Douglas Partners
Geotechnics / Environment / Groundwater

Report on
Geotechnical Investigation

Rocla Site - Proposed Development
158-164 Old Bathurst Road, Emu Plains

Prepared for
Penrith City Council

Project 200309.02
January 2024

Integrated Practical Solutions

Douglas Partners
Geotechnics / Environment / Groundwater

Document History

Document details

Project No.	200309.02	Document No.	R.001.Rev2
Document title	Report on Geotechnical Investigation Rocla Site - Proposed Development		
Site address	158-164 Old Bathurst Road, Emu Plains		
Report prepared for	Penrith City Council		
File name	200309.02.R.001.Rev2.docx		

Document status and review

Status	Prepared by	Reviewed by	Date issued
Revision 0	Gavin Boyd	Konrad Schultz	24 July 2023
Revision 1	Alexander Hanna	Peter Oitmaa	12 October 2023
Revision 2	Alexander Hanna	Peter Oitmaa	10 January 2024

Distribution of copies

Status	Electronic	Paper	Issued to
Revision 0	1	0	Ms Ruma McCracken, Penrith City Council
Revision 1	1	0	Ms Ruma McCracken, Penrith City Council
Revision 2	1	0	Ms Ruma McCracken, Penrith City Council

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	pp AH	10 January 2024
Reviewer		10 January 2024

bsi. ISO 9001 Quality Management
FS 604853

Douglas Partners Pty Ltd
ABN 75 053 980 117
www.douglaspartners.com.au
Unit 2, 593 Withers Road
Rouse Hill NSW 2155
Phone (02) 4666 0450

Executive Summary

This report presents the results of a geotechnical investigation undertaken by Douglas Partners Pty Ltd (DP) for a proposed development at Rocla, 158-164 Old Bathurst Road, Emu Plains. The investigation was commissioned in an email dated 4 January 2021 by JBS&G Pty Ltd on behalf of Penrith City Council and was undertaken in accordance with DP's proposal dated 11 December 2020. This updated report was commissioned by Ms Ruma McCracken of Penrith City Council on 25 September 2023.

It is understood that the proposed development will involve the subdivision of the site into industrial lots and the construction of a detention basin, internal road pavements and services.

The investigation included the drilling of boreholes, cone penetration tests (CPTs) and laboratory testing of selected samples. The details of the field work undertaken, and the results obtained, are presented in this report, together with comments and recommendations for design and construction.

Site investigations have indicated the following geotechnical model for the site in increasing depth order:

- Unit 1 – Uncontrolled Fill – typically in the range from 0.1 m to 1.5 m depth with localised deeper areas of up to about 3.0 m depth. The fill comprises a mixture of gravels and crushed concrete with clays and sand.
- Unit 2 – Alluvial soils – typically stiff to hard clay and loose to medium dense sand layers with some minor localised soft clay layers near old creek-lines on-site.
- Unit 3 – Gravels – gravels within a clay or soil matrix were encountered from depths of between 3.3 m and 8.4 m.
- Unit 4 – Bedrock – shale bedrock was encountered at 12 m depth at MW3 of the Ramboll investigation.

Previous investigations have indicated that groundwater levels are likely to be in the depth range of 6.6 m to 7.4 m (RL 17.4 to 17.9 m AHD) and flows to the east. Groundwater levels can fluctuate with climatic variations.

The major geotechnical consideration for development of the site is the potential ongoing settlement of the fill and underlying natural soils. The fill material on-site is variable in its thickness, composition and compaction and is expected to perform variably if relied upon for support in its current state. DP has provided a remedial approach with respect to the fill on-site.

Foundation support will be dependent on the magnitude of loads applied. Light industrial structures may be able to be supported by a shallow footing system (e.g. spread footings or raft slabs) provided they are appropriately designed by a structural engineer. Higher structural loads will need to be supported by piles, particularly for concentrated column and wall loads.

Further investigation will be required once the details of the development and the general approach to supporting the structures are known.

Table of Contents

Report on Geotechnical Investigation
Rocla Site - Proposed Development
158-164 Old Bathurst Road, Emu Plains

1. Introduction

This report presents the results of an updated geotechnical investigation report undertaken by Douglas Partners Pty Ltd (DP) for a proposed development at Rocla, 158-164 Old Bathurst Road, Emu Plains. The original investigation was commissioned in an email dated 4 January 2021 by JBS&G Pty Ltd on behalf of Penrith City Council and was undertaken in accordance with DP's email proposal dated 11 December 2020. This updated report was commissioned by Ms Ruma McCracken of Penrith City Council on 25 September 2023.

It is understood that the proposed development will involve the subdivision of the site into industrial lots and the construction of a detention basin, internal road pavements and services. Geotechnical investigation was carried out to provide information on subsurface conditions for planning and to support the submission of a development application.

The investigation included the drilling of boreholes, cone penetration tests (CPTs) and laboratory testing of selected samples. The details of the field work undertaken, and the results obtained, are presented in this report, together with comments and recommendations for design and construction.

2. Background

DP understands that this geotechnical investigation is being carried out concurrently with a contamination assessment by JBS&G Pty Ltd. The investigation by JBS&G included the excavation of 23 test pits, drilling of 13 boreholes and installation of three groundwater monitoring wells.

A previous investigation was also completed by Ramboll Australia in May 2020 which included the drilling of 31 boreholes (BH1 to BH31) and the installation of six groundwater monitoring boreholes (MW1 to MW6). The information from the boreholes was provided to DP and used to complement information obtained in this geotechnical investigation.

The detailed borehole and test pit logs from the aforementioned investigations (completed by others) are provided in Appendix E. It is understood that this site is subject to a site audit by an EPA accredited auditor.

3. Site Description

The site is located at 158 – 164 Old Bathurst Road, Emu Plains (Lot 1 DP 588918 and Lot 2 DP 588919). It is an irregular-shaped area of approximately 16 hectares, with maximum north-south and east-west dimensions of approximately 400 m and 450 m, respectively. The site area is shown in Figure 1.

At the time of the field work the site contained a concrete production, manufacturing and storage facility which was predominantly covered by a gravel surfaced area with numerous stored materials scattered over the site. Some warehouse buildings were located over the central and eastern portions of the site and small to large sized trees were observed along all boundaries and in the south-western corner of the site. A pond with a surface area of approximately 2000 m^2 was also located in the south-western corner of the site.

The site is bounded to the north-east by Old Bathurst Road, to the south-east by undeveloped land and the main Western Railway Line, to the south-west by industrial properties, and the north-west by David Road.

The site topography generally slopes down to the north-west at gradients estimated to be less than 1° with the ground surface level at approximately RL 24 (m AHD). A meander of the Nepean River surrounds the site located approximately 0.9 km to 1.5 km to the north, south-east and east of the site.

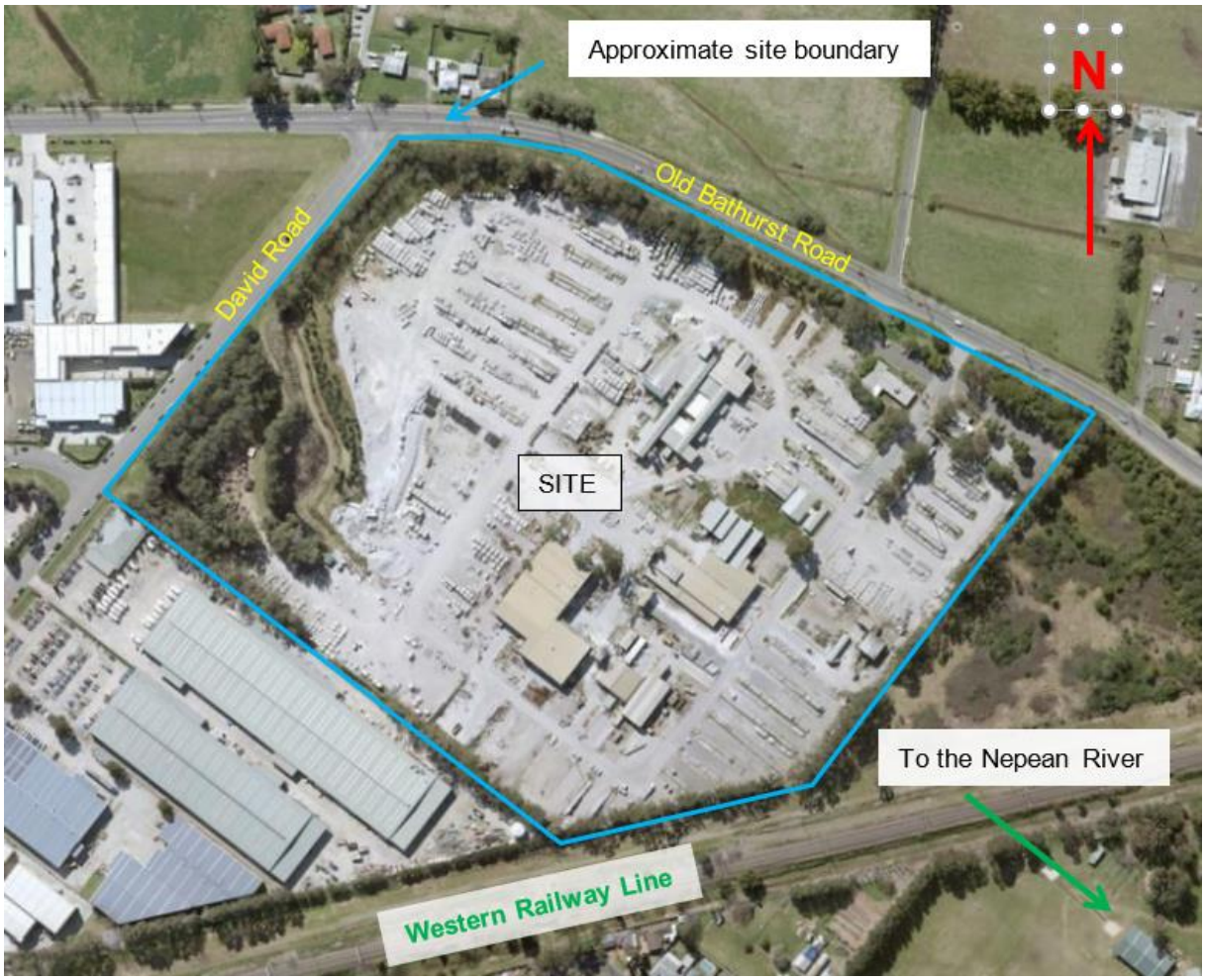


Figure 1: Site Location Plan (Source: Metro Map)

4. Published Data

4.1 Geology

Reference to the Penrith 1:100 000 scale Geological Series Sheet indicates that the site is underlain by the Cranebrook Formation soil of Quaternary age. This formation comprises gravel, sand, silt, and clay.

The site is in an area mapped as near Rickaby's Creek Gravels of Tertiary age. This geological unit is known to underlie the Quaternary aged sediments in the area. The Rickaby's Creek Gravels mapped to the west are typically poorly sorted gravel (gravels consist of clasts of quartz, quartzite, silcrete, chert, porphyry, granite, hornfels and sandstone) set in a sandy clay matrix. The Rickaby's Creek Gravels form an irregular basal unit of the Tertiary sediments that ranges in thickness from 2 m to 12 m and typically overlies the shales and sandstones of the Wianamatta Group.

The site is also located near a fault line associated with the formation of the Nepean River and the Blue Mountains.

4.2 Hydrogeology

The closest surface water receptor to the site is the Nepean River which is located about 1 km to the east and north of the site and, at its closest, is located about 950 m south-east of the site.

A review of the 1943 aerial photograph indicates that two creek-lines bisecting the north-eastern and south-western corners were present on-site (refer Figure 2). These creek-lines flowed north-west towards the Nepean River. A drainage channel in the south-western corner of the site is still visible. The creek in the north-eastern corner has been backfilled while the creek in the south-western corner has been partially backfilled.

A search of the NSW Department of Primary Industries Water (DPI Water) online map of registered groundwater works was undertaken as part of the investigation. The search carried out on 20 January 2021 identified no registered groundwater boreholes with groundwater information within 500 m of the site.

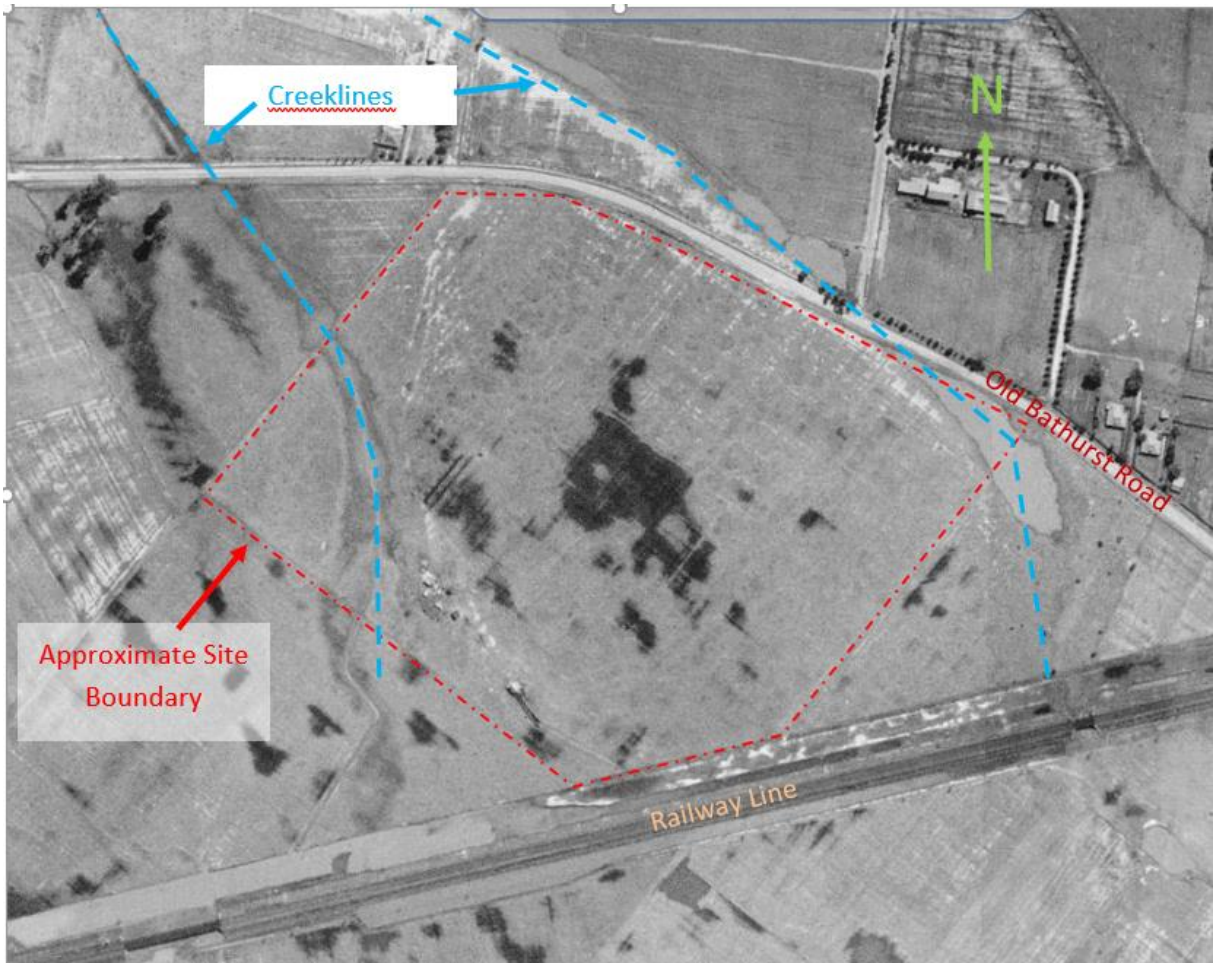


Figure 2: 1943 Aerial Photograph of the site

4.3 Soil Landscape

Reference to the Penrith 1:100 000 scale Soils Landscape Sheet indicates that the site is located within the Richmond soil landscape group. This group is characterised by alluvial soils which typically comprise deep acid red and brown podzolic soil possibly with ironstone nodules. These soils can be susceptible to erosion and localised flooding.

4.4 Acid Sulfate Soils

Review of published mapping indicates that the site is in an area of 'no known occurrence of acid sulfate soils'. The NSW Acid Sulfate Soils Manual 1998 published by the Acid Sulfate Soils Management Advisory Committee (ASSMAC) indicates that ASS (and Potential Acid Sulfate Soils – PASS) normally occur in alluvial or estuarine soils below RL 5 m AHD although occasionally are encountered up to RL 12 m AHD. Considering the ASS mapping and given that the site soils are at elevations above RL 20 m AHD it is considered unlikely that ASS is present on-site.

4.5 Salinity

The Department of Infrastructure, Planning and Natural Resources (DIPNR) "Map of Salinity Potential in Western Sydney 2002" suggests that the site is in an area of "moderate salinity potential" with a higher potential in the lower elevation areas south of the Nepean River associated with School House and Surveyors Creeks.

5. Field Work

5.1 Methods

The current field work included the following:

- Site inspection by a senior geotechnical engineer.
- Drilling of 10 boreholes (Bore 101 – Bore 110) using a track-mounted rig with 110 mm and 200 mm diameter augers. The boreholes were drilled to depths of 2.5 m. Standard penetration tests (SPTs) were also completed at regular depth intervals within the overburden.
- CPTs at 22 locations (CPTs 111 to 115, 117 to 123, 125 and 127 to 135) using a ballasted truck-mounted test rig to push a 35 mm diameter cone tipped probe into the soil with a hydraulic ram system. Continuous measurements were made of the end-bearing pressure on the cone tip and the friction on the sleeve located directly behind the cone. The cone tip resistance and friction readings were displayed during the test and were stored on a computer for subsequent plotting of results and interpretation. The CPTs were undertaken to practical refusal (or to a depth where excessive bending of the cone rods occurred) at depths ranging between 0.1 m and 8.4 m.

  At five CPT locations (CPTs 111, 112, 118, 121 and 125) additional tests were carried out due to the excessive bending of the rods on inferred gravel.

  At test locations 115, 117, 118A, 129 to 131 pre-drilling using an auger was carried out to penetrate the fill.

Disturbed samples were collected from the boreholes to assist with logging and for laboratory testing. Bulk samples were taken from some of the boreholes to enable testing to be undertaken for compaction properties and California bearing ratio (CBR).

The ground surface levels (measured in 'metres above Australian Height Datum AHD') together with the Eastings and Northings at the CPT and borehole locations were determined by using a High Precision Differential GPS which is typically accurate to approximately 0.1 m. The Eastings and Northings were taken with reference to GDA2020 datum. The locations of the CPTs and boreholes are shown on Drawing 1 in Appendix B.

5.2 Results

The detailed borehole logs and interpreted CPT logs are provided in Appendix C. Notes defining classification methods and terms used to describe the soils and rocks along with notes on the methods used for interpretation of the CPT results are provided in Appendix A. It is noted that it is sometimes difficult to distinguish between fill and natural soils. Therefore, the material types and boundaries shown on the CPT plots are interpretations only.

The subsurface conditions encountered underlying the site can be summarised as follows:

- Pavement - asphaltic concrete 40 mm thick at the surface of Bores 105 and 107;
- Topsoil - silty clay topsoil with vegetation to a depth of 0.1 m in Bore 110;
- Fill - crushed rock roadbase fill (possibly stabilised or crushed concrete) to depths ranging between 0.3 m and 1.5 m in all boreholes except Bore 110 where clayey fill soils were encountered at the surface.
  - Silty clay, gravelly sand, clayey sand, sandy clay, sandy gravel or sand fill to depth ranging between 0.2 m and 2.5 m in all boreholes except Bore 103 where natural soils were encountered directly below road base fill. Inclusions of gravel, sand and concrete were encountered within the fill. Fill was inferred to depths of between 0.1 m and 1.7 m in the CPTs but may vary;
  - the fill soils were typically moderately to well compacted, however, at the base of the fill layer (or possibly the top of the natural soils) a 100 mm to 300 mm thick loose sand or soft clay layer was encountered in CPTs 111B and 125B.
- Natural Soil - typically silty/sandy clay, or clayey/silty sand in all boreholes except Bore 101 which encountered fill to the termination depth of 2.5 m. Clayey and sandy soils were inferred to depths of between 3.3 m and 8.4 m in all CPTs except CPT118, CPT121 and CPT128 where the CPT refused on inferred gravel within the fill material. The clays were typically stiff to hard with some firm layers. The sands were typically loose to medium dense.

Free groundwater was observed at depths of 0.95 m and 1.2 m on completion of CPTs 111B and 125A, respectively. At CPTs 114, 115A, 117A, 118B, 119A, 120, 121B, 122, 123, 125 and 127 to 134 the holes collapsed to depths of between 0.1 m and 4.9 m on completion of testing. No free groundwater was observed during the drilling of the boreholes or on completion of the remaining CPTs. Backfilling of all boreholes at the completion of drilling precluded long-term monitoring of the groundwater levels. It is noted, however, that groundwater levels are affected by preceding climatic conditions and soil/rock permeability and can therefore fluctuate with time.

6. Laboratory Testing

6.1 Mechanical Testing

Selected samples from the boreholes were tested in the laboratory for measurement of plasticity and moisture content, compaction properties and CBR. The detailed results are given in Appendix D and are summarised in Table 1.

Table 1: Results of Laboratory Testing - Mechanical

Sample Location	Material	Depth (m)	FMC (%)	OMC (%)	MDD (t/m^3)	CBR (%)	W_L (%)	W_P (%)	PI (%)
Bore 101	Fill/Roadbase	0 – 0.8	10.4	14.0	1.82	180	-	-	-
Bore 103	Clayey Sand	0.3 – 1.5	8.7	12.5	1.91	13	21	14	7
Bore 105	Silty Clay	0.3 – 0.8	8.7	11.5	1.95	11	16	14	2
Bore 107	Sandy Clay	0.5 – 1.5	12.6	13.0	1.92	7	19	12	7
Bore 108	Silty Clay	0.5 – 1.5	10.4	12.5	1.91	8	-	-	-
Bore 109	Fill/Roadbase	0.0 – 0.8	12.9	14.0	1.91	100	-	-	-

Notes: FMC = Field Moisture Content; OMC = Standard Optimum Moisture Content; MDD = Maximum Dry Density; CBR = California bearing ratio; W_L = Liquid Limit; W_P = Plastic Limit; PI = Plasticity Index

The results of the laboratory testing indicate the following:

- The Atterberg Limit results indicate that the clayey samples were generally of low plasticity.
- The CBR values ranged between 7 % and 13 % for the natural clay and sand samples tested, and 100% and 180% for the roadbase fill samples tested.
- The field moisture contents ranged from 8.7 % to 12.6% for the clayey samples tested. The field moisture contents of the samples were between 5.3 % dry and 0.6 % wet of the plastic limit.

6.2 Chemical Testing

Selected samples collected from the boreholes were also tested in the laboratory for determination of aggressivity to concrete and steel, textural classification and salinity.

A result summary table (Appendix D) presents the results of laboratory tests, assessments of aggressivity to concrete and steel, textural classification, calculated salinity electrical conductivity (ECe) and salinity class inferred from ECe values using the method of Richards (1954). The detailed laboratory test reports and chain of custody information are also provided in Appendix D.

The total test sample numbers and the range of test results obtained are summarised in Table 2.

Table 2: Results of Laboratory Testing - Chemical

Parameter		Units	Number of Tests	Range of Results
pH		pH units	25	7.8 – 12.1
Chlorides		(mg/kg)	4	<10 – 71
Sulphates		(mg/kg)	4	<10 – 280
Aggressivity [AS 2159]	to Concrete	-	-	mildly aggressive
	to Steel	-	-	non-aggressive
EC1:5 [Lab.]		(mS/cm)	25	21 - 2800
ECe [M x EC1:5] [1]		(dS/m)	25	<2 - 40
Salinity Class [after Richards]		-	25	Non-Saline to Highly Saline

Notes: 1 M is soil textural factor

6.2.1 Aggressivity

Test results showing the aggressivity assessed by pH, EC, sulphate and chloride concentration criteria (of AS 2159) at the borehole locations, together with the aggressivity class ranges indicated in Australian Standard AS 2159, are given in Appendix D. The test results of existing fill soils and low permeable natural soils were compared to the aggressivity criteria for Condition "B" as defined by AS 2159, while the high permeable soils were compared to the aggressivity criteria for Condition "A".

The results show that the samples tested indicate the ground conditions are non-aggressive to concrete and steel with reference to AS2159. The pH profiles with depth are shown in Figure 3.

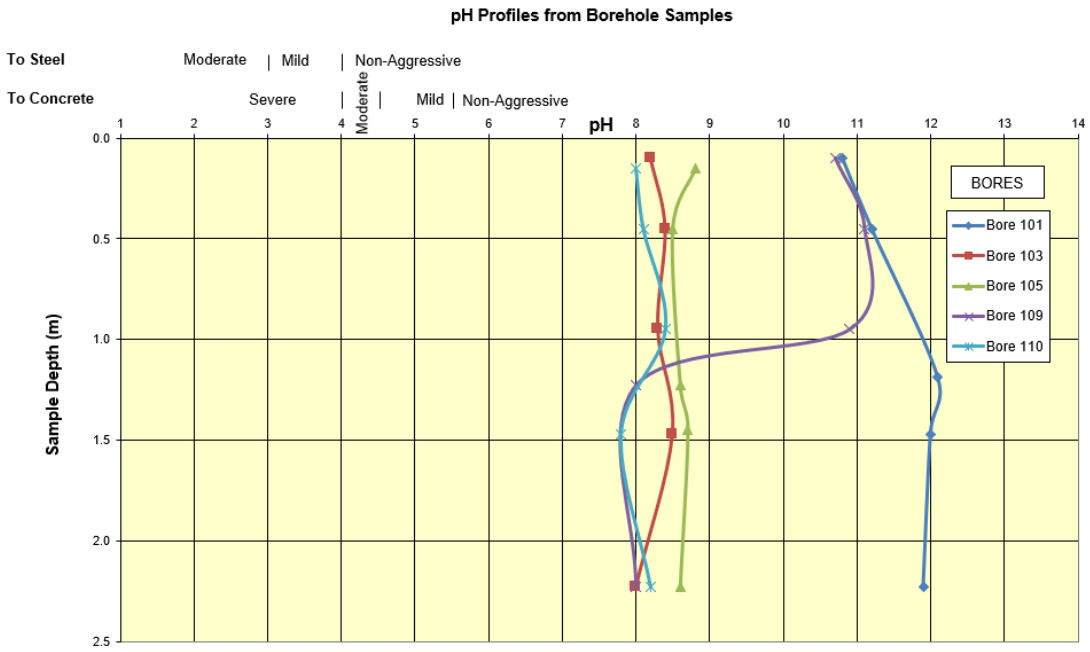


Figure 3: Vertical pH Profiles

6.2.2 Salinity

Figure 4 shows the salinity classifications based on the electrical conductivity (ECe) at borehole locations, together with the salinity classifications of Richards (1954). Test results are provided in Appendix D.

The results indicate that the samples tested ranged from non-saline to highly saline.

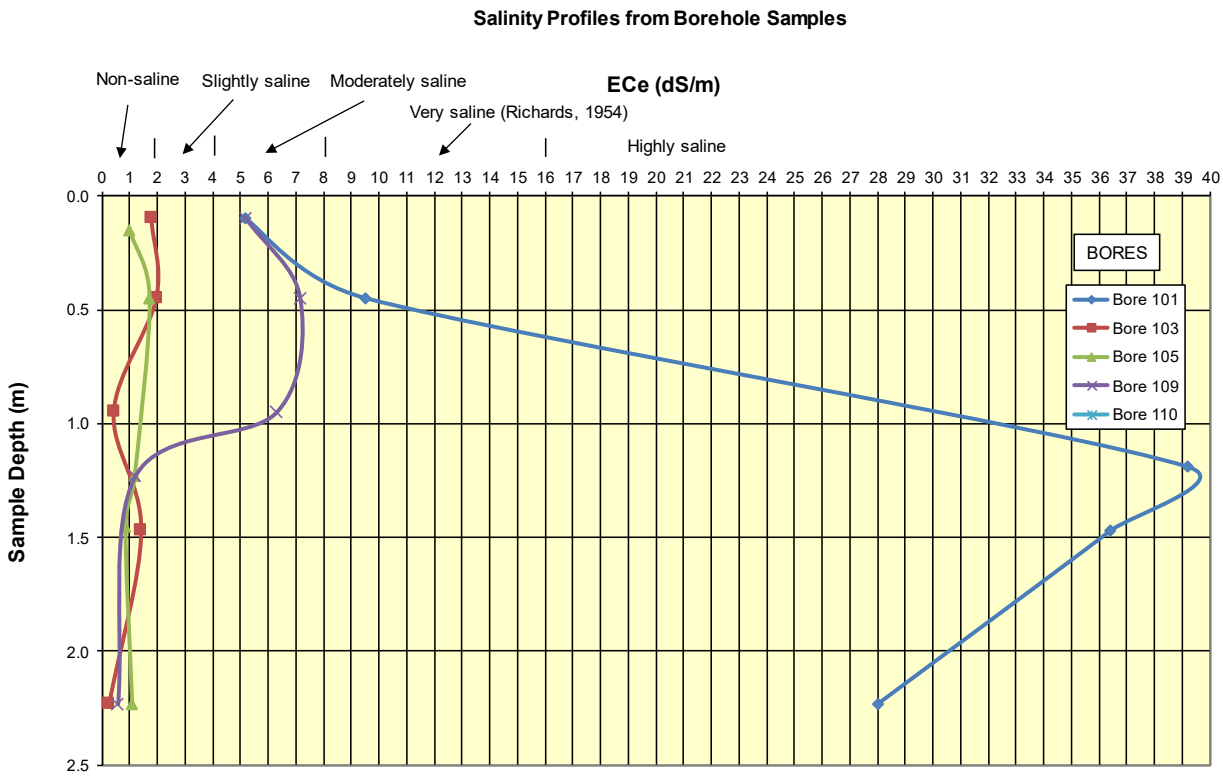


Figure 4: Vertical Salinity Profiles and Salinity Classes

7. Proposed Development

It is understood that the proposed development will involve the subdivision of the site into 39 lots along with the construction of a detention basin, internal road pavements and services. It is expected that light loads associated with light industrial development of up to an estimated applied load of 250 kN (a typical load for these structures) have been assumed.

It is understood that up to 1.5 m of fill and 2.2 m of cut is proposed for the site to achieve design levels ranging between RL 24.1 m and 25.7 m AHD. Localised excavations for water detention basins and drainage lines of up to 2.5 m are also proposed. Acor Consultants has estimated that approximately 24,930 m^3 of cut and 105,125 m^3 of fill is required to achieve site levels.

8. Geotechnical Model

DP has considered the results of this investigation, together with the results of JBS&G and Ramboll's borehole logs and well information, which are presented in Appendix E.

The geotechnical model for the site can be considered to comprise several units as follows, in increasing depth order:

- Unit 1 – Fill – typically in the range of 0.1 m to 1.5 m depth but with several localised areas where the fill has been measured up to about 3 m depth. Drawings 2 and 3 in Appendix B shows the fill depths at each test location and an interpreted heat map of the encountered fill depths.

  The fill comprises a mixture of gravels and crushed concrete with clays and sand. It includes foreign materials such as reinforcement, plastic, ash and slag with some concrete fragments that are in the order of 100 – 200 mm diameter (although concrete of significantly greater size could be present). The fill required pre-drilling or excavation with a rock-hammer in order to penetrate with drilling equipment in both the DP and JBS&G investigations.

  The fill appears to have been placed in piecemeal operations over many years, possibly as part of previous Rocla site operations. Compaction is variable and a 200 mm to 300 mm layer of very loose sand was identified close to the base of the fill layer at CPT111B.

  The fill on-site is considered uncontrolled and should not be relied upon for uniform support of any structural loads without rectification measures to improve the consistency of the fill profile (discussed further in Section 9.3).
- Unit 2 – Alluvial soils – typically stiff to hard clay and loose to medium dense sand layers. The sand, silt and clay are interbedded across the site with occasional gravel. Some firm to stiff clay and minor (100 mm to 200 mm thick) soft clay layers were identified at three CPT locations (119, 125A and 127) within the upper alluvial soil profile.
- Unit 3 – Gravels – gravels within a clay or soil matrix were encountered from depths of between 3.3 m and 8.4 m. These gravels were described as being up to 150 mm in diameter (cobble size) but may have been broken down during the drilling process and be of significantly greater diameter. The Geology of Penrith 1:100 000 notes indicate that the gravels can be up to 0.5 m in diameter with silcrete boulders also embedded within the gravels. The gravels were typically medium dense or dense.
- Unit 4 – Bedrock – shale bedrock was encountered in one Ramboll borehole at 12 m depth. The bedrock in the area is typically low strength (or stronger) with occasional pockets of weathered bedrock.

Groundwater was not encountered during drilling of the boreholes in DPs investigation. The free groundwater identified at depths of 0.95 m and 1.2 m within two CPT holes is anticipated to be perched within the fill profile. The results of the Ramboll and JBS&G investigations indicate groundwater levels to be in the range of 6.6 m to 7.4 m (RL 17.4 to 17.9 m AHD). These groundwater levels suggest groundwater flows to the north. Groundwater levels can fluctuate with climatic variations.

9. Comments

9.1 General

The major geotechnical consideration for development of the site is the presence of the uncontrolled fill and the potential for differential settlements over time. The existing fill material on-site is variable in its thickness, composition and compaction and is expected to perform variably if relied upon for support of any building loads in its current state.

The underlying natural soils are also variable and contain some soft to firm bands in the upper profile, which may be expected in an alluvial environment. However, the identified soft to firm bands are relatively minor (100 mm to 200 mm thick) and localised (only identified at three locations).

It is also understood that site levels will need to be raised by up to 1.5 m.

Council planners have also advised that the risk of total and differential settlement due to the presence of uncontrolled fill is unacceptable. Therefore, to reduce the risk of total and differential settlement a remedial approach is recommended to be adopted and is outlined in Section 9.3.

Foundation support will be dependent on the magnitude of loads applied which will not be known until the performance requirements are known and the design of the structure has commenced. Light industrial structures may be able to be supported by a shallow footing system (e.g. spread footings or raft slabs). Larger structural loads will need to be supported on piles, particularly for concentrated column and wall loads.

Further investigation of the allotments will be required once the details of the development and the general approach to supporting the structures are known.

9.2 Excavations

Bulk excavation to depths of 2.5 m is expected for the site development and will encounter fill and natural soils (Geotechnical Units 1 to 2).

Excavation within the fill and natural soils should be readily achievable by bulldozer blade or an excavator with bucket attachment. Some light to medium ripping assistance or the careful use of rock hammers, grinders or rock saws may be required for fill layers that include recycled concrete, similar to what was encountered in the investigation.

All excavated materials that will be removed from site will need to be disposed of in accordance with current EPA policies. Environmental testing will need to be carried out to classify spoil prior to transport from the site. The type and extent of testing undertaken will depend on the final use or destination of the spoil, and the requirements of the receiving site.

It is further understood that any excavations on-site would need the prior approval of Council and the Site Auditor.

The bulk excavation level for the development appears to be above the expected groundwater level, however, there may be some seepage of perched groundwater into excavations encountered at the

interface between the fill and natural soils or after a prolonged period of wet weather. Such seepage may need to be collected during construction by the judicious placement of drainage sumps and by intermittent pumping. At this stage, it is not possible to estimate the likely extent and rate of seepage although it is anticipated that it should be readily handled by sump and pump measures.

9.3 Site Preparation and Remediation of Existing Fill

The following remedial measures are recommended to manage the risks associated with the existing uncontrolled fill on the site:

- Zones of existing fill with a depth greater than 0.5 m should be excavated to remove all uncontrolled fill and encounter the underlying natural soil profile (refer to interpreted fill depth heatmap presented in Drawing 3 of Appendix B for a guide of fill depths across the site).
- Backfill excavations where uncontrolled fill was removed with controlled fill to provide a level platform with surrounding (unexcavated) portions of the site;
- Zones of existing fill with a depth of less than 0.5 m may be left in place and compacted using high energy impact compaction (HEIC). HEIC is a ground improvement method involving a three or five sided 'roller' drum (impact roller). Past experience has indicated that this method can improve clayey material up to a depth of 1.0 – 1.5 m. HEIC may also identify any localised deeper soft spots in the underlying natural soil;

  Vibrations are a side effect of the HEIC method and a specialist contractor should be consulted to develop a construction methodology for the site to effectively reduce vibration levels on adjoining sites; and
- Place additional fill across the site as required to further raise site levels.

As a part of the above remedial measures, and for any fill placement required for the development, the following should be adhered to:

- Remove any deleterious, soft, wet or highly compressible material or material rich in organics or root matter (such as topsoils) encountered during stripping works across the site. Topsoil materials should be separately stockpiled for use in landscaping or removed off site;
- Prior to any filling works, roll the exposed surface with at least six passes of a minimum 12 tonne deadweight smooth drum roller, with a final test roll accompanied by a geotechnical professional to confirm that any deleterious materials such as soft, wet or highly compressible soil and any organics are identified and removed;
- New fill should be placed in layers of 250 mm maximum loose thickness compacted to at least 98% Standard, increasing to 100% Standard within the upper 0.3 m of the subgrade. Moisture contents should be maintained within the range OMC – 3% to OMC +1%, where OMC is the optimum moisture content measured in the Standard compaction test;
- New fill should be free of oversize particles (>75mm) and deleterious material;
- New fill beneath the industrial lots should comprise either a high-quality ripped sandstone or recycled concrete with a CBR value greater that 15%, Plasticity Index less than 15% and Emerson Class No. of 4 or greater. Existing materials on-site may be suitable if appropriately modified (i.e. with cement or lime as appropriate);

- Moisture conditioning of clay soils may be required if soils are saturated or dry. Moisture conditioning of saturated soils would involve drying in 'sunny and windy' weather, blending with other drier materials or lime stabilisation. Where the soil is dry, it is expected that this will involve either tyning or excavation with the addition of water to increase the moisture content;
- Promptly cover any exposed clay at subgrade level with a minimum 150 mm of select granular fill (minimum CBR 15%) to reduce potential wetting and drying and trafficability problems; and
- New fill required to achieve design levels for support of any on-ground slabs and/or structural loads will need to be carried out under Level 1 testing conditions as defined in **AS 3798–2007 "Guidelines on Earthworks for Commercial and Residential Developments"**. Level 1 testing is also recommended for fill materials beneath pavements, recreational and landscaping areas.

The existing fill should be suitable for re-use from a geotechnical perspective provided that any deleterious and oversized materials are removed during placement.

The above procedures will require geotechnical inspection and testing services during construction.

Remediation of the existing fill as described above will allow the Structural engineer to design an appropriate foundation system for the site.

9.4 Foundations

Foundation support options will be dependent on the magnitude of loads applied which will not be known until the performance requirements are known and the design of the structure has commenced. Light industrial structures may be able to be supported by a shallow footing system (e.g. spread footings or raft slabs). Larger structural loads will need to be supported by piles, particularly for concentrated column and wall loads.

9.4.1 Pile Foundations

All structural loads will need to be supported on a uniform founding layer.

Suitable piled footings are expected to include friction-based piles such as continuous flight augered (CFA) piles or concrete screw piles (such as the 'Atlas' or 'Omega' pile types) founded in Units 2, 3 or 4. All footings in one structure should be founded on the same strata to achieve uniform founding conditions and limit the potential for differential movement between different parts of the structure.. Driven piles may also be considered, however, pre-drilling may be required.

These pile types support the ground during installation to limit the effect of collapsing ground conditions from sand lenses and groundwater, however, are "blind" piling techniques and require significant ground investigation works to characterise the ground conditions prior to additional investigation. In particular, the top of Unit 3 (Gravels) is inferred to be encountered close to the refusal depths of the CPTs which is variable in depth at between 3.3 m and 8.4 m and would need further verification in the form of conventional boreholes (particularly at the locations of shallower refusal). Information on the depth to Unit 4 (Bedrock) is also limited and would need to be verified with the completion of deeper cored boreholes.

Therefore, the preliminary design of piles, for axial compression loading may be based on the maximum Limit State Design or Working Stress parameters given in Table 3.

Table 3: Preliminary Foundation Design Parameters

Unit	Working Stress Design Values		Limit State Design Values		Elastic Modulus (MPa)
	Allowable End Bearing Pressure (kPa)	Shaft Adhesion (kPa)	Ultimate End Bearing Pressure (kPa)	Shaft Adhesion (kPa)	
Alluvial Soils – at least stiff (or medium dense) (Unit 2)	300	50	600	100	50
Gravel (Unit 3)	1000	75	2000	150	250
Low (or Stronger) Strength Siltstone (Unit 4)[1]	2000	100	4000	200	300

Note: 1.Preliminary parameters and subject to Core Drilling to confirm the rock depth, strength and consistency.

The total (long-term) settlement of a piled footing designed using the allowable parameters provided in this report should be less than about 1% of the pile diameter upon application of the design dead load. Serviceability analysis should be undertaken if the ultimate bearing pressures (incorporating a suitable reduction factor) are used to proportion the piles.

For uplift or tension loading, 60% of the above shaft adhesion parameters may be adopted for design purposes. In addition to traditional 'piston pull-out' or sidewall slip failure mechanisms, the uplift capacity should be checked for 'cone pull-out' failure modes. This should be based on AS4678-2002 "Earth-retaining Structures". Uplift capacity for groups of piles will need to consider interaction between piles, which will generally lead to a lesser capacity than the sum of the capacity of individual piles in the group.

Foundation excavations should be inspected by an experienced geotechnical professional prior to pouring concrete to confirm that the material is adequate for the required bearing pressure.

Further investigation will be required for foundation design, however the type and extent of further investigation will be dependent on the structure nominated and the associated magnitude of loads.

9.4.2 Shallow Foundations

Shallow footings (e.g. pad or strip footings) founded on controlled fill (or remediated fill as per the requirements in Section 9.3) or stiff or stronger natural soils could be designed for an allowable bearing pressure of 150 kPa.

Settlement of a footing is dependent on the loads applied to the footing/pile and the foundation conditions. The total settlement of a footing designed using the above allowable pressure should be less than 1% of the footing width upon application of the design load.

Testing of all footings should be carried out by an experienced geotechnical engineer. Localised removal of any identified unsuitable fill may be required.

Raft slabs may also be suitable where the design can consider potential differential settlements caused by variations of building loadings. A piled raft foundation may be considered to minimise differential settlements. Further geotechnical advice will be required in relation to the design of both raft slabs and possibly piled raft slabs once the column layout and loadings are available.

The modulus of subgrade reaction value for a raft slab will vary with the size of the loaded area. Design of raft foundations will require modelling of the distribution of the loads over the slab area.

9.5 Seismic Design

In accordance with Part 4 of the Structural design actions Standard, AS1170.4 – 2007, it is assessed that the site will have a Sub-Soil Class of "C_e" following successful earthworks activities (refer to Section 9.3). This is in accordance with the definitions presented in Section 4.2 – Class Definitions.

9.6 Floor Slabs

Where the building is to be designed with a suspended floor slab, site preparation measures will be minimal. If slabs are to be cast on ground (but designed as suspended slabs), then checks should be made to ensure that concrete is not poured onto softened or wet ground that could lead to deformation of the slab.

Where site preparation is undertaken in accordance with Section 9.3, on-grade slabs could be constructed in place of suspended slabs. On-grade floor slabs should be cast independently of pads or pile and beam footings and incorporate control joints to allow for differential movements. Edge protection, such as deepened stiffening edge beams in conjunction with surface paving should also be included to minimise the effects of reactivity movements.

9.7 Pavements

Laboratory testing for CBR and compaction was carried out on samples recovered from the subgrade soils over the site. CBR values ranging between 7% and 13% were obtained for the natural clay and sand samples tested. CBR values of 100% and 180% were obtained for samples of the roadbase materials tested. Allowing for variability of results, it is suggested that the design of pavements be based on a design CBR value of 7%. If imported material is used to level the site and form subgrade levels, the design CBR value will depend on the type and depth of imported material. Pavements should be placed on a subgrade prepared in accordance with the recommendations provided in Section 9.3.

The design CBR value given above depends on the provision of adequate surface and subsoil drainage to maintain the subgrade as close to OMC as possible. Subsoil drainage should be installed to not less than 500 mm depth below subgrade level adjacent to the pavement. Preparation of subgrade surfaces should be such that adequate cross-falls for the surface drainage purposes are achievable across the final pavement.

9.8 Salinity

9.8.1 Impact of the Saline Soils on the Proposed Development

The presence of saline soils are naturally occurring features of the local landscape and of the overlying fill soils. The very saline soils encountered on-site are considered unusually high. The Salinity Management Plan outlined in Section 9.9.2 has outlined risk management measures for the range of saline soils encountered on-site (including very saline soils). Further investigation may revise the salinity classification and zone the salinity of site soils across the site and have appropriate treatment measures for each zone.

They are not considered significant impediments for future redeveloped of the Site, provided appropriate remediation or management techniques are employed.

Salinity and aggressivity affects the durability of concrete and steel by causing premature breakdown of concrete and corrosion of steel. This has impacts on the longevity of structures in contact with these materials. As a result management will be required.

9.8.2 Salinity Management Plan

The presence of saline soils on-site is a naturally occurring feature of the local landscape that is not considered significant impediments for future redeveloped of the Site, provided appropriate remediation or management techniques are employed.

A salinity management plan to limit the impact of saline soils on-site, including strategies for service installation, building construction and roads and associated infrastructure will be required.

The current salinity investigation indicates that materials within the site range from non-saline to moderately within near-surface soils (within 0.3 m of the existing ground surface) generally non-saline to moderately saline with moderately to very saline soils encountered in soils deeper than 0.3 m. Testing of other parameters associated with salinity indicates that the materials are non – aggressive to concrete and steel. Based on experience in the area, natural soils are assumed to be highly sodic.

The amount of information regarding the distribution of salinity across the site is limited. Therefore, the management strategies assume the most conservative approach of very saline soils being present across the site. Further investigation may be able to delineate areas of lower salinity, however, given known salinity in surrounding areas it is likely that very saline soils will probably be encountered elsewhere on-site.

The following management strategies are confined to the management of those factors with a potential to impact on the development:

A. Management should focus on capping of the upper surface of the sodic soils, both exposed by excavation and placed as fill, with a more permeable material to prevent ponding, to reduce capillary rise, to act as a drainage layer and to reduce the potential for erosion.

B. With respect to any required imported fill, testing should be undertaken prior to importation, to determine the salinity characteristics of the material, which should not be greater than mildly-aggressive and, where possible, but should not be greater than “moderately saline” in classification.

C. Sodic soils can also be managed by maintaining vegetation where possible and planting new salt tolerant species. The addition of organic matter, gypsum and lime can also be considered where appropriate. After gypsum addition, reduction of sodicity levels may require some time for sufficient infiltration and leaching of sodium into the subsoils, however capping of exposed sodic material should remain the primary management method. Topsoil added at the completion of construction is, in effect, also adding organic matter which may help infiltration and leaching of sodium.

D. Avoiding water collecting in low lying areas, in depressions, or behind fill. This can lead to water logging of the soils, evaporative concentration of salts, and eventual breakdown in soil structure resulting in accelerated erosion.

E. Any pavements should be designed to be well drained of surface water. There should not be excessive concentrations of runoff or ponding that would lead to waterlogging of the pavement or additional recharge to the groundwater through any more permeable zones in the underlying filling material.

F. Surface drains should generally be provided along the top of batter slopes to reduce the potential for concentrated flows of water down slopes possibly causing scour.

G. Salt tolerant grasses and trees should be considered for landscaping in the drainage reserve, to reduce soil erosion and to maintain the existing evapo – transpiration and groundwater levels. Reference should be made to an experienced landscape planner or agronomist.

The above strategies should be considered in conjunction with the erosion controls outlined in Landcom, *Soils and Construction, Managing Urban Stormwater, Volume 1, 4th Edition,* March 2004.

The following additional strategies are recommended for completion of service installation and for building construction. These strategies should be complementary to standard good building practices recommended within the Building Code of Australia, including cover to reinforcement within concrete and correct installation of a brick damp course (where used), so that it cannot be bridged to allow moisture to move into brick work and up the wall.

H. Based on the results of this investigation, soils underlying the site were identified as non-aggressive to concrete, moderately aggressive in the upper 0.3 m of the site with underlying very saline soils. As such, the durability requirements provided in Tables 4 and 5 (below and following page) should be taken into account by the designer.

Table 4: Recommended Durability Requirements for Concrete Foundations and Structures

Site Salinity Classification	Site Soil Aggressivity to Concrete Classification	Recommended Durability Requirement (as per AS3600)		
		Minimum Concrete Strength (MPa)	Minimum Cover to Reinforcement (mm)	Minimum Cure Time (days)
Non-saline to Moderately Saline	Non-Aggressive	25	45	3

Site Salinity Classification	Site Soil Aggressivity to Concrete Classification	Recommended Durability Requirement (as per AS3600)		
		Minimum Concrete Strength (MPa)	Minimum Cover to Reinforcement (mm)	Minimum Cure Time (days)
(up to 0.3 m below existing surface levels)				
Non-saline to Very Saline (greater than 0.3 m below existing surface levels)	Non-Aggressive	40	55	7

Table 5: Recommended Durability Requirements for Concrete Piles

Concrete Aggressivity (refer Figure 11)	Recommended Durability Requirement (as per AS2159)	
	Minimum Concrete Strength (MPa)	Minimum Cover to Reinforcement (mm)
Non-aggressive	25	65

I. Wet cast concrete pipes and currently manufactured spun concrete pipes are understood to have estimated compressive strengths of 50 MPa and 60 – 70 MPa, respectively, in excess of the requirements for mass concrete in H to J above. Reference to the maximum and minimum test results of Table 4 (Section 6.2 of this report) and to Tables E1 and 3.1 of AS 4058 – 2007 "Precast concrete pipes" indicates that the site falls within the AS 4058 Clay/Stagnant (low sulphate) soil type (chlorides <=20,000 ppm, pH>=4.5 and sulphates <=1,000 ppm) and (in the absence of tidal water flow) falls within the AS 4058 Normal durability environment. Under these conditions, AS 4058-compliant reinforced concrete pipes of general purpose Portland cement, with a minimum cover to reinforcement of 10 mm, are expected to have a design life in excess of 100 years. Any concrete pipes installed within the site should employ AS 4058-compliant steel reinforced pipes of general purpose Portland cement, with minimum cover to reinforcement of 10 mm, or should be fibre reinforced.

J. In all masonry buildings a brick damp course should be installed so that it cannot be bridged either internally or externally. This will limit the potential for moisture moving into brickwork and up the wall.

9.9 Site Drainage

Surface and subsurface drainage will be required across the entire site, beneath buildings, pavements, hardstands. Water, including stormwater, can introduce additional moisture into the fill which can enhance settlements. Therefore, it is prudent to provide suitable site drainage.

10. Further Investigation

This geotechnical investigation has been carried out to give a broad appreciation of site conditions across the site. It is anticipated that once development details have been finalised and the site layout has been determined further geotechnical investigation and advice will be required to provide detailed information to optimise design.

Specific geotechnical investigations would include (but not necessarily be limited to):

- Detailed geotechnical investigations using test pit methods to assess the extent and conditions of existing fill on-site;
- Further CPTs to assess the variability of natural soils on each industrial allotment to allow for foundation design; and
- The drilling of deeper conventional boreholes to confirm the depth the Gravel and Bedrock Units across the site.

11. References

- AS 1170 (2007) *Structural Design Actions, Part 4: Earthquake Actions in Australia*, Standards Australia
- AS 1726 (2017) *Geotechnical Site Investigations*, Standards Australia
- AS 2159 (2009) *Piling Design and Installation,* Standards Australia
- AS 2870 (2011) *Residential Slabs and Footings*, Standards Australia
- AS3600 (2018) *Concrete Structures*, Standards Australia
- AS 3798 (2007) *Guidelines on Earthworks for Commercial and Residential Developments*, Standards Australia
- AS 4678 (2002) *Earth-retaining Structures*, Standards Australia
- Clark and Jones (1991) Penrith *1: 100 000 Geological Sheet* 9030 1st edition, Geological Survey of New South Wales, Sydney
- Department of Infrastructure, Planning and Natural Resources, *Salinity Potential in Western Sydney* (2002), NSW Government.
- Department of Land and Water Conservation (DLWC) publication “Site Investigation for Urban Salinity” (2002)
- Landcom (2004), *Soils and Construction, Managing Urban Stormwater, Volume 1, 4th Edition,*
- NSW Department of Minerals and Energy, Penrith Geological Series Sheet No 9030 (1991), NSW Government.
- Richards, L. A. (ed.) (1954), Diagnosis and Improvement of Saline and Alkaline Soils, USDA Handbook No. 60, Washington D.C.

12. Limitations

Douglas Partners Pty Ltd (DP) has prepared this report for this project at 158-164 Old Bathurst Road, Emu Plains in accordance with DP's email proposal dated 25 September 2023and acceptance received from Ms Ruma McCracken of Penrith City Council dated 25 September 2023. The work was carried out under DP's Conditions of Engagement. This report is provided for the exclusive use of Penrith City Council 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.

The assessment of atypical safety hazards arising from this advice is restricted to the geotechnical components set out in this report and based on known project conditions and stated design advice and assumptions. While some recommendations for safe controls may be provided, detailed 'safety in design' assessment is outside the current scope of this report and requires additional project data and assessment.

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

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

Douglas Partners Pty Ltd

Appendix A

About This Report

About this Report

August 2020

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

This report is the property of Douglas Partners Pty Ltd. The report may only be used for the purpose for which it was commissioned and in accordance with the Conditions of Engagement for the commission supplied at the time of proposal. Unauthorised use of this report in any form whatsoever is prohibited.

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.

continued next page

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.

intentionally blank

intentionally blank

Introduction to Terminology, Symbols and Abbreviations

Douglas Partners' reports, investigation logs, and other correspondence may use terminology which has quantitative or qualitative connotations. To remove ambiguity or uncertainty surrounding the use of such terms, the following sets of notes pages may be attached Douglas Partners' reports, depending on the work performed and conditions encountered:

- Soil Descriptions;
- Rock Descriptions; and
- Sampling, insitu testing, and drilling methodologies

In addition to these pages, the following notes generally apply to most documents.

Abbreviation Codes

Site conditions may also be presented in a number of different formats, such as investigation logs, field mapping, or as a written summary. In some of these formats textual or symbolic terminology may be presented using textual abbreviation codes or graphic symbols, and, where commonly used, these are listed alongside the terminology definition. For ease of identification in these note pages, textual codes are presented in these notes in the following style `XW`. Code usage conforms with the following guidelines:

- Textual codes are case insensitive, although herein they are generally presented in upper case; and
- Textual codes are contextual (i.e. the same or similar combinations of characters may be used in different contexts with different meanings (for example `PL` is used for plastic limit in the context of soil moisture condition, as well as in `PL(A)` for point load test result in the testing results column)).

Data Integrity Codes

Subsurface investigation data recorded by Douglas Partners is generally managed in a highly structured database environment, where records "span" between a top and bottom depth interval. Depth interval "gaps" between records are considered to introduce ambiguity, and, where appropriate, our practice guidelines may require contiguous data sets. Recording meaningful data is not always appropriate (for example assigning a "strength" to a concrete pavement) and the following codes may be used to maintain contiguity in such circumstances.

Term	Description	Abbreviation Code
Core loss	No core recovery	KL
Unknown	Information was not available to allow classification of the property. For example, when auguring in loose, saturated sand auger cuttings may not be returned.	UK
No data	Information required to allow classification of the property was not available. For example if drilling is commenced from the base of a hole predrilled by others	ND
Not Applicable	Derivation of the properties not appropriate or beyond the scope of the investigation. For example providing a description of the strength of a concrete pavement	NA

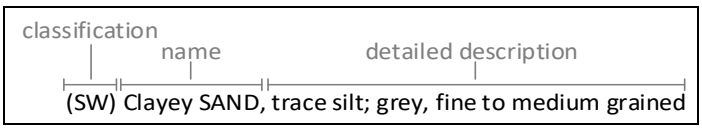
Graphic Symbols

Douglas Partners' logs contain a "graphic" column which provides a pictorial representation of the basic composition of the material. The symbols used are directly representing the material name stated in the adjacent "Description of Strata" column, and as such no specific graphic symbology legend has been provided in these notes.

intentionally blank

Introduction

All materials which are not considered to be "in-situ rock" are described in general accordance with the soil description model of AS 1726-2017 Part 6.1.3, and can be broken down into the following description structure:



The "classification" comprises a two character "group symbol" providing a general summary of dominant soil characteristics. The "name" summarises the particle sizes within the soil which most influence it's behaviour. The detailed description presents more information about the soil's composition, condition, structure, and origin.

Classification, naming and description of soils requires the relative proportion of particles of different sizes within the whole soil mixture to be considered.

Particle size designation and Behaviour Model

Solid particles within a soil are differentiated on the basis of size.

The engineering behaviour properties of a soil can subsequently be modelled to be either "fine grained" (also known as "cohesive" behaviour) or "coarse grained" ("non cohesive" behaviour), depending on the relative proportion of fine or coarse fractions in the soil mixture.

Particle Size Fraction	Particle Size (mm)	Behaviour Model	
		Behaviour	Approximate Dry Mass
Boulder	>200	Excluded from particle behaviour model as "oversize"	
Cobble	63 - 200		
Gravel[1]	2.36 - 63	Coarse	>65%
Sand[1]	0.075 - 2.36		
Silt	0.002 - 0.075	Fine	>35%
Clay	<0.002		

[1] – refer grain size subdivision descriptions below

The behaviour model boundaries defined above are not precise, and the material behaviour should be assumed from the name given to the material (which considers the particle fraction which dominates the behaviour, refer "component proportions" below), rather than strict observance of the proportions of particle sizes. For example, if a material is named a "Sandy CLAY", this is indicative that the material exhibits fine grained behaviour, even if the dry mass of coarse grained material may exceed 65%.

Component proportions

The relative proportion of the dry mass of each particle size fraction is assessed to be a "primary", "secondary", or "minor" component of the soil mixture, depending on it's influence over the soils behaviour.

Component Proportion Designation	Definition[1]	Relative Proportion	
		In Fine Grained Soil	In Coarse Grained Soil
Primary	The component (particle size designation, refer above) which dominates the engineering behaviour of the soil	The clay/silt component with the greater proportion	The sand/gravel component with the greater proportion
Secondary	Any component which is not the primary, but is significant to the engineering properties of the soil	Any component with greater than 30% proportion	Any granular component with greater than 30%; or Any fine component with greater than 12%
Minor[2]	Present in the soil, but not significant to it's engineering properties	All other components	All other components

[1] – As defined in AS1726-2017 6.1.4.4

[2] – in the detailed material description, minor components are split into two further sub categories. Refer "identification of minor components" below

Composite Materials

In certain situations a lithology description may describe more than one material, for example, collectively describing a layer of interbedded sand and clay. In such a scenario, the two materials would be described independently, with the names preceded or followed by a statement describing the arrangement by which the materials co-exist. For example "INTERBEDDED Silty CLAY AND SAND".

Classification

The soil classification comprises a two character group symbol. The first symbol identifies the primary component. The second symbol identifies either the grading or presence of fines in a coarse grained soil, or the plasticity in a fine grained soil. Refer AS1726-2017 6.1.6 for further clarification.

Soil Name

For most soils the name is derived with the primary component included as the noun (in upper case), preceded by any secondary components stated in an adjective form. In this way the soil name also describes the general composition and indicates the dominant behaviour of the material.

Component[1]	Prominence in Soil Name
Primary	Noun (eg "CLAY")
Secondary	Adjective modifier (eg "Sandy")
Minor	No influence

[1] – for determination of component proportions, refer component proportions on previous page

For materials which cannot be disaggregated, or which are not comprised of rock or mineral fragments, the names "ORGANIC MATTER" or "ARTIFICIAL MATERIAL" may be used, in accordance with AS1726-2017 Table 14.

Commercial or colloquial names are not used for the soil name where a component derived name is possible (for example "Gravelly SAND" rather than "CRACKER DUST").

Identification of minor components

Minor components are identified in the soil description immediately following the soil name. The minor component fraction is usually preceded with a term indicating the relative proportion of the component.

Minor Component Proportion Term	Relative Proportion	
	In Fine Grained Soil	In Coarse Grained Soil
With	All fractions: 15-30%	clay/silt: 5-12% sand/gravel: 15-30%
Trace	All fractions: 0-15%	clay/silt: 0-5% sand/gravel: 0-15%

Soil Composition

Plasticity

Descriptive Term	Laboratory liquid limit range	
	Silt	Clay
Non-plastic materials	Not applicable	Not applicable
Low plasticity	≤50	≤35
Medium plasticity	Not applicable	>35 and ≤50
High plasticity	>50	>50

Note, Plasticity descriptions generally describe the plasticity behaviour of the whole of the fine grained soil, not individual fine grained fractions.

Grain Size

Type		Particle size (mm)
Gravel	Coarse	19 - 63
	Medium	6.7 - 19
	Fine	2.36 – 6.7
Sand	Coarse	0.6 - 2.36
	Medium	0.21 - 0.6
	Fine	0.075 - 0.21

Grading

Grading Term	Particle size (mm)
Well	A good representation of all particle sizes
Poorly	An excess or deficiency of particular sizes within the specified range
Uniformly	Essentially of one size
Gap	A deficiency of a particular particle size with the range

Note, AS1726-2017 provides terminology for additional attributes not listed here.

intentionally blank

Soil Condition

Moisture

The moisture condition of soils is assessed relative to the plastic limit for fine grained soils, while for coarse grained soils it is assessed based on the appearance and feel of the material. The moisture condition of a material is considered to be independent of stratigraphy (although commonly these are related), and this data is presented in its own column on logs.

Applicability	Term	Tactile Assessment	Abbreviation code
Fine	Dry of plastic limit	Hard and friable or powdery	<PL
	Near plastic limit	Can be moulded	≈PL
	Wet of plastic limit	Water residue remains on hands when handling	>PL
	Near liquid limit	"oozes" when agitated	≈LL
	Wet of liquid limit	"oozes"	>LL
Coarse	Dry	Non-cohesive and free running	D
	Moist	Feels cool, darkened in colour, particles may stick together	M
	Wet	Feels cool, darkened in colour, particles may stick together, free water forms when handling	W

The abbreviation code NDF, meaning "not-assessable due to drilling fluid use" may also be used.

Note, observations relating to free ground water or drilling fluids are provided independent of soil moisture condition.

Consistency/Density/Compaction/Cementation/Extremely Weathered Rock

These concepts give an indication of how the material may respond to applied forces (when considered in conjunction with other attributes of the soil). This behaviour can vary independent of the composition of the material, and on logs these are described in an independent column and are generally mutually exclusive (i.e it is inappropriate to describe both consistency and compaction at the same time). The method by which the behaviour is described depends on the behaviour model and other characteristics of the soil as follows:

- In fine grained soils, the "consistency" describes the ease with which the soil can be remoulded, and is generally correlated against the materials undrained shear strength;
- In granular materials, the relative density describes how tightly packed the particles are, and is generally correlated against the density index;
- In anthropogenically modified materials the compaction of the material is described qualitatively;
- In cemented soils (both natural and anthropogenic), the cemented "strength" is described qualitatively, relative to the difficulty with which the material is disaggregated; and
- In soils of extremely weathered rock origin, the engineering behaviour may be governed by relic rock features, and expected behaviour needs to be assessed based the overall material description

Quantitative engineering performance of these materials may be determined by laboratory testing, or estimated by correlated field tests (for example penetration or shear vane testing), or by tactile methods, as appropriate.

Consistency (fine grained soils)

Consistency Term	Tactile Assessment	Undrained Shear Strength (kPa)	Abbreviation Code
Very soft	Extrudes between fingers when squeezed	<12	VS
Soft	Mouldable with light finger pressure	>12 - ≤25	S
Firm	Mouldable with strong finger pressure	>25 - ≤50	F
Stiff	Cannot be moulded by fingers	>50 - ≤100	ST
Very stiff	Indented by thumbnail	>100 - ≤200	VST
Hard	Indented by thumbnail with difficulty	>200	H
Friable	Easily crumbled or broken into small pieces by hand	-	FR

Relative Density (coarse grained soils)

Tactile assessment of relative density is difficult, and generally requires penetration testing, hence a tactile assessment guide is not provided.

Relative Density Term	Density Index	Abbreviation Code
Very loose	<15	VL
Loose	>15-≤35	L
Medium dense	>35-≤65	MD
Dense	>65-≤85	D
Very dense	>85	VD

Compaction (anthropogenically modified soil)

Compaction Term	Abbreviation Code
Well compacted	WC
Poorly compacted	PC
Moderately compacted	MC
Variably compacted	VC

Cementation (natural and anthropogenic)

Cementation Term	Abbreviation Code
Moderately cemented	MCE
Weakly cemented	WKCE
Cemented	CE
Strongly bound	SB
Weakly bound	WB
Unbound	UB

Extremely Weathered Rock

AS1726-2017 considers weathered rock material to be soil if the unconfined compressive strength is less than 0.6 MPa (i.e. very low strength rock). These materials may be identified as "extremely weathered rock" in reports and by the abbreviation code XWR on log sheets. This identification is not correlated to any specific qualitative or quantitative behaviour, and the engineering properties of this material must therefore be assessed according to engineering principles with reference to any relic rock structure, fabric, or texture described in the description.

Soil Origin

Term	Description	Abbreviation Code
Residual	Derived from in-situ weathering of the underlying rock	RES
Extremely weathered material	Formed from in-situ weathering of geological formations. Has strength of less than 'very low' as per as1726 but retains the structure or fabric of the parent rock.	XWM
Alluvial	Deposited by streams and rivers	ALV
Estuarine	Deposited in coastal estuaries	EST
Marine	Deposited in a marine environment	MAR
Lacustrine	Deposited in freshwater lakes	LCS
Aeolian	Carried and deposited by wind	AEO
Colluvial	Soil and rock debris transported down slopes by gravity	COL
Topsoil	Mantle of surface soil, often with high levels of organic material	TOP
Fill	Any material which has been moved by man	FILL
Littoral	Deposited on the lake or sea shore	LIT
Unidentifiable	Not able to be identified	UID

Cobbles and Boulders

The presence of particles considered to be "oversize" may be described using one of the following strategies:

- Oversize encountered in a minor proportion (when considered relative to the wider area) are noted in the soil description; or
- Where a significant proportion of oversize is encountered, the cobbles/boulders are described independent of the soil description, in a similar manner to composite soils (described above) but qualified with "MIXTURE OF".

intentionally blank

Rock Strength

Rock strength is defined by the unconfined compressive strength and it refers to the strength of the rock substance and not the strength of the overall rock mass, which may be considerably weaker due to defects.

The Point Load Strength Index $I_{s(50)}$ is commonly used to provide an estimate of the rock strength and site specific correlations should be developed to allow UCS values to be determined. The point load strength test procedure is described by Australian Standard AS4133.4.1-2007. The terms used to describe rock strength are as follows:

Strength Term	Unconfined Compressive Strength (MPa)	Point Load Index[1] $I_{s(50)}$ MPa	Abbreviation Code
Very low	0.6 - 2	0.03 - 0.1	VL
Low	2 - 6	0.1 - 0.3	L
Medium	6 - 20	0.3 - 1.0	M
High	20 - 60	1 - 3	H
Very high	60 - 200	3 - 10	VH
Extremely high	>200	>10	EH

[1] Assumes a ratio of 20:1 for UCS to $I_{s(50)}$. It should be noted that the UCS to $I_{s(50)}$ ratio varies significantly for different rock types and specific ratios may be required for each site.

On investigation logs only, the following data contiguity codes may be in rock strength tables for layers or seams of material "within rock", but for which the equivalent UCS strength is less than 0.6 MPa.

Scenario	Abbreviation Code
The material encountered has an equivalent UCS strength of less than 0.6 MPa, and therefore is considered to be soil (as per Note 1 of Table 20 of AS 1726-2017). The properties of the material encountered over this interval are described in the "Description of Strata" and soil properties columns.	SOIL
The material encountered has an equivalent UCS strength of less than 0.6 MPa, and therefore is considered to be soil (as per Note 1 of Table 20 of AS 1726-2017). The prominence of the material is such that it can be considered to be a seam (as defined in Table 22 of AS1726-2017) and the properties of the material are described in the defect column.	SEAM

Degree of Weathering

The degree of weathering of rock is classified as follows:

Weathering Term	Description	Abbreviation Code
Residual Soil[1,2]	Material is weathered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are no longer visible, but the soil has not been significantly transported.	RS
Extremely weathered[1,2]	Material is weathered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are still visible	XW
Highly weathered	The whole of the rock material is discoloured, usually by iron staining or bleaching to the extent that the colour of the original rock is not recognisable. Rock strength is significantly changed by weathering. Some primary minerals have weathered to clay minerals. Porosity may be increased by leaching, or may be decreased due to deposition of weathering products in pores.	HW
Moderately weathered	The whole of the rock material is discoloured, usually by iron staining or bleaching to the extent that the colour of the original rock is not recognisable, but shows little or no change of strength from fresh rock.	MW
Slightly weathered	Rock is partially discoloured with staining or bleaching along joints but shows little or no change of strength from fresh rock.	SW
Fresh	No signs of decomposition or staining.	FR
Note: If HW and MW cannot be differentiated use DW (see below)		
Distinctly weathered	Rock strength usually changed by weathering. The rock may be highly discoloured, usually by iron staining. Porosity may be increased by leaching or may be decreased due to deposition of weathered products in pores.	DW

[1] – AS1726-2017 6.1.9 provides similar definitions for "residual soil" and "extremely weathered material" as soil origins. Generally, the soil origin terms would be used above the depth at which very low strength or stronger rock material is first encountered, while both soil origin and weathering should may be stated for soil encountered below the first contact with rock material, where appropriate.

[2] –The parent rock type, of which the residual/extremely weathered material is a derivative, will be stated in the description (where discernible).

Degree of Alteration

The degree of alteration of the rock material (physical or chemical changes caused by hot gasses or liquids at depth) is classified as follows:

Term	Description	Abbreviation Code
Extremely altered	Material is altered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are still visible.	XA
Highly altered	The whole of the rock material is discoloured, usually by staining or bleaching to the extent that the colour of the original rock is not recognisable. Rock strength is changed by alteration. Some primary minerals are altered to clay minerals. Porosity may be increased by leaching, or may be decreased due to precipitation of secondary materials in pores.	HA
Moderately altered	The whole of the rock material is discoloured, usually by staining or bleaching to the extent that the colour of the original rock is not recognisable but shows little or no change of strength from fresh rock.	MA
Slightly altered	Rock is slightly discoloured but shows little or no change of strength from fresh rock	SA
Note: If HA and MA cannot be differentiated use DA (see below)		
Distinctly altered	Rock strength usually changed by alteration. The rock may be highly discoloured, usually by staining or bleaching. Porosity may be increased by leaching, or may be decreased due to precipitation of secondary minerals in pores.	DA

Degree of Fracturing

The following descriptive classification apply to the spacing of natural occurring fractures in the rock mass. It includes bedding plane partings, joints and other defects, but excludes drilling breaks. These terms are generally not required on investigation logs where fracture spacing is presented as a histogram, and where used are presented in an unabbreviated format.

Term	Description
Fragmented	Fragments of <20 mm
Highly Fractured	Core lengths of 20-40 mm with occasional fragments
Fractured	Core lengths of 30-100 mm with occasional shorter and longer sections
Slightly Fractured	Core lengths of 300 mm or longer with occasional sections of 100-300 mm
Unbroken	Core contains very few fractures

Rock Quality Designation

The quality of the cored rock can be measured using the Rock Quality Designation (RQD) index, defined as:

$$\text{RQD \%} = \frac{\text{cumulative length of 'sound' core sections} \geq 100 \text{ mm long}}{\text{total drilled length of section being assessed}}$$

where 'sound' rock is assessed to be rock of low strength or stronger. The RQD applies only to natural fractures. If the core is broken by drilling or handling (i.e. drilling breaks) then the broken pieces are fitted back together and are not included in the calculation of RQD.

Stratification Spacing

These terms may be used to describe the spacing of bedding partings in sedimentary rocks. Where used, these terms are generally presented in an unabbreviated format

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

Defect Descriptions

Defect Type

Term	Abbreviation Code
Bedding plane	B
Clay seam	CS
Cleavage	CV
Crushed zone	CZ
Decomposed seam	DS
Fault	F
Joint	J
Lamination	LAM
Parting	PT
Sheared zone	SZ
Vein	VN
Drilling/handling break	DB , HB
Fracture	FCT

Rock Defect Orientation

Term	Abbreviation Code
Horizontal	H
Vertical	V
Sub-horizontal	SH
Sub-vertical	SV

Rock Defect Coating

Term	Abbreviation Code
Clean	CLN
Coating	CO
Healed	HE
Infilled	INF
Stained	STN
Tight	TI
Veneer	VEN

Rock Defect Infill

Term	Abbreviation Code
Calcite	CA
Carbonaceous	CBS
Clay	CLY
Iron oxide	FE
Manganese	MN
Silty	SLT

intentionally blank

Rock Defect Shape/Planarity

Term	Abbreviation Code
Curved	CU
Irregular	IR
Planar	PL
Stepped	ST
Undulating	UN

Rock Defect Roughness

Term	Abbreviation Code
Polished	PO
Rough	RO
Slickensided	SL
Smooth	SM
Very rough	VR

Other Rock Defect Attributes

Term	Abbreviation Code
Fragmented	FG
Band	BND
Quartz	QTZ

Defect Orientation

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

intentionally blank

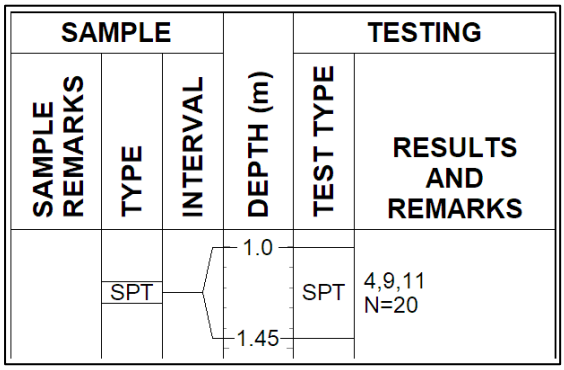
Sampling, Testing and Excavation Methodology

Terminology
Symbols
Abbreviations

August 2020

Sampling and Testing

A record of samples retained and field testing performed is usually shown on a Douglas Partners' log with samples appearing to the left of a depth scale, and selected field and laboratory testing (including results, where relevant) appearing to the right of the scale, as illustrated below:



Sampling

The type or intended purpose for which a sample was taken is indicated by the following abbreviation codes.

Sample Type	Code
Auger sample	A
Acid sulfate sample	ASS
Bulk sample	B
Core sample	C
Disturbed sample	D
Sample from SPT test	SPT
Environmental sample	E
Gas sample	G
Jar sample	J
Undisturbed tube sample	U[1]
Water sample	W
Piston sample	P
Core sample for unconfined compressive strength testing	UCS

[1] – numeric suffixes indicate tube diameter/width in mm

The above codes only indicate that a sample was retained, and not that testing was scheduled or performed.

Field and Laboratory Testing

A record that field and laboratory testing was performed is indicated by the following abbreviation codes.

Test Type	Code
Pocket penetrometer (kpa)	PP
Photo ionisation detector	PID
Standard Penetration Test	SPT
Shear vane (kpa)	V
Unconfined compressive strength, (MPa)	UCS
Point load test, axial (A), diametric (D), irregular (I)	PLT(_)

Field and laboratory testing (continued)

Test Type	Code
Dynamic cone penetrometer, followed by blow count penetration increment in mm (cone tip, generally in accordance with AS1289.6.3.2)	DCP/150
Perth sand penetrometer, followed by blow count penetration increment in mm (flat tip, generally in accordance with AS1289.6.3.3)	PSP/150

Groundwater Observations

▷	seepage/inflow
▽	standing or observed water level
NFGWO	no free groundwater observed
OBS	Observations obscured by drilling fluids

Drilling or Excavation Methods/Tools

The drilling/excavation methods used to perform the investigation may be shown either in a dedicated column down the left hand edge of the log, or stated in the log footer. In some circumstances abbreviation codes may be used.

Method	Abbreviation Code
Excavator/backhoe bucket	B[1]
Toothed bucket	TB[1]
Mud/blade bucket	MB[1]
Ripping tyne/ripper	RT
Rock breaker/hydraulic hammer	RB
Hand auger	HA[1]
NMLC series coring	NMLC
HMLC series coring	HMLC
NQ coring	NQ
HQ coring	HQ
PQ coring	PQ
Push tube	PT [1]
Rock roller	RR[1]
Solid flight auger. Suffixes (TC) and (V) indicate tungsten carbide or v-shaped tip respectively	SFA[1]
Sonic drilling	SON[1]
Vibrocore	VC[1]
Wash bore (unspecified bit type)	WB[1]
Existing exposure	X
Hand tools (unspecified)	HT
Predrilled	PD
Specialised bit (refer report)	SPEC[1]
Diatube	DT[1]
Hollow flight auger	HFA[1]
Vacuum excavation	VE

[1] – numeric suffixes indicate tool diameter/width in mm

Cone Penetration Testing

August 2020

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

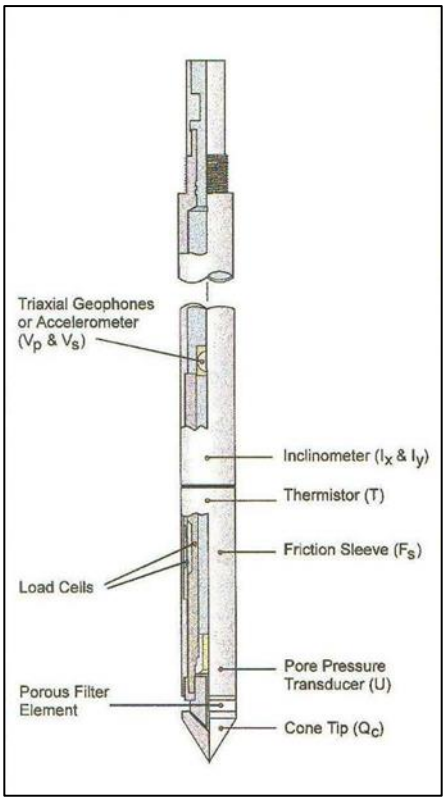


Figure 1: Cone Diagram

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 (qc, fs, i & z)
Piezocone	Dynamic pore pressure (u) plus basic parameters. Dissipation tests estimate consolidation parameters
Conductivity	Bulk soil electrical conductivity (□) plus basic parameters
Seismic	Shear wave velocity (Vs), compression wave velocity (Vp), 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)

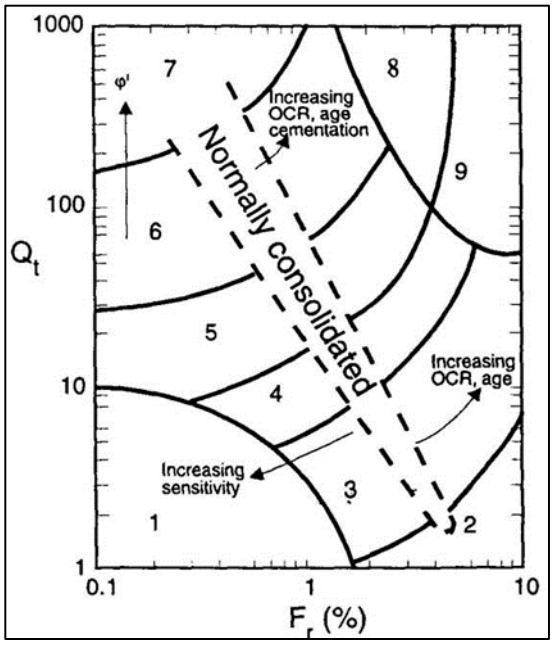


Figure 3: Soil Classification Chart

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 G0. 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.

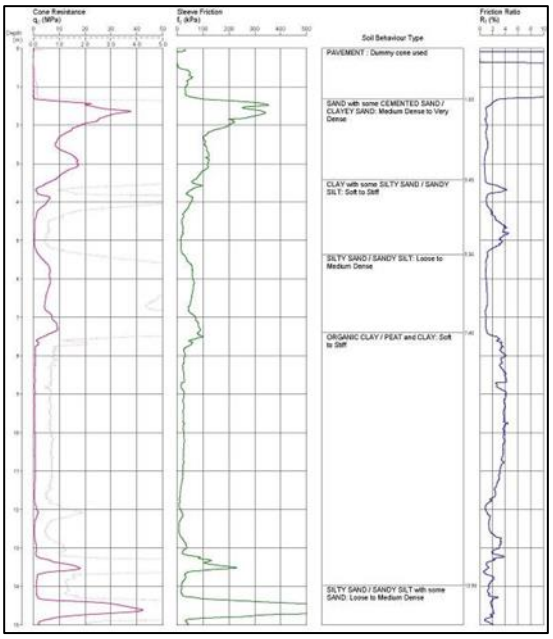
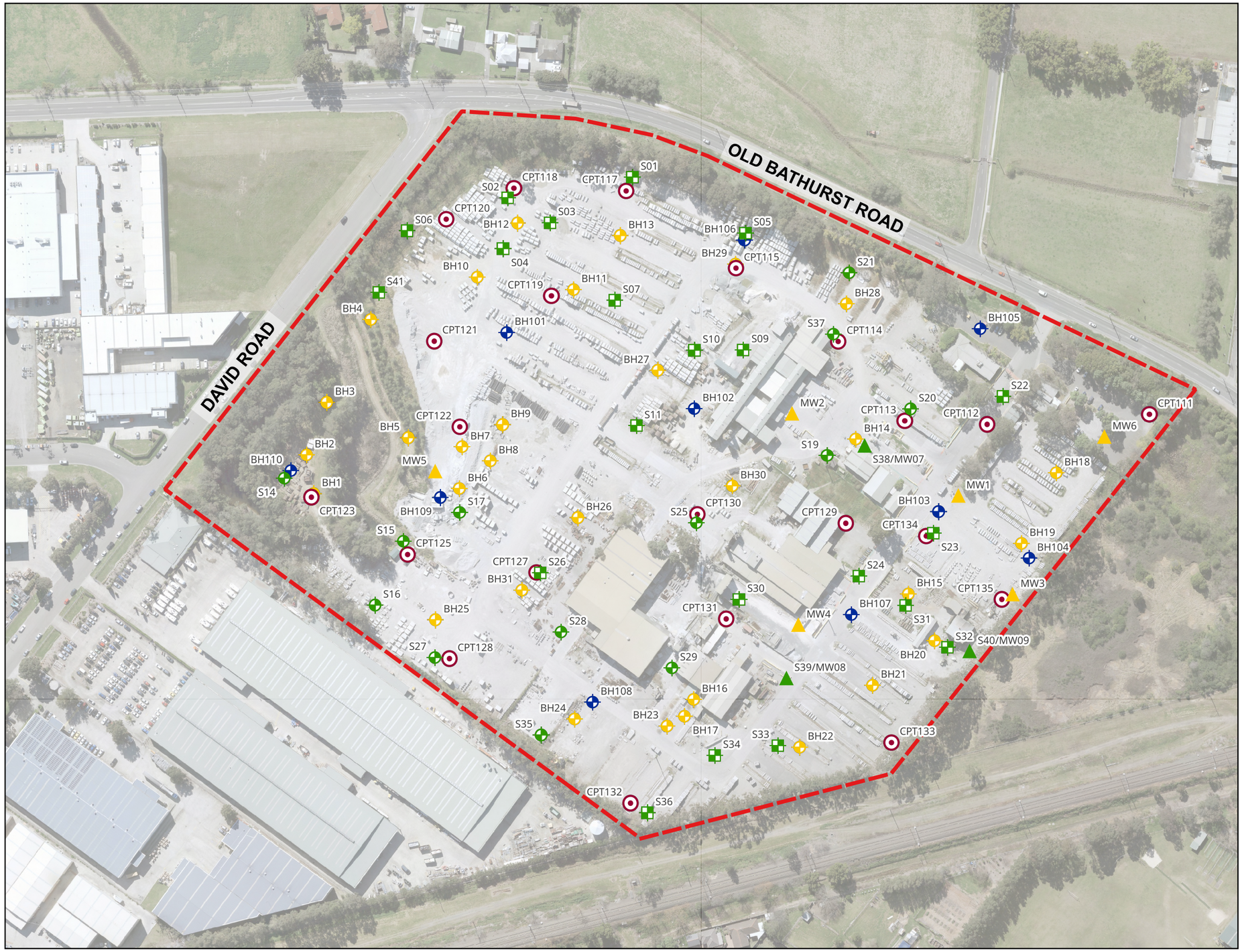


Figure 4: Sample Cone Plot

intentionally blank

Appendix B

Drawings



Locality Plan

LEGEND

- Approximate Site Boundary
- CPT Location (DP 2021)
- Borehole Location (DP 2021)
- Test Pit Location (JBS&G 2021)
- Borehole Location (JBS&G 2021)
- Monitoring Well (JBS&G 2021)
- Borehole Location (Ramboll, 2020)
- Monitoring Well (Ramboll, 2020)

NOTE:
1:Basemap from MetroMap (Dated 29.08.2020)

0 20 40 60 80 100 120 140 160 180 200 m

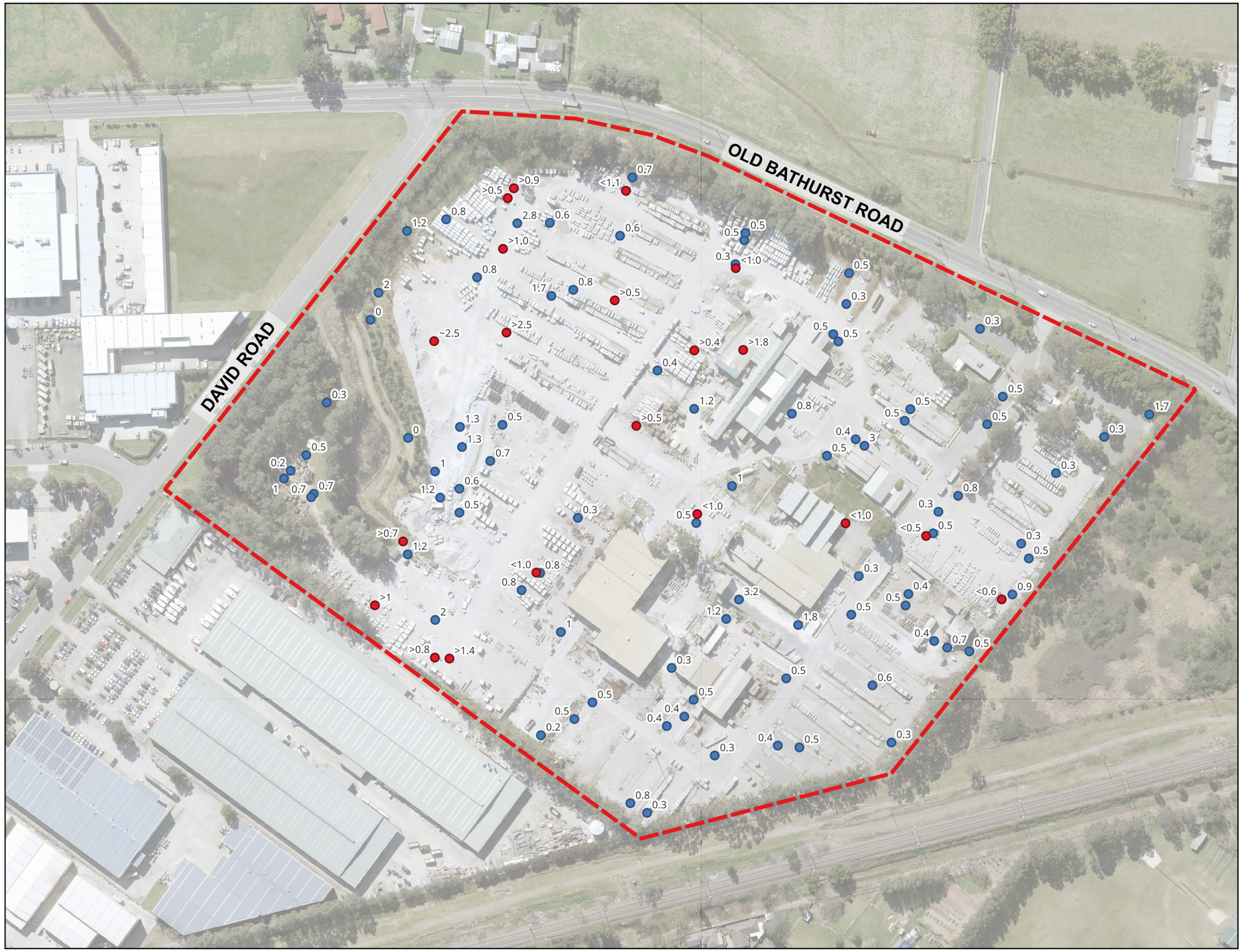
1:2500 @ A3

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Penrith City Council		TITLE: **Site and Test Location Plan** **Rocla Site - Proposed Development** **158-164 Old Bathurst Road, Emu Plains**
OFFICE: Sydney	DRAWN BY: AH	
SCALE: 1:2500 @ A3	DATE: 11.10.2023	

N

PROJECT No:	200309.02
DRAWING No:	1
REVISION:	0



Locality Plan

LEGEND

- Approximate Site Boundary
- Fill Depth Based on Borehole/Test Pit Log
- Fill Depth Not Well Defined

NOTE:
1:Basemap from MetroMap (Dated 29.08.2020)

0 20 40 60 80 100 120 140 160 180 200 m

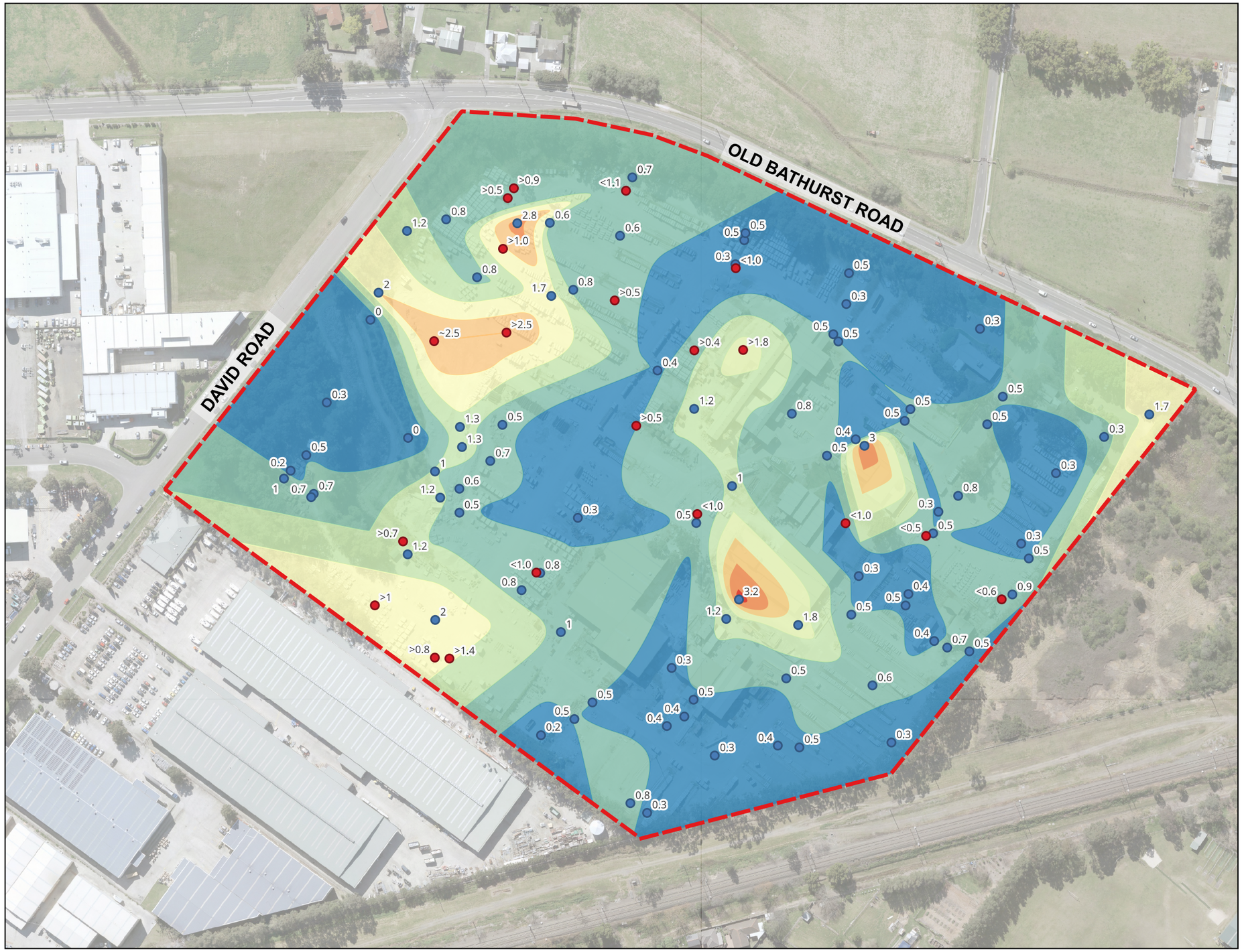
1:2500 @ A3

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Penrith City Council		TITLE: **Depth of Existing Fill Location Plan** **Rocla Site - Proposed Development** **158-164 Old Bathurst Road, Emu Plains**
OFFICE: Sydney	DRAWN BY: AH	
SCALE: 1:2500 @ A3	DATE: 11.10.2023	

N

PROJECT No:	200309.02
DRAWING No:	2
REVISION:	0



Locality Plan

LEGEND

- Approximate Site Boundary
- Fill Depth Based on Borehole/Test Pit Log
- Fill Depth Not Well Defined

Fill Depth Heat Map Legend

- 0.0 - 0.5
- 0.5 - 1.0
- 1.0 - 1.5
- 1.5 - 2.0
- 2.0 - 2.5
- 2.5 - 3.0
- 3.0 - 3.5

NOTE:
1:Basemap from MetroMap (Dated 29.08.2020)

0 20 40 60 80 100 120 140 160 180 200 m

1:2500 @ A3

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Penrith City Council		TITLE: **Interpreted Existing Fill Depth Heat Map** **Rocla Site - Proposed Development** **158-164 Old Bathurst Road, Emu Plains**
OFFICE: Sydney	DRAWN BY: AH	
SCALE: 1:2500 @ A3	DATE: 11.10.2023	

PROJECT No: 200309.02
DRAWING No: 3
REVISION: 0

Appendix C

Results of Field Work

BOREHOLE LOG

CLIENT: JBS&G Australia Pty Ltd
PROJECT: Rocla Site - Proposed Development
LOCATION: 158-164 Old Bathurst Road, Emu Plains

SURFACE LEVEL: 24.2 mAHD
EASTING: 283615.8
NORTHING: 6263796.7
DIP/AZIMUTH: 90°/--

BORE No: 101
PROJECT No: 200309.00
DATE: 14/1/2021
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 0mm)
24	0.0	FILL/ROADBASE: 20-40mm, medium to coarse grained, crushed igneous rock, grey, dry (possibly stabilised with cement)		A	0.0				
					0.2				
				B	0.4		B:0-0.8m		
				A	0.5				
	0.8				0.8				
23	1	FILL/Sandy GRAVEL GW: fine to medium gravel, grey and pale grey, medium to coarse grained sand, damp (possibly roadbase)			1.0				1
		- trace concrete fragments from 1.0m		S			11,15,20/80 refusal		
					1.38				
				A	1.45				
	1.5				1.5				
22	2	FILL /Gravelly SAND SP: grey and pale grey, medium to coarse grained, damp (roadbase)			2.0				2
				S			15,13,15 N = 28		
	2.45				2.45				
21	3	Bore discontinued at 2.45m							3
20	4								4

RIG: MCT200 **DRILLER:** Terratest **LOGGED:** JY **CASING:** Uncased

TYPE OF BORING: 200mm diameter auger to 0.8m then 110mm spiral flight auger

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

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

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: JBS&G Australia Pty Ltd
PROJECT: Rocla Site - Proposed Development
LOCATION: 158-164 Old Bathurst Road, Emu Plains

SURFACE LEVEL: 24.3 mAHD
EASTING: 283730
NORTHING: 6263750.3
DIP/AZIMUTH: 90°/--

BORE No: 102
PROJECT No: 200309.00
DATE: 14/1/2021
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
24	0.2	FILL/ROADBASE: 20-40mm, medium to coarse grained, crushed igneous rock, grey, dry (possibly stabilised with cement)							
	0.5	FILL/Sandy GRAVEL GW: medium to coarse grained, orange-brown, grey, dry							
	1	FILL/Sandy CLAY CL: low plasticity, pale grey and brown, with silt, trace gravel, w<PL			1.0				1
23	1.2	Silty CLAY CL: low plasticity, orange-brown mottled pale grey, w<PL, stiff, alluvial		S			4,5,7 N = 12		
				B	1.45		B:1-2.0m		
	2	- becoming very stiff from 2.0m			2.0				2
22				S			7,8,8 N = 16		
	2.45	Bore discontinued at 2.45m			2.45				
	3								3
21									
	4								4
20									

RIG: MCT200 **DRILLER:** Terratest **LOGGED:** JY **CASING:** Uncased

TYPE OF BORING: 200mm diameter auger to 1.2m then 110mm spiral flight auger

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: JBS&G Australia Pty Ltd
PROJECT: Rocla Site - Proposed Development
LOCATION: 158-164 Old Bathurst Road, Emu Plains

SURFACE LEVEL: 24.3 mAHD
EASTING: 283878.6
NORTHING: 6263687.7
DIP/AZIMUTH: 90°/--

BORE No: 103
PROJECT No: 200309.00
DATE: 14/1/2021
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
24	0.3	FILL/ROADBASE: 20-40mm, medium to coarse grained, crushed igneous rock, grey, dry (possibly stabilised with cement)		A	0.0 0.2				
		Clayey SAND SC: fine to medium grained, orange-brown, with some cemented layers, dry, dense, alluvial		A	0.3 0.4 0.5				
				B			B:0.3-1.0m		
23	1			S	1.0		16,15,12/100B refusal		1
				A	1.42 1.45 1.5				
22	2			S	2.0		15,16,15 N = 31		2
	2.45	Bore discontinued at 2.45m			2.45				
21	3								3
20	4								4

RIG: MCT200 **DRILLER:** Terratest **LOGGED:** JY **CASING:** Uncased

TYPE OF BORING: 200mm diameter auger to 1.5m then 110mm spiral auger

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: JBS&G Australia Pty Ltd
PROJECT: Rocla Site - Proposed Development
LOCATION: 158-164 Old Bathurst Road, Emu Plains

SURFACE LEVEL: 24.7 mAHD
EASTING: 283933.6
NORTHING: 6263659.3
DIP/AZIMUTH: 90°/--

BORE No: 104
PROJECT No: 200309.00
DATE: 14/1/2021
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)
					0.0				
	0.2	FILL/ROADBASE: 20-40mm, medium to coarse grained, crushed igneous rock, grey, dry (possibly stabilised with cement)		A					
		FILL/SAND SP: medium grained, grey and orange-brown, with gravel, grey, dry			0.2				
				A	0.4				
	0.5	Silty SAND SM: fine to medium grained, orange-brown, with clay, grey, dry, medium dense, alluvial			0.5				
24				A	0.9				
	1				1.0				1
				S			7,13,13 N = 26		
				A	1.45				
23					1.5				
				A	1.9				
	2				2.0				2
				S			10,8,10 N = 18		
	2.45	Bore discontinued at 2.45m			2.45				
22									
	3								3
21									
	4								4
20									

RIG: MCT200 **DRILLER:** Terratest **LOGGED:** JY **CASING:** Uncased

TYPE OF BORING: 110mm diameter SFA

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

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

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: JBS&G Australia Pty Ltd
PROJECT: Rocla Site - Proposed Development
LOCATION: 158-164 Old Bathurst Road, Emu Plains

SURFACE LEVEL: 24.7 mAHD
EASTING: 283903.9
NORTHING: 6263799
DIP/AZIMUTH: 90°/--

BORE No: 105
PROJECT No: 200309.00
DATE: 14/1/2021
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
24	0.04	ASPHALTIC CONCRETE							
	0.1	FILL/ROADBASE: 20-40mm, medium to coarse grained, crushed igneous rock, grey, dry (possibly stabilised with cement)		A	0.1 0.2				
	0.3	FILL/Gravelly SAND SW: brown, igneous gravel, grey, dry			0.3				
		Silty CLAY CL: low plasticity, orange-brown, trace sand, w<PL, alluvial		A	0.4 0.5				
	0.8	SAND: fine to medium grained, orange-brown, medium dense, alluvial		B	1.0		B:0.3-1.5m		
	1			S			6,8,10 N = 18		1
23				A	1.45 1.5				
	2				2.0				2
				S			11,10,11 N = 21		
	2.45	Bore discontinued at 2.45m			2.45				
22	3								3
21	4								4
20									

RIG: MCT200 **DRILLER:** Terratest **LOGGED:** JY **CASING:** Uncased

TYPE OF BORING: 110mm diameter SFA

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: JBS&G Australia Pty Ltd
PROJECT: Rocla Site - Proposed Development
LOCATION: 158-164 Old Bathurst Road, Emu Plains

SURFACE LEVEL: 24.5 mAHD
EASTING: 283760.5
NORTHING: 6263852.9
DIP/AZIMUTH: 90°/--

BORE No: 106
PROJECT No: 200309.00
DATE: 14/1/2021
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
24	0.0	FILL/ROADBASE: 20-40mm, medium to coarse grained, crushed igneous rock, grey, dry (possibly stabilised with cement)		A	0.0				
	0.2	FILL/Sandy CLAY CL: low plasticity, brown, trace gravel, w<PL		A	0.2 0.4				
	0.5	Sandy CLAY CL: low plasticity, pale brown mottled orange-brown, w<PL, very stiff, alluvial		A S	0.5 0.9 1.0		11,13,12 N = 25		
23	1				1.45				1
	2.0	SAND SW: fine to medium grained, orange-brown, grey, dry, medium dense, alluvial		A S	1.9 2.0		8,13,6 N = 19		
22	2								2
	2.45	Bore discontinued at 2.45m			2.45				
21	3								3
20	4								4

RIG: MCT200 **DRILLER:** Terratest **LOGGED:** JY **CASING:** Uncased
TYPE OF BORING: 110mm diameter SFA
WATER OBSERVATIONS: No free groundwater observed
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: JBS&G Australia Pty Ltd
PROJECT: Rocla Site - Proposed Development
LOCATION: 158-164 Old Bathurst Road, Emu Plains

SURFACE LEVEL: 24.2 mAHD
EASTING: 283825.6
NORTHING: 6263625.1
DIP/AZIMUTH: 90°/--

BORE No: 107
PROJECT No: 200309.00
DATE: 14/1/2021
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
24	0.04	ASPHALTIC CONCRETE							
		FILL/ROADBASE: 20-40mm, medium to coarse grained, crushed igneous rock, grey, dry (possibly stabilised with cement)							
	0.3	FILL/Clayey SAND SC: fine to medium grained, orange-brown, trace gravel, grey, dry							
	0.5	Sandy CLAY CL: low plasticity, orange-brown, w<PL, stiff, alluvial			0.5				
23	1			B	1.0		B:0.5-1.5m		1
				S			4,5,6 N = 11		
	1.5				1.45				
		Clayey SAND SC: fine to medium grained, orange-brown, damp, loose, alluvial			1.5				
	2				2.0				2
22				S			3,3,3 N = 6		
	2.45	Bore discontinued at 2.45m			2.45				
	3								3
21									
	4								4
20									

RIG: MCT200 **DRILLER:** Terratest **LOGGED:** JY **CASING:** Uncased

TYPE OF BORING: 200mm diameter auger to 1.5m then 110mm diameter auger

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: JBS&G Australia Pty Ltd
PROJECT: Rocla Site - Proposed Development
LOCATION: 158-164 Old Bathurst Road, Emu Plains

SURFACE LEVEL: 24.1 mAHD
EASTING: 283668.1
NORTHING: 6263571.7
DIP/AZIMUTH: 90°/--

BORE No: 108
PROJECT No: 200309.00
DATE: 14/1/2021
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
24	0.25	FILL/ROADBASE: 20-40mm, medium to coarse grained, crushed igneous rock, grey, dry (possibly stabilised with cement)							
	0.5	FILL/Clayey SAND SC: fine to medium grained, brown, grey, dry							
23	1	Silty CLAY CH: medium plasticity, orange-brown, w<PL, stiff, alluvial		B	0.5		B:0.5-1.5m		1
				S	1.0		7,8,7 N = 15		
	1.5				1.45				
22	2	Clayey SAND SC: fine to medium grained, orange-brown,damp, loose to medium dense, alluvial		S	1.5 2.0		6,5,5 N = 10		2
	2.45	Bore discontinued at 2.45m			2.45				
21	3								3
20	4								4

RIG: MCT200 **DRILLER:** Terratest **LOGGED:** JY **CASING:** Uncased

TYPE OF BORING: 200mm diameter auger to 1.5m then 110mm diameter auger

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: JBS&G Australia Pty Ltd
PROJECT: Rocla Site - Proposed Development
LOCATION: 158-164 Old Bathurst Road, Emu Plains

SURFACE LEVEL: 24.4 mAHD
EASTING: 283575.5
NORTHING: 6263696.3
DIP/AZIMUTH: 90°/--

BORE No: 109
PROJECT No: 200309.00
DATE: 14/1/2021
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 0mm)
24	0.0	FILL/ROADBASE: 20-40mm, medium to coarse grained, crushed igneous rock, grey, dry (possibly stabilised with cement)		A	0.0				
					0.2				
				B	0.4		B:0-0.8m		
		- becoming damp, trace sandstone gravel from 0.5m		A	0.5				
	0.8	FILL/Gravelly SAND SP: dark grey and brown, with sandstone gravel, moist			0.8				
				A	0.9				
	1				1.0				1
	1.2	Silty CLAY CH: medium plasticity, orange-brown, w<PL, firm, alluvial		S			2,2,4 N = 6		
23				A	1.45				
					1.5				
	2				2.0				2
				S			2,3,4 N = 7		
22	2.45	Bore discontinued at 2.45m			2.45				
	3								3
21									
	4								4
20									

RIG: MCT200 **DRILLER:** Terratest **LOGGED:** JY **CASING:** Uncased

TYPE OF BORING: 200mm diameter auger to 0.8m then 110mm spiral flight auger

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

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

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: JBS&G Australia Pty Ltd
PROJECT: Rocla Site - Proposed Development
LOCATION: 158-164 Old Bathurst Road, Emu Plains

SURFACE LEVEL: 24.3 mAHD
EASTING: 283484.5
NORTHING: 6263712.7
DIP/AZIMUTH: 90°/--

BORE No: 110
PROJECT No: 200309.00
DATE: 14/1/2021
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
24	0.1	FILL/TOPSOIL: Silty CLAY: brown, with vegetation throughout, w<PL		A	0.1				
	0.2	FILL/Silty CLAY CL: low plasticity, grey and brown, trace gravel, w<PL			0.2				
		Clayey SAND SC: fine to medium grained, orange-brown, w<PL, medium dense, alluvial		A	0.4				
	0.5	Silty CLAY CH: medium plasticity, grey, w<PL, stiff, alluvial			0.5				
				A	0.9				
23	1.0	Silty CLAY CH: medium plasticity, orange-brown, w<PL, stiff, alluvial		S	1.0		4,5,6 N = 11		
				A	1.45 1.5				
22				S	2.0		4,5,6 N = 11		
	2.45	Bore discontinued at 2.45m			2.45				
21									
20									

RIG: MCT200 **DRILLER:** Terratest **LOGGED:** JY **CASING:** Uncased
TYPE OF BORING: 110mm diameter SFA
WATER OBSERVATIONS: No free groundwater observed
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

CONE PENETRATION TEST

CLIENT: JBS&G AUSTRALIA PTY LTD

PROJECT: PROPOSED INDUSTRIAL DEVELOPMENT

LOCATION: 158-164 OLD BATHURST RD, EMU PLAINS

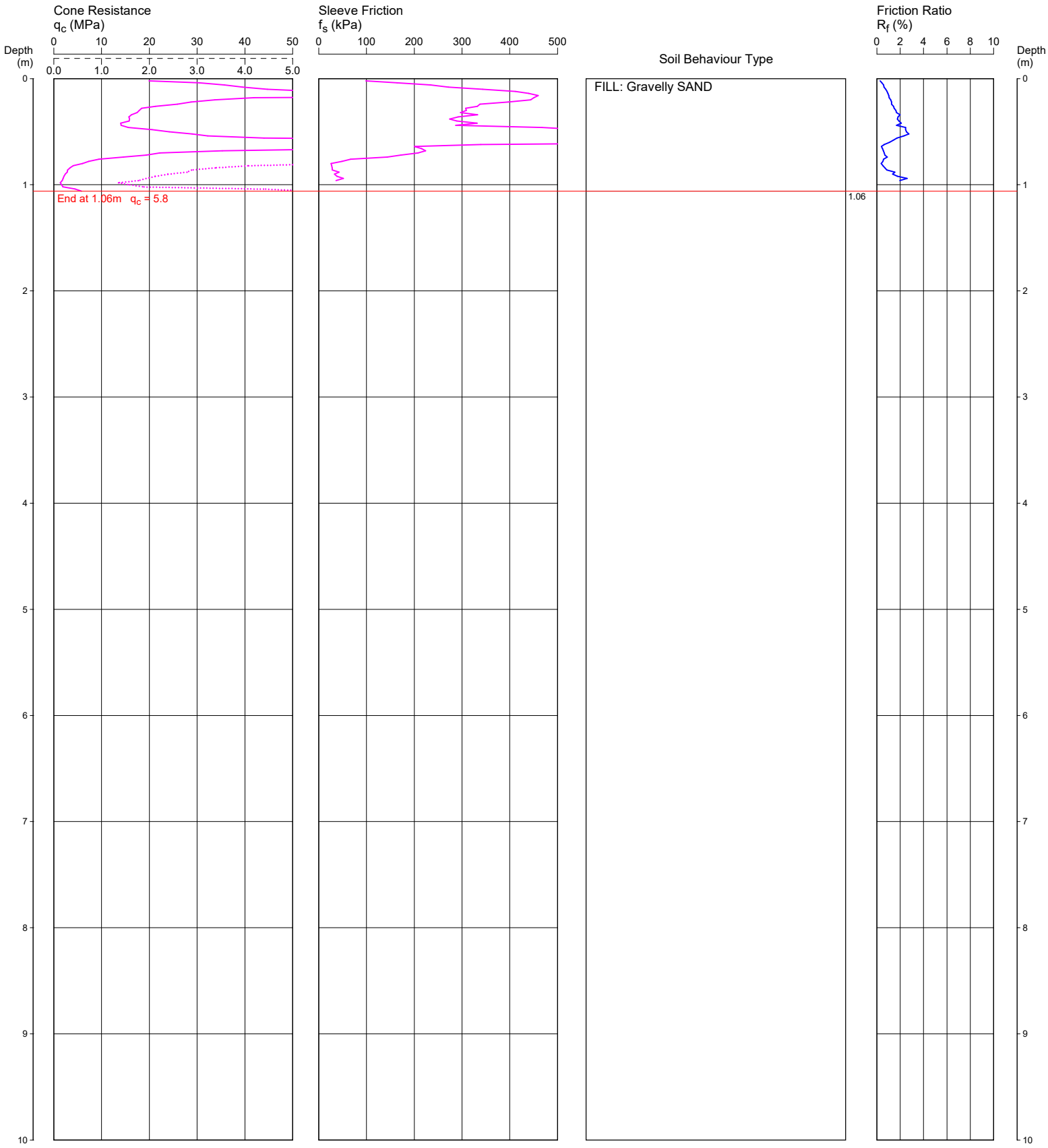
REDUCED LEVEL: 23.8m AHD

COORDINATES: 284006.9E 6263746.9N

CPT111

DATE 14/01/2021

PROJECT No: 200309.00



REMARKS: TEST DISCONTINUED DUE TO SUDDEN BEND IN FILLING.
NO GROUNDWATER OBSERVED AFTER WITHDRAWAL OF RODS.

File: P:\200309.00 - EMU PLAINS, 158-164 Old Bathurst Road\4.0 Field Work\4.2 Testing\CPT111.CP5
Cone ID: 160626 **Type:** I-CFXY-10

ConePlot Version 5.9.2

© 2003 Douglas Partners Pty Ltd

Douglas Partners
Geotechnics / Environment / Groundwater

CONE PENETRATION TEST

CLIENT: JBS&G AUSTRALIA PTY LTD

PROJECT: PROPOSED INDUSTRIAL DEVELOPMENT

LOCATION: 158-164 OLD BATHURST RD, EMU PLAINS

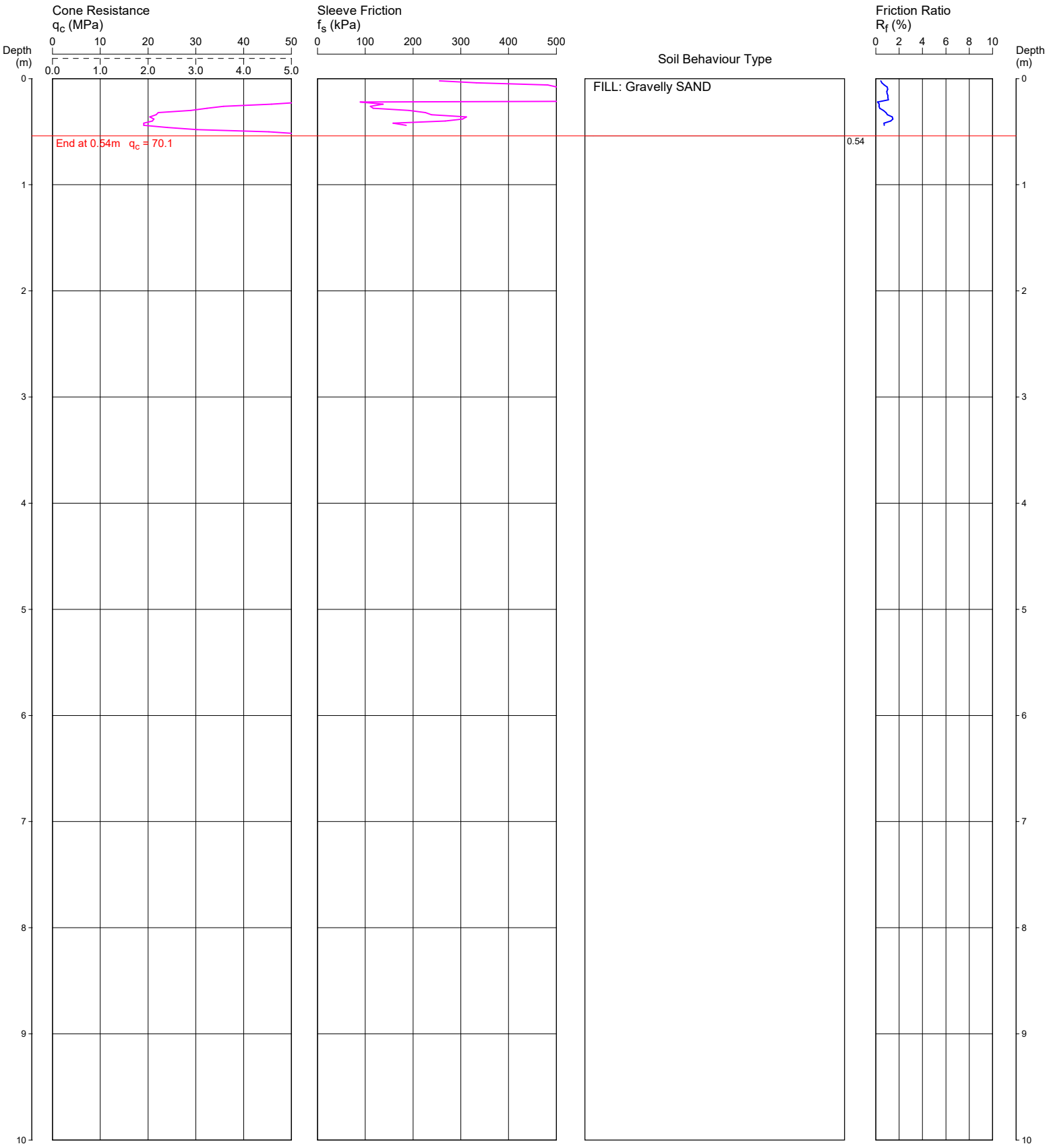
REDUCED LEVEL: 23.8m AHD

COORDINATES: 284006.9E 6263746.9N

CPT111A

DATE 14/01/2021

PROJECT No: 200309.00



REMARKS: TEST DISCONTINUED DUE TO SUDDEN BEND IN FILLING.
NO GROUNDWATER OBSERVED AFTER WITHDRAWAL OF RODS.

File: P:\200309.00 - EMU PLAINS, 158-164 Old Bathurst Road\4.0 Field Work\4.2 Testing\CPT111A.CP5
Cone ID: 160626 **Type:** I-CFXY-10

ConePlot Version 5.9.2

© 2003 Douglas Partners Pty Ltd

Douglas Partners
Geotechnics / Environment / Groundwater

CONE PENETRATION TEST

CLIENT: JBS&G AUSTRALIA PTY LTD

PROJECT: PROPOSED INDUSTRIAL DEVELOPMENT

LOCATION: 158-164 OLD BATHURST RD, EMU PLAINS

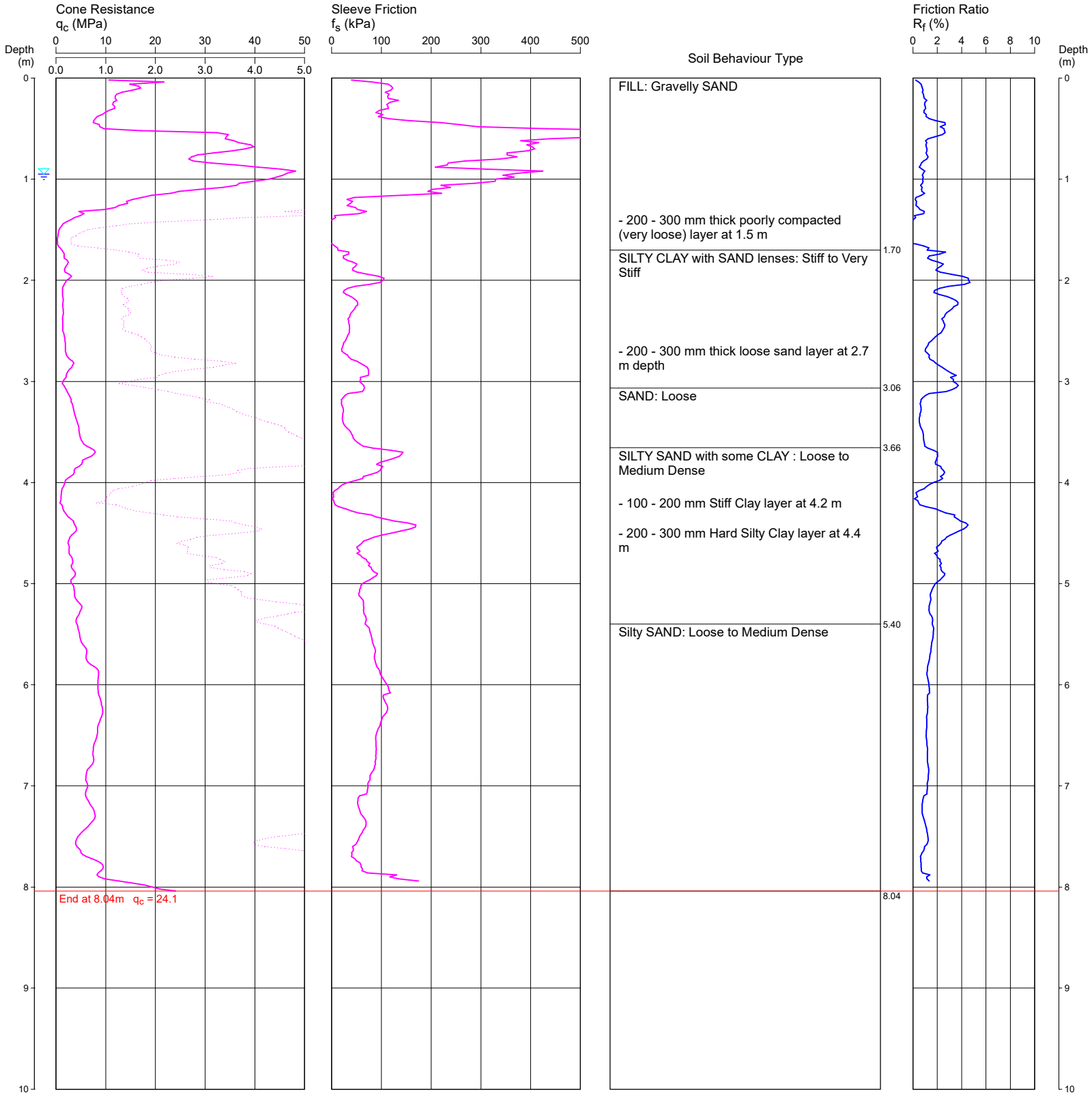
REDUCED LEVEL: 23.8m AHD

COORDINATES: 284006.9E 6263746.9N

CPT111B

DATE 14/01/2021

PROJECT No: 200309.00



REMARKS: TEST DISCONTINUED DUE TO BENDING IN GRAVEL.
GROUNDWATER OBSERVED AT 0.95m AFTER WITHDRAWAL OF RODS.

Water depth after test: 0.95m depth (assumed)

File: \\dpnwsnas01\Projects\200309.02 - EMU PLAINS, 158-164 Old Bathurst Road\4.0 Field Work\4.2 Testing\CPT111B.CP5

Cone ID: 160626 **Type:** I-CFXY-10

ConePlot Version 5.9.2

© 2003 Douglas Partners Pty Ltd

Douglas Partners
Geotechnics / Environment / Groundwater

CONE PENETRATION TEST

CLIENT: JBS&G AUSTRALIA PTY LTD

PROJECT: PROPOSED INDUSTRIAL DEVELOPMENT

LOCATION: 158-164 OLD BATHURST RD, EMU PLAINS

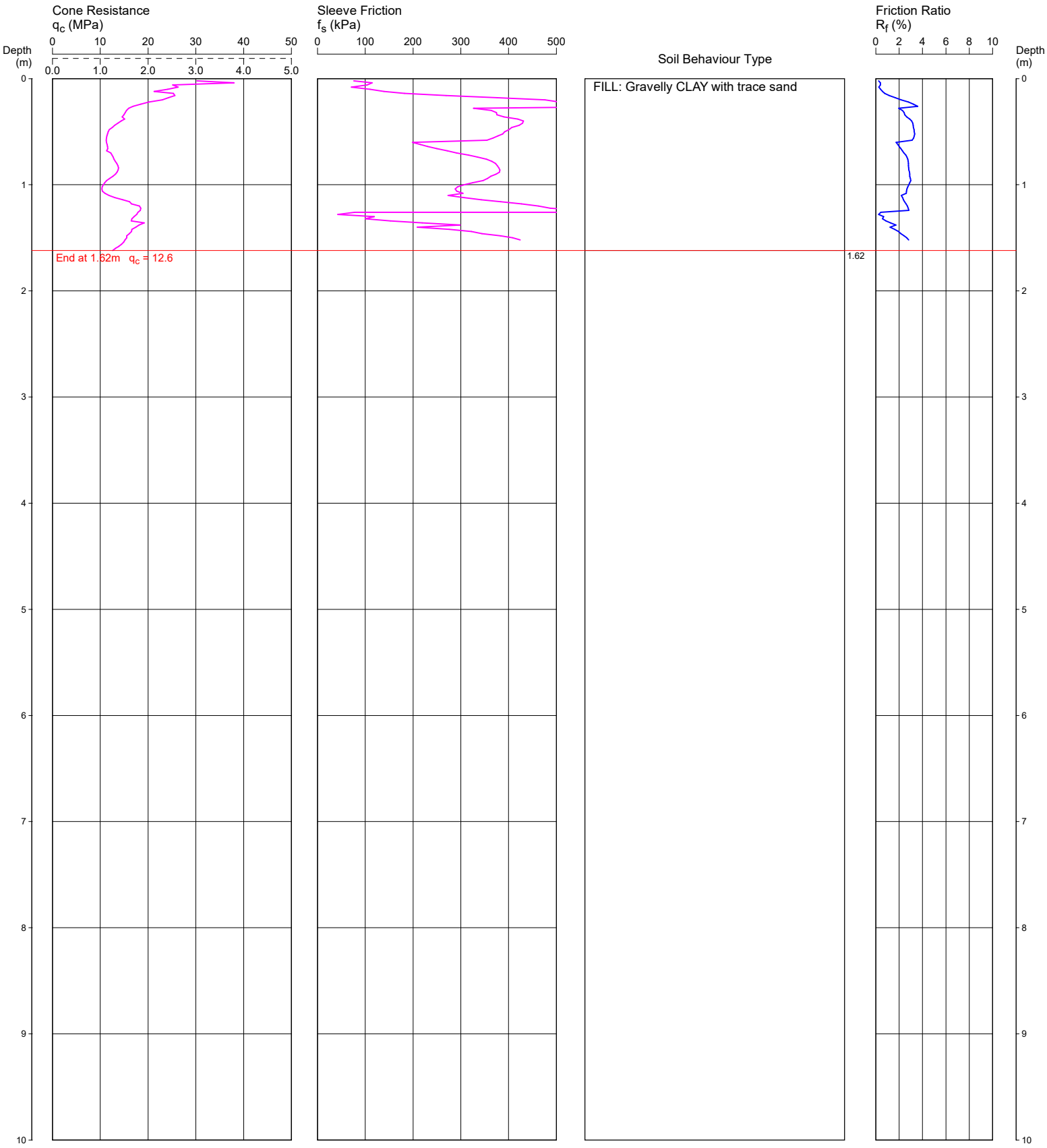
REDUCED LEVEL: 24.2m AHD

COORDINATES: 283908.3E 6263740.9N

CPT112

DATE 14/01/2021

PROJECT No: 200309.00



REMARKS: TEST DISCONTINUED DUE TO EXCESSIVE CONE BENDING.
NO GROUNDWATER OBSERVED AFTER WITHDRAWAL OF RODS.

File: P:\200309.00 - EMU PLAINS, 158-164 Old Bathurst Road\4.0 Field Work\4.2 Testing\CPT112.CP5
Cone ID: 160626 **Type:** I-CFXY-10

ConePlot Version 5.9.2

© 2003 Douglas Partners Pty Ltd

Douglas Partners
Geotechnics / Environment / Groundwater

CONE PENETRATION TEST

CLIENT: JBS&G AUSTRALIA PTY LTD

PROJECT: PROPOSED INDUSTRIAL DEVELOPMENT

LOCATION: 158-164 OLD BATHURST RD, EMU PLAINS

REDUCED LEVEL: 24.2m AHD

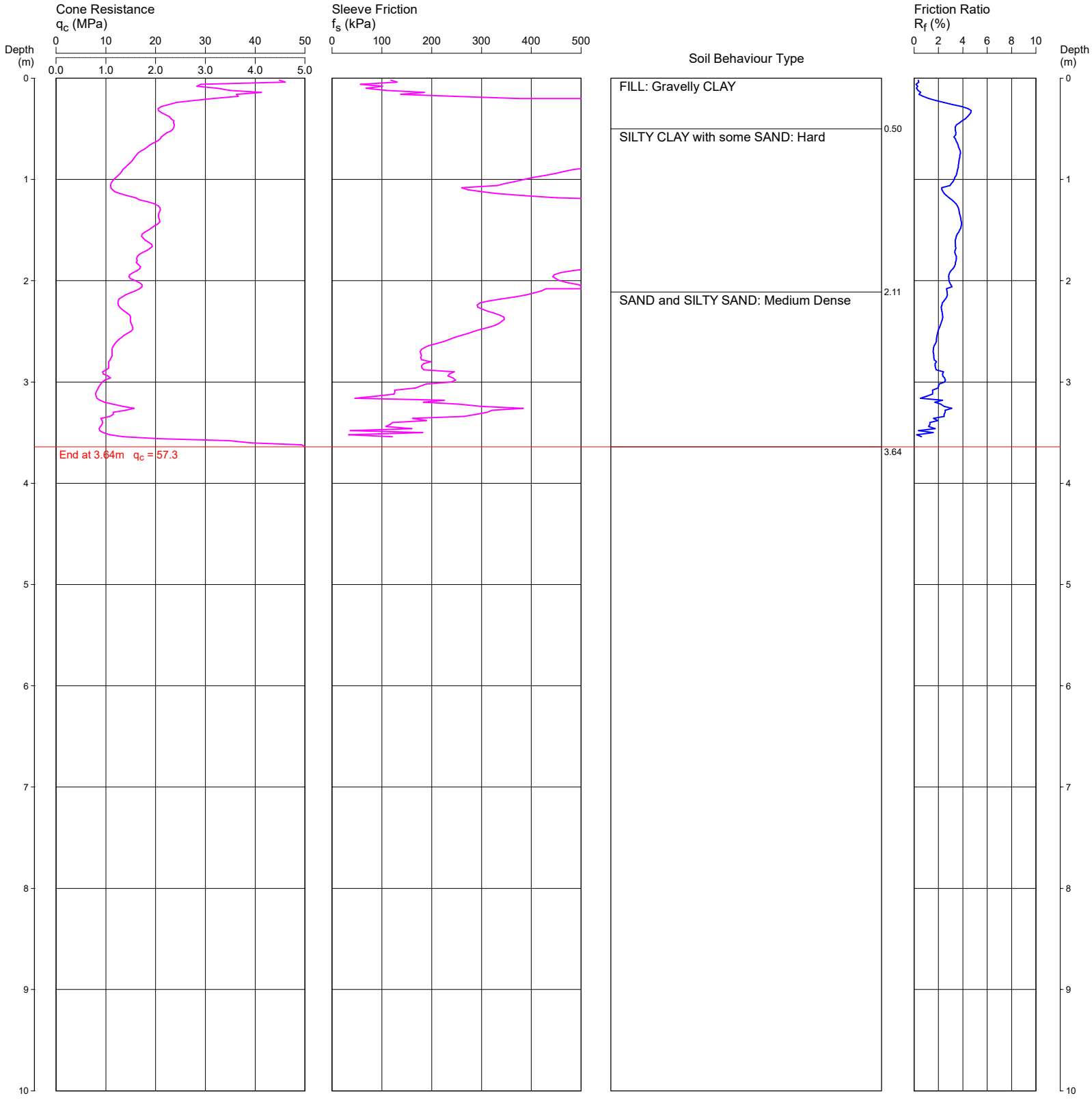
COORDINATES: 283908.3E 6263740.9N

CPT112A

Page 1 of 1

DATE 14/01/2021

PROJECT No: 200309.00



REMARKS: TEST DISCONTINUED DUE TO EXCESSIVE CONE BENDING IN GRAVEL.
NO GROUNDWATER OBSERVED AFTER WITHDRAWAL OF RODS.

File: \\dpnwsnas01\Projects\200309.02 - EMU PLAINS, 158-164 Old Bathurst Road\4.0 Field Work\4.2 Testing\CPT112A.CP5
Cone ID: 160626 **Type:** I-CFXY-10

ConePlot Version 5.9.2
© 2003 Douglas Partners Pty Ltd

Douglas Partners
Geotechnics / Environment / Groundwater

CONE PENETRATION TEST

CLIENT: JBS&G AUSTRALIA PTY LTD

PROJECT: PROPOSED INDUSTRIAL DEVELOPMENT

LOCATION: 158-164 OLD BATHURST RD, EMU PLAINS

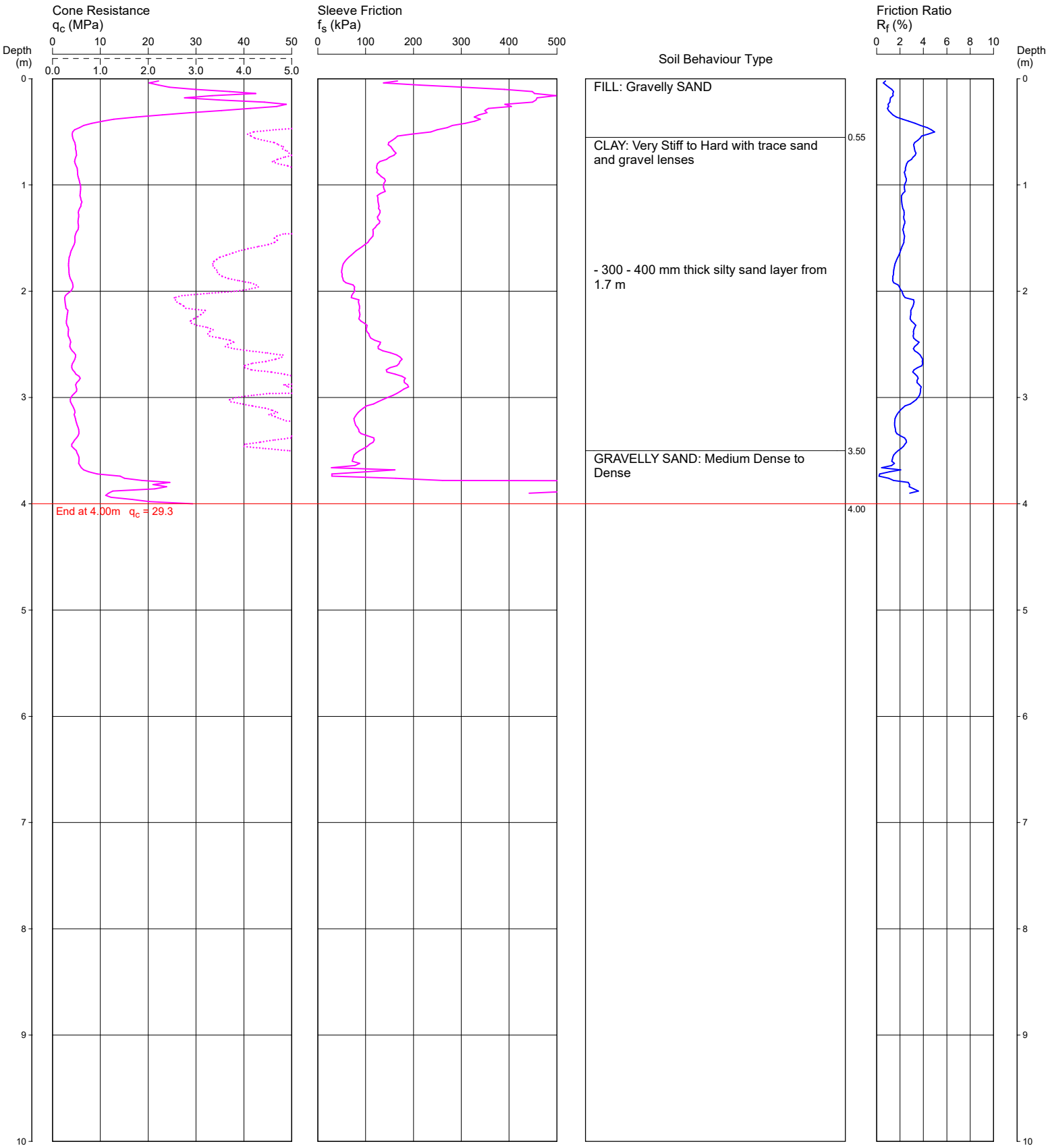
REDUCED LEVEL: 24.7m AHD

COORDINATES: 283858.1E 6263743.0N

CPT113

DATE 14/01/2021

PROJECT No: 200309.00



REMARKS: TEST DISCONTINUED DUE TO BENDING IN GRAVEL.
NO GROUNDWATER OBSERVED AFTER WITHDRAWAL OF RODS.

File: P:\200309.00 - EMU PLAINS, 158-164 Old Bathurst Road\4.0 Field Work\4.2 Testing\CPT113.CP5
Cone ID: 160626 **Type:** I-CFXY-10

ConePlot Version 5.9.2

© 2003 Douglas Partners Pty Ltd

Douglas Partners
Geotechnics / Environment / Groundwater

CONE PENETRATION TEST

CLIENT: JBS&G AUSTRALIA PTY LTD

PROJECT: PROPOSED INDUSTRIAL DEVELOPMENT

LOCATION: 158-164 OLD BATHURST RD, EMU PLAINS

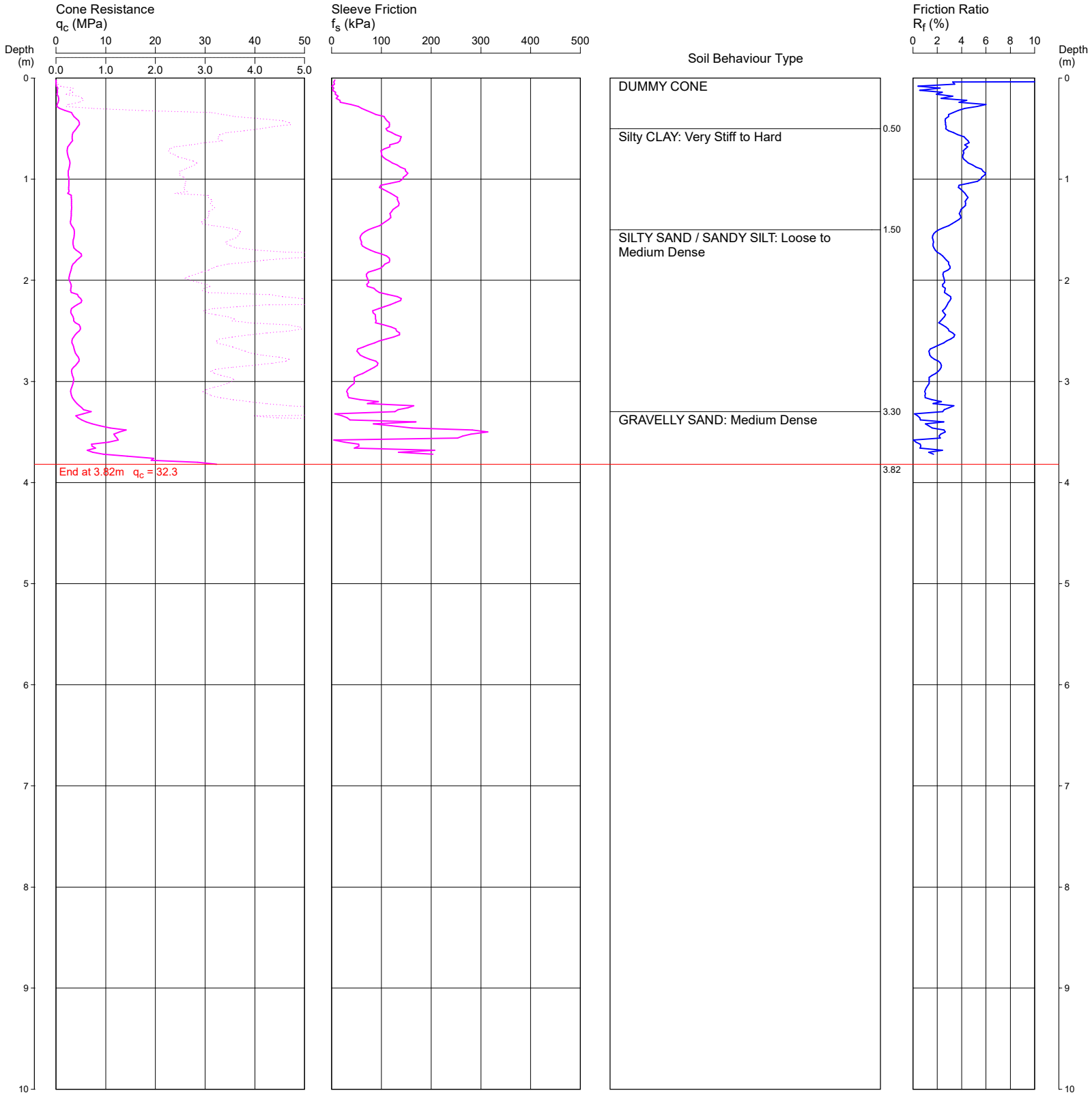
REDUCED LEVEL: 24.5m AHD

COORDINATES: 283817.7E 6263791.3N

CPT114

DATE 14/01/2021

PROJECT No: 200309.00



REMARKS: DUMMY CONE FROM 0.0 TO 0.5m DEPTH TO PENETRATE FILLING. TEST DISCONTINUED DUE TO SUDDEN BEND IN GRAVEL. HOLE COLLAPSED AT 3.5m AFTER WITHDRAWAL OF RODS.

File: P:\200309.02 - EMU PLAINS, 158-164 Old Bathurst Road\4.0 Field Work\4.2 Testing\CPT114.CP5
Cone ID: 160626 **Type:** I-CFXY-10

ConePlot Version 5.9.2

© 2003 Douglas Partners Pty Ltd

Douglas Partners
Geotechnics / Environment / Groundwater

CONE PENETRATION TEST

CLIENT: JBS&G AUSTRALIA PTY LTD

PROJECT: PROPOSED INDUSTRIAL DEVELOPMENT

LOCATION: 158-164 OLD BATHURST RD, EMU PLAINS

REDUCED LEVEL: 24.5m AHD

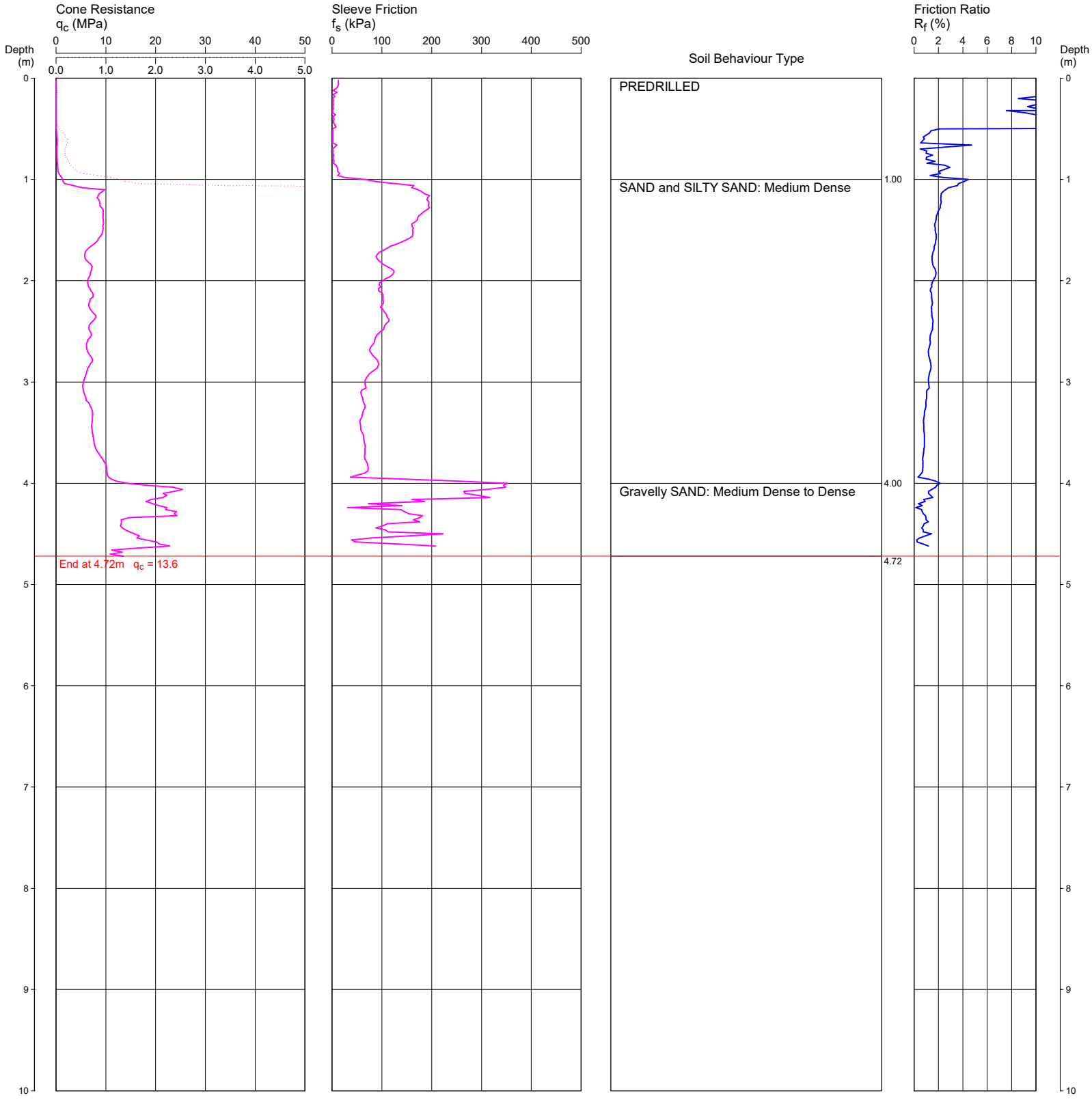
COORDINATES: 283755.3E 6263835.9N

CPT115

Page 1 of 1

DATE 15/01/2021

PROJECT No: 200309.00



REMARKS: AUGER TO 1.0m DEPTH TO PENETRATE FILLING. TEST DISCONTINUED DUE TO BENDING IN GRAVEL. HOLE COLLAPSED AT 0.m AFTER WITHDRAWAL OF RODS.

File: P:\200309.02 - EMU PLAINS, 158-164 Old Bathurst Road\4.0 Field Work\4.2 Testing\CPT115.CP5
Cone ID: 161225 **Type:** I-CFXY-10

ConePlot Version 5.9.2
© 2003 Douglas Partners Pty Ltd

Douglas Partners
Geotechnics / Environment / Groundwater

CONE PENETRATION TEST

CLIENT: JBS&G AUSTRALIA PTY LTD

PROJECT: PROPOSED INDUSTRIAL DEVELOPMENT

LOCATION: 158-164 OLD BATHURST RD, EMU PLAINS

REDUCED LEVEL: 24.8m AHD

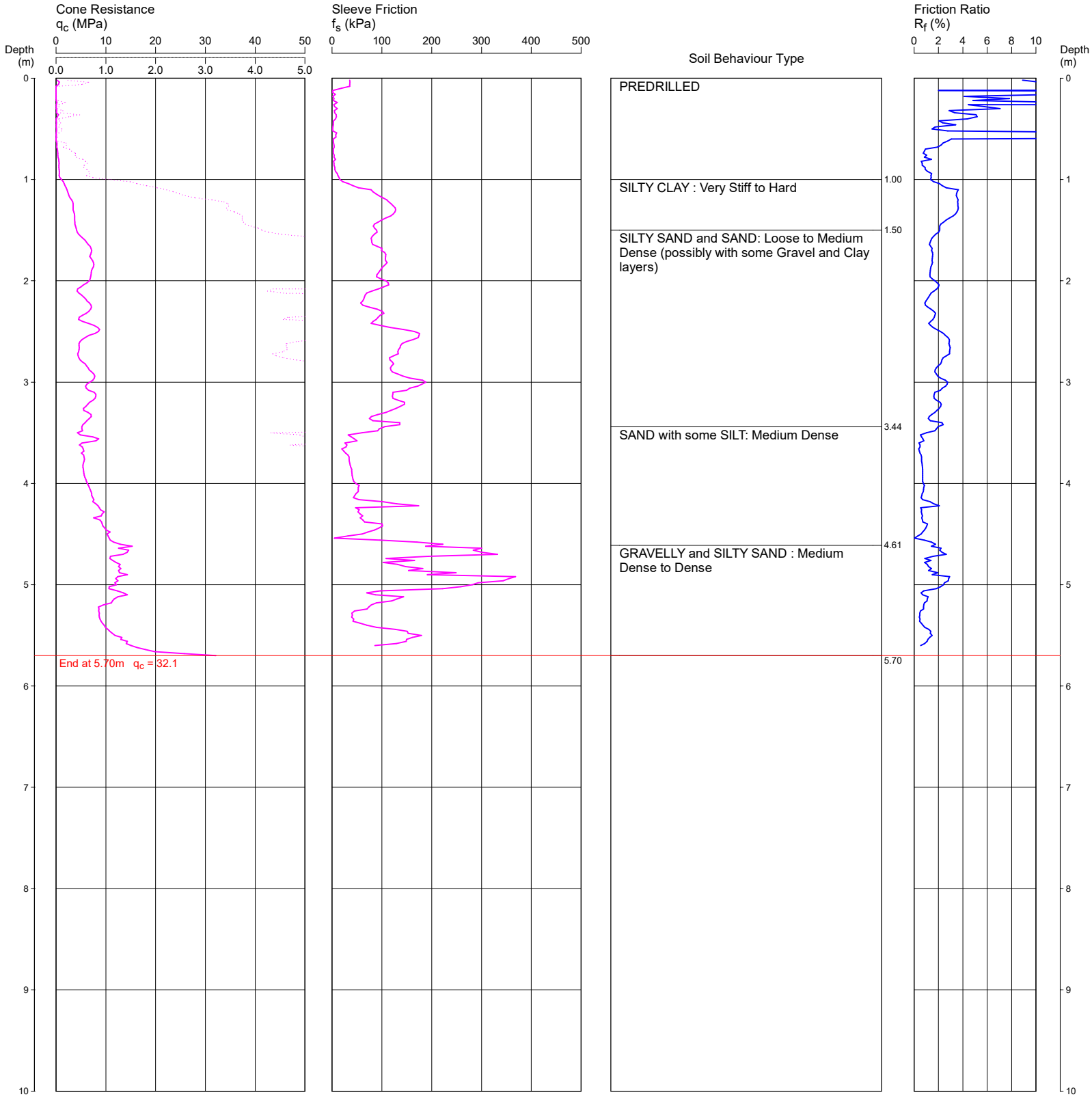
COORDINATES: 283688.5E 6263883.0N

CPT117

Page 1 of 1

DATE 15/01/2021

PROJECT No: 200309.00



REMARKS: AUGER TO 1.0m DEPTH TO PENETRATE FILLING. TEST DISCONTINUED DUE TO REFUSAL IN GRAVEL. HOLE COLLAPSED AT 0.8m AFTER WITHDRAWAL OF RODS.

File: P:\200309.02 - EMU PLAINS, 158-164 Old Bathurst Road\4.0 Field Work\4.2 Testing\CPT117.CP5
Cone ID: 161225 **Type:** I-CFXY-10

ConePlot Version 5.9.2
© 2003 Douglas Partners Pty Ltd

Douglas Partners
Geotechnics / Environment / Groundwater

CONE PENETRATION TEST

CLIENT: JBS&G AUSTRALIA PTY LTD

PROJECT: PROPOSED INDUSTRIAL DEVELOPMENT

LOCATION: 158-164 OLD BATHURST RD, EMU PLAINS

REDUCED LEVEL: 24.5m AHD

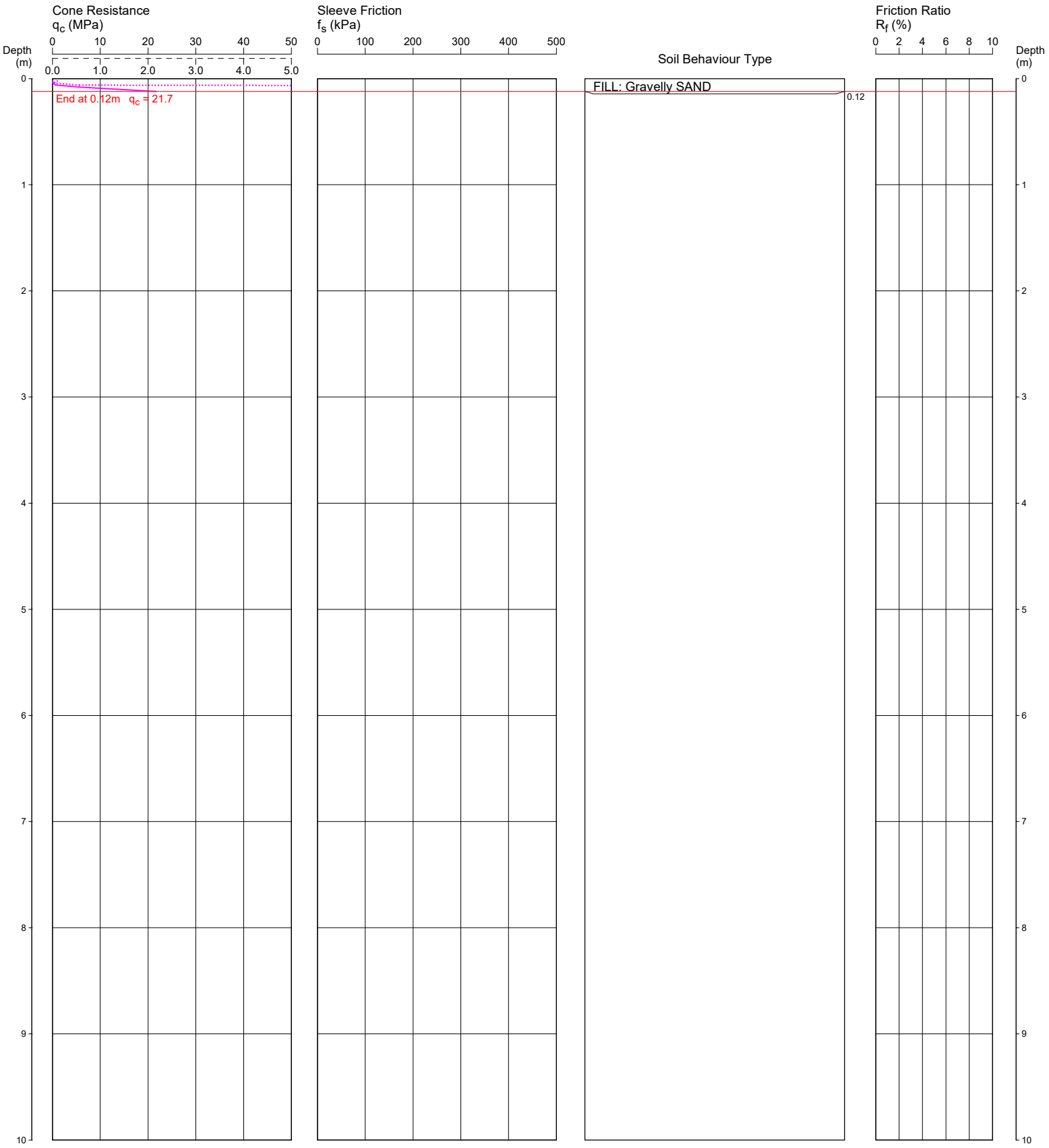
COORDINATES: 283620.3E 6263884.5N

CPT118

Page 1 of 1

DATE 14/01/2021

PROJECT No: 200309.00



REMARKS: DUMMY CONE FROM 0.10 TO 0.15m DEPTH TO PENETRATE FILLING. TEST DISCONTINUED DUE TO REFUSAL IN FILLING. NO GROUNDWATER OBSERVED AFTER WITHDRAWAL OF RODS.

File: P:\200309.00 - EMU PLAINS, 158-164 Old Bathurst Road\4.0 Field Work\4.2 Testing\CPT118.CP5
Cone ID: 161225 **Type:** I-CFXY-10

ConePlot Version 5.9.2

© 2003 Douglas Partners Pty Ltd

Douglas Partners
Geotechnics / Environment / Groundwater

CONE PENETRATION TEST

CLIENT: JBS&G AUSTRALIA PTY LTD

PROJECT: PROPOSED INDUSTRIAL DEVELOPMENT

LOCATION: 158-164 OLD BATHURST RD, EMU PLAINS

REDUCED LEVEL: 24.5m AHD

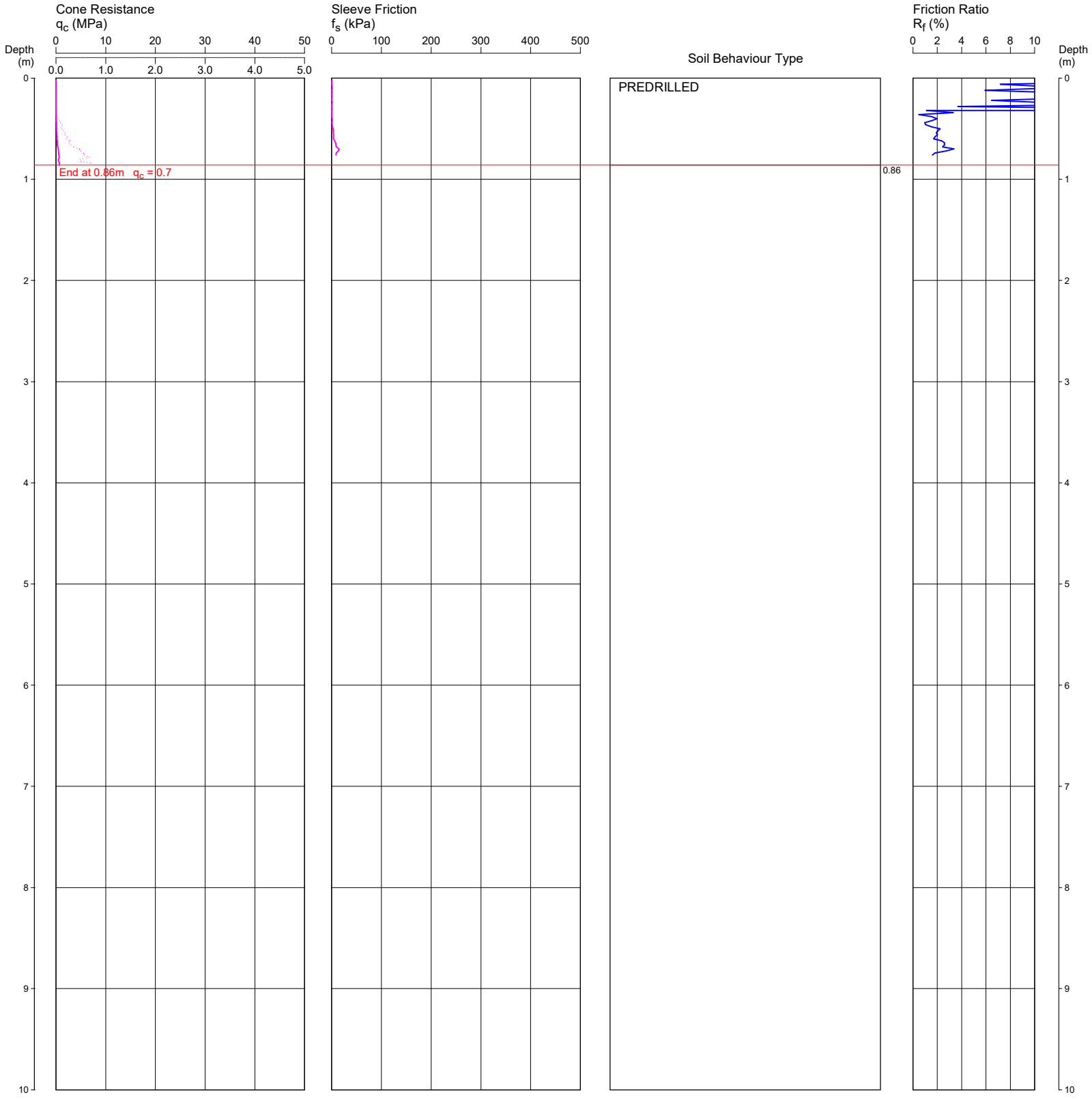
COORDINATES: 283620.3E 6263884.5N

CPT118A

Page 1 of 1

DATE 15/01/2021

PROJECT No: 200309.00



REMARKS: AUGER TO 1.20m DEPTH TO PENETRATE FILLING. TEST DISCONTINUED DUE TO BENDING IN FILLING. HOLE COLLAPSED AT 0.3m AFTER WITHDRAWAL OF RODS.

File: P:\200309.02 - EMU PLAINS, 158-164 Old Bathurst Road\4.0 Field Work\4.2 Testing\CPT118A.CP5
Cone ID: 161225 **Type:** I-CFXY-10

ConePlot Version 5.9.2
© 2003 Douglas Partners Pty Ltd

Douglas Partners
Geotechnics / Environment / Groundwater

CONE PENETRATION TEST

CLIENT: JBS&G AUSTRALIA PTY LTD

PROJECT: PROPOSED INDUSTRIAL DEVELOPMENT

LOCATION: 158-164 OLD BATHURST RD, EMU PLAINS

REDUCED LEVEL: 24.5m AHD

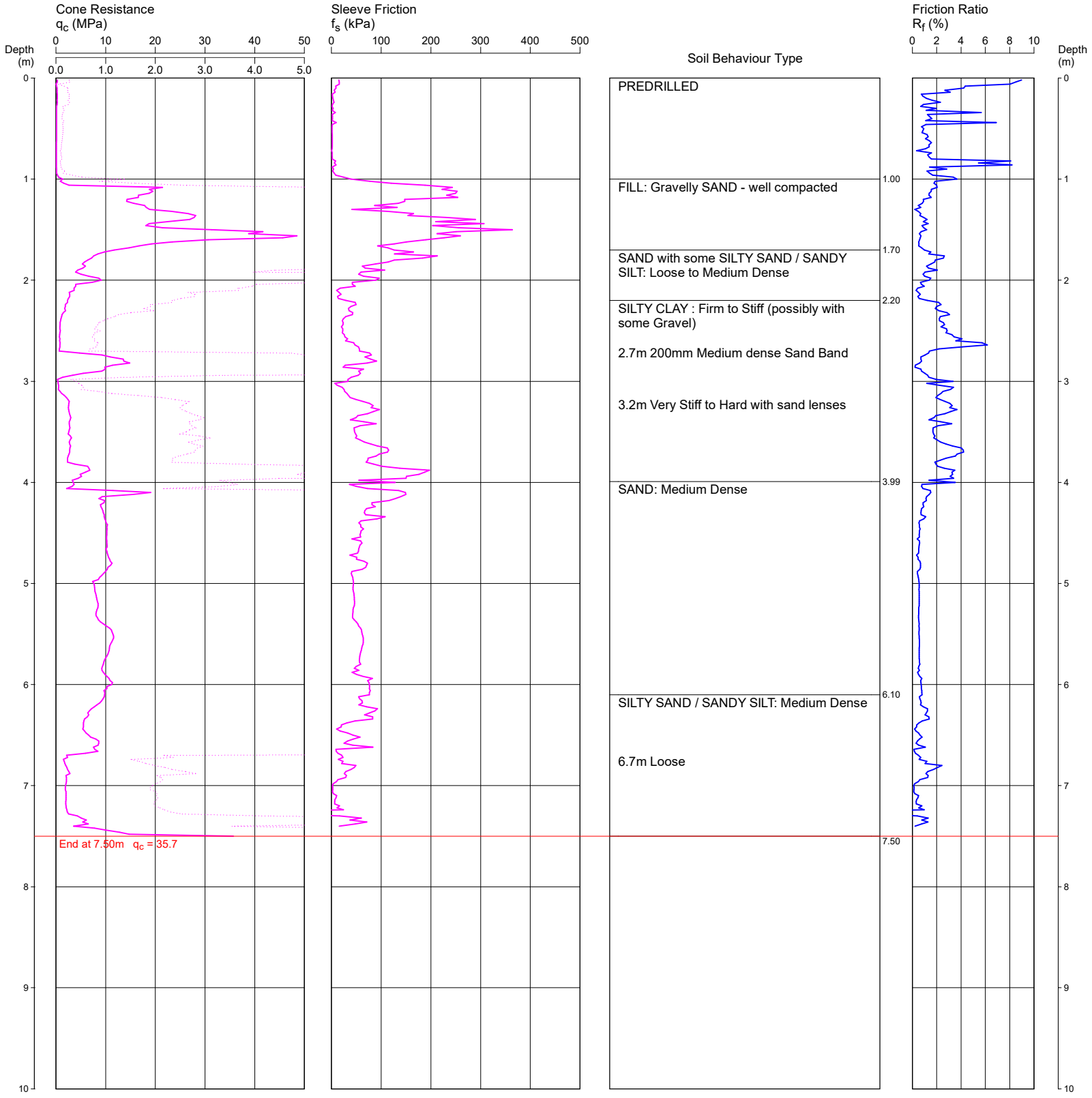
COORDINATES: 283643.1E 6263819.0N

CPT119

Page 1 of 1

DATE 15/01/2021

PROJECT No: 200309.00



REMARKS: AUGER TO 1.0m DEPTH TO PENETRATE FILLING. TEST DISCONTINUED DUE TO BENDING IN GRAVEL. HOLE COLLAPSED AT 0.1m AFTER WITHDRAWAL OF RODS.

File: \\dpnwsnas01\Projects\200309.02 - EMU PLAINS, 158-164 Old Bathurst Road\4.0 Field Work\4.2 Testing\CPT119.CP5
Cone ID: 161225 **Type:** I-CFXY-10

ConePlot Version 5.9.2
© 2003 Douglas Partners Pty Ltd

Douglas Partners
Geotechnics / Environment / Groundwater

CONE PENETRATION TEST

CLIENT: JBS&G AUSTRALIA PTY LTD

PROJECT: PROPOSED INDUSTRIAL DEVELOPMENT

LOCATION: 158-164 OLD BATHURST RD, EMU PLAINS

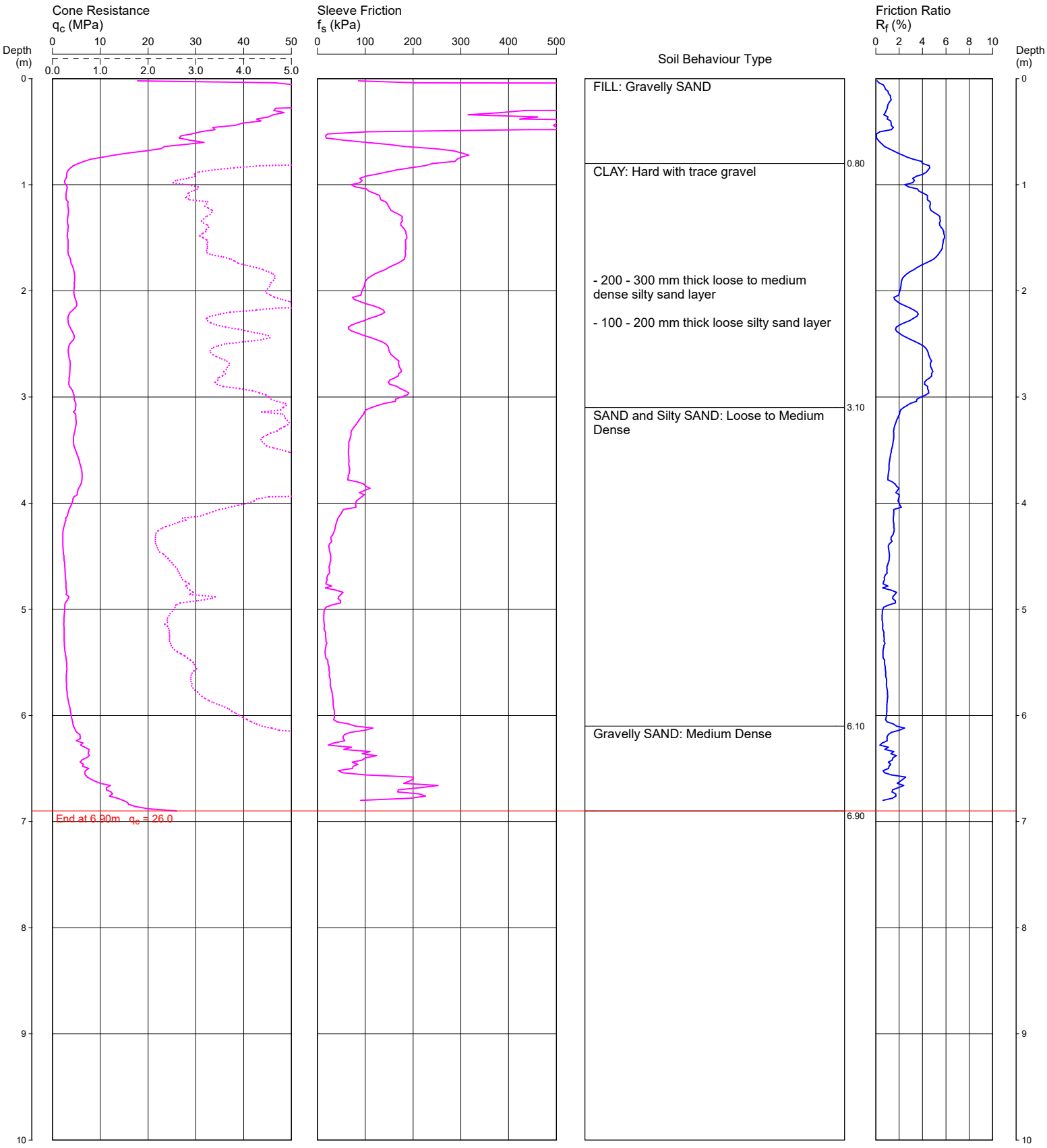
REDUCED LEVEL: 24.3m AHD

COORDINATES: 283579.1E 6263865.6N

CPT120

DATE 14/01/2021

PROJECT No: 200309.00



REMARKS: TEST DISCONTINUED DUE TO SUDDEN BEND IN GRAVEL.
HOLE COLLAPSED AT 0.6m AFTER WITHDRAWAL OF RODS.

File: P:\200309.00 - EMU PLAINS, 158-164 Old Bathurst Road\4.0 Field Work\4.2 Testing\CPT120.CP5
Cone ID: 160626 **Type:** I-CFXY-10

ConePlot Version 5.9.2

© 2003 Douglas Partners Pty Ltd

Douglas Partners
Geotechnics / Environment / Groundwater

CONE PENETRATION TEST

CLIENT: JBS&G AUSTRALIA PTY LTD

PROJECT: PROPOSED INDUSTRIAL DEVELOPMENT

LOCATION: 158-164 OLD BATHURST RD, EMU PLAINS

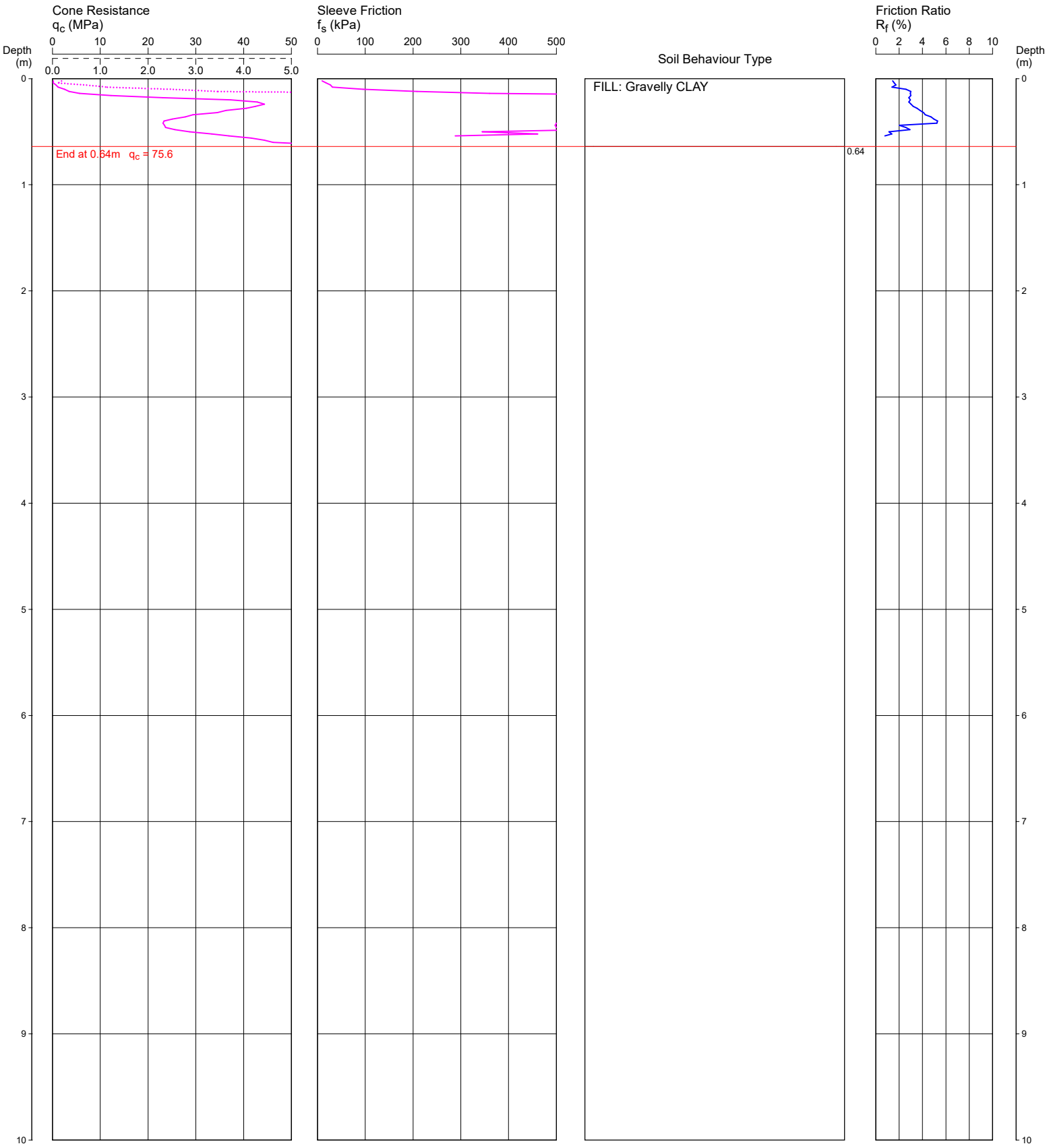
REDUCED LEVEL: 23.9m AHD

COORDINATES: 283571.8E 6263791.5N

CPT121

DATE 14/01/2021

PROJECT No: 200309.00



REMARKS: DUMMY CONE FROM 0.64 TO 0.65m DEPTH TO PENETRATE FILLING. TEST DISCONTINUED DUE TO CONE TIP REFUSAL IN FILLING. NO GROUNDWATER OBSERVED AFTER WITHDRAWAL OF RODS.

File: P:\200309.00 - EMU PLAINS, 158-164 Old Bathurst Road\4.0 Field Work\4.2 Testing\CPT121.CP5
Cone ID: 160626 **Type:** I-CFXY-10

ConePlot Version 5.9.2

© 2003 Douglas Partners Pty Ltd

Douglas Partners
Geotechnics / Environment / Groundwater

CONE PENETRATION TEST

CLIENT: JBS&G AUSTRALIA PTY LTD

PROJECT: PROPOSED INDUSTRIAL DEVELOPMENT

LOCATION: 158-164 OLD BATHURST RD, EMU PLAINS

REDUCED LEVEL: 23.9m AHD

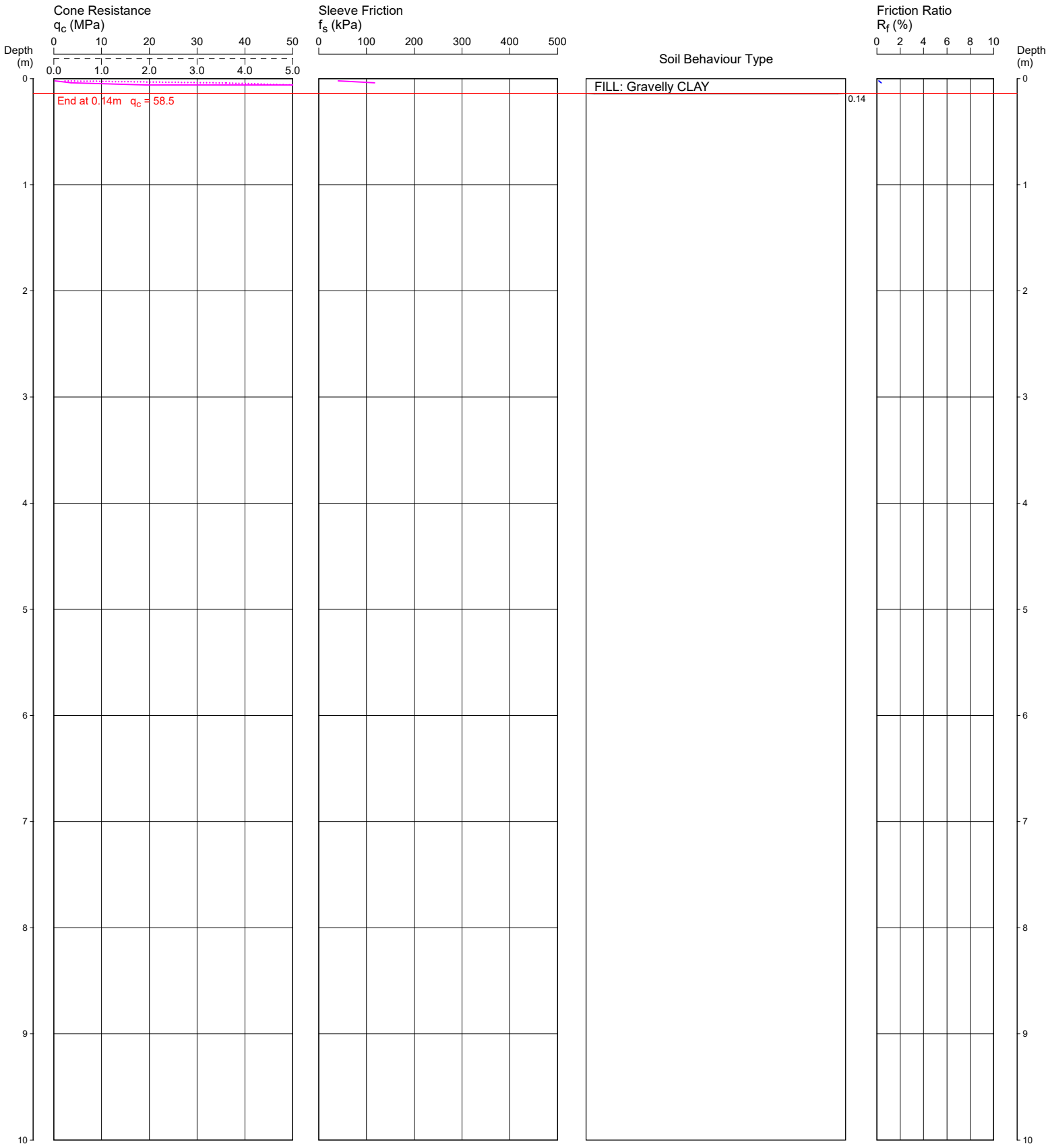
COORDINATES: 283571.8E 6263791.5N

CPT121A

Page 1 of 1

DATE 14/01/2021

PROJECT No: 200309.00



REMARKS: DUMMY CONE FROM 0.14 TO 0.67m DEPTH TO PENETRATE FILLING. TEST DISCONTINUED DUE TO CONE TIP REFUSAL IN FILLING. NO GROUNDWATER OBSERVED AFTER WITHDRAWAL OF RODS.

File: P:\200309.00 - EMU PLAINS, 158-164 Old Bathurst Road\4.0 Field Work\4.2 Testing\CPT121A.CP5
Cone ID: 160626 **Type:** I-CFXY-10

ConePlot Version 5.9.2

© 2003 Douglas Partners Pty Ltd

Douglas Partners
Geotechnics / Environment / Groundwater

CONE PENETRATION TEST

CLIENT: JBS&G AUSTRALIA PTY LTD

PROJECT: PROPOSED INDUSTRIAL DEVELOPMENT

LOCATION: 158-164 OLD BATHURST RD, EMU PLAINS

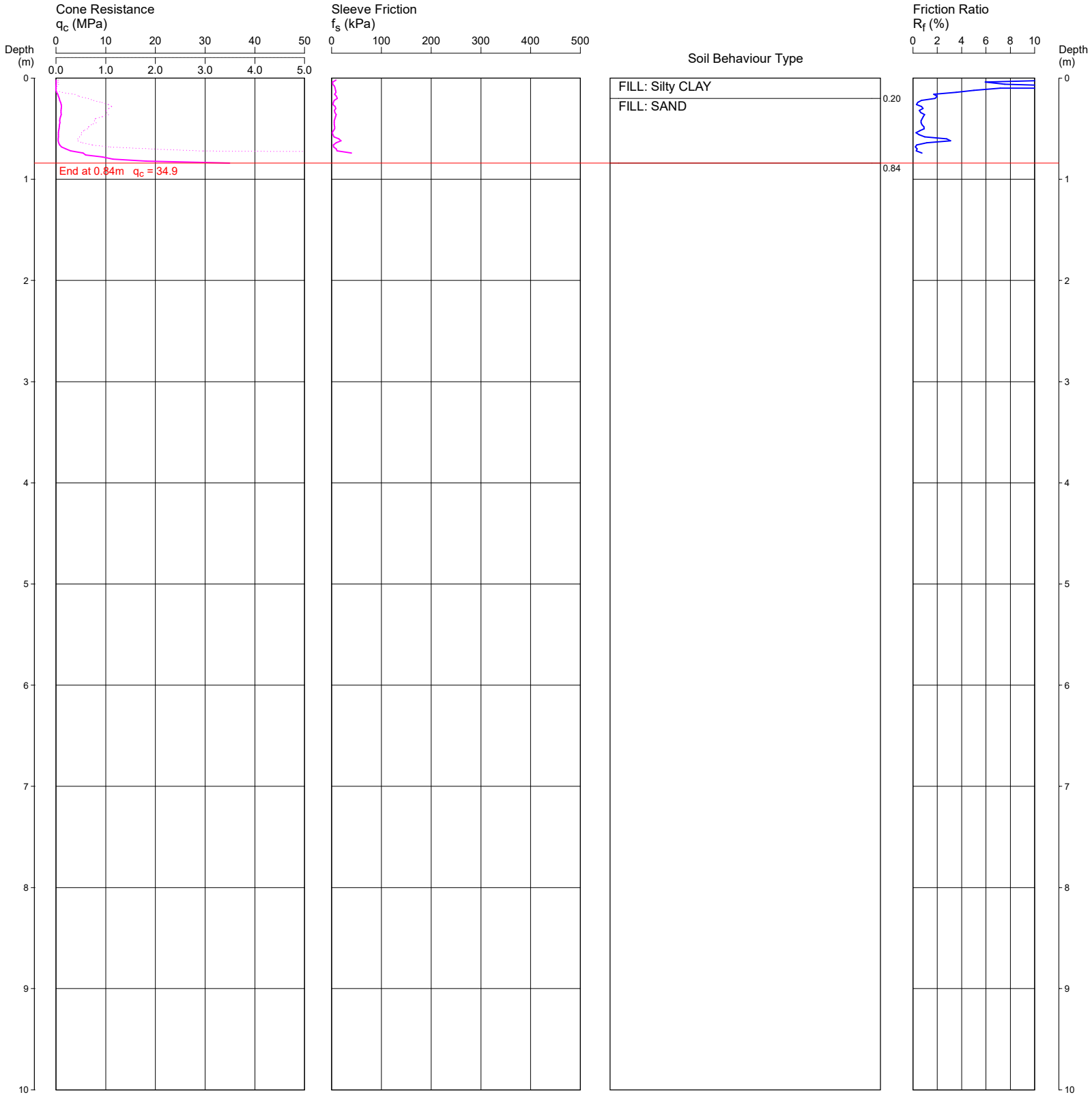
REDUCED LEVEL: 23.9m AHD

COORDINATES: 283571.8E 6263791.5N

CPT121B

DATE 15/01/2021

PROJECT No: 200309.00



REMARKS: DUMMY CONE FROM 0.84 TO 2.5m DEPTH TO PENETRATE FILLING. TEST DISCONTINUED DUE TO LOST OF A DUMMY CONE. HOLE COLLAPSED AT 0.2m AFTER WITHDRAWAL OF RODS.

File: \\dpnwsnas01\Projects\200309.02 - EMU PLAINS, 158-164 Old Bathurst Road\4.0 Field Work\4.2 Testing\CPT121B.CP5
Cone ID: 161225 **Type:** I-CFXY-10

ConePlot Version 5.9.2

© 2003 Douglas Partners Pty Ltd

Douglas Partners
Geotechnics / Environment / Groundwater

CONE PENETRATION TEST

CLIENT: JBS&G AUSTRALIA PTY LTD

PROJECT: PROPOSED INDUSTRAL DEVELOPMENT

LOCATION: 158-164 OLD BATHURST RD, EMU PLAINS

REDUCED LEVEL: 24.3m AHD

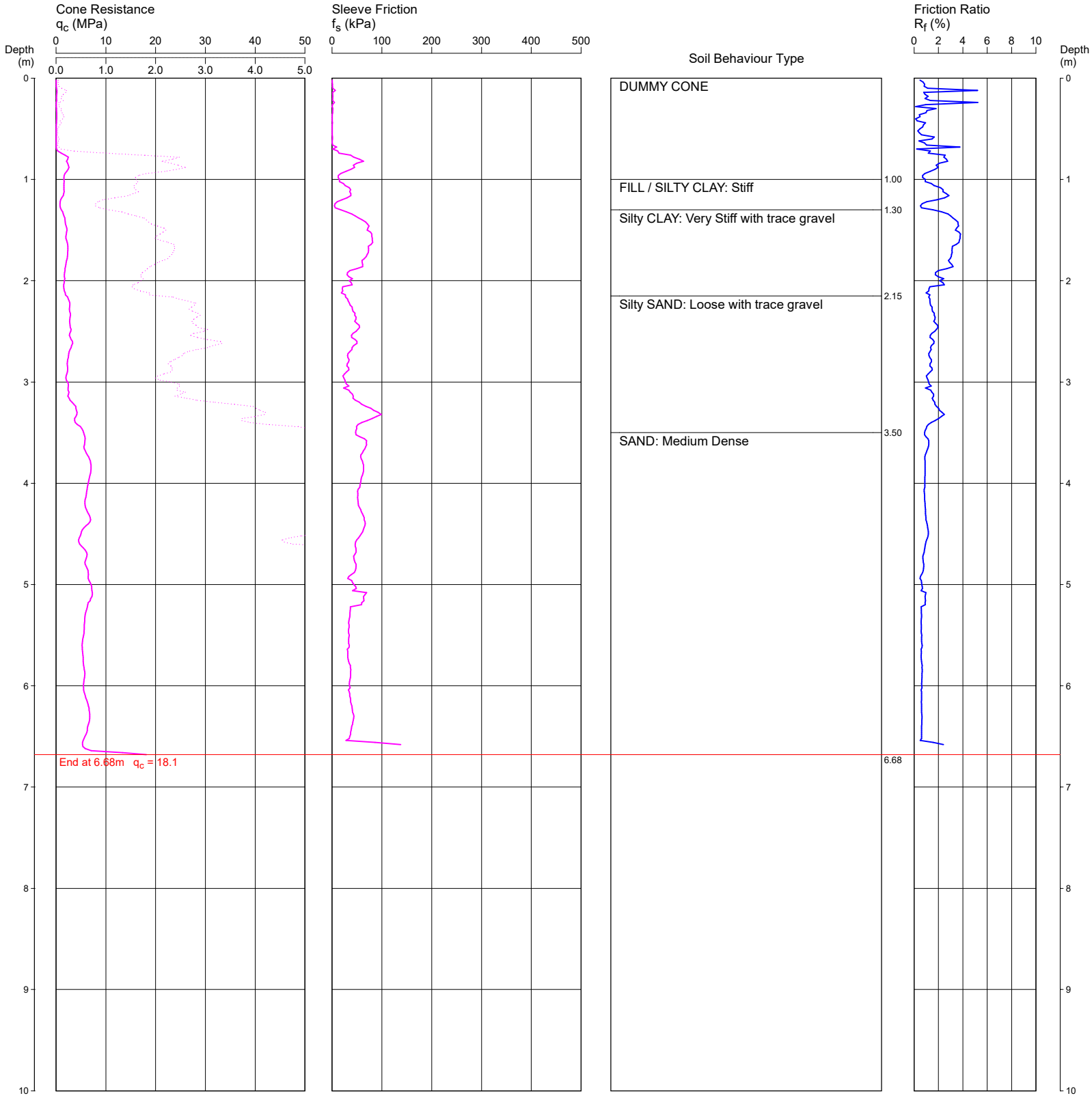
COORDINATES: 283587.5E 6263739.3N

CPT122

Page 1 of 1

DATE 14/01/2021

PROJECT No: 200309.00



REMARKS: DUMMY CONE FROM 0.0 TO 1.0m DEPTH TO PENETRATE FILLING. TEST DISCONTINUED DUE TO SUDDEN BEND IN GRAVEL. HOLE COLLAPSED AT 0.9m AFTER WITHDRAWAL OF RODS.

File: \\dpnwsnas01\Projects\200309.02 - EMU PLAINS, 158-164 Old Bathurst Road\4.0 Field Work\4.2 Testing\CPT122.CP5
Cone ID: 160626 **Type:** I-CFXY-10

ConePlot Version 5.9.2
© 2003 Douglas Partners Pty Ltd

Douglas Partners
Geotechnics / Environment / Groundwater

CONE PENETRATION TEST

CLIENT: JBS&G AUSTRALIA PTY LTD

PROJECT: PROPOSED INDUSTRIAL DEVELOPMENT

LOCATION: 158-164 OLD BATHURST RD, EMU PLAINS

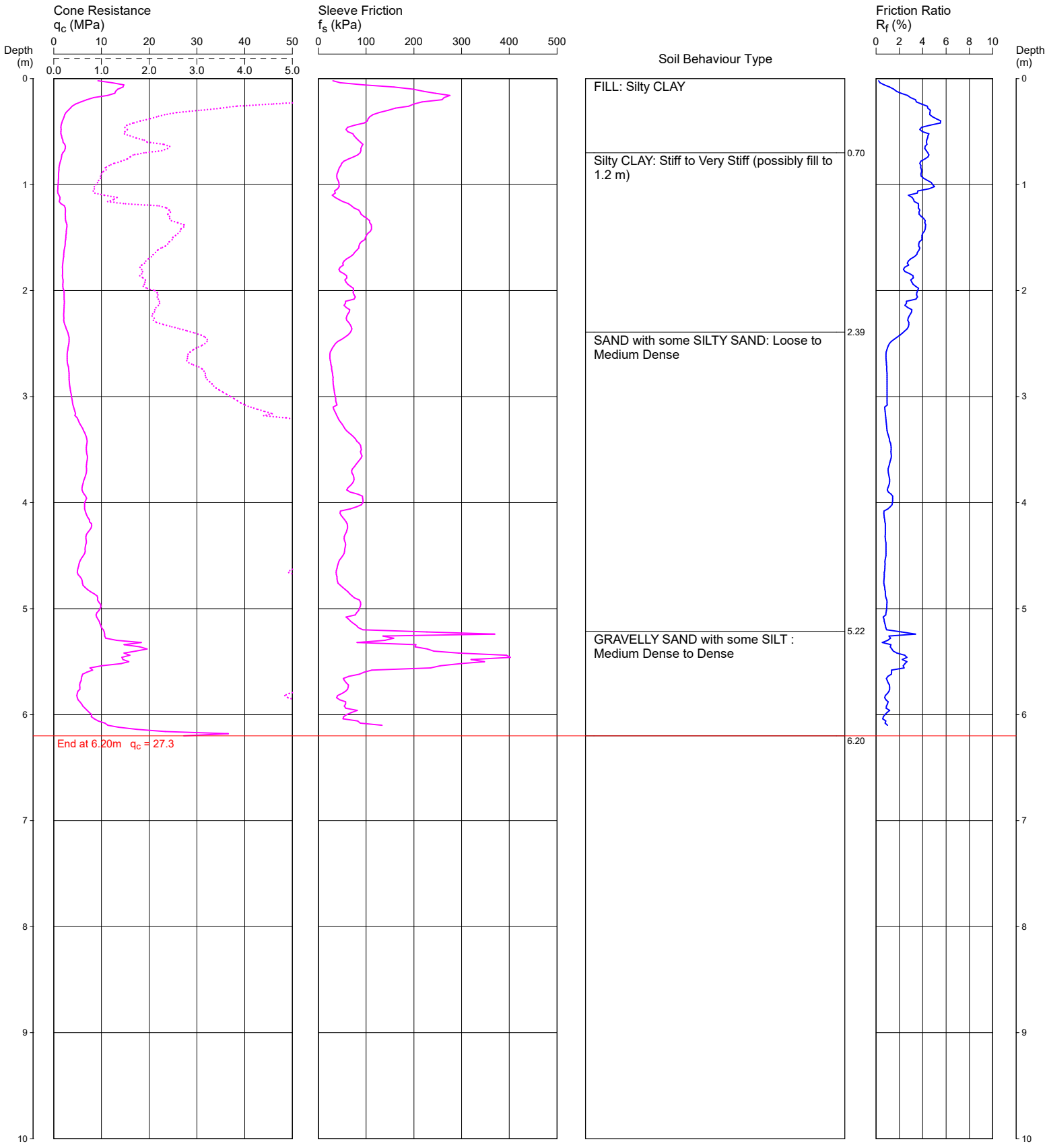
REDUCED LEVEL: 24.2m AHD

COORDINATES: 283497.0E 6263696.6N

CPT123

DATE 15/01/2021

PROJECT No: 200309.00



REMARKS: TEST DISCONTINUED DUE TO BENDING IN GRAVEL.
HOLE COLLAPSED AT 0.7m AFTER WITHDRAWAL OF RODS.

File: P:\200309.00 - EMU PLAINS, 158-164 Old Bathurst Road\4.0 Field Work\4.2 Testing\CPT123.CP5
Cone ID: 161225 **Type:** I-CFXY-10

ConePlot Version 5.9.2

© 2003 Douglas Partners Pty Ltd

Douglas Partners
Geotechnics / Environment / Groundwater

CONE PENETRATION TEST

CLIENT: JBS&G AUSTRALIA PTY LTD

PROJECT: PROPOSED INDUSTRIAL DEVELOPMENT

LOCATION: 158-164 OLD BATHURST RD, EMU PLAINS

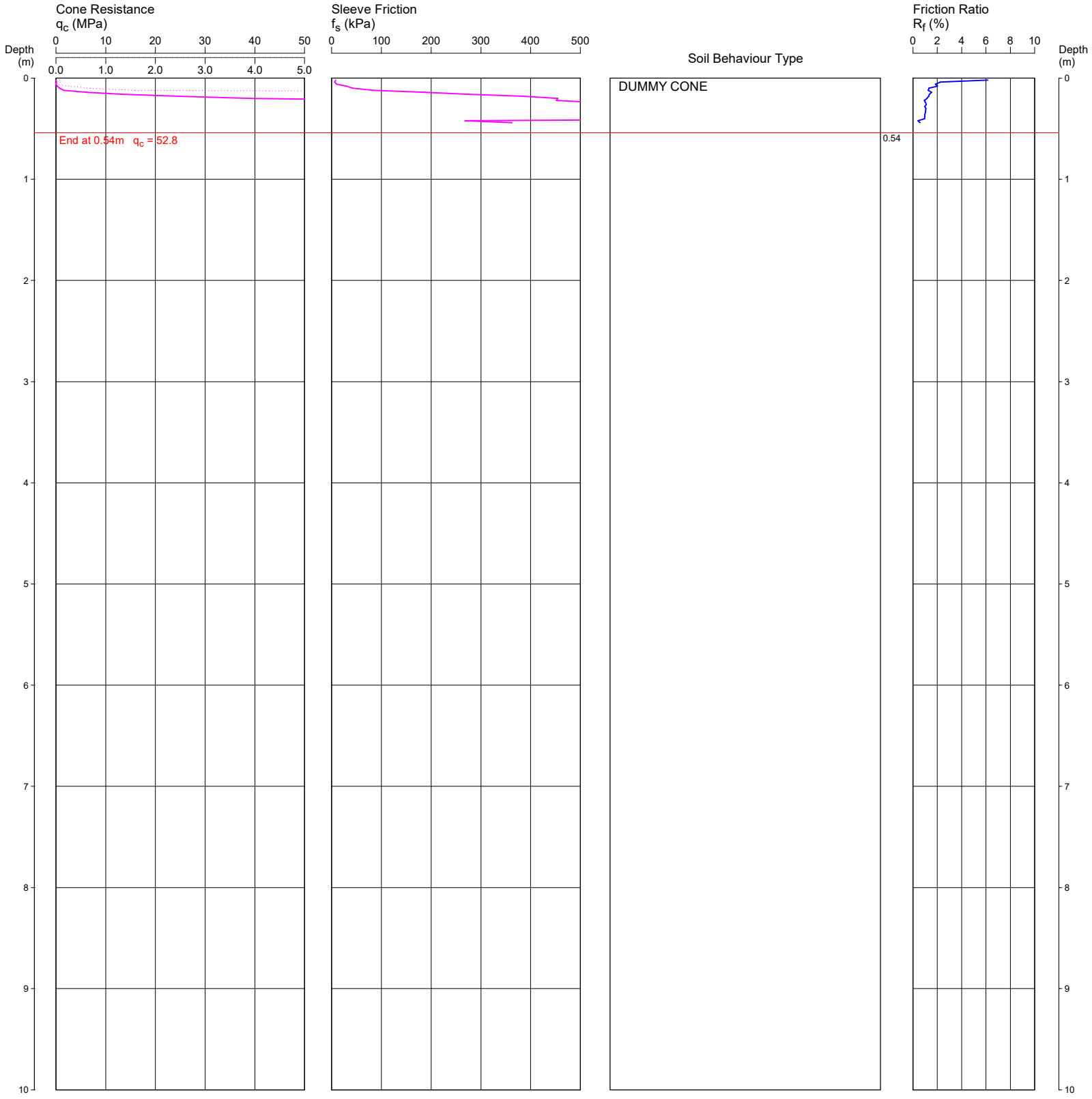
REDUCED LEVEL: 24.2m AHD

COORDINATES: 283555.7E 6263661.8N

CPT125

DATE 15/01/2021

PROJECT No: 200309.00



REMARKS: DUMMY CONE FROM 0.0 TO 0.5m DEPTH TO PENETRATE FILLING. TEST DISCONTINUED DUE TO BENDING IN FILLING. HOLE COLLAPSED AT 0.3m AFTER WITHDRAWAL OF RODS.

File: P:\200309.02 - EMU PLAINS, 158-164 Old Bathurst Road\4.0 Field Work\4.2 Testing\CPT125.CP5
Cone ID: 161225 **Type:** I-CFXY-10

ConePlot Version 5.9.2

© 2003 Douglas Partners Pty Ltd

Douglas Partners
Geotechnics / Environment / Groundwater

CONE PENETRATION TEST

CLIENT: JBS&G AUSTRALIA PTY LTD

PROJECT: PROPOSED INDUSTRIAL DEVELOPMENT

LOCATION: 158-164 OLD BATHURST RD, EMU PLAINS

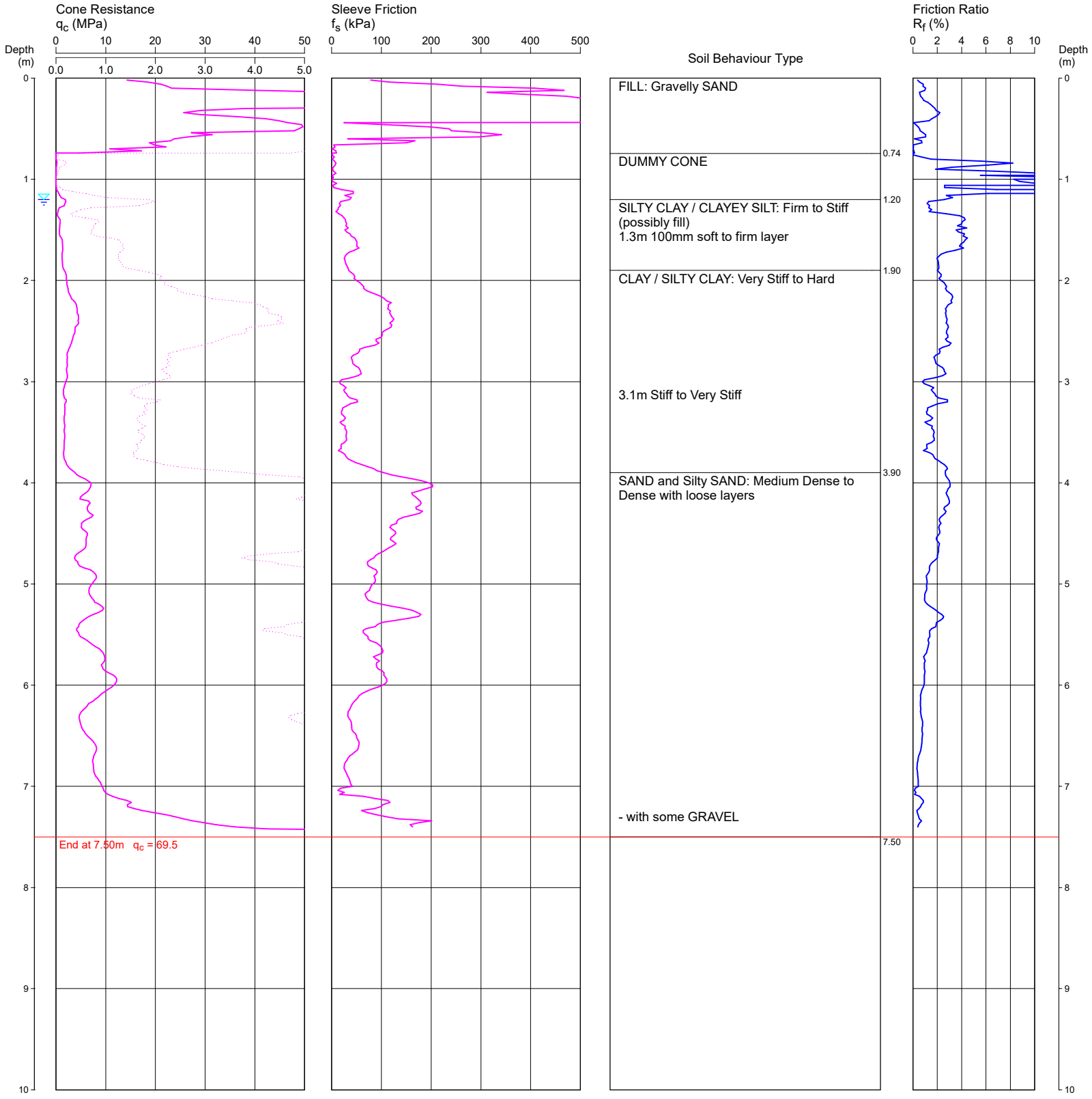
REDUCED LEVEL: 24.2m AHD

COORDINATES: 283555.7E 6263661.8N

CPT125A

DATE 15/01/2021

PROJECT No: 200309.00



REMARKS: DUMMY CONE FROM 0.74 TO 1.20m DEPTH TO PENETRATE FILLING. TEST DISCONTINUED DUE TO BENDING IN GRAVEL. GROUNDWATER OBSERVED AT 1.2m AFTER WITHDRAWAL OF RODS.

Water depth after test: 1.20m depth (assumed)

File: P:\200309.02 - EMU PLAINS, 158-164 Old Bathurst Road\4.0 Field Work\4.2 Testing\CPT125A.CP5

Cone ID: 161225 **Type:** I-CFXY-10

ConePlot Version 5.9.2

© 2003 Douglas Partners Pty Ltd

Douglas Partners
Geotechnics / Environment / Groundwater

CONE PENETRATION TEST

CLIENT: JBS&G AUSTRALIA PTY LTD

PROJECT: PROPOSED INDUSTRIAL DEVELOPMENT

LOCATION: 158-164 OLD BATHURST RD, EMU PLAINS

REDUCED LEVEL: 24.6m AHD

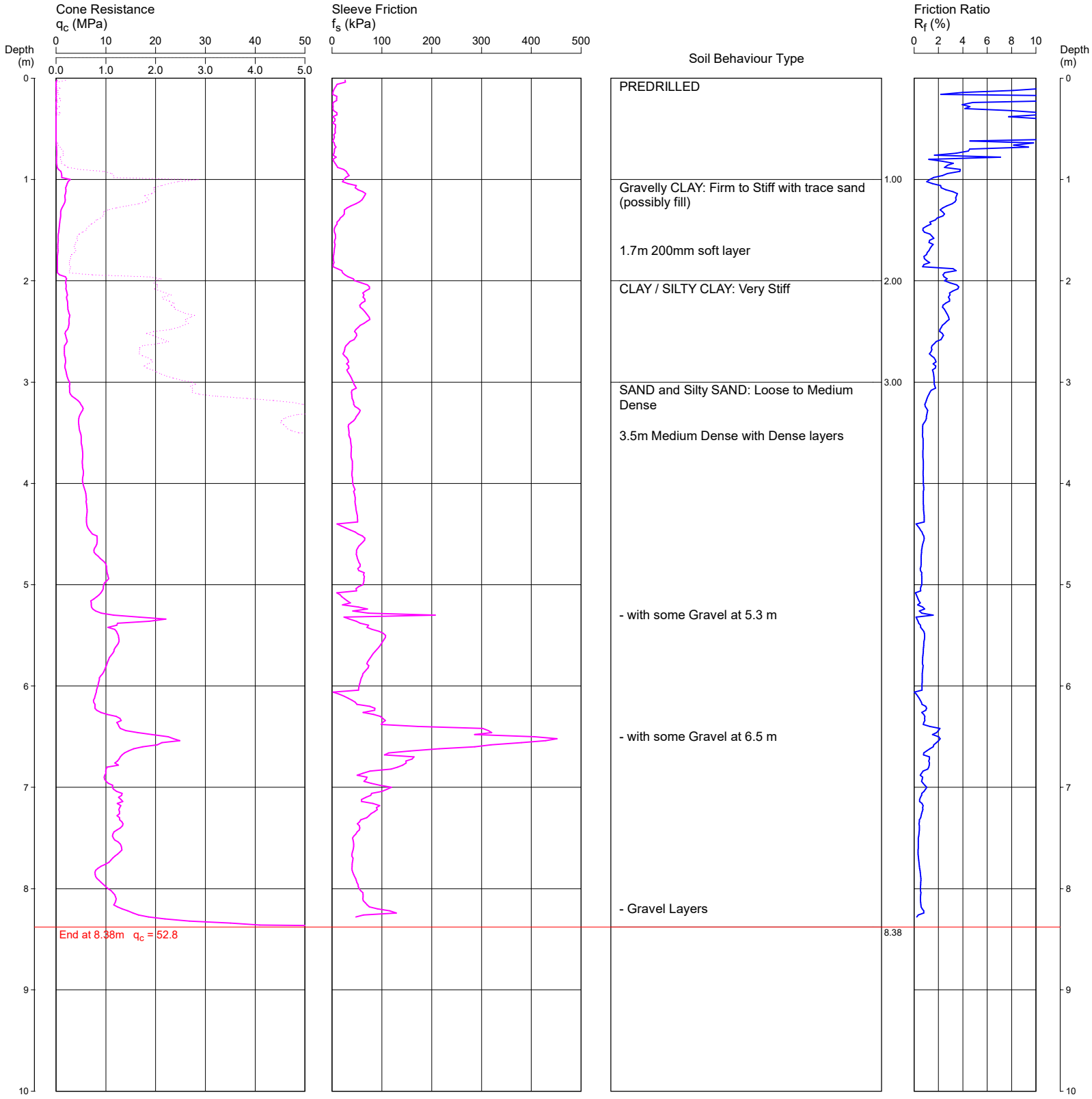
COORDINATES: 283634.0E 6263650.7N

CPT127

Page 1 of 1

DATE 15/01/2021

PROJECT No: 200309.00



REMARKS: AUGER TO 1.0m DEPTH TO PENETRATE FILLING. TEST DISCONTINUED DUE TO REFUSAL IN GRAVEL. HOLE COLLAPSED AT 0.8m AFTER WITHDRAWAL OF RODS.

File: P:\200309.02 - EMU PLAINS, 158-164 Old Bathurst Road\4.0 Field Work\4.2 Testing\CPT127.CP5
Cone ID: 161225 **Type:** I-CFXY-10

ConePlot Version 5.9.2
© 2003 Douglas Partners Pty Ltd

Douglas Partners
Geotechnics / Environment / Groundwater

CONE PENETRATION TEST

CLIENT: JBS&G AUSTRALIA PTY LTD

PROJECT: PROPOSED INDUSTRIAL DEVELOPMENT

LOCATION: 158-164 OLD BATHURST RD, EMU PLAINS

REDUCED LEVEL: 24.4m AHD

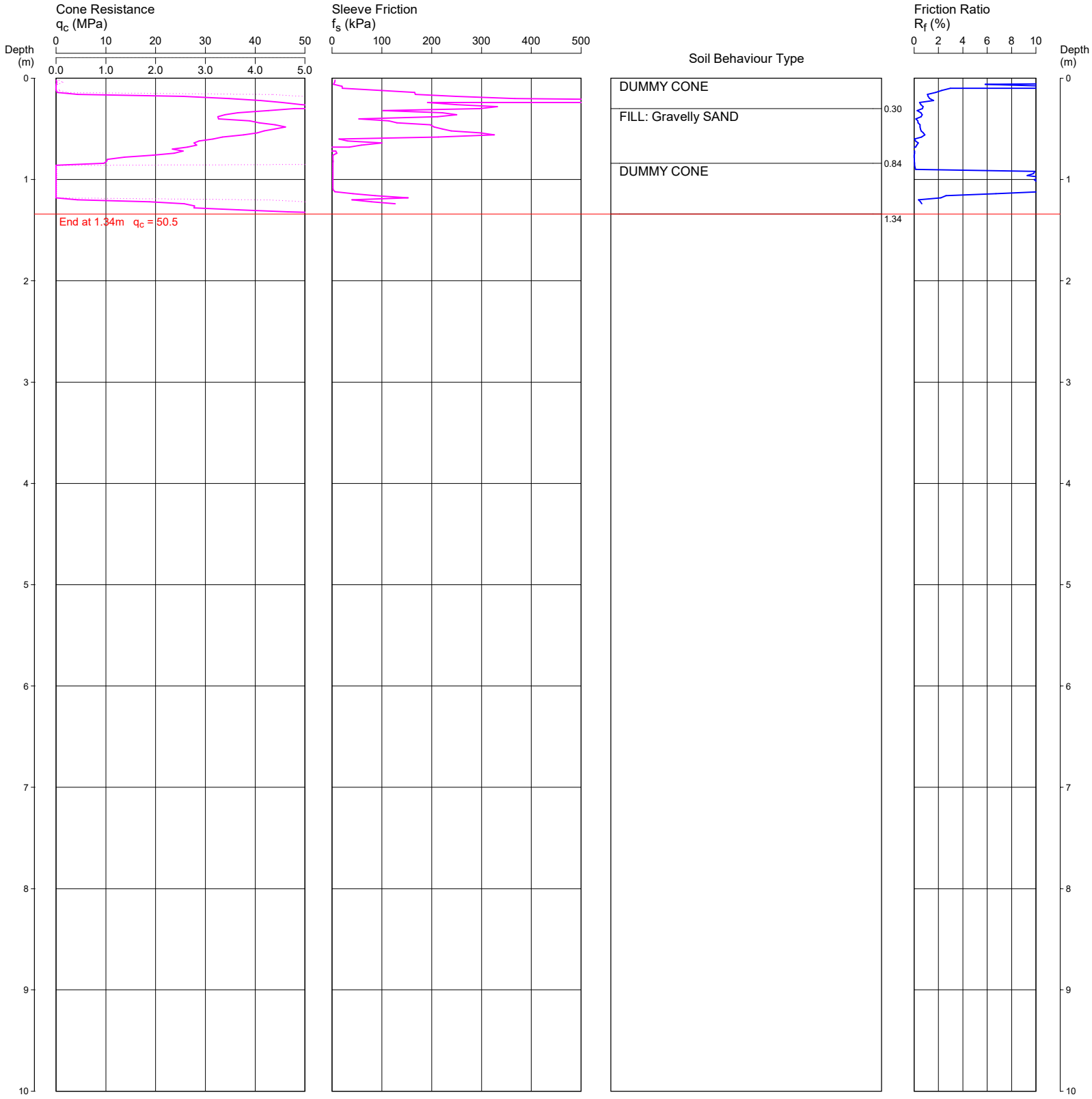
COORDINATES: 283581.1E 6263598.4N

CPT128

Page 1 of 1

DATE 15/01/2021

PROJECT No: 200309.00



REMARKS: DUMMY CONE FROM 0.84 TO 1.20m DEPTH TO PENETRATE FILLING. TEST DISCONTINUED DUE TO BENDING IN FILLING. HOLE COLLAPSED AT 0.3m AFTER WITHDRAWAL OF RODS.

File: P:\200309.02 - EMU PLAINS, 158-164 Old Bathurst Road\4.0 Field Work\4.2 Testing\CPT128.CP5
Cone ID: 161225 **Type:** I-CFXY-10

ConePlot Version 5.9.2
© 2003 Douglas Partners Pty Ltd

Douglas Partners
Geotechnics / Environment / Groundwater

CONE PENETRATION TEST

CLIENT: JBS&G AUSTRALIA PTY LTD

PROJECT: PROPOSED INDUSTRIAL DEVELOPMENT

LOCATION: 158-164 OLD BATHURST RD, EMU PLAINS

REDUCED LEVEL: 24.5m AHD

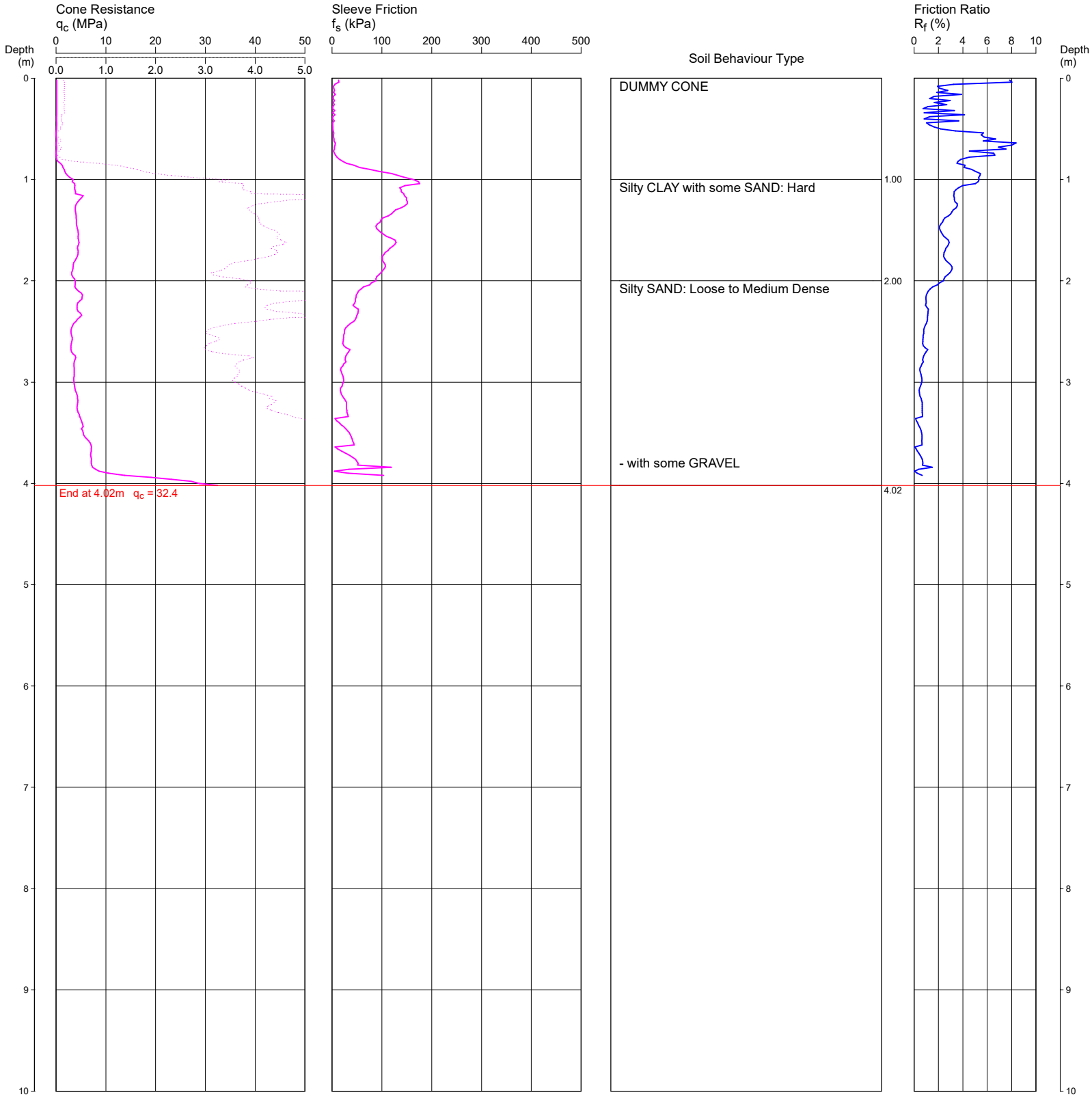
COORDINATES: 283822.1E 6263680.7N

CPT129

Page 1 of 1

DATE 15/01/2021

PROJECT No: 200309.00



REMARKS: AUGER TO 1.0m DEPTH TO PENETRATE FILLING. TEST DISCONTINUED DUE TO BENDING IN GRAVEL. HOLE COLLAPSED AT 2.5m AFTER WITHDRAWAL OF RODS.

File: P:\200309.02 - EMU PLAINS, 158-164 Old Bathurst Road\4.0 Field Work\4.2 Testing\CPT129.CP5
Cone ID: 161225 **Type:** I-CFXY-10

ConePlot Version 5.9.2
© 2003 Douglas Partners Pty Ltd

Douglas Partners
Geotechnics / Environment / Groundwater

CONE PENETRATION TEST

CLIENT: JBS&G AUSTRALIA PTY LTD

PROJECT: ROCLA PIPES, PROPOSED REDEVELOPMENT

LOCATION: 158-164 OLD BATHURST RD, EMU PLAINS

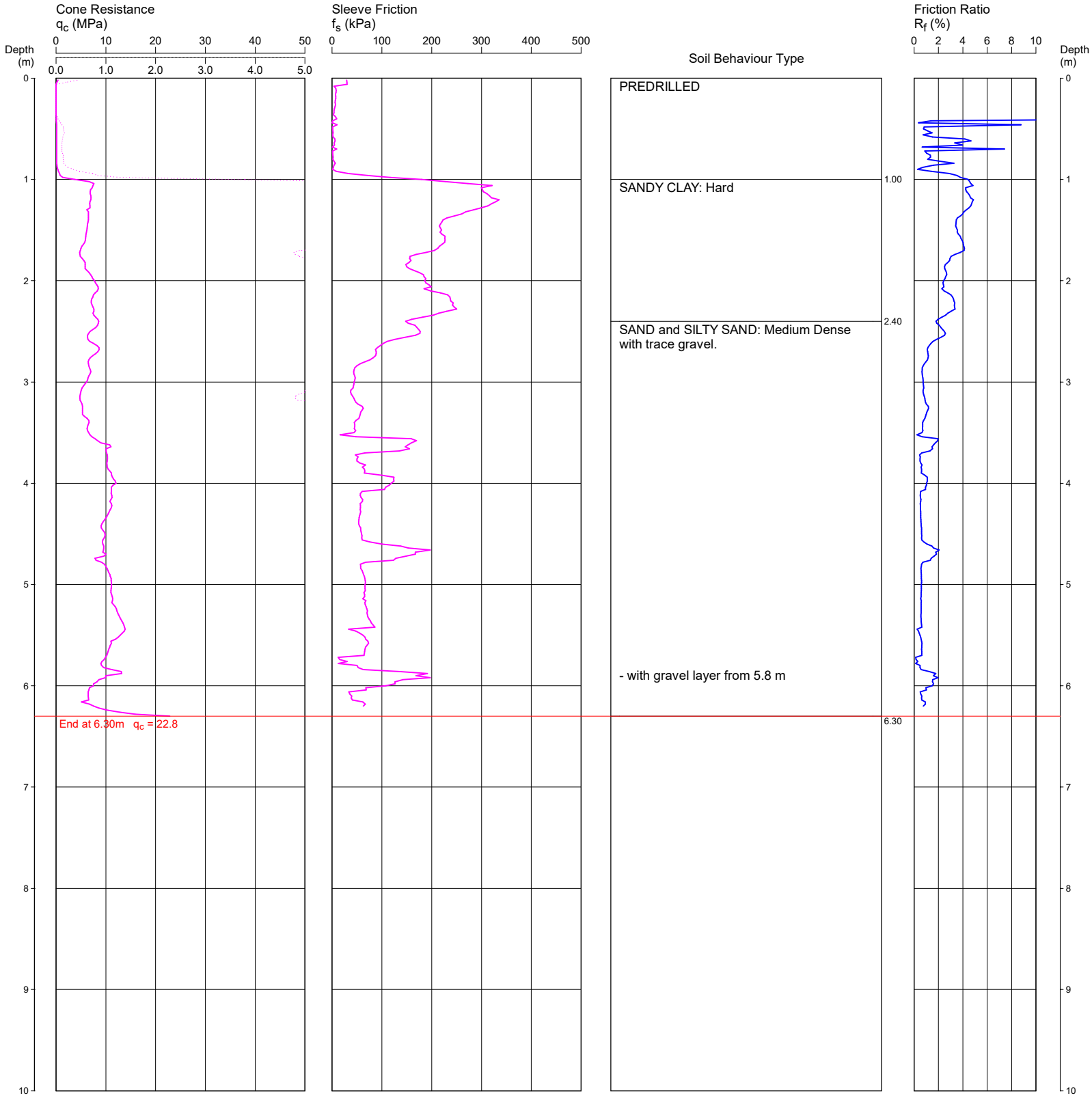
REDUCED LEVEL: 24.3m AHD

COORDINATES: 283731.9E 6263686.3N

CPT130

DATE 15/01/2021

PROJECT No: 200309.00



REMARKS: AUGER TO 1.0m DEPTH TO PENETRATE FILLING. TEST DISCONTINUED DUE TO BENDING IN GRAVEL. HOLE COLLAPSED AT 0.9m AFTER WITHDRAWAL OF RODS.

File: \\dpnwsnas01\Projects\200309.02 - EMU PLAINS, 158-164 Old Bathurst Road\4.0 Field Work\4.2 Testing\CPT130.CP5
Cone ID: 161225 **Type:** I-CFXY-10

ConePlot Version 5.9.2

© 2003 Douglas Partners Pty Ltd

Douglas Partners
Geotechnics / Environment / Groundwater

CONE PENETRATION TEST

CLIENT: JBS&G AUSTRALIA PTY LTD

PROJECT: PROPOSED INDUSTIAL DEVELOPMENT

LOCATION: 158-164 OLD BATHURST RD, EMU PLAINS

REDUCED LEVEL: 24.2m AHD

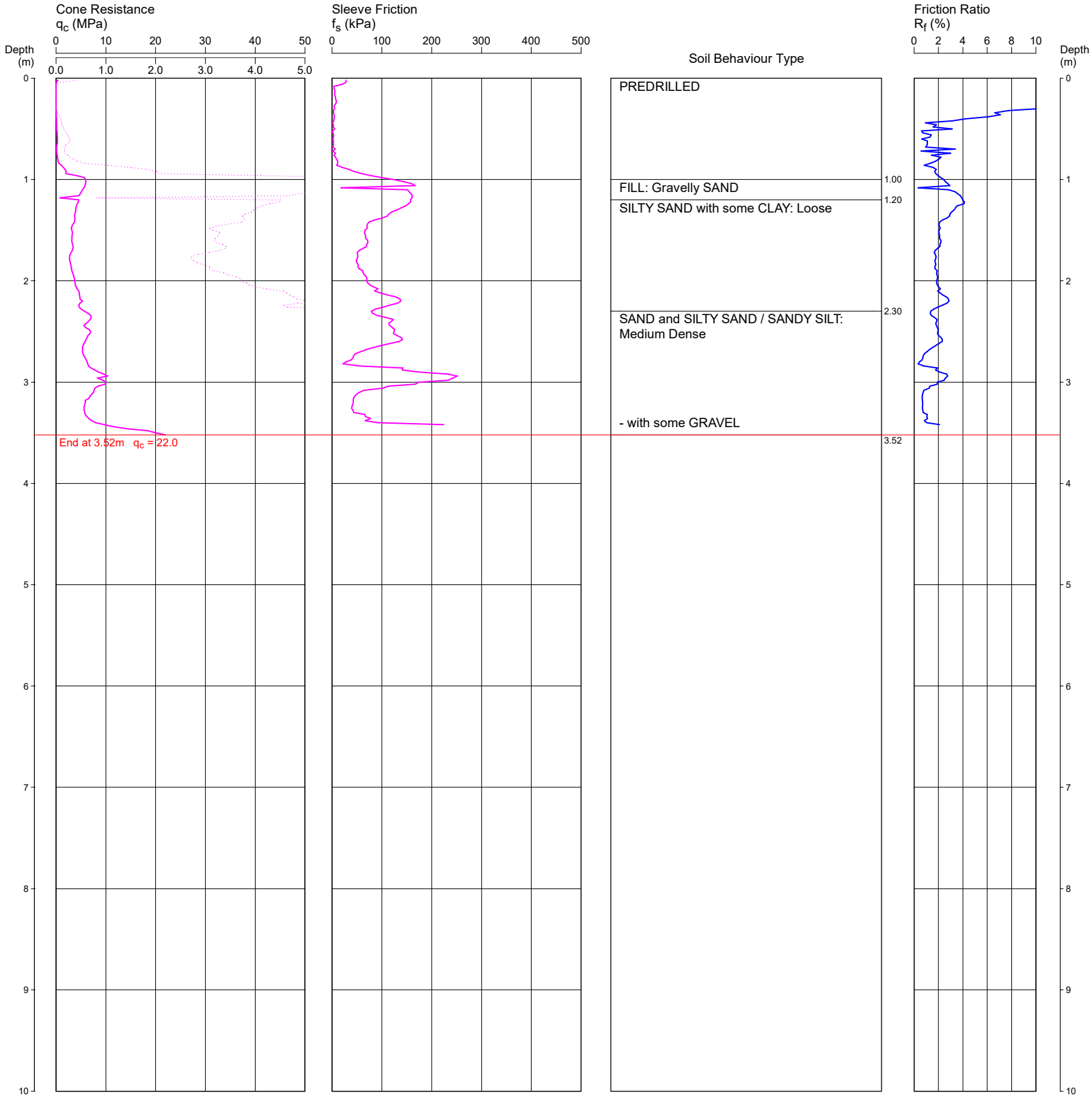
COORDINATES: 283749.5E 6263622.5N

CPT131

Page 1 of 1

DATE 15/01/2021

PROJECT No: 200309.00



REMARKS: AUGER TO 1.0m DEPTH TO PENETRATE FILLING. TEST DISCONTINUED DUE TO BENDING IN GRAVEL. HOLE COLLAPSED AT 0.7m AFTER WITHDRAWAL OF RODS.

File: P:\200309.02 - EMU PLAINS, 158-164 Old Bathurst Road\4.0 Field Work\4.2 Testing\CPT131.CP5
Cone ID: 161225 **Type:** I-CFXY-10

ConePlot Version 5.9.2
© 2003 Douglas Partners Pty Ltd

Douglas Partners
Geotechnics / Environment / Groundwater

CONE PENETRATION TEST

CLIENT: JBS&G AUSTRALIA PTY LTD

PROJECT: PROPOSED INDUSTRIAL DEVELOPMENT

LOCATION: 158-164 OLD BATHURST RD, EMU PLAINS

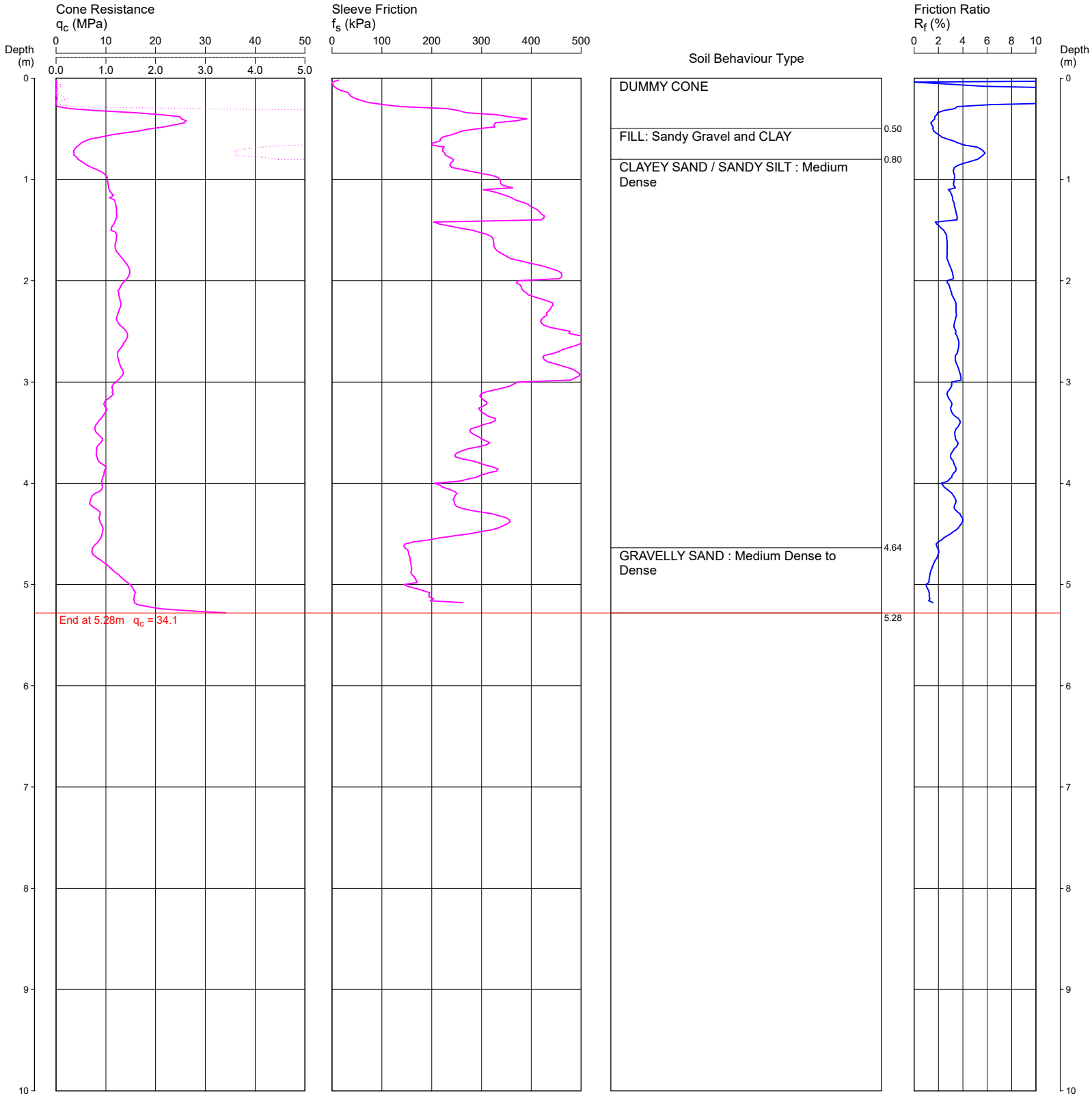
REDUCED LEVEL: 24.0m AHD

COORDINATES: 283691.2E 6263510.4N

CPT132

DATE 14/01/2021

PROJECT No: 200309.00



REMARKS: DUMMY CONE FROM 0.0 TO 0.5m DEPTH TO PENETRATE FILLING. TEST DISCONTINUED DUE TO BENDING IN GRAVEL. HOLE COLLAPSED AT 4.9m AFTER WITHDRAWAL OF RODS.

File: P:\200309.02 - EMU PLAINS, 158-164 Old Bathurst Road\4.0 Field Work\4.2 Testing\CPT132.CP5
Cone ID: 160626 **Type:** I-CFXY-10

ConePlot Version 5.9.2

© 2003 Douglas Partners Pty Ltd

Douglas Partners
Geotechnics / Environment / Groundwater

CONE PENETRATION TEST

CLIENT: JBS&G AUSTRALIA PTY LTD

PROJECT: PROPOSED INDUSTRIAL DEVELOPMENT

LOCATION: 158-164 OLD BATHURST RD, EMU PLAINS

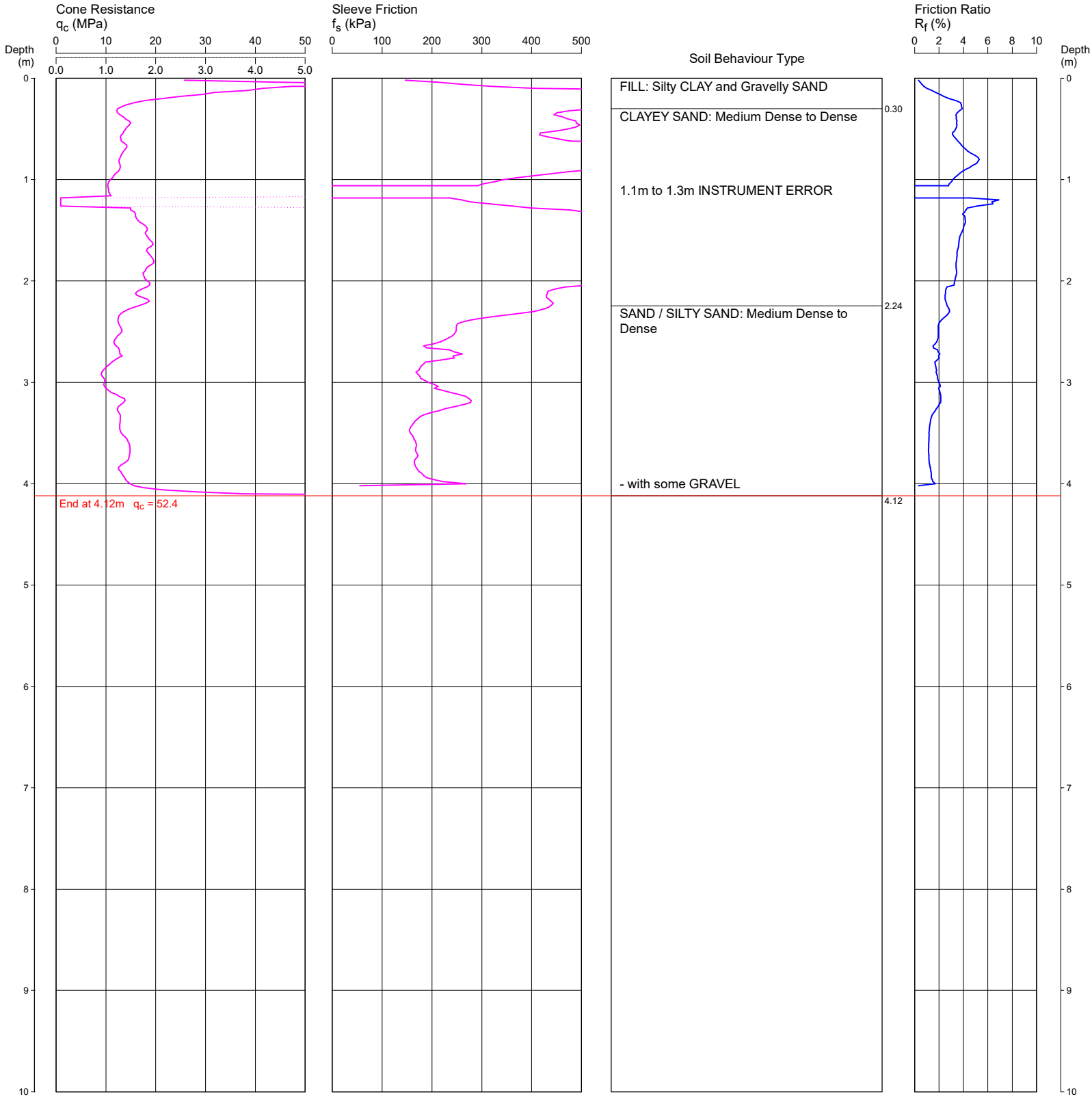
REDUCED LEVEL: 24.3m AHD

COORDINATES: 283850.0E 6263547.3N

CPT133

DATE 14/01/2021

PROJECT No: 200309.00



REMARKS: TEST DISCONTINUED DUE TO REFUSAL IN GRAVEL.
HOLE COLLAPSE AT 3.6m AFTER WITHDRAWAL OF RODS.

File: P:\200309.02 - EMU PLAINS, 158-164 Old Bathurst Road\4.0 Field Work\4.2 Testing\CPT133.CP5
Cone ID: 160626 **Type:** I-CFXY-10

ConePlot Version 5.9.2
© 2003 Douglas Partners Pty Ltd

Douglas Partners
Geotechnics / Environment / Groundwater

CONE PENETRATION TEST

CLIENT: JBS&G AUSTRALIA PTY LTD

PROJECT: PROPOSED INDUSTRIAL DEVELOPMENT

LOCATION: 158-164 OLD BATHURST RD, EMU PLAINS

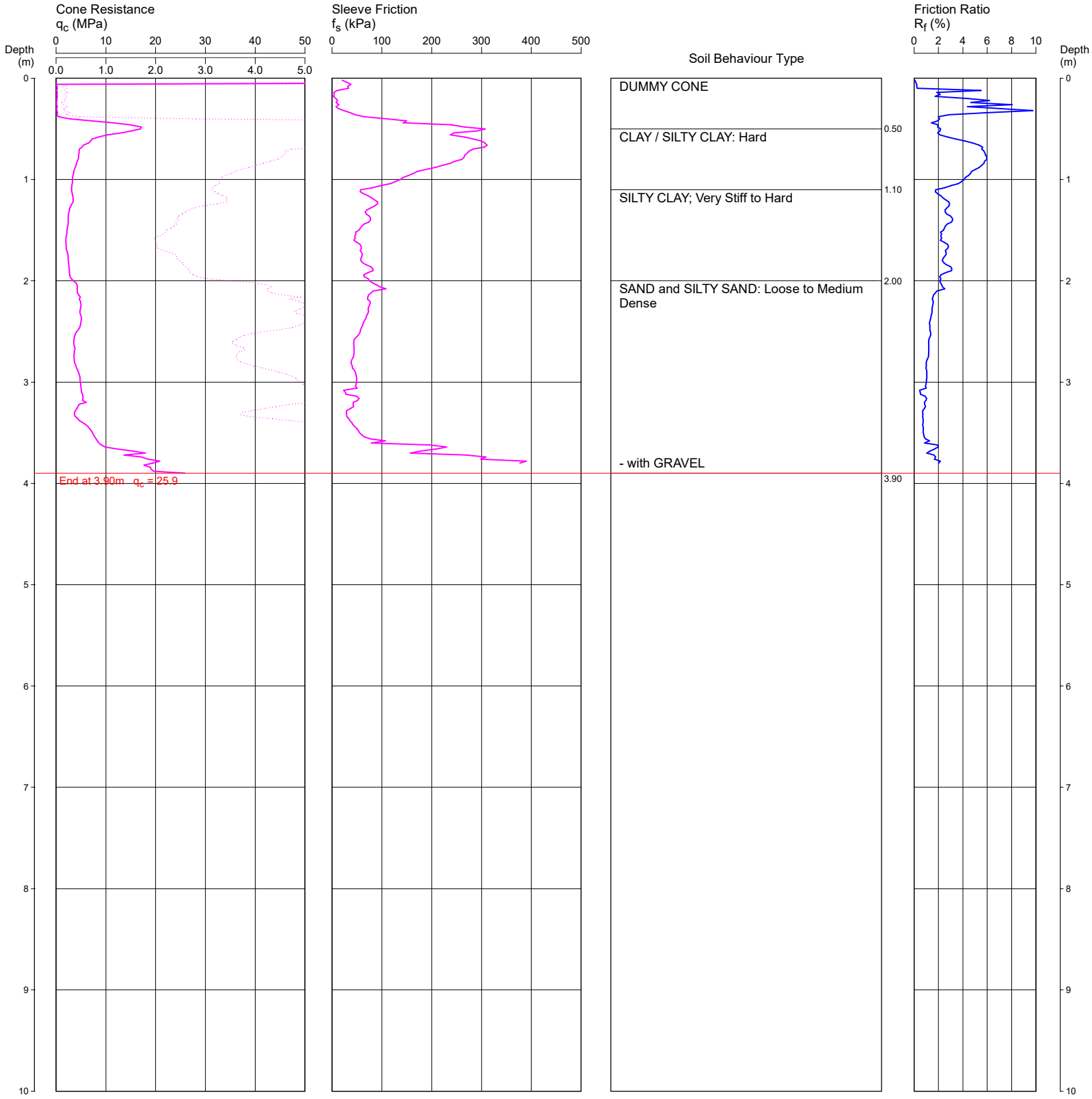
REDUCED LEVEL: 24.6m AHD

COORDINATES: 283871.1E 6263673.0N

CPT134

DATE 14/01/2021

PROJECT No: 200309.00



REMARKS: DUMMY CONE FROM 0.0 TO 0.5m DEPTH TO PENETRATE FILLING. TEST DISCONTINUED DUE TO BENDING IN GRAVEL. HOLE COLLAPSED AT 1.1m AFTER WITHDRAWAL OF RODS.

File: P:\200309.02 - EMU PLAINS, 158-164 Old Bathurst Road\4.0 Field Work\4.2 Testing\CPT134.CP5
Cone ID: 160626 **Type:** I-CFXY-10

ConePlot Version 5.9.2

© 2003 Douglas Partners Pty Ltd

Douglas Partners
Geotechnics / Environment / Groundwater

CONE PENETRATION TEST

CLIENT: JBS&G AUSTRALIA PTY LTD

PROJECT: PROPOSED INDUSTRIAL DEVELOPMENT

LOCATION: 158-164 OLD BATHURST RD, EMU PLAINS

REDUCED LEVEL: 24.7m AHD

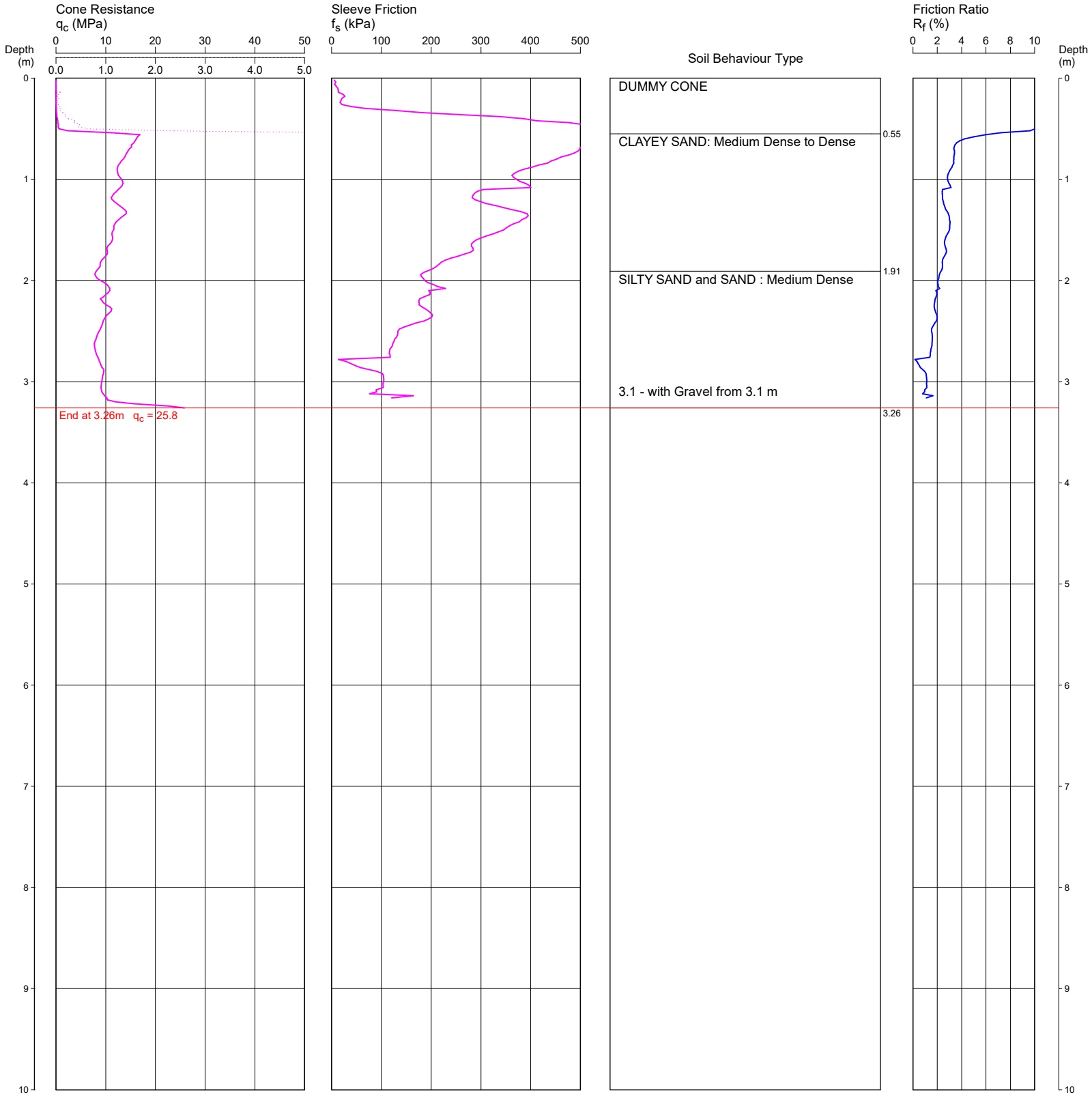
COORDINATES: 283917.1E 6263634.4N

CPT135

Page 1 of 1

DATE 14/01/2021

PROJECT No: 200309.00



REMARKS: DUMMY CONE FROM 0.0 TO 0.55m DEPTH TO PENETRATE FILLING. TEST DISCONTINUED DUE TO BENDING IN GRAVEL. NO GROUNDWATER OBSERVED AFTER WITHDRAWAL OF RODS.

File: P:\200309.02 - EMU PLAINS, 158-164 Old Bathurst Road\4.0 Field Work\4.2 Testing\CPT135.CP5
Cone ID: 160626 **Type:** I-CFXY-10

ConePlot Version 5.9.2
© 2003 Douglas Partners Pty Ltd

Douglas Partners
Geotechnics / Environment / Groundwater

Appendix D

Laboratory Test Results

Douglas Partners
Geotechnics / Environment / Groundwater

Table D1: Summary of Borehole Data, Laboratory Tests and Assessments

Bore	Top of soil unit (m)	Base of soil unit (m)	Sample Depth (m)	pH	Chlorides (mg/kg)	Sulphates (mg/kg)	Aggressivity [AS2159 pH criteria]				Soil Texture Group [after DLWC]	Textural Factor [M] [after DLWC]	$EC_{1:5}$ [Lab.] (µS/cm)	EC_e [M x $EC_{1:5}$] (dS/m)	Salinity Class [Richards 1954]
							Soil Condition "A" used for high permeable natural soils		Soil Condition "B" used for low permeable natural soils and existing filling						
							To Concrete	To Steel	To Concrete	To Steel					
101	0.00	0.20	0.10	10.8			-	-	Non-Aggressive	Non-Aggressive	Sandy loam	14	370	5.2	Moderately Saline
101	0.40	0.50	0.45	11.2			-	-	Non-Aggressive	Non-Aggressive	Sandy loam	14	680	9.5	Very Saline
101	1.00	1.38	1.19	12.1			-	-	Non-Aggressive	Non-Aggressive	Sandy loam	14	2800	39.2	Highly Saline
101	1.45	1.50	1.47	12.0			-	-	Non-Aggressive	Non-Aggressive	Sandy loam	14	2600	36.4	Highly Saline
101	2.00	2.45	2.23	11.9			-	-	Non-Aggressive	Non-Aggressive	Sandy loam	14	2000	28.0	Highly Saline
103	0.00	0.20	0.10	8.2			-	-	Non-Aggressive	Non-Aggressive	Clay loam	9	200	1.8	Non Saline
103	0.40	0.50	0.45	8.4			Mild	Non-Aggressive	-	-	Clay loam	9	220	2.0	Non Saline
103	0.90	1.00	0.95	8.3			Mild	Non-Aggressive	-	-	Clay loam	9	50	0.5	Non Saline
103	1.45	1.50	1.47	8.5	10	110	Mild	Non-Aggressive	-	-	Clay loam	9	160	1.4	Non Saline
103	2.00	2.45	2.23	8.0			Mild	Non-Aggressive	-	-	Clay loam	9	32	0.3	Non Saline
105	0.10	0.20	0.15	8.8			-	-	Non-Aggressive	Non-Aggressive	Clay loam	9	110	1.0	Non Saline
105	0.40	0.50	0.45	8.5			-	-	Non-Aggressive	Non-Aggressive	Clay loam	9	190	1.7	Non Saline
105	1.00	1.45	1.23	8.6			Mild	Non-Aggressive	-	-	Clay loam	9	130	1.2	Non Saline
105	1.45	1.50	1.45	8.7	71	38	Mild	Non-Aggressive	-	-	Clay loam	9	94	0.8	Non Saline
105	2.00	2.45	2.23	8.6			Mild	Non-Aggressive	-	-	Clay loam	9	120	1.1	Non Saline
109	0.00	0.20	0.10	10.7			-	-	Non-Aggressive	Non-Aggressive	Sandy loam	14	370	5.2	Moderately Saline
109	0.40	0.50	0.45	11.1			-	-	Non-Aggressive	Non-Aggressive	Sandy loam	14	510	7.1	Moderately Saline
109	0.90	1.00	0.95	10.9			-	-	Non-Aggressive	Non-Aggressive	Sandy loam	14	450	6.3	Moderately Saline
109	1.00	1.45	1.23	8.0	<10	280	-	-	Non-Aggressive	Non-Aggressive	Light medium clay	8	150	1.2	Non Saline
109	2.00	2.45	2.23	8.0			-	-	Non-Aggressive	Non-Aggressive	Light medium clay	8	71	0.6	Non Saline
110	0.10	0.20	0.15	8.0			-	-	Non-Aggressive	Non-Aggressive	Light medium clay	8	330	2.6	Slightly Saline
110	0.40	0.50	0.45	8.1			-	-	Non-Aggressive	Non-Aggressive	Clay loam	9	210	1.9	Non Saline
110	0.90	1.00	0.95	8.4			-	-	Non-Aggressive	Non-Aggressive	Clay loam	9	250	2.3	Slightly Saline
110	1.45	1.50	1.47	7.8			-	-	Non-Aggressive	Non-Aggressive	Light medium clay	8	72	0.6	Non Saline
110	2.00	2.45	2.23	8.2	10	<10	-	-	Non-Aggressive	Non-Aggressive	Light medium clay	8	21	0.2	Non Saline

Notes: $EC_{1.5}$ Electrical Conductivity (1:5 Soil/Water suspension)
M = Multiplier factor based on soil texture
EC_e Electrical Conductivity = $EC_{1.5}$ * M

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

CERTIFICATE OF ANALYSIS 259697

Client Details

Client	Douglas Partners Pty Ltd
Attention	Gavin Boyd
Address	96 Hermitage Rd, West Ryde, NSW, 2114

Sample Details

Your Reference	**200309.00, Emu Plains**
Number of Samples	26 SOIL
Date samples received	18/01/2021
Date completed instructions received	18/01/2021

Analysis Details

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

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

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

Report Details

Date results requested by	25/01/2021
Date of Issue	22/01/2021

NATA Accreditation Number 2901. This document shall not be reproduced except in full.

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

Results Approved By
Diego Bigolin, Team Leader, Inorganics
Priya Samarawickrama, Senior Chemist

Authorised By

Nancy Zhang, Laboratory Manager

Misc Inorg - Soil						
Our Reference		259697-1	259697-2	259697-3	259697-4	259697-5
Your Reference	UNITS	101	101	101	101	101
Depth		0-0.2	0.4-0.5	1.0-1.38	1.45-1.5	2.0-2.45
Date Sampled		14/01/2021	14/01/2021	14/01/2021	14/01/2021	14/01/2021
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date prepared	-	20/01/2021	20/01/2021	20/01/2021	20/01/2021	20/01/2021
Date analysed	-	20/01/2021	20/01/2021	20/01/2021	20/01/2021	20/01/2021
pH 1:5 soil:water	pH Units	10.8	11.2	12.1	12.0	11.9

Misc Inorg - Soil						
Our Reference		259697-6	259697-7	259697-8	259697-9	259697-10
Your Reference	UNITS	103	103	103	103	103
Depth		0-0.2	0.4-0.5	0.9-1.0	1.45-1.5	2.0-2.45
Date Sampled		14/01/2021	14/01/2021	14/01/2021	14/01/2021	14/01/2021
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date prepared	-	20/01/2021	20/01/2021	20/01/2021	20/01/2021	20/01/2021
Date analysed	-	20/01/2021	20/01/2021	20/01/2021	20/01/2021	20/01/2021
pH 1:5 soil:water	pH Units	8.2	8.4	8.3	8.5	8.0
Chloride, Cl 1:5 soil:water	mg/kg	[NA]	[NA]	[NA]	10	[NA]
Sulphate, SO4 1:5 soil:water	mg/kg	[NA]	[NA]	[NA]	110	[NA]

Misc Inorg - Soil						
Our Reference		259697-11	259697-12	259697-13	259697-14	259697-15
Your Reference	UNITS	105	105	105	105	105
Depth		0.1-0.2	0.4-0.5	1-1.45	1.45-1.5	2-2.45
Date Sampled		14/01/2021	14/01/2021	14/01/2021	14/01/2021	14/01/2021
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date prepared	-	20/01/2021	20/01/2021	20/01/2021	20/01/2021	20/01/2021
Date analysed	-	20/01/2021	20/01/2021	20/01/2021	20/01/2021	20/01/2021
pH 1:5 soil:water	pH Units	8.8	8.5	8.6	8.7	8.6
Chloride, Cl 1:5 soil:water	mg/kg	[NA]	[NA]	[NA]	71	[NA]
Sulphate, SO4 1:5 soil:water	mg/kg	[NA]	[NA]	[NA]	38	[NA]

Misc Inorg - Soil						
Our Reference		259697-16	259697-17	259697-18	259697-19	259697-20
Your Reference	UNITS	109	109	109	109	109
Depth		0-0.2	0.4-0.5	0.9-1.0	1-1.45	2.0-2.45
Date Sampled		14/01/2021	14/01/2021	14/01/2021	14/01/2021	14/01/2021
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date prepared	-	20/01/2021	20/01/2021	20/01/2021	20/01/2021	20/01/2021
Date analysed	-	20/01/2021	20/01/2021	20/01/2021	20/01/2021	20/01/2021
pH 1:5 soil:water	pH Units	10.7	11.1	10.9	8.0	8.0
Chloride, Cl 1:5 soil:water	mg/kg	[NA]	[NA]	[NA]	<10	[NA]
Sulphate, SO4 1:5 soil:water	mg/kg	[NA]	[NA]	[NA]	280	[NA]

Misc Inorg - Soil						
Our Reference		259697-21	259697-22	259697-23	259697-24	259697-25
Your Reference	UNITS	110	110	110	110	110
Depth		0.1-0.2	0.4-0.5	0.9-1.0	1.45-1.5	2.0-2.45
Date Sampled		14/01/2021	14/01/2021	14/01/2021	14/01/2021	14/01/2021
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date prepared	-	20/01/2021	20/01/2021	20/01/2021	20/01/2021	20/01/2021
Date analysed	-	20/01/2021	20/01/2021	20/01/2021	20/01/2021	20/01/2021
pH 1:5 soil:water	pH Units	8.0	8.1	8.4	7.8	8.2
Chloride, Cl 1:5 soil:water	mg/kg	[NA]	[NA]	[NA]	[NA]	10
Sulphate, SO4 1:5 soil:water	mg/kg	[NA]	[NA]	[NA]	[NA]	<10

Texture and Salinity*						
Our Reference		259697-1	259697-2	259697-3	259697-4	259697-5
Your Reference	UNITS	101	101	101	101	101
Depth		0-0.2	0.4-0.5	1.0-1.38	1.45-1.5	2.0-2.45
Date Sampled		14/01/2021	14/01/2021	14/01/2021	14/01/2021	14/01/2021
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date prepared	-	20/01/2021	20/01/2021	20/01/2021	20/01/2021	20/01/2021
Date analysed	-	20/01/2021	20/01/2021	20/01/2021	20/01/2021	20/01/2021
Electrical Conductivity 1:5 soil:water	µS/cm	370	680	2,800	2,600	2,000
Texture Value	-	14	14	14	14	14
Texture	-	SANDY LOAM	SANDY LOAM	SANDY LOAM	SANDY LOAM	SANDY LOAM
ECe	dS/m	5.2	9.6	40	36	28
Class	-	MODERATELY SALINE	VERY SALINE	HIGHLY SALINE	HIGHLY SALINE	HIGHLY SALINE

Texture and Salinity*						
Our Reference		259697-6	259697-7	259697-8	259697-9	259697-10
Your Reference	UNITS	103	103	103	103	103
Depth		0-0.2	0.4-0.5	0.9-1.0	1.45-1.5	2.0-2.45
Date Sampled		14/01/2021	14/01/2021	14/01/2021	14/01/2021	14/01/2021
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date prepared	-	20/01/2021	20/01/2021	20/01/2021	20/01/2021	20/01/2021
Date analysed	-	20/01/2021	20/01/2021	20/01/2021	20/01/2021	20/01/2021
Electrical Conductivity 1:5 soil:water	µS/cm	200	220	50	160	32
Texture Value	-	9.0	9.0	9.0	9.0	9.0
Texture	-	CLAY LOAM	CLAY LOAM	CLAY LOAM	CLAY LOAM	CLAY LOAM
ECe	dS/m	<2	<2	<2	<2	<2
Class	-	NON SALINE	NON SALINE	NON SALINE	NON SALINE	NON SALINE

Texture and Salinity*						
Our Reference		259697-11	259697-12	259697-13	259697-14	259697-15
Your Reference	UNITS	105	105	105	105	105
Depth		0.1-0.2	0.4-0.5	1-1.45	1.45-1.5	2-2.45
Date Sampled		14/01/2021	14/01/2021	14/01/2021	14/01/2021	14/01/2021
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date prepared	-	20/01/2021	20/01/2021	20/01/2021	20/01/2021	20/01/2021
Date analysed	-	20/01/2021	20/01/2021	20/01/2021	20/01/2021	20/01/2021
Electrical Conductivity 1:5 soil:water	µS/cm	110	190	130	94	120
Texture Value	-	9.0	9.0	9.0	9.0	9.0
Texture	-	CLAY LOAM	CLAY LOAM	CLAY LOAM	CLAY LOAM	CLAY LOAM
ECe	dS/m	<2	<2	<2	<2	<2
Class	-	NON SALINE	NON SALINE	NON SALINE	NON SALINE	NON SALINE

Texture and Salinity*						
Our Reference		259697-16	259697-17	259697-18	259697-19	259697-20
Your Reference	UNITS	109	109	109	109	109
Depth		0-0.2	0.4-0.5	0.9-1.0	1-1.45	2.0-2.45
Date Sampled		14/01/2021	14/01/2021	14/01/2021	14/01/2021	14/01/2021
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date prepared	-	20/01/2021	20/01/2021	20/01/2021	20/01/2021	20/01/2021
Date analysed	-	20/01/2021	20/01/2021	20/01/2021	20/01/2021	20/01/2021
Electrical Conductivity 1:5 soil:water	µS/cm	370	510	450	150	71
Texture Value	-	14	14	14	8.0	8.0
Texture	-	SANDY LOAM	SANDY LOAM	SANDY LOAM	LIGHT MEDIUM CLAY	LIGHT MEDIUM CLAY
ECe	dS/m	5.2	7.2	6.3	<2	<2
Class	-	MODERATELY SALINE	MODERATELY SALINE	MODERATELY SALINE	NON SALINE	NON SALINE

Texture and Salinity*						
Our Reference		259697-21	259697-22	259697-23	259697-24	259697-25
Your Reference	UNITS	110	110	110	110	110
Depth		0.1-0.2	0.4-0.5	0.9-1.0	1.45-1.5	2.0-2.45
Date Sampled		14/01/2021	14/01/2021	14/01/2021	14/01/2021	14/01/2021
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date prepared	-	20/01/2021	20/01/2021	20/01/2021	20/01/2021	20/01/2021
Date analysed	-	20/01/2021	20/01/2021	20/01/2021	20/01/2021	20/01/2021
Electrical Conductivity 1:5 soil:water	µS/cm	330	210	250	72	21
Texture Value	-	8.0	9.0	9.0	8.0	8.0
Texture	-	LIGHT MEDIUM CLAY	CLAY LOAM	CLAY LOAM	LIGHT MEDIUM CLAY	LIGHT MEDIUM CLAY
ECe	dS/m	2.7	<2	2.3	<2	<2
Class	-	SLIGHTLY SALINE	NON SALINE	SLIGHTLY SALINE	NON SALINE	NON SALINE

Method ID	Methodology Summary
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA latest edition, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-002	Conductivity and Salinity - measured using a conductivity cell at 25°C in accordance with APHA latest edition 2510 and Rayment & Lyons.
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA latest edition, 4110-B. Waters samples are filtered on receipt prior to analysis. Alternatively determined by colourimetry/turbidity using Discrete Analyser.
INORG-123	Determined using a "Texture by Feel" method.

QUALITY CONTROL: Misc Inorg - Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			20/01/2021	6	20/01/2021	20/01/2021		20/01/2021	[NT]
Date analysed	-			20/01/2021	6	20/01/2021	20/01/2021		20/01/2021	[NT]
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	6	8.2	8.2	0	102	[NT]
Chloride, Cl 1:5 soil:water	mg/kg	10	Inorg-081	<10	[NT]	[NT]	[NT]	[NT]	118	[NT]
Sulphate, SO4 1:5 soil:water	mg/kg	10	Inorg-081	<10	[NT]	[NT]	[NT]	[NT]	109	[NT]

QUALITY CONTROL: Misc Inorg - Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-2	[NT]
Date prepared	-			[NT]	13	20/01/2021	20/01/2021		20/01/2021	[NT]
Date analysed	-			[NT]	13	20/01/2021	20/01/2021		20/01/2021	[NT]
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	13	8.6	8.7	1	101	[NT]

QUALITY CONTROL: Misc Inorg - Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	21	20/01/2021	20/01/2021		[NT]	[NT]
Date analysed	-			[NT]	21	20/01/2021	20/01/2021		[NT]	[NT]
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	21	8.0	8.2	2	[NT]	[NT]

QUALITY CONTROL: Texture and Salinity*						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			20/01/2021	6	20/01/2021	20/01/2021		20/01/2021	[NT]
Date analysed	-			20/01/2021	6	20/01/2021	20/01/2021		20/01/2021	[NT]
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	<1	6	200	210	5	98	[NT]
Texture Value	-		INORG-123	[NT]	6	9.0	9.0	0	[NT]	[NT]

QUALITY CONTROL: Texture and Salinity*						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-2	[NT]
Date prepared	-			[NT]	13	20/01/2021	20/01/2021		20/01/2021	[NT]
Date analysed	-			[NT]	13	20/01/2021	20/01/2021		20/01/2021	[NT]
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	[NT]	13	130	99	27	98	[NT]
Texture Value	-		INORG-123	[NT]	13	9.0	9.0	0	[NT]	[NT]

QUALITY CONTROL: Texture and Salinity*						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	21	20/01/2021	20/01/2021		[NT]	[NT]
Date analysed	-			[NT]	21	20/01/2021	20/01/2021		[NT]	[NT]
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	[NT]	21	330	320	3	[NT]	[NT]
Texture Value	-		INORG-123	[NT]	21	8.0	8.0	0	[NT]	[NT]

Result Definitions

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

Quality Control Definitions

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

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

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

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

Laboratory Acceptance Criteria

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

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

Spikes for Physical and Aggregate Tests are not applicable.

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

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

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

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

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

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

Measurement Uncertainty estimates are available for most tests upon request.

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

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

Douglas Partners
Geotechnics · Environment · Groundwater

CHAIN OF CUSTODY

SCA0542

Project Name: Emu Plains ..... To: Envirolab Services
Project No: 200309.00..... Sampler:G Boyd..... .....
Project Mgr: G Boyd .....Mob. Phone: 0431 496 721
Email: gavin.boyd@douglaspartners.com.au .....
Date Required: Standard Lab Quote No. .....

12 Ashley Street, Chatswood NSW 2067
Attn: Tania Notaras
Phone: 02 9910 6200 Fax: 02 9910 6201
Email: tnotaras@envirolabservices.com.au

Sample ID	Sample Depth	Lab ID	Sampling Date	Sample Type S - soil W – water	Container type	Analytes										Notes
						pH	eCe	Textural Class	CL, SO4							
101	0.0-0.2	1	14/1	S	P	•	•	•								
101	0.4-0.5	2	14/1	S	P	•	•	•								
101	1.0-1.38	3	14/1	S	P	•	•	•								
101	1.45-1.5	4	14/1	S	P	•	•	•								
101	2.0-2.45	5	14/1	S	P	•	•	•								
103	0.0-0.2	6	14/1	S	P	•	•	•								
103	0.4-0.5	7	14/1	S	P	•	•	•								
103	0.9-1.0	8	14/1	S	P	•	•	•								
103	1.45-1.5	9	14/1	S	P	•	•	•	•							
103	2.0-2.45	10	14/1	S	P	•	•	•								
105	0.1-0.2	11	14/1	S	P	•	•	•								
105	0.4-0.5	12	14/1	S	P	•	•	•								

ENVIROLAB

Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200

Job No: 259607
Date Received: 18-01-2021.
Time Received: 1515
Received By: VG
Temp: Cool/Ambient 18.1°C
Cooling: Ice/icepack
Security: Intact/Broken/None

Lab Report No. .....
Send Results to: Douglas Partners Address: 96 Hermitage Road, West Ryde 2114
Phone: (02) 9809 0666
Fax: (02) 9809 4095

Relinquished by:	GB	Signed:	Date & Time: 16/7 – 1pm	Received By:	Date & Time:
Relinquished by:		Signed:	Date & Time:	Received By: K-Chow	Date & Time: 18-1-21 1515

Douglas Partners
Geotechnics · Environment · Groundwater

CHAIN OF CUSTODY

Project Name: Emu Plains ..... To: Envirolab Services
Project No: 200309.00..... Sampler:G Boyd..... ..... 12 Ashley Street, Chatswood NSW 2068
Project Mgr: G Boyd .....Mob. Phone: 0431 496 721 Attn: Tania Notaras
Email: gavin.boyd@douglaspartners.com.au ..... Phone: 02 9910 6200 Fax: 02 9910 6201
Date Required: Standard Lab Quote No. ..... Email: tnotaras@envirolabservices.com.au

Sample ID	Sample Depth	Lab ID	Sampling Date	Sample Type S - soil W – water	Container type	Analytes										Notes
						pH	eCe	Textural Class	CL, SO4							
105	1.0-1.45	13	14/1	S	P	•	•	•								
105	1.45-1.5	14	14/1	S	P	•	•	•	•							
105	2.0-2.45	15	14/1	S	P	•	•	•								
109	0.0-0.2	16	14/1	S	P	•	•	•								
109	0.4-0.5	17	14/1	S	P	•	•	•								
109	0.9-1.0	18	14/1	S	P	•	•	•								
109	~~1.45-1.5~~ (KZ) 1-1.45	19	14/1	S	P	•	•	•	•							
109	2.0-2.45	20	14/1	S	P	•	•	•								
110	0.1-0.2	21	14/1	S	P	•	•	•								
110	0.4-0.5	22	14/1	S	P	•	•	•								
110	0.9-1.0	23	14/1	S	P	•	•	•								
110	1.45-1.5	24	14/1	S	P	•	•	•								
110	2.0-2.45	25	14/1	S	P	•	•	•	•							
extra 110	1-1.45	26	14/1	S	P											

Lab Report No. ..... 259697. Phone: (02) 9809 0666
Send Results to: Douglas Partners Address: 96 Hermitage Road, West Ryde 2114 Fax: (02) 9809 4095

Relinquished by: GB	Signed:	Date & Time: 16/7 – 1pm	Received By:	Date & Time:	
Relinquished by:	Signed:	Date & Time:	Received By: K.Cove	Date & Time: 18-1-21	1515.

Material Test Report

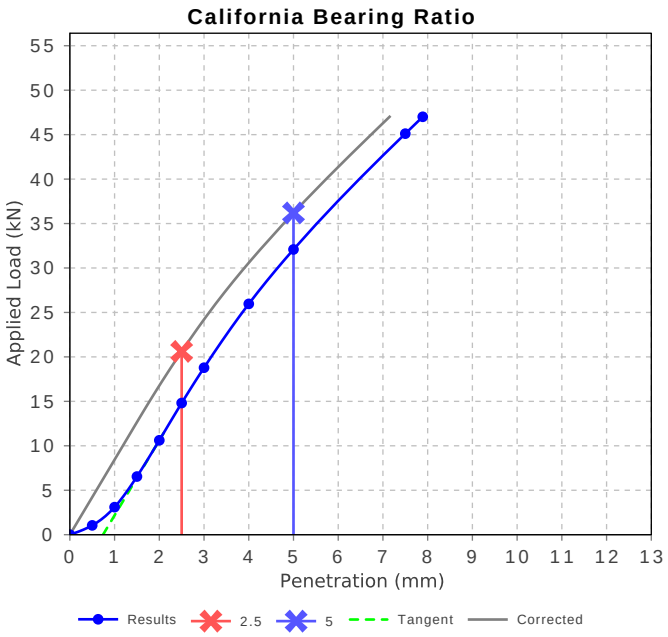
Douglas Partners
Geotechnics / Environment / Groundwater
Douglas Partners Pty Ltd
Unanderra Laboratory
Unit 1/1 Luso Drive Unanderra NSW 2526
Phone: (02) 4271 1836
Fax: (02) 4271 1897
Email: anes.ibricic@douglaspartners.com.au

Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Anes Ibricic
Laboratory Manager
Laboratory Accreditation Number: 828

Report Number: **200309.00-1**
Issue Number: 1
Date Issued: 01/02/2021
Client: JBS&G Australia Pty Ltd
Level 1, 50 Margaret Street, Sydney NSW 2000
Contact: Rohan Hammond
Project Number: 200309.00
Project Name: Rocla Site - Proposed Development
Project Location: 158-164 Old Bathurst Road, Emu Plains
Work Request: 6764
Sample Number: WO-6764A
Date Sampled: 18/01/2021
Dates Tested: 20/01/2021 - 27/01/2021
Sampling Method: Sampled by Engineering Department
The results apply to the sample as received
Sample Location: **101, Depth: 0 - 0.8m**
Material: Fill/Roadbase: medium to coarse crushed igneous rock

California Bearing Ratio (AS 1289 6.1.1 & 2.1.1)		Min	Max
CBR taken at	5 mm		
CBR %	**180**		
Method of Compactive Effort	Standard		
Method used to Determine MDD	AS 1289 5.1.1 & 2.1.1		
Method used to Determine Plasticity	Visual Assessment		
Maximum Dry Density (t/m^3)	1.82		
Optimum Moisture Content (%)	14.0		
Laboratory Density Ratio (%)	100.0		
Laboratory Moisture Ratio (%)	100.0		
Dry Density after Soaking (t/m^3)	1.82		
Field Moisture Content (%)	10.4		
Moisture Content at Placement (%)	14.0		
Moisture Content Top 30mm (%)	15.8		
Moisture Content Rest of Sample (%)	14.6		
Mass Surcharge (kg)	4.5		
Soaking Period (days)	4		
Curing Hours	48		
Swell (%)	-0.5		
Oversize Material (mm)	19		
Oversize Material Included	Excluded		
Oversize Material (%)	0.8		
The maximum load has been reached for the CBR Machine. Maximum Applied Load 47.007 kN, Penetration at Maximum Applied Load 7.890 mm.			



This document shall not be reproduced except in full without approval of the laboratory.
Results relate only to the items tested/sampled.

Material Test Report

Douglas Partners
Geotechnics / Environment / Groundwater
Douglas Partners Pty Ltd
Unanderra Laboratory
Unit 1/1 Luso Drive Unanderra NSW 2526
Phone: (02) 4271 1836
Fax: (02) 4271 1897
Email: anes.ibricic@douglaspartners.com.au

Accredited for compliance with ISO/IEC 17025 - Testing

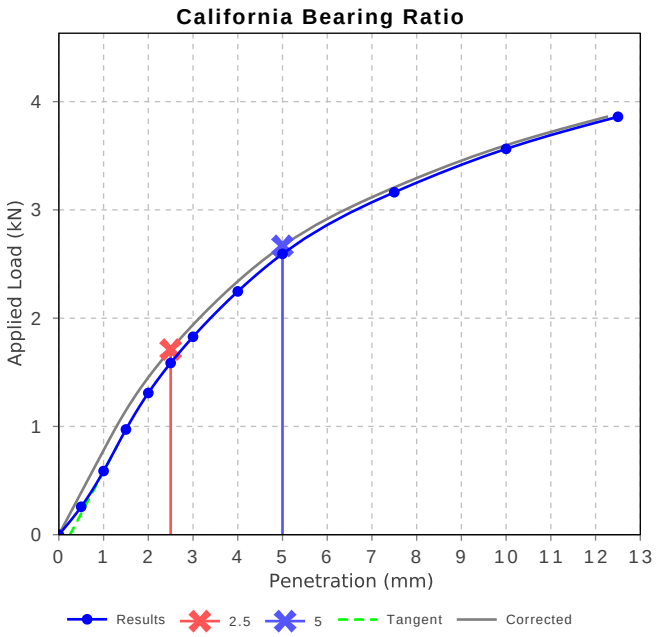
Approved Signatory: Anes Ibricic
Laboratory Manager
Laboratory Accreditation Number: 828

Report Number: **200309.00-1**
Issue Number: 1
Date Issued: 01/02/2021
Client: JBS&G Australia Pty Ltd
Level 1, 50 Margaret Street, Sydney NSW 2000
Contact: Rohan Hammond
Project Number: 200309.00
Project Name: Rocla Site - Proposed Development
Project Location: 158-164 Old Bathurst Road, Emu Plains
Work Request: 6764
Sample Number: WO-6764B
Date Sampled: 18/01/2021
Dates Tested: 20/01/2021 - 28/01/2021
Sampling Method: Sampled by Engineering Department
The results apply to the sample as received
Sample Location: **103, Depth: 0.3 - 1.5m**
Material: Clayey Sand orange brown

California Bearing Ratio (AS 1289 6.1.1 & 2.1.1)		Min	Max
CBR taken at	5 mm		
CBR %	**13**		
Method of Compactive Effort	Standard		
Method used to Determine MDD	AS 1289 5.1.1 & 2.1.1		
Method used to Determine Plasticity	Visual Assessment		
Maximum Dry Density (t/m^3)	1.91		
Optimum Moisture Content (%)	12.5		
Laboratory Density Ratio (%)	100.0		
Laboratory Moisture Ratio (%)	98.5		
Dry Density after Soaking (t/m^3)	1.90		
Field Moisture Content (%)	8.7		
Moisture Content at Placement (%)	12.5		
Moisture Content Top 30mm (%)	16.1		
Moisture Content Rest of Sample (%)	13.0		
Mass Surcharge (kg)	4.5		
Soaking Period (days)	4		
Curing Hours	69.8		
Swell (%)	0.5		
Oversize Material (mm)	19		
Oversize Material Included	Excluded		
Oversize Material (%)	0		

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	21		
Plastic Limit (%)	14		
Plasticity Index (%)	**7**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)	3.5		
Cracking Crumbling Curling	None		



This document shall not be reproduced except in full without approval of the laboratory.
Results relate only to the items tested/sampled.

Material Test Report

Douglas Partners
Geotechnics / Environment / Groundwater
Douglas Partners Pty Ltd
Unanderra Laboratory
Unit 1/1 Luso Drive Unanderra NSW 2526
Phone: (02) 4271 1836
Fax: (02) 4271 1897
Email: anes.ibricic@douglaspartners.com.au

Accredited for compliance with ISO/IEC 17025 - Testing

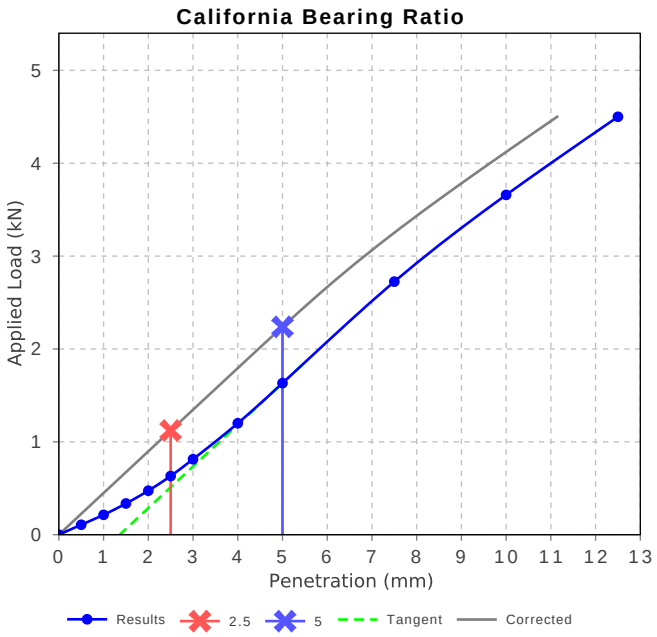
Approved Signatory: Anes Ibricic
Laboratory Manager
Laboratory Accreditation Number: 828

Report Number: **200309.00-1**
Issue Number: 1
Date Issued: 01/02/2021
Client: JBS&G Australia Pty Ltd
Level 1, 50 Margaret Street, Sydney NSW 2000
Contact: Rohan Hammond
Project Number: 200309.00
Project Name: Rocla Site - Proposed Development
Project Location: 158-164 Old Bathurst Road, Emu Plains
Work Request: 6764
Sample Number: WO-6764C
Date Sampled: 18/01/2021
Dates Tested: 20/01/2021 - 28/01/2021
Sampling Method: Sampled by Engineering Department
The results apply to the sample as received
Sample Location: **105, Depth: 0.3 - 0.8m**
Material: Silty Clay; orange brown traces of sand

California Bearing Ratio (AS 1289 6.1.1 & 2.1.1)		Min	Max
CBR taken at	5 mm		
CBR %	**11**		
Method of Compactive Effort	Standard		
Method used to Determine MDD	AS 1289 5.1.1 & 2.1.1		
Method used to Determine Plasticity	Visual Assessment		
Maximum Dry Density (t/m^3)	1.95		
Optimum Moisture Content (%)	11.5		
Laboratory Density Ratio (%)	90.5		
Laboratory Moisture Ratio (%)	101.0		
Dry Density after Soaking (t/m^3)	1.77		
Field Moisture Content (%)	8.7		
Moisture Content at Placement (%)	11.7		
Moisture Content Top 30mm (%)	13.0		
Moisture Content Rest of Sample (%)	12.5		
Mass Surcharge (kg)	4.5		
Soaking Period (days)	4		
Curing Hours	72		
Swell (%)	0.0		
Oversize Material (mm)	19		
Oversize Material Included	Excluded		
Oversize Material (%)	0		

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Wet Sieve		
Liquid Limit (%)	16		
Plastic Limit (%)	14		
Plasticity Index (%)	**2**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)	0.5		
Cracking Crumbling Curling	Cracking		



This document shall not be reproduced except in full without approval of the laboratory.
Results relate only to the items tested/sampled.

Material Test Report

Douglas Partners
Geotechnics / Environment / Groundwater
Douglas Partners Pty Ltd
Unanderra Laboratory
Unit 1/1 Luso Drive Unanderra NSW 2526
Phone: (02) 4271 1836
Fax: (02) 4271 1897
Email: anes.ibricic@douglaspartners.com.au

Accredited for compliance with ISO/IEC 17025 - Testing

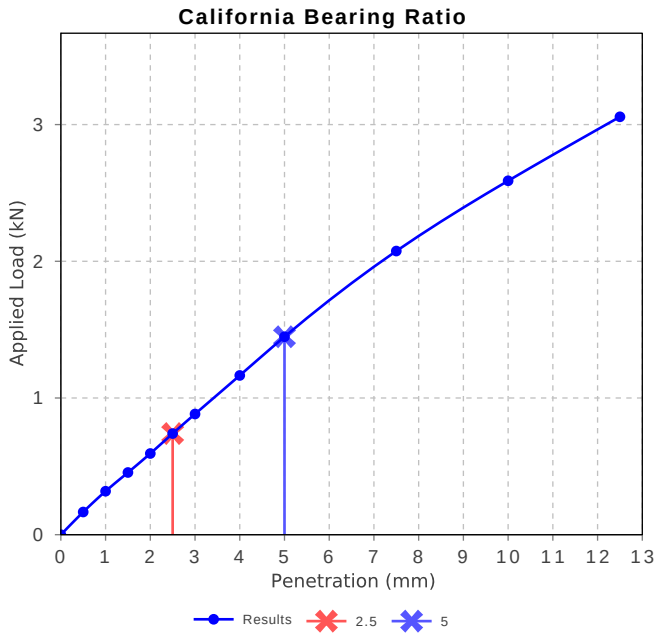
Approved Signatory: Anes Ibricic
Laboratory Manager
Laboratory Accreditation Number: 828

Report Number: **200309.00-1**
Issue Number: 1
Date Issued: 01/02/2021
Client: JBS&G Australia Pty Ltd
Level 1, 50 Margaret Street, Sydney NSW 2000
Contact: Rohan Hammond
Project Number: 200309.00
Project Name: Rocla Site - Proposed Development
Project Location: 158-164 Old Bathurst Road, Emu Plains
Work Request: 6764
Sample Number: WO-6764D
Date Sampled: 18/01/2021
Dates Tested: 20/01/2021 - 28/01/2021
Sampling Method: Sampled by Engineering Department
The results apply to the sample as received
Sample Location: **107, Depth: 0.5 - 1.5m**
Material: Sandy Clay; orange brown

California Bearing Ratio (AS 1289 6.1.1 & 2.1.1)		Min	Max
CBR taken at	5 mm		
CBR %	**7**		
Method of Compactive Effort	Standard		
Method used to Determine MDD	AS 1289 5.1.1 & 2.1.1		
Method used to Determine Plasticity	Visual Assessment		
Maximum Dry Density (t/m^3)	1.92		
Optimum Moisture Content (%)	13.0		
Laboratory Density Ratio (%)	99.5		
Laboratory Moisture Ratio (%)	99.0		
Dry Density after Soaking (t/m^3)	1.91		
Field Moisture Content (%)	12.6		
Moisture Content at Placement (%)	12.9		
Moisture Content Top 30mm (%)	14.8		
Moisture Content Rest of Sample (%)	13.6		
Mass Surcharge (kg)	4.5		
Soaking Period (days)	4		
Curing Hours	68.8		
Swell (%)	0.0		
Oversize Material (mm)	19		
Oversize Material Included	Excluded		
Oversize Material (%)	0		

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	19		
Plastic Limit (%)	12		
Plasticity Index (%)	**7**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)	3.5		
Cracking Crumbling Curling	None		



This document shall not be reproduced except in full without approval of the laboratory.
Results relate only to the items tested/sampled.

Material Test Report

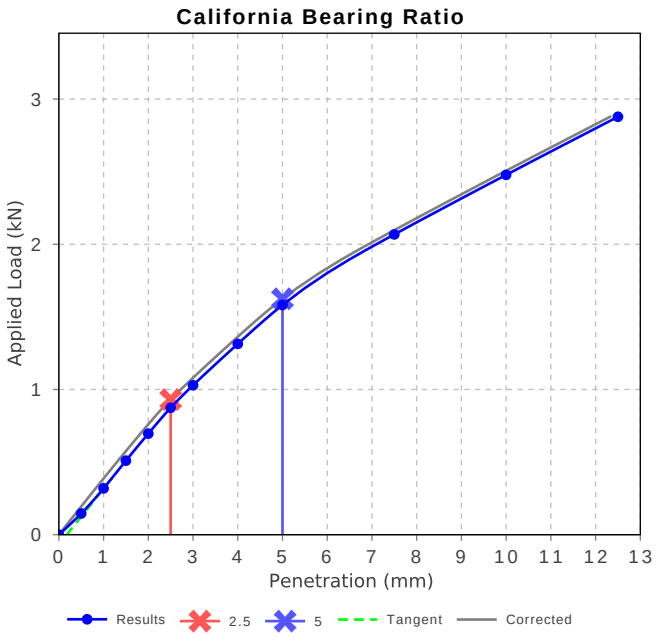
Douglas Partners
Geotechnics / Environment / Groundwater
Douglas Partners Pty Ltd
Unanderra Laboratory
Unit 1/1 Luso Drive Unanderra NSW 2526
Phone: (02) 4271 1836
Fax: (02) 4271 1897
Email: anes.ibricic@douglaspartners.com.au

Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Anes Ibricic
Laboratory Manager
Laboratory Accreditation Number: 828

Report Number: **200309.00-1**
Issue Number: 1
Date Issued: 01/02/2021
Client: JBS&G Australia Pty Ltd
Level 1, 50 Margaret Street, Sydney NSW 2000
Contact: Rohan Hammond
Project Number: 200309.00
Project Name: Rocla Site - Proposed Development
Project Location: 158-164 Old Bathurst Road, Emu Plains
Work Request: 6764
Sample Number: WO-6764E
Date Sampled: 18/01/2021
Dates Tested: 20/01/2021 - 27/01/2021
Sampling Method: Sampled by Engineering Department
The results apply to the sample as received
Sample Location: **108, Depth: 0.5 - 1.5m**
Material: Silty Clay; orange brown

California Bearing Ratio (AS 1289 6.1.1 & 2.1.1)		Min	Max
CBR taken at	5 mm		
CBR %	**8**		
Method of Compactive Effort	Standard		
Method used to Determine MDD	AS 1289 5.1.1 & 2.1.1		
Method used to Determine Plasticity	Visual Assessment		
Maximum Dry Density (t/m^3)	1.91		
Optimum Moisture Content (%)	12.5		
Laboratory Density Ratio (%)	100.0		
Laboratory Moisture Ratio (%)	98.5		
Dry Density after Soaking (t/m^3)	1.91		
Field Moisture Content (%)	10.4		
Moisture Content at Placement (%)	12.1		
Moisture Content Top 30mm (%)	16.7		
Moisture Content Rest of Sample (%)	14.4		
Mass Surcharge (kg)	4.5		
Soaking Period (days)	4		
Curing Hours	68.4		
Swell (%)	0.5		
Oversize Material (mm)	19		
Oversize Material Included	Excluded		
Oversize Material (%)	0		



This document shall not be reproduced except in full without approval of the laboratory.
Results relate only to the items tested/sampled.

Material Test Report

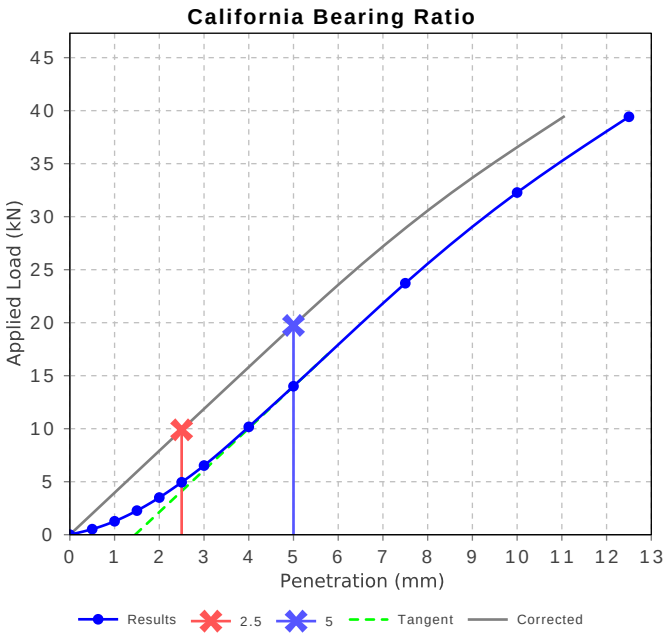
Douglas Partners
Geotechnics / Environment / Groundwater
Douglas Partners Pty Ltd
Unanderra Laboratory
Unit 1/1 Luso Drive Unanderra NSW 2526
Phone: (02) 4271 1836
Fax: (02) 4271 1897
Email: anes.ibricic@douglaspartners.com.au

Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Anes Ibricic
Laboratory Manager
Laboratory Accreditation Number: 828

Report Number: **200309.00-1**
Issue Number: 1
Date Issued: 01/02/2021
Client: JBS&G Australia Pty Ltd
Level 1, 50 Margaret Street, Sydney NSW 2000
Contact: Rohan Hammond
Project Number: 200309.00
Project Name: Rocla Site - Proposed Development
Project Location: 158-164 Old Bathurst Road, Emu Plains
Work Request: 6764
Sample Number: WO-6764F
Date Sampled: 18/01/2021
Dates Tested: 20/01/2021 - 27/01/2021
Sampling Method: Sampled by Engineering Department
The results apply to the sample as received
Sample Location: **109, Depth: 0.0 - 0.8m**
Material: Fill/roadbase: medium to coarse crushed igneous rock

California Bearing Ratio (AS 1289 6.1.1 & 2.1.1)		Min	Max
CBR taken at	5 mm		
CBR %	**100**		
Method of Compactive Effort	Standard		
Method used to Determine MDD	AS 1289 5.1.1 & 2.1.1		
Method used to Determine Plasticity	Visual Assessment		
Maximum Dry Density (t/m^3)	1.91		
Optimum Moisture Content (%)	14.0		
Laboratory Density Ratio (%)	99.5		
Laboratory Moisture Ratio (%)	98.5		
Dry Density after Soaking (t/m^3)	1.91		
Field Moisture Content (%)	12.9		
Moisture Content at Placement (%)	13.8		
Moisture Content Top 30mm (%)	14.1		
Moisture Content Rest of Sample (%)	13.9		
Mass Surcharge (kg)	4.5		
Soaking Period (days)	4		
Curing Hours	68		
Swell (%)	-0.5		
Oversize Material (mm)	19		
Oversize Material Included	Excluded		
Oversize Material (%)	1.4		



This document shall not be reproduced except in full without approval of the laboratory.
Results relate only to the items tested/sampled.

Appendix E

Results of Previous Investigations (by others)

Legend:

- Approximate Site Boundary
- NSW Cadastre (DFSI, 2020)

Exisiting Sample Locations

- Groundwater Monitoring Well (Ramboll, 2020)
- Soil Borehole (Ramboll, 2020)

Proposed Sample Locations

- Groundwater Monitoring Well (JBS&G 2021)
- Soil Vapour (JBS&G 2021)
- Targeted Soil Borehole (JBS&G 2021)
- Systematic Soil Borehole (JBS&G 2021)

no location → S08 ~~S28~~ ~~S34~~
S12 ~~S39~~ ~~S40~~
S13 ~~S38~~ ~~no location~~
~~S20~~ inaccessible

JBS&G

Job No: 60007	
Client: Penrith City Council	
Version: R01 Rev A	Date 7/01/2021
Drawn By: RF	Checked By: RH
Scale 1:3,000	
0 40 80 metres	
Coord. Sys. GDA 1994 MGA Zone 56	

158-164 Old Bathurst Road, Emu Plains

Current & historic
~~**PROPOSED**~~ **SAMPLE LOCATION** ~~**PLAN**~~ **-**
~~**SOIL BORE**~~
+ layout over development plan.

FIGURE 5A

File Name: N:\Projects\Penrith City Council\60007 Rocla Site Investigation - Emu Plains\GIS\Maps\R01 Rev A\60007_05A_Sample_Locs_Soil.mxd
Reference: NSW DFSI, 2019

TEST PIT S01

PROJECT NUMBER 60007
PROJECT NAME PCC DSI and RAP
CLIENT Penrith City Council
ADDRESS 158 to 164 Old Bathurst Road, Emu Plains, NSW

DRILLING COMPANY Ken Coles
DRILLING DATE 14-Jan-21
DRILL RIG
DRILLING METHOD Test Pit
DIMENSIONS 2 x 0.5 m

EASTING N/A
NORTHING N/A
COORD SYS N/A
COORD SOURCE Map Approximation
LOGGED BY T Frisken

COMMENTS

Drilling Method	Water (m bgl)	Depth (m bgl)	Graphic Log	Lithological Class	Lithological Description	Moisture	Samples	PID	Additional Observations
		0.5		Fill	FILL - Roadbase, brown-grey, heterogeneous, dry, well graded, very dense, coarse gravels, inclusions of concrete and igneous gravels		S01_0-0.1		No staining, odours or ACM observed
		1		Fill	FILL - Roadbase, brown, heterogeneous, dry, well graded, very dense, coarse gravels, inclusions of igneous gravels, ash and slag		S01_0.4-0.5		No staining, odours or ACM observed
				CH-MH	Silty CLAY - brown, homogeneous, dry, high plasticity,		S01_0.9-1.0		No staining, odours or ACM observed
		1.5			Termination Depth at: 1.3 m.				
		2							
		2.5							
		3							
		3.5							
		4							
		4.5							
		5							
		5.5							
		6							
		6.5							
		7							
		7.5							
		8							
		8.5							
		9							
		9.5							

DRAFT

Disclaimer This log is intended for environmental not geotechnical purposes.

produced by ESlog.ESdat.net on 03 Feb 2021

TEST PIT S02

PROJECT NUMBER 60007
PROJECT NAME PCC DSI and RAP
CLIENT Penrith City Council
ADDRESS 158 to 164 Old Bathurst Road, Emu Plains, NSW

DRILLING COMPANY Ken Coles
DRILLING DATE 14-Jan-21
DRILL RIG
DRILLING METHOD Test Pit
DIMENSIONS 2 x 0.5 m

EASTING N/A
NORTHING N/A
COORD SYS N/A
COORD SOURCE Map Approximation
LOGGED BY T Frisken

COMMENTS Refusal on compacted roadbase with Reo inclusions

Drilling Method	Water (m bgl)	Depth (m bgl)	Graphic Log	Lithological Class	Lithological Description	Moisture	Samples	PID	Additional Observations
		0		Fill	FILL - Roadbase, brown-grey, heterogeneous, dry, well graded, very dense, coarse gravels, inclusions of concrete, igneous gravels and large amount of reinforcment bars		S02_0.0-0.1		No staining, odours or ACM observed
		0.5		Fill	FILL - Roadbase, brown, heterogeneous, dry, well graded, very dense, coarse gravels, inclusions of concrete, igneous gravels and large amount of reinforcment bars - Refusal		S02_0.4-0.5		No staining, odours or ACM observed
		1			Termination Depth at: 0.5 m.				
		1.5							
		2							
		2.5							
		3							
		3.5							
		4							
		4.5							
		5							
		5.5							
		6							
		6.5							
		7							
		7.5							
		8							
		8.5							
		9							
		9.5							

DRAFT

Disclaimer This log is intended for environmental not geotechnical purposes.
produced by ESlog.ESdat.net on 03 Feb 2021

TEST PIT S03

PROJECT NUMBER 60007
PROJECT NAME PCC DSI and RAP
CLIENT Penrith City Council
ADDRESS 158 to 164 Old Bathurst Road, Emu Plains, NSW

DRILLING COMPANY Ken Coles
DRILLING DATE 14-Jan-21
DRILL RIG
DRILLING METHOD Test Pit
DIMENSIONS 2 x 0.5 m

EASTING N/A
NORTHING N/A
COORD SYS N/A
COORD SOURCE Map Approximation
LOGGED BY T Frisken

COMMENTS

Drilling Method	Water (m bgl)	Depth (m bgl)	Graphic Log	Lithological Class	Lithological Description	Moisture	Samples	PID	Additional Observations
		0.5		Fill	FILL - Roadbase, brown-grey, heterogeneous, dry, well graded, very dense, coarse gravels, inclusions of concrete, igneous gravels, wire and metal		S03_0-0.1	0.7	No staining, odours or ACM observed
				Fill			S03_0.4-0.5	0.6	No staining, odours or ACM observed
				CL-ML	FILL - Lense of extremely dense compacted roadbase		S03_0.6-0.7	1.1	Slight organic odour, no staining or ACM observed
		1		CL-ML	Silty CLAY - black, homogeneous, low plasticity, damp, soft		S03_0.9-1	0.9	
		1.5		CL-ML	Silty CLAY - grey, homogeneous, dry, low plasticity, soft		S03_1.4-1.5	1.2	No staining, odours or ACM observed
		2			Silty CLAY - brown, homogeneous, dry, low plasticity, firm				No staining, odours or ACM observed
					Termination Depth at: 2.0 m.				
		2.5							
		3							
		3.5							
		4							
		4.5							
		5							
		5.5							
		6							
		6.5							
		7							
		7.5							
		8							
		8.5							
		9							
		9.5							

DRAFT

Disclaimer This log is intended for environmental not geotechnical purposes.
produced by ESlog.ESdat.net on 03 Feb 2021

TEST PIT S04

PROJECT NUMBER 60007
PROJECT NAME PCC DSI and RAP
CLIENT Penrith City Council
ADDRESS 158 to 164 Old Bathurst Road, Emu Plains, NSW

DRILLING COMPANY Ken Coles
DRILLING DATE 14-Jan-21
DRILL RIG
DRILLING METHOD Test Pit
DIMENSIONS 2 x 0.5 m

EASTING N/A
NORTHING N/A
COORD SYS N/A
COORD SOURCE Map Approximation
LOGGED BY T Frisken

COMMENTS Refusal on compacted roadbase with Reo inclusions

Drilling Method	Water (m bgl)	Depth (m bgl)	Graphic Log	Lithological Class	Lithological Description	Moisture	Samples	PID	Additional Observations
		0.5		Fill	FILL - Roadbase, brown-grey, heterogeneous, dry, well graded, very dense, coarse gravels, inclusions of concrete, igneous gravels and large amount of reinforcment bars		S04_0-0.1 S04_0.4-0.5		No staining, odours or ACM observed No staining, odours or ACM observed
		1		Fill	FILL - Roadbase, brown-grey, heterogeneous, damp, well graded, very dense, coarse gravels, inclusions of concrete, igneous gravels and large amount of reinforcment bars - Refusal Termination Depth at: 1.0 m.		S04_0.9-1		No staining, odours or ACM observed

DRAFT

TEST PIT S05

PROJECT NUMBER 60007	**DRILLING COMPANY** Ken Coles	**EASTING** N/A
PROJECT NAME PCC DSI and RAP	**DRILLING DATE** 14-Jan-21	**NORTHING** N/A
CLIENT Penrith City Council	**DRILL RIG**	**COORD SYS** N/A
ADDRESS 158 to 164 Old Bathurst Road, Emu Plains, NSW	**DRILLING METHOD** Test Pit	**COORD SOURCE** Map Approximation
	DIMENSIONS 2 x 0.5 m	**LOGGED BY** T Frisken

COMMENTS

Drilling Method	Water (m bgl)	Depth (m bgl)	Graphic Log	Lithological Class	Lithological Description	Moisture	Samples	PID	Additional Observations
		0		Fill	FILL - Roadbase / light grey clay heterogeneous, dry, low plasticity, firm		S05_0-0.1		No staining, odours or ACM observed
				Fill					
		0.5					S05_0.4-0.5		No staining, odours or ACM observed
				CL-ML	FILL - Roadbase, brown, heterogeneous, dry, well graded, medium dense, coarse gravels, inclusions of igneous gravels				
							S05_0.9-1		No staining, odours or ACM observed
		1			Silty CLAY - brown, homogeneous, dry, low plasticity, firm				
					Termination Depth at: 1.0 m.				
		1.5							
		2							
		2.5							
		3							
		3.5							
		4							
		4.5							
		5							
		5.5							
		6							
		6.5							
		7							
		7.5							
		8							
		8.5							
		9							
		9.5							

DRAFT

Disclaimer This log is intended for environmental not geotechnical purposes.

produced by ESlog.ESdat.net on 03 Feb 2021

TEST PIT S06

PROJECT NUMBER 60007
PROJECT NAME PCC DSI and RAP
CLIENT Penrith City Council
ADDRESS 158 to 164 Old Bathurst Road, Emu Plains, NSW

DRILLING COMPANY Ken Coles
DRILLING DATE 14-Jan-21
DRILL RIG
DRILLING METHOD Test Pit
DIMENSIONS 2 x 0.5 m

EASTING N/A
NORTHING N/A
COORD SYS N/A
COORD SOURCE Map Approximation
LOGGED BY T Frisken

COMMENTS TP Elevation Approximately 1.5m above adjacent gs

Drilling Method	Water (m bgl)	Depth (m bgl)	Graphic Log	Lithological Class	Lithological Description	Moisture	Samples	PID	Additional Observations
		0		Fill	RWN - Clayey SAND, brown, hetergeneous, dry to damp, poorly graded, loose, medium grain size, inclusions of steel bars and plastic		S06_0.0-0.1		No staining, odours or ACM observed
		0.5		RWN	RWN - Clayey SAND, brown, hetergeneous, dry to damp, poorly graded, loose, medium grain size		S06_0.4-0.5		No staining, odours or ACM observed
		1					S06_0.9-1		No staining, odours or ACM observed
		1.5		SC	Clayey SAND - brown, hetergeneous, dry to damp, poorly graded, loose, medium grain size				
		2			Termination Depth at: 2.0 m.				
		2.5							
		3							
		3.5							
		4							
		4.5							
		5							
		5.5							
		6							
		6.5							
		7							
		7.5							
		8							
		8.5							
		9							
		9.5							

DRAFT

Disclaimer This log is intended for environmental not geotechnical purposes.
produced by ESlog.ESdat.net on 03 Feb 2021

TEST PIT S07

PROJECT NUMBER 60007	**DRILLING COMPANY** Ken Coles	**EASTING** N/A
PROJECT NAME PCC DSI and RAP	**DRILLING DATE** 14-Jan-21	**NORTHING** N/A
CLIENT Penrith City Council	**DRILL RIG**	**COORD SYS** N/A
ADDRESS 158 to 164 Old Bathurst Road, Emu Plains, NSW	**DRILLING METHOD** Test Pit	**COORD SOURCE** Map Approximation
	DIMENSIONS 2 x 0.5 m	**LOGGED BY** T Frisken

COMMENTS

Drilling Method	Water (m bgl)	Depth (m bgl)	Graphic Log	Lithological Class	Lithological Description	Moisture	Samples	PID	Additional Observations
		0		Fill	FILL - Roadbase, brown-grey, heterogeneous, dry, well graded, very dense, coarse gravels, inclusions of concrete and igneous gravels		S07_0.0-0.1		No staining, odours or ACM observed
		0.5		Fill	FILL - Roadbase, brown, heterogeneous, dry, well graded, very dense, coarse gravels, inclusions of concrete, igneous gravels and large amount of reinforcment bars - Refusal Termination Depth at: 0.5 m.		S07_0.4-0.5		No staining, odours or ACM observed
		1							
		1.5							
		2							
		2.5							
		3							
		3.5							
		4							
		4.5							
		5							
		5.5							
		6							
		6.5							
		7							
		7.5							
		8							
		8.5							
		9							
		9.5							

DRAFT

TEST PIT S09

PROJECT NUMBER 60007
PROJECT NAME PCC DSI and RAP
CLIENT Penrith City Council
ADDRESS 158 to 164 Old Bathurst Road, Emu Plains, NSW

DRILLING COMPANY Ken Coles
DRILLING DATE 14-Jan-21
DRILL RIG
DRILLING METHOD Test Pit
DIMENSIONS 2 x 0.5 m

EASTING N/A
NORTHING N/A
COORD SYS N/A
COORD SOURCE Map Approximation
LOGGED BY T Frisken

COMMENTS TP Elevation Approximately 3.5m above adjacent gsRefusal on compacted roadbase with Reo inclusions

Drilling Method	Water (m bgl)	Depth (m bgl)	Graphic Log	Lithological Class	Lithological Description	Moisture	Samples	PID	Additional Observations
		0		Fill	FILL - Light yellow (sandstone), heterogeneous, dry, medium dense, cobbles to coarse sand, geofab liner at base		S09_0-0.1		No staining, odours or ACM observed
				Fill	FILL - Clayey SAND, brown, heterogeneous, coarse to medium grained sand, horizontal steel bars at 0.5mbgs		S09_0.4-0.5		No staining, odours or ACM observed
		0.5					S09_0.9-1.0		No staining, odours or ACM observed
		1			FILL - Clayey SAND, brown, heterogeneous, coarse to medium grained sand, horizontal steel bars at 0.5mbgs and large amount of concrete and steel inclusions - Refusal		S09_1.4-1.5		No staining, odours or ACM observed
		1.5		Fill					
		2			Termination Depth at: 1.8 m.				
		2.5							
		3							
		3.5							
		4							
		4.5							
		5							
		5.5							
		6							
		6.5							
		7							
		7.5							
		8							
		8.5							
		9							
		9.5							

DRAFT

Disclaimer This log is intended for environmental not geotechnical purposes.

produced by ESlog.ESdat.net on 03 Feb 2021

TEST PIT S10

PROJECT NUMBER 60007
PROJECT NAME PCC DSI and RAP
CLIENT Penrith City Council
ADDRESS 158 to 164 Old Bathurst Road, Emu Plains, NSW

DRILLING COMPANY Ken Coles
DRILLING DATE 14-Jan-21
DRILL RIG
DRILLING METHOD Test Pit
DIMENSIONS 2 x 0.5 m

EASTING N/A
NORTHING N/A
COORD SYS N/A
COORD SOURCE Map Approximation
LOGGED BY T Frisken

COMMENTS Refusal on compacted roadbase with Reo inclusions

Drilling Method	Water (m bgl)	Depth (m bgl)	Graphic Log	Lithological Class	Lithological Description	Moisture	Samples	PID	Additional Observations
				Fill	FILL - CLAY, light grey, dry, homogeneous		S10_0.1-0.2		No staining, odours or ACM observed
				Fill	FILL - Sandy CLAY, light brown, heterogeneous, dry, low plasticity, firm, inclusions of concrete and gravel		S10_0.2-0.3		No staining, odours or ACM observed
		0.5		Fill	FILL - Sandy CLAY, dark brown, heterogeneous, dry, coarse sand, medium dense				
		1			Termination Depth at: 0.4 m.				
		1.5							
		2							
		2.5							
		3							
		3.5							
		4							
		4.5							
		5							
		5.5							
		6							
		6.5							
		7							
		7.5							
		8							
		8.5							
		9							
		9.5							

DRAFT

Disclaimer This log is intended for environmental not geotechnical purposes.
produced by ESlog.ESdat.net on 03 Feb 2021

TEST PIT S11

PROJECT NUMBER 60007
PROJECT NAME PCC DSI and RAP
CLIENT Penrith City Council
ADDRESS 158 to 164 Old Bathurst Road, Emu Plains, NSW

DRILLING COMPANY Ken Coles
DRILLING DATE 14-Jan-21
DRILL RIG
DRILLING METHOD Test Pit
DIMENSIONS 2 x 0.5 m

EASTING N/A
NORTHING N/A
COORD SYS N/A
COORD SOURCE Map Approximation
LOGGED BY T Frisken

COMMENTS Refusal on large concrete conduit

Drilling Method	Water (m bgl)	Depth (m bgl)	Graphic Log	Lithological Class	Lithological Description	Moisture	Samples	PID	Additional Observations
		0.5		Fill	FILL - Roadbase, light brown,		S11_0-0.1		No staining, odours or ACM observed
				Fill	FILL - Roadbase, dark brown, heterogeneous, dry, well graded, very dense, coarse gravels, inclusions of concrete, igneous gravels and large amount of reinforcment bars - Refusal		S11_0.4-0.5		No staining or odours, ACM fragment observed
					Termination Depth at: 0.5 m.				

DRAFT

TEST PIT S12

PROJECT NUMBER 60007
PROJECT NAME PCC DSI and RAP
CLIENT Penrith City Council
ADDRESS 158 to 164 Old Bathurst Road, Emu Plains, NSW

DRILLING COMPANY Ken Coles
DRILLING DATE 14-Jan-21
DRILL RIG
DRILLING METHOD Test Pit
DIMENSIONS 2 x 0.5 m

EASTING N/A
NORTHING N/A
COORD SYS N/A
COORD SOURCE Map Approximation
LOGGED BY T Frisken

COMMENTS Refusal on reinforced concrete

Drilling Method	Water (m bgl)	Depth (m bgl)	Graphic Log	Lithological Class	Lithological Description	Moisture	Samples	PID	Additional Observations
				Concrete	FILL - Concrete - Refusal Termination Depth at: 0.1 m.				

0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
5.5
6
6.5
7
7.5
8
8.5
9
9.5

DRAFT

SOIL BOREHOLE S14

PROJECT NUMBER 60007
PROJECT NAME PCC DSI and RAP
CLIENT Penrith City Council
ADDRESS 158 to 164 Old Bathurst Road, Emu Plains, NSW

DRILLING COMPANY Teratest
DRILLING DATE 18-Jan-21
DRILL RIG
DRILLING METHOD Push Tube / Solid Flight Aug
DIAMETER 125 mm

EASTING N/A
NORTHING N/A
COORD SYS N/A
COORD SOURCE Map Approximation
LOGGED BY J Zeng

COMMENTS

Drilling Method	Water (m bgl)	Depth (m bgl)	Graphic Log	Lithological Class	Lithological Description	Moisture	Samples	PID	Additional Observations
		0		Fill	FILL - CLAY, brown black, heterogeneous, dry, high plasticity, soft, inclusions of grass roots and gravels		S14_0-0.1		No staining, odours or ACM observed
				Fill			S14_0.2-0.3		
		0.5					S14_0.4-0.5		No staining, odours or ACM observed
				Fill	FILL - CLAY, brown, heterogeneous, dry, high plasticity, soft				
		1			FILL - Gravelly CLAY, brown, heterogeneous, dry, high plasticity, soft, inclusions of grass roots		S14_0.9-1		No staining, odours or ACM observed
				CH	CLAY - dark brown, heterogeneous, dry, high plasticity, firm				No staining, odours or ACM observed
		1.5					S14_1.4-1.5		
				CH	CLAY - brown, heterogeneous, dry, high plasticity, firm				No staining, odours or ACM observed
		2			Termination Depth at: 2.0 m.				
		2.5							
		3							
		3.5							
		4							
		4.5							
		5							
		5.5							
		6							
		6.5							
		7							
		7.5							
		8							
		8.5							
		9							
		9.5							

DRAFT

Disclaimer This log is intended for environmental not geotechnical purposes.

produced by ESlog.ESdat.net on 03 Feb 2021

SOIL BOREHOLE S15

PROJECT NUMBER 60007	**DRILLING COMPANY** Teratest	**EASTING** N/A
PROJECT NAME PCC DSI and RAP	**DRILLING DATE** 18-Jan-21	**NORTHING** N/A
CLIENT Penrith City Council	**DRILL RIG**	**COORD SYS** N/A
ADDRESS 158 to 164 Old Bathurst Road, Emu Plains, NSW	**DRILLING METHOD** Push Tube / Solid Flight Aug	**COORD SOURCE** Map Approximation
	DIAMETER 125 mm	**LOGGED BY** J Zeng

COMMENTS Refusal on compacted roadbase with Reo inclusions

Drilling Method	Water (m bgl)	Depth (m bgl)	Graphic Log	Lithological Class	Lithological Description	Moisture	Samples	PID	Additional Observations
		0.5		Fill	FILL - Gravelly CLAY, dark brown, grey, heterogenous,dry, high plasticity, firm, inclusions of medium sized gravels		S15_0-0.1		No staining, odours or ACM observed
							S15_0.4-0.5		No staining, odours or ACM observed
				Fill	FILL - Gravelly CLAY, dark brown, grey, heterogenous,dry, high plasticity, firm, inclusions of medium sized gravels - Refusal				
					Termination Depth at: 0.7 m.				

DRAFT

SOIL BOREHOLE S16

PROJECT NUMBER 60007
PROJECT NAME PCC DSI and RAP
CLIENT Penrith City Council
ADDRESS 158 to 164 Old Bathurst Road, Emu Plains, NSW

DRILLING COMPANY Teratest
DRILLING DATE 18-Jan-21
DRILL RIG
DRILLING METHOD Push Tube / Solid Flight Aug
DIAMETER 125 mm

EASTING N/A
NORTHING N/A
COORD SYS N/A
COORD SOURCE Map Approximation
LOGGED BY J Zeng

COMMENTS Refusal on compacted roadbase with Reo inclusions

Drilling Method	Water (m bgl)	Depth (m bgl)	Graphic Log	Lithological Class	Lithological Description	Moisture	Samples	PID	Additional Observations
		0		Fill	FILL - GRAVEL, grey, heterogeneous, dry, well graded, medium grained, dense, inclusions trace leaves		S16_0-0.1 S16_0.2-0.3		No staining, odours or ACM observed
		0.5		Fill	FILL - Clayey GRAVEL, grey brown, dry, well graded, medium grained, dense		S16_0.4-0.5		No staining, odours or ACM observed
		1		Fill	FILL - Clayey GRAVEL, grey brown, dry, poorly graded, medium grained, dense - Refusal				No staining, odours or ACM observed
					Termination Depth at: 1.0 m.				
		1.5							
		2							
		2.5							
		3							
		3.5							
		4							
		4.5							
		5							
		5.5							
		6							
		6.5							
		7							
		7.5							
		8							
		8.5							
		9							
		9.5							

DRAFT

SOIL BOREHOLE S17

PROJECT NUMBER 60007
PROJECT NAME PCC DSI and RAP
CLIENT Penrith City Council
ADDRESS 158 to 164 Old Bathurst Road, Emu Plains, NSW

DRILLING COMPANY Teratest
DRILLING DATE 18-Jan-21
DRILL RIG
DRILLING METHOD Push Tube / Solid Flight Aug
DIAMETER 125 mm

EASTING N/A
NORTHING N/A
COORD SYS N/A
COORD SOURCE Map Approximation
LOGGED BY J Zeng

COMMENTS

Drilling Method	Water (m bgl)	Depth (m bgl)	Graphic Log	Lithological Class	Lithological Description	Moisture	Samples	PID	Additional Observations
		0.5		Fill	FILL - Gravelly CLAY, dark brown, grey, heterogenous,dry, high plasticity, firm, inclusions of medium sized gravels		S17_0-0.1		No staining, odours or ACM observed
							S17_0.4-0.5		No staining, odours or ACM observed
		1		CH	CLAY - brown, heterogeneous, dry, high plasticity, soft		S17_0.9-1		No staining, odours or ACM observed
					Termination Depth at: 1.0 m.				
		1.5							
		2							
		2.5							
		3							
		3.5							
		4							
		4.5							
		5							
		5.5							
		6							
		6.5							
		7							
		7.5							
		8							
		8.5							
		9							
		9.5							

DRAFT

Disclaimer This log is intended for environmental not geotechnical purposes.

produced by ESlog.ESdat.net on 03 Feb 2021

TEST PIT S18

PROJECT NUMBER 60007	**DRILLING COMPANY** Ken Coles	**EASTING** N/A
PROJECT NAME PCC DSI and RAP	**DRILLING DATE** 14-Jan-21	**NORTHING** N/A
CLIENT Penrith City Council	**DRILL RIG**	**COORD SYS** N/A
ADDRESS 158 to 164 Old Bathurst Road, Emu Plains, NSW	**DRILLING METHOD** Test Pit	**COORD SOURCE** Map Approximation
	DIMENSIONS 2 x 0.5 m	**LOGGED BY** T Frisken

COMMENTS Refusal on reinforced concrete

Drilling Method	Water (m bgl)	Depth (m bgl)	Graphic Log	Lithological Class	Lithological Description	Moisture	Samples	PID	Additional Observations
				Concrete	FILL - Concrete - Refusal Termination Depth at: 0.1 m.				

0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
5.5
6
6.5
7
7.5
8
8.5
9
9.5

DRAFT

SOIL BOREHOLE S19

PROJECT NUMBER 60007
PROJECT NAME PCC DSI and RAP
CLIENT Penrith City Council
ADDRESS 158 to 164 Old Bathurst Road, Emu Plains, NSW

DRILLING COMPANY Teratest
DRILLING DATE 18-Jan-21
DRILL RIG
DRILLING METHOD Push Tube / Solid Flight Aug
DIAMETER 125 mm

EASTING N/A
NORTHING N/A
COORD SYS N/A
COORD SOURCE Map Approximation
LOGGED BY J Zeng

COMMENTS

Drilling Method	Water (m bgl)	Depth (m bgl)	Graphic Log	Lithological Class	Lithological Description	Moisture	Samples	PID	Additional Observations
		0		Fill	FILL - GRAVEL, grey, heterogeneous, dry, well graded, medium grained, dense, angular		S19_0-0.1		No staining, odours or ACM observed
				Fill			S19_0.2-0.3		
		0.5		CH-SC	FILL - Gravelly CLAY, grey, light brown, heterogeneous, dry, high plasticity, firm, inclusions of small to medium gravels		S19_0.4-0.5		No staining, odours or ACM observed
		1		CH-MH	Sandy CLAY - brown grey, heterogeneous, dry, high plasticity, firm		S19_0.9-1		No staining, odours or ACM observed
		1.5			CLAY - brown, heterogeneous, dry, high plasticity, firm		S19_1.4-1.5		No staining, odours or ACM observed
					Termination Depth at: 1.5 m.				
		2							
		2.5							
		3							
		3.5							
		4							
		4.5							
		5							
		5.5							
		6							
		6.5							
		7							
		7.5							
		8							
		8.5							
		9							
		9.5							

DRAFT

Disclaimer This log is intended for environmental not geotechnical purposes.

produced by ESlog.ESdat.net on 03 Feb 2021

SOIL BOREHOLE S20

PROJECT NUMBER 60007	**DRILLING COMPANY** Teratest	**EASTING** N/A
PROJECT NAME PCC DSI and RAP	**DRILLING DATE** 18-Jan-21	**NORTHING** N/A
CLIENT Penrith City Council	**DRILL RIG**	**COORD SYS** N/A
ADDRESS 158 to 164 Old Bathurst Road, Emu Plains, NSW	**DRILLING METHOD** Push Tube / Solid Flight Aug	**COORD SOURCE** Map Approximation
	DIAMETER 125 mm	**LOGGED BY** J Zeng

COMMENTS

Drilling Method	Water (m bgl)	Depth (m bgl)	Graphic Log	Lithological Class	Lithological Description	Moisture	Samples	PID	Additional Observations
		0.5		Fill	FILL - Gravelly CLAY, brown, heterogeneous, dry, high plasticity, firm, inclusions of grey gravels		S20_0-0.1 S20_0.2-0.3 S20_0.4-0.5		No staining, odours or ACM observed No staining, odours or ACM observed
		1		CH	CLAY - brown, heterogeneous, dry, high plasticity, firm		S20_0.9-1		No staining, odours or ACM observed
		1.5			Termination Depth at: 1.0 m.				No staining, odours or ACM observed
		2							
		2.5							
		3							
		3.5							
		4							
		4.5							
		5							
		5.5							
		6							
		6.5							
		7							
		7.5							
		8							
		8.5							
		9							
		9.5							

DRAFT

Disclaimer This log is intended for environmental not geotechnical purposes.

produced by ESlog.ESdat.net on 03 Feb 2021

SOIL BOREHOLE S21

PROJECT NUMBER 60007
PROJECT NAME PCC DSI and RAP
CLIENT Penrith City Council
ADDRESS 158 to 164 Old Bathurst Road, Emu Plains, NSW

DRILLING COMPANY Teratest
DRILLING DATE 18-Jan-21
DRILL RIG
DRILLING METHOD Push Tube / Solid Flight Aug
DIAMETER 125 mm

EASTING N/A
NORTHING N/A
COORD SYS N/A
COORD SOURCE Map Approximation
LOGGED BY J Zeng

COMMENTS

Drilling Method	Water (m bgl)	Depth (m bgl)	Graphic Log	Lithological Class	Lithological Description	Moisture	Samples	PID	Additional Observations
		0		Fill	FILL - GRAVEL, grey, heterogeneous, dry, well graded, medium grained, dense, angular		S21_0-0.1		No staining, odours or ACM observed
				Fill					
		0.5		CH	FILL - Gravelly CLAY, grey, light brown, heterogeneous, dry, high plasticity, firm		S21_0.4-0.5		No staining, odours or ACM observed
					CLAY - brown, heterogeneous, dry, high plasticity, firm		S21_0.9-1.0		No staining, odours or ACM observed
		1			Termination Depth at: 1.0 m.				
		1.5							
		2							
		2.5							
		3							
		3.5							
		4							
		4.5							
		5							
		5.5							
		6							
		6.5							
		7							
		7.5							
		8							
		8.5							
		9							
		9.5							

DRAFT

TEST PIT S22

PROJECT NUMBER 60007
PROJECT NAME PCC DSI and RAP
CLIENT Penrith City Council
ADDRESS 158 to 164 Old Bathurst Road, Emu Plains, NSW

DRILLING COMPANY Ken Coles
DRILLING DATE 15-Jan-21
DRILL RIG
DRILLING METHOD Test Pit
DIMENSIONS 2 x 0.5 m

EASTING N/A
NORTHING N/A
COORD SYS N/A
COORD SOURCE Map Approximation
LOGGED BY J Zeng

COMMENTS

Drilling Method	Water (m bgl)	Depth (m bgl)	Graphic Log	Lithological Class	Lithological Description	Moisture	Samples	PID	Additional Observations
		0		Concrete	FILL - Concrete		S22_0.1-0.2	0.6	No staining, odours or ACM observed
		0.5		Fill	FILL - Gravelly CLAY, brown, heterogeneous, dry, medium plasticity, firm		S22_0.5-0.6	0.8	No staining, odours or ACM observed
				CH	CLAY, brown, heterogeneous, dry, high plasticity, firm		S22_0.9-1	0.4	No staining, odours or ACM observed
		1			Termination Depth at: 1.0 m.				
		1.5							
		2							
		2.5							
		3							
		3.5							
		4							
		4.5							
		5							
		5.5							
		6							
		6.5							
		7							
		7.5							
		8							
		8.5							
		9							
		9.5							

DRAFT

Disclaimer This log is intended for environmental not geotechnical purposes.
produced by ESlog.ESdat.net on 03 Feb 2021

TEST PIT S23

PROJECT NUMBER 60007
PROJECT NAME PCC DSI and RAP
CLIENT Penrith City Council
ADDRESS 158 to 164 Old Bathurst Road, Emu Plains, NSW

DRILLING COMPANY Ken Coles
DRILLING DATE 13-Jan-21
DRILL RIG
DRILLING METHOD Test Pit
DIMENSIONS 2 x 0.5 m

EASTING N/A
NORTHING N/A
COORD SYS N/A
COORD SOURCE Map Approximation
LOGGED BY E Piccinin

COMMENTS

Drilling Method	Water (m bgl)	Depth (m bgl)	Graphic Log	Lithological Class	Lithological Description	Moisture	Samples	PID	Additional Observations
		0.5		Fill	FILL - Compressed Roadbase		S23_0.1-0.2		No staining, odours or ACM observed
				Fill	FILL - Gravelly SAND, brown heterogeneous, damp, medium grained sand and gravel, well graded, angular gravels		S23_0.4-0.5		No staining, odours or ACM observed
		1		Fill	FILL - Clayey Gravelly SAND, orange brown: heterogeneous, damp, medium grained sand and gravel, well graded, angular gravel with inclusions of ash		S23_0.7-0.8		No staining, odours or ACM observed
				CL	CLAY - orange brown, homogeneous, damp, hard, dense, non plastic to low plasticity				
					Termination Depth at: 1.0 m.				

DRAFT

TEST PIT S24

PROJECT NUMBER 60007	**DRILLING COMPANY** Ken Coles	**EASTING** N/A
PROJECT NAME PCC DSI and RAP	**DRILLING DATE** 13-Jan-21	**NORTHING** N/A
CLIENT Penrith City Council	**DRILL RIG**	**COORD SYS** N/A
ADDRESS 158 to 164 Old Bathurst Road, Emu Plains, NSW	**DRILLING METHOD** Test Pit	**COORD SOURCE** Map Approximation
	DIMENSIONS 2 x 0.5 m	**LOGGED BY** E Piccinin

COMMENTS

Drilling Method	Water (m bgl)	Depth (m bgl)	Graphic Log	Lithological Class	Lithological Description	Moisture	Samples	PID	Additional Observations
		0		Fill	FILL - Compressed roadbase		S24_0.0-0.1		No staining, odours or ACM observed
				Fill	FILL - Sandy GRAVEL, brown, heterogeneous, damp, fine to medium gravels and medium sands, well graded, sub-angular gravels		S24_0.2-0.3		No staining, odours or ACM observed
		0.5		CL	CLAY - orange brown, heterogeneous, damp, soft to firm, low plasticity		S24_0.4-0.5		No staining, odours or ACM observed
		1			Termination Depth at: 0.8 m.				
		1.5							
		2							
		2.5							
		3							
		3.5							
		4							
		4.5							
		5							
		5.5							
		6							
		6.5							
		7							
		7.5							
		8							
		8.5							
		9							
		9.5							

DRAFT

Disclaimer This log is intended for environmental not geotechnical purposes.
produced by ESlog.ESdat.net on 03 Feb 2021

SOIL BOREHOLE S25

PROJECT NUMBER 60007	**DRILLING COMPANY** Teratest	**EASTING** N/A
PROJECT NAME PCC DSI and RAP	**DRILLING DATE** 18-Jan-21	**NORTHING** N/A
CLIENT Penrith City Council	**DRILL RIG**	**COORD SYS** N/A
ADDRESS 158 to 164 Old Bathurst Road, Emu Plains, NSW	**DRILLING METHOD** Push Tube / Solid Flight Aug	**COORD SOURCE** Map Approximation
	DIAMETER 125 mm	**LOGGED BY** J Zeng

COMMENTS

Drilling Method	Water (m bgl)	Depth (m bgl)	Graphic Log	Lithological Class	Lithological Description	Moisture	Samples	PID	Additional Observations
		0		Fill	FILL - GRAVEL, grey, heterogeneous, dry, well graded, medium grained, dense, angular		S25_0-0.1		No staining, odours or ACM observed
				Fill			S25_0.4-0.5		No staining, odours or ACM observed
		0.5		CH	FILL - Gravelly CLAY, brown black, heterogeneouos, dry, high plasticity, firm, inclusions of gravels				No staining, odours or ACM observed
		1		CH	CLAY - light brown, dry, high plasticity, firm		S25_0.9-1		
		1.5			CLAY - brown, dry, high plasticity, firm				
					Termination Depth at: 1.5 m.				
		2							
		2.5							
		3							
		3.5							
		4							
		4.5							
		5							
		5.5							
		6							
		6.5							
		7							
		7.5							
		8							
		8.5							
		9							
		9.5							

DRAFT

TEST PIT S26

PROJECT NUMBER 60007
PROJECT NAME PCC DSI and RAP
CLIENT Penrith City Council
ADDRESS 158 to 164 Old Bathurst Road, Emu Plains, NSW

DRILLING COMPANY Ken Coles
DRILLING DATE 14-Jan-21
DRILL RIG
DRILLING METHOD Test Pit
DIMENSIONS 2 x 0.5 m

EASTING N/A
NORTHING N/A
COORD SYS N/A
COORD SOURCE Map Approximation
LOGGED BY T Frisken

COMMENTS

Drilling Method	Water (m bgl)	Depth (m bgl)	Graphic Log	Lithological Class	Lithological Description	Moisture	Samples	PID	Additional Observations
		0		Fill	FILL - Roadbase / gravel, grey, heterogeneous, dry, well graded, very hard, very compacted, inclusions of concrete, igneous gravels, metal, polystyrene and plastic		S26_0-0.1	1.5	No staining, odours or ACM observed
		0.5		Fill			S26_0.4-0.5	1.2	No staining, odours or ACM observed
		1		CL-ML	FILL - Roadbase / gravel, grey, heterogeneous, dry, well graded, hard, compacted, inclusions of concrete, igneous gravels, metal, reinforced bars. polystyrene and plastic		S26_0.9-1	2.1	No staining, odours or ACM observed
		1.5			Silty CLAY - brown black, homogeneous, damp, soft, low plasticity				
		2							
		2.5			Termination Depth at: 2.2 m.				
		3							
		3.5							
		4							
		4.5							
		5							
		5.5							
		6							
		6.5							
		7							
		7.5							
		8							
		8.5							
		9							
		9.5							

DRAFT

Disclaimer This log is intended for environmental not geotechnical purposes.

produced by ESlog.ESdat.net on 03 Feb 2021

SOIL BOREHOLE S27

PROJECT NUMBER 60007	**DRILLING COMPANY** Teratest	**EASTING** N/A
PROJECT NAME PCC DSI and RAP	**DRILLING DATE** 18-Jan-21	**NORTHING** N/A
CLIENT Penrith City Council	**DRILL RIG**	**COORD SYS** N/A
ADDRESS 158 to 164 Old Bathurst Road, Emu Plains, NSW	**DRILLING METHOD** Push Tube / Solid Flight Aug	**COORD SOURCE** Map Approximation
	DIAMETER 125 mm	**LOGGED BY** J Zeng

COMMENTS Refusal on compacted roadbase with Reo inclusions

Drilling Method	Water (m bgl)	Depth (m bgl)	Graphic Log	Lithological Class	Lithological Description	Moisture	Samples	PID	Additional Observations
		0		Fill	FILL - GRAVEL, grey, heterogeneous, dry, well graded, medium grained, dense		S27_0-0.1		No staining, odours or ACM observed
		0.5		Fill	FILL - GRAVEL, grey, heterogeneous, dry, well graded, medium grained, dense - Refusal		S27_0.4-0.5		No staining, odours or ACM observed
					Termination Depth at: 0.8 m.				

DRAFT

SOIL BOREHOLE S28

PROJECT NUMBER 60007
PROJECT NAME PCC DSI and RAP
CLIENT Penrith City Council
ADDRESS 158 to 164 Old Bathurst Road, Emu Plains, NSW

DRILLING COMPANY Teratest
DRILLING DATE 18-Jan-21
DRILL RIG
DRILLING METHOD Push Tube / Solid Flight Aug
DIAMETER 125 mm

EASTING N/A
NORTHING N/A
COORD SYS N/A
COORD SOURCE Map Approximation
LOGGED BY J Zeng

COMMENTS

Drilling Method	Water (m bgl)	Depth (m bgl)	Graphic Log	Lithological Class	Lithological Description	Moisture	Samples	PID	Additional Observations
		0.5		Fill	FILL - GRAVEL, crushed concrete, grey, dry, heterogeneous, well graded, coarse grained, dense		S28_0-0.1 S28_0.2-0.3 S28_0.4-0.5		No staining, odours or ACM observed No staining, odours or ACM observed
		1		Fill	FILL - Gravelly CLAY, brown, heterogeneous, dry,low plasticity, firm, inclusions of gravels		S28_0.9-1.0		No staining, odours or ACM observed
		1.5		CH	CLAY - brown, heterogeneous, dry, high plasticity, firm, inclusions of trace tiny gravels		S28_1.4-1.5		No staining, odours or ACM observed
		2		CH	CLAY - brown, heterogeneous, dry, high plasticity, firm		S28_1.9-2		No staining, odours or ACM observed
		2.5			Termination Depth at: 2.0 m.				
		3							
		3.5							
		4							
		4.5							
		5							
		5.5							
		6							
		6.5							
		7							
		7.5							
		8							
		8.5							
		9							
		9.5							

DRAFT

Disclaimer This log is intended for environmental not geotechnical purposes.

produced by ESlog.ESdat.net on 03 Feb 2021

SOIL BOREHOLE S29

PROJECT NUMBER 60007
PROJECT NAME PCC DSI and RAP
CLIENT Penrith City Council
ADDRESS 158 to 164 Old Bathurst Road, Emu Plains, NSW

DRILLING COMPANY Teratest
DRILLING DATE 18-Jan-21
DRILL RIG
DRILLING METHOD Push Tube / Solid Flight Aug
DIAMETER 125 mm

EASTING N/A
NORTHING N/A
COORD SYS N/A
COORD SOURCE Map Approximation
LOGGED BY J Zeng

COMMENTS

Drilling Method	Water (m bgl)	Depth (m bgl)	Graphic Log	Lithological Class	Lithological Description	Moisture	Samples	PID	Additional Observations
		0		Concrete	Concrete		S29_0.13-0.23		No staining, odours or ACM observed
				Fill	FILL - Gravelly CLAY, brown grey, heterogeneous,dry, low plasticity, firm		S29_0.33-0.43		
		0.5		CH	CLAY, dark brown, heterogeneous, dry, high plasticity, firm		S29_0.53-0.63		No staining, odours or ACM observed
				CH	CLAY, brown, heterogeneous, dry, high plasticity, firm		S29_1.12-1.13		No staining, odours or ACM observed
		1			Termination Depth at: 1.1 m.				No staining, odours or ACM observed
		1.5							
		2							
		2.5							
		3							
		3.5							
		4							
		4.5							
		5							
		5.5							
		6							
		6.5							
		7							
		7.5							
		8							
		8.5							
		9							
		9.5							

DRAFT

Disclaimer This log is intended for environmental not geotechnical purposes.
produced by ESlog.ESdat.net on 03 Feb 2021

TEST PIT S30

PROJECT NUMBER 60007
PROJECT NAME PCC DSI and RAP
CLIENT Penrith City Council
ADDRESS 158 to 164 Old Bathurst Road, Emu Plains, NSW

DRILLING COMPANY Ken Coles
DRILLING DATE 14-Jan-21
DRILL RIG
DRILLING METHOD Test Pit
DIMENSIONS 2 x 0.5 m

EASTING N/A
NORTHING N/A
COORD SYS N/A
COORD SOURCE Map Approximation
LOGGED BY T Frisken

COMMENTS TP Elevation Approximately 2.5m above adjacent gs

Drilling Method	Water (m bgl)	Depth (m bgl)	Graphic Log	Lithological Class	Lithological Description	Moisture	Samples	PID	Additional Observations
		0		Fill	FILL - Roadbase, light grey, densely graded base, igneous gravels and inclusions of ash/asphalt		S30_0.0-0.1		No staining, odours or ACM observed
		0.5		Fill	FILL - Clayey SAND, brown, heterogeneous, dry, medium dense, fine grained sand, well graded, inclusions of concrete, igneous gravels, sandstone gravels and scrap metal		S30_0.4-0.5		No staining, odours or ACM observed
		1					S30_0.9-1		No staining, odours or ACM observed
		1.5		Fill	FILL - Clayey SAND, brown, heterogeneous, dry, medium dense, fine grained sand, well graded, inclusions of concrete, igneous gravels, sandstone gravels, scrap metal and clay clasts		S30_1.4-1.5		No staining or odours, ACM fragment observed
		2		Fill	FILL - Sandy CLAY, brown, heterogeneous, damp, low plasticity, soft, inclusions of ash		S30_1.9-2.0		No staining, odours or ACM observed
		2.5					S30_2.0-2.1		
		3					S30_2.4-2.5		No staining, odours or ACM observed
		3.5		CH	Sandy CLAY:brown heterogeneous, damp, high plasticity, soft, inclusions of ash		S30_2.9-3		No staining, odours or ACM observed
		4			Termination Depth at: 3.6 m.		S30_3-3.1		No staining, odours or ACM observed
		4.5					S30_3.5-3.6		No staining, odours or ACM observed
		5							
		5.5							
		6							
		6.5							
		7							
		7.5							
		8							
		8.5							
		9							
		9.5							

DRAFT

TEST PIT S31

PROJECT NUMBER 60007
PROJECT NAME PCC DSI and RAP
CLIENT Penrith City Council
ADDRESS 158 to 164 Old Bathurst Road, Emu Plains, NSW

DRILLING COMPANY Ken Coles
DRILLING DATE 13-Jan-21
DRILL RIG
DRILLING METHOD Test Pit
DIMENSIONS 2 x 0.5 m

EASTING N/A
NORTHING N/A
COORD SYS N/A
COORD SOURCE Map Approximation
LOGGED BY E Piccinin

COMMENTS

Drilling Method	Water (m bgl)	Depth (m bgl)	Graphic Log	Lithological Class	Lithological Description	Moisture	Samples	PID	Additional Observations
		0.5 1 1.5 2		Fill Fill Fill SC	FILL - Compressed Roadbase FILL - Sandy GRAVEL, yellow brown, heterogeneous, damp, fine to medium grained gravel, medium grained sand, well graded, angular gravels FILL - Clayey Gravelly SAND, brown, heterogeneous, damp, fine to medium grained gravel and fine sand, well graded, sub-angular gravels Clayey SAND - orange, heterogeneous, damp, medium dense, soft to firm, fine grained		S31_0.0-0.1 S31_0.1-0.2 S31_0.4-0.5 S31_0.7-0.8		No staining, odours or ACM observed No staining, odours or ACM observed No staining, odours or ACM observed
		2.5 3 3.5 4 4.5 5 5.5 6 6.5 7 7.5 8 8.5 9 9.5			Termination Depth at: 2.2 m.				

DRAFT

TEST PIT S32

PROJECT NUMBER 60007
PROJECT NAME PCC DSI and RAP
CLIENT Penrith City Council
ADDRESS 158 to 164 Old Bathurst Road, Emu Plains, NSW

DRILLING COMPANY Ken Coles
DRILLING DATE 14-Jan-21
DRILL RIG
DRILLING METHOD Test Pit
DIMENSIONS 2 x 0.5 m

EASTING N/A
NORTHING N/A
COORD SYS N/A
COORD SOURCE Map Approximation
LOGGED BY T Frisken

COMMENTS

Drilling Method	Water (m bgl)	Depth (m bgl)	Graphic Log	Lithological Class	Lithological Description	Moisture	Samples	PID	Additional Observations
		0.5		Fill	FILL - Roadbase, grey, heterogeneous, dry, well graded, coarse gravels, inclusions ofconcrete, reinforcment bars, rags		S32_0.0-0.1	1.8	Staining observed on ground surface, no odours or ACM
							S32_0.4-0.5	1.2	
				CH	CLAY - dark brown to grey, homogeneous, high plasticity, dry, firm		S32_0.8-0.9	1.1	No staining, odours or ACM observed
		1		CH	CLAY - dark brown, homogeneous, high plasticity, dry, firm		S32_1-1.1	0.9	No staining, odours or ACM observed
		1.5							No staining, odours or ACM observed
					Termination Depth at: 1.5 m.				
		2							
		2.5							
		3							
		3.5							
		4							
		4.5							
		5							
		5.5							
		6							
		6.5							
		7							
		7.5							
		8							
		8.5							
		9							
		9.5							

DRAFT

Disclaimer This log is intended for environmental not geotechnical purposes.
produced by ESlog.ESdat.net on 03 Feb 2021

TEST PIT S33

PROJECT NUMBER 60007	**DRILLING COMPANY** Ken Coles	**EASTING** N/A
PROJECT NAME PCC DSI and RAP	**DRILLING DATE** 13-Jan-21	**NORTHING** N/A
CLIENT Penrith City Council	**DRILL RIG**	**COORD SYS** N/A
ADDRESS 158 to 164 Old Bathurst Road, Emu Plains, NSW	**DRILLING METHOD** Test Pit	**COORD SOURCE** Map Approximation
	DIMENSIONS 2 x 0.5 m	**LOGGED BY** E Piccinin

COMMENTS

Drilling Method	Water (m bgl)	Depth (m bgl)	Graphic Log	Lithological Class	Lithological Description	Moisture	Samples	PID	Additional Observations
		0		Asphalt	Asphalt		S33_0.2-0.3		No staining, odours or ACM observed
				Concrete	Concrete				
		0.5		Fill	FILL - Gravelly SAND, brown, heterogeneous, damp, fine to medium gravels, medium sands, sub-angular gravels, well graded		S33_0.7-0.8		No staining, odours or ACM observed
				CL-SC					
		1			Sandy CLAY - orange brown, heterogeneous, damp, soft to firm, low plasticity				
					Termination Depth at: 1.0 m.				
		1.5							
		2							
		2.5							
		3							
		3.5							
		4							
		4.5							
		5							
		5.5							
		6							
		6.5							
		7							
		7.5							
		8							
		8.5							
		9							
		9.5							

DRAFT

Disclaimer This log is intended for environmental not geotechnical purposes.
produced by ESlog.ESdat.net on 03 Feb 2021

TEST PIT S34

PROJECT NUMBER 60007
PROJECT NAME PCC DSI and RAP
CLIENT Penrith City Council
ADDRESS 158 to 164 Old Bathurst Road, Emu Plains, NSW

DRILLING COMPANY Ken Coles
DRILLING DATE 13-Jan-21
DRILL RIG
DRILLING METHOD Test Pit
DIMENSIONS 2 x 0.5 m

EASTING N/A
NORTHING N/A
COORD SYS N/A
COORD SOURCE Map Approximation
LOGGED BY E Piccinin

COMMENTS

Drilling Method	Water (m bgl)	Depth (m bgl)	Graphic Log	Lithological Class	Lithological Description	Moisture	Samples	PID	Additional Observations
		0.5		Fill Fill CL-SC	FILL - Compressed Roadbase with inclusions of concrete FILL - Sandy GRAVEL, yellow, heterogeneous, damp, fine to medium grained gravel, medium grained sand, sub-angular gravels with inclusions of clay clasts Sandy CLAY - orange brown, heterogeneous, damp, soft to firm, low plasticity Termination Depth at: 0.8 m.		S34_0.0-0.1 S34_0.2-0.3 S34_0.7-0.8		No staining, odours or ACM observed No staining, odours or ACM observed No staining, odours or ACM observed

DRAFT

SOIL BOREHOLE S35

PROJECT NUMBER 60007	**DRILLING COMPANY** Teratest	**EASTING** N/A
PROJECT NAME PCC DSI and RAP	**DRILLING DATE** 18-Jan-21	**NORTHING** N/A
CLIENT Penrith City Council	**DRILL RIG**	**COORD SYS** N/A
ADDRESS 158 to 164 Old Bathurst Road, Emu Plains, NSW	**DRILLING METHOD** Push Tube / Solid Flight Aug	**COORD SOURCE** Map Approximation
	DIAMETER 125 mm	**LOGGED BY** J Zeng

COMMENTS

Drilling Method	Water (m bgl)	Depth (m bgl)	Graphic Log	Lithological Class	Lithological Description	Moisture	Samples	PID	Additional Observations
				Concrete	Concrete				
		0.5		CH	CLAY - brown black, heterogeneous, dry, high plasticity, firm		S35_0.61-0.71		No staining, odours or ACM observed
		1		CH	CLAY - brown, heterogeneous, dry, high plasticity, firm		S35_1.11-1.21		No staining, odours or ACM observed
		1.5			Termination Depth at: 1.2 m.				
		2							
		2.5							
		3							
		3.5							
		4							
		4.5							
		5							
		5.5							
		6							
		6.5							
		7							
		7.5							
		8							
		8.5							
		9							
		9.5							

DRAFT

TEST PIT S36

PROJECT NUMBER 60007
PROJECT NAME PCC DSI and RAP
CLIENT Penrith City Council
ADDRESS 158 to 164 Old Bathurst Road, Emu Plains, NSW

DRILLING COMPANY Ken Coles
DRILLING DATE 13-Jan-21
DRILL RIG
DRILLING METHOD Test Pit
DIMENSIONS 2 x 0.5 m

EASTING N/A
NORTHING N/A
COORD SYS N/A
COORD SOURCE Map Approximation
LOGGED BY E Piccinin

COMMENTS

Drilling Method	Water (m bgl)	Depth (m bgl)	Graphic Log	Lithological Class	Lithological Description	Moisture	Samples	PID	Additional Observations
		0.5		Fill Fill CL-SC	FILL - Compressed raodbase with inclusions of concrete FILL - Sandy GRAVEL, yellow, heterogeneous, damp, fine to medium grained gravel, medium grained sand, sub-angular gravels, well graded with inclusions of sandstone gravels and clay clasts Sandy CLAY - orange brown, heterogeneous, damp, soft to firm, low plasticity Termination Depth at: 0.8 m.		S36_0.0-0.1 S36_0.2-0.3 S36_0.7-0.8		No staining, odours or ACM observed No staining, odours or ACM observed No staining, odours or ACM observed

DRAFT

SOIL BOREHOLE S37

PROJECT NUMBER 60007
PROJECT NAME PCC DSI and RAP
CLIENT Penrith City Council
ADDRESS 158 to 164 Old Bathurst Road, Emu Plains, NSW

DRILLING COMPANY Teratest
DRILLING DATE 18-Jan-21
DRILL RIG
DRILLING METHOD Push Tube / Solid Flight Aug
DIAMETER 125 mm

EASTING N/A
NORTHING N/A
COORD SYS N/A
COORD SOURCE Map Approximation
LOGGED BY J Zeng

COMMENTS

Drilling Method	Water (m bgl)	Depth (m bgl)	Graphic Log	Lithological Class	Lithological Description	Moisture	Samples	PID	Additional Observations
		0.5		Fill	FILL - Gravelly CLAY, brown grey, heterogeneous, dry, high plasticity, firm		S37_0-0.1		No staining, odours or ACM observed
							S37_0.4-0.5		No staining, odours or ACM observed
		1		CH	CLAY - brown, heterogeneous, dry, high plasticity, firm		S37_0.9-1		No staining, odours or ACM observed
					Termination Depth at: 1.0 m.				
		1.5							
		2							
		2.5							
		3							
		3.5							
		4							
		4.5							
		5							
		5.5							
		6							
		6.5							
		7							
		7.5							
		8							
		8.5							
		9							
		9.5							

DRAFT

Disclaimer This log is intended for environmental not geotechnical purposes.

produced by ESlog.ESdat.net on 03 Feb 2021

GROUNDWATER WELL S38/MW07

PROJECT NUMBER 60007	**DRILLING COMPANY** Teratest	**EASTING** 283,833.53
PROJECT NAME PCC DSI and RAP	**DRILLING DATE** 13-Jan-21	**NORTHING** 6,263,729.42
CLIENT Penrith City Council	**DRILL RIG**	**ELEVATION** 24.2558 m AHD
PERMIT NO. N/A	**DRILLING METHOD** Push Tube / Solid Flight Aug	**COORD SYS** N/A
ADDRESS 158 to 164 Old Bathurst Road, Emu Plains, NSW	**TOTAL DEPTH** 9.75 m bgl	**COORD SOURCE** Surveyor
	DIAMETER 125 mm	**LOGGED BY** J Zeng
COMPLETION Roadbox	**CASING** Class 18 PVC - 50mm	**SCREEN INTERVAL** 6.25 - 9.25 m bgl

COMMENTS

Drilling Method	Water (m bgl)	Well Details	Depth (m bgl)	Graphic Log	Lithological Class	Lithological Description	Moisture	Samples	PID	Additional Observations
PT / SFA			0		Concrete	Concrete		S38/MW07_0.25-0.35	0.4	No staining, odours or ACM observed
			0.5		Fill	FILL - Sandy GRAVEL, grey brown, heterogeneous, dry, well graded, very dense		S38/MW07_0.45-0.55	0.6	No staining, odours or ACM observed
					Fill	FILL - Gravelly CLAY, brown, heterogeneous, dry, firm		S38/MW07_0.65-0.75	0.5	No staining, odours or ACM observed
			1		CH-SC	FILL - Sandy CLAY, brown, heterogeneous, dry, high plasticity, firm		S38/MW07_1.15-1.255	0.2	No staining, odours or ACM observed
			1.5		CH-SC	FILL - Sandy CLAY, brown, heterogeneous, dry, high plasticity, firm, inclusions of gravels		S38/MW07_1.65-1.75	0.2	No staining, odours or ACM observed
			2					S38/MW07_2.15-2.25	0.3	No staining, odours or ACM observed
			2.5		CH-SC	FILL - Sandy CLAY, brown, heterogeneous, dry, high plasticity, firm, inclusions of gravels		S38/MW07_2.65-2.75	0.3	No staining, odours or ACM observed
			3		SG	Gravelly SAND - brown to light brown, poorly graded, fine sand, inclusions of gravel in variable size		S38/MW07_3.15-3.25		No staining, odours or ACM observed
			3.5					S38/MW07_3.65-3.75		No staining, odours or ACM observed
			4					S38/MW07_4.15-4.25		No staining, odours or ACM observed
			4.5					S38/MW07_4.65-4.75		No staining, odours or ACM observed
			5					S38/MW07_5.15-5.25		No staining, odours or ACM observed
			5.5					S38/MW07_5.65-5.75		No staining, odours or ACM observed
			6					S38/MW07_6.15-6.25		No staining, odours or ACM observed
			6.5		SG	Gravelly SAND - brown to light brown, poorly graded, fine sand, inclusions of gravel in variable size, wet from 7.25mbgs		S38/MW07_6.65-6.75		No staining, odours or ACM observed
	▽		7					S38/MW07_7.15-7.25		No staining, odours or ACM observed
			7.5		SG	Gravelly SAND - brown to light brown, poorly graded, fine sand, inclusions of gravel in variable size, wet		S38/MW07_8.15-8.25		No staining, odours or ACM observed
			8							
			8.5							
			9					S38/MW07_9.15-9.25		No staining, odours or ACM observed
			9.5							
						Termination Depth at: 9.8 m.				

DRAFT

GROUNDWATER WELL S39/MW08

PROJECT NUMBER 60007	**DRILLING COMPANY** Teratest	**EASTING** 283,784.55
PROJECT NAME PCC DSI and RAP	**DRILLING DATE** 14-Jan-21	**NORTHING** 6,263,587.57
CLIENT Penrith City Council	**DRILL RIG**	**ELEVATION** 24.3997 m AHD
PERMIT NO. N/A	**DRILLING METHOD** Push Tube / Solid Flight Aug	**COORD SYS** N/A
ADDRESS 158 to 164 Old Bathurst Road, Emu Plains, NSW	**TOTAL DEPTH** 9.5 m bgl	**COORD SOURCE** Surveyor
	DIAMETER 125 mm	**LOGGED BY** J Zeng
COMPLETION Roadbox	**CASING** Class 18 PVC - 50mm	**SCREEN INTERVAL** 6 - 9 m bgl

COMMENTS

Drilling Method	Water (m bgl)	Well Details	Depth (m bgl)	Graphic Log	Lithological Class	Lithological Description	Moisture	Samples	PID	Additional Observations
PT / SFA	▽		0.5		Fill	FILL - Sandy GRAVEL, grey brown, heterogeneous, dry, well graded, medium dense		S39/MW08_0-0.1	0.5	No staining, odours or ACM observed
								S39/MW08_0.2-0.3	0.4	
								S39/MW08_0.4-0.5	0.3	No staining, odours or ACM observed
			1		CH-SC	Sandy CLAY - brown grey, heterogeneous, dry, high plasticity, firm		S39/MW08_0.9-1	0.3	No staining, odours or ACM observed
			1.5					S39/MW08_1.4-1.5	0.3	No staining, odours or ACM observed
			2					S39/MW08_1.9-2	0.3	No staining, odours or ACM observed
			2.5							
			3					S39/MW08_2.9-3		No staining, odours or ACM observed
			3.5		SG	Gravelly SAND - brown, white, grey, poorly graded, medium sand, loose, dry, inclusions of gravel in variable size				
			4					S39/MW08_3.9-4		No staining, odours or ACM observed
			4.5							
			5					S39/MW08_4.9-5		No staining, odours or ACM observed
			5.5							
			6					S39/MW08_5.9-6		No staining, odours or ACM observed
			6.5		SG	Gravelly SAND - brown, white, grey, poorly graded, medium sand, loose, damp to wet, inclusions of gravel in variable size				
			7					S39/MW08_6.9-7		No staining, odours or ACM observed
			7.5		SP	SAND - brown, heterogeneous, damp to wet, poorly graded, medium grained sand, loose				
			8					S39/MW08_7.9-8		No staining, odours or ACM observed
			8.5		SP	SAND - light brown, heterogeneous, wet, poorly graded, mediium grained sand, loose				
			9					S39/MW08_8.9-9		No staining, odours or ACM observed
			9.5			Termination Depth at: 9.5 m.				

DRAFT

GROUNDWATER WELL S40/MW09

PROJECT NUMBER 60007	**DRILLING COMPANY** Teratest	**EASTING** 283,894.93
PROJECT NAME PCC DSI and RAP	**DRILLING DATE** 14-Jan-21	**NORTHING** 6,263,602.31
CLIENT Penrith City Council	**DRILL RIG**	**ELEVATION** 24.501 m AHD
PERMIT NO. N/A	**DRILLING METHOD** Push Tube / Solid Flight Aug	**COORD SYS** N/A
ADDRESS 158 to 164 Old Bathurst Road, Emu Plains, NSW	**TOTAL DEPTH** 9.5 m bgl	**COORD SOURCE** Surveyor
	DIAMETER 125 mm	**LOGGED BY** J Zeng
COMPLETION Roadbox	**CASING** Class 18 PVC - 50mm	**SCREEN INTERVAL** 6 - 9 m bgl

COMMENTS

Drilling Method	Water (m bgl)	Well Details	Depth (m bgl)	Graphic Log	Lithological Class	Lithological Description	Moisture	Samples	PID	Additional Observations
PT / SFA			0		Fill	FILL - Sandy GRAVEL, dark grey to brown, heterogeneous, dry, well graded, angular, medium dense		S40/MW09_0.0-0.1	0.3	No staining, odours or ACM observed
								S40/MW09_0.2-0.3	0.9	No staining, odours or ACM observed
			0.5		CH-SC	Sandy CLAY - dark grey brown, heterogeneous, dry, high plasticity, firm		S40/MW09_0.4-0.5	0.7	No staining, odours or ACM observed
			1					S40/MW09_0.9-1.00	0.5	No staining, odours or ACM observed
			1.5					S40/MW09_1.4-1.50	0.5	No staining, odours or ACM observed
			2					S40/MW09_1.9-2.00	0.3	No staining, odours or ACM observed
PT / SFA			2.5					S40/MW09_2.9-3.00		No staining, odours or ACM observed
			3							
			3.5		SG	Gravelly SAND - grey white, heterogeneous, dry, high plasticity, firm		S40/MW09_3.9-4.00		No staining, odours or ACM observed
			4							
			4.5					S40/MW09_4.9-5.00		No staining, odours or ACM observed
			5							
			5.5					S40/MW09_5.9-6.00		No staining, odours or ACM observed
			6							
			6.5		SP	SAND - brown, heterogeneous, damp, poorly graded, mediium grained sand, loose		S40/MW09_6.9-7.00		No staining, odours or ACM observed
	▽		7							
			7.5		SP	SAND - brown, heterogeneous, damp, poorly graded, mediium grained sand, loose		S40/MW09_7.9-8.00		No staining, odours or ACM observed
			8							
			8.5					S40/MW09_8.9-9.00		No staining, odours or ACM observed
			9							
			9.5			Termination Depth at: 9.5 m.				

DRAFT

TEST PIT S41

PROJECT NUMBER 60007
PROJECT NAME PCC DSI and RAP
CLIENT Penrith City Council
ADDRESS 158 to 164 Old Bathurst Road, Emu Plains, NSW

DRILLING COMPANY Ken Coles
DRILLING DATE 14-Jan-21
DRILL RIG
DRILLING METHOD Test Pit
DIMENSIONS 2 x 0.5 m

EASTING N/A
NORTHING N/A
COORD SYS N/A
COORD SOURCE Map Approximation
LOGGED BY T Frisken

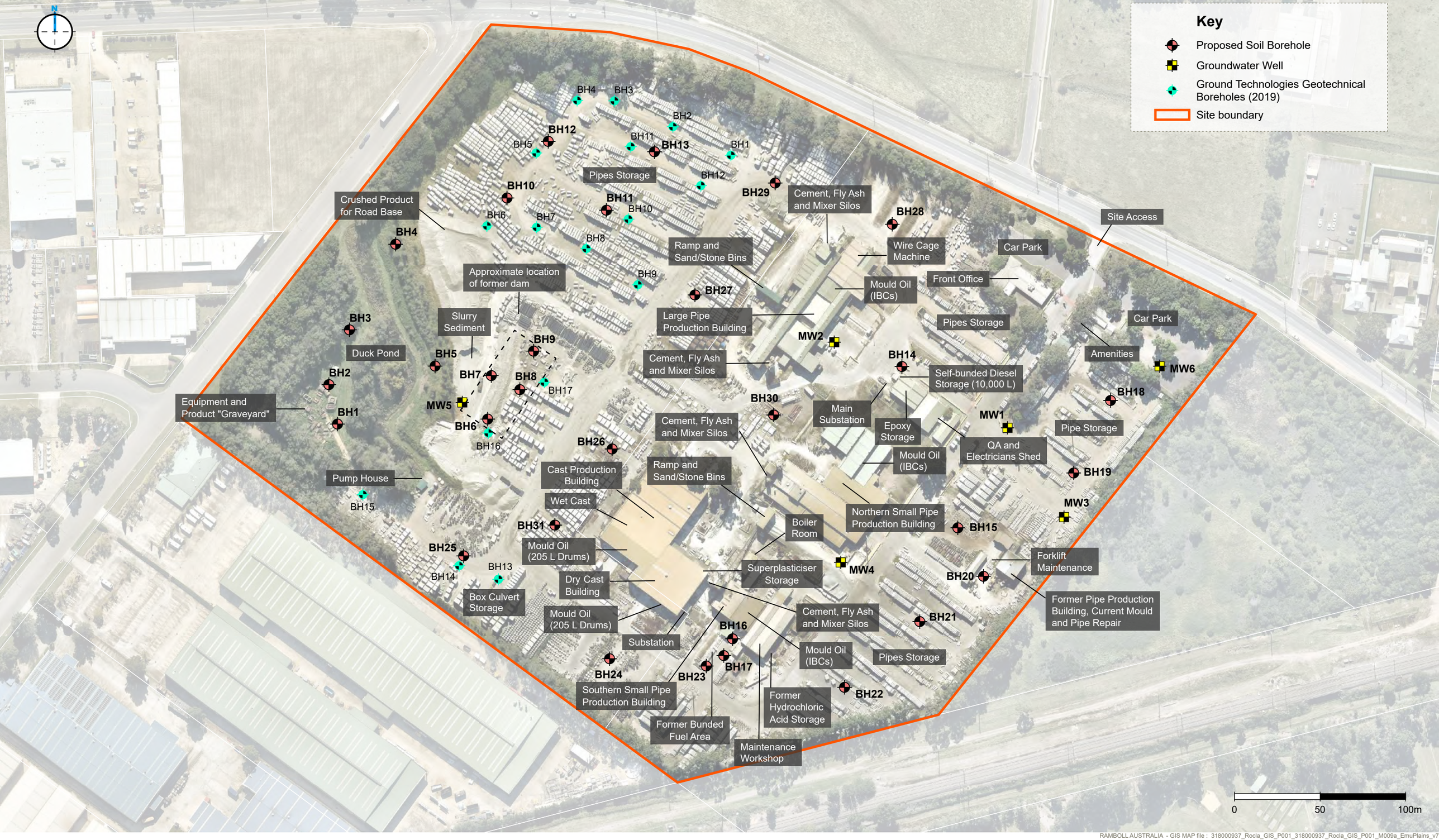
COMMENTS TP Elevation Approximately 2.0m above adjacent gs

Drilling Method	Water (m bgl)	Depth (m bgl)	Graphic Log	Lithological Class	Lithological Description	Moisture	Samples	PID	Additional Observations
		0.5		RWN	RWN - Clayey SAND, heterogeneous, dry, poorly graded, loose, fine sand		S41_0-0.1		No staining, odours or ACM observed
							S41_0.4-0.5		No staining, odours or ACM observed
		1					S41_0.9-1		No staining, odours or ACM observed
		1.5							
		2		SW	Clayey SAND heterogeneous, dry, loose to medium-dense, fine sand				
		2.5			Termination Depth at: 2.5 m.				
		3							
		3.5							
		4							
		4.5							
		5							
		5.5							
		6							
		6.5							
		7							
		7.5							
		8							
		8.5							
		9							
		9.5							

DRAFT

Disclaimer This log is intended for environmental not geotechnical purposes.

produced by ESlog.ESdat.net on 03 Feb 2021



RAMBOLL AUSTRALIA - GIS MAP file : 318000937_Rocla_GIS_P001_318000937_Rocla_GIS_P001_M009a_EmuPlains_v7

Figure 1 - Site Plan and Sampling Locations

Rocla - Emu Plains
318000937

BOREHOLE NUMBER BH1

CLIENT Rocla **PROJECT NAME** Site Investigation

PROJECT NUMBER 318000937 **PROJECT LOCATION** Emu Plains

DATE STARTED 14/5/20 **COMPLETED** 14/5/20 **R.L. SURFACE** _____ **DATUM** _____

DRILLING CONTRACTOR Matrix Drilling **SLOPE** 90° **BEARING** ---

EQUIPMENT Hand Auger / Geoprobe (pushtube or solid flight auger) **HOLE LOCATION** _____

HOLE SIZE 50 mm **LOGGED BY** VW **CHECKED BY** _____

NOTES _____

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
			0,0			FILL; silty CLAY, reworked natural, brown, minor gravels, rootlets, no observed contamination	BH1_0.0, ACM, PID 0.0ppm	
			0,5			FILL; sandy GRAVEL, grey-brown, dense.	BH1_0.6, PID 0.4ppm	
						CLAY; dark brown, natural, high plasticity, moist, no observed contamination		
			1,0					
			1,5			Grading to red/brown	BH1_1.5, PID 0.1ppm	
			2,0			Borehole BH1 terminated at 2m		
			2,5					
			3,0					
			3,5					
			4,0					

BOREHOLE NUMBER BH2

RAMBOLL

CLIENT Rocla **PROJECT NAME** Site Investigation

PROJECT NUMBER 318000937 **PROJECT LOCATION** Emu Plains

DATE STARTED 14/5/20 **COMPLETED** 14/5/20 **R.L. SURFACE** **DATUM**

DRILLING CONTRACTOR Matrix Drilling **SLOPE** 90° **BEARING** ---

EQUIPMENT Hand Auger / Geoprobe (pushtube or solid flight auger) **HOLE LOCATION**

HOLE SIZE 50 mm **LOGGED BY** VW **CHECKED BY**

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
			0,5			FILL; silty CLAY, brown, minor gravels, rootlets, no observed contamination	BH2_0.0, ACM, PID 0.0ppm	
			1,0			CLAY; dark brown, high plasticity, consistent, moist, no observed contamination Grading to brown	BH2_0.6, PID 0.1ppm	
			1,5				BH2_1.5, PID 0.0ppm	
			2,0			Borehole BH2 terminated at 2m		
			2,5					
			3,0					
			3,5					
			4,0					

BOREHOLE NUMBER BH3

CLIENT Rocla **PROJECT NAME** Site Investigation

PROJECT NUMBER 318000937 **PROJECT LOCATION** Emu Plains

DATE STARTED 14/5/20 **COMPLETED** 14/5/20 **R.L. SURFACE** _____ **DATUM** _____

DRILLING CONTRACTOR Matrix Drilling **SLOPE** 90° **BEARING** ---

EQUIPMENT Hand Auger / Geoprobe (pushtube or solid flight auger) **HOLE LOCATION** _____

HOLE SIZE 50 mm **LOGGED BY** VW **CHECKED BY** _____

NOTES _____

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
						FILL; silty CLAY, reworked natural, brown, minor gravels, rootlets, no observed contamination	BH3_0.0, ACM, PID 0.0ppm	
						CLAY; natural, dark brown, high plasticity, consistent, moist, no observed contamination	BH3_0.3, PID 0.0ppm	
			0,5					
			1,0			Grading to orange/brown	BH3_1.0, PID 0.1ppm	
						Borehole BH3 terminated at 1.2m		
			2,5					
			3,0					
			3,5					
			4,0					

BOREHOLE NUMBER BH4

CLIENT Rocla **PROJECT NAME** Site Investigation

PROJECT NUMBER 318000937 **PROJECT LOCATION** Emu Plains

DATE STARTED 14/5/20 **COMPLETED** 14/5/20 **R.L. SURFACE** _____ **DATUM** _____

DRILLING CONTRACTOR Matrix Drilling **SLOPE** 90° **BEARING** ---

EQUIPMENT Hand Auger / Geoprobe (pushtube or solid flight auger) **HOLE LOCATION** _____

HOLE SIZE 50 mm **LOGGED BY** VW **CHECKED BY** _____

NOTES _____

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
			0,5			Grass on surface Silty CLAY; brown/dark brown, high plasticity, rootlets, moist, no observed contamination	BH4_0.6, ACM	
			1,0			Borehole BH4 terminated at 0.8m		
			1,5					
			2,0					
			2,5					
			3,0					
			3,5					
			4,0					

BOREHOLE NUMBER BH5

CLIENT Rocla **PROJECT NAME** Site Investigation

PROJECT NUMBER 318000937 **PROJECT LOCATION** Emu Plains

DATE STARTED 14/5/20 **COMPLETED** 14/5/20 **R.L. SURFACE** _____ **DATUM** _____

DRILLING CONTRACTOR Matrix Drilling **SLOPE** 90° **BEARING** ---

EQUIPMENT Hand Auger / Geoprobe (pushtube or solid flight auger) **HOLE LOCATION** _____

HOLE SIZE 50 mm **LOGGED BY** VW **CHECKED BY** _____

NOTES _____

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
			0,5			Grass on surface Silty CLAY; brown/dark brown, high plasticity, rootlets, moist, no observed contamination	BH5_0.3, ACM	
			1,0 1,5 2,0 2,5 3,0 3,5 4,0			Borehole BH5 terminated at 0.5m		

BOREHOLE NUMBER BH6

CLIENT Rocla **PROJECT NAME** Site Investigation

PROJECT NUMBER 318000937 **PROJECT LOCATION** Emu Plains

DATE STARTED 14/5/20 **COMPLETED** 14/5/20 **R.L. SURFACE** _____ **DATUM** _____

DRILLING CONTRACTOR Matrix Drilling **SLOPE** 90° **BEARING** ---

EQUIPMENT Hand Auger / Geoprobe (pushtube or solid flight auger) **HOLE LOCATION** _____

HOLE SIZE 50 mm **LOGGED BY** VW **CHECKED BY** _____

NOTES _____

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
			0,5			FILL; gravelly SILT, grey/brown, 10% gravels, dry, no observed contamination	BH6_0.1, ACM	
						FILL; silty GRAVEL, brown/grey, 70% fine gravels, 30% silt, moist, no observed contamination		
			1,0			Silty CLAY; light brown with shale (grey/white) inclusions, no observed contamination	BH6_0.7	
			1,5			CLAY; red/brown, high plasticity, consistent, very moist, no observed contamination	BH6_1.5	
			2,0			Borehole BH6 terminated at 2m		
			2,5					
			3,0					
			3,5					
			4,0					

BOREHOLE NUMBER BH7

RAMBOLL

CLIENT Rocla **PROJECT NAME** Site Investigation

PROJECT NUMBER 318000937 **PROJECT LOCATION** Emu Plains

DATE STARTED 14/5/20 **COMPLETED** 14/5/20 **R.L. SURFACE** **DATUM**

DRILLING CONTRACTOR Matrix Drilling **SLOPE** 90° **BEARING** ---

EQUIPMENT Hand Auger / Geoprobe (pushtube or solid flight auger) **HOLE LOCATION**

HOLE SIZE 50 mm **LOGGED BY** VW **CHECKED BY**

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
			0,5			FILL; gravelly SILT, grey/brown, 10% loose gravels, dry, no observed contamination	BH7_0.0, ACM, PID 2.8ppm	
			1,0			FILL; silty GRAVEL, brown/grey, 70% gravels, 30% silt, moist, no observed contamination	BH7_0.9, PID 0.1ppm	
			1,5			CLAY; natural, brown/red mottled, very high plasticity, consistent, very moist, grading to dark brown/red, no observed contamination	BH7_1.5, PID 0.1ppm	
			2,0			Borehole BH7 terminated at 2m		
			2,5					
			3,0					
			3,5					
			4,0					

BOREHOLE NUMBER BH8

CLIENT Rocla **PROJECT NAME** Site Investigation

PROJECT NUMBER 318000937 **PROJECT LOCATION** Emu Plains

DATE STARTED 14/5/20 **COMPLETED** 14/5/20 **R.L. SURFACE** _____ **DATUM** _____

DRILLING CONTRACTOR Matrix Drilling **SLOPE** 90° **BEARING** ---

EQUIPMENT Hand Auger / Geoprobe (pushtube or solid flight auger) **HOLE LOCATION** _____

HOLE SIZE 50 mm **LOGGED BY** VW **CHECKED BY** _____

NOTES _____

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
			0,5			FILL; gravelly SILT, grey/brown, 10% gravels, dry, no observed contamination	BH8_0.1, ACM, PID 1.1ppm	
			1,0			Sandy SILT; natural, brown/red, consistent, low plasticity, moist	BJ8_1.0, PID 0.1ppm	
			1,5					
			2,0			Borehole BH8 terminated at 2m		
			2,5					
			3,0					
			3,5					
			4,0					

BOREHOLE / TEST PIT 318000937 ROCLA EMU PLAINS.GPJ GINT STD AUSTRALIA.GDT 4/6/20

BOREHOLE NUMBER BH9

CLIENT Rocla **PROJECT NAME** Site Investigation

PROJECT NUMBER 318000937 **PROJECT LOCATION** Emu Plains

DATE STARTED 14/5/20 **COMPLETED** 14/5/20 **R.L. SURFACE** _____ **DATUM** _____

DRILLING CONTRACTOR Matrix Drilling **SLOPE** 90° **BEARING** ---

EQUIPMENT Hand Auger / Geoprobe (pushtube or solid flight auger) **HOLE LOCATION** _____

HOLE SIZE 50 mm **LOGGED BY** VW **CHECKED BY** _____

NOTES _____

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
			0,5			FILL; Gravelly SILT, grey/brown, 10% loose gravels 1-2cm, dry, no observed contamination	BH9_0.0, ACM, PID 1.4ppm	
						Becoming dark brown, moist, higher gravel content (70% gravel/ 30% sand, 1-2mm), no observed contamination	BH9_0.4, PID 0.0ppm	
			1,0			CLAY; natural, red/brown, high plasticity, consistent, moist	BH9_0.8. PID 0.0ppm	
			1,5			Borehole BH9 terminated at 1m		
			2,0					
			2,5					
			3,0					
			3,5					
			4,0					

BOREHOLE NUMBER BH10

CLIENT Rocla **PROJECT NAME** Site Investigation

PROJECT NUMBER 318000937 **PROJECT LOCATION** Emu Plains

DATE STARTED 14/5/20 **COMPLETED** 14/5/20 **R.L. SURFACE** _____ **DATUM** _____

DRILLING CONTRACTOR Matrix Drilling **SLOPE** 90° **BEARING** ---

EQUIPMENT Hand Auger / Geoprobe (pushtube or solid flight auger) **HOLE LOCATION** _____

HOLE SIZE 50 mm **LOGGED BY** VW **CHECKED BY** _____

NOTES _____

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
			0,5			FILL; sandy GRAVEL, brown, concrete and cobbles (1-5cm), plastic fragments, slightly moist, no odour, no observed contamination	BH10_0.0, ACM, PID 1.6ppm	
						With gravels and sand (80/20), band of cobbles/gravels, cocnrete/gravel, rounded, plastic fragments	BH10_0.5, PID 0.2ppm	
			1,0			Sandy SILT; natural, brown, with gravels, moist, no observed contamination	BH10_1.0, PID 0.0	
			1,5					
			2,0			Borehole BH10 terminated at 2m		
			2,5					
			3,0					
			3,5					
			4,0					

BOREHOLE / TEST PIT 318000937 ROCLA EMU PLAINS.GPJ GINT STD AUSTRALIA.GDT 4/6/20

BOREHOLE NUMBER BH11

CLIENT Rocla **PROJECT NAME** Site Investigation

PROJECT NUMBER 318000937 **PROJECT LOCATION** Emu Plains

DATE STARTED 14/5/20 **COMPLETED** 14/5/20 **R.L. SURFACE** _____ **DATUM** _____

DRILLING CONTRACTOR Matrix Drilling **SLOPE** 90° **BEARING** ---

EQUIPMENT Hand Auger / Geoprobe (pushtube or solid flight auger) **HOLE LOCATION** _____

HOLE SIZE 50 mm **LOGGED BY** VW **CHECKED BY** _____

NOTES _____

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
			0.5			FILL; gravelly SAND, light brown/grey, gravels 20% sand 80%, dry, no observed contamination	BH11_0.0, ACM, PID 0.9ppm	
			1.0			Sandy SILT; natural, brown, with gravels, moist, no observed contamination	BH11_0.7. PID 0.1ppm	
			1.5			Borehole BH11 terminated at 1.3m	BH11_1.3, PID 0.1ppm	
			2.0					
			2.5					
			3.0					
			3.5					
			4.0					

BOREHOLE / TEST PIT 318000937 ROCLA EMU PLAINS.GPJ GINT STD AUSTRALIA.GDT 4/6/20

BOREHOLE NUMBER BH12

CLIENT Rocla **PROJECT NAME** Site Investigation

PROJECT NUMBER 318000937 **PROJECT LOCATION** Emu Plains

DATE STARTED 14/5/20 **COMPLETED** 14/5/20 **R.L. SURFACE** _____ **DATUM** _____

DRILLING CONTRACTOR Matrix Drilling **SLOPE** 90° **BEARING** ---

EQUIPMENT Hand Auger / Geoprobe (pushtube or solid flight auger) **HOLE LOCATION** _____

HOLE SIZE 50 mm **LOGGED BY** VW **CHECKED BY** _____

NOTES _____

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
			0,5			FILL; sandy GRAVEL, grey/brown, concrete fragments 1-4cm, slightly moist, no odour or signs of contamination	BH12_0.0, ACM, PID 0.5ppm	
						Becoming less gravelly, more sandy		
			1,0			FILL; sandy GRAVEL, brown, grading to more sandy than gravel (80/20%), wire fragments (5cm), concrete gravel fragments, no odour, no observed contamination	BH12_1.0, PID 0.0ppm	
			1,5				BH12_1.5, PID 0.0ppm	
			2,0					
			2,5				BH12_2.5, PID 0.0ppm	
			3,0			Sandy SILT; natural, brown, with gravels, moist, no observed contamination	BH12_3.0, PID 0.0ppm	
						Borehole BH12 terminated at 3m		
			3,5					
			4,0					

BOREHOLE NUMBER BH13

CLIENT Rocla **PROJECT NAME** Site Investigation

PROJECT NUMBER 318000937 **PROJECT LOCATION** Emu Plains

DATE STARTED 14/5/20 **COMPLETED** 14/5/20 **R.L. SURFACE** **DATUM**

DRILLING CONTRACTOR Matrix Drilling **SLOPE** 90° **BEARING** ---

EQUIPMENT Hand Auger / Geoprobe (pushtube or solid flight auger) **HOLE LOCATION**

HOLE SIZE 50 mm **LOGGED BY** VW **CHECKED BY**

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
			0,5			FILL; gravel/concrete on surface then CLAY, reworked natural, red/brown, high plasticity, loose gravels (1-2mm gravels), wood fragments, dry-slightly moist	BH13_0.1, ACM, PID 1.4ppm	
						GRAVEL; seam of gravel, 1-2mm, moist	BH13_0.6, PID 0.0ppm	
			1,0			CLAY; natural, red/brown, moist, high plasticity, fine grained, minor gravels	BH13_1.0, PID 0.0ppm	
						Borehole BH13 terminated at 1m		
			1,5					
			2,0					
			2,5					
			3,0					
			3,5					
			4,0					

BOREHOLE / TEST PIT 318000937 ROCLA EMU PLAINS.GPJ GINT STD AUSTRALIA.GDT 4/6/20

BOREHOLE NUMBER BH14

CLIENT Rocla **PROJECT NAME** Site Investigation

PROJECT NUMBER 318000937 **PROJECT LOCATION** Emu Plains

DATE STARTED 15/5/20 **COMPLETED** 15/5/20 **R.L. SURFACE** _____ **DATUM** _____

DRILLING CONTRACTOR Matrix Drilling **SLOPE** 90° **BEARING** ---

EQUIPMENT Hand Auger / Geoprobe (pushtube or solid flight auger) **HOLE LOCATION** _____

HOLE SIZE 50 mm **LOGGED BY** VW **CHECKED BY** _____

NOTES _____

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
						CONCRETE hardstand		
						FILL; backfill sand with gravels 1-2mm, brown, moist, no observed contamination	BH14_0.2, ACM, PID 1.1ppm	
			0,5			CLAY; natural, dark brown mottled orange, consistent, fine grained Becoming mottled dark brown	BH14_0.4, PID 0.2ppm	
			1,0			Clayey SILT; brown/red, consistent, low-moderate plasticity		
			1,5			Silty CLAY; brown, consistent, low-medium plasticity, very moist	BH14_1.5, PID 0.0ppm	
			2,0			Borehole BH14 terminated at 1.55m		
			2,5					
			3,0					
			3,5					
			4,0					

BOREHOLE NUMBER BH15

CLIENT Rocla **PROJECT NAME** Site Investigation

PROJECT NUMBER 318000937 **PROJECT LOCATION** Emu Plains

DATE STARTED 15/5/20 **COMPLETED** 15/5/20 **R.L. SURFACE** _____ **DATUM** _____

DRILLING CONTRACTOR Matrix Drilling **SLOPE** 90° **BEARING** ---

EQUIPMENT Hand Auger / Geoprobe (pushtube or solid flight auger) **HOLE LOCATION** _____

HOLE SIZE 50 mm **LOGGED BY** VW **CHECKED BY** _____

NOTES _____

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
						FILL; mulch/topsoil	BH15_0.1, PID 0.1ppm	
						FILL; gravelly SAND, light brown, coarse grained, 10% gravels, dry, no observed contamation	BH15_0.3, PID 0.0ppm	black staining at 0.3 m
			0,5			CLAY; natural, red/brown, hard, brittle, fine grained, dry-slightly moist, no observed contamination	BH15_0.5, PID 0.0ppm	
			1,0			grading to silty CLAY; higher plasticity		
			1,5			Borehole BH15 terminated at 1m		
			2,0					
			2,5					
			3,0					
			3,5					
			4,0					

BOREHOLE / TEST PIT 318000937 ROCLA EMU PLAINS.GPJ GINT STD AUSTRALIA.GDT 4/6/20

BOREHOLE NUMBER BH16

CLIENT Rocla **PROJECT NAME** Site Investigation

PROJECT NUMBER 318000937 **PROJECT LOCATION** Emu Plains

DATE STARTED 15/5/20 **COMPLETED** 15/5/20 **R.L. SURFACE** **DATUM**

DRILLING CONTRACTOR Matrix Drilling **SLOPE** 90° **BEARING** ---

EQUIPMENT Hand Auger / Geoprobe (pushtube or solid flight auger) **HOLE LOCATION**

HOLE SIZE 50 mm **LOGGED BY** VW **CHECKED BY**

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
			0.5			FILL; gravelly SAND, light brown, coarse grained, 10% gravels, dry, no observed contamination	BH16_0.0, ACM, PID 1.6ppm	
			1.0			CLAY; natural, red/brown grading to red, hard, brittle, fine grained, dry-slightly moist, no observed contamination	BH16_0.6, PID 0.0ppm	
			1.5					
						Borehole BH16 terminated at 1.6m		
			2.0					
			2.5					
			3.0					
			3.5					
			4.0					

BOREHOLE / TEST PIT 318000937 ROCLA EMU PLAINS.GPJ GINT STD AUSTRALIA.GDT 4/6/20

BOREHOLE NUMBER BH17

CLIENT Rocla **PROJECT NAME** Site Investigation

PROJECT NUMBER 318000937 **PROJECT LOCATION** Emu Plains

DATE STARTED 15/5/20 **COMPLETED** 15/5/20 **R.L. SURFACE** _____ **DATUM** _____

DRILLING CONTRACTOR Matrix Drilling **SLOPE** 90° **BEARING** ---

EQUIPMENT Hand Auger / Geoprobe (pushtube or solid flight auger) **HOLE LOCATION** _____

HOLE SIZE 50 mm **LOGGED BY** VW **CHECKED BY** _____

NOTES _____

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
						FILL; gravelly sandy SILT, grey/brown, loose gravels (10%), no observed contamination		
						FILL; gravelly SAND, light brown, coarse grained, gravels 10%, dry	BH17_0.2, ACM, PID 0.1ppm	
			0,5			CLAY; natural, red/brown, hard, brittle, fine grained, dry-slightly moist, no observed contamination	BH17_0.5, PID 0.1ppm	
			1,0			Borehole BH17 terminated at 1m		
			1,5					
			2,0					
			2,5					
			3,0					
			3,5					
			4,0					

BOREHOLE / TEST PIT 318000937 ROCLA EMU PLAINS.GPJ GINT STD AUSTRALIA.GDT 4/6/20

BOREHOLE NUMBER BH18

CLIENT Rocla **PROJECT NAME** Site Investigation

PROJECT NUMBER 318000937 **PROJECT LOCATION** Emu Plains

DATE STARTED 15/5/20 **COMPLETED** 15/5/20 **R.L. SURFACE** _____ **DATUM** _____

DRILLING CONTRACTOR Matrix Drilling **SLOPE** 90° **BEARING** ---

EQUIPMENT Hand Auger / Geoprobe (pushtube or solid flight auger) **HOLE LOCATION** _____

HOLE SIZE 50 mm **LOGGED BY** VW **CHECKED BY** _____

NOTES _____

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
						FILL; sandy GRAVEL, grey/brown, gravels (concrete), slightly moist, no observed contamination	BH18_0.1, ACM, PID 0.1ppm	
			0,5			CLAY; natural, red/brown, hard, brittle, fine grained, dry-slightly moist, no observed contamination	BH18_0.5, PID 0.0ppm	
			1,0			Becoming slightly moist, silty clay, red/brown, no observed contamination		
			1,5					
			2,0				BH18_1.8, PID 0.0ppm	
						Borehole BH18 terminated at 2m		
			2,5					
			3,0					
			3,5					
			4,0					

BOREHOLE NUMBER BH19

CLIENT Rocla **PROJECT NAME** Site Investigation

PROJECT NUMBER 318000937 **PROJECT LOCATION** Emu Plains

DATE STARTED 15/5/20 **COMPLETED** 15/5/20 **R.L. SURFACE** _____ **DATUM** _____

DRILLING CONTRACTOR Matrix Drilling **SLOPE** 90° **BEARING** ---

EQUIPMENT Hand Auger / Geoprobe (pushtube or solid flight auger) **HOLE LOCATION** _____

HOLE SIZE 50 mm **LOGGED BY** VW **CHECKED BY** _____

NOTES _____

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
						FILL; gravelly SAND, light brown/brown, coarse grained, soft, gravels 5%, no observed contamination	BH19_0.0, ACM, PID 0.0ppm	
			0,5			CLAY; natural, brown grading to red/brown, hard, brittle, fine grained, dry-slightly moist, no observed contamination	BH19_0.5, PID 0.0ppm	
			1,0			Borehole BH19 terminated at 1m		
			1,5					
			2,0					
			2,5					
			3,0					
			3,5					
			4,0					

BOREHOLE / TEST PIT 318000937 ROCLA EMU PLAINS.GPJ GINT STD AUSTRALIA.GDT 4/6/20

BOREHOLE NUMBER BH20

CLIENT Rocla **PROJECT NAME** Site Investigation

PROJECT NUMBER 318000937 **PROJECT LOCATION** Emu Plains

DATE STARTED 15/5/20 **COMPLETED** 15/5/20 **R.L. SURFACE** _____ **DATUM** _____

DRILLING CONTRACTOR Matrix Drilling **SLOPE** 90° **BEARING** ---

EQUIPMENT Hand Auger / Geoprobe (pushtube or solid flight auger) **HOLE LOCATION** _____

HOLE SIZE 50 mm **LOGGED BY** VW **CHECKED BY** _____

NOTES _____

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
						FILL; sandy silty GRAVEL, brown/grey, 1-3cm, loose, dry	BH20_0.0, ACM, PID 66.1 ppm	
						Black stain inclusion, hydrocarbon odour	BH20_0.3, PID 57.8ppm	
			0,5			CLAY; natural, black/brown, stain patches, stiff, high plasticity, moist, hydrocarbon odour	BH20_0.5, PID 1.0ppm	
						Grading to brown/red, no observed contamination		
			1,0				BH20_0.9, PID 0.0ppm	
						Borehole BH20 terminated at 1m		
			1,5					
			2,0					
			2,5					
			3,0					
			3,5					
			4,0					

BOREHOLE / TEST PIT 318000937 ROCLA EMU PLAINS.GPJ GINT STD AUSTRALIA.GDT 4/6/20

BOREHOLE NUMBER BH21

CLIENT Rocla **PROJECT NAME** Site Investigation

PROJECT NUMBER 318000937 **PROJECT LOCATION** Emu Plains

DATE STARTED 15/5/20 **COMPLETED** 15/5/20 **R.L. SURFACE** _____ **DATUM** _____

DRILLING CONTRACTOR Matrix Drilling **SLOPE** 90° **BEARING** ---

EQUIPMENT Hand Auger / Geoprobe (pushtube or solid flight auger) **HOLE LOCATION** _____

HOLE SIZE 50 mm **LOGGED BY** VW **CHECKED BY** _____

NOTES _____

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
			0,5			FILL; gravelly SAND backfill, brown/grey, coarse grained gravels 1-2cm, no observed contamination	BH21_0.1, ACM, PID 0.2ppm	
			1,0			CLAY; natural, mottled dark grey/brown, fine grained, high plasticity, rootlets, moist, no observed contamination	BH21_0.6, PID 0.2ppm	
			1,5			Borehole BH21 terminated at 1m		
			2,0					
			2,5					
			3,0					
			3,5					
			4,0					

BOREHOLE NUMBER BH22

CLIENT Rocla **PROJECT NAME** Site Investigation

PROJECT NUMBER 318000937 **PROJECT LOCATION** Emu Plains

DATE STARTED 15/5/20 **COMPLETED** 15/5/20 **R.L. SURFACE** _____ **DATUM** _____

DRILLING CONTRACTOR Matrix Drilling **SLOPE** 90° **BEARING** ---

EQUIPMENT Hand Auger / Geoprobe (pushtube or solid flight auger) **HOLE LOCATION** _____

HOLE SIZE 50 mm **LOGGED BY** VW **CHECKED BY** _____

NOTES _____

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
						FILL; gravelly sandy SILT, fine grained, with loose gravels, soft, rootlets, dry	BH22_0.0, ACM, PID 1.7ppm	
			0,5			FILL; sandy GRAVEL, light brown/grey, coarse grained, 1-4cm gravels, grading to brown, no observed contamination	BH22_0.4, PID 0.0ppm	
			1,0			CLAY; natural, red/brown, hard, brittle, fine grained, dry-slightly moist, no observed contamination	BH22_0.6, PID 0.0ppm	
			1,5			Borehole BH22 terminated at 1m		
			2,0					
			2,5					
			3,0					
			3,5					
			4,0					

BOREHOLE NUMBER BH23

RAMBOLL

CLIENT Rocla **PROJECT NAME** Site Investigation

PROJECT NUMBER 318000937 **PROJECT LOCATION** Emu Plains

DATE STARTED 15/5/20 **COMPLETED** 15/5/20 **R.L. SURFACE** **DATUM**

DRILLING CONTRACTOR Matrix Drilling **SLOPE** 90° **BEARING** ---

EQUIPMENT Hand Auger / Geoprobe (pushtube or solid flight auger) **HOLE LOCATION**

HOLE SIZE 50 mm **LOGGED BY** VW **CHECKED BY**

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
						FILL; gravelly sandy SILT, brey/brown, loose gravels 10%, no observed contamination		
						FILL; gravelly SAND, light brown, coarse grained gravels 10%, dry, no observed contamination	BH23_0.2, ACM, PID 0.1ppm	
			0,5			CLAY; natural, red/brown, hard, brittle, fine grained, dry-slightly moist, no observed contamination	BH23_0.6, PID 0.1ppm	
			1,0					
			1,5					
			2,0			Borehole BH23 terminated at 2m		
			2,5					
			3,0					
			3,5					
			4,0					

BOREHOLE NUMBER BH24

CLIENT Rocla **PROJECT NAME** Site Investigation

PROJECT NUMBER 318000937 **PROJECT LOCATION** Emu Plains

DATE STARTED 15/5/20 **COMPLETED** 15/5/20 **R.L. SURFACE** _____ **DATUM** _____

DRILLING CONTRACTOR Matrix Drilling **SLOPE** 90° **BEARING** ---

EQUIPMENT Hand Auger / Geoprobe (pushtube or solid flight auger) **HOLE LOCATION** _____

HOLE SIZE 50 mm **LOGGED BY** VW **CHECKED BY** _____

NOTES _____

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
						FILL; gravelly sandy SILT, grey/brown, loose gravels 10%, 1mm-1cm, no observed contamination	BH24_0.0, ACM, PID 0.0ppm	
			0.5			FILL; gravelly SAND, light brown, coarse grained gravels 10%, dry, no observed contamination	BH24_0.4, PID 0.0ppm	
						CLAY; natural, red/brown, hard, brittle, fine grained, slightly moist, no observed contamination	BH24_0.8, PID 0.2ppm	
			1.0			Borehole BH24 terminated at 1m		
			1.5					
			2.0					
			2.5					
			3.0					
			3.5					
			4.0					

BOREHOLE / TEST PIT 318000937 ROCLA EMU PLAINS.GPJ GINT STD AUSTRALIA.GDT 4/6/20

BOREHOLE NUMBER BH25

CLIENT Rocla **PROJECT NAME** Site Investigation

PROJECT NUMBER 318000937 **PROJECT LOCATION** Emu Plains

DATE STARTED 14/5/20 **COMPLETED** 14/4/20 **R.L. SURFACE** _____ **DATUM** _____

DRILLING CONTRACTOR Matrix Drilling **SLOPE** 90° **BEARING** ---

EQUIPMENT Hand Auger / Geoprobe (pushtube or solid flight auger) **HOLE LOCATION** _____

HOLE SIZE 50 mm **LOGGED BY** VW **CHECKED BY** _____

NOTES _____

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
			0,5			FILL; sandy SILT, light grey, with gravels (60%), dry, no observed contamination	BH25_0.1, PID 0.0ppm	
			1,0			Becoming higher gravel content (90%)	BH25_1.0, PID 0.0ppm	
			1,5			Becoming moist, gravel (50%) /sand (50%)	BH25_1.5, PID 0.1ppm	
			2,0			CLAY; natural, light brown, plastic, loose gravels, no observed contamination	BH25_2.0, PID 0.0ppm	
			2,5			Borehole BH25 terminated at 2.2m		
			3,0					
			3,5					
			4,0					

BOREHOLE NUMBER BH26

CLIENT Rocla **PROJECT NAME** Site Investigation

PROJECT NUMBER 318000937 **PROJECT LOCATION** Emu Plains

DATE STARTED 14/5/20 **COMPLETED** 14/5/20 **R.L. SURFACE** **DATUM**

DRILLING CONTRACTOR Matrix Drilling **SLOPE** 90° **BEARING** ---

EQUIPMENT Hand Auger / Geoprobe (pushtube or solid flight auger) **HOLE LOCATION**

HOLE SIZE 50 mm **LOGGED BY** VW **CHECKED BY**

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
						FILL; sandy SILT, light grey, with gravels, dry, no observed contamination	BH26_0.0, ACM, PID 1.1ppm	
			0.5			Silty CLAY; natural, brown, consistent, moderate plasticity, moist, no observed contamination	BH26_0.4, PID 0.1ppm	
			1.0			Silty CLAY; natural, grey/white, with shale like inclusions, no observed contamination	BH26_0.7, PID 0.1ppm	
			1.5			Borehole BH26 terminated at 1m		
			2.0					
			2.5					
			3.0					
			3.5					
			4.0					

BOREHOLE / TEST PIT 318000937 ROCLA EMU PLAINS.GPJ GINT STD AUSTRALIA.GDT 4/6/20

BOREHOLE NUMBER BH27

CLIENT Rocla **PROJECT NAME** Site Investigation

PROJECT NUMBER 318000937 **PROJECT LOCATION** Emu Plains

DATE STARTED 14/5/20 **COMPLETED** 14/5/20 **R.L. SURFACE** _____ **DATUM** _____

DRILLING CONTRACTOR Matrix Drilling **SLOPE** 90° **BEARING** ---

EQUIPMENT Hand Auger / Geoprobe (pushtube or solid flight auger) **HOLE LOCATION** _____

HOLE SIZE 50 mm **LOGGED BY** VW **CHECKED BY** _____

NOTES _____

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
						FILL; sandy SILT, light grey, with gravels, dry, no observed contamination	BH27_0.0, ACM, PID 1.2ppm	
			0,5			Silty CLAY; natural, brown, consistent, moderate plasticity, moist, no observed contamination	BH27_0.5, PID 0.4ppm	
						Borehole BH27 terminated at 0.8m		
			1,0					
			1,5					
			2,0					
			2,5					
			3,0					
			3,5					
			4,0					

BOREHOLE / TEST PIT 318000937 ROCLA EMU PLAINS.GPJ GINT STD AUSTRALIA.GDT 4/6/20

BOREHOLE NUMBER BH28

CLIENT Rocla **PROJECT NAME** Site Investigation

PROJECT NUMBER 318000937 **PROJECT LOCATION** Emu Plains

DATE STARTED 14/5/20 **COMPLETED** 14/5/20 **R.L. SURFACE** **DATUM**

DRILLING CONTRACTOR Matrix Drilling **SLOPE** 90° **BEARING** ---

EQUIPMENT Hand Auger / Geoprobe (pushtube or solid flight auger) **HOLE LOCATION**

HOLE SIZE 50 mm **LOGGED BY** VW **CHECKED BY**

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
						FILL; gravelly SILT, brown/grey, gravels 1-2cm, some rootlets, dry, no observed contamination	BH28_0.0, ACM, PID 2.9ppm	
			0,5			CLAY; natural, brown grading to red, consistent, high plasticity, slightly moist, no observed contamination	BH28_0.6, PID 0.1ppm	
			1,0			Borehole BH28 terminated at 1m		
			1,5					
			2,0					
			2,5					
			3,0					
			3,5					
			4,0					

BOREHOLE / TEST PIT 318000937 ROCLA EMU PLAINS.GPJ GINT STD AUSTRALIA.GDT 4/6/20

BOREHOLE NUMBER BH29

CLIENT Rocla **PROJECT NAME** Site Investigation

PROJECT NUMBER 318000937 **PROJECT LOCATION** Emu Plains

DATE STARTED 14/5/20 **COMPLETED** 14/5/20 **R.L. SURFACE** **DATUM**

DRILLING CONTRACTOR Matrix Drilling **SLOPE** 90° **BEARING** ---

EQUIPMENT Hand Auger / Geoprobe (pushtube or solid flight auger) **HOLE LOCATION**

HOLE SIZE 50 mm **LOGGED BY** VW **CHECKED BY**

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
						FILL; sandy SILT, light grey, loose gravels, no observed contamination	BH29_0.0, ACM, PID 0.9ppm	
			0,5			Silty CLAY; natural, brown, consistent, moderate plasticity, moist, no observed contamination	BH29_0.5, PID 0.3ppm	
			1,0			Borehole BH29 terminated at 1m		
			1,5					
			2,0					
			2,5					
			3,0					
			3,5					
			4,0					

BOREHOLE / TEST PIT 318000937 ROCLA EMU PLAINS.GPJ GINT STD AUSTRALIA.GDT 4/6/20

BOREHOLE NUMBER BH30

CLIENT Rocla **PROJECT NAME** Site Investigation

PROJECT NUMBER 318000937 **PROJECT LOCATION** Emu Plains

DATE STARTED 14/5/20 **COMPLETED** 14/5/20 **R.L. SURFACE** _____ **DATUM** _____

DRILLING CONTRACTOR Matrix Drilling **SLOPE** 90° **BEARING** ---

EQUIPMENT Hand Auger / Geoprobe (pushtube or solid flight auger) **HOLE LOCATION** _____

HOLE SIZE 50 mm **LOGGED BY** VW **CHECKED BY** _____

NOTES _____

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
						FILL; gravelly SAND, brown, 1-2cm, rootlets, no observed contamination	BH30_0.0, ACM, PID 2.0ppm	
			0.5			FILL; clayey SILT, reworked natural, brown/mottled orange, fine grained, moderate palsticity, moist, no obserevd contamination	BH30_0.4, PID 0.0ppm	
			1.0			Grading to light brown/mottled orange		
						CLAY; natural, brown, consistent, high plasticity, moist	BH30_1.3, PID 0.1ppm	
			1.5			Borehole BH30 terminated at 1.5m		
			2.0					
			2.5					
			3.0					
			3.5					
			4.0					

BOREHOLE NUMBER BH31

CLIENT Rocla **PROJECT NAME** Site Investigation

PROJECT NUMBER 318000937 **PROJECT LOCATION** Emu Plains

DATE STARTED 14/5/20 **COMPLETED** 14/5/20 **R.L. SURFACE** _____ **DATUM** _____

DRILLING CONTRACTOR Matrix Drilling **SLOPE** 90° **BEARING** ---

EQUIPMENT Hand Auger / Geoprobe (pushtube or solid flight auger) **HOLE LOCATION** _____

HOLE SIZE 50 mm **LOGGED BY** VW **CHECKED BY** _____

NOTES _____

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
			0.5			FILL; Sandy SILT, light grey, loose gravels, some large gravels ~30mm, plastic inclusions, slighty hydrocarbon odour, becoming moist, no observed contamination	BH31_0.0, ACM, PID 0.1ppm BH31_0.5, PID 0.1ppm	
			1.0			Silty CLAY; natural, brown, even, moderate plasticity, slightly moist, no observed contamination	BH31_0.9, PID 0.0ppm	
						Silty CLAY; natural, black brown, loose gravel (1mm), moist, no observed contamination	BH31_1.3, PID 0.0ppm	
			1.5			Borehole BH31 terminated at 1.3m		
			2.0					
			2.5					
			3.0					
			3.5					
			4.0					

BOREHOLE / TEST PIT 318000937 ROCLA EMU PLAINS.GPJ GINT STD AUSTRALIA.GDT 4/6/20

BOREHOLE NUMBER MW1

RAMBOLL

CLIENT Rocla **PROJECT NAME** Site Investigation

PROJECT NUMBER 318000937 **PROJECT LOCATION** Emu Plains

DATE STARTED 13/5/20 **COMPLETED** 13/5/20 **R.L. SURFACE** **DATUM**

DRILLING CONTRACTOR Matrix Drilling **SLOPE** 90° **BEARING** ---

EQUIPMENT Sonic Drill Rig **HOLE LOCATION**

HOLE SIZE 50mm **LOGGED BY** TF **CHECKED BY**

NOTES

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
							FILL; Gravelly SAND, brown, firm, dry, fine-medium grained granules, no observed contamination	MW1_0.0, PID 0.1ppm	
							FILL; Gravelly SAND, brown, firm, dry medium grained, coarse gravels, minor cobbles, no observed contamination	MW1_0.5, PID 0.0ppm	
				1			CLAY; natural, red-brown, high plasticity, hard, dry, fine sands present, no observed contamination		
				2					
								MW1_2.5, PID 0.4ppm	
				3			Gravelly CLAY; natural, red-brown, high plasticity, medium grained sands, medium-coarse gravels and large cobbles (siltstone, river stone),dry, no observed contamination		
				4					
								MW1_4.5, PID 0.2ppm	
				5			Gravelly SAND; natural, red-orange becoming darker red/brown with depth, medium-coarse grained limestone/river stone gravels/cobbles up to 150mm, loose, moist		
				6					
	▼			7					
								MW1_7.5	
				8					
				9					
							Borehole MW1 terminated at 9m		
				10					

BOREHOLE NUMBER MW2

RAMBOLL

CLIENT Rocla **PROJECT NAME** Site Investigation

PROJECT NUMBER 318000937 **PROJECT LOCATION** Emu Plains

DATE STARTED 15/5/20 **COMPLETED** 15/5/20 **R.L. SURFACE** **DATUM**

DRILLING CONTRACTOR Matrix Drilling **SLOPE** 90° **BEARING** ---

EQUIPMENT Sonic Drill Rig **HOLE LOCATION**

HOLE SIZE 50 mm **LOGGED BY** TF **CHECKED BY**

NOTES

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
							CONCRETE on surface	MW2_0.2, PID 0.2ppm	
							FILL; Sandy GRAVEL, grey-brown, compact, dry, coarse sands, no observed contamination	MW2_0.5, QC7, QC8, PID 0.3ppm	
							FILL; Gravelly CLAY, brown-orange, high plasticity, firm, fine gravels, minor sands, medium grained, no observed contamination		
				1			Sandy CLAY; natural, red-brown, high plasticity, firm, fine sands and silts present, dry, no observed contamination	MW2_1.0, PID 0.2ppm	
				2				MW2_2.0, PID 0.0ppm	
				3					
				4					
								MW2_4.5, PID 0.1ppm	
				5			Gravelly SAND; natural, red-brown, medium coarse grained, limestone/river stone gravels and cobbles up to 150mm, loose, dry-moist, wet with depth		
				6					
	▼			7				NW2_7.0, PID 0.0ppm	
				8					
				9					
				10			Borehole MW2 terminated at 9m		

BOREHOLE NUMBER MW3

RAMBOLL

CLIENT Rocla **PROJECT NAME** Site Investigation

PROJECT NUMBER 318000937 **PROJECT LOCATION** Emu Plains

DATE STARTED 13/5/20 **COMPLETED** 13/5/20 **R.L. SURFACE** **DATUM**

DRILLING CONTRACTOR Matrix Drilling **SLOPE** 90° **BEARING** ---

EQUIPMENT Sonic Drill Rig **HOLE LOCATION**

HOLE SIZE 50 mm **LOGGED BY** TF **CHECKED BY**

NOTES

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
Sonic							FILL; Sandy GRAVEL, grey-brown, hard, blue metal, concrete cobbles, gravel is medium-coarse grained, high plasticity clays, dry, no observed contamination	MW3_0.0, QC1, QC2, PID 0.3ppm	
							FILL; Sandy GRAVEL, grey-brown, stiff, blue metal gravels, medium-coarse, minor clays, high plasticity clays present, dry, no observed contamination	MW3_0.5, PID 0.4ppm	
				1			CLAY; natural, red-brown, high plasticity, hard, dry, no observed contamation	MW3_1.0, PID 0.9ppm	
				2				MW3_2.0, PID 0.2ppm	
							Sandy CLAY; red-orange-brown, low plasticity, fine-medium grained sands, firm, dry, no observed contamination		
				3				MW3_3.0, PID 0.1ppm	
							Gravelly SAND; red-brown, medium-coarse grained, loose, coarse gravels, minor cobbles, dry		
				4				MW3_4.5, PID 0.5ppm	
				5			Gravelly SAND; natural, grey-orange, loose, dry, medium grained limestone/river cobbles, coarse gravels up to 150mm, moist, no observed contamination		
				6					
				7					
				8					
				9				MW3_9.0, PID 0.5ppm	
				10					

BOREHOLE NUMBER MW3

CLIENT Rocla **PROJECT NAME** Site Investigation

PROJECT NUMBER 318000937 **PROJECT LOCATION** Emu Plains

DATE STARTED 13/5/20 **COMPLETED** 13/5/20 **R.L. SURFACE** _____ **DATUM** _____

DRILLING CONTRACTOR Matrix Drilling **SLOPE** 90° **BEARING** ---

EQUIPMENT Sonic Drill Rig **HOLE LOCATION** _____

HOLE SIZE 50 mm **LOGGED BY** TF **CHECKED BY** _____

NOTES _____

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
Sonic				11			Gravelly SAND; natural, grey-orange, loose, dry, medium grained limestone/river cobbles, coarse gravels up to 150mm, moist, no observed contamination *(continued)*		
				12			BEDROCK; weathered Shale, natural, grey		
				13					
				14					
				15			Borehole MW3 terminated at 15m		
				16					
				17					
				18					
				19					
				20					

BOREHOLE NUMBER MW4

RAMBOLL

CLIENT Rocla **PROJECT NAME** Site Investigation

PROJECT NUMBER 318000937 **PROJECT LOCATION** Emu Plains

DATE STARTED 14/5/20 **COMPLETED** 14/5/20 **R.L. SURFACE** **DATUM**

DRILLING CONTRACTOR Matrix Drilling **SLOPE** 90° **BEARING** ---

EQUIPMENT Sonic Drill Rig **HOLE LOCATION**

HOLE SIZE 50 mm **LOGGED BY** TF **CHECKED BY**

NOTES

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
							FILL; Sandy GRAVEL, brown-grey, very firm (highly compact), medium-coarse grained, medium grained sand, minor plastics noted in fill, dry, no observed contamination	MW4_0.0, PID 0.7ppm	
							FILL; Sandy GRAVEL, grey, coarse grained, coarse sands, firm, dry, no observed contamination	MW4_0.5, QC3, QC4, PID 0.5ppm	
				1			FILL; CLAY, orange-brown, low plasticity, hard, minor sands and gravels present, dry, no observed contamination	MW4_1.0, PID 0.6ppm	
							FILL; Gravelly CLAY, grey-brown, hard, high plasticity, coarse gravels present, dry, no observed contamination	MW4_1.5, PID 0.3ppm	
				2			Sandy CLAY; natural, red-brown, high plasticity, fine-medium grained sands present, firm, dry-moist, no observed contamination	MW4_2.0, PID 0.4ppm	
				3					
				4					
				5			Gravelly SAND; natural, red-orange-brown, medium-coarse grained, limestone/river stone gravels and cobbles up to 150mm, loose, moist/wet, no observed contamination		
				6					
	▼			7				MW4_7.0, PID 0.3ppm	
				8					
				9					
				10			Borehole MW4 terminated at 9m		

BOREHOLE NUMBER MW5

RAMBOLL

CLIENT Rocla **PROJECT NAME** Site Investigation

PROJECT NUMBER 318000937 **PROJECT LOCATION** Emu Plains

DATE STARTED 14/5/20 **COMPLETED** 14/5/20 **R.L. SURFACE** **DATUM**

DRILLING CONTRACTOR Matrix Drilling **SLOPE** 90° **BEARING** ---

EQUIPMENT Sonic Drill Rig **HOLE LOCATION**

HOLE SIZE 50 mm **LOGGED BY** TF **CHECKED BY**

NOTES

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
				0			FILL; Sandy GRAVEL, light grey-brown, coarse, medium grained sands, hard/very firm, crushed concrete gravels mixed with soil, dry	MW5_0.0, PID 0.1ppm	
							FILL; Sandy GRAVEL, brown, firm, coarse, medium grained sands, some metal and concrete fragments, dry	MW5_0.5, QC5, QC6, PID 0.0ppm	
				1			CLAY; natural, red-brown, high plasticity, minor medium grained sands, hard, moist, no observed contamination		
				2				MW5_1.5, PID 0.3ppm	
				3			Sandy CLAY; natural, red-brown, medium-coarse sands, high plasticity, firm/soft, moist, no observed contamination	MW5_3.0, PID 0.6ppm	
				4					
				5			Gravelly SAND; natural, red-brown, medium-coarse grained, limeston/river stone gravels and cobbles up to 150mm, loose, wet, no observed contamination		
	▼			6					
				7				MW5_7.0, PID 0.0ppm	
				8					
				9					
				10			Borehole MW5 terminated at 9m		

BOREHOLE NUMBER MW6

RAMBOLL

CLIENT Rocla **PROJECT NAME** Site Investigation

PROJECT NUMBER 318000937 **PROJECT LOCATION** Emu Plains

DATE STARTED 15/5/20 **COMPLETED** 15/5/20 **R.L. SURFACE** **DATUM**

DRILLING CONTRACTOR Matrix Drilling **SLOPE** 90° **BEARING** ---

EQUIPMENT Sonic Drill Rig **HOLE LOCATION**

HOLE SIZE 50 mm **LOGGED BY** TF **CHECKED BY**

NOTES

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
							FILL; Sandy SILT, brown, low plasticity, medium grained sands, minor gravels, minor organic content (roots, leaves, sticks, no observed contamination	MW6_0.0, PID 0.4ppm	
							CLAY; natural, red-brown, high plasticity, firm, dry, no observed contamination	MW6_0.5, PID 0.2ppm	
				1			Sandy CLAY; red-brown, high plasticity, firm, fine sands present, becoming hard with depth, dry	MW6_1.0, PID 0.5ppm	
				2				MW6_2.0, PID 0.4ppm	
				3					
				4					
				5			Gravelly SAND; natural, red-brown, medium-coarse grained, limestone/river stone cobbles and gravels up to 150mm, dry, becoming wet with depth	MW6_4.5, PID 0.3ppm	
				6					
				7					
	▼			8				MW6_8.0, PID 0.3ppm	
				9					
				10					

BOREHOLE NUMBER MW6

CLIENT Rocla **PROJECT NAME** Site Investigation

PROJECT NUMBER 318000937 **PROJECT LOCATION** Emu Plains

DATE STARTED 15/5/20 **COMPLETED** 15/5/20 **R.L. SURFACE** _____ **DATUM** _____

DRILLING CONTRACTOR Matrix Drilling **SLOPE** 90° **BEARING** ---

EQUIPMENT Sonic Drill Rig **HOLE LOCATION** _____

HOLE SIZE 50 mm **LOGGED BY** TF **CHECKED BY** _____

NOTES _____

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
							Gravelly SAND; natural, red-brown, medium-coarse grained, limestone/river stone cobbles and gravels up to 150mm, dry, becoming wet with depth *(continued)*		
							Borehole MW6 terminated at 10.5m		