Douglas Partners
Geotechnics / Environment / Groundwater

Integrated Practical Solutions

Report on
Geotechnical Investigation

Huntington
35 Honeysuckle Drive, Newcastle

Prepared for
Lee 4 Pty Ltd

Project 91303.00
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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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Report on Geotechnical Investigation
Huntington
35 Honeysuckle Drive, Newcastle

1. Introduction

1.1 Purpose

This report presents the results of a geotechnical investigation undertaken for the Huntington development at 35 Honeysuckle Drive, Newcastle. The investigation was commissioned in an email dated 4 April 2018 by Chris Farrington of Lee 4 Pty Ltd and was undertaken with reference to Douglas Partners' Pty Ltd (DP) email proposal NCL180001 dated 11 January 2018.

It is understood that the development of the site will include the construction of two eight-storey residential towers, with two basement levels across the site, below both towers (see further details below).

The aim of the investigation was to assess the subsurface soil and groundwater conditions across the site in order to provide geotechnical advice on a range of matters including excavation support, water levels, dewatering, footings, and soil aggressiveness.

The investigation was undertaken with reference to email correspondence with the client over the period 18 December 2017 to 4 April 2018 and the NSW Planning & Environment department Secretary's Environmental Assessment Requirements (SEARs) dated 15 January 2018.

1.2 Proposed Development

It is understood that the development of the site will include:

- Two eight-storey residential towers, with two basement levels across the site below both towers;
- Existing ground levels range from about RL2.3 (AHD) to RL2.9. The proposed level of the basement is about RL-3.1. Localised deeper excavations (about 1 m below basement level) are anticipated for lift pit and services construction;
- The structure comprises reinforced concrete slabs on load bearing walls and columns. Column loads have not been advised; and
- The site currently comprises a disused bitumen sealed carpark.

Reference should be made to the architectural drawings provided in Appendix D showing the proposed development.

This assessment was part of a larger investigation that also covered contamination matters and mine subsidence. These aspects are reported separately. The current report present the details of the field work and testing conducted for geotechnical purposes, together with comments on the findings and recommendations.

1.3 Scope of Work

The scope of work for the investigation was based on discussions with the Client and the SEARs dated 15 January 2018. The scope comprised:

- Data review of existing information pertinent to the site;
- Preparation of safe work method statements;
- Underground service checks at test locations;
- Subsurface investigation via test pits and bores;
- Cone penetration testing (CPT);
- Laboratory testing of selected soil and groundwater samples for soil aggressiveness testing (pH, Cl, SO_4, EC).
- Preparation of a geotechnical report providing engineering comment on the following items:
    - Data review of reports carried out in this area;
    - Subsurface conditions;
    - Geotechnical design parameters for a variety of foundation systems and ground improvement if required. This should include bearing and shaft capacities (compression and tension), rock depths, estimated total and differential settlements and soil aggressiveness;
    - Advice on trafficability;
    - Retention wall system parameters for temporary and permanent conditions, including indicative earth pressure coefficients, soil properties, batter slopes etc.;
    - Assessment of the site factor for earthquake design to AS 1170.4;
    - Advice on vibration criteria for the subgrade for major equipment subjected to vibration during operation;
- Provide a recommendation of California bearing ratio (CBR) values for pavement and slab on ground design.

The following were also requested in the SEARs:

- Geotechnical report detailing the suitability of the site to support the proposal considering Mine Subsidence;
- Details of dewatering requirements (if any) during construction;
- Assessment of water quality and level.

2. Site Description

The site is known as 35 Honeysuckle Drive. The development site is roughly rectangular in shape (120 m long by 46 m to 50 m wide) and has an approximated plan area of 4700 m^2. The site is bounded to the south by Honeysuckle Drive, to the east by 21 Honeysuckle Drive and to the north and west by undeveloped land. Newcastle Harbour lies about 5 m to 10 m to the north of the site.

It is almost fully occupied by a bitumen-sealed area which is currently disused. The location and aerial view of the site is shown in Figure 1.

Figure 1: Site Location - 35 Honeysuckle Drive, Newcastle (Photo dated 7 April 2018, Nearmap)

3. Background Information

3.1 Published Data

The regional geology at the site is shown on the 1:100,000 scale regional geology map for Newcastle (Newcastle Coalfield Regional Geology, Sheet 9321, NSW Department of Mineral Resources). This map indicates that site is underlain by Quaternary Alluvium (Qa), comprising gravel, sand, silt and clay deposits.

The natural soils in this area are typically overlain by man-made fill materials to varying depths, related to reclamation, historical industrial usage, infrastructure and commercial development.

Reference to the Newcastle Acid Sulphate Soil Risk Map published by the Department of Land and Water Conservation indicates that the site has a high probability of acid sulphate soil conditions occurring between 1 m and 3 m depth. The mapping is shown in Figure 2.

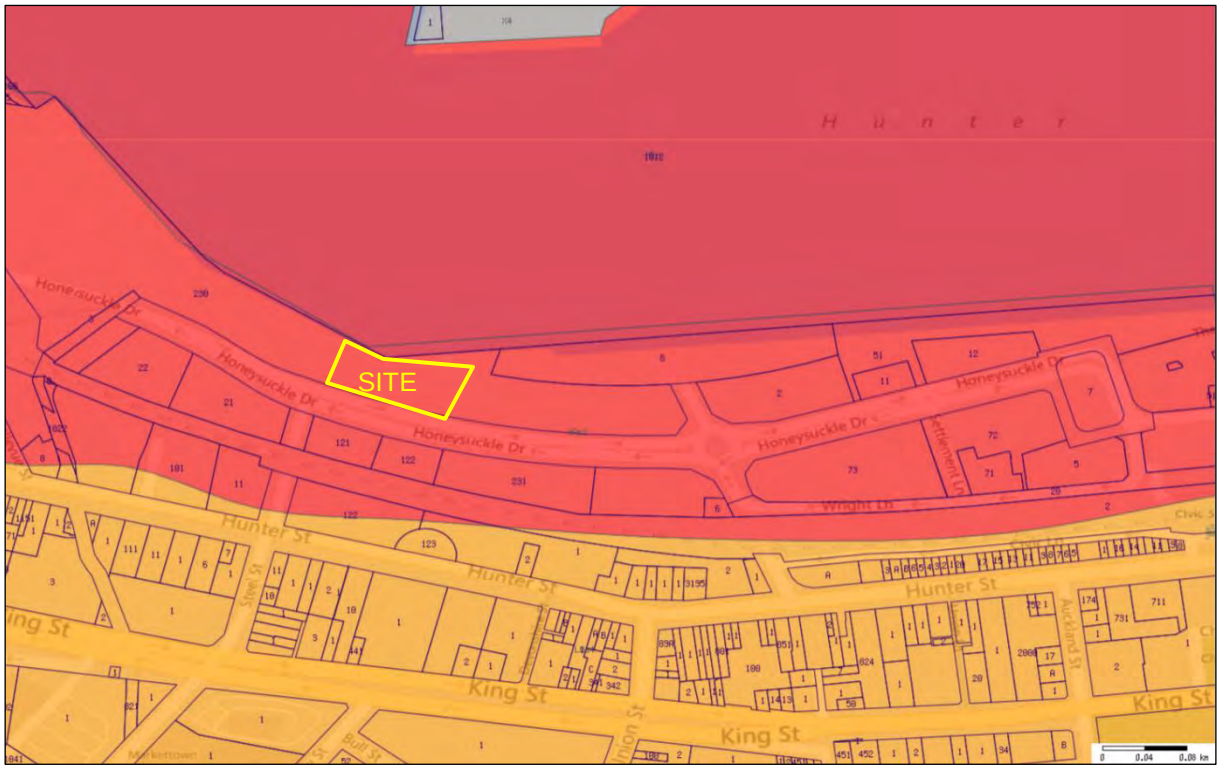

Figure 2: Acid Sulphate Risk Mapping (DLWC)

3.2 Previous Reports

3.2.1 Douglas Partners Pty Ltd Reports

Report on Geotechnical Investigation of Abandoned Mine Workings, Wickham & Bullock Island Coal Company Lot 112, Project 31145A dated October 2000.

A previous mine subsidence investigation was undertaken by DP across the broader Honeysuckle development and included the drilling of one bore (Bore DEV 3) within the subject site. The bore was drilled to target a coal pillar associated with workings in the Borehole Seam. The Borehole Seam was encountered at a depth of 69.9 m depth and the base of the seam was encountered at 75.2 m depth.

Report on Geotechnical Investigation, 50 Honeysuckle Drive, Newcastle, Project 91034.00 dated March 2017 (Ref 1).

A geotechnical investigation was undertaken by DP at the adjacent site (east of subject site) for the construction of three six storey residential towers, with a single basement level below all three towers.

The geological profile is consistent with the profile encountered in the current investigation, where results from the previous investigation have been used to supplement data for this report.

3.2.2 Client Supplied Reports

Proposed Mine Subsidence Mitigation Plan – Honeysuckle – Coffey Report, 20 December 2010

This report summarised the results of previous mine subsidence investigations and presented the output of mine subsidence modelling undertaken by Ditton Geotechnical Services (DgS). The report presents recommendations to partially grout the workings in the Borehole Seam beneath the site to reduce surface subsidence parameters to the following values:

- Maximum surface subsidence (Smax) of 0.1m;
- Maximum surface tensile strain (+Emax) of 1.0mm / m;
- Maximum surface compressive strain (-Emax) of 1.45mm / m; and
- Maximum surface tilt (Gmax) of 2.7mm / m.

4. Field Work

4.1 Field Work Methods

The field work consisted of the following:

- Nine test bores (Bores DP1-BH, DP2-BH, DP4-BH DP6-BH, DP14-BH, DP16-BH to DP18-BH and DP20-BH) using a Geoprobe drilling rig fitted with a 100 mm continuous tube sampler, mainly for contamination purposes, to depths ranging from 7.0 m to 7.3 m;
- Twenty-five test pits (Pits DP1-TP to DP25-TP) excavated using a 5 tonne excavator fitted with a 450 mm toothed bucket, mainly for contamination purposes, mostly to depths 0.35 m to 1.6 m, with 8 of the test pits refusing on an obstruction at 0.6 m depth or less;
- Twelve dynamic penetrometer tests (DPT) - at selected test pit locations, to depths of up to 1.2 m or prior refusal;
- Installation of three groundwater monitoring wells in Bores DP4-BH, DP14-BH and DP20-BH to depths of 7.2 m. The wells comprised Class 18 machine-slotted, machine-threaded PVC with graded gravel backfill and bentonite seal;
- Nine cone penetration tests (CPTs C1 to C9) to depths ranging from 19.0 m to 31.54 m, mainly for geotechnical purposes, providing information on the stratigraphy at depth. At CPT C2 a problem with the cone occurred, and at C5 an obstruction was encountered during the test in the near surface filling at about 2.3 m depth. At these locations the CPT was relocated about 1 m offset from the original test location and the test was recommenced;
- Measurement of field groundwater parameters;
- Collection of soil and groundwater samples for laboratory testing (see below); and
- Three rising head permeability tests in the three wells (i.e. DP4-BH, DP14-BH and DP20-BH).

The test locations for the current investigation are shown on Drawing 2 in Appendix D. The test locations from investigation of the adjacent are shown on Drawing 3 in Appendix D.

The field work, logging and sampling was undertaken by geo-environmental engineers from DP.

It is noted that accurate survey was not conducted. The locations of the bores and CPTs were recorded using a handheld GPS typically accurate to ± 5 m depending on satellite coverage. The ground surface levels shown on the logs were interpolated from a survey plan supplied by the client and are therefore approximate. Reduced levels were measured for groundwater wells to assist with groundwater level monitoring.

4.2 Field Work Results

4.2.1 Subsurface Conditions

The borehole logs, test pit logs and CPT charts are provided in Appendix B which should be read in conjunction with the accompanying explanatory notes that define classification methods and terms used to describe the soils provided in Appendix A. The geotechnical subsurface conditions are summarised below and are indicated on Section A-A' in Appendix D:

Table 1: Summary of Geotechnical Subsurface Profile

Unit	Description	Range at Base of Stratum[(1)]	
		Depth (m)	RL (AHD)
1.1	Upper Fill: pavement materials, gravelly sand, rubble	0.32 to 1.0	2.58 to 1.9
1.2	Lower Fill: sand, silty sand, some gravelly sand,	0.51 to 4.0	2.39 to -1.10
2	SILTY CLAY/CLAYEY SILT - soft to firm (CPTs 5, 6 & 9 only)	5.07 to 6.44 (2)	-2.17 to -3.54
3.1	SAND / SILTY SAND – typically medium dense, loose in parts	6.75 to 15.57	-3.85 to -12.67
3.2	SAND - medium dense to dense, very dense in parts	10.10 to 11.84	-7.20 to -8.94
4	CLAY - stiff to hard, some interbedded sand layers	19.00 to 30.69	-16.10 to -27.79
5	CPT refusal in Weathered Rock (inferred)	29.68 to 31.54 - limit of investigation	

Notes to Table 1:

1. Layers vary in base depth across the site (i.e. not level) hence a range is given.
2. Unit 2 (soft to firm clay) is commonly encountered in alluvial areas of Newcastle but is not continuous over this site.

A number of test locations reference refusal during excavation / drilling on possible obstructions. The depth of refusal ranged from 0.24 m to 0.55 m below ground levels (refer to attached test logs for details and drawing 4, Appendix D).

Table 2 presents the groundwater parameters recorded at the time of sampling on 4 May 2018 and 10 May 2018.

Table 2: Field Measurements of Groundwater at Time of Sampling

Parameter (Units)	DP4-BH		DP14-BH		DP20-BH	
	04/05/2018	10/05/2018	4/05/2018	10/05/2018	4/05/2018	10/05/2018
Reduced Level of Well Collar (AHD)	2.06		1.84		2.07	
Depth to Groundwater below Well Collar (m)	2.08	1.94	2.00	1.97	1.99	1.74
Depth to Groundwater below Ground Level (m)	2.18	2.04	2.07	2.04	2.03	1.78
Reduced Level of Groundwater (AHD)	-0.02	0.12	-0.16	-0.13	0.08	0.328
PID Well Headspace (ppm)	-	<1	-	<1	-	<1
Thickness of free product (mm)	<1	<1	<1	<1	<1	<1
pH	7.7	5.6	7.5	7.0	7.4	7.2
Electrical Conductivity (mS/cm)	0.638	0.734	.512	.601	0.01	0.01
Redox, Eh (mV)	-63	28	48	54	-75	-47
Colour	Turbid/ Grey	Moderate Turbidity/ Grey	Very Turbid/ Grey	Very Turbid/ Brown	Very Turbid/ Dark Brown	Extremely Turbid/ Brown

The results of groundwater field testing indicated the following:

- Groundwater is generally neutral to slightly alkaline (i.e. pH 7.0 to 7.7) with a single test indicating slight acidity in Bore DP4-BH on the 10/05/2018;
- Groundwater is brackish;
- Reducing conditions were encountered (i.e. Redox potential -47 to -75);
- The results of PID screening on groundwater headspace suggest the absence of gross volatile hydrocarbon impacts (i.e. <1 ppm); and
- Floating product was not detected visually or by the interface meter (i.e. <1 mm).

The groundwater samples collected did not exhibit obvious indications of gross contamination (e.g. staining or odours).

4.2.2 Groundwater Level Monitoring

The groundwater levels were recorded manually on 4 May 2018 and 10 May 2018 and have been summarised in Table 2 above. Long term groundwater monitoring was not possible following the installation of groundwater wells given the site was being utilised for the reconstruction of the adjacent wharf embankments.

Groundwater monitoring was undertaken as part of the investigation for the adjacent site (Ref 1) over the period 20 December 2016 to 23 January 2017 (34 days). Figure B1 in Appendix B shows the reduced water levels to AHD plotted against time from the previous investigation along with the average water levels observed in the current investigation. The plots also show the corresponding tide levels and rainfall (Nobby's BOM Station), as well as manual gauging checks from the adjacent site investigation. The proposed bulk excavation of the proposed development is also shown for comparison.

The results from the adjacent site indicate the following:

- Water levels during monitoring period for the adjacent site and current investigation were about 3 m to 4 m above the proposed bulk excavation level. Dewatering will therefore be required during construction;
- There were two moderate rainfall events of about 30 mm during the monitoring period for the adjacent site. There was no noticeable response in water level as a result of the rainfall. This is most likely due to the majority of the site being paved; and
- A subdued tidal response in the order of 0.2 m amplitude was apparent, having a time-lag of about three to four hours relative to the tide.

It is noted that during construction, while the ground is open to rainfall and runoff, there would likely be a more direct groundwater response to rainfall.

It should be noted that groundwater levels are affected by factors such as climatic conditions, soil permeability and tidal movements and will therefore vary with time.

4.2.3 In-situ Permeability Tests

The results of the in-situ permeability tests are shown on the report sheets in Appendix B and are summarised in Table 3. In each well three tests were performed; the results show the minima, maxima and mean values recorded.

The permeability was estimated using the Hvorslev method. The permeability values are applicable only to the soil unit corresponding to the well screen interval, in this case the natural sand.

Table 3: Results of Rising Head Permeability Tests

Bore/Well	Well Construction			Permeability K (m/s)		
	Casing Radius (m)	Gravel radius (m)	Screen Interval (m)	Minimum	Maximum	Mean
DP4-BH	0.025	0.05	1.2 to 7.2	2.1×10^{-4}	2.8×10^{-4}	2.3×10^{-4}
DP14-BH	0.025	0.05	1.2 to 7.2	3.1×10^{-4}	4.2×10^{-4}	3.8×10^{-4}
DP20-BH	0.025	0.05	1.2 to 7.2	2.8×10^{-4}	3.3×10^{-4}	3.0×10^{-4}

The results are consistent with those observed at the adjacent development site. Comments on dewatering design and groundwater effects are contained in the Section 6.4 noting that the basement excavation will require dewatering.

5. Laboratory Testing for Soil Aggressiveness

5.1 Aggressiveness of Soil

Selected soil samples were collected from a range of depths and sent to Envirolab Services Pty Ltd for aggressiveness testing purposes. Groundwater samples from the three wells were also sent to the same laboratory for testing. The soil and water samples were tested for the following parameters:

- pH;
- Electrical Conductivity (EC);
- Chloride; and
- Sulphate.

The laboratory reports for soil and groundwater aggressiveness will be presented in the contamination assessment report. The results presented in Figure 3 below show the distribution of each parameter with depth. A discussion on the results is presented in Section 6.8.

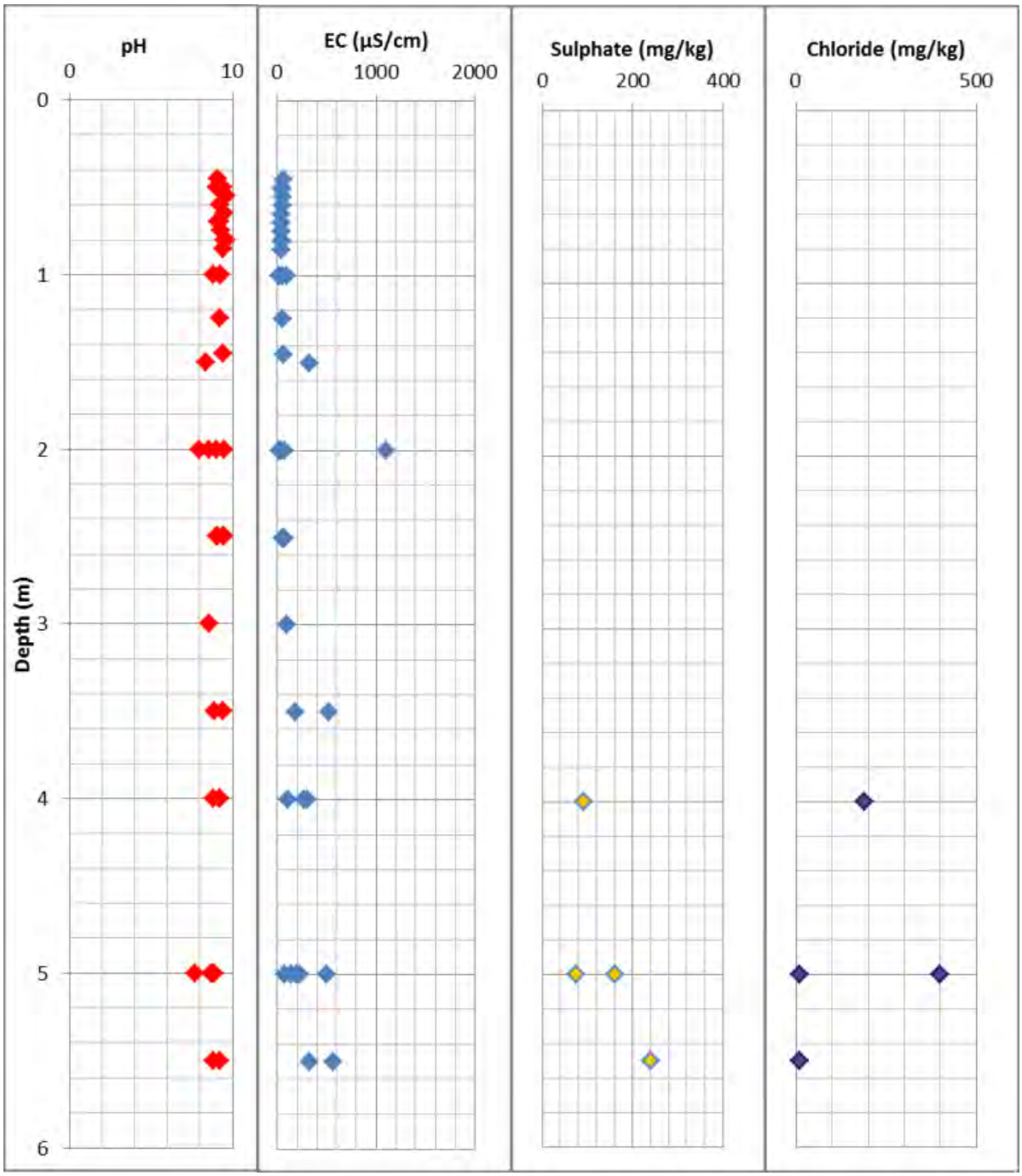

Figure 3: Soil Aggressiveness Parameters with Depth (m)

Notes to Figure 3:

EC – Electrical Conductivity µS – micro Siemens

Cl – Chloride Content SO_4 – Sulphate Content

6. Comments

6.1 Earthworks and Excavations

The lowest basement slab level proposed is RL-3.1. Allowing for slab thickness, gravel basecourse and / or underdrainage features, the base level of bulk excavation is anticipated to be about RL-3.7 or lower. Construction of pile caps, lift wells, cores and other similar features will require locally deeper excavations.

The current ground levels are about RL2.2 to RL2.9, hence the bulk excavations will be about 6.6 m deep relative to current ground levels. Excavations will therefore penetrate through Units 1.1 to 1.2 and into Unit 3 and possibly encounter Unit 2. Groundwater is likely to be encountered from about 1.4 m to 2.6 m depth, hence excavation will be to depths of about 4 m below water level.

The near-surface filling includes large areas of pavement materials which will need to be broken up for appropriate classification and removal. Once the upper fill is penetrated it is expected that the remainder of the fill materials and underlying natural sands should be readily excavated using conventional earthmoving equipment. Dewatering will be required in conjunction with excavation as discussed in Section 6.4.

In some areas buried inclusions / obstructions were encountered which resulted in CPT and test pit refusal. The location and depth of refusal has been shown on Drawing 4 in Appendix D. Furthermore, recent works on the adjacent site have confirmed that an old sea wall may cross the site boundary and traverse the subject site. Brief review of historical aerial imagery as far back as 1954 does not show the sea wall encountered on the adjacent site, however, the review of aerial photos was difficult due to the relatively small scale and poor resolutions. There is therefore a risk that the site may contain further obstructions. We recommended further subsurface investigation to assess the possible presence of obstructions with the site which could be conducted during initial earthworks construction.

The exposed sand subgrade at the base of the excavation is expected to be within the Unit 3.1 to 3.2 sand and silty sand material.

The base layer and any imported gravel basecourse will require suitable compaction to provide uniform subgrade support for the basement slab. The subgrade should be compacted to at least 100% Standard dry density ratio (AS1289.5.1.1) for cohesive soils, or 80% Density Index (AS1289.6.1.1) for cohesionless sand, as appropriate to the type of material.

A design subgrade CBR of 7% could be adopted for support of pavements on a silty sand subgrade compacted to at least 80% Density Index (AS1289.6.1.1).

6.2 Excavation Support

The proposed basement excavation will require the sandy water-charged soils to be adequately supported. This could include the use of sheet pile walls or secant walls to support the excavation. The use of anchors or props may be required to limit deflections at the site boundaries. A discussion on anchors (if required) is presented in Section 6.3.

If used, secant piles should be installed by experienced contractors using guide walls to reduce loss of verticality ('wander'). Nevertheless some gaps between piles may eventuate which would increase leakage through the wall.
The use of active pressure coefficients (Ka) requires that there will be sufficient deflection of the retaining system during construction to reach active conditions. If lateral deflections will be inhibited, at-rest coefficients (Ko) should be used.

The recommended design parameters for estimating long-term earth pressures on retaining walls are shown in Table 4. These values are unfactored hence a suitable factor of safety should be used in design.

Table 4: Design Parameters for Retaining Structures

Unit	Description	γ_b (kN/m^3)	Ka	Ko	Kp
1.1	Filling – pavement materials, concrete	20	0.35	0.50	3.3
1.2	Filling – sand, silty sand, some gravelly sand	18	0.33	0.50	3.3
2	SILTY CLAY/CLAYEY SILT - soft to firm	18	0.4*	0.6*	2.5*
3.1	SAND / SILTY SAND - loose to medium dense	19	0.30	0.45	3.4
3.2	SAND - medium dense to dense, very dense in parts	20	0.27	0.43	3.7
4	CLAY - stiff to hard some interbedded sand layers	20	0.40	0.60	2.5

Notes to Table 4:
γ_b - bulk density
Ka - coefficient of active earth pressure
Ko - coefficient of 'at-rest' earth pressure
Kp - coefficient of passive earth pressure
* Analysis of the soft to firm clay layer should also consider short term parameters using an undrained cohesion of 25 kPa

The design values given are based on level ground behind the wall and do not include any surcharge loads that may be imposed near the top of the wall e.g. vehicle/ machinery loads. Below the long-term water table, earth pressures may be based on submerged (buoyant) unit weights of the soil plus the hydrostatic pressure on the wall.

The design pile wall toe level should take into account wall stability as well as the need to limit water ingress into the basement excavation. It is suggested that the secant wall be installed at least 1 m into the Unit 4 clay layer to assist in reducing inflows by virtue of a lower permeability than the overlying sands. This layer was encountered from about 13.8 m to 15.6 m depth, hence will be about 7 m to 9 m below the bottom basement level. See further discussion regarding dewatering in Section 6.4.

6.3 Anchors

In the event lateral and vertical movement of the excavation support is important to the project, anchors could be considered. The design and performance of anchors (if used) are typically the responsibility of the contractor, however the design should generally have the following features:

- A free length of at least 3 m that extends behind the potential failure plane; in soil the failure plane may be taken preliminarily as a line subtended at 26° from the base of the excavation to the ground surface;

- The angle of the anchors should generally be in the range 5° to 20° below horizontal. Steeper angles can be used but must take account of the larger vertical forces on the piles and at the anchorage point;
- The grouted bond length should generally be at least 3 m and sufficient to achieve the designated loads; and
- Grouted bond lengths exceeding 8 m should take account of the effects of elongation.

The design should also consider the following possible failure modes for the anchors:

- Tensile failure of the anchor strands;
- Failure at the grout-strand interface;
- Failure at the grout-soil or grout-rock interfaces; and
- Failure of the soil or rock by pull-out of a cone of soil and / or rock;
- The anchor design should also consider possible presence of obstructions within and adjacent to the site (refer to Section 6.1).

Preliminary design values for anchors are shown in Table 5. These values should be confirmed or revised (by DP or the anchor contractor) when the detailed design of the anchors is undertaken to take account of the type of anchor and installation technique proposed.

Table 5: Preliminary Design Bond Stresses for Anchors

Unit	Description	Anchor Type[1]	Ultimate Bond Stress (kPa)	Working Bond Stress[2] (kPa)
1.1, 1.2	Filling (unlikely to be present within bond zone)	NA	NA	NA
2.0	Silty Clay / Clayey Sand - soft to firm	NA	NA	NA
3.1	Sand - loose to medium dense to dense	B	30	15
3.1	Sand - medium dense to dense	B	80	40
4	Clay - stiff to hard	C,D	20	10
5	Bedrock (Sandstone, Siltstone, Laminite - typically medium to high strength	A	1000	500

Notes to Table 5:

1. The type of anchor will need to be selected to suit the predominant soil type over the anchor bond length - see below for a description of basic types.
2. Working Stress is based on a factor of safety of 2.

The above working bond stress is based on a typical factor of safety of 2, however it may be varied according to the load testing regime (e.g. more testing might allow a lower factor of safety to be adopted).

The anchor type selected will affect the detailed design and anchor capacities. The basic types are outlined below:

Type A: straight shafted borehole, most commonly used in rock or hard clays.

Type B: grouted under low pressure, whereby the grout permeates into coarse granular soil, in order to increase the diameter of the fixed length.

Type C: grouted under high pressure via a lining tube or packer; most commonly used in fine cohesionless soils, but also in stiff cohesive soils.

Type D: the fixed length is belled or under-reamed; most commonly used in firm to hard cohesive soils.

Other types of anchors (e.g. platypus soil anchors) may be suitable and advice should be sought from suitably experienced contractors in this regard.

The bond stress will relate to the inclined anchor load, which should be resolved into horizontal and vertical components, depending on the angle of anchor installation. For a given required horizontal load, increasing the anchor inclination increases the inclined load and vertical component on the wall and anchorage points.

The design loads for anchors should be determined using appropriate analysis techniques (e.g. WALLAP) and include allowances for surcharge loads during and following construction. Consideration should also be given to whether the anchors are intended to be temporary or permanent.

Anchors are typically stressed to 125% to 150% of their design value as a proof test and then relaxed to 80% to 100% of the design value before locking off, in order to minimise wall movements. Selected anchors should be tested after 7 days of initial proof loading to assess any reduction in capacity due to relaxation. A detailed specification for installation and testing of anchors should be prepared by the anchor contractor for review by the Principal prior to installation.

6.4 Dewatering

Dewatering will be required for basement construction in order to draw down the water level to at least RL-4.2 (about 0.5 m below underside of the basement floor level), and locally lower at lift wells and large pile caps (if used). Based on the water level monitoring of nearby sites and the results of the CPT, this will entail lowering the water table by up to about 6 m to 7 m generally, and an additional further 2 m to 3 m at the lift wells.

The suggested permeability parameters for the design of dewatering systems are shown in Table 6.

Table 6: Suggested Parameters for Design of Dewatering

Unit	Description	Permeability K (m/s)
1.1	Filling – pavement materials, concrete	NA - above water table
1.2	Filling – sand, silty sand, gravel, some rubble	3×10^{-4}
2	Silty Clay / Clayey Sand - soft to firm (not continuous)	NA - Not continuous
3.1	Sand / Silty Sand - loose to medium dense	6×10^{-4}
3.2	Sand - medium dense to dense	4×10^{-4}
4	CLAY - stiff to very stiff	1×10^{-8}

It should be noted that soil permeability can vary widely between locations and different layers. The design of the dewatering system should cater for potential variations. A sensitivity analysis should be undertaken to assess the effect of varying the permeability of critical layers in the groundwater model. The in-situ permeability values are effectively horizontal values (Kh). It is suggested that analysis incorporates a degree of anisotropy whereby the ratio of vertical to horizontal permeability is 0.5.

There are two main arrangements possible for dewatering: internal and external spear points.

Internal Dewatering

This could only work if the perimeter wall is installed into the Unit 4 clay layer, which would substantially reduce groundwater inflow through the base of the excavation. Spear points or large sumps / pumps could be located inside the pile wall. The potential advantages include lower volumes of water generated and little to no drawdown beneath nearby properties and structures. Disadvantages include dewatering equipment getting in the way of excavation, anchoring and other construction activities. This assumes that the perimeter pile wall would allow minor seepage only into the excavation.

External Dewatering

If the perimeter wall is terminated above the clay (in Unit 3.1 or Unit 3.2 sand) the water table would have to be drawn down external to the basement excavation. Advantages include shorter perimeter wall embedment and unobstructed work area inside the excavation. Disadvantages include much larger volumes of water to manage and drawdown of the water table beneath nearby properties and structures, potentially inducing settlement.

Preliminary groundwater modelling has been undertaken of the proposed dewatering arrangements to assist with selection of the methodology, sizing and location of dewatering equipment and has been reported in Douglas Partners “Report on Groundwater Inflow Analysis for Proposed Basement, 35 Honeysuckle Drive, Newcastle”, Report 91303.R002.Rev0, April 2018.

The basement will need to be either fully drained (requiring constant pumping) or fully tanked. A fully tanked basement is most likely to be used. The design should include contingency measures in the event of leakage into to basement (e.g. sumps and automatically triggered pumps). Once the dewatering is turned off and water levels revert to equilibrium conditions there will be hydrostatic uplift pressures on the basement slab, at which point there needs to be sufficient load on the slab to resist it.

Comments on groundwater management from an environmental perspective have been provided in a separate report.

6.5 Footings

6.5.1 General

The site contains greater than 3 m of sandy filling and therefore the site is classified Class P with reference to AS2870-2011 (Ref 3).

Based on the site conditions encountered in the CPTs and Bores, piled foundations are considered suitable for the proposed development, as discussed below.

Although column loads are expected to be substantial for this structure, based on the drawings provided it is anticipated that the bulk excavation level will be beneath the soft to firm clay encountered between RL-2.17 to RL-3.54 m. Consideration could be given to the use of a stiffened raft footing system founded in the medium dense or stronger sand as an alternative to more conventional piled footings. Further comments regarding a raft slab have been provided in Section 6.5.4. Due consideration should be given to the possible presence of obstructions within the site (refer to Section 6.1).

6.5.2 Pile in Soil

It is recommended that the dense sand which was encountered below about 9 m (RL-6) presents the most suitable founding strata for piles.

The pile types considered suitable for this site comprise continuous flight auger (CFA) piles and concrete screw cast piles. Driven piles are unlikely to be suitable due to the potential vibrations associated with installation, taking into account the proximity of existing buildings along Honeysuckle Drive. Other pile types could be technically feasible for this site and could be assessed if required.

As a guide, the geotechnical capacity of selected single piles has been assessed at each CPT location.

The estimations have been carried out for the following selected piles using in-house software ConePile:

- 0.56 / 0.71 m diameter screw cast pile (e.g. Atlas);
- 0.60 m and 0.75 m diameter (CFA or grout-injected).

Estimates of pile capacities in compression have been undertaken with reference to the piling code AS 2159-2009 (Ref 4). The pile capacities are expressed in limit state terms whereby the Design Geotechnical Strength ($R_{d,g}$) is defined in (Ref 4) as:

$R_{d,g} = \phi_g R_{ug}$, which must exceed the Design Action Effect E_d

R_{ug} is the ultimate geotechnical strength, which is calculated using static theory, and therefore represents an estimate only. The geotechnical strength reduction factor ϕ_g depends on a number of factors including the extent of site investigation, type of analysis and pile testing regime during construction. For the estimates presented below, a value of $\phi_g = 0.52$ was adopted. Higher values of ϕ_g may be justifiable if sufficient load testing is conducted, as per AS 2159-2009. The traditional "allowable" capacity is related to "working" load and is generally lower than $R_{d,g}$, depending on the structural factors applied to determine E_d.

Estimates of geotechnical pile capacities have been determined using the CPT results and an in-house program ConePile Version 5.9.1. The plots of estimated pile capacity against depth are included in Appendix C and have ignored the upper 6.5 m of the soil profile to take into account the depth of basement.

From the charts presented in Appendix C, the optimal founding depth with respect to both capacity and potential consolidation of the underlying clay layers has been presented in Table 7 which shows the geotechnical capacity of single piles founded in the medium dense to dense sand at about 9 m depth (RL-6).

Table 7: Estimated Pile Capacities for Selected Piles Founded at 9 m Depth (approximate RL-6)

CPT	Estimated Design Geotechnical Strength (Rd,g) [1,3] (kN), ϕg = 0.52		
	Grout – Injected (CFA)		Screw Cast Concrete (e.g. Atlas)
	0.6 m dia	0.75 m dia	0.56 / 0.71[4] m dia
C1	700	1000	1500
C2A	800	1200	2200
C3	800	1200	2250
C4	1100	1600	2300
C5A	750	1200	1800
C6	900	1300	2200
C7	800	1400	1800
C8	600	850	1500
C9	700	1000	1750

Notes to Table 7:

1. All pile types, particularly grout piles, should be checked for structural adequacy.
2. Strength Reduction factor (ϕ_g) = 0.52.
3. Group capacities are not necessarily a straight multiple of individual capacities due to interaction effects.
4. Inner / Outer diameter of screw cast pile. Capacity of the pile usually limited to about 2400 kN.

Depending on the column load, a single pile may not be able to support the heaviest proposed column loads due to geotechnical capacity limitations. Depending on the pile type and size adopted, the more heavily loaded columns may require a group of several piles (possibly five to seven or even more).

The foregoing estimated capacities relate to geotechnical strength only, and the structural adequacy of the piles should also be checked, particularly in the case of grout piles. Prospective piling contractors should confirm the pile capacities and founding depths achievable with their equipment. In regard to verification of load capacity at the time of installation, it is noted that screw cast concrete piles have an advantage over grout-injected piles because torque measurements provide an indication of capacity. If grout-injected piles are selected for this project, it is recommended that further CPTs be carried out at a high proportion of pile / pile group locations in order to identify and confirm the strength of the founding layer.

As a guide for the design of piles using traditional methods, Table 8 presents design parameters of non-displacement type single piles (e.g. CFA piles). Design parameters greater than 8 m to 9 m depth have not been provided as the end bearing capacity reduces with increasing depth due to the presence of the underlying weaker Unit 4 clays.

Table 8: Pile design parameters for non- displacement type single piles e.g. CFA piles

Depth (m)	Ultimate Shaft Adhesion (kPa)	Allowable shaft adhesion (kPa)	Allowable End Bearing Pressure (kPa)
1 to 6	0	0	0
6 to 7	50	20	1000
7 to 8	70	28	1200
8 to 9	70	28	1200

The allowable design parameters have been based on a factor of safety of 2.5 and the conditions encountered at CPT C8 which is considered to be one of the tests where weaker soil conditions were encountered. The above parameters are for compressive loads. Tension (uplift) capacities should be based on 75% of the allowable shaft adhesion values shown in Table 8.

With the larger pile groups, the settlement of the underlying clay strata becomes as important an issue as the geotechnical capacity. Hence, although individual pile capacity versus depth plots may indicate slightly higher geotechnical capacities below 8 m depth, the founding depths for pile groups should be at or above this level to minimise the potential 'pile group' settlements.

As a guide, the estimated settlement of a single pile and, twin pile and a three pile group are shown in Table 9, for piles founded at 8 m depth. The settlement estimates has been based on the following:

- Pile diameter of 0.75 m;
- Working load of 700 kN per pile (i.e. based on parameters in Table 8); and
- Pile spacing of 2.5 diameters (centre to centre) for the pile group.

Table 9: Settlement Estimates for Piles and Pile Groups

Pile Location	'Immediate' Settlement(1) (mm)	Consolidation of Clay (mm)	Total Settlement (mm)
Single Pile	5 to 10	0 to 5	5 to 15
Two Pile Group	5 to 10	5 to 10	10 to 20
Four Pile Group	10 to 15	10 to 15	20 to 30

Note to Table 9:

1. The settlement of the pile due to sand and interaction effects will not actually be "immediate', as the load is applied gradually as the building is constructed.

The above total settlements could lead to significant differential settlements between columns or other structural elements. The differential settlements will depend on the spatial arrangement of loads and the pile configuration adopted.

6.5.3 Piles to Rock

Significantly higher load capacities could be achieved by installing piles to rock. It was beyond the scope of the current investigation to confirm rock strength, however the results from previous mine investigation bores and tests on the adjacent site (refer Section 3.2) and CPT data indicate that rock is at a depth of about 30 m to 32 m at this site. A suitable socket would then need to be formed within the rock.

As a guide, Table 10 provides preliminary design parameters for rock-socketed piles

Table 10: Preliminary Design Parameters for Piles in Rock

Unit	Stratum	Approx. Depth (m)	Ultimate Values		Serviceability Values	
			End Bearing (kPa)	Shaft Adhesion (kPa)	End Bearing (kPa)	Shaft Adhesion (kPa)
5	SANDSTONE / SILTSTONE - variable very low to high strength	30 to 32 (excluding socket)	4000	200	1200	100

Notes to Table 10:

1. Piles terminated in coal should be avoided due to potential for softening and excessive settlement.
2. Ultimate Values occur at large settlements (> 5% of minimum footing diameter) - Ref 5
3. Design geotechnical strength ($R_{d,g}$) based on a strength reduction factor of ϕ_g = 0.40.
4. Shaft adhesion values based on a shaft roughness of R2 or better.
5. Serviceability / Max Allowable end bearing to cause settlement of < 1% of minimum footing dimension or pile diameter.
6. AS 2159 – 2009 requires that the contribution of the shaft from ground surface to 1.5 times pile diameter or 1 m (whichever is greater) shall be ignored.

Tension (uplift) capacities should be based on 75% of the shaft adhesion values shown in Table 10.

Prior to adopting the option of piles to rock, further investigation would be required to confirm the depth and strength of the rock. This would include at least three cored borehole and strength testing of recovered rock core.

6.5.4 Raft Slab

Due to the presence of medium dense or stronger sand at the anticipated base excavation level and the potential complications associated with piling, as discussed above, it is suggested that consideration be given to the use of a stiffened raft slab at the site.

Preliminary calculations indicate that the slab would need to be proportioned for an allowable bearing capacity of 200 kPa. Furthermore, provided that the slab has sufficient stiffness and dependant on loads (assumed about 15 kPa per level at this point) the total settlements may be able to be managed such that they are less than about 25 mm to 50 mm, with differential settlements about half of the total settlements or lower.

In conjunction with a raft slab, top-down construction techniques may be appropriate for the two level basements. The boundary retaining walls could be propped by the basement slabs as excavation proceeds.

Where total and differential settlements are found to be problematic a piled raft system could be considered, whereby a proportion of the structural load is carried by a stiff raft at basement level and piles at depth.

In order to confirm the viability of the raft option, a detailed geotechnical analysis of the stiffened raft would need to be undertaken by DP in conjunction with the client's structural engineer. This would require accurate loading data as well as footing stiffness information for the proposed development.

6.6 Seismic Parameters

The Earthquake Code AS1170.4 (Ref 2) provides seismic design parameters based on location and soil profile. Reference to Table 3.2 of AS1170.4 indicates a Hazard Factor (Z) of 0.11 for Newcastle.

The subsurface profile at this site, with reference to Table 4.1 and Section 4.2 of AS1170.4, indicates that the appropriate "Site Sub-soil Class" would be **C_e** "Shallow Soil", since the depths of loose or soft soils at this site do not exceed the limits provided in Table 4.1 of AS1170.4.

6.7 Vibration

The site is in close proximity to both commercial enterprises and residential apartments. The main source of vibration during construction is expected to be associated with piling operations. Control measures should be put in place to restrict vibration to reasonable levels.

There are three aspects for which vibrations need to be assessed:

Effects on Structures

The recommended maximum peak particle velocity from AS 2187 Explosives Code for houses and low rise residential buildings subject to blast vibration is 10 mm/sec (Peak Particle Velocity - PPV). However, there is currently no Australian Standard directly relevant to protection of structures from vibrations generated by construction plant.

The German Standard DIN 4150-3 provides guidance relevant to construction equipment and recommends that vibrations be limited to 5 mm/sec to 20 mm/sec (PPVi – any component direction) depending on the frequency of vibration in order to reduce the potential for structural damage to residential buildings. The vertical component of the vibration (PPVz) is generally found to be the most critical.

Effects on Architectural Finishes

It has been found from experience that vibration levels as low as 10 mm/sec PPV may cause minor defects such as cracks through rendering, cornices and skirtings, although some brick and concrete frame buildings can withstand significantly higher vibration levels.

Effects on Humans

While vibration is only slightly perceptible to humans at levels of the order of 1.0 mm/sec (PPV), it becomes strongly perceptible above 3.0 mm/sec (PPV) and disturbing at levels above 5.0 mm/sec (PPV).

Complaints from residents and building occupants are sometimes received for values as low as 1.0 mm/sec (PPV) hence some reassurance, possibly by vibration monitoring, may be necessary. The Australian Standard AS 2670.2-1990 "Evaluation of human exposure to whole-body vibrations – continuous and shock induced vibrations in buildings (1 - 80 Hz)" indicates an acceptable day time level of 8 mm/sec (PPVi) for human comfort. A comparison of the AS 2670.2 and DIN 4150-3 requirements is given in Figure 4 below.

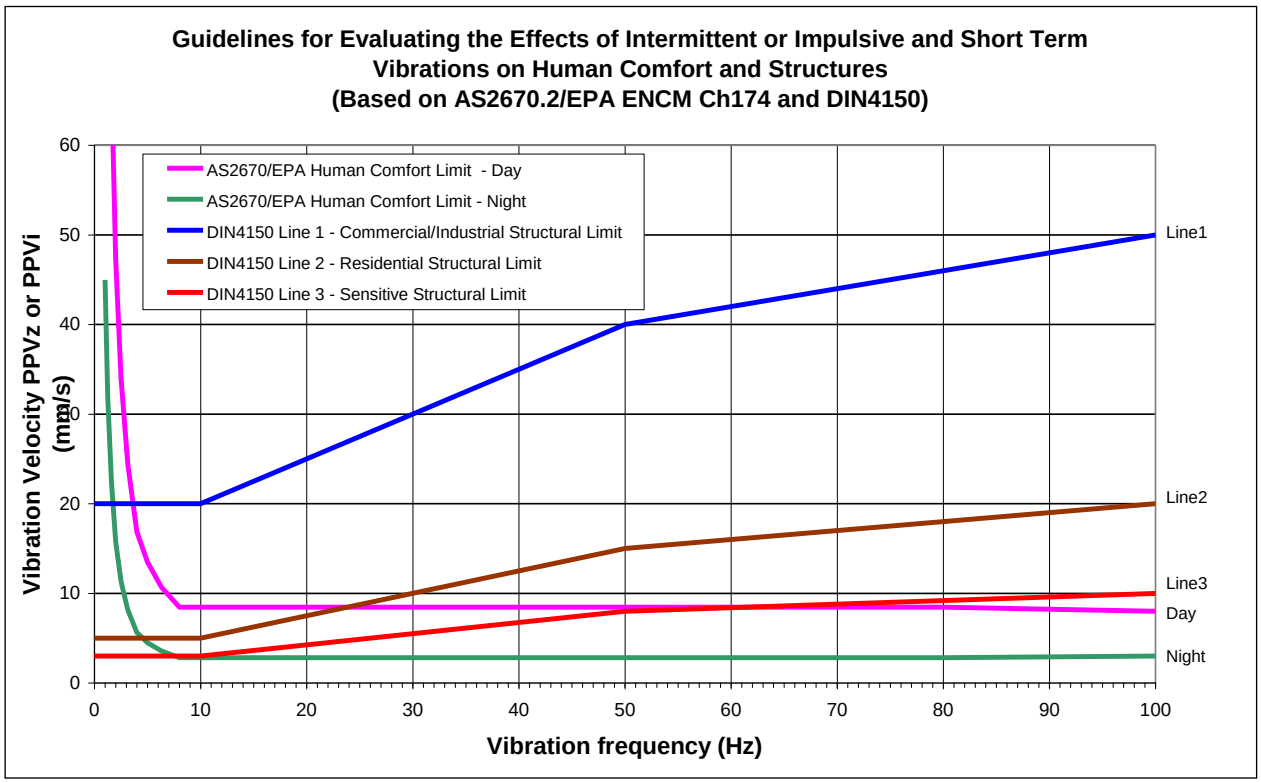

Figure 4: Vibration Guidelines

For the type of nearby structures and occupation of the site, the effect on humans requires the lowest vibration levels when addressed in relation to the above standards. It is therefore provisionally recommended that vibration levels at the foundation level of adjoining residences be kept below 8.0 mm/sec (PPVi).

This provisional limit, however, should be revised following:

- Condition inspections / dilapidation surveys of the adjoining buildings (prior to site works);
- Site and equipment specific vibration trial; and
- The provision of continuous monitoring on the site (or adjacent building) during excavation and piling works.

6.8 Aggressiveness

The results of soil aggressiveness testing on selected samples from each borehole (see Section 5.1) were compared to classifications for exposure in soil provided in the Piling Standard (Ref 4). These results indicate that the soils tested are classified as “mild” with respect to concrete and generally “non-aggressive” with respect to steel, however, some tests did indicate “mild to moderate” classifications.

The results of groundwater parameters on water extracted from each selected boreholes were compared to classifications for exposure in groundwater provided in the Piling Standard (Ref 4). These results indicate that the groundwater samples tested are classified as “mild” with respect to concrete and “moderate to severe” with respect to steel.

7. References

1. Douglas Partners Pty Ltd “Report on Geotechnical Investigation, 50 Honeysuckle Drive, Newcastle”, Report 91034.00.R.002.Rev1, April 2017.
2. Australian Standard AS1170.4-2007, “Structural Design Actions, Part 4: Earthquake Actions in Australia”, Standards Australia.
3. Australian Standard AS 2870-2011 "Residential Slabs and Footings", 2011, Standards Australia.
4. Australian Standard AS2159-2009, “Piling - Design and Installation”, Standards Australia.
5. P.J.N.Pells, G. Mostyn and B.F.Walker, “Foundations on Sandstone and Shale in the Sydney Region”, Australian Geomechanics – December 1998.
6. Australian Standard AS/NZS 1547:2012, “On-site domestic wastewater management” Standards Australia.

8. Limitations

Douglas Partners Pty Ltd (DP) has prepared this report for this project at 35 Honeysuckle Drive, Newcastle in accordance with DP’s proposal email dated 11 January 2018 and acceptance received from Chris Farrington dated 4 April 2018. The work was carried out under DP’s Conditions of Engagement. This report is provided for the exclusive use of Lee 4 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.

DP's advice is based upon the conditions encountered during this investigation. The accuracy of the advice provided by DP in this report may be affected by undetected variations in ground conditions across the site between and beyond the sampling and/or testing locations. The advice may also be limited by budget constraints imposed by others or by site accessibility.

This report must be read in conjunction with all of the attached 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 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 / environmental / groundwater) components set out in this report and to their application by the project designers to project design, construction, maintenance and demolition.

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Appendix A

About This Report
Sampling Methods
Soil Descriptions
Symbols and Abbreviations
Information on Cone Penetration Tests

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.

Sampling Methods

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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.

Soil Descriptions

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Description and Classification Methods

The methods of description and classification of soils and rocks used in this report are based on Australian Standard AS 1726-1993, Geotechnical Site Investigations Code. In general, the descriptions include strength or density, colour, structure, soil or rock type and inclusions.

Soil Types

Soil types are described according to the predominant particle size, qualified by the grading of other particles present:

Type	Particle size (mm)
Boulder	>200
Cobble	63 - 200
Gravel	2.36 - 63
Sand	0.075 - 2.36
Silt	0.002 - 0.075
Clay	<0.002

The sand and gravel sizes can be further subdivided as follows:

Type	Particle size (mm)
Coarse gravel	20 - 63
Medium gravel	6 - 20
Fine gravel	2.36 - 6
Coarse sand	0.6 - 2.36
Medium sand	0.2 - 0.6
Fine sand	0.075 - 0.2

The proportions of secondary constituents of soils are described as:

Term	Proportion	Example
And	Specify	Clay (60%) and Sand (40%)
Adjective	20 - 35%	Sandy Clay
Slightly	12 - 20%	Slightly Sandy Clay
With some	5 - 12%	Clay with some sand
With a trace of	0 - 5%	Clay with a trace of sand

Definitions of grading terms used are:

- Well graded - a good representation of all particle sizes
- Poorly graded - an excess or deficiency of particular sizes within the specified range
- Uniformly graded - an excess of a particular particle size
- Gap graded - a deficiency of a particular particle size with the range

Cohesive Soils

Cohesive soils, such as clays, are classified on the basis of undrained shear strength. The strength may be measured by laboratory testing, or estimated by field tests or engineering examination. The strength terms are defined as follows:

Description	Abbreviation	Undrained shear strength (kPa)
Very soft	vs	<12
Soft	s	12 - 25
Firm	f	25 - 50
Stiff	st	50 - 100
Very stiff	vst	100 - 200
Hard	h	>200

Cohesionless Soils

Cohesionless soils, such as clean sands, are classified on the basis of relative density, generally from the results of standard penetration tests (SPT), cone penetration tests (CPT) or dynamic penetrometers (PSP). The relative density terms are given below:

Relative Density	Abbreviation	SPT N value	CPT qc value (MPa)
Very loose	vl	<4	<2
Loose	l	4 - 10	2 -5
Medium dense	md	10 - 30	5 - 15
Dense	d	30 - 50	15 - 25
Very dense	vd	>50	>25

Soil Descriptions

Soil Origin

It is often difficult to accurately determine the origin of a soil. Soils can generally be classified as:

- Residual soil - derived from in-situ weathering of the underlying rock;
- Transported soils - formed somewhere else and transported by nature to the site; or
- Filling - moved by man.

Transported soils may be further subdivided into:

- Alluvium - river deposits
- Lacustrine - lake deposits
- Aeolian - wind deposits
- Littoral - beach deposits
- Estuarine - tidal river deposits
- Talus - scree or coarse colluvium
- Slopewash or Colluvium - transported downslope by gravity assisted by water. Often includes angular rock fragments and boulders.

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

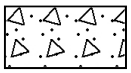
Symbols & Abbreviations

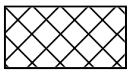
Graphic Symbols for Soil and Rock

General

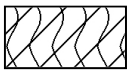

Asphalt

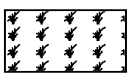

Road base

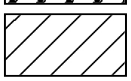

Concrete


Filling

Soils


Topsoil

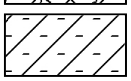

Peat


Clay


Silty clay

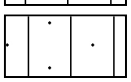

Sandy clay

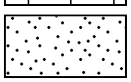

Gravelly clay

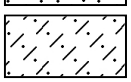

Shaly clay

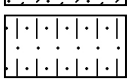

Silt


Clayey silt


Sandy silt

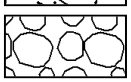

Sand


Clayey sand


Silty sand


Gravel

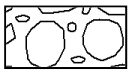

Sandy gravel


Cobbles, boulders

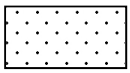

Talus

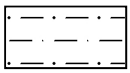
Sedimentary Rocks

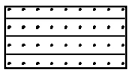

Boulder conglomerate

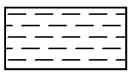

Conglomerate


Conglomeratic sandstone

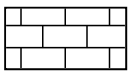

Sandstone


Siltstone

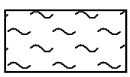

Laminite

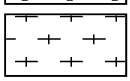

Mudstone, claystone, shale

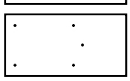

Coal


Limestone

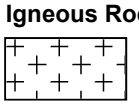
Metamorphic Rocks

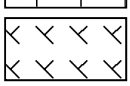

Slate, phyllite, schist

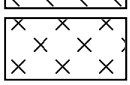

Gneiss

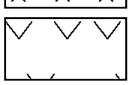

Quartzite

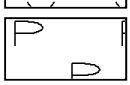
Igneous Rocks


Granite


Dolerite, basalt, andesite


Dacite, epidote


Tuff, breccia


Porphyry

Cone Penetration Tests

Douglas Partners

Introduction

The Cone Penetration Test (CPT) is a sophisticated soil profiling test carried out in-situ. A special cone shaped probe is used which is connected to a digital data acquisition system. The cone and adjoining sleeve section contain a series of strain gauges and other transducers which continuously monitor and record various soil parameters as the cone penetrates the soils.

The soil parameters measured depend on the type of cone being used, however they always include the following basic measurements

- Cone tip resistance q_c
- Sleeve friction f_s
- Inclination (from vertical) i
- Depth below ground z

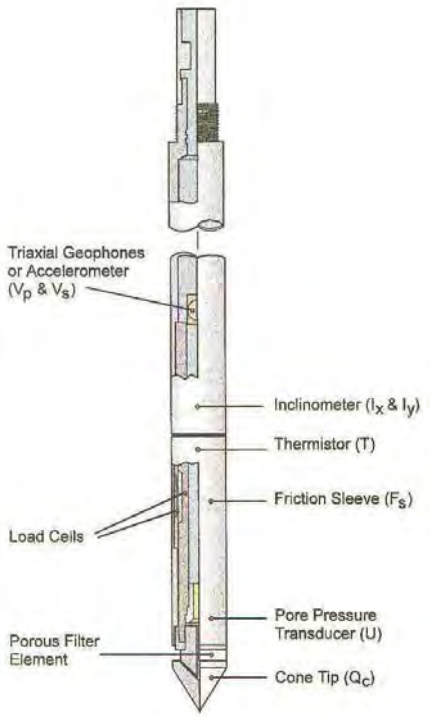


Figure 1: Cone Diagram

The inclinometer in the cone enables the verticality of the test to be confirmed and, if required, the vertical depth can be corrected.

The cone is thrust into the ground at a steady rate of about 20 mm/sec, usually using the hydraulic rams of a purpose built CPT rig, or a drilling rig. The testing is carried out in accordance with the Australian Standard AS1289 Test 6.5.1.

Figure 2: Purpose built CPT rig

The CPT can penetrate most soil types and is particularly suited to alluvial soils, being able to detect fine layering and strength variations. With sufficient thrust the cone can often penetrate a short distance into weathered rock. The cone will usually reach refusal in coarse filling, medium to coarse gravel and on very low strength or better rock. Tests have been successfully completed to more than 60 m.

Types of CPTs

Douglas Partners (and its subsidiary GroundTest) owns and operates the following types of CPT cones:

Type	Measures
Standard	Basic parameters (q_c, f_s, i & z)
Piezocone	Dynamic pore pressure (u) plus basic parameters. Dissipation tests estimate consolidation parameters
Conductivity	Bulk soil electrical conductivity (σ) plus basic parameters
Seismic	Shear wave velocity (V_s), compression wave velocity (V_p), plus basic parameters

Strata Interpretation

The CPT parameters can be used to infer the Soil Behaviour Type (SBT), based on normalised values of cone resistance (Qt) and friction ratio (Fr). These are used in conjunction with soil classification charts, such as the one below (after Robertson 1990)

Cone Penetration Tests

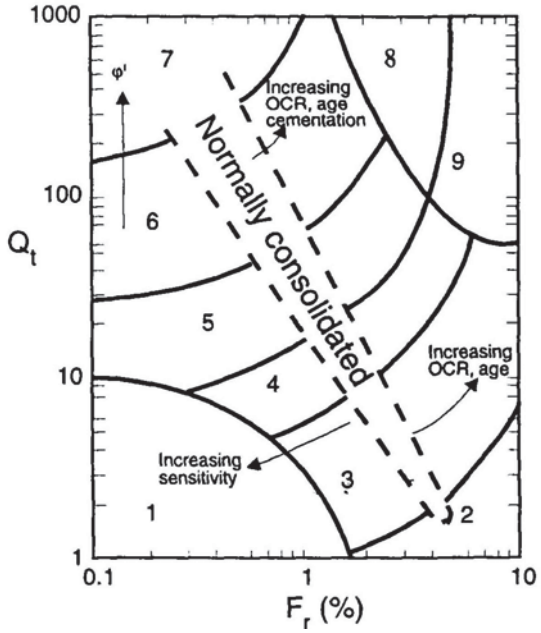


Figure 3: Soil Classification Chart

DP's in-house CPT software provides computer aided interpretation of soil strata, generating soil descriptions and strengths for each layer. The software can also produce plots of estimated soil parameters, including modulus, friction angle, relative density, shear strength and over consolidation ratio.

DP's CPT software helps our engineers quickly evaluate the critical soil layers and then focus on developing practical solutions for the client's project.

Engineering Applications

There are many uses for CPT data. The main applications are briefly introduced below:

Settlement

CPT provides a continuous profile of soil type and strength, providing an excellent basis for settlement analysis. Soil compressibility can be estimated from cone derived moduli, or known consolidation parameters for the critical layers (eg. from laboratory testing). Further, if pore pressure dissipation tests are undertaken using a piezocone, in-situ consolidation coefficients can be estimated to aid analysis.

Pile Capacity

The cone is, in effect, a small scale pile and, therefore, ideal for direct estimation of pile capacity. DP's in-house program ConePile can analyse most pile types and produces pile capacity versus depth plots. The analysis methods are based on proven static theory and empirical studies, taking account of scale effects, pile materials and method of installation. The results are expressed in limit state format, consistent with the Piling Code AS2159.

Dynamic or Earthquake Analysis

CPT and, in particular, Seismic CPT are suitable for dynamic foundation studies and earthquake response analyses, by profiling the low strain shear modulus G_0. Techniques have also been developed relating CPT results to the risk of soil liquefaction.

Other Applications

Other applications of CPT include ground improvement monitoring (testing before and after works), salinity and contaminant plume mapping (conductivity cone), preloading studies and verification of strength gain.

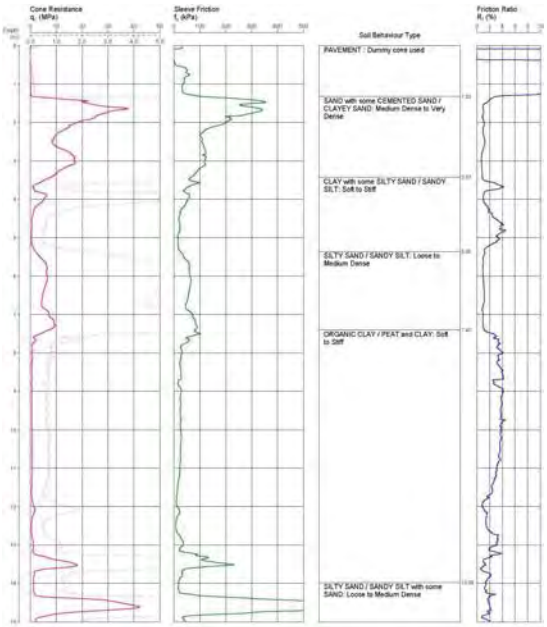


Figure 4: Sample Cone Plot

Appendix B

Borehole Logs - Bores DP1-BH, DP2-BH, DP4-BH DP6-BH, DP14-BH, DP16-BH to DP18-BH and DP20-BH
Test Pit Logs - Pits DP1-TP to DP25-TP
Cone Penetration Tests - CPTs C1 to C9
Results of Dynamic Penetrometer Tests
Results of Rising Head Permeability Tests

BOREHOLE LOG

CLIENT: Lee 4 Pty Ltd
PROJECT: Huntington
LOCATION: 35 Honeysuckle Drive, Newcaslte

SURFACE LEVEL: 2.2 AHD
EASTING: 384493
NORTHING: 6356304
DIP/AZIMUTH: 90°/--

BORE No: DP1-BH
PROJECT No: 91303.00
DATE: 23/4/2018
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
	0.05	ASPHALT - Slag aggregate and quarry gravel aggregate							
	0.32	FILLING - Generally comprising grey, brown, green and blue sand, gravel and cobble sized subangular slag filling up to 100mm diameter, damp							
	0.45								
	0.55	FILLING - Generally comprising grey / brown clayey fine to coarse grained sandy gravel filling (grey subangular quarry gravel up to 40mm diameter and grey, brown and green subangular slag gravel up to 50mm diameter) with trace bituminous subangular gravels with moderate PAH odour, damp		D, ASS	0.6		PID<1		
					0.75		PID<1		
				D, ASS	1.0		PID<1		
					1.25		PID<1		
		FILLING - Generally comprising medium to coarse grained sand filling with trace subangular grey slag gravel and subangular quarry gravel up to 50mm diameter, damp		D, ASS	1.5		PID<1		
				D, ASS	1.75		PID<1		
		FILLING - Generally comprising light brown medium to coarse grained sand filling with trace shell fragments and trace subrounded / subangular gravels up to 20mm diameter, damp		D, ASS	2.0		PID<1		
		From 1.6m, wet			2.25		PID<1		
		At 2.0m, trace brown staining		D, ASS	2.5		PID<1		
		At 2.2m, wet			2.75		PID<1		
	2.9	From 2.3m, wet, abundant shells		D, ASS	3.0		PID<1	▼ 23-04-18	
		SAND - Light brown / grey medium to coarse grained sand, with shells, wet			3.25		PID<1		
		From 3.0m, saturated		D, ASS	3.5		PID<1		
		From 3.8m, dark grey, with trace to some subrounded gravels up to 4mm diameter, with trace shells							
	7.2	Bore discontinued at 7.2m, limit of investigation							

RIG: Geoprobe **DRILLER:** Terratest **LOGGED:** Abberton **CASING:** Drill Tube

TYPE OF BORING: 100mm continuous tube

WATER OBSERVATIONS: Free groundwater observed at 3.0m

REMARKS: Coordinates taken using hand held GPS typically accurate to ± logging of upper fill material based on conditions encountered in adjacent test pits

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: Lee 4 Pty Ltd
PROJECT: Huntington
LOCATION: 35 Honeysuckle Drive, Newcaslte

SURFACE LEVEL: 2.27 AHD
EASTING: 384493
NORTHING: 6356304
DIP/AZIMUTH: 90°/--

BORE No: DP2-BH
PROJECT No: 91303.00
DATE: 23/4/2018
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
	0.015	ASPHALT - Slag aggregate and quarry gravel aggregate							
	0.08								
	0.4	ASPHALT - Slag aggregate and quarry gravel aggregate							
	0.6	FILLING - Generally comprising grey brown and green sand, gravel and cobble sized subangular slag filling with trace light brown cemented slag, trace some subangular dark grey ballast up to 30mm diameter, trace subangular sandstone gravels and cobbles up to 200mm diameter, and trace subangluar bituminous gravels and cobbles with moderate PAH odour, damp							
		FILLING - Generally comprising grey / brown medium to coarse grained sand filling with trace subangular grey and brown slag gravels up to 30mm diameter, trace subangular brown cemented slag gravel up to 20mm diameter, trace subangular / subrounded sandstone gravels up to 40mm diameter and with trace shells, damp							
	2.3	FILLING - Generally comprising light brown / grey, medium to coarse grained sand with trace shell fragments, damp							
		SAND - Light brown / grey, medium to coarse grained sand, with trace shells, damp							
		From 2.3m, Wet, abundant shells						▼ 23-04-18	
		From 3.0m, saturated		D, ASS	3.25				
					3.5				
				D, ASS	3.75				
		From 4.0m, dark grey / brown, trace shells			4.0				
				D, ASS	4.25				
					4.5				
				D, ASS	4.75				
					5.0				
		From 5.3m, clayey silty dark grey / brown medium to coarse grained sand, abundant shells		D, ASS	5.25				
					5.5				
		From 5.6m, with trace shells		D, ASS	5.75				
					6.0				
				D, ASS	6.25				
					6.5				
		From 6.6m, dark grey / brown medium to coarse grained sand, some shells		D, ASS	6.75				
	7.0	Bore discontinued at 7.0m, limit of investigation			7.0				

RIG: Geoprobe **DRILLER:** Terratest **LOGGED:** Abberton **CASING:** Drill Tube

TYPE OF BORING: 100mm continuous tube

WATER OBSERVATIONS: Free groundwater observed at 3.0m

REMARKS: Coordinates taken using hand held GPS typically accurate to ± logging of upper fill material based on conditions encountered in adjacent test pits

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: Lee 4 Pty Ltd
PROJECT: Huntington
LOCATION: 35 Honeysuckle Drive, Newcaslte

SURFACE LEVEL: 2.3 AHD
EASTING: 384998
NORTHING: 6756313
DIP/AZIMUTH: 90°/--

BORE No: DP4-BH
PROJECT No: 91303.00
DATE: 24/4/2018
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
	0.08	ASPHALT - Slag aggregate and quarry gravel aggregate			0.19		PID<1		Gatic From 0-0.2m, concrete
	0.35	FILLING - Generally comprising grey, brown, green and blue sand, gravel and cobble sized subangular slag filling up to 100mm diameter, damp							From 0.2-0.5, bentonite
	0.5	FILLING - Generally comprising brown / orange fine to coarse grained sandy clay / clayey sand gravel filling (green, grey and brown subangular slag gravels and cobbles up to 100mm diameter and subangular to subrounded (sandstone) gravels and cobbles up to 100mm diameter), damp		D, ASS	0.9		PID<1		
	0.85	FILLING - Generally comprising medium to coarse grained sand filling with trace subangluar grey slag gravel and subangular quarry gravel up to 50mm diameter, damp		D, ASS	1.25		PID<1		
				D, ASS	1.5		PID<1		
					1.75		PID<1		
		FILLING - Generally comprising light brown, medium to coarse grained sand filling with trace shells, damp		D, ASS	2.0		PID<1		
		From 2.0m, wet			2.25		PID<1		
		From 2.2m, with some shells		D, ASS	2.5		PID<1		
					2.75		PID<1		
		From 3.0m, saturated		D, ASS	3.0		PID<1		
					3.25		PID<1		
	3.5	SAND - Light brown / grey medium to coarse grained sand and gravelly sand, subrounded gravels up to 5mm diameter and shells, saturated		D, ASS	3.5		PID<1		
					3.75		PID<1		From 0.5-7.2m, sand
					4.0		PID<1		
					4.25		PID<1		From 1.2m-7.2m, Class 18 PVC hand slotted PVC
		From 4.5m, with trace to some gravels and shells			4.5		PID<1		
					4.75		PID<1		
					5.0		PID<1		
					5.25		PID<1		
					5.5		PID<1		
					5.75		PID<1		
		From 6.1m, with trace shells and gravels			6.0		PID<1		
					6.25		PID<1		
					6.5		PID<1		
					6.75		PID<1		
					7.0		PID<1		
	7.2	Bore discontinued at 7.2m, limit of investigation							End cap

RIG: Geoprobe **DRILLER:** Terratest **LOGGED:** Abberton **CASING:** Drill Tube

TYPE OF BORING: 100mm continuous tube

WATER OBSERVATIONS: Free groundwater observed at 3.0m

REMARKS: Coordinates taken using hand held GPS typically accurate to ± logging of upper fill material based on conditions encountered in adjacent test pits

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: Lee 4 Pty Ltd
PROJECT: Huntington
LOCATION: 35 Honeysuckle Drive, Newcaslte

SURFACE LEVEL: 2.33 AHD
EASTING: 384516
NORTHING: 6356302
DIP/AZIMUTH: 90°/--

BORE No: DP6-BH
PROJECT No: 91303.00
DATE: 24/4/2018
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
	0.06	ASPHALT - Slag aggregate and quarry gravel aggregate							
	0.35	FILLING - Generally comprising grey, brown and green sand, gravel and cobble sized subangular slag filling with trace light brown cemented slag trace some subangular sandstone gravels up to 30mm diameter and trace bituminous gravel with moderate PAH odour, damp			0.5				
	0.45				0.75				
					1.0				
		FILLING - Generally comprising grey / brown clayey fine to coarse grained sandy gravel filling (grey subangular quarry gravel up to 40mm diameter and grey, brown and green subangular slag gravelly up to 50mm diameter) with trace bituminous subangular gravels with moderate PAH odour, damp		D	1.25	ASS	PID<1		
					1.5	ASS	PID<1		
				D	1.75	ASS	PID<1		
		FILLING - Generally comprising light brown, medium to coarse grained sand with trace shells, damp			2.0	ASS	PID<1		
				D	2.25	ASS	PID<1		
					2.5	ASS	PID<1		
		From 2.6m, wet		D	2.75	ASS	PID<1		
					3.0	ASS	PID<1		
	3.1	CLAYEY SILTY SAND / SANDY SILT - Dark grey / brown clayey silty medium to coarse grained sand / sandy silt with trace to some sandstone gravels up to 40mm diameter, saturated		D	3.25	ASS	PID<1		
					3.5	ASS	PID<1		
				D	3.75	ASS	PID<1		
					4.0	ASS	PID<1		
				D	4.25	ASS	PID<1		
					4.5	ASS	PID<1		
				D	4.75	ASS	PID<1		
					5.0	ASS	PID<1		
	5.2	SAND - Dark grey, medium to coarse grained sand with trace to some shells, saturated		D	5.25	ASS	PID<1		
					5.5	ASS	PID<1		
				D	5.75	ASS	PID<1		
					6.0	ASS	PID<1		
				D	6.25	ASS	PID<1		
					6.5	ASS	PID<1		
				D	6.75	ASS	PID<1		
					7.0	ASS	PID<1		
	7.2	Bore discontinued at 7.2m, limit of investigation							

RIG: Geoprobe **DRILLER:** Terratest **LOGGED:** Abberton **CASING:** Drill Tube

TYPE OF BORING: 100mm continuous tube

WATER OBSERVATIONS: Free groundwater observed at 3.0m

REMARKS: Coordinates taken using hand held GPS typically accurate to ± logging of upper fill material based on conditions encountered in adjacent test pits

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: Lee 4 Pty Ltd
PROJECT: Huntington
LOCATION: 35 Honeysuckle Drive, Newcaslte

SURFACE LEVEL: 2.33 AHD
EASTING: 384596
NORTHING: 6356287
DIP/AZIMUTH: 90°/--

BORE No: DP14-BH
PROJECT No: 91303.00
DATE: 23/4/2018
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
	0.08	ASPHALT - Slag aggregate and quarry gravel aggregate							Gatic From 0-0.2m, concrete
		FILLING - Generally comprising orange / brown clayey fine to coarse grained sandy gravel (subangular gravels (quarry rock) up to 60mm diameter), with trace to some subangular sandstone cobbles and boulders up to 350mm diameter, damp							From 0.2-0.6m, bentonite
	0.7			D	0.75	ASS			
	1	FILLING - Generally comprising light brown medium to coarse grained sand filling, with trace subangular gravel up to 50mm diameter, with trace shells, damp		D	1.0	ASS			1
					1.25	ASS			
				D	1.5	ASS	PID<1		
					1.75	ASS	PID<1		
	2			D	2.0	ASS	PID<1		2
					2.25	ASS	PID<1		
				D	2.5	ASS	PID<1		
	2.6	SAND - Dark brown / grey, medium to coarse grained sand with trace to some shells, wet		D	2.75	ASS	PID<1		
		From 2.85m - 3.05m, clayey silty sand							
	3	From 2.9m, saturated		D	3.0	ASS	PID<1		3
					3.25	ASS	PID<1		
				D	3.5	ASS	PID<1		
					3.75	ASS	PID<1		
	4			D	4.0	ASS	PID<1		4 From 0.6-7.2m, sand
					4.25	ASS	PID<1		From 1.2m-7.2m, Class 18 PVC hand slotted PVC
					4.5	ASS	PID<1		
					4.75	ASS	PID<1		
	5			D	5.0	ASS	PID<1		5
		From 5.1m - 6.0m, clayey silty medium to coarse grained sand			5.25	ASS	PID<1		
					5.5	ASS	PID<1		
					5.75	ASS	PID<1		
	6			D	6.0	ASS	PID<1		6
					6.25	ASS	PID<1		
					6.5	ASS	PID<1		
					6.75	ASS	PID<1		
	7			D	7.0	ASS	PID<1		7
	7.2	Bore discontinued at 7.2m, limit of investigation							End cap

RIG: Geoprobe **DRILLER:** Terratest **LOGGED:** Abberton **CASING:** Drill Tube

TYPE OF BORING: 100mm continuous tube

WATER OBSERVATIONS: Free groundwater observed at 3.0m

REMARKS: Coordinates taken using hand held GPS typically accurate to ± logging of upper fill material based on conditions encountered in adjacent test pits

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: Lee 4 Pty Ltd
PROJECT: Huntington
LOCATION: 35 Honeysuckle Drive, Newcaslte

SURFACE LEVEL: 2.2 AHD
EASTING: 389611
NORTHING: 6356293
DIP/AZIMUTH: 90°/--

BORE No: DP16-BH
PROJECT No: 91303.00
DATE: 23/4/2018
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
2	0.08	ASPHALT - Slag aggregate and quarry gravel aggregate							
	0.28	FILLING - Generally comprising dark brown / grey fine to medium grained sandy gravel (subangular / subrounded gravel up to 60mm diameter) with subangular blue, green and brown slag up to 30mm diameter, with trace to some cobbles and boulders up to 400mm, damp		D	0.5	ASS	PID<1		
	0.45				0.75	ASS	PID<1		
1		FILLING - Generally comprising orange / brown clayey fine to coarse grained sand with subangular / subrounded gravels up to 50mm diameter, damp							
1		FILLING - Generally comprising light brown, medium to coarse grained sand filling with trace to some shells, damp			1.5	ASS	PID<1		
2		From 1.9m, brown / grey clayey sand / sandy clay filling		D	2.0	ASS	PID<1		
0		From 2.1m, dark brown / grey medium to coarse grained sand filling with trace to some shells, wet		D	2.25	ASS	PID<1		
3				D	3.0	ASS	PID<1	▼	
-1		From 3.1m, saturated			3.5	ASS	PID<1		
4				D	4.0	ASS	PID<1		
-2					4.5	ASS	PID<1		
					4.75	ASS	PID<1		
5				D	5.0	ASS	PID<1		
-3					5.25	ASS	PID<1		
					5.5	ASS	PID<1		
					5.75	ASS	PID<1		
6				D	6.0	ASS	PID<1		
-4					6.25	ASS	PID<1		
					6.5	ASS	PID<1		
					6.75	ASS	PID<1		
7				D	7.0	ASS	PID<1		
-5	7.2	Bore discontinued at 7.2m, limit of investigation							

RIG: Geoprobe **DRILLER:** Terratest **LOGGED:** Abberton **CASING:** Drill Tube

TYPE OF BORING: 100mm continuous tube

WATER OBSERVATIONS: Free groundwater observed at 3.1m

REMARKS: Coordinates taken using hand held GPS typically accurate to ± logging of upper fill material based on conditions encountered in adjacent test pits

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: Lee 4 Pty Ltd
PROJECT: Huntington
LOCATION: 35 Honeysuckle Drive, Newcaslte

SURFACE LEVEL: 2.05 AHD
EASTING: 384597
NORTHING: 6356298
DIP/AZIMUTH: 90°/--

BORE No: DP17-BH
PROJECT No: 91303.00
DATE: 23/4/2018
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
	0.08	ASPHALT - Slag aggregate and quarry gravel aggregate							
	0.15								
	0.4	FILLING - Generally comprising brown sandy gravel filling (subangular gravel up to 40mm diameter and subangular green, blue and grey slag gravel up to 50mm diameter), damp		D	0.45	ASS			
				D	0.75	ASS	PID<1		
		FILLING - Generally comprising orange / brown clayey fine to coarse grained sandy gravel (subangular quarry rock up to 60mm diameter) with trace to some sandstone cobbles and boulders up to 450mm diameter, damp		D	1.0	ASS	PID<1		
					1.25	ASS	PID<1		
		FILLING - Generally comprising light brown, medium to coarse grained sand with trace shells, damp		D	1.5	ASS	PID<1		
					1.75	ASS	PID<1		
				D	2.0	ASS	PID<1		
					2.25	ASS	PID<1		
				D	2.5	ASS	PID<1		
	2.7	CLAYEY SAND - Dark grey silty clayey medium to coarse grained sand with trace shells, wet		D	2.75	ASS	PID<1		
		From 3.0m, saturated		D	3.0	ASS	PID<1		
					3.25	ASS	PID<1		
		From 3.5m, no clay component		D	3.5	ASS	PID<1		
					3.75	ASS	PID<1		
				D	4.0	ASS	PID<1		
					4.25	ASS	PID<1		
				D	4.5	ASS	PID<1		
					4.75	ASS			
	5.0	SANDY CLAY - Dark grey medium to coarse grained sandy clay, saturated		D	5.0	ASS			
					5.25	ASS			
				D	5.5	ASS			
					5.75	ASS			
				D	6.0	ASS			
	6.1	SAND - Dark grey medium to coarse grained sand with trace shells,saturated			6.25	ASS			
					6.5	ASS			
					6.75	ASS			
				D	7.0	ASS			
	7.3	Bore discontinued at 7.3m, limit of investigation							

RIG: Geoprobe **DRILLER:** Terratest **LOGGED:** Abberton **CASING:** Drill Tube

TYPE OF BORING: 100mm continuous tube

WATER OBSERVATIONS: Free groundwater observed at 3.1m

REMARKS: Coordinates taken using hand held GPS typically accurate to ± logging of upper fill material based on conditions encountered in adjacent test pits

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: Lee 4 Pty Ltd
PROJECT: Huntington
LOCATION: 35 Honeysuckle Drive, Newcaslte

SURFACE LEVEL: 2.86 AHD
EASTING: 384603
NORTHING: 6356271
DIP/AZIMUTH: 90°/--

BORE No: DP18-BH
PROJECT No: 91303.00
DATE: 23/4/2018
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
	0.15	FILLING - Generally comprising light grey / brown silty sand filling with some subangular to subrounded gravel up to 120mm diameter trace rootlets, humid							
	0.3	FILLING - Generally comprising brown / grey clayey sandy gravel (subangular to subrounded gravel up to 60mm diameter) with trace subangular grey and blue slag gravel up to 20mm diameter, with trace bituminous gravel up to 10mm diameter with moderate PAH odour, damp		D	0.65	ASS	PID<1		
	0.55			D	1.0	ASS	PID<1		
		FILLING - Generally comprising brown / orange silty clayey medium to coarse grained sand filling with some subangular to subrounded gravel up to 40mm diameter, damp		D	1.25	ASS	PID <1		
				D	1.5	ASS	PID<1		
		FILLING - Generally comprising light brown medium to coarse grained sand with trace shells, damp		D	1.75	ASS	PID<1		
				D	2.0	ASS	PID<1		
				D	2.25	ASS	PID<1		
				D	2.5	ASS	PID<1		
				D	2.75	ASS	PID<1		
	2.9	SAND - Dark brown grey medium to coarse grained sand with trace to some shells, wet		D	3.0	ASS	PID<1	▼	
		From 3m to 3.1m, clayey sand		D	3.25	ASS	PID<1		
				D	3.5	ASS	PID<1		
				D	3.75	ASS	PID<1		
				D	4.0	ASS	PID<1		
				D	4.25	ASS	PID<1		
				D	4.5	ASS	PID<1		
				D	4.75	ASS	PID<1		
				D	5.0	ASS	PID<1		
				D	5.25	ASS	PID<1		
				D	5.5	ASS	PID<1		
				D	5.75	ASS	PID<1		
				D	6.0	ASS	PID<1		
				D	6.25	ASS	PID<1		
				D	6.5	ASS	PID<1		
				D	6.75	ASS	PID<1		
				D	7.0	ASS	PID<1		
	7.2	Bore discontinued at 7.2m, limit of investigation							

RIG: Geoprobe **DRILLER:** Terratest **LOGGED:** Abberton **CASING:** Drill Tube

TYPE OF BORING: 100mm continuous tube

WATER OBSERVATIONS: Free groundwater observed at 3.1m

REMARKS: Coordinates taken using hand held GPS typically accurate to ± logging of upper fill material based on conditions encountered in adjacent test pits

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: Lee 4 Pty Ltd
PROJECT: Huntington
LOCATION: 35 Honeysuckle Drive, Newcaslte

SURFACE LEVEL: 2.1 AHD
EASTING: 384551
NORTHING: 6356302
DIP/AZIMUTH: 90°/--

BORE No: DP20-BH
PROJECT No: 91303.00
DATE: 23/4/2018
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
	0.05	FILLING - Generally comprising dark brown / grey clayey fine to coarse grained sand filling with trace angular gravel up to 5mm diameter, damp							Gatic From 0-0.2m, concrete From 0.2-0.5m, bentonite
	0.8	FILLING - Generally comprising brown / grey sand, gravel and cobble sized subangular ballast up to 100mm diameter with trace dark brown / grey clayey fine to coarse grained sand, damp		D	0.85	ASS	PID <1		
	1	FILLING - Generally comprising light brown medium to coarse grained sand with trace to some shells, damp		D	1.0	ASS	PID<1		
		At 1m to 1.1m, brown, medium to coarse grained sand with subangular gravel up to 30mm diameter		D	1.25	ASS	PID<1		
				D	1.5	ASS	PID<1		
				D	1.75	ASS	PID<1		
	2			D	2.0	ASS	PID<1		
	2.0	From 2m, brown-grey, wet							
		SAND - Brown / grey, medium to coarse grained sand, with trace shells, damp		D	2.25	ASS	PID<1		
				D	2.5	ASS	PID<1		
				D	2.75	ASS	PID<1		
	3			D	3.0	ASS	PID<1	▼	
		From 3.1m, saturated		D	3.25	ASS	PID<1		
				D	3.5	ASS	PID<1		
				D	3.75	ASS	PID<1		
	4			D	4.0	ASS	PID<1		From 0.5-7.2m, sand
				D	4.25	ASS	PID<1		From 1.2m-7.2m, Class 18 PVC hand slotted PVC
				D	4.5	ASS	PID<1		
				D	4.75	ASS	PID<1		
	5			D	5.0	ASS	PID<1		
				D	5.5	ASS	PID<1		
	6			D	6.0	ASS	PID<1		
				D	6.5	ASS	PID<1		
	7			D	7.0	ASS	PID<1		
	7.2	Bore discontinued at 7.2m, limit of investigation							End cap

RIG: Geoprobe **DRILLER:** Terratest **LOGGED:** Abberton **CASING:** Drill Tube

TYPE OF BORING: 100mm continuous tube

WATER OBSERVATIONS: Free groundwater observed at 3.1m

REMARKS: Coordinates taken using hand held GPS typically accurate to ± logging of upper fill material based on conditions encountered in adjacent test pits

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 LOG

CLIENT: Lee 4 Pty Ltd
PROJECT: Huntington
LOCATION: 35 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 2.2 AHD
EASTING: 384497
NORTHING: 6356313

PIT No: DP1-TP
PROJECT No: 91303.00
DATE: 18/4/2018
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 150mm)
	0.05	ASPHALT - Slag aggregate and quarry gravel aggregate		D	0.02				
		FILLING - Generally comprising grey, brown, green and blue sand, gravel and cobble sized subangular slag filling up to 100mm diameter, damp		D	0.1		PID<1		
	0.32	FILLING - Generally comprising grey / brown clayey fine to coarse grained sandy gravel filling (grey subangular quarry gravel up to 40mm diameter) and grey, brown and green subangular slag gravel up to 50mm diameter) with trace bituminous subangular gravels with moderate PAH odour, damp		D	0.4		PID<1		
	0.45			D, ASS	0.5		PID<1		
	0.55	FILLING - Generally comprising grey / brown medium to coarse grained sand filling with trace subangluar grey slag gravel and subangular quarry gravel up to 50mm diameter, damp		D, ASS	0.6		PID<1		
		FILLING - Generally comprising light brown medium to coarse grained sand filling with trace shell fragments and trace subrounded to subangluar gravels up to 20mm diameter, damp		D, ASS	0.9		PID<1		
1	1.0	Pit discontinued at 1.0m, limit of investigation							

RIG: ZAXUS 48U 5 Tonne Excavator, 450mm GP Tooth Bucket

LOGGED: Abberton

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Coordinates taken using hand held GPS typically accurate to ± 5m

☐ 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 LOG

CLIENT: Lee 4 Pty Ltd
PROJECT: Huntington
LOCATION: 35 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 2.27 AHD
EASTING: 384493
NORTHING: 6356304

PIT No: DP2-TP
PROJECT No: 91303.00
DATE: 18/4/2018
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 150mm)
	0.05	ASPHALT - Slag aggregate and quarry gravel aggregate		D	0.01				
	0.08	ASPHALT - Slag aggregate and quarry gravel aggregate		D	0.04				
		FILLING - Generally comprising grey brown and green sand, gravel and cobble sized subangular slag filling with trace light brown cemented slag with trace to some subangular dark grey ballast up to 30mm diameter, with trace subangular sandstone gravel and cobbles up to 200mm diameter, and trace subangular bituminous gravel and cobbles with moderate PAH odour, damp		D	0.2		PID<2		
				D	0.35		(Bitumen for coal tar 10)		
	0.4			D	0.45	ASS	PID<1		
	0.5	At 0.15m, timber		D	0.55	ASS	PID<1		
		FILLING - Generally comprising grey / brown medium to coarse grained sand filling with trace subangular grey and brown slag gravel up to 30mm diameter, with trace subangular brown cemented slag gravel up to 20mm diameter, with trace subangular / subrounded sandstone gravels up to 40mm diameter, trace shells, damp		D	0.7	ASS	PID<1		
		FILLING - Generally comprising light brown medium to coarse grained sand filling, with trace shell fragments, damp		D	0.9	ASS	PID<1		
	1.0	Pit discontinued at 1.0m, limit of investigation							

RIG: ZAXUS 48U 5 Tonne Excavator, 450mm GP Tooth Bucket

LOGGED: Abberton

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Coordinates taken using hand held GPS typically accurate to ± 5m

☐ 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)

Douglas Partners
Geotechnics / Environment / Groundwater

TEST PIT LOG

CLIENT: Lee 4 Pty Ltd
PROJECT: Huntington
LOCATION: 35 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 2.29 AHD
EASTING: 384500
NORTHING: 6356293

PIT No: DP3-TP
PROJECT No: 91303.00
DATE: 18/4/2018
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 150mm)
	0.06	ASPHALT - Slag aggregate and quarry gravel aggregate							
		FILLING - Generally comprising grey, brown, green and blue medium to coarse grained sand, gravel and cobble sized subangular slag filling up to 250mm diameter, damp		D	0.1		PID<1		
	0.4								
		FILLING - Generally comprising brown / grey medium to coarse grained sand filling with trace subangular brown, grey and green slag gravel up to 30mm diameter trace subrounded to subangular gravels up to 20mm diameter, trace shells, damp		D, ASS	0.45		PID<1		
	0.5			D, ASS	0.55		PID<1		
		FILLING - Generally comprising light brown medium to coarse grained sand with trace shell fragments, damp		D, ASS	0.7		PID<1		
				D, ASS	0.95		PID<1		
	1.0	Pit discontinued at 1.0m, limit of investigation							

RIG: ZAXUS 48U 5 Tonne Excavator, 450mm GP Tooth Bucket

LOGGED: Abberton

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Coordinates taken using hand held GPS typically accurate to ± 5m

☐ 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)

Douglas Partners
Geotechnics / Environment / Groundwater

TEST PIT LOG

CLIENT: Lee 4 Pty Ltd
PROJECT: Huntington
LOCATION: 35 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 2.3 AHD
EASTING: 384498
NORTHING: 6356313

PIT No: DP4-TP
PROJECT No: 91303.00
DATE: 18/4/2018
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)
		ASPHALT - Slag aggregate and quarry gravel aggregate		D	0.04				
	0.08			D	0.1		PID=5		
		FILLING - Generally comprising grey, brown and green sand, gravel and cobble sized subangular slag filling with trace light brown cemented slag trace to some subangular sandstone gravels up to 30mm diameter, trace bituminous gravels with moderate PAH odour, damp							
	0.35			D	0.4		PID<1		
		FILLING - Generally comprising brown / orange fine to coarse grained sandy clay / clayey sand gravel filling (green, grey and brown subangular slag gravels and cobbles up to 100mm diameter and subangular to subrounded (sandstone) gravels and cobbles up to 100mm diameter), damp							
	0.5			D	0.55		(sandstone sample for inspection)		
		Pit discontinued at 0.6m, limit of investigation refusal on concrete slab							

Dynamic Penetrometer Test (blows per mm): 5, 10, 15, 20

RIG: ZAXUS 48U 5 Tonne Excavator, 450mm GP Tooth Bucket

LOGGED: Abberton

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Coordinates taken using hand held GPS typically accurate to ± 5m

☐ 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)

Douglas Partners
Geotechnics / Environment / Groundwater

TEST PIT LOG

CLIENT: Lee 4 Pty Ltd
PROJECT: Huntington
LOCATION: 35 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 2.17 AHD
EASTING: 384507
NORTHING: 6356328

PIT No: DP5-TP
PROJECT No: 91303.00
DATE: 18/4/2018
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 150mm)
	0.07	ASPHALT - Slag aggregate and quarry gravel aggregate							
		FILLING - Generally comprising grey, brown and green sand, gravel and cobble sized subangular slag filling with trace pale brown cemented slag, trace some subangular sandstone gravel up to 30mm diameter, trace bituminous gravels with moderate PAH odour, damp		D	0.1		PID<1		
				D, ASS	0.5		PID<1		
				D, ASS	0.7		PID<1		
				D, ASS	0.9		PID<1		
	0.95								
	1.0	FILLING - Generally comprising medium to coarse grained sand filling with trace to some grey / brown silty clay pockets, with trace to some subangular grey, brown and green slag up to 40mm diameter trace subrounded / subangular sandstone gravel, cobbles and boulders up to 350mm diameter and trace shell, damp		D, ASS	1.05		PID<1		
		FILLING - Generally comprising medium to coarse grained sandy clay / clayey sand filling with trace to some subangular subrounded gravels up to 30mm, trace sandstone boulders up to 400mm diameter and trace shell, damp		D, ASS	1.25		PID<1		
		At 1.5m, wire cable		D, ASS	1.5		PID<1		
	1.6	Pit discontinued at 1.6m, limit of investigation							

RIG: ZAXUS 48U 5 Tonne Excavator, 450mm GP Tooth Bucket

LOGGED: Abberton

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Coordinates taken using hand held GPS typically accurate to ± 5m

☐ 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 LOG

CLIENT: Lee 4 Pty Ltd
PROJECT: Huntington
LOCATION: 35 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 2.33 AHD
EASTING: 384516
NORTHING: 6356302

PIT No: DP6-TP
PROJECT No: 91303.00
DATE: 18/4/2018
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)
	0.06	ASPHALT - Slag aggregate and quarry gravel aggregate		D	0.03				
		FILLING - Generally comprising grey, brown and green sand, gravel and cobble sized subangular slag filling with trace light brown cemented slag trace some subangular sandstone gravel up to 30mm diameter and trace bituminous gravel with moderate PAH odour, damp		D	0.15		PID<1		
	0.35			D	0.4				
	0.45	FILLING - Generally comprising brown / orange fine to coarse grained sandy clay / clayey sand gravel filling (green, grey and brown subangular slag gravels and cobbles up to 100mm diameter and subangular to subrounded (sandstone) gravels and cobbles up to 100mm diameter), damp							
		Pit discontinued at 0.45m, refusal on concrete slab							

Dynamic Penetrometer Test (blows per mm): 5, 10, 15, 20

RIG: ZAXUS 48U 5 Tonne Excavator, 300mm GP Tooth Bucket

LOGGED: Abberton

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Coordinates taken using hand held GPS typically accurate to ± 5m

☐ 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 LOG

CLIENT: Lee 4 Pty Ltd
PROJECT: Huntington
LOCATION: 35 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 2.13 AHD
EASTING: 384521
NORTHING: 6356318

PIT No: DP7-TP
PROJECT No: 91303.00
DATE: 18/4/2018
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 150mm)
	0.08	ASPHALT							
		FILLING - Generally comprising grey, brown and green sand, gravel and cobble sized subangular slag filling with trace light brown cemented slag trace some subangular sandstone gravel up to 30mm diameter trace bituminous gravels with moderate PAH odour, damp		D	0.15		PID<1		
	0.35	FILLING - Generally comprising brown medium to coarse grained sand filling with trace to some subangular grey, brown and green slag gravels up to 30mm diameter, trace subangular to subrounded sandstone gravel size cobbles and boulders up to 400mm diameter		D, ASS	0.38		PID<1		
				D, ASS	0.4		PID<1		
				D, ASS	0.55		PID<1		
		At 0.40 - 0.45m, iron staining, orange sand in partial section of test pit wall							
	0.7	FILLING - Generally comprising brown medium to coarse grained sand filling with trace to some sandstone gravels and cobbles up to 200mm diameter, trace sandstone boulders up to 350mm diameter and trace shells, damp		D, ASS	0.75		PID<1		
				D, ASS	1.0		PID<1		
				D, ASS	1.25		PID<1		
				D, ASS	1.45		PID<1		
	1.5	Pit discontinued at 1.5m, limit of investigation							

RIG: ZAXUS 48U 5 Tonne Excavator, 300mm GP Tooth Bucket **LOGGED:** Abberton **SURVEY DATUM:** MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Coordinates taken using hand held GPS typically accurate to ± 5m

☐ 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 LOG

CLIENT: Lee 4 Pty Ltd
PROJECT: Huntington
LOCATION: 35 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 2.21 AHD
EASTING: 384533
NORTHING: 6356291

PIT No: DP8-TP
PROJECT No: 91303.00
DATE: 18/4/2018
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 150mm)
	0.08	ASPHALT - Slag aggregate and quarry gravel aggregate							
		FILLING - Generally comprising dark brown / grey medium to coarse grained sandy gravelly filling (grey, blue and brown subangular slag gravel up to 50mm diameter and subangular grey ballast up to 50mm diameter) with trace bituminous gravel with mild PAH odour, damp At 0.2m trace timber (railway sleepers)		D	0.2		PID<1		
	0.45	FILLING - Generally comprising light brown medium to coarse grained sand filling, with trace shell fragments, damp		D, ASS	0.5		PID<1		
				D, ASS	0.7		PID<1		
				D, ASS	0.9		PID<1		
	1.0	Pit discontinued at 1.0m, limit of investigation							

RIG: ZAXUS 48U 5 Tonne Excavator, 300mm GP Tooth Bucket **LOGGED:** Abberton **SURVEY DATUM:** MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Coordinates taken using hand held GPS typically accurate to ± 5m

☐ 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 LOG

CLIENT: Lee 4 Pty Ltd
PROJECT: Huntington
LOCATION: 35 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 2.16 AHD
EASTING: 384544
NORTHING: 6356306

PIT No: DP9-TP
PROJECT No: 91303.00
DATE: 19/4/2018
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)
	0.08	ASPHALT		D	0.04				
	0.13	FILLING - Generally comprising dark brown / grey clayey fine to coarse grained sandy gravel sized slag filling (subangular blue, grey and brown slag up to 30mm diameter), with trace subangular bituminous gravel with moderate PAH odour, damp		D	0.1		PID<1		
	0.2			D	0.15		PID=25.5		
	0.24			D	0.22		PID<1		
	0.3			D	0.25		PID=24.9		
	0.35	FILLING - Generally comprising black subangular bituminous gravel filling with moderate PAH odour trace to some blue, green and brown slag gravels up to 20mm diameter, damp							
		FILLING - Generally comprising orange / brown clayey fine to coarse grained sandy gravel filling (subrounded gravel up to 40mm diameter with trace subangular bituminous gravel with moderate PAH odour, with trace subangular green and grey slag up to 20mm diameter, damp							
		FILLING - Generally comprising black subangular bituminous gravel filling with moderate PAH odour trace to some blue, green and brown slag gravels up to 20mm diameter, damp							
		FILLING - Generally comprising brown / orange fine to coarse grained sandy clay / clayey sand gravel filling (green, grey and brown subangular slag gravels and cobbles up to 100mm diameter and subangular to subrounded (sandstone) gravels and cobbles up to 100mm diameter), damp							
		Pit discontinued at 0.35m, refusal on concrete slab (teeth smoking)							

RIG: ZAXUS 48U 5 Tonne Excavator, 300mm GP Tooth Bucket **LOGGED:** Abberton **SURVEY DATUM:** MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Coordinates taken using hand held GPS typically accurate to ± 5m

☐ 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 LOG

CLIENT: Lee 4 Pty Ltd
PROJECT: Huntington
LOCATION: 35 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 2.14 AHD
EASTING: 384552
NORTHING: 6356303

PIT No: DP10-TP
PROJECT No: 91303.00
DATE: 19/4/2018
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)
	0.06	ASPHALT							
	0.12	FILLING - Generally comprising dark brown / grey clayey fine to coarse grained sandy gravel sized slag filling (subangular blue, grey and brown slag up to 30mm diameter), with trace subangular bituminous gravels. with moderate PAH odour, damp		D	0.1		PID<1		
	0.16			D	0.15		PID=28		
	0.19			D	0.18		PID=2		
	0.24			D	0.2				
		FILLING - Generally black comprising subangular bituminous gravel filling with moderate PAH odour trace to some blue, green and brown slag gravel up to 20mm diameter, damp							
		FILLING - Generally comprising orange / brown clayey fine to coarse grained sandy gravel filling (subrounded gravel up to 40mm diameter with trace subangular bituminous gravel with moderate PAH odour, and trace subangular green and grey slag up to 20mm diameter, damp							
		FILLING - Generally comprising brown / orange fine to coarse grained sandy clay / clayey sand gravel filling (green, grey and brown subangular slag gravels and cobbles up to 100mm diameter and subangular to subrounded (sandstone) gravels and cobbles up to 100mm diameter), damp							
		Pit discontinued at 0.24m, refusal on concrete slab							

Dynamic Penetrometer Test (blows per mm): 5, 10, 15, 20

RIG: ZAXUS 48U 5 Tonne Excavator, 300mm GP Tooth Bucket

LOGGED: Abberton

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Coordinates taken using hand held GPS typically accurate to ± 5m

☐ 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 LOG

CLIENT: Lee 4 Pty Ltd
PROJECT: Huntington
LOCATION: 35 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 2.29 AHD
EASTING: 384552
NORTHING: 6356278

PIT No: DP11-TP
PROJECT No: 91303.00
DATE: 19/4/2018
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)
		ASPHALT - Slag aggregate and quarry gravel aggregate		D	0.05				
	0.08			D	0.1		PID=105		
	0.15	FILLING - Generally comprising black subangular bituminous gravel filling with moderate PAH odour trace to some blue, green and brown slag gravel up to 20mm diameter		D, ASS	0.2		PID=2.5		
	0.33	FILLING - Generally comprising orange / brown clayey fine to coarse grained sandy gravelly filling with (subrounded gravel up to 40mm diameter with trace subangular bituminous gravel with moderate PAH odour, with trace subangular green and grey slag up to 20mm diameter, damp		D	0.35				
	0.4	FILLING - Generally comprising brown / orange fine to coarse grained sandy clay / clayey sand gravel filling (green, grey and brown subangular slag gravels and cobbles up to 100mm diameter and subangular to subrounded (sandstone) gravels and cobbles up to 100mm diameter), damp							
		Pit discontinued at 0.4m, refusal on concrete slab (teeth smoking)							

Dynamic Penetrometer Test (blows per mm): 5, 10, 15, 20

RIG: ZAXUS 48U 5 Tonne Excavator, 300mm GP Tooth Bucket

LOGGED: Abberton

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Coordinates taken using hand held GPS typically accurate to ± 5m

☐ 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 LOG

CLIENT: Lee 4 Pty Ltd
PROJECT: Huntington
LOCATION: 35 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 2.34 AHD
EASTING: 384574
NORTHING: 6356270

PIT No: DP12-TP
PROJECT No: 91303.00
DATE: 19/4/2018
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)
2	0.08	ASPHALT - Slag aggregate and quarry gravel aggregate							
		FILLING - Generally comprising orange / brown clayey fine to coarse grained sandy gravel (subangular gravels (quarry rock) up to 60mm diameter), with trace to some subangular sandstone cobbles and boulders up to 350mm diameter, damp		D	0.2		PID<1		
	0.6	FILLING - Generally comprising light brown medium to coarse grained sand filling, with trace subangular gravel up to 50mm diameter, with trace shells, damp		D, ASS	0.65		PID<1		
		From 0.7m, gravel fraction no longer evident		D, ASS	0.8		PID<1		
1	1.0	Pit discontinued at 1.0m, limit of investigation							
0									
-1									
-2									

RIG: ZAXUS 48U 5 Tonne Excavator, 300mm GP Tooth Bucket **LOGGED:** Abberton **SURVEY DATUM:** MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Coordinates taken using hand held GPS typically accurate to ± 5m

☐ 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)

Douglas Partners
Geotechnics / Environment / Groundwater

TEST PIT LOG

CLIENT: Lee 4 Pty Ltd
PROJECT: Huntington
LOCATION: 35 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 2.31 AHD
EASTING: 384596
NORTHING: 6356278

PIT No: DP13-TP
PROJECT No: 91303.00
DATE: 19/4/2018
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)
	0.08	ASPHALT - Slag aggregate and quarry gravel aggregate		D	0.05				
		FILLING - Generally comprising orange / brown clayey fine to coarse grained sandy gravel filling (subangular (quarry rock) up to 60mm diameter) with trace to some sandstone cobbles and boulders up to 450mm diameter, damp		D	0.15		PID<1		
	0.6	FILLING - Generally comprising brown medium to coarse grained sand filling, with trace subangular gravel up to 60mm diameter, damp From 0.7m, gravel fraction no longer evident		D, ASS	0.65		PID<1		
				D, ASS	0.8		PID<1		
				D, ASS	0.95		PID<1		
	1.0	Pit discontinued at 1.0m, collapse							

RIG: ZAXUS 48U 5 Tonne Excavator, 300mm GP Tooth Bucket **LOGGED:** Abberton **SURVEY DATUM:** MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Coordinates taken using hand held GPS typically accurate to ± 5m

☐ 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)

Douglas Partners
Geotechnics / Environment / Groundwater

TEST PIT LOG

CLIENT: Lee 4 Pty Ltd
PROJECT: Huntington
LOCATION: 35 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 2.33 AHD
EASTING: 384596
NORTHING: 6356287

PIT No: DP14-TP
PROJECT No: 91303.00
DATE: 19/4/2018
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)
	0.08	ASPHALT - Slag aggregate and quarry gravel aggregate		D	0.04				
		FILLING - Generally comprising orange / brown clayey fine to coarse grained sandy gravel filling (subangular (quarry rock) up to 60mm diameter) with trace to some sandstone cobbles and boulders up to 450mm diameter, damp		D	0.15				
	0.7	FILLING - Generally comprising brown medium to coarse grained sand filling, with trace subangular gravels up to 60mm diameter, damp		D, ASS	0.75		PID<1		
		From 0.8m, gravel fraction no longer evident		D, ASS	0.85		PID<1		
	0.9	Pit discontinued at 0.9m, collapse							

RIG: ZAXUS 48U 5 Tonne Excavator, 300mm GP Tooth Bucket
LOGGED: Abberton
SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Coordinates taken using hand held GPS typically accurate to ± 5m

☐ 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)

Douglas Partners
Geotechnics / Environment / Groundwater

TEST PIT LOG

CLIENT: Lee 4 Pty Ltd
PROJECT: Huntington
LOCATION: 35 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 2.34 AHD
EASTING: 384602
NORTHING: 6356282

PIT No: DP15-TP
PROJECT No: 91303.00
DATE: 19/4/2018
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)
	0.08	ASPHALT - Slag aggregate and quarry gravel aggregate		D	0.05				
		FILLING - Generally comprising orange / brown clayey fine to coarse grained sandy gravel filling (subangular (quarry rock) up to 60mm diameter) with trace to some sandstone cobbles and boulders up to 450mm diameter, damp		D	0.2		PID<1		
	0.7	FILLING - Generally comprising light brown medium to coarse grained sand filling with trace subangular gravel up to 60mm diameter and filling, trace shells, damp		D, ASS	0.75		PID<1		
		From 0.8m, no gravels		D, ASS	0.85		PID<1		
	1.0	Pit discontinued at 1.0m, collapse							

Dynamic Penetrometer Test (blows per mm): 5, 10, 15, 20

RIG: ZAXUS 48U 5 Tonne Excavator, 300mm GP Tooth Bucket

LOGGED: Abberton

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Coordinates taken using hand held GPS typically accurate to ± 5m

☐ 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)

Douglas Partners
Geotechnics / Environment / Groundwater

TEST PIT LOG

CLIENT: Lee 4 Pty Ltd
PROJECT: Huntington
LOCATION: 35 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 2.2 AHD
EASTING: 384611
NORTHING: 6356293

PIT No: DP16-TP
PROJECT No: 91303.00
DATE: 19/4/2018
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 150mm)
	0.08	ASPHALT - Slag aggregate and quarry gravel aggregate							
		FILLING - Generally comprising brown / grey fine to medium grained sandy gravel filling (subangular / subrounded gravels up to 60mm diameter) with subangular blue, green and brown slag up to 30mm diameter trace to some cobbles and boulders up to 400mm, damp		D	0.15		PID<1		
	0.28			D	0.3		PID<1		
	0.35	FILLING - Generally comprising orange / brown clayey fine to coarse grained sand filling with trace subangular to subrounded gravels up to 50mm diameter, damp		D, ASS	0.45		PID<1		
		FILLING - Generally comprising light brown medium to coarse grained sand filling, with trace subangular gravels up to 60mm diameter and trace shells, damp		D, ASS	0.55		PID<1		
		From 0.5m, gravel fraction no longer evident		D, ASS	0.75		PID<1		
	0.9	Pit discontinued at 0.9m, collapse							

RIG: ZAXUS 48U 5 Tonne Excavator, 300mm GP Tooth Bucket

LOGGED: Abberton

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Coordinates taken using hand held GPS typically accurate to ± 5m

☐ 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)

Douglas Partners
Geotechnics / Environment / Groundwater

TEST PIT LOG

CLIENT: Lee 4 Pty Ltd
PROJECT: Huntington
LOCATION: 35 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 2.05 AHD
EASTING: 384597
NORTHING: 6356298

PIT No: DP17-TP
PROJECT No: 91303.00
DATE: 19/4/2018
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 150mm)
2	0.08	ASPHALT - Slag aggregate and quarry gravel aggregate							5 10 15 20
	0.15	FILLING - Generally comprising brown sandy gravel filling (subangular gravel up to 40mm diameter and subangular green, blue and grey slag gravel up to 50mm diameter), damp		D	0.1		PID<1		
	0.4	FILLING - Generally comprising orange / brown clayey fine to coarse grained sandy gravel filling (subangular (quarry rock) up to 60mm diameter) with trace to some sandstone cobbles and boulders up to 450mm diameter, damp		D	0.2		PID<1		
		FILLING - Generally comprising light brown medium to coarse grained sand filling with subangular gravel up to 40mm diameter, damp From 0.5m, gravel fraction no longer evident		D, ASS	0.45		PID<1		
				D, ASS	0.55		PID<1		
				D, ASS	0.8		PID<1		
	0.9	Pit discontinued at 0.9m, collapse							
1									1
1									
0									
									2

RIG: ZAXUS 48U 5 Tonne Excavator, 300mm GP Tooth Bucket

LOGGED: Abberton

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Coordinates taken using hand held GPS typically accurate to ± 5m

☐ 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)

Douglas Partners
Geotechnics / Environment / Groundwater

TEST PIT LOG

CLIENT: Lee 4 Pty Ltd
PROJECT: Huntington
LOCATION: 35 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 2.86 AHD
EASTING: 384603
NORTHING: 6356271

PIT No: DP18-TP
PROJECT No: 91303.00
DATE: 19/4/2018
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 150mm)
		FILLING - Generally comprising light grey / brown silty sand filling with some subangular to subrounded gravel up to 20mm diameter trace rootlets, humid		D	0.05		PID<1		
	0.15	FILLING - Generally comprising brown / grey clayey sandy gravel (subangular to subrounded gravel up to 60mm diameter) with trace subangular grey and blue slag gravel up to 20mm diameter, with trace bituminous gravel up to 10mm diameter with moderate PAH odour, damp		D	0.2		PID<1		
	0.3	FILLING - Generally comprising brown / orange silty clayey medium to coarse grained sand filling with some subangular to subrounded gravel up to 40mm diameter, damp		D, ASS	0.35		PID<1		
	0.55	FILLING - Generally comprising light brown medium to coarse grained sand filling with subangular gravel up to 40mm diameter, damp		D, ASS	0.6		PID<1		
		From 0.65m, gravel fraction no longer evident		D, ASS	0.7		PID<1		
2									
1				D, ASS	1.0		PID<1		1
	1.4	Pit discontinued at 1.4m, limit of investigation							
1									
	2								2
0									

RIG: ZAXUS 48U 5 Tonne Excavator, 300mm GP Tooth Bucket

LOGGED: Abberton

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Coordinates taken using hand held GPS typically accurate to ± 5m

☐ 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 LOG

CLIENT: Lee 4 Pty Ltd
PROJECT: Huntington
LOCATION: 35 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 2.76 AHD
EASTING: 384595
NORTHING: 6356250

PIT No: DP19-TP
PROJECT No: 91303.00
DATE: 19/4/2018
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 150mm)
		FILLING - Generally comprising light grey / brown silty sand filling with some subangular to subrounded gravel up to 120mm diameter, with trace rootlets, humid		D, ASS	0.1		PID<1		
		At 0.20m, plastic sheet							
	0.3	FILLING - Generally comprising brown medium to coarse grained sand filling with trace shells, with trace subrounded to subangular gravel up to 20mm diameter, damp		D, ASS	0.35		PID<1		
				D, ASS	0.45		PID<1		
	0.6	FILLING - Generally comprising light brown medium to coarse grained sand filling with some subangular gravel up to 40mm diameter, damp		D, ASS	0.65		PID<1		
				D, ASS	0.75		PID<1		
				E, ASS	1.0				
	1.1	Pit discontinued at 1.1m, limit of investigation							

RIG: ZAXUS 48U 5 Tonne Excavator, 300mm GP Tooth Bucket

LOGGED: Abberton

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Coordinates taken using hand held GPS typically accurate to ± 5m

☐ 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)

Douglas Partners
Geotechnics / Environment / Groundwater

TEST PIT LOG

CLIENT: Lee 4 Pty Ltd
PROJECT: Huntington
LOCATION: 35 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 2.1 AHD
EASTING: 384551
NORTHING: 6356302

PIT No: DP20-TP
PROJECT No: 91303.00
DATE: 19/4/2018
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)
2	0.05	FILLING - Generally comprising dark brown / grey clayey fine to coarse grained sand filling with trace angular gravel up to 5mm diameter, damp		D	0.03		PID<1		
		FILLING - Generally comprising brown / grey sand, gravel and cobble sized subangular ballast up to 100mm diameter with trace dark brown / grey clayey fine to coarse grained sand, damp At 0.1m, rail tracks At 0.2m, timber (railway sleepers)		D	0.4		only ballast		
	0.8	FILLING - Generally comprising brown, medium to coarse grained sand filling with trace subangular ballast cobbles up to 100mm diameter, damp		D, ASS	0.85		PID<1		
1	1.0	From 0.9m (approx) , ballast fraction no longer evident Pit discontinued at 1.0m, collapse		D, ASS	0.95		PID<1		1
0	2								2

Dynamic Penetrometer Test (blows per mm): 5 10 15 20

RIG: ZAXUS 48U 5 Tonne Excavator, 300mm GP Tooth Bucket **LOGGED:** Abberton **SURVEY DATUM:** MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Coordinates taken using hand held GPS typically accurate to ± 5m

☐ 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)

Douglas Partners
Geotechnics / Environment / Groundwater

TEST PIT LOG

CLIENT: Lee 4 Pty Ltd
PROJECT: Huntington
LOCATION: 35 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 2.25 AHD
EASTING: 384574
NORTHING: 6356317

PIT No: DP21-TP
PROJECT No: 91303.00
DATE: 19/4/2018
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)
2	0.03	FILLING - Generally comprising dark brown / grey clayey fine to coarse grained sand filling with trace angular gravel up to 5mm diameter, damp		D	0.02		PID<1		
				D	0.1		PID=50		
	0.2	FILLING - Generally comprising brown, grey, green and blue sand, cobble sized subangular slag gravel filling, with trace some subangular bituminous gravels, up to 60mm, damp		D	0.25		PID<1		
				D	0.32		PID<1		
	0.35	FILLING - Generally comprising orange/brown clayey fine to coarse grained sandy gravel filling (subangular gravel up to 50mm diameter), damp							
1		Pit discontinued at 0.35m, refusal on concrete slab (teeth smoking)							1
1									
0									2

RIG: ZAXUS 48U 5 Tonne Excavator, 300mm GP Tooth Bucket

LOGGED: Abberton

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Coordinates taken using hand held GPS typically accurate to ± 5m

☐ 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)

Douglas Partners
Geotechnics / Environment / Groundwater

TEST PIT LOG

CLIENT: Lee 4 Pty Ltd
PROJECT: Huntington
LOCATION: 35 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 2.18 AHD
EASTING: 384565
NORTHING: 6356311

PIT No: DP22-TP
PROJECT No: 91303.00
DATE: 19/4/2018
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)
		ASPHALT							
	0.08	FILLING - Generally comprising dark brown / grey clayey fine to coarse grained sand filling with trace subrounded to subangular gravel up to 5mm diameter, damp		D	0.1		PID<1		
	0.2			D	0.25		PID=29		
	0.35	FILLING - Generally comprising sand, gravel and cobble sized subangular dark brown, grey, green and blue slag gravel subangular bituminous gravels, damp							
		Pit discontinued at 0.35m, refusal on concrete slab (teeth smoking)							

RIG: ZAXUS 48U 5 Tonne Excavator, 300mm GP Tooth Bucket **LOGGED:** Abberton **SURVEY DATUM:** MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Coordinates taken using hand held GPS typically accurate to ± 5m

☐ 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 LOG

CLIENT: Lee 4 Pty Ltd
PROJECT: Huntington
LOCATION: 35 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 2.29 AHD
EASTING: 384543
NORTHING: 6356279

PIT No: DP23-TP
PROJECT No: 91303.00
DATE: 20/4/2018
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)
	0.08	ASPHALT - Slag aggregate and quarry gravel aggregate							
		FILLING - Generally comprising sand, gravel and cobble sized subangular dark brown, grey, green and blue slag gravel with subangular bituminous gravels, damp		D	0.1		PID=77		
	0.18			D, ASS	0.2				
		FILLING - Generally comprising brown sandy subangular ballast gravel filling with trace bituminous gravel with moderate PAH odour, damp							
	0.35			D, ASS	0.4				
		FILLING - Generally comprising brown medium to coarse grained sand filling with trace to some subangular to subrounded gravels up to 60mm diameter, trace shells, damp							
	0.55								
		Pit discontinued at 0.55m, refusal on concrete slab (teeth smoking)							

Dynamic Penetrometer Test (blows per mm): 5, 10, 15, 20

RIG: ZAXUS 48U 5 Tonne Excavator, 300mm GP Tooth Bucket

LOGGED: Abberton

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Coordinates taken using hand held GPS typically accurate to ± 5m

☐ 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 LOG

CLIENT: Lee 4 Pty Ltd
PROJECT: Huntington
LOCATION: 35 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 2.24 AHD
EASTING: 384537
NORTHING: 6356278

PIT No: DP24-TP
PROJECT No: 91303.00
DATE: 20/4/2018
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 150mm)
	0.08	ASPHALT - Slag aggregate and quarry gravel aggregate							
		FILLING - Generally sand, gravel and cobble sized subangular dark brown, grey, green and blue slag gravel with subangular bituminous gravels, damp		D	0.1		PID=26		
	0.2	FILLING - Generally comprising brown sandy subangular ballast gravel filling with trace subangular blue, green and grey slag gravel up to 30mm diameter, damp		D, ASS	0.25		PID=26.5		
	0.35	FILLING - Generally comprising pale brown medium to coarse grained sand filling with trace bituminous gravels with moderate PAH odour, trace shells, damp		D, ASS	0.4		PID<1		
		From 0.45m, gravel fraction no longer evident		D, ASS	0.5		PID<1		
				D, ASS	0.8		PID<1		
	0.9	Pit discontinued at 0.9m, limit of investigation							

Dynamic Penetrometer Test (blows per 150mm): 5, 10, 15, 20

RIG: ZAXUS 48U 5 Tonne Excavator, 300mm GP Tooth Bucket

LOGGED: Abberton

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Coordinates taken using hand held GPS typically accurate to ± 5m

☐ 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 LOG

CLIENT: Lee 4 Pty Ltd
PROJECT: Huntington
LOCATION: 35 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 2.36 AHD
EASTING: 384530
NORTHING: 6356271

PIT No: DP25-TP
PROJECT No: 91303.00
DATE: 20/4/2018
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 150mm)
	0.08	ASPHALT - Slag aggregate and quarry gravel aggregate							
		FILLING - Generally comprising brown gravel filling (subangular / subrounded gravel up to 60mm and blue, green and grey subangular slag up to 40mm diameter), with trace to some bituminous gravel, with moderate PAH odour, damp		D	0.2		PID=10		
	0.35	FILLING - Generally comprising pale brown medium to coarse grained sand filling with trace bituminous gravel with moderate PAH odour, trace shells, damp		D	0.4	ASS	PID<1		
		From 0.45m, gravel fraction no longer evident		D	0.5	ASS	PID<1		
				D	0.8	ASS	PID<1		
	0.9	Pit discontinued at 0.9m, limit of investigation							

RIG: ZAXUS 48U 5 Tonne Excavator, 300mm GP Tooth Bucket
LOGGED: Abberton
SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Coordinates taken using hand held GPS typically accurate to ± 5m

☐ 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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Appendix C

Pile Capacity Plots:
ConePile CFA 0.6 m diameter
ConePile CFA 0.75 m diameter
ConePile Screw Cast Concrete (0.56 m / 0.71 m diameter)

CONE PENETRATION TEST

CLIENT: Lee 4 Pty Ltd c/- Doma Group

PROJECT: Huntington

LOCATION: 35 Honeysuckle Drive, Newcastle

REDUCED LEVEL: 2.2

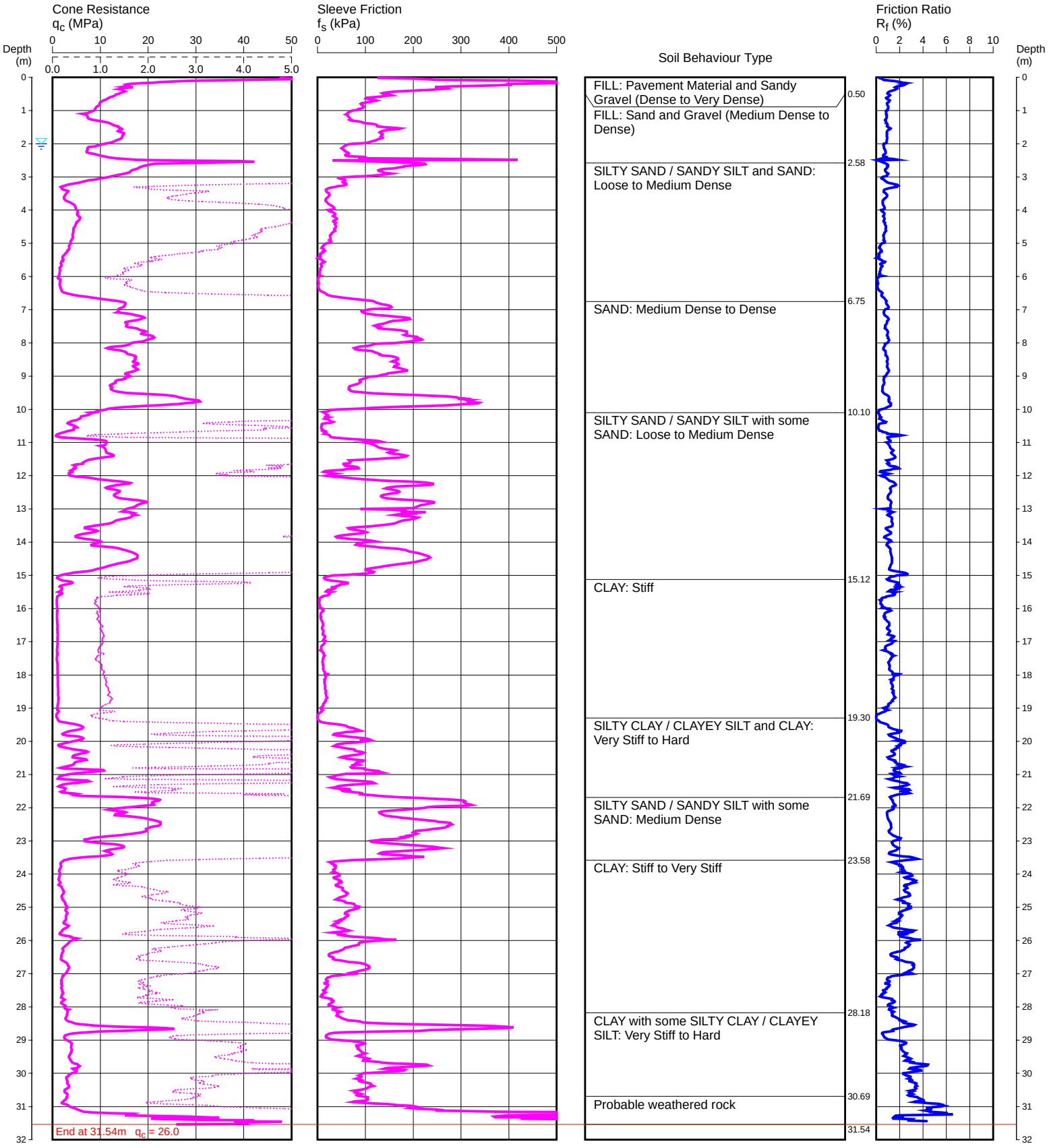
COORDINATES:

C1

Page 1 of 1

DATE 19/04/2018

PROJECT No: 91303



REMARKS: TEST DISCONTINUED DUE TO HIGH SLEEVE IN PROBABLE WEATHERED ROCK
GROUNDWATER MEASURED AT 2.0 m DEPTH AFTER WITHDRAWAL OF RODS

Water depth after test: 2.00m depth (measured)

File: P:\91303.00 - NEWCASTLE, 35 Honeysuckle Drive\4.0 Field Work\4.2 Testing\C1-Interpretted.CP5

Cone ID: 120634 **Type:** I-CFXY-10

ConePlot Version 5.9.2

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CONE PENETRATION TEST

CLIENT: Lee 4 Pty Ltd c/- Doma Group

PROJECT: Huntington

LOCATION: 35 Honeysuckle Drive, Newcastle

REDUCED LEVEL: 2.2

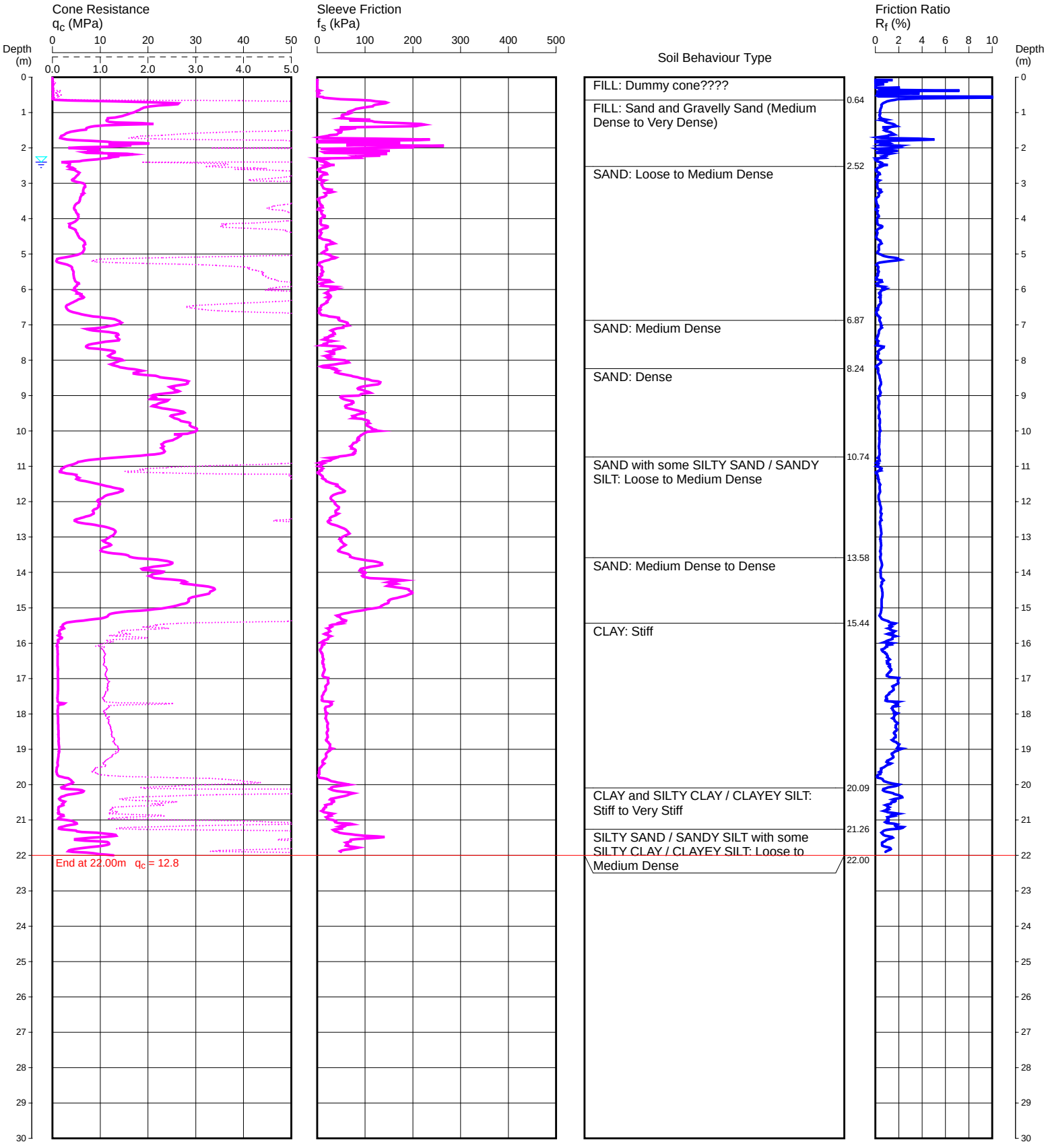
COORDINATES:

C2A

Page 1 of 1

DATE 24/04/2018

PROJECT No: 91303



REMARKS: TEST DISCONTINUED AT TARGET STRATA
GROUNDWATER MEASURED AT 2.4 m DEPTH AFTER WITHDRAWAL OF RODS

Water depth after test: 2.40m depth (measured)

File: P:\91303.00 - NEWCASTLE, 35 Honeysuckle Drive\4.0 Field Work\4.2 Testing\C2A - Interpretted.CP5
Cone ID: 170705 **Type:** I-CFXY-10

ConePlot Version 5.9.2

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CONE PENETRATION TEST

CLIENT: Lee 4 Pty Ltd c/- Doma Group

PROJECT: Huntington

LOCATION: 35 Honeysuckle Drive, Newcastle

REDUCED LEVEL: 2.3

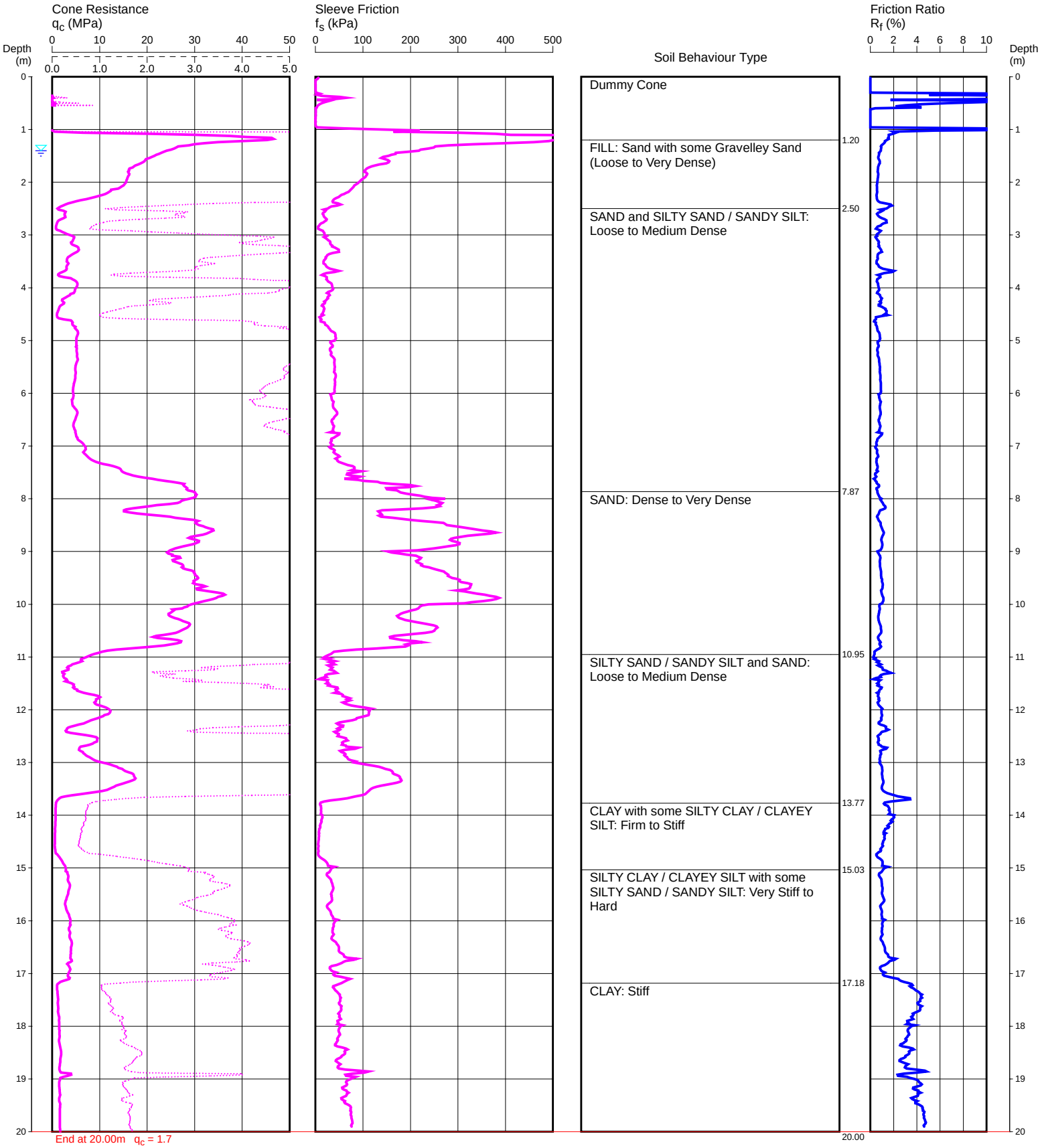
COORDINATES:

C3

Page 1 of 1

DATE 20/04/2018

PROJECT No: 91303



REMARKS: DUMMY CONE USED FROM 0 m TO 1.2 m DEPTH TO PENETRATE FILLING; TEST DISCONTINUED AT TARGET STRATA
HOLE COLLAPSED AT 1.4 m DEPTH AFTER WITHDRAWAL OF RODS

Water depth after test: 1.40m depth (assumed)

File: P:\91303.00 - NEWCASTLE, 35 Honeysuckle Drive\4.0 Field Work\4.2 Testing\C3 - Interpretted.CP5

Cone ID: 120630 **Type:** I-CFXY-10

ConePlot Version 5.9.2

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CONE PENETRATION TEST

CLIENT: Lee 4 Pty Ltd c/- Doma Group

PROJECT: Huntington

LOCATION: 35 Honeysuckle Drive, Newcastle

REDUCED LEVEL: 2.3

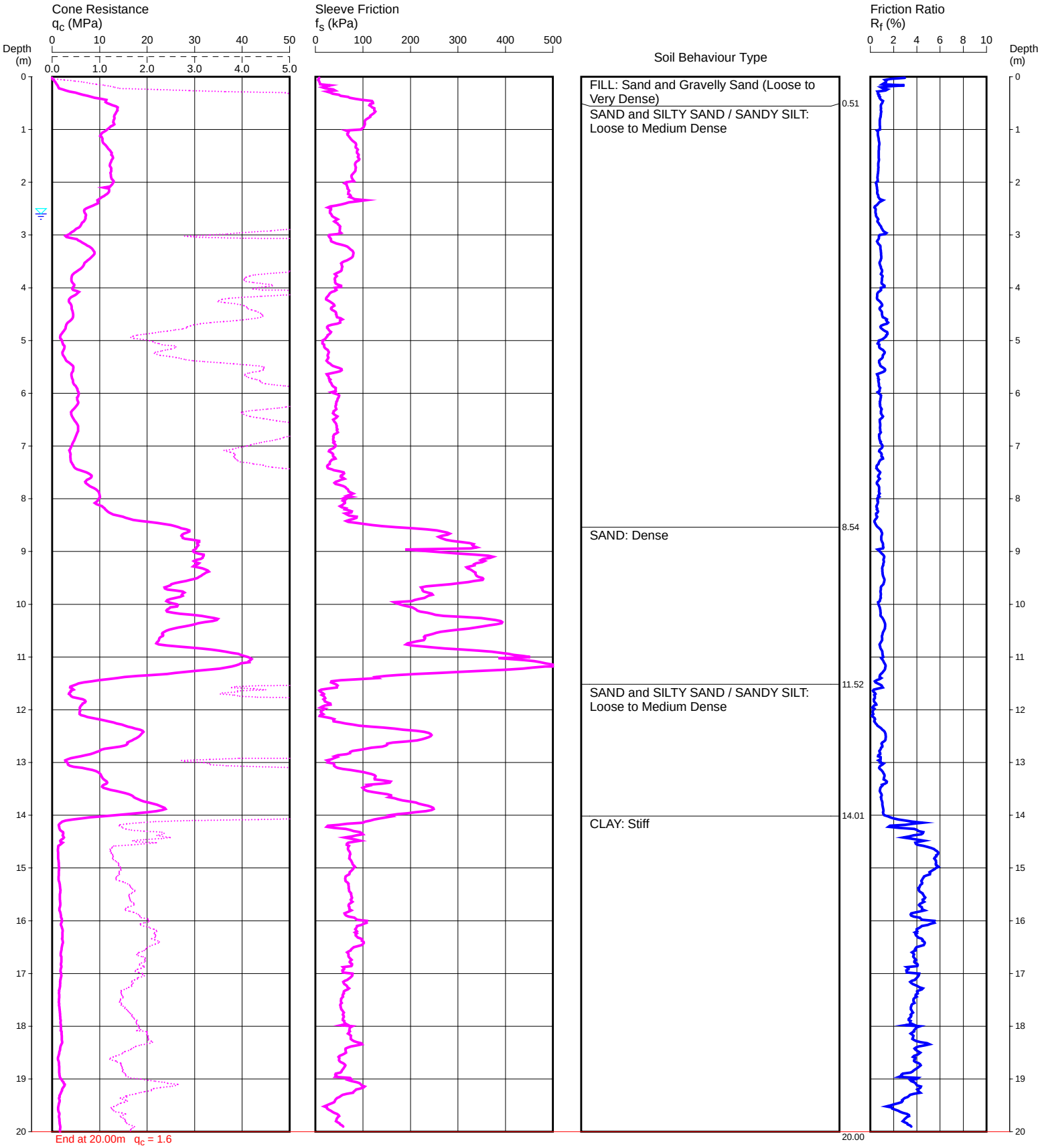
COORDINATES:

C4

Page 1 of 1

DATE 20/04/2018

PROJECT No: 91303



REMARKS: TEST DISCONTINUED AT TARGET STRATA
GROUNDWATER MEASURED AT 2.6 m DEPTH AFTER WITHDRAWAL OF RODS

Water depth after test: 2.60m depth (measured)

File: P:\91303.00 - NEWCASTLE, 35 Honeysuckle Drive\4.0 Field Work\4.2 Testing\C4 - Interpretted.CP5

Cone ID: 120630 **Type:** I-CFXY-10

ConePlot Version 5.9.2

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CONE PENETRATION TEST

CLIENT: Lee 4 Pty Ltd c/- Doma Group

PROJECT: Huntington

LOCATION: 35 Honeysuckle Drive, Newcastle

REDUCED LEVEL: 2.2

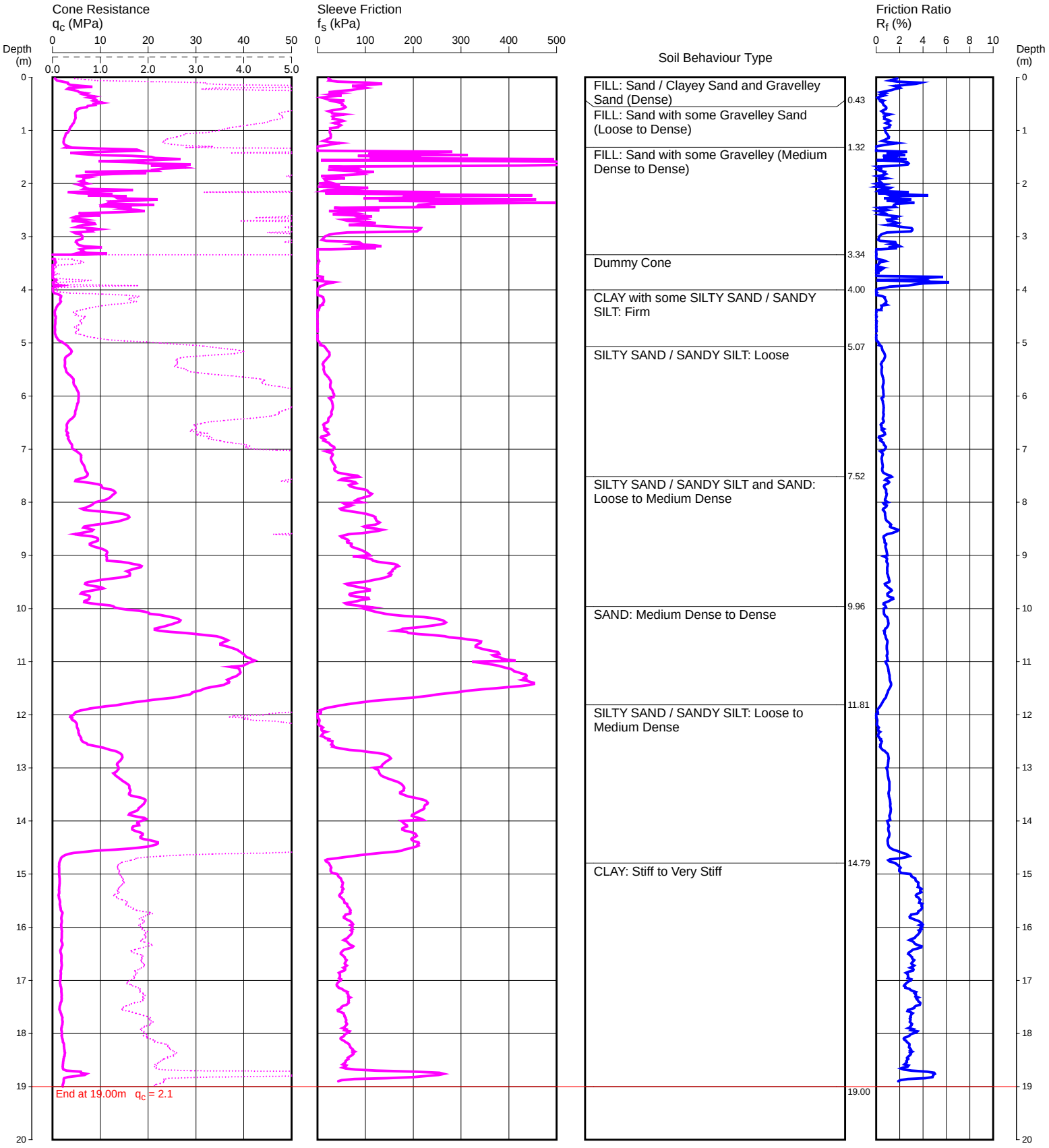
COORDINATES:

C5A

Page 1 of 1

DATE 20/04/2018

PROJECT No: 91303



REMARKS: DUMMY CONE USED FROM 3.34 m TO 4.0 m DEPTH TO PENETRATE FILLING; TEST DISCONTINUED AT TARGET STRATA
HOLE COLLAPSED AT 0.4 m DEPTH AFTER WITHDRAWAL OF RODS

File: P:\91303.00 - NEWCASTLE, 35 Honeysuckle Drive\4.0 Field Work\4.2 Testing\C5A - Interpretted.CP5
Cone ID: 120630 **Type:** I-CFXY-10

ConePlot Version 5.9.2

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CONE PENETRATION TEST

CLIENT: Lee 4 Pty Ltd c/- Doma Group

PROJECT: Huntington

LOCATION: 35 Honeysuckle Drive, Newcastle

REDUCED LEVEL: 2.2

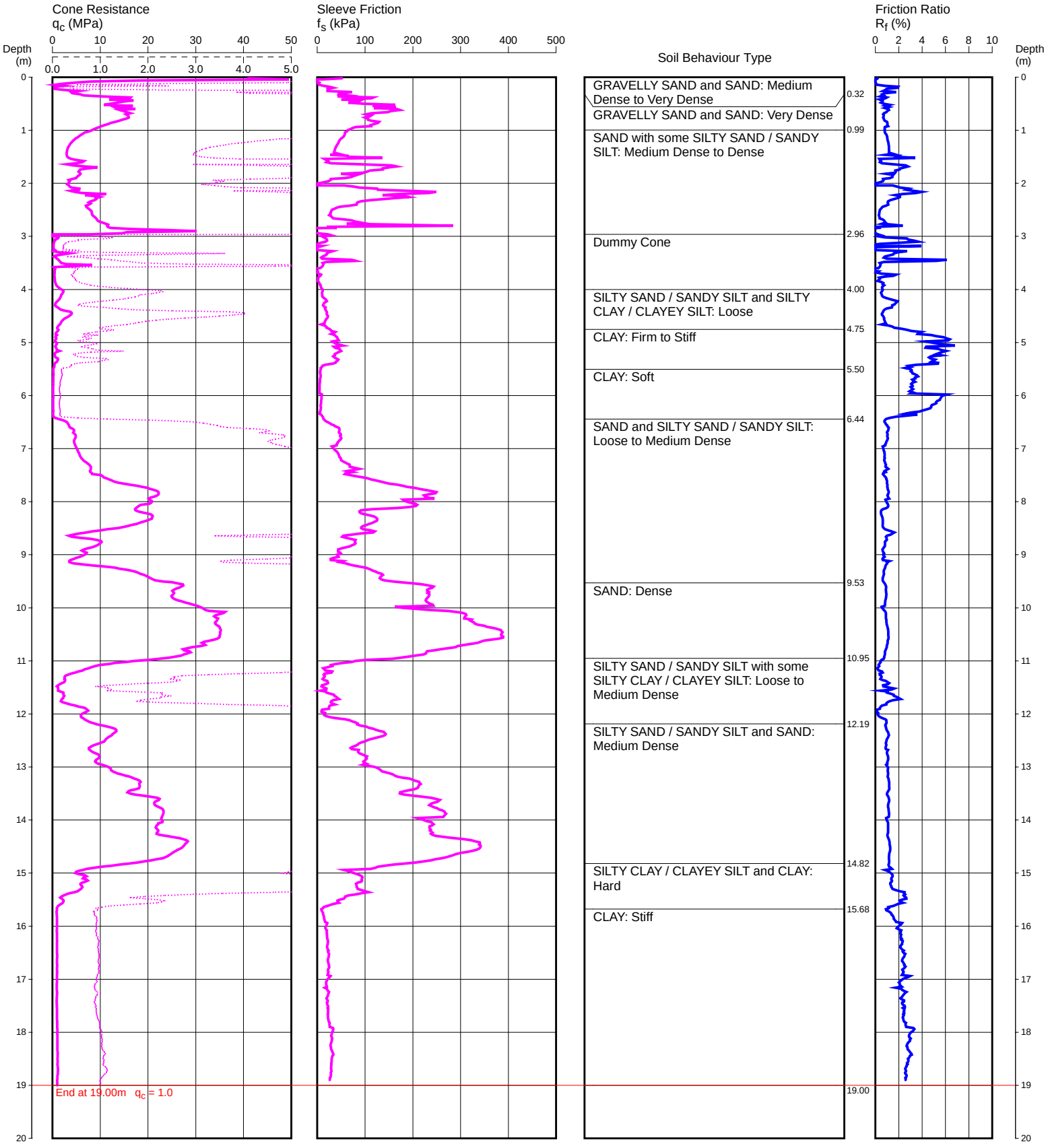
COORDINATES:

C6

Page 1 of 1

DATE 20/04/2018

PROJECT No: 91303



REMARKS: DUMMY CONE USED FROM 2.96 m TO 4.0 m DEPTH TO PENETRATE FILLING; TEST DISCONTINUED AT TARGET STRATA
HOLE COLLAPSED AT 0.5 m DEPTH AFTER WITHDRAWAL OF RODS

File: P:\91303.00 - NEWCASTLE, 35 Honeysuckle Drive\4.0 Field Work\4.2 Testing\C6 - Interpretted.CP5
Cone ID: 120630 **Type:** I-CFXY-10

ConePlot Version 5.9.2

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CONE PENETRATION TEST

CLIENT: Lee 4 Pty Ltd c/- Doma Group

PROJECT: Huntington

LOCATION: 35 Honeysuckle Drive, Newcastle

REDUCED LEVEL: 2.2

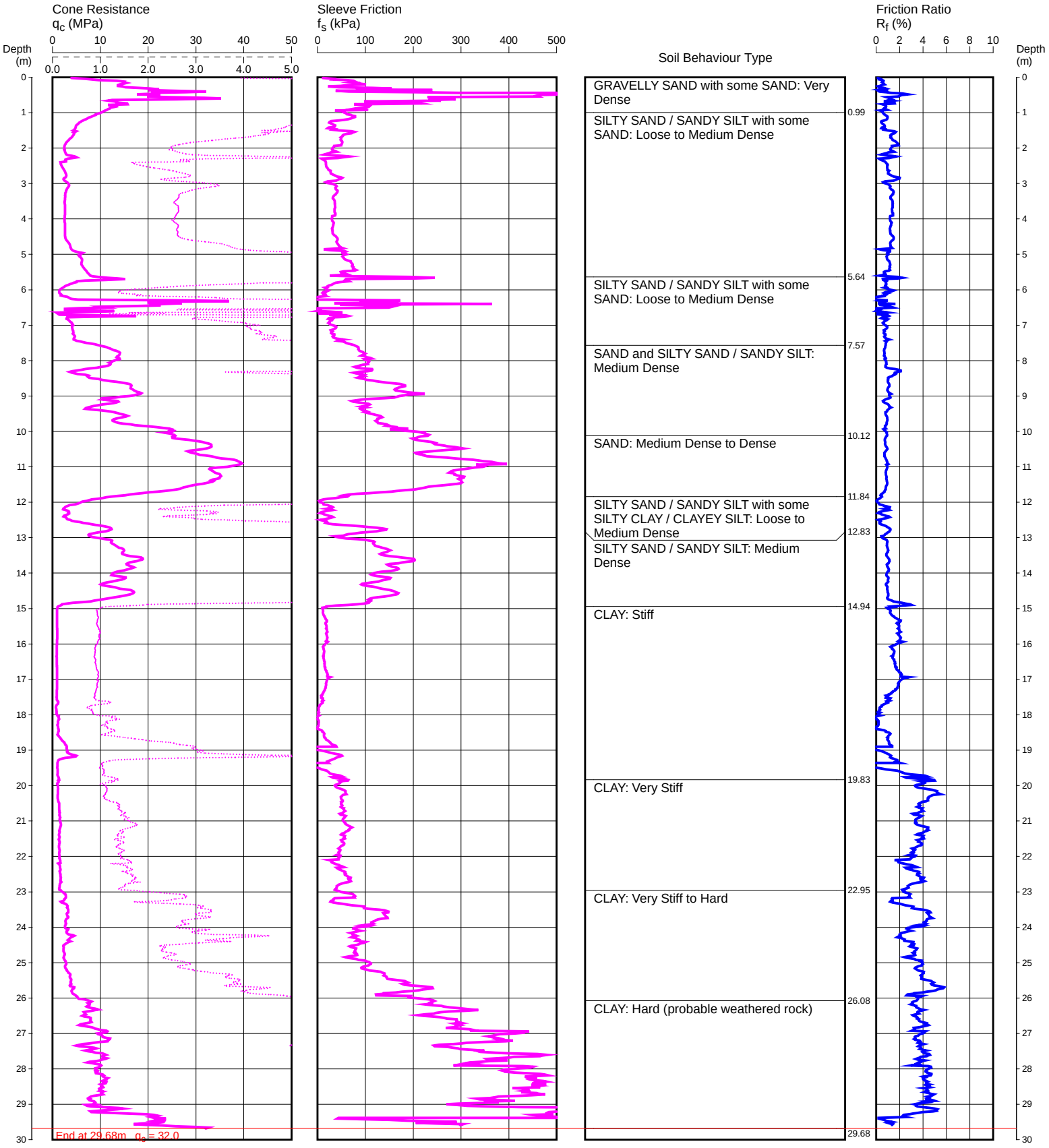
COORDINATES:

C7

Page 1 of 1

DATE 20/04/2018

PROJECT No: 91303



REMARKS: TEST DISCONTINUED DUE TO ROD BREAK NEAR REFUSAL (BREAK AT 2 m DEPTH)

File: P:\91303.00 - NEWCASTLE, 35 Honeysuckle Drive\4.0 Field Work\4.2 Testing\C7 - Interpretted.CP5
Cone ID: 120630 **Type:** I-CFXY-10

ConePlot Version 5.9.2

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CONE PENETRATION TEST

CLIENT: Lee 4 Pty Ltd c/- Doma Group

PROJECT: Huntington

LOCATION: 35 Honeysuckle Drive, Newcastle

REDUCED LEVEL: 2.3

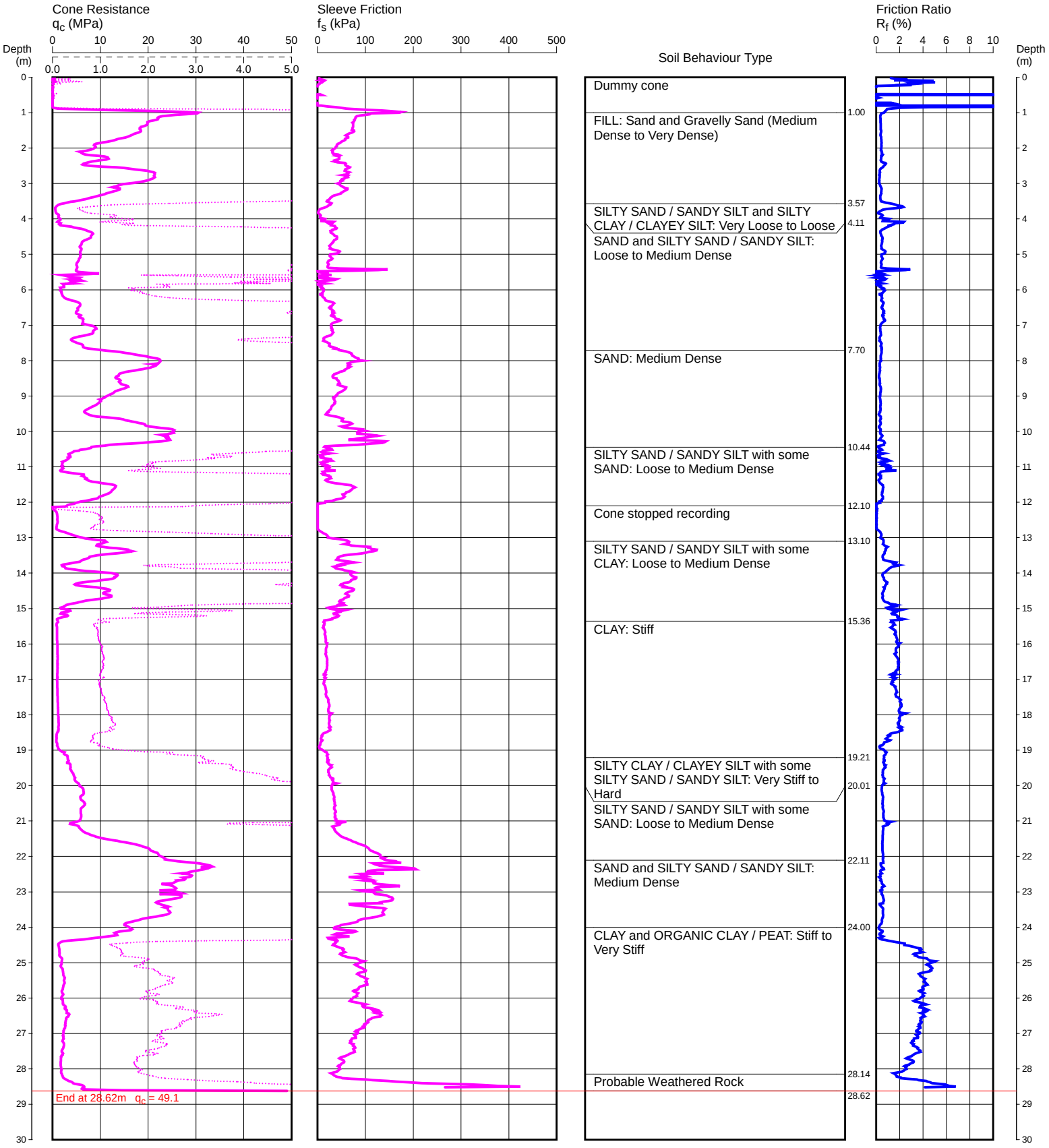
COORDINATES:

C8

Page 1 of 1

DATE 26/04/2018

PROJECT No: 91303



REMARKS: DUMMY CONE USED FROM 0 m TO 1.0 m DEPTH TO PENETRATE FILLING; TEST DISCONTINUED DUE TO SUDDEN BEND ON PROBABLE ROCK
DATA RECORDING ERROR FROM 12.1 m TO 13.1 m DEPTH - FALSE READINGS;HOLE COLLAPSED AT 2.0 m DEPTH AFTER WITHDRAWAL OF RODS

File: P:\91303.00 - NEWCASTLE, 35 Honeysuckle Drive\4.0 Field Work\4.2 Testing\C8 - Interpretted.CP5
Cone ID: 170705 **Type:** I-CFXY-10

ConePlot Version 5.9.2

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CONE PENETRATION TEST

CLIENT: Lee 4 Pty Ltd c/- Doma Group

PROJECT: Huntington

LOCATION: 35 Honeysuckle Drive, Newcastle

REDUCED LEVEL: 2.3

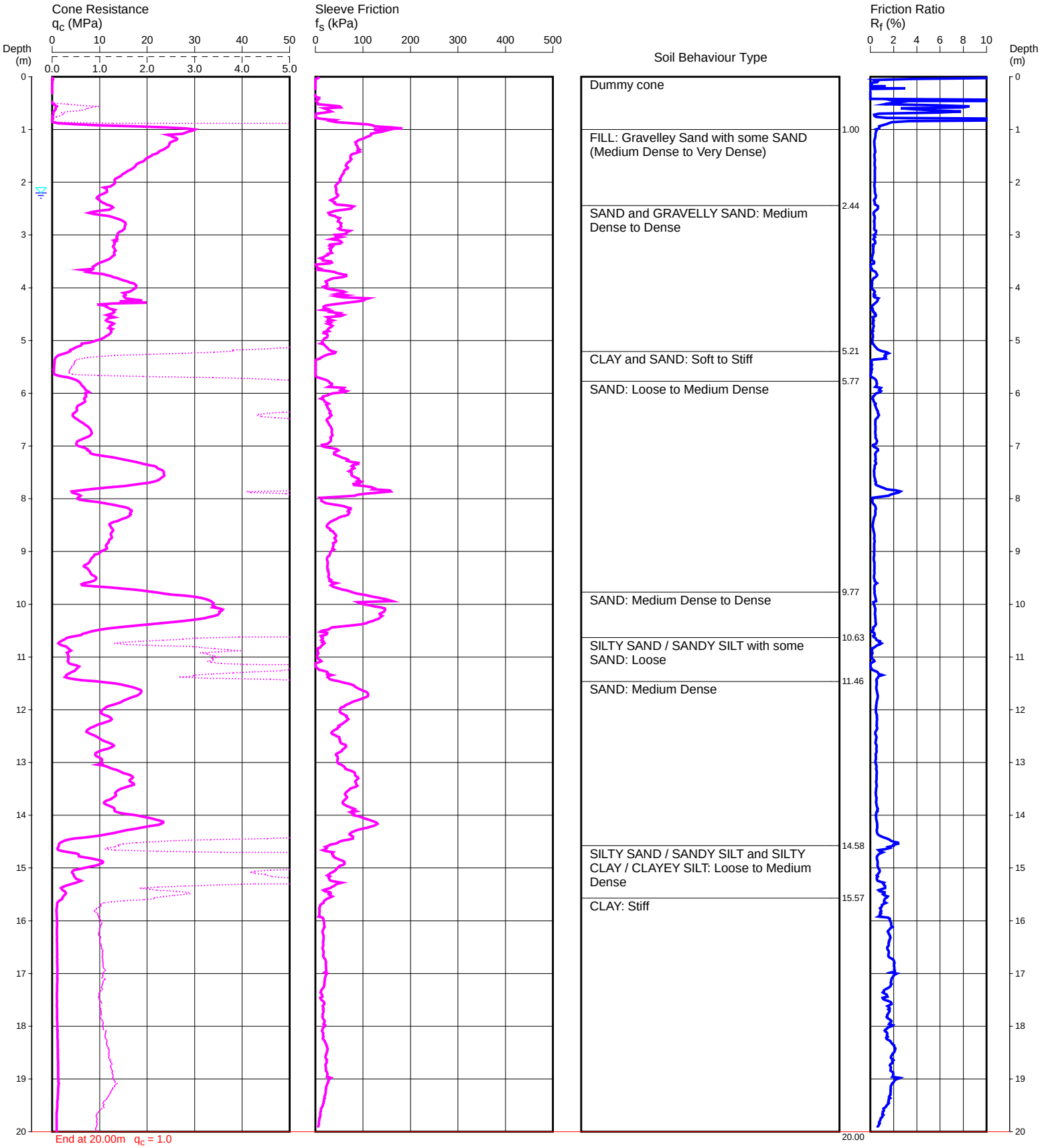
COORDINATES:

C9

Page 1 of 1

DATE 26/04/2018

PROJECT No: 91303



REMARKS: DUMMY CONE USED FROM 0 m TO 1.0 m DEPTH TO PENETRATE FILLING; TEST DISCONTINUED AT TARGET STRATA
GROUNDWATER MEASURED AT 2.2 m DEPTH AFTER WITHDRAWAL OF RODS

Water depth after test: 2.20m depth (measured)

File: P:\91303.00 - NEWCASTLE, 35 Honeysuckle Drive\4.0 Field Work\4.2 Testing\C9 - Interpretted.CP5

Cone ID: 170705 **Type:** I-CFXY-10

ConePlot Version 5.9.2

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Hunter Region Mail Centre NSW 2310
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Fax (02) 4960 9601

Results of Dynamic Penetrometer Tests

Client Lee 4 Pty Ltd

Project Huntington

Location 35 Honeysuckle Drive, Newcastle

Project No. 91303.00

Date 01/06/18

Page No. 1 of 2

Test Location	DP1-TP	DP2-TP	DP3-TP	DP5-TP	DP7-TP	DP8-TP	DP16-TP	DP17-TP	DP18-TP	DP19-TP
RL of Test (AHD)										
Depth (m)	**Penetration Resistance** Blows/150 mm									
0 - 0.15	-	-	-	-	-	-	-	-	-	1
0.15 - 0.30	-	-	-	-	-	-	-	-	-	2
0.30 - 0.45	-	4	1	-	1	2	-	1	0	9
0.45 - 0.60	4	16	9	2	3	4	1	5	8	14
0.60 - 0.75	13	22	14	5	5	9	9	10	18	26
0.75 - 0.90	19	23	16	3	Bouncing	10	13	9	16	25
0.90 - 1.05	18	23	24	9	Ref	8	13	9	17	22
1.05 - 1.20	17	28	20	14		8	10	7	18	24
1.20 - 1.35	19	20	20	11		5	10	6	20	
1.35 - 1.50	17	26	21	17		4	13	5	21	
1.50 - 1.65	19			Bouncing			10			
1.65 - 1.80										
1.80 - 1.95										
1.95 - 2.10										
2.10 - 2.25										
2.25 - 2.40										
2.40 - 2.55										
2.55 - 2.70										
2.70 - 2.85										
2.85 - 3.00										
3.00 - 3.15										
3.15 - 3.30										
3.30 - 3.45										
3.45 - 3.60										

Test Method AS 1289.6.3.2, Cone Penetrometer ☑

AS 1289.6.3.3, Sand Penetrometer ☐

Tested By RAA

Checked By RAA

Remarks Ref = Refusal, 24/110 indicates 25 blows for 110 mm penetration

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Results of Dynamic Penetrometer Tests

Client Lee 4 Pty Ltd

Project Huntington

Location 35 Honeysuckle Drive, Newcastle

Project No. 91303.00

Date 01/06/18

Page No. 2 of 2

Test Location	DP24-TP	DP25-TP								
RL of Test (AHD)										
Depth (m)	**Penetration Resistance** Blows/150 mm									
0 - 0.15	-	-								
0.15 - 0.30	-	-								
0.30 - 0.45	3	5								
0.45 - 0.60	18	14								
0.60 - 0.75	23	20								
0.75 - 0.90	23	26								
0.90 - 1.05	24	24								
1.05 - 1.20	21	22								
1.20 - 1.35	20	21								
1.35 - 1.50	25	25								
1.50 - 1.65										
1.65 - 1.80										
1.80 - 1.95										
1.95 - 2.10										
2.10 - 2.25										
2.25 - 2.40										
2.40 - 2.55										
2.55 - 2.70										
2.70 - 2.85										
2.85 - 3.00										
3.00 - 3.15										
3.15 - 3.30										
3.30 - 3.45										
3.45 - 3.60										

Test Method AS 1289.6.3.2, Cone Penetrometer ☑

AS 1289.6.3.3, Sand Penetrometer ☐

Tested By RAA

Checked By RAA

Remarks Ref = Refusal, 24/110 indicates 25 blows for 110 mm penetration

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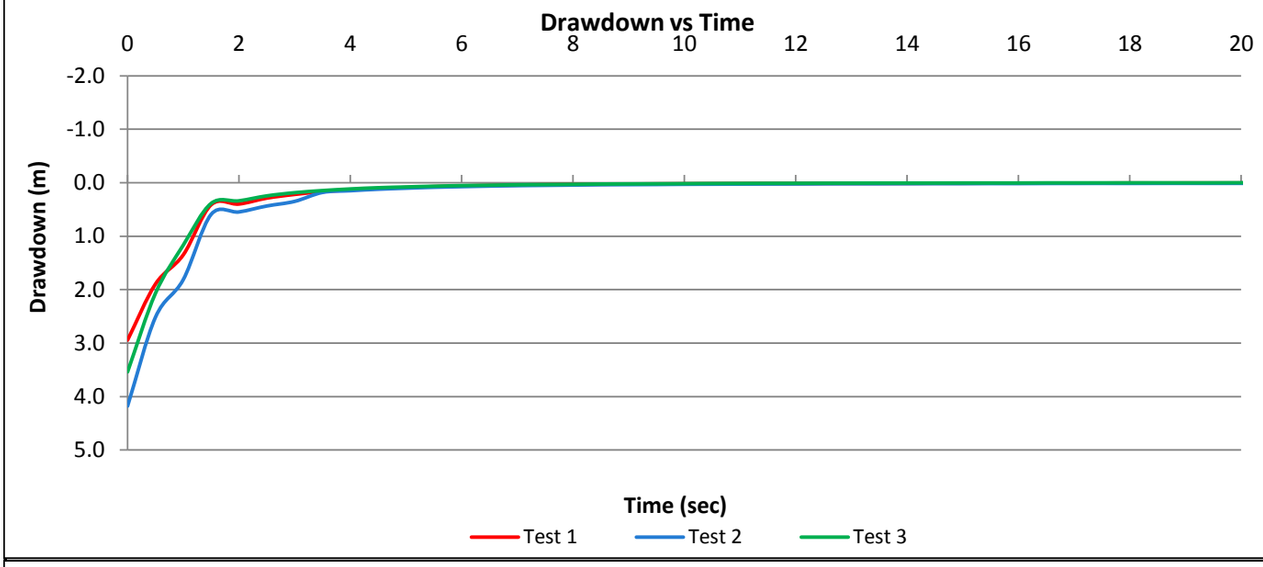
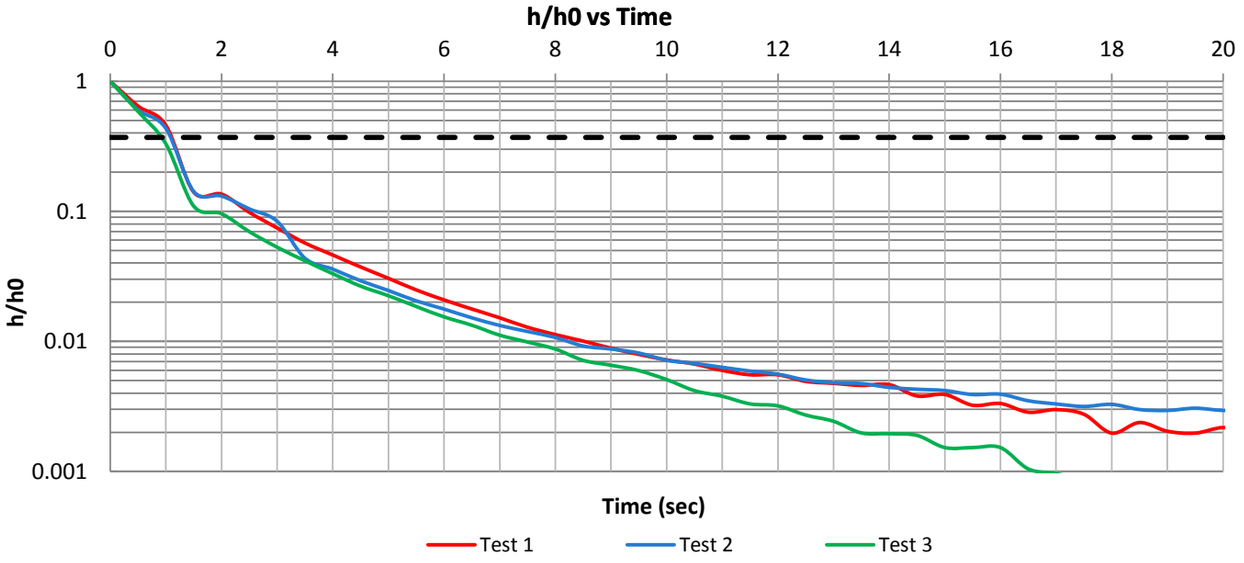
Rising Head Test Analysis Report

Project: Huntington
Project No: 91303

Client: Lee 4 Pty Ltd

Test Well No: DP4 **Date Tested:** 10/05/2018 to 10/05/2018





Test parameters:

Casing radius:			0.025	m
Gravel radius:			0.05	m
Screen length:			6	m
Sreen interval:	1.2	m -	7.2	m
Screened stratum:			Sand	

Analysis Method: Hvorslev

Analysis Results:

	Conductivity K			
Test 1:	2.1E-04	m/s	17.95	m/d
Test 2:	2.1E-04	m/s	17.95	m/d
Test 3:	2.8E-04	m/s	23.94	m/d

Range of Conductivity K	m/s	m/d
Minimum	2.1E-04	17.953
Maximum	2.77E-04	23.937
Mean	2.31E-04	19.948

Comments:

Calculated by: MJP
Date: 9/05/2018

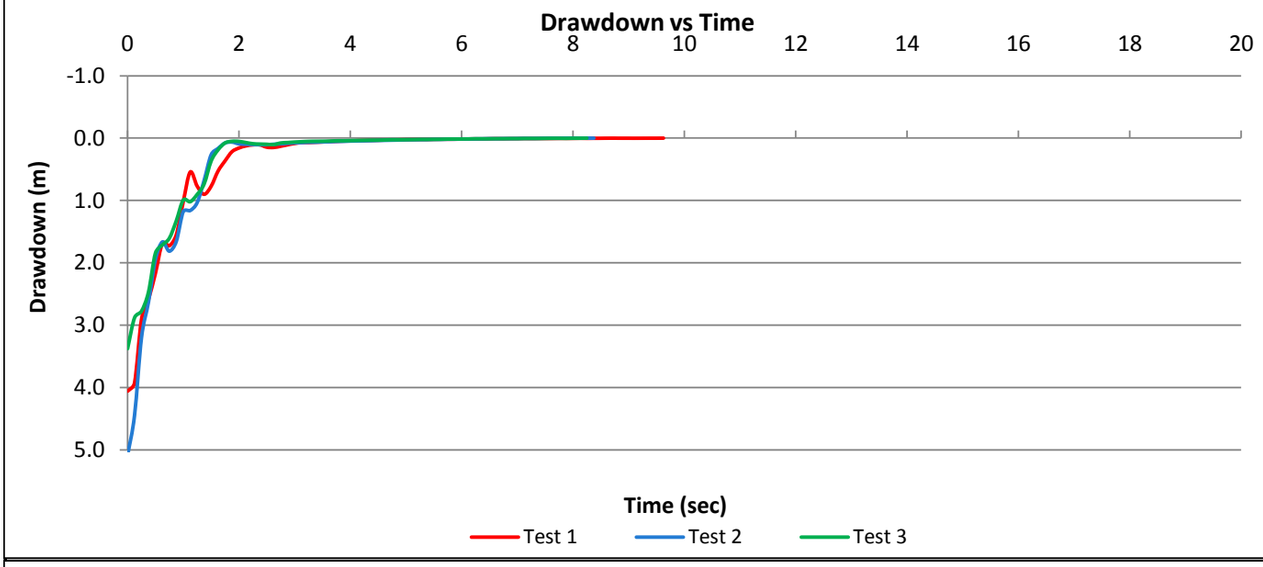
Douglas Partners
Geotechnics / Environment / Groundwater

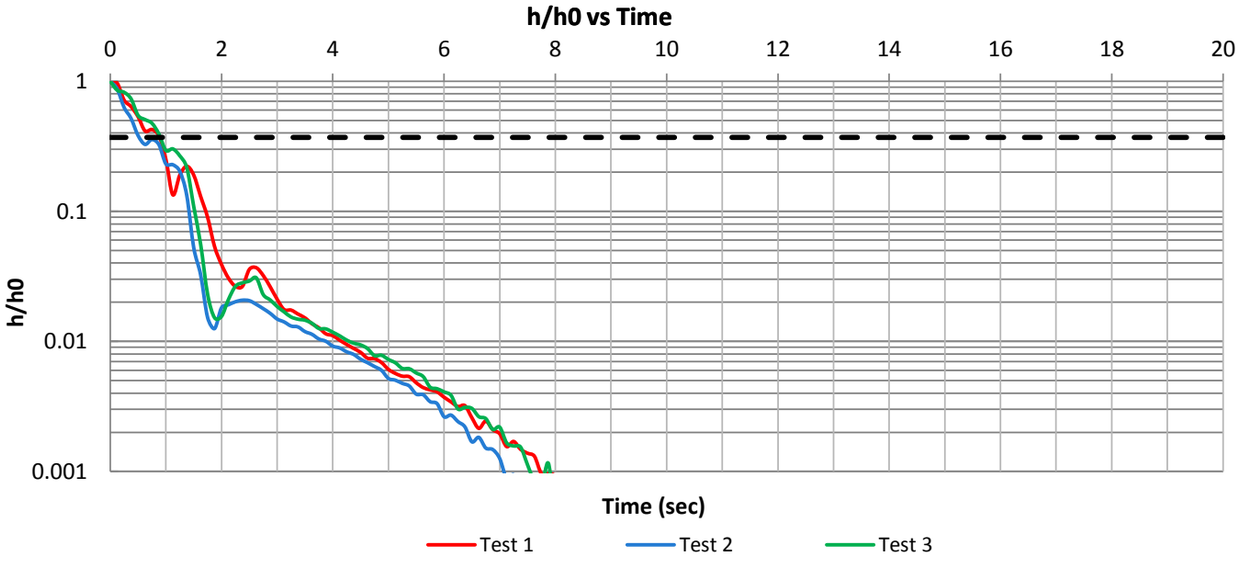
Rising Head Test Analysis Report

Project: Huntington
Project No: 91303

Client: Lee 4 Pty Ltd c/- Doma Group

Test Well No: DP20 **Date Tested:** 10/05/2018 to 10/05/2018





Test parameters:

Casing radius:			0.025	m
Gravel radius:			0.05	m
Screen length:			6	m
Sreen interval:	1.2	m -	7.2	m
Screened stratum:			Sand	

Analysis Method: Hvorslev

Analysis Results:

	Conductivity K			
Test 1:	2.8E-04	m/s	23.94	m/d
Test 2:	3.3E-04	m/s	28.72	m/d
Test 3:	2.8E-04	m/s	23.94	m/d

Range of Conductivity K	m/s	m/d
Minimum	2.8E-04	23.937
Maximum	3.32E-04	28.725
Mean	2.96E-04	25.533

Comments:

Calculated by: MJP
Date: 9/05/2018

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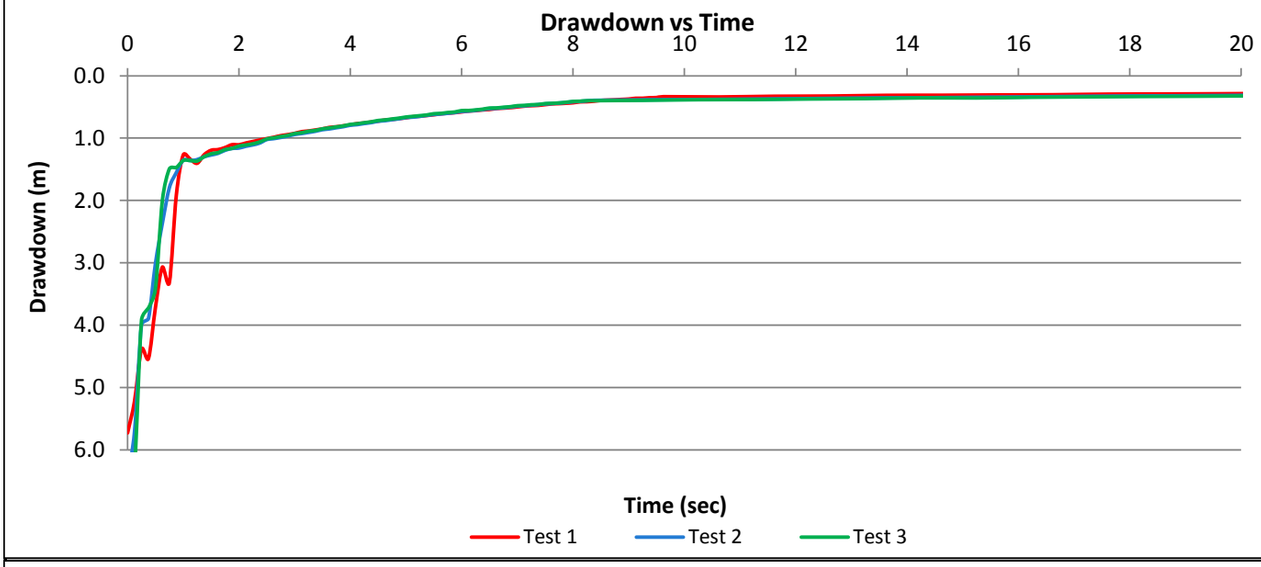
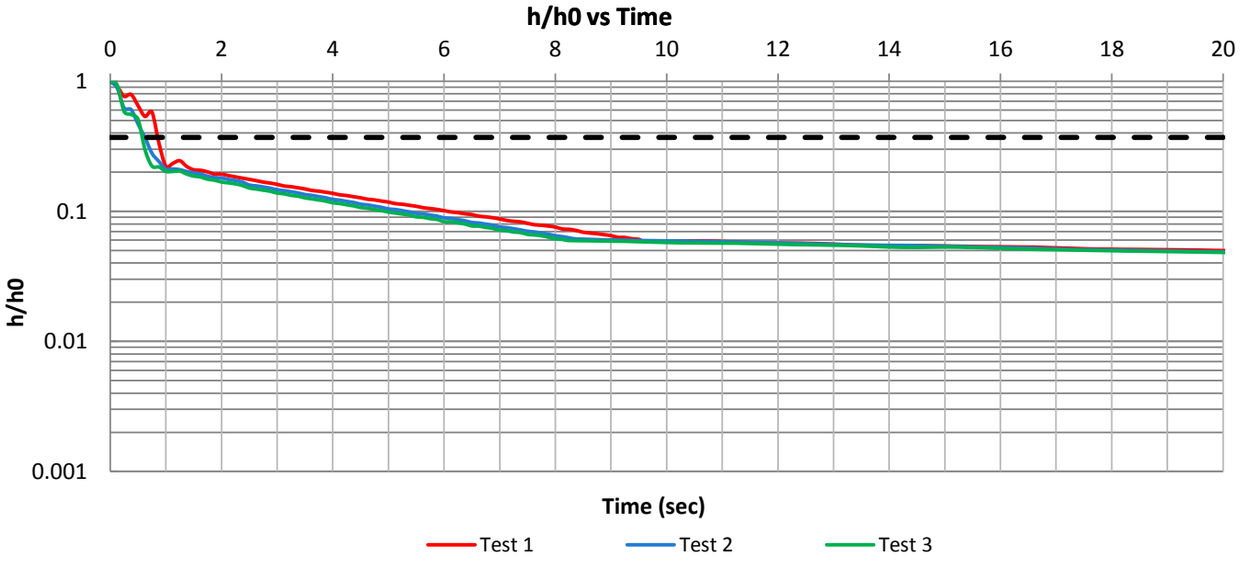
Rising Head Test Analysis Report

Project: Huntington
Project No: 91303

Client: Lee 4 Pty Ltd

Test Well No: DP14 **Date Tested:** 10/05/2018 to 10/05/2018





Test parameters:

Casing radius:			0.025	m
Gravel radius:			0.05	m
Screen length:			6	m
Sreen interval:	1.2	m -	7.2	m
Screened stratum:			Sand	

Analysis Method: Hvorslev

Analysis Results:

	Conductivity K			
Test 1:	3.1E-04	m/s	26.93	m/d
Test 2:	4.2E-04	m/s	35.91	m/d
Test 3:	4.2E-04	m/s	35.91	m/d

Range of Conductivity K	m/s	m/d
Minimum	3.1E-04	26.930
Maximum	4.16E-04	35.906
Mean	3.81E-04	32.914

Comments:

Calculated by: MJP
Date: 9/05/2018

Appendix C

Pile Capacity Plots:
ConePile CFA 0.6 m diameter
ConePile CFA 0.75 m diameter
ConePile Screw Cast Concrete (0.56 m / 0.71 m diameter)

PILE CAPACITY ESTIMATE

PILE TYPE: Grout-Injected
PILE SHAPE: Round
PILE SIZE: Diameter = 0.60
STRENGTH REDUCTION FACTOR $Ø_g$: 0.52
CALCULATION METHOD: Douglas Method

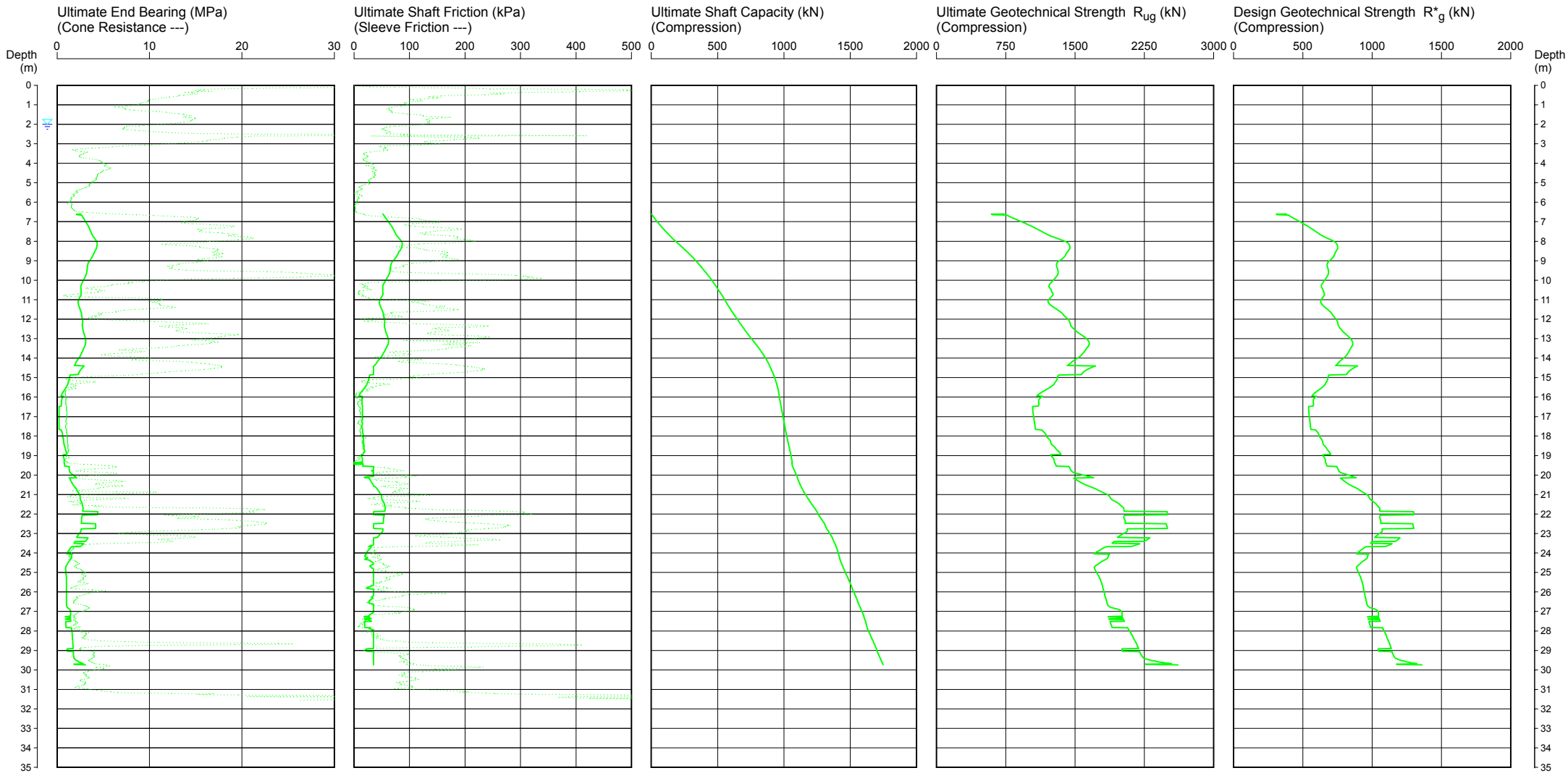
PROJECT: Geotechnical & Contamination Sampling and Testing

LOCATION: 35 Honeysuckle Drive

CLIENT: Lee 4 Pty Ltd c/- Doma Group

C1
Page 1 of 1

DATE 19/04/2018
PROJECT No: 91303
SURFACE RL:



DISCLAIMER:
These capacities have been estimated using accepted static theory, and are a guide only. Suitable verification procedures should be adopted (refer to AS2159), and piling contractors should confirm pile suitability and capacities. Structural capacity should be checked, and due allowance made for inclined or eccentric loads, and possible corrosion effects.

Water depth after test: 2.00m depth

File: P:\91303.00 - NEWCASTLE, 35 Honeysuckle Drive\4.0 Field Work\4.2 Testing\C1-Interpretted.CP5
Cone ID: 120634 **Type:** I-CFXY-10

ConePile Version 5.9.1

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PILE CAPACITY ESTIMATE

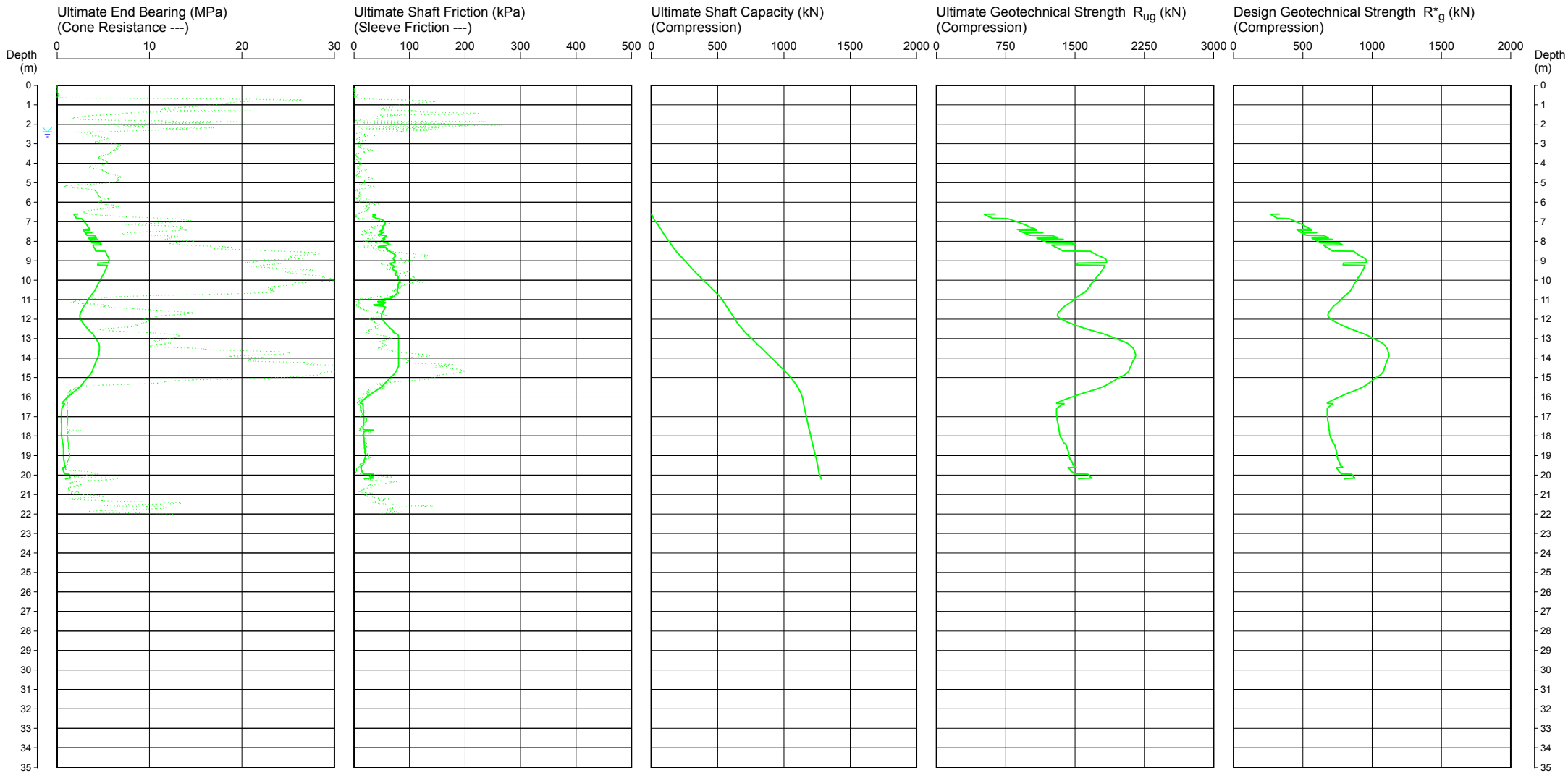
PILE TYPE: Grout-Injected
PILE SHAPE: Round
PILE SIZE: Diameter = 0.60
STRENGTH REDUCTION FACTOR $Ø_g$: 0.52
CALCULATION METHOD: Douglas Method

PROJECT: Geotechnical & Contamination Sampling and Testing

LOCATION: 35 Honeysuckle Drive

CLIENT: Lee 4 Pty Ltd c/- Doma Group

C2A
Page 1 of 1
DATE 24/04/2018
PROJECT No: 91303
SURFACE RL:



DISCLAIMER:
These capacities have been estimated using accepted static theory, and are a guide only. Suitable verification procedures should be adopted (refer to AS2159), and piling contractors should confirm pile suitability and capacities. Structural capacity should be checked, and due allowance made for inclined or eccentric loads, and possible corrosion effects.

Water depth after test: 2.40m depth

File: P:\91303.00 - NEWCASTLE, 35 Honeysuckle Drive\4.0 Field Work\4.2 Testing\C2A - Interpretted.CP5
Cone ID: 170705 **Type:** I-CFXY-10

ConePile Version 5.9.1

Douglas Partners
Geotechnics | Environment | Groundwater

PILE CAPACITY ESTIMATE

PILE TYPE: Grout-Injected
PILE SHAPE: Round
PILE SIZE: Diameter = 0.60
STRENGTH REDUCTION FACTOR $Ø_g$: 0.52
CALCULATION METHOD: Douglas Method

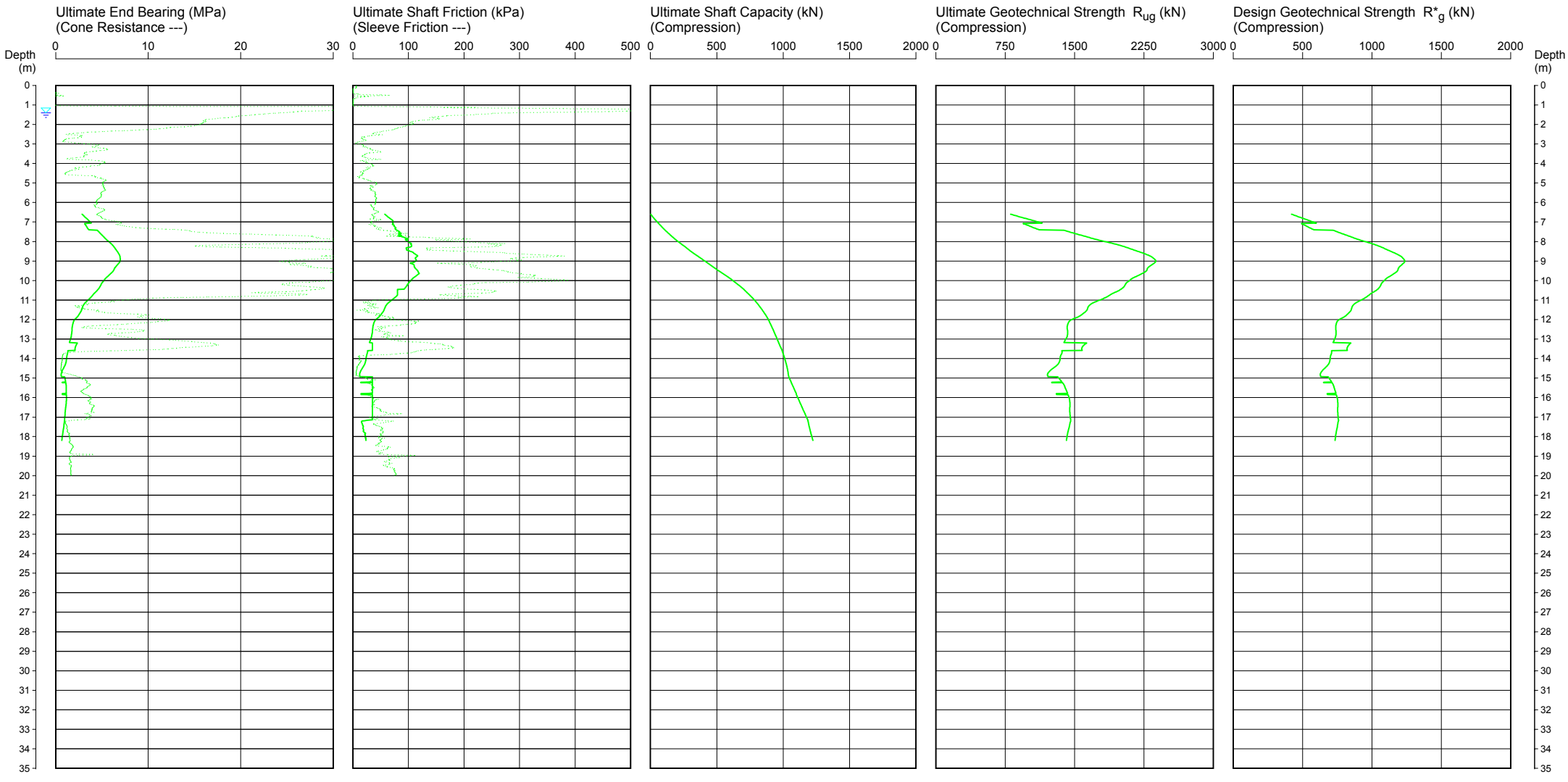
PROJECT: Geotechnical & Contamination Sampling and Testing

LOCATION: 35 Honeysuckle Drive

CLIENT: Lee 4 Pty Ltd c/- Doma Group

C3
Page 1 of 1

DATE 20/04/2018
PROJECT No: 91303
SURFACE RL:



DISCLAIMER:
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Water depth after test: 1.40m depth

File: P:\91303.00 - NEWCASTLE, 35 Honeysuckle Drive\4.0 Field Work\4.2 Testing\C3 - Interpretted.CP5
Cone ID: 120630 **Type:** I-CFXY-10

ConePile Version 5.9.1

Douglas Partners
Geotechnics | Environment | Groundwater

PILE CAPACITY ESTIMATE

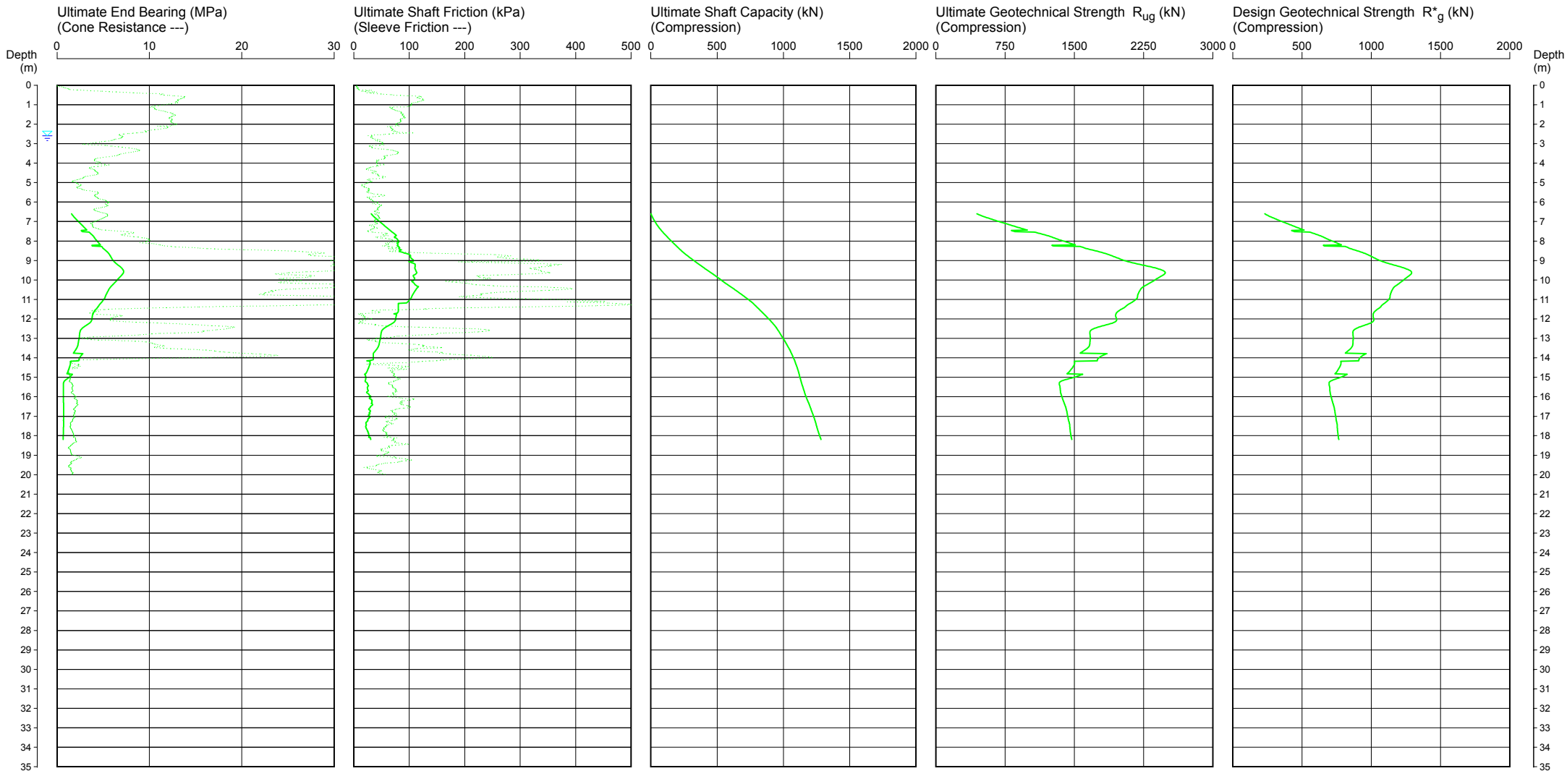
PILE TYPE: Grout-Injected
PILE SHAPE: Round
PILE SIZE: Diameter = 0.60
STRENGTH REDUCTION FACTOR $Ø_g$: 0.52
CALCULATION METHOD: Douglas Method

PROJECT: Geotechnical & Contamination Sampling and Testing

LOCATION: 35 Honeysuckle Drive

CLIENT: Lee 4 Pty Ltd c/- Doma Group

C4
Page 1 of 1
DATE 20/04/2018
PROJECT No: 91303
SURFACE RL:



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Water depth after test: 2.60m depth

File: P:\91303.00 - NEWCASTLE, 35 Honeysuckle Drive\4.0 Field Work\4.2 Testing\C4 - Interpretted.CP5
Cone ID: 120630 **Type:** I-CFXY-10

ConePile Version 5.9.1

Douglas Partners
Geotechnics | Environment | Groundwater

PILE CAPACITY ESTIMATE

PILE TYPE: Grout-Injected
PILE SHAPE: Round
PILE SIZE: Diameter = 0.60
STRENGTH REDUCTION FACTOR $Ø_g$: 0.52
CALCULATION METHOD: Douglas Method

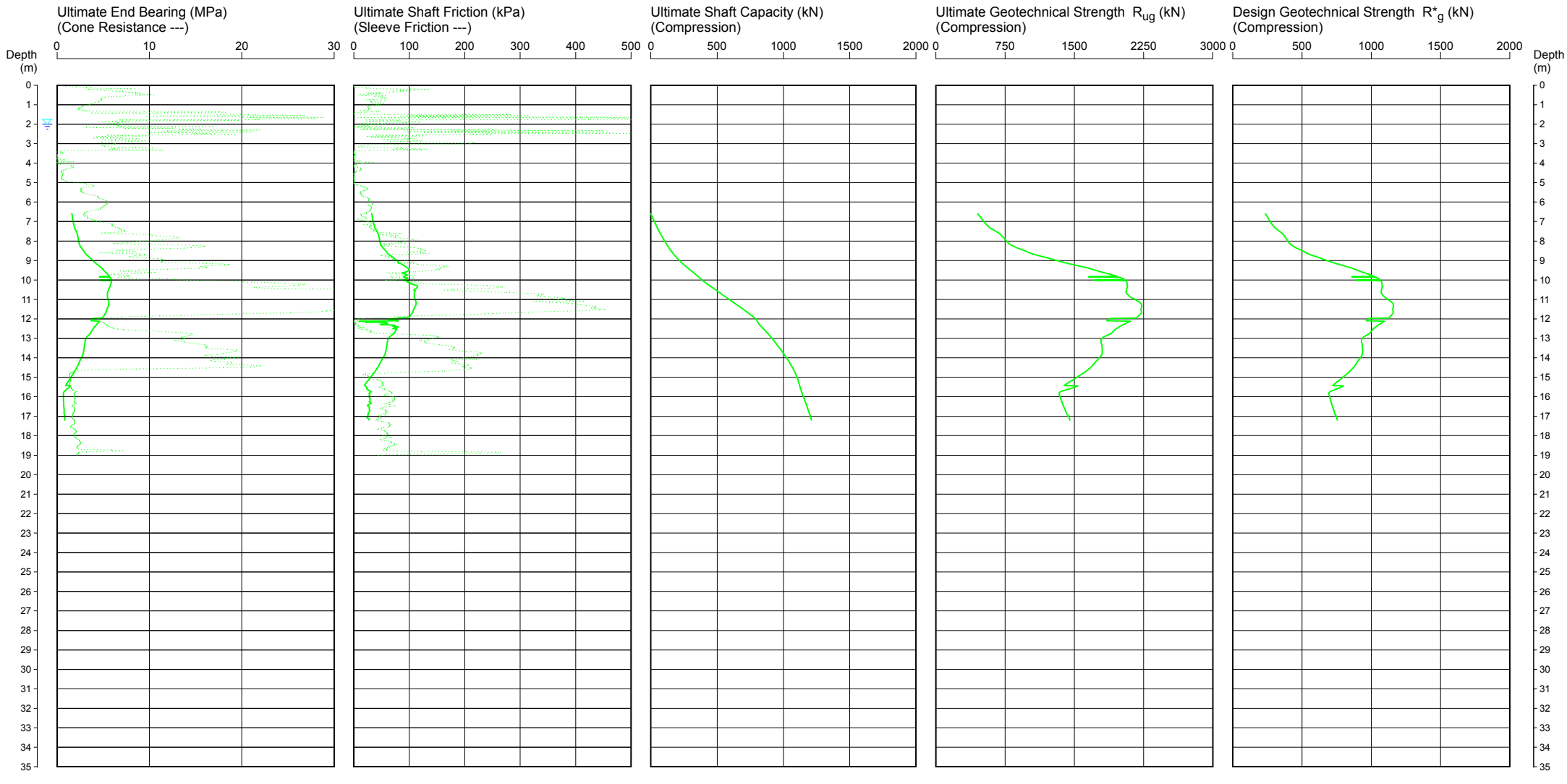
PROJECT: Geotechnical & Contamination Sampling and Testing

LOCATION: 35 Honeysuckle Drive

CLIENT: Lee 4 Pty Ltd c/- Doma Group

C5A
Page 1 of 1

DATE 20/04/2018
PROJECT No: 91303
SURFACE RL:



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Water depth after test: 2.00m depth

File: P:\91303.00 - NEWCASTLE, 35 Honeysuckle Drive\4.0 Field Work\4.2 Testing\C5A - Interpretted.CP5
Cone ID: 120630 **Type:** I-CFXY-10

ConePile Version 5.9.1

Douglas Partners
Geotechnics | Environment | Groundwater

PILE CAPACITY ESTIMATE

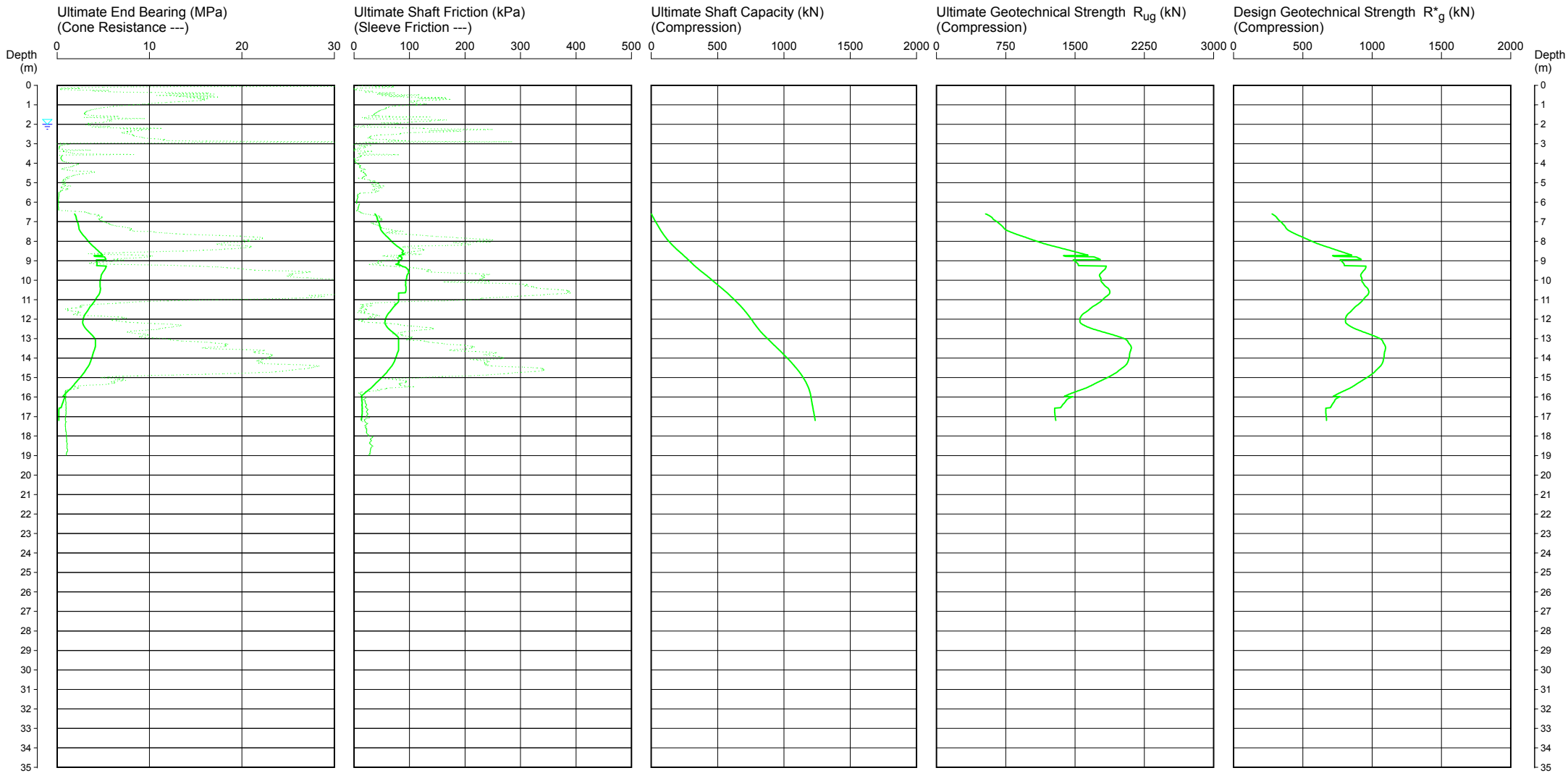
PILE TYPE: Grout-Injected
PILE SHAPE: Round
PILE SIZE: Diameter = 0.60
STRENGTH REDUCTION FACTOR $Ø_g$: 0.52
CALCULATION METHOD: Douglas Method

PROJECT: Geotechnical & Contamination Sampling and Testing

LOCATION: 35 Honeysuckle Drive

CLIENT: Lee 4 Pty Ltd c/- Doma Group

C6
Page 1 of 1
DATE 20/04/2018
PROJECT No: 91303
SURFACE RL:



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Water depth after test: 2.00m depth

File: P:\91303.00 - NEWCASTLE, 35 Honeysuckle Drive\4.0 Field Work\4.2 Testing\C6 - Interpretted.CP5
Cone ID: 120630 **Type:** I-CFXY-10

ConePile Version 5.9.1

Douglas Partners
Geotechnics | Environment | Groundwater

PILE CAPACITY ESTIMATE

PILE TYPE: Grout-Injected
PILE SHAPE: Round
PILE SIZE: Diameter = 0.60
STRENGTH REDUCTION FACTOR $Ø_g$: 0.52
CALCULATION METHOD: Douglas Method

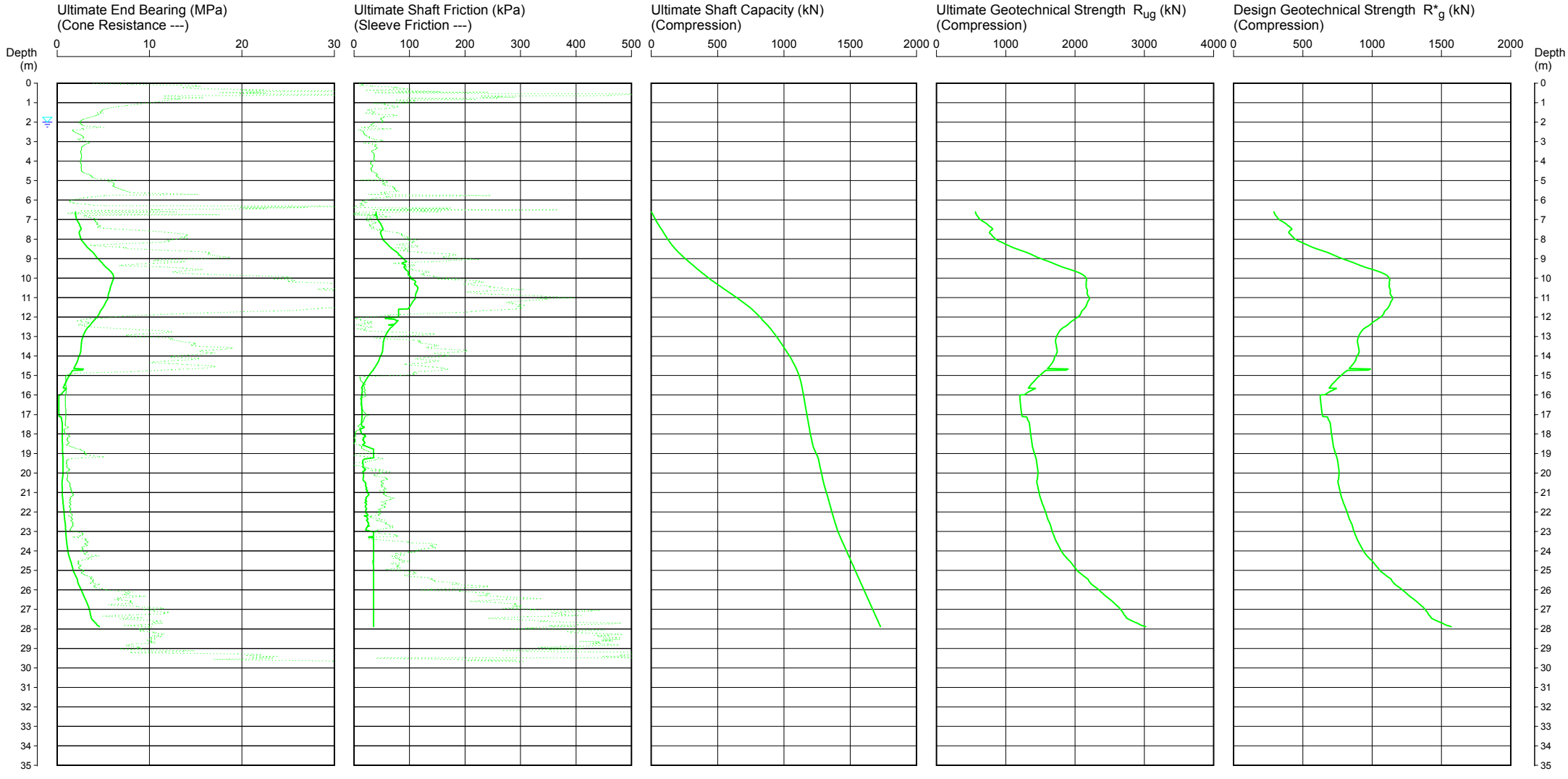
PROJECT: Geotechnical & Contamination Sampling and Testing

LOCATION: 35 Honeysuckle Drive

CLIENT: Lee 4 Pty Ltd c/- Doma Group

C7
Page 1 of 1

DATE 20/04/2018
PROJECT No: 91303
SURFACE RL:



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Water depth after test: 2.00m depth

File: P:\91303.00 - NEWCASTLE, 35 Honeysuckle Drive\4.0 Field Work\4.2 Testing\C7 - Interpretted.CP5
Cone ID: 120630 **Type:** I-CFXY-10

ConePile Version 5.9.1

Douglas Partners
Geotechnics | Environment | Groundwater

PILE CAPACITY ESTIMATE

PILE TYPE: Grout-Injected
PILE SHAPE: Round
PILE SIZE: Diameter = 0.60
STRENGTH REDUCTION FACTOR $Ø_g$: 0.52
CALCULATION METHOD: Douglas Method

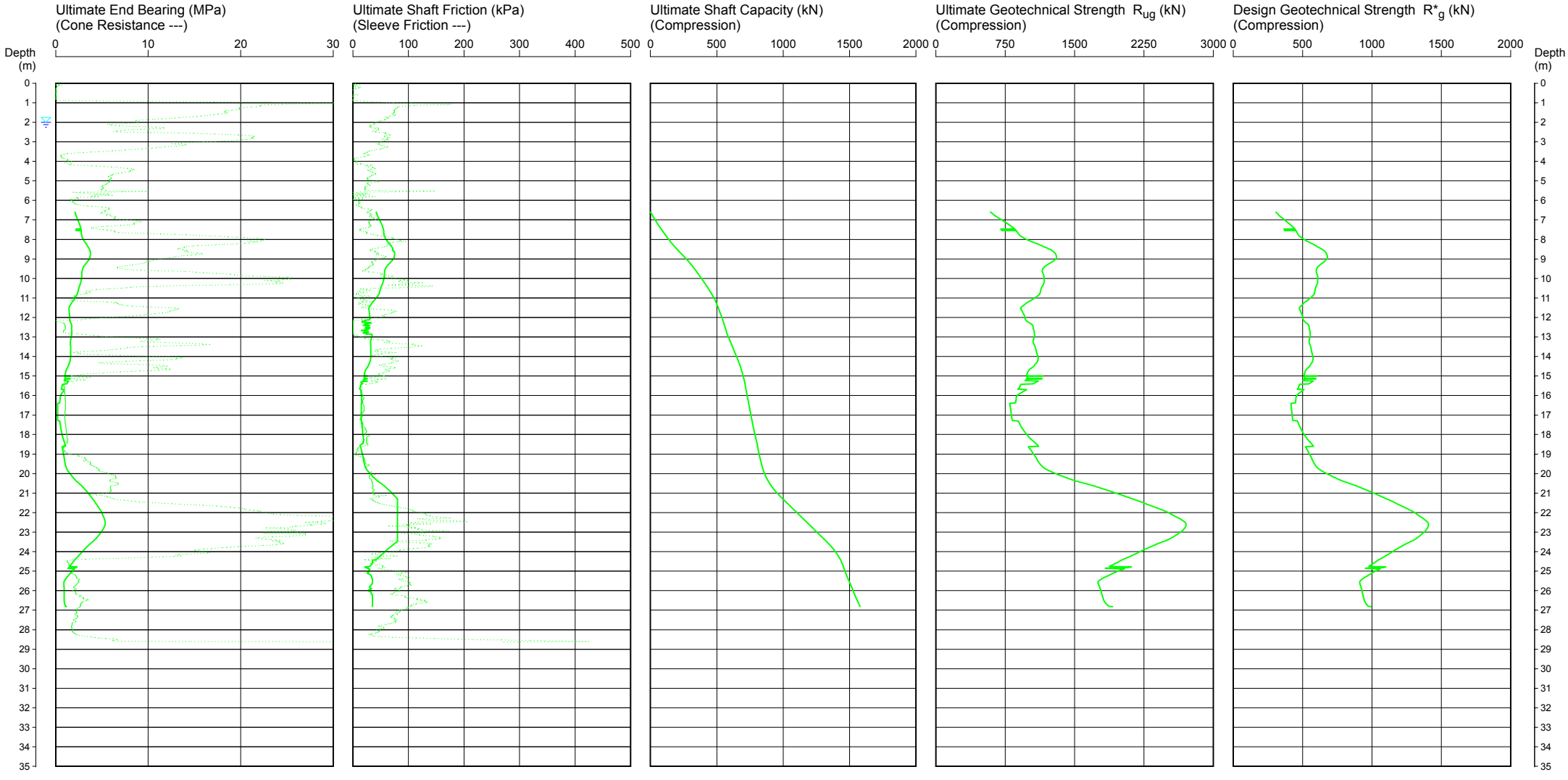
PROJECT: Geotechnical & Contamination Sampling and Testing

LOCATION: 35 Honeysuckle Drive

CLIENT: Lee 4 Pty Ltd c/- Doma Group

C8

DATE 26/04/2018
PROJECT No: 91303
SURFACE RL:



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Water depth after test: 2.00m depth

File: P:\91303.00 - NEWCASTLE, 35 Honeysuckle Drive\4.0 Field Work\4.2 Testing\C8 - Interpretted.CP5
Cone ID: 170705 **Type:** I-CFXY-10

ConePile Version 5.9.1

Douglas Partners
Geotechnics | Environment | Groundwater

PILE CAPACITY ESTIMATE

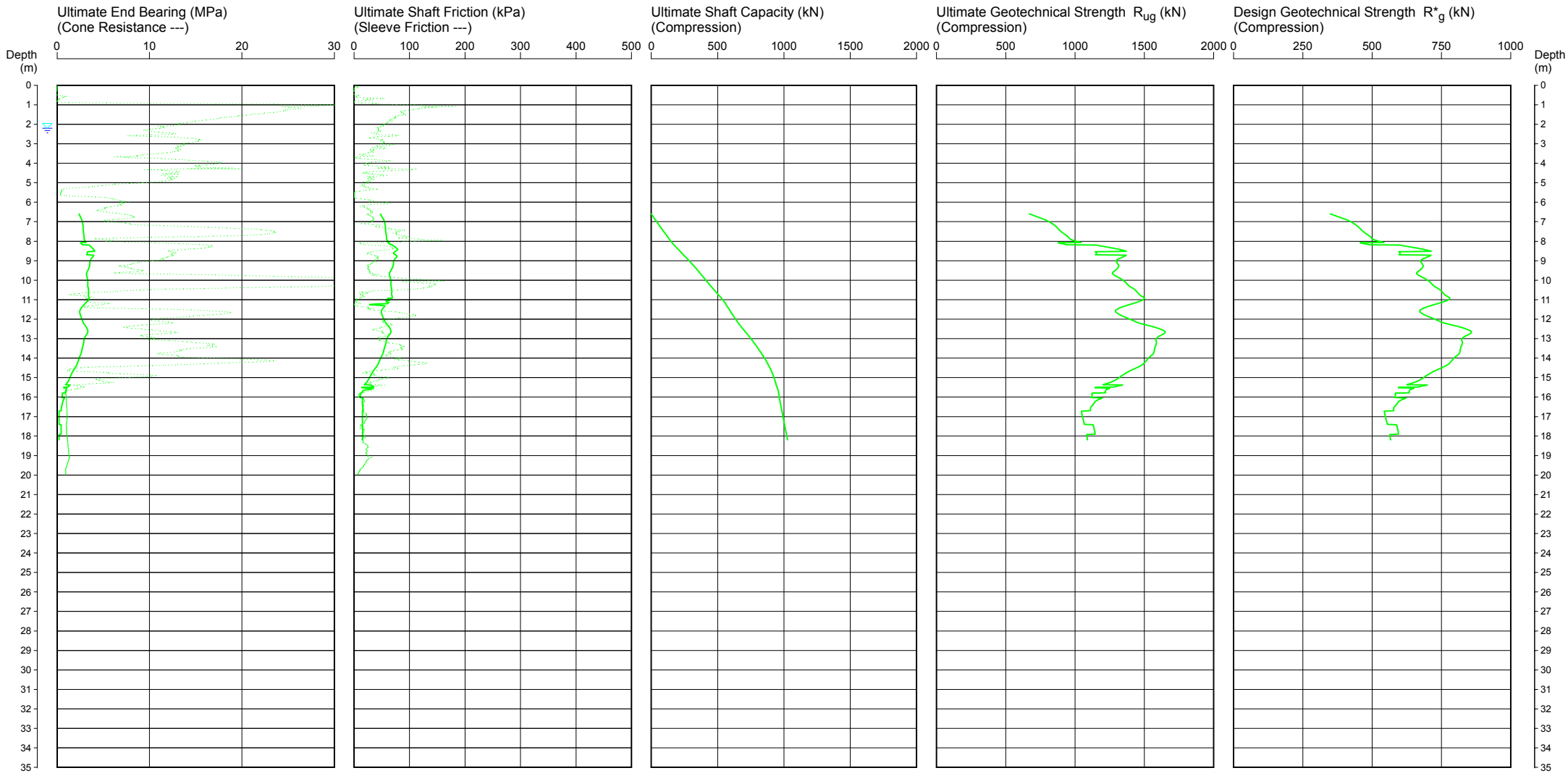
PILE TYPE: Grout-Injected
PILE SHAPE: Round
PILE SIZE: Diameter = 0.60
STRENGTH REDUCTION FACTOR $Ø_g$: 0.52
CALCULATION METHOD: Douglas Method

PROJECT: Geotechnical & Contamination Sampling and Testing

LOCATION: 35 Honeysuckle Drive

CLIENT: Lee 4 Pty Ltd c/- Doma Group

C9
Page 1 of 1
DATE 26/04/2018
PROJECT No: 91303
SURFACE RL:



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Water depth after test: 2.20m depth

File: P:\91303.00 - NEWCASTLE, 35 Honeysuckle Drive\4.0 Field Work\4.2 Testing\C9 - Interpretted.CP5
Cone ID: 170705 **Type:** I-CFXY-10

ConePile Version 5.9.1

Douglas Partners
Geotechnics | Environment | Groundwater

PILE CAPACITY ESTIMATE

PILE TYPE: Grout-Injected
PILE SHAPE: Round
PILE SIZE: Diameter = 0.75
STRENGTH REDUCTION FACTOR $Ø_g$: 0.52
CALCULATION METHOD: Douglas Method

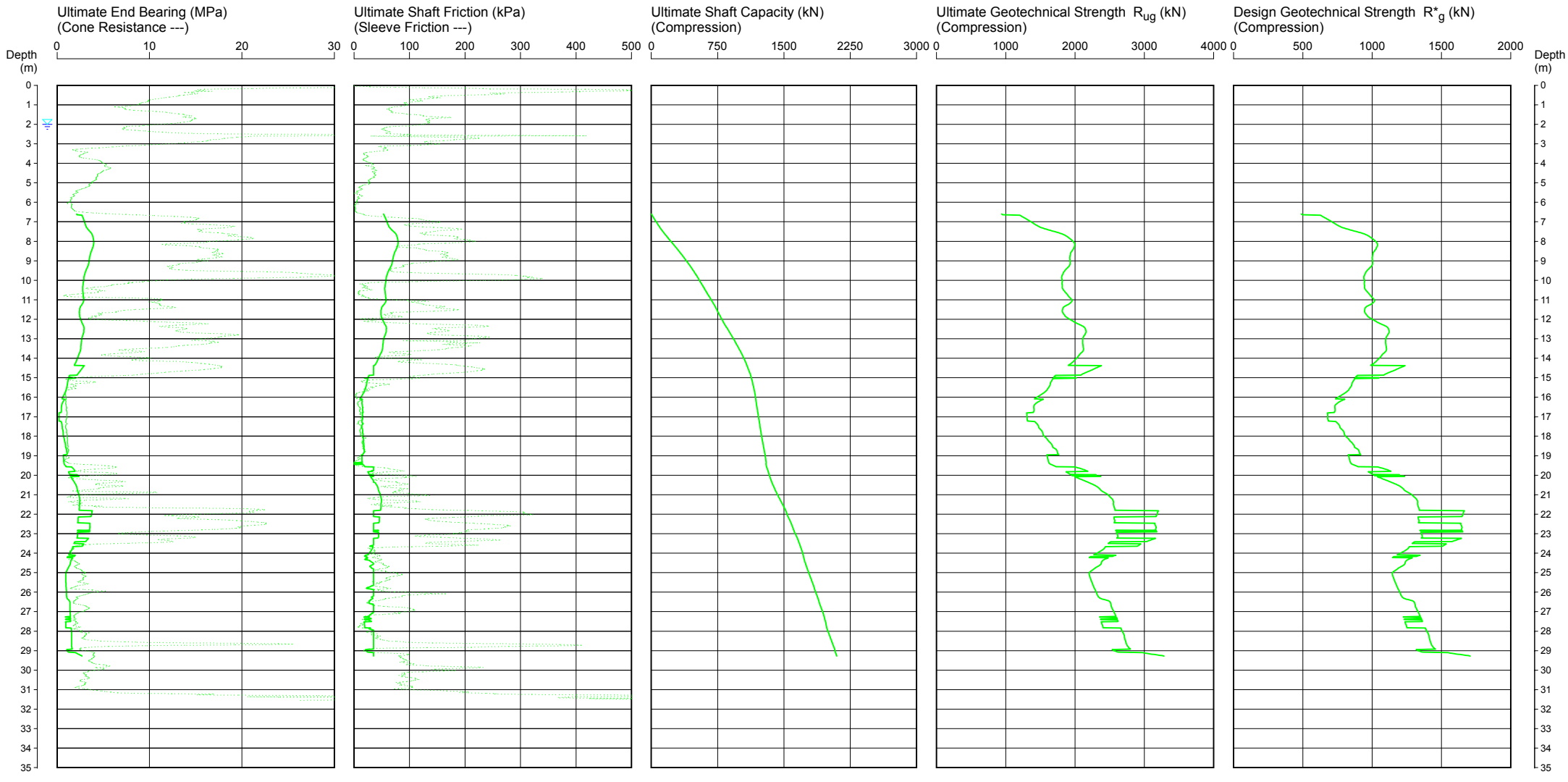
PROJECT: Geotechnical & Contamination Sampling and Testing

LOCATION: 35 Honeysuckle Drive

CLIENT: Lee 4 Pty Ltd c/- Doma Group

C1
Page 1 of 1

DATE 19/04/2018
PROJECT No: 91303
SURFACE RL:



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Water depth after test: 2.00m depth

File: P:\91303.00 - NEWCASTLE, 35 Honeysuckle Drive\4.0 Field Work\4.2 Testing\C1-Interpretted.CP5
Cone ID: 120634 **Type:** I-CFXY-10

ConePile Version 5.9.1

Douglas Partners
Geotechnics | Environment | Groundwater

PILE CAPACITY ESTIMATE

PILE TYPE: Grout-Injected
PILE SHAPE: Round
PILE SIZE: Diameter = 0.75
STRENGTH REDUCTION FACTOR $Ø_g$: 0.52
CALCULATION METHOD: Douglas Method

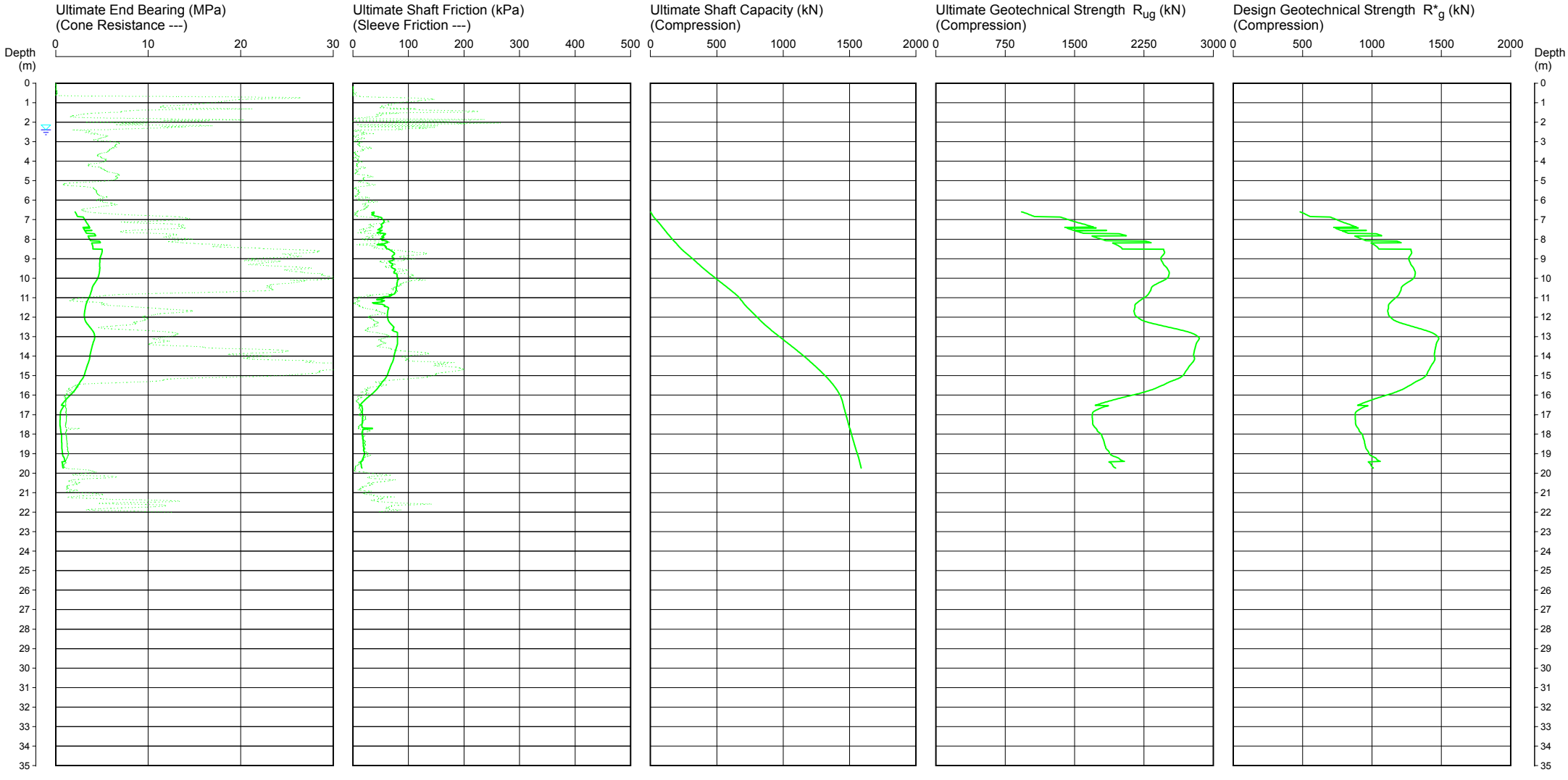
PROJECT: Geotechnical & Contamination Sampling and Testing

LOCATION: 35 Honeysuckle Drive

CLIENT: Lee 4 Pty Ltd c/- Doma Group

C2A

DATE 24/04/2018
PROJECT No: 91303
SURFACE RL:



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Water depth after test: 2.40m depth

File: P:\91303.00 - NEWCASTLE, 35 Honeysuckle Drive\4.0 Field Work\4.2 Testing\C2A - Interpretted.CP5
Cone ID: 170705 **Type:** I-CFXY-10

ConePile Version 5.9.1

Douglas Partners
Geotechnics | Environment | Groundwater

PILE CAPACITY ESTIMATE

PILE TYPE: Grout-Injected
PILE SHAPE: Round
PILE SIZE: Diameter = 0.75
STRENGTH REDUCTION FACTOR $Ø_g$: 0.52
CALCULATION METHOD: Douglas Method

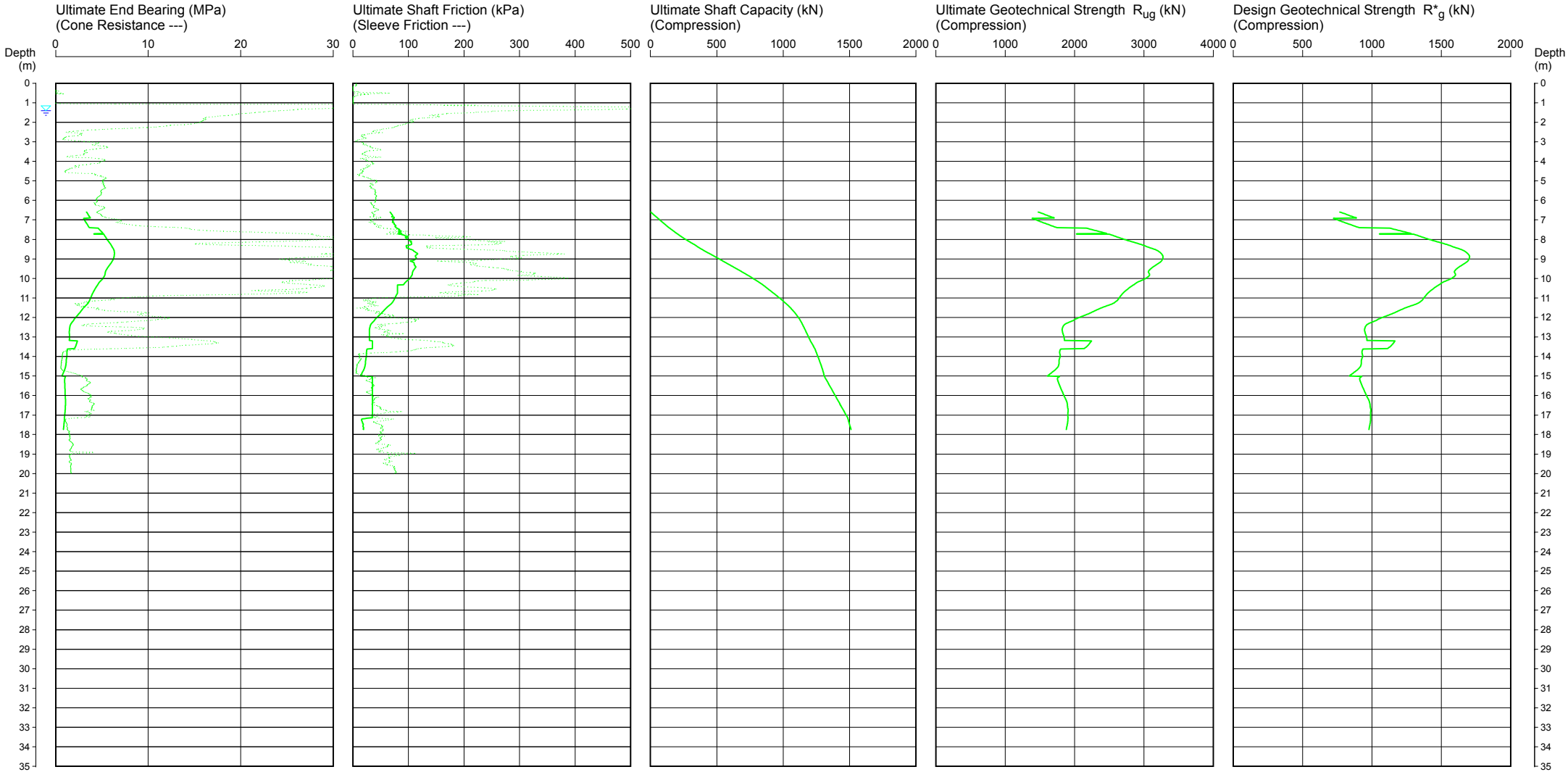
PROJECT: Geotechnical & Contamination Sampling and Testing

LOCATION: 35 Honeysuckle Drive

CLIENT: Lee 4 Pty Ltd c/- Doma Group

C3

DATE 20/04/2018
PROJECT No: 91303
SURFACE RL:



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Water depth after test: 1.40m depth

File: P:\91303.00 - NEWCASTLE, 35 Honeysuckle Drive\4.0 Field Work\4.2 Testing\C3 - Interpretted.CP5
Cone ID: 120630 **Type:** I-CFXY-10

ConePile Version 5.9.1

Douglas Partners
Geotechnics | Environment | Groundwater

PILE CAPACITY ESTIMATE

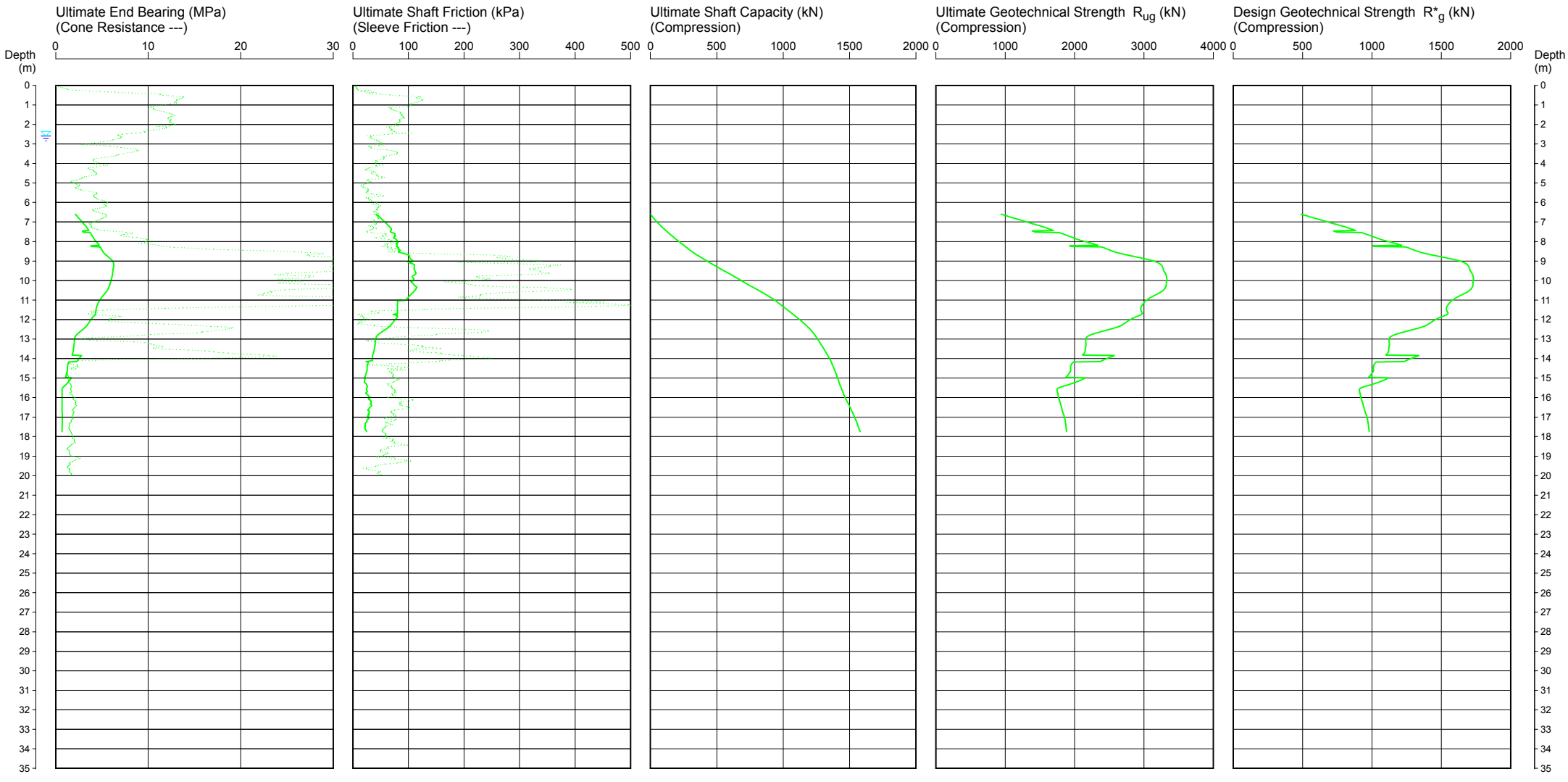
PILE TYPE: Grout-Injected
PILE SHAPE: Round
PILE SIZE: Diameter = 0.75
STRENGTH REDUCTION FACTOR $Ø_g$: 0.52
CALCULATION METHOD: Douglas Method

PROJECT: Geotechnical & Contamination Sampling and Testing

LOCATION: 35 Honeysuckle Drive

CLIENT: Lee 4 Pty Ltd c/- Doma Group

C4
Page 1 of 1
DATE 20/04/2018
PROJECT No: 91303
SURFACE RL:



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Water depth after test: 2.60m depth

File: P:\91303.00 - NEWCASTLE, 35 Honeysuckle Drive\4.0 Field Work\4.2 Testing\C4 - Interpretted.CP5
Cone ID: 120630 **Type:** I-CFXY-10

ConePile Version 5.9.1

Douglas Partners
Geotechnics | Environment | Groundwater

PILE CAPACITY ESTIMATE

PILE TYPE: Grout-Injected
PILE SHAPE: Round
PILE SIZE: Diameter = 0.75
STRENGTH REDUCTION FACTOR $Ø_g$: 0.52
CALCULATION METHOD: Douglas Method

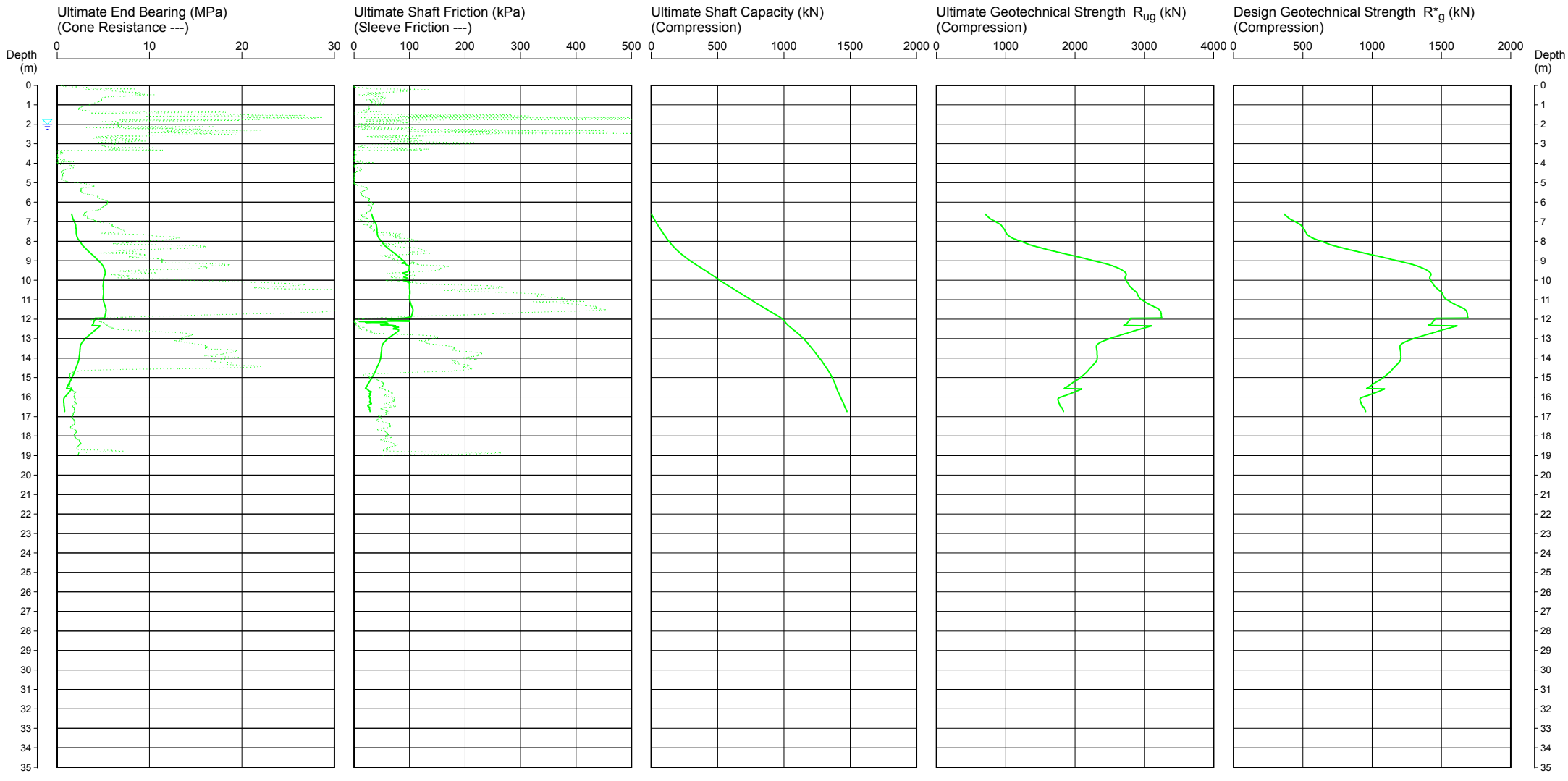
PROJECT: Geotechnical & Contamination Sampling and Testing

LOCATION: 35 Honeysuckle Drive

CLIENT: Lee 4 Pty Ltd c/- Doma Group

C5A
Page 1 of 1

DATE 20/04/2018
PROJECT No: 91303
SURFACE RL:



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Water depth after test: 2.00m depth

File: P:\91303.00 - NEWCASTLE, 35 Honeysuckle Drive\4.0 Field Work\4.2 Testing\C5A - Interpretted.CP5
Cone ID: 120630 **Type:** I-CFXY-10

ConePile Version 5.9.1

Douglas Partners
Geotechnics | Environment | Groundwater

PILE CAPACITY ESTIMATE

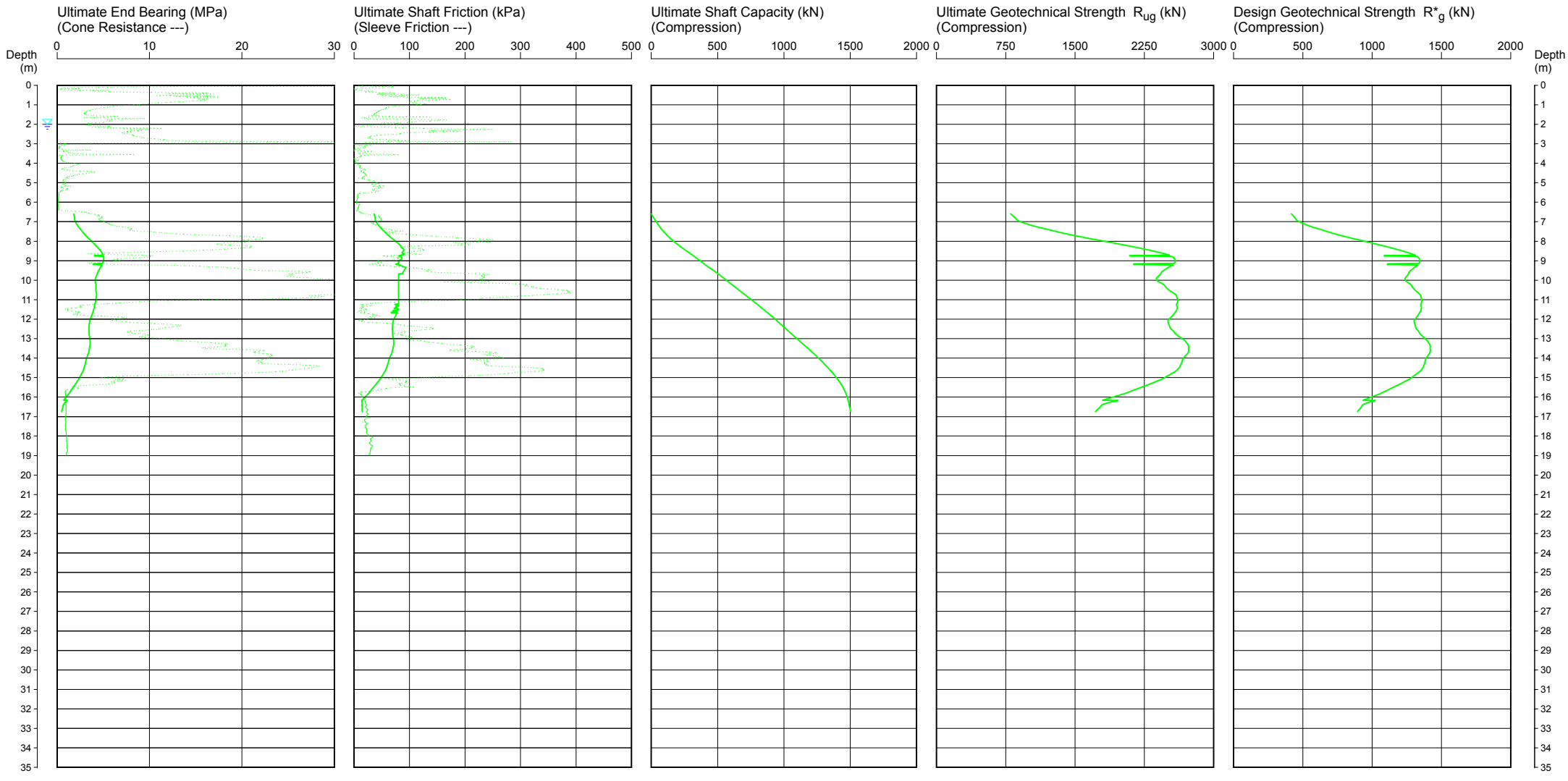
PILE TYPE: Grout-Injected
PILE SHAPE: Round
PILE SIZE: Diameter = 0.75
STRENGTH REDUCTION FACTOR $Ø_g$: 0.52
CALCULATION METHOD: Douglas Method

PROJECT: Geotechnical & Contamination Sampling and Testing

LOCATION: 35 Honeysuckle Drive

CLIENT: Lee 4 Pty Ltd c/- Doma Group

C6
Page 1 of 1
DATE 20/04/2018
PROJECT No: 91303
SURFACE RL:



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Water depth after test: 2.00m depth

File: P:\91303.00 - NEWCASTLE, 35 Honeysuckle Drive\4.0 Field Work\4.2 Testing\C6 - Interpretted.CP5
Cone ID: 120630 **Type:** I-CFXY-10

ConePile Version 5.9.1

Douglas Partners
Geotechnics | Environment | Groundwater

PILE CAPACITY ESTIMATE

PILE TYPE: Grout-Injected
PILE SHAPE: Round
PILE SIZE: Diameter = 0.75
STRENGTH REDUCTION FACTOR $Ø_g$: 0.52
CALCULATION METHOD: Douglas Method

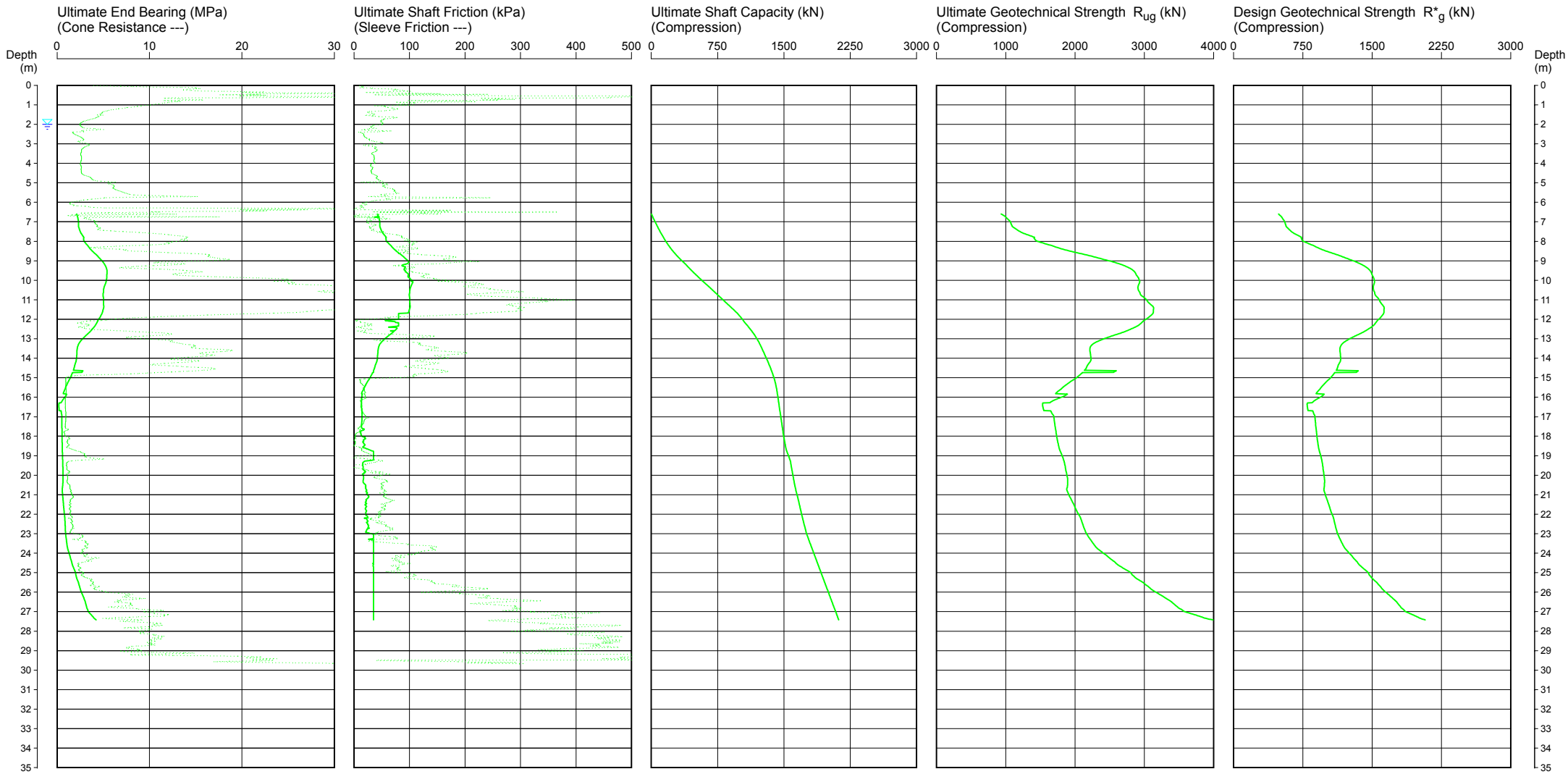
PROJECT: Geotechnical & Contamination Sampling and Testing

LOCATION: 35 Honeysuckle Drive

CLIENT: Lee 4 Pty Ltd c/- Doma Group

C7
Page 1 of 1

DATE 20/04/2018
PROJECT No: 91303
SURFACE RL:



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Water depth after test: 2.00m depth

File: P:\91303.00 - NEWCASTLE, 35 Honeysuckle Drive\4.0 Field Work\4.2 Testing\C7 - Interpretted.CP5
Cone ID: 120630 **Type:** I-CFXY-10

ConePile Version 5.9.1

Douglas Partners
Geotechnics | Environment | Groundwater

PILE CAPACITY ESTIMATE

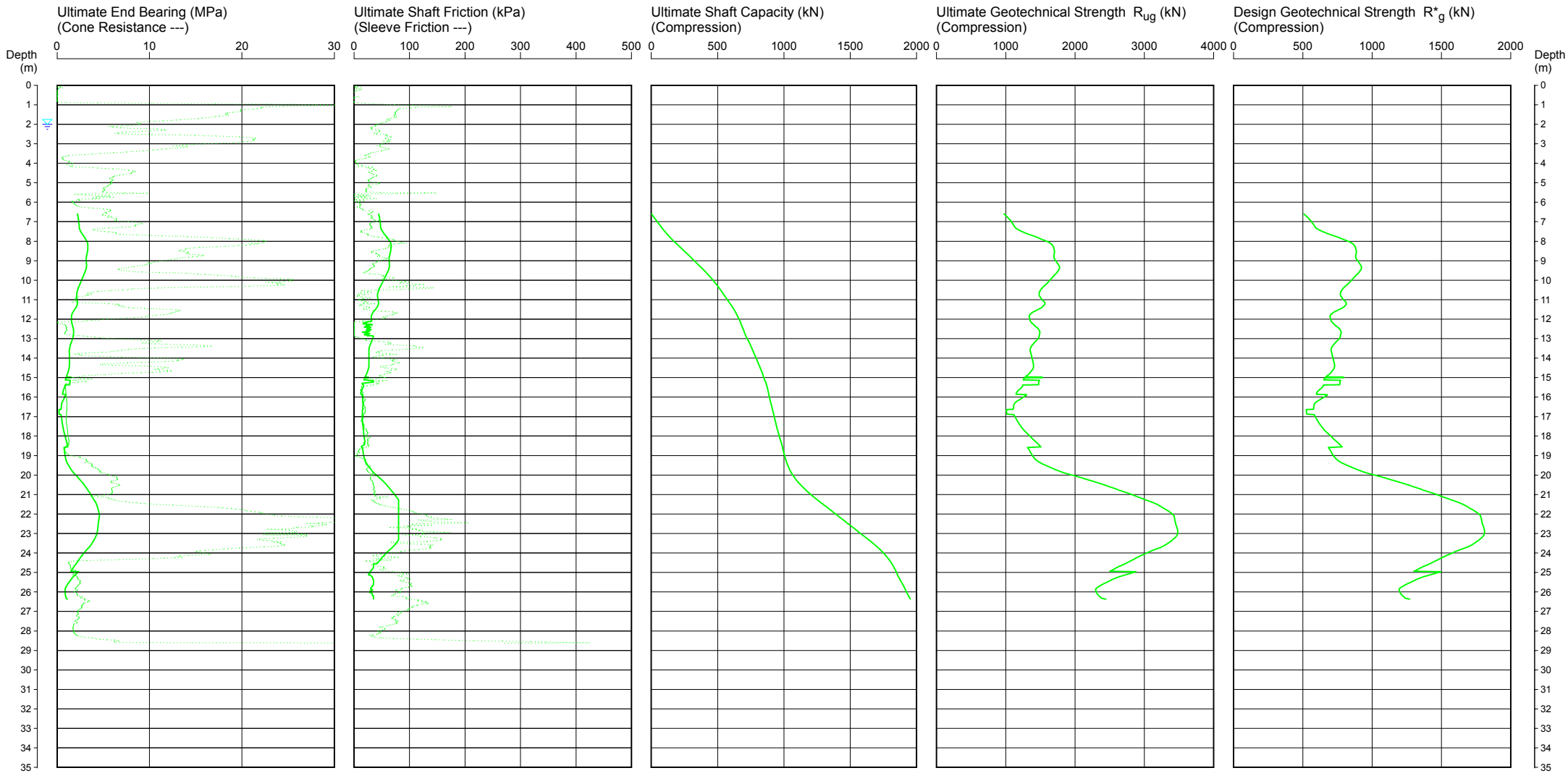
PILE TYPE: Grout-Injected
PILE SHAPE: Round
PILE SIZE: Diameter = 0.75
STRENGTH REDUCTION FACTOR $Ø_g$: 0.52
CALCULATION METHOD: Douglas Method

PROJECT: Geotechnical & Contamination Sampling and Testing

LOCATION: 35 Honeysuckle Drive

CLIENT: Lee 4 Pty Ltd c/- Doma Group

C8
Page 1 of 1
DATE 26/04/2018
PROJECT No: 91303
SURFACE RL:



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Water depth after test: 2.00m depth

File: P:\91303.00 - NEWCASTLE, 35 Honeysuckle Drive\4.0 Field Work\4.2 Testing\C8 - Interpretted.CP5
Cone ID: 170705 **Type:** I-CFXY-10

ConePile Version 5.9.1

Douglas Partners
Geotechnics | Environment | Groundwater

PILE CAPACITY ESTIMATE

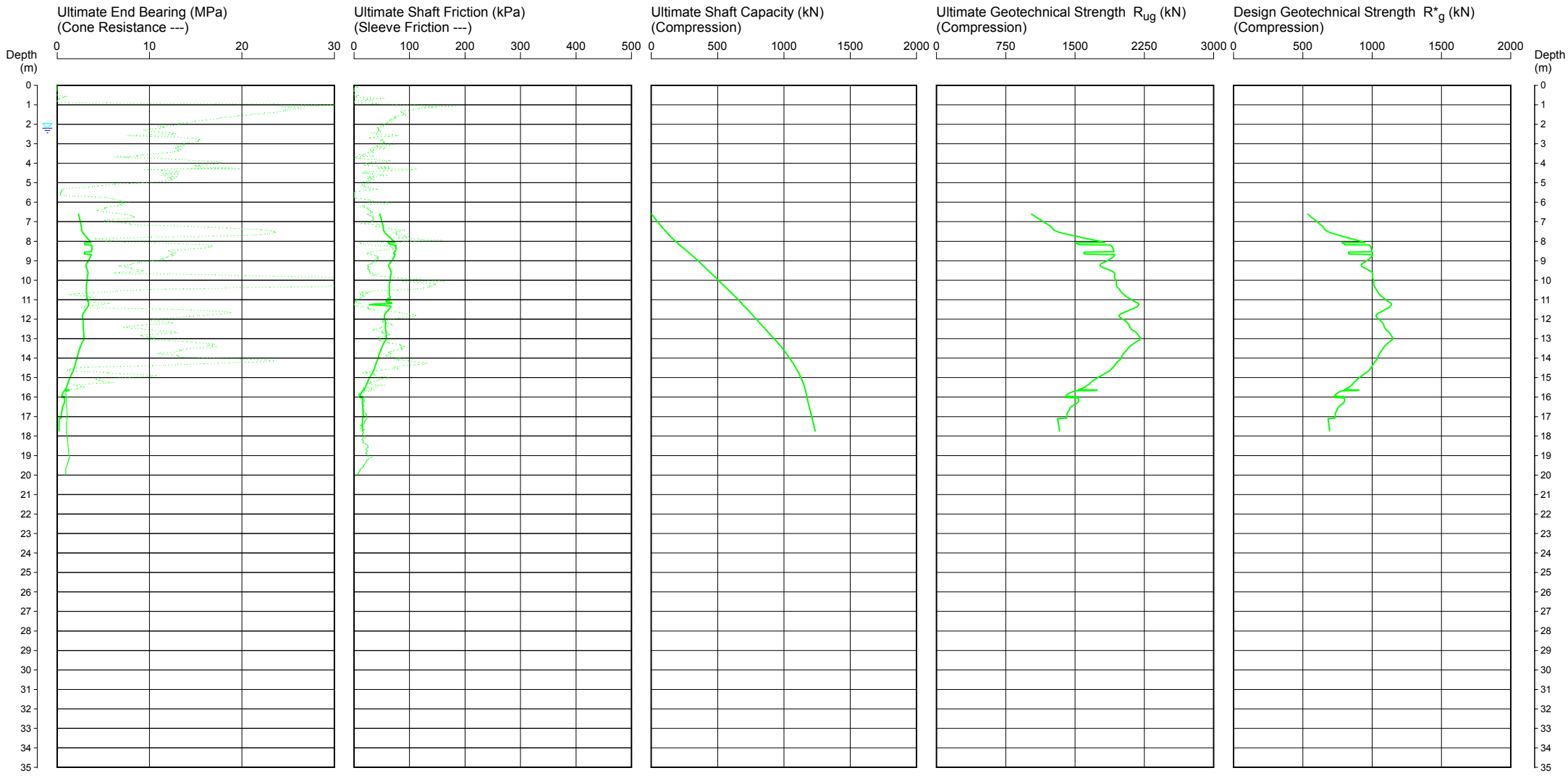
PILE TYPE: Grout-Injected
PILE SHAPE: Round
PILE SIZE: Diameter = 0.75
STRENGTH REDUCTION FACTOR $Ø_g$: 0.52
CALCULATION METHOD: Douglas Method

PROJECT: Geotechnical & Contamination Sampling and Testing

LOCATION: 35 Honeysuckle Drive

CLIENT: Lee 4 Pty Ltd c/- Doma Group

C9
Page 1 of 1
DATE 26/04/2018
PROJECT No: 91303
SURFACE RL:



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Water depth after test: 2.20m depth

File: P:\91303.00 - NEWCASTLE, 35 Honeysuckle Drive\4.0 Field Work\4.2 Testing\C9 - Interpretted.CP5
Cone ID: 170705 **Type:** I-CFXY-10

ConePile Version 5.9.1

Douglas Partners
Geotechnics | Environment | Groundwater

PILE CAPACITY ESTIMATE

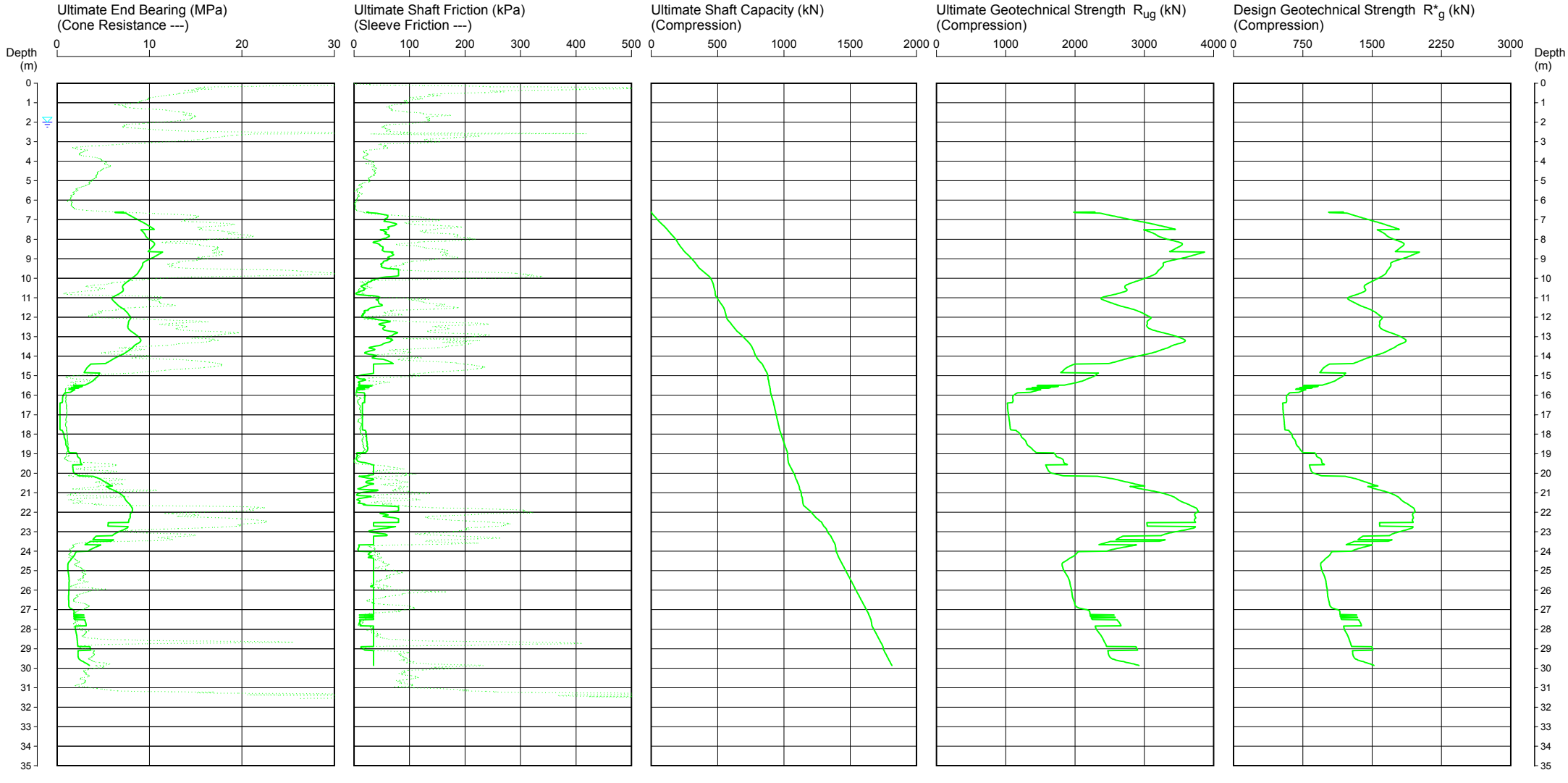
PILE TYPE: Screw Cast Concrete
PILE SHAPE: Round Screw
PILE SIZE: Inner Diameter = 0.56 Outer Diameter = 0.71
STRENGTH REDUCTION FACTOR $Ø_g$: 0.52
CALCULATION METHOD: Douglas Method

PROJECT: Geotechnical & Contamination Sampling and Testing

LOCATION: 35 Honeysuckle Drive

CLIENT: Lee 4 Pty Ltd c/- Doma Group

C1
Page 1 of 1
DATE 19/04/2018
PROJECT No: 91303
SURFACE RL:



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Water depth after test: 2.00m depth

File: P:\91303.00 - NEWCASTLE, 35 Honeysuckle Drive\4.0 Field Work\4.2 Testing\C1-Interpretted.CP5
Cone ID: 120634 **Type:** I-CFXY-10

ConePile Version 5.9.1

Douglas Partners
Geotechnics | Environment | Groundwater

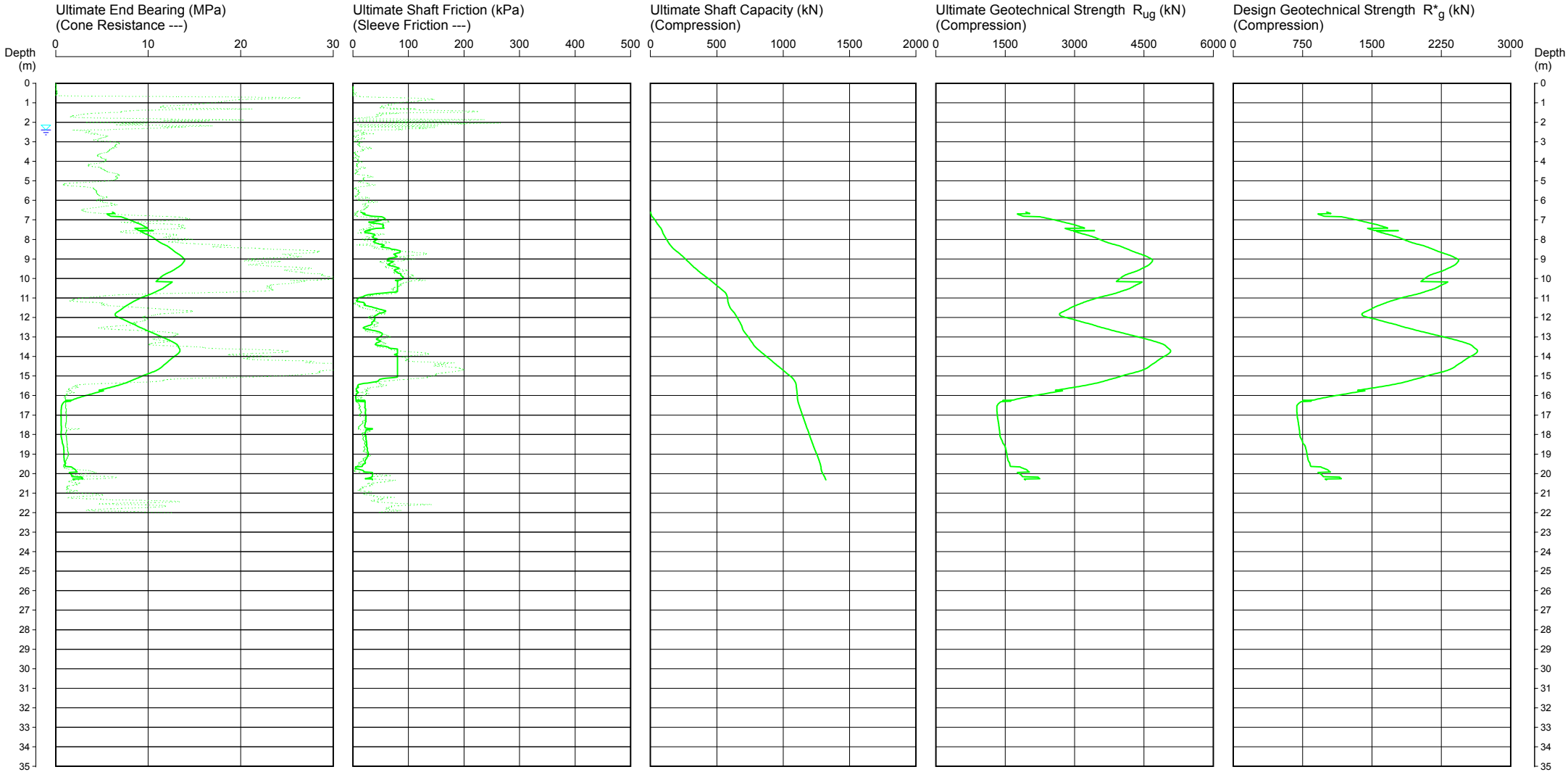
PILE CAPACITY ESTIMATE

PILE TYPE: Screw Cast Concrete
PILE SHAPE: Round Screw
PILE SIZE: Inner Diameter = 0.56 Outer Diameter = 0.71
STRENGTH REDUCTION FACTOR $Ø_g$: 0.52
CALCULATION METHOD: Douglas Method

PROJECT: Geotechnical & Contamination Sampling and Testing
LOCATION: 35 Honeysuckle Drive
CLIENT: Lee 4 Pty Ltd c/- Doma Group

C2A

DATE 24/04/2018
PROJECT No: 91303
SURFACE RL:



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Water depth after test: 2.40m depth

File: P:\91303.00 - NEWCASTLE, 35 Honeysuckle Drive\4.0 Field Work\4.2 Testing\C2A - Interpretted.CP5
Cone ID: 170705 **Type:** I-CFXY-10

ConePile Version 5.9.1

Douglas Partners
Geotechnics | Environment | Groundwater

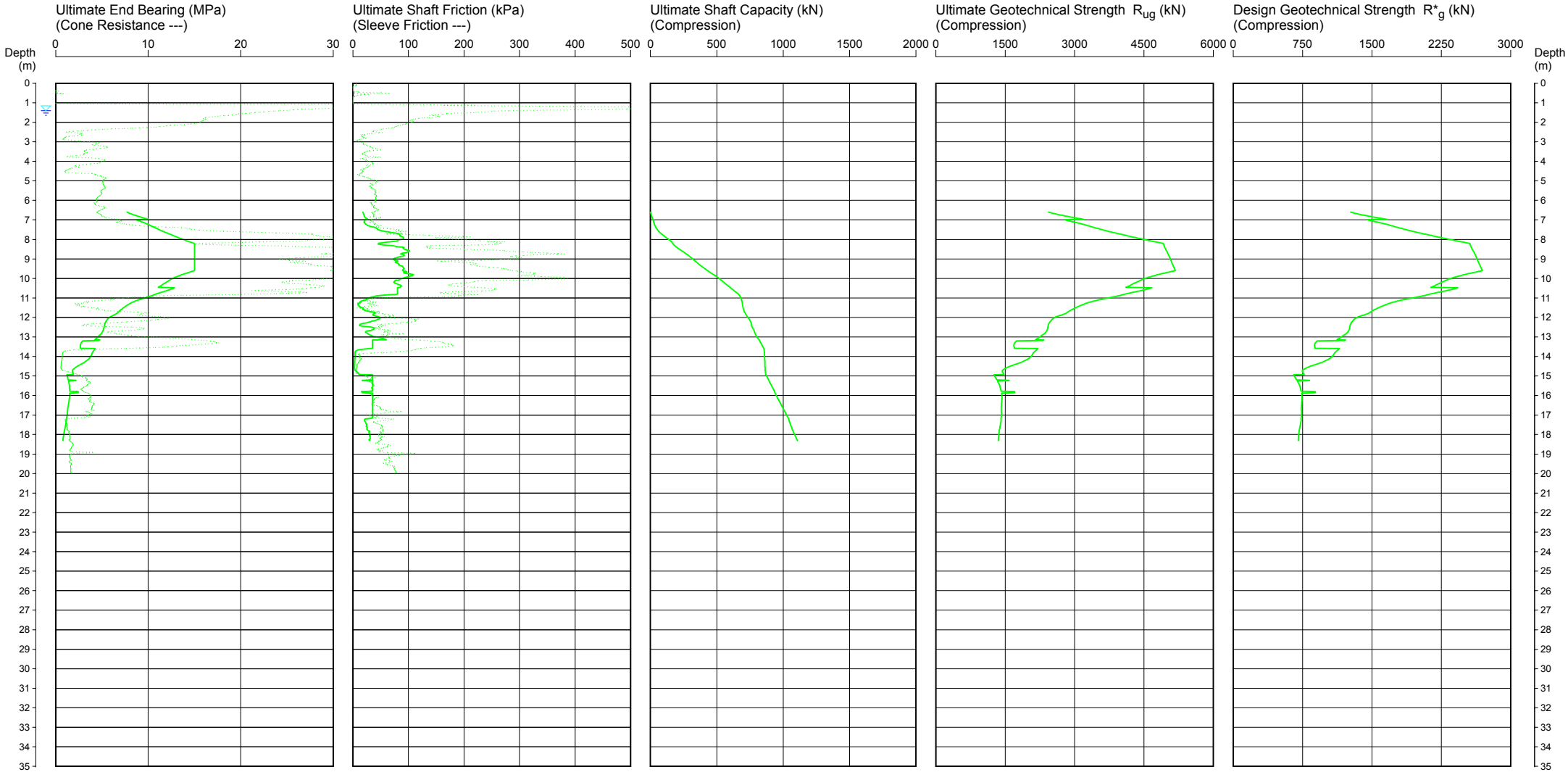
PILE CAPACITY ESTIMATE

PILE TYPE: Screw Cast Concrete
PILE SHAPE: Round Screw
PILE SIZE: Inner Diameter = 0.56 Outer Diameter = 0.71
STRENGTH REDUCTION FACTOR $Ø_g$: 0.52
CALCULATION METHOD: Douglas Method

PROJECT: Geotechnical & Contamination Sampling and Testing
LOCATION: 35 Honeysuckle Drive
CLIENT: Lee 4 Pty Ltd c/- Doma Group

C3

DATE 20/04/2018
PROJECT No: 91303
SURFACE RL:



DISCLAIMER:
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Water depth after test: 1.40m depth

File: P:\91303.00 - NEWCASTLE, 35 Honeysuckle Drive\4.0 Field Work\4.2 Testing\C3 - Interpretted.CP5
Cone ID: 120630 **Type:** I-CFXY-10

ConePile Version 5.9.1

Douglas Partners
Geotechnics | Environment | Groundwater

PILE CAPACITY ESTIMATE

PILE TYPE: Screw Cast Concrete
PILE SHAPE: Round Screw
PILE SIZE: Inner Diameter = 0.56 Outer Diameter = 0.71
STRENGTH REDUCTION FACTOR $Ø_g$: 0.52
CALCULATION METHOD: Douglas Method

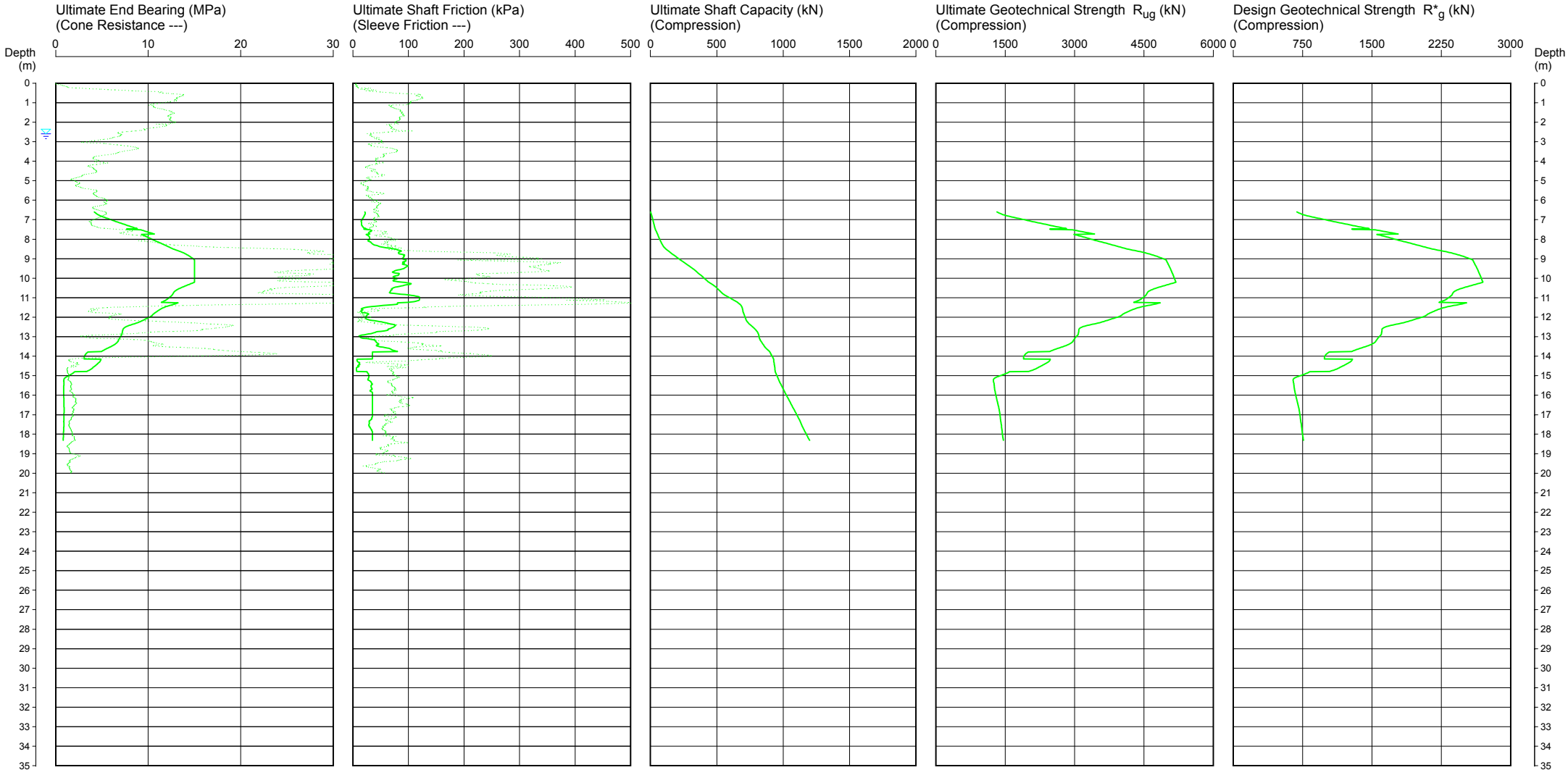
PROJECT: Geotechnical & Contamination Sampling and Testing

LOCATION: 35 Honeysuckle Drive

CLIENT: Lee 4 Pty Ltd c/- Doma Group

C4

DATE 20/04/2018
PROJECT No: 91303
SURFACE RL:



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Water depth after test: 2.60m depth

File: P:\91303.00 - NEWCASTLE, 35 Honeysuckle Drive\4.0 Field Work\4.2 Testing\C4 - Interpretted.CP5
Cone ID: 120630 **Type:** I-CFXY-10

ConePile Version 5.9.1

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PILE CAPACITY ESTIMATE

PILE TYPE: Screw Cast Concrete
PILE SHAPE: Round Screw
PILE SIZE: Inner Diameter = 0.56 Outer Diameter = 0.71
STRENGTH REDUCTION FACTOR $Ø_g$: 0.52
CALCULATION METHOD: Douglas Method

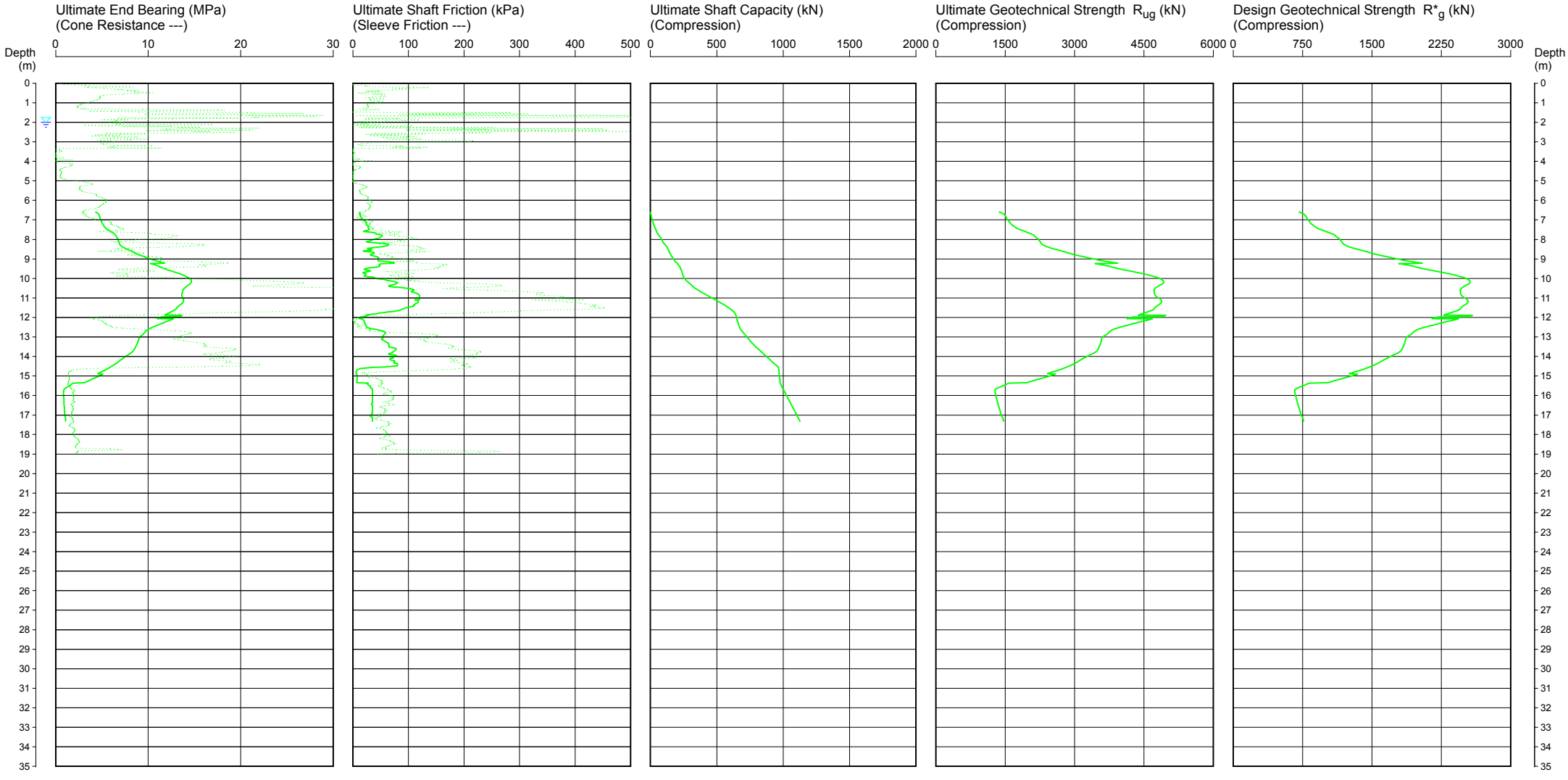
PROJECT: Geotechnical & Contamination Sampling and Testing

LOCATION: 35 Honeysuckle Drive

CLIENT: Lee 4 Pty Ltd c/- Doma Group

C5A

DATE 20/04/2018
PROJECT No: 91303
SURFACE RL:



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Water depth after test: 2.00m depth

File: P:\91303.00 - NEWCASTLE, 35 Honeysuckle Drive\4.0 Field Work\4.2 Testing\C5A - Interpretted.CP5
Cone ID: 120630 **Type:** I-CFXY-10

ConePile Version 5.9.1

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PILE CAPACITY ESTIMATE

PILE TYPE: Screw Cast Concrete
PILE SHAPE: Round Screw
PILE SIZE: Inner Diameter = 0.56 Outer Diameter = 0.71
STRENGTH REDUCTION FACTOR $Ø_g$: 0.52
CALCULATION METHOD: Douglas Method

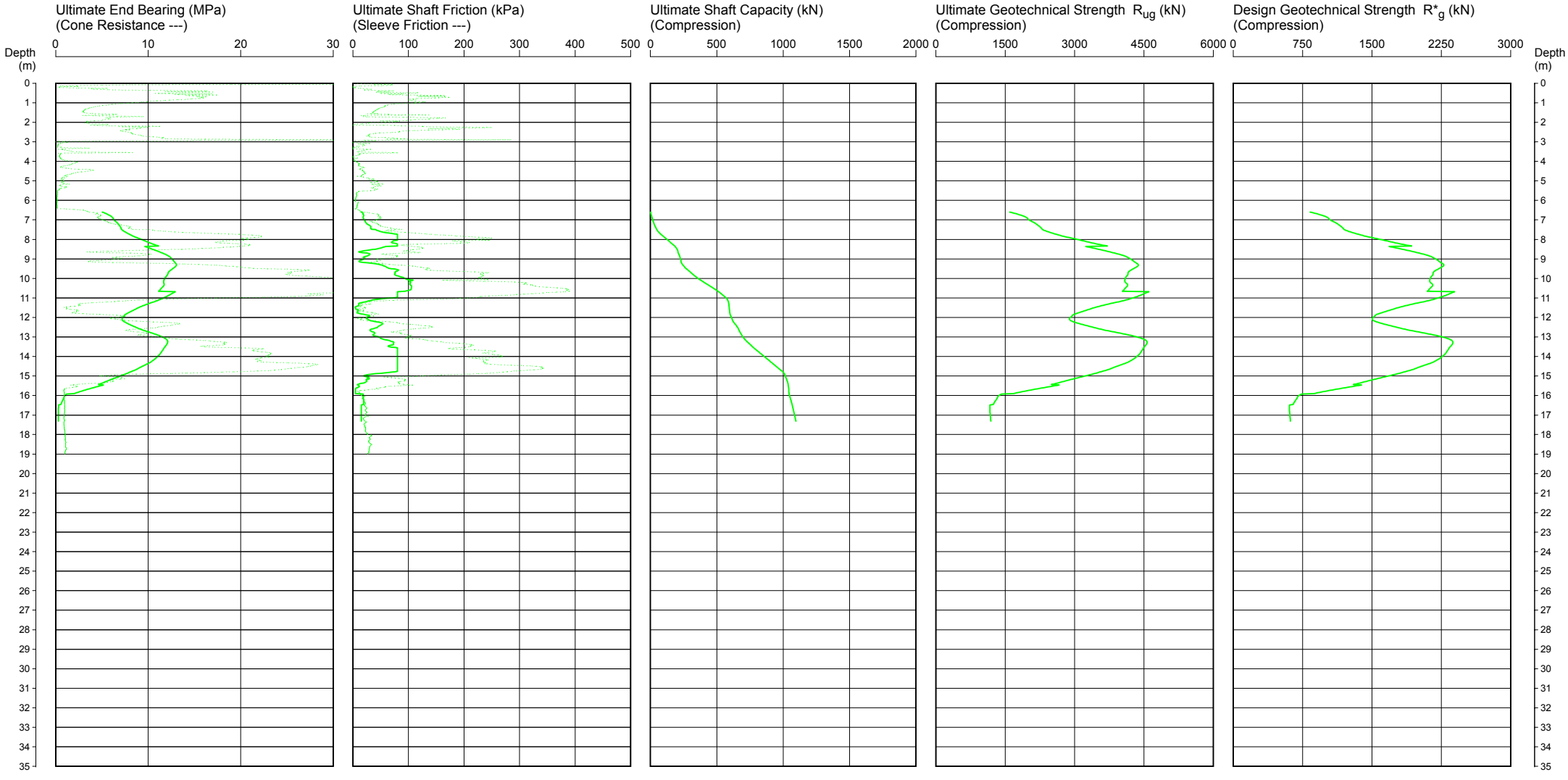
PROJECT: Geotechnical & Contamination Sampling and Testing

LOCATION: 35 Honeysuckle Drive

CLIENT: Lee 4 Pty Ltd c/- Doma Group

C6

DATE 20/04/2018
PROJECT No: 91303
SURFACE RL:



DISCLAIMER:
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File: P:\91303.00 - NEWCASTLE, 35 Honeysuckle Drive\4.0 Field Work\4.2 Testing\C6 - Interpretted.CP5
Cone ID: 120630 **Type:** I-CFXY-10

ConePile Version 5.9.1

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PILE CAPACITY ESTIMATE

PILE TYPE: Screw Cast Concrete
PILE SHAPE: Round Screw
PILE SIZE: Inner Diameter = 0.56 Outer Diameter = 0.71
STRENGTH REDUCTION FACTOR $Ø_g$: 0.52
CALCULATION METHOD: Douglas Method

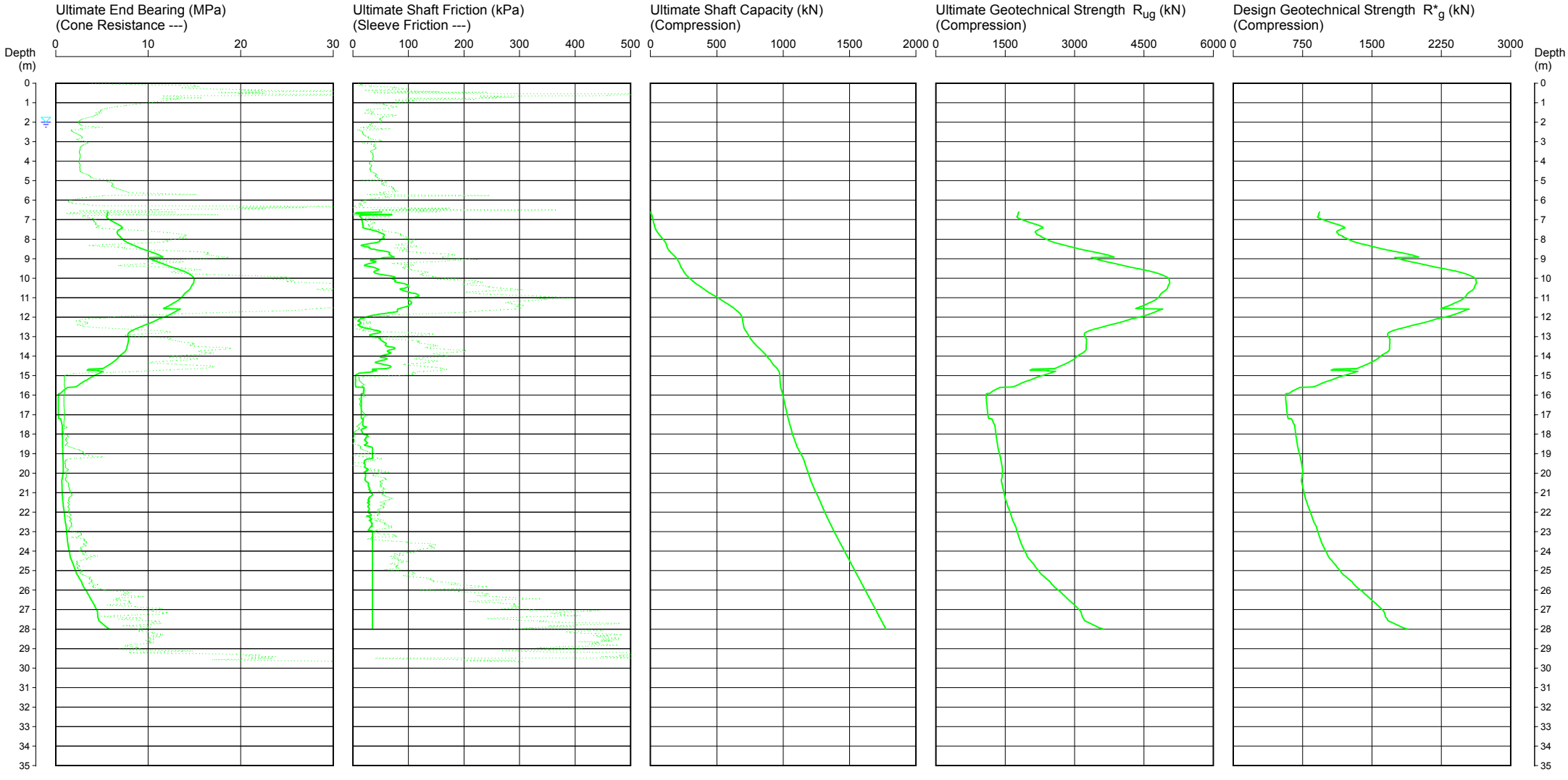
PROJECT: Geotechnical & Contamination Sampling and Testing

LOCATION: 35 Honeysuckle Drive

CLIENT: Lee 4 Pty Ltd c/- Doma Group

C7

DATE 20/04/2018
PROJECT No: 91303
SURFACE RL:



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Water depth after test: 2.00m depth

File: P:\91303.00 - NEWCASTLE, 35 Honeysuckle Drive\4.0 Field Work\4.2 Testing\C7 - Interpretted.CP5
Cone ID: 120630 **Type:** I-CFXY-10

ConePile Version 5.9.1

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Geotechnics | Environment | Groundwater

PILE CAPACITY ESTIMATE

PILE TYPE: Screw Cast Concrete
PILE SHAPE: Round Screw
PILE SIZE: Inner Diameter = 0.56 Outer Diameter = 0.71
STRENGTH REDUCTION FACTOR $Ø_g$: 0.52
CALCULATION METHOD: Douglas Method

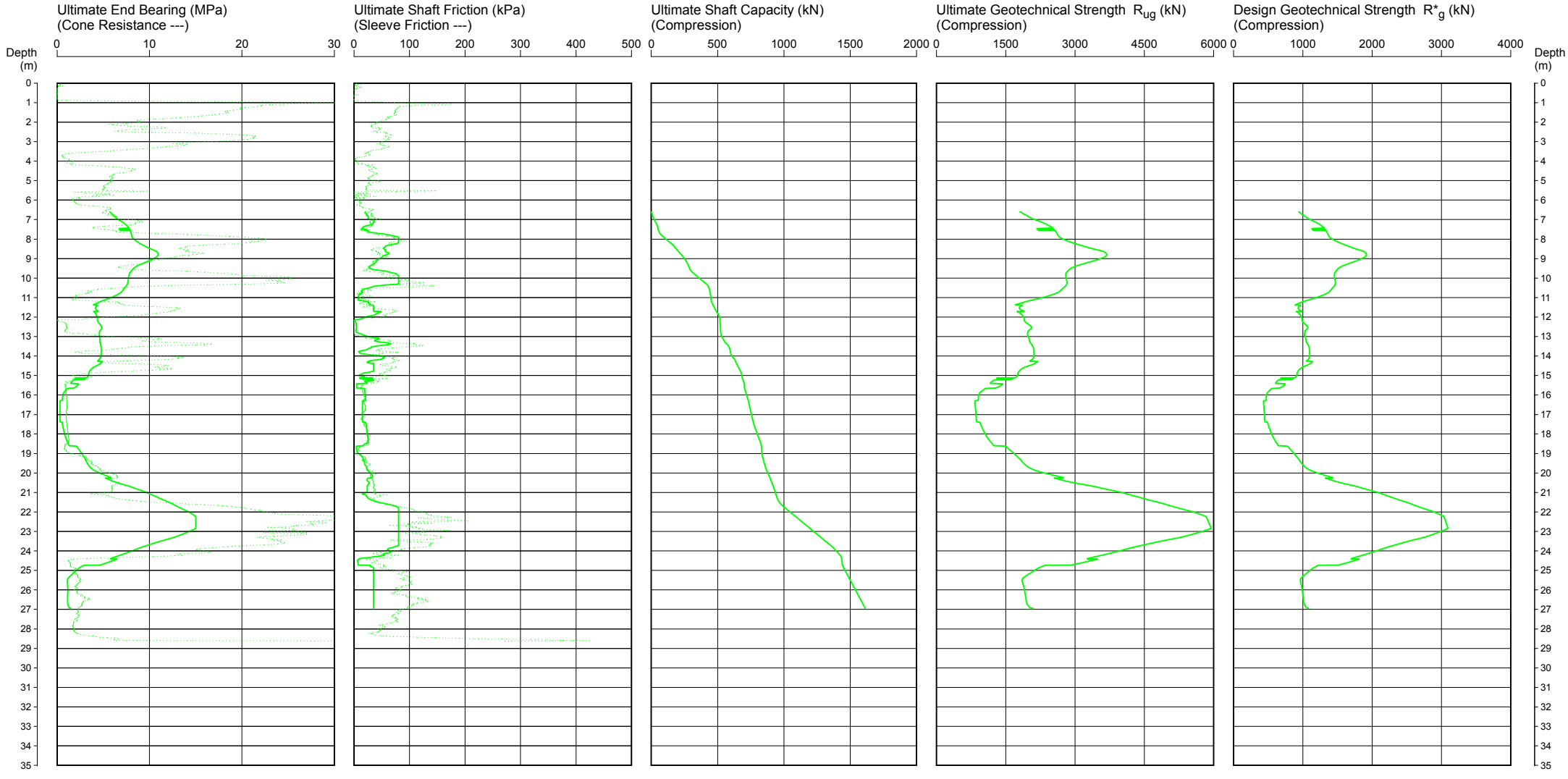
PROJECT: Geotechnical & Contamination Sampling and Testing

LOCATION: 35 Honeysuckle Drive

CLIENT: Lee 4 Pty Ltd c/- Doma Group

C8

DATE 26/04/2018
PROJECT No: 91303
SURFACE RL:



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File: P:\91303.00 - NEWCASTLE, 35 Honeysuckle Drive\4.0 Field Work\4.2 Testing\C8 - Interpretted.CP5
Cone ID: 170705 **Type:** I-CFXY-10

ConePile Version 5.9.1

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PILE CAPACITY ESTIMATE

PILE TYPE: Screw Cast Concrete
PILE SHAPE: Round Screw
PILE SIZE: Inner Diameter = 0.56 Outer Diameter = 0.71
STRENGTH REDUCTION FACTOR $Ø_g$: 0.52
CALCULATION METHOD: Douglas Method

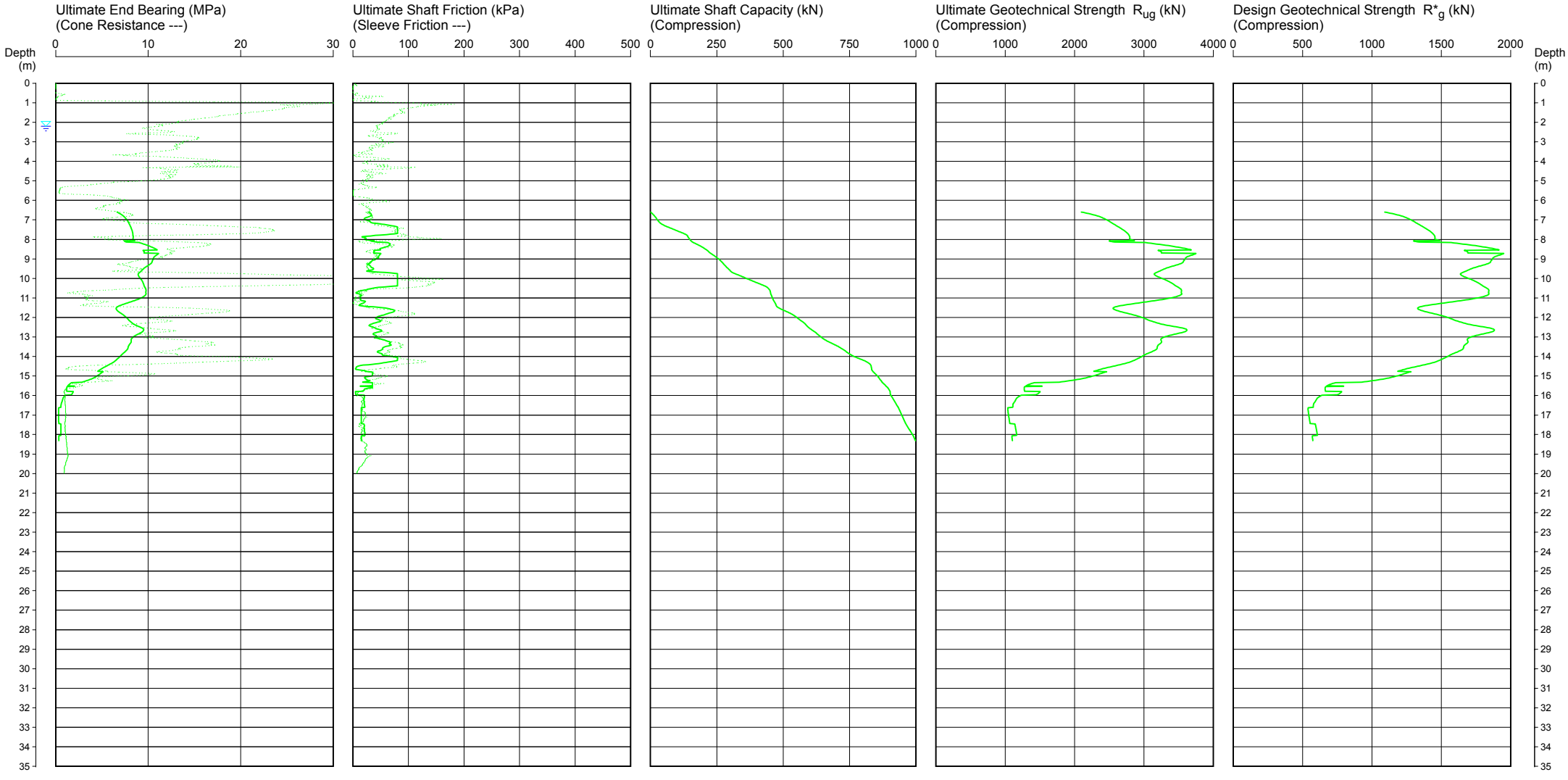
PROJECT: Geotechnical & Contamination Sampling and Testing

LOCATION: 35 Honeysuckle Drive

CLIENT: Lee 4 Pty Ltd c/- Doma Group

C9

DATE 26/04/2018
PROJECT No: 91303
SURFACE RL:



DISCLAIMER:
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Water depth after test: 2.20m depth

File: P:\91303.00 - NEWCASTLE, 35 Honeysuckle Drive\4.0 Field Work\4.2 Testing\C9 - Interpretted.CP5
Cone ID: 170705 **Type:** I-CFXY-10

ConePile Version 5.9.1

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Appendix D

Drawing 1 - Site Locality Plan
Drawing 2 - Test Location Plan
Drawing 3 - Test Location Plan (21 Honeysuckle Drive)
Drawing 4 - Shallow Refusal Locations
Drawing 5 - Geotechnical Cross Section A
Architectural Drawings (SJB Architects, Job No 5711, dated 09.07.18):
Cover Sheet No. 0001 Rev 04
Floor Plan – Basement 02, Drawing No. DA-A-0201 Rev 04
Floor Plan – Basement 01, Drawing No. DA-A-0202 Rev 04
Building Sections – Sheet 1, Drawing No. DA-A-0601 Rev 04
Building Sections – Sheet 2, Drawing No. DA-A-0602 Rev 04
GFA Analysis, Drawing No. DA-A-3101 Rev 04
Detail and Contour Survey – De Witt Consulting (8215-DET-14.02.18)

NOTES

1. Drawing adapted from Nearmap Imaged dated 7 December 2017.

0 5 10 15 20 30 40 60 80m

1:800 @ A3

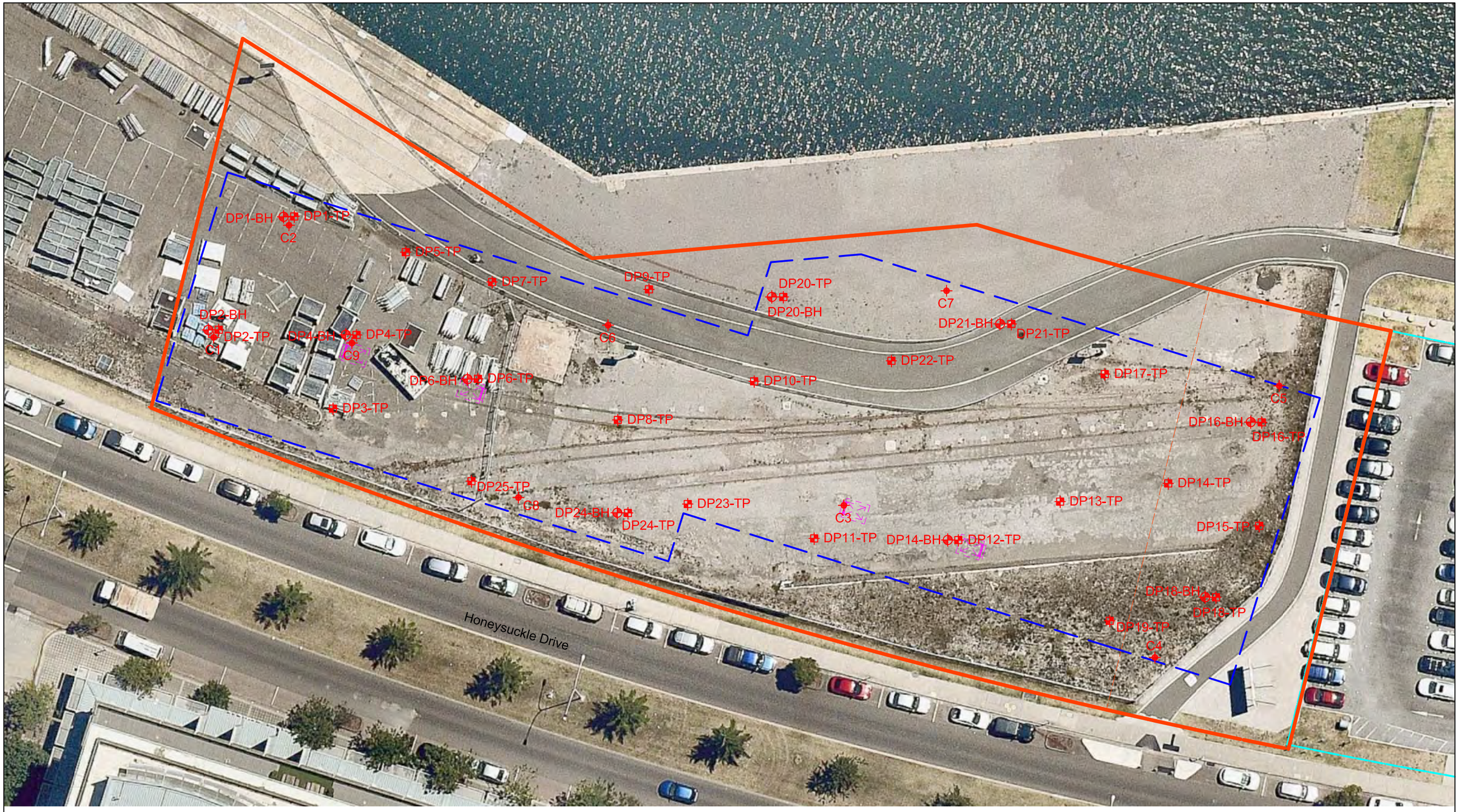
LEGEND

- Site Boundary
- Adjacent Site (21 Honeysuckle Drive (Project 91034.00)
- A A Section A-A (Drawing 5)

Douglas Partners
Geotechnics | Environment | Groundwater

CLIENT: Lee 4 Pty Ltd		TITLE: **Site Locality Plan**	PROJECT No: 91303.00
OFFICE: Newcastle	DRAWN BY: PLH	**Huntington**	DRAWING No: 1
SCALE: 1:800@A3 Sheet	DATE: 01.06.2018	**35 Honeysuckle Drive, Newcastle**	REVISION: 0

N



NOTES

1. Drawing adapted from Nearmap Imaged dated 7 December 2017.
2. Test locations are approximate only and were located using hand-held GPS.

0 5 10 15 20 30 40 60 80m

1:800 @ A3

LEGEND

- Site Boundary
- Proposed Basement
- Borehole Location
- Test Pit Location
- CPT Location

Douglas Partners
Geotechnics | Environment | Groundwater

CLIENT: Lee 4 Pty Ltd		
OFFICE: Newcastle	DRAWN BY: PLH	
SCALE: 1:800@A3 Sheet	DATE: 01.06.2018	

TITLE: **Test Location Plan**
Huntington
35 Honeysuckle Drive, Newcastle

N

PROJECT No:	91303.00
DRAWING No:	2
REVISION:	0

0 5 10 15 20 30 40 50m

1:500 @ A3

LEGEND

- 300mm diameter Borehole Location
- Cone Penetration Test Location
- W Well Location
- Former Wharf Road Alignment
- Approximate Site Area

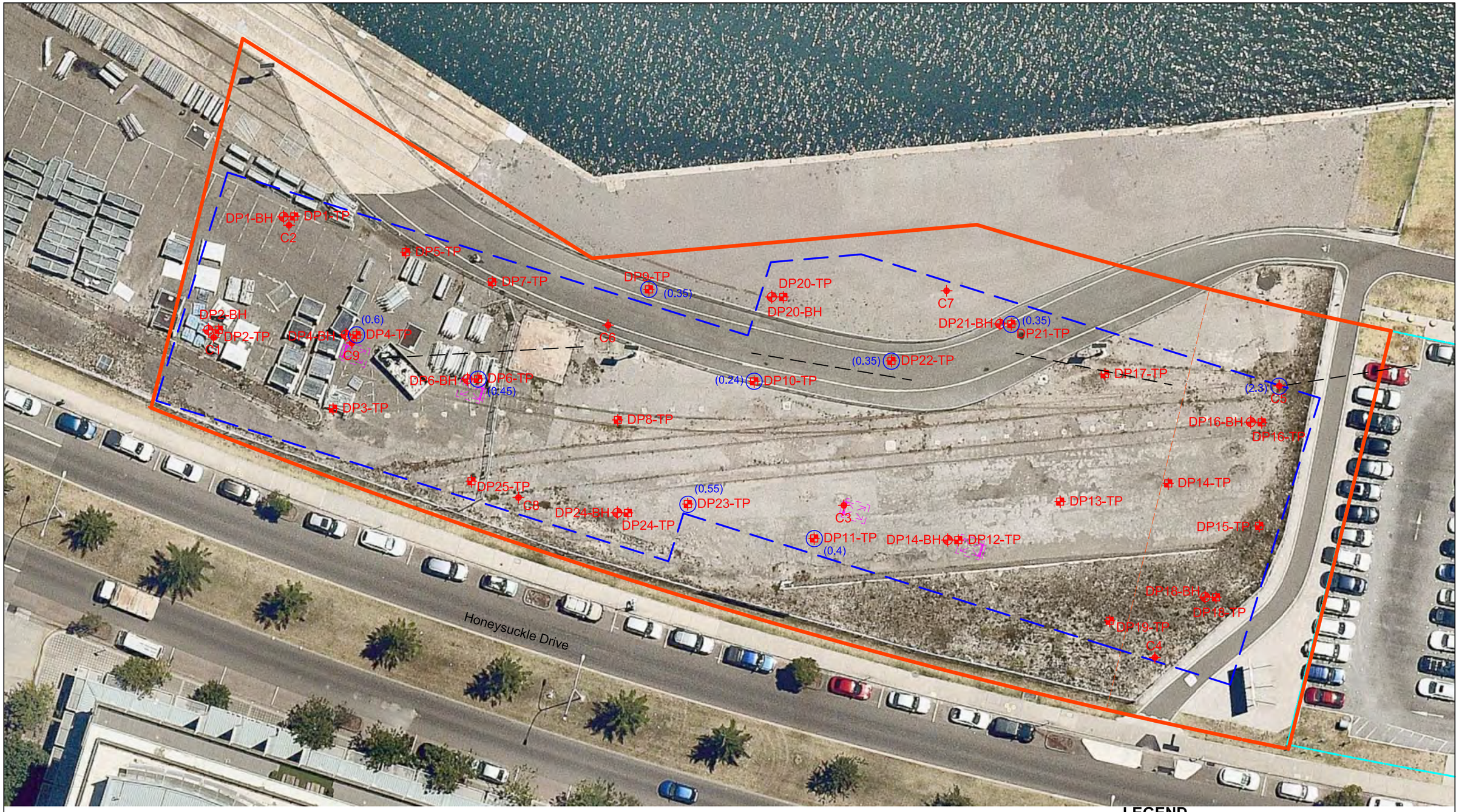
Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Lee 4 Pty Ltd		
OFFICE: Newcastle	DRAWN BY: PLH	
SCALE: 1:500@A3 Sheet	DATE: 01.06.2018	

TITLE: **Test Location Plan (21 Honeysuckle Drive)**
Huntington
35 Honeysuckle Drive, Newcastle

N

PROJECT No:	91303.00
DRAWING No:	3
REVISION:	0



NOTES

1. Drawing adapted from Nearmap Imaged dated 7 December 2017.
2. Test locations are approximate only and were located using hand-held GPS.

0 5 10 15 20 30 40 60 80m

1:800 @ A3

LEGEND

- Site Boundary
- Proposed Basement
- Borehole Location
- Test Pit Location
- CPT Location
- (0.4) Refusal (Depth (m))
- Possible Shallow Refusal Obstruction

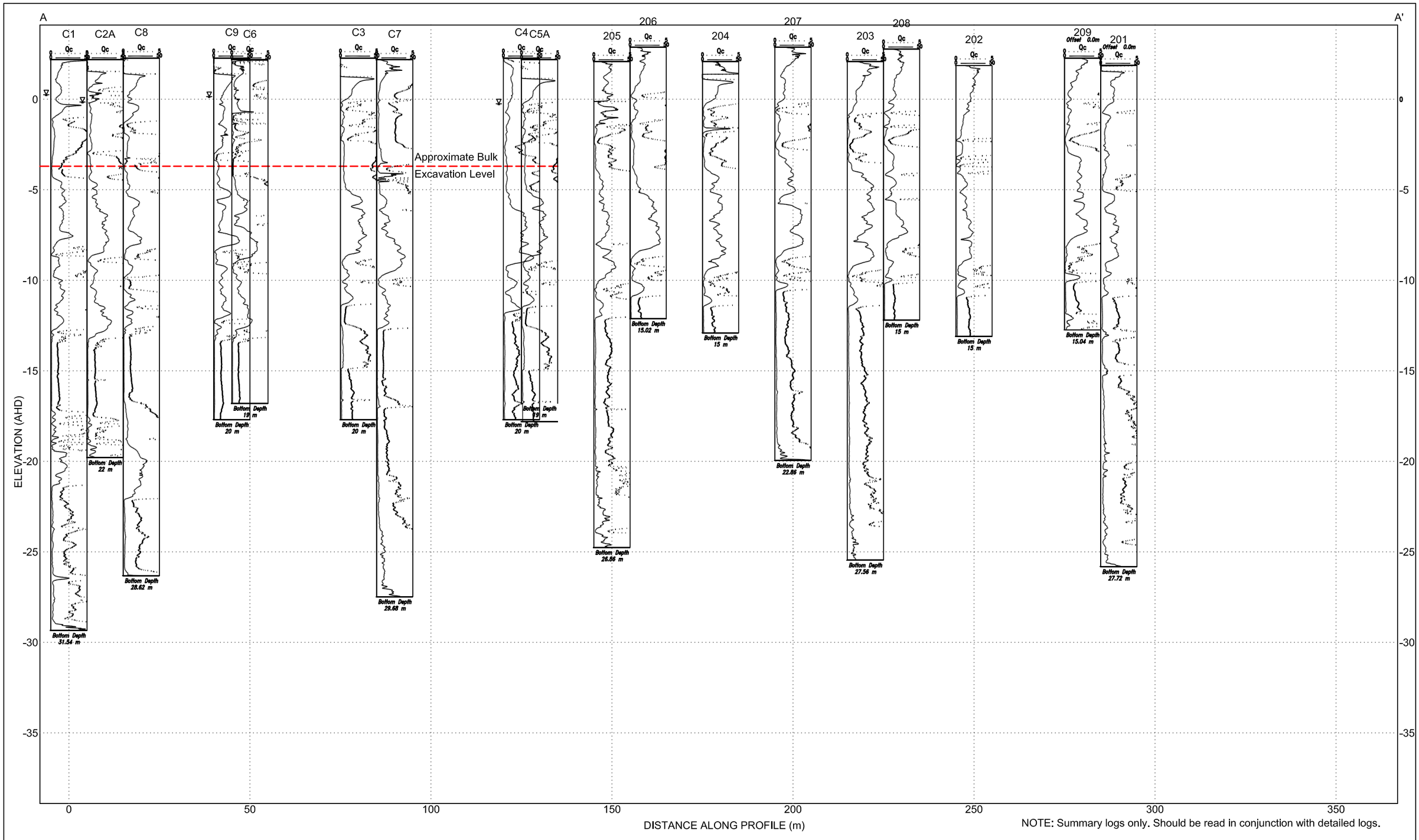
Douglas Partners
Geotechnics | Environment | Groundwater

CLIENT: Lee 4 Pty Ltd		
OFFICE: Newcastle	DRAWN BY: PLH	
SCALE: 1:800@A3 Sheet	DATE: 01.06.2018	

TITLE: **Shallow Refusal Locations**
Huntington
35 Honeysuckle Drive, Newcastle

N

PROJECT No:	91303.00
DRAWING No:	4
REVISION:	0



NOTE: Summary logs only. Should be read in conjunction with detailed logs.

TESTS / OTHER

N - Standard penetration test value

▽ - Water level

0 20

Horizontal Scale (metres)

Vertical Exaggeration = 5.0

Douglas Partners
Geotechnics | Environment | Groundwater

CLIENT: Lee 4 Pty Ltd		TITLE: Geotechnical Cross-section A	PROJECT No: 91303.00
OFFICE: Newcastle	DRAWN BY: PLH	Huntington	DRAWING No: 5
SCALE: 1:1000 (H) 1:200 (V) @ A3	DATE: 01.06.2018	35 Honeysuckle Drive, Newcastle	REVISION: 0

SJB Architects

35 HONEYSUCKLE

35 Honeysuckle
35 Honeysuckle Drive
Newcastle, NSW 2300

SJB Architects
Level 2, 490 Crown Street
Surry Hills NSW
2010 Australia
T 61 2 9380 9911
F 61 2 9380 9922

Project Number:5711
Date: 09.07.18
Client: DOMA GROUP

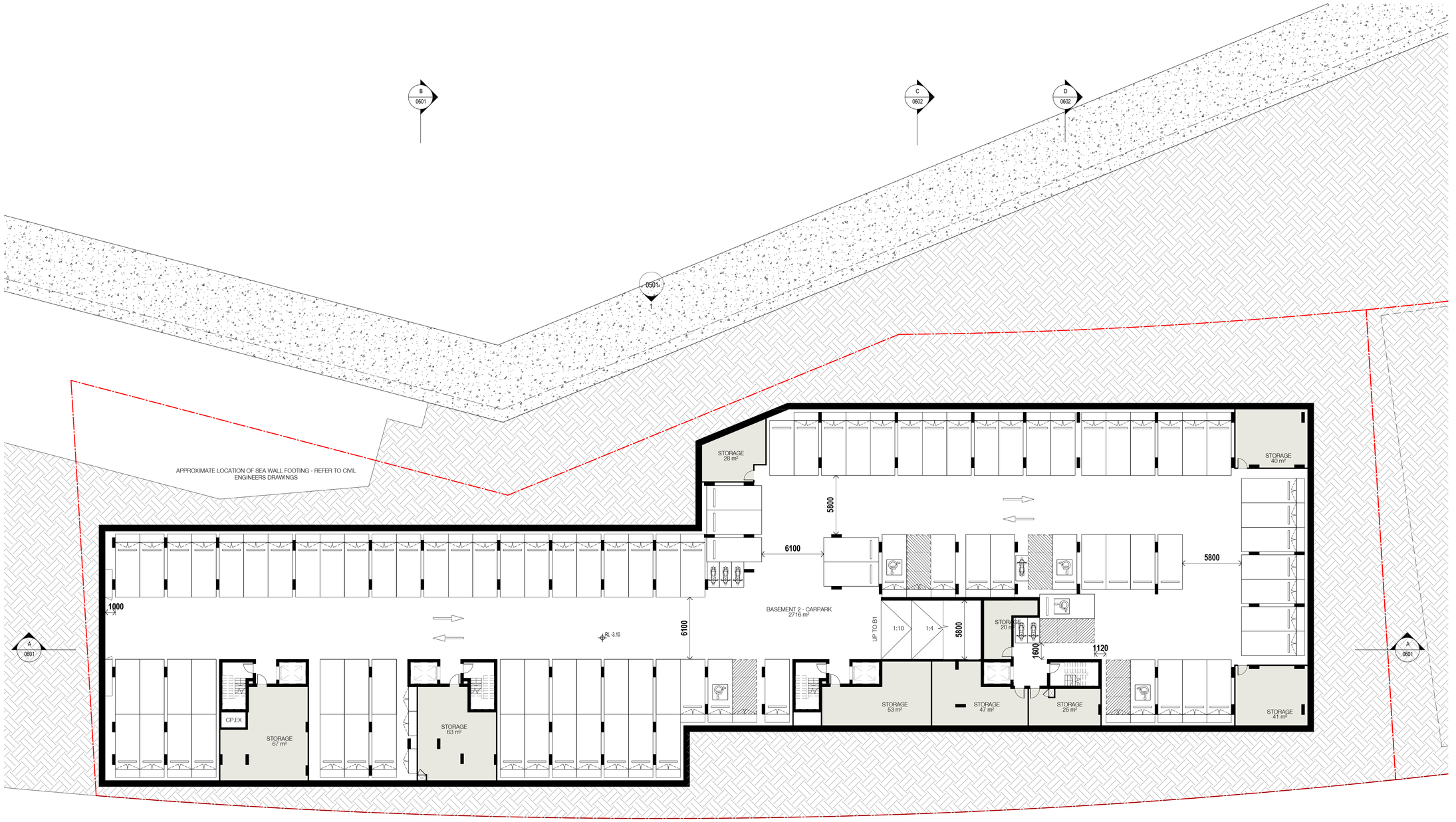
DRAWING LIST

Sheet No.	Sheet Name	Rev.	Date
0001	Cover	04	09.07.18
0101	Context Plan	04	09.07.18
0103	Site Plan / Site Analysis	04	09.07.18
0201	Floor Plan - Basement 02	04	09.07.18
0202	Floor Plan - Basement 01	04	09.07.18
0203	Floor Plan - Ground Floor	04	09.07.18
0204	Floor Plan - Level 01	04	09.07.18
0205	Floor Plan - Level 02	04	09.07.18
0206	Floor Plan - Level 03	04	09.07.18
0207	Floor Plan - Level 04-06	04	09.07.18
0210	Floor Plan - Level 07	04	09.07.18
0211	Roof Plan	04	09.07.18
0501	Elevations - Sheet 1	04	09.07.18
0502	Elevations - Sheet 2	04	09.07.18
0601	Building Sections - Sheet 1	04	09.07.18
0602	Building Sections - Sheet 2	04	09.07.18
1401	Apartment Plans - Sheet 1	04	09.07.18
1402	Apartment Plans - Sheet 2	04	09.07.18
1404	Apartment Plans - Adaptable	04	09.07.18
3001	Shadow Analysis - 9AM	04	09.07.18
3002	Shadow Analysis - 10AM	04	09.07.18
3003	Shadow Analysis - 11AM	04	09.07.18
3004	Shadow Analysis - 12PM	04	09.07.18
3005	Shadow Analysis - 1PM	04	09.07.18
3006	Shadow Analysis - 2PM	04	09.07.18
3007	Shadow Analysis - 3PM	04	09.07.18
3101	GFA Analysis	04	09.07.18
3201	SEPP 65 Analysis - Solar	04	09.07.18
3202	SEPP 65 Analysis - Ventilation	04	09.07.18
3203	SEPP 65 Analysis - Deep Soil	04	09.07.18
3204	SEPP 65 Analysis - Communal Space	04	09.07.18
4001	External Finishes	04	09.07.18
4005	Photomontage - Sheet 1	04	09.07.18
4006	Photomontage - Sheet 2	04	09.07.18

Nominated Architects: Adam Haddow-7188 | John Pradel-7004

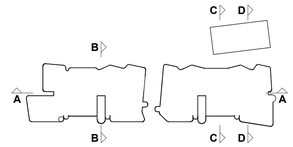
FOR APPROVAL

Rev	Date	Revision	By	Chk.
01	04.05.18	Issued to Consultants	MJL	EW
02	11.05.18	Issued to Consultants	MJL	EW
03	06.06.18	Issued for Review	MJL	EW
04	09.07.18	Issued for Approval	MJL	AH



Carparking Allocation - By Level

Basement 2	
Accessible 2400x5400	5
Standard 2400x5400	79
Standard 2400x5400 (Tandem)	14
	98
Basement 1	
Accessible 2400x5400	5
R = Retail Parking 2400x5400	22
Standard 2400x5400	37
Standard 2400x5400 (Tandem)	7
V = Visitor Parking 2400x5400	20
Visitor Accessible 2400x5400	1
	92
TOTAL	190



Structural Engineer
Northrop Consulting Engineers

Mechanical / Hydraulic Engineer
S4B / WPFD

Electrical Engineer
S4B

Fire Engineer
WPFD

Access Consultant
Phillip Chun

Basix
David Gradwell

Client

DOMAGROUP

Project
35 Honeysuckle

35 Honeysuckle Drive
Newcastle, NSW 2300

Drawing Name
Floor Plan - Basement 02

Date	Scale	Sheet Size
09.07.18	1 : 200	@ A1

Drawn	Chk.
MJL	EW

Job No.	Drawing No.	Revision
5711	DA-A-0201 / 04	

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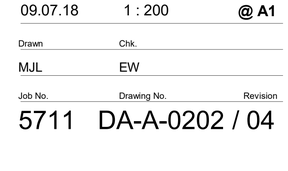
FOR APPROVAL

Rev	Date	Revision	By	Chk.
01	04.05.18	Issued to Consultants	MJL	EW
02	11.05.18	Issued to Consultants	MJL	EW
03	06.06.18	Issued for Review	MJL	EW
04	09.07.18	Issued for Approval	MJL	AH

Carparking Allocation - By Level

Basement 2	
Accessible 2400x5400	5
Standard 2400x5400	79
Standard 2400x5400 (Tandem)	14
	98
Basement 1	
Accessible 2400x5400	5
R = Retail Parking 2400x5400	22
Standard 2400x5400	37
Standard 2400x5400 (Tandem)	7
V = Visitor Parking 2400x5400	20
Visitor Accessible 2400x5400	1
	92
TOTAL	190



Structural Engineer
Northrop Consulting Engineers

Mechanical / Hydraulic Engineer
S4B / WPFD

Electrical Engineer
S4B

Fire Engineer
WPFD

Access Consultant
Phillip Chun

Basix
David Gradwell

Client
DOMAGROUP

Project
35 Honeysuckle

35 Honeysuckle Drive
Newcastle, NSW 2300

Drawing Name
Floor Plan - Basement 01

Date	Scale	Sheet Size
09.07.18	1 : 200	@ A1

Drawn	Chk.
MJL	EW

Job No.	Drawing No.	Revision
5711	DA-A-0202 / 04	

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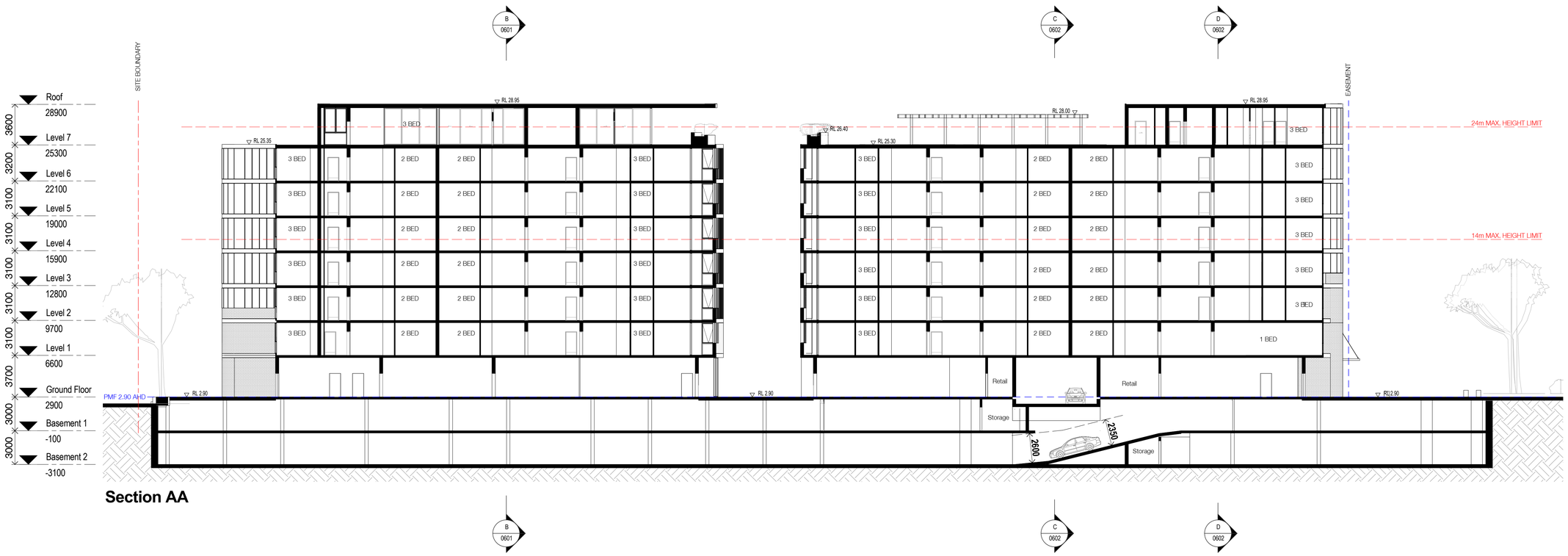
04	09.07.18	Issued for Approval	MJL	AH



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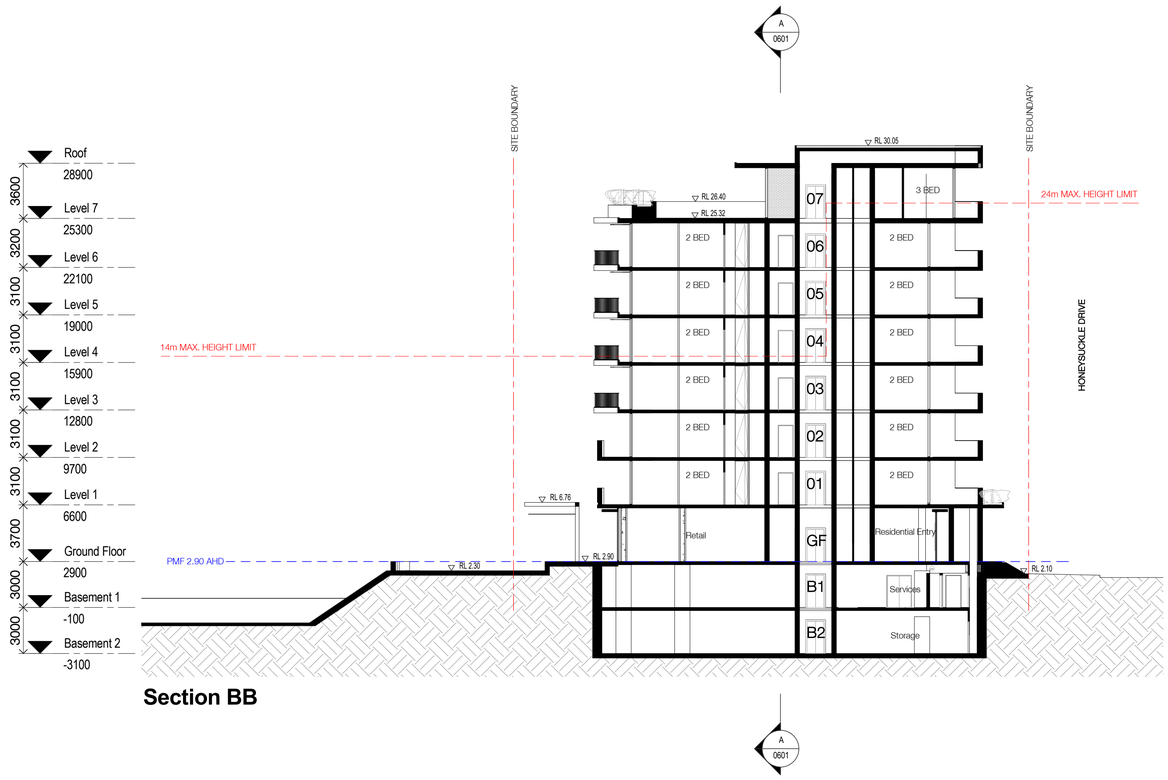

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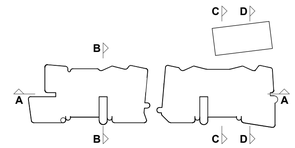

Structural Engineer
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Project
35 Honeysuckle

35 Honeysuckle Drive
Newcastle, NSW 2300

Drawing Name
Building Sections - Sheet 1

Date	Scale	Sheet Size
09.07.18	1 : 200	@ A1

Drawn	Chk.
MJL	EW

Job No.	Drawing No.	Revision
5711	DA-A-0601 / 04	

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FOR APPROVAL

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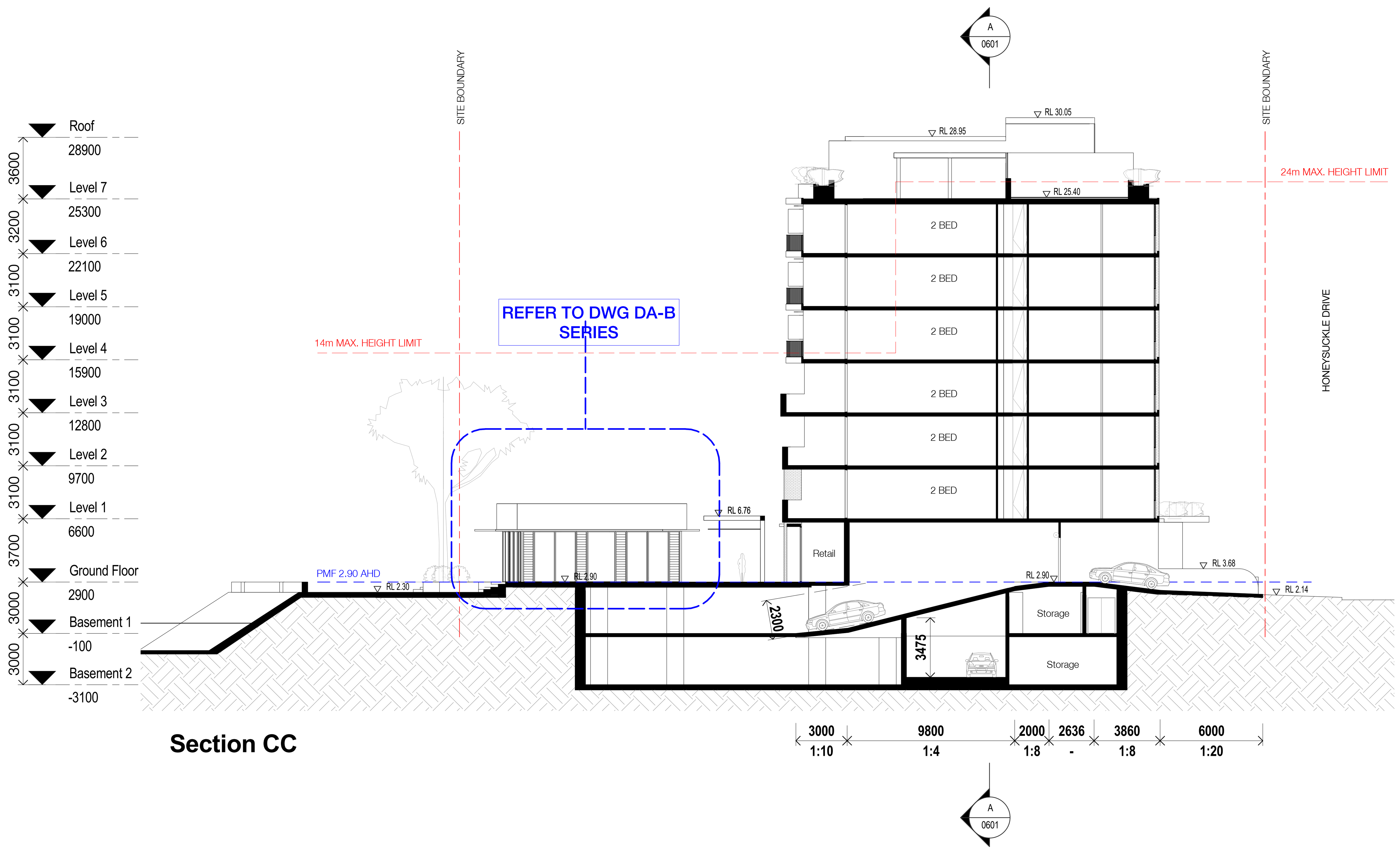
03	06.06.18	Issued for Review	MJL	EW
04	09.07.18	Issued for Approval	MJL	AH



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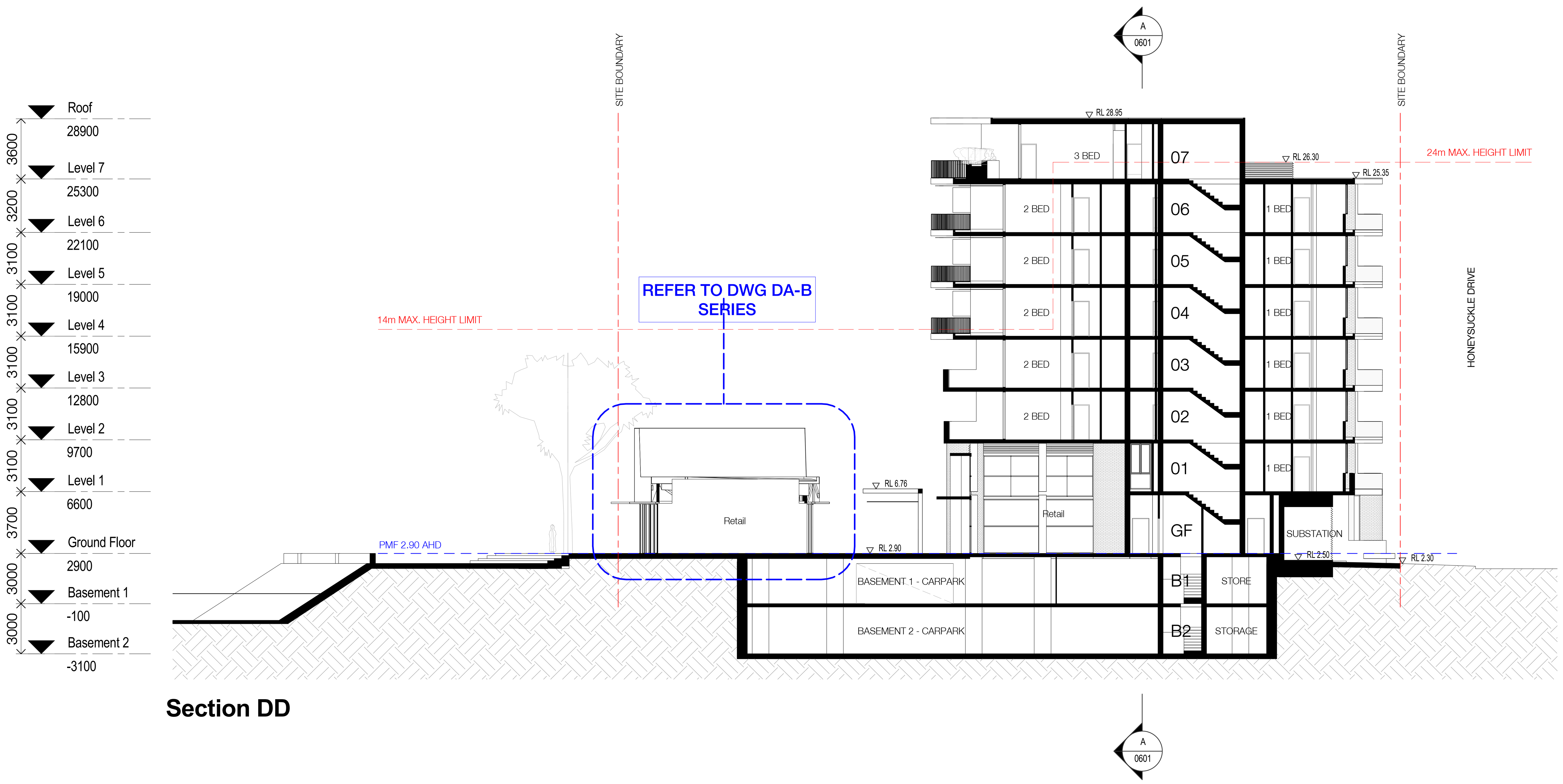
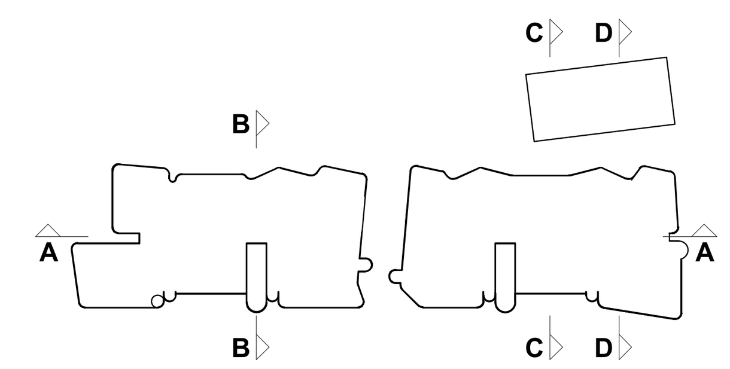


Section DD



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Basix
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DOMAGROUP

Project
35 Honeysuckle

35 Honeysuckle Drive
Newcastle, NSW 2300

Drawing Name
Building Sections - Sheet 2

Date	Scale	Sheet Size
09.07.18	1 : 200	@ A1

Drawn	Chk.
MJL	EW

Job No.	Drawing No.	Revision
5711	DA-A-0602	/ 04

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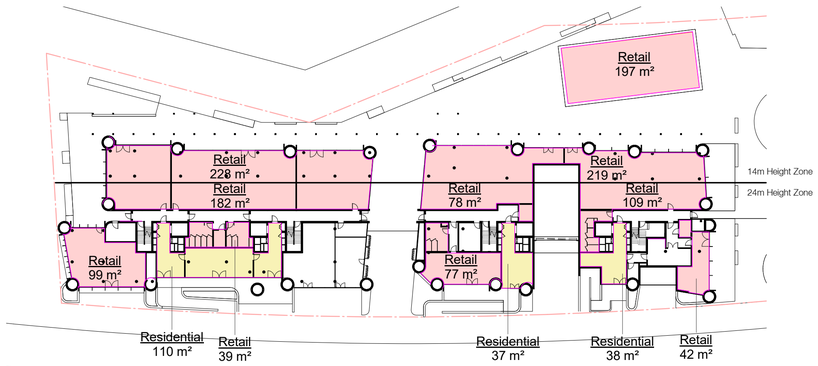
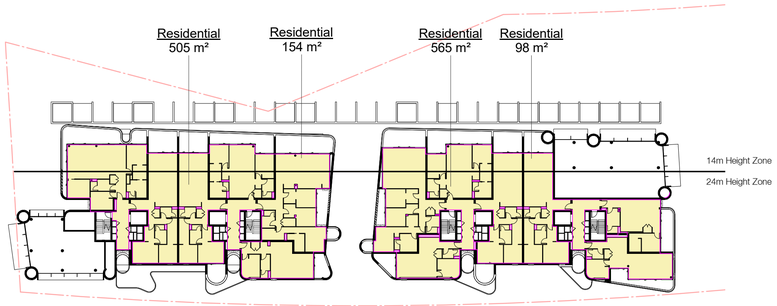
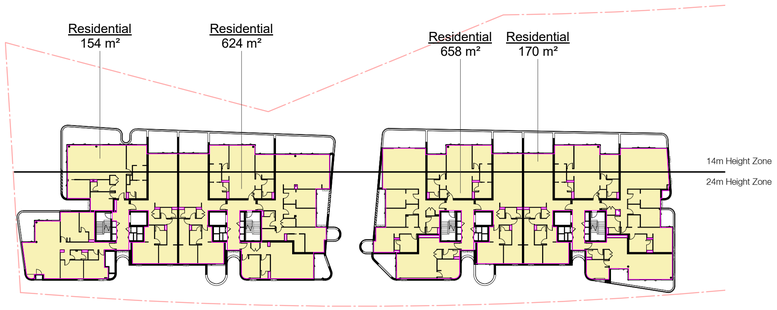


Ground Floor



Level 1



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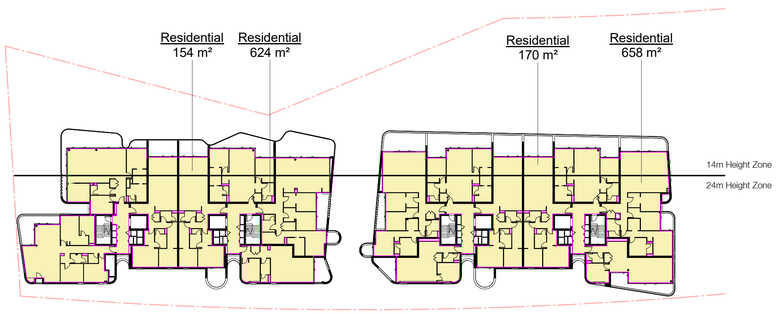

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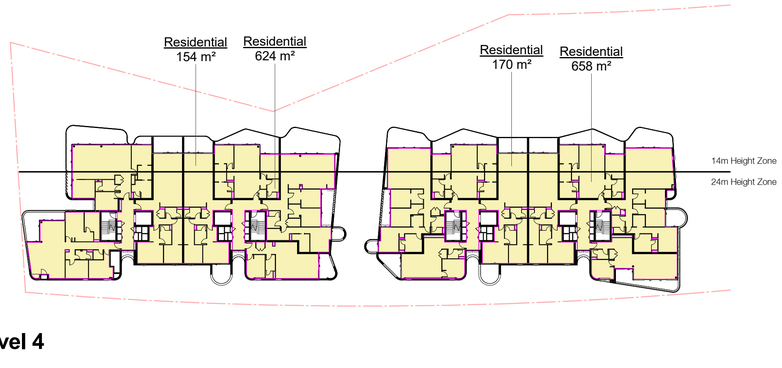

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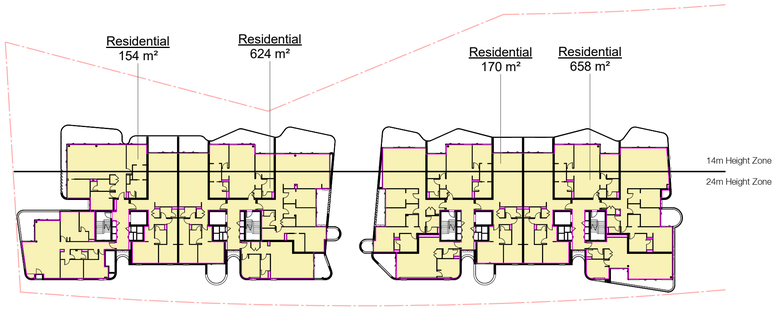

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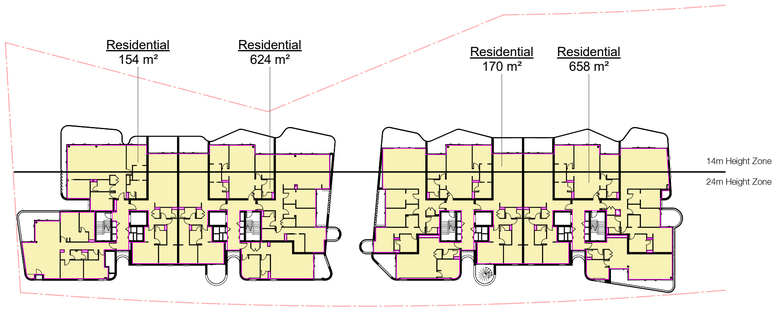

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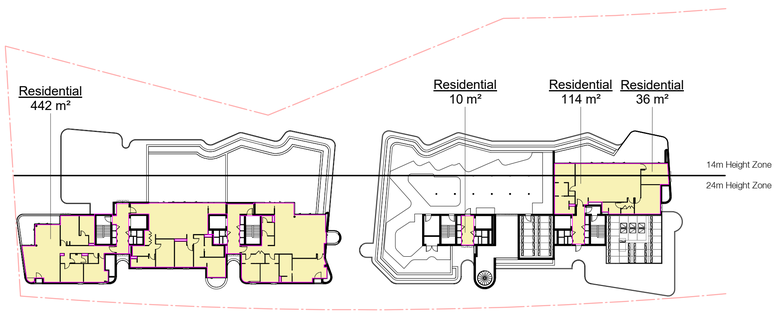


Level 7

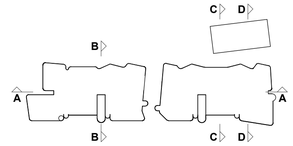
Residential

Retail

Nominated Architects: Adam Haddow-7188 | John Pradel-7004

FOR APPROVAL

Rev	Date	Revision	By	Chk.
01	04.05.18	Issued to Consultants	MJL	EW
02	11.05.18	Issued to Consultants	MJL	EW
03	06.06.18	Issued for Review	MJL	EW
04	09.07.18	Issued for Approval	MJL	AH



Structural Engineer
Northrop Consulting Engineers

Mechanical / Hydraulic Engineer
S4B / WPFD

Electrical Engineer
S4B

Fire Engineer
WPFD

Access Consultant
Phillip Chun

Basix
David Gradwell

Client
DOMAGROUP

Project
35 Honeysuckle

35 Honeysuckle Drive
Newcastle, NSW 2300

Drawing Name
GFA Analysis

Date	Scale	Sheet Size
09.07.18	1 : 500	@ A1

Drawn	Chk.
MJL	EW

Job No.	Drawing No.	Revision
5711	DA-A-3101 / 04	

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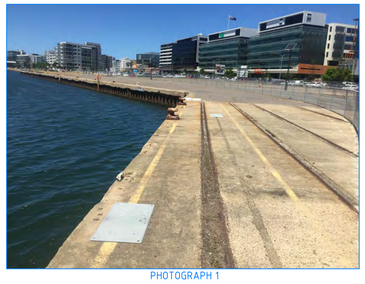
NOTES:

1. FEATURES SHOWN TO SCALE ACCURACY.
2. THIS PLAN IS SUITABLE FOR DETAILED PLANNING AND DESIGN AT THE SCALE/S STATED. THE PLAN MAY NOT BE SUITABLE FOR ANY OTHER PURPOSE OR FOR USE AT ANY OTHER SCALE/S.
3. SERVICE LINES SHOWN ON THIS PLAN HAVE BEEN SCALED FROM RELEVANT AUTHORITY PLANS. IT IS RECOMMENDED THAT THE LOCATION OF THESE SERVICES SHOULD BE PRECISELY DETERMINED BY POTHOLING PRIOR TO DESIGN & CONSTRUCTION
4. CONTOUR INTERVAL – 0.2m
5. THE BOUNDARIES SHOWN HAVE BEEN SURVEYED AND ARE ACCURATE.
6. DURING THE COURSE OF THIS SURVEY NO INVESTIGATION HAS BEEN UNDERTAKEN TO DETERMINE THE EXISTENCE OF ANY POSSIBLE SUBTERRANEAN ENCROACHMENTS.
7. THE SUBJECT PROPERTY IS AFFECTED BY A COVENANT. THE RELEVANT CONDITIONS OF THE COVENANT SHOULD BE CHECKED FOR COMPLIANCE PRIOR TO DESIGN & CONSTRUCTION. (D.P.1094812)


PHOTOGRAPH 1


PHOTOGRAPH 2

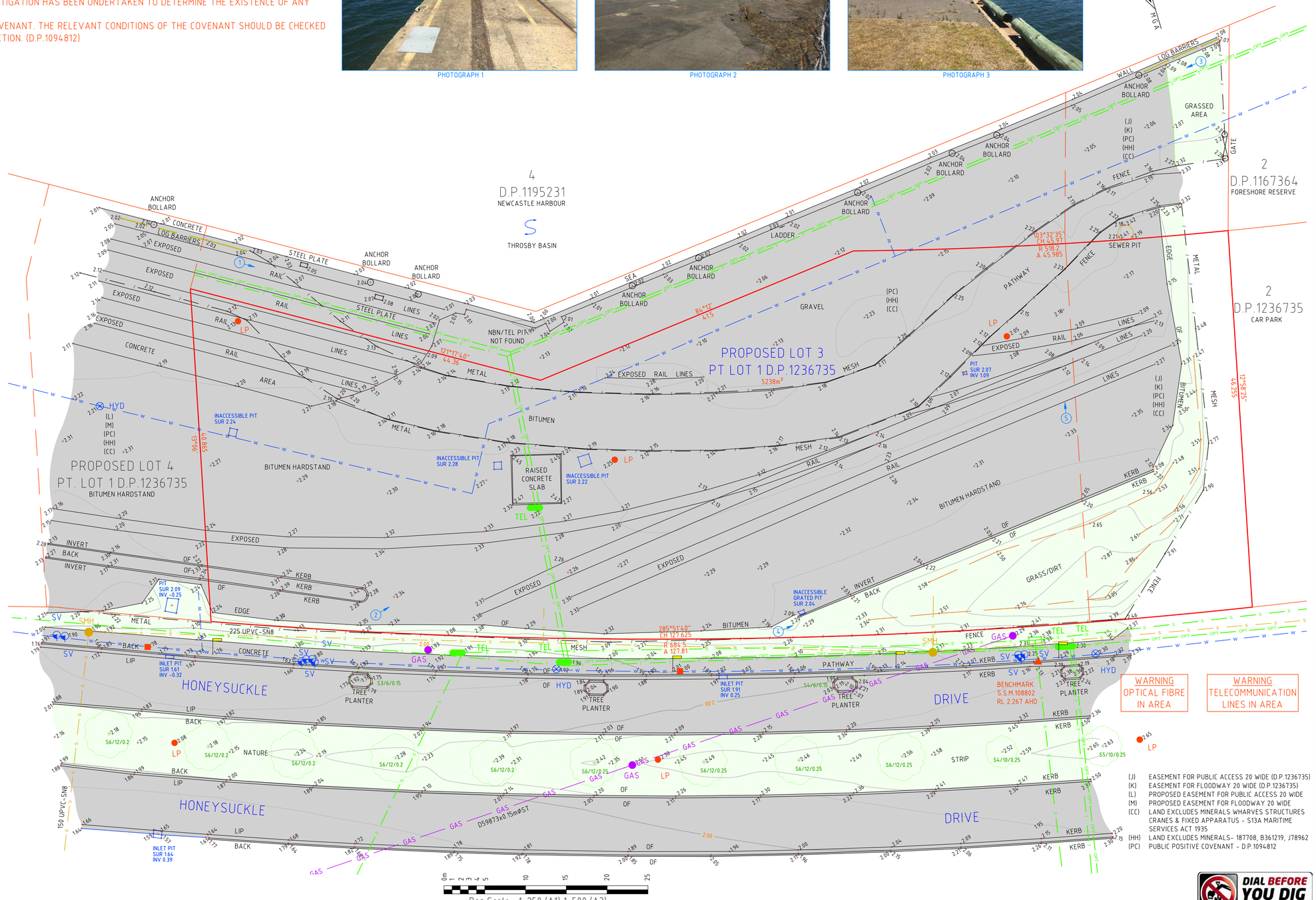

PHOTOGRAPH 3

LEGEND

- BOUNDARY LINE
- ADJACENT BOUNDARY
- MINOR CONTOUR LINE
- 10 MAJOR CONTOUR LINE
- EASEMENT
- FENCE LINE
- TOP & TOE OF BANKS
- W UNDERGROUND WATER LINE
- S UNDERGROUND OPTUS CABLE
- T UNDERGROUND TELSTRA LINE
- OPT UNDERGROUND OPTICAL FIBRE
- S UNDERGROUND SEWER LINE
- BENCH MARK
- LP LIGHT POLE
- PIT DRAINAGE PIT
- SV STOP VALVE
- HYD HYDRANT
- SMH SEWER MAN HOLE
- GAS NATURAL GAS MARKER
- TEL TELSTRA PIT
- DENOTES TREE — SS/10/0.6 spread radius/approx height/trunk diameter
- 2 PHOTOGRAPH LOCATION AND DIRECTION
- DENOTES SIGNAGE
- TICKET MACHINE


PHOTOGRAPH 4


PHOTOGRAPH 5



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PO Box 232 Gulgong NSW 2852
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ABN 23 104 067 405

TITLE

DETAIL AND CONTOUR SURVEY OF PROPOSED LOT 3

PART LOT 1 D.P.1236735

Ed.	Date	Amendment
H		
G		
F		
E		
D		
C		
B		
A	14.02.18	INITIAL ISSUE

JOB ADDRESS: HONEYSUCKLE DRIVE, NEWCASTLE

CLIENT: DCMA GROUP

PLAN No 001

JOB REF: 8215

SCALE: A1 1:250 A3 1:500

SURVEY DATE: 07.02.18

PLAN DATE: 14.02.18

DATUM: AHD

CAD REF: 8215-DE-180207

ORIGIN OF LEVELS S.S.M108802 RL 2.267

DRAWN CJ
SURVEYOR NS
CHECKED SW
APPROVED SW

SHEET No 1/1

DRAWING REF: 8215-DET-14.02.18