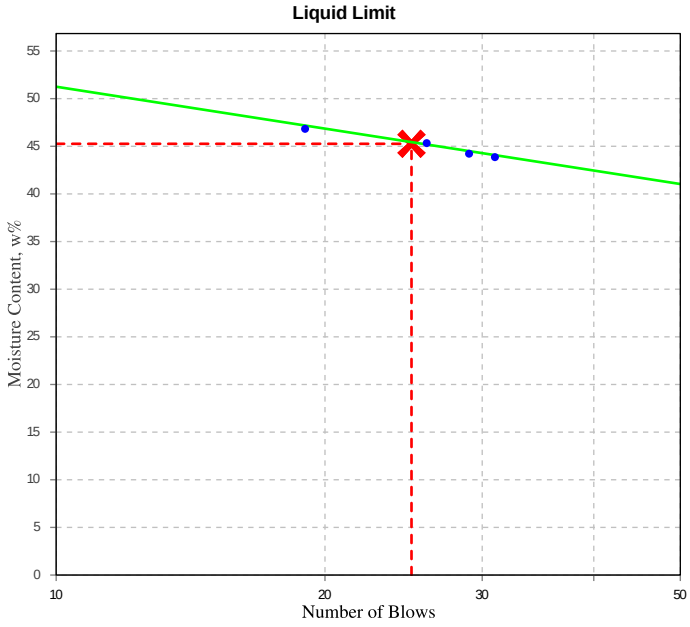
Approved Signatory: Andrew Hutchings
Laboratory Manager
NATA Accredited Laboratory Number: 828

Report Number: **84822.04-4B**
Issue Number: 1
Date Issued: 17/04/2020
Client: Cleanaway Operations Pty Ltd
Level 4, 441 St Kilda Road, Melbourne 3004
Contact: Nick Schutt
Project Number: 84822.04
Project Name: Green Waratah
Project Location: 339 Wallgrove Road, Eastern Creek
Work Request: 5759
Sample Number: SY-5759R
Date Sampled: 21/02/2020
Dates Tested: 18/03/2020 - 07/04/2020
Sampling Method: Sampled by Engineering Department
The results apply to the sample as received
Sample Location: **ATP04 (2.4-2.5m)**
Material: SILTSTONE

Atterberg Limit (AS1289 3.1.1 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	45		
Plastic Limit (%)	21		
Plasticity Index (%)	**24**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Linear Shrinkage (%)	12.0		
Cracking Crumbling Curling	None		

Emerson Class Number of a Soil (AS 1289 3.8.1)		Min	Max
Emerson Class	**2**		
Soil Description	SILTSTONE		
Nature of Water	Distilled		
Temperature of Water (^{o}C)	20		



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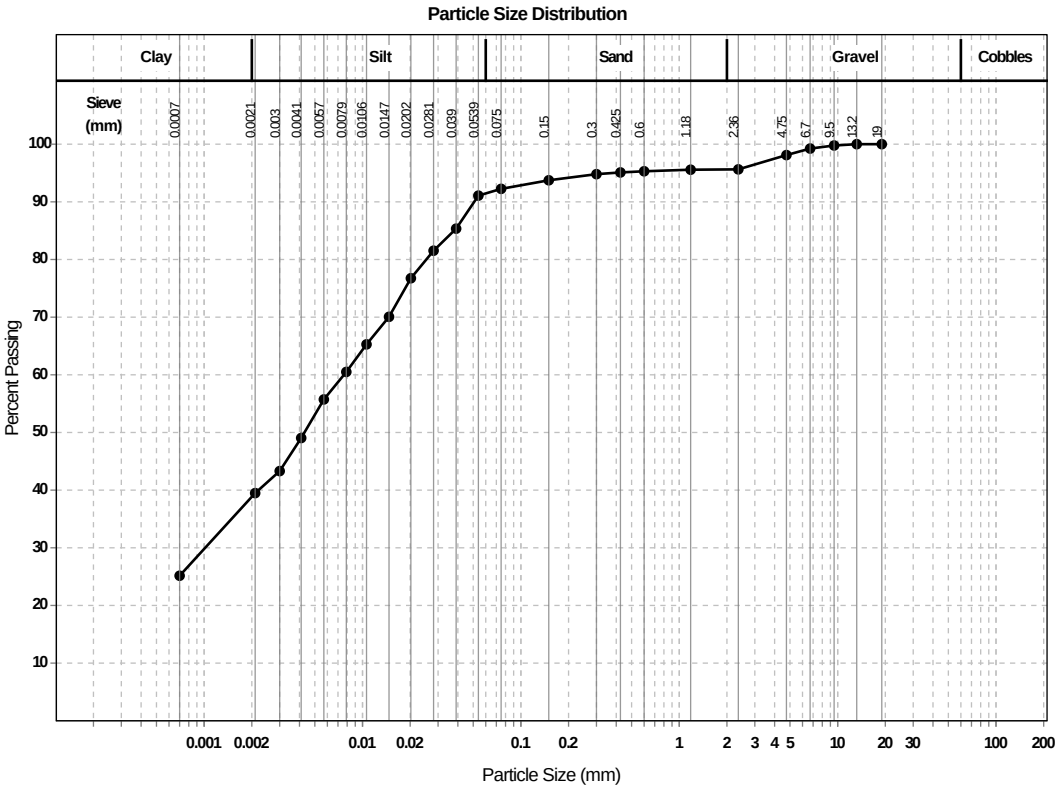
Approved Signatory: Andrew Hutchings
Laboratory Manager
NATA Accredited Laboratory Number: 828

Report Number: **84822.04-4**
Issue Number: 1
Date Issued: 27/04/2020
Client: Cleanaway Operations Pty Ltd
Level 4, 441 St Kilda Road, Melbourne 3004
Contact: Nick Schutt
Project Number: 84822.04
Project Name: Green Waratah
Project Location: 339 Wallgrove Road, Eastern Creek
Work Request: 5759
Sample Number: SY-5759R
Date Sampled: 21/02/2020
Dates Tested: 18/03/2020 - 30/03/2020
Sampling Method: Sampled by Client
The results apply to the sample as received
Sample Location: **ATP04 (2.4-2.5m)**
Material: SILTSTONE

Fine Analysis using a Hydrometer (AS 1289 3.6.3)	
Method of Dispersion	Mechanical Device
Loss in Pretreatment	

Particle Size Distribution (AS 1289 3.6.1)			
Sieve	Passed %	Passing Limits	
19 mm	**100**		
13.2 mm	**100**		
9.5 mm	**100**		
6.7 mm	**99**		
4.75 mm	**98**		
2.36 mm	**96**		
1.18 mm	**96**		
0.6 mm	**95**		
0.425 mm	**95**		
0.3 mm	**95**		
0.15 mm	**94**		
0.075 mm	**92**		

Fine Analysis Using a Hydrometer (AS 1289 3.6.3)	
Particle Size (mm)	Passed %
0.0539	**91.1**
0.0390	**85.3**
0.0281	**81.5**
0.0202	**76.7**
0.0147	**70.1**
0.0106	**65.3**
0.0079	**60.5**
0.0057	**55.7**
0.0041	**49.0**
0.0030	**43.3**
0.0021	**39.5**
0.0007	**25.1**



Test Report

Client : Douglas Partners	**Project Number :** 1725
	Project Details : Eastern Creek (Project 84822.04)
	Order/Request Number :
Report Date : 24th April 2020	**Report Number :** 172502 rev1

Sample Details

Sample ID / Name / Number	ABH02 2.4-2.8m
Sample Description	
Sampled by	Client
Sample Type	Loose Bulk
Date Sampled	21/2/2020

Dry Density / Moisture Relationship (AS 1289.5.1.1) - As provided by Douglas Partners .

Maximum Dry Density (t/m^3)	1.616
Optimum Moisture Content (% Dry Weight)	23.5

Thermal Conductivity (ASTM D5334)

Test Date	Preparation Method	Specimen	Moisture Content (%)	Test Time (s)	Initial Temp. (^{O}C)	Thermal Conductivity (W/m.K)	Thermal Resistivity (Km/W) *
9/04/2020	Compacted. 98% of MDD at OMC	A	23.24%	600	20.5	1.59	0.63
9/04/2020	Compacted. 98% of MDD at OMC	B	22.96%	600	20.5	1.56	0.64
16/04/2020	Compacted. 98% of MDD. Partially dry.	A	13.77%	600	20.7	1.43	0.70
17/04/2020	Compacted. 98% of MDD. Partially dry.	B	5.21%	600	20.4	0.88	1.13
20/04/2020	Compacted. 98% of MDD. Partially dry.	A	9.53%	600	19.3	1.16	0.86
20/04/2020	Compacted. 98% of MDD. Partially dry.	B	2.78%	600	19.5	0.76	1.32
24/04/2020	Compacted. 98% of MDD. Fully dry.	B	0.00%	500	21.2	0.61	1.64

Specimen	Length (mm)	Diameter (mm)	Mass (g)	Dry Density (t/m$^{3)}$
A	177	73	1175.80	1.59
B	177	73	1178.31	1.59

Notes

- *Thermal resistivity calculation = 1 / Thermal Conductivity.
- 2 specimens from this sample were prepared and tested as part of this report.
- All testing undertaken at Geotherm's Hornsby Laboratory, unless noted.
- Specimens prepared by BH. Wet specimens tested by BH. Dry and partially dry specimens tested by PV, BL, BH
- The above samples will be discarded after 2 weeks.

Brett Hobson
Approved Signatory

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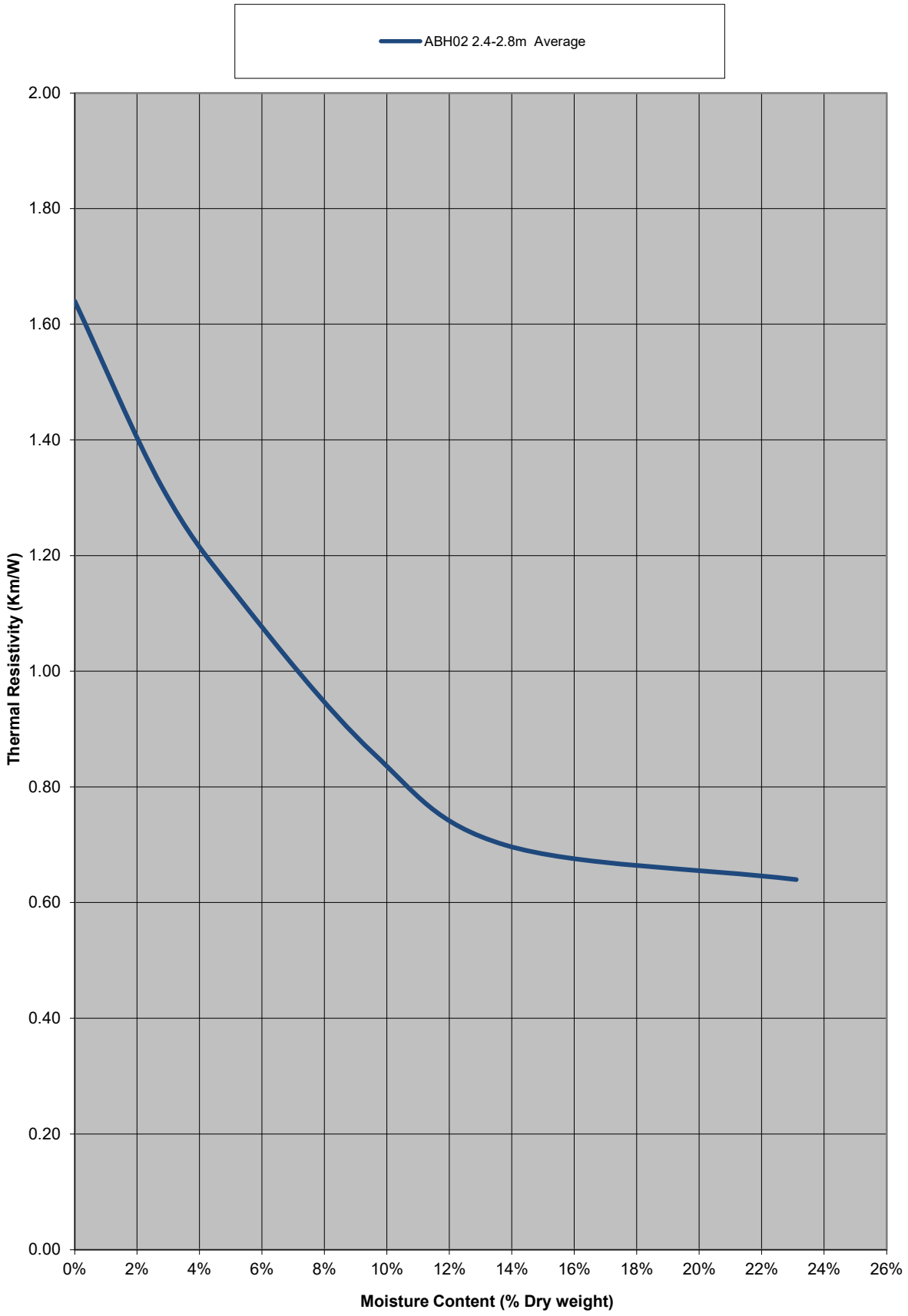
Website: www.geothermaust.com.au
ABN 35 097 576 611

NATA Accreditation Number 20321 – Site 24277

Geotherm Australasia

Dry-out Curve



Test Report

Client : Douglas Partners	**Project Number :** 1725
	Project Details : Eastern Creek (Project 84822.04)
	Order/Request Number :
Report Date : 23rd April 2020	**Report Number :** 172501

Sample Details

Sample ID / Name / Number	ABH01 1.3-1.6m
Sample Description	
Sampled by	Client
Sample Type	Loose Bulk
Date Sampled	21/2/2020

Dry Density / Moisture Relationship (AS 1289.5.1.1) - As provided by Douglas Partners.

Maximum Dry Density (t/m^3)	1.728
Optimum Moisture Content (% Dry Weight)	17.3

Thermal Conductivity (ASTM D5334)

Test Date	Preparation Method	Specimen	Moisture Content (%)	Test Time (s)	Initial Temp. (^{O}C)	Thermal Conductivity (W/m.K)	Thermal Resistivity (Km/W) *
7/04/2020	Compacted. 98% of MDD at OMC	A	17.54%	600	20.2	1.28	0.78
7/04/2020	Compacted. 98% of MDD at OMC	B	17.37%	600	20.7	1.37	0.73
14/04/2020	Compacted. 98% of MDD. Partially dry.	A	10.45%	400	18.4	0.92	1.09
11/04/2020	Compacted. 98% of MDD. Partially dry.	B	3.66%	500	19.4	0.68	1.48
16/04/2020	Compacted. 98% of MDD. Partially dry.	A	6.76%	600	20.0	0.76	1.32
23/04/2020	Compacted. 98% of MDD. Fully dry.	B	0.00%	600	20.3	0.53	1.89
23/04/2020	Compacted. 98% of MDD. Fully dry.	A	0.00%	600	20.0	0.49	2.03

Specimen	Length (mm)	Diameter (mm)	Mass (g)	Dry Density (t/m$^{3)}$
A	177	73	1251.56	1.69
B	177	73	1252.76	1.69

Notes

- *Thermal resistivity calculation = 1 / Thermal Conductivity.
- 2 specimens from this sample were prepared and tested as part of this report.
- All testing undertaken at Geotherm's Hornsby Laboratory, unless noted.
- Specimens prepared by PV. Wet specimens tested by BL. Dry and partially dry specimens tested by PV, BL, BH
- The above samples will be discarded after 2 weeks.

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Approved Signatory

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Website: www.geothermaust.com.au
ABN 35 097 576 611

NATA Accreditation Number 20321 – Site 24277

Geotherm Australasia

Dry-out Curve