Douglas Partners
Geotechnics / Environment / Groundwater

Integrated Practical Solutions

Report on
Geotechnical Investigation

50 Honeysuckle Drive
Newcastle

Prepared for
Doma Holdings (NSW) Pty Ltd

Project 91034.00
June 2017

Douglas Partners
Geotechnics / Environment / Groundwater

Document History

Document details

Project No.	91034.00	Document No.	R.002.Rev2
Document title	Report on Geotechnical Investigation 50 Honeysuckle Drive		
Site address	Newcastle		
Report prepared for	Doma Holdings (NSW) Pty Ltd		
File name	91034.00.R.002.Rev2		

Document status and review

Status	Prepared by	Reviewed by	Date issued
Draft A	Scott McFarlane	Stephen Jones	2 March 2017
Revision 0	Scott McFarlane	Stephen Jones	15 March 2017
Revision 1	Scott McFarlane	Stephen Jones	13 April 2017
Revision 2	Scott McFarlane	Stephen Jones	2 June 2017

Distribution of copies

Status	Electronic	Paper	Issued to
Draft A	1	0	Chris Farrington – Doma Holdings (NSW) Pty Ltd
Revision 0	1	0	Chris Farrington – Doma Holdings (NSW) Pty Ltd
Revision 1	1	0	Chris Farrington – Doma Holdings (NSW) Pty Ltd
Revision 2	1	0	Chris Farrington – Doma Holdings (NSW) Pty Ltd

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.

	Signature	Date
Author		2 June 2017
Reviewer		2 June 2017

bsi. ISO 9001 Quality Management

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1. Introduction

1.1 Purpose

This report presents the results of a geotechnical investigation for a proposed development undertaken at 50 Honeysuckle Drive, Newcastle. The investigation was commissioned in an email dated 8 December 2016 by Chris Farrington of Doma Holdings (NSW) Pty Ltd and was undertaken in accordance with Douglas Partners' proposal NCL160734 dated 22 November 2016.

It is understood that the development of the site will include the construction of three six-storey residential towers, with a single basement level across the site, below all three 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 a brief prepared by AWT Consulting Engineers Pty Ltd (dated 28.10.16) and the secretary's environmental assessment requirements (SEARs) dated 4 November 2016.

1.2 Proposed Development

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

- Three six-storey residential towers, with a single basement level across the site, below all three towers;
- Existing ground levels range from about RL 1.8 to 2.9 AHD. The proposed bulk excavation level for construction of the basement is about RL -0.8 AHD. Localised deeper excavations (about 1 m below basement level) will be required for lift pit construction;
- The structure comprises reinforced concrete slabs on load bearing walls and columns. Column loads of 7500 kN (working) have been estimated by AWT Consulting Engineers Pty Ltd; and
- The site currently comprises an operating 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 covered contamination matters. These aspects are reported separately. The current report present the details of the field work and laboratory 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 the brief prepared by AWT Consulting Engineers Pty Ltd (dated 28.10.16) and the SEARs dated 4 November 2016. The scope comprised:

- Data review of existing information pertinent to the site;
- Preparation of safe work method statements;
- Underground service checks at test locations;
- Cone penetration testing (CPT);
- Laboratory testing of four samples for soil aggressivity 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 aggressivity;
  - 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 qualitative assessment of the potential for on-site disposal of stormwater; and
  - Provide a recommendation of 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 currently comprises the eastern portion of Lot 2000 DP1145678, with the street address 50 Honeysuckle Drive, Newcastle. It is noted that subdivision approval has been granted for the site, and the site will therefore be known as 21 Honeysuckle Drive. The development site is roughly rectangular in shape (145 m to 150 m long by 46 m to 50 m wide) and has an approximated plan area of 7230 m^2. The site is bounded to the south by Honeysuckle Drive, to the east by Worth Place and to the north and west by undeveloped land. Newcastle Harbour lies about 50 m to the north of the carpark.

It is almost fully occupied by a bitumen-sealed carpark which is currently active (operated by Wilson Parking). The location and aerial view of the site is shown in Figure 1.

Figure 1: Site Location - 50 Honeysuckle Drive, Newcastle (Photo dated 6 October 2016)

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 Reports

Report on Geotechnical Investigation of Abandoned Mine Workings, Wickham & Bullock Island Coal Company Lot 112, Douglas Partners Report 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.

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.

Park Residential Site - Cottage Creek Precinct Development, Final Report - Summary of Mine Stabilisation Activities – Coffey Report, 2 February 2016

This report presented the result of the grouting and verification methods that were undertaken to reduce mine subsidence parameters to the values presented in the above Mine Subsidence Mitigation Plan. The grouting works were undertaken by Keller Ground Engineering between 17 June and 22 July 2015. The Coffey report indicated that the grout of the grout exceeded the requirements of the specifications.

It was noted in the Coffey report that there might be an opportunity to further refine the parameters presented above by additional detailed modelling using the results from the verification process. As far as DP is aware, such modelling has not been completed.

4. Field Work

4.1 Field Work Methods

The field work consisted of the following:

- 34 test bores (Bores 101 to 134) drilled using a 300 mm diameter auger fitted to a small excavator, mainly for contamination purposes, mostly to depths ranging from 3.0 m to 6.0 m, with three bores refusing on an obstruction at depths of 1.0 m or less;
- 34 dynamic penetrometer tests (DPT) - one at each bore location, to depths of up to 1.2 m or prior refusal;
- Installation of four groundwater monitoring wells (103W, 114W, 116W and 130W) to depths of 5.0 m; the wells comprised Class 18 machine-slotted, machine-threaded PVC with graded gravel backfill and bentonite seal;
- Nine cone penetration tests (CPTs 201 to 209) to depths ranging from 15.0 m to 27.7 m, mainly for geotechnical purposes, providing information on the stratigraphy at depth. At CPTs 204 and 205, an obstruction was encountered during the test in the near surface filling. At these locations the CPT 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);
- Installation of three automatic water level data loggers in groundwater monitoring wells: Bores 103W, 116W and 130W; levels were recorded over the period 20 December 2016 to 23 January 2017, with measurements taken at 10 minute intervals;
- Three rising head permeability tests in three wells (i.e. 103W, 116W and 130W); and
- Collection of two surface water samples from the Hunter River (SW1 and HR1) for laboratory testing and measurement of field parameters at the sampling locations.

The test locations are shown on Drawings 1 and 2 in Appendix C.

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 by measurement from site features and boundaries. 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 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. The geotechnical subsurface conditions are summarised below:

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	0.28 to 2.45	+2.35 to -0.33
1.2	Lower Fill: sand, silty sand, some gravelly sand,	1.10 to 3.60	+1.35 to -1.48
2	SILTY CLAY/CLAYEY SILT - soft to firm (CPTs 204 & 207 only)	3.55 - 4.15(2)	-0.70 to -2.05
3.1	SAND / SILTY SAND - loose to medium dense	5.20 to 8.70	-2.89 to -5.85
3.2	SAND - medium dense to dense, very dense in parts	12.30 to 14.10	-9.99 to -11.98
4	CLAY - stiff to hard, some interbedded sand layers	22.30 to 27.50	-19.45 to -23.37
5	CPT refusal in Weathered Rock (inferred)	22.86 to 27.72 - 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 this site.

The upper Unit 1.1 Fill Layer can be further divided into the following sub-units based on potential contamination observations and presence of anthropogenic materials:

- **Unit 1.1A – Pavement Gravels:**
  - Beneath bitumen spray seal (generally 0.01 m thick);
  - From 0.01 m depth to 0.17 / 0.3 m depth;
  - Average thickness of about 0.22 m and up to 0.3 m at bore locations.

- **Unit 1.1B – Fill Containing Anthropogenic Materials:**
  - Present in all bores;
  - From 0.17 / 0.3 m to 0.28 / 1.0 m depth;
  - Average thickness of about 0.35 m and up to 0.8 m thick at bore locations (excluding Bore 102);
  - Generally described as brown gravelly sand with anthropogenic inclusions (slag, concrete, terracotta concrete, brick, steel, coal, porcelain, glass, plastic, occasional cobbles);
  - Some bores contained gravel in bituminous matrix (possible coal tar?) and fibro fragments (possible asbestos containing materials – ACM) as discussed below in the potential contamination observations;
  - Bore 102 comprised sand filling and clay filling with abundant anthropogenic inclusions (glass, steel, terracotta, brick and plastic refuse) from beneath pavement gravels to 2.7 m depth.

- **Unit 1.1C – Fill Containing Some Anthropogenic Materials:**
  - Bores 103, 106, 107, 123, 132 and 133 contained a fill layer beneath Unit 1.1B which generally comprised yellow-brown sand with some / occasional inclusions (slag / concrete fragments);
  - From 0.35 / 0.7 m to 0.7 / 1.8 m depth;
  - Average thickness of about 0.5 m and up to 1.2 m thick.

Unit 1.2 filling (possible hydraulic filling) generally comprised yellow-brown and yellow-grey sandy fill with some shells from 0.28 / 1.8 m to 1.9 / 3.0 m depth. Occasional gravel / cobble was observed at some locations within this layer. Although anthropogenic inclusions were generally not observed in this layer within the bores drilled, such inclusions cannot be precluded due to the nature of filling.

Yellow-brown-grey sands with some to abundant shells were observed within the bores from depths 1.9 / 3.0 m. These material could potentially be natural.

It is noted that refusal occurred during drilling in the following bores due to obstructions such as concrete / sandstone cobbles:

- 107 / 1.0 m;
- 112 / 0.6 m;
- 118 / 1.0 m;
- 126 / 2.0 m;
- 132 / 2.0 m.

The presence of possible obstructions within filling, therefore, cannot be precluded.

Table 2 presents the groundwater parameters recorded at the time of sampling on 5 January 2016.

Table 2: Field Measurements of Groundwater at Time of Sampling (05/01/2017)

Parameter (Units)	Bore / Well			
	103W	114W	116W	130W
Reduced Level of Well Collar (AHD)	2.02	2.54	2.03	2.52
Depth to Groundwater below Well Collar (m)	1.72	2.22	1.75	2.18
Depth to Groundwater below Ground Level (m)	1.80	2.31	1.86	2.28
Reduced Level of Groundwater (AHD)	0.30	0.32	0.28	0.34
PID Well Headspace (ppm)	<1	<1	<1	<1
Thickness of free product (mm)	<1	<1	<1	<1
pH	5.8	7.7	7.1	7.5
Electrical Conductivity (mS/cm)	6.8	0.98	0.86	0.79
Redox, Eh (mV)	-85	-298	-185	-187
Colour	Turbid / grey-brown	Turbid / grey-brown	Turbid / grey-brown	Turbid / grey-brown

The results of groundwater field testing indicated the following:

- Groundwater is slightly acidic to slightly alkaline (i.e. pH 5.8 to 7.7);
- Groundwater is brackish to saline;
- Reducing conditions were encountered (i.e. Redox potential -85 to -298);
- The results of PID screening on groundwater headspace suggest the absence of 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 any obvious indications of gross contamination (e.g. staining or odours).

4.2.2 Groundwater Level Monitoring

The groundwater levels were recorded in Bores 103W, 116W and 130W 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. The plots also show the corresponding tide levels and rainfall (Nobby's BOM Station), as well as manual gauging checks. The proposed bulk excavation and finished floor levels of the proposed development are also shown for comparison.

The results indicate the following:

- Water levels during the monitoring period were about 0.6 m to 0.8 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. 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 3 to 4 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 gravelly sand and sand immediately below the fill layer.

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
103W	0.025	0.05	0.5 to 5.0	2.5×10^{-4}	2.6×10^{-4}	2.5×10^{-4}
116W	0.025	0.05	0.4 to 5.0	2.7×10^{-4}	9.1×10^{-4}	6.4×10^{-4}
130W	0.025	0.05	0.4 to 5.0	2.9×10^{-4}	4.2×10^{-4}	3.3×10^{-4}

Basement excavation will require dewatering. Comments on dewatering design and groundwater effects are contained in the Section 6.4.

4.2.4 Surface Water

The field measurements taken at the two surface water collection points are shown in Table 4.

Table 4: Field Measurements of Surface Water at Time of Sampling

Parameter (Units)	HR1	SW1
Date	19/12/2016	05/01/2017
pH	7.1 - 7.5	7.1
Electrical Conductivity (mS/cm)	44.9	39.4
Redox, Eh (mV)	+56	+49
Colour	Clear	Clear

The results of harbour surface water field testing indicated the following:

- The harbour water is neutral (i.e. pH 7.1 to 7.5);
- The harbour water is saline;
- Oxidising conditions were encountered (i.e. Redox potential +49 to +56); and
- The results of PID screening on surface water headspace suggests the absence of volatile hydrocarbon impacts (i.e. <1 ppm).

Surface water sample SW1 was collected immediately down-gradient of the subject site (i.e. receiving waters from the site).

Surface water sample HR1 was collected approximately 100 m west of the site as shown on Drawing 2 in Appendix D.

5. Laboratory Testing

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 aggressiveness are presented in 91034.00.R.001 and the results presented in Figure 3 below which shows the distribution of each parameter with depth.

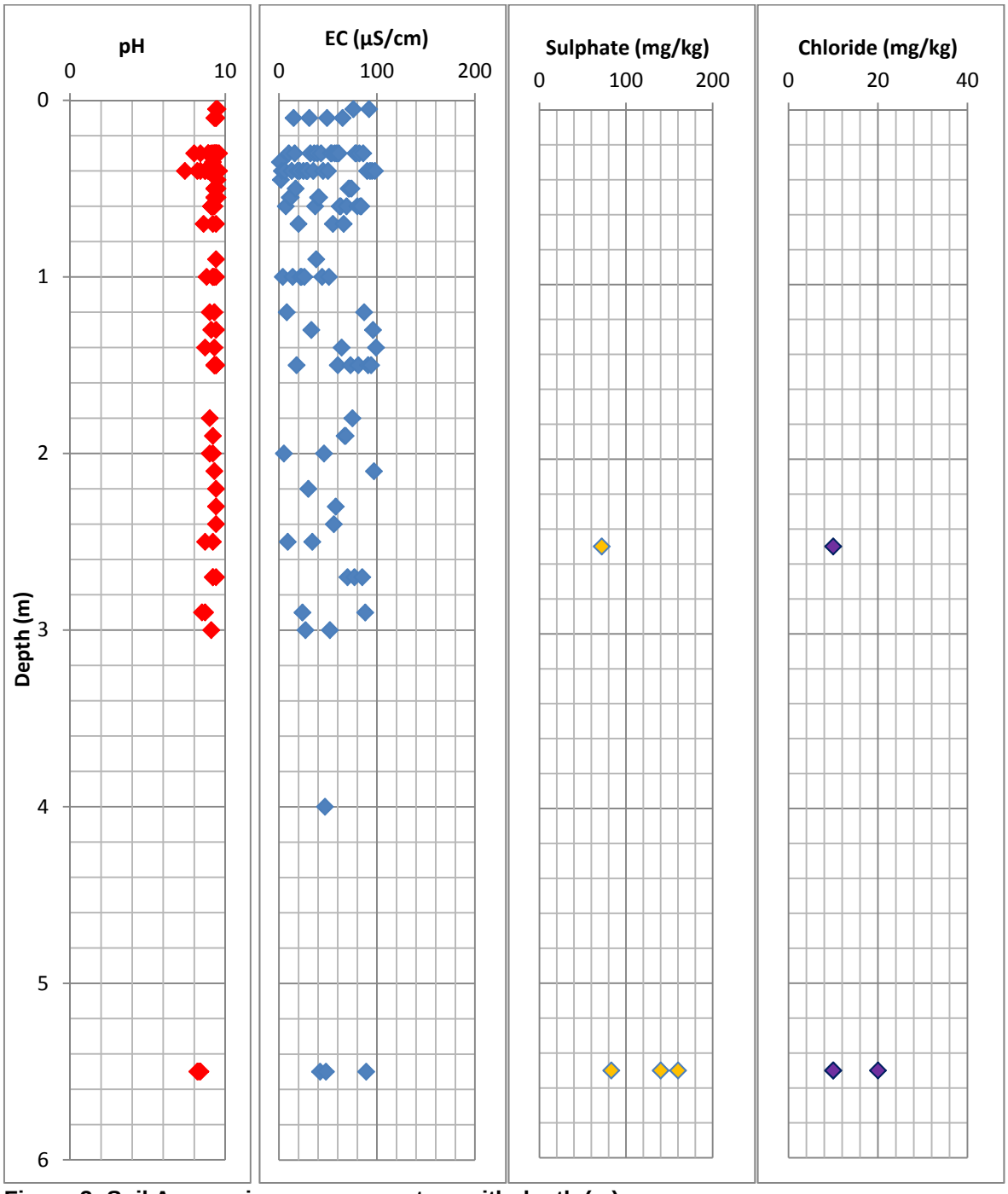


Figure 3: Soil Aggressiveness parameters with depth (m)

Notes to Figure 3
EC – Electrical Conductivity (from field measurement)
µS – micro Siemens
Cl – Chloride Content
SO_4 – Sulphate Content

A discussion on the results is presented in Section 6.9.

6. Comments

6.1 Earthworks and Excavations

The lowest basement slab level proposed is RL -0.3 m AHD. Allowing for slab thickness, gravel basecourse and / or underdrainage features, the base level of bulk excavation is anticipated to be about RL -0.8 AHD or lower. Construction of pile caps, lift wells, cores and other similar features will require locally deeper excavations.

The current ground levels are in the order of 1.8 to 2.9 m AHD, hence the bulk excavations will be about 2.6 m to 3.7 m deep relative to current ground levels. Excavations will therefore penetrate Units 1.1 to 1.2 and possibly Units 2 and 3 and encounter predominantly granular fill materials, with groundwater likely to be encountered from about 1.7 m to 2.3 m depth.

The near-surface filling includes large areas of pavement materials which will need to be broken up for appropriate classification and removal. In some areas buried inclusions were encountered which resulted in borehole refusal. 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.

The exposed sand subgrade at the base of the excavation will be generally within the Unit 1.2 sand and silty sand filling material and the Unit 2 silty clay / clayey sand (CPTs 204 and 207). The presence of the Unit 2 clay layer and the Unit 1.2 silty sand layer is expected to require a 0.2 m to 0.6 m thick low fines / low plasticity granular bridging layer to assist with trafficability of the surface. Some localised over excavation in the Unit 2 clayey layers may be required to enable compaction of the granular bridging layer.

Where heavy plant is required to traffic the site such as piling rigs and cranes, it is recommended that specific design of the granular platform is undertaken which will required dynamic penetrometer testing to confirm subgrade conditions across the site.

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 3.5 m deep basement excavations 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.

The 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 (K_a) requires that there will be sufficient deflection of the retaining system during construction to reach active conditions. If lateral deflections are inhibited, at-rest coefficients (K_0) should be used.

The recommended design parameters for estimating long-term earth pressures on retaining walls are shown in Table 5. These values are unfactored hence a suitable factor of safety should be used in design.

Table 5: 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 5:

γ_b - bulk density

K_0 - coefficient of 'at-rest' earth pressure

K_a - coefficient of active earth pressure

K_p - 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 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 12.3 m to 14.1 m depth, hence will be about 9 m to 11 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 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;
- 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.

Preliminary design values for anchors are shown in Table 6. 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 6: 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 6:

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.

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 -1.3 AHD (about 0.5 m below the basement excavation level), and locally lower at lift wells and large pile caps (if used). Based on the water level monitoring to date this will entail lowering the water table by up to about 2 m generally, and a further 2 m to 3 m at the lift wells.

The suggested permeability parameters for the design of dewatering systems are shown in Table 7.

Table 7: 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	3×10^{-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 (K_h). 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 spearpoints.

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. Spearpoints 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.

It is recommended that groundwater modelling be undertaken of the proposed dewatering arrangement to assist with selection of the methodology, sizing and location of dewatering equipment.

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 are provided in 91034.R.001 report.

6.5 Infiltration

It is understood one option to disposal of water generated from the dewatering activities as discussed in Section 6.4 is via overland flow or infiltration galleries installed on the undeveloped area to the west of the site.

The ability of the subsurface profile on site to accept stormwater, and consequently the estimated infiltration rates, are influenced by several factors, including the following:

- The subsurface profile within the proposed disposal area;
- The presence of thin less permeable layers (i.e. silt or clay) within the subsurface profile. Such layers lower the permeability (hydraulic conductivity) of the subsurface profile by several orders of magnitude;
- Current climate conditions during testing; and
- The presence of a groundwater table.

It is noted that subsurface investigation of the area to the west of the site was not undertaken for this project. The results of the current investigation including the in-situ permeability testing and parameters presented in AS 1547 (Ref 5) based on soil type have been used to estimate the expected infiltration.

The subsurface conditions in the upper profile consisted of Unit 1.1A pavement materials overlying Unit 1.1B and Unit 1.1C sand and gravelly sand filling, overlying Unit 1.2 sand filling.

Where possible, it is recommended that the upper Unit 1.1A pavement materials and Unit 1.1B sand material should be excavated to allow water to infiltrate into the underlying Unit 1.1C and Unit 1.2 sand. As a guide to estimating the size of the infiltration area, it is suggested that a preliminary infiltration rate in the range of 3 m / day to 10 m/day be adopted. In situ infiltration testing, however, is recommended to confirm these design parameters.

Water discharged to the surface is expected to have an infiltration rate of less than 0.1 m per day due to the presence of variable material containing a silty sand (i.e. less permeable) layers. The presence of less permeable layers would impede the efficiency of an infiltration area and result in possible offsite run-off.

The above estimation of infiltration rate is based on the assumption of careful construction and regular on-going maintenance of the infiltration system. This would include removal of sediments collecting at the base of the infiltration beds.

An alternative option to manage groundwater is reinjection using spear points or similar. This method would require multiple injection wells installed into the Unit 3.1 sand. Specific analysis would be require to determine the number, depth and construction requirements for reinjection wells.

6.6 Footings

6.6.1 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 2).

Due to the depth of filling, the presence of a weak Unit 2 clay layer and anticipated column loads, shallow pad or strip footings founded within the sand filling are unlikely to be suitable for the proposed building. Therefore consideration has been given to piled foundations, as discussed below.

6.6.2 Pile in Soil

It is recommended that the dense sand which was encountered below about 8 m about (RL -5.5 AHD) 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 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 3). The pile capacities are expressed in limit state terms whereby the Design Geotechnical Strength ($R_{d,g}$) is defined in (Ref 3) 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.

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 8 which shows the geotechnical capacity of single piles founded in the medium dense to dense sand at about 8 m depth (approximate RL -5.5 AHD).

Table 8: Estimated Pile Capacities for Selected Piles Founded at 8 m Depth (approximate RL -5.5 AHD)

CPT	Estimated Design Geotechnical Strength ($R_{d,g}$) [1,3] (kN), ϕ_g = 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
201	800	1100	1750
202	800	1200	1950
203	1300	1900	2400
204	1000	1500	2100
205	750	1050	1900
206	1000	1500	2200
207	1100	1700	2400
208	800	1450	1900
209	1100	1500	2400

Notes to Table 8:

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 (maybe 5 to 7 or possibly 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 9 presents design parameters of non-displacement type single piles (e.g. CFA piles). Design parameters greater than 8 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 9: 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)
1-3	0	0	0
3-4	30	12	0
4-5	30	12	650
5-6	40	16	800
6-7	50	20	1000
7-8	75	30	1500

The allowable design parameters have been based on a factor of safety of 2.5 and the conditions encountered at CPT 202 which is considered to be one of the tests where weaker soil conditions were encountered.

The above parameters are for compressive loads. If tension loads are required for design, the above parameters presented in Table 8 should be reduced to 75% of the values presented in the table.

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 880 kN per pile (i.e. based on parameters in Table 9); and
- Pile spacing of 2.5 diameters (centre to centre) for the pile group.

Table 10: Settlement Estimates for Piles and Pile Groups

Pile Location	'Immediate' Settlement[(1)] (mm)	Consolidation of Clay (mm)	Total Settlement (mm)
Single Pile	5-10	0-5	5-15
Two Pile Group	5-10	5-10	10-20
Four Pile Group	20-25	5-10	30-35

Note to Table 10:

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. The total and differential settlements could probably be reduced by utilising a piled raft system, whereby a proportion of the structural load is carried by a stiff raft at basement level. Further analysis would be required to assess the feasibility of this option, based on the actual layout of working loads on columns and wall footings.

6.6.3 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 (Refer Section 3.2) and CPT data suggested that rock is at a depth of about 23 m to 28 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 11: Preliminary Design Parameters for Piles in Rock

Unit	Stratum	Approx Depth Range (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	22.86-27.72	4000	200	1200	100

Notes to Table 11:

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 4
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 11.

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.

6.7 Seismic Parameters

The Earthquake Code AS1170.4 (Ref 1) 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.

6.8 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/s (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.

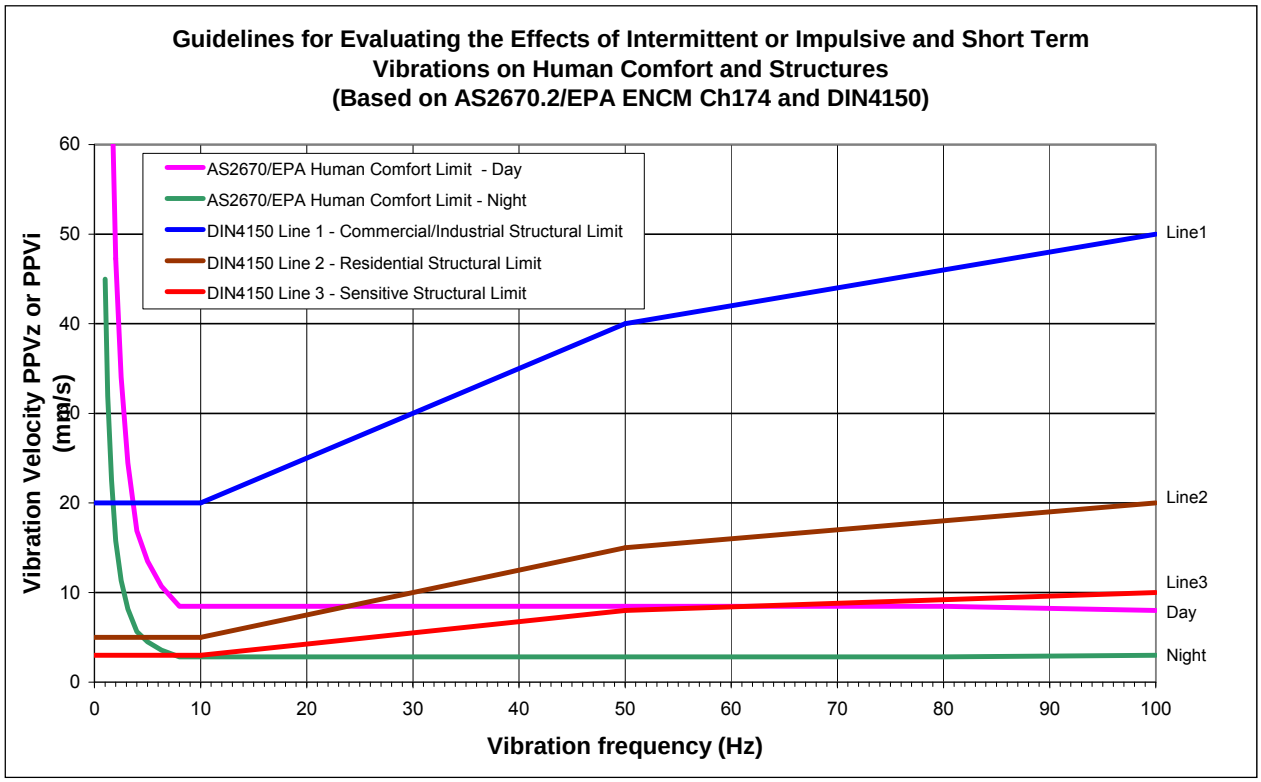


Figure 4: Vibration Guidelines

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:

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

6.9 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 3). These results indicate that the soils tested are classified as “mild” with respect to concrete and “non-aggressive” with respect to steel.

The results of groundwater parameters on water abstracted from each borehole (see Section 5.1) were compared to classifications for exposure in groundwater provided in the Piling Standard (Ref 3). These results indicate that the groundwater samples tested are classified as “mild” with respect to concrete and “moderate” with respect to steel.

6.10 Mine Subsidence

The site is underlain by mine workings in the Borehole Seam at a depth of about 70 m. As presented in Coffey report titled “Park Residential Site - Cottage Creek Precinct Development, Final Report - Summary of Mine Stabilisation Activities”, dated 2 February 2016, grouting and verification of the grouting was undertaken at the site to reduce mine subsidence parameters to the following parameters:

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

It was noted in the Coffey report that there might be an opportunity to further refine the parameters presented above by additional detailed modelling using the results from the verification process. S far as DP is aware, such modelling has not been completed.

A structural engineering assessment (Mine Impact Assessment) report is expected to be required by Subsidence Advisory NSW (formerly Mine Subsidence Board) for this development. In general, this report is required to detail how the structure can accommodate the above parameters such that the structure will remain “safe serviceable and without damage due to mine subsidence”. Further correspondence from the Subsidence Advisory NSW will be required as part of the approval process.

7. References

1. Australian Standard AS1170.4-2007, “Structural Design Actions, Part 4: Earthquake Actions in Australia”, Standards Australia.
2. Australian Standard AS 2870-2011 "Residential Slabs and Footings", 2011, Standards Australia.
3. Australian Standard AS2159-2009, “Piling - Design and Installation”, Standards Australia
4. P.J.N.Pells, G. Mostyn and B.F.Walker, “Foundations on Sandstone and Shale in the Sydney Region”, Australian Geomechanics – December 1998.
5. 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 in accordance with DP's proposal dated NCL160734 dated 22 November 2016 and email acceptance received from Chris Farrington of Doma Holdings (NSW) Pty Ltd dated 8 December 2016. The work was carried out under DP's Conditions of Engagement. This report is provided for the exclusive use of 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.

Douglas Partners Pty Ltd

Appendix A

About This Report
Sampling Methods
Soil Descriptions
Symbols and Abbreviations
Information of 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

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

Douglas Partners

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, 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

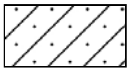
Soils


Topsoil

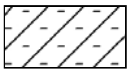

Peat


Clay

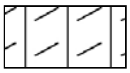

Silty clay

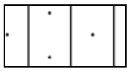

Sandy clay

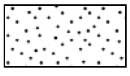

Gravelly clay

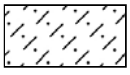

Shaly clay

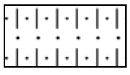

Silt


Clayey silt


Sandy silt

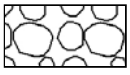

Sand

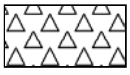

Clayey sand


Silty sand


Gravel


Sandy gravel


Cobbles, boulders

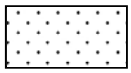

Talus

Sedimentary Rocks

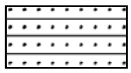

Boulder conglomerate

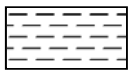

Conglomerate


Conglomeratic sandstone

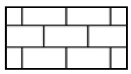

Sandstone


Siltstone


Laminite

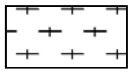

Mudstone, claystone, shale

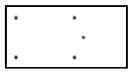

Coal


Limestone

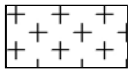
Metamorphic Rocks

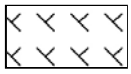

Slate, phyllite, schist

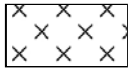

Gneiss

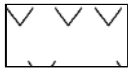

Quartzite

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

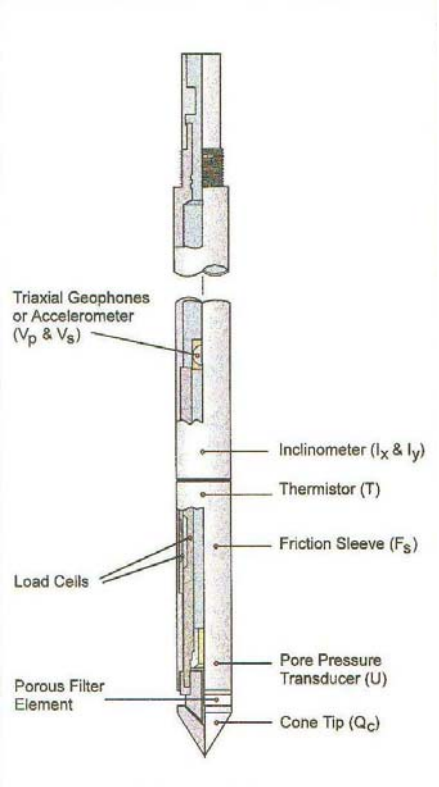


Figure 1: Cone Diagram

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

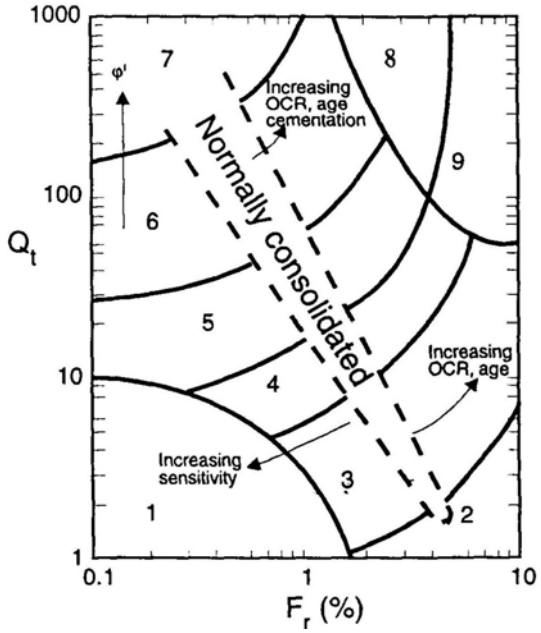


Figure 3: Soil Classification Chart

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.

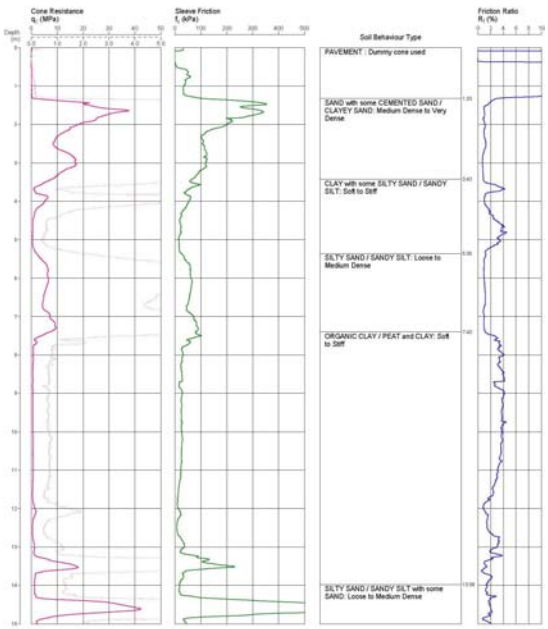


Figure 4: Sample Cone Plot

Appendix B

Borehole Logs - Bores 101 to 134
Cone Penetration Tests - CPTs 201 to 209
Results of Dynamic Penetrometer Tests
Results of Rising Head Permeability Tests
Figure B1 - Groundwater Pressure head vs Rainfall

BOREHOLE LOG

CLIENT: Doma Holdings (NSW) Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 21 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 1.85m AHD*
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 101
PROJECT No: 91034.00
DATE: 19/12/2016
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)
	0.01	Spray Seal (Bitumen)							
		FILLING - Generally comprising brown, fine to medium sandy gravel and slag filling with subangular gravel and slag fragments up to 40mm in size, moist		E	0.1		PID <1		
	0.28			E	0.3				
	0.35	FILLING - Generally comprising brown gravelly sand filling with subangular gravel and slag up to 50mm in size with trace brick, concrete and steel, moist		E	0.35		PID <1		
				E	0.45		PID <1		
		At 0.35m, fibrous fragment, possible ACM							
		FILLING - Generally comprising yellow-brown, fine to coarse grained sand with some shells up to 10mm in size, moist							
	1			E	1.0		PID <1		1
		From 1.7m, clay in parts							
		From 1.9m, saturated		E	1.9		PID <1	▼	
	2								2
				E	2.4		PID <1		
		From 2.6m, grey							
	3 3.0	Bore discontinued at 3.0m , limit of investigation							3

RIG: 3.5 tonne excavator **DRILLER:** Paice **LOGGED:** West **CASING:** Nil

TYPE OF BORING: 300mm diameter solid flight auger

WATER OBSERVATIONS: Free groundwater observed at 1.9m, whilst augering

REMARKS: * Surface levels interpolated from survey plan provided by client

☒ 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

BOREHOLE LOG

CLIENT: Doma Holdings (NSW) Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 21 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 1.83m AHD*
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 102
PROJECT No: 91034.00
DATE: 20/12/2016
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)
	0.01	Spray Seal (Bitumen)							
		FILLING - Generally comprising brown, fine to medium sandy gravel and slag filling with subangular gravel and slag fragments up to 40mm in size, moist		E	0.1		PID <1		
	0.25								
	0.3	FILLING - Generally comprising brown gravelly sand filling with some subangular gravel and slag up to 50mm in size, moist		E	0.4		PID <1		
		FILLING - Generally comprising yellow-brown, fine to coarse grained sand filling with some shells, humid		A	0.55		PID<1		
		From 0.6m, with abundant plastic, glass, steel wire refuse							
1				A, E	1.0		PID<1		1
	1.2	FILLING - Generally comprising grey-brown clay filling with abundant refuse including plastic, terracotta, brick							
				A, E	1.5		PID<1		
	1.8	FILLING - Generally comprising brown, fine to coarse grained sand filling with abundant refuse, including plastic terracotta and brick with some clay in parts, saturated						▼	
2				A, E	2.0		PID<1		2
				E	2.6		PID <1		
	2.7	SAND - (Medium dense), yellow-brown, fine to coarse grained sand with abundant shells up to 15mm in size, saturated							
3	3.0	Bore discontinued at 3.0m , limit of investigation		A	3.0				3

RIG: 3.5 tonne excavator **DRILLER:** Paice **LOGGED:** West **CASING:** Nil

TYPE OF BORING: 300mm diameter solid flight auger

WATER OBSERVATIONS: Free groundwater observed at 1.8m, whilst augering

REMARKS: * Surface levels interpolated from survey plan provided by client

☒ 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

BOREHOLE LOG

CLIENT: Doma Holdings (NSW) Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 21 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 2.03m AHD*
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 103
PROJECT No: 91034.00
DATE: 19/12/2016
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)
	0.01	Spray Seal (Bitumen)							
		FILLING - Generally comprising brown, fine to medium sandy gravel and slag filling with subangular gravel and slag fragments up to 40mm in size, moist		E	0.1		PID <1		
	0.23	FILLING - Generally comprising brown gravelly sand filling with subangular gravel and slag up to 60mm in size with some shells up to 5mm in size, moist		E	0.4		PID <1		
	0.5	FILLING - Generally comprising grey-brown, fine to medium grained sand filling with some gravel and slag up to 60mm in size with trace cobble, moist		E	0.6		PID <1		
1									1
				E	1.2		PID <1		
	1.3	FILLING - Generally comprising yellow-brown, fine to coarse grained sand filling with some shells up to 30mm in size, moist		E	1.5		PID <1		
2		From 2.0m, saturated						▼	2
				E	2.3		PID <1		
	2.4	FILLING - Generally comprising grey-brown clay filling, slightly sandy with fine to medium grained sand and with trace glass		E	2.7		PID <1		
	2.8	SAND - (Medium dense), grey-brown, fine to coarse grained sand with some to abundant shells, saturated		E	2.9		PID <1		
3	3.0	Bore discontinued at 3.0m , limit of investigation							3

RIG: 3.5 tonne excavator **DRILLER:** Paice **LOGGED:** West **CASING:** Nil

TYPE OF BORING: 300mm diameter solid flight auger

WATER OBSERVATIONS: Free groundwater observed at 2.0m, whilst augering

REMARKS: * Surface levels interpolated from survey plan provided by client

☒ 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

BOREHOLE LOG

CLIENT: Doma Holdings (NSW) Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 21 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 2.10m AHD*
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 103W
PROJECT No: 91034.00
DATE: 19/12/2016
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.01	Spray Seal (Bitumen)							From 0m to 0.2m, concrete
	0.23	FILLING - Generally comprising brown, fine to medium sandy gravel and slag filling with subangular gravel and slag fragments up to 40mm in size, moist							From 0m to 0.5m, Class 18 PVC From 0.2m to 0.4m, bentonite
	0.5	FILLING - Generally comprising brown gravelly sand filling with subangular gravel and slag up to 60mm in size with some shells up to 5mm in size, moist							
	1	FILLING - Generally comprising grey-brown, fine to medium grained sand filling with some gravel and slag up to 60mm in size with trace cobble, moist		E,PID, ASS	1.0		2,12,13 N = 25 PID <1		1
	1.3	FILLING - Generally comprising yellow-brown, fine to coarse grained sand filling with some shells up to 30mm in size, moist			1.45				
	2	From 2.0m, saturated						▼	2
	2.4	FILLING - Generally comprising grey-brown clay filling, slightly sandy with fine to medium grained sand and with trace glass		E,PID, ASS	2.5		PID <1		From 0.4m to 5.0m, gravel From 0.5m to 5.0m, 50mm diameter Class 18 machine slotted PVC screen
	2.8	SAND - (Loose), grey-brown, fine to coarse grained sand with some to abundant shells, saturated			2.95				
	3 3.0	SAND - Loose, fine to coarse grained sand with some shell fragments, saturated							3

RIG: Truck mounted FG101 **DRILLER:** Fico **LOGGED:** Benson **CASING:** Nil

TYPE OF BORING: Solid flight auger to 5.0m

WATER OBSERVATIONS: Free groundwater observed at 2.0m, whilst augering

REMARKS: * Surface levels interpolated from survey plan provided by client

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: Doma Holdings (NSW) Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 21 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 2.10m AHD*
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 103W
PROJECT No: 91034.00
DATE: 19/12/2016
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
		SAND - Loose, fine to coarse grained sand with some shell fragments, saturated *(continued)*		E,PID, ASS	4.0		PID <1		
	4.3	SANDY CLAY - (Soft), dark grey, fine to medium grained sandy clay, trace shell fragments, M>Wp, (estuarine deposit)			4.45				
	4.5	SAND - (Loose), dark grey, fine grained sand with some clay, saturated (estuarine deposit)							
5	5.0	Bore discontinued at 5.0m , limit of investigation							End cap
6									
7									

RIG: Truck mounted FG101 **DRILLER:** Fico **LOGGED:** Benson **CASING:** Nil

TYPE OF BORING: Solid flight auger to 5.0m

WATER OBSERVATIONS: Free groundwater observed at 2.0m, whilst augering

REMARKS: * Surface levels interpolated from survey plan provided by client

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: Doma Holdings (NSW) Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 21 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 1.92m AHD*
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 104
PROJECT No: 91034.00
DATE: 20/12/2016
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)
	0.01	Spray Seal (Bitumen)							
		FILLING - Generally comprising brown, fine to medium sandy gravel and slag filling with subangular gravel and slag fragments up to 40mm in size, moist		E	0.1		PID <1		
	0.25								
		FILLING - Generally comprising brown sandy gravel filling with subangular gravel and slag up to 60mm in size with occasional slag cobbles up to 100mm in size, moist		E	0.3		PID <1		
	0.36								
		FILLING - Generally comprising yellow-brown, fine to coarse grained sand filling with some shells up to 5mm in size, moist		E	0.55		PID <1		
	1								1
		From 1.8m, saturated						▼	
	1.9								
	2	SAND - (Medium dense), brown, fine to coarse grained sand with some shells up to 15mm in size, saturated		E	2.0		PID <1		2
	3								3
	3.0	Bore discontinued at 3.0m , limit of investigation							

RIG: 3.5 tonne excavator **DRILLER:** Paice **LOGGED:** West **CASING:** Nil

TYPE OF BORING: 300mm diameter solid flight auger

WATER OBSERVATIONS: Free groundwater observed at 1.8m, whilst augering

REMARKS: * Surface levels interpolated from survey plan provided by client

☒ 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

BOREHOLE LOG

CLIENT: Doma Holdings (NSW) Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 21 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 1.91m AHD*
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 105
PROJECT No: 91034.00
DATE: 20/12/2016
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)
	0.01	Spray Seal (Bitumen)							
		FILLING - Generally comprising brown, fine to medium sandy gravel and slag filling with subangular gravel and slag fragments up to 40mm in size, moist		E	0.1		PID <1		
	0.22	FILLING - Generally comprising brown gravelly sand filling with gravel and slag up to 20mm in size, moist		E	0.4		PID <1		
	0.45	FILLING - Generally comprising grey-brown, fine to medium grained sand filling with some shells up to 5mm in size, moist							
	1			E	1.0		PID <1		
		From 1.8m, with some to abundant shells							
	2			E	2.0		PID <1		
	2.6	SAND - (Medium dense), grey-brown, fine to coarse grained sand with some to abundant shells, saturated						▼	
		From 2.8m, grey-brown with trace H2S odour							
	3 3.0	Bore discontinued at 3.0m , limit of investigation		E	3.0		PID <1		

RIG: 3.5 tonne excavator **DRILLER:** Paice **LOGGED:** West **CASING:** Nil

TYPE OF BORING: 300mm diameter solid flight auger

WATER OBSERVATIONS: Free groundwater observed at 2.6m, whilst augering

REMARKS: * Surface levels interpolated from survey plan provided by client

☐ 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

BOREHOLE LOG

CLIENT: Doma Holdings (NSW) Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 21 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 2.1m AHD*
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 106
PROJECT No: 91034.00
DATE: 20/12/2016
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)
	0.01	Spray Seal (Bitumen)							
		FILLING - Generally comprising brown, fine to medium sandy gravel and slag filling with subangular gravel and slag fragments up to 40mm in size, moist		E	0.1		PID <1		
	0.25	FILLING - Generally comprising brown gravelly sand filling with subangular gravel and slag up to 40mm in size, humid to moist		E	0.3		PID <1		
	0.35	FILLING - Generally comprising yellow-brown, fine to coarse grained sand filling with some shells up to 5mm in size, humid		E	0.5		PID <1		
		At 0.4m, concrete fragments							
		At 0.6m, concrete fragments							
	1	From 1.2m, moist		E	1.5		PID <1		
	2								
	2.3	FILLING? / SAND (Medium dense), brown, fine to coarse grained sand, possible filling with some to abundant shells up to 15mm in size, saturated		E	2.4		PID <1	▼	
		From 2.6m, grey							
		From 2.8m, clay in parts		E	2.8		PID <1		
	3 3.0	Bore discontinued at 3.0m , limit of investigation							

RIG: 3.5 tonne excavator **DRILLER:** Paice **LOGGED:** West **CASING:** Nil

TYPE OF BORING: 300mm diameter solid flight auger

WATER OBSERVATIONS: Free groundwater observed at 2.3m, whilst augering

REMARKS: * Surface levels interpolated from survey plan provided by client

☒ 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

BOREHOLE LOG

CLIENT: Doma Holdings (NSW) Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 21 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 2.31m AHD*
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 107
PROJECT No: 91034.00
DATE: 19/12/2016
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)
	0.01	Spray Seal (Bitumen)							
		FILLING - Generally comprising brown, fine to medium sandy gravel and slag filling with subangular gravel and slag fragments up to 40mm in size, moist		E	0.1		PID <1		
	0.28	FILLING - Generally comprising brown gravelly sand filling with subangular gravel up to 40mm in size and possible slag with occasional fragments of gravel in bituminous matrix, concrete and terracotta, moist		D E	0.35 0.4		PID <1		
	0.6	FILLING - Generally comprising yellow-brown, fine to coarse grained sand filling with occasional cobbles and boulders up to 20mm in size, moist		D	0.7		PID <1		
1	1.0	Bore discontinued at 1.0m , refusal on obstruction							1
2									2
3									3

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

RIG: 3.5 tonne excavator **DRILLER:** Paice **LOGGED:** West **CASING:** Nil

TYPE OF BORING: 300mm diameter solid flight auger

WATER OBSERVATIONS: No free groundwater observed, whilst augering

REMARKS: * Surface levels interpolated from survey plan provided by client

☒ 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

BOREHOLE LOG

CLIENT: Doma Holdings (NSW) Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 21 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 2.25m AHD*
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 108
PROJECT No: 91034.00
DATE: 20/12/2016
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)
	0.01	Spray Seal (Bitumen)							
		FILLING - Generally comprising brown, fine to medium sandy gravel and slag filling with subangular gravel and slag fragments up to 40mm in size, moist		E	0.1		PID <1		
	0.2	FILLING - Generally comprising dark grey gravelly sand filling with fine to medium grained sand and slag and concrete fragments up to 60mm in size, moist		E	0.4		PID <1		
	0.75	FILLING - Generally comprising yellow-brown, fine to medium grained sand filling with some shells up to 5mm in size, moist		E	1.0		PID <1		
	1								1
	2	From 2m, saturated		E	2.0		PID <1	▼	2
	2.8	CLAYEY SAND - (Medium dense), dark grey clayey sand with fine to coarse grained sand and abundant shells, saturated		E	2.9		PID <1		
	3 3.0	Bore discontinued at 3.0m , limit of investigation							3

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

RIG: 3.5 tonne excavator **DRILLER:** Paice **LOGGED:** West **CASING:** Nil

TYPE OF BORING: 300mm diameter solid flight auger

WATER OBSERVATIONS: Free groundwater observed at 2.0m, whilst augering

REMARKS: * Surface levels interpolated from survey plan provided by client

☒ 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

BOREHOLE LOG

CLIENT: Doma Holdings (NSW) Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 21 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 2.09m AHD*
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 109
PROJECT No: 91034.00
DATE: 20/12/2016
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)
	0.01	Spray Seal (Bitumen)							
		FILLING - Generally comprising brown, fine to medium sandy gravel and slag filling with subangular gravel and slag fragments up to 40mm in size, moist		E	0.1		PID <1		
	0.25	FILLING - Generally comprising brown gravelly sand filling with subangular gravel and slag up to 60mm in size, moist		A, E	0.4		PID<1		
	0.7	FILLING - Generally comprising yellow-brown, fine to medium grained sand filling with some shells, moist		A, E	1.0		PID<1		
				A	1.5		PID<1		
				E	2.0		PID <1		
	2.4	SAND (Medium dense), brown, fine to coarse grained sand with some shells up to 15mm in size, saturated		A	2.5		PID<1	▼	
	3.0	Bore discontinued at 3.0m , limit of investigation		E, A	3.0		PID <1		

RIG: 3.5 tonne excavator **DRILLER:** Paice **LOGGED:** West **CASING:** Nil

TYPE OF BORING: 300mm diameter solid flight auger

WATER OBSERVATIONS: Free groundwater observed at 2.4m, whilst augering

REMARKS: * Surface levels interpolated from survey plan provided by client

☐ 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

BOREHOLE LOG

CLIENT: Doma Holdings (NSW) Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 21 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 2.35m AHD*
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 110
PROJECT No: 91034.00
DATE: 20/12/2016
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)
	0.01	Spray Seal (Bitumen)							
		FILLING - Generally comprising brown, fine to medium sandy gravel and slag filling with subangular gravel and slag fragments up to 40mm in size, moist		E	0.1		PID <1		
	0.25	FILLING - Generally comprising brown gravelly sand / sandy gravel filling with subangular gravel, slag, concrete and brick fragments, up to 60mm in size, moist		E	0.4		PID <1		
		At 0.4m, fibrous fragment, possible ACM							
	0.75	FILLING - Generally comprising brown, fine to coarse grained sand filling with some shells up to 5mm in size, moist		E	0.8		PID <1		
1									1
		From 1.8m, saturated						▼	
2				E	2.2		PID <1		2
	2.6	SAND - (Medium dense), grey, fine to coarse grained sand with some to abundant shells, saturated		E	2.8		PID <1		
3	3.0	Bore discontinued at 3.0m , limit of investigation							3

RIG: 3.5 tonne excavator **DRILLER:** Paice **LOGGED:** West **CASING:** Nil

TYPE OF BORING: 300mm diameter solid flight auger

WATER OBSERVATIONS: Free groundwater observed at 1.8m, whilst augering

REMARKS: * Surface levels interpolated from survey plan provided by client

☒ 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

BOREHOLE LOG

CLIENT: Doma Holdings (NSW) Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 21 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 1.89m AHD*
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 111
PROJECT No: 91034.00
DATE: 19/12/2016
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)
	0.01	Spray Seal (Bitumen)							
		FILLING - Generally comprising brown, fine to medium sandy gravel and slag filling with subangular gravel and slag fragments up to 40mm in size, moist		E	0.1		PID <1		
	0.25			E	0.3		PID <1		
	0.35	FILLING - Generally comprising brown gravelly sand filling with subangular gravel up to 40mm in size with trace brick and steel, moist		E	0.45		PID <1		
		FILLING - Generally comprising yellow-brown, fine to coarse grained sand with some shells up to 15mm in size, moist							
	1			E	1.3		PID <1		
	2	From 2.0m, saturated						▼	
	2.4	SAND - Medium dense, grey, fine to coarse grained sand with some to abundant shells, saturated		E	2.5		PID <1		
	3 3.0	Bore discontinued at 3.0m , limit of investigation							

RIG: 3.5 tonne excavator **DRILLER:** Paice **LOGGED:** West **CASING:** Nil

TYPE OF BORING: 300mm diameter solid flight auger

WATER OBSERVATIONS: Free groundwater observed at 2.0m, whilst augering

REMARKS: * Surface levels interpolated from survey plan provided by client

☒ 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

BOREHOLE LOG

CLIENT: Doma Holdings (NSW) Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 21 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 2.33m AHD*
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 112
PROJECT No: 91034.00
DATE: 20/12/2016
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)
	0.01	Spray Seal (Bitumen)							
		FILLING - Generally comprising brown, fine to medium sandy gravel and slag filling with subangular gravel and slag fragments up to 40mm in size, moist		E	0.1		PID <1		
	0.25	FILLING - Generally comprising dark brown sandy gravel filling with subangular gravel, slag, brick and concrete fragments up to 60mm in size with occasional cobbles up to 200mm in size, moist		E	0.4		PID <1		
	0.6	Bore discontinued at 0.6m , refusal on obstruction							
	1								
	2								
	3								

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

RIG: 3.5 tonne excavator **DRILLER:** Paice **LOGGED:** West **CASING:** Nil

TYPE OF BORING: 300mm diameter solid flight auger

WATER OBSERVATIONS: No free groundwater observed, whilst augering

REMARKS: * Surface levels interpolated from survey plan provided by client

☒ 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

BOREHOLE LOG

CLIENT: Doma Holdings (NSW) Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 21 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 2.72m AHD*
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 113
PROJECT No: 91034.00
DATE: 19/12/2016
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)
	0.01	Spray Seal (Bitumen)							
		FILLING - Generally comprising brown, fine to medium sandy gravel and slag filling with subangular gravel and slag fragments up to 40mm in size, moist		E	0.1		PID <1		
	0.23	FILLING - Generally comprising brown sandy gravel filling with subangular igneous gravel and slag up to 40mm in size with trace steel wire, concrete, steel nails, moist		E	0.3		PID <1		
		At 0.6m, bituminous fragment		D	0.6				
	0.75	FILLING - Generally comprising yellow-brown, fine to medium grained sand filling with some shells up to 5mm in size, moist		E	0.9		PID <1		
		From 2.8m, saturated		E	2.2		PID <1	▼	
	2.9	Bore discontinued at 2.9m , limit of investigation							

RIG: 3.5 tonne excavator **DRILLER:** Paice **LOGGED:** West **CASING:** Nil

TYPE OF BORING: 300mm diameter solid flight auger

WATER OBSERVATIONS: Free groundwater observed at 2.8m, whilst augering

REMARKS: * Surface levels interpolated from survey plan provided by client

☒ 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

BOREHOLE LOG

CLIENT: Doma Holdings (NSW) Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 21 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 2.6m AHD*
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 114
PROJECT No: 91034.00
DATE: 19/12/2016
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)
	0.01	Spray Seal (Bitumen)							
		FILLING - Generally comprising brown, fine to medium sandy gravel and slag filling with subangular gravel and slag fragments up to 40mm in size, moist		E	0.1		PID<1		
	0.2	FILLING - Generally comprising brown, fine to coarse grained gravelly sand filling with subangular gravel and slag up to 40mm in size with trace concrete and coal fragments, moist		E	0.3		PID<1		
	0.45	FILLING - Generally comprising yellow-brown, fine to coarse grained sand with some abundant shells up to 20mm in size, moist		E	0.55		PID<1		
	1								1
	2			E	2.2		PID<1		2
		From 2.6m, saturated, possible natural						▼	
	3 3.0	Bore discontinued at 3.0m , limit of investigation							3

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

RIG: 3.5 tonne excavator **DRILLER:** Paice **LOGGED:** West **CASING:** Nil

TYPE OF BORING: 300mm diameter solid flight auger

WATER OBSERVATIONS: Free groundwater observed at 2.6m, whilst augering

REMARKS: * Surface levels interpolated from survey plan provided by client

☒ 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

BOREHOLE LOG

CLIENT: Doma Holdings (NSW) Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 21 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 2.63m AHD*
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 114W
PROJECT No: 91034.00
DATE: 19/12/2016
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.01	Spray Seal (Bitumen)							From 0m to 0.2m, concrete
	0.2	FILLING - Generally comprising brown, fine to medium sandy gravel and slag filling with subangular gravel and slag fragments up to 40mm in size, moist							From 0m to 0.5m, Class 18 PVC From 0.2m to 0.4m, bentonite
	0.45	FILLING - Generally comprising brown, fine to coarse grained gravelly sand filling with subangular gravel and slag up to 40mm in size with trace concrete and coal fragments, moist							
		FILLING - Generally comprising yellow-brown, fine to coarse grained sand with some abundant shells up to 20mm in size, moist							
	1			E,PID, ASS	1.0		3,6,9 N = 15 PID <1		
					1.45				
		From 1.9m, saturated						▼	
	2								
		From 2.6m, possible natural		E,PID, ASS	2.5		2,4,4 N = 8 PID <1		From 0.4m to 5.0m, gravel From 0.5m to 5.0m, 50mm diameter Class 18 machine slotted PVC screen
					2.95				
	3 3.0	SAND - (Loose), brown, fine to coarse grained sand with some shell fragments, saturated							

RIG: Truck mounted FG101 **DRILLER:** Fico **LOGGED:** Benson **CASING:** Nil

TYPE OF BORING: Solid flight auger to 5.95m

WATER OBSERVATIONS: Free groundwater observed at 1.9m, whilst augering

REMARKS: * Surface levels interpolated from survey plan provided by client

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: Doma Holdings (NSW) Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 21 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 2.63m AHD*
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 114W
PROJECT No: 91034.00
DATE: 19/12/2016
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
		SAND - (Loose), brown, fine to coarse grained sand with some shell fragments, saturated *(continued)*			4.0				
		From 4m, dark grey		E,PID, ASS			PID <1		
					4.45				
	5								End cap
					5.5				
				E,PID, ASS			0,1,6 N = 7 PID <1		
	5.95				5.95				
	6	Bore discontinued at 5.95m , limit of investigation							
	7								

RIG: Truck mounted FG101 **DRILLER:** Fico **LOGGED:** Benson **CASING:** Nil

TYPE OF BORING: Solid flight auger to 5.95m

WATER OBSERVATIONS: Free groundwater observed at 1.9m, whilst augering

REMARKS: * Surface levels interpolated from survey plan provided by client

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: Doma Holdings (NSW) Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 21 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 2.25m AHD*
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 115
PROJECT No: 91034.00
DATE: 20/12/2016
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)
	0.01	Spray Seal (Bitumen)							
		FILLING - Generally comprising brown, fine to medium sandy gravel and slag filling with subangular gravel and slag fragments up to 40mm in size, moist		E	0.1		PID <1		
	0.25	FILLING - Generally comprising brown sandy gravel filling with occasional fragments of brick and concrete, moist		E	0.3		PID <1		
	0.4	FILLING - Generally comprising yellow-brown, fine to medium grained sand filling with some shells up to 5mm in size, moist							
	1			E	1.0		PID <1		
	2	From 2m, saturated		E	2.0		PID <1	▼	
	2.4	SAND - (Medium dense), grey-brown, fine to coarse grained sand with some to abundant shells up to 5mm in size, saturated							
		From 2.8m, grey		E	2.9		PID <1		
	3 3.0	Bore discontinued at 3.0m , limit of investigation							

RIG: 3.5 tonne excavator **DRILLER:** Paice **LOGGED:** West **CASING:** Nil

TYPE OF BORING: 300mm diameter solid flight auger

WATER OBSERVATIONS: Free groundwater observed at 2.0m, whilst augering

REMARKS: * Surface levels interpolated from survey plan provided by client

☐ 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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BOREHOLE LOG

CLIENT: Doma Holdings (NSW) Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 21 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 2.08m AHD*
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 116
PROJECT No: 91034.00
DATE: 20/12/2016
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)
	0.01	Spray Seal (Bitumen)							
		FILLING - Generally comprising brown, fine to medium sandy gravel and slag filling with subangular gravel and slag fragments up to 40mm in size, moist		E	0.1		PID<1		
	0.2	FILLING - Generally comprising brown sandy gravel filling with subangular gravel, slag, brick and concrete fragments up to 60mm in size with trace steel, moist		A, E	0.4		PID<1		
	0.6	FILLING - Generally comprising yellow-brown, fine to medium grained sand with some shells up to 5mm in size, saturated							
	1			A, E	1.0		PID<1		
		From 1.6m, saturated		A	1.5		PID<1	▼	
	2 2.0	SAND - (Medium dense), grey, fine to coarse grained sand with some to abundant shells, saturated		A, E	2.0				
				A	2.5		PID<1		
	3 3.0	Bore discontinued at 3.0m , limit of investigation		A, E	3.0		PID<1		

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

RIG: 3.5 tonne excavator **DRILLER:** Paice **LOGGED:** West **CASING:** Nil

TYPE OF BORING: 300mm diameter solid flight auger

WATER OBSERVATIONS: Free groundwater observed at 1.6m, whilst augering

REMARKS: * Surface levels interpolated from survey plan provided by client

☐ 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

BOREHOLE LOG

CLIENT: Doma Holdings (NSW) Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 21 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 2.14m AHD*
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 116W
PROJECT No: 91034.00
DATE: 19/12/2016
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.01	Spray Seal (Bitumen)							From 0m to 0.2m, concrete
	0.2	FILLING - Generally comprising brown, fine to medium sandy gravel and slag filling with subangular gravel and slag fragments up to 40mm in size, moist							From 0m to 0.5m, Class 18 PVC From 0.2m to 0.4m, bentonite
		FILLING - Generally comprising brown sandy gravel filling with subangular gravel, slag, brick and concrete fragments up to 60mm in size with trace steel, moist							
	0.6	FILLING - Generally comprising yellow-brown, fine to medium grained sand with some shells up to 5mm in size, saturated							
1				E,PID, ASS	1.0		4,7,10 N = 17 PID <1		1
					1.45				
		From 1.6m, saturated							
2	2.0	SAND - (Medium dense), grey, fine to coarse grained sand with some to abundant shells, saturated						▼	2
				E,PID, ASS	2.5		1,3,4 N = 7 PID <1		From 0.4m to 5.0m, gravel From 0.4m to 5.0m, 50mm diameter Class 18 machine slotted PVC screen
3					2.95				3
	3.2	CLAYEY SAND - (Loose), dark grey, fine to coarse grained clayey sand, some silt, (estuarine deposit), trace shell fragments, saturated							

RIG: Truck mounted FG101 **DRILLER:** Fico **LOGGED:** Benson **CASING:** Nil

TYPE OF BORING: Solid flight auger to 5.95m

WATER OBSERVATIONS: Free groundwater observed at 2.0m, whilst augering

REMARKS: * Surface levels interpolated from survey plan provided by client

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: Doma Holdings (NSW) Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 21 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 2.14m AHD*
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 116W
PROJECT No: 91034.00
DATE: 19/12/2016
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
		CLAYEY SAND - (Loose), dark grey, fine to coarse grained clayey sand, some silt, (estuarine deposit), trace shell fragments, saturated *(continued)*		E,PID, ASS	4.0		PID <1		
	4.5	CLAYEY SILT - (Soft), dark grey clayey silt with some fine to coarse grained sand (estuarine deposit), M>Wp			4.45				
5	5.0	SAND - (Loose), grey, fine to coarse grained sand, trace shell fragments			5.5				End cap
				E,PID, ASS			PID <1		
	5.95	Bore discontinued at 5.95m , limit of investigation			5.95				
6									6
7									7

RIG: Truck mounted FG101 **DRILLER:** Fico **LOGGED:** Benson **CASING:** Nil

TYPE OF BORING: Solid flight auger to 5.95m

WATER OBSERVATIONS: Free groundwater observed at 2.0m, whilst augering

REMARKS: * Surface levels interpolated from survey plan provided by client

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: Doma Holdings (NSW) Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 21 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 2.36m AHD*
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 117
PROJECT No: 91034.00
DATE: 20/12/2016
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)
	0.01	Spray Seal (Bitumen)							
		FILLING - Generally comprising brown, fine to medium sandy gravel and slag filling with subangular gravel and slag fragments up to 40mm in size, moist		E	0.1		PID <1		
	0.22	FILLING - Generally comprising brown sandy gravel filling with subangular gravel and slag with concrete fragments up to 60mm in size, trace porcelain, moist		A, E	0.4		PID <1		
	0.7	FILLING - Generally comprising yellow-brown, fine to coarse grained sand filling with some shells up to 10mm in size, moist		A, E	1.0		PID <1		
1				A	1.5		PID<1		1
				A, E	2.0		PID<1		
2	2.4	SAND - (Medium dense), brown, fine to coarse grained sand with some to abundant shells, saturated		A	2.5		PID<1	▼	2
3	3.0	Bore discontinued at 3.0m , limit of investigation		A, E	3.0		PID <1		3

RIG: 3.5 tonne excavator **DRILLER:** Paice **LOGGED:** West **CASING:** Nil

TYPE OF BORING: 300mm diameter solid flight auger

WATER OBSERVATIONS: Free groundwater observed at 2.4m, whilst augering

REMARKS: * Surface levels interpolated from survey plan provided by client

☐ 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

BOREHOLE LOG

CLIENT: Doma Holdings (NSW) Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 21 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 2.85m AHD*
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 118
PROJECT No: 91034.00
DATE: 19/12/2016
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
	0.01	Spray Seal (Bitumen)							
		FILLING - Generally comprising brown, fine to medium sandy gravel and slag filling with subangular gravel and slag fragments up to 40mm in size, moist		E	0.1		PID <1		
	0.2	FILLING - Generally comprising dark brown sandy gravel filling with igneous gravel and concrete fragments up to 60mm in size, moist		E	0.3		PID <1		
1	1.0	Bore discontinued at 1.0m , refusal on obstruction							1
2									2
3									3

RIG: 3.5 tonne excavator **DRILLER:** Paice **LOGGED:** West **CASING:** Nil
TYPE OF BORING: 300mm diameter solid flight auger
WATER OBSERVATIONS: No free groundwater observed, whilst augering
REMARKS: * Surface levels interpolated from survey plan provided by client

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: Doma Holdings (NSW) Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 21 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 2.65m AHD*
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 119
PROJECT No: 91034.00
DATE: 16/12/2016
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)
	0.01	Spray Seal (Bitumen)		E	0.05		PID <1		
	0.25	FILLING - Generally comprising brown, fine to medium sandy gravel and slag filling with subangular gravel and slag fragments up to 40mm in size, moist		E	0.3		PID <1		
		FILLING - Generally comprising brown gravelly, fine to medium grained sand filling with subangular gravel and slag upto 60mm in size with occasional brick, concrete, steel reinforcement and glass, moist		D	0.4				
	0.6	From 0.4m, gravel with bituminous matrix fragment							
		FILLING - Generally comprising yellow-brown, fine to coarse grained sand with some shells up to 40mm in size, moist		E	0.7		PID <1		
	1								1
				E	1.5		PID <1		
	2	From 2.0m, possible natural							2
	2.3	SAND - (Medium dense), yellow-brown, fine to coarse grained sand with some to abundant sheels up to 40mm in size, moist to wet		E	2.4		PID <1		
		From 2.7m, saturated						▼	
	3 3.0	Bore discontinued at 3.0m , limit of investigation							3

RIG: 3.5 tonne excavator **DRILLER:** Paice **LOGGED:** West **CASING:** Nil

TYPE OF BORING: 300mm diameter solid flight auger

WATER OBSERVATIONS: Free groundwater observed at 2.7m, whilst augering

REMARKS: * Surface levels interpolated from survey plan provided by client

☒ 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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BOREHOLE LOG

CLIENT: Doma Holdings (NSW) Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 21 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 2.25m AHD*
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 120
PROJECT No: 91034.00
DATE: 16/12/2016
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)
	0.01	Spray Seal (Bitumen)		E	0.05		PID <1		
		FILLING - Generally comprising brown, fine to medium sandy gravel and slag filling with subangular gravel and slag fragments up to 40mm in size, moist		E	0.25		PID <1		
	0.22			E	0.3		PID <1		
	0.28	FILLING - Generally comprising of brown sand filling with subrounded to subangular gravel and slag up to 50mm insize, moist							
		FILLING - Generally comprising yellow-brown, fine to medium grained sand filling with some shells up to 30mm in size, moist							
	1			E	1.0		PID <1		
		From 1.5m, possible natural							
	2								
	2.2	SAND - (Medium dense), yellow-brown, fine to coarse grained sand with some to abundant shells up to 30mm in size, saturated		E	2.3		PID <1	▼	
		From 2.7m, grey							
	3 3.0	Bore discontinued at 3.0m , limit of investigation							

RIG: 3.5 tonne excavator **DRILLER:** Paice **LOGGED:** West **CASING:** Nil

TYPE OF BORING: 300mm diameter solid flight auger

WATER OBSERVATIONS: Free groundwater observed at 2.3m, whilst augering

REMARKS: * Surface levels interpolated from survey plan provided by client

☒ 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

BOREHOLE LOG

CLIENT: Doma Holdings (NSW) Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 21 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 2.01m AHD*
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 121
PROJECT No: 91034.00
DATE: 19/12/2016
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)
	0.01	Spray Seal (Bitumen)							
		FILLING - Generally comprising brown, fine to medium sandy gravel and slag filling with subangular gravel and slag fragments up to 40mm in size, moist		E	0.1		PID <1		
	0.2	FILLING - Generally comprising brown gravelly, fine to medium grained sand filling with subangular gravel up to 60mm in size with some slag gravel and trace brick and plastic, moist		E	0.3		PID <1		
	0.6	FILLING - Generally comprising yellow-brown, fine to medium grained sand filling, moist		E	0.7		PID <1		
	1	From 1.0m, fine to coarse grained with some shells up to 5mm in size							
				E	1.5		PID <1		
	2	2.0 SAND - Medium dense, grey-brown, fine to coarse grained sand with some to abundant shells up to 15mm in size, saturated						▼	
				E	2.3		PID <1		
		From 2.4m, grey							
	3	3.0 Bore discontinued at 3.0m , limit of investigation							

RIG: 3.5 tonne excavator **DRILLER:** Paice **LOGGED:** West **CASING:** Nil

TYPE OF BORING: 300mm diameter solid flight auger

WATER OBSERVATIONS: Free groundwater observed at 2.0m, whilst augering

REMARKS: * Surface levels interpolated from survey plan provided by client

☒ 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

BOREHOLE LOG

CLIENT: Doma Holdings (NSW) Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 21 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 2.45m AHD*
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 122
PROJECT No: 91034.00
DATE: 16/12/2016
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)
	0.01	Spray Seal (Bitumen)		E	0.05		PID <1		
	0.22	FILLING - Generally comprising brown, fine to medium sandy gravel and slag filling with subangular gravel and slag fragments up to 40mm in size, moist		E	0.3		PID <1		
	0.5	FILLING - Generally comprising brown gravelly sand filling with subangular gravel and slag up to 60mm in size with some cobbles up to 200mm in size and trace plastic and coal chitter, moist		A	0.55				
		FILLING - Generally comprising yellow-brown, fine to coarse grained sand with some shells, moist		E	0.6		PID <1		
	1			A	1.0				
				E	1.4		PID <1		
				A	1.5				
	2			A	2.0		PID<1		
				A	2.5				
	2.6	SAND - (Medium dense), yellow-brown, fine to coarse grained sand with some abundant shells up to 30mm in size, saturated		E	2.7		PID <1	▼	
	3 3.0	Bore discontinued at 3.0m , limit of investigation		A	3.0				

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

RIG: 3.5 tonne excavator **DRILLER:** Paice **LOGGED:** West **CASING:** Nil

TYPE OF BORING: 300mm diameter solid flight auger

WATER OBSERVATIONS: Free groundwater observed at 2.7m, whilst augering

REMARKS: * Surface levels interpolated from survey plan provided by client

☒ 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

BOREHOLE LOG

CLIENT: Doma Holdings (NSW) Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 21 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 2.85m AHD*
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 123
PROJECT No: 91034.00
DATE: 19/12/2016
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)
	0.01	Spray Seal (Bitumen)							
		FILLING - Generally comprising brown, fine to medium sandy gravel and slag filling with subangular gravel and slag fragments up to 40mm in size, moist		E	0.1		PID <1		
	0.3	FILLING - Generally comprising brown gravelly, fine to medium grained sand filling with subangular gravel and slag up to 30mm in size, moist		E	0.3		PID <1		
	0.6	FILLING - Generally comprising brown, fine to medium grained sand filling with some subangular to subrounded gravel up to 30mm in size and some shells up to 20mm in size, moist		E	0.7		PID <1		
	1.8	FILLING - Generally comprising yellow-brown, fine to medium grained sand filling with some shells, moist		E	1.9		PID <1		
	2.6	SAND - Medium dense, yellow-brown, fine to coarse grained sand with some to abundant shells up to 20mm in size, saturated			2.8		PID <1	▼	
	3.0	Bore discontinued at 3.0m , limit of investigation							

RIG: 3.5 tonne excavator **DRILLER:** Paice **LOGGED:** West **CASING:** Nil

TYPE OF BORING: 300mm diameter solid flight auger

WATER OBSERVATIONS: Free groundwater observed at 2.6m, whilst augering

REMARKS: * Surface levels interpolated from survey plan provided by client

☒ 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

BOREHOLE LOG

CLIENT: Doma Holdings (NSW) Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 21 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 2.66m AHD*
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 124
PROJECT No: 91034.00
DATE: 15/12/2016
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)
	0.01	Spray Seal (Bitumen)		E	0.05		PID <1		
	0.17	FILLING - Generally comprising brown, fine to medium sandy gravel and slag filling with subangular gravel and slag fragments up to 40mm in size, moist							
		FILLING - Generally comprising grey-brown sandy gravel filling with subangular igneous gravel up to 60mm in size, moist		E	0.4		PID <1		
	0.45	FILLING - Generally comprising yellow-brown, fine to coarse grained sand filling with some shells up to 20mm in size, humid		E	0.6		PID <1		
	1	From 1m, moist							1
				E	1.5		PID <1		
	2								2
	2.5	SAND - (Medium dense), brown, fine to coarse grained sand with some shells up to 40mm in size, saturated						▼	
		From 2.7m to 2.9m, with abundant shells		E	2.7		PID<1		
	3								3
	3.0	Bore discontinued at 3.0m , limit of investigation							

RIG: 3.5 tonne excavator **DRILLER:** Paice **LOGGED:** West **CASING:** Nil

TYPE OF BORING: 300mm diameter solid flight auger

WATER OBSERVATIONS: Free groundwater observed at 2.6m, whilst augering

REMARKS: * Surface levels interpolated from survey plan provided by client

☒ 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

BOREHOLE LOG

CLIENT: Doma Holdings (NSW) Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 21 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 2.29m AHD*
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 125
PROJECT No: 91034.00
DATE: 16/12/2016
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)
	0.01	Spray Seal (Bitumen)		E	0.05		PID <1		
	0.2	FILLING - Generally comprising brown, fine to medium sandy gravel and slag filling with subangular gravel and slag fragments up to 40mm in size, moist		E	0.3		PID <1		
	0.45	FILLING - Generally comprising brown, fine to medium grained sand filling with some subrounded to subangular gravel up to 20mm in size and clay in parts, moist		E	0.5		PID <1		
	1	FILLING - Generally comprising yellow-brown, fine to medium grained sand with some shells up to 20mm in size, humid From 1.0m, humid to moist							
				E	1.5		PID <1		
	2								
	2.4	SAND - (Medium dense), yellow-brown, fine to coarse grained sand with some to abundant shells up to 30mm in size, saturated		E	2.6		PID <1	▼	
	3								
	3.0	Bore discontinued at 3.0m , limit of investigation							

RIG: 3.5 tonne excavator **DRILLER:** Paice **LOGGED:** West **CASING:** Nil

TYPE OF BORING: 300mm diameter solid flight auger

WATER OBSERVATIONS: Free groundwater observed at 2.4m, whilst augering

REMARKS: * Surface levels interpolated from survey plan provided by client

☒ 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

BOREHOLE LOG

CLIENT: Doma Holdings (NSW) Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 21 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 1.99m AHD*
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 126
PROJECT No: 91034.00
DATE: 15/12/2016
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)
	0.01	Spray Seal (Bitumen)		E	0.05		PID <1		
	0.2	FILLING - Generally comprising brown, fine to medium sandy gravel and slag filling with subangular gravel and slag fragments up to 40mm in size, moist							
	0.45	FILLING - Generally comprising brown gravelly sand filling with fine to coarse grained sand and subangular gravel and slag up to 60mm in size, moist		E	0.4		PID <1		
		FILLING - Generally comprising yellow-brown, fine to medium grained sand filling with some shells up to 5mm in size and some gravel, moist		E	0.5		PID <1		
1		From 1.0m, sandstone cobbles up to 200mm in size		E	1.2		PID <1		1
				E	1.8		PID <1		
2	2.0	Bore discontinued at 2.0m , refusal on sandstone boulder							2
3									3

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

RIG: 3.5 tonne excavator **DRILLER:** Paice **LOGGED:** West **CASING:** Nil

TYPE OF BORING: 300mm diameter solid flight auger

WATER OBSERVATIONS: No free groundwater observed, whilst augering

REMARKS: * Surface levels interpolated from survey plan provided by client

☒ 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

BOREHOLE LOG

CLIENT: Doma Holdings (NSW) Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 21 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 2.38m AHD*
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 127
PROJECT No: 91034.00
DATE: 16/12/2016
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)
	0.01	Spray Seal (Bitumen)		E	0.05		PID <1		
	0.23	FILLING - Generally comprising brown, fine to medium sandy gravel and slag filling with subangular gravel and slag fragments up to 40mm in size, moist		E	0.3		PID <1		
		FILLING - Generally comprising brown gravelly sand filling with fine to medium grained sand and subrounded to subangular gravel up to 30mm in size with trace to some shells, moist From 0.5m, with steel fragments At 0.6m, possible ACM fragment		E	0.6		PID <1		
	0.7	FILLING - Generally comprising yellow-brown, fine to coarse grained sand with some shells up to 40mm in size, humid to moist		E	0.8		PID <1		
1									1
				E	1.5		PID <1		
2									2
	2.5	SAND - (Medium dense), grey, fine to coarse grained sand with abundant shells up to 20mm in size, saturated		E	2.7		PID <1	▼	
3	3.0	Bore discontinued at 3.0m , limit of investigation							3

RIG: 3.5 tonne excavator **DRILLER:** Paice **LOGGED:** West **CASING:** Nil

TYPE OF BORING: 300mm diameter solid flight auger

WATER OBSERVATIONS: Free groundwater observed at 2.5m, whilst augering

REMARKS: * Surface levels interpolated from survey plan provided by client

☒ 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

BOREHOLE LOG

CLIENT: Doma Holdings (NSW) Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 21 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 2.65m AHD*
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 128
PROJECT No: 91034.00
DATE: 16/12/2016
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)
	0.01	Spray Seal (Bitumen)		E	0.05		PID <1		
	0.22	FILLING - Generally comprising brown, fine to medium sandy gravel and slag filling with subangular gravel and slag fragments up to 40mm in size, moist		D, E	0.3		PID <1		
		FILLING - Generally comprising brown gravelly sand filling with subangular gravel and slag up to 30mm in size with trace brick, wire, moist		E	0.4		PID <1		
	0.5	At 0.3m, fibrous fragment, possible ACM From 0.4m with some coal chitter		E	0.6		PID <1		
		FILLING - Generally comprising yellow-brown, fine to coarse grained sand filling with some shells up to 20mm in size, moist							
	1								1
				E	1.5		PID <1		
		From 1.8m, with shells up to 30mm in size, moist							
	2	From 2.0m, possible natural, moist to wet							2
	2.6	SAND - Medium dense, grey, fine to coarse grained sand with some shells, saturated		E	2.7		PID <1	▼	
		From 2.8m, with abundant shells							
	3 3.0	Bore discontinued at 3.0m , limit of investigation							3

RIG: 3.5 tonne excavator **DRILLER:** Paice **LOGGED:** West **CASING:** Nil

TYPE OF BORING: 300mm diameter solid flight auger

WATER OBSERVATIONS: Free groundwater observed at 2.6m, whilst augering

REMARKS: * Surface levels interpolated from survey plan provided by client

☒ 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

BOREHOLE LOG

CLIENT: Doma Holdings (NSW) Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 21 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 2.85m AHD*
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 129
PROJECT No: 91034.00
DATE: 19/12/2016
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)
	0.01	Spray Seal (Bitumen)							
		FILLING - Generally comprising brown, fine to medium sandy gravel and slag filling with subangular gravel and slag fragments up to 40mm in size, moist		E	0.1		PID <1		
	0.22	FILLING - Generally comprising brown gravelly sand filling with subangular gravel and slag up to 40mm in size with trace brick and plastic, moist		E	0.3		PID <1		
		At 0.4m, gravel in bituminous matrix		D	0.4				
	0.55	FILLING - Generally comprising yellow-brown, fine to coarse grained sand filling with some shells up to 10mm in size, moist		E	0.6		PID <1		
	1								1
				E	1.5		PID <1		
	2								2
	2.6	SAND - Medium dense, brown, fine to medium grained sand with some shells up to 5mm in size, saturated		E	2.7		PID <1	▼	
		From 2.7m to 2.8m, with abundant shells up to 15mm in size							
	3 3.0	Bore discontinued at 3.0m , limit of investigation							3

RIG: 3.5 tonne excavator **DRILLER:** Paice **LOGGED:** West **CASING:** Nil

TYPE OF BORING: 300mm diameter solid flight auger

WATER OBSERVATIONS: Free groundwater observed at 2.6m, whilst augering

REMARKS: * Surface levels interpolated from survey plan provided by client

☒ 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

BOREHOLE LOG

CLIENT: Doma Holdings (NSW) Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 21 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 2.56m AHD*
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 130
PROJECT No: 91034.00
DATE: 15/12/2016
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
	0.01	Spray Seal (Bitumen)		E	0.05		PID <1		
	0.2	FILLING - Generally comprising brown, fine to medium grained sandy gravel and slag filling with subangular gravel and slag fragments up to 40mm in size, moist		E	0.3		PID <1		
	0.4	FILLING - Generally comprising brown sandy gravel filling with subangular gravel and slag up to 60mm in size with occasional cobbles, and fine to medium grained sand, with trace steel, moist		A	0.5				
		FILLING - Generally comprising yellow brown, fine to medium grained sand with trace to some shells, moist		E	0.6		PID <1		
1				A	1.0				1
				E	1.2		PID <1		
				A	1.5				
2		From 2.0m, possible natural		A	2.0				2
				E	2.1		PID <1		
		From 2.3m to 2.4m, fine to coarse grained with abundant shells							
		From 2.5m, saturated						▼	
				E	2.6		PID <1		
	2.7	SAND - (Loose), grey, fine to coarse grained sand with some shells up to 10mm in size, saturated							
				E	2.9		PID <1		
3	3.0	Bore discontinued at 3.0m , limit of investigation		A	3.0				3

RIG: 3.5 tonne excavator **DRILLER:** Paice **LOGGED:** West **CASING:** Nil

TYPE OF BORING: 300mm diameter solid flight auger

WATER OBSERVATIONS: Free groundwater observed at 2.5m, whilst augering

REMARKS: * Surface levels interpolated from survey plan provided by client

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: Doma Holdings (NSW) Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 21 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 2.62m AHD*
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 130W
PROJECT No: 91034.00
DATE: 19/12/2016
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.01	Spray Seal (Bitumen)							From 0m to 0.2m, concrete
	0.2	FILLING - Generally comprising brown, fine to medium grained sandy gravel and slag filling with subangular gravel and slag fragments up to 40mm in size, moist							From 0m to 0.5m, Class 18 PVC From 0.2m to 0.4m, bentonite
	0.4	FILLING - Generally comprising brown sandy gravel filling with subangular gravel and slag up to 60mm in size with occasional cobbles, and fine to medium grained sand, with trace steel, moist							
		FILLING - Generally comprising yellow brown, fine to medium grained sand with trace to some shells, moist							
	1				1.0				1
				E			7,11,12 N = 23 PID <1		
					1.45				
	2	From 2.0m, possible natural						▼	2
		From 2.3m to 2.4m, fine to coarse grained with abundant shells							
		From 2.5m, saturated			2.5				
	2.7	SAND - (Loose), grey, fine to coarse grained sand with some shells up to 10mm in size, saturated		E			PID <1		From 0.4m to 5.0m, gravel From 0.4m to 5.0m, 50mm diameter Class 18 machine slotted PVC screen
	2.8	SAND - (Loose), dark grey, fine to coarse grained sand, some shell fragments, with estuarine deposits, saturated			2.95				
	3								3

RIG: Truck mounted FG101 **DRILLER:** Fico **LOGGED:** Benson **CASING:** Nil

TYPE OF BORING: Solid flight auger to 5.95m

WATER OBSERVATIONS: Free groundwater observed at 2.0m, whilst augering

REMARKS: * Surface levels interpolated from survey plan provided by client

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: Doma Holdings (NSW) Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 21 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 2.62m AHD*
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 130W
PROJECT No: 91034.00
DATE: 19/12/2016
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
		SAND - (Loose), dark grey, fine to coarse grained sand, some shell fragments, with estuarine deposits, saturated *(continued)*			4.0				
		From 4.3m, trace to some silt		E			PID <1		
	5				4.45				End cap
					5.5				
				E			PID <1		
	5.95	Bore discontinued at 5.95m , limit of investigation			5.95				
	6								
	7								

RIG: Truck mounted FG101 **DRILLER:** Fico **LOGGED:** Benson **CASING:** Nil

TYPE OF BORING: Solid flight auger to 5.95m

WATER OBSERVATIONS: Free groundwater observed at 2.0m, whilst augering

REMARKS: * Surface levels interpolated from survey plan provided by client

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: Doma Holdings (NSW) Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 21 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 2.2m AHD*
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 131
PROJECT No: 91034.00
DATE: 15/12/2016
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)
	0.01	Spray Seal (Bitumen)		E	0.05		PID <1		
	0.1	FILLING - Generally comprising brown, fine to medium grained sandy gravel and slag filling with subangular gravel and slag fragments up to 40mm in size, moist		E	0.15		PID <1		
	0.2	FILLING - Generally comprising grey sandy gravel filling with subangular gravel and slag up to 20mm in size, moist		D	0.3				
		FILLING - Generally comprising brown gravelly sand filling with subangular gravel up to 40mm in size and fine to medium grained sand with trace brick and plastic, moist		E	0.4		PID <1		
		At 0.3m, gravel in bituminous matrix		A	0.5				
	0.6	At 0.55m, gravel in bituminous matrix							
		FILLING - Medium dense to dense, yellow brown, fine to coarse grained sand with some shells up to 5mm in size, moist		E	0.7		PID <1		
1				A	1.0				1
				A, E	1.5		PID <1		
2		From 2.0m, saturated		A, E	2.0			▼	2
				E	2.4		PID <1		
	2.6	SAND - (Medium dense), grey, fine to coarse grained sand with some shells up to 10mm in size, saturated		E	2.8		PID <1		
3	3.0	Bore discontinued at 3.0m , limit of investigation		A	3.0				3

RIG: 3.5 tonne excavator **DRILLER:** Paice **LOGGED:** West **CASING:** Nil

TYPE OF BORING: 300mm diameter solid flight auger

WATER OBSERVATIONS: Free groundwater observed at 2.0m, whilst augering

REMARKS: * Surface levels interpolated from survey plan provided by client

☒ 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

BOREHOLE LOG

CLIENT: Doma Holdings (NSW) Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 21 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 2.13m AHD*
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 132
PROJECT No: 91034.00
DATE: 15/12/2016
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)
	0.02	Spray Seal (Bitumen)		E	0.05		PID <1		
	0.14	FILLING - Generally comprising brown, fine to medium sandy gravel and slag filling with subangular gravel and slag fragments up to 40mm in size, moist							
	0.25	FILLING - Generally comprising grey, fine to medium grained sandy gravel and slag filling with subangular gravel and slag up to 40mm in size, moist		E	0.3		PID <1		
				E	0.4		PID <1		
				E	0.45		PID <1		
		FILLING - Generally comprising gravelly fine to medium grained sand filling with subangular gravel up to 40mm in size with trace tile, concrete, moist		ASS D	0.5				
	0.6	At 0.3m, gravel in bituminous matrix fragments							
		At 0.45m, gravel in bituminous matrix fragments							
		At 0.5m, gravel in bituminous matrix fragments		E	0.8		PID <1		
1	1.0	FILLING - Generally comprising brown gravelly, fine to medium grained sand filling with some sandstone cobbles up to 200mm in size and trace to some shells, moist							1
		FILLING - Generally comprising yellow-brown, fine to medium grained sand filling with some sand and cobbles up to 200mm in size and trace to some shells up to 5mm in size, moist		E	1.1		PID <1		
				E, ASS	1.5		PID <1		
				E, ASS	1.9		PID <1		
2	2.0	Bore discontinued at 2.0m , refusal on sandstone boulder							2
3									3

RIG: 3.5 tonne excavator **DRILLER:** Paice **LOGGED:** West **CASING:** Nil

TYPE OF BORING: 300mm diameter solid flight auger

WATER OBSERVATIONS: No free groundwater observed, whilst augering

REMARKS: * Surface levels interpolated from survey plan provided by client

☒ 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

BOREHOLE LOG

CLIENT: Doma Holdings (NSW) Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 21 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 2.45m AHD*
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 133
PROJECT No: 91034.00
DATE: 15/12/2016
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)
	0.01	Spray Seal (Bitumen)							
	0.12	FILLING - Generally comprising brown, fine to medium grained sandy gravel and slag filling with subangular gravel and slag fragments up to 40mm in size, moist		E	0.1		PID <1		
	0.22	FILLING - Generally comprising grey, fine to medium grained sandy gravel and slag filling with subangular gravel and slag up to 40mm in size, moist		E	0.2		PID <1		
		FILLING - Generally comprising brown sandy gravel / gravelly sand with fine to medium grained sand and subrounded to subangular gravel, slag and concrete up to 60mm in size, moist		E	0.4		PID <1		
	0.7	FILLING - Generally comprising yellow-brown, fine to medium grained sand filling with some subangular gravel up to 40mm in size, and shells up to 20mm in size, moist		E	0.8		PID <1		
1	1.1	FILLING- Medium dense, yellow-brown, fine to coarse grained sand with trace to some shells up to 20mm in size, moist		E	1.3		PID <1		1
				E	1.6		PID <1		
2		From 2.2m, saturated double natural		E	2.1		PID <1	▼	2
				E	2.6		PID <1		
3	3.0	Bore discontinued at 3.0m , limit of investigation							3

RIG: 3.5 tonne excavator **DRILLER:** Paice **LOGGED:** West **CASING:** Nil

TYPE OF BORING: 300mm diameter solid flight auger

WATER OBSERVATIONS: Free groundwater observed at 2.2m, whilst augering

REMARKS: * Surface levels interpolated from survey plan provided by client

☒ 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

BOREHOLE LOG

CLIENT: Doma Holdings (NSW) Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 21 Honeysuckle Drive, Newcastle

SURFACE LEVEL: 2.75m AHD*
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 134
PROJECT No: 91034.00
DATE: 15/12/2016
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)
	0.01	Spray Seal (Bitumen)		E	0.05		PID <1		
	0.2	FILLING - Generally comprising brown, fine to medium grained sandy gravel and slag filling with subangular gravel and slag fragments up to 40mm in size, moist							
		FILLING - Generally comprising brown gravelly sand filling with fine to coarse grained sand and subangular gravel and slag up to 40mm in size with trace to some shells, saturated		E	0.4		PID <1		
	0.45			E	0.5		PID <1		
		FILLING - Generally comprising yellow-brown, fine to coarse grained sand with some shells up to 10mm in size, moist							
	1			E	1.1		PID <1		
		From 1.3m, with some gravel and slag up to 40mm in size		E	1.4		PID <1		
		At 1.5m, metal fragment							
	2			E	1.9		PID <1		
		From 2.2m, possible natural, wet		E	2.4		PID <1	▼	
		From 2.5m, saturated							
	2.7	SAND - (Medium dense), light grey, fine to medium grained sand with trace to some shells up to 5mm in size, saturated		E	2.9		PID <1		
	3 3.0	Bore discontinued at 3.0m , limit of investigation							

RIG: 3.5 tonne excavator **DRILLER:** Paice **LOGGED:** West **CASING:** Nil

TYPE OF BORING: 300mm diameter solid flight auger

WATER OBSERVATIONS: Free groundwater observed at 2.5m, whilst augering

REMARKS: * Surface levels interpolated from survey plan provided by client

☒ 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

CONE PENETRATION TEST

CLIENT: DOMA HOLDING (NSW) PTY LTD

PROJECT: NEWCASTLE, PROPOSED RESIDENTIAL TOWER DEVELOPMENT

LOCATION: 21 HONEYSUCKLE DRIVE, NEWCASTLE

REDUCED LEVEL: 1.9 AHD

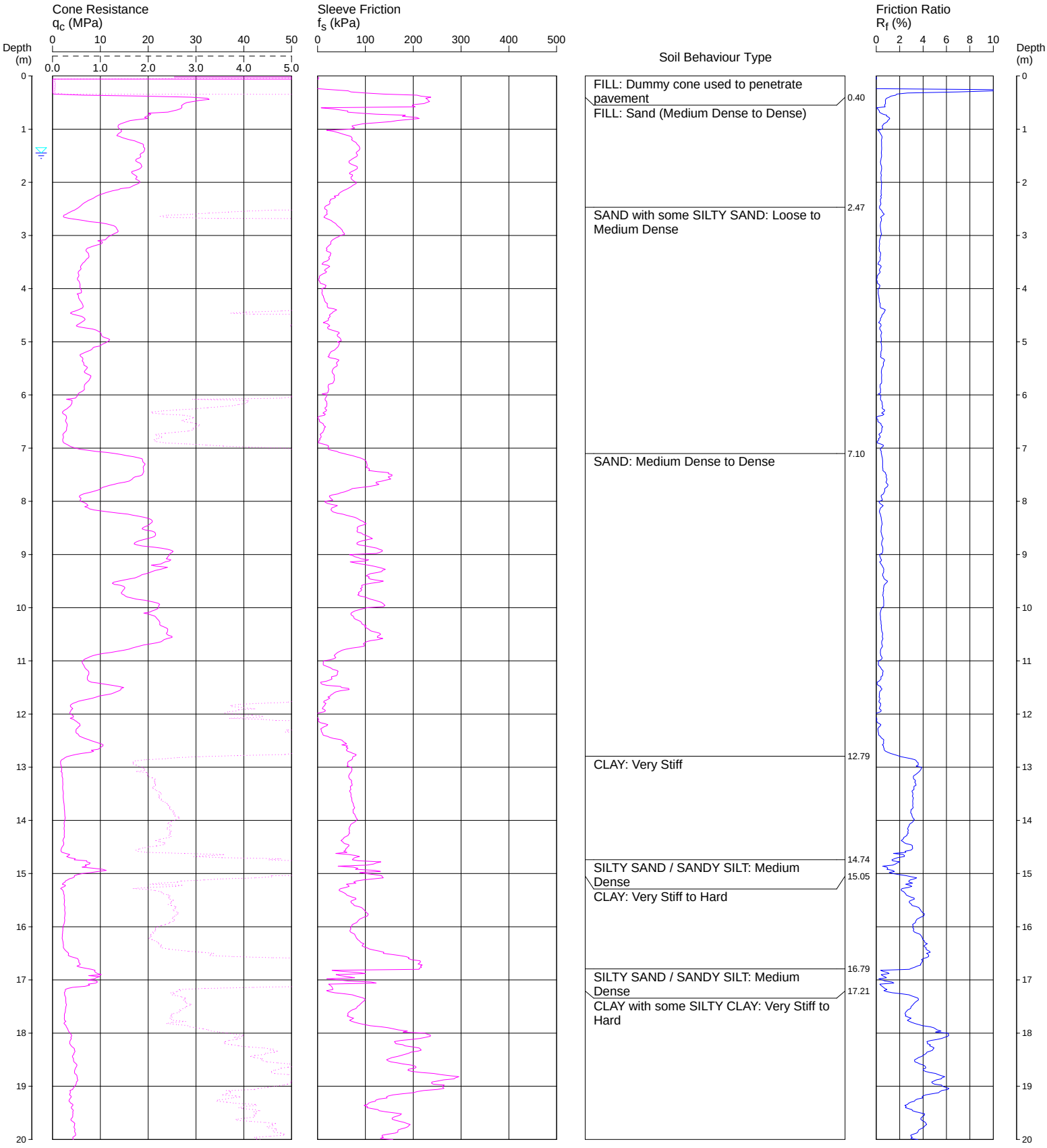
COORDINATES: 384758E 6356298N MGA Zone 56

201

Page 1 of 2

DATE 20/12/2016

PROJECT No: 91034



REMARKS: DUMMY CONE USED FROM 0.1 m TO 0.4 m DEPTH TO PENETRATE ROADBASE
TEST DISCONTINUED DUE TO CONE TIP REFUSAL AND BENDING IN WEATHERED ROCK, GROUNDWATER OBSERVED AT 1.45 m DEPTH AFTER WITHDRAWAL OF RODS

Water depth after test: 1.45m depth (measured)

File: P:\91034.00 - NEWCASTLE, 21 Honeysuckle Drive\4.0 Field Work\4.2 Testing\201.CP5

Cone ID: 120621 **Type:** I-CFXY-10

ConePlot Version 5.9.2

Douglas Partners
Geotechnics / Environment / Groundwater

CONE PENETRATION TEST

CLIENT: DOMA HOLDING (NSW) PTY LTD

PROJECT: NEWCASTLE, PROPOSED RESIDENTIAL TOWER DEVELOPMENT

LOCATION: 21 HONEYSUCKLE DRIVE, NEWCASTLE

REDUCED LEVEL: 1.9 AHD

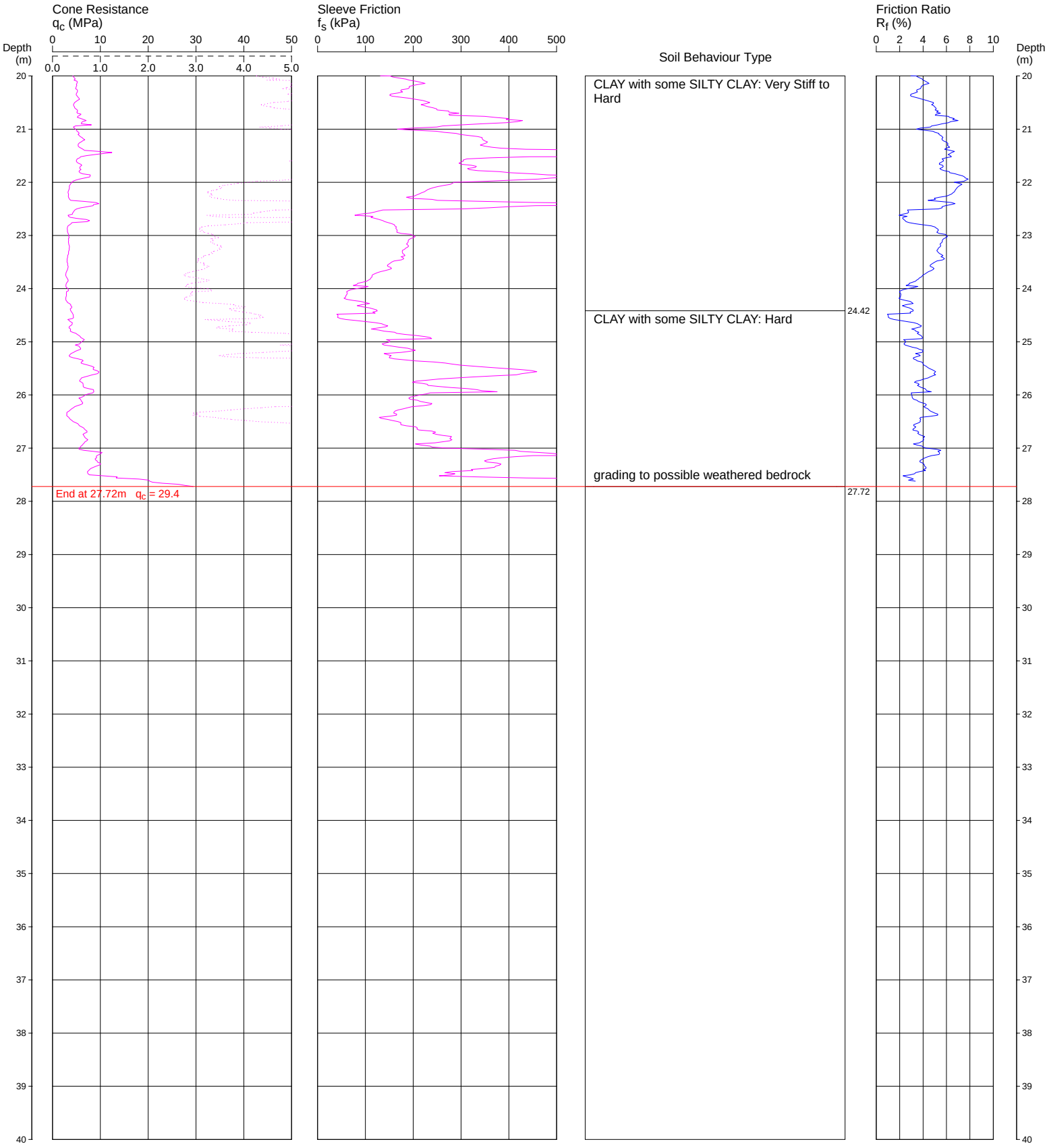
COORDINATES: 384758E 6356298N MGA Zone 56

201

Page 2 of 2

DATE 20/12/2016

PROJECT No: 91034



REMARKS: DUMMY CONE USED FROM 0.1 m TO 0.4 m DEPTH TO PENETRATE ROADBASE
TEST DISCONTINUED DUE TO CONE TIP REFUSAL AND BENDING IN WEATHERED ROCK, GROUNDWATER OBSERVED AT 1.45 m DEPTH AFTER WITHDRAWAL OF RODS

Water depth after test: 1.45m depth (measured)

File: P:\91034.00 - NEWCASTLE, 21 Honeysuckle Drive\4.0 Field Work\4.2 Testing\201.CP5

Cone ID: 120621 **Type:** I-CFXY-10

ConePlot Version 5.9.2

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Geotechnics / Environment / Groundwater

CONE PENETRATION TEST

CLIENT: DOMA HOLDING (NSW) PTY LTD

PROJECT: NEWCASTLE, PROPOSED RESIDENTIAL TOWER DEVELOPMENT

LOCATION: 21 HONEYSUCKLE DRIVE, NEWCASTLE

REDUCED LEVEL: 1.9 AHD

COORDINATES: 384724E 6356296N MGA Zone 56

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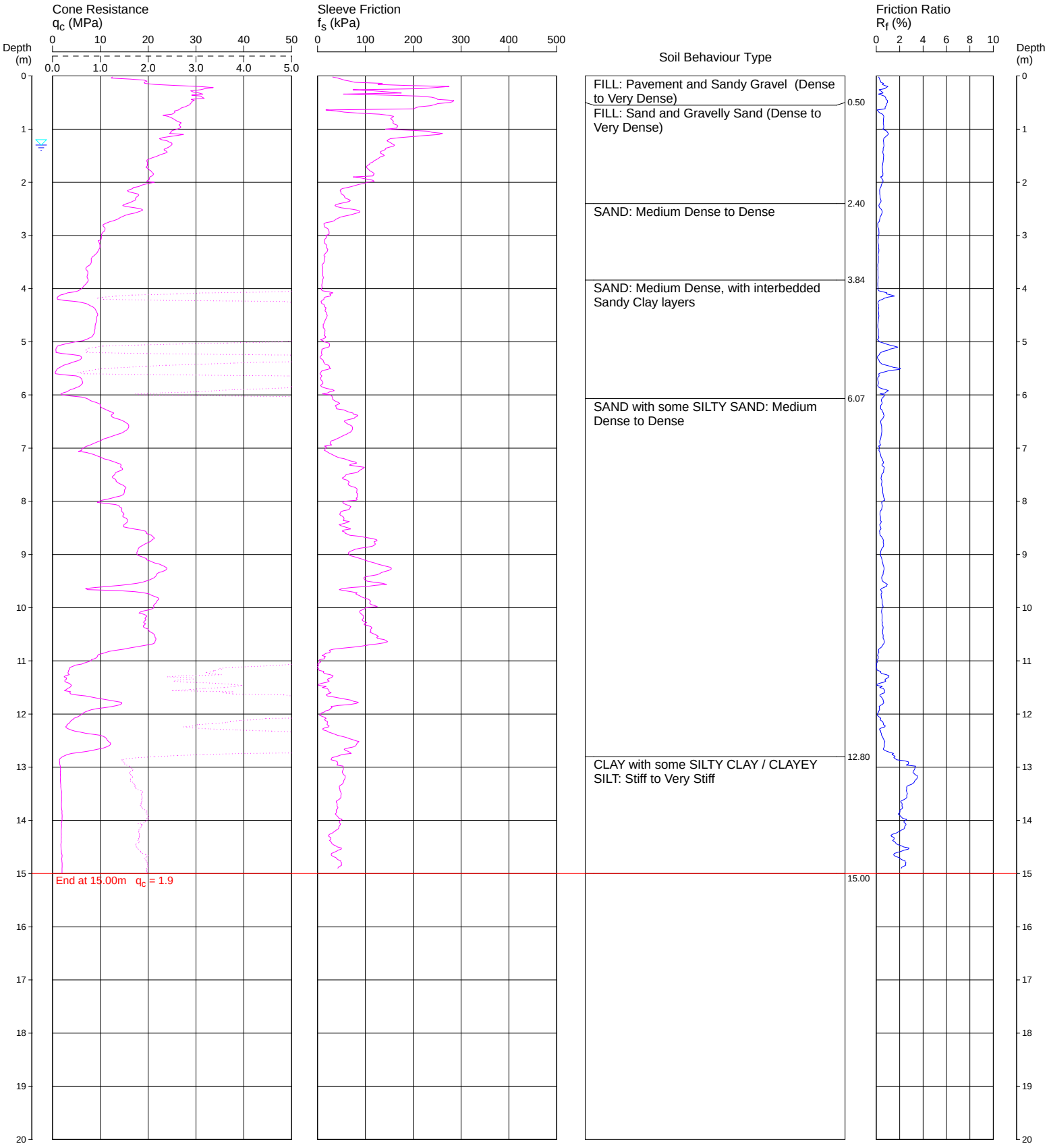
Page 1 of 1

DATE 20/12/2016

PROJECT No: 91034



REMARKS: TEST DISCONTINUED DUE TO TARGET DEPTH REACHED
HOLE COLLAPSED AT 1.3 m DEPTH AFTER WITHDRAWAL OF RODS

Water depth after test: 1.30m depth (assumed)

File: P:\91034.00 - NEWCASTLE, 21 Honeysuckle Drive\4.0 Field Work\4.2 Testing\202.CP5

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

ConePlot Version 5.9.2

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Geotechnics / Environment / Groundwater

CONE PENETRATION TEST

CLIENT: DOMA HOLDING (NSW) PTY LTD

PROJECT: NEWCASTLE, PROPOSED RESIDENTIAL TOWER DEVELOPMENT

LOCATION: 21 HONEYSUCKLE DRIVE, NEWCASTLE

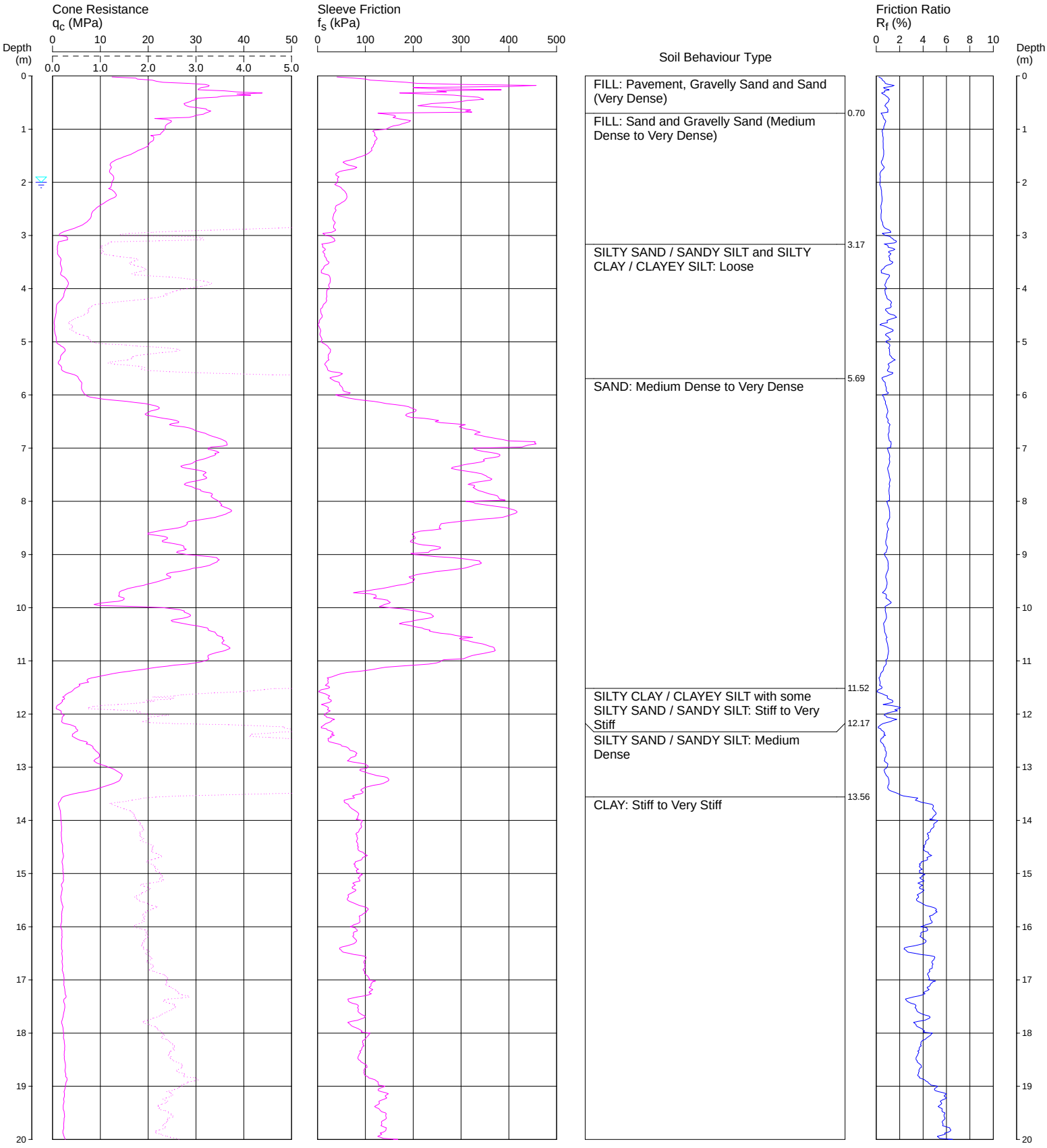
REDUCED LEVEL: 2.1 AHD

COORDINATES: 384696E 6356297N MGA Zone 56

203

DATE 20/12/2016

PROJECT No: 91034



REMARKS: TEST DISCONTINUED DUE TO BENDING IN WEATHERED ROCK
HOLE COLLAPSED AT 1.7 m DEPTH AFTER WITHDRAWAL OF RODS

Water depth after test: 2.00m depth (assumed)

File: P:\91034.00 - NEWCASTLE, 21 Honeysuckle Drive\4.0 Field Work\4.2 Testing\203.CP5

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

ConePlot Version 5.9.2

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CONE PENETRATION TEST

CLIENT: DOMA HOLDING (NSW) PTY LTD

PROJECT: NEWCASTLE, PROPOSED RESIDENTIAL TOWER DEVELOPMENT

LOCATION: 21 HONEYSUCKLE DRIVE, NEWCASTLE

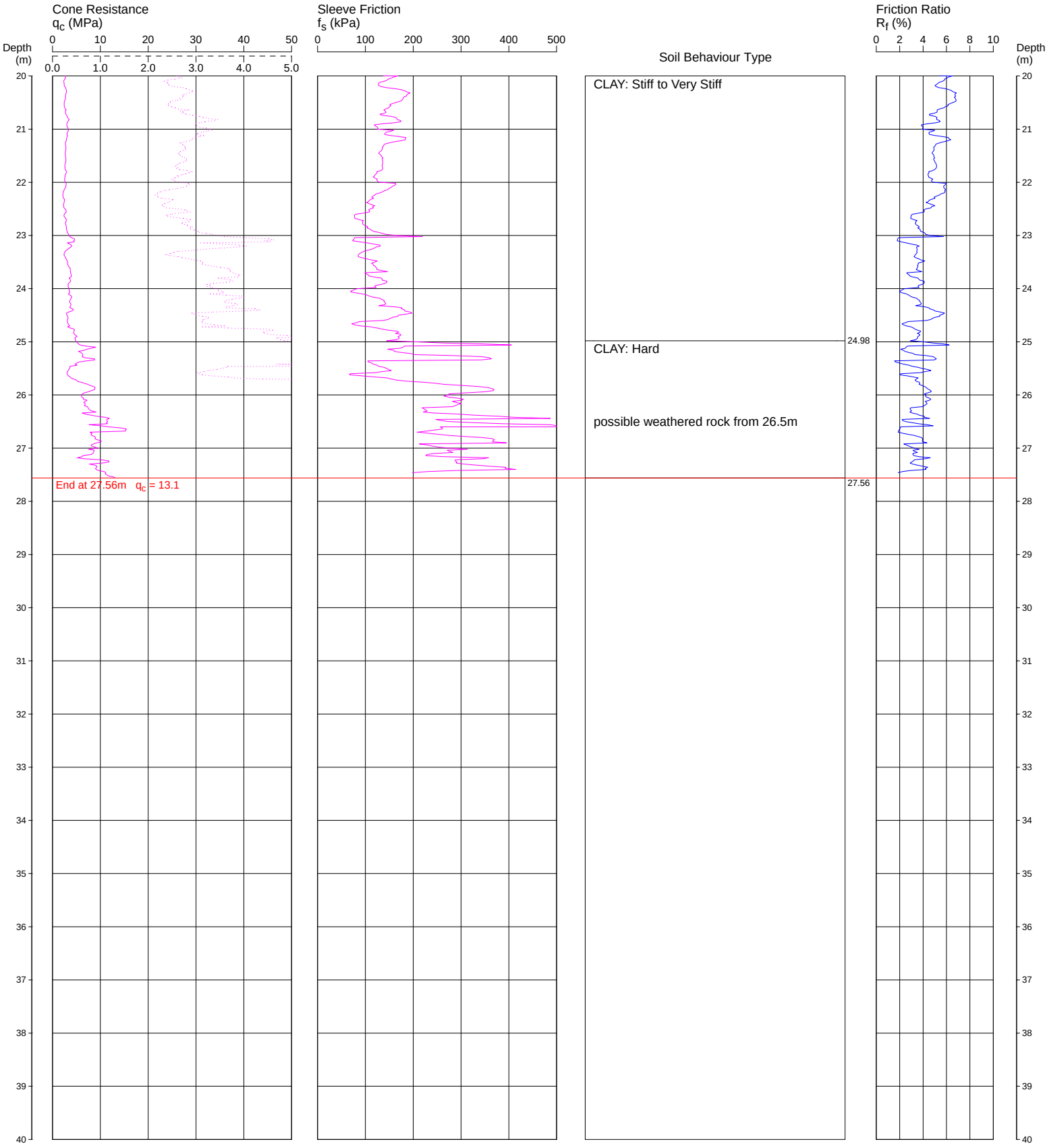
REDUCED LEVEL: 2.1 AHD

COORDINATES: 384696E 6356297N MGA Zone 56

203

DATE 20/12/2016

PROJECT No: 91034



REMARKS: TEST DISCONTINUED DUE TO BENDING IN WEATHERED ROCK
HOLE COLLAPSED AT 1.7 m DEPTH AFTER WITHDRAWAL OF RODS

Water depth after test: 2.00m depth (assumed)

File: P:\91034.00 - NEWCASTLE, 21 Honeysuckle Drive\4.0 Field Work\4.2 Testing\203.CP5

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

ConePlot Version 5.9.2

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CONE PENETRATION TEST

CLIENT: DOMA HOLDING (NSW) PTY LTD

PROJECT: NEWCASTLE, PROPOSED RESIDENTIAL TOWER DEVELOPMENT

LOCATION: 21 HONEYSUCKLE DRIVE, NEWCASTLE

REDUCED LEVEL: 2.1 AHD

COORDINATES: 384660E 6356300N MGA Zone 56

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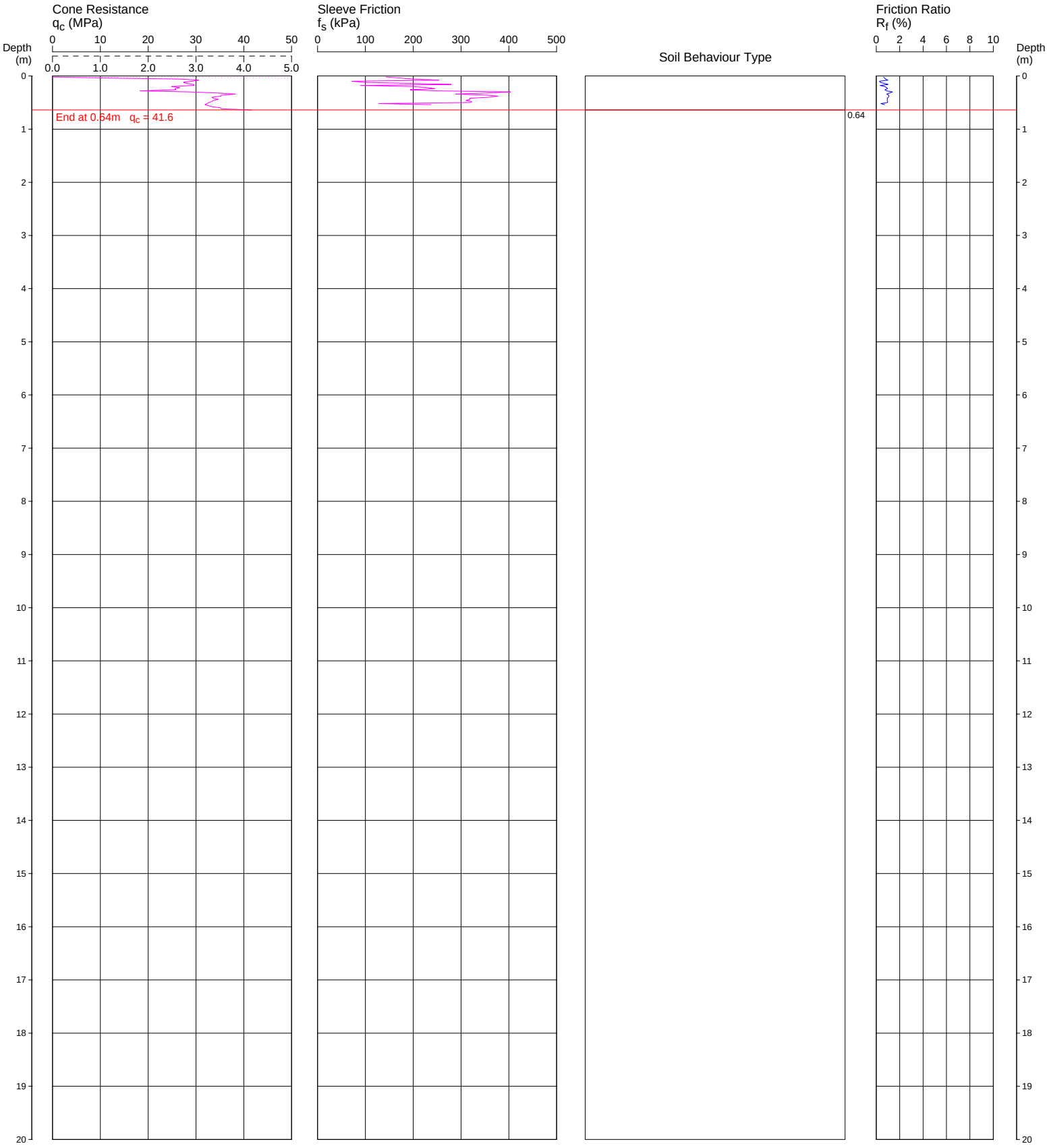
Page 1 of 1

DATE 19/12/2016

PROJECT No: 91034



REMARKS: TEST DISCONTINUED DUE TO BENDING IN FILLING, TEST MOVED 0.5 m EAST AND RECOMMENCED AT 204A
NO GROUNDWATER OBSERVED AFTER WITHDRAWAL OF RODS

File: P:\91034.00 - NEWCASTLE, 21 Honeysuckle Drive\4.0 Field Work\4.2 Testing\204.CP5
Cone ID: 120630 **Type:** I-CFXY-10

ConePlot Version 5.9.2

Douglas Partners
Geotechnics / Environment / Groundwater

CONE PENETRATION TEST

CLIENT: DOMA HOLDING (NSW) PTY LTD

PROJECT: NEWCASTLE, PROPOSED RESIDENTIAL TOWER DEVELOPMENT

LOCATION: 21 HONEYSUCKLE DRIVE, NEWCASTLE

REDUCED LEVEL: 2.1 AHD

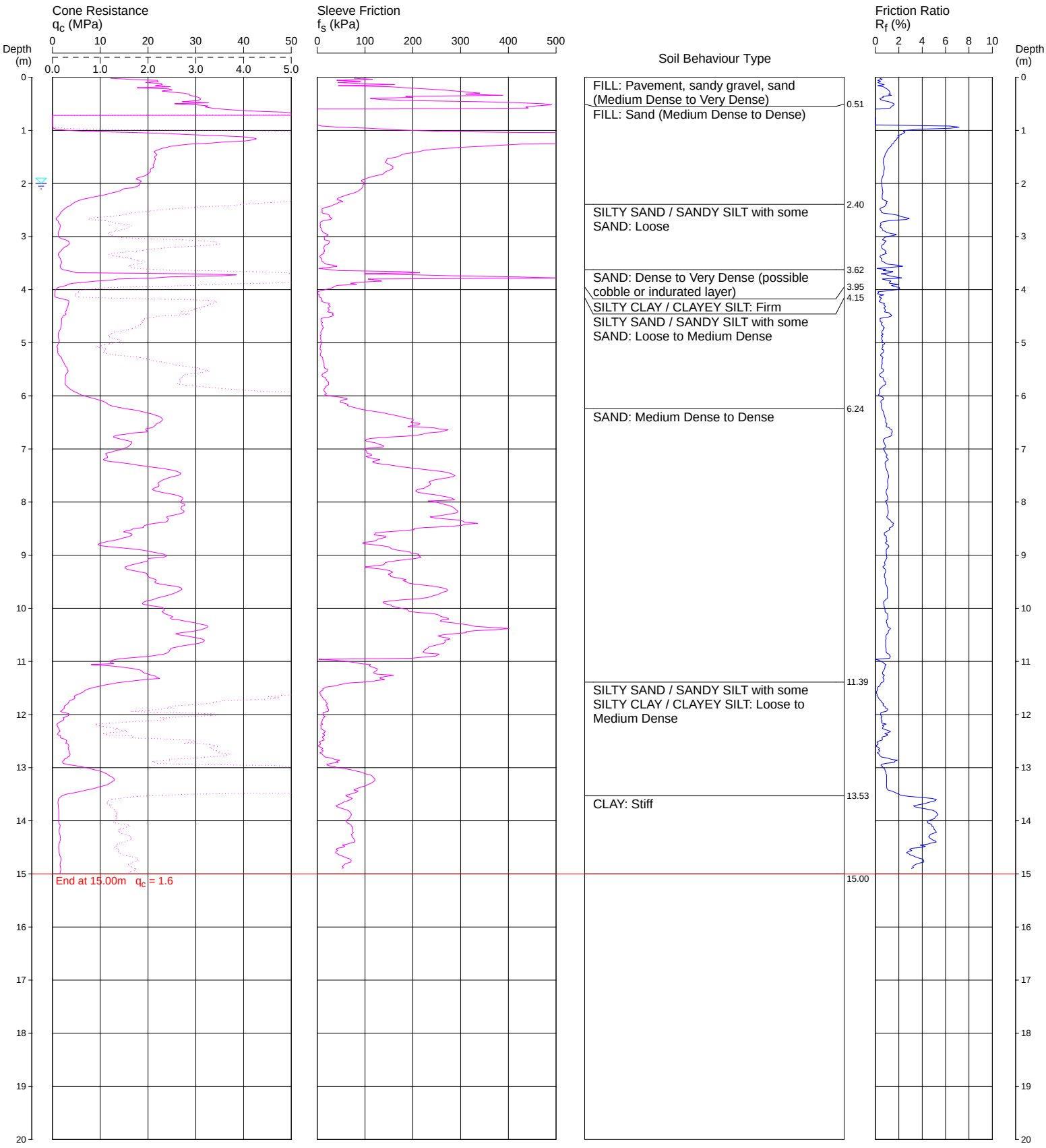
COORDINATES: 384660E 6356300N MGA Zone 56

204

Page 1 of 1

DATE 19/12/2016

PROJECT No: 91034



REMARKS: DUMMY CONE USED FROM 0.7 m TO 1.2 m DEPTH TO PENETRATE FILLING
TEST DISCONTINUED DUE TO TARGET DEPTH REACHED, HOLE COLLAPSED AT 1.6 m DEPTH AFTER WITHDRWAWAL OF RODS

Water depth after test: 2.00m depth (assumed)

File: P:\91034.00 - NEWCASTLE, 21 Honeysuckle Drive\4.0 Field Work\4.2 Testing\204A.CP5

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

ConePlot Version 5.9.2

Douglas Partners
Geotechnics / Environment / Groundwater

CONE PENETRATION TEST

CLIENT: DOMA HOLDING (NSW) PTY LTD

PROJECT: NEWCASTLE, PROPOSED RESIDENTIAL TOWER DEVELOPMENT

LOCATION: 21 HONEYSUCKLE DRIVE, NEWCASTLE

REDUCED LEVEL: 2.1 AHD

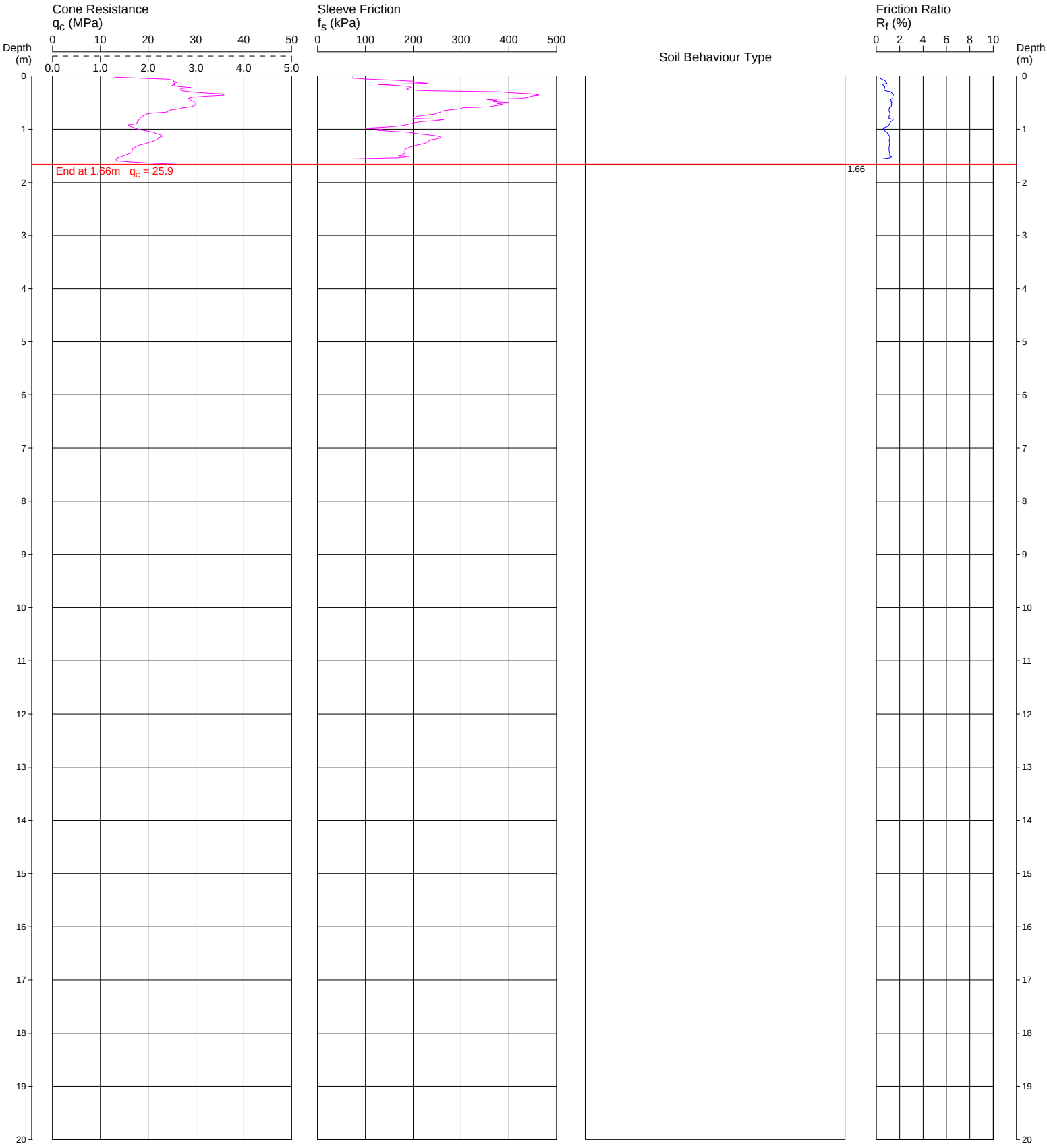
COORDINATES: 384630E 6356304N MGA Zone 56

205

Page 1 of 1

DATE 19/12/2016

PROJECT No: 91034



REMARKS: TEST DISCONTINUED DUE TO BENDING IN FILLING, TEST MOVED 0.5 m WEST AND RECOMMENCED AT 205A
NO GROUNDWATER OBSERVED AFTER WITHDRAWAL OF RODS

File: P:\91034.00 - NEWCASTLE, 21 Honeysuckle Drive\4.0 Field Work\4.2 Testing\205.CP5
Cone ID: 120630 **Type:** I-CFXY-10

ConePlot Version 5.9.2

Douglas Partners
Geotechnics / Environment / Groundwater

CONE PENETRATION TEST

CLIENT: DOMA HOLDING (NSW) PTY LTD

PROJECT: NEWCASTLE, PROPOSED RESIDENTIAL TOWER DEVELOPMENT

LOCATION: 21 HONEYSUCKLE DRIVE, NEWCASTLE

REDUCED LEVEL:

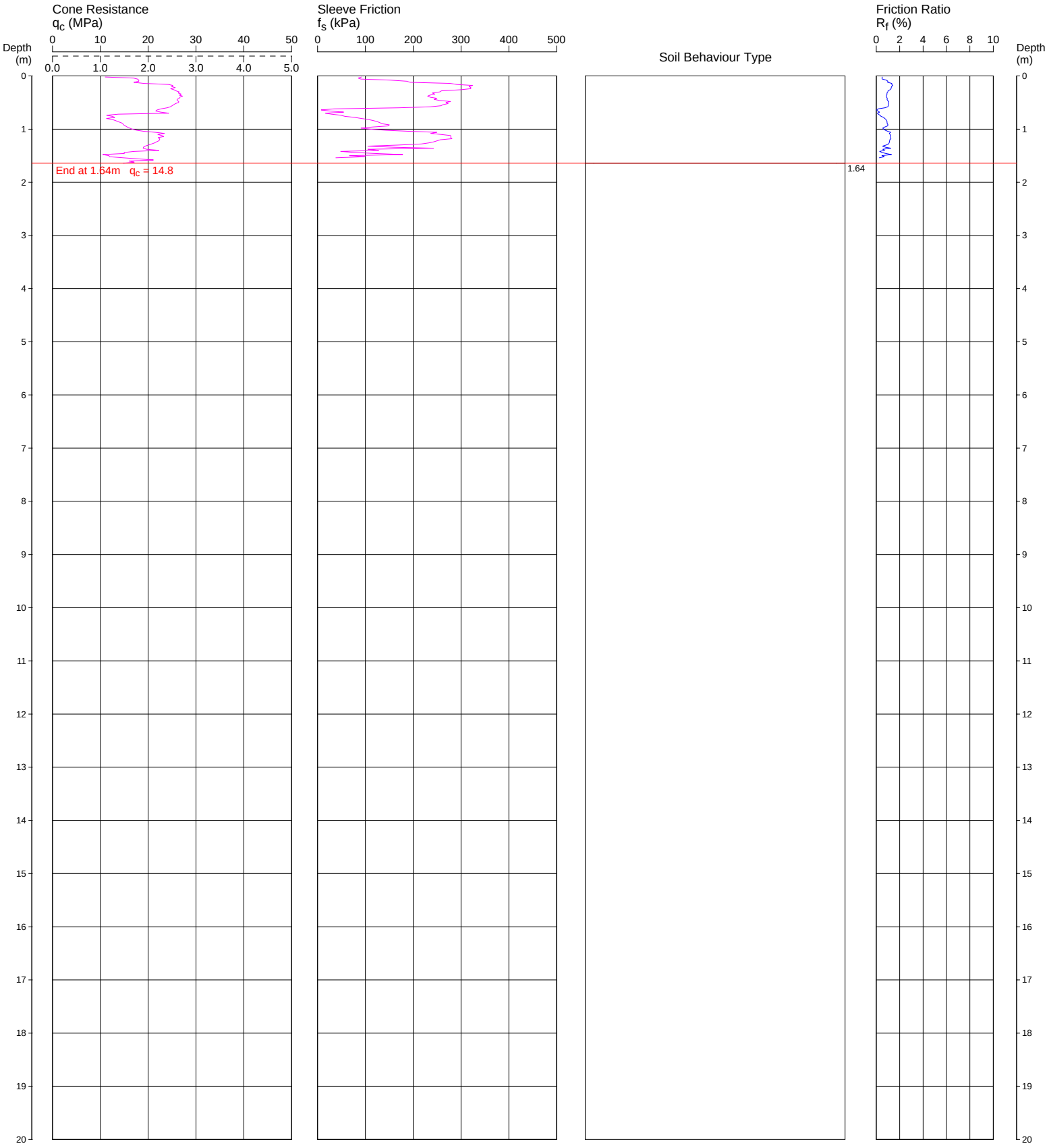
COORDINATES:

205B

Page 1 of 1

DATE 19/12/2016

PROJECT No: 91034



REMARKS: TEST DISCONTINUED DUE TO BENDING IN FILLING, TEST MOVED 0.5 m EAST AND RECOMMENCED AT 205C
NO GROUNDWATER OBSERVED AFTER WITHDRAWAL OF RODS

File: P:\91034.00 - NEWCASTLE, 21 Honeysuckle Drive\4.0 Field Work\4.2 Testing\205B.CP5
Cone ID: 120630 **Type:** I-CFXY-10

ConePlot Version 5.9.2

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CONE PENETRATION TEST

CLIENT: DOMA HOLDING (NSW) PTY LTD

PROJECT: NEWCASTLE, PROPOSED RESIDENTIAL TOWER DEVELOPMENT

LOCATION: 21 HONEYSUCKLE DRIVE, NEWCASTLE

REDUCED LEVEL: 2.9 AHD

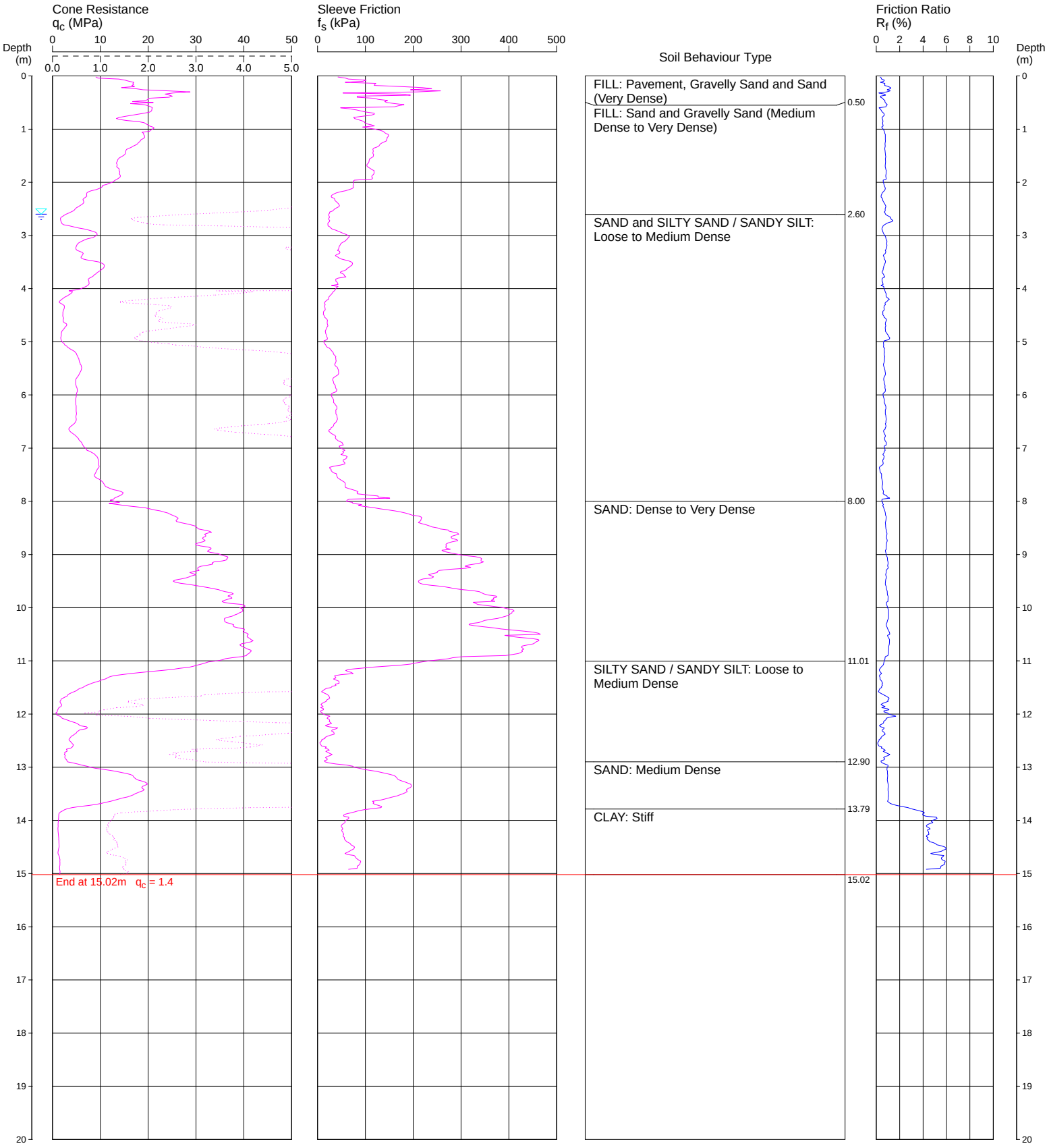
COORDINATES: 384635E 6356262N MGA Zone 56

206

Page 1 of 1

DATE 19/12/2016

PROJECT No: 91034



REMARKS: TEST DISCONTINUED DUE TO TARGET DEPTH REACHED
HOLE COLLAPSED AT 2.2 m DEPTH AFTER WITHDRAWAL OF RODS

Water depth after test: 2.60m depth (assumed)

File: P:\91034.00 - NEWCASTLE, 21 Honeysuckle Drive\4.0 Field Work\4.2 Testing\206.CP5

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

ConePlot Version 5.9.2

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Geotechnics / Environment / Groundwater

CONE PENETRATION TEST

CLIENT: DOMA HOLDING (NSW) PTY LTD

PROJECT: NEWCASTLE, PROPOSED RESIDENTIAL TOWER DEVELOPMENT

LOCATION: 21 HONEYSUCKLE DRIVE, NEWCASTLE

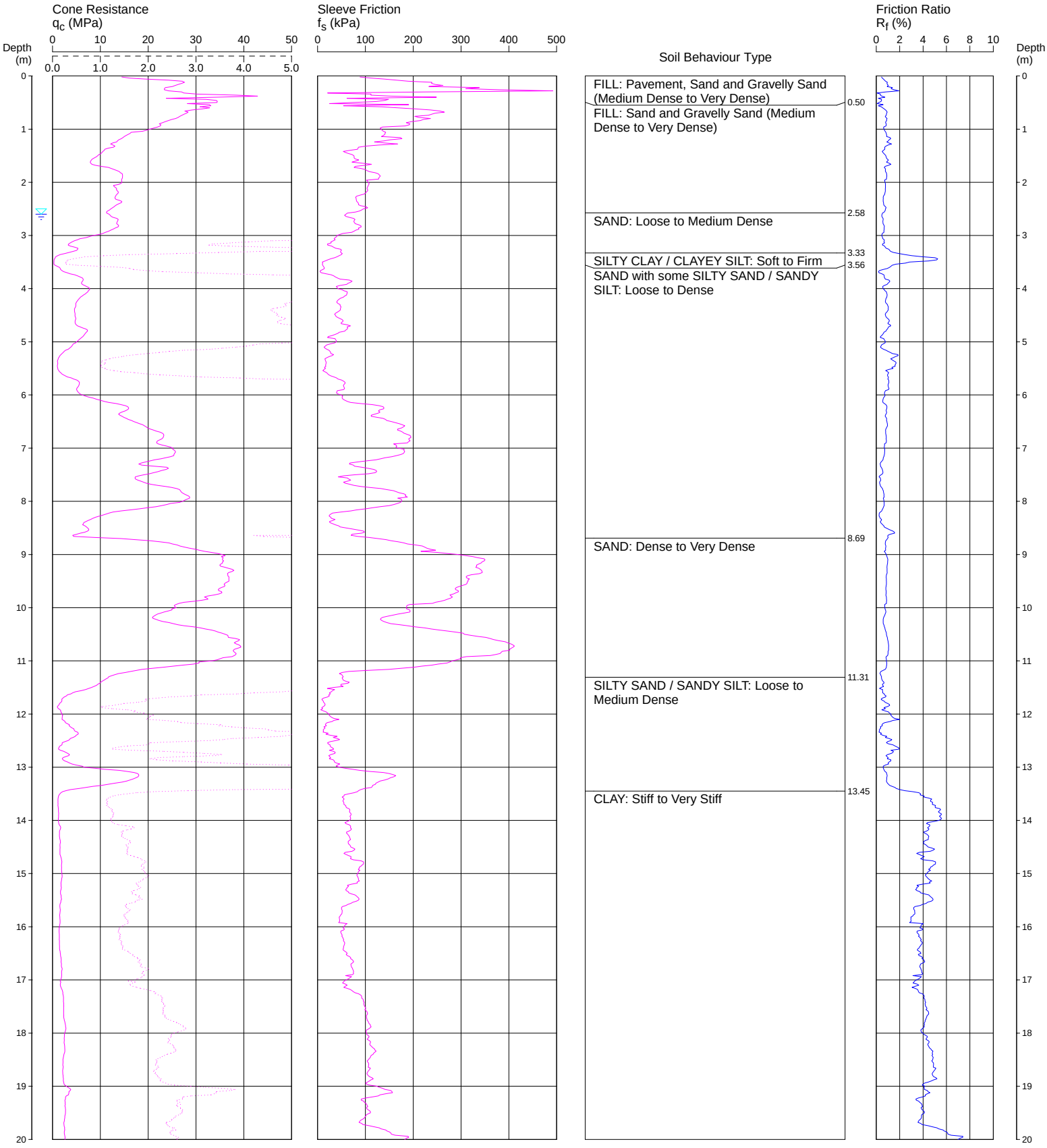
REDUCED LEVEL: 2.9 AHD

COORDINATES: 384674E 6356257N MGA Zone 56

207

DATE 19/12/2016

PROJECT No: 91034



REMARKS: TEST DISCONTINUED DUE TO CONE TIP REFUSAL
HOLE COLLAPSED AT 2.45 m DEPTH AFTER WITHDRAWAL OF RODS

Water depth after test: 2.60m depth (assumed)

File: P:\91034.00 - NEWCASTLE, 21 Honeysuckle Drive\4.0 Field Work\4.2 Testing\207.CP5

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

ConePlot Version 5.9.2

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CONE PENETRATION TEST

CLIENT: DOMA HOLDING (NSW) PTY LTD

PROJECT: NEWCASTLE, PROPOSED RESIDENTIAL TOWER DEVELOPMENT

LOCATION: 21 HONEYSUCKLE DRIVE, NEWCASTLE

REDUCED LEVEL: 2.9 AHD

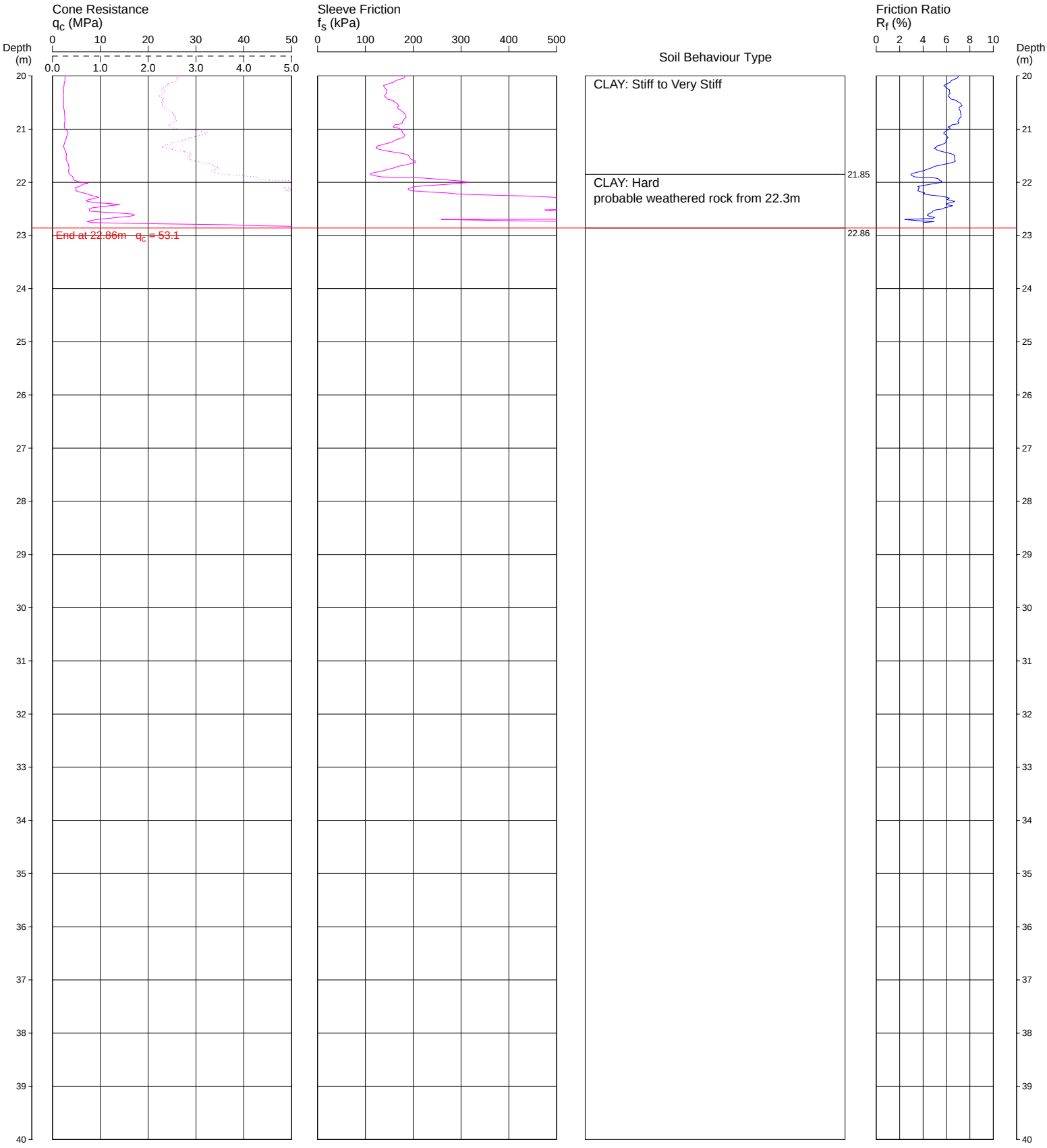
COORDINATES: 384674E 6356257N MGA Zone 56

207

Page 2 of 2

DATE 19/12/2016

PROJECT No: 91034



REMARKS: TEST DISCONTINUED DUE TO CONE TIP REFUSAL
HOLE COLLAPSED AT 2.45 m DEPTH AFTER WITHDRAWAL OF RODS

Water depth after test: 2.60m depth (assumed)

File: P:\91034.00 - NEWCASTLE, 21 Honeysuckle Drive\4.0 Field Work\4.2 Testing\207.CP5

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

ConePlot Version 5.9.2

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CONE PENETRATION TEST

CLIENT: DOMA HOLDING (NSW) PTY LTD

PROJECT: NEWCASTLE, PROPOSED RESIDENTIAL TOWER DEVELOPMENT

LOCATION: 21 HONEYSUCKLE DRIVE, NEWCASTLE

REDUCED LEVEL: 2.8 AHD

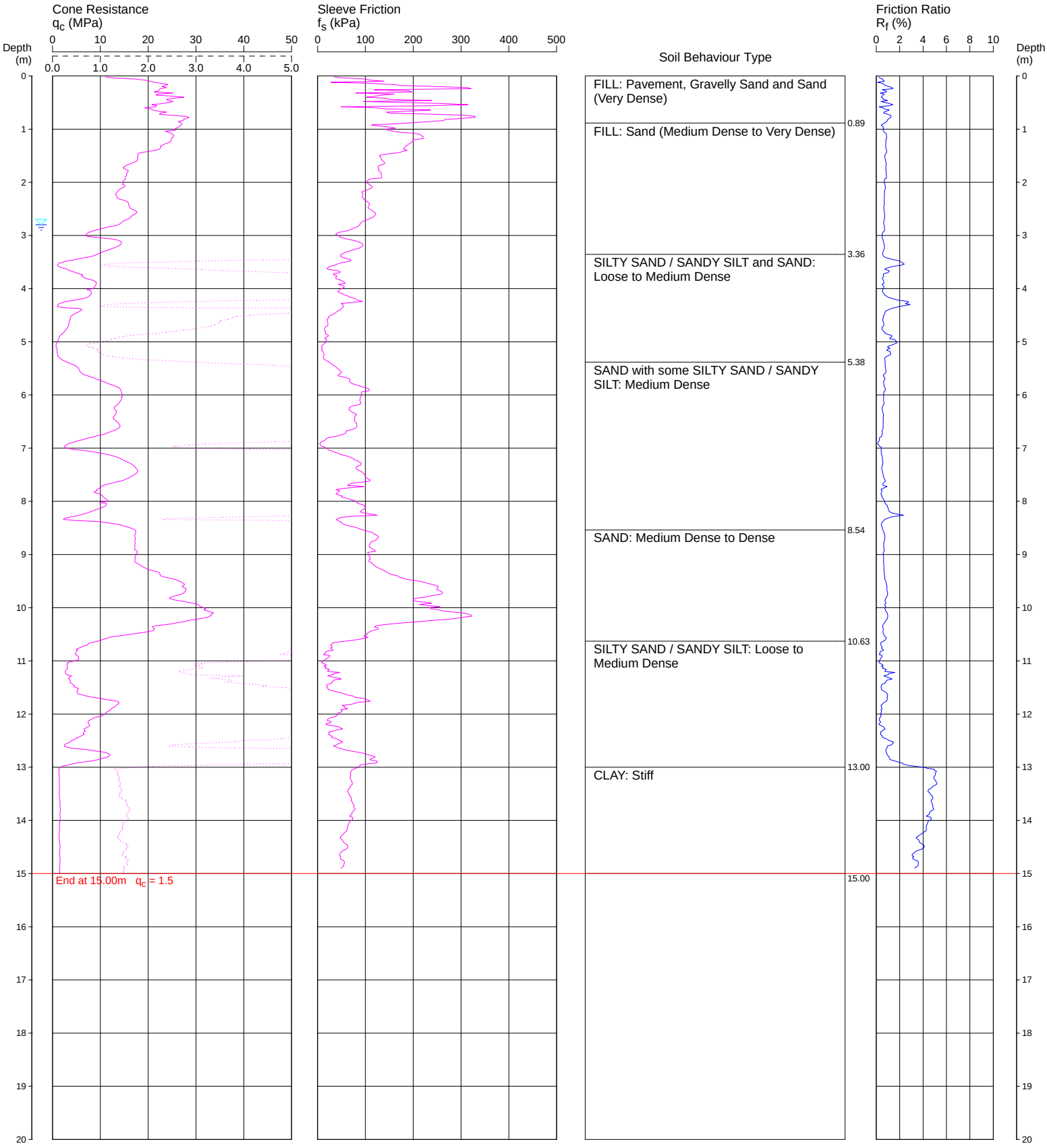
COORDINATES: 384707E 6356255N MGA Zone 56

208

Page 1 of 1

DATE 19/12/2016

PROJECT No: 91034



REMARKS: TEST DISCONTINUED DUE TO TARGET DEPTH REACHED
HOLE COLLAPSED AT 0.6 m DEPTH AFTER WITHDRAWAL OF RODS

Water depth after test: 2.80m depth (assumed)

File: P:\91034.00 - NEWCASTLE, 21 Honeysuckle Drive\4.0 Field Work\4.2 Testing\208.CP5

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

ConePlot Version 5.9.2

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CONE PENETRATION TEST

CLIENT: DOMA HOLDING (NSW) PTY LTD

PROJECT: NEWCASTLE, PROPOSED RESIDENTIAL TOWER DEVELOPMENT

LOCATION: 21 HONEYSUCKLE DRIVE, NEWCASTLE

REDUCED LEVEL: 2.3 AHD

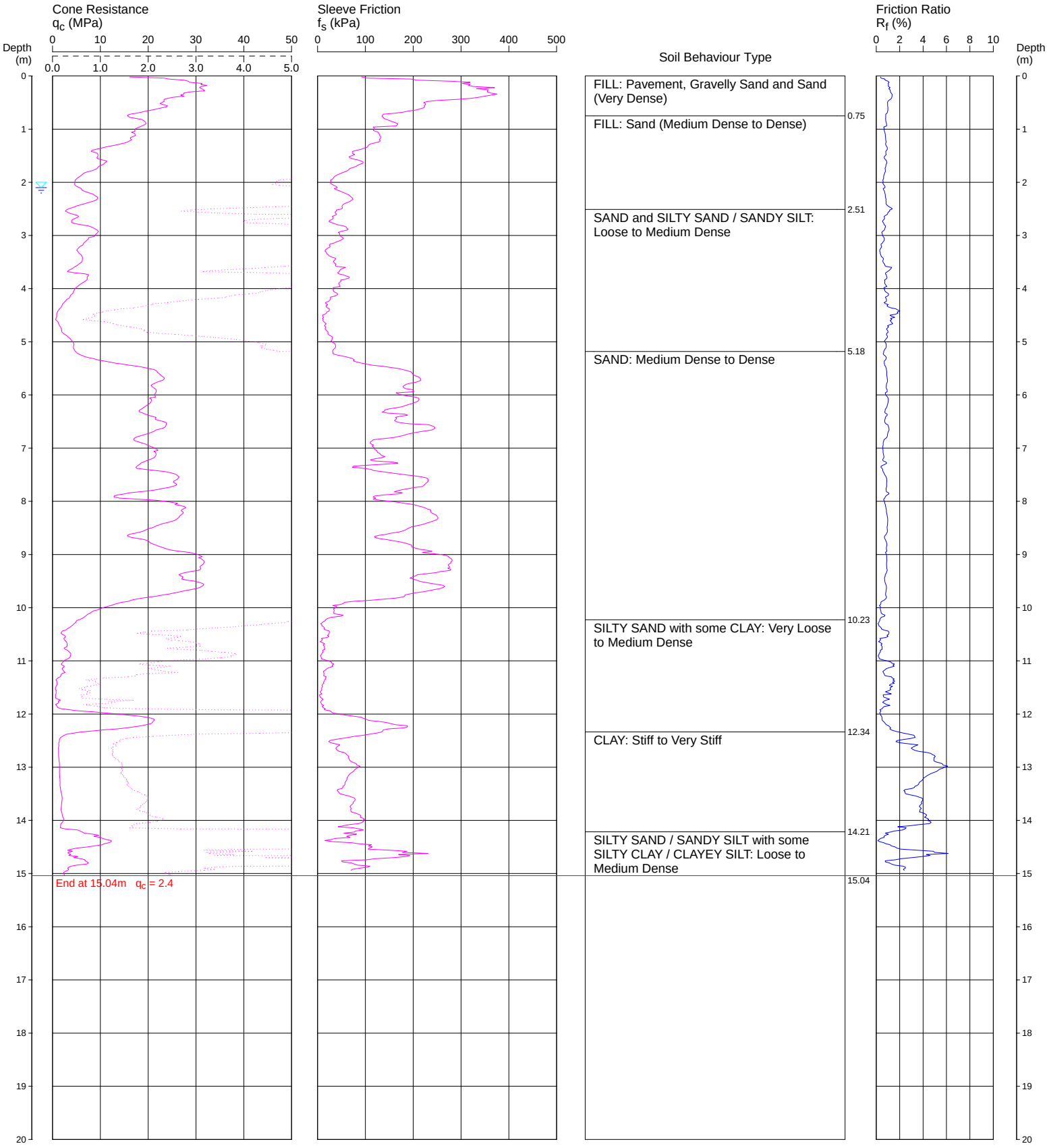
COORDINATES: 384745E 6356256N MGA Zone 56

209

Page 1 of 1

DATE 19/12/2016

PROJECT No: 91034



REMARKS: TEST DISCONTINUED DUE TO TARGET DEPTH REACHED
GROUNDWATER OBSERVED AT 2.1 m DEPTH AFTER WITHDRAWAL OF RODS

Water depth after test: 2.10m depth (measured)

File: P:\91034.00 - NEWCASTLE, 21 Honeysuckle Drive\4.0 Field Work\4.2 Testing\209.CP5

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

ConePlot Version 5.9.2

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Results of Dynamic Penetrometer Tests

Client	Doma Holdings (NSW) Pty Ltd	**Project No.**	91034.00
Project	Proposed Residential Tower	**Date**	15-16/12/16
Location	21 Honeysuckle Drive, Newcastle	**Page No.**	1 of 4

Test Location	101	102	103	104	105	106	107	108	109	110
RL of Test (AHD)										
Depth (m)	**Penetration Resistance** Blows/150 mm									
0 - 0.15	-	-	-	-	-	-	-	-	-	-
0.15 - 0.30	-	-	-	-	-	-	-	-	-	-
0.30 - 0.45	-	-	-	-	12	-	-	-	8	-
0.45 - 0.60	8	7	15	-	13	-	8	16	25	-
0.60 - 0.75	12	4	20	9	10	12	10	19	20	10
0.75 - 0.90	18	3	16	14	15	12	10	20	24	19
0.90 - 1.05	13	6	20	12	18	11	15/100	15	25	18
1.05 - 1.20	16	12		15		10		16		22
1.20 - 1.35										
1.35 - 1.50										
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	☐	**Tested By**	DJW
	AS 1289.6.3.3, Sand Penetrometer	☑	**Checked By**	CB
Remarks	Ref = Refusal, 24/110 indicates 25 blows for 110 mm penetration			

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Results of Dynamic Penetrometer Tests

Client	Doma Holdings (NSW) Pty Ltd	**Project No.**	91034.00
Project	Proposed Residential Tower	**Date**	15-16/12/16
Location	21 Honeysuckle Drive, Newcastle	**Page No.**	2 of 4

Test Location	111	112	113	114	115	116	117	118	119	120
RL of Test (AHD)										
Depth (m)	**Penetration Resistance** Blows/150 mm									
0 - 0.15	-	-	-	-	-	-	-		-	-
0.15 - 0.30	-	-	-	-	-	-	-		-	-
0.30 - 0.45	-	-	-	-	-	-	-		-	-
0.45 - 0.60	-	-	18	13	-	-	7		15	15
0.60 - 0.75	8	5	23	25	15	10	25		19	20
0.75 - 0.90	8	8	23	19	22	22	25		15/50	21
0.90 - 1.05	20	15/100	26	20	19	22	23			22
1.05 - 1.20	22				19	20				22
1.20 - 1.35										
1.35 - 1.50										
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	☐	**Tested By**	DJW
	AS 1289.6.3.3, Sand Penetrometer	☑	**Checked By**	CB

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

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Results of Dynamic Penetrometer Tests

Client	Doma Holdings (NSW) Pty Ltd	**Project No.**	91034.00
Project	Proposed Residential Tower	**Date**	15-16/12/16
Location	21 Honeysuckle Drive, Newcastle	**Page No.**	3 of 4

Test Location	121	122	123	124	125	126	127	128	129	130
RL of Test (AHD)										
Depth (m)	**Penetration Resistance** Blows/150 mm									
0 - 0.15	-	-	-	-	-	-	-	-	-	
0.15 - 0.30	-	-	-	-	-	-	-	-	-	
0.30 - 0.45	-	-	-	-	-	-	-	-	-	
0.45 - 0.60	14	16	18	-	15	8	11	8	10	
0.60 - 0.75	23	22	14	-	25	19	22	16	14	
0.75 - 0.90	25	23	13	10	31	24	25	19	16	
0.90 - 1.05	16	21	6	14	30	25/100	25	13	12	
1.05 - 1.20	20	20	8	20				16	12	
1.20 - 1.35										
1.35 - 1.50										
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	☐	**Tested By**	DJW
	AS 1289.6.3.3, Sand Penetrometer	☑	**Checked By**	CB

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

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Results of Dynamic Penetrometer Tests

Client	Doma Holdings (NSW) Pty Ltd	**Project No.**	91034.00
Project	Proposed Residential Tower	**Date**	15-16/12/16
Location	21 Honeysuckle Drive, Newcastle	**Page No.**	4 of 4

Test Location	131	132	133	134						
RL of Test (AHD)										
Depth (m)	**Penetration Resistance** Blows/150 mm									
0 - 0.15	-	-	-	-						
0.15 - 0.30	-	-	-	-						
0.30 - 0.45	-	-	-	-						
0.45 - 0.60	25	11	-	-						
0.60 - 0.75	25	21	-	10						
0.75 - 0.90	26	20	15	13						
0.90 - 1.05	25/100	16	16	10						
1.05 - 1.20			15	8						
1.20 - 1.35										
1.35 - 1.50										
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										

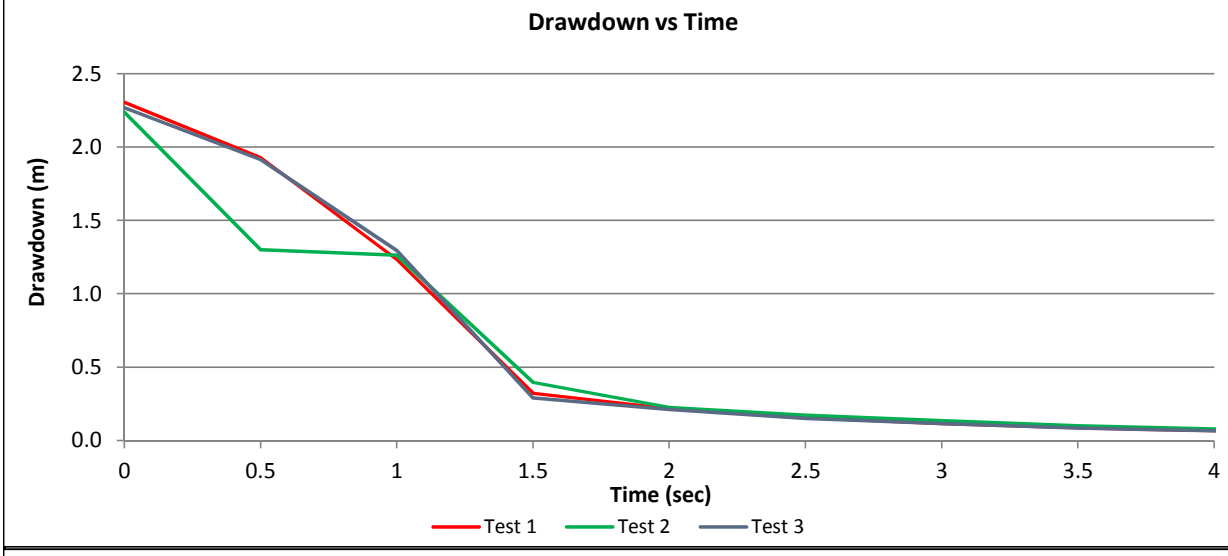
Test Method	AS 1289.6.3.2, Cone Penetrometer	☐	**Tested By**	DJW
	AS 1289.6.3.3, Sand Penetrometer	☑	**Checked By**	CB
Remarks	Ref = Refusal, 24/110 indicates 25 blows for 110 mm penetration			

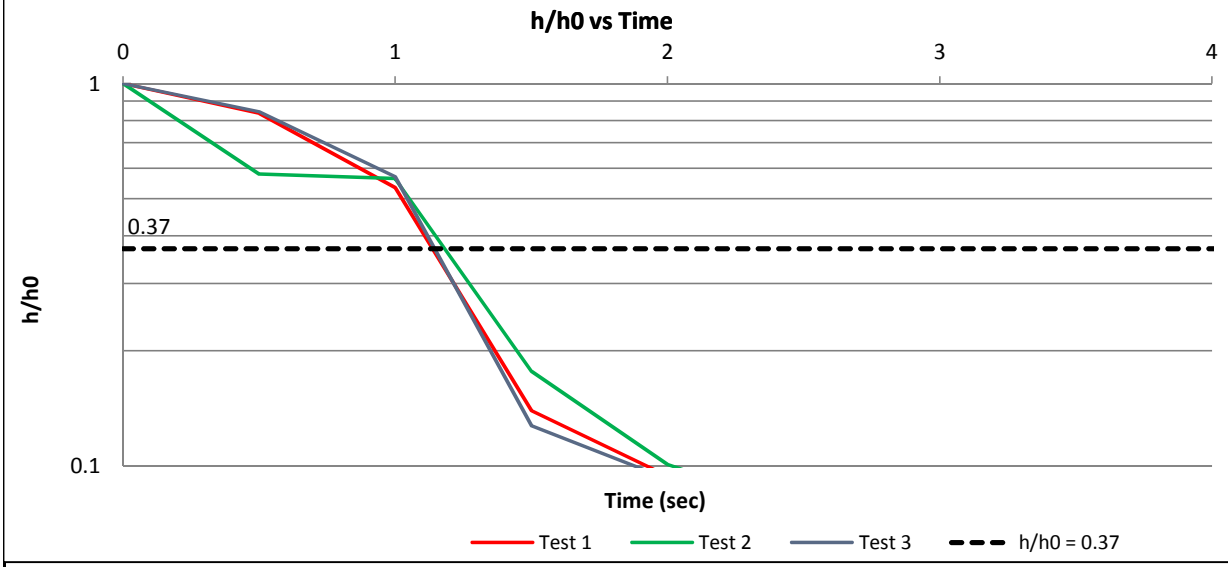
Douglas Partners
Geotechnics / Environment / Groundwater

Rising Head Test Analysis Report

Project: Proposed Residential Tower Development
Project No: 91034.00
Client: Doma Holdings (NSW) Pty Ltd

Test Well No: Bore 103 **Date Tested:** 6/01/2017





Test parameters:	Casing radius:	0.025	m
	Gravel radius:	0.05	m
	Screen length:	4.5	m
	Sreen interval:	0.5 m - 5.0	m
	Screened test stratum:	Filling (Sand; Clay) / Sand / Sandy Clay / Sand	
Analysis Method:	Hvorslev		

Analysis Results:

Conductivity K			Range of Conductivity K		
				m/s	m/d
Test 1:	2.6E-04 m/s	22 m/d	Minimum	2.5E-04	22
Test 2:	2.5E-04 m/s	22 m/d	Maximum	2.6E-04	22
Test 3:	2.5E-04 m/s	22 m/d	Mean	2.5E-04	22

Comments:

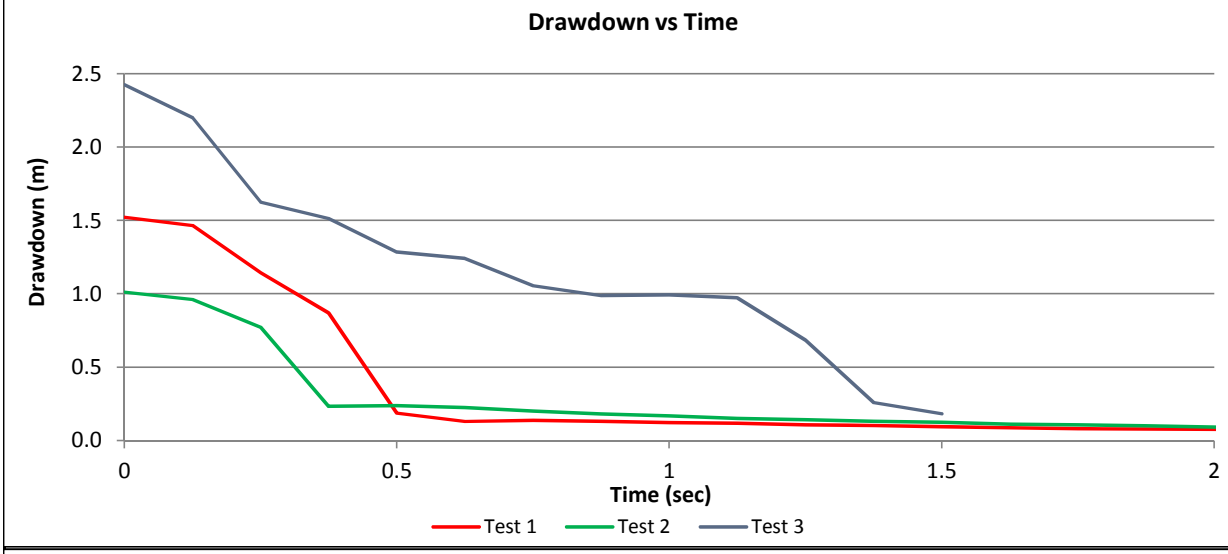
Calculated by: DEW
Date: 10/01/2017

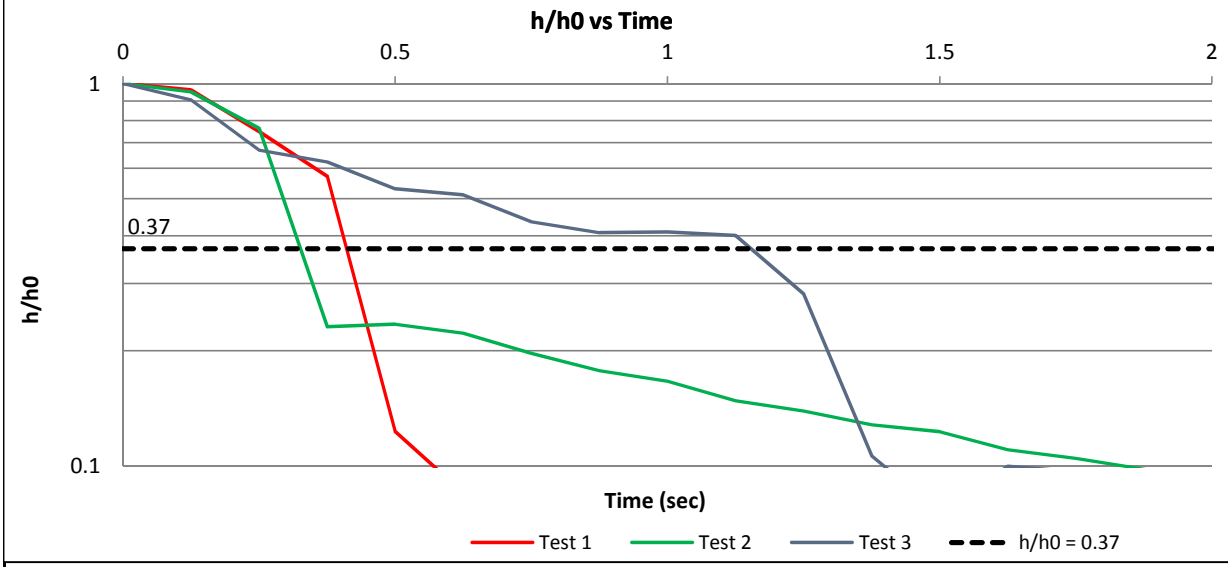
Douglas Partners
Geotechnics / Environment / Groundwater

Rising Head Test Analysis Report

Project: Proposed Residential Tower Development
Project No: 91034.00
Client: Doma Holdings (NSW) Pty Ltd

Test Well No: Bore 116 **Date Tested:** 6/01/2017





Test parameters:	Casing radius:	0.025	m	
	Gravel radius:	0.05	m	
	Screen length:	4.6	m	
	Sreen interval:	0.4 m -	5.0	m
	Screened test stratum:	Sand / Clayey Sand / Clayey Silt		
Analysis Method:	Hvorslev			

Analysis Results:

	Conductivity K		Range of Conductivity K		
				m/s	m/d
Test 1:	7.2E-04 m/s	63 m/d	Minimum	2.7E-04	23
Test 2:	9.1E-04 m/s	79 m/d	Maximum	9.1E-04	79
Test 3:	2.7E-04 m/s	23 m/d	Mean	6.4E-04	55

Comments:

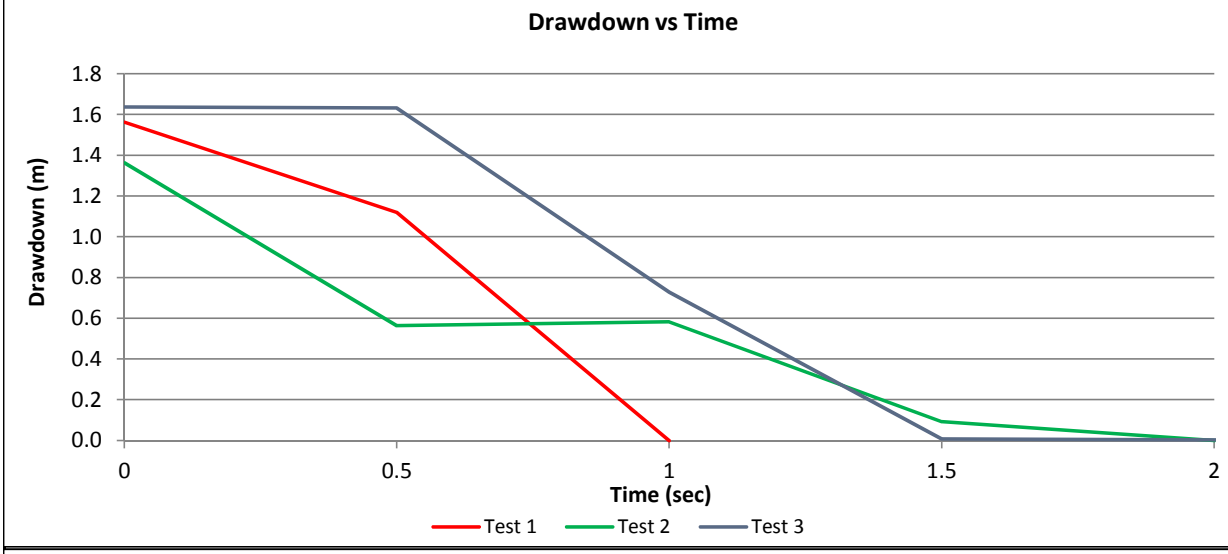
Calculated by: DEW
Date: 10/01/2017

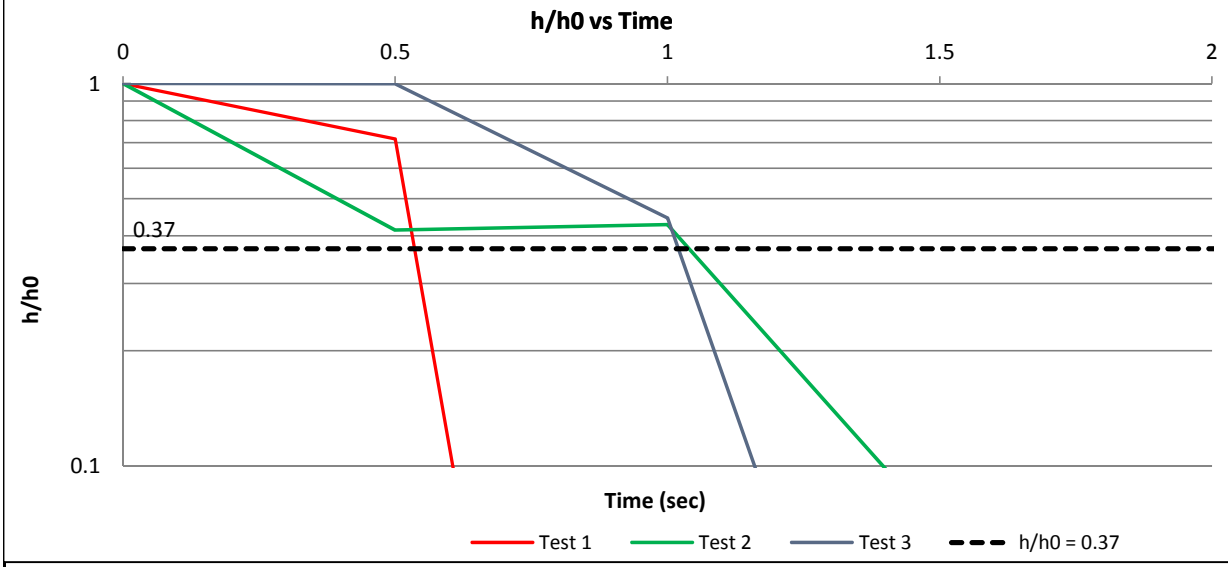
Douglas Partners
Geotechnics / Environment / Groundwater

Rising Head Test Analysis Report

Project: Proposed Residential Tower Development
Project No: 91034.00
Client: Doma Holdings (NSW) Pty Ltd

Test Well No: Bore 130 **Date Tested:** 6/01/2017





Test parameters:	Casing radius:	0.025	m
	Gravel radius:	0.05	m
	Screen length:	4.6	m
	Sreen interval:	0.4 m - 5.0	m
	Screened test stratum:	Filling (Sand - possible natural) / Sand	

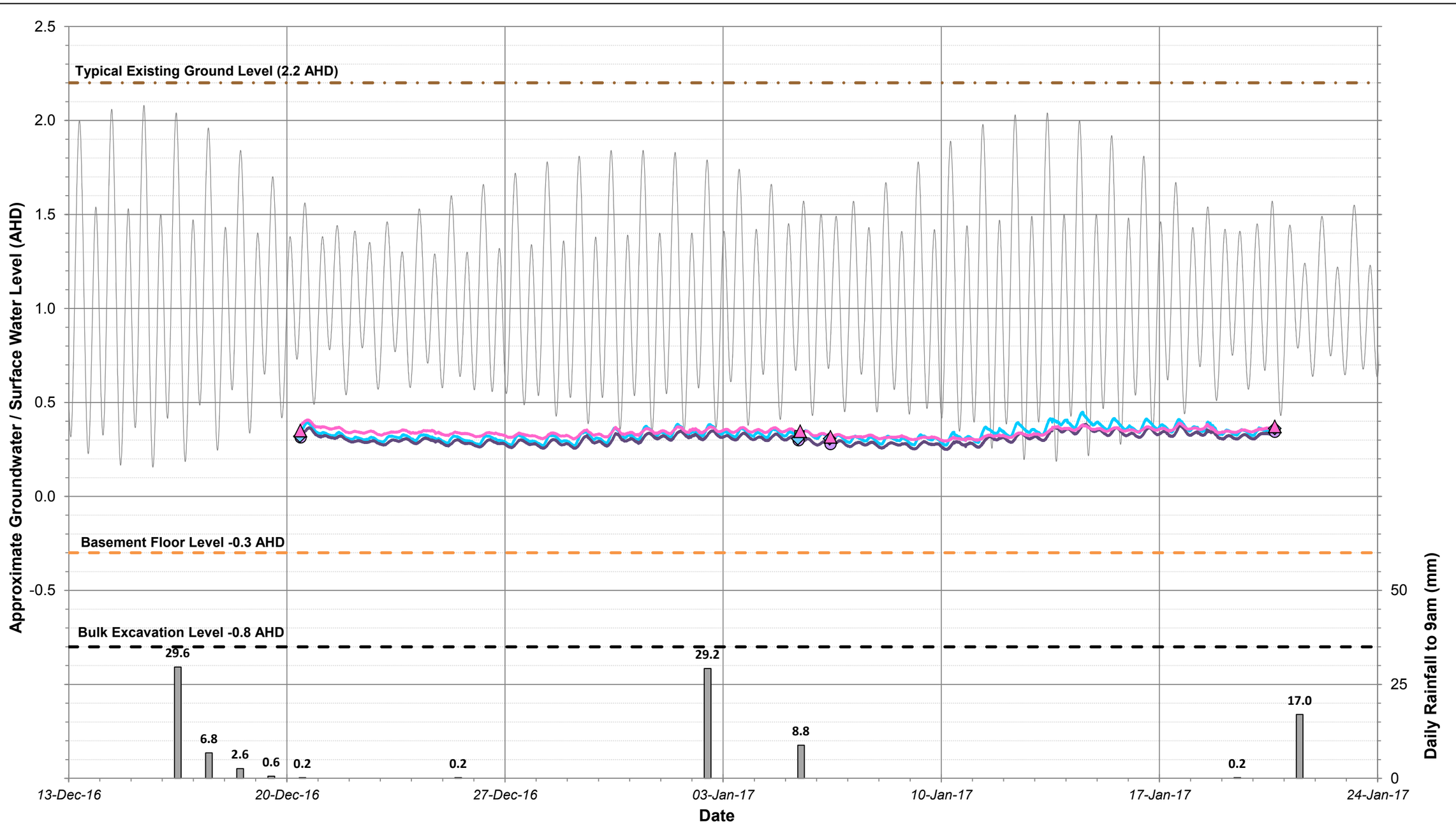
Analysis Method: Hvorslev

Analysis Results:

Conductivity K			Range of Conductivity K		
				m/s	m/d
Test 1:	4.2E-04 m/s	36 m/d	Minimum	2.9E-04	25
Test 2:	2.9E-04 m/s	25 m/d	Maximum	4.2E-04	36
Test 3:	2.9E-04 m/s	25 m/d	Mean	3.3E-04	29

Comments:

Calculated by: DEW
Date: 10/01/2017



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Geotechnics / Environment / Groundwater

CLIENT: Doma Holdings (NSW) Pty Ltd		TITLE: **Groundwater Pressure Head vs Rainfall**	PROJECT NO: 91034.00
OFFICE: Newcastle	DRAWN: DEW	**Proposed Residential Tower Development**	FIGURE NO: B1
SCALE: N/A	DATE: 08.02.2017	**21 Honeysuckle Drive, Newcastle**	REVISION: Rev1

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

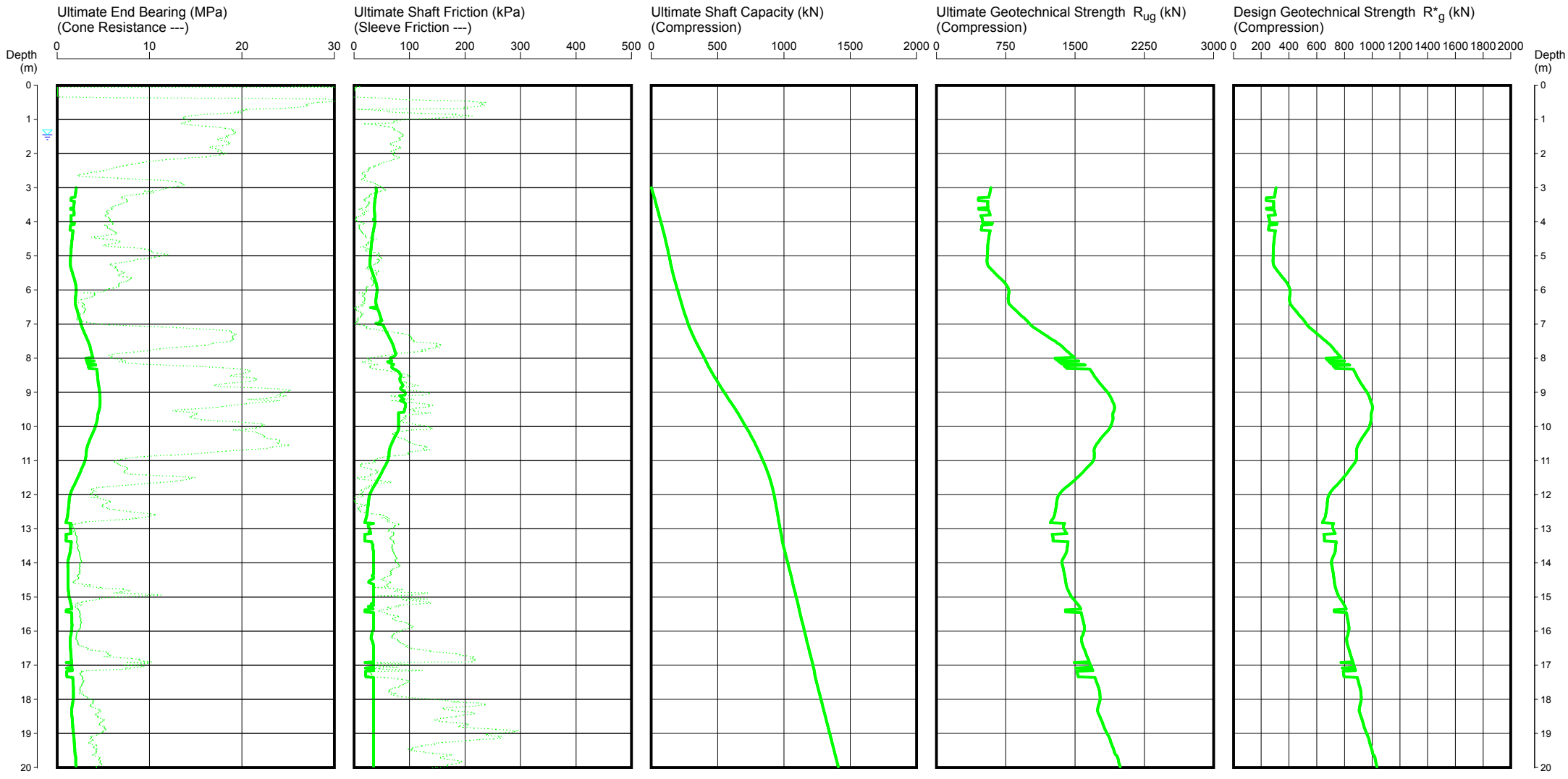
PROJECT: NEWCASTLE, PROPOSED RESIDENTIAL TOWER DEVELOPMENT

LOCATION: 21 HONEYSUCKLE DRIVE, NEWCASTLE

CLIENT: DOMA HOLDING (NSW) PTY LTD

201

DATE 20/12/2016
PROJECT No: 91034
SURFACE RL: 1.9 AHD



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: 1.45m depth

Coordinates: 384758 6356298

File: P:\91034.00 - NEWCASTLE, 21 Honeysuckle Drive\4.0 Field Work\4.2 Testing\201.CP5
Cone ID: 120621 **Type:** I-CFXY-10

ConePile Version 5.9.1

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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

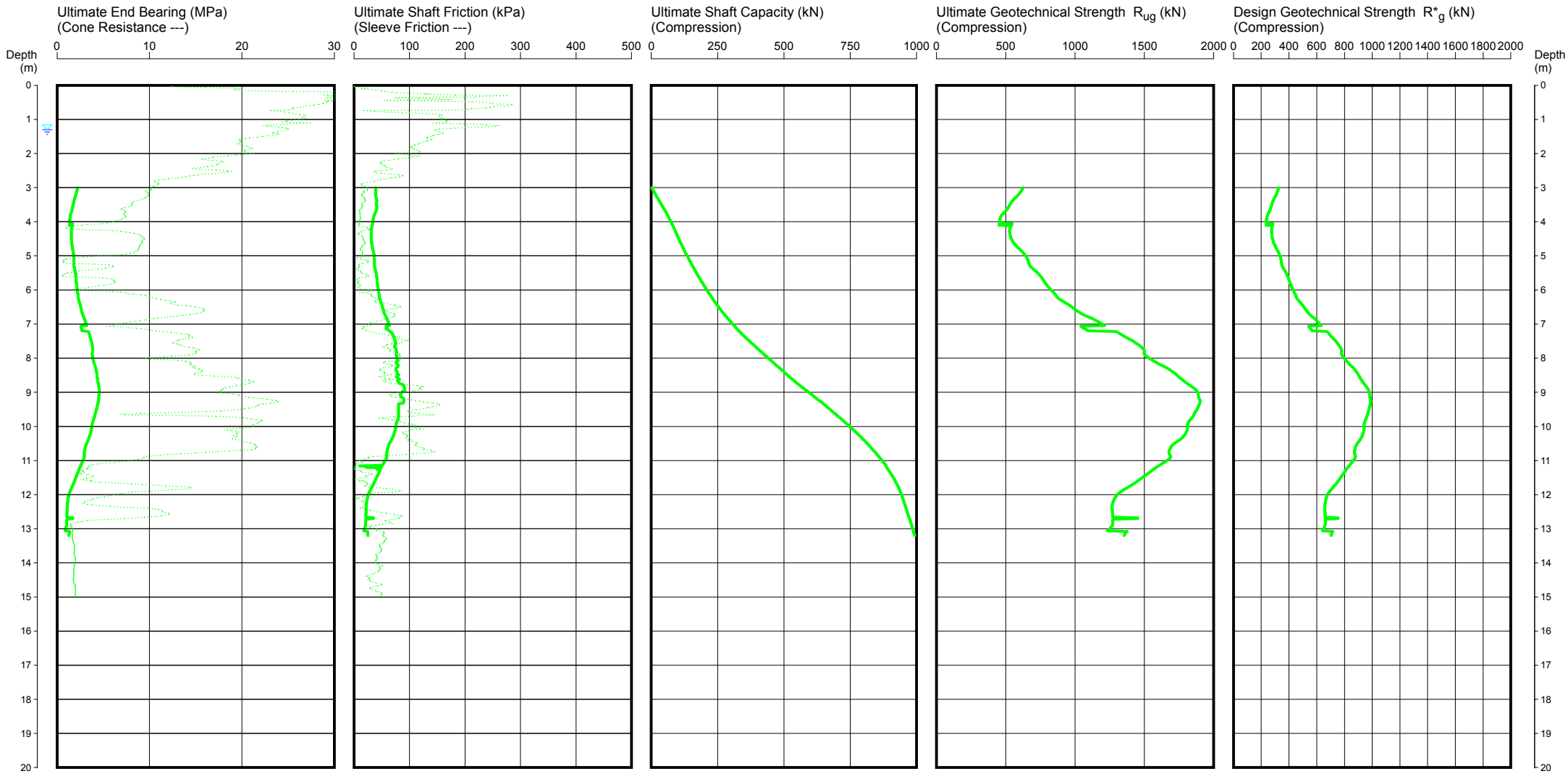
PROJECT: NEWCASTLE, PROPOSED RESIDENTIAL TOWER DEVELOPMENT

LOCATION: 21 HONEYSUCKLE DRIVE, NEWCASTLE

CLIENT: DOMA HOLDING (NSW) PTY LTD

202

DATE 20/12/2016
PROJECT No: 91034
SURFACE RL: 1.9 AHD



DISCLAIMER:
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Water depth after test: 1.30m depth

Coordinates: 384724 6356296

File: P:\91034.00 - NEWCASTLE, 21 Honeysuckle Drive\4.0 Field Work\4.2 Testing\202.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

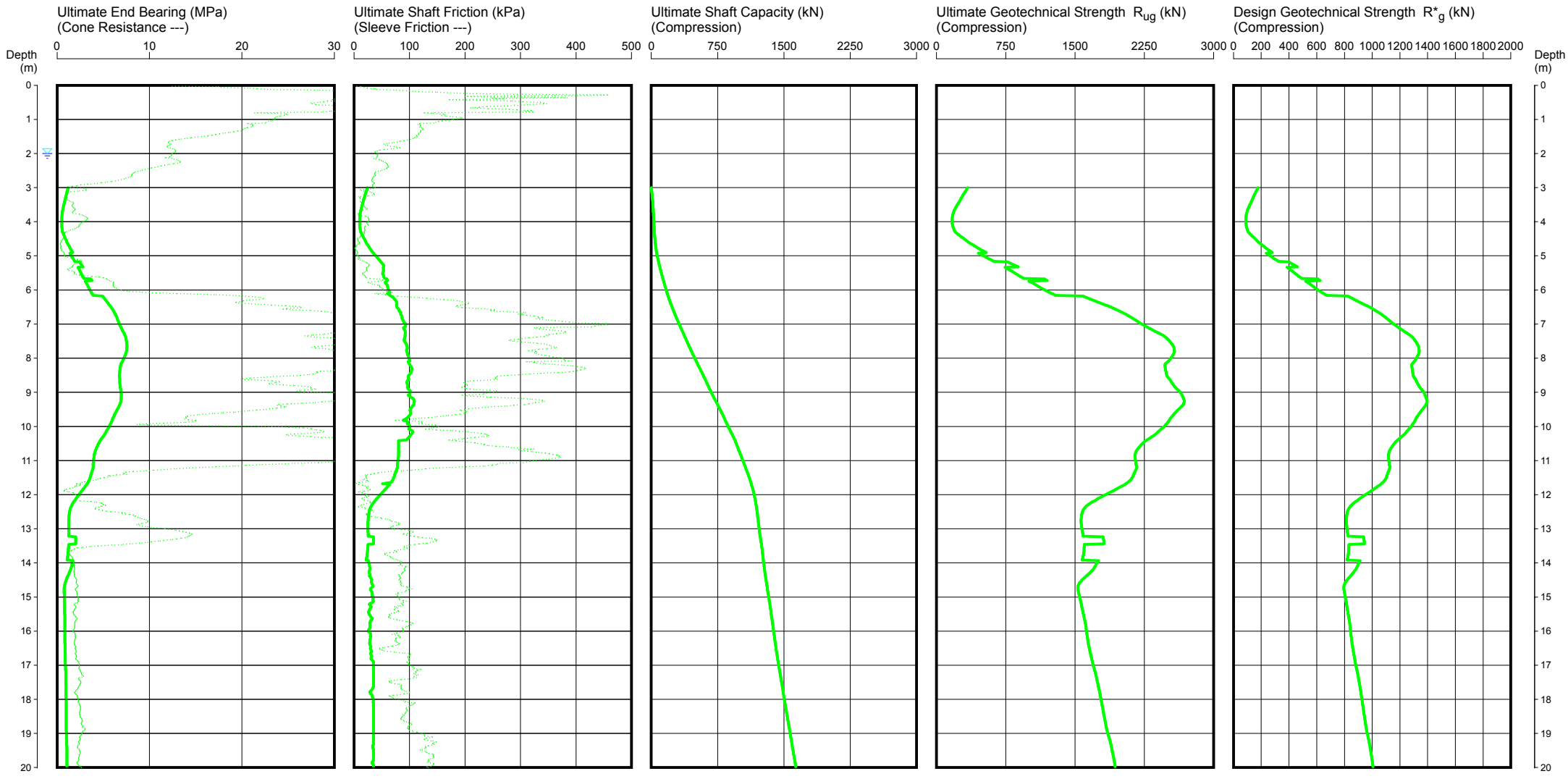
PROJECT: NEWCASTLE, PROPOSED RESIDENTIAL TOWER DEVELOPMENT

LOCATION: 21 HONEYSUCKLE DRIVE, NEWCASTLE

CLIENT: DOMA HOLDING (NSW) PTY LTD

203

DATE 20/12/2016
PROJECT No: 91034
SURFACE RL: 2.1 AHD



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Water depth after test: 2.00m depth

Coordinates: 384696 6356297

File: P:\91034.00 - NEWCASTLE, 21 Honeysuckle Drive\4.0 Field Work\4.2 Testing\203.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

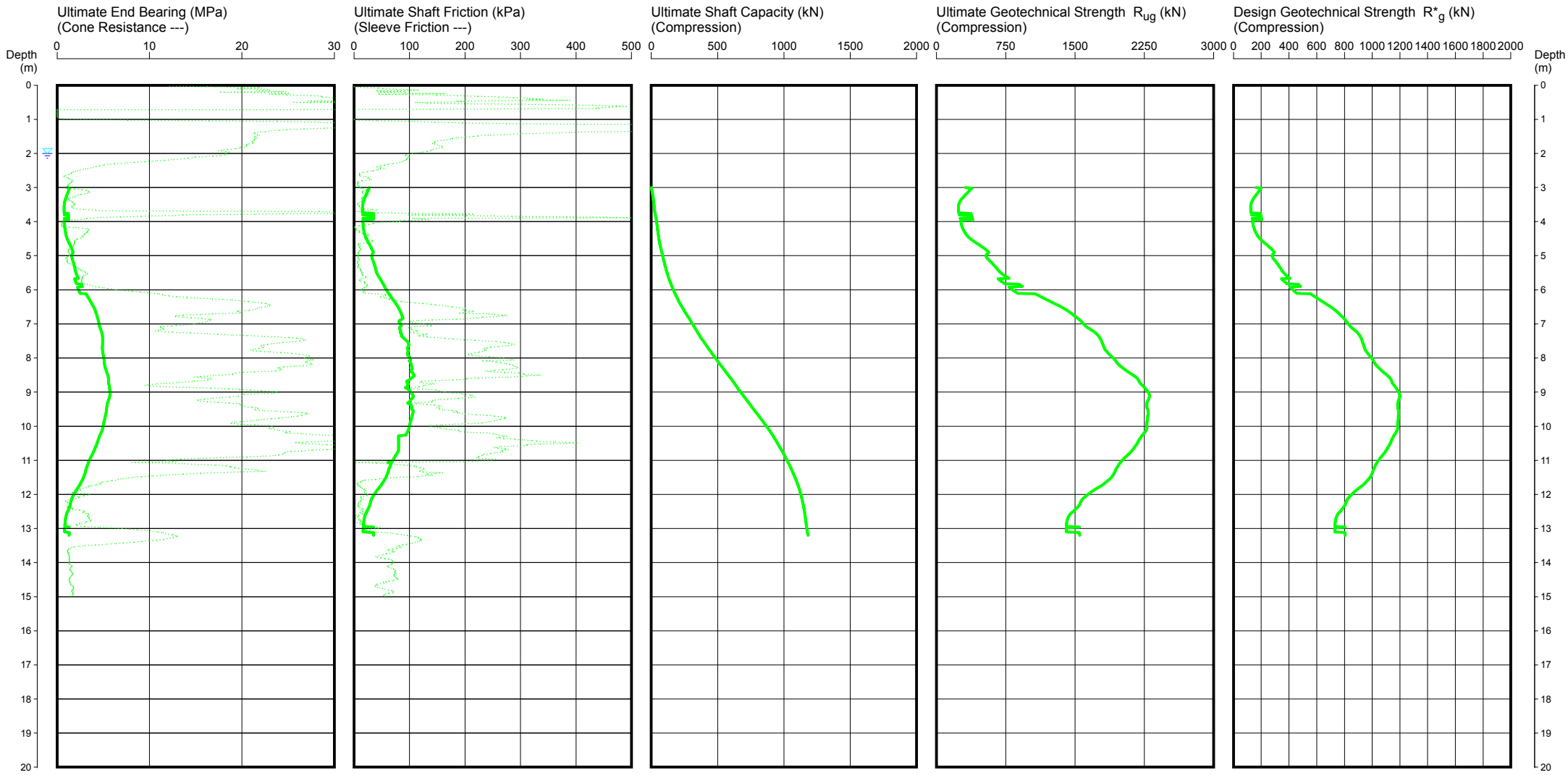
PROJECT: NEWCASTLE, PROPOSED RESIDENTIAL TOWER DEVELOPMENT

LOCATION: 21 HONEYSUCKLE DRIVE, NEWCASTLE

CLIENT: DOMA HOLDING (NSW) PTY LTD

204

DATE 19/12/2016
PROJECT No: 91034
SURFACE RL: 2.1 AHD



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Water depth after test: 2.00m depth

Coordinates: 384660 6356300

File: P:\91034.00 - NEWCASTLE, 21 Honeysuckle Drive\4.0 Field Work\4.2 Testing\204A.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

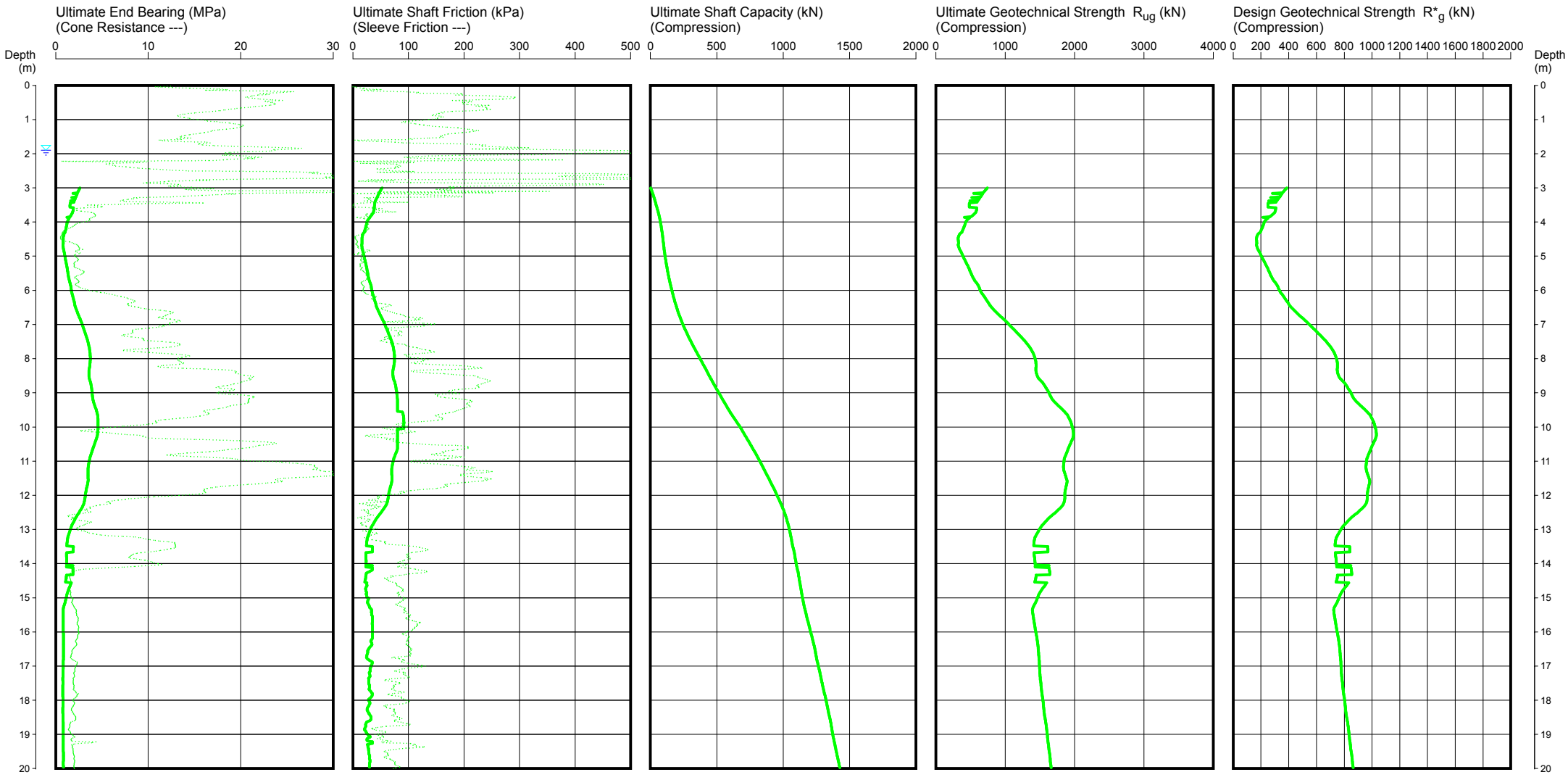
PROJECT: NEWCASTLE, PROPOSED RESIDENTIAL TOWER DEVELOPMENT

LOCATION: 21 HONEYSUCKLE DRIVE, NEWCASTLE

CLIENT: DOMA HOLDING (NSW) PTY LTD

205

DATE 19/12/2016
PROJECT No: 91034
SURFACE RL: 2.1 AHD



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Water depth after test: 1.90m depth

Coordinates: 384629 6356304

File: P:\91034.00 - NEWCASTLE, 21 Honeysuckle Drive\4.0 Field Work\4.2 Testing\205C.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

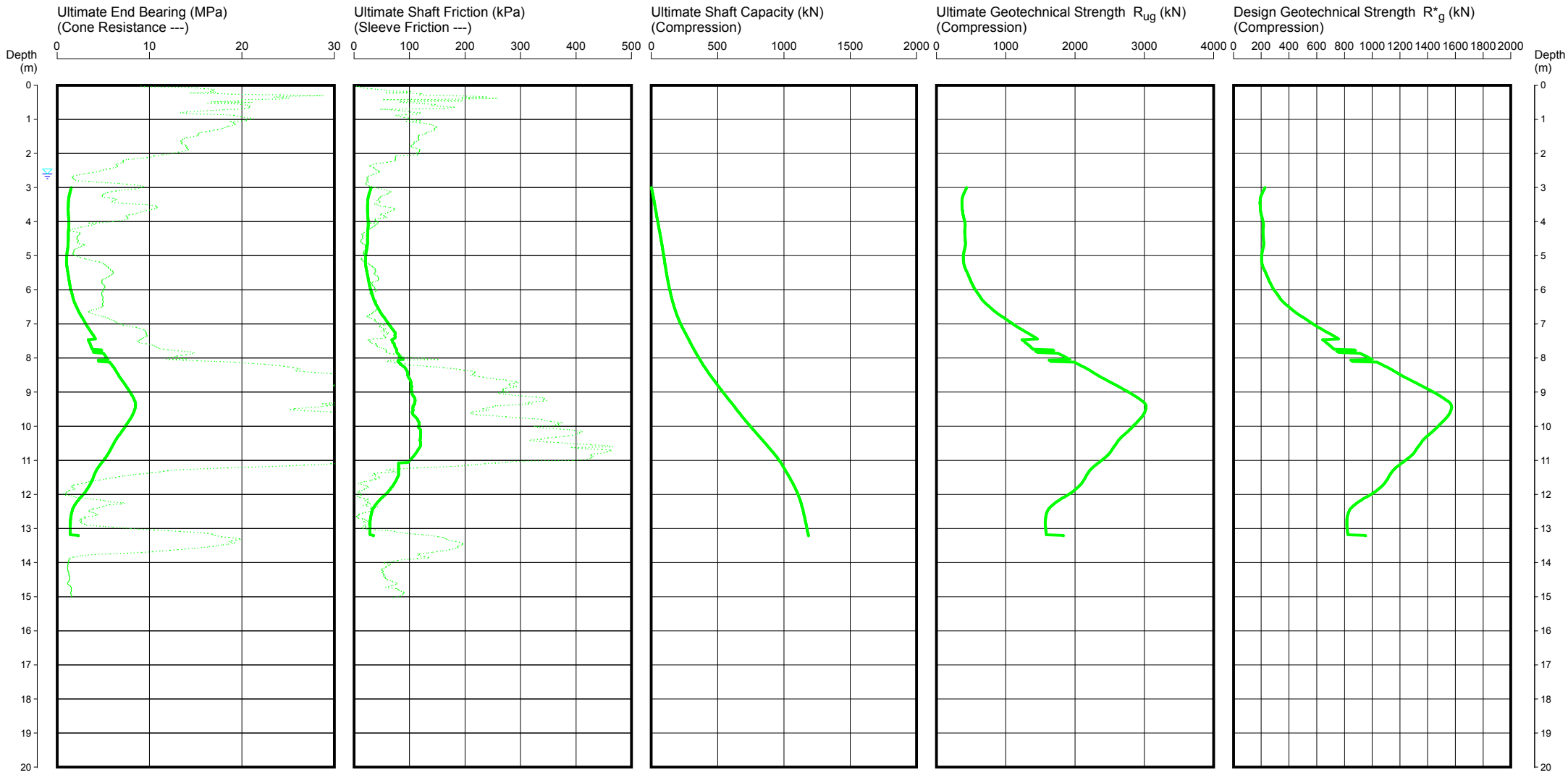
PROJECT: NEWCASTLE, PROPOSED RESIDENTIAL TOWER DEVELOPMENT

LOCATION: 21 HONEYSUCKLE DRIVE, NEWCASTLE

CLIENT: DOMA HOLDING (NSW) PTY LTD

206

DATE 19/12/2016
PROJECT No: 91034
SURFACE RL: 2.9 AHD



DISCLAIMER:
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Water depth after test: 2.60m depth

Coordinates: 384635 6356262

File: P:\91034.00 - NEWCASTLE, 21 Honeysuckle Drive\4.0 Field Work\4.2 Testing\206.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

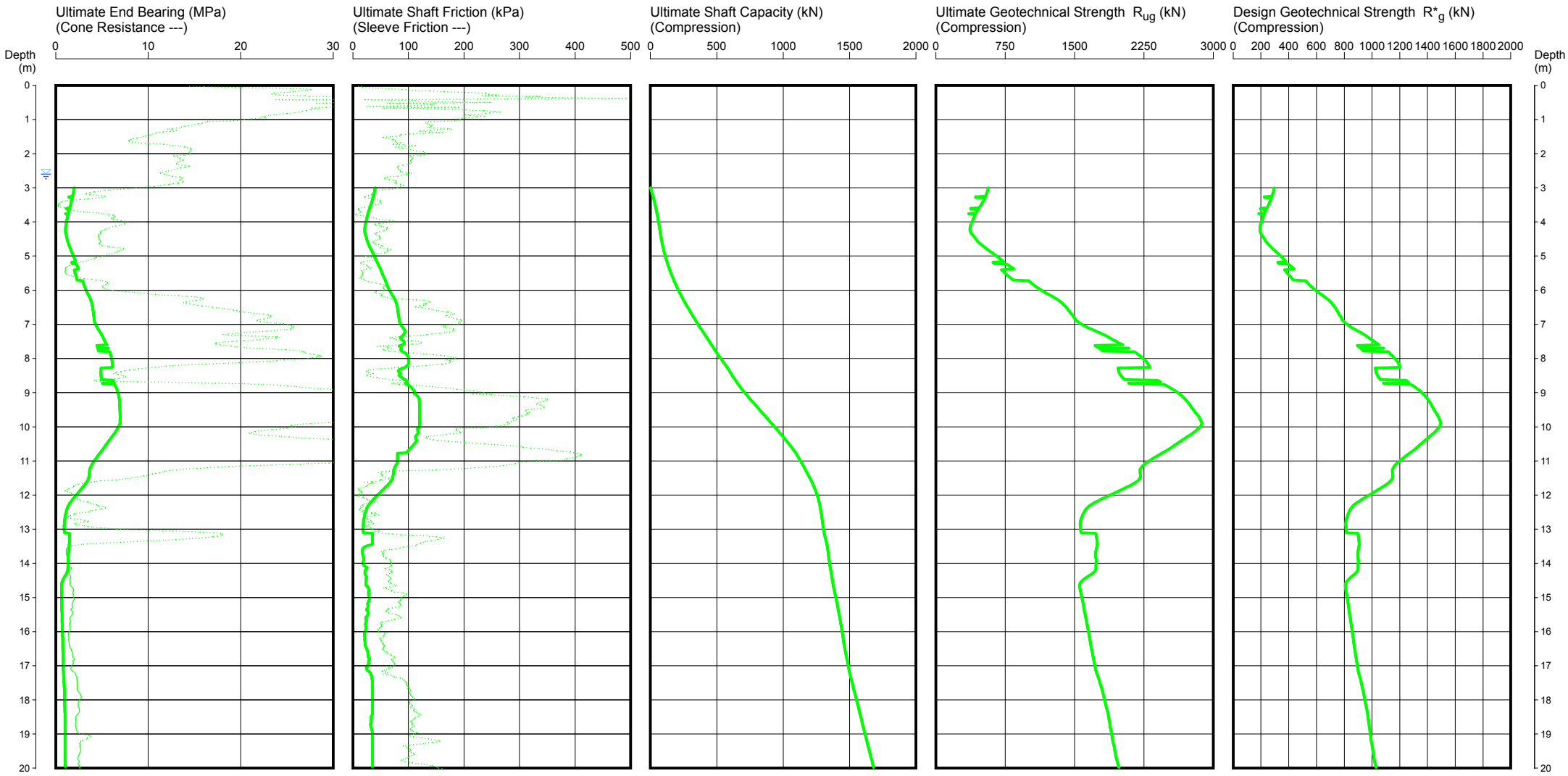
PROJECT: NEWCASTLE, PROPOSED RESIDENTIAL TOWER DEVELOPMENT

LOCATION: 21 HONEYSUCKLE DRIVE, NEWCASTLE

CLIENT: DOMA HOLDING (NSW) PTY LTD

207

DATE 19/12/2016
PROJECT No: 91034
SURFACE RL: 2.9 AHD



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Water depth after test: 2.60m depth

Coordinates: 384674 6356257

File: P:\91034.00 - NEWCASTLE, 21 Honeysuckle Drive\4.0 Field Work\4.2 Testing\207.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

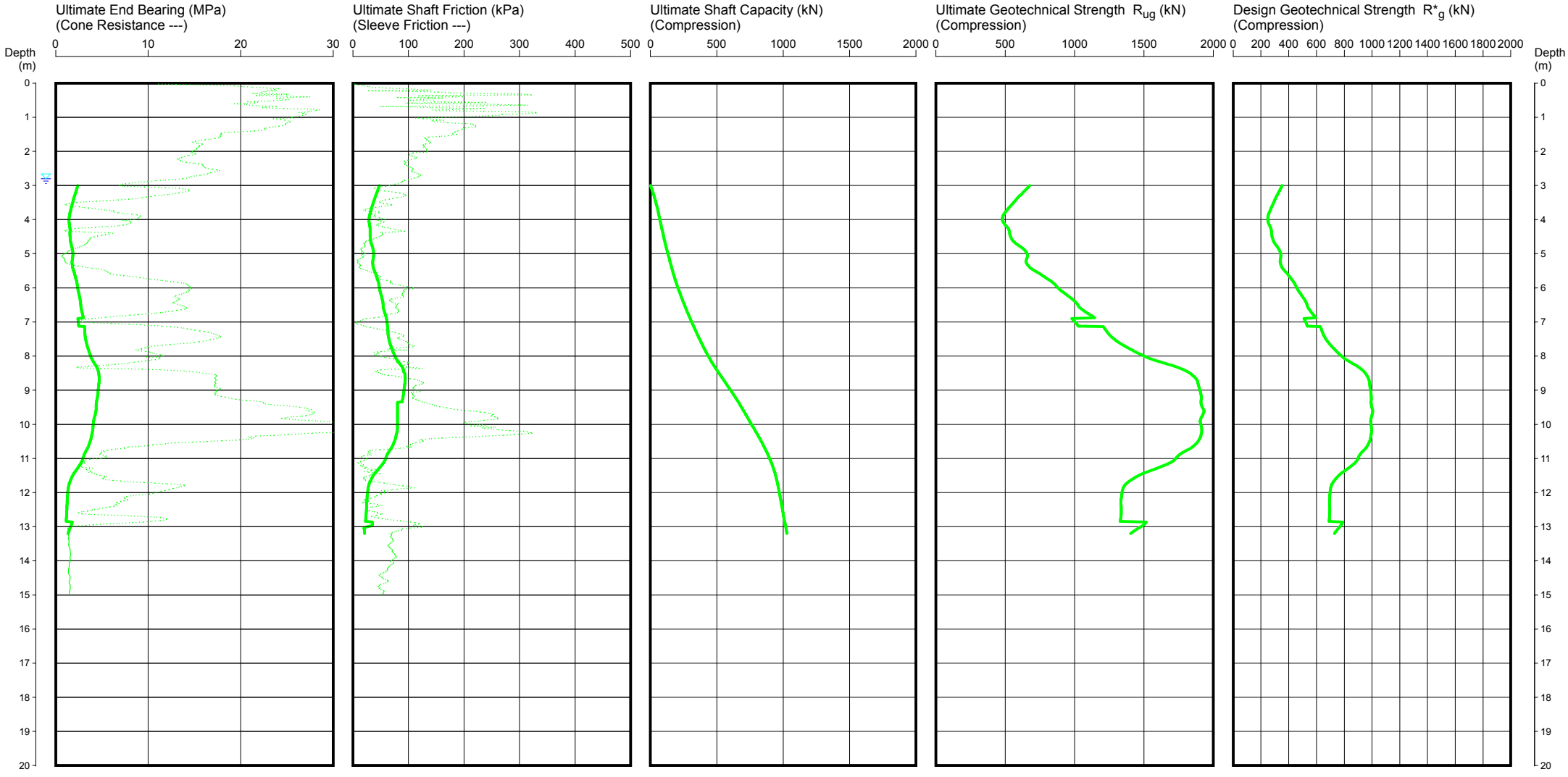
PROJECT: NEWCASTLE, PROPOSED RESIDENTIAL TOWER DEVELOPMENT

LOCATION: 21 HONEYSUCKLE DRIVE, NEWCASTLE

CLIENT: DOMA HOLDING (NSW) PTY LTD

208
Page 1 of 1

DATE 19/12/2016
PROJECT No: 91034
SURFACE RL: 2.8 AHD



DISCLAIMER:
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Water depth after test: 2.80m depth

Coordinates: 384707 6356255

File: P:\91034.00 - NEWCASTLE, 21 Honeysuckle Drive\4.0 Field Work\4.2 Testing\208.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

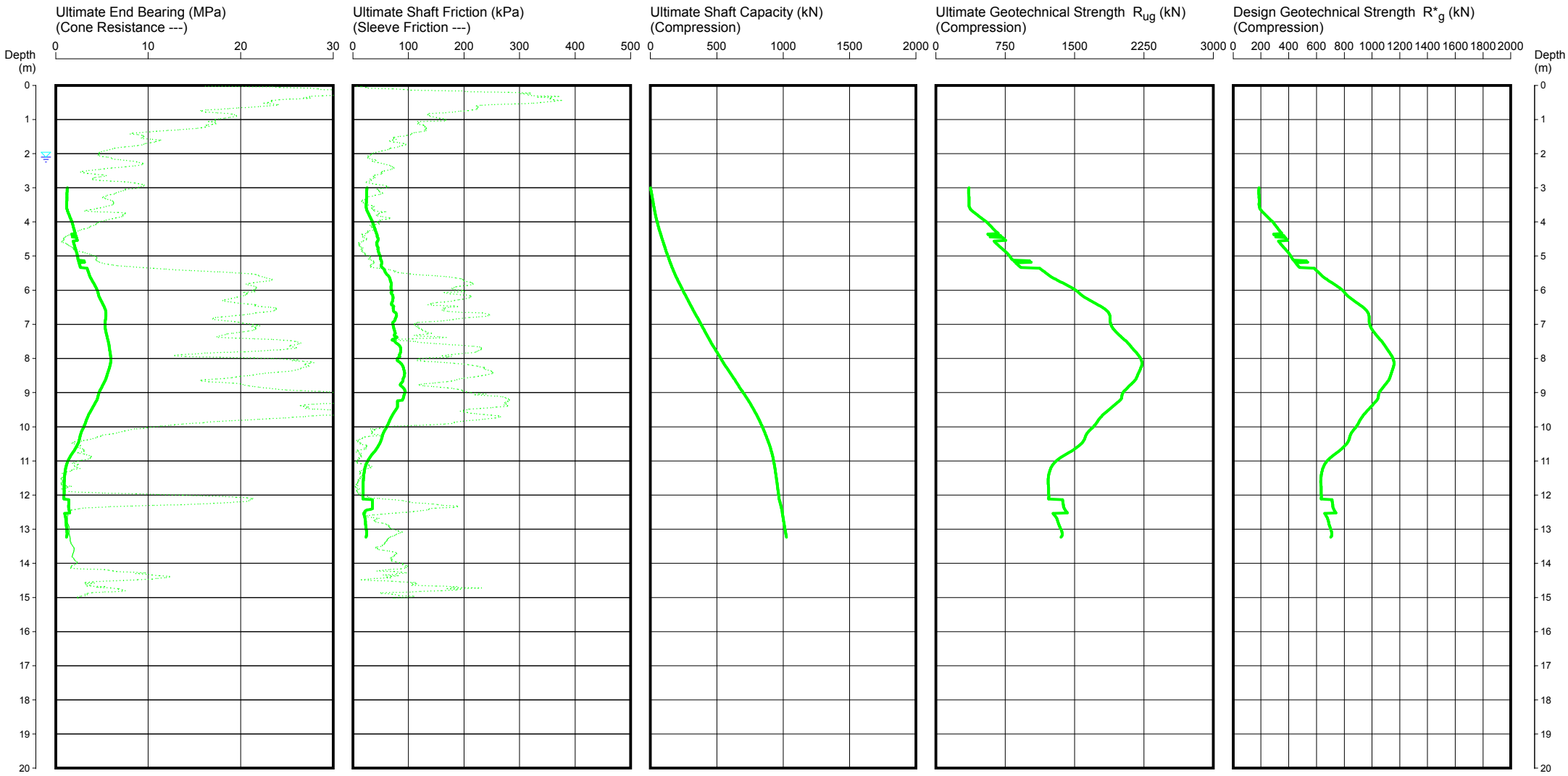
PROJECT: NEWCASTLE, PROPOSED RESIDENTIAL TOWER DEVELOPMENT

LOCATION: 21 HONEYSUCKLE DRIVE, NEWCASTLE

CLIENT: DOMA HOLDING (NSW) PTY LTD

209

DATE 19/12/2016
PROJECT No: 91034
SURFACE RL: 2.3 AHD



DISCLAIMER:
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Water depth after test: 2.10m depth

Coordinates: 384745 6356256

File: P:\91034.00 - NEWCASTLE, 21 Honeysuckle Drive\4.0 Field Work\4.2 Testing\209.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

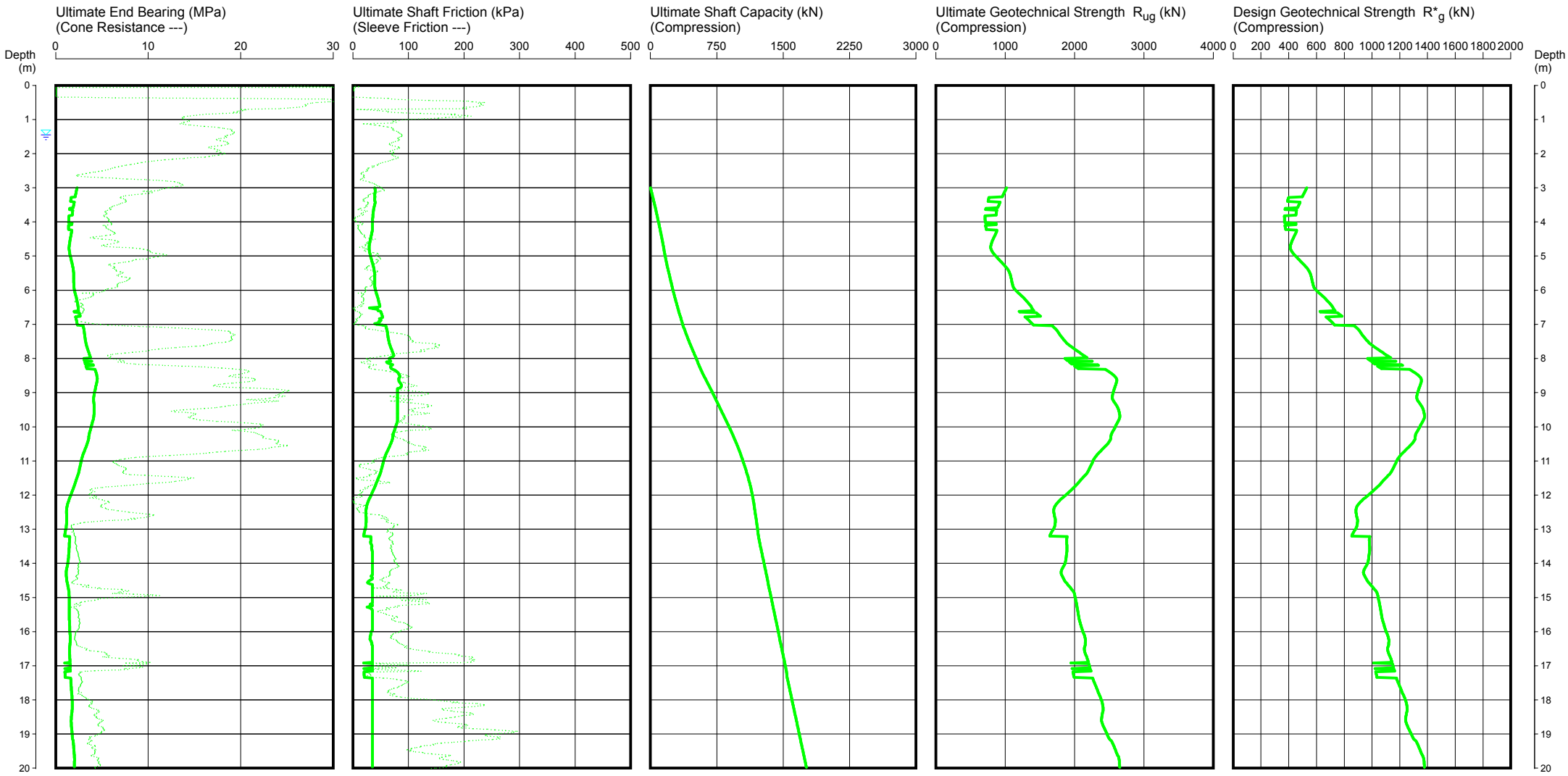
PROJECT: NEWCASTLE, PROPOSED RESIDENTIAL TOWER DEVELOPMENT

LOCATION: 21 HONEYSUCKLE DRIVE, NEWCASTLE

CLIENT: DOMA HOLDING (NSW) PTY LTD

201

DATE 20/12/2016
PROJECT No: 91034
SURFACE RL: 1.9 AHD



DISCLAIMER:
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Water depth after test: 1.45m depth

Coordinates: 384758 6356298

File: P:\91034.00 - NEWCASTLE, 21 Honeysuckle Drive\4.0 Field Work\4.2 Testing\201.CP5
Cone ID: 120621 **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

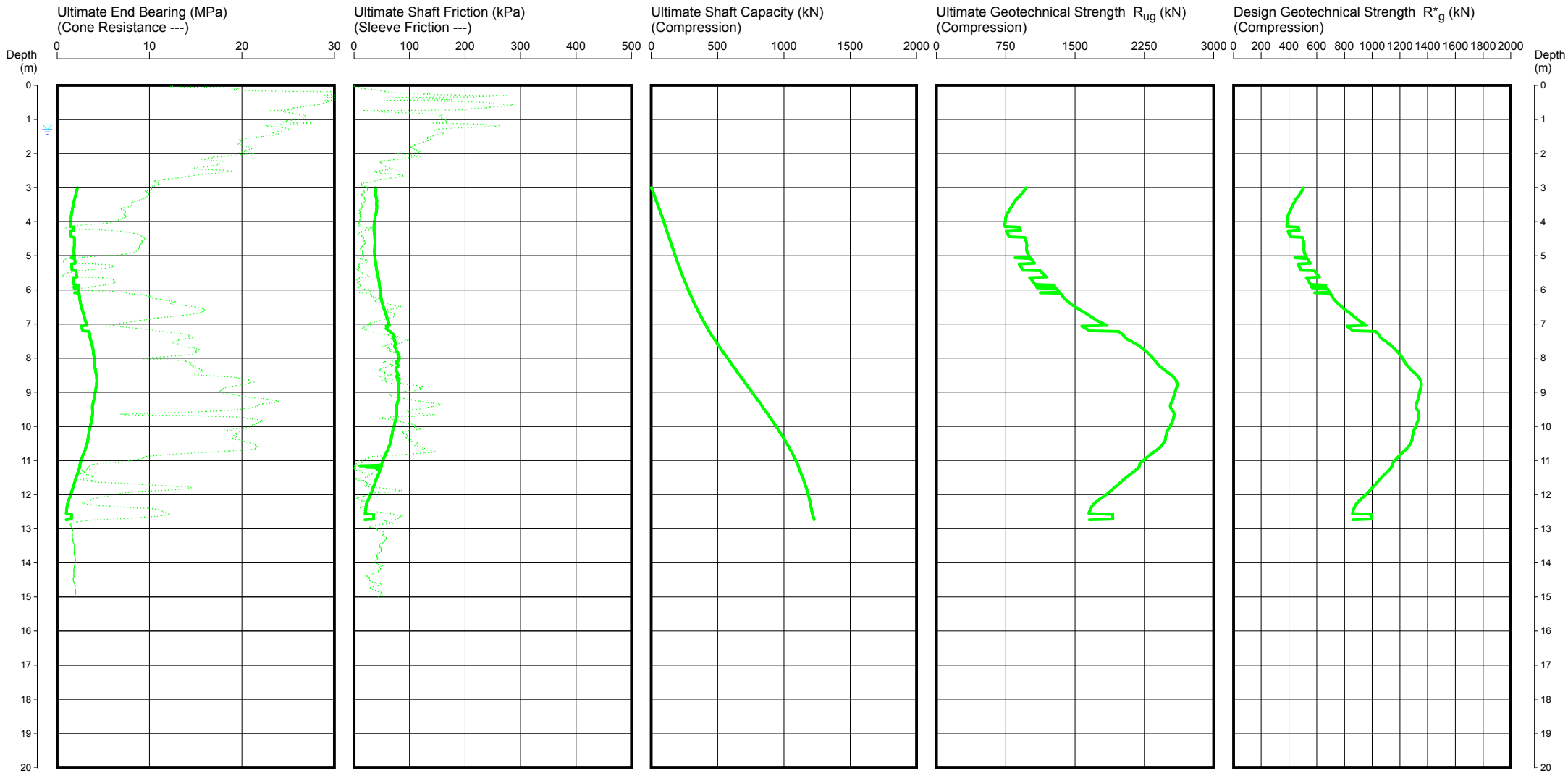
PROJECT: NEWCASTLE, PROPOSED RESIDENTIAL TOWER DEVELOPMENT

LOCATION: 21 HONEYSUCKLE DRIVE, NEWCASTLE

CLIENT: DOMA HOLDING (NSW) PTY LTD

202

DATE 20/12/2016
PROJECT No: 91034
SURFACE RL: 1.9 AHD



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Water depth after test: 1.30m depth

Coordinates: 384724 6356296

File: P:\91034.00 - NEWCASTLE, 21 Honeysuckle Drive\4.0 Field Work\4.2 Testing\202.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

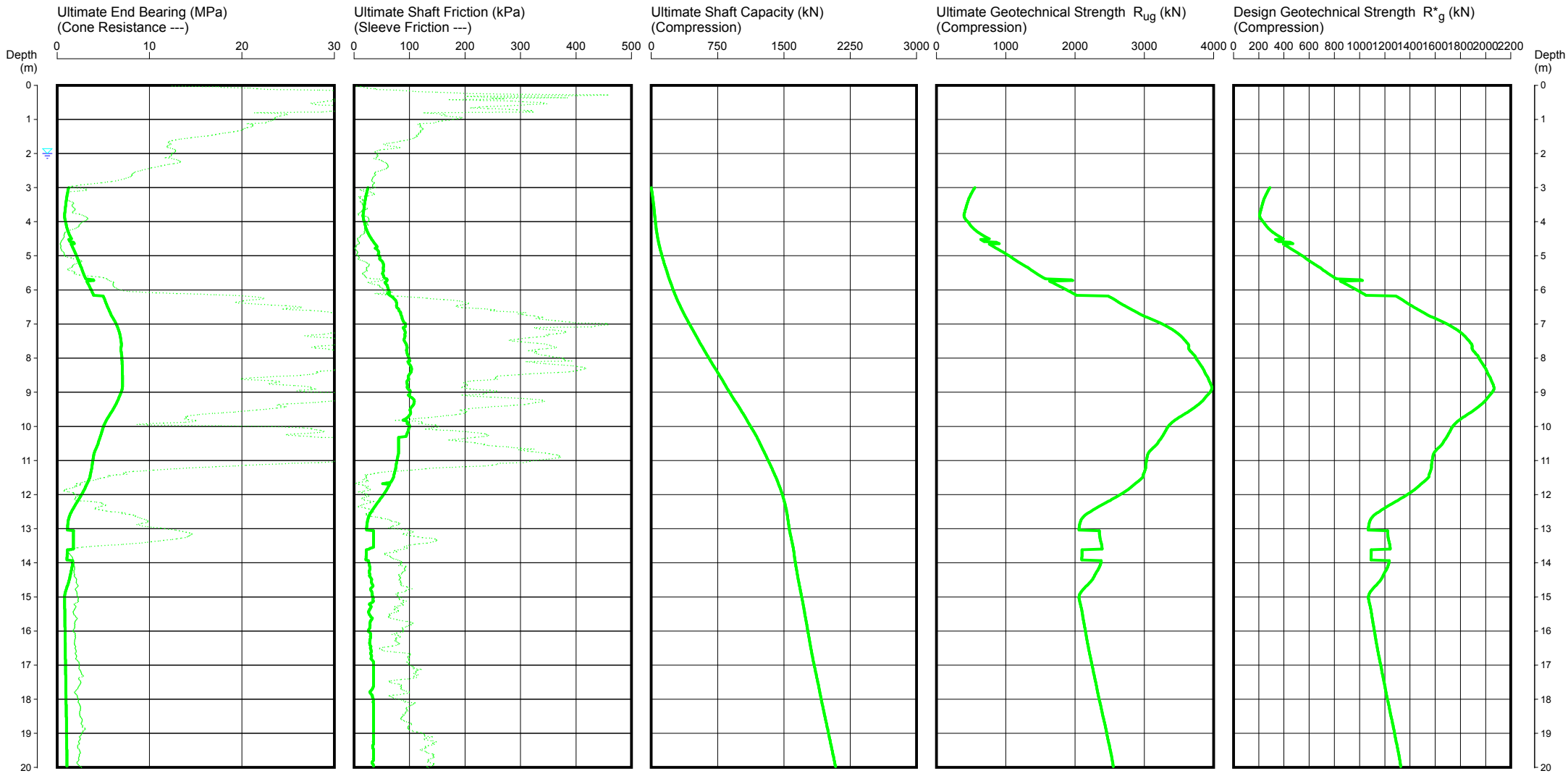
PROJECT: NEWCASTLE, PROPOSED RESIDENTIAL TOWER DEVELOPMENT

LOCATION: 21 HONEYSUCKLE DRIVE, NEWCASTLE

CLIENT: DOMA HOLDING (NSW) PTY LTD

203

DATE 20/12/2016
PROJECT No: 91034
SURFACE RL: 2.1 AHD



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Water depth after test: 2.00m depth

Coordinates: 384696 6356297

File: P:\91034.00 - NEWCASTLE, 21 Honeysuckle Drive\4.0 Field Work\4.2 Testing\203.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

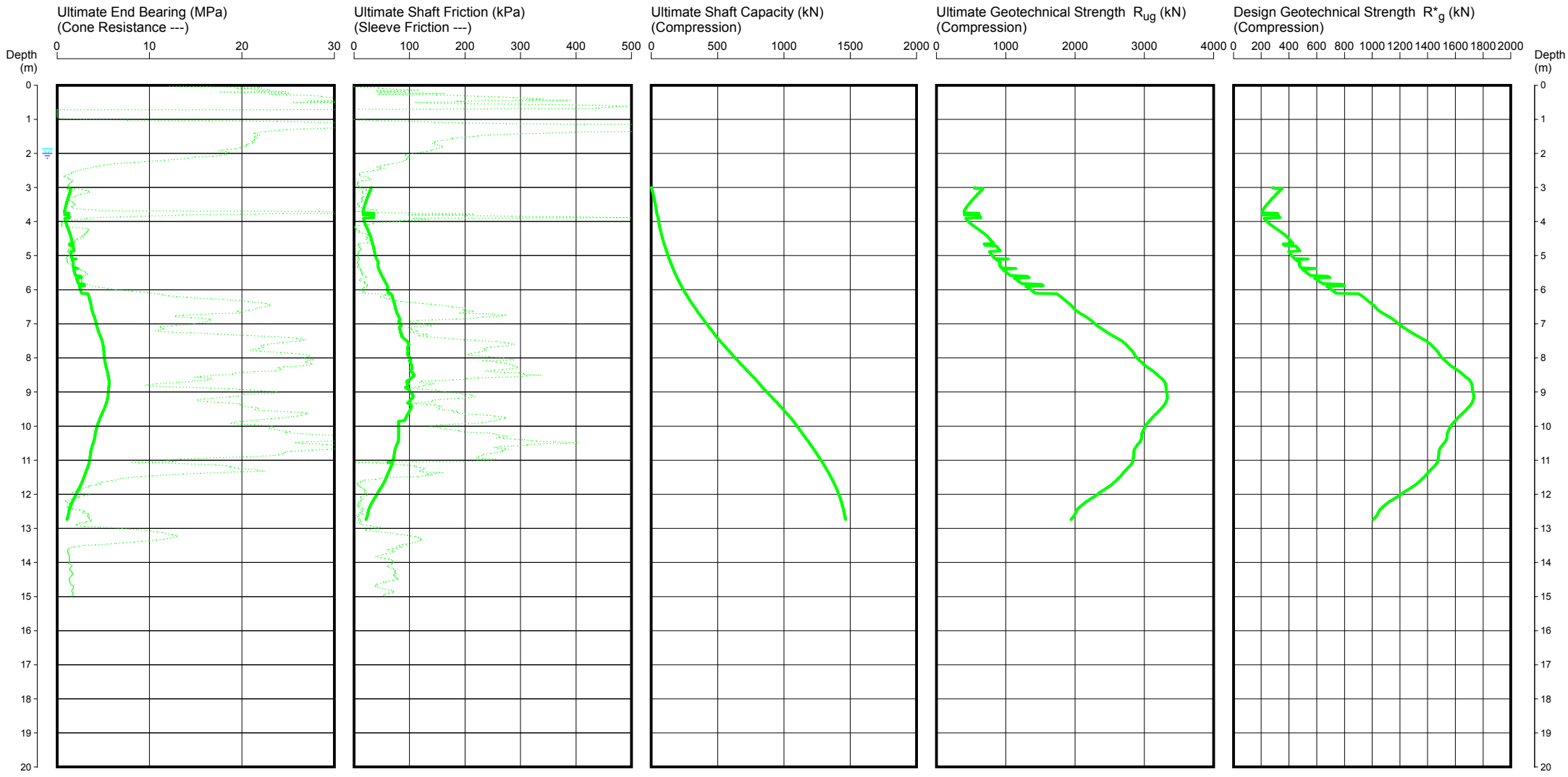
PROJECT: NEWCASTLE, PROPOSED RESIDENTIAL TOWER DEVELOPMENT

LOCATION: 21 HONEYSUCKLE DRIVE, NEWCASTLE

CLIENT: DOMA HOLDING (NSW) PTY LTD

204

DATE 19/12/2016
PROJECT No: 91034
SURFACE RL: 2.1 AHD



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Water depth after test: 2.00m depth

Coordinates: 384660 6356300

File: P:\91034.00 - NEWCASTLE, 21 Honeysuckle Drive\4.0 Field Work\4.2 Testing\204A.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

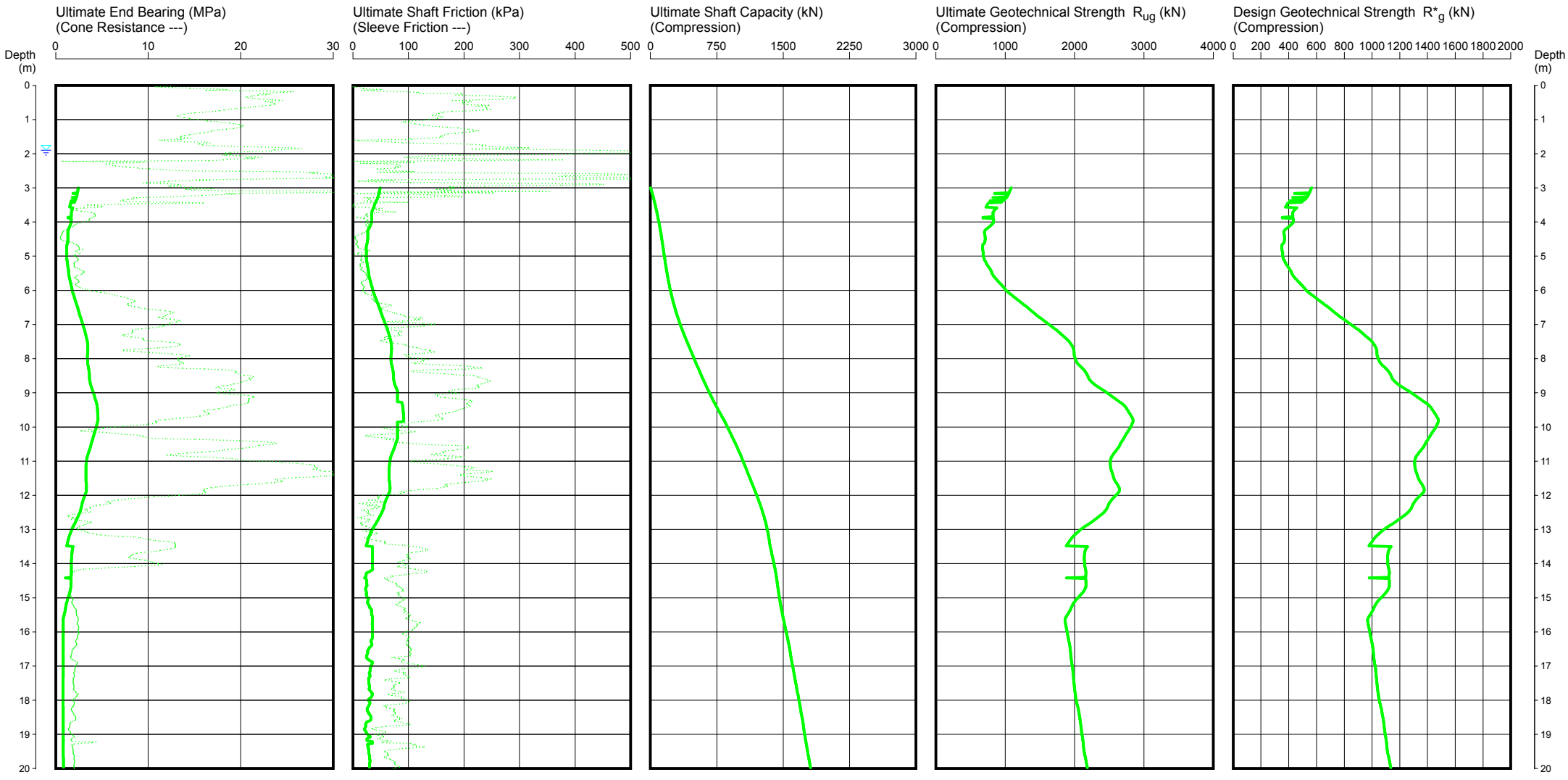
PROJECT: NEWCASTLE, PROPOSED RESIDENTIAL TOWER DEVELOPMENT

LOCATION: 21 HONEYSUCKLE DRIVE, NEWCASTLE

CLIENT: DOMA HOLDING (NSW) PTY LTD

205

DATE 19/12/2016
PROJECT No: 91034
SURFACE RL: 2.1 AHD



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Water depth after test: 1.90m depth

Coordinates: 384629 6356304

File: P:\91034.00 - NEWCASTLE, 21 Honeysuckle Drive\4.0 Field Work\4.2 Testing\205C.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

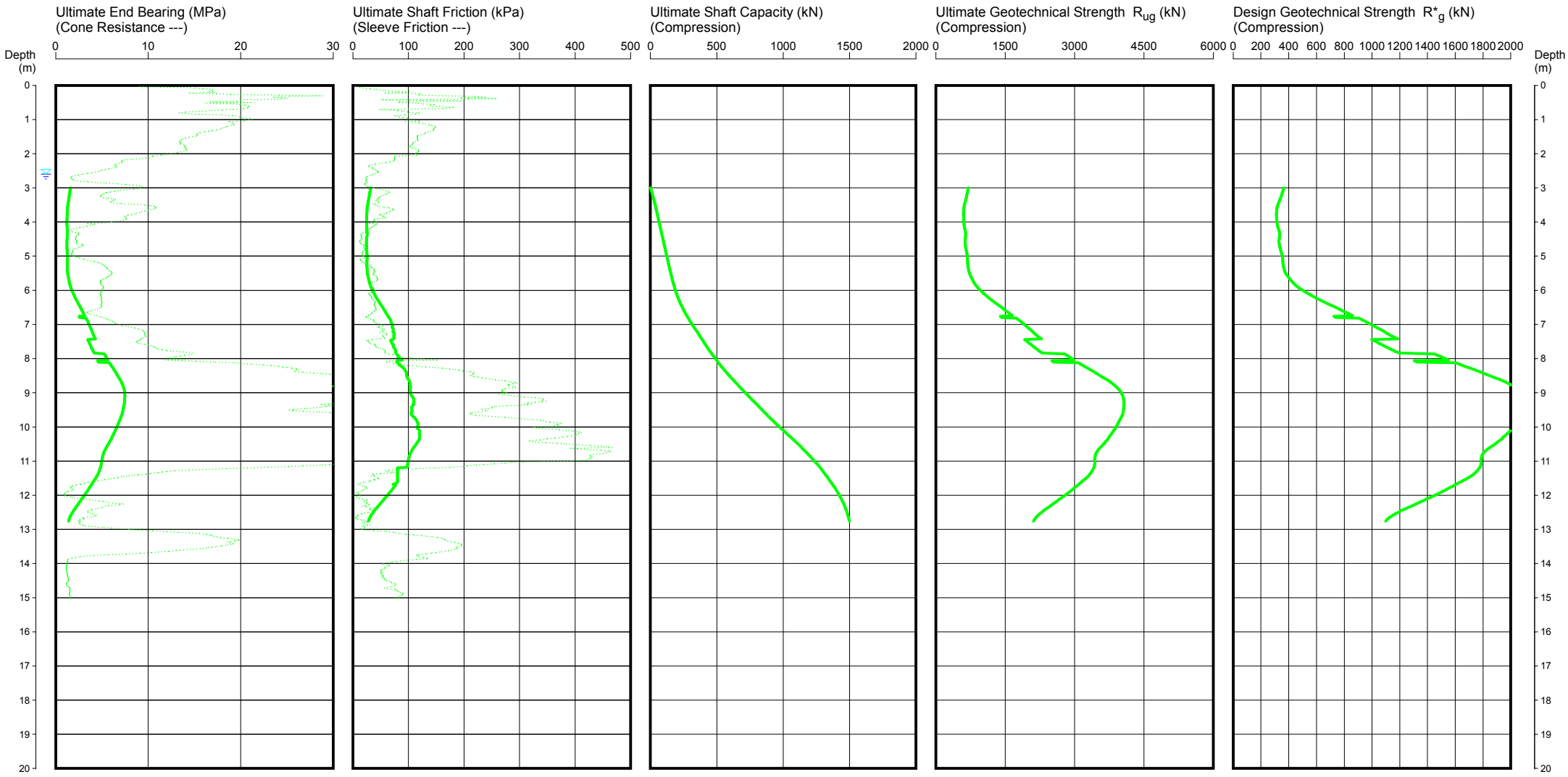
PROJECT: NEWCASTLE, PROPOSED RESIDENTIAL TOWER DEVELOPMENT

LOCATION: 21 HONEYSUCKLE DRIVE, NEWCASTLE

CLIENT: DOMA HOLDING (NSW) PTY LTD

206

DATE 19/12/2016
PROJECT No: 91034
SURFACE RL: 2.9 AHD



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Water depth after test: 2.60m depth

Coordinates: 384635 6356262

File: P:\91034.00 - NEWCASTLE, 21 Honeysuckle Drive\4.0 Field Work\4.2 Testing\206.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

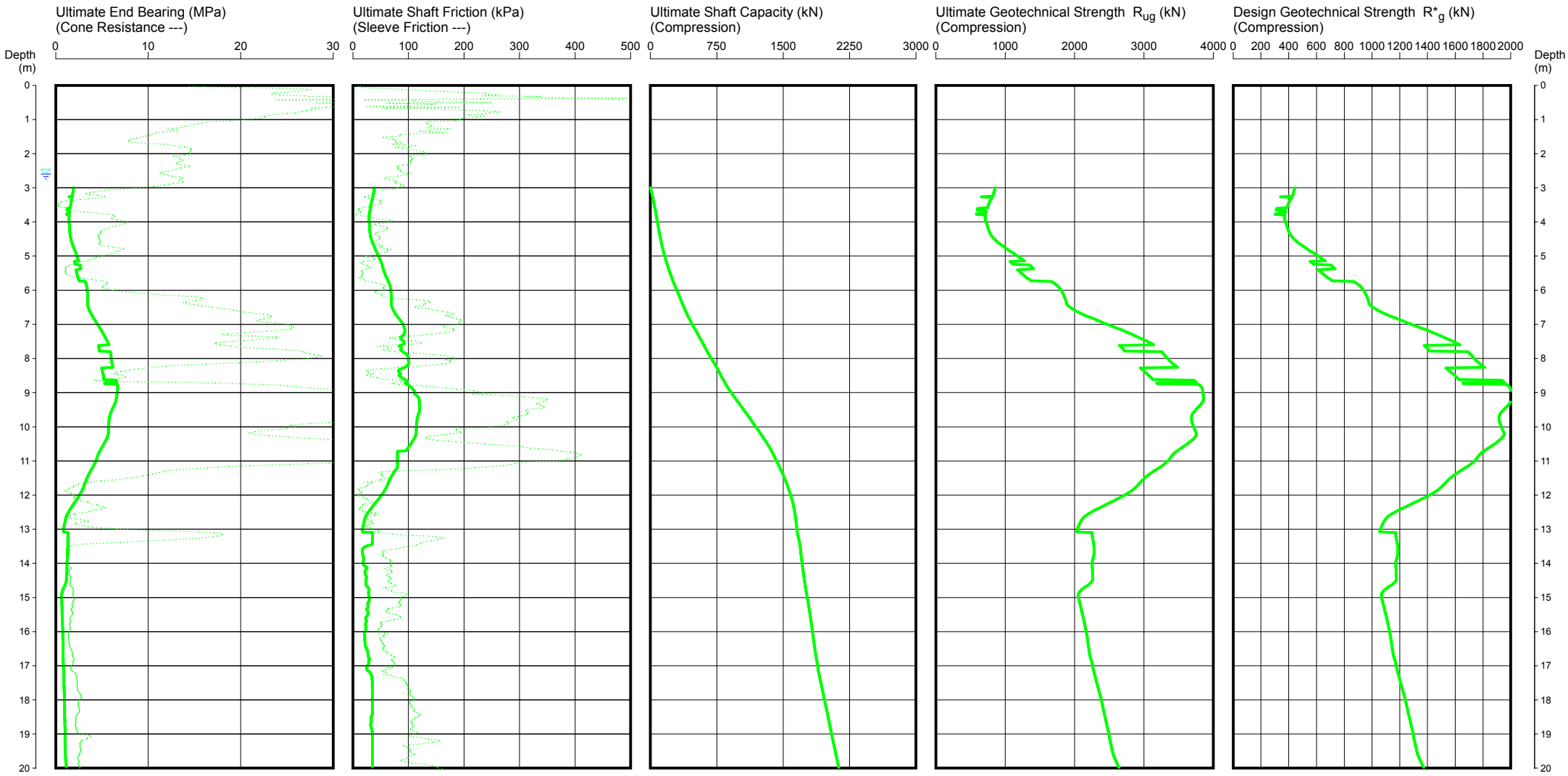
PROJECT: NEWCASTLE, PROPOSED RESIDENTIAL TOWER DEVELOPMENT

LOCATION: 21 HONEYSUCKLE DRIVE, NEWCASTLE

CLIENT: DOMA HOLDING (NSW) PTY LTD

207

DATE 19/12/2016
PROJECT No: 91034
SURFACE RL: 2.9 AHD



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Water depth after test: 2.60m depth

Coordinates: 384674 6356257

File: P:\91034.00 - NEWCASTLE, 21 Honeysuckle Drive\4.0 Field Work\4.2 Testing\207.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

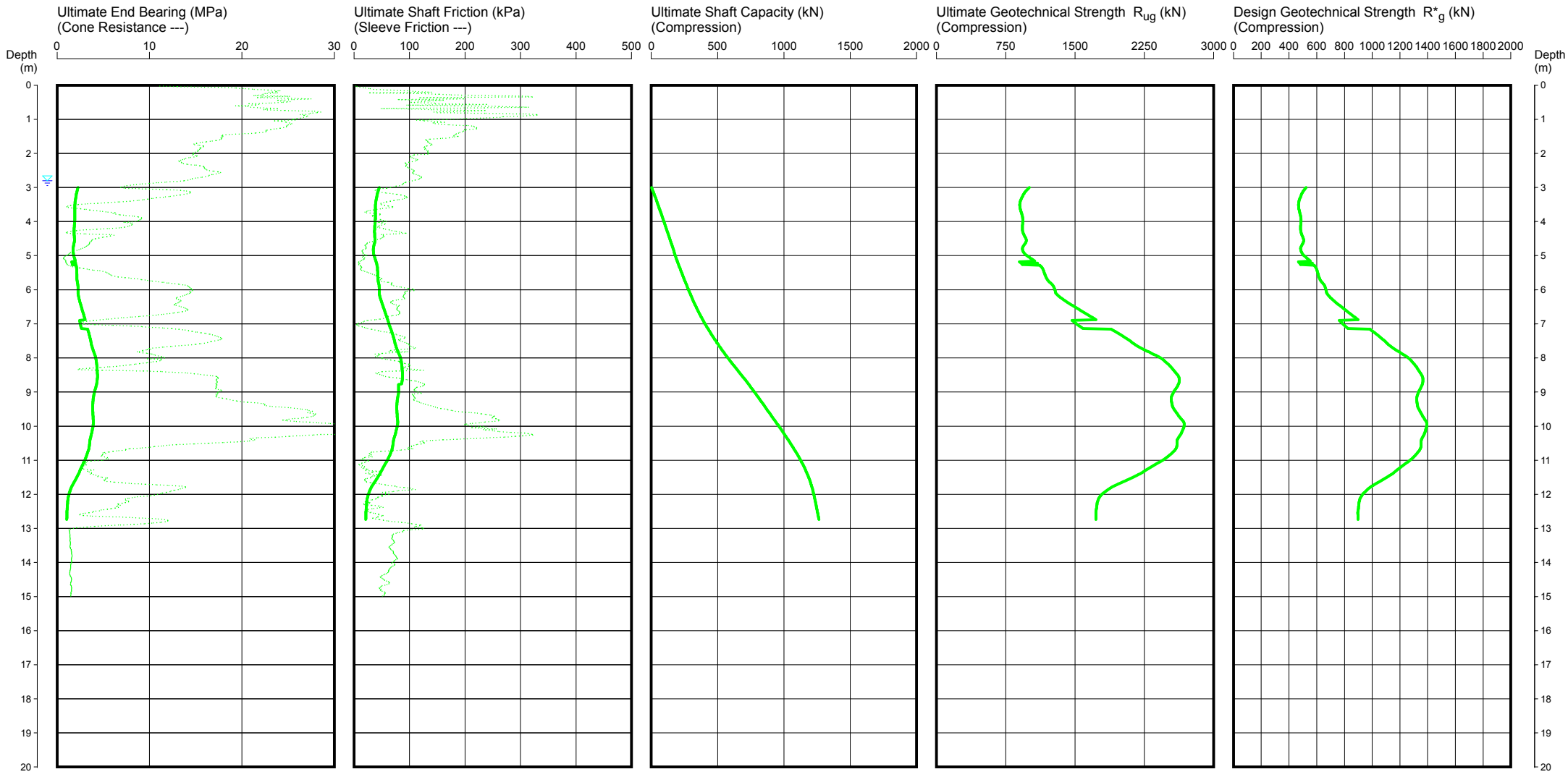
PROJECT: NEWCASTLE, PROPOSED RESIDENTIAL TOWER DEVELOPMENT

LOCATION: 21 HONEYSUCKLE DRIVE, NEWCASTLE

CLIENT: DOMA HOLDING (NSW) PTY LTD

208

DATE 19/12/2016
PROJECT No: 91034
SURFACE RL: 2.8 AHD



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Water depth after test: 2.80m depth

Coordinates: 384707 6356255

File: P:\91034.00 - NEWCASTLE, 21 Honeysuckle Drive\4.0 Field Work\4.2 Testing\208.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

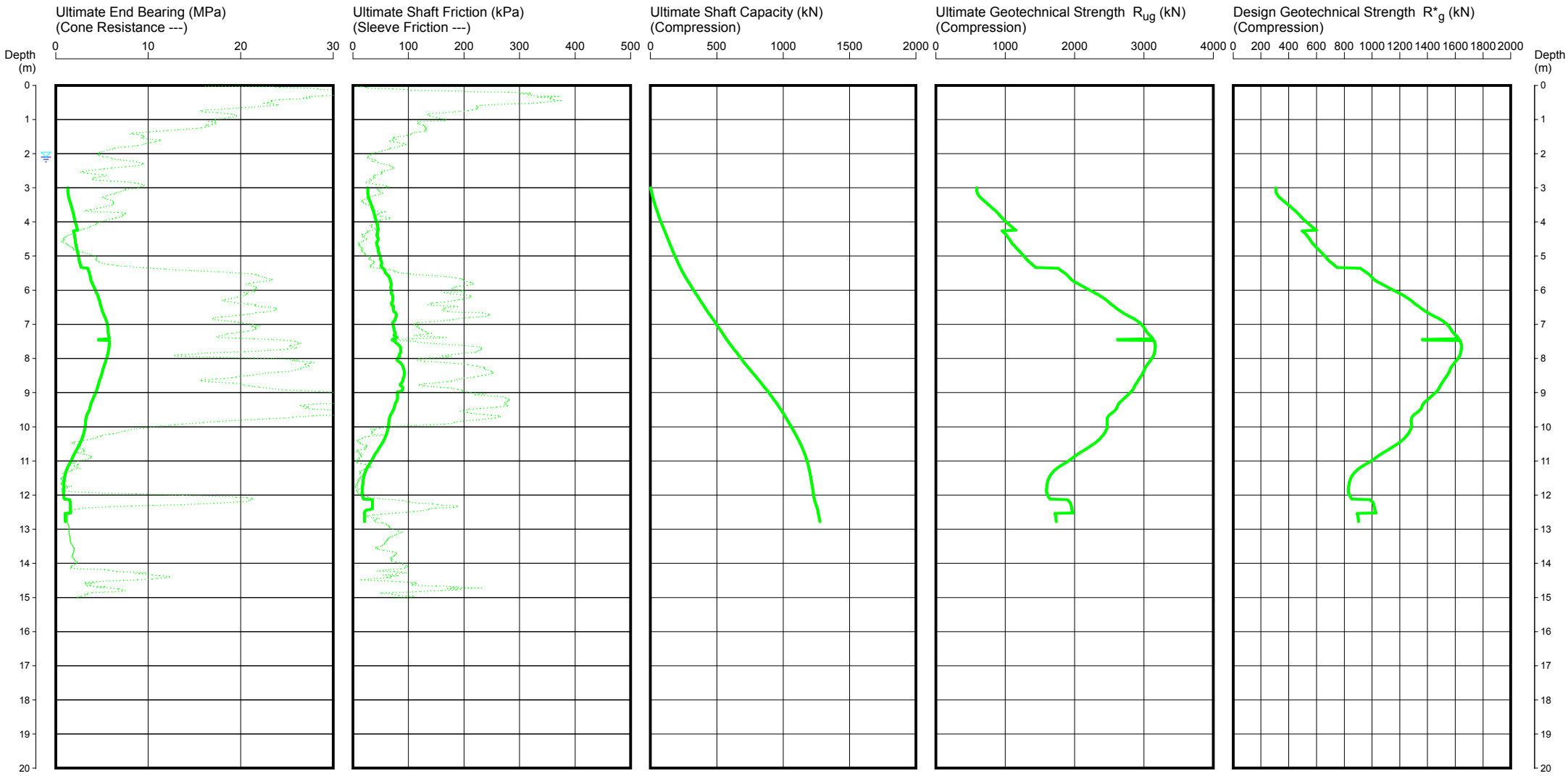
PROJECT: NEWCASTLE, PROPOSED RESIDENTIAL TOWER DEVELOPMENT

LOCATION: 21 HONEYSUCKLE DRIVE, NEWCASTLE

CLIENT: DOMA HOLDING (NSW) PTY LTD

209

DATE 19/12/2016
PROJECT No: 91034
SURFACE RL: 2.3 AHD



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Water depth after test: 2.10m depth

Coordinates: 384745 6356256

File: P:\91034.00 - NEWCASTLE, 21 Honeysuckle Drive\4.0 Field Work\4.2 Testing\209.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

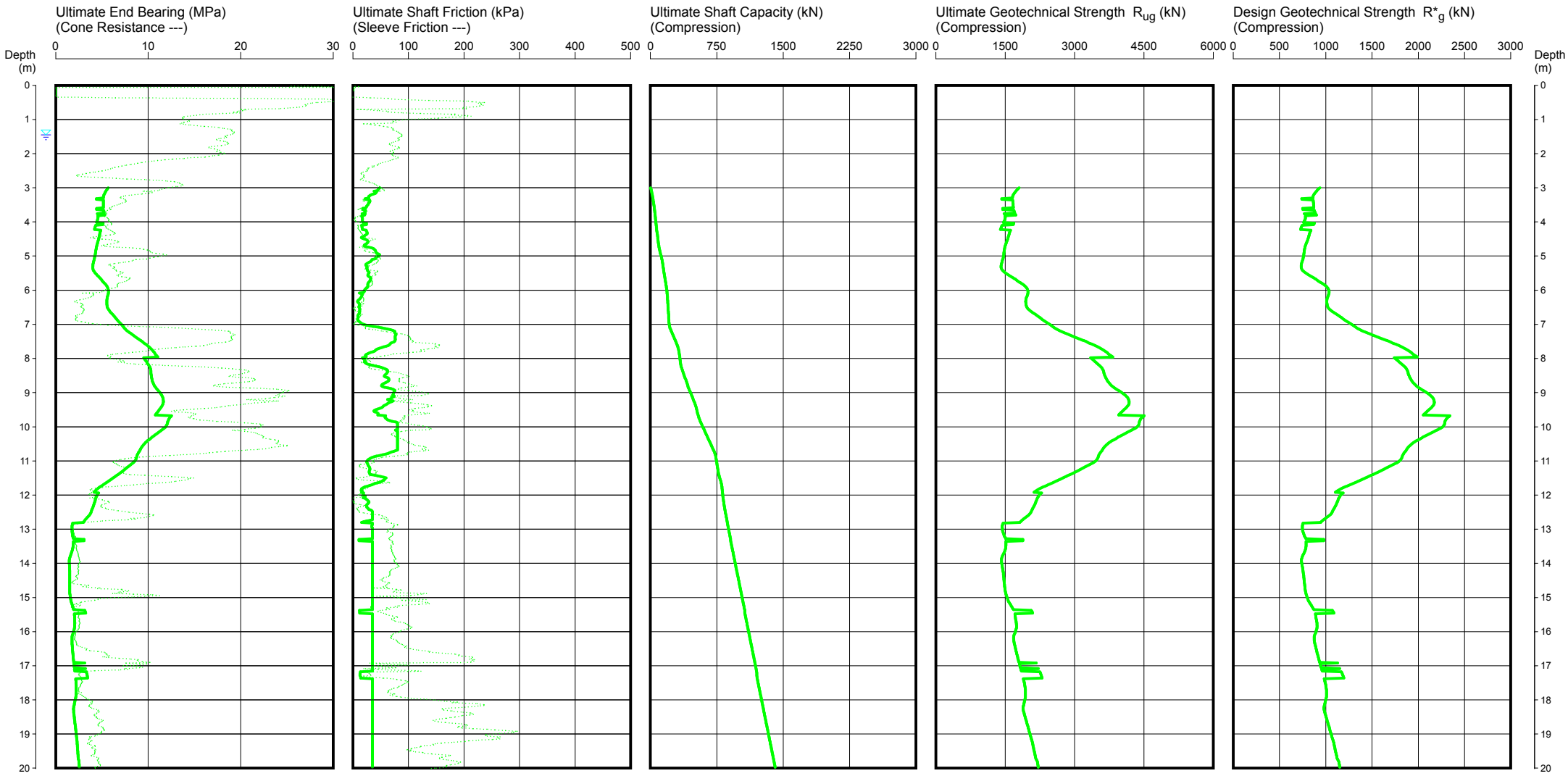
PROJECT: NEWCASTLE, PROPOSED RESIDENTIAL TOWER DEVELOPMENT

LOCATION: 21 HONEYSUCKLE DRIVE, NEWCASTLE

CLIENT: DOMA HOLDING (NSW) PTY LTD

201
Page 1 of 1

DATE 20/12/2016
PROJECT No: 91034
SURFACE RL: 1.9 AHD



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Water depth after test: 1.45m depth

Coordinates: 384758 6356298

File: P:\91034.00 - NEWCASTLE, 21 Honeysuckle Drive\4.0 Field Work\4.2 Testing\201.CP5
Cone ID: 120621 **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: NEWCASTLE, PROPOSED RESIDENTIAL TOWER DEVELOPMENT

LOCATION: 21 HONEYSUCKLE DRIVE, NEWCASTLE

CLIENT: DOMA HOLDING (NSW) PTY LTD

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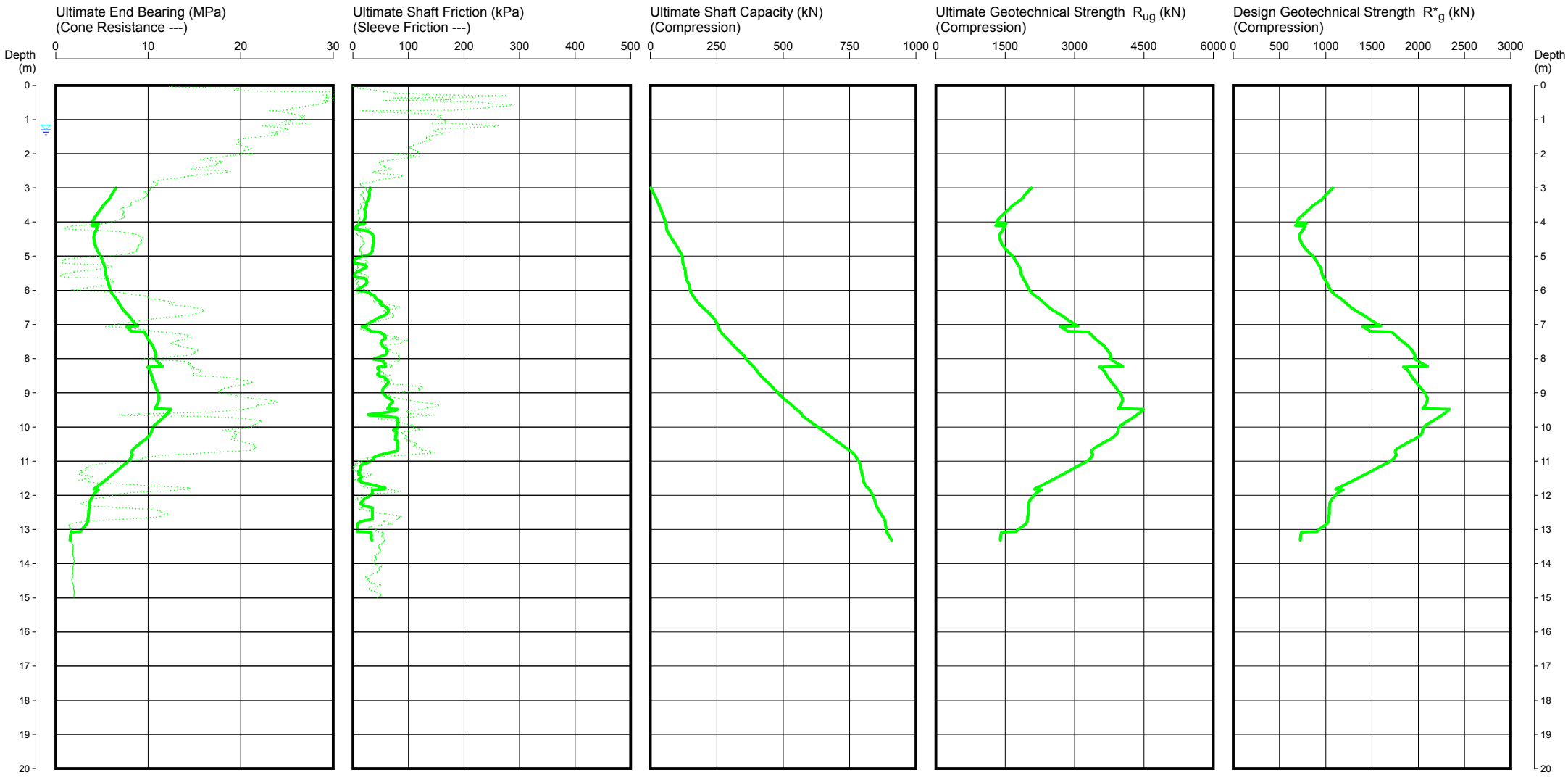
Page 1 of 1

DATE 20/12/2016
PROJECT No: 91034
SURFACE RL: 1.9 AHD



DISCLAIMER:
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Water depth after test: 1.30m depth

Coordinates: 384724 6356296

File: P:\91034.00 - NEWCASTLE, 21 Honeysuckle Drive\4.0 Field Work\4.2 Testing\202.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: NEWCASTLE, PROPOSED RESIDENTIAL TOWER DEVELOPMENT

LOCATION: 21 HONEYSUCKLE DRIVE, NEWCASTLE

CLIENT: DOMA HOLDING (NSW) PTY LTD

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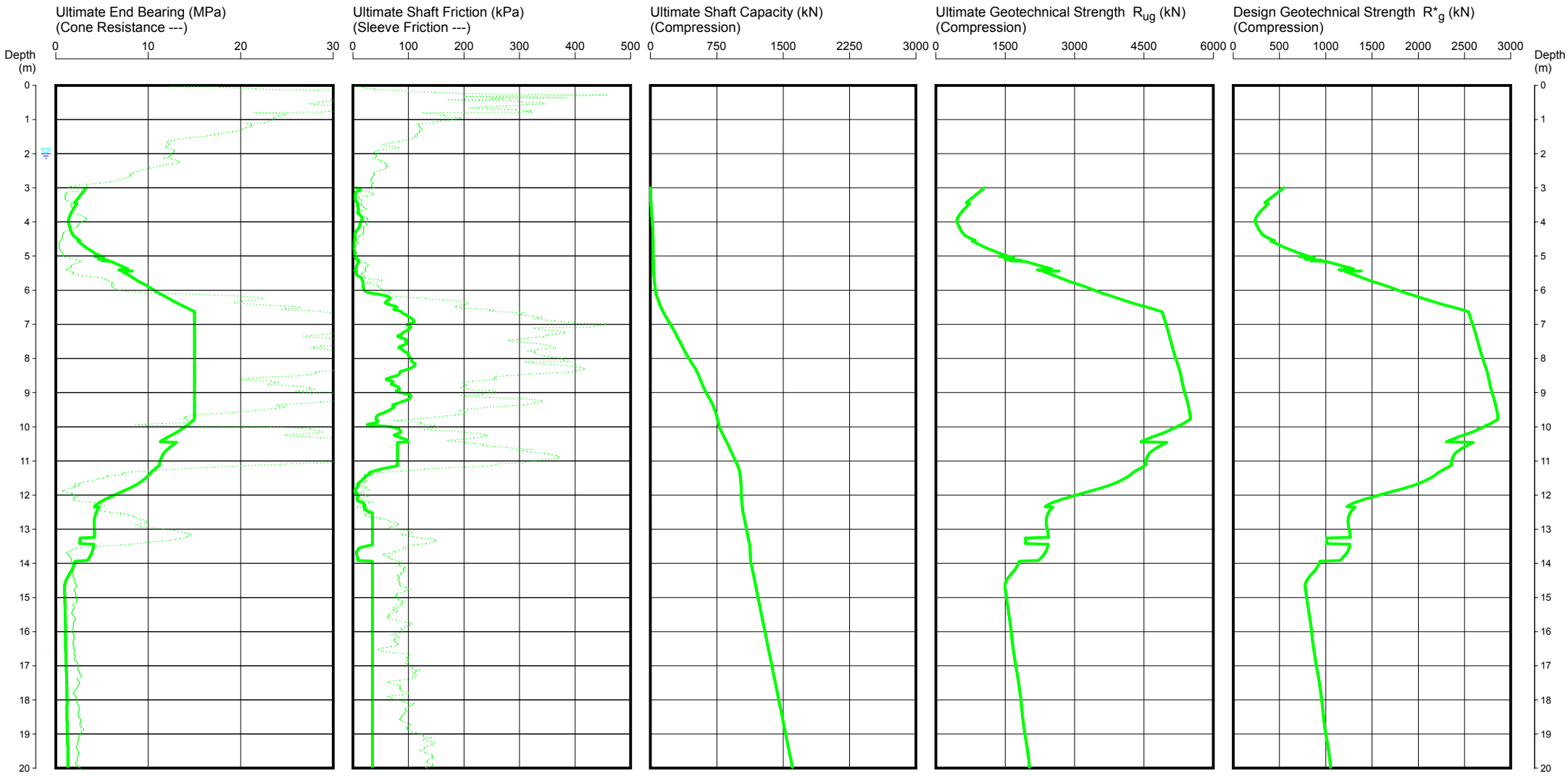
Page 1 of 1

DATE 20/12/2016
PROJECT No: 91034
SURFACE RL: 2.1 AHD



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Water depth after test: 2.00m depth

Coordinates: 384696 6356297

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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: NEWCASTLE, PROPOSED RESIDENTIAL TOWER DEVELOPMENT

LOCATION: 21 HONEYSUCKLE DRIVE, NEWCASTLE

CLIENT: DOMA HOLDING (NSW) PTY LTD

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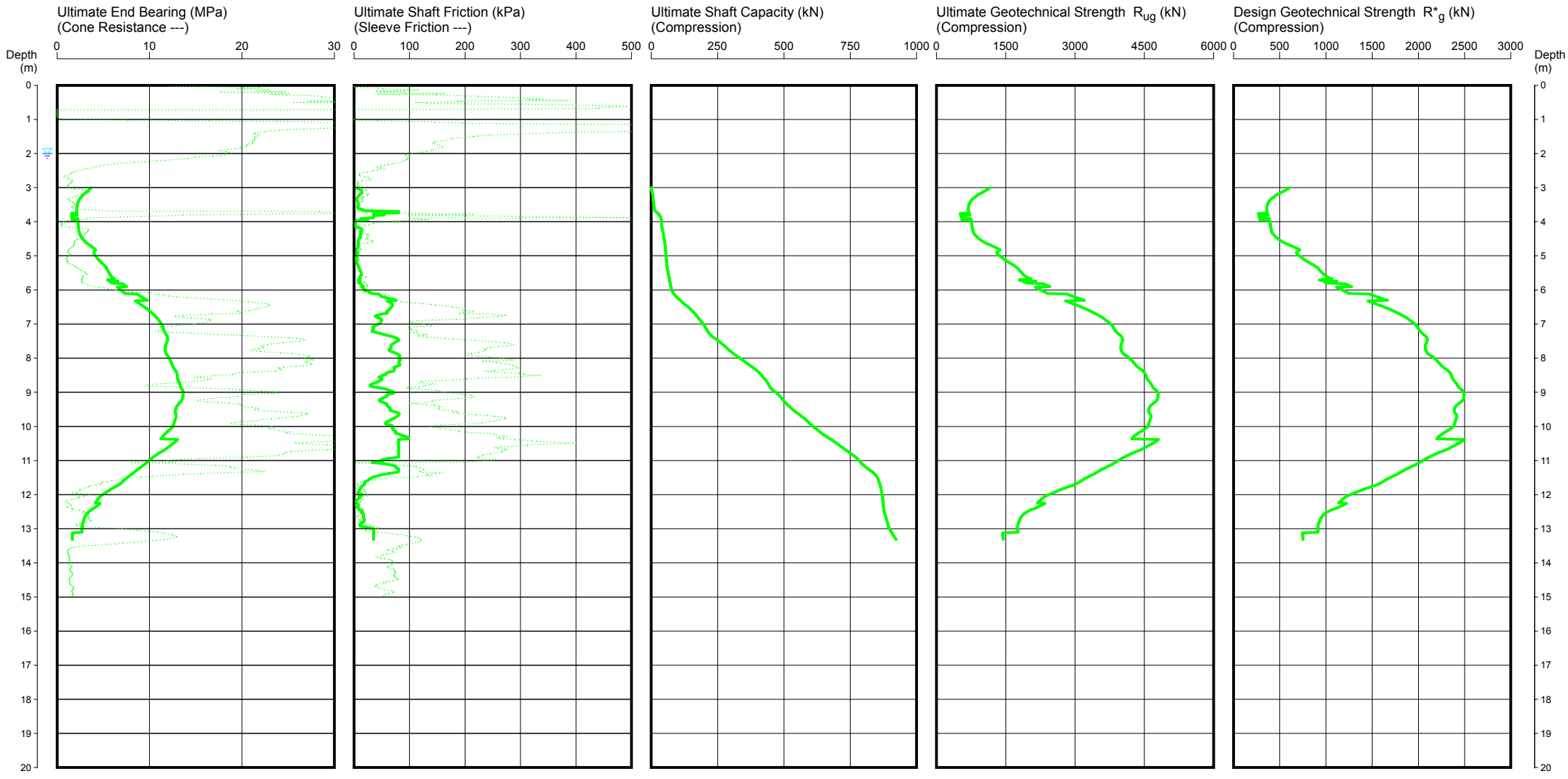
Page 1 of 1

DATE 19/12/2016
PROJECT No: 91034
SURFACE RL: 2.1 AHD



DISCLAIMER:
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Water depth after test: 2.00m depth

Coordinates: 384660 6356300

File: P:\91034.00 - NEWCASTLE, 21 Honeysuckle Drive\4.0 Field Work\4.2 Testing\204A.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: NEWCASTLE, PROPOSED RESIDENTIAL TOWER DEVELOPMENT

LOCATION: 21 HONEYSUCKLE DRIVE, NEWCASTLE

CLIENT: DOMA HOLDING (NSW) PTY LTD

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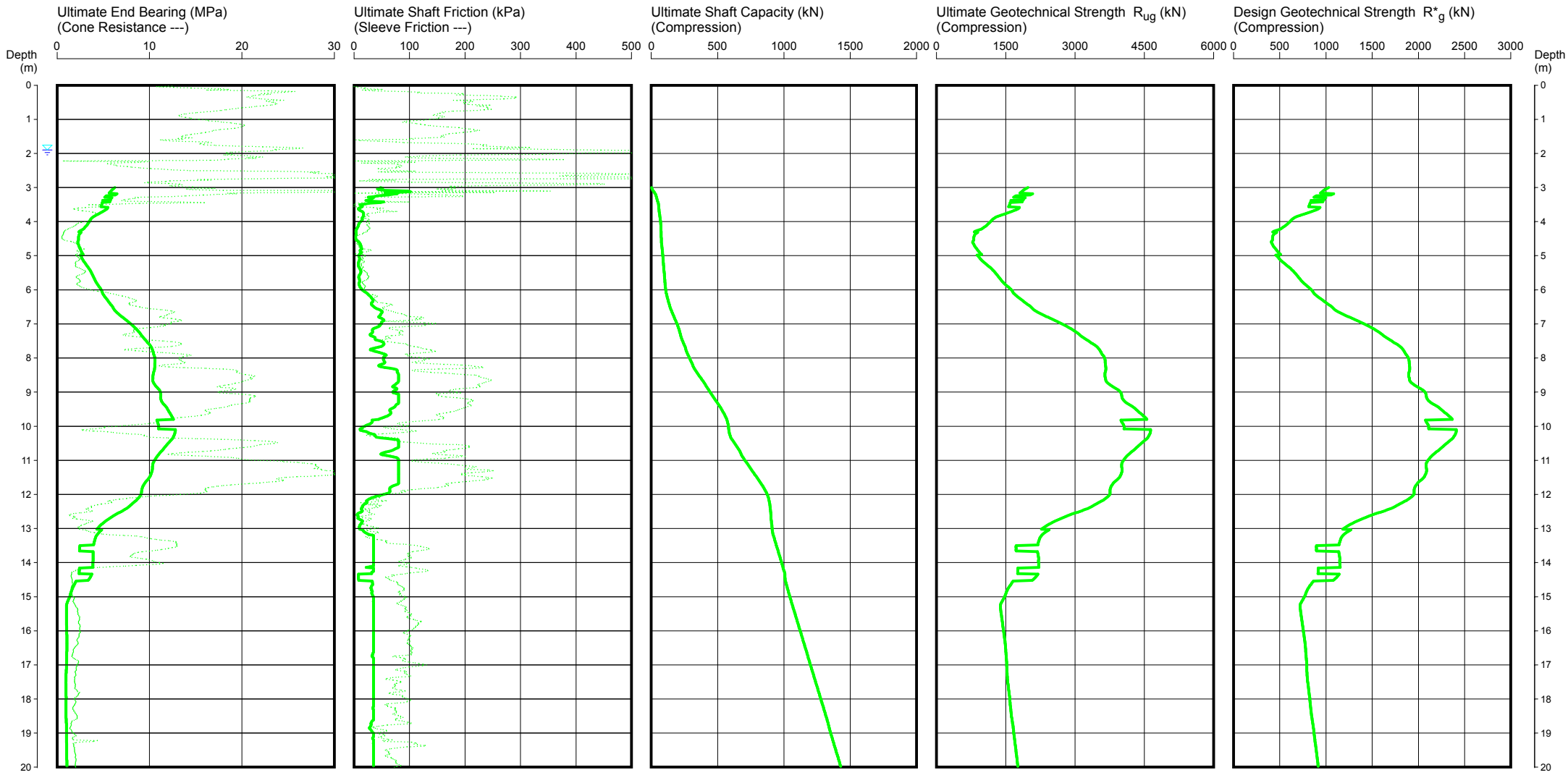
Page 1 of 1

DATE 19/12/2016
PROJECT No: 91034
SURFACE RL: 2.1 AHD



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Water depth after test: 1.90m depth

Coordinates: 384629 6356304

File: P:\91034.00 - NEWCASTLE, 21 Honeysuckle Drive\4.0 Field Work\4.2 Testing\205C.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: NEWCASTLE, PROPOSED RESIDENTIAL TOWER DEVELOPMENT

LOCATION: 21 HONEYSUCKLE DRIVE, NEWCASTLE

CLIENT: DOMA HOLDING (NSW) PTY LTD

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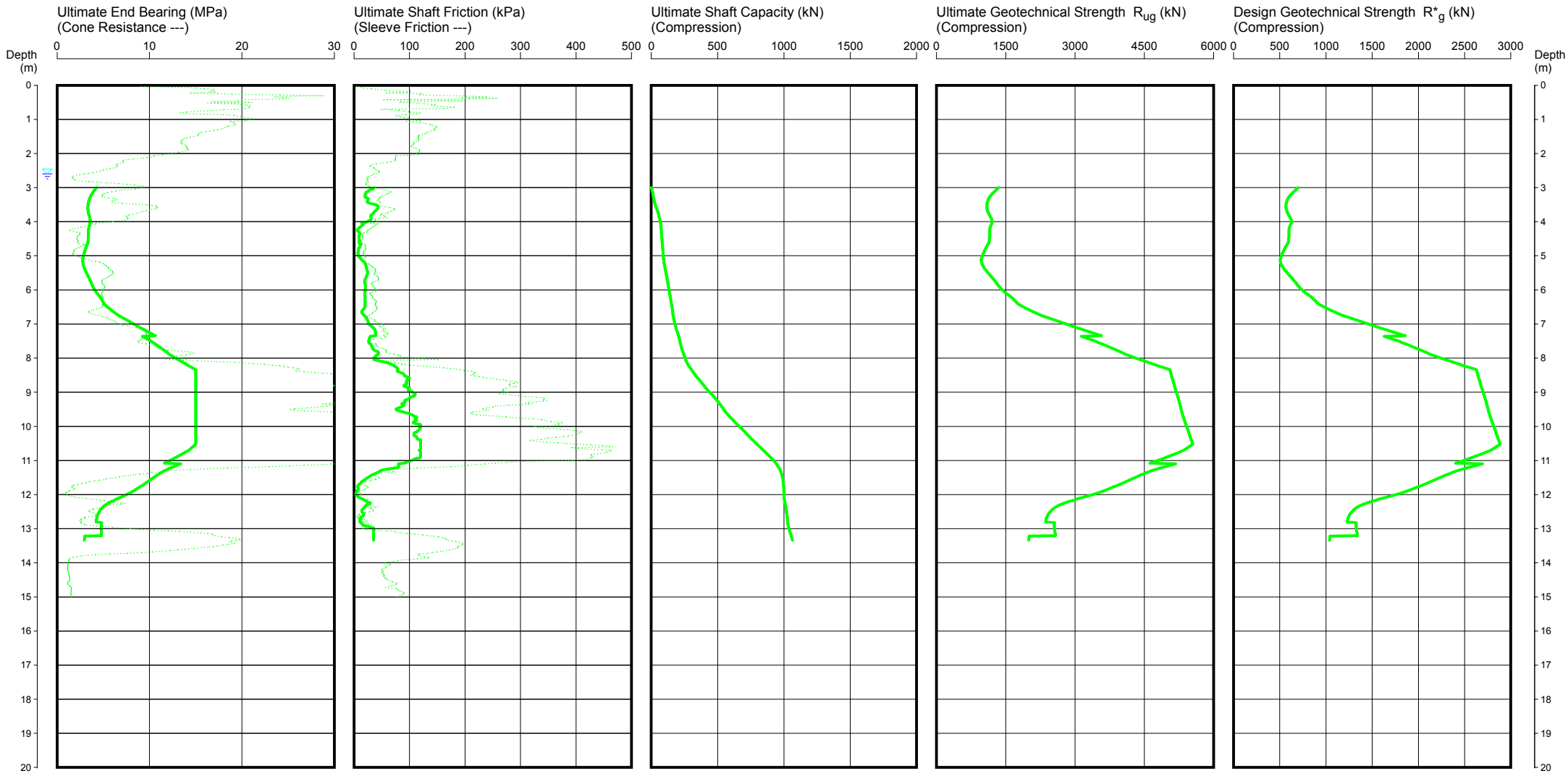
Page 1 of 1

DATE 19/12/2016
PROJECT No: 91034
SURFACE RL: 2.9 AHD



DISCLAIMER:
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Water depth after test: 2.60m depth

Coordinates: 384635 6356262

File: P:\91034.00 - NEWCASTLE, 21 Honeysuckle Drive\4.0 Field Work\4.2 Testing\206.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: NEWCASTLE, PROPOSED RESIDENTIAL TOWER DEVELOPMENT

LOCATION: 21 HONEYSUCKLE DRIVE, NEWCASTLE

CLIENT: DOMA HOLDING (NSW) PTY LTD

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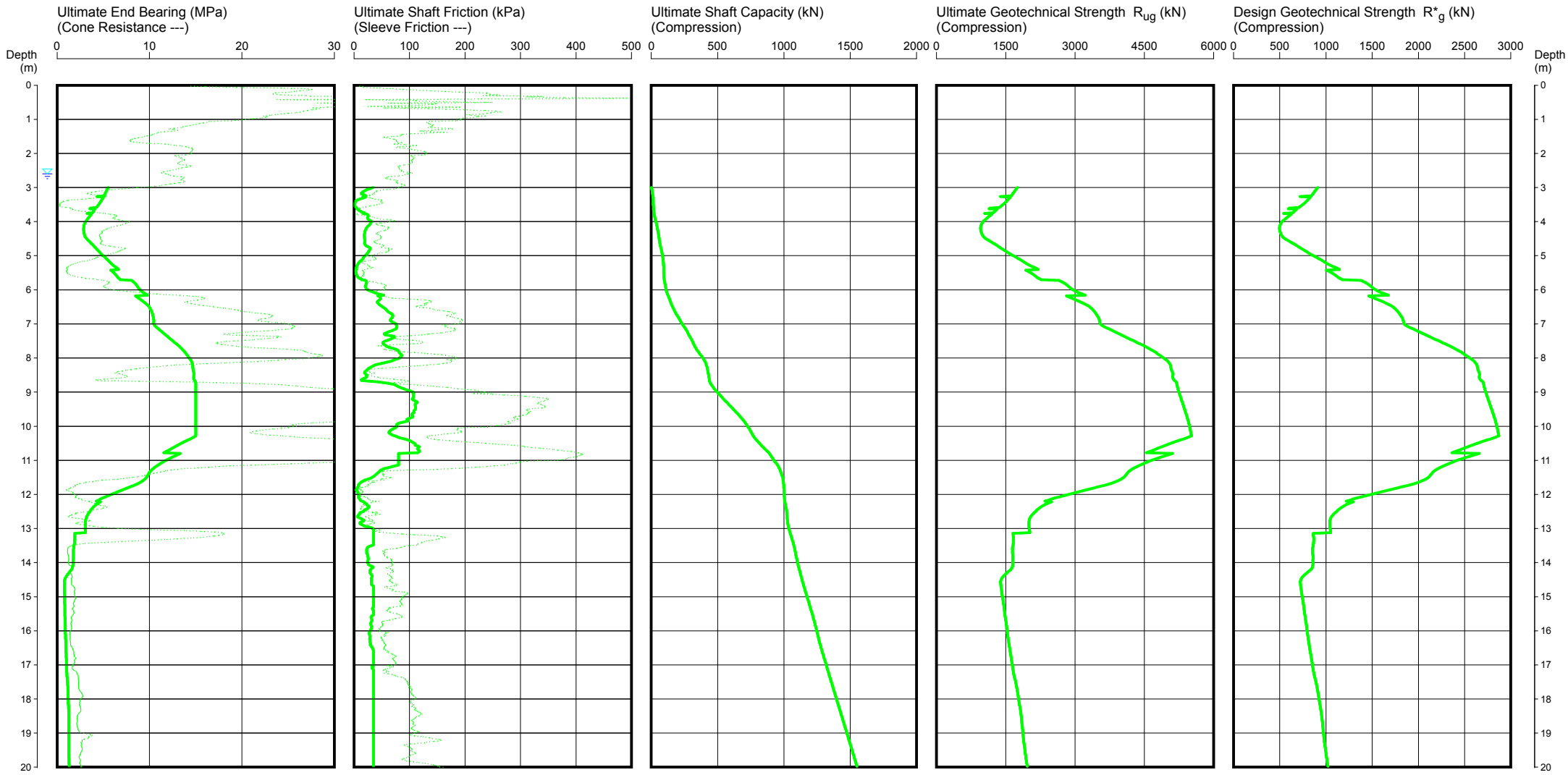
Page 1 of 1

DATE 19/12/2016
PROJECT No: 91034
SURFACE RL: 2.9 AHD



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Water depth after test: 2.60m depth

Coordinates: 384674 6356257

File: P:\91034.00 - NEWCASTLE, 21 Honeysuckle Drive\4.0 Field Work\4.2 Testing\207.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: NEWCASTLE, PROPOSED RESIDENTIAL TOWER DEVELOPMENT

LOCATION: 21 HONEYSUCKLE DRIVE, NEWCASTLE

CLIENT: DOMA HOLDING (NSW) PTY LTD

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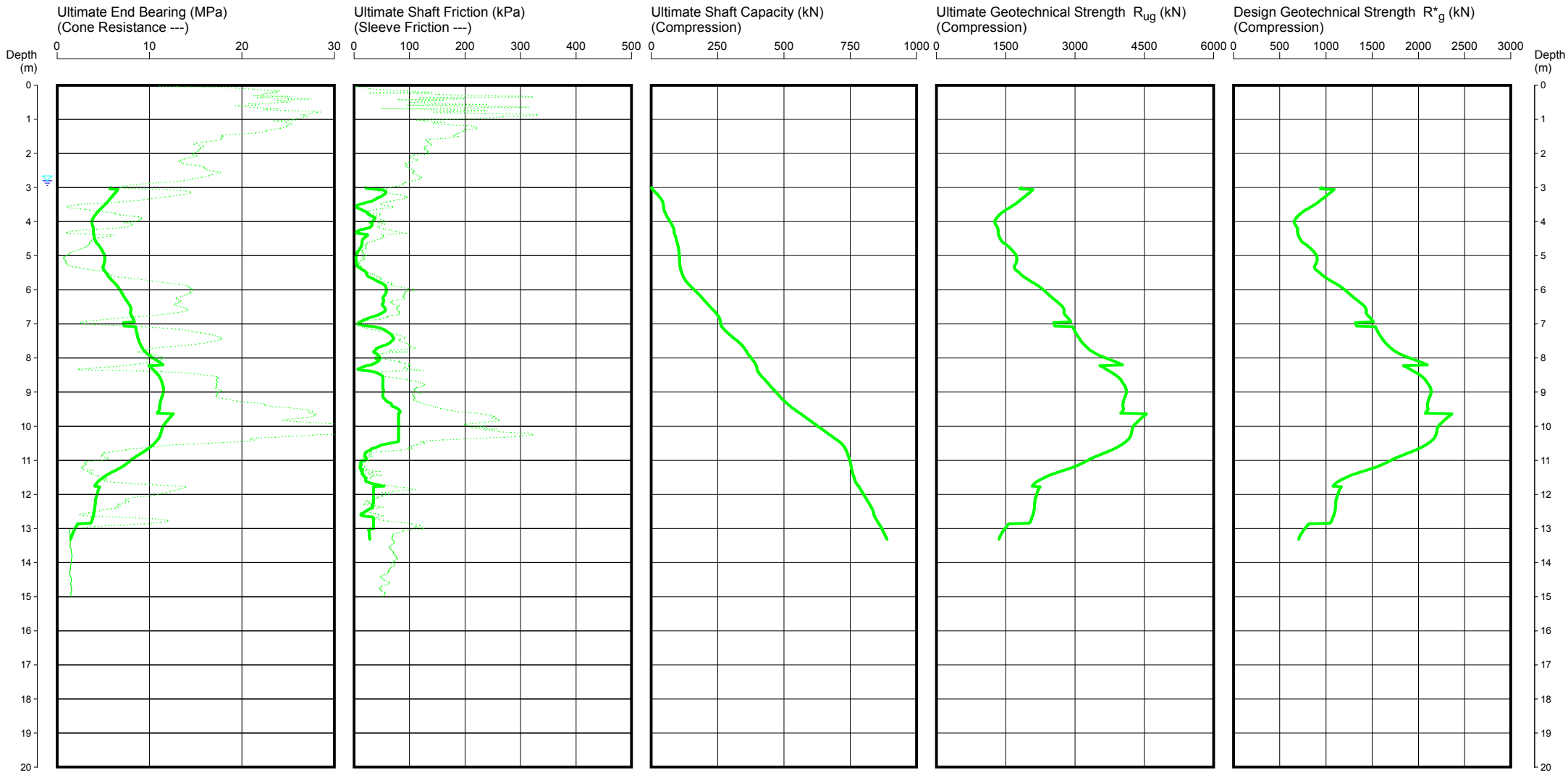
Page 1 of 1

DATE 19/12/2016
PROJECT No: 91034
SURFACE RL: 2.8 AHD



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Water depth after test: 2.80m depth

Coordinates: 384707 6356255

File: P:\91034.00 - NEWCASTLE, 21 Honeysuckle Drive\4.0 Field Work\4.2 Testing\208.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: NEWCASTLE, PROPOSED RESIDENTIAL TOWER DEVELOPMENT

LOCATION: 21 HONEYSUCKLE DRIVE, NEWCASTLE

CLIENT: DOMA HOLDING (NSW) PTY LTD

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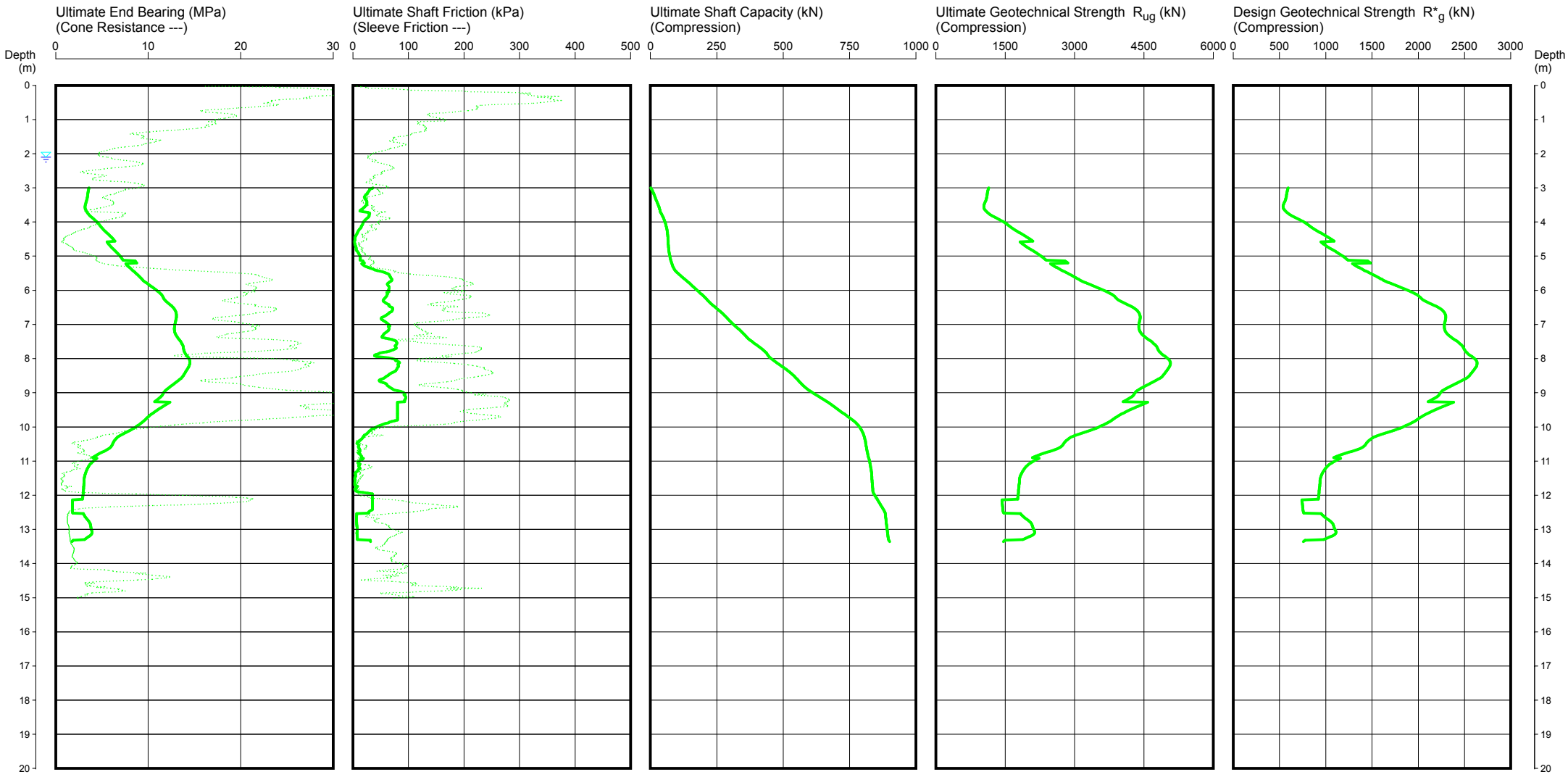
Page 1 of 1

DATE 19/12/2016
PROJECT No: 91034
SURFACE RL: 2.3 AHD



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Water depth after test: 2.10m depth

Coordinates: 384745 6356256

File: P:\91034.00 - NEWCASTLE, 21 Honeysuckle Drive\4.0 Field Work\4.2 Testing\209.CP5
Cone ID: 120630 **Type:** I-CFXY-10

ConePile Version 5.9.1

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Appendix D

Drawings 1 and 2– Test Location Plan
Architectural Drawings

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
- 1 Approximate Photo Location and Orientation
- Approximate Site Area

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Geotechnics / Environment / Groundwater

CLIENT: Doma Holdings (NSW) Pty Ltd		TITLE: **Test Location Plan**	PROJECT No: 91034.00
OFFICE: Newcastle	DRAWN BY: PLH	**Geotechnical & Environmental Assessment**	DRAWING No: 1
SCALE: 1:500@A3 Sheet	DATE: 13.04.2017	**50 Honeysuckle Drive, Newcastle**	REVISION: 1

0 10 20 30 40 50 75 100m

1:1000 @ A3

LEGEND

- X HR1 - (used for ASLP-Sea Water Testing)
- X SW1 - Surface Water Sample Downgradient of Site

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Doma Holdings (NSW) Pty Ltd		TITLE: **Surface Water Sample Location Plan**	PROJECT No: 91034.00
OFFICE: Newcastle	DRAWN BY: PLH	**Geotechnical & Environmental Assessment**	DRAWING No: 2
SCALE: 1:100@A3 Sheet	DATE: 13.04.2017	**50 Honeysuckle Drive, Newcastle**	REVISION: 1

SJB Architects

Honeysuckle
50 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:5485
Date: 29.05.17
Client: DOMA Group

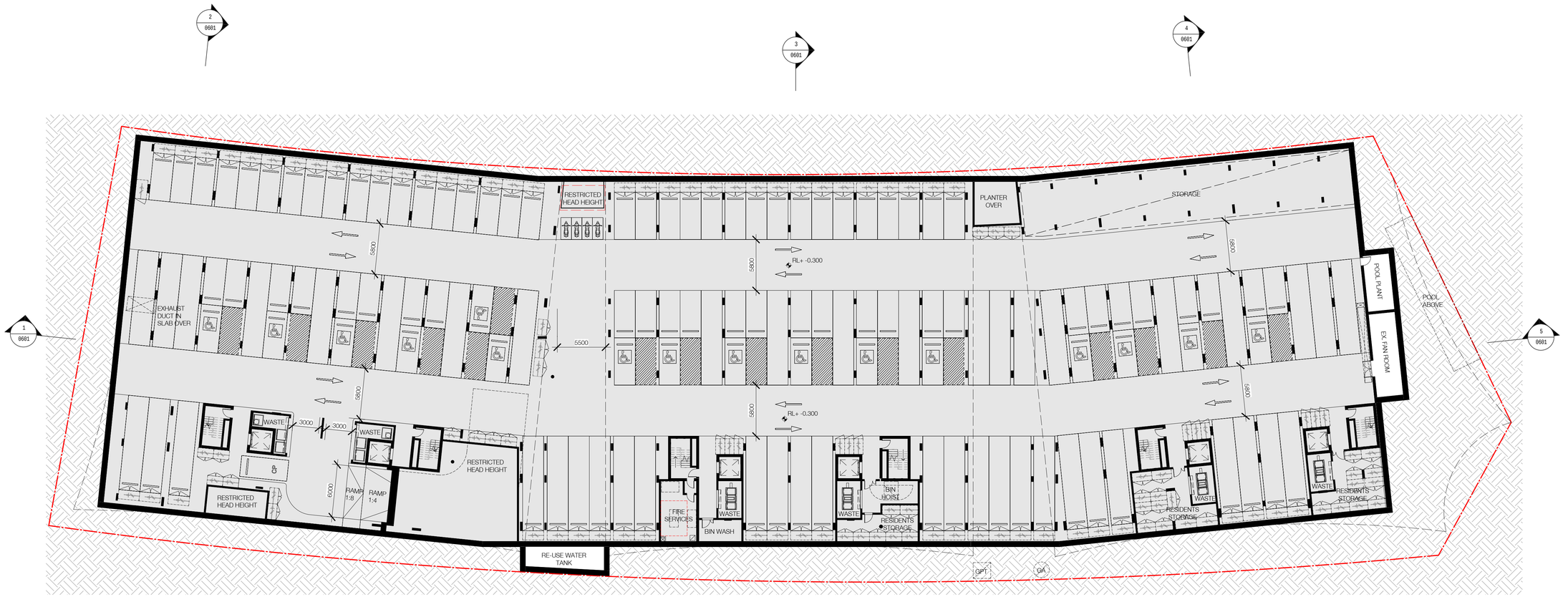
Contents

DRAWING LIST

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

FOR APPROVAL

Rev	Date	Revision	By	Chk.
1	17.03.17	DEVELOPMENT APPLICATION ISSUE		
3	23.03.17	REVISED CAR PARK NUMBER		
4	10.04.17	DA SUBMISSION		
6	25.05.17	FOR COORDINATION		
10	29.05.17	ISSUED FOR DA	JO	ML



Client

DOMAGROUP

Project

Project Name

50 Honeysuckle Drive,
Newcastle NSW 2300

Drawing Name

BASEMENT PLAN

Date	Scale	Sheet Size
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Drawn	Chk.
JO	ML

Job No.	Drawing No.	Revision
5485	DA-0200	/ 10

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1:250

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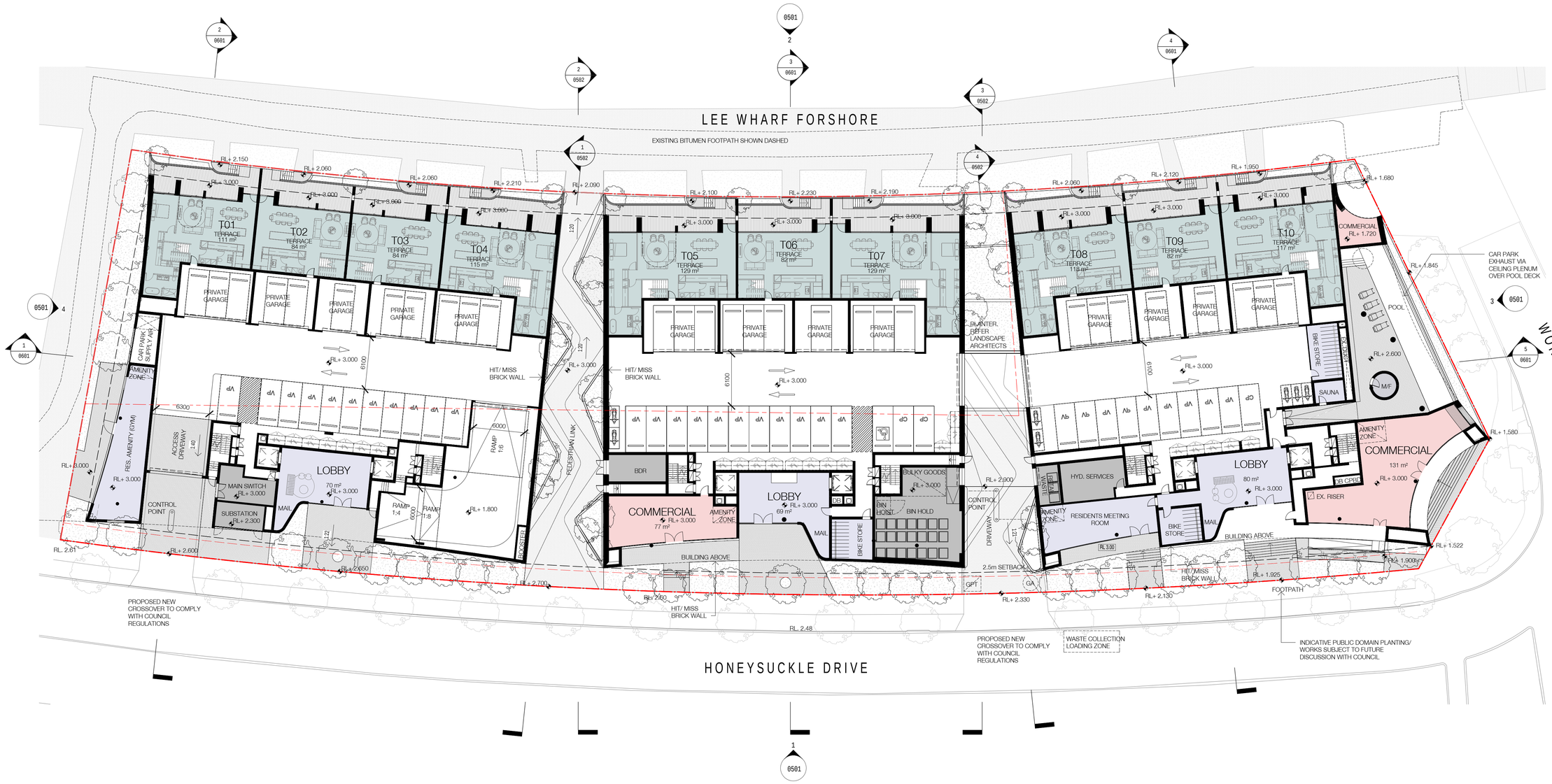
1	17.03.17	DEVELOPMENT APPLICATION ISSUE		
3	23.03.17	REVISED CAR PARK NUMBER		
4	10.04.17	DA SUBMISSION		
5	22.05.17	FOR COORDINATION		
10	29.05.17	ISSUED FOR DA	JO	ML



Client

DOMAGROUP

Project

Project Name

50 Honeysuckle Drive,
Newcastle NSW 2300

Drawing Name

GROUND FLOOR PLAN

Date	Scale	Sheet Size
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Drawn	Chk.
JO	ML

Job No.	Drawing No.	Revision
5485	DA-0201	/ 10

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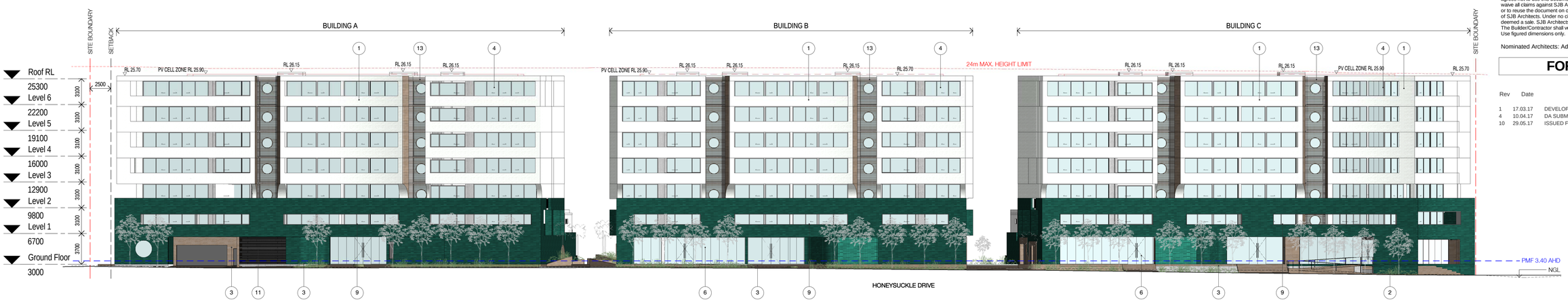

1 SOUTH ELEVATION

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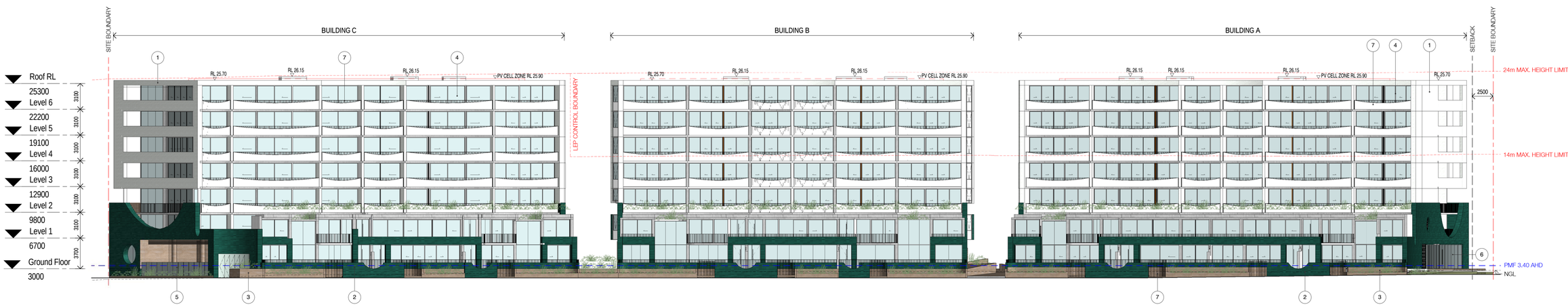
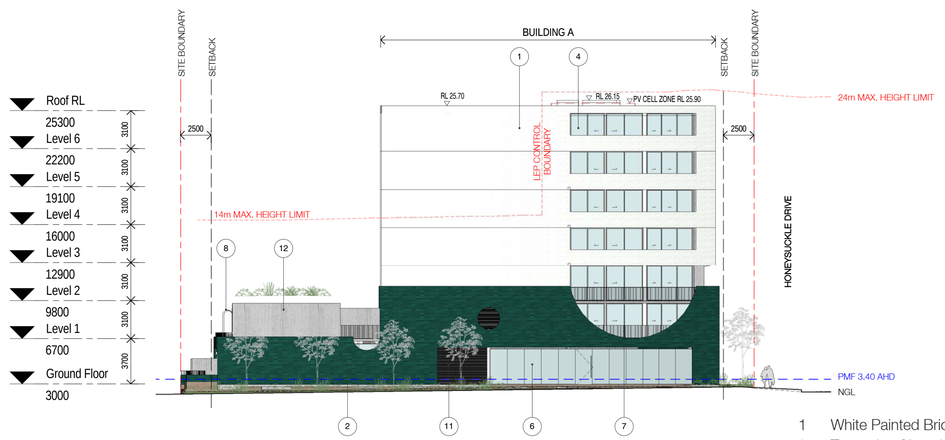


2 NORTH ELEVATION

0201 1 : 250

3 EAST ELEVATION

0201 1 : 250



4 WEST ELEVATION

0201 1 : 250

1 White Painted Brick
2 Turquoise Glazed Brick
3 Terracotta Brick
4 Residential Glazing
5 Swimming Pool Glazed Balustrade
6 Commercial Glazing
7 Metalwork - Gates Railings Balustrades
8 Marble Privacy Screen
9 White Metal Panels
11 Aluminium Louvre Wall
12 Off-form concrete
13 Brick Screen
15 Hit and Miss Terracotta Brick

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

FOR APPROVAL

Rev	Date	Revision	By	Chk.
1	17.03.17	DEVELOPMENT APPLICATION ISSUE		
4	10.04.17	DA SUBMISSION		
10	29.05.17	ISSUED FOR DA	JO	ML

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Project

Honeysuckle

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Newcastle NSW 2300

Drawing Name

SITE ELEVATIONS

Date	Scale	Sheet Size
29.05.17	1 : 250	@ A1

Drawn	Chk.
JO	ML

Job No.	Drawing No.	Revision
5485	DA-0501	/ 10

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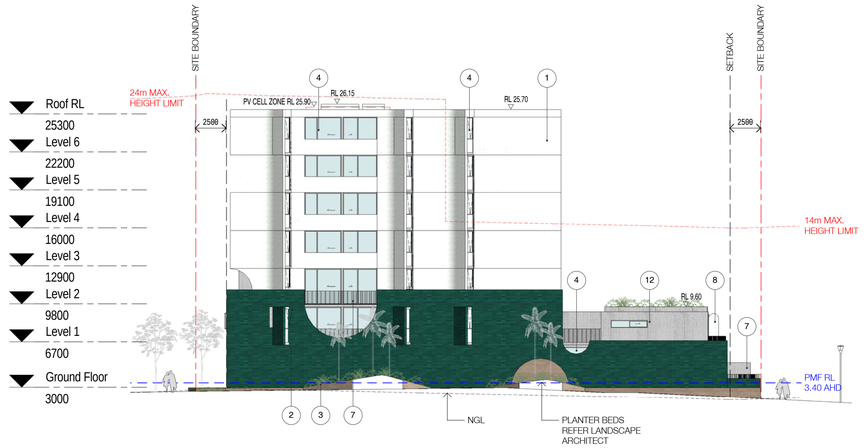

1 BUILDING A EAST ELEVATION

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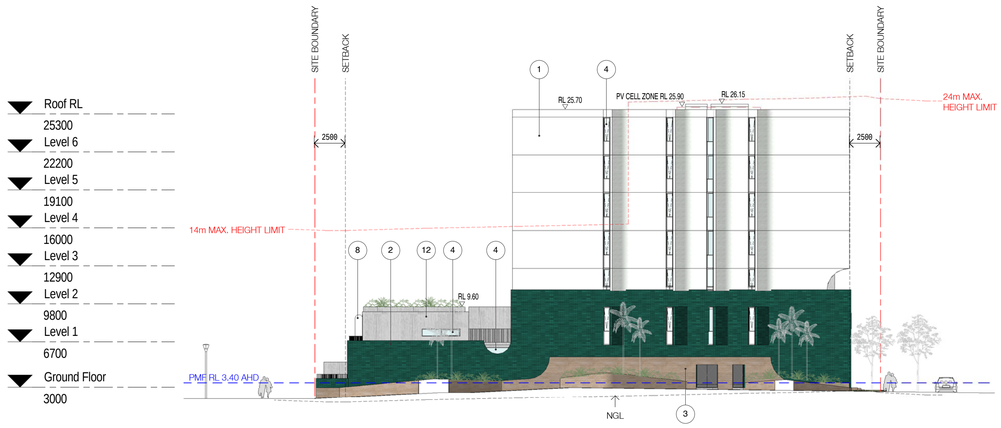

2 BUILDING B WEST ELEVATION

0201 1 : 250

3 BUILDING B EAST ELEVATION

0201 1 : 250

4 BUILDING C WEST ELEVATION

0201 1 : 250

1 White Painted Brick
2 Turquoise Glazed Brick
3 Terracotta Brick
4 Residential Glazing
5 Swimming Pool Glazed Balustrade
6 Commercial Glazing
7 Metalwork - Gates Railings Balustrades
8 Marble Privacy Screen
9 White Metal Panels
11 Aluminium Louvre Wall
12 Off-form concrete
13 Brick Screen
15 Hit and Miss Terracotta Brick

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

FOR APPROVAL

Rev	Date	Revision	By	Chk.
1	17.03.17	DEVELOPMENT APPLICATION ISSUE		
4	10.04.17	DA SUBMISSION		
10	29.05.17	ISSUED FOR DA	JO	ML

Client

DOMAGROUP

Project

Honeysuckle

50 Honeysuckle Drive,
Newcastle NSW 2300

Drawing Name

INTERNAL ELEVATIONS

Date	Scale	Sheet Size
29.05.17	1 : 250	@ A1

Drawn	Chk.
JO	ML

Job No.	Drawing No.	Revision
5485	DA-0502	/ 10

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1:250

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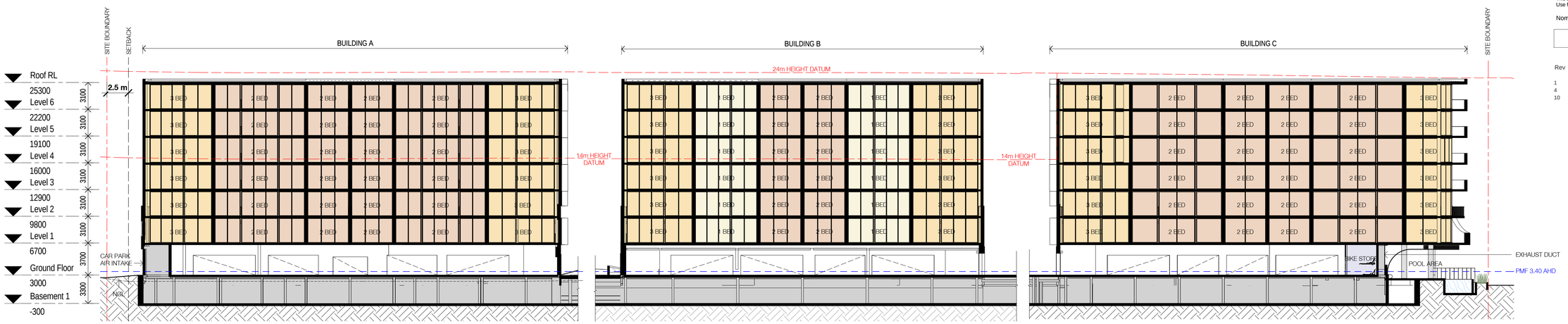
Nominated Architects: Adam Haddow-7188 | John Pradel-7004

FOR APPROVAL

Rev	Date	Revision	By	Chk.
1	17.03.17	DEVELOPMENT APPLICATION ISSUE		
4	10.04.17	DA SUBMISSION		
10	29.05.17	ISSUED FOR DA	JO	ML



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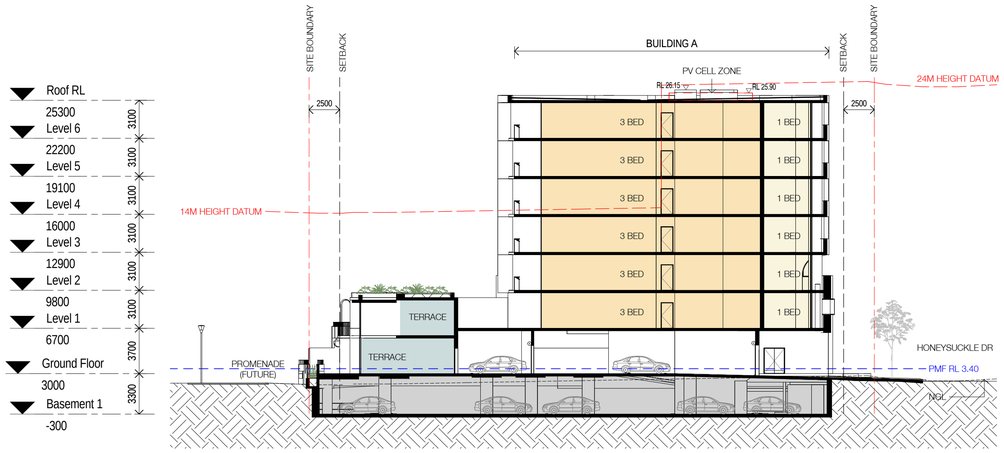

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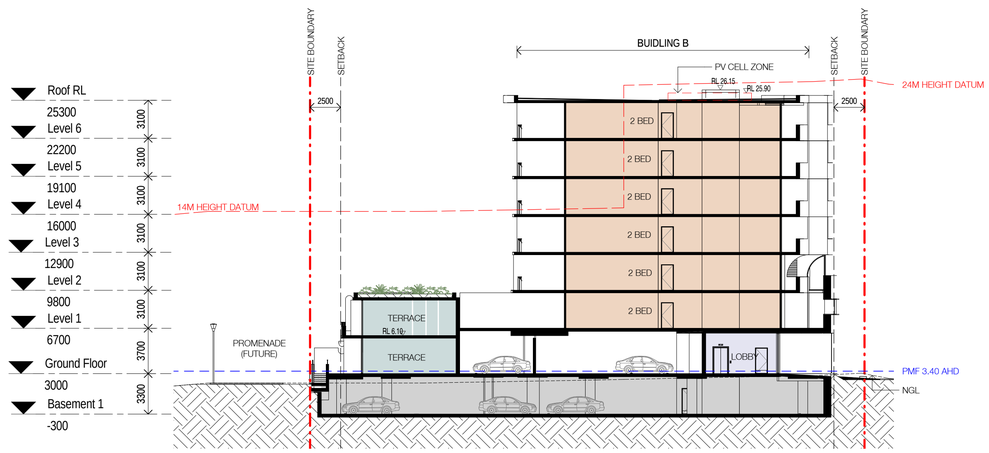

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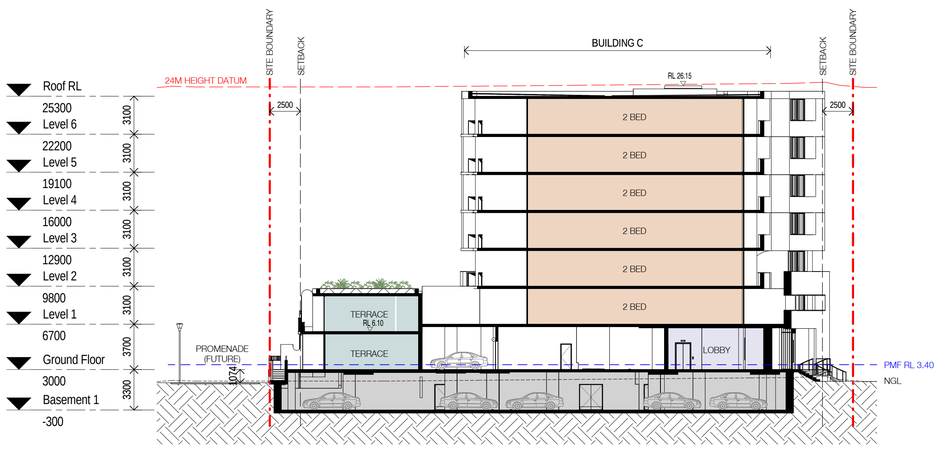

4 BUILDING C - TYP. SECTION

0200 1 : 250

Client

DOMAGROUP

Project

Honeysuckle

50 Honeysuckle Drive,
Newcastle NSW 2300

Drawing Name

SITE SECTIONS

Date	Scale	Sheet Size
29.05.17	1 : 250	@ A1

Drawn	Chk.
JO	ML

Job No.	Drawing No.	Revision
5485	DA-0601	/ 10

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1:250

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