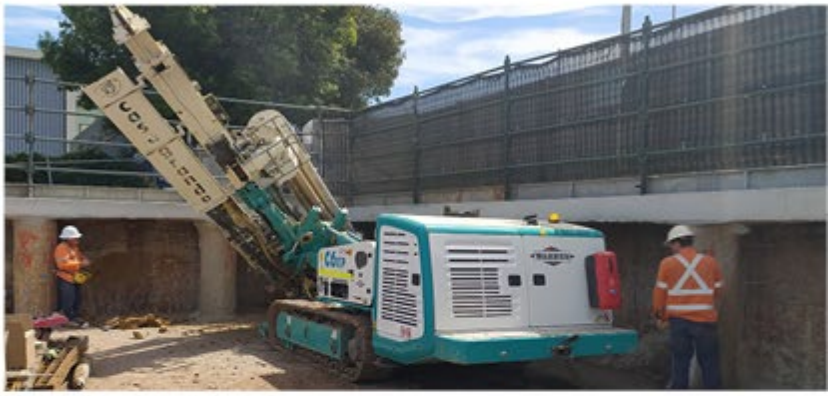
Geotechnical Investigation
Hunter Indoor Sports Centre
State Significant Development (SSD-65595459)

2 Monash Road and 24 Wallarah Road, New Lambton, NSW
24002155.001A

2 May 2024



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Megan Mathews	Phil Band	Phil Band

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1 INTRODUCTION

Kleinfelder Australia Pty Ltd (Kleinfelder) was commissioned by Basketball Association of Newcastle Limited (BANL) to prepare this report in accordance with the technical requirements of the Secretary's Environmental Assessment Requirements (SEARs), and in support of the State Significant Development (SSD-65595459) for the proposed Hunter Indoor Sport Centre with courts, indoor stadium, amenities and associated civil and landscaping works, at 2 Monash Road and 24 Wallarah Road, New Lambton, NSW (the site).

The objective of this investigation is to undertake a geotechnical investigation of the site. The purpose of the geotechnical investigation was to provide a report detailing the encountered ground conditions, geotechnical design parameters and recommendations for footings and pavement design.

1.1 SITE LOCATION AND DESCRIPTION

The Site is bounded by Lambton High School and residential units to the north, Turton Road to the east, a shared cycleway, Lambton Ker-rai Creek and Monash Road to the south (in consecutive order), and Arthur Edden Oval to the west. The Site is outlined in a regional context in **Figure 1-1**.

Figure 1-1: Site Location

A summary of the Site details is outlined in **Table 1-1**.

Table 1-1: Site Details

Site Name	Hunter Indoor Sports Centre
Site Address	2 Monash Road and 24 Wallarah Road, New Lambton, NSW
Current Title Identification	Lot 2377 DP 755247 Lot 2378 DP 755247 Lot 2379 DP 755247 Lot 2380 DP 755247 The project area also includes land on which the existing amenities block is located.
Local Council	City of Newcastle
Site Zoning	RE1 (Public Recreation)
Current Site Use	Public Oval
Proposed Site Use	It is understood the Site will be developed into a new sports facility.

1.2 GEOLOGICAL MAPPING

Based on the geological map published by NSW Resources Regulator (www.minview.geoscience.nsw.gov.au), the site is indicated to be underlain by Quaternary-aged, alluvial floodplain deposits of silt, very fine- to medium-grained lithic- to quartz-rich sand, and clay, shown as "Q_af" in **Figure 1-2** below.

Figure 1-2: Surface Geology

The observed ground conditions during the geotechnical investigation undertaken by Kleinfelder found conditions consistent with weathered units of the regional geology of the area.

1.3 ACID SULPHATE SOILS

A review of the Acid Sulfate Soils (ASS) Map on the NSW government's environment website SPADE (eSPADE v2.2 (nsw.gov.au)), shows that the Site is in the zone L4- low probability of ASS.

When disturbed, ASS has the potential to cause significant environmental and economic impacts including the contamination of groundwater resources, scalding of landscapes and the corrosion of steel and concrete infrastructure. Laboratory testing was undertaken to more accurately assess the risk of ASS in the Site, and results are shown in **Chapter 3**.

2 FIELDWORK

The geotechnical fieldwork investigation was undertaken from 4 to 6 October 2023. Simultaneously, a Detailed Site Investigation (DSI) was undertaken by Kleinfelder's Contaminated Land Management (CLM) team and a Groundwater Monitoring Event (GME) was undertaken on 13 October. **Appendix A** shows the layout of the Site including investigative hole locations.

Underground service location was undertaken by a qualified service locator on 4 October. A Site Walkover was conducted by an experienced Kleinfelder geotechnical engineer on the same day. Dynamic Cone Penetrometer (DCP) tests were advanced by the Kleinfelder geotechnical engineer at each borehole location.

Field testing and sampling consisted of:

- Eight boreholes were drilled to a depth of 8.0m below ground level (bgl).
- Standard Penetrometer Tests (SPTs) were conducted on all boreholes at 1.5m intervals.
- Three boreholes were converted to monitoring wells as part of the DSI.
- Eight DCPs were conducted, one at each borehole location.
- Twenty-two hand augers were advanced to between 0.5 and 2.0m bgl using either a hand auger or ute-mounted solid fight auger.
- Undisturbed and disturbed soil samples were collected for laboratory testing.

2.1 SOIL PROFILE

The soil profiles at all borehole locations were logged by a Kleinfelder geotechnical engineer in accordance with AS1726-2017. Borehole logs are presented in **Appendix B** and summarised in **Table 2-1** below.

Table 2-1: Borehole Subsurface Profiles

Material	Depth to Base of Strata (m)							
	BH01	BH02	BH03	BH04	BH05	MW01	MW02	MW03
FILL/TOPSOIL	1.5	0.2	1.0	0.5	0.5	0.5	1.2	0.7
Firm to stiff CLAY/Silty CLAY	7.7	1.8; >7.95	7.8	2.5; >7.95	3.7	3.1	6.0	2.8; 7.5
Alternating bands of medium-dense to dense SAND and firm to stiff CLAY	-	7.8	-	4.5	6.3	7.5	-	6.0
Very stiff to hard CLAY	-	-	>7.95	6.0	>7.95	>7.95	>7.95	>7.95
Very low strength SANDSTONE	>7.95	-	-	-	-	-	-	-
Total depth of borehole (m)	**7.95**	**7.95**	**7.95**	**7.95**	**7.95**	**7.95**	**7.95**	**7.95**

The soil profiles at all hand auger locations were logged by a Kleinfelder environmental scientist in accordance with AS1726-2017. Borehole logs are presented in **Appendix B** and summarised in **Table 2-2**.

Table 2-2: Hand Auger Subsurface Profiles

Material	Depth to base of strata (m)										
	HA01	HA12	HA13	HA14	BH06	BH07	BH08	BH09	BH10	BH11	BH12
FILL/ TOPSOIL	0.4	>0.5	0.7	1.3	1.2	0.9	1.4	1.0	1.0	0.5	0.5
CLAY/Sandy CLAY	>1.5	-	>0.9	>1.6	>2.0	>2.0	>2.0	>2.0	>2.0	>2.0	>2.0
Total depth of hole (m)	**1.5**	**0.5**	**0.9**	**1.6**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**
Material	**BH13**	**BH14**	**BH15**	**BH16**	**BH17**	**BH18**	**BH19**	**BH20**	**BH21**	**BH22**	**BH23**
FILL/ TOPSOIL	0.5	0.3	0.3	0.3	0.5	0.6	1.1	0.6	0.6	0.6	0.6
CLAY/Sandy CLAY	>2.0	>2.0	>2.0	>2.0	>2.0	>2.0	>2.0	>2.0	>2.0	>2.0	>2.0
Total depth of hole (m)	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**

2.2 GROUNDWATER

Groundwater was encountered in all boreholes during geotechnical fieldworks, and two hand augers during CLM fieldworks. Depths are shown below in **Table 2-3**. The groundwater depths in the monitoring wells recorded during the GME are also shown below.

Table 2-3: Groundwater Levels

	BH01	BH02	BH03	BH04	BH05	MW01	MW02	MW03	HA01	HA14
Depth of ground-water observed during drilling (m bgl)	0.8	3.1	4.5	3.05	3.3	2.1	4.1	2.9	1.2	1.2
GME ground-water depth	-	-	-	-	-	2.62	2.47	2.58	-	-

2.3 IN-SITU TESTS

In-situ strength tests included DCP tests and SPTs. Eight DCP tests were performed by hand to a maximum depth of 1.8m bgl or refusal, exactly at corresponding borehole locations. The DCP/borehole locations are shown in **Appendix A** and DCP results are presented in **Appendix D**. A summary of the DCP and SPT field test results are presented below in **Figure 2-1** and **Figure 2-2**.

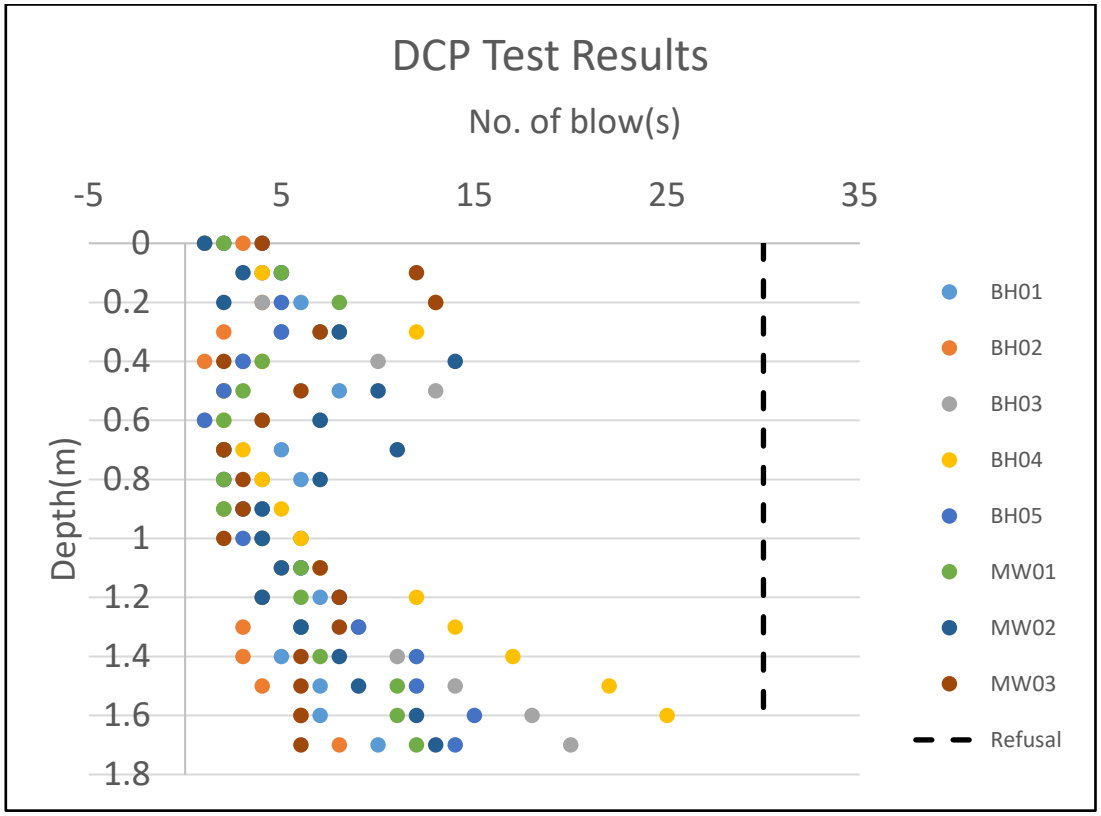

Figure 2-1: DCP Results

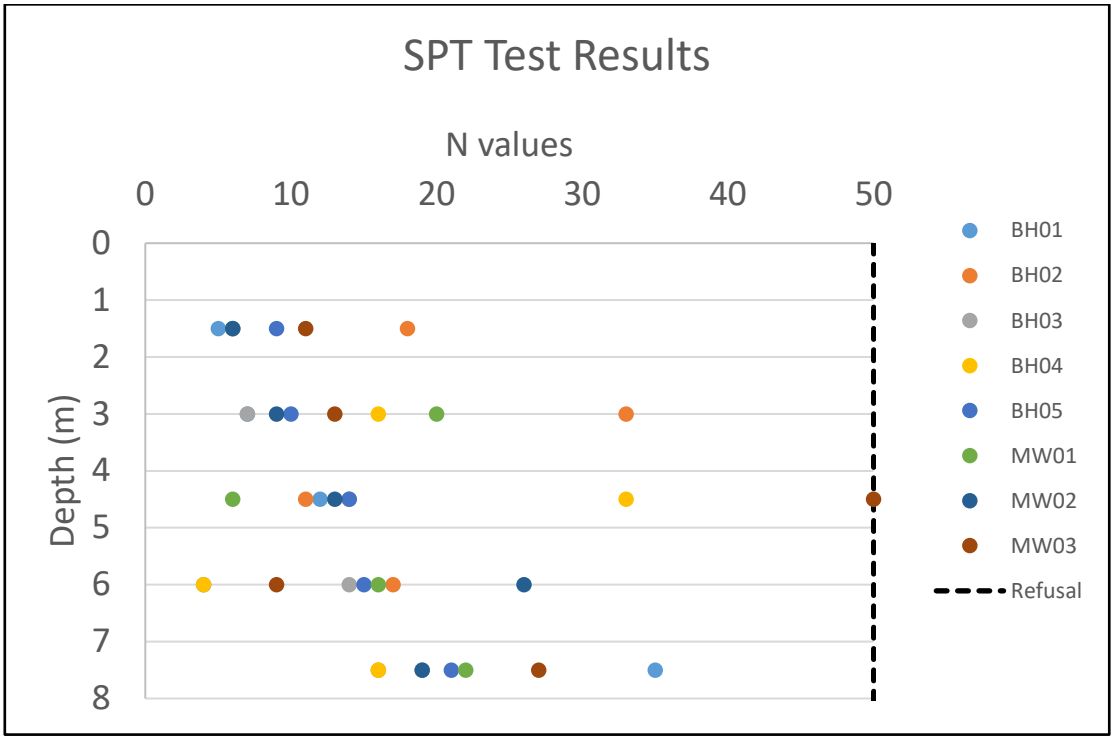

Figure 2-2: SPT Results

3 GEOTECHNICAL LABORATORY TESTING

NATA-accredited laboratory testing was undertaken in accordance with the relevant section of AS1289 "*Methods of Testing Soils for Engineering Purposes*". A summary of the laboratory results is presented below in **Table 3-1**.

Table 3-1: Testing Summary

Laboratory Test	Number Specified
Atterberg limits (including linear shrinkage)	7
California Bearing Ratio (CBR)	4
Particle Size Distribution (PSD)	3
Shrink-Swell tests	7
Aggressivity tests	8
pHFox tests	20

Table 3-2, below, presents a summary of the laboratory results for CBR, PSD, Atterberg limits and shrink-swell tests.

Table 3-2: CBR, PSD, Atterberg, Shrink-Swell Results

BH ID	Sample Depth (m)	CBR (%)	MDD* (t/m³)	OMC* (%)	Gravel (%)	Sand (%)	Fines (%)	Plasticity Index (%)	Plastic Limit (%)	Liquid Limit (%)	Linear Shrinkage (%)	Shrink Swell Index (%)
BH01	2.5-3.0	-	-	-	-	-	-	-	-	-	-	5.6
BH01	4.5-4.95	-	-	-	-	-	-	33	18	51	13.5	-
BH02	0.2-0.8	4.0	1.48	26.5	-	-	-	-	-	-	-	-
BH02	0.5-1.0	-	-	-	-	-	-	-	-	-	-	3.4
BH02	2.0-3.0	-	-	-	0	94	6	-	-	-	-	-
BH03	0.2-0.7	19	1.94	12.0	-	-	-	-	-	-	-	-
BH03	1.0-1.5	-	-	-	-	-	-	-	-	-	-	5.4
BH03	2.0-2.5	-	-	-	-	-	-	39	19	58	14.5	-
BH04	0.2-0.8	3.5	1.50	25.5	-	-	-	-	-	-	-	-
BH04	1.5-2.0	-	-	-	-	-	-	-	-	-	-	4.1
BH04	1.5-2.3	-	-	-	-	-	-	22	16	38	4.0	-
BH04	2.5-3.5	-	-	-	0	88	12	-	-	-	-	-
BH05	1.0-1.5	-	-	-	-	-	-	-	-	-	-	6.5
BH05	7.5-7.95	-	-	-	-	-	-	31	18	49	12.0	-
MW01	1.0-1.5	-	-	-	-	-	-	32	19	51	15.0	4.2

BH ID	Sample Depth (m)	CBR (%)	MDD* (t/m³)	OMC* (%)	Gravel (%)	Sand (%)	Fines (%)	Plasticity Index (%)	Plastic Limit (%)	Liquid Limit (%)	Linear Shrinkage (%)	Shrink Swell Index (%)
MW02	0.1-0.5	18	1.82	12.0	-	-	-	-	-	-	-	-
MW02	2.0-2.5	-	-	-	-	-	-	-	-	-	-	1.3
MW02	2.5-3.0	-	-	-	-	-	-	41	19	60	16.0	-
MW03	5.0-6.0	-	-	-	0	90	10	-	-	-	-	-
MW03	6.5-7.5	-	-	-	-	-	-	Cannot be determined- non-plastic				-

*MDD: Maximum Dry Density OMC: Optimum Moisture Content

Figure 3-1 below shows the results of the seven Atterberg limits tests plotted on the Casagrande chart, showing that all results were medium- or high- plasticity clays with the exception of MW03_6.5-7.5, which was found to be non-plastic.

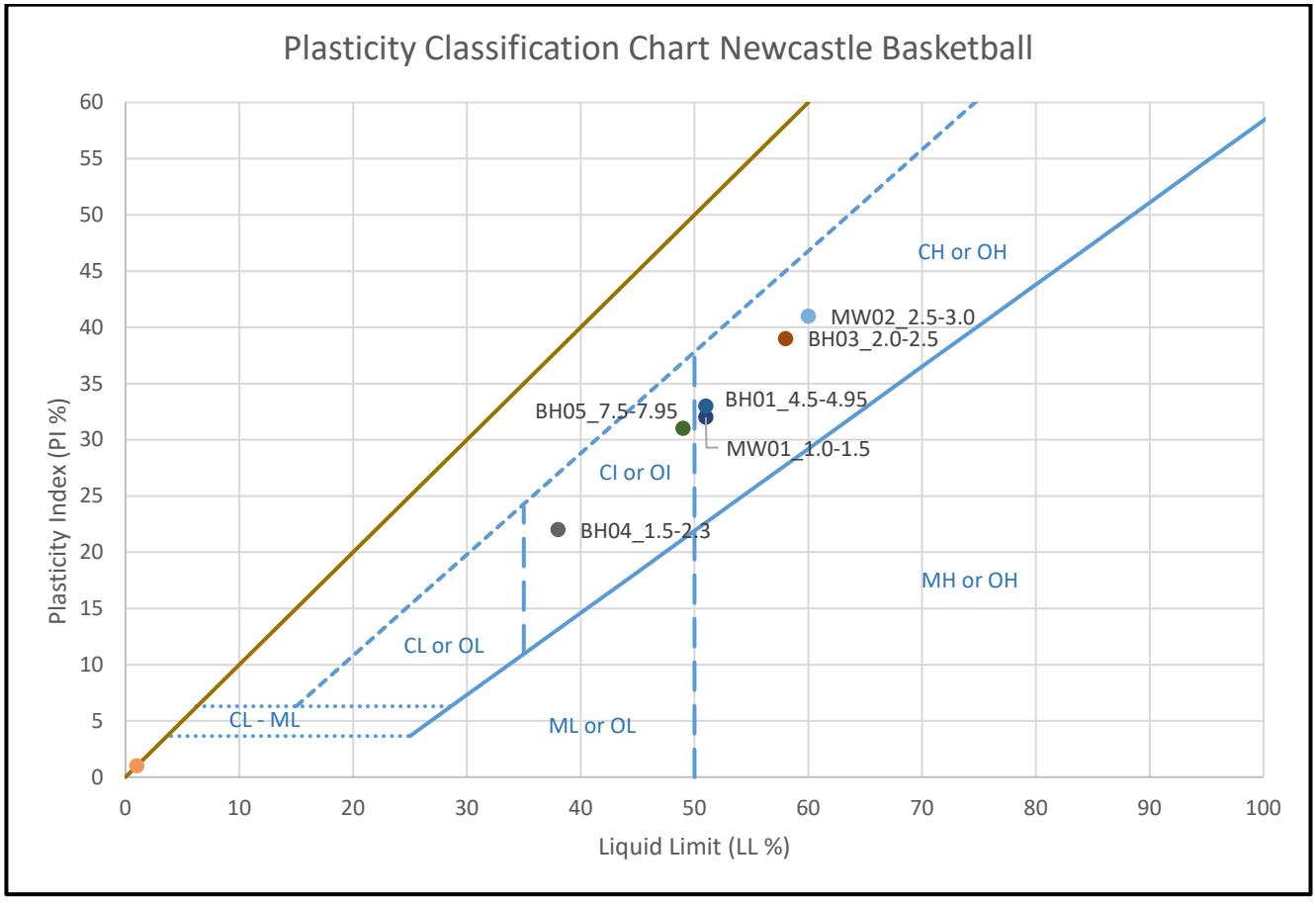

Figure 3-1: Casagrande Chart Showing Atterberg Results

Where C=Clay, M=Silt, O-Organic, H=High, I=Medium, L=Low

Table 3-3 and **Table 3-4** present the analytical results for aggressivity and pHFox testing, respectively.

Table 3-3: Aggressivity Results

BH ID	Sample Depth (m)	Soil Condition	Aggressivity to Concrete	Aggressivity to Steel
BH01	1.5-1.95	B	Mild	Mild
BH02	2.0-2.5	B	Mild	Non-Aggressive
BH03	1.5-1.8	B	Mild	Mild
BH04	1.5-2.3	B	Mild	Non-Aggressive
BH05	2.0-3.0	B	Mild	Mild
MW01	1.0-1.5	B	Mild	Non-Aggressive
MW02	1.2-1.5	B	Non-Aggressive	Non-Aggressive
MW03	2.5-3.0	B	Non-Aggressive	Non-Aggressive

Soil condition A=high permeability soils in groundwater.
Soil condition B=low permeability soil or all soils above groundwater.

Table 3-4: pHFox Results

Sample	pH (F)	pH (Fox)	Reaction Rate
BH01_2.0-2.5	4.9	2.9	2
BH01_2.5-3.0	4.9	3.1	2
BH02_1.0-1.5	4.8	3.0	2
BH02_3.4-3.5	5.5	2.2	2
BH03_1.5-1.8	4.8	2.9	2
BH03_2.0-2.5	5.1	2.8	2
BH03_3.0-3.45	5.0	3.4	2
BH04_1.5-2.3	4.4	3.5	2
BH04_2.5-3.5	5.4	3.7	2
BH04_3.5-4.5	4.8	3.4	2
BH05_0.5-1.0	4.3	4.7	2
BH05_1.5-2.0	5.0	3.3	2
BH05_2.0-3.0	5.0	3.6	2
MW01_1.0-1.5	5.1	3.5	2
MW01_1.5-1.6	4.7	3.0	2
MW02_1.2-1.5	4.6	3.5	2
MW02_1.5-2.0	6.2	3.6	2
MW02_2.5-3.0	5.2	3.5	2
MW03_1.0-1.5	4.7	3.3	2
MW03_1.8-2.0	5.4	3.9	2

4 GEOTECHNICAL ASSESSMENT AND RECOMMENDATIONS

4.1 GEOTECHNICAL DESIGN PARAMETERS

Based on the current Site investigation, field test results, the guidance given in Appendix D3 of AS4678:2002 Earth Retaining Structures, and Kleinfelder's geotechnical engineering experience, the following geotechnical design parameters were derived to calculate the allowable bearing capacity using Meyerhof's Bearing Capacity Theory (Meyerhof, G, (1965)). The design parameters and allowable bearing capacity that may be used for the Site at the test locations is presented below in **Table 4-1**.

Table 4-1: Allowable Bearing Capacity and Geotechnical Design Parameters

Strata (Refer to Table 2-1 for applicable depths)	Unit Weight γb kN/m³	Undrained Shear Strength Cu kPa	Effective Cohesion c' kPa	Effective Friction Angle ϕ'°	Undrained Elastic Modulus Eu MPa	Allowable Bearing Capacity kPa		
						Shallow Footing	Piered[1] Footing	Skin Friction
FILL: Gravelly Clayey Sand	18	-	1	28	10	-	-	-
Firm to stiff CLAY/Silty CLAY	18	35	4	26	14	-	-	-
Medium-dense to dense SAND/Silty/Clayey SAND	19	-	-	34	15	-	-	-
Firm to stiff CLAY	19	25	2.5	29	10	-	-	-
Very stiff to hard CLAY	21	150	5	26	60	-	500	20
Very low strength SANDSTONE	21	-	-	32	60	-	500	-

1. Minimum embedment 3 pile diameters into stratum.

The elastic settlement of footings up to 1.5m wide at the maximum allowable bearing pressure is expected to be less than 25mm (Terzaghi, K., Peck, R. B. and Mesri, G. (1996)). Larger footings shall be checked by a geotechnical engineer to ensure settlements are within project tolerances.

4.2 SHALLOW FOOTINGS

The site is not suitable for shallow footing because of the prevalence of soft to firm clay with sand bands in the upper 5-6m. It is therefore recommended that all structural loads are supported by piers or piles taken to the very stiff clay and/or sandstone bedrock at approximately 8m depth.

4.3 GROUND BEARING FLOOR SLABS

Ground bearing floor slabs may be used up to a total loading of 15kpa, above this it is recommended that slabs are suspended and supported on piers taken to the very stiff clay and/or sandstone bedrock at approximately 8m depth. Slabs that are particularly sensitive to differential settlement should be supported on piers taken to the very stiff clay and/or sandstone bedrock at approximately 8m depth.

4.4 DEEP FOOTINGS

Piered or piled footings are expected to transfer the loads to layers with higher bearing capacities and as such will eliminate the potential requirement of ground improvement and excavation of fill material.

It is recommended that bored pier or pile excavations be assessed by a geotechnical engineer during construction to ensure that founding conditions are consistent with those on which the design recommendations are based. Care should be taken to ensure that the base and side of any pile excavations are clean of loose material and water prior to pouring concrete.

Piles shall be designed in accordance with AS2159-2009. Piles should be founded at a minimum of three pile diameters within the design founding stratum, and a minimum of 3 pile diameters below the finished surface. Based on the understanding of the development and investigation results, the piles are anticipated to be founded in very stiff to hard CLAY &/or very dense SAND. The depth to the appropriate founding stratum may be variable, and increased sockets and pile depths will potentially be required to achieve the desired pile capacity. A geotechnical strength reduction factor (Φ_g) of **0.52** was derived to calculate the above allowable end bearing pressures in accordance with AS2159-2009 “Piling-Design and installation”; however, the pier designers shall calculate their own value base upon guidance given in the Standard and experience in the particular project details and testing regime.

Piles should be located with a horizontal separation of no less than 2.5 pile diameters centre-to-centre to avoid capacity reduction and increased settlement with pile interaction. Where piles are required to be spaced closer than 2.5 pile diameters centre-to-centre, the design capacities should be reduced, and the pile group assessed for increased settlement. Although the potential for differential settlement across the site exists for piered footings, it is considered it would be within normal two-story building tolerances.

Indicative end bearing and skin friction values, for single isolated piles are presented above in **Table 4-1**.

4.5 EARTHQUAKE DESIGN SOIL CLASSIFICATION

Soft soil less than 10m deep with SPT N-values less than 6 was encountered during the investigation. Hence, for earthquake design, a site classification of **Class D_e** (**Soft Soil Site**) is recommended in accordance with AS1170.4-2007 “Structural design action Part 4: Earthquake action in Australia”.

4.6 SITE CLASSIFICATION

In accordance with AS2870:2011 “Residential slabs and footings” Table 2.3 and based on the shrink-swell test results, it is anticipated that the characteristic surface movement (y_s) will be between 60 and 75 mm, therefore the site is classified as **CLASS H2** and should be designed using engineering principles as per AS2870:2011.

4.7 EXPOSURE CLASSIFICATION FOR CONCRETE AND STEEL

Based on the material encountered during the site investigation and laboratory results presented in Table 3-3, the soil is classified as **mild** to concrete and **mild** to steel in accordance with AS2159-2009 “Piling design and installation”.

4.8 ACID SULPHATE SOIL CONSIDERATIONS

Acid sulfate soil screening test returned four tests that dropped by a pH of 2 or more in a pH_f and pH_{fox} test and all samples displayed a Moderate reaction rate. Based upon this it is possible that the soils are Potential Acid Sulfate; further Chromium Suite testing has been scheduled and results will be reported in a future version of this report.

5 PAVEMENT DESIGN RECOMMENDATIONS

5.1 DESIGN SUBGRADE CBR

Based on the laboratory testing results (**Table 3-2**) and the Site investigation, it is recommended that a design subgrade CBR value of **3.5%** be adopted.

The contractor should avoid placing fill material such as clays and clayey sands as they will not have a sufficient CBR to support the designed pavement effectively.

5.2 DESIGN TRAFFIC LOADING

In the absence of specific traffic data, the design traffic loads (DTL) have been determined on the basis of the following assumptions:

- 200 vehicles will access the site daily, on average, over the life of the pavement.
- Service vehicles accessing the site will be light vehicle or 2-axle truck.
- Values of other traffic parameters reported in Austroads Guide to Pavement and Technology Part 2- 2017.

Should more specific traffic information become available in future, the pavement design options need to be reviewed and re-calculated.

A summary of the calculated DTL and other design parameters is presented in **Table 5-1** below.

Table 5-1: Design Traffic Loading (DTL) Parameters

Traffic Load Parameter	Value
Design Period (years)	20
Annual Average Daily Traffic (AADT) (Vehicles per day)	200
Direction Factor (DF)	0.5
Lane Distribution Factor (LDF)	1.0
Average Percentage of Heavy Vehicles (%)	3.0
Annual Growth Rate (%)	1.0
N_{HVAG}*	2.5
ESA**/HVAG	0.7
DESA* **	$4.2x10^4$

*HVAG: Heavy Vehicle Axle Group **ESA: Equivalent Standard Axles *** Design Equivalent Standard Axles

5.3 PAVEMENT STRUCTURE AND RECOMMENDATION

Based on the site investigation, the result of the laboratory testing and the calculated traffic loadings, it is recommended to use a **Thin Asphalt surfaced Granular Pavement** in accordance with Austroads Guide to Pavement Technology Part 2 (2017) “Pavement Structural Design”.

Considering the initial assumption and execution limitations, pavement design has been developed for this site as per **Table 5-2** in accordance with Austroads Guide to Pavement Technology Part 2 (2017) “Pavement Structural Design”.

Table 5-2: Pavement Design

Layer	Details
Wearing Course	30 mm Size 10 mm Type N Class Dense Graded Asphalt with C320 binder with 7mm primer seal.

Layer	Details
Base	*150 mm DGB20* *Compacted to a minimum density of 98% (modified) AS1289.5.2.1*
Subbase	*310 mm DGS40* *Compacted to a minimum density of 98% (modified) AS1289.5.2.1*
Total	390 mm including asphalt
Subgrade	Material as found minimum CBR 3.5% *Compacted to a minimum density of 98% (standard) AS1289.5.1.1*

5.4 PAVEMENT CONSTRUCTION

5.4.1.1 Subgrade Compaction

Subgrade should be compacted to a minimum density ratio of 98% of Standard Maximum Dry Density (SMDD) or 75% Density Index (DI) at moisture contents of ±2% of standard optimum moisture content. The subgrade shall be proof rolled to confirm that the subgrade is a uniform surface. Proof-rolling shall be conducted using a fully loaded water truck or similar and be observed and assessed by a suitably qualified geotechnical engineer.

6 CONSTRUCTION AND GEOTECHNICAL CONSIDERATIONS

6.1 SOFT / LOOSE SOIL

Due to the nature of soils on this site, the surface may become soft and boggy during wet weather. Affected material shall be removed prior to construction of footings, slabs or pavements.

6.2 REACTIVE SOIL

The site is Class He, therefore for stiffened rafts, waffle rafts, or strip footings on moderately, highly and extremely reactive sites, the following requirements apply to the building services and footing system in addition to the general requirements in accordance with AS2870-2011 “Residential slabs and footings”.

- Where the design of the footing system relies on particular detailing of masonry construction to minimise any damage caused by foundation movement, that detailing shall be included on the drawings.
- Penetration of the edge beam and footing by drainpipes shall be sleeved using closed-cell polyethylene lagging or similar.
- During construction, water run-off shall be collected and channeled away from the building.
- Excavation near the edge of footing system shall be backfilled in such a way as to prevent access of water to the foundation as described in Clause 5.6.3(b) of AS 2870-2011.

6.3 SUITABILITY SITE SOILS FOR ENGINEERED BACKFILL

Taking into account the conditions observed onsite and the guidelines outlined in AS3798-2007, it seems that the fill material on this site is likely to be suitable for future engineered backfill, provided that any unsuitable material according to AS3798-2007 Section 4.3 is removed before placing the engineered layers. Nevertheless, Kleinfelder recommends that a competent geotechnical engineer assesses the excavated material and conducts the necessary laboratory tests to evaluate its engineering properties prior to using it for backfilling.

Natural site soil comprise soft to firm clay and may be Potential Acid Sulfate Soils (PASS) and are not likely to be suitable fore-use without treatment using lime to improve the geotechnical properties and potentially ameliorate the PASS.

The unsuitable material may include:

- Organic soils, such as many topsoils, severely root-affected subsoils and peat.
- Materials contaminated through past site usage which may contain toxic substances or soluble compounds harmful to water supply or agriculture.
- Materials containing substances that can be dissolved or leached out in the presence of moisture (e.g., gypsum), or which undergo volume change or loss of strength when disturbed and exposed to moisture (e.g., some shales and sandstones), unless these matters are specifically addressed in the design.
- Silts, or materials that have the deleterious engineering properties of silt.
- Other materials with properties that are unsuitable for the forming of structural fill; and
- Fill that contains wood, metal, plastic, boulders or other deleterious material, in sufficient proportions to affect the required performance of the fill.

6.4 BACKFILLING REQUIREMENTS

Excavations below subgrade level shall be backfilled with suitable soils compatible with the surrounding natural soil profile. Fill is to be placed in layers not exceeding 300 mm loose thickness and should be compacted to a dry density ratio of at least 98% Standard Maximum Dry Density (SMDD) at a moisture content in the range ±2% of optimum moisture content.

6.5 PAVEMENT AND SITE DRAINAGE

To improve the trafficability of the site, minimise construction delays, and enable proper functioning of the pavement, adequate surface and sub-surface drainage should be provided. Sub-soil edge drains shall extend to below the bottom of the sub-base layer.

Reticulated garden beds shall not be sited within 2m of pavement edges.

The pavement shall be constructed with a minimum cross fall of 3% to ensure drainage of the asphalt surface in accordance with Master Specification – Part RD-DK-D1 – Road Drainage Design and Austroads Part 5A Section 4.

Where pipes pass under the footing system, the trench shall be backfilled full depth with clay to act as a barrier to the ingress of water beneath the footing system. Alternatively, a plastic membrane across the cross-section of the trench, taped to the pipe and keyed into the sides and base of the trench may be used.

Subsurface drains to remove groundwater shall not be used within 1.5 m of the building unless designed in accordance with engineering principles.

The roof water should be diverted away from the footing as soon as the roof is constructed by using temporary pipes, if necessary. Surface water should also be managed by constructing surface gutters or grading the surface to divert the water away from the building footings.

6.6 EXCAVATION AND TEMPORARY BATTERS

Excavations to depths of up 3m below existing ground surface level will be achievable using medium sized earthmoving equipment.

Excavations must comply with applicable safety regulations. Construction site safety is solely the responsibility of the contractor, who shall also be solely responsible for the means, methods, and sequencing of construction operations. We are providing the preliminary advice below as a service to our client; under no circumstances should the information provided be interpreted to mean that Kleinfelder is assuming responsibility for construction site safety or the contractor's activities.

The recommended bulking factors for excavation to transporting to placement and compaction shown in **Table 6-1**.

Table 6-1: Bulking Factors for Excavation to Transporting

Material	Bulk up on Excavation (%)	Bulk density (in-situ t/m^3)
Granular soils	10 - 15	1.6 – 2.3
Cohesive soils	20 - 40	1.4 – 2.2
Peat / Topsoil	25 - 45	1.1 – 1.4

Confined excavations deeper than 1.0 m must be battered, benched, or have a lateral soil retaining device inserted, such as a trench box, for stability, and be assessed, prior to anyone entering them.

The face of unsupported excavations is to be battered to the safe batter angles shown in **Table 6-2** below. These batter angles are based on there being no groundwater; if groundwater seepage is encountered then the angles should be reduced, and a geotechnical engineer consulted.

Excavated spoil shall not be stockpiled at distances from the top of the excavated faces of less than the depth of the excavation. The ground around the excavation should be graded to fall away from the excavation to minimise surface water runoff over the unprotected batters.

Table 6-2: Safe Batter Slopes

Soil layers	Less than 2 weeks	In excess of 2 weeks
FILL	1 (v) : 1.5 (h)	1 (v) : 2.5 (h)
Clay/sandy Clay	1 (v) : 1.5 (h)	1 (v) : 2.5 (h)

Steeper angles may be achieved under the supervision of a suitably experienced and qualified geotechnical engineer.

6.7 CONSTRAINTS TO DEVELOPMENT

The site is not suitable for shallow footings and all structural loads shall be piles to very stiff clay and/or sandstone bedrock at approximately 8m depth.

The site soils are potential Potential Acid Sulfate Soils and may require appropriate treatment on excavation or disturbance. Further testing is underway to better define this issue.

The site has a high groundwater level at around 1-3m below ground level and works below this depth may require dewatering measures.

The site is comprised of highly expansive clay (H2 Classification) and will likely require piers or other structural measures to prevent excessive movement of the footings and floor slabs.

7 REFERENCES

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8 LIMITATIONS

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This work was performed in a manner consistent with that level of care and skill ordinarily exercised by other members of Kleinfelder's profession practising in the same locality, under similar conditions and at the date the services are provided. Our conclusions, opinions, and recommendations are based on a limited number of observations and data. It is possible that conditions could vary between or beyond the data evaluated. Kleinfelder makes no other representation, guarantee, or warranty, express or implied, regarding the services, communication (oral or written), report, opinion, or instrument of service provided.

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The findings and conclusions contained within this report are relevant to the conditions of the site and the state of legislation currently enacted in the relevant jurisdiction in which the site is located as at the date of this report.

Additionally, the findings and conclusions contained within this report are made following a review of certain information, reports, correspondence and data noted by methods described in this report including information supplied by the client or its assigns. Kleinfelder has designed and managed the program for this report in good faith and in a manner that seeks to confirm the information provided and test its accuracy and completeness. However, Kleinfelder does not provide guarantees or assurances regarding the accuracy, completeness and validity of information and data obtained from these sources and accepts no responsibility for errors or omissions arising from relying on data or conclusions obtained from these sources.

Any representation, statement, opinion or advice expressed or implied in this report is made on the basis that Kleinfelder, its agents and employees are not liable to any other person taking or not taking (as the case may be) action in respect of any representation, statement, opinion or advice referred to above.

APPENDIX A FIGURES

Legend
- Subject Area
- Borehole
- Hand Auger
- Monitoring Well

0 5 10 20 30 40 50
Scale @ A4 1:1,000 Metres
GDA 1994 MGA Zone 56
N

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PROJECT REFERENCE:	24002155
DATE DRAWN:	22/11/2023 Version 1
DRAWN BY:	RHourigan
DATA SOURCE:	Metromap - 2023

Investigation locations

APP
Basketball Association of Newcastle Limited
New Lambton, NSW 2305

FIGURE:
1

J:\00 CLIENT FILES\89268_APP\24002155_BasketballAssociation\231106_BasketballAssociation_DSI.aprx (1)

APPENDIX B SOIL LOGS

Date Begin - End:	06/10/23	**Drilling Company:**	FICO Group	**BORING LOG BH01**
Logged By:	M. Mathews	**Drill Crew:**	S. Currie	
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	FG102 ute-mounted rig	
Inclination:	-90 degrees	**Drilling Method:**	Solid Flight Auger	
Weather:	Fine	**Bore Diameter:**	110 mm. O.D.	

FIELD EXPLORATION

Depth (metres)	Graphical Log	Surface Condition: Grass Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/152 mm. Pocket Pen(PP)= kg/cm²	Drill Notes / Remarks
1		**TOPSOIL**: brown, dry, medium dense FILL: **Silty CLAY with Sand and Gravel**: angular gravel, dark brown to black, w=p.l., stiff, Gravel of phaneritic texture. Trace coal. At 0.8m: Groundwater				
2		**CLAY with Silt**: medium plasticity, black/dark brown mottled yellow, w=l.l., firm, trace organics			BC=1 2 3 N=5 PP=1.6	
3					BC=3 3 4 N=7	
4		**CLAY**: grey mottled yellow and brown, w=l.l., stiff, mottling shows structure				
5					BC=4 4 8 N=12	
6		**CLAY trace Gravel**: medium plasticity, grey mottled yellow and brown, w=l.l., firm, Gravel is Ironstone-medium-grained and angular.			BC=2 2 2 N=4	
7		**CLAY with Gravel**: high plasticity, light grey mottled yellow and brown, w=l.l., firm, Gravel is Ironstone-medium-grained and angular.				
8		**SANDSTONE**: light grey, wet, very low strength, Extremely weathered/Residual soil			BC=4 13 22 N=35	
9						

The boring was terminated at approximately 8 m. below ground level. The boring was backfilled with auger cuttings on 06 October, 2023.

GROUNDWATER LEVEL INFORMATION:
Groundwater was observed at 0.8 m below ground level
GENERAL NOTES:

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PROJECT NO.:	24002155.001A
DRAWN BY:	MM
CHECKED BY:	PB
DATE:	3/11/23

BORING LOG BH01

Newcastle Basketball Precinct
Cnr Monash and Turton Rds
New Lambton, NSW, 2305

Date Begin - End:	05/10/23	**Drilling Company:**	FICO Group	**BORING LOG BH02**
Logged By:	M. Mathews	**Drill Crew:**	S. Currie	
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	FG102 ute-mounted rig	
Inclination:	-90 degrees	**Drilling Method:**	Solid Flight Auger	
Weather:	Fine	**Bore Diameter:**	110 mm. O.D.	

FIELD EXPLORATION

Surface Condition: Grass

Depth (metres)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/152 mm. Pocket Pen(PP)= kg/cm²	Drill Notes / Remarks
0		**TOPSOIL**: brown, dry				
		CLAY: medium plasticity, dark brown to black, w=p.l., stiff				
1						**PID=** 0.0
					BC=3 7 11 N=18	
2		**SAND**: fine to medium, rounded to subrounded, light grey, dry, medium dense				**PID=** 0.0
▽ 3		**Clayey SAND**: grey, wet, dense, Comprised of alternating layers of fine-med, light grey SAND 0.2-1.0m thick and med-high plasticity, grey CLAY, 0.1-0.5m thick. At 3.1m: Groundwater			BC=7 13 20 N=33	
4						
		At 4.5m: medium-dense			BC=9 5 6 N=11	
5						
6					BC=6 8 9 N=17	
7						
					BC=7 7 9 N=16	
8		**CLAY**: high plasticity, grey mottled red, w=p.l., stiff, clay shows iron staining.				
9						

The boring was terminated at approximately 8 m. below ground level. The boring was backfilled with auger cuttings on 05 October, 2023.

GROUNDWATER LEVEL INFORMATION:
Groundwater was observed at 3.1 m below ground level
GENERAL NOTES:

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PROJECT NO.:	24002155.001A
DRAWN BY:	MM
CHECKED BY:	PB
DATE:	3/11/23

BORING LOG BH02

Newcastle Basketball Precinct
Cnr Monash and Turton Rds
New Lambton, NSW, 2305

Date Begin - End:	05/10/23	**Drilling Company:**	FICO Group	**BORING LOG BH03**
Logged By:	M. Mathews	**Drill Crew:**	S. Currie	
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	FG102 ute-mounted rig	
Inclination:	-90 degrees	**Drilling Method:**	Solid Flight Auger	
Weather:	Fine	**Bore Diameter:**	110 mm. O.D.	

FIELD EXPLORATION

Depth (metres)	Graphical Log	Surface Condition: Grass Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/152 mm. Pocket Pen(PP)= kg/cm²	Drill Notes / Remarks
0		**TOPSOIL**: dark brown, dry				
		FILL: **Gravelly Sandy CLAY with Silt**: well-graded sand, medium gravel, subrounded sand, angular gravel, medium plasticity, brown, w<p.l., very stiff, Trace coal.				
1		**CLAY**: medium plasticity, black mottled dark grey, w=p.l., firm				
2					BC=2 2 4 N=6 PP=1	
3		From 3m: black/dark grey mottled yellow. Some organics			BC=3 3 4 N=7	
4		From 4.2m: grey mottled yellow				
▽		From 4.5m: stiff. At 4.5m: Groundwater			BC=5 6 8 N=14	
5						
6		**Silty CLAY trace Sand**: fine sand, high plasticity, grey mottled red, w>p.l., stiff			BC=4 6 8 N=14	
7					BC=5 7 12 N=19	
8		**CLAY**: high plasticity, red, w>p.l., very stiff, Residual ironstone bands				
9						

The boring was terminated at approximately 8 m. below ground level. The boring was backfilled with auger cuttings on 05 October, 2023.

GROUNDWATER LEVEL INFORMATION:
Groundwater was observed at 4.5 m below ground level
GENERAL NOTES:

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PROJECT NO.:	24002155.001A
DRAWN BY:	MM
CHECKED BY:	PB
DATE:	3/11/23

BORING LOG BH03

Newcastle Basketball Precinct
Cnr Monash and Turton Rds
New Lambton, NSW, 2305

Date Begin - End:	05/10/23	**Drilling Company:**	FICO Group
Logged By:	M. Mathews	**Drill Crew:**	S. Currie
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	FG102 ute-mounted rig
Inclination:	-90 degrees	**Drilling Method:**	Solid Flight Auger
Weather:	Fine	**Bore Diameter:**	110 mm. O.D.

BORING LOG BH04

FIELD EXPLORATION

Surface Condition: Grass

Depth (metres)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/152 mm. Pocket Pen(PP)= kg/cm²	Drill Notes / Remarks
0		**TOPSOIL**				
		FILL: **Gravelly Clayey SAND with Silt**: well-graded sand, medium gravel, subrounded sand, angular gravel, medium plasticity clay, brown, dry, very dense				
1		**Silty CLAY with Sand**: medium plasticity, dark brown to black, w<p.l., firm to stiff, with roots				
2					PP=1	
		Silty CLAY: medium to high plasticity, grey mottled red and yellow, w=p.l., stiff				
▽ 3		**Clayey SAND**: grey, moist, medium dense, Comprised of alternating layers of fine-med, light grey SAND and med-high plasticity, grey CLAY, 0.1-0.5m thick. At 3.05m: Groundwater			BC=8 8 8 N=16	
4						
		CLAY with Sand: fine-med sand, high plasticity, grey, w=l.l., very stiff			BC=10 18 15 N=33	
5						
6		**CLAY trace Sand**: high plasticity, grey, w=l.l., firm			BC=2 1 3 N=4	
7						
		CLAY trace Gravel: high plasticity, black mottled red and yellow, w=p.l., stiff, Soil shows platy structure. Gravel is ironstone.			BC=5 8 8 N=16	
8						
9						

The boring was terminated at approximately 8 m. below ground level. The boring was backfilled with auger cuttings on 05 October, 2023.

GROUNDWATER LEVEL INFORMATION:
Groundwater was observed at 3.05 m below ground level
GENERAL NOTES:

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PROJECT NO.:	24002155.001A
DRAWN BY:	MM
CHECKED BY:	PB
DATE:	3/11/23

BORING LOG BH04

Newcastle Basketball Precinct
Cnr Monash and Turton Rds
New Lambton, NSW, 2305

Date Begin - End:	04/10/23	**Drilling Company:**	FICO Group
Logged By:	M. Mathews	**Drill Crew:**	S. Currie
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	FG102 ute-mounted rig
Inclination:	-90 degrees	**Drilling Method:**	Solid Flight Auger
Weather:	Fine	**Bore Diameter:**	110 mm. O.D.

BORING LOG BH05

FIELD EXPLORATION

Surface Condition: Grass

Depth (metres)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/152 mm. Pocket Pen(PP)= kg/cm²	Drill Notes / Remarks
0		**TOPSOIL**				
		FILL: **Gravelly Clayey SAND with Silt**: well-graded sand, medium gravel, subrounded sand, angular gravel, medium plasticity clay, brown, dry, very dense				
		Silty CLAY with Sand: low to medium plasticity, dark brown to black, w<p.l., stiff, with roots				
1						**PID=** 0.0
						PID= 0.0
					BC=2 4 5 N=9	
2		From 2m: high plasticity				
3						**PID=** 0.0
		At 3.3m: Groundwater			BC=4 5 5 N=10	
		Sandy CLAY: light grey, wet/w=l.l., stiff/medium dense, Comprised of alternating layers of fine-med, light grey SAND and med-high plasticity, grey CLAY, 0.1-0.5m thick.				
4						
					BC=4 6 8 N=14	
5						
6					BC=4 6 9 N=17	
		CLAY with Silt trace Gravel: high plasticity, red mottled yellow, w>p.l., very stiff, Soil shows platy structure. Gravel is ironstone.				
7						
					BC=6 8 13 N=21	
8						
9						

The boring was terminated at approximately 8 m. below ground level. The boring was backfilled with auger cuttings on 04 October, 2023.

GROUNDWATER LEVEL INFORMATION:
Groundwater was observed at 3.3 m below ground level
GENERAL NOTES:

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PROJECT NO.: 24002155.001A
DRAWN BY: MM
CHECKED BY: PB
DATE: 3/11/23

BORING LOG BH05

Newcastle Basketball Precinct
Cnr Monash and Turton Rds
New Lambton, NSW, 2305

Date Begin - End:	04/10/23	**Drilling Company:**	FICO Drilling
Logged By:	M. Mathews	**Drill Crew:**	S. Currie
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	FG102 ute-mounted rig
Inclination:	-90 degrees	**Drilling Method:**	Solid Flight Auger
Weather:	Fine	**Bore Diameter:**	110 mm. O.D.

BORING LOG MW01

FIELD EXPLORATION

Surface Condition: Grass

Depth (metres)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/152 mm. Pocket Pen(PP)= kg/cm²	Drill Notes / Remarks
0		**TOPSOIL**: dark brown, dry, medium dense				
		FILL: **Gravelly Sandy CLAY with Silt**: well-graded sand, medium gravel, subrounded sand, angular gravel, medium plasticity, brown, w>p.l., very stiff, Gravel of phaneritic texture. Trace coal.				
1		**CLAY trace Sand**: fine sand, medium plasticity, black, w>p.l., firm, with organics				
2		At 2.1m: groundwater encountered			BC=2 2 4 N=6	
3		**Silty Clayey SAND**: high plasticity clay, grey, moist, medium dense, Comprised of alternating layers of fine-med, light grey SAND and med-high plasticity, grey CLAY, 0.1-0.5m thick.			BC=10 9 11 N=20	
4		At 4.5m: loose			BC=3 3 3 N=6	
5						
6		From 6.0m: medium-dense			BC=5 6 10 N=16	
7						
8		**Sandy CLAY**: high plasticity, grey mottled yellow and red, w>p.l., very stiff, Residual soil of ironstone- SPT sample shows platy structure and is difficult to break apart.			BC=7 9 13 N=22	
9		The boring was terminated at approximately 8 m. below ground level. Monitoring Well installed to a depth of 5 m.				

MONITORING WELL CONSTRUCTION*

Completion Method: Gatic Cover

Gatic Cover
2" SCH 40 Bentonite Seal
Solid uPVC Riser
20/40 Sand Pack
2" SCH 40 Slotted 0.010 uPVC Pipe
Auger Cuttings

GROUNDWATER LEVEL INFORMATION:
Groundwater was observed at 2.1 m below ground level

GENERAL NOTES:
A PID (ppmv) was used for environmental field screening.
A 50 mm. diameter uPVC casing was to a depth of 4.2 m.

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PROJECT NO.:	24002155.001A
DRAWN BY:	MM
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DATE:	3/11/23

BORING LOG MW01

Newcastle Basketball Precinct
Cnr Monash and Turton Rds
New Lambton, NSW, 2305

Date Begin - End:	04/10/23	**Drilling Company:**	FICO Drilling
Logged By:	M. Mathews	**Drill Crew:**	S. Currie
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	FG102 ute-mounted rig
Inclination:	-90 degrees	**Drilling Method:**	Solid Flight Auger
Weather:	Fine	**Bore Diameter:**	110 mm. O.D.

BORING LOG MW02

FIELD EXPLORATION

Surface Condition: Grass

Depth (metres)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/152 mm. Pocket Pen(PP)= kg/cm²	Drill Notes / Remarks	MONITORING WELL CONSTRUCTION* Completion Method: Gatic Cover
0		**TOPSOIL**: dark brown, dry, medium dense				**PID=** 0.0	Gatic Cover
		FILL: **Gravelly Clayey SAND with Silt**: well-graded sand, medium gravel, subrounded sand, angular gravel, medium plasticity clay, brown, dry, dense, Gravel of phaneritic texture				**PID=** 0.0 **PID=** 0.0	20/40 Sand Pack Solid uPVC Riser
1		**Silty Sandy CLAY with Gravel**: medium plasticity, black, w>p.l., firm				**PID=** 0.0	
					BC=2 3 3 N=6	**PID=** 0.0 PID = 0.0ppm	Bentonite Seal
2							20/40 Sand Pack
3		From 3m: becoming stiff. Black mottled brown. Organic inclusions			BC=3 4 5 N=9		2" SCH 40 Slotted 0.010 uPVC Pipe
4							
					BC=4 6 7 N=13		
5		**Sandy CLAY**: grey, w>p.l., stiff Groundwater at 5m initially then rose to 4.1m upon terminating the hole At 5.8m: increasing resistance to SFA					
6		**Sandy CLAY**: high plasticity, grey mottled yellow and red, w>p.l., very stiff, Residual soil of ironstone- SPT sample shows platy structure.			BC=7 9 17 N=26		Auger Cuttings
7							
					BC=6 9 10 N=19		
8		The boring was terminated at approximately 8 m. below ground level. The boring was not backfilled at time of drilling completion because monitoring well was installed.					
9							

GROUNDWATER LEVEL INFORMATION:
Groundwater was observed at 3.9 m below ground level

GENERAL NOTES:
A PID (ppmv) was used for environmental field screening.
A 50 mm. diameter uPVC casing was to a depth of 6.1 m.

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PROJECT NO.:	24002155.001A
DRAWN BY:	MM
CHECKED BY:	PB
DATE:	3/11/23

BORING LOG MW02

Newcastle Basketball Precinct
Cnr Monash and Turton Rds
New Lambton, NSW, 2305

Date Begin - End:	05/10/23	**Drilling Company:**	FICO Drilling	**BORING LOG MW03**
Logged By:	M. Mathews	**Drill Crew:**	S. Currie	
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	FG102 ute-mounted rig	
Inclination:	-90 degrees	**Drilling Method:**	Solid Flight Auger	
Weather:	Fine	**Bore Diameter:**	110 mm. O.D.	

FIELD EXPLORATION

Surface Condition: Grass

Depth (metres)	Graphical Log	Lithologic Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. Blows/152 mm. Pocket Pen(PP)= kg/cm²	Drill Notes / Remarks
0		**TOPSOIL**: dark brown, dry, dense				
		FILL: **Gravelly Clayey SAND with Silt**: well-graded sand, medium gravel, subrounded sand, angular gravel, medium plasticity clay, brown, dry, dense, Gravel of phaneritic texture				
1		**CLAY**: dark brown to black mottled yellow, w=p.l., stiff, with organics				
2					BC=3 3 8 N=11	
3		**Silty SAND with Clay**: fine to medium, rounded to subrounded, medium plasticity clay, light grey, wet, medium dense At 2.9m: Groundwater			BC=5 6 7 N=13	
4						
5		**Clayey SAND**: grey, wet, very dense, Comprised of alternating layers of fine-med, light grey SAND 0.2-1.0m thick and med-high plasticity, grey CLAY, 0.1-0.5m thick.			BC=25 over 130 N=Refusal	
6		**CLAY**: medium to high plasticity, grey, w=l.l., stiff From 6.5m: grey mottled red			BC=3 4 5 N=9	
7		At 7.5m: very stiff			BC=6 11 16 N=27	
8						
9						

MONITORING WELL CONSTRUCTION*

Completion Method: Gatic Cover

2" SCH 40 Solid uPVC Riser
Gatic Cover
Bentonite Seal
20/40 Sand Pack
2" SCH 40 Slotted 0.010 uPVC Pipe
Auger Cuttings

The boring was terminated at approximately 8 m. below ground level. The boring was not backfilled at time of drilling completion because monitoring well was installed.

GROUNDWATER LEVEL INFORMATION:
Groundwater was observed at 2.9 m below ground level
GENERAL NOTES:
A PID (ppmv) was used for environmental field screening.
A 50 mm. diameter uPVC casing was to a depth of 5 m.

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PROJECT NO.: 24002155.001A
DRAWN BY: MM
CHECKED BY: PB
DATE: 3/11/23

BORING LOG MW03

Newcastle Basketball Precinct
Cnr Monash and Turton Rds
New Lambton, NSW, 2305

Date Begin - End:	05/10/23	**Drilling Company:**	FICO Group
Logged By:	M. Gosling	**Drill Crew:**	S. Currie
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	FG102 ute-mounted rig
Plunge:	-90 degrees	**Drilling Method:**	Solid Flight Auger
Weather:	Fine	**Bore Diameter:**	110 mm. O.D.

BORING LOG BH06

FIELD EXPLORATION

Depth (metres)	Drilling Method	Sample Type	Sample Number	Recovery (NR=No Recovery)	PID / FID (ppmv)	Graphical Log	Surface Condition: Grass / Lithologic Description
			BH06_0.05-0.2		0.0		**FILL** **Silty TOPSOIL**: brown, no odor, moist, loose, no staining
							FILL **Silty SAND with Gravel**: brown, no odor, moist, loose, no staining
1	Solid Flight Auger		BH06_1.0-1.5		0.0		**FILL** **CLAY with Gravel**: medium plasticity, dark brown, no odor, w>p.l., soft, no staining
							NATURAL **CLAY**: high plasticity, dark brown, no odor, w>p.l., soft, no staining
2							

The bore was terminated at approximately 2 m. below ground level.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.
GENERAL NOTES:
The boring was backfilled with auger cuttings on 05 October, 2023.

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PROJECT NO.:	24002155.001A
DRAWN BY:	MG
CHECKED BY:	MM
DATE:	3/11/23

BORING LOG BH06

Newcastle Basketball Precinct
Cnr Monash and Turton Rds
New Lambton, NSW, 2305

Date Begin - End:	05/10/23	**Drilling Company:**	FICO Group
Logged By:	M. Gosling	**Drill Crew:**	S. Currie
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	FG102 ute-mounted rig
Plunge:	-90 degrees	**Drilling Method:**	Solid Flight Auger
Weather:	Fine	**Bore Diameter:**	110 mm. O.D.

BORING LOG BH07

FIELD EXPLORATION

Depth (metres)	Drilling Method	Sample Type	Sample Number	Recovery (NR=No Recovery)	PID / FID (ppmv)	Graphical Log	Surface Condition: Grass / Lithologic Description
			BH07_0.05-0.2		0.0		**FILL** **Silty TOPSOIL**: brown, no odor, moist, loose, no staining
							FILL **Silty SAND with Gravel**: brown, no odor, moist, loose, no staining
			BH07_0.7-0.9		0.0		
1	Solid Flight Auger						**NATURAL** **CLAY**: high plasticity, dark brown, no odor, w>p.l., soft, no staining
2							

The bore was terminated at approximately 2 m. below ground level.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.
GENERAL NOTES:
The boring was backfilled with auger cuttings on 05 October, 2023.

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PROJECT NO.: 24002155.001A
DRAWN BY: MG
CHECKED BY: MM
DATE: 3/11/23

BORING LOG BH07

Newcastle Basketball Precinct
Cnr Monash and Turton Rds
New Lambton, NSW, 2305

Date Begin - End:	05/10/23	**Drilling Company:**	FICO Group	**BORING LOG BH08**
Logged By:	M. Gosling	**Drill Crew:**	S. Currie	
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	FG102 ute-mounted rig	
Plunge:	-90 degrees	**Drilling Method:**	Solid Flight Auger	
Weather:	Fine	**Bore Diameter:**	110 mm. O.D.	

FIELD EXPLORATION

Depth (metres)	Drilling Method	Sample Type	Sample Number	Recovery (NR=No Recovery)	PID / FID (ppmv)	Graphical Log	Surface Condition: Grass / Lithologic Description
			BH08_0.05-0.2		0.0		**FILL** **Silty TOPSOIL**: brown, no odor, moist, loose, no staining
			BH08_0.5-0.7		0.0		**FILL** **Silty SAND with Gravel**: brown, no odor, moist, loose, no staining
1	Solid Flight Auger						
							NATURAL **CLAY**: high plasticity, dark brown, no odor, w>p.l., soft, no staining
2							

The bore was terminated at approximately 2 m. below ground level.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.
GENERAL NOTES:
The boring was backfilled with auger cuttings on 05 October, 2023.

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PROJECT NO.: 24002155.001A
DRAWN BY: MG
CHECKED BY: MM
DATE: 3/11/23

BORING LOG BH08

Newcastle Basketball Precinct
Cnr Monash and Turton Rds
New Lambton, NSW, 2305

Date Begin - End:	05/10/23	**Drilling Company:**	FICO Group
Logged By:	M. Gosling	**Drill Crew:**	S. Currie
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	FG102 ute-mounted rig
Plunge:	-90 degrees	**Drilling Method:**	Solid Flight Auger
Weather:	Fine	**Bore Diameter:**	110 mm. O.D.

BORING LOG BH09

FIELD EXPLORATION

Depth (metres)	Drilling Method	Sample Type	Sample Number	Recovery (NR=No Recovery)	PID / FID (ppmv)	Graphical Log	Surface Condition: Grass / Lithologic Description
	Solid Flight Auger		BH09_0.05-0.2		0.0		**FILL** **Silty TOPSOIL**: brown, no odor, moist, loose, no staining
							FILL **Sandy CLAY with Gravel**: high plasticity, brown, no odor, moist, soft, no staining
1			BH09_1.0-1.5		0.0		**NATURAL** **CLAY**: high plasticity, dark brown, no odor, w>p.l., soft, no staining
2							

The bore was terminated at approximately 2 m. below ground level.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.
GENERAL NOTES:
The boring was backfilled with auger cuttings on 05 October, 2023.

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PROJECT NO.: 24002155.001A
DRAWN BY: MG
CHECKED BY: MM
DATE: 3/11/23

BORING LOG BH09

Newcastle Basketball Precinct
Cnr Monash and Turton Rds
New Lambton, NSW, 2305

BORING LOG BH10

Date Begin - End:	05/10/23	**Drilling Company:**	FICO Group
Logged By:	M. Gosling	**Drill Crew:**	S. Currie
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	FG102 ute-mounted rig
Plunge:	-90 degrees	**Drilling Method:**	Solid Flight Auger
Weather:	Fine	**Bore Diameter:**	110 mm. O.D.

FIELD EXPLORATION

Depth (metres)	Drilling Method	Sample Type	Sample Number	Recovery (NR=No Recovery)	PID / FID (ppmv)	Graphical Log	Surface Condition: Grass / Lithologic Description
	Solid Flight Auger		BH10_0.05-0.2		0.0		**FILL** **Silty TOPSOIL**: brown, no odor, moist, loose, no staining
			BH10_0.4-0.5		0.0		**FILL** **Sandy CLAY with Gravel**: high plasticity, brown, no odor, w>p.l., soft, no staining
1							**NATURAL** **CLAY**: high plasticity, dark brown, no odor, w>p.l., soft, no staining
2							

The bore was terminated at approximately 2 m. below ground level.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.
GENERAL NOTES:
The boring was backfilled with auger cuttings on 05 October, 2023.

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PROJECT NO.: 24002155.001A
DRAWN BY: MG
CHECKED BY: MM
DATE: 3/11/23

BORING LOG BH10

Newcastle Basketball Precinct
Cnr Monash and Turton Rds
New Lambton, NSW, 2305

Date Begin - End:	05/10/23	**Drilling Company:**	FICO Group
Logged By:	M. Gosling	**Drill Crew:**	S. Currie
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	FG102 ute-mounted rig
Plunge:	-90 degrees	**Drilling Method:**	Solid Flight Auger
Weather:	Fine	**Bore Diameter:**	110 mm. O.D.

BORING LOG BH11

FIELD EXPLORATION

Depth (metres)	Drilling Method	Sample Type	Sample Number	Recovery (NR=No Recovery)	PID / FID (ppmv)	Graphical Log	Surface Condition: Grass / Lithologic Description
0	Solid Flight Auger		BH11_0.05-0.2		0.0		**FILL** **Sandy TOPSOIL**: brown, no odor, moist, loose, no staining
							FILL **Sandy CLAY**: high plasticity, brown, no odor, w>p.l., soft, no staining
			BH11_0.5-0.7		0.0		**NATURAL** **CLAY**: high plasticity, dark brown, no odor, w>p.l., soft, no staining
1							
							NATURAL **CLAY**: medium plasticity, dark brown, no odor, w=l.l., soft, no staining
2							

The bore was terminated at approximately 2 m. below ground level.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.
GENERAL NOTES:
The boring was backfilled with auger cuttings on 05 October, 2023.

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PROJECT NO.: 24002155.001A
DRAWN BY: MG
CHECKED BY: MM
DATE: 3/11/23

BORING LOG BH11

Newcastle Basketball Precinct
Cnr Monash and Turton Rds
New Lambton, NSW, 2305

Date Begin - End:	05/10/23	**Drilling Company:**	FICO Group
Logged By:	M. Gosling	**Drill Crew:**	S. Currie
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	FG102 ute-mounted rig
Plunge:	-90 degrees	**Drilling Method:**	Solid Flight Auger
Weather:	Fine	**Bore Diameter:**	110 mm. O.D.

BORING LOG BH12

FIELD EXPLORATION

Depth (metres)	Drilling Method	Sample Type	Sample Number	Recovery (NR=No Recovery)	PID / FID (ppmv)	Graphical Log	Surface Condition: Grass / Lithologic Description
0			BH12_0.05-0.2		2.5		**FILL** **Silty TOPSOIL with Gravel**: brown, no odor, dry, loose, no staining
			BH12_0.4-0.5		2.2		**FILL** **Gravelly SAND**: brown, no odor, dry, loose, no staining, coal wash reject or possible black slag fill present
1	Solid Flight Auger				0.6		**NATURAL** **Sandy CLAY**: medium plasticity, dark brown, no odor, w>p.l., soft, no staining
					0.0		
2							**NATURAL** **CLAY**: high plasticity, dark brown, no odor, w>p.l., soft, no staining

The bore was terminated at approximately 2 m. below ground level.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.
GENERAL NOTES:
The boring was backfilled with auger cuttings on 05 October, 2023.

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PROJECT NO.:	24002155.001A
DRAWN BY:	MG
CHECKED BY:	MM
DATE:	3/11/23

BORING LOG BH12

Newcastle Basketball Precinct
Cnr Monash and Turton Rds
New Lambton, NSW, 2305

BORING LOG BH13

Date Begin - End:	05/10/23	**Drilling Company:**	FICO Group
Logged By:	M. Gosling	**Drill Crew:**	S. Currie
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	FG102 ute-mounted rig
Plunge:	-90 degrees	**Drilling Method:**	Solid Flight Auger
Weather:	Fine	**Bore Diameter:**	110 mm. O.D.

FIELD EXPLORATION

Depth (metres)	Drilling Method	Sample Type	Sample Number	Recovery (NR=No Recovery)	PID / FID (ppmv)	Graphical Log	Surface Condition: Grass / Lithologic Description
0	Solid Flight Auger		BH13_0.05-0.2		0.6		**FILL** **Silty TOPSOIL with Gravel**: brown, no odor, dry, loose, no staining
			BH13_0.4-0.5		0.2		**FILL** **Sandy CLAY**: medium plasticity, brown, no odor, w>p.l., soft, no staining, minor coal wash reject present
1					0.0		**NATURAL** **Sandy CLAY**: high plasticity, dark brown, no odor, w>p.l., soft, no staining
							NATURAL **CLAY**: high plasticity, dark brown, no odor, w>p.l., soft, no staining
2							The bore was terminated at approximately 2 m. below ground level.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.
GENERAL NOTES:
The boring was backfilled with auger cuttings on 05 October, 2023.

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PROJECT NO.: 24002155.001A
DRAWN BY: MG
CHECKED BY: MM
DATE: 3/11/23

BORING LOG BH13

Newcastle Basketball Precinct
Cnr Monash and Turton Rds
New Lambton, NSW, 2305

Date Begin - End:	06/10/23	**Drilling Company:**	FICO Group
Logged By:	M. Gosling	**Drill Crew:**	S. Currie
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	FG102 ute-mounted rig
Plunge:	-90 degrees	**Drilling Method:**	Solid Flight Auger
Weather:	Fine	**Bore Diameter:**	110 mm. O.D.

BORING LOG BH14

FIELD EXPLORATION

Depth (metres)	Drilling Method	Sample Type	Sample Number	Recovery (NR=No Recovery)	PID / FID (ppmv)	Graphical Log	Surface Condition: Grass / Lithologic Description
0	Solid Flight Auger		BH14_0.05-0.2		0.0		**FILL** **Sandy Clayey TOPSOIL**: brown, no odor, moist, dense, no staining
							NATURAL **Sandy CLAY**: high plasticity, dark brown, no odor, w>p.l., firm, no staining
							NATURAL **CLAY**: high plasticity, dark brown, no odor, w>p.l., firm, no staining, orange mottling from 1.7 m to 2.0 m
1			BH14_1.0-1.5		0.0		
2							The bore was terminated at approximately 2 m. below ground level.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.
GENERAL NOTES:
The boring was backfilled with auger cuttings on 06 October, 2023.

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PROJECT NO.:	24002155.001A
DRAWN BY:	MG
CHECKED BY:	MM
DATE:	3/11/23

BORING LOG BH14

Newcastle Basketball Precinct
Cnr Monash and Turton Rds
New Lambton, NSW, 2305

Date Begin - End:	06/10/23	**Drilling Company:**	FICO Group
Logged By:	M. Gosling	**Drill Crew:**	S. Currie
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	FG102 ute-mounted rig
Plunge:	-90 degrees	**Drilling Method:**	Solid Flight Auger
Weather:	Fine	**Bore Diameter:**	110 mm. O.D.

BORING LOG BH15

FIELD EXPLORATION

Depth (metres)	Drilling Method	Sample Type	Sample Number	Recovery (NR=No Recovery)	PID / FID (ppmv)	Graphical Log	Surface Condition: Grass / Lithologic Description
0	Solid Flight Auger		BH15_0.05-0.2		0.0		**FILL** **Sandy Clayey TOPSOIL**: brown, no odor, moist, dense, no staining
			BH15_0.4-0.5		0.0		**NATURAL** **Sandy CLAY**: high plasticity, dark brown, no odor, w>p.l., firm, no staining
1							**NATURAL** **CLAY**: high plasticity, dark brown, no odor, w>p.l., firm, no staining, orange mottling from 1.7 m to 2.0 m
2							The bore was terminated at approximately 2 m. below ground level.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.
GENERAL NOTES:
The boring was backfilled with auger cuttings on 06 October, 2023.

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PROJECT NO.:	24002155.001A
DRAWN BY:	MG
CHECKED BY:	MM
DATE:	3/11/23

BORING LOG BH15

Newcastle Basketball Precinct
Cnr Monash and Turton Rds
New Lambton, NSW, 2305

Date Begin - End:	06/10/23	**Drilling Company:**	FICO Group
Logged By:	M. Gosling	**Drill Crew:**	S. Currie
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	FG102 ute-mounted rig
Plunge:	-90 degrees	**Drilling Method:**	Solid Flight Auger
Weather:	Fine	**Bore Diameter:**	110 mm. O.D.

BORING LOG BH16

FIELD EXPLORATION

Depth (metres)	Drilling Method	Sample Type	Sample Number	Recovery (NR=No Recovery)	PID / FID (ppmv)	Graphical Log	Surface Condition: Grass / Lithologic Description
			BH16_0.05-0.2		0.0		**FILL** **Sandy Clayey TOPSOIL**: brown, no odor, moist, dense, no staining
							NATURAL **Sandy CLAY**: high plasticity, dark brown, no odor, w>p.l., firm, no staining
	Solid Flight Auger						**NATURAL** **CLAY**: high plasticity, dark brown, no odor, w>p.l., firm, no staining, orange mottling from 1.7 m to 2.0 m
1			BH16_1.0-1.5		0.0		
2							

The bore was terminated at approximately 2 m. below ground level.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.
GENERAL NOTES:
The boring was backfilled with auger cuttings on 06 October, 2023.

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PROJECT NO.: 24002155.001A
DRAWN BY: MG
CHECKED BY: MM
DATE: 3/11/23

BORING LOG BH16

Newcastle Basketball Precinct
Cnr Monash and Turton Rds
New Lambton, NSW, 2305

Date Begin - End:	06/10/23	**Drilling Company:**	FICO Group
Logged By:	M. Gosling	**Drill Crew:**	S. Currie
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	FG102 ute-mounted rig
Plunge:	-90 degrees	**Drilling Method:**	Solid Flight Auger
Weather:	Fine	**Bore Diameter:**	110 mm. O.D.

BORING LOG BH17

FIELD EXPLORATION

Depth (metres)	Drilling Method	Sample Type	Sample Number	Recovery (NR=No Recovery)	PID / FID (ppmv)	Graphical Log	Surface Condition: Grass / Lithologic Description
0	Solid Flight Auger		BH17_0.05-0.2		0.0		**FILL** **Sandy TOPSOIL with Gravel**: brown, no odor, moist, loose, no staining
			BH17_0.5-1.0		0.0		**NATURAL** **Sandy CLAY**: high plasticity, dark brown, no odor, w>p.l., firm, no staining
1							**NATURAL** **CLAY**: high plasticity, dark brown, no odor, w>p.l., soft, no staining
2							

The bore was terminated at approximately 2 m. below ground level.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.
GENERAL NOTES:
The boring was backfilled with auger cuttings on 06 October, 2023.

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PROJECT NO.:	24002155.001A
DRAWN BY:	MG
CHECKED BY:	MM
DATE:	3/11/23

BORING LOG BH17

Newcastle Basketball Precinct
Cnr Monash and Turton Rds
New Lambton, NSW, 2305

Date Begin - End:	06/10/23	**Drilling Company:**	FICO Group
Logged By:	M. Gosling	**Drill Crew:**	S. Currie
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	FG102 ute-mounted rig
Plunge:	-90 degrees	**Drilling Method:**	Solid Flight Auger
Weather:	Fine	**Bore Diameter:**	110 mm. O.D.

BORING LOG BH18

FIELD EXPLORATION

Depth (metres)	Drilling Method	Sample Type	Sample Number	Recovery (NR=No Recovery)	PID / FID (ppmv)	Graphical Log	Surface Condition: Grass / Lithologic Description
			BH18_0.05-0.2		0.0		**FILL** **Sandy TOPSOIL with Gravel**: brown, no odor, moist, loose, no staining
							FILL **Sandy CLAY with Gravel**: medium plasticity, brown mottled orange, no odor, w>p.l., firm, no staining
			BH18_0.5-0.6		0.0		
							NATURAL **Sandy CLAY**: high plasticity, dark brown, no odor, w>p.l., firm, no staining
1	Solid Flight Auger						**NATURAL** **CLAY**: high plasticity, dark brown, no odor, w>p.l., soft, no staining
2							

The bore was terminated at approximately 2 m. below ground level.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.
GENERAL NOTES:
The boring was backfilled with auger cuttings on 06 October, 2023.

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PROJECT NO.: 24002155.001A
DRAWN BY: MG
CHECKED BY: MM
DATE: 3/11/23

BORING LOG BH18

Newcastle Basketball Precinct
Cnr Monash and Turton Rds
New Lambton, NSW, 2305

BORING LOG BH19

Date Begin - End:	06/10/23	**Drilling Company:**	FICO Group
Logged By:	M. Gosling	**Drill Crew:**	S. Currie
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	FG102 ute-mounted rig
Plunge:	-90 degrees	**Drilling Method:**	Solid Flight Auger
Weather:	Fine	**Bore Diameter:**	110 mm. O.D.

FIELD EXPLORATION

Depth (metres)	Drilling Method	Sample Type	Sample Number	Recovery (NR=No Recovery)	PID / FID (ppmv)	Graphical Log	Surface Condition: Grass / Lithologic Description
0	Solid Flight Auger		BH19_0.05-0.2		0.0		**FILL** **Silty Sandy TOPSOIL**: brown, no odor, moist, loose, no staining
			BH19_0.6-0.7		0.0		**FILL** **Sandy SAND with Gravel**: brown mottled orange, no odor, moist, dense, no staining
1							**NATURAL** **CLAY**: high plasticity, dark brown, no odor, w>p.l., firm, no staining
2							The bore was terminated at approximately 2 m. below ground level.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.
GENERAL NOTES:
The boring was backfilled with auger cuttings on 06 October, 2023.

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CHECKED BY: MM
DATE: 3/11/23

BORING LOG BH19

Newcastle Basketball Precinct
Cnr Monash and Turton Rds
New Lambton, NSW, 2305

BORING LOG BH20

Date Begin - End:	06/10/23	**Drilling Company:**	FICO Group
Logged By:	M. Gosling	**Drill Crew:**	S. Currie
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	FG102 ute-mounted rig
Plunge:	-90 degrees	**Drilling Method:**	Solid Flight Auger
Weather:	Fine	**Bore Diameter:**	110 mm. O.D.

FIELD EXPLORATION

Depth (metres)	Drilling Method	Sample Type	Sample Number	Recovery (NR=No Recovery)	PID / FID (ppmv)	Graphical Log	Surface Condition: Grass / Lithologic Description
0	Solid Flight Auger		BH20_0.05-0.2		0.0		**FILL** **Silty Sandy TOPSOIL**: brown, no odor, dry, loose, no staining
							FILL **Clayey SAND with Gravel**: brown, no odor, moist, dense, no staining
			BH20_0.6-0.7		0.0		**NATURAL** **Sandy CLAY**: medium plasticity, dark brown, no odor, w>p.l., firm, no staining
1							**NATURAL** **CLAY**: high plasticity, dark brown, no odor, w>p.l., firm, no staining
2							The bore was terminated at approximately 2 m. below ground level.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.
GENERAL NOTES:
The boring was backfilled with auger cuttings on 06 October, 2023.

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PROJECT NO.: 24002155.001A
DRAWN BY: MG
CHECKED BY: MM
DATE: 3/11/23

BORING LOG BH20

Newcastle Basketball Precinct
Cnr Monash and Turton Rds
New Lambton, NSW, 2305

Date Begin - End:	06/10/23	**Drilling Company:**	FICO Group	**BORING LOG BH21**
Logged By:	M. Gosling	**Drill Crew:**	S. Currie	
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	FG102 ute-mounted rig	
Plunge:	-90 degrees	**Drilling Method:**	Solid Flight Auger	
Weather:	Fine	**Bore Diameter:**	110 mm. O.D.	

FIELD EXPLORATION

Depth (metres)	Drilling Method	Sample Type	Sample Number	Recovery (NR=No Recovery)	PID / FID (ppmv)	Graphical Log	Surface Condition: Grass / Lithologic Description
0	Solid Flight Auger		BH21_0.05-0.2		0.0		**FILL** **Silty Sandy TOPSOIL**: brown, no odor, dry, loose, no staining
							FILL **Clayey SAND with Gravel**: brown, no odor, moist, dense, no staining
			BH21_0.6-0.7		0.0		**NATURAL** **Sandy CLAY**: medium plasticity, dark brown, no odor, w>p.l., firm, no staining
1							**NATURAL** **CLAY**: high plasticity, dark brown, no odor, w>p.l., firm, no staining
2							The bore was terminated at approximately 2 m. below ground level.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.
GENERAL NOTES:
The boring was backfilled with auger cuttings on 06 October, 2023.

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PROJECT NO.:	24002155.001A
DRAWN BY:	MG
CHECKED BY:	MM
DATE:	3/11/23

BORING LOG BH21

Newcastle Basketball Precinct
Cnr Monash and Turton Rds
New Lambton, NSW, 2305

BORING LOG BH22

Date Begin - End:	06/10/23	**Drilling Company:**	FICO Group
Logged By:	M. Gosling	**Drill Crew:**	S. Currie
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	FG102 ute-mounted rig
Plunge:	-90 degrees	**Drilling Method:**	Solid Flight Auger
Weather:	Fine	**Bore Diameter:**	110 mm. O.D.

FIELD EXPLORATION

Depth (metres)	Drilling Method	Sample Type	Sample Number	Recovery (NR=No Recovery)	PID / FID (ppmv)	Graphical Log	Surface Condition: Grass / Lithologic Description
	Solid Flight Auger		BH22_0.05-0.2		0.0		**FILL** **Silty Sandy TOPSOIL with Gravel**: brown, no odor, dry, loose, no staining
			BH22_0.4-0.5		0.0		**FILL** **Clayey SAND with Gravel**: brown, no odor, moist, dense, no staining
1							**NATURAL** **Sandy CLAY**: medium plasticity, dark brown, no odor, w>p.l., firm, no staining
							NATURAL **CLAY**: high plasticity, dark brown, no odor, w>p.l., firm, no staining
2							

The bore was terminated at approximately 2 m. below ground level.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.
GENERAL NOTES:
The boring was backfilled with auger cuttings on 06 October, 2023.

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PROJECT NO.: 24002155.001A
DRAWN BY: MG
CHECKED BY: MM
DATE: 3/11/23

BORING LOG BH22

Newcastle Basketball Precinct
Cnr Monash and Turton Rds
New Lambton, NSW, 2305

BORING LOG BH23

Date Begin - End:	06/10/23	**Drilling Company:**	FICO Group
Logged By:	M. Gosling	**Drill Crew:**	S. Currie
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	FG102 ute-mounted rig
Plunge:	-90 degrees	**Drilling Method:**	Solid Flight Auger
Weather:	Fine	**Bore Diameter:**	110 mm. O.D.

FIELD EXPLORATION

Depth (metres)	Drilling Method	Sample Type	Sample Number	Recovery (NR=No Recovery)	PID / FID (ppmv)	Graphical Log	Surface Condition: Grass / Lithologic Description
0	Solid Flight Auger		BH23_0.05-0.2		0.0		**FILL** **Silty Sandy TOPSOIL**: brown, no odor, dry, loose, no staining
							FILL **Clayey SAND with Gravel**: brown, no odor, moist, dense, no staining
			BH23_0.7-0.8		0.0		**NATURAL** **Sandy CLAY**: medium plasticity, dark brown, no odor, w>p.l., firm, no staining
1							**NATURAL** **CLAY**: high plasticity, dark brown, no odor, w>p.l., firm, no staining
2							The bore was terminated at approximately 2 m. below ground level.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.
GENERAL NOTES:
The boring was backfilled with auger cuttings on 06 October, 2023.

KLEINFELDER
Bright People. Right Solutions.

PROJECT NO.: 24002155.001A
DRAWN BY: MG
CHECKED BY: MM
DATE: 3/11/23

BORING LOG BH23

Newcastle Basketball Precinct
Cnr Monash and Turton Rds
New Lambton, NSW, 2305

HAND EXPLORATION LOG HA01

Date Begin - End:	04/10/23	**Drilling Company:**	Kleinfelder
Logged By:	M. Gosling	**Drill Crew:**	M. Gosling
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	Hand Auger
Plunge:	-90 degrees	**Drilling Method:**	Hand Auger
Weather:	Fine	**Bore Diameter:**	75 mm. O.D.

FIELD EXPLORATION

Depth (metres)	Drilling Method	Sample Type	Sample Number	Recovery (NR=No Recovery)	PID / FID (ppmv)	Graphical Log	Surface Condition: Grass / Lithologic Description
0	Hand Auger		HA01_0.1-0.2		0.1		**FILL** **Sandy TOPSOIL**: brown, no odor, dry, loose, no staining
							FILL **Silty SAND with Gravel**: brown, no odor, dry, loose, no staining
			HA01_0.4-0.5		0.0		**NATURAL** **Sandy CLAY**: medium plasticity, dark brown, no odor, w>p.l., soft, no staining, trace amounts of coal chitter or charcoal present at 0.5 m
1							
▽							**NATURAL** **CLAY**: high plasticity, dark brown, no odor, w>p.l., soft, no staining
							NATURAL **CLAY**: high plasticity, dark brown, no odor, w>l.l., very soft, no staining
2							

The bore was terminated because of practical auger refusal at approximately 1.5 m. below ground level on groundwater encountered which compromised the bore.

GROUNDWATER LEVEL INFORMATION:
Groundwater was observed at 1.2 m below ground level
GENERAL NOTES:
The hand exploration was backfilled with auger cuttings on 04 October, 2023.

KLEINFELDER
Bright People. Right Solutions.

PROJECT NO.:	24002155.001A
DRAWN BY:	MG
CHECKED BY:	MM
DATE:	3/11/23

HAND EXPLORATION LOG HA01

Newcastle Basketball Precinct
Cnr Monash and Turton Rds
New Lambton, NSW, 2305

HAND EXPLORATION LOG HA12

Date Begin - End:	04/10/23	**Drilling Company:**	Kleinfelder
Logged By:	M. Gosling	**Drill Crew:**	M. Gosling
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	Hand Auger
Plunge:	-90 degrees	**Drilling Method:**	Hand Auger
Weather:	Fine	**Bore Diameter:**	75 mm. O.D.

FIELD EXPLORATION

Depth (metres)	Drilling Method	Sample Type	Sample Number	Recovery (NR=No Recovery)	PID / FID (ppmv)	Graphical Log	Surface Condition: Grass / Lithologic Description
	Hand Auger		HA12_0.05-0.2		0.0		**FILL** **Silty TOPSOIL**: brown, no odor, dry, dense, no staining
			HA12_0.4-0.5		0.0		**FILL** **Sandy CLAY with Gravel**: high plasticity, brown, no odor, w>p.l., stiff, no staining, minor coal chitter or charcoal inclusions
1							
2							

The bore was terminated because of practical auger refusal at approximately 0.5 m. below ground level on rock within soil profile.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.
GENERAL NOTES:
The hand exploration was backfilled with auger cuttings on 04 October, 2023.

KLEINFELDER
Bright People. Right Solutions.

PROJECT NO.:	24002155.001A
DRAWN BY:	MG
CHECKED BY:	MM
DATE:	3/11/23

HAND EXPLORATION LOG HA12

Newcastle Basketball Precinct
Cnr Monash and Turton Rds
New Lambton, NSW, 2305

HAND EXPLORATION LOG HA13

Date Begin - End:	04/10/23	**Drilling Company:**	Kleinfelder
Logged By:	M. Gosling	**Drill Crew:**	M. Gosling
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	Hand Auger
Plunge:	-90 degrees	**Drilling Method:**	Hand Auger
Weather:	Fine	**Bore Diameter:**	75 mm. O.D.

FIELD EXPLORATION

Depth (metres)	Drilling Method	Sample Type	Sample Number	Recovery (NR=No Recovery)	PID / FID (ppmv)	Graphical Log	Surface Condition: Grass / Lithologic Description
0	Hand Auger		HA13_0.05-0.2		0.0		**FILL** **Sandy TOPSOIL**: brown, no odor, dry, loose, no staining
							FILL **Silty SAND with Gravel**: brown, no odor, dry, loose, no staining
			HA13_0.5-0.7		0.0		**FILL** **Sandy CLAY with Gravel**: dark brown, no odor, w>p.l., soft, no staining, minor coal chitter or charcoal at 0.5 m
							NATURAL **CLAY with Gravel**: dark brown mottled orange and grey, no odor, w>p.l., soft, no staining
1							The bore was terminated because of practical auger refusal at approximately 0.9 m. below ground level on rock within soil profile.
2							

GROUNDWATER LEVEL INFORMATION:
Groundwater was not observed during drilling or after completion.
GENERAL NOTES:
The hand exploration was backfilled with auger cuttings on 04 October, 2023.

KLEINFELDER
Bright People. Right Solutions.

PROJECT NO.:	24002155.001A
DRAWN BY:	MG
CHECKED BY:	MM
DATE:	3/11/23

HAND EXPLORATION LOG HA13

Newcastle Basketball Precinct
Cnr Monash and Turton Rds
New Lambton, NSW, 2305

HAND EXPLORATION LOG HA14

Date Begin - End:	04/10/23	**Drilling Company:**	Kleinfelder
Logged By:	M. Gosling	**Drill Crew:**	M. Gosling
Hor.-Vert. Datum:	Not Available	**Drilling Equipment:**	Hand Auger
Plunge:	-90 degrees	**Drilling Method:**	Hand Auger
Weather:	Fine	**Bore Diameter:**	75 mm. O.D.

FIELD EXPLORATION

Depth (metres)	Drilling Method	Sample Type	Sample Number	Recovery (NR=No Recovery)	PID / FID (ppmv)	Graphical Log	Surface Condition: Grass / Lithologic Description
0	Hand Auger		HA14_0.05-0.2		0.0		**FILL** **Sandy TOPSOIL**: brown, no odor, dry, loose, no staining
							FILL **Silty SAND with Gravel**: brown, no odor, dry, loose, no staining
							FILL **Sandy CLAY with Gravel**: dark brown, no odor, w>p.l., soft, no staining, minor coal chitter or charcoal at 0.5 m
1			HA14_1.1-1.2		0.0		
▽							**NATURAL** **CLAY**: high plasticity, dark brown, no odor, w>l.l., very soft, no staining
2							

The bore was terminated because of practical auger refusal at approximately 1.6 m. below ground level on groundwater encountered which compromised the bore.

GROUNDWATER LEVEL INFORMATION:
Groundwater was observed at 1.2 m below ground level
GENERAL NOTES:
The hand exploration was backfilled with auger cuttings on 04 October, 2023.

KLEINFELDER
Bright People. Right Solutions.

PROJECT NO.: 24002155.001A
DRAWN BY: MG
CHECKED BY: MM
DATE: 3/11/23

HAND EXPLORATION LOG HA14

Newcastle Basketball Precinct
Cnr Monash and Turton Rds
New Lambton, NSW, 2305

APPENDIX C LABORATORY RESULTS

Construction Sciences

Construction Sciences Pty Ltd
ABN: 74 128 806 735

Address:
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Laboratory: **Warabrook Laboratory**
Phone: 02 4062 0200
Fax: 02 6654 0261
Email: Newcastle@constructionsciences.net

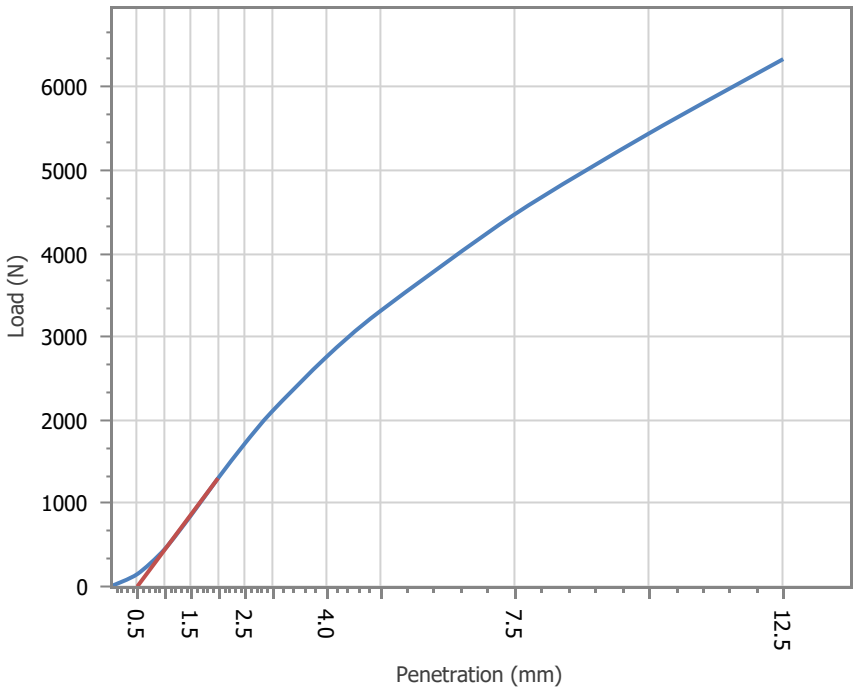
CALIFORNIA BEARING RATIO REPORT

Client:	Kleinfelder Pty Ltd	Report Number:	16822/R/44455-1
Client Address:	Suite 3, 2440-244 Pacific Highway, Charlestown	Project Number:	16822/P/214
Project:	Construction Materials Testing	Lot Number:	24002155
Location:	NSW Regional	Internal Test Request:	16822/T/25702
Component:	Test Pits	Client Reference/s:	24002155
Area Description:	Newcastle Basketbal Assiociation	Report Date / Page:	6/11/2023 Page 1 of 4

Test Procedures	AS1289.6.1.1, AS1289.5.1.1, AS1289.2.1.1			
Sample Number	16822/S/136952	Pit No.		MW02_0.1-0.5
Sampling Method	Tested As Received	Sample Type		BULK
Date Sampled	19/10/2023	Sample Depth	m	0.1-0.5
Sampled By	Client Sampled			
Date Tested	31/10/2023	Prep Material > 53mm (%)		-
Material Source	In situ	Material Limit Start		-
Material Type	Insitu	Material Limit End		-
Client Reference	MW02_0.1-0.5	Compactive Effort		Standard
Material Description	Silty Gravelly SAND			

Maximum Dry Density (t/m³):	1.82
Optimum Moisture Content (%):	12.0
Field Moisture Content (%):	8.9
Sample Percent Oversize (%)	15.0
Oversize Included / Excluded	Excluded
Target Density Ratio (%):	100
Target Moisture Ratio (%):	100
Placement Dry Density (t/m³):	1.82
Placement Dry Density Ratio (%):	100.0
Placement Moisture Content (%):	12.1
Placement Moisture Ratio (%):	101.5
Test Condition / Soaking Period:	Soaked / 4 Days
CBR Surcharge (kg)	4.5
Dry Density After Soak (t/m³):	1.81
Total Curing Time (hrs)	90
Liquid Limit Method	Estimation
Moisture (top 30mm) After Soak (%)	12.9
Moisture (remainder) After Soak (%)	12.0
CBR Swell (%):	0.5
Minimum CBR Specification (%):	-
CBR Value @ 5.0mm (%):	**18**

CBR PENETRATION PLOT



Remarks	Results apply to the sample/s as received.,

Accredited for compliance with ISO/IEC 17025 – Testing

NATA

Accreditation Number: 1986
Corporate Site Number: 16822

Approved Signatory: Zane Elphick
Form ID: W2ASRep Rev 3

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Email: Newcastle@constructionsciences.net

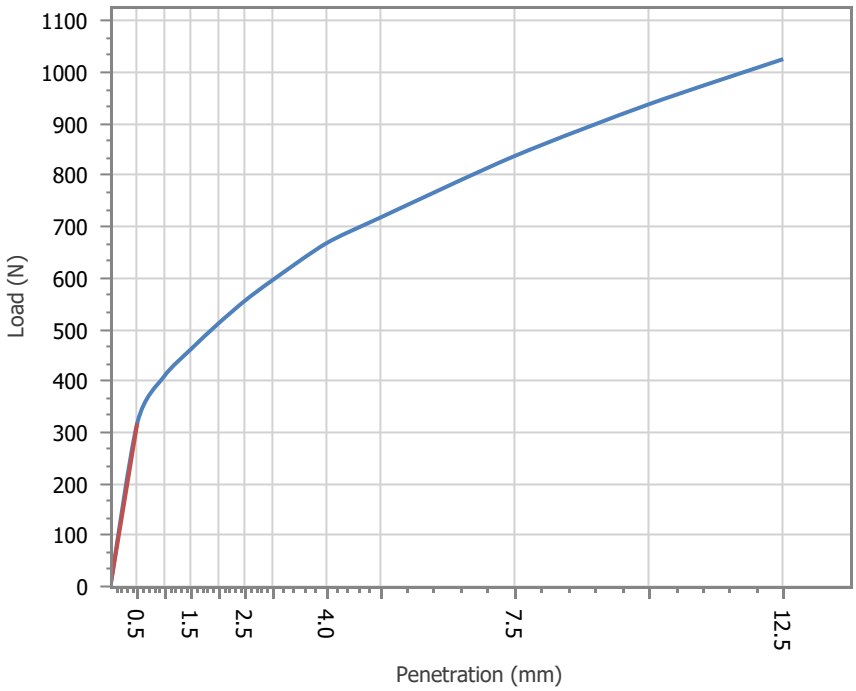
CALIFORNIA BEARING RATIO REPORT

Client:	Kleinfelder Pty Ltd	Report Number:	16822/R/44455-1
Client Address:	Suite 3, 2440-244 Pacific Highway, Charlestown	Project Number:	16822/P/214
Project:	Construction Materials Testing	Lot Number:	24002155
Location:	NSW Regional	Internal Test Request:	16822/T/25702
Component:	Test Pits	Client Reference/s:	24002155
Area Description:	Newcastle Basketbal Assiociation	Report Date / Page:	6/11/2023 Page 2 of 4

Test Procedures	AS1289.6.1.1, AS1289.5.1.1, AS1289.2.1.1		
Sample Number	16822/S/136953	Pit No.	BH02_0.2-0.8
Sampling Method	Tested As Received	Sample Type	BULK
Date Sampled	19/10/2023	Sample Depth m	0.2-0.8
Sampled By	Client Sampled		
Date Tested	31/10/2023	Prep Material > 53mm (%)	-
Material Source	In situ	Material Limit Start	-
Material Type	Insitu	Material Limit End	-
Client Reference	BH02_0.2-0.8	Compactive Effort	Standard
Material Description	CLAY		

Maximum Dry Density (t/m³):	1.48
Optimum Moisture Content (%):	26.5
Field Moisture Content (%):	24.2
Sample Percent Oversize (%)	0.0
Oversize Included / Excluded	Excluded
Target Density Ratio (%):	100
Target Moisture Ratio (%):	100
Placement Dry Density (t/m³):	1.48
Placement Dry Density Ratio (%):	99.5
Placement Moisture Content (%):	27.0
Placement Moisture Ratio (%):	101.5
Test Condition / Soaking Period:	Soaked / 4 Days
CBR Surcharge (kg)	4.5
Dry Density After Soak (t/m³):	1.45
Total Curing Time (hrs)	91
Liquid Limit Method	Estimation
Moisture (top 30mm) After Soak (%)	27.5
Moisture (remainder) After Soak (%)	26.6
CBR Swell (%):	2.0
Minimum CBR Specification (%):	-
CBR Value @ 2.5mm (%):	**4.0**

CBR PENETRATION PLOT



Remarks	Results apply to the sample/s as received.,

Accredited for compliance with ISO/IEC 17025 – Testing

NATA

Accreditation Number: 1986
Corporate Site Number: 16822

Approved Signatory: Zane Elphick
Form ID: W2ASRep Rev 3

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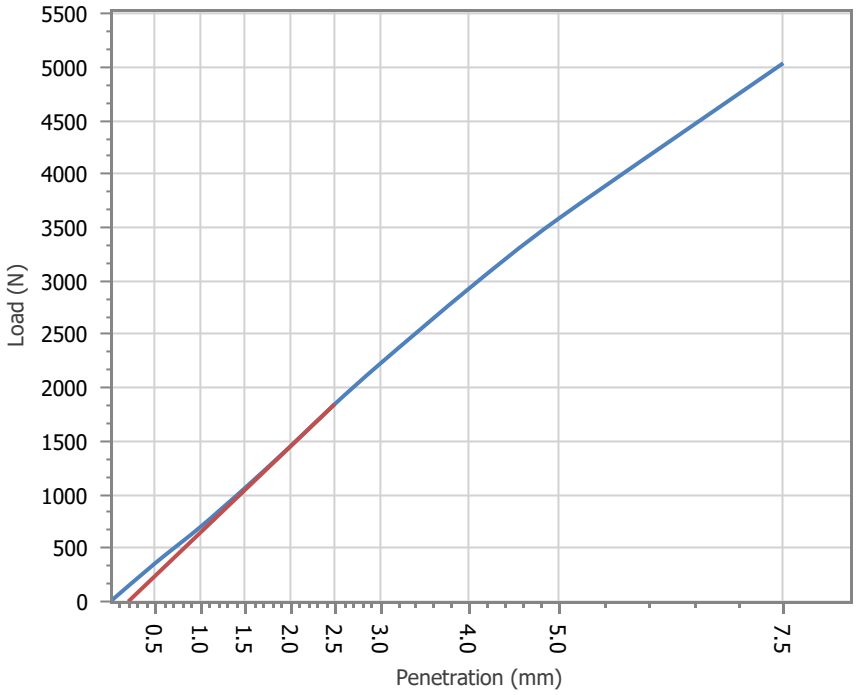
CALIFORNIA BEARING RATIO REPORT

Client:	Kleinfelder Pty Ltd	Report Number:	16822/R/44455-1
Client Address:	Suite 3, 2440-244 Pacific Highway, Charlestown	Project Number:	16822/P/214
Project:	Construction Materials Testing	Lot Number:	24002155
Location:	NSW Regional	Internal Test Request:	16822/T/25702
Component:	Test Pits	Client Reference/s:	24002155
Area Description:	Newcastle Basketbal Assiociation	Report Date / Page:	6/11/2023 Page 3 of 4

Test Procedures	AS1289.6.1.1, AS1289.5.1.1, AS1289.2.1.1		
Sample Number	16822/S/136954	Pit No.	BH03_0.2-0.7
Sampling Method	Tested As Received	Sample Type	BULK
Date Sampled	19/10/2023	Sample Depth m	0.2-0.7
Sampled By	Client Sampled		
Date Tested	31/10/2023	Prep Material > 53mm (%)	-
Material Source	In situ	Material Limit Start	-
Material Type	Insitu	Material Limit End	-
Client Reference	BH03_0.2-0.7	Compactive Effort	Standard
Material Description	Silty Gravelly Sand		

Maximum Dry Density (t/m³):	1.94
Optimum Moisture Content (%):	12.0
Field Moisture Content (%):	9.8
Sample Percent Oversize (%)	5.0
Oversize Included / Excluded	Excluded
Target Density Ratio (%):	100
Target Moisture Ratio (%):	100
Placement Dry Density (t/m³):	1.94
Placement Dry Density Ratio (%):	100.0
Placement Moisture Content (%):	11.8
Placement Moisture Ratio (%):	99.0
Test Condition / Soaking Period:	Soaked / 4 Days
CBR Surcharge (kg)	4.5
Dry Density After Soak (t/m³):	1.93
Total Curing Time (hrs)	89
Liquid Limit Method	Estimation
Moisture (top 30mm) After Soak (%)	12.5
Moisture (remainder) After Soak (%)	11.9
CBR Swell (%):	0.5
Minimum CBR Specification (%):	-
CBR Value @ 5.0mm (%):	**19**

CBR PENETRATION PLOT



Remarks	Results apply to the sample/s as received.,

Accredited for compliance with ISO/IEC 17025 – Testing

NATA

Accreditation Number: 1986
Corporate Site Number: 16822

Approved Signatory: Zane Elphick
Form ID: W2ASRep Rev 3

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Email: Newcastle@constructionsciences.net

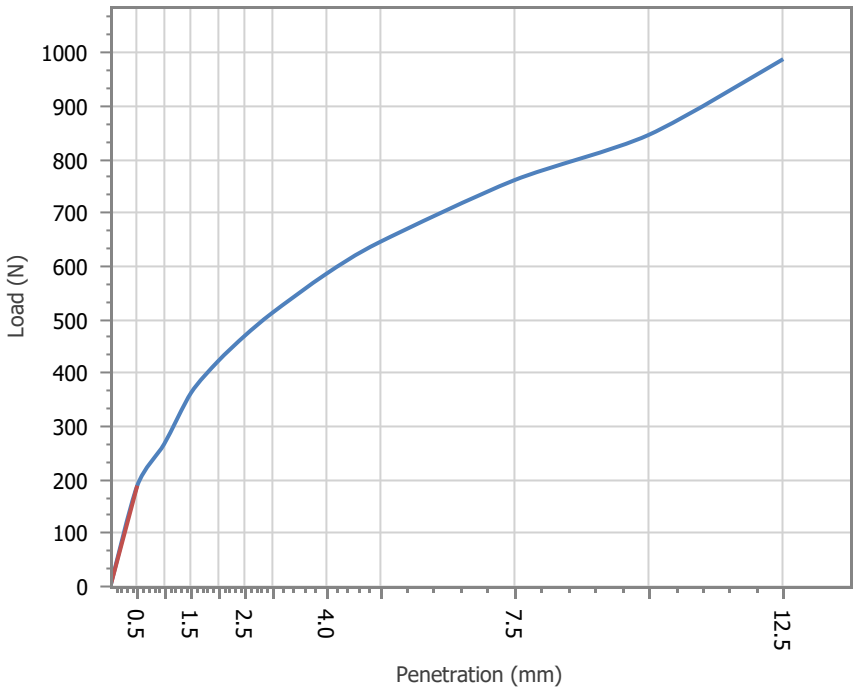
CALIFORNIA BEARING RATIO REPORT

Client:	Kleinfelder Pty Ltd	Report Number:	16822/R/44455-1
Client Address:	Suite 3, 2440-244 Pacific Highway, Charlestown	Project Number:	16822/P/214
Project:	Construction Materials Testing	Lot Number:	24002155
Location:	NSW Regional	Internal Test Request:	16822/T/25702
Component:	Test Pits	Client Reference/s:	24002155
Area Description:	Newcastle Basketbal Assiociation	Report Date / Page:	6/11/2023 Page 4 of 4

Test Procedures	AS1289.6.1.1, AS1289.5.1.1, AS1289.2.1.1			
Sample Number	16822/S/136955	Pit No.		BH04_0.2-0.8
Sampling Method	Tested As Received	Sample Type		BULK
Date Sampled	19/10/2023	Sample Depth	m	0.2-0.8
Sampled By	Client Sampled			
Date Tested	31/10/2023	Prep Material > 53mm (%)		-
Material Source	In situ	Material Limit Start		-
Material Type	Insitu	Material Limit End		-
Client Reference	BH04_0.2-0.8	Compactive Effort		Standard
Material Description	CLAY			

Maximum Dry Density (t/m³):	1.50
Optimum Moisture Content (%):	25.5
Field Moisture Content (%):	27.6
Sample Percent Oversize (%)	0.0
Oversize Included / Excluded	Excluded
Target Density Ratio (%):	100
Target Moisture Ratio (%):	100
Placement Dry Density (t/m³):	1.49
Placement Dry Density Ratio (%):	99.5
Placement Moisture Content (%):	25.8
Placement Moisture Ratio (%):	102.0
Test Condition / Soaking Period:	Soaked / 4 Days
CBR Surcharge (kg)	4.5
Dry Density After Soak (t/m³):	1.46
Total Curing Time (hrs)	96
Liquid Limit Method	Estimation
Moisture (top 30mm) After Soak (%)	26.2
Moisture (remainder) After Soak (%)	25.6
CBR Swell (%):	2.5
Minimum CBR Specification (%):	-
CBR Value @ 2.5mm (%):	**3.5**

CBR PENETRATION PLOT



Remarks	Results apply to the sample/s as received.,

Accredited for compliance with ISO/IEC 17025 – Testing

NATA

Accreditation Number: 1986
Corporate Site Number: 16822

Approved Signatory: Zane Elphick
Form ID: W2ASRep Rev 3

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Laboratory: **Warabrook Laboratory**
Phone: 02 4062 0200
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Email: Newcastle@constructionsciences.net

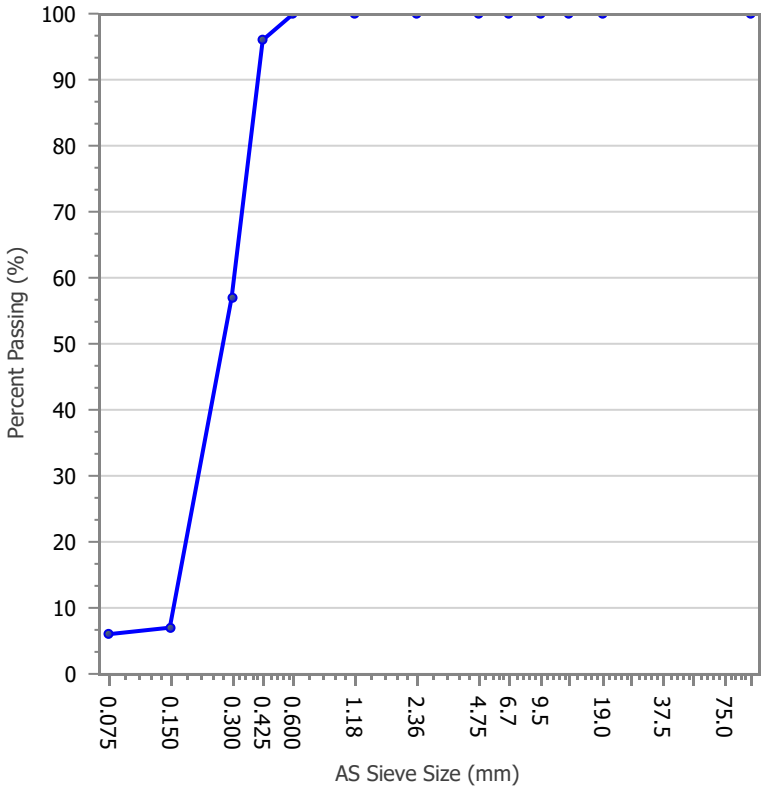
PARTICLE SIZE DISTRIBUTION REPORT

Client:	Kleinfelder Pty Ltd	Report Number:	16822/R/44574-1
Client Address:	Suite 3, 2440-244 Pacific Highway, Charlestown	Project Number:	16822/P/214
Project:	Construction Materials Testing	Lot Number:	24002155
Location:	NSW Regional	Internal Test Request:	16822/T/25702
Component:	Test Pits	Client Reference/s:	24002155
Area Description:	Newcastle Basketbal Assiociation	Report Date / Page:	8/11/2023 Page 1 of 3

Test Procedures:	AS1289.3.6.1			
Sample Number	16822/S/136963	Pit No.		BH02_2.0-3.0
Sampling Method	Tested As Received	Sample Type		BULK
Date Sampled	19/10/2023	Sample Depth	m	2.0-3.0
Sampled By	Client Sampled			
Date Tested	26/10/2023	Material Source	In situ	
Prep / Drying Method	n/a	Material Type	Insitu	
Prep > 53mm (%)	-	Specification	-	

AS Sieve (mm)	Specification Minimum (%)	**Percent Passing (%)**	Specification Maximum (%)
100.0		**100**	
19.0		**100**	
13.2		**100**	
9.5		**100**	
6.7		**100**	
4.75		**100**	
2.36		**100**	
1.18		**100**	
0.600		**100**	
0.425		**96**	
0.300		**57**	
0.150		**7**	
0.075		**6**	

PARTICLE SIZE DISTRIBUTION GRAPH



Remarks	Results apply to the sample/s as received.,

Accredited for compliance with ISO/IEC 17025 – Testing

NATA

Accreditation Number: 1986
Corporate Site Number: 16822

Approved Signatory: Zane Elphick
Form ID: W9Rep Rev 3

Construction Sciences

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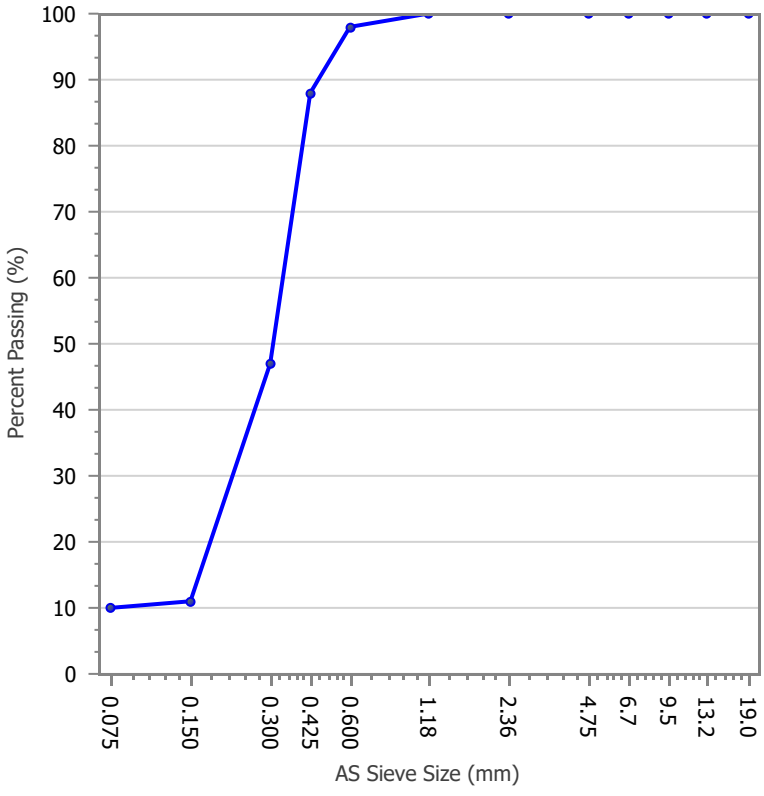
PARTICLE SIZE DISTRIBUTION REPORT

Client:	Kleinfelder Pty Ltd	Report Number:	16822/R/44574-1
Client Address:	Suite 3, 2440-244 Pacific Highway, Charlestown	Project Number:	16822/P/214
Project:	Construction Materials Testing	Lot Number:	24002155
Location:	NSW Regional	Internal Test Request:	16822/T/25702
Component:	Test Pits	Client Reference/s:	24002155
Area Description:	Newcastle Basketbal Assiociation	Report Date / Page:	8/11/2023 Page 2 of 3

Test Procedures:	AS1289.3.6.1			
Sample Number	16822/S/136964	Pit No.		MW03_5.0-6.0
Sampling Method	Tested As Received	Sample Type		BULK
Date Sampled	19/10/2023	Sample Depth	m	5.0-6.0
Sampled By	Client Sampled			
Date Tested	8/11/2023	Material Source	In situ	
Prep / Drying Method	n/a	Material Type	Insitu	
Prep > 53mm (%)	-	Specification	-	

AS Sieve (mm)	Specification Minimum (%)	**Percent Passing (%)**	Specification Maximum (%)
19.0		**100**	
13.2		**100**	
9.5		**100**	
6.7		**100**	
4.75		**100**	
2.36		**100**	
1.18		**100**	
0.600		**98**	
0.425		**88**	
0.300		**47**	
0.150		**11**	
0.075		**10**	

PARTICLE SIZE DISTRIBUTION GRAPH



Remarks	Results apply to the sample/s as received.,

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NATA

Accreditation Number: 1986
Corporate Site Number: 16822

Approved Signatory: Zane Elphick
Form ID: W9Rep Rev 3

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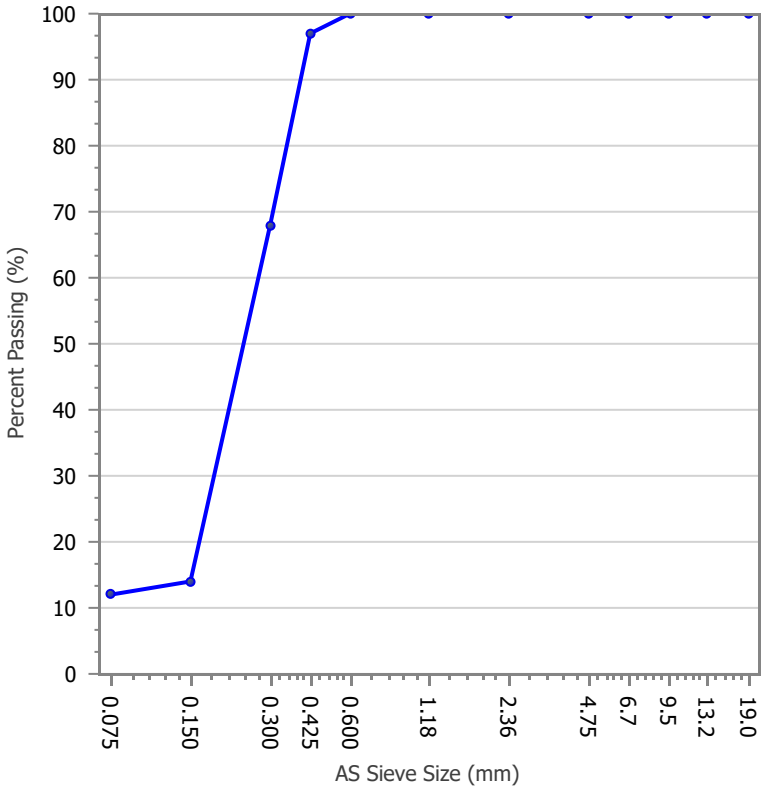
PARTICLE SIZE DISTRIBUTION REPORT

Client:	Kleinfelder Pty Ltd	Report Number:	16822/R/44574-1
Client Address:	Suite 3, 2440-244 Pacific Highway, Charlestown	Project Number:	16822/P/214
Project:	Construction Materials Testing	Lot Number:	24002155
Location:	NSW Regional	Internal Test Request:	16822/T/25702
Component:	Test Pits	Client Reference/s:	24002155
Area Description:	Newcastle Basketbal Assiociation	Report Date / Page:	8/11/2023 Page 3 of 3

Test Procedures:	AS1289.3.6.1			
Sample Number	16822/S/136965	Pit No.		BH04_2.5-3.5
Sampling Method	Tested As Received	Sample Type		BULK
Date Sampled	19/10/2023	Sample Depth	m	2.5-3.5
Sampled By	Client Sampled			
Date Tested	26/10/2023	Material Source	In situ	
Prep / Drying Method	n/a	Material Type	Insitu	
Prep > 53mm (%)	-	Specification	-	

AS Sieve (mm)	Specification Minimum (%)	**Percent Passing (%)**	Specification Maximum (%)
19.0		**100**	
13.2		**100**	
9.5		**100**	
6.7		**100**	
4.75		**100**	
2.36		**100**	
1.18		**100**	
0.600		**100**	
0.425		**97**	
0.300		**68**	
0.150		**14**	
0.075		**12**	

PARTICLE SIZE DISTRIBUTION GRAPH



Remarks	Results apply to the sample/s as received.,

Accredited for compliance with ISO/IEC 17025 – Testing

NATA

Accreditation Number: 1986
Corporate Site Number: 16822

Approved Signatory: Zane Elphick
Form ID: W9Rep Rev 3

Construction Sciences

Construction Sciences Pty Ltd
ABN: 74 128 806 735

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Warabrook NSW 2304

Laboratory: **Warabrook Laboratory**
Phone: 02 4062 0200
Fax: 02 6654 0261
Email: Newcastle@constructionsciences.net

SHRINK SWELL INDEX

Client:	Kleinfelder Pty Ltd	Report Number:	16822/R/44742-1
Client Address:	Suite 3, 2440-244 Pacific Highway, Charlestown	Project Number:	16822/P/214
Project:	24002155	Lot Number:	Finished
Location:	NSW Regional	Internal Test Request:	16822/T/25764
Component:	Shrink-swells	Client Reference/s:	24002155 - Newcastle Basketball Ce
Area Description:	.	Report Date / Page:	15/11/2023 Page 1 of 7

Test Procedures:	AS1289.7.1.1, AS1289.2.1.1	Bore No.	BH04
Sample Number	16822/S/137312	Sample Type	
Sampling Method	Tested As Received	Sample Depth m	1.5-2.0
Date Sampled	25/10/2023		
Sampled By	Client Sampled	Material Source	Existing
Date Tested	25/10/2023	Material Type	Insitu
Client Reference	-	Specification	-

Soil Description:	CLAY		
Cracking / Crumbling:	None		
Estimated Inert Inclusions (%):	0.00	Swell Pre-Soak Moisture Content (%)	29.3
Shrinkage Moisture Content (%):	30.1	Swell Post-Soak Moisture Content (%)	30.9

Shrinkage Strain (%)	7.4	Shrink / Swell Index	4.1
Swell Strain (%)	0.2		

Remarks	Results apply to the sample/s as received.,

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NATA

Accreditation Number: 1986
Corporate Site Number: 16822

Approved Signatory: Callum O'Neill
Form ID: W21Rep Rev 1

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SHRINK SWELL INDEX

Client:	Kleinfelder Pty Ltd	Report Number:	16822/R/44742-1
Client Address:	Suite 3, 2440-244 Pacific Highway, Charlestown	Project Number:	16822/P/214
Project:	24002155	Lot Number:	Finished
Location:	NSW Regional	Internal Test Request:	16822/T/25764
Component:	Shrink-swells	Client Reference/s:	24002155 - Newcastle Basketball Ce
Area Description:	.	Report Date / Page:	15/11/2023 Page 2 of 7

Test Procedures:	AS1289.7.1.1, AS1289.2.1.1	Bore No.	BH02
Sample Number	16822/S/137313	Sample Type	
Sampling Method	Tested As Received	Sample Depth m	0.5-1.0
Date Sampled	25/10/2023		
Sampled By	Client Sampled	Material Source	Existing
Date Tested	25/10/2023	Material Type	Insitu
Client Reference	-	Specification	-

Soil Description:	CLAY		
Cracking / Crumbling:	None		
Estimated Inert Inclusions (%):	0.00	Swell Pre-Soak Moisture Content (%)	26.9
Shrinkage Moisture Content (%):	25.6	Swell Post-Soak Moisture Content (%)	31.1

Shrinkage Strain (%)	6.0	Shrink / Swell Index	3.4
Swell Strain (%)	0.3		

Remarks	Results apply to the sample/s as received.,

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NATA

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Corporate Site Number: 16822

Approved Signatory: Callum O'Neill
Form ID: W21Rep Rev 1

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SHRINK SWELL INDEX

Client:	Kleinfelder Pty Ltd	Report Number:	16822/R/44742-1
Client Address:	Suite 3, 2440-244 Pacific Highway, Charlestown	Project Number:	16822/P/214
Project:	24002155	Lot Number:	Finished.
Location:	NSW Regional	Internal Test Request:	16822/T/25764
Component:	Shrink-swells	Client Reference/s:	24002155 - Newcastle Basketball Ce
Area Description:	.	Report Date / Page:	15/11/2023 Page 3 of 7

Test Procedures:	AS1289.7.1.1, AS1289.2.1.1	Bore No.	BH05
Sample Number	16822/S/137314	Sample Type	
Sampling Method	Tested As Received	Sample Depth m	1.0-1.5
Date Sampled	25/10/2023		
Sampled By	Client Sampled	Material Source	Existing
Date Tested	7/11/2023	Material Type	Insitu
Client Reference	-	Specification	-

Soil Description:	CLAY		
Cracking / Crumbling:	Moderate		
Estimated Inert Inclusions (%):	0.00	Swell Pre-Soak Moisture Content (%)	33.5
Shrinkage Moisture Content (%):	33.2	Swell Post-Soak Moisture Content (%)	34.2

Shrinkage Strain (%)	10.9	Shrink / Swell Index	6.5
Swell Strain (%)	1.5		

Remarks	Results apply to the sample/s as received.,

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Corporate Site Number: 16822

Approved Signatory: Callum O'Neill
Form ID: W21Rep Rev 1

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SHRINK SWELL INDEX

Client:	Kleinfelder Pty Ltd	Report Number:	16822/R/44742-1
Client Address:	Suite 3, 2440-244 Pacific Highway, Charlestown	Project Number:	16822/P/214
Project:	24002155	Lot Number:	Finished
Location:	NSW Regional	Internal Test Request:	16822/T/25764
Component:	Shrink-swells	Client Reference/s:	24002155 - Newcastle Basketball Ce
Area Description:	.	Report Date / Page:	15/11/2023 Page 4 of 7

Test Procedures:	AS1289.7.1.1, AS1289.2.1.1	Bore No.	BH01
Sample Number	16822/S/137315	Sample Type	
Sampling Method	Tested As Received	Sample Depth m	2.5-3.0
Date Sampled	25/10/2023		
Sampled By	Client Sampled	Material Source	Existing
Date Tested	7/11/2023	Material Type	Insitu
Client Reference	-	Specification	-

Soil Description:	CLAY		
Cracking / Crumbling:	Minor		
Estimated Inert Inclusions (%):	0.00	Swell Pre-Soak Moisture Content (%)	35.2
Shrinkage Moisture Content (%):	34.5	Swell Post-Soak Moisture Content (%)	34.5

Shrinkage Strain (%)	10.0	Shrink / Swell Index	5.6
Swell Strain (%)	0.2		

Remarks	Results apply to the sample/s as received.,

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Corporate Site Number: 16822

Approved Signatory: Callum O'Neill
Form ID: W21Rep Rev 1

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SHRINK SWELL INDEX

Client:	Kleinfelder Pty Ltd	Report Number:	16822/R/44742-1
Client Address:	Suite 3, 2440-244 Pacific Highway, Charlestown	Project Number:	16822/P/214
Project:	24002155	Lot Number:	Finished
Location:	NSW Regional	Internal Test Request:	16822/T/25764
Component:	Shrink-swells	Client Reference/s:	24002155 - Newcastle Basketball Ce
Area Description:	.	Report Date / Page:	15/11/2023 Page 5 of 7

Test Procedures:	AS1289.7.1.1, AS1289.2.1.1	Bore No.		BH03
Sample Number	16822/S/137316	Sample Type		
Sampling Method	Tested As Received	Sample Depth	m	1.0-1.5
Date Sampled	25/10/2023			
Sampled By	Client Sampled	Material Source	Existing	
Date Tested	7/11/2023	Material Type	Insitu	
Client Reference	-	Specification	-	

Soil Description:	CLAY		
Cracking / Crumbling:	Moderate		
Estimated Inert Inclusions (%):	0.30	Swell Pre-Soak Moisture Content (%)	33.2
Shrinkage Moisture Content (%):	35.9	Swell Post-Soak Moisture Content (%)	34.8

Shrinkage Strain (%)	9.8	Shrink / Swell Index	5.4
Swell Strain (%)	0.0		

Remarks	Results apply to the sample/s as received.,

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Corporate Site Number: 16822

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Form ID: W21Rep Rev 1

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SHRINK SWELL INDEX

Client:	Kleinfelder Pty Ltd	Report Number:	16822/R/44742-1
Client Address:	Suite 3, 2440-244 Pacific Highway, Charlestown	Project Number:	16822/P/214
Project:	24002155	Lot Number:	Finished.
Location:	NSW Regional	Internal Test Request:	16822/T/25764
Component:	Shrink-swells	Client Reference/s:	24002155 - Newcastle Basketball Ce
Area Description:	.	Report Date / Page:	15/11/2023 Page 6 of 7

Test Procedures:	AS1289.7.1.1, AS1289.2.1.1	Bore No.	MW02
Sample Number	16822/S/137317	Sample Type	
Sampling Method	Tested As Received	Sample Depth m	2.0-2.5
Date Sampled	25/10/2023		
Sampled By	Client Sampled	Material Source	Existing
Date Tested	13/11/2023	Material Type	Insitu
Client Reference	-	Specification	-

Soil Description:	CLAY		
Cracking / Crumbling:	Moderate		
Estimated Inert Inclusions (%):	14.90	Swell Pre-Soak Moisture Content (%)	20.7
Shrinkage Moisture Content (%):	16.6	Swell Post-Soak Moisture Content (%)	28.8

Shrinkage Strain (%)	2.0	Shrink / Swell Index	1.3
Swell Strain (%)	0.6		

Remarks	Results apply to the sample/s as received.,

NATA

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Form ID: W21Rep Rev 1

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SHRINK SWELL INDEX

Client:	Kleinfelder Pty Ltd	Report Number:	16822/R/44742-1
Client Address:	Suite 3, 2440-244 Pacific Highway, Charlestown	Project Number:	16822/P/214
Project:	24002155	Lot Number:	Finished.
Location:	NSW Regional	Internal Test Request:	16822/T/25764
Component:	Shrink-swells	Client Reference/s:	24002155 - Newcastle Basketball Ce
Area Description:	.	Report Date / Page:	15/11/2023 Page 7 of 7

Test Procedures:	AS1289.7.1.1, AS1289.2.1.1	Bore No.	MW01
Sample Number	16822/S/137319	Sample Type	
Sampling Method	Tested As Received	Sample Depth m	1.0-1.5
Date Sampled	25/10/2023		
Sampled By	Client Sampled	Material Source	Existing
Date Tested	7/11/2023	Material Type	Insitu
Client Reference	-	Specification	-

Soil Description:	CLAY		
Cracking / Crumbling:	Minor		
Estimated Inert Inclusions (%):	0.50	Swell Pre-Soak Moisture Content (%)	23.4
Shrinkage Moisture Content (%):	31.2	Swell Post-Soak Moisture Content (%)	22.9

Shrinkage Strain (%)	7.6	Shrink / Swell Index	4.2
Swell Strain (%)	0.0		

Remarks	Results apply to the sample/s as received.,

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Form ID: W21Rep Rev 1

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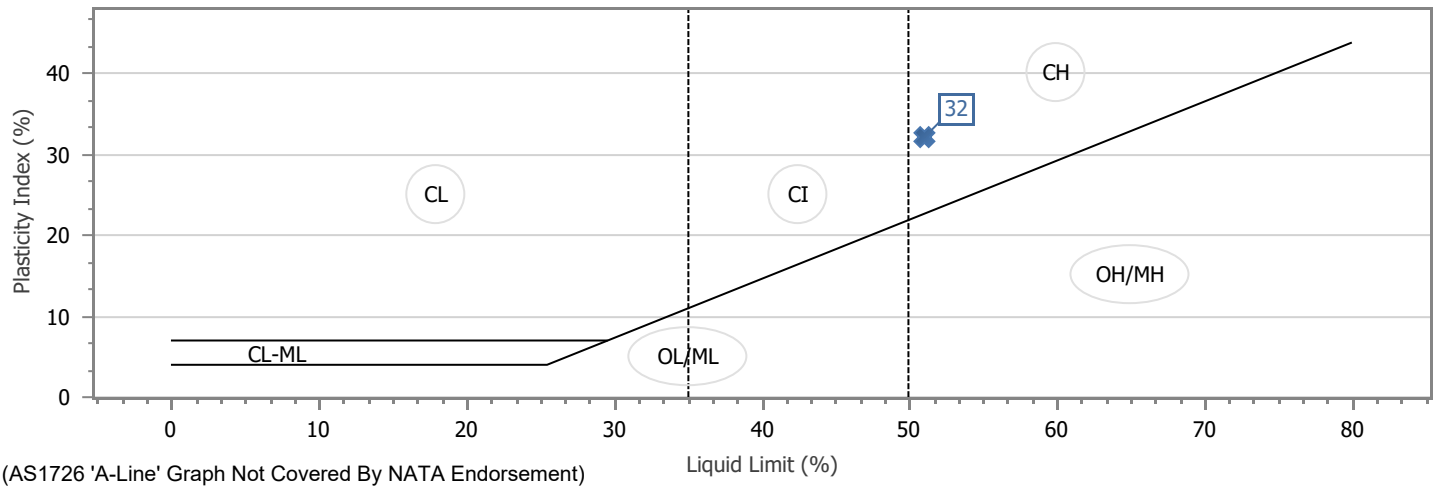
ATTERBERG LIMITS REPORT

Client:	Kleinfelder Pty Ltd	Report Number:	16822/R/44575-1
Client Address:	Suite 3, 2440-244 Pacific Highway, Charlestown	Project Number:	16822/P/214
Project:	Construction Materials Testing	Lot Number:	24002155
Location:	NSW Regional	Internal Test Request:	16822/T/25702
Component:	Test Pits	Client Reference/s:	24002155
Area Description:	Newcastle Basketbal Assiociation	Report Date / Page:	8/11/2023 Page 1 of 7

Test Procedures:	AS1289.3.1.1, AS 1289.3.3.1, AS1289.3.2.1, AS1289.3.4.1, AS1289.2.1.1		
Sample Number	16822/S/136956	Sample Location	
Sampling Method	Tested As Received	Pit No.	MW01_1.0-1.5
Date Sampled	19/10/2023	Sample Type	BULK
Sampled By	Client Sampled	Sample Depth m	1.0-1.5
Date Tested	2/11/2023		
Drying / Prep Method	Oven Dried / Dry Sieved	Material Source	In situ
LL Water Type	Potable	Material Type	Insitu
LL Device Type	Cassagrande	Specification	-
Client Reference	MW01_1.0-1.5	Prep Mat > 53mm (%)	-
Material Description	Silty CLAY		

Atterberg Limit	Specification Minimum	Test Result	Specification Maximum
Liquid Limit (%)		**51**	
Plastic Limit (%)		**19**	
Plasticity Index (%)		**32**	
Linear Shrinkage (%)		**15.0**	
Linear Shrinkage Mould Length / Defects:	Mould Length: 250.6mm / None		

Atterberg Limits 'A-Line' Graph



(AS1726 'A-Line' Graph Not Covered By NATA Endorsement)

Remarks: Results apply to the sample/s as received.,

Accredited for compliance with ISO/IEC 17025 – Testing

Accreditation Number: 1986
Corporate Site Number: 16822

Approved Signatory: Eric Foster
Form ID: W11Rep Rev 2

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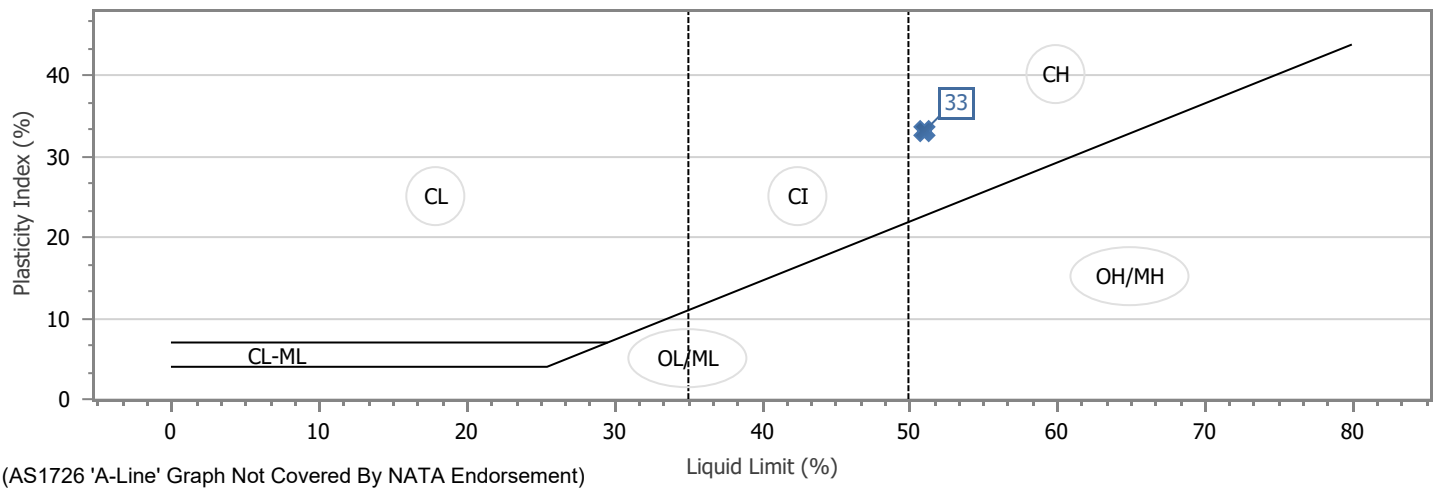
ATTERBERG LIMITS REPORT

Client:	Kleinfelder Pty Ltd	Report Number:	16822/R/44575-1
Client Address:	Suite 3, 2440-244 Pacific Highway, Charlestown	Project Number:	16822/P/214
Project:	Construction Materials Testing	Lot Number:	24002155
Location:	NSW Regional	Internal Test Request:	16822/T/25702
Component:	Test Pits	Client Reference/s:	24002155
Area Description:	Newcastle Basketbal Assiociation	Report Date / Page:	8/11/2023 Page 2 of 7

Test Procedures:	AS1289.3.1.1, AS 1289.3.3.1, AS1289.3.2.1, AS1289.3.4.1, AS1289.2.1.1		
Sample Number	16822/S/136957	Sample Location	
Sampling Method	Tested As Received	Pit No.	BH01_4.5-4.95
Date Sampled	19/10/2023	Sample Type	BULK
Sampled By	Client Sampled	Sample Depth m	4.5-4.95
Date Tested	6/11/2023		
Drying / Prep Method	Oven Dried / Dry Sieved	Material Source	In situ
LL Water Type	Potable	Material Type	Insitu
LL Device Type	Cassagrande	Specification	-
Client Reference	BH01_4.5-4.95	Prep Mat > 53mm (%)	-
Material Description	Silty CLAY		

Atterberg Limit	Specification Minimum	Test Result	Specification Maximum
Liquid Limit (%)		**51**	
Plastic Limit (%)		**18**	
Plasticity Index (%)		**33**	
Linear Shrinkage (%)		**13.5**	
Linear Shrinkage Mould Length / Defects:	Mould Length: 250.4mm / Cracking		

Atterberg Limits 'A-Line' Graph



(AS1726 'A-Line' Graph Not Covered By NATA Endorsement)

Remarks	Results apply to the sample/s as received.,

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NATA

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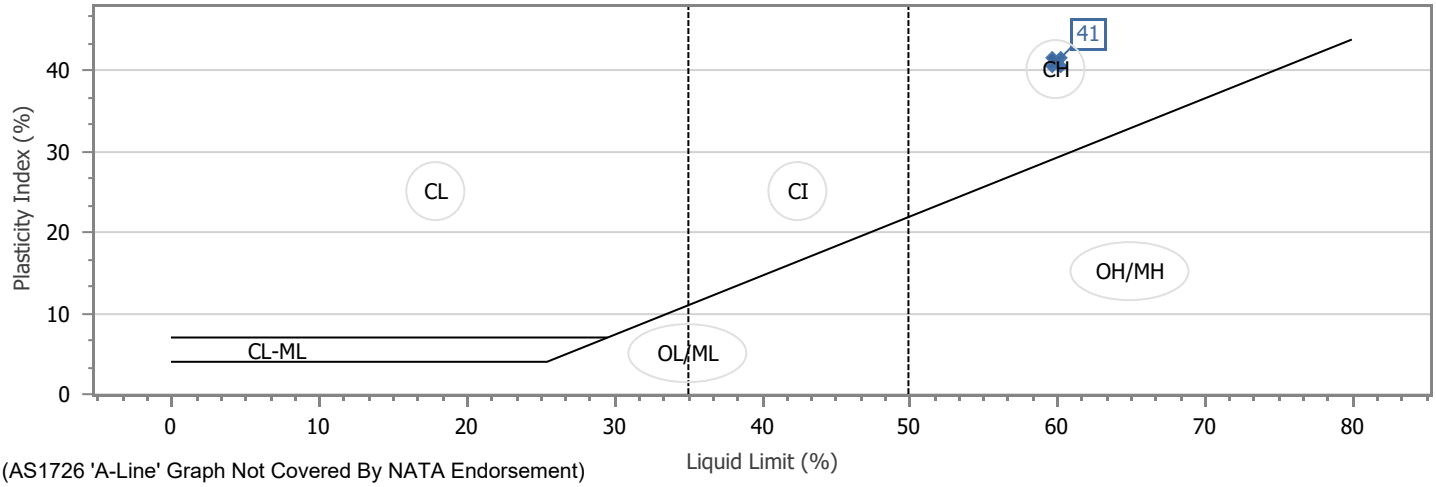
ATTERBERG LIMITS REPORT

Client:	Kleinfelder Pty Ltd	Report Number:	16822/R/44575-1
Client Address:	Suite 3, 2440-244 Pacific Highway, Charlestown	Project Number:	16822/P/214
Project:	Construction Materials Testing	Lot Number:	24002155
Location:	NSW Regional	Internal Test Request:	16822/T/25702
Component:	Test Pits	Client Reference/s:	24002155
Area Description:	Newcastle Basketbal Assiociation	Report Date / Page:	8/11/2023 Page 3 of 7

Test Procedures:	AS1289.3.1.1, AS 1289.3.3.1, AS1289.3.2.1, AS1289.3.4.1, AS1289.2.1.1		
Sample Number	16822/S/136958	Sample Location	
Sampling Method	Tested As Received	Pit No.	MW02_2.5-3.0
Date Sampled	19/10/2023	Sample Type	BULK
Sampled By	Client Sampled	Sample Depth m	2.5-3.0
Date Tested	2/11/2023		
Drying / Prep Method	Oven Dried / Dry Sieved	Material Source	In situ
LL Water Type	Potable	Material Type	Insitu
LL Device Type	Cassagrande	Specification	-
Client Reference	MW02_2.5-3.0	Prep Mat > 53mm (%)	-
Material Description	Silty CLAY		

Atterberg Limit	Specification Minimum	Test Result	Specification Maximum
Liquid Limit (%)		**60**	
Plastic Limit (%)		**19**	
Plasticity Index (%)		**41**	
Linear Shrinkage (%)		**16.0**	
Linear Shrinkage Mould Length / Defects:	Mould Length: 250.3mm / Cracking		

Atterberg Limits 'A-Line' Graph



(AS1726 'A-Line' Graph Not Covered By NATA Endorsement)

Remarks	Results apply to the sample/s as received.,

Accredited for compliance with ISO/IEC 17025 – Testing

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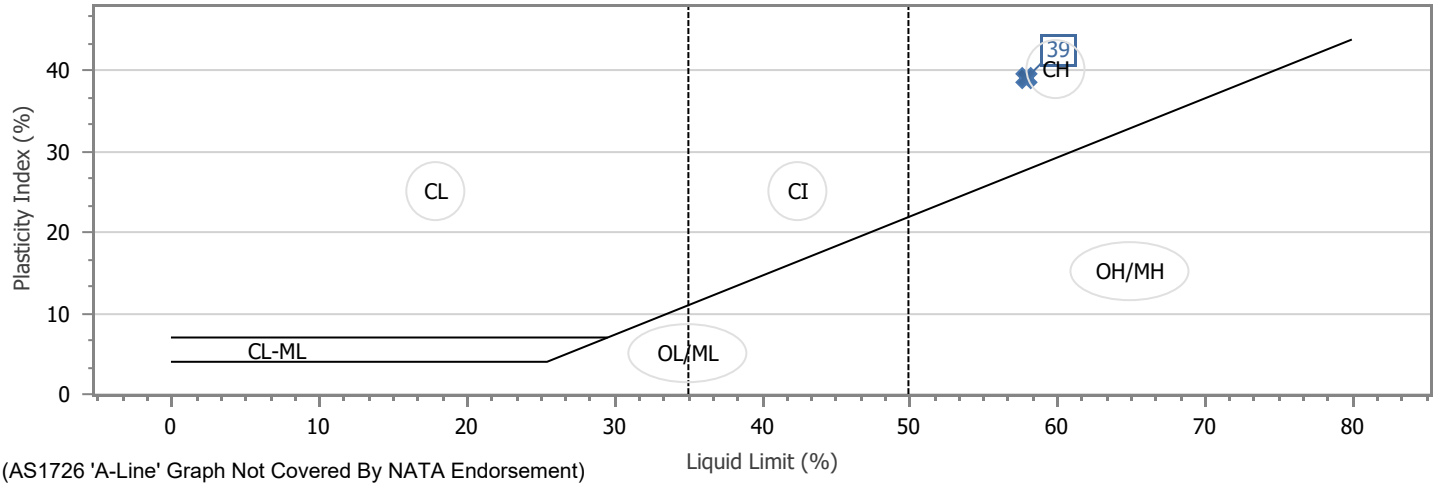
ATTERBERG LIMITS REPORT

Client:	Kleinfelder Pty Ltd	Report Number:	16822/R/44575-1
Client Address:	Suite 3, 2440-244 Pacific Highway, Charlestown	Project Number:	16822/P/214
Project:	Construction Materials Testing	Lot Number:	24002155
Location:	NSW Regional	Internal Test Request:	16822/T/25702
Component:	Test Pits	Client Reference/s:	24002155
Area Description:	Newcastle Basketbal Assiociation	Report Date / Page:	8/11/2023 Page 4 of 7

Test Procedures:	AS1289.3.1.1, AS 1289.3.3.1, AS1289.3.2.1, AS1289.3.4.1, AS1289.2.1.1		
Sample Number	16822/S/136959	Sample Location	
Sampling Method	Tested As Received	Pit No.	BH03_2.0-2.5
Date Sampled	19/10/2023	Sample Type	BULK
Sampled By	Client Sampled	Sample Depth m	2.0-2.5
Date Tested	6/11/2023		
Drying / Prep Method	Oven Dried / Dry Sieved	Material Source	In situ
LL Water Type	Potable	Material Type	Insitu
LL Device Type	Cassagrande	Specification	-
Client Reference	BH03_2.0-2.5	Prep Mat > 53mm (%)	-
Material Description	Silty CLAY		

Atterberg Limit	Specification Minimum	Test Result	Specification Maximum
Liquid Limit (%)		**58**	
Plastic Limit (%)		**19**	
Plasticity Index (%)		**39**	
Linear Shrinkage (%)		**14.5**	
Linear Shrinkage Mould Length / Defects:	Mould Length: 250.4mm / Cracking		

Atterberg Limits 'A-Line' Graph



(AS1726 'A-Line' Graph Not Covered By NATA Endorsement)

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ATTERBERG LIMITS REPORT

Client:	Kleinfelder Pty Ltd	Report Number:	16822/R/44575-1
Client Address:	Suite 3, 2440-244 Pacific Highway, Charlestown	Project Number:	16822/P/214
Project:	Construction Materials Testing	Lot Number:	24002155
Location:	NSW Regional	Internal Test Request:	16822/T/25702
Component:	Test Pits	Client Reference/s:	24002155
Area Description:	Newcastle Basketbal Assiociation	Report Date / Page:	8/11/2023 Page 5 of 7

Test Procedures:	AS1289.3.1.1, AS 1289.3.3.1, AS1289.3.2.1		
Sample Number	16822/S/136960	Sample Location	
Sampling Method	Tested As Received	Pit No.	MW03_6.5-7.5
Date Sampled	19/10/2023	Sample Type	BULK
Sampled By	Client Sampled	Sample Depth m	6.5-7.5
Date Tested	30/10/2023		
Drying / Prep Method	Oven Dried / Dry Sieved	Material Source	In situ
LL Water Type	Potable	Material Type	Insitu
LL Device Type	Cassagrande	Specification	-
Client Reference	MW03_6.5-7.5	Prep Mat > 53mm (%)	-
Material Description	Silty SAND		

Atterberg Limit	Specification Minimum	Test Result	Specification Maximum
Liquid Limit (%)		**Can't be determined**	
Plastic Limit (%)		**Can't be determined**	
Plasticity Index (%)		**Non Plastic**	
Linear Shrinkage (%)			
Linear Shrinkage Observations:			

Remarks	Results apply to the sample/s as received.,

Accredited for compliance with ISO/IEC 17025 – Testing

NATA

Accreditation Number: 1986
Corporate Site Number: 16822

Approved Signatory: Eric Foster
Form ID: W11Rep Rev 2

Construction Sciences

Construction Sciences Pty Ltd
ABN: 74 128 806 735

Address:
Unit 1, 12 Callistemon Close
Warabrook NSW 2304

Laboratory: **Warabrook Laboratory**
Phone: 02 4062 0200
Fax: 02 6654 0261
Email: Newcastle@constructionsciences.net

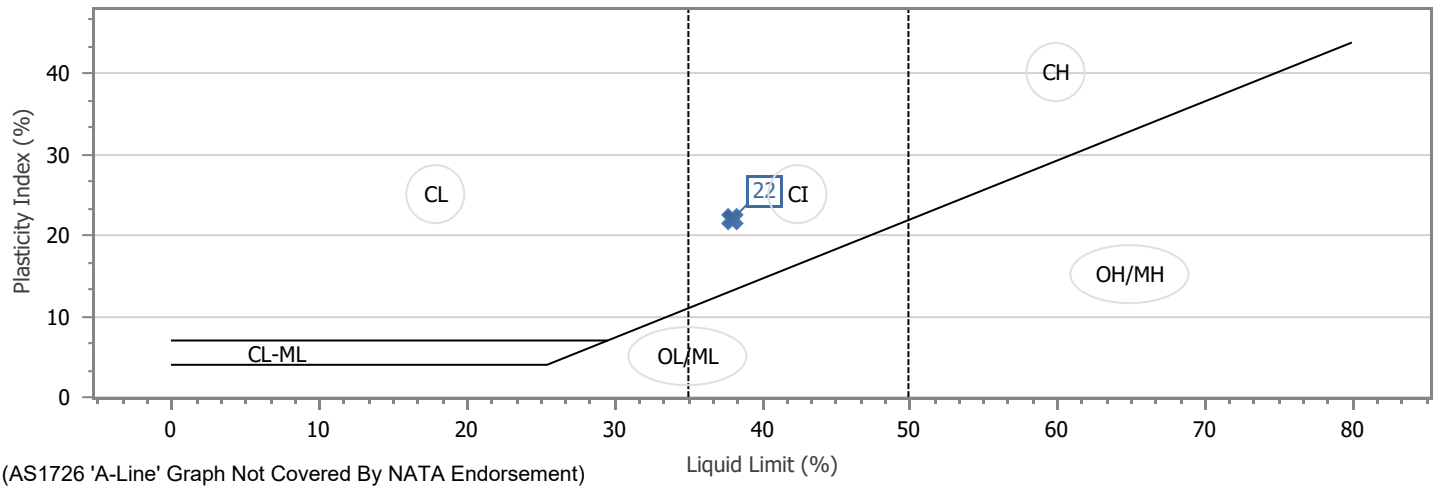
ATTERBERG LIMITS REPORT

Client:	Kleinfelder Pty Ltd	Report Number:	16822/R/44575-1
Client Address:	Suite 3, 2440-244 Pacific Highway, Charlestown	Project Number:	16822/P/214
Project:	Construction Materials Testing	Lot Number:	24002155
Location:	NSW Regional	Internal Test Request:	16822/T/25702
Component:	Test Pits	Client Reference/s:	24002155
Area Description:	Newcastle Basketbal Assiociation	Report Date / Page:	8/11/2023 Page 6 of 7

Test Procedures:	AS1289.3.1.1, AS 1289.3.3.1, AS1289.3.2.1, AS1289.3.4.1, AS1289.2.1.1		
Sample Number	16822/S/136961	Sample Location	
Sampling Method	Tested As Received	Pit No.	BH04_1.5-2.3
Date Sampled	19/10/2023	Sample Type	BULK
Sampled By	Client Sampled	Sample Depth m	1.5-2.3
Date Tested	6/11/2023		
Drying / Prep Method	Oven Dried / Dry Sieved	Material Source	In situ
LL Water Type	Potable	Material Type	Insitu
LL Device Type	Cassagrande	Specification	-
Client Reference	BH04_1.5-2.3	Prep Mat > 53mm (%)	-
Material Description	Sandy CLAY		

Atterberg Limit	Specification Minimum	Test Result	Specification Maximum
Liquid Limit (%)		**38**	
Plastic Limit (%)		**16**	
Plasticity Index (%)		**22**	
Linear Shrinkage (%)		**4.0**	
Linear Shrinkage Mould Length / Defects:	Mould Length: 251.1mm / None		

Atterberg Limits 'A-Line' Graph



(AS1726 'A-Line' Graph Not Covered By NATA Endorsement)

Remarks	Results apply to the sample/s as received.,

Accredited for compliance with ISO/IEC 17025 – Testing

Accreditation Number: 1986
Corporate Site Number: 16822

Approved Signatory: Eric Foster
Form ID: W11Rep Rev 2

Construction Sciences

Construction Sciences Pty Ltd
ABN: 74 128 806 735

Address:
Unit 1, 12 Callistemon Close
Warabrook NSW 2304

Laboratory: **Warabrook Laboratory**
Phone: 02 4062 0200
Fax: 02 6654 0261
Email: Newcastle@constructionsciences.net

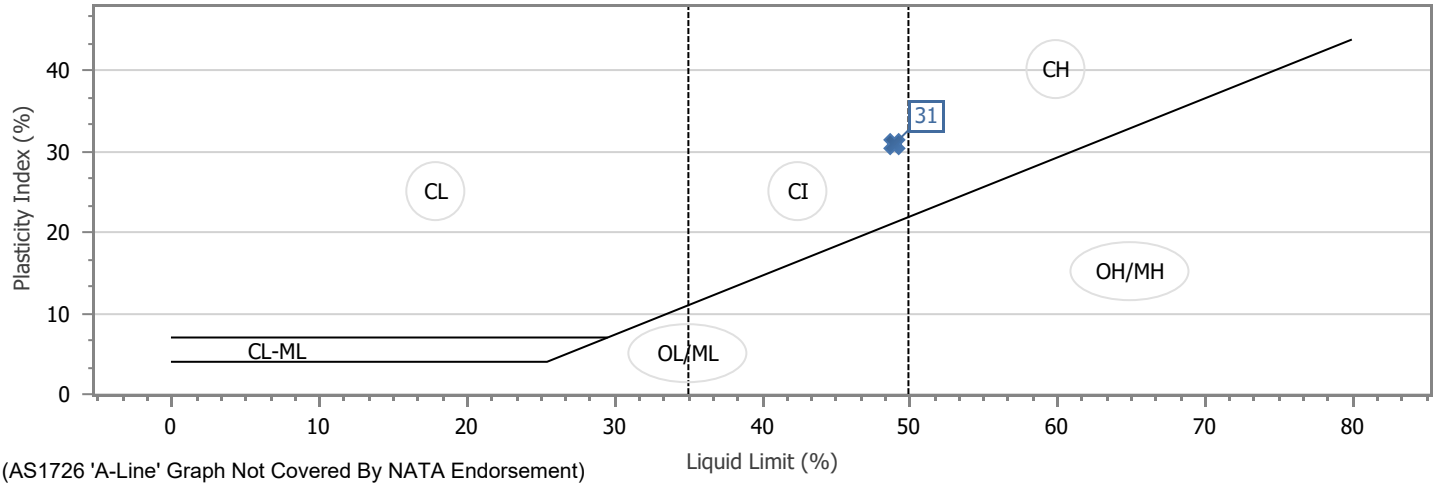
ATTERBERG LIMITS REPORT

Client:	Kleinfelder Pty Ltd	Report Number:	16822/R/44575-1
Client Address:	Suite 3, 2440-244 Pacific Highway, Charlestown	Project Number:	16822/P/214
Project:	Construction Materials Testing	Lot Number:	24002155
Location:	NSW Regional	Internal Test Request:	16822/T/25702
Component:	Test Pits	Client Reference/s:	24002155
Area Description:	Newcastle Basketbal Assiociation	Report Date / Page:	8/11/2023 Page 7 of 7

Test Procedures:	AS1289.3.1.1, AS 1289.3.3.1, AS1289.3.2.1, AS1289.3.4.1, AS1289.2.1.1		
Sample Number	16822/S/136962	Sample Location	
Sampling Method	Tested As Received	Pit No.	BH05_7.5-7.95
Date Sampled	19/10/2023	Sample Type	BULK
Sampled By	Client Sampled	Sample Depth m	7.5-7.95
Date Tested	6/11/2023		
Drying / Prep Method	Oven Dried / Dry Sieved	Material Source	In situ
LL Water Type	Potable	Material Type	Insitu
LL Device Type	Cassagrande	Specification	-
Client Reference	BH05_7.5-7.95	Prep Mat > 53mm (%)	-
Material Description	Silty CLAY		

Atterberg Limit	Specification Minimum	Test Result	Specification Maximum
Liquid Limit (%)		**49**	
Plastic Limit (%)		**18**	
Plasticity Index (%)		**31**	
Linear Shrinkage (%)		**12.0**	
Linear Shrinkage Mould Length / Defects:	Mould Length: 253.9mm / Cracking		

Atterberg Limits 'A-Line' Graph



(AS1726 'A-Line' Graph Not Covered By NATA Endorsement)

Remarks	Results apply to the sample/s as received.,

Accredited for compliance with ISO/IEC 17025 – Testing

NATA

Accreditation Number: 1986
Corporate Site Number: 16822

Approved Signatory: Eric Foster
Form ID: W11Rep Rev 2

CERTIFICATE OF ANALYSIS

Work Order	: **EB2331741**	Page	: 1 of 8
Client	: **KLEINFELDER AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: Phil Band	Contact	: Graeme Jablonskas
Address	: Suite 3, 240 - 244 Pacific Highway Charlestown NSW 2290	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: ----	Telephone	: +6138549 9609
Project	: Newcastle Basketball	Date Samples Received	: 11-Oct-2023 08:40
Order number	: 24002155	Date Analysis Commenced	: 16-Oct-2023
C-O-C number	: ----	Issue Date	: 23-Oct-2023 12:06
Sampler	: Megan Ferguson		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 28		
No. of samples analysed	: 28		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ben Felgendrejeris	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Ben Felgendrejeris	Senior Acid Sulfate Soil Chemist	Brisbane Soil Preparation, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- Corrosion assessment for Concrete and Steel piles in soil per Australian Standard AS2159-2009 uses a combination of soil and groundwater data (Tables 6.4.2 C & 6.5.2 C). In the absence of groundwater data, assessment has been made against soil criteria only. Refer to AS2159-2009 section 6.4 for further interpretation of corrosion assessment. ALS is not NATA accredited for Corrosion Assessment comments
- EA167: Soil Condition A – High permeability soils (e.g. sands and gravels) which are in groundwater
- EA167: Soil Condition B – Low permeability soils (e.g. silts and clays) or all soils above groundwater
- ASS: EA003 (NATA Field and F(ox) screening): pH F(ox) Reaction Rate: 1 - Slight; 2 - Moderate; 3 - Strong; 4 - Extreme
- ED045G: The presence of Thiocyanate, Thiosulfate and Sulfite can positively contribute to the chloride result, thereby may bias results higher than expected. Results should be scrutinised accordingly.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	MW03_1.8-2.0	MW02_2.5-3.0	MW01_1.5-1.6	BH03_2.0-2.5	MW01_1.0-1.5
			Sampling date / time	09-Oct-2023 00:00	09-Oct-2023 00:00	09-Oct-2023 00:00	09-Oct-2023 00:00	09-Oct-2023 00:00
Compound	CAS Number	LOR	Unit	EB2331741-001	EB2331741-002	EB2331741-003	EB2331741-004	EB2331741-005
				Result	Result	Result	Result	Result
EA003 :pH (field/fox)								
pH (F)	----	0.1	pH Unit	**5.4**	**5.2**	**4.7**	**5.1**	**5.1**
pH (Fox)	----	0.1	pH Unit	**3.9**	**3.5**	**3.0**	**2.8**	**3.5**
Reaction Rate	----	1	Reaction Unit	**2**	**2**	**2**	**2**	**2**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH05_1.5-2.0	BH03_1.5-1.8	BH01_2.0-2.5	BH01_2.5-3.0	BH04_3.5-4.5
			Sampling date / time	09-Oct-2023 00:00	09-Oct-2023 00:00	09-Oct-2023 00:00	09-Oct-2023 00:00	09-Oct-2023 00:00
Compound	CAS Number	LOR	Unit	EB2331741-006	EB2331741-007	EB2331741-008	EB2331741-009	EB2331741-010
				Result	Result	Result	Result	Result
EA003 :pH (field/fox)								
pH (F)	----	0.1	pH Unit	**5.0**	**4.8**	**4.9**	**4.9**	**4.8**
pH (Fox)	----	0.1	pH Unit	**3.3**	**2.9**	**2.9**	**3.1**	**3.4**
Reaction Rate	----	1	Reaction Unit	**2**	**2**	**2**	**2**	**2**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH03_3.0-3.45	BH05_2.0-3.0	MW02_1.2-1.5	MW02_1.5-2.0	MW03_1.0-1.5
			Sampling date / time	09-Oct-2023 00:00	09-Oct-2023 00:00	09-Oct-2023 00:00	09-Oct-2023 00:00	09-Oct-2023 00:00
Compound	CAS Number	LOR	Unit	EB2331741-011	EB2331741-012	EB2331741-013	EB2331741-014	EB2331741-015
				Result	Result	Result	Result	Result
EA003 :pH (field/fox)								
pH (F)	----	0.1	pH Unit	**5.0**	**5.0**	**4.6**	**6.2**	**4.7**
pH (Fox)	----	0.1	pH Unit	**3.4**	**3.6**	**3.5**	**3.6**	**3.3**
Reaction Rate	----	1	Reaction Unit	**2**	**2**	**2**	**2**	**2**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH04_2.5-3.5	BH04_1.5-2.3	BH02_3.5-3.4	BH05_0.5-1.0	BH02_1.0-1.5
			Sampling date / time	09-Oct-2023 00:00	09-Oct-2023 00:00	09-Oct-2023 00:00	09-Oct-2023 00:00	09-Oct-2023 00:00
Compound	CAS Number	LOR	Unit	EB2331741-016	EB2331741-017	EB2331741-018	EB2331741-019	EB2331741-020
				Result	Result	Result	Result	Result
EA003 :pH (field/fox)								
pH (F)	----	0.1	pH Unit	**5.4**	**4.4**	**5.5**	**4.3**	**4.8**
pH (Fox)	----	0.1	pH Unit	**3.7**	**3.5**	**2.2**	**4.7**	**3.0**
Reaction Rate	----	1	Reaction Unit	**2**	**2**	**2**	**2**	**2**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	MW02_1.2-1.5	BH05_2.0-3.0	BH02_2.0-2.5	MW01_1.0-1.5	BH01_1.5-1.95
			Sampling date / time	09-Oct-2023 00:00	09-Oct-2023 00:00	09-Oct-2023 00:00	09-Oct-2023 00:00	09-Oct-2023 00:00
Compound	CAS Number	LOR	Unit	EB2331741-021	EB2331741-022	EB2331741-023	EB2331741-024	EB2331741-025
				Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	7.6	4.8	5.3	5.2	4.6
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	122	913	113	347	608
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	18.8	26.7	18.2	20.2	26.0
EA080: Resistivity								
Resistivity at 25°C	----	1	ohm cm	8200	1100	8850	2880	1640
EA167: Corrosion Classification (per AS2159-2009)								
Ø Exposure Classification - Concrete Piles Soil Condition A	----	-	-	Mild	Moderate	Moderate	Moderate	Moderate
Ø Exposure Classification - Concrete Piles Soil Condition B	----	-	-	Non Aggressive	Mild	Mild	Mild	Mild
Ø Exposure Classification - Steel Piles Soil Condition A	----	-	-	Non Aggressive	Moderate	Non Aggressive	Mild	Moderate
Ø Exposure Classification - Steel Piles Soil Condition B	----	-	-	Non Aggressive	Mild	Non Aggressive	Non Aggressive	Mild
ED040S: Soluble Major Anions								
Sulfate as SO4 2-	14808-79-8	10	mg/kg	80	1030	120	600	930
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	10	mg/kg	30	1560	100	310	730

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH03_1.5-1.8	BH04_1.5-2.3	MW03_2.5-3.0	----	----
			Sampling date / time	09-Oct-2023 00:00	09-Oct-2023 00:00	09-Oct-2023 00:00	----	----
Compound	CAS Number	LOR	Unit	EB2331741-026	EB2331741-027	EB2331741-028	--------	--------
				Result	Result	Result	----	----
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	4.9	5.0	6.7	----	----
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	622	156	48	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	24.2	20.8	14.6	----	----
EA080: Resistivity								
Resistivity at 25°C	----	1	ohm cm	1610	6410	20800	----	----
EA167: Corrosion Classification (per AS2159-2009)								
Ø Exposure Classification - Concrete Piles Soil Condition A	----	-	-	Moderate	Moderate	Mild	----	----
Ø Exposure Classification - Concrete Piles Soil Condition B	----	-	-	Mild	Mild	Non Aggressive	----	----
Ø Exposure Classification - Steel Piles Soil Condition A	----	-	-	Moderate	Mild	Non Aggressive	----	----
Ø Exposure Classification - Steel Piles Soil Condition B	----	-	-	Mild	Non Aggressive	Non Aggressive	----	----
ED040S: Soluble Major Anions								
Sulfate as SO4 2-	14808-79-8	10	mg/kg	920	220	50	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	10	mg/kg	910	100	30	----	----

CERTIFICATE OF ANALYSIS

Work Order	: **EB2336905**	Page	: 1 of 3
Client	: **KLEINFELDER AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: Phil Band	Contact	: Graeme Jablonskas
Address	: Suite 3, 240 - 244 Pacific Highway Charlestown NSW 2290	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: ----	Telephone	: +6138549 9609
Project	: Newcastle Basketball	Date Samples Received	: 22-Nov-2023 14:00
Order number	: 24002155	Date Analysis Commenced	: 28-Nov-2023
C-O-C number	: ----	Issue Date	: 28-Nov-2023 16:26
Sampler	: Megan Ferguson		
Site	: Newcastle Basketball Association, New Lambton		
Quote number	: EN/222		
No. of samples received	: 5		
No. of samples analysed	: 5		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

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- General Comments
- Analytical Results

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Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ben Felgendrejeris	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- ASS: EA033 (CRS Suite): Analysis is performed as per the Acid Sulfate Soils Laboratory Methods Guidelines (2004) and the updated National Acid Sulfate Soils Guidance: National acid sulfate soils identification and laboratory methods manual, Department of Agriculture and Water Resources, Canberra, ACT (2018)
- ASS: EA033 (CRS Suite): ANC not required because pH KCl less than 6.5
- ASS: EA033 (CRS Suite): Liming rate is calculated and reported on a dry weight basis assuming use of fine agricultural lime (CaCO3) and using a safety factor of 1.5 to allow for non-homogeneous mixing and poor reactivity of lime. For conversion of Liming Rate from 'kg/t dry weight' to 'kg/m3 in-situ soil', multiply 'reported results' x 'wet bulk density of soil in t/m3'.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	MW03_1.0-1.5	BH01_2.0-2.5	BH03_2.0-2.5	MW02_1.5-2.0	BH02_3.5-3.4
			Sampling date / time	09-Oct-2023 00:00	09-Oct-2023 00:00	09-Oct-2023 00:00	09-Oct-2023 00:00	09-Oct-2023 00:00
Compound	CAS Number	LOR	Unit	EB2336905-001	EB2336905-002	EB2336905-003	EB2336905-004	EB2336905-005
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	**4.0**	**4.3**	**4.3**	**5.3**	**5.4**
Titratable Actual Acidity (23F)	----	2	mole H+ / t	**57**	**67**	**42**	**15**	**5**
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	**0.09**	**0.11**	**0.07**	**0.02**	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	**0.024**	**0.013**	**0.021**	**0.018**	**0.019**
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	**15**	<10	**13**	**11**	**12**
EA033-D: Retained Acidity								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	**0.05**	**0.05**	**0.06**	**----**	**----**
HCl Extractable Sulfur (20Be)	----	0.02	% S	**0.07**	**0.06**	**0.07**	**----**	**----**
Net Acid Soluble Sulfur (20Je)	----	0.02	% S	**0.04**	<0.02	<0.02	**----**	**----**
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t	**21**	<10	<10	**----**	**----**
sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S	**0.03**	<0.02	<0.02	**----**	**----**
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S	**0.15**	**0.13**	**0.10**	**0.04**	**0.03**
Net Acidity (acidity units)	----	10	mole H+ / t	**92**	**82**	**63**	**26**	**17**
Liming Rate	----	1	kg CaCO3/t	**7**	**6**	**5**	**2**	**1**
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	**0.15**	**0.13**	**0.10**	**0.04**	**0.03**
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	**92**	**82**	**63**	**26**	**17**
Liming Rate excluding ANC	----	1	kg CaCO3/t	**7**	**6**	**5**	**2**	**1**

APPENDIX D DCP RESULTS

DCP TEST RESULTS

KLEINFELDER Bright People. Right Solutions.		Project:	Basketball Association of Newcastle	Project No.:	24002155
		Address:	Cnr Monash & Turton Rds, New Lambton	Sheet No.:	1 of 2
Tested By:	MM	Kit ID:	DCP02	Rods and Cone Condition:	Good
Date:	4-6 Oct 23	Drop Height:	510±5mm	Hammer Weight:	9.0 ± 0.1 kg

Test Location / ID		Test Location / ID		Test Location / ID		Test Location / ID		Test Location / ID	
BH01		BH02		BH03		BH04		BH05	
Starting Depth(m)		Starting Depth(m)		Starting Depth(m)		Starting Depth(m)		Starting Depth(m)	
0.0		0.0		0.0		0.0			
Depth (m)	Blow	Depth (m)	Blow	Depth (m)	Blow	Depth (m)	Blow	Depth (m)	Blow
0	4	0	3	0	1	0	1	0	2
0.1	5	0.1	4	0.1	4	0.1	4	0.1	5
0.2	6	0.2	4	0.2	4	0.2	13	0.2	5
0.3	5	0.3	2	0.3	8	0.3	12	0.3	5
0.4	3	0.4	1	0.4	10	0.4	4	0.4	3
0.5	8	0.5	2	0.5	13	0.5	2	0.5	2
0.6	7	0.6	1	0.6	4	0.6	2	0.6	1
0.7	5	0.7	2	0.7	2	0.7	3	0.7	2
0.8	6	0.8	2	0.8	4	0.8	4	0.8	2
0.9	4	0.9	2	0.9	3	0.9	5	0.9	3
1	6	1	4	1	4	1	6	1	3
1.1	6	1.1	5	1.1	7	1.1	7	1.1	6
1.2	7	1.2	4	1.2	8	1.2	12	1.2	8
1.3	6	1.3	3	1.3	9	1.3	14	1.3	9
1.4	5	1.4	3	1.4	11	1.4	17	1.4	12
1.5	7	1.5	4	1.5	14	1.5	22	1.5	12
1.6	7	1.6	6	1.6	18	1.6	25	1.6	15
1.7	10	1.7	8	1.7	20	1.7		1.7	14
1.8		1.8		1.8		1.8		1.8	
1.9		1.9		1.9		1.9		1.9	
2		2		2		2		2	
2.1		2.1		2.1		2.1		2.1	
2.2		2.2		2.2		2.2		2.2	
2.3		2.3		2.3		2.3		2.3	
2.4		2.4		2.4		2.4		2.4	
2.5		2.5		2.5		2.5		2.5	
2.6		2.6		2.6		2.6		2.6	
2.7		2.7		2.7		2.7		2.7	
2.8		2.8		2.8		2.8		2.8	
2.9		2.9		2.9		2.9		2.9	
3		3		3		3		3	
Material Description	As per logs	Material Description	As per logs	Material Description	As per logs	Material Description	As per logs	Material Description	As per logs

DCP TEST RESULTS

KLEINFELDER Bright People. Right Solutions.		Project:	Basketball Association of Newcastle	Project No.:	24002155
		Address:	Cnr Monash & Turton Rds, New Lambton	Sheet No.:	2 of 2
Tested By:	MM	Kit ID:	DCP02	Rods and Cone Condition:	Good
Date:	4-6 Oct 23	Drop Height:	510±5mm	Hammer Weight:	9.0 ± 0.1 kg

Test Location / ID		Test Location / ID		Test Location / ID		Test Location / ID		Test Location / ID	
MW01		MW02		MW03					
Starting Depth(m)		Starting Depth(m)		Starting Depth(m)		Starting Depth(m)		Starting Depth(m)	
Depth (m)	Blow	Depth (m)	Blow	Depth (m)	Blow	Depth (m)	Blow	Depth (m)	Blow
0	2	0	1	0	4	0		0	
0.1	5	0.1	3	0.1	12	0.1		0.1	
0.2	8	0.2	2	0.2	13	0.2		0.2	
0.3	7	0.3	8	0.3	7	0.3		0.3	
0.4	4	0.4	14	0.4	2	0.4		0.4	
0.5	3	0.5	10	0.5	6	0.5		0.5	
0.6	2	0.6	7	0.6	4	0.6		0.6	
0.7	2	0.7	11	0.7	2	0.7		0.7	
0.8	2	0.8	7	0.8	3	0.8		0.8	
0.9	2	0.9	4	0.9	3	0.9		0.9	
1	4	1	4	1	2	1		1	
1.1	6	1.1	5	1.1	7	1.1		1.1	
1.2	6	1.2	4	1.2	8	1.2		1.2	
1.3	6	1.3	6	1.3	8	1.3		1.3	
1.4	7	1.4	8	1.4	6	1.4		1.4	
1.5	11	1.5	9	1.5	6	1.5		1.5	
1.6	11	1.6	12	1.6	6	1.6		1.6	
1.7	12	1.7	13	1.7	6	1.7		1.7	
1.8		1.8		1.8		1.8		1.8	
1.9		1.9		1.9		1.9		1.9	
2		2		2		2		2	
2.1		2.1		2.1		2.1		2.1	
2.2		2.2		2.2		2.2		2.2	
2.3		2.3		2.3		2.3		2.3	
2.4		2.4		2.4		2.4		2.4	
2.5		2.5		2.5		2.5		2.5	
2.6		2.6		2.6		2.6		2.6	
2.7		2.7		2.7		2.7		2.7	
2.8		2.8		2.8		2.8		2.8	
2.9		2.9		2.9		2.9		2.9	
3		3		3		3		3	
Material Description	As per logs	Material Description	As per logs	Material Description	As per logs	Material Description	As per logs	Material Description	As per logs