GEOTECHNICAL INVESTIGATION

FLOOD STORAGE BASINS AT ALSPEC INDUSTRIAL PARK 221-227 AND 289-311 LUDDENHAM ROAD, ORCHARD HILLS NSW

Prepared for **HBB Property Pty Ltd**

24 April 2024

Ref: DRM P23.1039-R07

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Report Title	Geotechnical Investigation
Site	Flood Storage Basins At Alspec Industrial Park 221-227 And 289-311 Luddenham Road, Orchard Hills NSW
File Reference	DRM P23.1039-R07
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DOCUMENT HISTORY & DISTRIBUTION

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Final	24 April 2024	Raj Singh of Core Geotech	Vipul De Silva Nalin De Silva	George Henien of HBB Property Pty Ltd

LIMITATIONS AND GENERAL NOTES

LIMITATIONS

The report was prepared in accordance with the scope agreed between **Development Risk Management Pty Ltd (DRM)** and the client. The scope of services was agreed to with due consideration of a range of factors including time, budget, access and site constraints. The report is provided for the specific purpose as described in the report. The report may not contain sufficient information for purposes other than that described in the report.

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Geotechnical and environmental reporting relies on the interpretation of factual information based on judgment and opinion and is far less exact than other engineering or design disciplines due to a range of uncertainties and variabilities. Geotechnical and environmental reports are for a specific purpose, development and site as described in the report and may not contain sufficient information for other purposes, developments or sites (including adjacent sites) other than that described in the report.

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Data obtained from nominated discrete locations, subsequent laboratory testing and empirical or external sources are interpreted by trained professionals in order to provide an opinion about overall site conditions, their likely impact with respect to the report purpose and recommended actions in accordance with any relevant industry standards, guidelines or procedures.

DRM P23.1039-R07

Wednesday, 24 April 2024

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Geotechnical Investigation

Flood Storage Basins At Alspec Industrial Park 221-227 And 289-311 Luddenham Road, Orchard Hills NSW

Development Risk Management Pty Ltd (DRM) is pleased to present the Geotechnical Investigation for site located at Flood Storage Basins At Alspec Industrial Park 221-227 And 289-311 Luddenham Road, Orchard Hills NSW (the site) prepared by our subcontractor Core Geotech.

I trust this report meets your current requirements. Please do not hesitate to contact me on 0450 715 562 or nalin_desilva@drm.ltd if you have any queries.

For and on behalf of Development Risk Management Pty Ltd,

NALIN DE SILVA

Principal Environmental Engineer

This report must be read in conjunction with the ***Information About This Report*** page at the front of this report.

Document Status

Date	Rev No.	Comments
23.04.2024	0	Geotechnical Investigation Report

Document Delivery.

CG provides this document in either printed format, electronic format or both. The electronic format is provided for the client's convenience and CG requests that the client ensures the integrity of this electronic information is maintained.

Where an electronic only version is provided to the client, a signed hard copy of this document is held on file by CG and a copy will be provided if requested.

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Appendices

1 Introduction

As requested, Core Geotech Pty Ltd (CG) has carried out a geotechnical investigation of a part of the site located at 221-227 & 289-311 Luddenham Road, Orchard Hills NSW which is being considered for the construction of three flood storage basins as a part of the proposed future Alspec Industrial Business Park.

The geotechnical investigation comprised site inspection, non-intrusive and intrusive site investigations followed by laboratory testing of selected samples, engineering analysis and reporting for the proposed basins.

Details of the work undertaken, and the results obtained are presented in this report, together with comments relating to engineering design and construction practice. Comments are also provided on the need for further geotechnical investigations that are required when the project progresses to the development application stage.

The scope of work and associated terms and conditions of our engagement were detailed in our services proposal letter QU24-0154 Rev 0 dated 5 March 2024.

2 Scope of Works

As detailed in our proposal letter, the instructed scope of work to be conducted by CG was defined as follows:

- Desktop study of available information relevant to the proposed development;
- Arrange and execute a geotechnical Site Investigation (SI);
- Review of all the data relevant to existing subsurface information and the proposed project;
- Details and descriptions of the existing subsoil strata with laboratory test results; and
- Comments and recommendations on plasticity characteristics of in situ soils, erodibility, salinity and soil/rock aggressivity.

3 Project Description

Based on the supplied information, it is understood that the proposed project involve excavation of three (3) flood storage basins (1, 2 and 3) near the northwest boundary of the site. The depth of excavation ranges from 2m to 4m below the existing surface grade. CG understands that the Client wishes to use the material excavated from the basins to fill the low-lying areas of the site during the bulk cut/fill earthworks stage. The proposed location of three (3) flood storage basins is shown in Figure 1 below.

Figure 1: A Master plan showing the flood storage basins

4 Site Description

The proposed site is irregular in shape and located on the west of Luddenham Road. The site is bounded to the north by Patons lane, to the south by rural residential properties, to the east by Luddenham Road and to the west by an under construction north south rail track. The site includes an electrical easement on the northwest side. The area within the proposed basins was generally vacant and the vegetation comprises naturally occurring grass and shrubs. Two dams were observed within and near the footprints of the basins. One Dam covers only a small northern area of basin 1 and the second dam covers a small portion of basin 2 near the eastern side.

Based on the Six map NSW topographic map the general direction of the slope is northeast facing. However, by visual observation the site has an undulating terrain throughout, with a part of the site trending slope of 1° to 2º to toward the northwest and southwest boundary.

The surface soils generally comprise silty sand/sandy silt topsoil. Site photography is shown in Appendix E.

5 Fieldwork

Fieldwork was carried out on 18 March 2024 which included drilling twelve (12) boreholes (BH01 to BH12) to a termination depth ranging from 3.0m to 4.0m using a Ute mounted drilling rig fitted with 110mm diameter solid flight auger attachment. In conjunction with the borehole drilling, DRM excavated twenty-two (22) test pits (TP01 to TP22) using a 30-tonne excavator fitted with 1.0m wide bucket attachment.

Disturbed samples were collected, labelled and sent to a NATA Accredited laboratories with Chain of Custody (COC) documentation.

The field investigation was carried out in the presence of a Principal Geotechnical Engineer and a Geotechnical Engineer from CG who selected borehole locations, carried out sampling and prepared borehole logs. A site plans showing the borehole and test pit locations (Ref. CG24-0297-1) and logs are attached in Appendix B and C respectively.

6 Laboratory Testing

Laboratory testing was carried out generally in accordance with Australian Standards. All testing was scheduled by CG and carried out by ALS, Benchmark Geotechnical and STS Geotechnics Pty Ltd, NATA Accredited Testing Laboratories.

The extent of testing carried out to provide the geotechnical parameters required for this study is as follows:

- Four (4) samples California Bearing Ratio (CBR) and Shrink/Swell index test;
- Six (6) samples for Atterberg Limit and Linear Shrinkage test;
- Nine (9) samples for Aggressivity Suite to aid in assessment of exposure classification of in situ soils to concrete and steel members;
- Ten (10) samples for Exchangeable Sodium Percentage (ESP);
- Thirteen (13) samples for Field Moisture Content test; and
- Forty-six (46) samples for Electrical Conductivity and pH tests.

7 Ground Model

7.1 Soil Landscape

The NSW Environment & Heritage eSPADE web application identifies the soil landscape of basin 1 and 3 is underlain by South Creek (sc) alluvial soils and of basin 2 is Blacktown (bt) residual.

The South Creek (sc) alluvial soil landscape is characterised by:

Landscape – floodplains, valley flats and drainage depressions of the channels on the Cumberland Plain. Usually flat with incised channels; mainly cleared.

Soils – often very deep layered sediments over bedrock or relict soils. Where pedogenesis has occurred Structured Plastic Clays or Structured Loams in and immediately adjacent to drainage lines; Red and Yellow Podzolic Soils are most common terraces with small areas of Structured Grey Clays, leached clays and Yellow Solodic Soils.

Limitations – flood hazard, seasonal waterlogging, localised permanently high watertables, localised water erosion hazard, localised surface movement potential.

The Blacktown (bt) residual soil landscape is characterised by:

Landscape - gently undulating rises on Wianamatta Group shales. Local relief to 30m, slopes usually >5%. Broad rounded crests and ridges with gently inclined slopes. Cleared Eucalypt woodland and tall open forest (dry schlerophyll forest).

Soils - shallow to moderately deep (>100 cm) hardsetting mottled texture contrast soils, Red and Brown Podzolic Soils on crests grading to Yellow Podzolic Soils on lower slopes and in drainage lines.

Limitations - localised seasonal waterlogging, localised water erosion hazard, moderately reactive highly plastic subsoil, localised surface movement potential.

7.2 Geology

In reference to Penrith 1:100,000 Geological Series Sheet 9030 (Edition 1) 1991 by Geological Survey of NSW Department of Mineral Resources the site to the northwest is underlain by Quaternary Alluvial soils and to the east is underlain by Triassic Middle-aged geology Wianamatta Group Rw (undifferentiated) Bringelly Shale (Rwb) which comprises shale, carbonaceous claystone, claystone, laminate, fine to medium grained lithic sandstone, rare coal and tuff.

7.3 Subsurface Conditions

The ground conditions encountered and inferred from the investigation were considered to be generally consistent with the published geology for the area and can be summarised according to the following subsurface sequence:

Table 1: Summary of subsurface profile encountered in BH01 to BH12, TP01, TP12, TP15 and TP22

Layer	Description	Depth to the base of layer (m)
Fill	Silty SAND, fine grained sand, low plasticity fines, moisture condition = plastic limit (only BH02)	
		0.2
Topsoil	Silty SAND/Silty Gravelly SAND/Sandy SILT, low plasticity, dark grey, trace fine to medium grained gravel, moisture condition < plastic limit	
		0.2 – 0.3
Alluvium	SILT/CLAY/Sandy Silty CLAY/Sandy CLAY, medium to high plasticity,	

Table 1: Summary of subsurface profile encountered in BH01 to BH12, TP01, TP12, TP15 and TP22		
Layer	**Description**	**Depth to the base of layer (m)**
	brown, grey yellow. moisture Condition ≥plastic limit	
		>3.0
'Probable' Residual	CLAY/Silty Sandy CLAY, medium to high plasticity, grey pale red brown with fine to medium grained sand, moisture condition < plastic limit (only BH10, BH11 and BH12)	
		>4.0

It should be noted that the depths and layer thickness provided in Table 1 are based on the subsurface conditions as observed at the investigation locations and may not be a representative of the entire site.

7.4 Groundwater

No free groundwater was encountered during the geotechnical investigation. However, it is pointed out that standing groundwater and seepages may fluctuate with variations in rainfall, temperature and other factors. No longer term groundwater monitoring has been carried out.

8 Laboratory Test Results

8.1 FMC and Atterberg Limit, Linear Shrinkage and Shrink Swell

Field Moisture Content (FMC) of soil samples tested ranged from 13.5% to 25.0% and liquid limit recorded ranged from 40% to 70%. The linear shrinkage ranged from 12.5% to 20.0% indicating medium to high plasticity soils and of similar reactivity. Shrink/swell index values ranged from 0.6% to 2.9%. A summary of laboratory test results including field moisture content, Atterberg Limit, Shrinkage and Shrink/Swell index tests is presented in Table 2 below.

Table 2: Summary of FMC and Atterberg Limit, Linear Shrinkage and Shrink Swell Test Results							
BH/TP No.	**Depth (m)**	**Material Description**	**FMC (%)**	**LL (%)**	**PI (%)**	**LS (%)**	**SS (%)**
TP01	0.9 – 1.0	Silt	13.5	-	-	-	-
TP01	1.9 – 2.0	Silty Clay	13.5				
TP12	1.5 – 1.7	Sandy Clay	18.9	40	27	12.5	-
TP15	0.8 – 1.0	Clay	14.9	-	-	-	-
TP22	0.8 – 1.0	Clay	23.2	-	-	-	-
BH02	0.3	Silty Clay	-	63	48	20.0	-
BH02	1.7 – 1.9	Clay	25.0	-	-	-	-
BH03	1.5 – 1.8	Clay		-	-	-	0.6
BH03	1.2 – 1.5	Clay	17.3	45	31	15.0	-
BH06	2.0 – 2.3	Clay	-	-	-	-	0.7
BH07	1.3 – 1.5	Clay	21.3	-	-	-	-
BH08	1.5 – 1.8	Clay	-	-	-	-	1.0
BH09	1.3 – 1.5	Clay	18.4	50	36	16.5	-
BH10	1.6 – 1.8	Clay	22.4	69	51	18.5	-
BH11	1.0 – 1.3	Clay	-	-	-	-	2.9
BH11	2.0 – 2.5	Clay	22.7	70	53	20.0	-
BH12	1.0 – 1.4	Silty Sandy Clay	15.7	-	-	-	-
BH12	2.5 – 2.8	Silty Clay/Clay	16.9	-	-	-	-
BH12	3.5	Silty Clay/Clay	19.0	-	-	-	-

Table 2: Summary of FMC and Atterberg Limit, Linear Shrinkage and Shrink Swell Test Results							
BH/TP No.	**Depth (m)**	**Material Description**	**FMC (%)**	**LL (%)**	**PI (%)**	**LS (%)**	**SS (%)**
Note: FMC – Field Moisture Content, LL – Liquid Limit, PI – Plasticity Index and LS – Linear Shrinkage							

8.2 California Bearing Ratio (CBR)

Four (4) bulk samples were collected from to aid in assessment of strength of in situ soils. The FMC and CBR test results are shown in Table 3.

Table 3: A summary of FMC and CBR Test Results							
TP No.	**Depth (m)**	**Material Description/Origin**	**FMC (%)**	**OMC (%)**	**Swell (%)**	**MDD (t/m³)**	**CBR (%)**
TP01	0.9 – 1.0	Silt/Alluvium	13.5	16.0	3.5	1.84	3.0
TP12	1.5 – 1.7	Sandy Clay/Alluvium	18.9	15.0	2.0	1.82	7.0
TP15	0.8 – 1.0	Clay/Alluvium	14.9	17.0	2.0	1.77	8.0
TP22	0.8 – 1.0	Clay/Alluvium	23.2	22.5	2.5	1.65	5.0
Note: FMC – Field Moisture Content, OMC – Optimum Moisture Content, MDD – Maximum Dry Density, CBR – California Bearing Ratio							

8.3 Aggressivity

Nine (9) soil samples were collected from the selected boreholes to test for aggressivity suite to assess the exposure classification of in situ soils to buried concrete and steel members. The results of the laboratory testing are summarised in Table 4 below.

Table 4: Summary of FMC and Aggressivity test								
BH No.	**Depth (m)**	**Material Description/Origin**	**FMC (%)**	**pH**	**Conductivity µS/cm**	**Resistivity Ohm.cm**	**Chloride, Cl- (ppm)**	**Sulphate, SO4- (ppm)**
BH01	0.3 – 0.5	Clay/Alluvium	16.3	6.1	110	9090	20	180
BH02	0.8 – 1.0	Silty Clay	11.4	8.1	189	5290	60	140
BH04	0.8 – 1.0	Clay/Alluvium	14.7	5.9	856	1170	1470	340
BH05	1.7 – 1.9	Clay/Alluvium	22.1	6.5	767	1300	1430	210
BH06	1.3 – 1.5	Clay/Alluvium	13.1	6.0	850	1180	1410	180
BH07	2.0 – 2.2	Sandy Clay/Alluvium	14.1	8.6	639	1560	1050	80
BH10	0.8 – 1.0	Clay/'Probable' Residual	12.8	5.1	399	2510	550	330
BH11	0.7 – 0.9	Clay/'Probable' Residual	14.8	5.5	314	3180	180	240
BH12	3.8 – 4.0	Clay/'Probable' Residual	13.0	7.9	421	2380	660	140
Note: FMC – Field Moisture Content								

8.4 Salinity Rating and Exposure Classification

Forty-Six (46) samples were collected to assess the salinity rating and exposure classification of in situ soils. A summary Electrical Conductivity and pH test results are shown in Table 5.

Table 5: Summary of Salinity Rating and Exposure Classification								
BH/TP No.	**Depth (m)**	**Material Description**	**Conductivity µS/cm**	**Multiplication Factor**	**Ece**	**Salinity Rating**	**pH**	**Exposure Classification**
BH01	0.3 – 0.5	Clay	110	8	0.88	NS	6.1	A1
BH01	1.3 – 1.5	Sandy Silty Clay	669	9	6.02	MS	6.9	A1
BH02	0.8 – 1.0	Silty Clay	189	8	1.51	NS	8.1	A1
BH02	1.8 – 2.0	Clay	654	8	5.23	MS	8.2	A1

Table 5: Summary of Salinity Rating and Exposure Classification								
BH/TP No.	**Depth (m)**	**Material Description**	**Conductivity µS/cm**	**Multiplication Factor**	**Ece**	**Salinity Rating**	**pH**	**Exposure Classification**
BH03	0.5	Silty Sandy Clay	224	9	2.02	SS	5.8	A1
BH03	2.0	Clay	209	8	1.67	NS	6.6	A1
BH03	3.0	Silty Gravelly Clay	176	9	1.58	NS	6.9	A1
BH04	0.8 – 1.0	Clay	856	7	5.99	MS	5.9	A1
BH04	1.8 – 2.0	Clay	643	7	4.50	MS	7.3	A1
BH05	0.5 – 0.7	Clay	755	7	5.29	MS	5.7	A1
BH05	1.7 – 1.9	Clay	767	7	5.37	MS	6.5	A1
BH06	0.6 – 0.8	Clay	251	7	1.76	NS	5.6	A1
BH06	1.3 – 1.5	Clay	850	7	5.95	MS	6.0	A1
BH07	0.8 – 1.0	Clay	256	7	1.79	NS	5.8	A1
BH07	2.0 – 2.2	Sandy Clay	639	8	5.11	MS	8.6	A1
BH07	2.8 – 3.0	Sandy Clay	492	8	3.94	SS	8.1	A1
BH09	0.5 – 0.7	Clay	441	7	3.09	SS	5.6	A1
BH09	1.5 – 1.7	Clay/Sandy Clay	824	9	7.42	MS	6.1	A1
BH10	0.8 – 1.0	Clay	399	7	2.79	SS	5.1	A2
BH10	2.3 – 2.5	Clay	584	7	4.09	MS	8.2	A1
BH11	0.7 – 0.9	Clay	314	7	2.20	SS	5.5	A2
BH11	1.7 – 2.0	Clay	885	7	6.20	MS	5.0	A2
BH11	3.1 – 3.3	Clay	759	7	5.31	MS	6.4	A1
BH11	3.8 – 4.0	Clay	784	7	5.49	MS	6.3	A1
BH12	0.7 – 0.8	Silty Sandy Clay	95	9	0.86	NS	5.6	A1
BH12	1.7 – 1.9	Silty Clay/Clay	61	8	0.49	NS	5.6	A1
BH12	2.7 – 2.9	Silty Clay/Clay	147	8	1.18	NS	8.0	A1
BH12	3.8 – 4.0	Silty Clay/Clay	421	8	3.37	SS	7.9	A1
TP01	0.8 – 1.0	Clay	117	7	0.82	NS	5.9	A1
TP01	1.8 – 2.0	Clay	219	7	1.53	NS	6.1	A1
TP03	1.3 – 1.5	Clay	632	7	4.42	MS	5.3	A2
TP03	1.8 – 2.0	Clay	491	7	3.44	SS	6.5	A1
TP08	0.8 – 1.0	Clay	803	7	5.62	MS	5.7	A1
TP08	1.8 – 2.0	Clay	853	7	5.97	MS	6.5	A1
TP09	0.8 – 1.0	Clay	834	7	5.84	MS	5.3	A2
TP09	1.8 – 2.0	Clay	980	7	6.86	MS	5.2	A2
TP12	0.8 – 1.0	Clay	482	7	3.37	SS	7.7	A1
TP12	1.8 – 2.0	Clay	622	7	4.35	MS	7.7	A1
TP15	0.8 – 1.0	Clay	52	7	0.36	NS	6.7	A1
TP15	1.8 – 2.0	Clay	289	7	2.02	SS	7.7	A1
TP16	0.8 – 1.0	Clay	398	7	2.79	SS	5.1	A2
TP16	1.8 – 2.0	Clay	434	7	3.04	SS	5.8	A1
TP19	0.8 – 1.0	Clay	631	7	4.42	MS	5.6	A1
TP19	1.8 – 2.0	Clay	792	7	5.54	MS	5.8	A1
TP22	0.8 – 1.0	Clay	455	7	3.19	SS	5.0	A2
TP22	1.8 – 2.0	Clay	522	7	3.65	SS	4.9	A2

8.5 Exchangeable Cation

During fieldwork, a total of nine (9) soil samples were collected for chemical testing in a NATA accredited laboratory called ALS for erodibility properties. The laboratory test results are summarised below in Table 6:

Table 6: Summary of Exchangeable Cation Test Results

BH No.	Depth (m)	Material Description/Origin	CEC meq/100g	ESP	
				meq/100g	%
BH01	1.3 – 1.5	Sandy Silty Clay/Alluvium	1.8	0.4	22.4
BH03	2.0	Clay/Alluvium	9.0	2.6	29.1
BH05	0.5 – 0.7	Clay/Alluvium	4.6	1.1	24.4
BH06	0.6 – 0.8	Clay/Alluvium	13.5	2.9	21.9
BH09	0.5 – 0.7	Clay/Alluvium	8.2	1.7	21.1
BH10	2.3 – 2.5	Clay/Alluvium	11.8	5.2	43.9
BH11	1.7 – 2.0	Clay/Alluvium	10.8	2.6	24.0
BH11	3.8 – 4.0	Clay/'Probable' Residual	8.9	2.2	24.9
BH12	2.7 – 2.9	Silty Clay/'Probable' Residual	11.5	3.5	30.0
BH12	3.8 – 4.0	Silty Clay/'Probable' Residual	6.6	2.6	38.9

The laboratory test results are attached in Appendix D.

9 Geotechnical Discussion and Recommendations

9.1 General

In majority of the boreholes, the subsurface profile generally comprises sandy silty clay/sandy clay alluvial soils up to the termination depth of the boreholes. Only in three boreholes (BH10 to BH12) 'probable' residual clay soils were observed at the time of borehole drilling.

9.2 Excavation Conditions

The depth of excavation to achieve the proposed design levels of basin will vary across the site due to variations in existing surface levels.

Based on the subsurface profile encountered up to the termination depth of the boreholes, the excavation below the existing surface grade is expected to be through alluvial and 'probable' residual clay soils. Excavation of such soils should be readily achieved using conventional earthmoving equipment.

9.3 Plasticity Characteristics

During fieldwork, a total of six (6) Atterberg Limit with Linear Shrinkage and six (6) Shrink/Swell samples were collected from the selected boreholes and test pits. The recorded test results indicate that natural clayey soils are generally medium to high plasticity with pockets of low plasticity clays. Hence the natural soils are likely to be moderately to highly reactive.

Based on the existing subsurface conditions and laboratory test results, it is expected that the future industrial lots filled with such soils will be classified as Class "H1" and Class "H2" in accordance with AS2870-2011 "Residential slabs and footings".

9.4 Subgrade CBR Design

During fieldwork, a total of four (4) samples were collected for soaked California Bearing Ratio (CBR) tests from the selected test pits within the proposed footprints of three basins. The CBR tests were conducted on samples compacted to 100% standard dry density with optimum moisture content and soaked for four days in a NATA accredited laboratory called Benchmark

Geotechnical Pty Ltd. The CBR value ranges between 3.0% to 8.0% with an average of 5.5%. The swell was recorded ranging from 2.0% to 3.5%.

Based on the CBR test results swell values, if the excavated material is used for filling under the proposed roads, it has the capacity to achieve a design CBR of 3%.

9.5 Erodibility Assessment

Erosion is the detachment and movement of soil materials. Depending on the local landscape and weather condition, erosion could be very slow or rapid. Susceptibility of soils to erosion depends on dispersivity (and sodicity) of soils. Soil dispersivity is generally assessed by conducting chemical test such as Exchangeable Sodium Percentage (ESP), sodium Absorption Ratio (SAR) and physical tests such as Emerson Class, Dispersion Percentage. It should be noted that assessment of soil dispersivity based on these methods might differ from each other.

For the proposed work, only ESP for representative soil samples were determined. Soils with ESP values of 5% or more are considered sodic and those with ESP more than 15% are considered highly sodic. Sodic soils are susceptible to excessive erosion.

ESP values for ten (10) representative soil samples are presented in table 6 and indicate ESP values of 21.1% to 43.9%. Therefore, it is our assessment that the in-situ soils are dispersive and susceptible to excessive erosion.

While ESP is one of the important factors in assessment of the potential for erosion, the presence of calcium and magnesium cations can reduce the erosion p[potential in clay soils with high Cation Exchange capacity.

9.6 Salinity Assessment

Salinity refers to the presence of excess salt in the environment, either in soil or water. Salinity is a serious problem for any development due to the many environmental, economic and social impacts.

Soil salinity was assessed based on electrical conductivity (EC) of 1:5 by mass soil: water suspension and multiplying by a factor depending upon textural classification of soil to assess the electrical conductivity of pore water within the soil mass when it is saturated (ECe). A salinity scale adopted in the Salinity WSROC Code of Practice was used for salinity rating. The salinity scale adopted is presented in the Table 7 below:

Table 7: Salinity classification

Salinity Classification	ECe dS/m
Non Saline (NS)	<2
Slightly Saline (SS)	2 to 3.99
Moderately Saline (MS)	4 to 7.99
Highly Saline (HS)	8 to 15.99
Very Saline (VS)	>16

Electrical Conductivity (EC) values for forty-six (46) representative soils samples recovered from the area within the proposed basins are summarised in table 5.

For the nature of soils encountered across the investigated area, multiplying factor ranging from 7 to 9 is considered to be appropriate. Therefore, Corrected Electrical Conductivity (ECe) for the soils across the site is anticipated to vary from 0.36dS/m to 7.42dS/m. Out of forty-six (46) samples tested, 25 samples (i.e. 54%) shows ECe values of less than 4.0dS/m and 21 samples (i.e 46%) shows ECe values ranging between 4.0dS/m and 8.0dS/m. No sample show ECe values of more than 8.0dS/m.

Therefore, it is our assessment that the soils to be excavated for the basins would be non-saline to moderately saline. Most of the moderately saline soils are located generally below

0.8m depth. Therefore, excavation for the proposed basins should follow proper saline Soil Management Plan (SMP).

9.7 Aggressivity

Based on the aggressivity test results, a 'non-aggressive' exposure classification for concrete piles in accordance with Table 6.4.2 (C) in AS2159-2009 and a 'non-aggressive' exposure classification for steel piles in accordance with Table 6.5.2 (C) in AS2159- 2009 'Piling – Design and Construction' is applicable. This classification is for low permeability soils (type B). Therefore, we recommend use of construction materials, such as concrete and steel that are appropriate to assessed aggressivity.

9.8 Soil Management Plan

The soils to be excavated for the basins are generally susceptible to erosion and it could be a main concern for the area where such soils to be placed. About 56% of tested samples were moderately saline soils. Therefore, we recommend that the soil management plan should minimise impacts of erosion and possible soil salinity.

The following should be considered in developing a Soil Management Plan:

- Minimise erosion and sediment loss before, during and after construction;
- Minimise water pollution due to erosion, siltation, and sedimentation; and
- Reduce and manage salinity within the site so that impacts on future structures (including buildings, roads etc.) are minimised and acceptable.

We recommend the following as part of the Soil Management Plan during earthworks to manage impacts from erosion and saline soils:

- We anticipate that material to be excavated from the basin to be used for fill operations for construction of building platform, preparation of road subgrade and filling of other low-lying areas. We recommend avoiding exposure of moderately saline soils and use such soils for filling only below 1.0m depth of the design levels of roads and building platforms. In case the moderately saline soils to be used within 1m of the finished level, appropriate salinity and erosion management techniques such as mixing with lime and implementing other remedial measures would be required. (Refer below);
- Appropriate batter slopes for fill embankment should be adopted to prevent erosion and scouring. Where excavated material is used for filling then construct a V-drain behind the crest of all fill batters slopes to divert water away from the slope face. It can be an option to provide a secured turf overlay, deep rooted vegetation cover or shotcreting to guard against erosion on the fill batters made from the excavated material;
- Utilise native and deep-rooted plants to minimise soil erosion. Where vegetation cover is not adequate to control erosion, improve soil resistance to erosion by stabilising dispersive soils with hydrated lime and gypsum. Exact proportions of lime and gypsum to be used can be determined on the basis of laboratory testing, but for preliminary planning purposes we suggest about 1% to 2% of lime or gypsum;
- In the areas where the excavated material is used for filling then a special consideration must be given to the design, bedding of pipework for stormwater and other services, as the insitu soils are generally 'erodible' or 'dispersive'. It is recommended rubber-ring jointed pipes be used. Special types of 'pipe-bedding' (eg clean coarse sand) may also be required;
- As the insitu soil was found to be sodic, therefore unstable in the presence of water resulting in tunnelling. Construction of infrastructures should include adequate compaction

of service trenches and construction of cut-off walls to prevent migration of fines and prevent breakdown of soil structures;

- Erosion and sediment control plans must be developed and implemented by the earthworks contractors, in accordance with recommendations provided by the NSW Department of Housing (Blue Book). All sediment and erosion controls proposed by the Erosion and Sediment Control Plan are to be installed prior to commencement of any construction works;
- Retaining walls for fill slopes, where required, should be provided with adequate and appropriate drainage; and
- If required, a post site works salinity assessment to confirm salinity and aggressivity of the completed industrial lots can be carried out on completion of all site works;

10 Reference

1. AS1726-2017, “Geotechnical Site Investigation”.
2. AS2870-2011, “Residential slabs and footings”.
3. AS2159-2009, “Piling – Design and installation”.
4. NSW Environment & Heritage eSPADE web application.
5. Penrith 1:100,000 Geological Series Sheet 9030 (Edition 1) 1991.
6. NSW department of Housing, managing Urban Stormwater, Soils and Construction, 4th Edition, March 2004.
7. Department of Land and Water Conservation , NSW, Site Investigation for Urban salinity (2002)

11 Closure

This report has been prepared for Development Risk Management Pty Ltd in accordance with CG's proposal dated 5 March 2024 (Ref. QU24-0154 Rev 0) under CG's Terms of Engagement.

The report is provided for the exclusive use of Development Risk Management Pty Ltd for the specific development and purpose as described in the report. The report may not contain sufficient information for developments or purposes other than that described in the report.

The information in this report is considered accurate at the date of issue with regard to the current conditions of the site. The conclusions drawn in the report are based on interpolation between boreholes and test pits. Conditions can vary between test locations that cannot be explicitly defined or inferred by investigation.

The report, or sections of the report, should not be used as part of a specification for a project, without review and agreement by CG, as the report has been written as advice and opinion rather than instructions for construction.

The report must be read in conjunction with the attached Information Sheets and any other explanatory notes and should be kept in its entirety without separation of individual pages or sections. CG cannot be held responsible for interpretations or conclusions from review by others of this report or test data, which are not otherwise supported by an expressed statement, interpretation, outcome or conclusion stated in this report. In preparing the report CG has necessarily relied upon information provided by the client and/or their agents.

This report has been prepared to advise on causes of distress and to suggest methods of remediation and should not be used for any litigation matters as the scope of work did not include such litigation objectives.

This report must be read in conjunction with the attached Information Sheets and any other explanatory notes.

We trust these comments are sufficient to meet your present requirements. Please do not hesitate to contact the undersigned should you have any queries.

For and on behalf of
Core Geotech Pty Ltd

Report prepared by:

Raj Singh
Principal Geotechnical Engineer
MIEAust CPEng NER
(Membership No. 3428360)

Appendix A
Information About this Report

Information About This Report

Limitations

Scope of Services: The report has been prepared in accordance with the scope of services set out in CG's Proposal under CG's Terms of Engagement, or as otherwise agreed with the client. The scope of services may have been limited and/or amended by a range of factors including time, budget, access and site constraints.

Specific Purpose: The report is provided for the specific development and purpose as described in the report. The report may not contain sufficient information for developments or purposes other than that described in the report.

Currency of Information: The information in this report is considered accurate at the date of issue with regard to the current conditions of the site.

Reliance on Information: In preparing the report CG has necessarily relied upon information provided by the Client and/or their Agents. Such data may include surveys, analyses, designs, maps and plans. CG has not verified the accuracy or completeness of the data except as stated in this report.

Copyright and Reproductions: The contents of this documents are and remain the intellectual property of CG. This document should only be used for the purpose for which it was commissioned and should not be used for other projects or by a third party. This report shall not be reproduced either totally or in part without the permission of CG. Where information from this report is to be included in contract documents or engineering specification for the project, the entire report should be included in order to minimise the likelihood of misinterpretation.

Construction Specifications: Unless otherwise stated, the report, or sections of the report, should not be used as part of a specification for a project, without review and agreement by CG.

Report Should Not be Separated: The report must be read in conjunction with the attached information Sheets and any other explanatory notes and should be kept in its entirely without separation of individual pages or sections.

Review by Others: CG cannot be held responsible for interpretation or conclusions from review by others of this report or test data, which are not otherwise supported by an expressed statement, interpretation, outcome or conclusion stated in this report.

GENERAL NOTES

Geotechnical Reporting: Geotechnical reporting relies on the interpretation of factual information based on judgment and opinion and is far less exact than other engineering or design disciplines. Geotechnical reports are for a specific purpose, development and site as described in the report and may not contain sufficient information for other purposes, developments or sites (including adjacent sites) other than that described in the report.

Subsurface Conditions: Subsurface conditions can change with time and can vary between test locations. For example, the actual interface between the materials may be far more gradual or abrupt than indicated and contaminant presence may be affected by spatial and temporal patterns. Therefore, actual conditions in areas not sampled may differ from those predicted since no subsurface investigation, no matter how comprehensive, can reveal all subsurface details and anomalies. Construction operations at or adjacent to the site and natural events such as floods, earthquakes or groundwater fluctuations can also affect subsurface conditions and thus the continuing adequacy of a geotechnical report. CG should be kept informed of any such events and should be retained to identify variances, conduct additional tests if required, and recommend solutions to problems encountered on site.

Groundwater: Groundwater levels indicated on borehole and test pit logs are recorded at specific times. Depending on ground permeability, measured levels may or may not reflect actual levels if measured over a longer time period. Also, groundwater levels and seepage inflows may fluctuate with seasonal and environmental variations and construction activities.

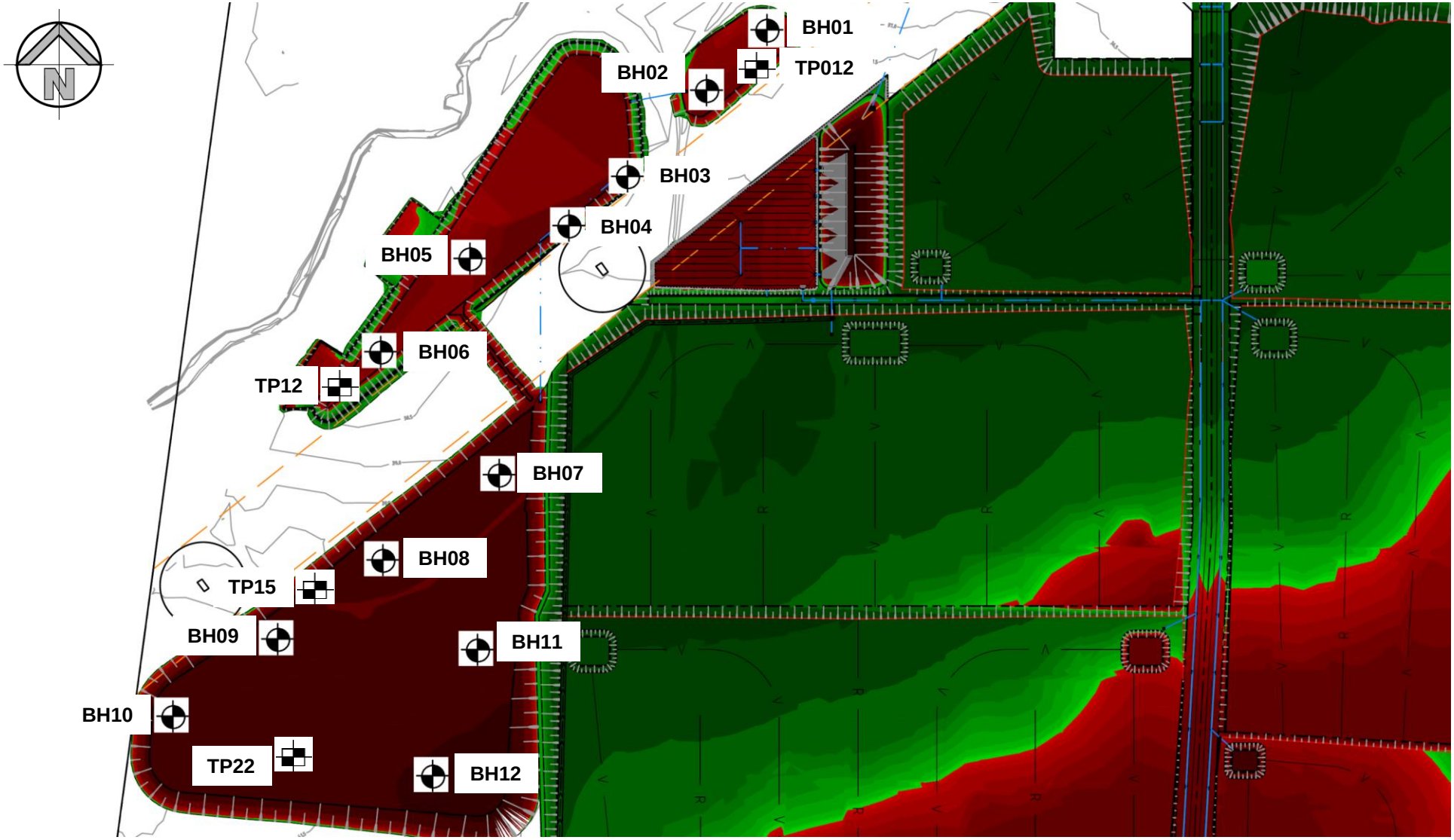
Interpretation of Data: Data obtained from nominated discrete locations, subsequent laboratory testing and empirical or external sources are interpreted by trained professionals in order to provide an opinion about overall site conditions, their likely impact with respect to the report purpose and recommended actions in accordance with any relevant industry standards, guidelines or procedures.

Soil and Rock Descriptions: Soil and rock descriptions are based on AS 1726 – 2017, using visual and tactile assessment except at discrete locations where field and / or laboratory tests have been carried out. Refer to the accompanying soil and rock terms sheet for further information.

Further Advice: CG would be pleased to further discuss how any of the above issues could affect a specific project. We would also be pleased to provide further advice or assistance including:

- Assessment of suitability of designs and construction techniques;
- Contract documentation and specification;
- Construction control testing (earthworks, pavement materials, concrete);
- Construction advice (foundation assessments, excavation support).

Appendix B
Borehole and Test Pit Location Plan



	LEGEND:	Core Geotech	Scale: A4 - NOT TO SCALE	Client: DEVELOPMENT RISK MANAGEMENT PTY LTD
	APPROXIMATE BOREHOLE LOCATION APPROXIMATE TEST PIT LOCATION		Date: 14/04/2024	Project: PROPOSED ALSPEC INDUSTRIAL BUSINESS PARK
		Suite 3.14/33 Lexington Drive *Bella Vista NSW 2153* *Tel: 0479 154 977* *Email:* *rsingh@coregeotech.com.au*	Drawing: RS	Location: 221-227 & 289-311 LUDDENHAM ROAD, ORCHARD HILLS NSW
			Drawing No: CG24/0297-1	Sheet: 1 of 1 — **SITE PLAN**

Appendix C
Borehole and Test Pit Logs

Core Geotech Pty Ltd
Suite 314 Level 3/33 Lexington Drive Bella Vista NSW 2153
Telephone: +61479154977

BOREHOLE NUMBER BH01

CLIENT DRM Pty Ltd **PROJECT NAME** Proposed Alspec Industrial Business Park

PROJECT NUMBER CG24-0297 **PROJECT LOCATION** 221-227 & 289-311 Luddenham Road, Orchard Hills NSW

DATE STARTED 18/3/24 **COMPLETED** 18/3/24 **R.L. SURFACE** --- **DATUM** ---

DRILLING CONTRACTOR Soil Strata Pty Ltd **SLOPE** 90° **BEARING** ---

EQUIPMENT Ute Mounted Drilling Rig **HOLE LOCATION** Refer to CG24-0291-1

HOLE SIZE 110 **LOGGED BY** JR **CHECKED BY** RS

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
ADT	NONE ENCOUNTERED		0.0		ML	Sandy SILT, low plasticity, dark grey, trace fine to medium grained gravel, moisture condition < plastic limit		TOPSOIL
			0.5		CI/CH	CLAY, medium to high plasticity, brown, moisture condition > plastic limit		ALLUVIUM
			1.0					
			1.5		CL/CI	Sandy Silty CLAY, low to medium plasticity, grey mottled brown, fine to medium grained sand, moisture condition > plastic limit		
			2.0					
			2.5		CI	Sandy CLAY, medium plasticity, grey mottled brown, fine to medium grained sand and gravel, some seepage at 2.6m depth, moisture condition >plastic limit		
			3.0					

Borehole BH01 terminated at 3m

Core Geotech Pty Ltd
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Telephone: +61479154977

BOREHOLE NUMBER BH02

CLIENT DRM Pty Ltd
PROJECT NAME Proposed Alspec Industrial Business Park
PROJECT NUMBER CG24-0297
PROJECT LOCATION 221-227 & 289-311 Luddenham Road, Orchard Hills NSW

DATE STARTED 18/3/24 **COMPLETED** 18/3/24 **R.L. SURFACE** --- **DATUM** ---
DRILLING CONTRACTOR Soil Strata Pty Ltd **SLOPE** 90° **BEARING** ---
EQUIPMENT Ute Mounted Drilling Rig **HOLE LOCATION** Refer to CG24-0291-1
HOLE SIZE 110 **LOGGED BY** JR **CHECKED BY** RS
NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
ADT	NONE ENCOUNTERED		0.0		SM	Silty SAND, fine grained sand, low plasticity fines, moisture condition = plastic limit		FILL
			0.5		CH	Silty CLAY, high plasticity, brown, moisture condition > plastic limit		ALLUVIUM
			1.0					
			1.5		CH	CLAY, high plasticity, grey, moisture condition > plastic limit		
			2.0					
			2.5		CI/CH	Silty CLAY, medium to high plasticity, brown grey, fine to medium gravel, moisture condition > plastic limit		
			3.0			Borehole BH02 terminated at 3m		

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BOREHOLE NUMBER BH03

CLIENT DRM Pty Ltd
PROJECT NAME Proposed Alspec Industrial Business Park
PROJECT NUMBER CG24-0297
PROJECT LOCATION 221-227 & 289-311 Luddenham Road, Orchard Hills NSW

DATE STARTED 18/3/24 **COMPLETED** 18/3/24 **R.L. SURFACE** --- **DATUM** ---
DRILLING CONTRACTOR Soil Strata Pty Ltd **SLOPE** 90° **BEARING** ---
EQUIPMENT Ute Mounted Drilling Rig **HOLE LOCATION** Refer to CG24-0291-1
HOLE SIZE 110 **LOGGED BY** JR **CHECKED BY** RS
NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
ADT	NONE ENCOUNTERED		0.5		CL	Silty Sandy CLAY, low plasticity, yellow brown, moisture condition < plastic limit		ALLUVIUM
			1.0		CH	CLAY, high plasticity, yellow brown becoming grey yellow, some seepage at 2.5m depth, moisture condition > plastic limit		
			1.5					
			2.0					
			2.5		CL	Silty Gravelly CLAY, low plasticity, grey brown, moisture condition > plastic limit		
			3.0					

Borehole BH03 terminated at 3m

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BOREHOLE NUMBER BH04

CLIENT DRM Pty Ltd
PROJECT NAME Proposed Alspec Industrial Business Park
PROJECT NUMBER CG24-0297
PROJECT LOCATION 221-227 & 289-311 Luddenham Road, Orchard Hills NSW

DATE STARTED 18/3/24 **COMPLETED** 18/3/24 **R.L. SURFACE** **DATUM**
DRILLING CONTRACTOR Soil Strata Pty Ltd **SLOPE** 90° **BEARING** ---
EQUIPMENT Ute Mounted Drilling Rig **HOLE LOCATION** Refer to CG24-0291-1
HOLE SIZE 110 **LOGGED BY** JR **CHECKED BY** RS
NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
ADT	NONE ENCOUNTERED		0.0		SP	Silty SAND, low plasticity, grey, fine grained, moisture condition = plastic limit		TOPSOIL
			0.5		CH	CLAY, high plasticity, red brown, moisture condition > plastic limit		ALLUVIUM
			1.0		CI/CH	CLAY, medium to high plasticity, grey yellow, trace fine gravel, moisture condition > plastic limit		
			1.5					
			2.0		CI	CLAY, medium plasticity, grey, fine gravel and sand (slightly wet of optimum), moisture content > plastic limit		
			2.5					
			3.0					

Borehole BH04 terminated at 3m

Core Geotech Pty Ltd
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Telephone: +61479154977

BOREHOLE NUMBER BH05

CLIENT DRM Pty Ltd **PROJECT NAME** Proposed Alspec Industrial Business Park

PROJECT NUMBER CG24-0297 **PROJECT LOCATION** 221-227 & 289-311 Luddenham Road, Orchard Hills NSW

DATE STARTED 18/3/24 **COMPLETED** 18/3/24 **R.L. SURFACE** --- **DATUM** ---

DRILLING CONTRACTOR Soil Strata Pty Ltd **SLOPE** 90° **BEARING** ---

EQUIPMENT Ute Mounted Drilling Rig **HOLE LOCATION** Refer to CG24-0291-1

HOLE SIZE 110 **LOGGED BY** JR **CHECKED BY** RS

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
ADT	NONE ENCOUNTERED				SM	Silty SAND, low plasticity, grey, fine grained sand, moisture condition = plastic limit		TOPSOIL
			0.5		CH	CLAY, high plasticity, brown, moisture condition < plastic limit		ALLUVIUM
			1.0		CH	CLAY, high plasticity, grey brown, trace fine gravel, moisture condition > plastic limit		
			1.5		CH	CLAY, high plasticity, grey, moisture condition > plastic limit		
			2.0					
			2.5					
			3.0					

Borehole BH05 terminated at 3m

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BOREHOLE NUMBER BH06

CLIENT DRM Pty Ltd
PROJECT NAME Proposed Alspec Industrial Business Park
PROJECT NUMBER CG24-0297
PROJECT LOCATION 221-227 & 289-311 Luddenham Road, Orchard Hills NSW

DATE STARTED 18/3/24 **COMPLETED** 18/3/24 **R.L. SURFACE** --- **DATUM** ---
DRILLING CONTRACTOR Soil Strata Pty Ltd **SLOPE** 90° **BEARING** ---
EQUIPMENT Ute Mounted Drilling Rig **HOLE LOCATION** Refer to CG24-0291-1
HOLE SIZE 110 **LOGGED BY** JR **CHECKED BY** RS
NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
ADT	NONE ENCOUNTERED		0.0		SM	Silty SAND, low plasticity, grey, fine grained sand, moisture condition = plastic limit		TOPSOIL
					CI/CH	CLAY, medium to high plasticity, brown, moisture condition < plastic limit		ALLUVIUM
			0.5					
			1.0		CI/CH	CLAY, medium to high plasticity, brown grey, fine to medium gravel, moisture condition > plastic limit		
			1.5		CI	CLAY, medium plasticity, grey mottled brown yellow, trace fine grained sand (+2% wet of optimum), moisture condition > plastic limit		
			2.0					
			2.5					
			3.0					

Borehole BH06 terminated at 3m

Core Geotech

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BOREHOLE NUMBER BH07

CLIENT DRM Pty Ltd **PROJECT NAME** Proposed Alspec Industrial Business Park

PROJECT NUMBER CG24-0297 **PROJECT LOCATION** 221-227 & 289-311 Luddenham Road, Orchard Hills NSW

DATE STARTED 18/3/24 **COMPLETED** 18/3/24 **R.L. SURFACE** --- **DATUM** ---

DRILLING CONTRACTOR Soil Strata Pty Ltd **SLOPE** 90° **BEARING** ---

EQUIPMENT Ute Mounted Drilling Rig **HOLE LOCATION** Refer to CG24-0291-1

HOLE SIZE 110 **LOGGED BY** JR **CHECKED BY** RS

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
ADT	NONE ENCOUNTERED		0.5		SM	Silty SAND, fine grained sand, grey low plasticity, moisture condition = plastic limit		TOPSOIL
			1.0		CI/CH	CLAY, medium to high plasticity, brown, moisture condition > plastic limit		ALLUVIUM
			1.5					
			2.0		CI/CH	Sandy CLAY, medium to high plasticity, grey brown, fine to medium grained sand (+2% wet of optimum moisture content), moisture condition > plastic limit		
			2.5					
			3.0					

Borehole BH07 terminated at 3m

Core Geotech

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BOREHOLE NUMBER BH08

CLIENT DRM Pty Ltd **PROJECT NAME** Proposed Alspec Industrial Business Park

PROJECT NUMBER CG24-0297 **PROJECT LOCATION** 221-227 & 289-311 Luddenham Road, Orchard Hills NSW

DATE STARTED 18/3/24 **COMPLETED** 18/3/24 **R.L. SURFACE** --- **DATUM** ---

DRILLING CONTRACTOR Soil Strata Pty Ltd **SLOPE** 90° **BEARING** ---

EQUIPMENT Ute Mounted Drilling Rig **HOLE LOCATION** Refer to CG24-0291-1

HOLE SIZE 110 **LOGGED BY** JR **CHECKED BY** RS

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
ADT	NONE ENCOUNTERED				SM	Silty SAND, fine to medium grained, grey, low plasticity, moisture condition = plastic limit		TOPSOIL
			0.5		CI/CH	CLAY, medium to high plasticity, yellow brown, moisture condition < plastic limit		ALLUVIUM
			1.0		CH	CLAY, high plasticity, red brown, moisture condition < plastic limit		
			1.5		CI/CH	CLAY, medium to high plasticity, grey pale yellow, trace fine gravel, moisture condition < plastic limit		
			2.0		CI/CH	CLAY, medium to high plasticity, brown, trace fine gravel, moisture condition < plastic limit		
			2.5					
			3.0					

Borehole BH08 terminated at 3m

Core Geotech

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BOREHOLE NUMBER BH09

CLIENT DRM Pty Ltd **PROJECT NAME** Proposed Alspec Industrial Business Park

PROJECT NUMBER CG24-0297 **PROJECT LOCATION** 221-227 & 289-311 Luddenham Road, Orchard Hills NSW

DATE STARTED 18/3/24 **COMPLETED** 18/3/24 **R.L. SURFACE** --- **DATUM** ---

DRILLING CONTRACTOR Soil Strata Pty Ltd **SLOPE** 90° **BEARING** ---

EQUIPMENT Ute Mounted Drilling Rig **HOLE LOCATION** Refer to CG24-0291-1

HOLE SIZE 110 **LOGGED BY** JR **CHECKED BY** RS

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
ADT	NONE ENCOUNTERED		0.0		SC	Silty Clayey SAND, fine to medium grained, brown, low plasticity fines, moisture condition = plastic limit		TOPSOIL
					CH	CLAY, medium to high plasticity, brown, moisture condition < plastic limit		ALLUVIUM
			0.5		CH	CLAY, medium to high plasticity, grey yellow, trace fine grained sand, moisture condition < plastic limit		
			1.0					
			1.5		CL	CLAY/Sandy CLAY, medium plasticity, grey, fine grained, moisture condition > plastic limit		
					CL	Gravelly CLAY, medium plasticity, grey, fine to medium gravel, moisture condition > plastic limit		
			2.0					
			2.5		CH	CLAY, high plasticity, grey with ironstone gravel (red), moisture condition < plastic limit		
			3.0					

Borehole BH09 terminated at 3m

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BOREHOLE NUMBER BH10

CLIENT DRM Pty Ltd **PROJECT NAME** Proposed Alspec Industrial Business Park

PROJECT NUMBER CG24-0297 **PROJECT LOCATION** 221-227 & 289-311 Luddenham Road, Orchard Hills NSW

DATE STARTED 18/3/24 **COMPLETED** 18/3/24 **R.L. SURFACE** **DATUM**

DRILLING CONTRACTOR Soil Strata Pty Ltd **SLOPE** 90° **BEARING** ---

EQUIPMENT Ute Mounted Drilling Rig **HOLE LOCATION** Refer to CG24-0291-1

HOLE SIZE 110 **LOGGED BY** JR **CHECKED BY** RS

NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
ADT	NONE ENCOUNTERED				SM	Silty SAND, fine to medium grained, grey, low plasticity, moisture condition = plastic limit		TOPSOIL
			0.5		CI	CLAY, medium plasticity, grey mottled brown, moisture condition > plastic limit		'PROBABLE' RESIDUAL
			1.0		CI/CH	CLAY, medium to high plasticity, red, moisture condition < plastic limit		
			1.5					
			2.0		CH	CLAY, high plasticity, grey with ironstone gravel (red), moisture condition < plastic limit		
			2.5					
			3.0					

Borehole BH10 terminated at 3m

Core Geotech Pty Ltd
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Telephone: +61479154977

BOREHOLE NUMBER BH11

CLIENT DRM Pty Ltd
PROJECT NAME Proposed Alspec Industrial Business Park
PROJECT NUMBER CG24-0297
PROJECT LOCATION 221-227 & 289-311 Luddenham Road, Orchard Hills NSW

DATE STARTED 18/3/24 **COMPLETED** 18/3/24 **R.L. SURFACE** --- **DATUM** ---
DRILLING CONTRACTOR Soil Strata Pty Ltd **SLOPE** 90° **BEARING** ---
EQUIPMENT Ute Mounted Drilling Rig **HOLE LOCATION** Refer to CG24-0291-1
HOLE SIZE 110 **LOGGED BY** JR **CHECKED BY** RS
NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
ADT	NONE ENCOUNTERED		0.0		SM	Silty SAND, fine to medium grained, grey, low plasticity fines, moisture condition = plastic limit		TOPSOIL
					CI/CH	CLAY, medium to high plasticity, brown, moisture condition < plastic limit		'PROBABLE' RESIDUAL
			0.5		CH	CLAY, high plasticity, red mottled grey, trace fine gravel, moisture condition < plastic limit		
			1.0		CH	CLAY, high plasticity, grey, moisture condition > plastic limit		
			1.5					
			2.0					
			2.5					
			3.0		CH	CLAY, high plasticity, grey, trace fine gravel, moisture condition < plastic limit		
			3.5		CI	CLAY, medium plasticity, brown, trace fine gravel, moisture condition < plastic limit		
			4.0			Borehole BH11 terminated at 4m		

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BOREHOLE NUMBER BH12

CLIENT DRM Pty Ltd
PROJECT NAME Proposed Alspec Industrial Business Park
PROJECT NUMBER CG24-0297
PROJECT LOCATION 221-227 & 289-311 Luddenham Road, Orchard Hills NSW

DATE STARTED 18/3/24 **COMPLETED** 18/3/24 **R.L. SURFACE** **DATUM**
DRILLING CONTRACTOR Soil Strata Pty Ltd **SLOPE** 90° **BEARING** ---
EQUIPMENT Ute Mounted Drilling Rig **HOLE LOCATION** Refer to CG24-0291-1
HOLE SIZE 110 **LOGGED BY** JR **CHECKED BY** RS
NOTES

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Additional Observations
ADT	NONE ENCOUNTERED		0.5		SM	Silty Gravelly SAND, fine to medium grained, yellow brown, low plasticity fines, moisture condition < plastic limit		TOPSOIL
			1.0		CL	Silty Sandy CLAY, medium plasticity, pale red brown with fine to medium grained sand, moisture condition < plastic limit		'PROBABLE' RESIDUAL
			1.5		CL	Silty CLAY/CLAY, medium to high plasticity, red brown becoming grey yellow brown below 1.7m depth. , moisture condition < plastic limit		
			2.0					
			2.5					
			3.0					
			3.5					
			4.0					

Borehole BH12 terminated at 4m

Abbreviations, Notes & Symbols

Core Geotech

SUBSURFACE INVESTIGATION

METHOD

Borehole Logs		Excavation Logs	
AS#	Auger screwing (#-bit)	BH	Backhoe/excavator bucket
AD#	Auger drilling (#-bit)	NE	Natural exposure
B	Blank bit	HE	Hand excavation
V	V-bit	X	Existing excavation
T	TC-bit		
HA	Hand auger	**Cored Borehole Logs**	
R	Roller/tricone	NMLC	NMLC core drilling
W	Washbore	NQ/HQ	Wireline core drilling
AH	Air hammer		
AT	Air track		
LB	Light bore push tube		
MC	Macro core push tube		
DT	Dual core push tube		

SUPPORT

Borehole Logs		Excavation Logs	
C	Casing	S	Shoring
M	Mud	B	Benched

SAMPLING

B	Bulk sample
D	Disturbed sample
U#	Thin-walled tube sample (#mm diameter)
ES	Environmental sample
EW	Environmental water sample

FIELD TESTING

PP	Pocket penetrometer (kPa)
DCP	Dynamic cone penetrometer
PSP	Perth sand penetrometer
SPT	Standard penetration test
PBT	Plate bearing test
s_u	Vane shear strength peak/residual (kPa) and vane size (mm)
N*	SPT (blows per 300mm)
Nc	SPT with solid cone
R	Refusal

**denotes sample taken*

BOUNDARIES

————	Known
— — — -	Probable
.....	Possible

SOIL

MOISTURE CONDITION

D	Dry
M	Moist
W	Wet
Wp	Plastic Limit
Wl	Liquid Limit
MC	Moisture Content

CONSISTENCY

VS	Very Soft
S	Soft
F	Firm
St	Stiff
VSt	Very Stiff
H	Hard
Fb	Friable

DENSITY INDEX

VL	Very Loose
L	Loose
MD	Medium Dense
D	Dense
VD	Very Dense

USCS SYMBOLS

GW	Well graded gravels and gravel-sand mixtures, little or no fines
GP	Poorly graded gravels and gravel-sand mixtures, little or no fines
GM	Silty gravels, gravel-sand-silt mixtures
GC	Clayey gravels, gravel-sand-clay mixtures
SW	Well graded sands and gravelly sands, little or no fines
SP	Poorly graded sands and gravelly sands, little or no fines
SM	Silty sand, sand-silt mixtures
SC	Clayey sand, sand-clay mixtures
ML	Inorganic silts of low plasticity, very fine sands, rock flour, silty or clayey fine sands
CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays
OL	Organic silts and organic silty clays of low plasticity
MH	Inorganic silts of high plasticity
CH	Inorganic clays of high plasticity
OH	Organic clays of medium to high plasticity
PT	Peat muck and other highly organic soils

ROCK

WEATHERING		STRENGTH	
RS	Residual Soil	EL	Extremely Low
XW	Extremely Weathered	VL	Very Low
HW	Highly Weathered	L	Low
MW	Moderately Weathered	M	Medium
DW*	Distinctly Weathered	H	High
SW	Slightly Weathered	VH	Very High
FR	Fresh	EH	Extremely High

**covers both HW & MW*

ROCK QUALITY DESIGNATION (%)

$$= \frac{\text{sum of intact core pieces} > 100\text{mm}}{\text{total length of section being evaluated}} \times 100$$

CORE RECOVERY (%)

$$= \frac{\text{core recovered}}{\text{core lift}} \times 100$$

NATURAL FRACTURES

Type

JT	Joint
BP	Bedding plane
SM	Seam
FZ	Fractured zone
SZ	Shear zone
VN	Vein

Infill or Coating

Cn	Clean
St	Stained
Vn	Veneer
Co	Coating
Cl	Clay
Ca	Calcite
Fe	Iron oxide
Mi	Micaceous
Qz	Quartz

Shape

pl	Planar
cu	Curved
un	Undulose
st	Stepped
ir	Irregular

Roughness

pol	Polished
slk	Slickensided
smo	Smooth
rou	Rough

Soil and Rock Terms

Core Geotech

SOIL

MOISTURE CONDITION

Term	Description
Dry	Looks and feels dry. Cohesive and cemented soils are hard, friable or powdery. Uncemented granular soils run freely through the hand.
Moist	Feels cool and darkened in colour. Cohesive soils can be moulded. Granular soils tend to cohere.
Wet	As for moist, but with free water forming on hands when handled.

For cohesive soils, moisture content may also be described in relation to plastic limit (W_P) or liquid limit (W_L). [>> much greater than, > greater than, < less than, << much less than].

CONSISTENCY

Term	c_u (kPa)	Term	c_u (kPa)
Very Soft	< 12	Very Stiff	100 - 200
Soft	12 - 25	Hard	> 200
Firm	25 - 50	Friable	-
Stiff	50 - 100		

DENSITY INDEX

Term	I_D (%)	Term	I_D (%)
Very Loose	< 15	Dense	65 – 85
Loose	15 – 35	Very Dense	> 85
Medium Dense	35 – 65		

PARTICLE SIZE

Name	Subdivision	Size (mm)
Boulders		> 200
Cobbles		63 - 200
Gravel	coarse	20 - 63
	medium	6 - 20
	fine	2.36 - 6
Sand	coarse	0.6 - 2.36
	medium	0.2 - 0.6
	fine	0.075 - 0.2
Silt & Clay		< 0.075

MINOR COMPONENTS

Term	Proportion by Mass coarse grained	fine grained
Trace	≤ 5%	≤ 15%
Some	5 - 2%	15 - 30%

SOIL ZONING

Layers	Continuous exposures
Lenses	Discontinuous layers of lenticular shape
Pockets	Irregular inclusions of different material

SOIL CEMENTING

Weakly	Easily broken up by hand
Moderately	Effort is required to break up the soil by hand

SOIL STRUCTURE

Massive	Coherent, with any partings both vertically and horizontally spaced at greater than 100mm
Weak	Peds indistinct and barely observable on pit face. When disturbed approx. 30% consist of peds smaller than 100mm
Strong	Peds are quite distinct in undisturbed soil. When disturbed >60% consists of peds smaller than 100mm

ROCK

SEDIMENTARY ROCK TYPE DEFINITIONS

Rock Type	Definition (more than 50% of rock consists of….)
Conglomerate	… gravel sized (> 2mm) fragments
Sandstone	… sand sized (0.06 to 2mm) grains
Siltstone	… silt sized (<0.06mm) particles, rock is not laminated
Claystone	… clay, rock is not laminated
Shale	… silt or clay sized particles, rock is laminated

STRENGTH

Term	Is50 (MPa)	Term	Is50 (MPa)
Extremely Low	< 0.03	High	1 – 3
Very Low	0.03 – 0.1	Very High	3 – 10
Low	0.1 – 0.3	Extremely High	> 10
Medium	0.3 – 1		

WEATHERING

Term	Description
Residual Soil	Soil developed on extremely weathered rock; the mass structure and substance fabric are no longer evident
Extremely Weathered	Rock is weathered to such an extent that it has 'soil' properties, i.e. it either disintegrates or can be remoulded, in water. Fabric of original rock is still visible
Highly Weathered	Rock strength usually highly changed by weathering; rock may be highly discoloured
Moderately Weathered	Rock strength usually moderately changed by weathering; rock may be moderately discoloured
Distinctly Weathered	See 'Highly Weathered' or 'Moderately Weathered'
Slightly Weathered	Rock is slightly discoloured but shows little or no change of strength from fresh rock
Fresh	Rock shows no signs of decomposition or staining

NATURAL FRACTURES

Type	Description
Joint	A discontinuity or crack across which the rock has little or no tensile strength. May be open or closed
Bedding plane	Arrangement in layers of mineral grains of similar sizes or composition
Seam	Seam with deposited soil (infill), extremely weathered insitu rock (XW), or disoriented usually angular fragments of the host rock (crushed)
Shear zone	Zone with roughly parallel planar boundaries, of rock material intersected by closely spaced (generally < 50mm) joints and /or microscopic fracture (cleavage) planes
Vein	Intrusion of any shape dissimilar to the adjoining rock mass. Usually igneous

Shape	Description
Planar	Consistent orientation
Curved	Gradual change in orientation
Undulose	Wavy surface
Stepped	One or more well defined steps
Irregular	Many sharp changes in orientation

Infill or Coating	Description
Clean	No visible coating or discolouring
Stained	No visible coating but surfaces are discoloured
Veneer	A visible coating of soil or mineral, too thin to measure; may be patchy
Coating	Visible coating ≤ 1mm thick. Ticker soil material described as seam

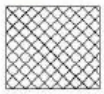
Roughness	Description
Polished	Shiny smooth surface
Slickensided	Grooved or striated surface, usually polished
Smooth	Smooth to touch. Few or no surface irregularities
Rough	Many small surface irregularities (amplitude generally < 1mm). Feels like fine to coarse sandpaper

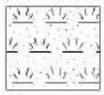
Note: soil and rock descriptions are generally in accordance with AS1726-2017 Geotechnical Site Investigations

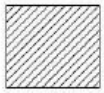
Graphic Symbols Index

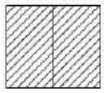
Core Geotech

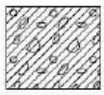
Soil


Fill

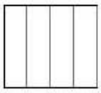

Peat, Topsoil


Clay

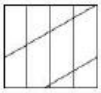

Silty Clay

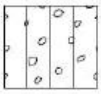

Gravelly Clay

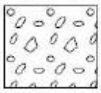

Sandy Clay


Silt

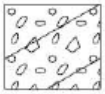

Sandy Silt


Clayey Silt

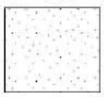

Gravelly Silt

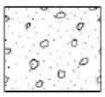

Gravel

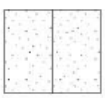

Sandy Gravel


Clayey Gravel


Silty Gravel


Sand

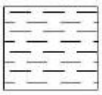

Gravelly Sand

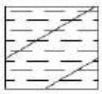

Silty Sand


Clayey Sand

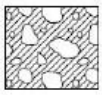
Rock


Sandstone

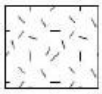

Shale

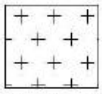

Clayey Shale

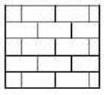

Siltstone


Conglomerate

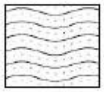

Claystone

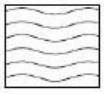

Dolerite, Basalt

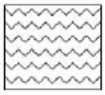

Granite


Limestone


Tuff


Coarse grained Metamorphic

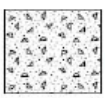

Medium grained Metamorphic

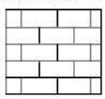

Fine grained Metamorphic


Coal

Other


Asphalt


Concrete


Brick

Water Measurements

Level at time of drilling

Level after drilling

Inflow

Outflow

DEVELOPMENT RISK MANAGEMENT

Testpit No: TP01

UTM	:	**Excavator**	: 30T	**Job Number**	: P23.1039-V05
Latitude	: -33.818712	**Excavator Supplier**	: Client	**Client**	: HB&B Property Pty Ltd
Longitude	: 150.776821	**Logged By**	: RA	**Project**	: Sediment basin
Elevation	: Not Surveyed	**Reviewed By**	: NDS	**Location**	: 221-227 Luddenham Road, Orchard Hills
Total Depth	: 1 m	**Date**	: 18/03/2024	**Loc Comment**	:

Drilling Method	Depth (m)	Graphic Log	Classification Code	Material Description	Moisture	Consistency	Samples B,J	Samples J	Samples B	Remarks & Other Observations
	0.2		ML	FILL: Gravelly SILT, non-plastic, brown, fine sized gravel.	M	S				
	0.3		GP	FILL: Sandy GRAVEL, grey, medium sized, fine grained sand, roadbase.	M	L				
			ML	SILT: non-plastic, brown.	D	F				
	1			**TP01 Terminated at 1m**						
	2									

DEVELOPMENT RISK MANAGEMENT

Testpit No: TP03

UTM	:	**Excavator**	: 30T	**Job Number**	: P23.1039-V05
Latitude	: -33.818748	**Excavator Supplier**	: Client	**Client**	: HB&B Property Pty Ltd
Longitude	: 150.751349	**Logged By**	: RA	**Project**	: Sediment basin
Elevation	: Not Surveyed	**Reviewed By**	: NDS	**Location**	: 221-227 Luddenham Road, Orchard Hills
Total Depth	: 2 m	**Date**	: 18/03/2024	**Loc Comment**	:

Drilling Method	Depth (m)	Graphic Log	Classification Code	Material Description	Moisture	Consistency	Samples J	Samples B	Remarks & Other Observations
	0.1			SILT: low plasticity, dark brown.	M	S			
	1		CH	CLAY: high plasticity, grey with red and orange mottled.	M	F			
	2			**TP03 Terminated at 2m**					

DEVELOPMENT RISK MANAGEMENT

Testpit No: TP04

UTM	:	**Excavator**	: 30T	**Job Number**	: P23.1039-V05
Latitude	: 1.000000	**Excavator Supplier**	: Client	**Client**	: HB&B Property Pty Ltd
Longitude	: 1.000000	**Logged By**	: RA	**Project**	: Sediment basin
Elevation	: Not Surveyed	**Reviewed By**	: NDS	**Location**	: 221-227 Luddenham Road, Orchard Hills
Total Depth	: 0.6 m	**Date**	: 18/03/2024	**Loc Comment**	:

Drilling Method	Depth (m)	Graphic Log	Classification Code	Material Description	Moisture	Consistency	Samples	Remarks & Other Observations
	0.25		ML	SILT: low plasticity, brown, topsoil.	M	F		
			CI	CLAY: medium plasticity, brown orange.	M	F		
	1			**TP04 Terminated at 0.6m**				
	2							

DEVELOPMENT RISK MANAGEMENT

Testpit No: TP05

UTM	:	**Excavator**	: 30T	**Job Number**	: P23.1039-V05
Latitude	: -33.819250	**Excavator Supplier**	: Client	**Client**	: HB&B Property Pty Ltd
Longitude	: 150.750487	**Logged By**	: RA	**Project**	: Sediment basin
Elevation	: Not Surveyed	**Reviewed By**	: NDS	**Location**	: 221-227 Luddenham Road, Orchard Hills
Total Depth	: 0.8 m	**Date**	: 18/03/2024	**Loc Comment**	:

Drilling Method	Depth (m)	Graphic Log	Classification Code	Material Description	Moisture	Consistency	Samples	Remarks & Other Observations
	0.2		ML	SILT: low plasticity, dark brown.	M	S		
			CH	CLAY: high plasticity, grey with red and orange mottled.	M	F		
	1			**TP05 Terminated at 0.8m**				
	2							

DEVELOPMENT RISK MANAGEMENT

Testpit No: TP06

UTM	:	**Excavator**	: 30T	**Job Number**	: P23.1039-V05
Latitude	: -33.819436	**Excavator Supplier**	: Client	**Client**	: HB&B Property Pty Ltd
Longitude	: 150.750102	**Logged By**	: RA	**Project**	: Sediment basin
Elevation	: Not Surveyed	**Reviewed By**	: NDS	**Location**	: 221-227 Luddenham Road, Orchard Hills
Total Depth	: 0.6 m	**Date**	: 18/03/2024	**Loc Comment**	:

Drilling Method	Depth (m)	Graphic Log	Classification Code	Material Description	Moisture	Consistency	Samples J	Samples B	Remarks & Other Observations
			ML	SILT: low plasticity, dark brown.	M	S			
	0.4		CH	CLAY: high plasticity, grey with red and orange mottled.	M	F			
	1			**TP06 Terminated at 0.6m**					
	2								

DEVELOPMENT RISK MANAGEMENT

Testpit No: TP07

UTM	:	**Excavator**	: 30T	**Job Number**	: P23.1039-V05
Latitude	: -33.819705	**Excavator Supplier**	: Client	**Client**	: HB&B Property Pty Ltd
Longitude	: 150.749714	**Logged By**	: RA	**Project**	: Sediment basin
Elevation	: Not Surveyed	**Reviewed By**	: NDS	**Location**	: 221-227 Luddenham Road, Orchard Hills
Total Depth	: 0.8 m	**Date**	: 18/03/2024	**Loc Comment**	:

Drilling Method	Depth (m)	Graphic Log	Classification Code	Material Description	Moisture	Consistency	Samples B J	Samples J	Samples DUP	Remarks & Other Observations
			ML	FILL: SILT, low plasticity, dark brown, with blue metal .	M	S				
	0.3		CH	CLAY: high plasticity, brown orange with black mottled.	D	F				
	0.6		CH		M-D	F				
	1			**TP07 Terminated at 0.8m**						
	2									

DEVELOPMENT RISK MANAGEMENT

Testpit No: TP08

UTM	:	**Excavator**	: 30T	**Job Number**	: P23.1039-V05
Latitude	: -33.819403	**Excavator Supplier**	: Client	**Client**	: HB&B Property Pty Ltd
Longitude	: 150.749644	**Logged By**	: RA	**Project**	: Sediment basin
Elevation	: Not Surveyed	**Reviewed By**	: NDS	**Location**	: 221-227 Luddenham Road, Orchard Hills
Total Depth	: 2 m	**Date**	: 18/03/2024	**Loc Comment**	:

Drilling Method	Depth (m)	Graphic Log	Classification Code	Material Description	Moisture	Consistency	Samples J	Samples B	Remarks & Other Observations
	0		ML	SILT: low plasticity, dark brown.	M	S			
	0.2		ML	SILT: low plasticity, grey brown.	D	F			
	0.6		CH	CLAY: high plasticity, grey with red and orange mottled.	M	F			
	1								
	2			**TP08 Terminated at 2m**					

DEVELOPMENT RISK MANAGEMENT

Testpit No: TP09

UTM	:	**Excavator**	: 30T	**Job Number**	: P23.1039-V05
Latitude	: -33.819810	**Excavator Supplier**	: Client	**Client**	: HB&B Property Pty Ltd
Longitude	: 150.749207	**Logged By**	: RA	**Project**	: Sediment basin
Elevation	: Not Surveyed	**Reviewed By**	: NDS	**Location**	: 221-227 Luddenham Road, Orchard Hills
Total Depth	: 2.1 m	**Date**	: 18/03/2024	**Loc Comment**	:

Drilling Method	Depth (m)	Graphic Log	Classification Code	Material Description	Moisture	Consistency	Samples J	Samples B	Remarks & Other Observations
	0.2		ML	SILT: low plasticity, dark brown.	M	S			
	0.6		ML	SILT: low plasticity, grey brown.	D	F			
	1		CH	CLAY: high plasticity, grey with red and orange mottled.	M	F			
	2			**TP09 Terminated at 2.1m**					

DEVELOPMENT RISK MANAGEMENT

Testpit No: TP02

UTM	:	**Excavator**	: 30T	**Job Number**	: P23.1039-V05
Latitude	: -33.818244	**Excavator Supplier**	: Client	**Client**	: HB&B Property Pty Ltd
Longitude	: 150.751463	**Logged By**	: RA	**Project**	: Sediment basin
Elevation	: Not Surveyed	**Reviewed By**	: NDS	**Location**	: 221-227 Luddenham Road, Orchard Hills
Total Depth	: 3 m	**Date**	: 18/03/2024	**Loc Comment**	:

Drilling Method	Depth (m)	Graphic Log	Classification Code	Material Description	Moisture	Consistency	Samples	Remarks & Other Observations
			ML	SILT: low plasticity, dark brown.	M	S		
	0.3		CH	CLAY: high plasticity, grey with red and orange mottled.	M	F		
	0.5		CH	Grey and light brown.	M	F		
	1							
	2							
	2.4		CH	Moderately weathered shale, water seeping through.	M	F		
				TP02 Terminated at 3m				

DEVELOPMENT RISK MANAGEMENT

Testpit No: TP10

UTM	: 43Q	**Excavator**	: 30T	**Job Number**	: P23.1039-V05
Latitude	: -33.820081	**Excavator Supplier**	: Client	**Client**	: HB&B Property Pty Ltd
Longitude	: 150.749437	**Logged By**	: RA	**Project**	: Sediment basin
Elevation	: Not Surveyed	**Reviewed By**	: NDS	**Location**	: 221-227 Luddenham Road, Orchard Hills
Total Depth	: 0.9 m	**Date**	: 18/03/2024	**Loc Comment**	:

Drilling Method	Depth (m)	Graphic Log	Classification Code	Material Description	Moisture	Consistency	Samples B	Samples J	Remarks & Other Observations
			ML	FILL: SILT, low plasticity, dark brown.	M	S			
	0.4		ML	FILL: SILT, low plasticity, grey, possible deposited topsoil.	D	S			charcoal
	0.6		CH	CLAY: high plasticity, brown orange with black mottled.	M-D	F			
	1			**TP10 Terminated at 0.9m**					
	2								

DEVELOPMENT RISK MANAGEMENT

Testpit No: TP11

UTM	: 43Q	**Excavator**	: 30T	**Job Number**	: P23.1039-V05
Latitude	: -33.820269	**Excavator Supplier**	: Client	**Client**	: HB&B Property Pty Ltd
Longitude	: 150.748871	**Logged By**	: RA	**Project**	: Sediment basin
Elevation	: Not Surveyed	**Reviewed By**	: NDS	**Location**	: 221-227 Luddenham Road, Orchard Hills
Total Depth	: 0.9 m	**Date**	: 18/03/2024	**Loc Comment**	:

Drilling Method	Depth (m)	Graphic Log	Classification Code	Material Description	Moisture	Consistency	Samples	Remarks & Other Observations
			ML	FILL: SILT, low plasticity, dark brown.	M	S		
	0.4		ML	FILL: SILT, low plasticity, grey, possible deposited topsoil, color bright grey.	D	S		trace charcoal
	0.6		CH	CLAY: high plasticity, brown orange with black mottled.	M-D	F		
	1			**TP11 Terminated at 0.9m**				
	2							

DEVELOPMENT RISK MANAGEMENT

Testpit No: TP12

UTM	: 43Q	**Excavator**	: 30T	**Job Number**	: P23.1039-V05
Latitude	: -33.820495	**Excavator Supplier**	: Client	**Client**	: HB&B Property Pty Ltd
Longitude	: 150.748781	**Logged By**	: RA	**Project**	: Sediment basin
Elevation	: Not Surveyed	**Reviewed By**	: NDS	**Location**	: 221-227 Luddenham Road, Orchard Hills
Total Depth	: 2.1 m	**Date**	: 18/03/2024	**Loc Comment**	:

Drilling Method	Depth (m)	Graphic Log	Classification Code	Material Description	Moisture	Consistency	Samples J	Samples B	Remarks & Other Observations
	0		ML	SILT: low plasticity, dark brown.	M	S			
	0.2		ML	SILT: low plasticity, grey brown.	D	F			
	0.6		CH	CLAY: high plasticity, grey with red and orange mottled.	M	F			
	1								
	1.5		CI	Sandy CLAY: medium plasticity, grey brown with orange mottled, fine grained sand.	M	F			
	2			**TP12 Terminated at 2.1m**					

DEVELOPMENT RISK MANAGEMENT

Testpit No: TP13

UTM	: 43Q	**Excavator**	: 30T	**Job Number**	: P23.1039-V05
Latitude	: -33.820378	**Excavator Supplier**	: Client	**Client**	: HB&B Property Pty Ltd
Longitude	: 150.750192	**Logged By**	: RA	**Project**	: Sediment basin
Elevation	: Not Surveyed	**Reviewed By**	: NDS	**Location**	: 221-227 Luddenham Road, Orchard Hills
Total Depth	: 0.7 m	**Date**	: 18/03/2024	**Loc Comment**	:

Drilling Method	Depth (m)	Graphic Log	Classification Code	Material Description	Moisture	Consistency	Samples	Remarks & Other Observations
	0.2		ML	SILT: low plasticity, dark brown.	M	S		
	0.5		ML	SILT: low plasticity, grey.	D	S		
			CH	CLAY: high plasticity, brown orange with red mottled.	M	F		
	1			**TP13 Terminated at 0.7m**				
	2							

DEVELOPMENT RISK MANAGEMENT

Testpit No: TP14

UTM	: 43Q	**Excavator**	: 30T	**Job Number**	: P23.1039-V05
Latitude	: -33.821280	**Excavator Supplier**	: Client	**Client**	: HB&B Property Pty Ltd
Longitude	: 150.748976	**Logged By**	: RA	**Project**	: Sediment basin
Elevation	: Not Surveyed	**Reviewed By**	: NDS	**Location**	: 221-227 Luddenham Road, Orchard Hills
Total Depth	: 0.7 m	**Date**	: 18/03/2024	**Loc Comment**	:

Drilling Method	Depth (m)	Graphic Log	Classification Code	Material Description	Moisture	Consistency	Samples	Remarks & Other Observations
	0.1		ML	SILT: low plasticity, dark brown, trace charcoal .	M	S		
			ML	SILT: non-plastic, brown orange.	D	F		
	0.5		CH	Sandy CLAY: high plasticity, grey brown with orange mottled, fine grained sand.	M	St		
	1			**TP14 Terminated at 0.7m**				
	2							

DEVELOPMENT RISK MANAGEMENT

Testpit No: TP15

UTM	: 43Q	**Excavator**	: 30T	**Job Number**	: P23.1039-V05
Latitude	: -33.821910	**Excavator Supplier**	: Client	**Client**	: HB&B Property Pty Ltd
Longitude	: 150.748059	**Logged By**	: RA	**Project**	: Sediment basin
Elevation	: Not Surveyed	**Reviewed By**	: NDS	**Location**	: 221-227 Luddenham Road, Orchard Hills
Total Depth	: 2.2 m	**Date**	: 18/03/2024	**Loc Comment**	:

Drilling Method	Depth (m)	Graphic Log	Classification Code	Material Description	Moisture	Consistency	Samples J	Samples B	Remarks & Other Observations
	0.2		ML	SILT: low plasticity, dark brown.	M	S			
	0.6		ML	SILT: low plasticity, grey brown.	D	F			
	1		CH	CLAY: high plasticity, grey with red and orange mottled.	M	St-VSt			
	2			**TP15 Terminated at 2.2m**					

DEVELOPMENT RISK MANAGEMENT

Testpit No: TP16

UTM	: 43Q	**Excavator**	: 30T	**Job Number**	: P23.1039-V05
Latitude	: -33.821150	**Excavator Supplier**	: Client	**Client**	: HB&B Property Pty Ltd
Longitude	: 150.749516	**Logged By**	: RA	**Project**	: Sediment basin
Elevation	: Not Surveyed	**Reviewed By**	: NDS	**Location**	: 221-227 Luddenham Road, Orchard Hills
Total Depth	: 2.1 m	**Date**	: 18/03/2024	**Loc Comment**	:

Drilling Method	Depth (m)	Graphic Log	Classification Code	Material Description	Moisture	Consistency	Samples J	Samples B	Remarks & Other Observations
	0.8		ML	SILT: low plasticity, dark brown, change to light brown at .1.	M	S			
	1		CH	CLAY: high plasticity, brown orange with grey mottled.	M	F			
	2			**TP16 Terminated at 2.1m**					

DEVELOPMENT RISK MANAGEMENT

Testpit No: TP17

UTM	: 43Q	**Excavator**	: 30T	**Job Number**	: P23.1039-V05
Latitude	: -33.822013	**Excavator Supplier**	: Client	**Client**	: HB&B Property Pty Ltd
Longitude	: 150.749199	**Logged By**	: RA	**Project**	: Sediment basin
Elevation	: Not Surveyed	**Reviewed By**	: NDS	**Location**	: 221-227 Luddenham Road, Orchard Hills
Total Depth	: 0.8 m	**Date**	: 18/03/2024	**Loc Comment**	:

Drilling Method	Depth (m)	Graphic Log	Classification Code	Material Description	Moisture	Consistency	Samples J	Samples DUP	Remarks & Other Observations
	0.2		ML	SILT: low plasticity, dark brown.	M	S			
	0.5		ML	SILT: low plasticity, grey.	D	S			
			CH	CLAY: high plasticity, brown orange with red mottled, with trace charcoal .	M	F			
	1			**TP17 Terminated at 0.8m**					
	2								

DEVELOPMENT RISK MANAGEMENT

Testpit No: TP18

UTM	: 43Q	**Excavator**	: 30T	**Job Number**	: P23.1039-V05
Latitude	: -33.822387	**Excavator Supplier**	: Client	**Client**	: HB&B Property Pty Ltd
Longitude	: 150.747926	**Logged By**	: RA	**Project**	: Sediment basin
Elevation	: Not Surveyed	**Reviewed By**	: NDS	**Location**	: 221-227 Luddenham Road, Orchard Hills
Total Depth	: 0.8 m	**Date**	: 18/03/2024	**Loc Comment**	:

Drilling Method	Depth (m)	Graphic Log	Classification Code	Material Description	Moisture	Consistency	Samples	Remarks & Other Observations
			ML	SILT: low plasticity, dark brown, trace charcoal .	M	S		
	0.3		CH	CLAY: high plasticity, brown orange.	M	St		
	1			**TP18 Terminated at 0.8m**				
	2							

DEVELOPMENT RISK MANAGEMENT

Testpit No: TP19

UTM	: 43Q	**Excavator**	: 30T	**Job Number**	: P23.1039-V05
Latitude	: -33.822859	**Excavator Supplier**	: Client	**Client**	: HB&B Property Pty Ltd
Longitude	: 150.747638	**Logged By**	: RA	**Project**	: Sediment basin
Elevation	: Not Surveyed	**Reviewed By**	: NDS	**Location**	: 221-227 Luddenham Road, Orchard Hills
Total Depth	: 2.1 m	**Date**	: 18/03/2024	**Loc Comment**	:

Drilling Method	Depth (m)	Graphic Log	Classification Code	Material Description	Moisture	Consistency	Samples J	Samples B	Remarks & Other Observations
	0.2		ML	SILT: low plasticity, dark brown.	M	S			
	0.6		ML	SILT: low plasticity, grey brown.	D	F			
	1		CH	CLAY: high plasticity, grey with red and orange mottled.	M	F			
	2			**TP19 Terminated at 2.1m**					

DEVELOPMENT RISK MANAGEMENT

Testpit No: TP20

UTM	: 43Q	**Excavator**	: 30T	**Job Number**	: P23.1039-V05
Latitude	: -33.822880	**Excavator Supplier**	: Client	**Client**	: HB&B Property Pty Ltd
Longitude	: 150.748297	**Logged By**	: RA	**Project**	: Sediment basin
Elevation	: Not Surveyed	**Reviewed By**	: NDS	**Location**	: 221-227 Luddenham Road, Orchard Hills
Total Depth	: 0.8 m	**Date**	: 18/03/2024	**Loc Comment**	:

Drilling Method	Depth (m)	Graphic Log	Classification Code	Material Description	Moisture	Consistency	Samples B	Samples J	Remarks & Other Observations
	0.2		ML	SILT: low plasticity, dark brown, layer of shale at the top of topsoil.	M	S			
	0.6		ML	SILT: low plasticity, grey brown.	D	F			
			CH	CLAY: high plasticity, brown orange.	M	St			
	1			**TP20 Terminated at 0.8m**					
	2								

DEVELOPMENT RISK MANAGEMENT

Testpit No: TP21

UTM	: 43Q	**Excavator**	: 30T	**Job Number**	: P23.1039-V05
Latitude	: -33.822493	**Excavator Supplier**	: Client	**Client**	: HB&B Property Pty Ltd
Longitude	: 150.749379	**Logged By**	: RA	**Project**	: Sediment basin
Elevation	: Not Surveyed	**Reviewed By**	: NDS	**Location**	: 221-227 Luddenham Road, Orchard Hills
Total Depth	: 0.6 m	**Date**	: 18/03/2024	**Loc Comment**	:

Drilling Method	Depth (m)	Graphic Log	Classification Code	Material Description	Moisture	Consistency	Samples	Remarks & Other Observations
	0.2		ML	SILT: low plasticity, dark brown.	M	S		
	0.4		ML	SILT: low plasticity, brown.	D	S		
			CH	CLAY: high plasticity, brown orange with red mottled.	M	F		
	1			**TP21 Terminated at 0.6m**				
	2							

DEVELOPMENT RISK MANAGEMENT

Testpit No: TP22

UTM	**: 43Q**	**Excavator**	**: 30T**	**Job Number**	**: P23.1039-V05**
Latitude	**: -33.822957**	**Excavator Supplier**	**: Client**	**Client**	**: HB&B Property Pty Ltd**
Longitude	**: 150.749109**	**Logged By**	**: RA**	**Project**	**: Sediment basin**
Elevation	**: Not Surveyed**	**Reviewed By**	**: NDS**	**Location**	**: 221-227 Luddenham Road, Orchard Hills**
Total Depth	**: 2.2 m**	**Date**	**: 18/03/2024**	**Loc Comment**	**:**

Drilling Method	Depth (m)	Graphic Log	Classification Code	Material Description	Moisture	Consistency	Samples J	Samples B	Remarks & Other Observations
	0.2			SILT: low plasticity, dark brown.	M	S			
	0.6			SILT: low plasticity, grey brown.	D	F			
	0.8		CH	CLAY: high plasticity, mottled brown red with grey.	M	St			
	1		CH	CLAY: high plasticity, red brown with grey mottled.	M	VSt			
	2			**TP22 Terminated at 2.2m**					

Appendix D
Laboratory Test Results

CERTIFICATE OF ANALYSIS

Work Order	: **ES2409225**	Page	: 1 of 16
Client	: **Core Geotech Pty Ltd**	Laboratory	: Environmental Division Sydney
Contact	: Mr Raj Singh	Contact	: Customer Services ES
Address	: 31 Lilburn Street Tallawong 2762	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61-2-8784 8555
Project	: CG24-0297, Proposed Alspec Industrial Business Park	Date Samples Received	: 20-Mar-2024 16:00
Order number	: ----	Date Analysis Commenced	: 26-Mar-2024
C-O-C number	: ----	Issue Date	: 02-Apr-2024 19:29
Sampler	: Raj Singh		
Site	: ----		
Quote number	: EN/333		
No. of samples received	: 46		
No. of samples analysed	: 46		

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*
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Wisam Marassa	Inorganics Coordinator	Sydney Inorganics, Smithfield, NSW

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.

- ALS is not NATA accredited for the analysis of Exchangeable Cations on Alkaline Soils when performed under ALS Method ED006.
- 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
- ED007 and ED008: When Exchangeable Al is reported from these methods, it should be noted that Rayment & Lyons (2011) suggests Exchange Acidity by 1M KCl - Method 15G1 (ED005) is a more suitable method for the determination of exchange acidity (H+ + Al3+).
- 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	BH01 - 0.3 - 0.5	BH01 - 1.3 - 1.5	BH02 - 0.8 - 1.0	BH03 - 0.5	BH03 - 2.0
			Sampling date / time	18-Mar-2024 00:00	18-Mar-2024 00:00	18-Mar-2024 00:00	18-Mar-2024 00:00	18-Mar-2024 00:00
Compound	CAS Number	LOR	Unit	ES2409225-001	ES2409225-002	ES2409225-003	ES2409225-004	ES2409225-005
				Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	6.1	6.9	8.1	5.8	6.6
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	110	669	189	224	209
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	16.3	----	11.4	----	----
EA080: Resistivity								
Resistivity at 25°C	----	1	ohm cm	9090	----	5290	----	----
EA167: Corrosion Classification (per AS2159-2009)								
ø Exposure Classification - Concrete Piles Soil Condition A	----	-	-	Mild	----	Mild	----	----
ø Exposure Classification - Concrete Piles Soil Condition B	----	-	-	Non Aggressive	----	Non Aggressive	----	----
ø Exposure Classification - Steel Piles Soil Condition A	----	-	-	Non Aggressive	----	Non Aggressive	----	----
ø Exposure Classification - Steel Piles Soil Condition B	----	-	-	Non Aggressive	----	Non Aggressive	----	----
ED007: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	----	----	----	----	0.3
Exchangeable Magnesium	----	0.1	meq/100g	----	----	----	----	5.9
Exchangeable Potassium	----	0.1	meq/100g	----	----	----	----	0.2
Exchangeable Sodium	----	0.1	meq/100g	----	----	----	----	2.6
Cation Exchange Capacity	----	0.1	meq/100g	----	----	----	----	9.0
Exchangeable Sodium Percent	----	0.1	%	----	----	----	----	29.1
ED008: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	----	<0.1	----	----	----
Exchangeable Magnesium	----	0.1	meq/100g	----	1.3	----	----	----
Exchangeable Potassium	----	0.1	meq/100g	----	<0.1	----	----	----
Exchangeable Sodium	----	0.1	meq/100g	----	0.4	----	----	----
Cation Exchange Capacity	----	0.1	meq/100g	----	1.8	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH01 - 0.3 - 0.5	BH01 - 1.3 - 1.5	BH02 - 0.8 - 1.0	BH03 - 0.5	BH03 - 2.0
				Sampling date / time	18-Mar-2024 00:00	18-Mar-2024 00:00	18-Mar-2024 00:00	18-Mar-2024 00:00	18-Mar-2024 00:00
Compound	CAS Number	LOR	Unit		ES2409225-001	ES2409225-002	ES2409225-003	ES2409225-004	ES2409225-005
					Result	Result	Result	Result	Result
ED008: Exchangeable Cations - Continued									
Exchangeable Sodium Percent	----	0.1	%		**----**	**22.4**	**----**	**----**	**----**
ED040S: Soluble Major Anions									
Sulfate as SO4 2-	14808-79-8	10	mg/kg		**180**	**----**	**140**	**----**	**----**
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	10	mg/kg		**20**	**----**	**60**	**----**	**----**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH03 - 3.0	BH04 - 0.8 - 1.0	BH05 - 0.5 - 0.7	BH05 - 1.7 - 1.9	BH06 - 0.6 - 0.8
			Sampling date / time	18-Mar-2024 00:00	18-Mar-2024 00:00	18-Mar-2024 00:00	18-Mar-2024 00:00	18-Mar-2024 00:00
Compound	CAS Number	LOR	Unit	ES2409225-006	ES2409225-007	ES2409225-008	ES2409225-009	ES2409225-010
				Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	6.9	5.9	5.7	6.5	5.6
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	176	856	755	767	251
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	----	14.7	----	22.1	----
EA080: Resistivity								
Resistivity at 25°C	----	1	ohm cm	----	1170	----	1300	----
EA167: Corrosion Classification (per AS2159-2009)								
ø Exposure Classification - Concrete Piles Soil Condition A	----	-	-	----	Mild	----	Mild	----
ø Exposure Classification - Concrete Piles Soil Condition B	----	-	-	----	Non Aggressive	----	Non Aggressive	----
ø Exposure Classification - Steel Piles Soil Condition A	----	-	-	----	Mild	----	Mild	----
ø Exposure Classification - Steel Piles Soil Condition B	----	-	-	----	Non Aggressive	----	Non Aggressive	----
ED007: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	----	----	----	----	1.3
Exchangeable Magnesium	----	0.1	meq/100g	----	----	----	----	9.0
Exchangeable Potassium	----	0.1	meq/100g	----	----	----	----	0.3
Exchangeable Sodium	----	0.1	meq/100g	----	----	----	----	2.9
Cation Exchange Capacity	----	0.1	meq/100g	----	----	----	----	13.5
Exchangeable Sodium Percent	----	0.1	%	----	----	----	----	21.9
ED008: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	----	----	<0.1	----	----
Exchangeable Magnesium	----	0.1	meq/100g	----	----	3.3	----	----
Exchangeable Potassium	----	0.1	meq/100g	----	----	<0.1	----	----
Exchangeable Sodium	----	0.1	meq/100g	----	----	1.1	----	----
Cation Exchange Capacity	----	0.1	meq/100g	----	----	4.6	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH03 - 3.0	BH04 - 0.8 - 1.0	BH05 - 0.5 - 0.7	BH05 - 1.7 - 1.9	BH06 - 0.6 - 0.8
				Sampling date / time	18-Mar-2024 00:00	18-Mar-2024 00:00	18-Mar-2024 00:00	18-Mar-2024 00:00	18-Mar-2024 00:00
Compound	CAS Number	LOR	Unit		ES2409225-006	ES2409225-007	ES2409225-008	ES2409225-009	ES2409225-010
					Result	Result	Result	Result	Result
ED008: Exchangeable Cations - Continued									
Exchangeable Sodium Percent	----	0.1	%		**----**	**----**	**24.4**	**----**	**----**
ED040S: Soluble Major Anions									
Sulfate as SO4 2-	14808-79-8	10	mg/kg		**----**	**340**	**----**	**210**	**----**
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	10	mg/kg		**----**	**1470**	**----**	**1430**	**----**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH06 - 1.3 - 1.5	BH07 - 0.8 - 1.0	BH07 - 2.0 - 2.2	BH07 - 2.8 - 3.0	BH09 - 0.5 - 0.7
			Sampling date / time	18-Mar-2024 00:00	18-Mar-2024 00:00	18-Mar-2024 00:00	18-Mar-2024 00:00	18-Mar-2024 00:00
Compound	CAS Number	LOR	Unit	ES2409225-011	ES2409225-012	ES2409225-013	ES2409225-014	ES2409225-015
				Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	**6.0**	**5.8**	**8.6**	**8.1**	**5.6**
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	**850**	**256**	**639**	**492**	**441**
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	**13.1**	----	**14.1**	----	----
EA080: Resistivity								
Resistivity at 25°C	----	1	ohm cm	**1180**	----	**1560**	----	----
EA167: Corrosion Classification (per AS2159-2009)								
ø Exposure Classification - Concrete Piles Soil Condition A	----	-	-	**Mild**	----	**Mild**	----	----
ø Exposure Classification - Concrete Piles Soil Condition B	----	-	-	**Non Aggressive**	----	**Non Aggressive**	----	----
ø Exposure Classification - Steel Piles Soil Condition A	----	-	-	**Mild**	----	**Mild**	----	----
ø Exposure Classification - Steel Piles Soil Condition B	----	-	-	**Non Aggressive**	----	**Non Aggressive**	----	----
ED008: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	----	----	----	----	<0.1
Exchangeable Magnesium	----	0.1	meq/100g	----	----	----	----	**6.3**
Exchangeable Potassium	----	0.1	meq/100g	----	----	----	----	<0.1
Exchangeable Sodium	----	0.1	meq/100g	----	----	----	----	**1.7**
Cation Exchange Capacity	----	0.1	meq/100g	----	----	----	----	**8.2**
Exchangeable Sodium Percent	----	0.1	%	----	----	----	----	**21.1**
ED040S: Soluble Major Anions								
Sulfate as SO4 2-	14808-79-8	10	mg/kg	**180**	----	**80**	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	10	mg/kg	**1410**	----	**1050**	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH10 - 0.8 - 1.0	BH10 - 2.3 - 2.5	BH11 - 0.7 - 0.9	BH11 - 1.7 - 2.0	BH11 - 3.1 - 3.3
			Sampling date / time	18-Mar-2024 00:00	18-Mar-2024 00:00	18-Mar-2024 00:00	18-Mar-2024 00:00	18-Mar-2024 00:00
Compound	CAS Number	LOR	Unit	ES2409225-016	ES2409225-017	ES2409225-018	ES2409225-019	ES2409225-020
				Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	5.1	8.2	5.5	5.0	6.4
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	399	584	314	885	759
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	12.8	----	14.8	----	----
EA080: Resistivity								
Resistivity at 25°C	----	1	ohm cm	2510	----	3180	----	----
EA167: Corrosion Classification (per AS2159-2009)								
ø Exposure Classification - Concrete Piles Soil Condition A	----	-	-	Mild	----	Mild	----	----
ø Exposure Classification - Concrete Piles Soil Condition B	----	-	-	Non Aggressive	----	Non Aggressive	----	----
ø Exposure Classification - Steel Piles Soil Condition A	----	-	-	Moderate	----	Moderate	----	----
ø Exposure Classification - Steel Piles Soil Condition B	----	-	-	Mild	----	Mild	----	----
ED006: Exchangeable Cations on Alkaline Soils								
ø Exchangeable Calcium	----	0.2	meq/100g	----	<0.2	----	----	----
ø Exchangeable Magnesium	----	0.2	meq/100g	----	6.6	----	----	----
ø Exchangeable Potassium	----	0.2	meq/100g	----	<0.2	----	----	----
ø Exchangeable Sodium	----	0.2	meq/100g	----	5.2	----	----	----
ø Cation Exchange Capacity	----	0.2	meq/100g	----	11.8	----	----	----
ø Exchangeable Sodium Percent	----	0.2	%	----	43.9	----	----	----
ED008: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	----	----	----	0.4	----
Exchangeable Magnesium	----	0.1	meq/100g	----	----	----	7.7	----
Exchangeable Potassium	----	0.1	meq/100g	----	----	----	0.1	----
Exchangeable Sodium	----	0.1	meq/100g	----	----	----	2.6	----
Cation Exchange Capacity	----	0.1	meq/100g	----	----	----	10.8	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH10 - 0.8 - 1.0	BH10 - 2.3 - 2.5	BH11 - 0.7 - 0.9	BH11 - 1.7 - 2.0	BH11 - 3.1 - 3.3
				Sampling date / time	18-Mar-2024 00:00	18-Mar-2024 00:00	18-Mar-2024 00:00	18-Mar-2024 00:00	18-Mar-2024 00:00
Compound	CAS Number	LOR	Unit		ES2409225-016	ES2409225-017	ES2409225-018	ES2409225-019	ES2409225-020
					Result	Result	Result	Result	Result
ED008: Exchangeable Cations - Continued									
Exchangeable Sodium Percent	----	0.1	%		**----**	**----**	**----**	**24.0**	**----**
ED040S: Soluble Major Anions									
Sulfate as SO4 2-	14808-79-8	10	mg/kg		**180**	**----**	**240**	**----**	**----**
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	10	mg/kg		**550**	**----**	**330**	**----**	**----**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH11 - 3.8 - 4.0	BH12 - 0.7 - 0.8	BH12 - 1.7 - 1.9	BH12 - 2.7 - 2.9	BH12 - 3.8 - 4.0
			Sampling date / time	18-Mar-2024 00:00	18-Mar-2024 00:00	18-Mar-2024 00:00	18-Mar-2024 00:00	18-Mar-2024 00:00
Compound	CAS Number	LOR	Unit	ES2409225-021	ES2409225-022	ES2409225-023	ES2409225-024	ES2409225-025
				Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	**6.3**	**5.6**	**5.6**	**8.0**	**7.9**
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	**784**	**95**	**61**	**147**	**421**
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	----	----	----	----	**13.0**
EA080: Resistivity								
Resistivity at 25°C	----	1	ohm cm	----	----	----	----	**2380**
EA167: Corrosion Classification (per AS2159-2009)								
ø Exposure Classification - Concrete Piles Soil Condition A	----	-	-	----	----	----	----	**Mild**
ø Exposure Classification - Concrete Piles Soil Condition B	----	-	-	----	----	----	----	**Non Aggressive**
ø Exposure Classification - Steel Piles Soil Condition A	----	-	-	----	----	----	----	**Moderate**
ø Exposure Classification - Steel Piles Soil Condition B	----	-	-	----	----	----	----	**Mild**
ED006: Exchangeable Cations on Alkaline Soils								
ø Exchangeable Calcium	----	0.2	meq/100g	----	----	----	**0.2**	<0.2
ø Exchangeable Magnesium	----	0.2	meq/100g	----	----	----	**7.8**	**4.0**
ø Exchangeable Potassium	----	0.2	meq/100g	----	----	----	<0.2	<0.2
ø Exchangeable Sodium	----	0.2	meq/100g	----	----	----	**3.5**	**2.6**
ø Cation Exchange Capacity	----	0.2	meq/100g	----	----	----	**11.5**	**6.6**
ø Exchangeable Sodium Percent	----	0.2	%	----	----	----	**30.0**	**38.9**
ED008: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	**0.2**	----	----	----	----
Exchangeable Magnesium	----	0.1	meq/100g	**6.4**	----	----	----	----
Exchangeable Potassium	----	0.1	meq/100g	**0.1**	----	----	----	----
Exchangeable Sodium	----	0.1	meq/100g	**2.2**	----	----	----	----
Cation Exchange Capacity	----	0.1	meq/100g	**8.9**	----	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH11 - 3.8 - 4.0	BH12 - 0.7 - 0.8	BH12 - 1.7 - 1.9	BH12 - 2.7 - 2.9	BH12 - 3.8 - 4.0
				Sampling date / time	18-Mar-2024 00:00	18-Mar-2024 00:00	18-Mar-2024 00:00	18-Mar-2024 00:00	18-Mar-2024 00:00
Compound	CAS Number	LOR	Unit		ES2409225-021	ES2409225-022	ES2409225-023	ES2409225-024	ES2409225-025
					Result	Result	Result	Result	Result
ED008: Exchangeable Cations - Continued									
Exchangeable Sodium Percent	----	0.1	%		**24.9**	**----**	**----**	**----**	**----**
ED040S: Soluble Major Anions									
Sulfate as SO4 2-	14808-79-8	10	mg/kg		**----**	**----**	**----**	**----**	**140**
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	10	mg/kg		**----**	**----**	**----**	**----**	**660**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	TP01 0.8 - 1.0	TP03 1.3 - 1.5	TP03 1.8 - 2.0	TP08 0.8 - 1.0	TP08 1.8 - 2.0
			Sampling date / time	18-Mar-2024 00:00	18-Mar-2024 00:00	18-Mar-2024 00:00	18-Mar-2024 00:00	18-Mar-2024 00:00
Compound	CAS Number	LOR	Unit	ES2409225-026	ES2409225-027	ES2409225-028	ES2409225-029	ES2409225-030
				Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	**5.9**	**5.3**	**6.5**	**5.7**	**6.5**
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	**117**	**632**	**491**	**803**	**853**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	TP09 0.8 - 1.0	TP09 1.8 - 2.0	TP12 0.8 - 1.0	TP12 1.8 - 2.0	TP15 0.8 - 1.0
			Sampling date / time	18-Mar-2024 00:00	18-Mar-2024 00:00	18-Mar-2024 00:00	18-Mar-2024 00:00	18-Mar-2024 00:00
Compound	CAS Number	LOR	Unit	ES2409225-031	ES2409225-032	ES2409225-033	ES2409225-034	ES2409225-035
				Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	**5.3**	**5.2**	**7.7**	**7.7**	**6.7**
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	**834**	**980**	**482**	**622**	**52**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	TP15 1.8 - 2.0	TP16 0.8 - 1.0	TP16 1.8 - 2.0	TP19 0.8 - 1.0	TP19 1.8 - 2.0
			Sampling date / time	18-Mar-2024 00:00	18-Mar-2024 00:00	18-Mar-2024 00:00	18-Mar-2024 00:00	18-Mar-2024 00:00
Compound	CAS Number	LOR	Unit	ES2409225-036	ES2409225-037	ES2409225-038	ES2409225-039	ES2409225-040
				Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	**7.7**	**5.1**	**5.8**	**5.6**	**5.8**
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	**289**	**398**	**434**	**631**	**792**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	TP22 0.8 - 1.0	TP22 1.8 - 2.0	BH02 - 1.8 - 2.0	BH04 - 1.8 - 2.0	BH09
			Sampling date / time	18-Mar-2024 00:00	18-Mar-2024 00:00	18-Mar-2024 00:00	18-Mar-2024 00:00	18-Mar-2024 00:00
Compound	CAS Number	LOR	Unit	ES2409225-041	ES2409225-042	ES2409225-043	ES2409225-044	ES2409225-045
				Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	**5.0**	**4.9**	**8.2**	**7.3**	**6.1**
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	**455**	**522**	**654**	**643**	**824**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	TP1 - 1.8 - 2.0	----	----	----	----
			Sampling date / time	18-Mar-2024 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	ES2409225-046	---------	---------	---------	---------
				Result	----	----	----	----
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	**6.1**	**----**	**----**	**----**	**----**
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	**219**	**----**	**----**	**----**	**----**

Material Test Report

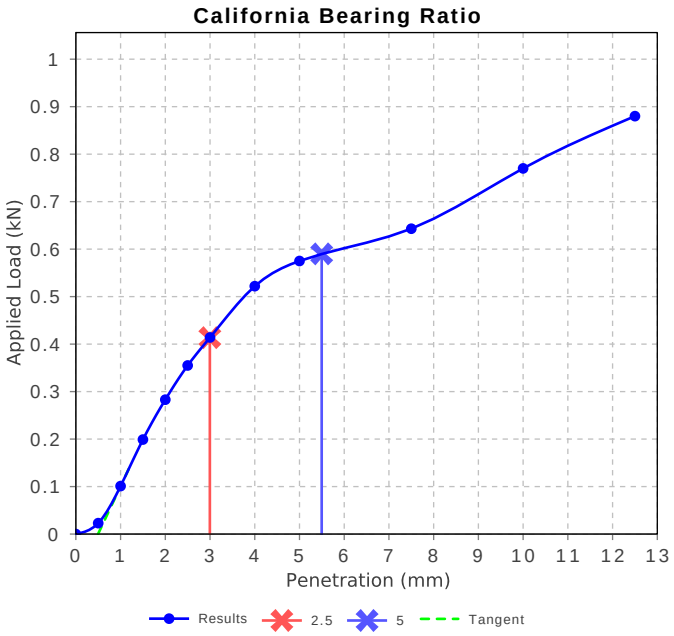
Benchmark Geotechnical Pty Ltd
Unit 3, 39 Eddie Road Minchinbury NSW 2770
Phone: 1300 919 000
Email: matt@bmgeo.com.au

Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Hamish Barsing
Laboratory Supervisor
NATA Accredited Laboratory Number: 20634

Report Number: **P240648-1**
Issue Number: 1
Date Issued: 11/04/2024
Client: Core Geotech
31 Lilburn Street, Tallawong NSW 2762
Contact: Raj Singh, 0479 154 977
Project Number: P240648
Project Name: Proposed Alspec Industrial Business Park
Project Location: 221 - 227 & 289 - 311 Luddenham Road, Orchard Hills
Client Reference: CG24-0297
Work Request: 2853
Sample Number: 24-2853A
Date Sampled: 20/03/2024
Dates Tested: 21/03/2024 - 08/04/2024
Sampling Method: Sampled by Client
The results apply to the sample as received
Site Selection: Selected by Client
Sample Location: **TP01 , Depth: 1.9 - 2.0 m**
Material: Light Brown Silty Clay with Gravel
Material Source: In-Situ

California Bearing Ratio (AS 1289 6.1.1 & 2.1.1)		Min	Max
CBR taken at	2.5 mm		
CBR %	**3.0**		
Method of Compactive Effort	Standard		
Method used to Determine MDD	AS 1289 5.1.1 & 2.1.1		
Method used to Determine Plasticity	Tactile		
Maximum Dry Density (t/m^3)	1.84		
Optimum Moisture Content (%)	16.0		
Laboratory Density Ratio (%)	99.5		
Laboratory Moisture Ratio (%)	98.5		
Dry Density after Soaking (t/m^3)	1.77		
Field Moisture Content (%)	14.5		
Moisture Content at Placement (%)	15.8		
Moisture Content Top 30mm (%)	20.6		
Moisture Content Rest of Sample (%)	15.6		
Mass Surcharge (kg)	9.0kg		
Soaking Period (days)	4		
Curing Hours (h)	167.7		
Swell (%)	3.5		
Oversize Material (mm)	19		
Oversize Material Included	Excluded		
Oversize Material (%)	0.0		



Material Test Report

Benchmark Geotechnical Pty Ltd
Unit 3, 39 Eddie Road Minchinbury NSW 2770
Phone: 1300 919 000
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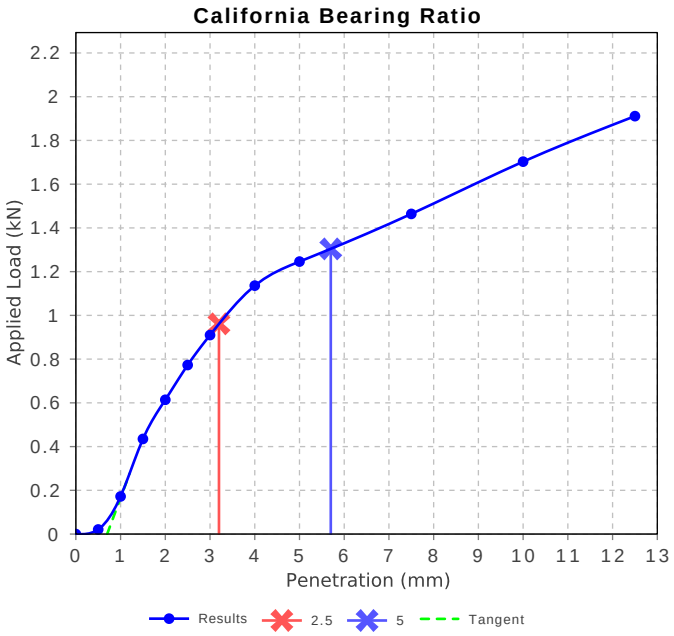
Approved Signatory: Hamish Barsing
Laboratory Supervisor
NATA Accredited Laboratory Number: 20634

Report Number:	**P240648-1**
Issue Number:	1
Date Issued:	11/04/2024
Client:	Core Geotech
	31 Lilburn Street, Tallawong NSW 2762
Contact:	Raj Singh, 0479 154 977
Project Number:	P240648
Project Name:	Proposed Alspec Industrial Business Park
Project Location:	221 - 227 & 289 - 311 Luddenham Road, Orchard Hills
Client Reference:	CG24-0297
Work Request:	2853
Sample Number:	24-2853B
Date Sampled:	20/03/2024
Dates Tested:	21/03/2024 - 08/04/2024
Sampling Method:	Sampled by Client
	The results apply to the sample as received
Site Selection:	Selected by Client
Sample Location:	**TP12 , Depth: 1.5 - 1.7 m**
Material:	Brown Silty Clay with Gravel
Material Source:	In-Situ

California Bearing Ratio (AS 1289 6.1.1 & 2.1.1)		Min	Max
CBR taken at	2.5 mm		
CBR %	**7**		
Method of Compactive Effort	Standard		
Method used to Determine MDD	AS 1289 5.1.1 & 2.1.1		
Method used to Determine Plasticity	Tactile		
Maximum Dry Density (t/m^3)	1.82		
Optimum Moisture Content (%)	15.0		
Laboratory Density Ratio (%)	100.0		
Laboratory Moisture Ratio (%)	98.0		
Dry Density after Soaking (t/m^3)	1.78		
Field Moisture Content (%)	18.3		
Moisture Content at Placement (%)	14.8		
Moisture Content Top 30mm (%)	18.9		
Moisture Content Rest of Sample (%)	15.6		
Mass Surcharge (kg)	9.0kg		
Soaking Period (days)	4		
Curing Hours (h)	48.0		
Swell (%)	2.0		
Oversize Material (mm)	19		
Oversize Material Included	Excluded		
Oversize Material (%)	0.0		



Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	40		
Plastic Limit (%)	13		
Plasticity Index (%)	**27**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)	**12.5**		
Cracking Crumbling Curling	Curling		

Material Test Report

Benchmark Geotechnical Pty Ltd
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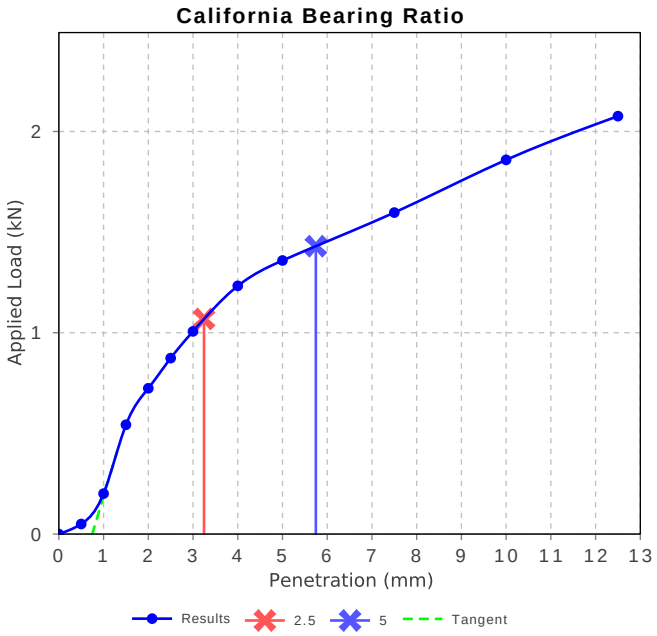
Approved Signatory: Hamish Barsing
Laboratory Supervisor
NATA Accredited Laboratory Number: 20634

Report Number:	**P240648-1**
Issue Number:	1
Date Issued:	11/04/2024
Client:	Core Geotech
	31 Lilburn Street, Tallawong NSW 2762
Contact:	Raj Singh, 0479 154 977
Project Number:	P240648
Project Name:	Proposed Alspec Industrial Business Park
Project Location:	221 - 227 & 289 - 311 Luddenham Road, Orchard Hills
Client Reference:	CG24-0297
Work Request:	2853
Sample Number:	24-2853C
Date Sampled:	20/03/2024
Dates Tested:	21/03/2024 - 08/04/2024
Sampling Method:	Sampled by Client
	The results apply to the sample as received
Site Selection:	Selected by Client
Sample Location:	**TP15 , Depth: 0.8 - 1.0 m**
Material:	Light Brown Silty Clay
Material Source:	In-Situ

California Bearing Ratio (AS 1289 6.1.1 & 2.1.1)		Min	Max
CBR taken at	2.5 mm		
CBR %	**8**		
Method of Compactive Effort	Standard		
Method used to Determine MDD	AS 1289 5.1.1 & 2.1.1		
Method used to Determine Plasticity	Tactile		
Maximum Dry Density (t/m^3)	1.77		
Optimum Moisture Content (%)	17.0		
Laboratory Density Ratio (%)	99.5		
Laboratory Moisture Ratio (%)	101.5		
Dry Density after Soaking (t/m^3)	1.73		
Field Moisture Content (%)	14.9		
Moisture Content at Placement (%)	17.4		
Moisture Content Top 30mm (%)	20.4		
Moisture Content Rest of Sample (%)	17.1		
Mass Surcharge (kg)	9.0kg		
Soaking Period (days)	4		
Curing Hours (h)	48.0		
Swell (%)	2.0		
Oversize Material (mm)	19		
Oversize Material Included	Excluded		
Oversize Material (%)	0.0		



Material Test Report

Benchmark Geotechnical Pty Ltd
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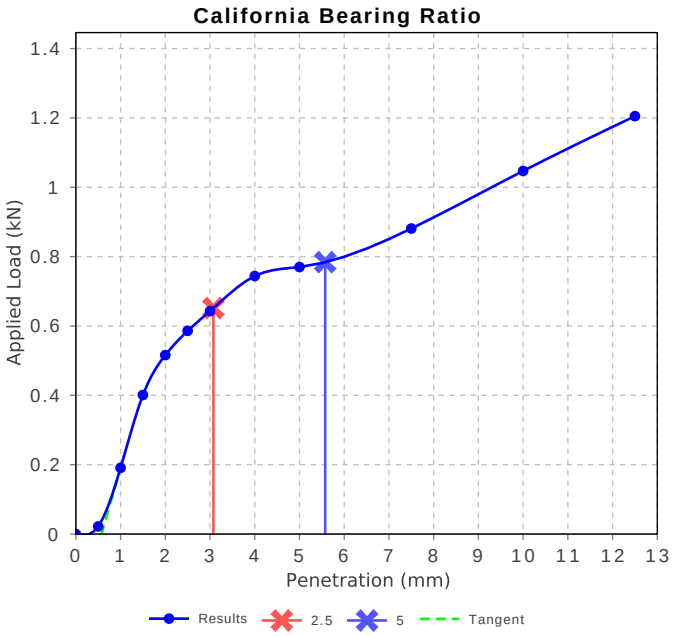
Approved Signatory: Hamish Barsing
Laboratory Supervisor
NATA Accredited Laboratory Number: 20634

Report Number: **P240648-1**
Issue Number: 1
Date Issued: 11/04/2024
Client: Core Geotech
31 Lilburn Street, Tallawong NSW 2762
Contact: Raj Singh, 0479 154 977
Project Number: P240648
Project Name: Proposed Alspec Industrial Business Park
Project Location: 221 - 227 & 289 - 311 Luddenham Road, Orchard Hills
Client Reference: CG24-0297
Work Request: 2853
Sample Number: 24-2853D
Date Sampled: 20/03/2024
Dates Tested: 21/03/2024 - 08/04/2024
Sampling Method: Sampled by Client
The results apply to the sample as received
Site Selection: Selected by Client
Sample Location: **TP22 , Depth: 0.8 - 1.0 m**
Material: Ruddy Silty Clay with Gravel
Material Source: In-Situ

California Bearing Ratio (AS 1289 6.1.1 & 2.1.1)		Min	Max
CBR taken at	2.5 mm		
CBR %	**5.0**		
Method of Compactive Effort	Standard		
Method used to Determine MDD	AS 1289 5.1.1 & 2.1.1		
Method used to Determine Plasticity	Tactile		
Maximum Dry Density (t/m^3)	1.65		
Optimum Moisture Content (%)	22.5		
Laboratory Density Ratio (%)	100.5		
Laboratory Moisture Ratio (%)	98.0		
Dry Density after Soaking (t/m^3)	1.62		
Field Moisture Content (%)	23.8		
Moisture Content at Placement (%)	22.3		
Moisture Content Top 30mm (%)	27.8		
Moisture Content Rest of Sample (%)	22.1		
Mass Surcharge (kg)	9.0kg		
Soaking Period (days)	4		
Curing Hours (h)	48.0		
Swell (%)	2.5		
Oversize Material (mm)	19		
Oversize Material Included	Excluded		
Oversize Material (%)	0.0		



Material Test Report

Benchmark Geotechnical Pty Ltd
Unit 3, 39 Eddie Road Minchinbury NSW 2770
Phone: 1300 919 000
Email: matt@bmgeo.com.au

Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Hamish Barsing
Laboratory Supervisor
NATA Accredited Laboratory Number: 20634

Report Number: **P240648-1**
Issue Number: 1
Date Issued: 11/04/2024
Client: Core Geotech
31 Lilburn Street, Tallawong NSW 2762
Contact: Raj Singh, 0479 154 977
Project Number: P240648
Project Name: Proposed Alspec Industrial Business Park
Project Location: 221 - 227 & 289 - 311 Luddenham Road, Orchard Hills
Client Reference: CG24-0297
Work Request: 2853
Sample Number: 24-2853H
Date Sampled: 20/03/2024
Dates Tested: 21/03/2024 - 03/04/2024
Sampling Method: Sampled by Client
The results apply to the sample as received
Site Selection: Selected by Client
Sample Location: **BH02 , Depth: 0.3 m**
Material Source: In-Situ

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	63		
Plastic Limit (%)	15		
Plasticity Index (%)	**48**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)	**20.0**		
Cracking Crumbling Curling	Curling		

Material Test Report

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Approved Signatory: Hamish Barsing
Laboratory Supervisor
NATA Accredited Laboratory Number: 20634

Report Number: **P240648-1**
Issue Number: 1
Date Issued: 11/04/2024
Client: Core Geotech
31 Lilburn Street, Tallawong NSW 2762
Contact: Raj Singh, 0479 154 977
Project Number: P240648
Project Name: Proposed Alspec Industrial Business Park
Project Location: 221 - 227 & 289 - 311 Luddenham Road, Orchard Hills
Client Reference: CG24-0297
Work Request: 2853
Sample Number: 24-2853J
Date Sampled: 20/03/2024
Dates Tested: 21/03/2024 - 02/04/2024
Sampling Method: Sampled by Client
The results apply to the sample as received
Site Selection: Selected by Client
Sample Location: **BH03 , Depth: 1.2 - 1.5 m**
Material: Mottled Brown White Silty Clay
Material Source: In-Situ

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	45		
Plastic Limit (%)	14		
Plasticity Index (%)	**31**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)	**15.0**		
Cracking Crumbling Curling	Curling		

Material Test Report

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Approved Signatory: Hamish Barsing
Laboratory Supervisor
NATA Accredited Laboratory Number: 20634

Report Number: **P240648-1**
Issue Number: 1
Date Issued: 11/04/2024
Client: Core Geotech
31 Lilburn Street, Tallawong NSW 2762
Contact: Raj Singh, 0479 154 977
Project Number: P240648
Project Name: Proposed Alspec Industrial Business Park
Project Location: 221 - 227 & 289 - 311 Luddenham Road, Orchard Hills
Client Reference: CG24-0297
Work Request: 2853
Sample Number: 24-2853L
Date Sampled: 20/03/2024
Dates Tested: 21/03/2024 - 03/04/2024
Sampling Method: Sampled by Client
The results apply to the sample as received
Site Selection: Selected by Client
Sample Location: **BH09 , Depth: 1.3 - 1.5 m**
Material: Brown Silty Clay
Material Source: In-Situ

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	50		
Plastic Limit (%)	14		
Plasticity Index (%)	**36**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)	**16.5**		
Cracking Crumbling Curling	Curling		

Material Test Report

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Approved Signatory: Hamish Barsing
Laboratory Supervisor
NATA Accredited Laboratory Number: 20634

Report Number: **P240648-1**
Issue Number: 1
Date Issued: 11/04/2024
Client: Core Geotech
31 Lilburn Street, Tallawong NSW 2762
Contact: Raj Singh, 0479 154 977
Project Number: P240648
Project Name: Proposed Alspec Industrial Business Park
Project Location: 221 - 227 & 289 - 311 Luddenham Road, Orchard Hills
Client Reference: CG24-0297
Work Request: 2853
Sample Number: 24-2853M
Date Sampled: 20/03/2024
Dates Tested: 21/03/2024 - 03/04/2024
Sampling Method: Sampled by Client
The results apply to the sample as received
Site Selection: Selected by Client
Sample Location: **BH10 , Depth: 1.6 - 1.8 m**
Material: Mottled Brown White Silty Clay
Material Source: In-Situ

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	69		
Plastic Limit (%)	18		
Plasticity Index (%)	**51**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)	**18.5**		
Cracking Crumbling Curling	Curling		

Material Test Report

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Approved Signatory: Hamish Barsing
Laboratory Supervisor
NATA Accredited Laboratory Number: 20634

Report Number: **P240648-1**
Issue Number: 1
Date Issued: 11/04/2024
Client: Core Geotech
31 Lilburn Street, Tallawong NSW 2762
Contact: Raj Singh, 0479 154 977
Project Number: P240648
Project Name: Proposed Alspec Industrial Business Park
Project Location: 221 - 227 & 289 - 311 Luddenham Road, Orchard Hills
Client Reference: CG24-0297
Work Request: 2853
Sample Number: 24-2853N
Date Sampled: 20/03/2024
Dates Tested: 21/03/2024 - 02/04/2024
Sampling Method: Sampled by Client
The results apply to the sample as received
Site Selection: Selected by Client
Sample Location: **BH11 , Depth: 2.0 - 2.5 m**
Material: Mottled Ruddy White-Brown Silty Clay
Material Source: In-Situ

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	70		
Plastic Limit (%)	17		
Plasticity Index (%)	**53**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)	**20.0**		
Cracking Crumbling Curling	Curling		

Material Test Report

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Approved Signatory: Hamish Barsing
Laboratory Supervisor
NATA Accredited Laboratory Number: 20634

Report Number: **P240648-1**
Issue Number: 1
Date Issued: 11/04/2024
Client: Core Geotech
31 Lilburn Street, Tallawong NSW 2762
Contact: Raj Singh, 0479 154 977
Project Number: P240648
Project Name: Proposed Alspec Industrial Business Park
Project Location: 221 - 227 & 289 - 311 Luddenham Road, Orchard Hills
Client Reference: CG24-0297
Work Request: 2853
Dates Tested: 21/03/2024 - 25/04/2024
Location: 221-226 & 289-311 Luddenham Road, Orchard Hills

Moisture Content AS 1289 2.1.1

Sample Number	Sample Location	Moisture Content (%)	Min	Max	Material
24-2853A	TP01 , Depth: 1.9 - 2.0 m	13.5 %	**	**	Light Brown Silty Clay with Gravel
24-2853B	TP12 , Depth: 1.5 - 1.7 m	18.9 %	**	**	Brown Silty Clay with Gravel
24-2853C	TP15 , Depth: 0.8 - 1.0 m	14.9 %	**	**	Light Brown Silty Clay
24-2853D	TP22 , Depth: 0.8 - 1.0 m	23.2 %	**	**	Ruddy Silty Clay with Gravel
24-2853I	BH02 , Depth: 1.7 - 1.9 m	25.0 %	**	**	Mottled Brown Grey Silty Clay
24-2853J	BH03 , Depth: 1.2 - 1.5 m	17.3 %	**	**	Mottled Brown White Silty Clay
24-2853K	BH07 , Depth: 1.3 - 1.5 m	21.3 %	**	**	Brown Silty Clay
24-2853L	BH09 , Depth: 1.3 - 1.5 m	18.4 %	**	**	Brown Silty Clay
24-2853M	BH10 , Depth: 1.6 - 1.8 m	22.4 %	**	**	Mottled Brown White Silty Clay
24-2853N	BH11 , Depth: 2.0 - 2.5 m	22.7 %	**	**	Mottled Ruddy White-Brown Silty Clay
24-2853O	BH12 , Depth: 1.0 - 1.4 m	15.7 %	**	**	Brown Silty Clay
24-2853P	BH12 , Depth: 2.5 - 2.8 m	16.9 %	**	**	Mottled Brown White Silty Clay
24-2853Q	BH12 , Depth: 3.5 m	19.0 %	**	**	Mottled Brown White Silty Clay

STS GEOTECHNICS PTY LTD
CONSULTING GEOTECHNICAL ENGINEERS

STS Geotechnics Pty Ltd
14/1 Cowpasture Place, Wetherill Park NSW 2164
Phone: (02)9756 2166 | Email: enquiries@stsgeo.com.au

Shrink Swell Index Report

Project: 221-227 & 289-311 LUDDENHAM RD, ORCHARD HILLS
Client: BENCHMARK GEOTECHNICAL PTY LTD
Address: Unit 3, 39 EDDIE ROAD, MINCHINBURY NSW, 2770
Test Method:

Project No.: 32660
Report No.: 24/0769
Report Date: 28/03 2024

Sampling Procedure: AS 1289.1.3.1 Clause 3.1.3.2 - Thin Walled Sampler

STS / Sample No.		8625D-L/24-2853R	8625D-L/24-2853S	8625D-L/24-2853T	8625D-L/24-2853U		
Sample Location		BH03	BH06	BH08	BH11		
Material Description		Silty Clay, grey yellow with sand	Gravelly Sandy Clay, grey yellow	Silty Clay, grey yellow with Sand	Silty Clay,orange grey brown		
Depth (m)		1.5 - 1.8	2.0 - 2.3	1.5 - 1.8	1.0 - 1.3		
Sample Date		20/03 /2024	20/03 /2024	20/03 /2024	20/03 /2024		
Shrink	Moisture Content (%)	18.6	16.1	17.4	21.5		
	Soil Crumbling	Nil	Nil	Nil	Nil		
	Extent of Cracking	Open Cracks	Open Cracks	Open Cracks	Nil		
	Strain (%)	0.8	1.2	1.8	4.8		
Swell	Moisture Content Initial (%)	22.0	17.3	17.4	17.8		
	Moisture Content Final (%)	24.3	17.2	19.0	26.8		
	Strain (%)	0.7	0.0	0.0	0.9		
Inert Inclusions (%)		<50	<40	<20	<20		
Shrink Swell Index (%)		**0.6**	**0.7**	**1.0**	**2.9**		

Remarks:

Approved Signatory.....

Technician: DL

Mrigesh Tamang - General Manager

Appendix E
Site Photography

Photo 1: Site view showing the area of Basin 1

Photo 2: Site view area of basin 3

Photo 3: Site view showing signs of soil erosion on the existing dam wall within basin 1

Photo 4: Site view showing the area of Basin 2

Photo 5: Site view showing a dam within the area of basin 2

Photo 6: Site view showing subsurface encountered during borehole drilling

DEVELOPMENT RISK MANAGEMENT

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