Geotechnical Investigation Report

Project

Ausgrid Underground Cable Project
Alexandria to Kingsford

Prepared for

Ausgrid

Date

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14777-GR-2-1

alliance
geotechnical & environmental solutions

Alliance Geotechnical Pty Ltd

Address: 8-10 Welder Road
Seven Hills, NSW
Phone: 1800 288 188
Office Email: info@allgeo.com.au
Web: www.allgeo.com.au

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	Author	Author	Reviewer
Signature			
Name	Roni Marquez	Anurag Sobti	Lachlan Taylor
Title	Geotechnical Engineer	Senior Geotechnical Engineer	Principal Geotechnical Engineer

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1 INTRODUCTION

This report presents the findings of a geotechnical investigation carried out by Alliance Geotechnical Pty Ltd (Alliance) for Ausgrid (the Client) for the Ausgrid Underground Cable Project from Alexandria to Kingsford. The investigation was commissioned on 25 February 2022 by Matthew Faferko of Ausgrid. The geotechnical investigation was undertaken in accordance with Alliance's fee proposal Quote No. 14777, dated 14 March 2022.

Alliance has been supplied with the following documents to aid this geotechnical investigation:

- Request for Quotations, Underground Cable Geotechnical Investigations (prepared by: Ausgrid; Ref: 01 – A2K, W2SH _NS Cable Project, Dated: 25/02/22).
- Annexure A of the RFQ – A2K, W2SH & NS Cable Project – Geotechnical Investigation Requirements (WBS no. SJ-00234 and SH-10045, Dated 23/02/2022).
- Old Structural/Route Plans (prepared by: The Electricity Commission of New South Wales; Ref: G-300xxx; Dated: 14/6/1988).

Based on the provided documents and information received from the Client, it is understood that a geotechnical assessment is required to be carried out for a new underground 132kV ductline route that is extending from Alexandria to Kingsford. Alliance understands that the cable installation will involve trenching and Horizontal Direction Drill (HDD).

The objective of this Geotechnical Investigation Report is to address the subsurface conditions encountered, field and laboratory testing results, and provide comments and recommendations regarding:

- Existing subsurface profile and groundwater conditions including inflows.
- Advice on benching/shoring for excavation of the in-situ materials.
- Excavation conditions.
- Advice on Horizontal Direction Drilling (HDD).
- Thermal resistivity characteristics of the soil and rock.

2 PROPOSED DEVELOPMENT

Alliance understands that the proposed alignment consists of a new cable route that stretches from Beaconsfield Substation through Kingsford Substation. It is understood that the proposed alignment installation includes the following:

- The excavation of new single circuit cable trenches similar to trench section 'A2' (from Annexure A provided by the Client) for the installation of high-voltage cables.
- Standard depth of cover will vary from 750mm within a Council road up to 1.0m in a state classified road. Non-standard depths of cover may be required if underground obstructions are encountered which may vary from 500mm (with additional steel plate protection) to 2.5m.
- Horizontal Direction Drill (HDD) with depths anticipated to be between 3m and 6m below Bunnerong Road crossing, and a maximum of 10m below Gardeners Rd and Southern Cross Drive crossings. A single bore will be made between 650mm and 700mm in diameter with depth of cover varying between the send and receive holes.

Alliance understands that a geotechnical investigation is required to inform the expected underboring conditions, and subsurface parameters for which Ausgrid designers can use to determine the cable size, cable system design, and cable rating calculations.

3 SITE DESCRIPTION AND REGIONAL GEOLOGY

The proposed alignment has a general NW-SE orientation and spans from Beaconsfield Substation (DP90878) along Burrows Road in Alexandria through to Kingsford Substation (DP1114019) on Anderson Street in Kingsford, in the City of Sydney and City of Randwick local government areas (LGA), respectively. The site location relative to the surrounding features is shown in Figure 1 below. The alignment primarily extends across urban areas, requiring underbores across major road crossings. The proposed alignment crosses over Alexandra Canal.

The proposed alignment traverses varying topographies, ascending and descending across its entirety. Based on the survey data gathered from the GNSS Rover, site elevations range between Reduced Level (RL) 2.59m and 26.57m Australian Height Datum (AHD).

Figure 1 - The Alignment Location & Aerial Image (extracted from MinView)

The New South Wales Seamless Geology dataset, version 2.1 [Digital Dataset] published by the Geological Survey of New South Wales indicates that the western extend of the site is underlain by Estuarine deposits which may contain *fine- to medium-grained lithic-carbonate-quartz sand (marine-deposited), silt, clay, organic mud, peat, gravel, and shell material.* The central to eastern extend of the site is underlain by Coastal deposits – dune facies characterised by *marine-deposited and aeolian-reworked coastal sand dunes.*

The site overlaying NSW Seamless Geology map with 10m contours are presented in Figure 2 below.

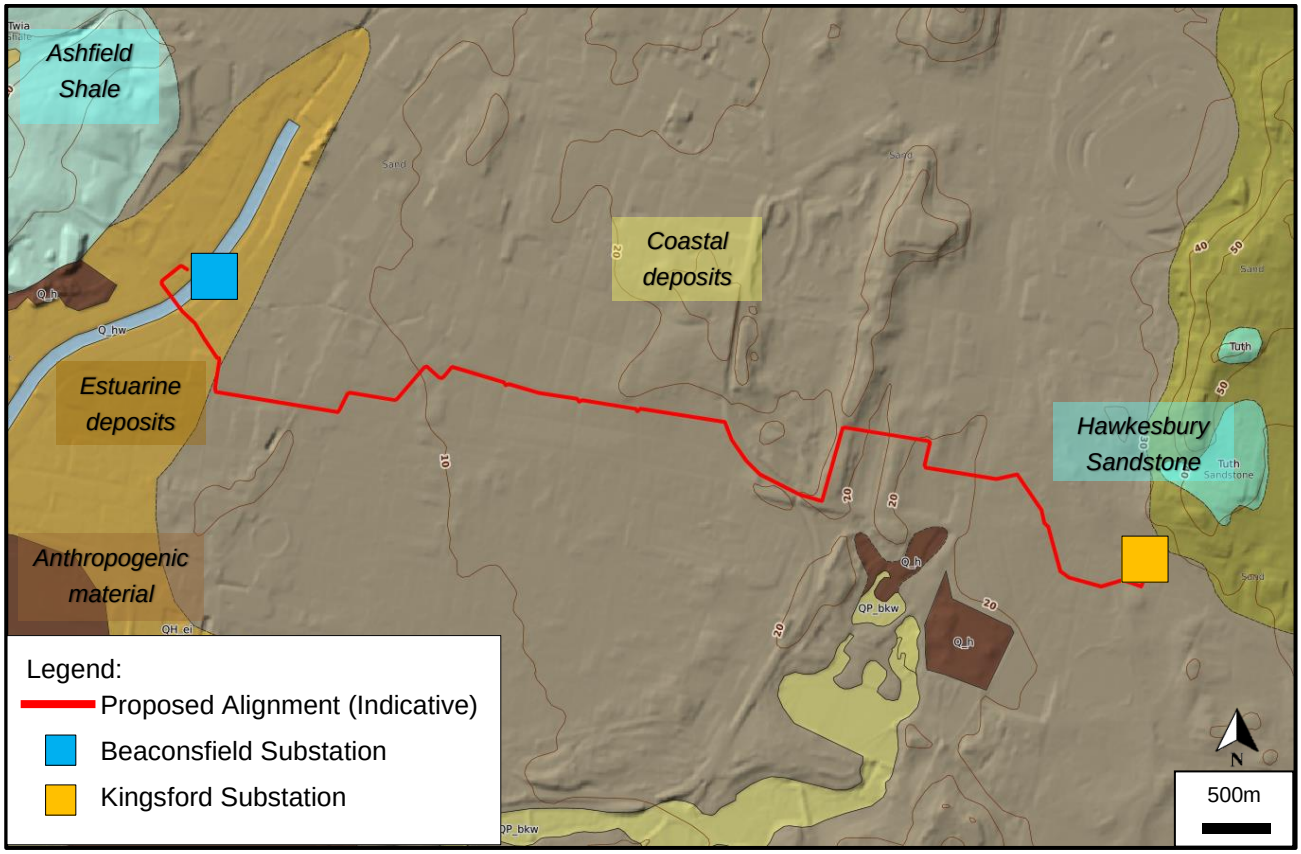

Figure 2 - The A2K Alignment with NSW Seamless Geology and 10m Contours

4 FIELDWORK

The geotechnical investigation was undertaken as per the details outlined in the geotechnical scope provided by the client. The methods and results are discussed in detail in the following sections of the report.

4.1 Methods

The geotechnical investigation was undertaken by Alliance between 23 May and 13 July 2022. Selected site photographs taken during the fieldwork are presented in Appendix A.

Alliance undertook the drilling of twenty (20) boreholes and dynamic cone penetrometer testing aligned to the geotechnical scope. Borehole locations were cleared of underground services by an accredited service locator prior to drilling. Initial borehole locations were provided by the client, and final locations were confirmed on site before drilling/testing.

During the field investigation, the boreholes were drilled using a ute-mounted drilling rig operated by an Alliance engineering geologist and a track-mounted drilling rig operated by BG Drilling and Stratacore Drilling. The boreholes were advanced in the overburden soils using 110mm diameter solid flight augers fitted with a tungsten carbide (TC)-bit.

Standard Penetration Tests (SPT) were undertaken at 1.5m intervals starting at 1.5m bgl to assess the soil consistency at depth. Dynamic Cone Penetrometer Tests (DCP) were undertaken adjacent to the borehole locations to a target depth of 1.5m or prior refusal to determine the near-surface soil consistency.

As an additional requirement for the Alexandria to Kingsford cable project, groundwater levels at borehole BH01 on Burrows Road were recorded at high tide.

The encountered soil profiles were documented by an experienced geotechnical engineer from Alliance generally in accordance with AS 1726 - 2017 Geotechnical Site Investigation. Recovered samples were transported to Alliance's NATA accredited materials testing laboratory and a subcontracted NATA accredited testing laboratory for further testing and storage.

A summary of the geotechnical site investigation scope at each site and approximate borehole coordinates are presented in Table 1.

Table 1 - Summary of the Geotechnical Site Investigation Scope of Work

ID	Easting (m MGA20)	Northing (m MGA20)	RLs m AHD	Termination Depth	
				m bgl	m AHD
A2K-BH01	332340	6245731	2.59	3.50	-0.91
A2K-BH02	332422	6245429	4.95	2.00	2.95
A2K-BH05	333222	6245183	11.27	2.00	9.27
A2K-BH06	333388	6245302	12.05	2.00	10.05
A2K-BH07	333746	6245253	11.59	2.00	9.59
A2K-BH08	334053	6245196	15.63	2.00	13.63
A2K-BH09	334381	6245150	18.12	2.00	16.12

A2K-BH10	334635	6245074	18.43	2.00	16.43
A2K-BH11	334784	6244886	20.35	9.00	11.35
A2K-BH12	334837	6244837	22.98	10.00	12.98
A2K-BH13	335044	6244806	26.57	10.00	16.57
A2K-BH14	335186	6245092	24.28	2.00	22.28
A2K-BH15	335474	6244982	20.26	2.00	18.26
A2K-BH16	335690	6244908	20.18	2.00	18.18
A2K-BH17	335962	6244745	23.64	2.00	21.64
A2K-BH18	335995	6244684	23.33	2.00	21.33
A2K-BH19	336072	6244495	21.92	2.00	19.92
A2K-BH20	336256	6244469	23.82	6.45	17.37
A2K-BH21	336320	6244478	23.59	6.45	17.14
A2K-BH22	334939	6244841	22.62	10.00	12.62

The approximate borehole locations are indicated on the Geotechnical Investigation Plan (Drawing 14777-GR-1-2-A) in Appendix B. The coordinate values provided should be used for reference only and a registered surveyor must be engaged for design and/or construction purposes.

On completion, the boreholes were backfilled with drilling spoils and made flush with the surrounding surface. A dilapidation survey was carried out 3 weeks after the completion of the fieldworks to ensure the borehole locations were reinstated as close to its original condition as possible.

4.2 Results

4.2.1 Soils

The borehole logs with DCP test results can be found in Appendix C. These results should be read in conjunction with the attached Explanatory Note which explains the terms, abbreviations, and symbols used, together with the interpretation and limitation of the logging procedure.

A summary of the generalised subsurface conditions encountered in the boreholes has been provided in Table 2, Table 3, Table 4 and Table 5 below. For ease of reference, the subsurface profiles were systematically grouped into three according to the borehole location proximity and method of proposed installation (open trench or HDD).

Table 2 - Summary of the Subsurface Profiles Encountered (A2K-BH01 – A2K-BH10)

Ground Profile	Consistency/ Density	Depth to top of unit (m)	Thickness (m)
Pavement Asphaltic Concrete/Concrete	-	0	0 – 0.12
Fill Sandy GRAVEL/Gravelly SAND/ SAND/ Silty SAND/Clayey SAND	-	0 – 0.12	0.30 – 1.60
Coastal Deposits Clayey SAND/Silty SAND	Very Loose to Loose	0.70 – 1.90	not penetrated
Coastal Deposits SAND	Medium Dense to Dense	0.40 – 0.50	0.95 – not penetrated
Coastal Deposits Sandy CLAY	Stiff	1.40	0.50
Note: **The depths and unit thicknesses are based on the information from the test locations only and do not necessarily represent the maximum and minimum values across the site.**			

The site subsurface profile for boreholes A2K-BH01 to A2K-BH10 generally comprises an Asphaltic Concrete pavement of thickness varying from 0.05m to 0.12m, which is underlain by a layer of uncontrolled fill (up to 0.7m thick) consisting of well graded Gravelly Sand (road base) and/or Sandy Gravel (ballast) except in borehole A2K-BH02, which consists of 1.6m thick fill layer with organics and foreign materials. Fill is underlain by very loose to loose granular coastal deposits. Medium dense to dense granular coastal deposits were also encountered at some locations. Still sandy clay (0.5m thick) layer was encountered at A2K-BH07.

Table 3 - Summary of the Subsurface Profiles Encountered (A2K-BH11 – A2K-BH13, A2K-BH22)

Ground Profile	Consistency/ Density	Depth to top of unit (m)	Thickness (m)
Pavement Asphaltic Concrete/Concrete	-	0	0.15
Fill Silty SAND/SAND/Sandy GRAVEL	-	0 – 0.15	0.20 – 1.70
Coastal Deposits SAND	Very Loose	0.50 – 1.70	1.50 – 2.80
Coastal Deposits SAND	Loose to Medium Dense	0.80– 4.50	not penetrated
Note: **The depths and unit thicknesses are based on the information from the test locations only and do not necessarily represent the maximum and minimum values across the site.**			

The site subsurface profile for boreholes A2K-BH11 to A2K-BH-13 and A2K-BH22 generally comprises of an Asphaltic Concrete pavement (0.15m thick) at A2K-BH13 and topsoil layer at other boreholes. The pavement is underlain by a layer of controlled fill (0.65m thick) consisting of sandy gravel and sand. Topsoil layer at other boreholes is underlain by uncontrolled fill (up to 1.7m thick) consisting of sand and silty sand. The fill layer is underlain by loose to medium dense granular coastal deposits. Very loose granular coastal deposits were also encountered at some borehole locations.

Table 4 - Summary of the Subsurface Profiles Encountered (A2K-BH14 to A2K-BH19)

Ground Profile	Consistency/ Density	Depth to top of unit (m)	Thickness (m)
Pavement Asphaltic Concrete/Concrete	-	0	0.05 – 0.07
Fill Sandy GRAVEL/Gravelly SAND	-	0.05 – 0.07	0.27 – 1.15
Coastal Deposits SAND	Very Loose to Loose	0.40 – 1.65	not penetrated
Coastal Deposits SAND/Silty SAND/Clayey SAND	Medium Dense to Dense	0.30 – 6.0	0.90 – not penetrated
Coastal Deposits SAND	Very Dense	0.40	0.10
Note: **The depths and unit thicknesses are based on the information from the test locations only and do not necessarily represent the maximum and minimum values across the site.**			

The site subsurface profile for boreholes A2K-BH14 to A2K-BH-19 generally comprises an Asphaltic Concrete pavement of thickness varying from 0.05 to 0.08m. The pavement is underlain by a layer of controlled fill (up to 1.15m thick) consisting of well graded Gravelly Sand (road base) and/or Sandy Gravel (ballast). The fill layer is generally underlain by a layer of medium dense to dense granular coastal deposits which are underlain by loose granular coastal deposits. Very loose to loose sand was encountered at A2K-BH19.

Table 5 Summary of the Subsurface Profiles Encountered (A2K-BH20 and A2K-BH21)

Ground Profile	Consistency/ Density	Depth to top of unit (m)	Thickness (m)
Pavement Asphaltic Concrete/Concrete	-	0	0.08
Fill Sandy GRAVEL/Gravelly SAND	-	0.08	0.27 – 0.82
Coastal Deposits Silty SAND/ SAND	Loose to Medium Dense	0.35 – 0.90	4.0 – 5.20
Coastal Deposits SAND	Dense to Very Dense	4.90 – 5.50	not penetrated
Note: **The depths and unit thicknesses are based on the information from the test locations only and do not necessarily represent the maximum and minimum values across the site.**			

The site subsurface profile for boreholes A2K-BH20 to A2K-BH-21 generally comprises an Asphaltic Concrete pavement (0.08m thick). The pavement is underlain by a layer of controlled fill (up to 0.82m thick) consisting of well graded Gravelly Sand (road base) and/or Sandy Gravel (ballast). The fill layer is generally underlain by a layer of loose to medium dense granular coastal deposits which are underlain by dense to very dense granular coastal deposits.

4.2.2 Groundwater

Groundwater was encountered in boreholes at depths shown in Table 6 during the geotechnical investigation.

Table 6 - Groundwater Levels Encountered at Each Borehole

Borehole	Existing Ground Surface Level (m AHD)	Groundwater level	
		m bgl	m AHD
A2K-BH01	2.59	0.9	1.69
A2K-BH02	4.95	1.8	3.15
A2K-BH07	11.59	0.9	10.69
A2K-BH11	20.35	2.8	17.55
A2K-BH12	22.98	6.2	16.78
A2K-BH20	23.82	5.0	18.82
A2K-BH21	23.59	4.7	18.89
A2K-BH22	22.62	5.0	17.62

It should be noted that groundwater conditions are subject to seasonal variations and major weather events (i.e. prolonged rainfall). It is noted that the groundwater observation may have been made before water levels had stabilised. No long-term groundwater monitoring was carried out.

5 LABORATORY TESTING

5.1 Classification Testing

Laboratory tests were carried out on selected soil samples collected from the boreholes during the site investigation. The following tests were carried out on selected soil samples in Alliance's NATA-accredited soil laboratory:

- Particle Size Distribution
- Moisture Content

The laboratory tests certificates are provided in Appendix D.

5.1.1 Moisture Content and Particle Size Distribution

Particle Size Distribution and Atterberg Limit tests were conducted on selected samples in accordance with AS1289 by Alliance NATA accredited laboratory. The results are summarised in Table 7 below and the detailed results are presented in Appendix D:

Table 7 - Summary of Particle Size Distribution

Sample Source	Soil Description	Moisture Content (%)	Particle Size Distribution Passing (%)	
			75 μm	2.36 mm
A2K-BH01 2.6 – 3.0m	Clayey SAND	46.1	29	97
A2K-BH02 0.8 – 1.0m	Clayey SAND	14.6	22	78
A2K-BH05 0.8 – 1.0m	SAND	2.9	6	99
A2K-BH06 0.6 – 0.8m	SAND	9.7	6	100
A2K-BH07 1.6 – 1.8m	Sandy CLAY	71.0	36	99
A2K-BH08 0.6 – 0.8m	SAND	2.2	1	100
A2K-BH09 0.9 – 1.2m	SAND	8.0	2	100
A2K-BH10 0.1 – 0.5m	SAND	13.2	5	99
A2K-BH11 3.9 – 4.2m	SAND	4.4	2	100
A2K-BH12 4.2 – 4.5m	SAND	-	4	100
A2K-BH13 4.5 – 5.0m	SAND	1.1	1	100

A2K-BH14 0.7 – 0.9m	SAND	2.1	9	100
A2K-BH15 1.5 – 1.6m	SAND	4.9	1	100
A2K-BH16 1.2 – 1.5m	SAND	3.6	1	100
A2K-BH17 1.2 – 1.4m	SAND	3.3	2	100
A2K-BH18 1.6 – 2.0m	SAND	3.2	1	100
A2K-BH19 0.6 – 0.8m	SAND	5.8	5	100
A2K-BH20 4.0 – 5.5m	SAND	1.5	3	100
A2K-BH21 4.9 – 5.2m	SAND	4.2	13	84
A2K-BH22 4.0 – 4.5m	SAND	-	5	100

5.2 Thermal Resistivity Testing

Thermal Resistivity (TR) were carried out on selected bulk samples. The laboratory test certificates are presented in Appendix D. A summary of the TR test results is summarised in Table 8 below:

Table 8 - Summary of Thermal Resistivity Testing Results

Test Location	Depth below ESL (m)	Material Description	Field Moisture Content (%)	Field Moisture Thermal Resistivity (mK/W)	0% Moisture Thermal Resistivity (mK/W)	3% Moisture Thermal Resistivity (mK/W)
A2K-BH01	0.9 – 1.2	Sandy CLAY	24.9	0.53	2.50	2.02
A2K-BH01	2.9 – 3.2	Clayey SAND	29.6	0.60	2.38	2.02
A2K-BH02	0.9 – 1.2	Clayey Gravelly SAND	16.1	0.51	1.22	0.95
A2K-BH05	0.9 – 1.2	SAND	2.9	1.15	2.22	1.13*
A2K-BH06	0.9 – 1.2	SAND	3.4	1.62	3.03	1.71
A2K-BH07	0.9 – 1.2	SAND	19.1	0.49	2.04	1.61
A2K-BH08	0.9 – 1.2	SAND	2.4	1.00	2.22	0.81*
A2K-BH09	0.9 – 1.2	SAND	2.4	2.12	3.13	1.79*
A2K-BH10	0.9 – 1.2	SAND	6.6	1.01	2.50	1.49

A2K-BH11	0.9 – 1.2	Silty SAND	6.8	0.82	1.79	1.20
A2K-BH11	2.9 – 3.2	SAND	22.4	0.49	1.56	1.31
A2K-BH11	4.9 – 5.2	SAND	20.9	0.68	1.85	1.59
A2K-BH12	0.9 – 1.2	SAND	5.0	0.85	2.00	1.19
A2K-BH12	3.9 – 4.2	SAND	4.4	1.15	2.56	1.43
A2K-BH12	5.9 – 6.2	SAND	13.1	0.69	1.79	1.30
A2K-BH12	7.9 – 8.2	SAND	17.4	0.56	1.82	1.48
A2K-BH12	9.9 – 10.0	SAND	20.7	0.47	2.00	1.61
A2K-BH13	0.9 – 1.2	SAND	2.2	1.72	3.23	1.48*
A2K-BH13	2.5 – 3.2	SAND	1.2	1.69	3.03	1.47*
A2K-BH13	4.5 – 5.0	SAND	1.1	1.67	3.23	0.72*
A2K-BH13	6.9 – 7.2	SAND	1.1	1.85	2.50	0.90*
A2K-BH13	8.9 – 9.2	SAND	5.4	0.78	2.58	0.96
A2K-BH14	0.9 – 1.2	SAND	1.4	1.28	2.27	0.22*
A2K-BH15	0.9 – 1.2	SAND	0.7	3.57	4.90	0.35*
A2K-BH16	0.9 – 1.2	SAND	2.6	1.72	3.03	1.60*
A2K-BH17	0.9 – 1.2	SAND	3.3	0.95	2.13	1.02
A2K-BH18	0.9 – 1.2	Gravelly SAND	9.4	0.74	1.69	0.95
A2K-BH19	0.9 – 1.2	SAND	3.0	1.60	2.94	1.60*
A2K-BH20	0.9 – 1.2	SAND	1.3	1.22	3.03	0.55*
A2K-BH20	2.8 – 3.2	SAND	1.7	1.75	3.13	1.49*
A2K-BH20	4.0 – 4.5	SAND	1.5	1.45	2.56	0.06*
A2K-BH20	5.5 – 6.0	SAND	8.9	0.49	1.96	1.24
A2K-BH21	0.9 – 1.2	SAND	1.3	1.82	2.86	1.75*

A2K-BH21	2.9 – 3.3	SAND	2.2	1.40	2.27	1.13*
A2K-BH21	4.9 – 5.2	SAND	4.2	0.65	1.75	1.07
A2K-BH22	0.9 – 1.2	Silty SAND	8.7	0.58	1.89	1.17
A2K-BH22	2.9 – 3.2	SAND	6.5	0.79	2.00	1.13
A2K-BH22	4.9 – 5.2	SAND	5.6	0.87	2.08	1.26
A2K-BH22	6.9 – 7.2	SAND	20.5	0.90	2.04	1.66
A2K-BH22	8.9 – 9.2	SAND	19.2	0.47	1.75	1.41
*Values have been extrapolated as insitu moisture content was <3%.						

6 COMMENTS AND RECOMMENDATIONS

6.1 Open Trench Excavation

6.1.1 Groundwater conditions including inflows

Most of the cable trenches will be constructed in granular fill and coastal deposit sands. As such significant groundwater management of open excavations is not anticipated, beyond the use of sump pump dewatering with potentially some exception in sections of the alignment where the groundwater level may be encountered above the base of the proposed trench excavations, where sheet piles (or other cut-off wall options) might be required to manage groundwater inflow into the trench.

Significant groundwater inflow may occur where the trench excavations intersect with granular fill material surrounding or at the surface of existing services. Groundwater encountered in such circumstances may be contaminated and require specialist treatment for disposal.

Optimal solutions (gravity drainage controls, cut-off walls, active dewatering) will depend on the nature and duration of groundwater control required. Equipment such as temporary sump pumps should be made available during construction to manage potential groundwater ingress and similarly provision should be made for additional shoring that may be required due to potential groundwater induced instability.

6.1.2 Excavation conditions

The expected depth of excavation for trenched sections of the alignment will be between 1.2 to 3m below the existing road surface level. The subsurface profiles prepared in Section 4.2.1 indicate that the proposed open trench excavations are anticipated through road pavement, moderately to well compacted fill and coastal deposit sands.

Excavation through road pavement, fill, coastal deposit sands is expected to be readily achievable using conventional earthwork equipment such as a tracked excavator with tiger-tooth bucket. The construction related vibrations are expected to be negligible. Generally, the peak particle velocity during any demolition, excavation, and construction should be limited to 5mm/s.

A dilapidation survey of structures within the zone of influence which is generally a horizontal distance of 2H from the edge of the excavation with H being the depth of the excavation is recommended to be undertaken by a structural engineer prior to the commencement of any site excavations. The report should include precise measurements of the existing defects and cracks presented with relevant photos. Impact of the proposed excavation on existing utilities is not covered in this geotechnical report but should be taken into consideration.

6.1.3 Impact on utilities in the area

In areas where the open trench will intersect or run adjacent to sensitive utilities such as gas or other fuel pipes, the utility pipe should be service located and, where necessary should undergo non-destructive digging to expose the utilities before excavating the trenches. The use of sheet piles for trench support may be required to reduce the risk of ground movements affecting movement sensitive existing utilities.

6.1.4 Very loose to loose sands

It is understood that the proposed cables will be installed within conduits, which are encased with concrete. The conduit joints are generally sensitive to movement therefore settlements can lead to issues. Based on the provided alignment invert levels and the ground investigation findings, it is anticipated that some trenched cables will be laid on very loose to loose sands that may not provide adequate bearing pressure for support of the conduits. It is recommended that the localised very loose to loose sand areas should be over excavated, compacted and replaced with engineered fill prior to laying of the cables. If the extent of very loose to loose sands is greater than the length of the conduits thereby affecting multiple joints, it may lead to movements which are greater than the tolerance of the conduits. In this case, a pier and beam type of footing may need to be considered and further investigations may be required to understand the extent of the very loose to loose sand layer. As the cable invert levels are determined at detailed design stage, consideration should be given to the presence of these soil conditions.

6.1.5 Temporary support of excavations

Given that the proposed trenched sections of the cabling alignment runs along existing roads, temporary batters are considered unfeasible for the trench excavations and the excavation should be supported by a properly designed shoring system. Shoring systems can take the form of sheet piles, trench boxes, time shorting or a combination of them. Any temporary earth retaining structures should be designed by a structural engineer in accordance with AS4678-2002 Earth Retaining Structures. They should withstand the applied lateral pressures exerted by soil and hydrostatic pressures applied by groundwater, together with any existing or live surcharge loads imposed within the zone of influence which is generally a horizontal distance of 2H from the edge of the excavation with H being the depth of the excavation. The selection of an appropriate shoring system is a design matter which needs to consider several geotechnical and non-geotechnical factors.

For the design of retaining structures where some lateral movement is acceptable, an ‘active’ lateral earth pressure coefficient (K_a) is recommended. If it is critical to limit horizontal deformations, the ‘at rest’ (K_0) earth pressure coefficient is recommended. Note that designing the wall using K_0 does not in itself limit deformations, which are highly dependent on other design elements as well as construction sequence. Based on the findings of the geotechnical investigation, retaining walls or temporary shoring can be designed using the recommended geotechnical design parameters provided in Table 9 below.

Table 9 Typical Material Properties for Retention Design

Geotechnical Units	c′ (kPa)	∅′ (degrees)	γ (kN/m³)	K_a	K_p	K_o	E′ (MPa)	ϑ'
Fill Sandy GRAVEL/Gravelly SAND (uncontrolled)	0	28	17	0.36	2.77	0.53	4	0.3
Coastal Deposits Clayey SAND/Silty SAND/ SAND (very loose to loose)	0	26	17	0.39	2.56	0.56	7	0.3
Coastal Deposits SAND/Silty SAND/Clayey SAND (medium dense to dense)	0	32	20	0.31	3.25	0.47	50	0.3
Coastal Deposits SAND (very dense)	0	38	21	0.29	4.20	0.38	100	0.3
Coastal Deposits Sandy CLAY (stiff)	5	26	18	0.39	2.56	0.56	15	0.3

Legend:
∅′ : Effective Friction Angle
c': Effective Cohesion
γ: Bulk Unit Weight
K_a: Active earth pressure
K_o: Earth pressure at rest
Kp: Passive earth pressure
E': Elasticity Modulus
ϑ': Poisson's Ratio

An assessment of the stability of an excavation during construction can be provided by Alliance if requested. We recommend this particularly if any part of the excavation face is to be unsupported.

6.1.6 Foundations

The existing fill material is not considered to be a suitable foundation strata and joint bays (precast/ insitu) should be taken to found on the underlying natural clays. The proposed structure may be supported at the ground level by shallow pad or strip footings founded on firm to stiff clay or medium dense to dense sand. Design parameters for shallow footing design in residual clay are presented in Table 10.

Table 10 Preliminary Geotechnical Design Parameters for Shallow Foundations

Description	Allowable Bearing Pressure (kPa)	Youngs Modulus (Mpa)
Coastal Deposits Clayey SAND/Silty SAND/ SAND (very loose to loose)	120*	7
Coastal Deposits SAND/Silty SAND/Clayey SAND (medium dense to dense)	300*	50
Coastal Deposits SAND (very dense)	770*	100

Coastal Deposits Sandy CLAY (stiff)	180*	15
*** Based on a 1.0m square pad footing, 1.0m deep. Separate settlement assessment should be undertaken to ensure that the footing settlements are within the tolerable range.**		

6.2 Trenchless Crossings

Based on the information provided an underbore using Horizontal Directional Drilling (HDD) techniques will be carried out across Southern Cross Drive and Bunnerong Road. It is anticipated that the depth will be between 3-6m below Bunnerong Road crossing, and a maximum of 10m below Gardeners Rd and Southern Cross Drive crossings.

6.2.1 Excavation conditions

Based on the information provided, and the subsurface profiles prepared in Table 3 and Table 5 indicate that the proposed HDDs across Southern Cross Drive and Bunnerong Road are anticipated to be installed through fill and sandy coastal deposits.

6.2.2 Groundwater conditions

Groundwater was encountered during the site investigations in the HDD section across Southern Cross Drive and Bunnerong Road. It should be noted that groundwater conditions are subject to seasonal variations and major weather events (i.e. prolonged rainfall). It is noted that the groundwater observation may have been made before water levels had stabilised. No long-term groundwater monitoring was carried out.

6.2.3 Impact on utilities and structures in the area

Consideration needs to be given to any existing utilities that the proposed underbore may cross during construction to ensure that the underbore construction doesn't intersect with any existing utility trenches, thereby causing damage to the utility.

An impact assessment including a include the review of accurate survey data including distances to the existing utilities should be carried out. A settlement assessment of nearby structures and utilities is recommended to be undertaken to understand the impact of the proposed HDD on Southern Cross Drive and Bunnerong Road and nearby structures. A ground deformation monitoring plan may also be required to monitor the impact of the HDD on existing utilities during construction.

6.2.4 Thermal resistivity characteristics of the soil and rock

Thermal resistivity at 0% moisture ranges for subsurface materials based on the soil laboratory test results are presented in Table 11.

Table 11 Thermal resistivity range for subsurface materials

Material	0% Moisture Thermal Resistivity (mK/W)
Fill **Sandy GRAVEL/Gravelly SAND/ SAND/Silty SAND/Clayey SAND**	1.22 – 2.13
Coastal Deposits **SAND/Silty SAND/Clayey SAND**	1.22 – 4.90

7 LIMITATIONS

Alliance Geotechnical Pty Ltd (Alliance) has prepared this report for the Ausgrid Underground Cable Project from Alexandria to Kingsford in accordance with Alliance's fee proposal and Terms of Engagement. This geotechnical report has been prepared for Ausgrid for this project and for the purposes outlined in this report. This report cannot be relied upon for other projects, other parties on this site or any other site. The comments and recommendations provided in this report are based on the assumption that the geotechnical recommendations contained in this report will be fully complied with during the design and construction of the proposed site development.

The borehole investigation and dynamic cone penetrometer test results provided in this report are indicative of the subsurface conditions at the site only at the specific sampling and testing locations, and to the depths drilled at the time of the investigation. Subsurface conditions can change significantly due to geological and human processes. Where variations in conditions are encountered further geotechnical advice should be sought from Alliance.

APPENDIX A – Site Photograph

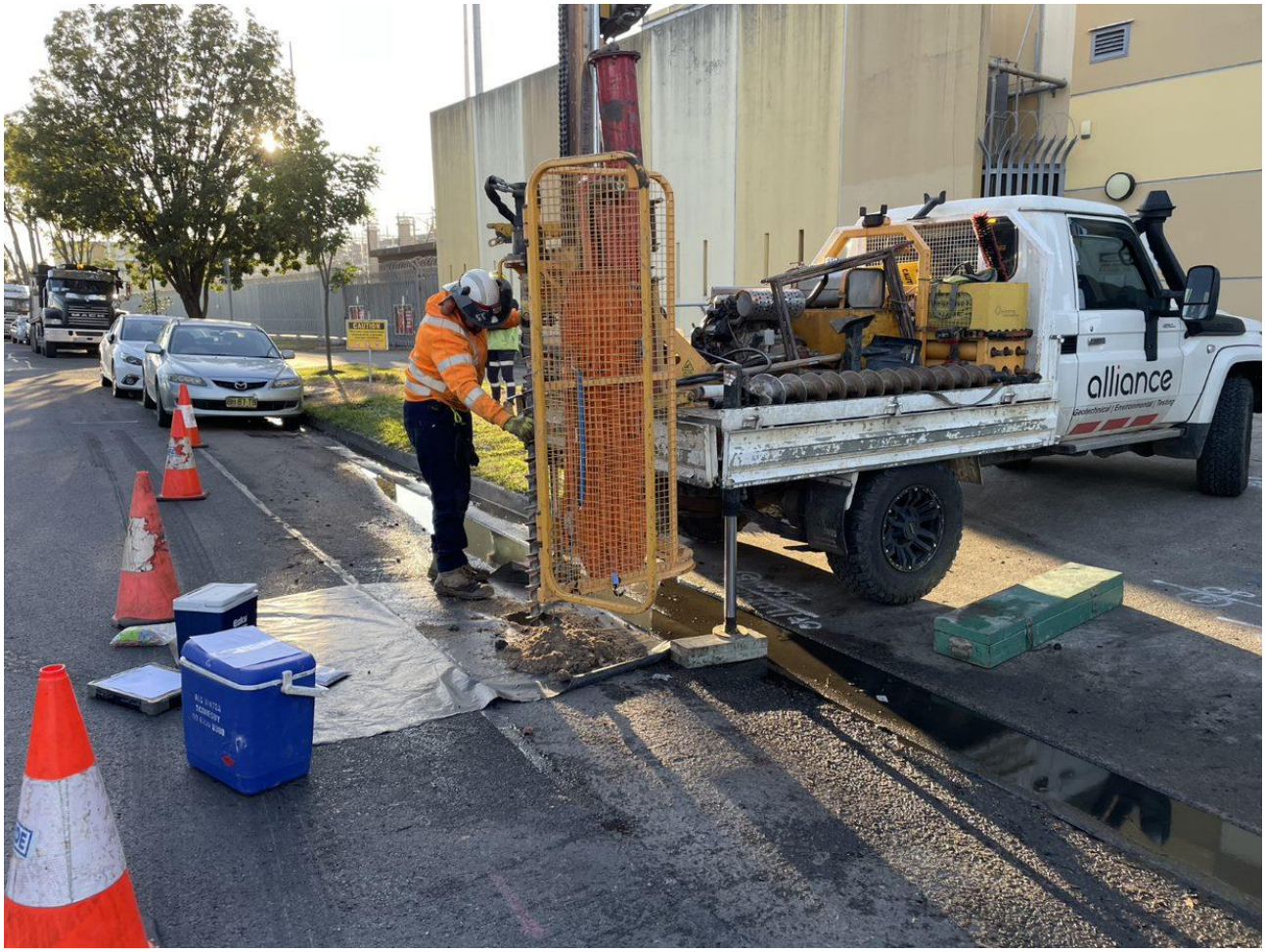

Photo 1 – Borehole A2K-BH01 drill rig set up

Photo 2 – SPT Split Spoon sample retrieved from borehole A2K-BH13 at 6.0m depth bgl

APPENDIX B – Geotechnical Investigation Plan (Drawing 14777-GR-1-2-A)

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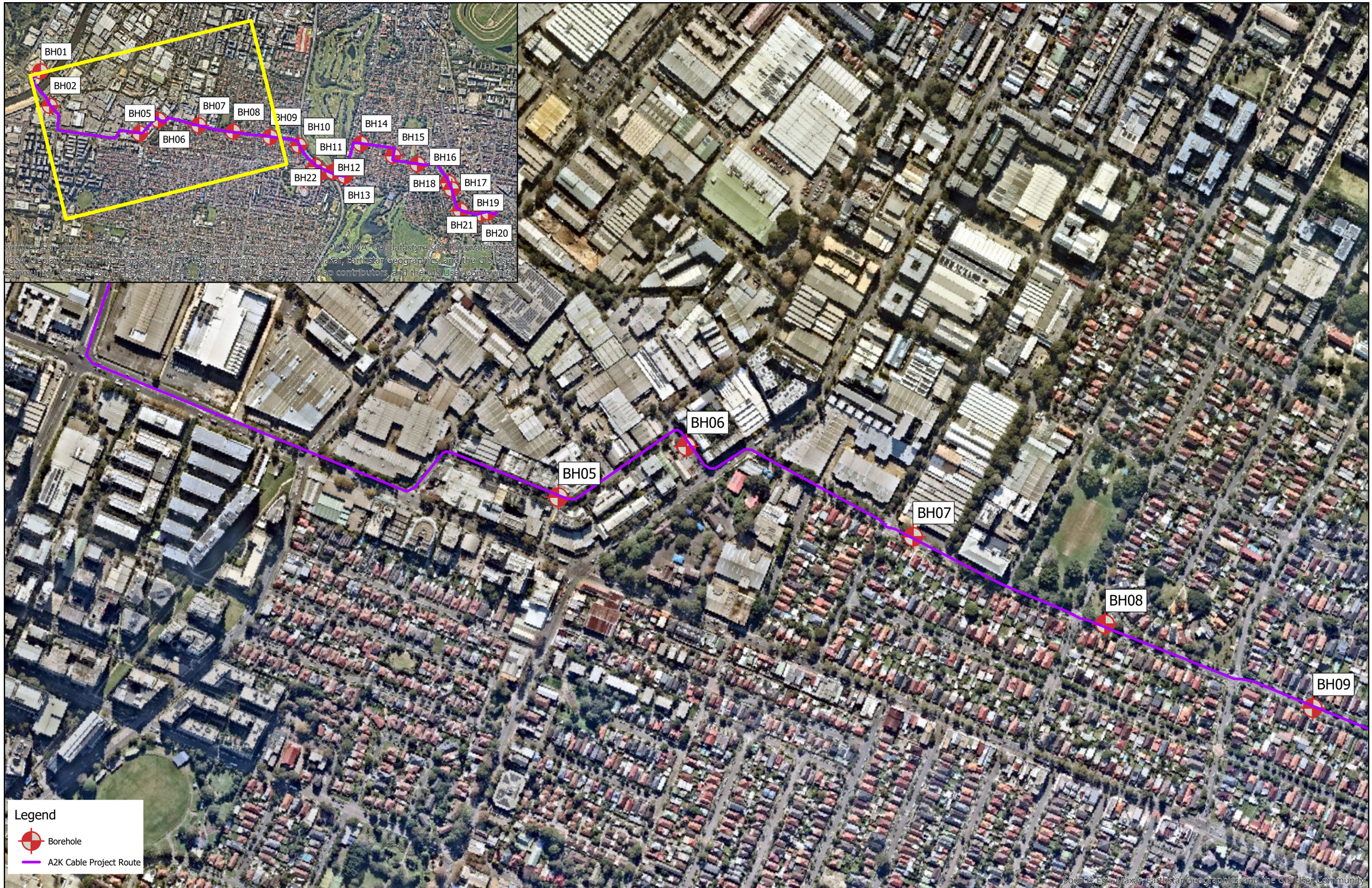
Site Plan Scale 1:5,000 on A3

Client Name:	Ausgrid	N 0 150 Meters	Figure Number:	14777-GR-1-2-A1
Project Name:	Underground Cable Projects		Figure/Drawing Date:	04/08/2022
Project Location	Alexandria NSW 2015 to Kingsford NSW 2032		Report Number:	14777-GR-1-2



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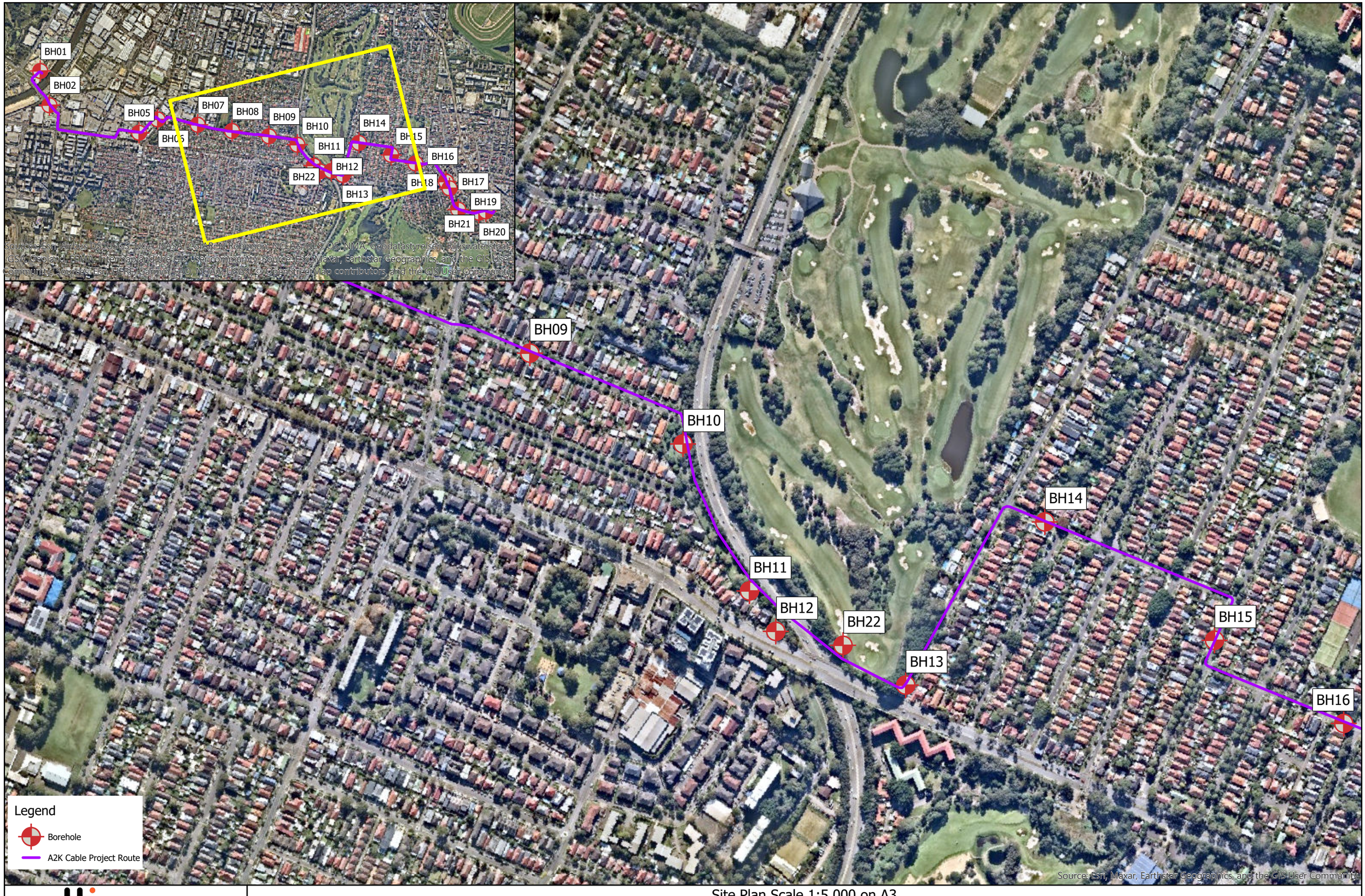
Site Plan Scale 1:5,000 on A3

Client Name:	Ausgrid	N 0 150 Meters	Figure Number:	14777-GR-1-2-A1
Project Name:	Underground Cable Projects		Figure/Drawing Date:	04/08/2022
Project Location	Alexandria NSW 2015 to Kingsford NSW 2032		Report Number:	14777-GR-1-2



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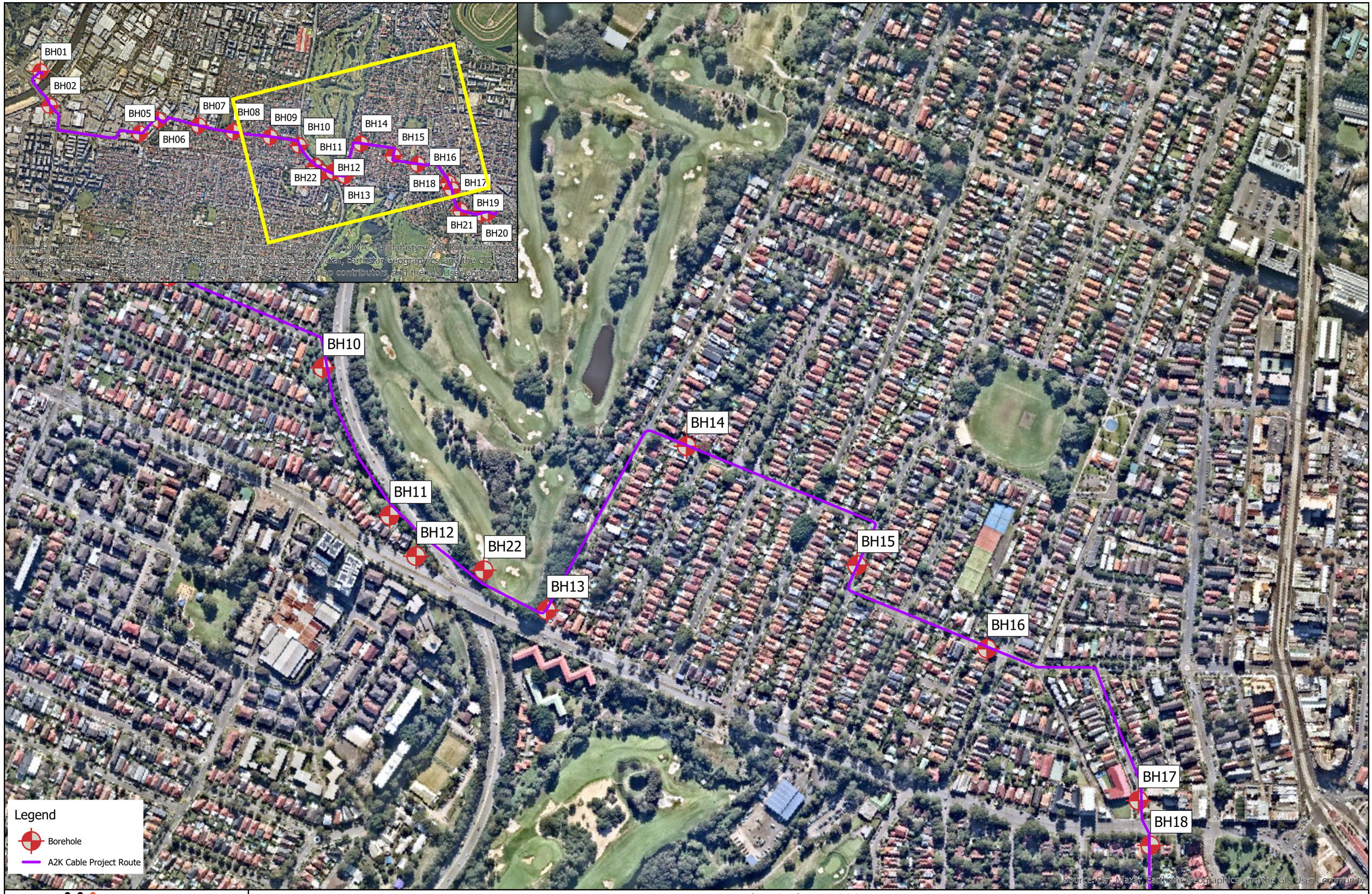
Site Plan Scale 1:5,000 on A3

Client Name:	Ausgrid	Figure Number:	14777-GR-1-2-A1
Project Name:	Underground Cable Projects	Figure/Drawing Date:	04/08/2022
Project Location	Alexandria NSW 2015 to Kingsford NSW 2032	Report Number:	14777-GR-1-2

N 0 150 Meters



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Site Plan Scale 1:5,000 on A3

Client Name:	Ausgrid	Figure Number:	14777-GR-1-2-A1
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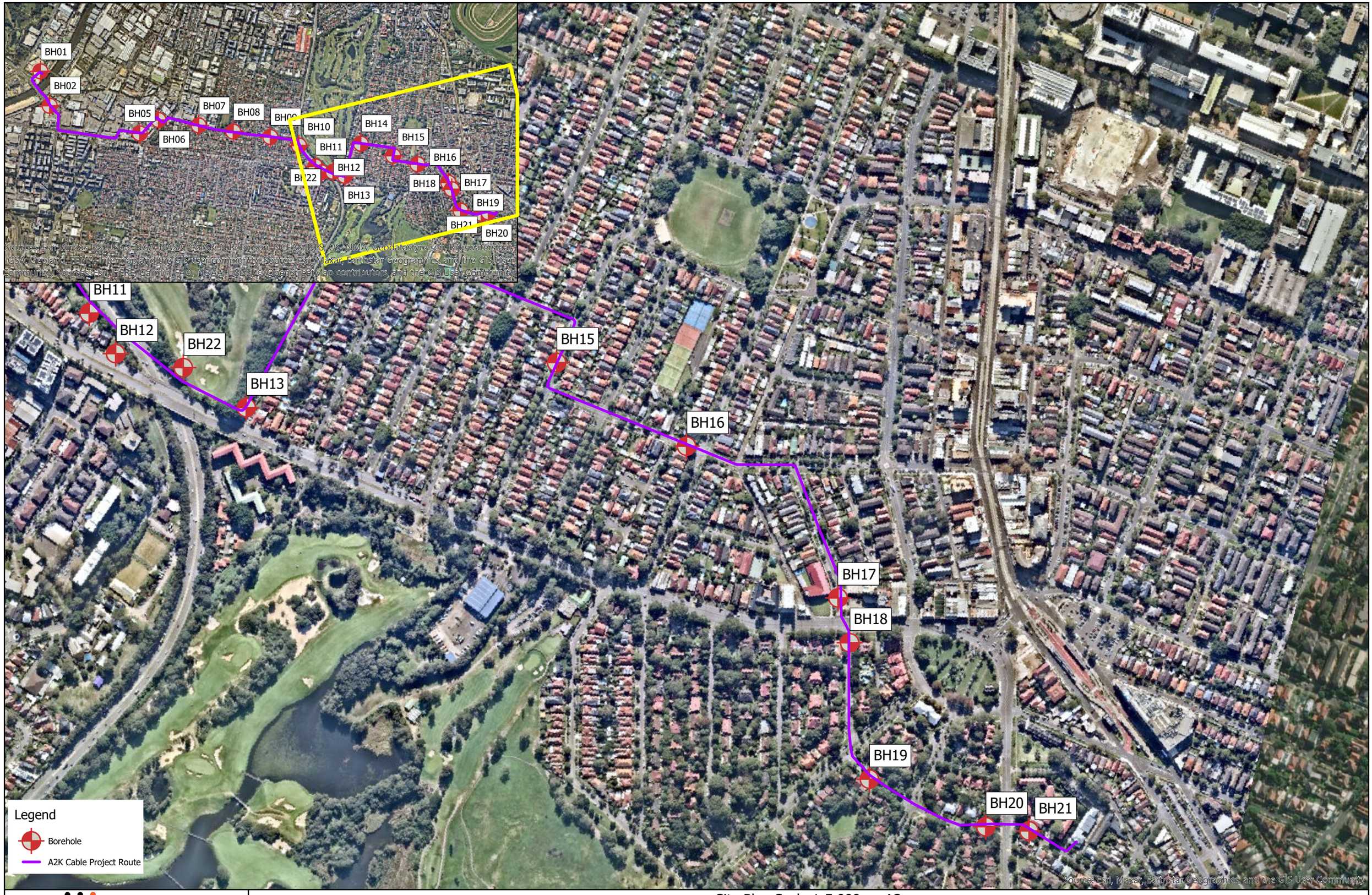
N 0 150 Meters



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Site Plan Scale 1:5,000 on A3

Client Name:	Ausgrid	Figure Number:	14777-GR-1-2-A1
Project Name:	Underground Cable Projects	Figure/Drawing Date:	04/08/2022
Project Location	Alexandria NSW 2015 to Kingsford NSW 2032	Report Number:	14777-GR-1-2

N 0 150 Meters

APPENDIX C – Explanatory Notes, Borehole Logs with DCP

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Explanatory Notes
Drill & Excavation Logs

General

Information obtained from site investigations is recorded on log sheets. Soils and very low strength rock are commonly drilled using a combination of solid-flight augers with a Tungsten-Carbide (TC) bit. Descriptions of these materials presented on the “Borehole Log” are based on a combination of regular sampling and in-situ testing. Rock coring techniques commences once material is encountered that cannot be penetrated using a combination of solid-flight augers and Tungsten-carbide bit. The "Cored Borehole Log" presents data from drilling where a core barrel has been used to recover material - commonly rock.

The "Excavation – Geological Log" presents data and drawings from exposures of soil and rock resulting from excavation of pits or trenches.

The heading of the log sheets contains information on Project Identification, Hole or Test Pit Identification, Location and Elevation. The main section of the logs contains information on methods and conditions, material description and structure presented as a series of columns in relation to depth below the ground surface which is plotted on the left side of the log sheet. The scale is presented in the depth column as metres below ground level.

As far as is practicable the data contained on the log sheets is factual. Some interpretation is included in the identification of material boundaries in areas of partial sampling, the location of areas of core loss, description and classification of material, estimation of strength and identification of drilling induced fractures, and geological unit. Material description and classifications are based on Australian Standard Geotechnical Site Investigations: AS 1726 - 2017 with some modifications as defined below.

These notes contain an explanation of the terms and abbreviations commonly used on the log sheets.

Drilling

Drilling, Casing and Excavating

Drilling methods deployed are abbreviated as follows

Abbreviation	Method
AS	Auger Screwing
ADV	Auger Drilling with V-Bit
ADT	Auger Drilling with TC Bit
BH	Backhoe
E	Excavator
HA	Hand Auger
HQ	HQ core barrel (~63.5 mm diameter core) *
HMLC	HMLC core barrel (~63.5 mm diameter core) *
NMLC	NMLC core barrel (~51.9 mm diameter core) *
NQ	NQ core barrel (~47.6 mm diameter core) *
RR	Rock Roller
WB	Wash-bore drilling

* Core diameters are approximate and vary due to the strength of material being drilled.

Drilling Fluid/Water

The drilling fluid used is identified and loss of return to the surface estimated as a percentage. It is introduced to assist with the drill process, in particular, when core drilling. The introduction of drill fluid/water does not allow for accurate identification of water seepages.

Drilling Penetration/Drill Depth

Core lifts are identified by a line and depth with core loss per run as a percentage. Ease of penetration in non-core drilling is abbreviated as follows:

Abbreviation	Description
VE	Very Easy
E	Easy
F	Firm
H	Hard
VH	Very Hard

Groundwater Levels

Date of measurement is shown.

Standing water level measured in completed borehole

Level taken during or immediately after drilling

Groundwater inflow water level

Samples/Tests

Samples collected and testing undertaken are abbreviated as follows

Abbreviation	Test
ES	Environmental Sample
DS	Disturbed Sample
BS	Bulk Sample
U50	Undisturbed (50 mm diameter)
C	Core Sample
SPT	Standard Penetration Test
N	Result of SPT (*sample taken)
VS	Vane Shear Test
IMP	Borehole Impression Device
PBT	Plate Bearing Test
PZ	Piezometer Installation
HP	Hand Penetrometer Test
HB	Hammer Bouncing

Excavation Logs

Explanatory notes are provided at the bottom of drill log sheets. Information about the origin, geology and pedology may be entered in the "Structure and other Observations" column. The depth of the base of excavation (for the logged section) at the appropriate depth in the "Material Description" column. Refusal of excavation plant is noted should it occur. A sketch of the exposure may be added. Photos are recommended.

Material Description – Soil

Material Description - In accordance with AS 1726-2017

Classification Symbol - In accordance with the Unified Classification System (AS 1726-2017).

Abbreviation	Typical Name
GW	Well-graded gravels, gravel-sand mixtures, little or no fines.
GP	Poorly graded gravels and gravel-sand mixtures, little or no fines, uniform gravels.
GM	Silty gravels, gravel-sand-silt mixtures.
GC	Clayey gravels, gravel-sand-clay mixtures.
SW	Well graded sands, gravelly sands, little or no fines.
SP	Poorly graded sands and gravelly sands; little or no fines, uniform sands.
SM	Silty sand, sand-silt mixtures.
SC	Clayey sands, sand-clay mixtures.
ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.
CL, CI	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
OL	Organic silts and organic silty clays of low plasticity. *
MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, clastic silts.
CH	Inorganic clays of high plasticity, fat clays.
OH	Organic clays of medium to high plasticity, organic silts. *
Pt	Peat and other highly organic soils. *

* Additional details may be provided in accordance with the Von Post classification system (1922).

Organic Soils – Identification using laboratory testing:

Material	Organic Content - % of dry mass
Inorganic	<2
Organic Soil	<2 ≤ 25
Peat	> 25

Organic Soils – Descriptive terms for the degree of decomposition of peat:

Term	Decomposition	Remains	Squeeze
Fibrous	Little or none	Clearly recognizable	Only water No solid
Pseudo-fibrous	Moderate	Mixture of fibrous and amorphous	Turbid water < 50% solids
Amorphous	Full	Not recognizable	Paste > 50% solids

Particle Characteristics – Definitions are as follows:

Fraction	Component (& subdivision)		Size (mm)
Oversize	**Boulders**		> 200
	Cobbles		> 63 ≤ 200
Coarse grained soils	**Gravel**	Coarse	> 19 ≤ 63
		Medium	> 6.7 ≤ 19
		Fine	> 2.36 ≤ 6.7
	Sand	Coarse	> 0.6 ≤ 2.36
		Medium	> 0.2 ≤ 0.6
		Fine	> 0.075 ≤ 0.21
Fine grained soils	**Silt**		0.002 ≤ 0.075
	Clay		< 0.002

Secondary and minor soil components

In coarse grained soils – The proportions of secondary and minor components are generally estimated from a visual and tactile assessment of the soils. Descriptions for secondary and minor soil components in coarse grained soils are as follows.

Designation of components	Percentage fines	Terminology (as applicable)	Percentage accessory coarse fraction	Terminology (as applicable)
Minor	≤ 5	Trace clay / silt	≤ 5	Trace sand / gravel
	> 5 ≤12	With clay / silt	> 5 ≤12	With sand / gravel
Secondary	> 12	Silty or clayey	> 30	Sandy or gravelly

Descriptions for secondary and minor soil components in fine grained soils are as follows.

Designation of components	Percentage coarse grained soils	Terminology (as applicable)
Minor	≤ 5	Trace sand / gravel / silt / clay
	> 5 ≤12	With sand / gravel / silt / clay
Secondary	> 30	Sandy / gravelly / silty / clayey

Plasticity Terms - Definitions for fine grained soils are as follows:

Descriptive Term	Range of Liquid Limit for silt	Range of Liquid Limit for clay
Low Plasticity	≤ 50	≤ 35
Medium Plasticity	N/A	> 35 ≤50
High Plasticity	> 50	> 50

Particle Characteristics

Particle shape and angularity are estimated from a visual assessment of coarse-grained soil particle characteristics. Terminology used includes the following:

Particle shape – spherical, platy, elongated,

Particle angularity – angular, sub-angular, sub-rounded, rounded.

Moisture Condition – Abbreviations are as follows:

D	Dry, looks and feels dry.
M	Moist, No free water on remoulding.
W	Wet, free water on remoulding.

Moisture content of fine-grained soils is based on judgement of the soils moisture content relative to the plastic and liquid limit as follows:

MC < PL	Moist, dry of plastic limit.
MC ≈ PL	Moist, near plastic limit.
MC > PL	Moist, wet of plastic limit.
MC ≈ LL	Wet, near liquid limit.
MC > LL	Wet of liquid limit.

Consistency - of cohesive soils in accordance with AS 1726-2017, Table 11 are abbreviated as follows:

Consistency Term	Abbreviation	Indicative Undrained Shear Strength Range (kPa)
Very Soft	**VS**	< 12
Soft	**S**	12 ≤ 25
Firm	**F**	25 ≤ 50
Stiff	**St**	50 ≤ 100
Very Stiff	**VSt**	100 ≤ 200
Hard	**H**	≥ 200
Friable	**Fr**	-

Density Index (%) of granular soils is estimated or is based on SPT results. Abbreviations are as follows:

Description	Abbreviation	Relative Density	SPT N
Very Loose	**VL**	< 15%	0 - 4
Loose	**L**	15 - 35%	4 - 10
Medium Dense	**MD**	35 - 65%	10 - 30
Dense	**D**	65 - 85%	30 - 50
Very Dense	**VD**	> 85%	> 50

Structures – Fissuring and other defects are described in accordance with AS 1726-2017 using the terminology for rock defects

Origin – Where practicable an assessment is provided of the probable origin of the soil, e.g. fill, topsoil, alluvium, colluvium, residual soil.

MATERIAL DESCRIPTION - ROCK

Material Description – In accordance with AS 1726-2017

Rock Naming – Where possible conventional geological names are used within the logs. Engineering properties cannot be inferred directly from the rock names in the table, but the use of a particular name provides an indicative range of characteristics to the reader. Lithological identification of rock is provided to appreciate the geology of an area, to correlate geological profiles seen in boreholes or to distinguish boulders from bedrock.

Grain Size – Grain size is done in accordance with AS1726-2017 as follows:

For sedimentary rock:

Coarse grained	Mainly 0.6mm to 2mm
Medium grained	Mainly 0.2mmto 0.6mm
Fine grained	Mainly 0.06mm to 0.2mm

For igneous and metamorphic rock:

Coarse grained	Mainly greater than 2 mm
Medium grained	Mainly 0.6mm to 2mm
Fine grained	Mainly less than 2mm

Colour - Rock colour is described in the moist condition.

Texture and Fabric

Frequently used terms:

Sedimentary Rock	Metamorphic Rock	Igneous
Bedded	Banded	Amorphous
Cross-bedded	Cleaved	Crystalline
Folded	Folded	Flow banded
Graded	Foliated	Folded
Interbedded	Gneissose	Lineated
Laminated	Lineated	Massive
Massive	Schistose	Porphyritic

Bedding and fabric:

Description	Spacing
Very Thickly Bedded	> 2m
Thickly Bedded	0.6m to 2m
Medium Bedded	0.2m to 0.6m
Thinly Bedded	60mm to 200mm
Very Thinly Bedded	20mm to 60mm
Thickly Laminated	6mm to 20mm
Thinly Laminated	< 6mm

Degree of development:

Massive	No layering or fabric. Rock is homogeneous.
Indistinct	Layering or fabric just visible, There is little effect on strength properties.
Distinct	Layering or fabric obvious. The rock may break more easily parallel to the fabric.

Features, inclusions, and minor components - Features, inclusions and minor components within the rock material shall be described where those features could be significant such as gas bubbles, mineral veins, carbonaceous material, salts, swelling minerals, mineral inclusions, ironstone or carbonate bands, cross-stratification, or minerals the readily oxidise upon atmospheric exposure.

Moisture content - Where possible descriptions are made by the feel and appearance of the rock using one according to following terms:

Dry	Looks and feels dry.
Moist	Feels cool, darkened in colour, but no water is visible on the surface.
Wet	Feels cool, darkened in colour, water film or droplets visible on the surface.

The moisture content of rock cored with water may not be representative of its in-situ condition.

Durability – Descriptions of the materials durability such as tendency to develop cracks, break into smaller pieces or disintegrate upon exposure to air or in contact with water are provided where observed.

Rock Material Strength – The strength of the rock material is based on uniaxial compressive strength (UCS). The following terms are used:

Term / Abbreviation		Description	UCS (MPa)	Point Load Strength Index (MPa)
Very Low	**VL**	Crumbles under firm blow with sharp end of pick, can be peeled with a knife; too hard to cut a triaxial by hand; 30mm pieces can be broken by hand.	0.6 – 2	0.03 – 0.1
Low	**L**	Easily scored with a knifed; indentations 1-3mm show with firm blows of the pick point; has dull sound under hammer. A piece of core 150mm long 50mm diameter may be broken by hand. Sharp edges of core may be friable and break during handling.	2 – 6	0.1 – 0.3
Medium	**M**	Readily scored with a knife; a piece of core 150mm long by 50mm diameter can be broken by hand with difficulty.	6 – 20	0.3 – 1
High	**H**	A piece of core 150mm long by 50mm diameter cannot be broken by hand but can be broken by a pick with a single firm blow; rock rings under hammer.	20 – 60	1 – 3
Very High	**VH**	Hand specimen breaks with pick after more than one blow; rock rings under hammer.	60 – 200	3 – 10
Extremely High	**EH**	Specimen requires many blows with geological pick to break into intact materials; rock rings under hammer.	> 200	> 10

Strengths are estimated and where possible supported by Point Load Index Testing of representative samples. Test results are plotted on the graphical logs as follows:

D	Diametral Point Load Test
A	Axial Point Load Test

Where the estimated strength log covers more than one range it indicates the rock strength varies between the limits shown. Point Load Strength Index test results are presented as $I_{s\,(50)}$ values in MPa.

Weathering – Weathering classification assists in identification but does not imply engineering properties. Descriptions are as follows:

Term / Abbreviation		Description
Residual Soil	**RS**	Material has soil properties. Mass structure and material texture and fabric of original rock not visible, but the soil has not been significantly transported.
Extremely Weathered	**EW**	Material has soil properties. Mass structure, material texture and fabric of original rock are still visible.
Highly Weathered	**HW**	Material is completely discoloured, significant decrease in strength from fresh rock.
Moderately Weathered	**MW**	Material is `completely discoloured, little or no change of strength from fresh rock.
Slightly Weathered	**SW**	Partly stained or discoloured, little or no change to strength from fresh rock.
Fresh	**FR**	No signs of mineral decomposition or colour change.

Alteration – Physical and chemical changes of the rock material due to geological processes by fluids at depth at pressures and temperatures above atmospheric conditions. Unlike weathering, alteration shows no relationship to topography and may occur at any depth. When altered materials are recognized, the following terms are used:

Term / Abbreviation				Description
Extremely Altered		**XA**		Material has soil properties. Structure, texture, and fabric of original rock are still visible. The rock name is replaced with the name of the parent material, e.g., Extremely Altered basalt. Soil descriptive terms are used.
Highly Altered	**Distinctly altered**	**HA**	**DA**	The whole of the rock material is discoloured. Rock strength is changed by alteration. Some primary minerals are altered to clay minerals. Porosity may be higher or lower due to loss of minerals or precipitation of secondary minerals in pores.
Moderately Altered	**Distinctly altered**	**MA**	**DA**	The whole of the rock material is discoloured. Little or no change of strength from fresh rock. The term 'Distinctly Altered' is used where it is not practicable to distinguish between 'Highly Altered' and 'Moderately Altered'. Distinctly Altered is defined as follows: - The rock may be highly discoloured; - Porosity may be higher due to mineral loss; or may be lower due to precipitation of secondary minerals in pores; and - Some change of rock strength.
Slightly Altered		**S**		Rock is slightly discoloured. Little or no change of strength from fresh rock.

Alteration is only described in the context of the project where it has relevance to the civil and structural design.

Defect Descriptions

General and Detailed Descriptions – Defect descriptions are provided to suit project requirements. Generalized descriptions are used for some projects where it is unnecessary to describe each individual defect in a rock mass, or where multiple similar defects are present which are too numerous to log individually. The part of the rock mass to which this applies is delineated.

Detailed descriptions are given of defects judged to be particularly significant in the context of the project. For example, crushed seams in an apparently unstable slope. As a minimum, general descriptions outlining the number of defect sets within the rock mass and their broad characteristics are provided where it is possible to do so.

Defect Type – Defect abbreviations are as follows:

BP	Bedding parting	**SSM**	Sheared seam	**DB**	Drilling break
JT	Joint	**CS**	Crushed seam	**HB**	Handling break
SS	Shear surface	**SM**	Infilled seam		
SZ	Sheared zone	**EWS**	Extremely weathered seam		

Sheared surfaces, sheared zones, sheared seams, and crushed seams are generally faults in geological terms.

Defect Orientation

For oriented core: The dip and dip direction are recorded as a two-digit and three-digit number separated by a slash, are collected e.g., 50°/240° and there is not core loss that could obscure core orientation. If alternative measurements are made, such as dip and strike or dip direction relative to magnetic north this shall be documented.

For non-oriented core: The dip is recorded as a two-digit number, e.g., 10°. In vertical boreholes the dip is generally measured relative to the horizontal plan. If the borehole is inclined the dip is generally measured from the core axis.

Surface Roughness – Defect surface roughness is described as follows:

VR	**Very rough**	Many large surface irregularities with amplitude generally more than 1 mm.
RO	**Rough**	Many small surface irregularities with amplitude generally less than 1 mm.
SO	**Smooth**	Smooth to touch. Few or no surface irregularities.
PO	**Polished**	Shiny smooth surface
SK	**Slickensided**	Grooved or striated surface, usually polished.

Surface Shape – Defect surface roughness is described as follows:

PL	**Planar**	The defect does not vary in orientation.
CU	**Curved**	The defect has a gradual change in orientation
UN	**Undulating**	The defect has a wavy surface.
ST	**Stepped**	The defect has one or more well defined steps
IR	**Irregular**	The defect has many sharp changes of orientation

Defect Infilling – Common abbreviation as follows:

Ca	Calcite	**Fe**	Iron Oxide	**Qz**	Quartz
Cy	Clay	**MS**	Secondary mineral	**X**	Carbonaceous

Defect Coatings and Seam Composition - Coatings are described using the following terms:

CN	**Clean**	No visible coating.
SN	**Stained**	No visible coating but surfaces are discoloured.
VN	**Veneered**	A visible coating of soil or mineral, too thin to measure; may ne patchy.
CO	**Coating**	A visible coating up to 1 mm thick. Soil in-fill greater than 1 mm shall be described using defect terms (e.g., infilled seam). Defects greater than 1 mm aperture containing rock material great described as a vein.

Defect Spacing, Length, Openness and Thickness – Described directly in millimetres and metres. In general descriptions, half order of magnitude categories is used, e.g. joint spacing typically 100 mm to 300 mm, sheared zones 1m to 3m thick.

Depending on project requirements and the scale of observation, spacing may be described as the mean spacing within a set of defects, or as the spacing between all defects within the rock mass. Where spacing is measured within a specific set of defects, measurements shall be made perpendicular to the defect set.

Where significant, the nature of the defect end condition is recorded in the context of the scale of the exposure.

Block Shape – Where it is considered significant, block shape should be described using terms given in Table 23, AS 1725:2017.

Stratigraphic Unit – Geological maps related to the project are used for the designation of lithological formation name and, where possible geological unit name, e.g., Bringelly Shale, Potts Hill Sandstone Member.

Core Loss – Core loss occurs when material is lost during the drilling process It is shown at the bottom of the run unless otherwise indicated where core loss is known.

Total Core Recovery – The percentage of rock recovered excluding core loss per core run.

Defect Spacing – The spacing of successive defects or the mean spacing for relatively broken core.

Fracture Index – Which is the number defects per metre of core.

Rock Quality Designation (RQD) – The percentage of sound core pieces of 100mm or greater per core run and is calculated using Deere et al. (1989) method.

Rock Classification System – For design purpose, Sydney Rock Mass Classification System (Pells et al. 1998, 2019) is adopted.

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BH No: A2K-BH01
Sheet: 1 of 1
Job No: 14777

Borehole Log

Client: Ausgrid
Project: Ausgrid Cable Project
Location: 53 Burrows Rd, St Peter
Hole Location: Refer to drawing 14777-GR-1-1-A
Started: 23/06/2022
Finished: 23/06/2022
Borehole Size: 250 mm

Rig Type: TDLR690
Hole Coordinates 332340E, 6245731N
Driller: CC
Logged: AH
RL Surface: 2.59m
Contractor: Alliance Geotechnical
Bearing: ---
Checked: AS

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	DCP per 150mm	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
DT			2.5			-	Asphaltic CONCRETE, 120mm.	2 4 9 18		-	-	PAVEMENT
ADT						-	FILL: Sandy GRAVEL, medium sub-angular igneous gravel, grey, fine to medium grained sand, poorly graded, appears well compacted.	25		D	-	FILL
						-	FILL: Gravelly SAND, medium grained, brown, fine to medium sub-rounded sandstone gravel, well graded, with boulders, trace clay and silt (crushed sandstone)		ES	M	-	
			2.0	0.5		-	FILL: SAND, medium grained, dark brown, with silt.		ES	M	-	
	GW @ 0.9m					CL-Cl	Clayey SAND, fine to medium grained, dark grey, low to medium plasticity.		ES	W	VL	COASTAL DEPOSITS
			1.5	1.0					TR			
			1.0	1.5						M		
			0.5	2.0					SPT 0, 1, 0 N=1			
			0.0	2.5					PSD			
			-0.5	3.0					TR			
				3.5					SPT 0, 1, 0 N=1			
			-1.0				Target Depth Borehole A2K-BH01 terminated at 3.5m					
				4.0								
			-1.5									
				4.5								
			-2.0									
				5.0								

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BH No: A2K-BH02
Sheet: 1 of 1
Job No: 14777

Borehole Log

Client: Ausgrid
Project: Ausgrid Cable Project
Location: 81A Campbell Rd Bridge, Alexandria
Hole Location: Refer to drawing 14777-GR-1-1-A
Started: 25/05/2022
Finished: 25/05/2022
Borehole Size: 110 mm

Rig Type: TDLR690
Hole Coordinates 332422E, 6245429N
Driller: CC
Logged: AH
RL Surface: 4.95m
Contractor: Alliance Geotechnical
Bearing: ---
Checked: AS

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	DCP per 150mm (2 4 9 18)	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
DT / ADT			4.5	0.5		-	FILL: Silty SAND, fine to medium grained, grey, trace sub-angular gravel, with organics (grass) and foreign material (porcelain), appears moderately compacted.	3, 4, 25	ES	M	-	FILL
									PSD			
			4.0	1.0		-	FILL: Clayey SAND, fine to coarse grained, pale brown, medium plasticity clay, with fine to medium rounded gravel, appears moderately compacted.		ES	M - W		
									TR	W		
			3.5	1.5					ES			
	GW @ 1.8m		3.0	2.0		SP	Silty SAND, fine grained, grey-brown, poorly graded.		SPT 0, 0, 1 N=1		VL	COASTAL DEPOSITS
			2.5	2.5			Target Depth Borehole A2K-BH02 terminated at 2m					
			2.0	3.0								
			1.5	3.5								
			1.0	4.0								
			0.5	4.5								
			0.0	5.0								

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BH No: A2K-BH05
Sheet: 1 of 1
Job No: 14777

Borehole Log

Client: Ausgrid
Project: Ausgrid Cable Project
Location: 30 Birmingham St, Alexadria
Hole Location: Refer to drawing 14777-GR-1-1-A
Started: 25/05/2022
Finished: 25/05/2022
Borehole Size: 110 mm

Rig Type: TDLR690
Hole Coordinates 333222E, 6245183N
Driller: CC
Logged: AH

RL Surface: 11.27m
Contractor: Alliance Geotechnical
Bearing: ---
Checked: AS

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	DCP per 150mm (2 4 9 18)	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
ADT DT	Not Encountered		11.27	0.0		-	Asphaltic CONCRETE, 80mm.			-	-	PAVEMENT
						-	FILL: Sandy GRAVEL, medium sub-angular igneous gravel, grey, fine to medium sand, poorly graded (ballast), appears well compacted.					FILL
			11.0			-	FILL: Gravelly SAND, fine grained, pale brown, with clay, fine to medium sub-angular sandstone gravel, appears well compacted.					
				0.5		SP	SAND, fine to medium grained, brown-grey, with silt, poorly graded, trace fine sub-angular gravel.	10 25	ES	M	MD	COASTAL DEPOSITS
			10.5						ES, PSD			
				1.0					TR			
			10.0						ES			
				1.5		SP	SAND, fine grained, brown, trace silt, poorly graded.			-	MD	
			9.5						SPT 4, 7, 7 N=14			
				2.0			1.84m: with medium plasticity clay.					
			9.0				Target Depth Borehole A2K-BH05 terminated at 2m					
				2.5								
			8.5									
				3.0								
			8.0									
				3.5								
			7.5									
				4.0								
			7.0									
				4.5								
			6.5									
				5.0								

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BH No: A2K-BH06
Sheet: 1 of 1
Job No: 14777

Borehole Log

Client: Ausgrid
Project: Ausgrid Cable Project
Location: 646 Gillespie Ave, Alexandria
Hole Location: Refer to drawing 14777-GR-1-1-A
Started: 25/05/2022
Finished: 25/05/2022
Borehole Size: 110 mm

Rig Type: TDLR690
Hole Coordinates 333388E, 6245302N
Driller: CC
Logged: AH

RL Surface: 12.05m
Contractor: Alliance Geotechnical
Bearing: ---
Checked: AS

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	DCP per 150mm (2 4 9 18)	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
ADDT	Not Encountered		12.0			-	Asphaltic CONCRETE, 60mm.			-	-	PAVEMENT
						-	FILL: Sandy GRAVEL, medium sub-angular igneous gravel, grey, fine to medium sand, poorly graded, appears moderately compacted.					FILL
						-	FILL: Gravelly SAND, fine to coarse grained, grey, fine to medium angular igneous gravel, appears well compacted.			M		
				0.5		-	FILL: Gravelly SAND, fine grained, orange-brown, well graded, sandstone gravel, with clay, appears well compacted.		ES			
			11.5			SP	SAND, fine to coarse grained, pale grey, white.	10 25	ES	D	(D)	COASTAL DEPOSITS
							0.6m: becoming brown.		PSD			
				1.0					TR			
			11.0						ES			
				1.5								
			10.5				1.5m: becoming orange brown and pale brown.		SPT 4, 8, 10 N=18		MD	
							1.8m: becoming dark brown.					
				2.0								
			10.0				Target Depth Borehole A2K-BH06 terminated at 2m					
				2.5								
			9.5									
				3.0								
			9.0									
				3.5								
			8.5									
				4.0								
			8.0									
				4.5								
			7.5									
				5.0								

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BH No: A2K-BH07
Sheet: 1 of 1
Job No: 14777

Borehole Log

Client: Ausgrid
Project: Ausgrid Cable Project
Location: 20 Harcourt Parade, Rosebery
Hole Location: Refer to drawing 14777-GR-1-1-A
Started: 25/05/2022
Finished: 25/05/2022
Borehole Size: 220 mm

Rig Type: TDLR690
Hole Coordinates 333746E, 6245253N
Driller: CC
Logged: AH
RL Surface: 11.59m
Contractor: Alliance Geotechnical
Bearing: ---
Checked: AS

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	DCP per 150mm (2 4 9 18)	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
DT			11.5			-	Asphaltic CONCRETE, 100mm.			-	-	PAVEMENT
ADT						-	FILL: Sandy GRAVEL, medium sub-angular igneous gravel, grey, fine to medium sand, poorly graded (ballast).			M		FILL
						-	FILL: Gravelly SAND, fine grained, pale brown, fine to medium sub-angular sandstone gravel, appears moderately to well compacted.	17	ES			
				0.5		SP	SAND, fine grained, brown, with silt.	17			D	COASTAL DEPOSITS
			11.0					10	ES			
	▼ GW @ 0.9m								PSD/PI			
				1.0					TR			
			10.5									
				1.5		CL-CH	Sandy CLAY, medium plasticity, dark grey, fine to coarse grained sand, trace fine to medium sub-angular gravel.		ES	MC > PL	St	
			10.0						SPT 2, 4, 5 N=9			
				2.0		SM	Silty SAND, fine grained, grey-brown, trace clay.			W	L	
			9.5				Target Depth Borehole A2K-BH07 terminated at 2m					
				2.5								
			9.0									
				3.0								
			8.5									
				3.5								
			8.0									
				4.0								
			7.5									
				4.5								
			7.0									
				5.0								

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BH No: A2K-BH08
Sheet: 1 of 1
Job No: 14777

Borehole Log

Client: Ausgrid
Project: Ausgrid Cable Project
Location: 71 Harcourt Parade, Rosebery
Hole Location: Refer to drawing 14777-GR-1-1-A
Started: 26/05/2022
Finished: 26/05/2022
Borehole Size: 110 mm

Rig Type: TDLR690
Hole Coordinates 334053E, 6245196N
Driller: CC
Logged: AH

RL Surface: 15.63m
Contractor: Alliance Geotechnical
Bearing: ---
Checked: AS

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	DCP per 150mm (2 4 9 18)	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
DT						-	Asphaltic CONCRETE, 120mm.			-	-	PAVEMENT
ADT	Not Encountered		15.5			-	FILL: Sandy GRAVEL, medium sub-angular igneous gravel, grey, fine to medium grained sand, poorly graded (ballast), appears well compacted.			M		FILL
						-	FILL: Gravelly SAND, fine grained, pale grey and white, fine to medium sub-angular crushed sandstone gravel, appears well compacted.	20 25	ES			
				0.5		SP	SAND, fine to medium grained, pale brown, trace silt.				D	COASTAL DEPOSITS
			15.0						PSD			
				1.0					TR			
			14.5									
				1.5					ES			
			14.0								MD	
									SPT 3, 4, 6 N=10			
				2.0								
			13.5				Target Depth Borehole A2K-BH08 terminated at 2m					
				2.5								
			13.0									
				3.0								
			12.5									
				3.5								
			12.0									
				4.0								
			11.5									
				4.5								
			11.0									
				5.0								

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BH No: A2K-BH09
Sheet: 1 of 1
Job No: 14777

Borehole Log

Client: Ausgrid
Project: Ausgrid Cable Project
Location: 101 Harcourt Parade, Rosebery
Hole Location: Refer to drawing 14777-GR-1-1-A
Started: 26/05/2022
Finished: 26/05/2022
Borehole Size: 110 mm

Rig Type: TDLR690
Hole Coordinates 334381E, 6245150N
Driller: CC
Logged: AH
RL Surface: 18.12m
Contractor: Alliance Geotechnical
Bearing: ---
Checked: AS

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	DCP per 150mm (2 4 9 18)	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
DT			18.0			-	Asphaltic CONCRETE, 115mm.			-	-	PAVEMENT
ADT	Not Encountered					-	FILL: Sandy GRAVEL, medium sub-angular igneous gravel, grey, fine to medium sand, poorly graded (ballast), appears well compacted.			D		FILL
						-	FILL: Gravelly SAND, fine grained, pale grey and white, fine to medium sub-angular crushed sandstone gravel, appears well compacted.		ES			
				0.5		SP	SAND, fine to coarse grained, brown-grey, poorly graded.	9			L	COASTAL DEPOSITS
			17.5					6	ES			
								9				
				1.0					TR			
			17.0				1.2m: brown.		ES			
				1.5					PSD			
			16.5								L	
						SP	SAND, fine grained, pale brown grey, trace silt.		SPT 2, 1, 2 N=3			
				2.0								
			16.0				Target Depth Borehole A2K-BH09 terminated at 2m					
				2.5								
			15.5									
				3.0								
			15.0									
				3.5								
			14.5									
				4.0								
			14.0									
				4.5								
			13.5									
				5.0								

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BH No: A2K-BH10
Sheet: 1 of 1
Job No: 14777

Borehole Log

Client: Ausgrid
Project: Ausgrid Cable Project
Location: 137 Harcourt Parade, Rosebery
Hole Location: Refer to drawing 14777-GR-1-1-A
Started: 23/06/2022
Finished: 23/06/2022
Borehole Size: 250 mm

Rig Type: TDLR690
Hole Coordinates 334635E, 6245074N
Driller: CC
Logged: AH
RL Surface: 18.43m
Contractor: Alliance Geotechnical
Bearing: ---
Checked: AS

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	DCP per 150mm (2 4 9 18)	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
DT	Not Encountered					-	FILL: SAND, fine to medium grained, pale brown, with silt and organics (rootlets).	6, 9	ES	-	-	FILL
ADT			18.0	0.5		-	FILL: Silty SAND, fine to medium grained, dark grey to grey.	17, 25	PSD ES	M	-	
			17.5	1.0		SP	SAND, fine to medium grained, yellow to pale brown, trace silt.		ES TR	M	MD	COASTAL DEPOSITS
			17.0	1.5			1.7m: brown-red.		SPT 2, 5, 7 N=12			
			16.5	2.0			1.9m: dark grey.					
							Target Depth Borehole A2K-BH10 terminated at 2m					
			16.0	2.5								
			15.5	3.0								
			15.0	3.5								
			14.5	4.0								
			14.0	4.5								
			13.5	5.0								

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BH No: A2K-BH11
Sheet: 1 of 2
Job No: 14777

Borehole Log

Client: Ausgrid
Project: Ausgrid Cable Project
Location: 218 Gardeners Rd, Roseberry
Hole Location: Refer to drawing 14777-GR-1-1-A
Started: 11/07/2022
Finished: 11/07/2022
Borehole Size: 110 mm

Rig Type: CE180
Hole Coordinates 334784E, 6244886N
Driller: DR
Logged: AH
RL Surface: 20.35m
Contractor: BG Drilling
Bearing: ---
Checked: AS

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	DCP per 150mm (2 4 9 18)	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
ADT			20	0		-	FILL: Silty SAND, fine to medium grained, grey-brown, with organics, appears poorly compacted.	1 0 2 2 2 1	ES	M	-	FILL
									ES			
				1			0.7m: orange and red brown		SPT 1, 1, 1 N=2			
									TR			
			19				1.2m: with foreign material (metal fragments)		ES			
									SPT 1, 1, 1 N=2			
				2		SP	SAND, fine to medium grained, orange-brown, trace silt.			M	VL	COASTAL DEPOSITS
	GW @ 2.8m		18									
				3			3.0m: orange and red brown		TR	W		
			17									
									SPT 0, 1, 2 N=3			
				4			3.9m: pale brown and yellow		PSD			
			16									
							4.5m: with fine to medioum sub-angular ironstone gravel.				MD	
				5					SPT 2, 6, 12 N=18			
									TR			
			15									
				6								NO SPTs below 4.5m, due to hole collapse
			14									
				7								
			13									
				8								

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BH No: A2K-BH11
Sheet: 2 of 2
Job No: 14777

Borehole Log

Client: Ausgrid
Project: Ausgrid Cable Project
Location: 218 Gardeners Rd, Roseberry
Hole Location: Refer to drawing 14777-GR-1-1-A
Started: 11/07/2022
Finished: 11/07/2022
Borehole Size: 110 mm

Rig Type: CE180
Hole Coordinates 334784E, 6244886N
Driller: DR
Logged: AH
RL Surface: 20.35m
Contractor: BG Drilling
Bearing: ---
Checked: AS

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	DCP per 150mm (2 4 9 18)	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
ADT			12	9		SP	SAND, fine to medium grained, orange-brown, trace silt. *(continued)*			W	MD	
			11	10			Beyond Target Depth Borehole A2K-BH11 terminated at 9m					
			10	11								
			9	12								
			8	13								
			7	14								
			6	15								
			5	16								

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BH No: A2K-BH12
Sheet: 1 of 2
Job No: 14777

Borehole Log

Client: Ausgrid
Project: Ausgrid Cable Project
Location: 216 Gardeners Rd, Roseberry
Hole Location: Refer to drawing 14777-GR-1-1-A
Started: 11/07/2022
Finished: 11/07/2022
Borehole Size: 110 mm

Rig Type: CE180
Hole Coordinates 334837E, 6244837N
Driller: DR
Logged: AH
RL Surface: 22.98m
Contractor: BG Drilling
Bearing: ---
Checked: AS

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	DCP per 150mm (2 4 9 18)	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
ADT						-	FILL: Silty SAND, fine to medium grained, brown, with organics.	2	ES	-	-	FILL
						-	FILL: SAND, fine to medium grained, pale brown-orange, trace silt and fine to medium sub-angular sandstone gravel, appears poorly compacted.	1 3		M	-	
						SP	SAND, fine grained, pale brown-orange, trace silt.	3	ES	M	VL	COASTAL DEPOSITS
			22	1					SPT 3, 2, 1 N=3			
									ES			
									SPT 0, 0, 0 N=0			
			21	2								
						SP	SAND, fine grained, pale brown, trace silt.			M	L	
			20	3					SPT 3, 4, 5 N=9			
			19	4					TR			
						SP	SAND, fine grained, orange-brown, trace silt and low plasticity clay.		PSD	M	L	
									SPT 3, 3, 5 N=8			
			18	5		SP	SAND, medium grained, pale brown, trace silt.			M - W	L	
	▼ GW @ 6.2m		17	6					SPT 2, 3, 4 N=7			No SPTs below 6.0m due to hole collapse
							From 6.5m: grey-brown.					
			16	7								
			15	8								

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BH No: A2K-BH12
Sheet: 2 of 2
Job No: 14777

Borehole Log

Client: Ausgrid
Project: Ausgrid Cable Project
Location: 216 Gardeners Rd, Roseberry
Hole Location: Refer to drawing 14777-GR-1-1-A
Started: 11/07/2022
Finished: 11/07/2022
Borehole Size: 110 mm

Rig Type: CE180
Hole Coordinates 334837E, 6244837N
Driller: DR
Logged: AH
RL Surface: 22.98m
Contractor: BG Drilling
Bearing: ---
Checked: AS

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	DCP per 150mm (2 4 9 18)	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
ADT			14	9		SP	SAND, medium grained, pale brown, trace silt. *(continued)*			M - W	L	
			13	10			Target Depth Borehole A2K-BH12 terminated at 10m					
			12	11								
			11	12								
			10	13								
			9	14								
			8	15								
			7	16								

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BH No: A2K-BH13
Sheet: 1 of 2
Job No: 14777

Borehole Log

Client: Ausgrid
Project: Ausgrid Cable Project
Location: 146 Turnstall Ave, Kensington
Hole Location: Refer to drawing 14777-GR-1-1-A
Started: 10/06/2002
Finished: 10/06/2002
Borehole Size: 250 mm

Rig Type: Ute Rig
Hole Coordinates 335044E, 6244806N
Driller: Nick
Logged: AH
RL Surface: 26.57m
Contractor: Stratacore
Bearing: ---
Checked: AS

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	DCP per 150mm (2 4 9 18)	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
DT			26.5			-	Asphaltic CONCRETE, 180mm.			-	-	PAVEMENT
ADT	Not Encountered					-	FILL: Sandy GRAVEL, fine to medium sub-angular igneous gravel, brown, fine to medium grained sand.		ES	-	-	FILL
						-	FILL: SAND, fine grained, pale brown, trace silt, with fine to medium angular igneous gravel.		ES	-	-	
			26.0	0.5				6 12 15	SPT 4, 9, 8 N=17			
						SP	SAND, fine grained, pale brown, trace silt.			D	L - MD	COASTAL DEPOSITS
			25.5	1.0					PSD-TR			
							1.2m: brown-orange.					
			25.0	1.5					SPT 3, 5, 5 N=10 ES			
			24.5	2.0								
			24.0	2.5		SP	SAND, fine to medium grained, pale brown/yellow, poorly graded.		PSD-TR	D - M	L - MD	
			23.5	3.0					SPT 2, 4, 5 N=9			
			23.0	3.5								
			22.5	4.0								
			22.0	4.5					SPT 5, 7, 10 N=17 PSD-TR			
			21.5	5.0								
				5.5								

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BH No: A2K-BH13
Sheet: 2 of 2
Job No: 14777

Borehole Log

Client: Ausgrid
Project: Ausgrid Cable Project
Location: 146 Turnstall Ave, Kensington
Hole Location: Refer to drawing 14777-GR-1-1-A
Started: 10/06/2002
Finished: 10/06/2002
Borehole Size: 250 mm

Rig Type: Ute Rig
Hole Coordinates 335044E, 6244806N
Driller: Nick
Logged: AH
RL Surface: 26.57m
Contractor: Stratacore
Bearing: ---
Checked: AS

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	DCP per 150mm (2 4 9 18)	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
ADT			21.0			SP	SAND, fine to medium grained, pale brown/yellow, poorly graded. *(continued)*			D - M	L - MD	
			20.5	6.0					SPT 7, 9, 10 N=19		MD	
			20.0	6.5								
			19.5	7.0					PSD-TR			
			19.0	7.5					SPT 6, 7, 10 N=17			
			18.5	8.0		SP	SAND, fine to medium grained, orange-brown, poorly graded, with clay.			M		
			18.0	8.5								
			17.5	9.0			9.1m: pale brown/yellow.		PSD-TR			
			17.0	9.5					SPT 5, 9, 15 N=24			
				10.0								
			16.5				Target Depth Borehole A2K-BH13 terminated at 10m					
			16.0	10.5								
				11.0								

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BH No: A2K-BH14
Sheet: 1 of 1
Job No: 14777

Borehole Log

Client: Ausgrid
Project: Ausgrid Cable Project
Location: 2 Tresidder Ave, Kingsford
Hole Location: Refer to drawing 14777-GR-1-1-A
Started: 26/05/2022
Finished: 26/05/2022
Borehole Size: 110 mm

Rig Type: TDLR690
Hole Coordinates 335186E, 6245092N
Driller: CC
Logged: AH
RL Surface: 24.28m
Contractor: Alliance Geotechnical
Bearing: ---
Checked: AS

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	DCP per 150mm (2 4 9 18)	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
ADDT	Not Encountered		24.28	0.0		-	Asphaltic CONCRETE, 50mm.			-	-	PAVEMENT
						-	FILL: Sandy GRAVEL, fine to medium sub-angular igneous gravel, grey, fine to medium grained sand, poorly graded (ballast), appears well compacted.			M		FILL
			24.0			-						
						SP	FILL: Gravelly SAND, fine grained, orange-brown, fine to medium sub-angular crushed sandstone, appears well compacted.	8	ES	D	D	COASTAL DEPOSITS
				0.5			SAND, fine grained, grey-brown, with silt.	19				
								15	ES			
			23.5					11	PSD			
				1.0					TR			
			23.0						ES			
				1.5							L	
			22.5						SPT 3, 3, 4 N=7			
				2.0								
							Target Depth Borehole A2K-BH14 terminated at 2m					
			22.0									
				2.5								
			21.5									
				3.0								
			21.0									
				3.5								
			20.5									
				4.0								
			20.0									
				4.5								
			19.5									
				5.0								

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BH No: A2K-BH15
Sheet: 1 of 1
Job No: 14777

Borehole Log

Client: Ausgrid
Project: Ausgrid Cable Project
Location: 142 Cottenham Ave, Kingsford
Hole Location: Refer to drawing 14777-GR-1-1-A
Started: 26/05/2022
Finished: 26/05/2022
Borehole Size: 110 mm

Rig Type: TDLR690
Hole Coordinates 335474E, 6244982N
Driller: CC
Logged: AH

RL Surface: 20.26m
Contractor: Alliance Geotechnical
Bearing: ---
Checked: AS

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	DCP per 150mm	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
ADTDT	Not Encountered		20.26	0.0		-	Asphaltic CONCRETE, 70mm.	2 4 9 18		-	-	PAVEMENT
						-	FILL: Sandy GRAVEL, fine to medium sub-angular igneous gravel, grey, fine to medium grained sand, poorly graded (ballast), appears well compacted.					FILL
			20.0			-	FILL: Gravelly SAND, fine grained, orange-brown, fine to medium sub-angular crushed sandstone, appears well compacted.	8	ES	M		
				0.5		SM	Silty SAND, fine grained, grey-brown, poorly graded.	25		D	D	COASTAL DEPOSITS
			19.5					25	ES			
				1.0					TR			
			19.0						ES			
				1.5								
			18.5			SP	SAND, medium grained, pale grey, white, trace silt, poorly graded.		SPT 2, 3, 3 N=6 PSD	M	L	
				2.0			Target depth. Borehole A2K-BH15 terminated at 2m					
			18.0									
				2.5								
			17.5									
				3.0								
			17.0									
				3.5								
			16.5									
				4.0								
			16.0									
				4.5								
			15.5									
				5.0								

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BH No: A2K-BH16
Sheet: 1 of 1
Job No: 14777

Borehole Log

Client: Ausgrid
Project: Ausgrid Cable Project
Location: 253 Borrodale Rd, Kingsford
Hole Location: Refer to drawing 14777-GR-1-1-A
Started: 26/05/2022
Finished: 26/05/2022
Borehole Size: 110 mm

Rig Type: TDLR690
Hole Coordinates 335690E, 6244908N
Driller: CC
Logged: AH

RL Surface: 20.18m
Contractor: Alliance Geotechnical
Bearing: ---
Checked: AS

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	DCP per 150mm	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
ADTDT	Not Encountered		20.0	0.0		-	Asphaltic CONCRETE, 70mm.	2 4 9 18		-	-	PAVEMENT
						-	FILL: Gravelly SAND, fine to medium grained, grey, well graded, fine to medium sub-angular igneous appears well compacted.			D		FILL
						-	FILL: SAND, fine to medium grained, grey, well graded, with fine to medium sub-angular igneous gravel, appears well compacted.		ES			
				0.5		SP	SAND, fine to medium grained, pale brown, poorly graded.				D	COASTAL DEPOSITS
			19.5			SP	SAND, fine to medium grained, brown, with clay and silt, poorly graded.	11 11 11	ES, PSD	M		
				1.0		SM	Silty SAND, fine grained, brown, poorly graded.		TR	D - M		
			19.0						ES, PSD			
				1.5								
			18.5			SP	SAND, fine to medium grained, pale brown, yellow, trace silt.		SPT 3, 3, 4 N=7	M	L	
				2.0			Borehole A2K-BH16 terminated at 2m					
			18.0									
				2.5								
			17.5									
				3.0								
			17.0									
				3.5								
			16.5									
				4.0								
			16.0									
				4.5								
			15.5									
				5.0								

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BH No: A2K-BH17
Sheet: 1 of 1
Job No: 14777

Borehole Log

Client: Ausgrid
Project: Ausgrid Cable Project
Location: 23 Bruce St, Kensington
Hole Location: Refer to drawing 14777-GR-1-1-A
Started: 9/06/2022
Finished: 9/06/2022
Borehole Size: 250 mm

Rig Type: Ute Rig
Hole Coordinates 335962E, 6244745N
Driller: Nick
Logged: AH
RL Surface: 23.64m
Contractor: Stratacore
Bearing: ---
Checked: AS

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	DCP per 150mm	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
ADDT	Not Encountered		23.5	0.0		-	Asphaltic CONCRETE, 60mm.	2 4 9 18		-	-	PAVEMENT
						-	FILL: Sandy GRAVEL, fine to medium sub-angular igneous gravel, grey, fine to medium grained sand, poorly graded (ballast), appears well compacted.			-	-	FILL
						-	FILL: SAND, fine grained, grey-brown, poorly graded, trace silt.	8	ES	D	MD	
			23.0	0.5				10	SPT 5, 10, 17 N=27 ES			
								11				
			22.5	1.0					TR			
						SP	SAND, fine grained, brown-orange, trace clay and silt, poorly graded.		PSD/ES	-	L	COASTAL DEPOSITS
			22.0	1.5					SPT 2, 4, 4 N=8			
				2.0								
			21.5				Target Depth Borehole A2K-BH17 terminated at 2m					
				2.5								
			21.0									
				3.0								
			20.5									
				3.5								
			20.0									
				4.0								
			19.5									
				4.5								
			19.0									
				5.0								

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BH No: A2K-BH18
Sheet: 1 of 1
Job No: 14777

Borehole Log

Client: Ausgrid
Project: Ausgrid Cable Project
Location: 25 Solander Rd, Kingsford
Hole Location: Refer to drawing 14777-GR-1-1-A
Started: 26/05/2022
Finished: 26/05/2022
Borehole Size: 110 mm

Rig Type: TDLR690
Hole Coordinates 335995E, 6244684N
Driller: CC
Logged: AH

RL Surface: 23.33m
Contractor: Alliance Geotechnical
Bearing: ---
Checked: AS

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	DCP per 150mm (2 4 9 18)	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
DT						-	Asphaltic CONCRETE, 70mm.			-	-	PAVEMENT
ADT	Not Encountered					-	FILL: Sandy GRAVEL, medium sub-angular igneous gravel, grey, fine to medium grained sand, poorly graded (ballast), appears well compacted.			M		FILL
			23.0			-	FILL: Gravelly SAND, fine grained, orange-brown, fine to medium sub-angular crushed sandstone gravel, appears well compacted.		ES			
				0.5		SM	Silty SAND, fine grained, grey-brown, poorly graded.	3		W	L	COASTAL DEPOSITS
			22.5					3	ES/PSD			
				1.0				3	TR			
			22.0						ES			
				1.5		SP	SAND, fine grained, pale grey/white, poorly graded.		SPT 1, 2, 2 N=4 PSD	D	L	
			21.5									
				2.0			Borehole A2K-BH18 terminated at 2m					
			21.0									
				2.5								
			20.5									
				3.0								
			20.0									
				3.5								
			19.5									
				4.0								
			19.0									
				4.5								
			18.5									
				5.0								

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BH No: A2K-BH19
Sheet: 1 of 1
Job No: 14777

Borehole Log

Client: Ausgrid
Project: Ausgrid Cable Project
Location: 3 Colenso Crescent, Kingsford
Hole Location: Refer to drawing 14777-GR-1-1-A
Started: 27/05/2022
Finished: 27/05/2022
Borehole Size: 220 mm

Rig Type: TDLR690
Hole Coordinates 336072E, 6244495N
Driller: CC
Logged: AH

RL Surface: 21.92m
Contractor: Alliance Geotechnical
Bearing: ---
Checked: AS

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	DCP per 150mm	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
ADT	Not Encountered		21.92	0.0		-	Asphaltic CONCRETE, 65mm.	2 4 9 18		-	-	PAVEMENT
						-	FILL: Gravelly SAND, fine grained, orange-brown, fine to medium sub-angular crushed sandstone gravel, appears well compacted.			M		FILL
			21.5	0.5		SP	SAND, fine grained, pale grey-brown, poorly graded.	18	ES		VD	COASTAL DEPOSITS
								8	ES		MD	
								7	PSD			
			21.0	1.0		SC	Clayey SAND, fine grained, brown-orange, low plasticity clay.		ES			
									TR			
			20.5	1.5		SP	SAND, fine to medium grained, pale brown-yellow, poorly graded.				VL - L	
			20.0	2.0					SPT 1, 2, 2 N=4			
							Borehole A2K-BH19 terminated at 2m					
			19.5	2.5								
			19.0	3.0								
			18.5	3.5								
			18.0	4.0								
			17.5	4.5								
			17.0	5.0								

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BH No: A2K-BH20
Sheet: 1 of 2
Job No: 14777

Borehole Log

Client: Ausgrid
Project: Ausgrid Cable Project
Location: 14 Colonel Braund Cres, Kingsford
Hole Location: Refer to drawing 14777-GR-1-1-A
Started: 9/06/2022
Finished: 9/06/2022
Borehole Size: 250 mm

Rig Type: Ute Rig
Hole Coordinates 336256E, 6244469N
Driller: Nick
Logged: AH
RL Surface: 23.82m
Contractor: Stratacore
Bearing: ---
Checked: AS

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	DCP per 150mm (2 4 9 18)	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
DT						-	Asphaltic CONCRETE, 120mm.			-	-	PAVEMENT
ADT						-	FILL: Sandy GRAVEL, medium sub-angular igneous gravel, grey, fine to medium grained sand, poorly graded (ballast), well cemented, appears well compacted.			-	-	FILL
			23.5			-				D	-	
				0.5		SP	FILL: Gravelly SAND, fine to medium grained, grey-brown, rounded igneous gravel, appears moderately compacted.	8	ES	D	MD	COASTAL DEPOSITS
							SAND, fine grained, grey, poorly graded.	8	ES			
			23.0					10	SPT 5, 5, 8 N=13 PSD			
				1.0			0.8m: pale brown, fine grained quartz sand.		TR			
			22.5									
				1.5					ES			
									SPT 2, 2, 4 N=6 PSD			
			22.0			SM	Silty SAND, fine grained, brown-orange, trace clay.			D - M	L	
				2.0								
			21.5									
				2.5			2.7m: with clay.					
			21.0						TR			
				3.0					SPT 2, 8, 10 N=18 Overfilled SPT due to hole collapse			
			20.5									
				3.5		SP	SAND, fine grained, yellow, trace silt, poorly graded.			D	MD	
			20.0									
				4.0					TR/PSD			
			19.5									
				4.5		SM	Silty SAND, fine grained, brown, poorly graded.			M	MD	No SPT at 4.5m due to hole collapse
			19.0									
	▼			5.0								

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BH No: A2K-BH20
Sheet: 2 of 2
Job No: 14777

Borehole Log

Client: Ausgrid
Project: Ausgrid Cable Project
Location: 14 Colonel Braund Cres, Kingsford
Hole Location: Refer to drawing 14777-GR-1-1-A
Started: 9/06/2022
Finished: 9/06/2022
Borehole Size: 250 mm

Rig Type: Ute Rig
Hole Coordinates 336256E, 6244469N
Driller: Nick
Logged: AH
RL Surface: 23.82m
Contractor: Stratacore
Bearing: ---
Checked: AS

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	DCP per 150mm (2 4 9 18)	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
ADT	GW @ ~5.0m		18.5			SM	Silty SAND, fine grained, brown, poorly graded. *(continued)*			M	MD	
				5.5		SP	SAND, fine grained, pale brown, poorly graded.		TR		D - VD	
			18.0	6.0					SPT 6, 25, 24 N=49			
			17.5	6.5			Target Depth Borehole A2K-BH20 terminated at 6.45m					
			17.0	7.0								
			16.5	7.5								
			16.0	8.0								
			15.5	8.5								
			15.0	9.0								
			14.5	9.5								
			14.0	10.0								

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BH No: A2K-BH21
Sheet: 1 of 2
Job No: 14777

Borehole Log

Client: Ausgrid
Project: Ausgrid Cable Project
Location: 65 Anderson St, Daceyville
Hole Location: Refer to drawing 14777-GR-1-1-A
Started: 9/06/2022
Finished: 9/06/2022
Borehole Size: 250 mm

Rig Type: Ute Rig
Hole Coordinates 336320E, 6244478N
Driller: Nick
Logged: AH
RL Surface: 23.59m
Contractor: Stratacore
Bearing: ---
Checked: AS

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	DCP per 150mm	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
DT			23.5			-	Asphaltic CONCRETE, 75mm.			-	-	PAVEMENT
ADT						-	FILL: Sandy GRAVEL, medium sub-angular igneous gravel, grey, fine to medium sand, poorly graded (ballast), appears well compacted.			-	-	FILL
						-	FILL: Gravelly SAND, fine grained, orange-brown, fine to medium sub-angular crushed sandstone gravel, appears moderately compacted.		ES	-	-	
						-	FILL: SAND, fine grained, brown, poorly graded.			D	-	
			23.0	0.5			0.7m: pale brown.	8 7 9	SPT 4, 6, 6 N=12 PSD/ES: 0.4-0.6			
			22.5	1.0		SP	SAND, fine grained, pale grey/white, poorly graded.					COASTAL DEPOSITS
			22.0	1.5			1.7m: brown-orange, trace clay.		SPT 1, 3, 4 N=7 PSD/ES		L	
			21.5	2.0								
			21.0	2.5		SP	SAND, fine to medium grained, pale brown and orange, poorly graded			D - M		
			20.5	3.0					TR			
										D		
			20.0	3.5					SPT 2, 4, 4 N=8			
			19.5	4.0								
				4.5								

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BH No: A2K-BH21
Sheet: 2 of 2
Job No: 14777

Borehole Log

Client: Ausgrid
Project: Ausgrid Cable Project
Location: 65 Anderson St, Daceyville
Hole Location: Refer to drawing 14777-GR-1-1-A
Started: 9/06/2022
Finished: 9/06/2022
Borehole Size: 250 mm

Rig Type: Ute Rig
Hole Coordinates 336320E, 6244478N
Driller: Nick
Logged: AH
RL Surface: 23.59m
Contractor: Stratacore
Bearing: ---
Checked: AS

Method	Water	Well Details	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	DCP per 150mm (2 4 9 18)	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
ADT	GW encountered at 4.7m		19.0			SP	SAND, fine to medium grained, pale brown and orange, poorly graded *(continued)*			D	L	SPT at 4.5m aborted due to hole collapse.
			18.5	5.0		SP	SAND, fine to medium grained, orange-brown, with clay, poorly graded.		TR/PSD	M	D	
			18.0	5.5			5.5m: pale brown/orange.					
			17.5	6.0					SPT 4, 12, 21 N=33			
			17.0	6.5			Target Depth Borehole A2K-BH21 terminated at 6.45m					
			16.5	7.0								
			16.0	7.5								
			15.5	8.0								
			15.0	8.5								
				9.0								

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BH No: A2K-BH22
Sheet: 1 of 2
Job No: 14777

Borehole Log

Client: Ausgrid
Project: Ausgrid Cable Project
Location: Australian Golf Course
Hole Location: Refer to drawing 14777-GR-1-1-A
Started: 7/12/2022
Finished: 7/12/2022
Borehole Size: 100 mm

Rig Type: CE180
Hole Coordinates 334939E, 6244841N
Driller: DR
Logged: AS/AH
RL Surface: 22.62m
Contractor: BG Drilling
Bearing: ---
Checked: JA

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	DCP per 150mm (2 4 9 18)	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
ADT					-	TOPSOIL: Silty SAND, fine to medium grained, grey-brown, with rootlets, fine gravel.		ES	D	-	TOPSOIL
					-	FILL: Silty SAND, medium to coarse grained, brown, appears moderately to well compacted.					FILL
		22	1					SPT 1, 1, 2 N=3			
		21	2		SP	SAND, fine to medium grained, pale grey, poorly graded.		SPT 1, 2, 2 N=4	M	VL	COASTAL DEPOSITS
								TR			
		20				From 2.3m: becoming grey-brown.					
			3					TR			
					SP	SAND, medium to coarse grained, brown, poorly graded.		SPT 3, 3, 4 N=7		L	
		19	4					PI			
		18						SPT 2, 3, 4 N=7			
	GW @ 5.0m		5			From 5.0m: becoming pale grey.		TR	W		
		17	6					SPT 3, 10, 15 N=25		MD	No SPT below 6.0m due to hole collapse
		16									
			7					TR			
		15									
			8								

A. AUGERED BOREHOLE + LOCATION CHANGE 14777.GPJ GINT STD AUSTRALIA.GDT 23/8/22

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T: 1800 288 188
E: office@allgeo.com.au
W: www.allgeo.com.au

BH No: A2K-BH22
Sheet: 2 of 2
Job No: 14777

Borehole Log

Client: Ausgrid
Project: Ausgrid Cable Project
Location: Australian Golf Course
Hole Location: Refer to drawing 14777-GR-1-1-A
Started: 7/12/2022
Finished: 7/12/2022
Borehole Size: 100 mm

Rig Type: CE180
Hole Coordinates 334939E, 6244841N
Driller: DR
Logged: AS/AH
RL Surface: 22.62m
Contractor: BG Drilling
Bearing: ---
Checked: JA

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	DCP per 150mm (2 4 9 18)	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
ADT		14	9		SP	SAND, medium to coarse grained, brown, poorly graded. *(continued)*		TR	W	MD	
		13	10			Target Depth Borehole A2K-BH22 terminated at 10m					
		12	11								
		11	12								
		10	13								
		9	14								
		8	15								
		7	16								

A. AUGERED BOREHOLE + LOCATION CHANGE 14777.GPJ GINT STD AUSTRALIA.GDT 23/8/22

APPENDIX D – Laboratory Test Certificates

Material Test Report

Report Number: **14777-1**
Issue Number: 1
Date Issued: 12/07/2022
Client: Alliance Geotechnical
10 Welder Road, Seven Hills NSW 2147
Contact: Aaron Hong
Project Number: 14777
Project Name: Ausgrid Cable Project
Project Location: Alexandria, Surry Hills & Waterloo
Contractor: Ausgrid
Work Request: 19419
Date Sampled: 29/05/2022
Dates Tested: 31/05/2022 - 30/06/2022
Sampling Method: Sampled by Client
The results apply to the sample as received

alliance
geotechnical & environmental solutions
Alliance Geotechnical Pty Ltd
10 Welder Road Seven Hills NSW 2147
PO Box 275, Seven Hills NSW 1730
Phone: 1800 288 188
Email: brett@allgeo.com.au

Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Brett Bellingham
Conformance Testing Manager
NATA Accredited Laboratory Number: 15100

Moisture Content AS 1289 2.1.1			
Sample Number	Sample Location	Moisture Content (%)	Material
22-19419A	A2KBH2, Depth: 0.8-1.0m	14.6 %	Clayey SAND, with gravel, brown
22-19419B	A2KBH2, Depth: 0.9-1.2m	16.5 %	Clayey Gravelly SAND, dark brown
22-19419C	A2KBH5, Depth: 0.8-1.0m	2.9 %	SAND, trace clay/silt, trace gravel, brown
22-19419D	A2KBH5, Depth: 0.9-1.2m	2.9 %	SAND, trace gravel, brown
22-19419E	A2KBH6, Depth: 0.6-0.8m	9.7 %	SAND, trace clay/silt, brown
22-19419F	A2KBH6, Depth: 0.9-1.2m	3.4 %	SAND, trace gravel, brown yellow
22-19419G	A2KBH7, Depth: 0.9-1.2m	19.4 %	SAND, trace gravel, trace clay/silt, brown
22-19419H	A2KBH7, Depth: 1.6-1.8m	71.0 %	Sandy CLAY, dark brown
22-19419I	A2KBH8, Depth: 0.6-0.8m	2.2 %	SAND, trace clay/silt, brown
22-19419J	A2KBH8, Depth: 0.9-1.2m	2.4 %	SAND, yellow
22-19419K	A2KBH9, Depth: 0.9-1.2m	8.0 %	SAND, trace clay/silt, grey brown
22-19419L	A2KBH9, Depth: 0.9-1.2m	1.9 %	SAND, trace gravel, brown
22-19419M	A2KBH14, Depth: 0.7-0.9m	2.1 %	SAND, with clay/silt, grey
22-19419N	A2KBH14, Depth: 0.9-1.2m	1.4 %	SAND, trace gravel, brown yellow
22-19419O	A2KBH15, Depth: 1.5-1.6m	4.9 %	SAND, trace clay/silt, grey
22-19419P	A2KBH15, Depth: 0.9-1.2m	0.4 %	SAND, brown
22-19419Q	A2KBH16, Depth: 0.9-1.2m	2.6 %	SAND, trace gravel, light brown-brown
22-19419R	A2KBH16, Depth: 1.2-1.5m	3.6 %	SAND, trace clay/silt, brown
22-19419S	A2KBH18, Depth: 0.9-1.2m	9.0 %	Gravelly SAND, brown
22-19419T	A2KBH18, Depth: 1.6-2.0m	3.2 %	SAND, trace clay/silt, grey
22-19419U	A2KBH19, Depth: 0.6-0.8m	5.8 %	SAND, trace clay/silt, brown grey
22-19419V	A2KBH19, Depth: 0.9-1.2m	3.5 %	SAND, trace gravel, yellow brown
22-19419W	W2SBH1, Depth: 0.6-0.9m	7.0 %	Clayey SAND, trace gravel, brown
22-19419X	W2SBH1, Depth: 0.9-1.2m	16.1 %	Clayey SAND, grey brown
22-19419Y	W2SBH3, Depth: 2.5-2.7m	2.5 %	SAND, trace clay/silt, yellow
22-19419Z	W2SBH3, Depth: 0.9-1.2m	2.5 %	SAND, trace clay/silt, brown
22-19419AA	W2SBH3, Depth: 2.9-3.2m	3.0 %	SAND, trace clay/silt, trace gravel, yellow brown
22-19419AB	W2SBH4, Depth: 1.4-1.6m	10.7 %	Clayey SAND, trace gravel, brown
22-19419AC	W2SBH4, Depth: 0.9-1.2m	3.8 %	SAND, trace clay/silt, brown

Material Test Report

Report Number: **14777-2**
Issue Number: 1
Date Issued: 12/07/2022
Client: Alliance Geotechnical
10 Welder Road, Seven Hills NSW 2147
Contact: Aaron Hong
Project Number: 14777
Project Name: Ausgrid Cable Project
Project Location: Alexandria, Surry Hills & Waterloo
Contractor: Ausgrid
Work Request: 19739
Date Sampled: 10/06/2022
Dates Tested: 20/06/2022 - 30/06/2022
Sampling Method: Sampled by Client
The results apply to the sample as received

alliance
geotechnical & environmental solutions
Alliance Geotechnical Pty Ltd
10 Welder Road Seven Hills NSW 2147
PO Box 275, Seven Hills NSW 1730
Phone: 1800 288 188
Email: brett@allgeo.com.au

Accredited for compliance with ISO/IEC 17025 - Testing

NATA WORLD RECOGNISED ACCREDITATION

Approved Signatory: Brett Bellingham
Conformance Testing Manager
NATA Accredited Laboratory Number: 15100

Moisture Content AS 1289 2.1.1			
Sample Number	Sample Location	Moisture Content (%)	Material
22-19739A	A2KBH13, Depth: 0.9-1.2m	2.2 %	SAND, trace gravel, light brown
22-19739B	A2KBH13, Depth: 2.5-3.2m	1.2 %	SAND, trace gravel, brown yellow
22-19739C	A2KBH13, Depth: 4.5-5.0m	1.1 %	SAND, yellow
22-19739D	A2KBH13, Depth: 6.9-7.2m	1.1 %	SAND, yellow
22-19739E	A2KBH13, Depth: 8.9-9.2m	5.4 %	SAND, yellow
22-19739F	A2KBH17, Depth: 0.9-1.2m	3.3 %	SAND, light brown and brown
22-19739H	A2KBH20, Depth: 0.9-1.2m	1.3 %	SAND, light brown
22-19739I	A2KBH20, Depth: 2.8-3.2m	1.7 %	SAND, trace gravel, light brown
22-19739J	A2KBH20, Depth: 4.0-4.5m	1.5 %	SAND, yellow
22-19739K	A2KBH20, Depth: 5.5-6.0m	8.9 %	SAND, yellow brown
22-19739L	A2KBH21, Depth: 0.9-1.2m	1.3 %	SAND, trace gravel, light brown
22-19739M	A2KBH21, Depth: 2.9-3.3m	2.2 %	SAND, yellow
22-19739N	A2KBH21, Depth: 4.9-5.2m	4.2 %	SAND, trace gravel, yellow

Material Test Report

Report Number: **14777-3**
Issue Number: 1
Date Issued: 29/07/2022
Client: Alliance Geotechnical Pty Ltd
8-10 Welder Road, Seven Hills NSW 2147
Contact: Aaron Hong
Project Number: 14777
Project Name: Ausgrid Cable Project
Project Location: Alexandria, Surry Hills & Waterloo
Contractor: Ausgrid
Work Request: 19742
Date Sampled: 08/06/2022
Dates Tested: 20/06/2022 - 05/07/2022
Sampling Method: Sampled by Client
The results apply to the sample as received

alliance
geotechnical & environmental solutions
Alliance Geotechnical Pty Ltd
10 Welder Road Seven Hills NSW 2147
PO Box 275, Seven Hills NSW 1730
Phone: 1800 288 188
Email: brett@allgeo.com.au

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NATA WORLD RECOGNISED ACCREDITATION

Approved Signatory: Brett Bellingham
Conformance Testing Manager
NATA Accredited Laboratory Number: 15100

Moisture Content AS 1289 2.1.1			
Sample Number	Sample Location	Moisture Content (%)	Material
22-19742A	W2SBH7, Depth: 0.8-0.9m	23.8 %	Silty CLAY, high plasticity, grey mottled brown-red, trace ironstone gravel
22-19742B	W2SBH7, Depth: 0.9-1.2m	14.3 %	Silty CLAY, high plasticity, grey mottled brown-red, trace ironstone gravel
22-19742C	NSBH5, Depth: 0.9-1.2m	17.4 %	Silty CLAY, low plasticity, brown, trace gravel
22-19742D	NSBH5, Depth: 1.2-1.4m	12.9 %	Silty CLAY, low plasticity, brown, trace gravel
22-19742E	NSBH6, Depth: 0.7-0.9m	27.1 %	Silty CLAY, medium plasticity, dark grey-brown, trace sand
22-19742F	NSBH6, Depth: 0.9-1.2m	29.3 %	Silty CLAY, medium plasticity, dark grey-brown, trace sand
22-19742G	NSBH7, Depth: 0.8-0.9m	21.9 %	SAND, with gravel, brown
22-19742H	NSBH7, Depth: 0.9-1.2m	26.6 %	Silty CLAY, medium plasticity, brown, trace gravel
22-19742I	NSBH8, Depth: 0.6-0.8m	25.3 %	Silty CLAY, high plasticity, dark brown
22-19742J	NSBH8, Depth: 0.9-1.2m	21.8 %	Silty CLAY, medium to high plasticity, red-brown

Material Test Report

Report Number: **14777-4**
Issue Number: 1
Date Issued: 29/07/2022
Client: Alliance Geotechnical Pty Ltd
8-10 Welder Road, Seven Hills NSW 2147
Contact: Aaron Hong
Project Number: 14777
Project Name: Ausgrid Cable Project
Project Location: Alexandria, Surry Hills & Waterloo
Contractor: Ausgrid
Work Request: 19954
Date Sampled: 24/06/2022
Dates Tested: 01/07/2022 - 11/07/2022
Sampling Method: Sampled by Client
The results apply to the sample as received
Remarks: Sample dates between 21/06/2022 to 24/06/2022

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geotechnical & environmental solutions
Alliance Geotechnical Pty Ltd
10 Welder Road Seven Hills NSW 2147
PO Box 275, Seven Hills NSW 1730
Phone: 1800 288 188
Email: brett@allgeo.com.au

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Approved Signatory: Brett Bellingham
Conformance Testing Manager
NATA Accredited Laboratory Number: 15100

Moisture Content AS 1289 2.1.1

Sample Number	Sample Location	Moisture Content (%)	Material
22-19954A	A2KBH01, Depth: 0.9-1.2m	28.2 %	Sandy CLAY, low to medium plasticity, dark grey, fine to medium grained sand, with silt
22-19954A	A2KBH01, Depth: 0.9-1.2m	24.9 %	Sandy CLAY, low to medium plasticity, dark grey, fine to medium grained sand, with silt
22-19954B	A2KBH01 (2.6-3.0m)	46.1 %	Clayey SAND, low plasticity, dark grey, trace gravel
22-19954C	A2KBH01, Depth: 2.9-3.2m	43.0 %	Clayey SAND, low plasticity, dark grey, trace gravel
22-19954C	A2KBH01, Depth: 2.9-3.2m	29.6 %	Clayey SAND, low plasticity, dark grey, trace gravel
22-19954D	A2KBH10, Depth: 0.1-0.5m	13.2 %	SAND, fine to medium grained, trace gravel, trace clay/silt, brown
22-19954E	A2KBH10, Depth: 0.9-1.2m	6.6 %	SAND, fine to medium grained, yellow-pale brown, trace silt
22-19954F	W2SBH2, Depth: 0.7-0.9m	3.8 %	SAND, trace gravel, trace clay/silt, grey-brown
22-19954G	W2SBH2, Depth: 0.9-1.2m	2.8 %	SAND, fine to medium grained, orange-yellow
22-19954H	W2SBH2, Depth: 0.9-1.5m	3.2 %	SAND, fine to medium grained, orange-yellow
22-19954J	W2SBH5, Depth: 0.9-1.2m	3.1 %	Clayey SAND, low plasticity, fine to medium grained, trace gravel, pale brown-orange
22-19954K	W2SBH5, Depth: 0.9-1.2m	2.9 %	Clayey SAND, low plasticity, fine to medium grained, trace gravel, pale brown-orange
22-19954L	W2SBH6, Depth: 1.0-1.4m	21.4 %	SAND, fine to medium grained, pale brown, with silt, trace clay
22-19954M	W2SBH6, Depth: 1.3-1.5m	22.3 %	Sandy CLAY, Low Plasticity, grey mottled orange-brown, fine to medium grained sand
22-19954N	W2SBH10, Depth: 0.9-1.2m	3.8 %	Clayey SAND, fine grained, low to medium plasticity, brown
22-19954O	W2SBH10 (1.8-2.0m)	7.7 %	Sandy CLAY, low plasticity, trace gravel, grey
22-19954P	W2SBH11, Depth: 1.2-1.5m	5.6 %	SAND, with clay/silt, trace gravel, brown
22-19954Q	W2SBH11, Depth: 0.9-1.2m	4.9 %	SAND, with clay/silt, trace gravel, brown
22-19954R	W2SBH12, Depth: 0.9-1.2m	8.0 %	Sandy CLAY, low to medium plasticity, with ironstone gravel, pale brown-orange
22-19954S	W2SBH12, Depth: 1.6-2.1m	13.3 %	Clayey SAND, low to medium plasticity, orange-brown
22-19954T	NSBH2, Depth: 1.2-1.5m	25.1 %	Sandy CLAY. medium plasticity, with silt, brown
22-19954U	NSBH2, Depth: 0.9-1.2m	11.5 %	Gravelly CLAY, medium plasticity, grey-brown

Material Test Report

Report Number: **14777-5**
Issue Number: 1
Date Issued: 29/07/2022
Client: Alliance Geotechnical Pty Ltd
8-10 Welder Road, Seven Hills NSW 2147
Contact: Aaron Hong
Project Number: 14777
Project Name: Ausgrid Cable Project
Project Location: Alexandria, Surry Hills & Waterloo
Contractor: Ausgrid
Work Request: 20102
Date Sampled: 07/07/2022
Dates Tested: 18/07/2022 - 20/07/2022
Sampling Method: Sampled by Client
The results apply to the sample as received
Remarks: Sampled between 07/07/2022 and 13/07/2022

alliance
geotechnical & environmental solutions
Alliance Geotechnical Pty Ltd
10 Welder Road Seven Hills NSW 2147
PO Box 275, Seven Hills NSW 1730
Phone: 1800 288 188
Email: brett@allgeo.com.au

Accredited for compliance with ISO/IEC 17025 - Testing

NATA
WORLD RECOGNISED ACCREDITATION

Approved Signatory: Brett Bellingham
Conformance Testing Manager
NATA Accredited Laboratory Number: 15100

Moisture Content AS 1289 2.1.1			
Sample Number	Sample Location	Moisture Content (%)	Material
22-20102A	W2SBH14, Depth: 1.0-1.5m	29.1 %	Clayey SAND, low plasticity, grey
22-20102B	W2SBH14, Depth: 0.9-1.2m	18.9 %	Clayey SAND, low plasticity, grey
22-20102C	NSBH3, Depth: 0.3-0.6m	26.2 %	CLAY, medium to high plasticity, with silt, brown
22-20102D	NSBH3, Depth: 0.9-1.2m	26.7 %	CLAY, medium to high plasticity, grey mottled pale brown, with silt, trace shale gravel
22-20102E	NSBH4, Depth: 0.9-1.2m	24.1 %	CLAY, medium plasticity, orange mottled pale grey-brown
22-20102G	NSBH1, Depth: 3.5-3.7m	21.8 %	Silty CLAY, high plasticity, red-brown & grey
22-20102H	NSBH1, Depth: 0.9-1.2m	19.1 %	Sandy CLAY, medium plasticity, dark grey, with gravel

Material Test Report

Report Number: **14777-6**
Issue Number: 1
Date Issued: 29/07/2022
Client: Alliance Geotechnical Pty Ltd
8-10 Welder Road, Seven Hills NSW 2147
Contact: Aaron Hong
Project Number: 14777
Project Name: Ausgrid Cable Project
Project Location: Alexandria, Surry Hills & Waterloo
Contractor: Ausgrid
Work Request: 20103
Date Sampled: 07/07/2022
Dates Tested: 18/07/2022 - 20/07/2022
Sampling Method: Sampled by Client
The results apply to the sample as received
Remarks: Sampled between 07/07/2022 and 13/07/2022

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geotechnical & environmental solutions
Alliance Geotechnical Pty Ltd
10 Welder Road Seven Hills NSW 2147
PO Box 275, Seven Hills NSW 1730
Phone: 1800 288 188
Email: brett@allgeo.com.au

Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Brett Bellingham
Conformance Testing Manager
NATA Accredited Laboratory Number: 15100

Moisture Content AS 1289 2.1.1			
Sample Number	Sample Location	Moisture Content (%)	Material
22-20103A	A2KBH11, Depth: 0.9-1.2m	6.8 %	Silty SAND, grey brown
22-20103B	A2KBH11, Depth: 2.9-3.2m	22.4 %	SAND, trace silt, orane-brown
22-20103C	A2KBH11, Depth: 4.9-5.2m	21.0 %	SAND, with silt, wih gravel, pale brown-yellow
22-20103E	A2KBH12, Depth: 0.9-1.2m	5.0 %	SAND, trace silt, pale brown-orange
22-20103F	A2KBH12, Depth: 3.9-4.2m	4.4 %	SAND, trace silt, pale brown
22-20103G	A2KBH12, Depth: 5.9-6.2m	13.1 %	SAND, trace silt, pale brown
22-20103H	A2KBH12, Depth: 7.9-8.2m	17.4 %	SAND, trace silt, grey-brown
22-20103I	A2KBH12, Depth: 9.9-10.0m	20.7 %	SAND, trace silt, grey-brown
22-20103K	A2KBH22, Depth: 0.9-1.2m	8.7 %	Silty SAND, brown
22-20103L	A2KBH22, Depth: 2.9-3.2m	6.5 %	SAND, brown
22-20103M	A2KBH22, Depth: 4.9-5.2m	5.6 %	SAND, brown
22-20103N	A2KBH22, Depth: 6.9-7.2m	20.5 %	SAND, pale grey
22-20103O	A2KBH22, Depth: 8.9-9.2m	19.2 %	SAND, pale grey
22-20103Q	W2SBH08, Depth: 0.9-1.2m	14.7 %	Silty CLAY, medium to high plasticity, with gravel, grey mottled red
22-20103R	W2SBH08, Depth: 2.9-3.2m	10.8 %	Silty CLAY, medium to high plasticity, with shale gravel, orange-brown
22-20103S	W2SBH09, Depth: 0.9-1.2m	15.7 %	SAND, with silt, grey-brown
22-20103T	W2SBH09, Depth: 2.9-3.2m	21.3 %	CLAY, medium to high plasticity, with silt, red-brown
22-20103U	W2SBH09, Depth: 4.9-5.2m	19.7 %	CLAY, high plasticity, with gravel, grey mottled brown-red
22-20103V	W2SBH09, Depth: 4.0-4.5m	22.7 %	CLAY, high plasticiity, with gravel, grey mottled brown-red
22-20103W	W2SBH15, Depth: 0.9-1.2m	18.7 %	CLAY, medium to high plasticity, grey mottled red
22-20103X	W2SBH15, Depth: 2.9-3.2m	13.7 %	CLAY, medium to high plasticity, with gravel, trace sand, grey mottled red
22-20103Z	W2SBH13, Depth: 0.9-1.5m	11.3 %	Sandy CLAY, low to medium plasticity, orange-brown

Material Test Report

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Alliance Geotechnical Pty Ltd
10 Welder Road Seven Hills NSW 2147
PO Box 275, Seven Hills NSW 1730
Phone: 1800 288 188
Email: brett@allgeo.com.au

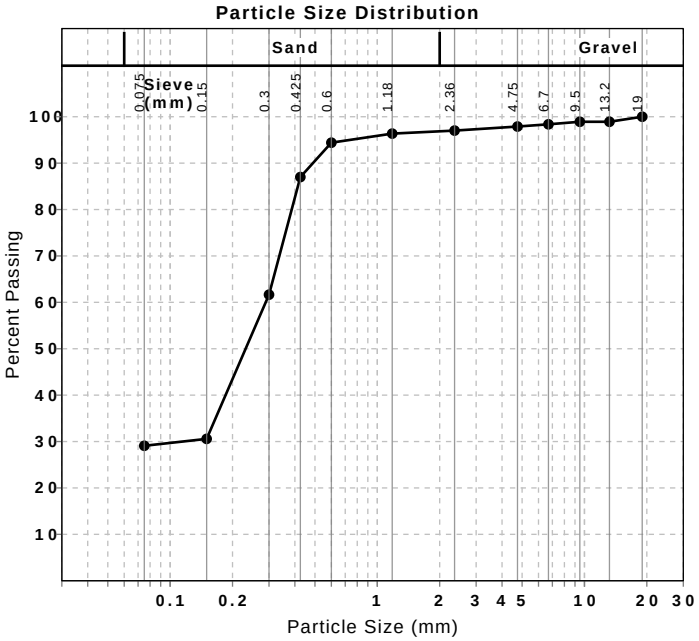
Report Number:	**14777-4**
Issue Number:	1
Date Issued:	29/07/2022
Client:	Alliance Geotechnical Pty Ltd
	8-10 Welder Road, Seven Hills NSW 2147
Contact:	Aaron Hong
Project Number:	14777
Project Name:	Ausgrid Cable Project
Project Location:	Alexandria to Kingsford Cable Project
Contractor:	Ausgrid
Work Request:	19954
Sample Number:	22-19954B
Date Sampled:	24/06/2022
Dates Tested:	01/07/2022 - 06/07/2022
Sampling Method:	Sampled by Client
	The results apply to the sample as received
Remarks:	Sample dates between 21/06/2022 to 24/06/2022
Sample Location:	**A2KBH01 (2.6-3.0m)**
Material:	Clayey SAND, low plasticity, dark grey, trace gravel

NATA WORLD RECOGNISED ACCREDITATION

Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Brett Bellingham
Conformance Testing Manager
NATA Accredited Laboratory Number: 15100

Particle Size Distribution (AS1289 3.6.1)			
Sieve	Passed %	Passing Limits	
19 mm	**100**		
13.2 mm	**99**		
9.5 mm	**99**		
6.7 mm	**98**		
4.75 mm	**98**		
2.36 mm	**97**		
1.18 mm	**96**		
0.6 mm	**94**		
0.425 mm	**87**		
0.3 mm	**62**		
0.15 mm	**31**		
0.075 mm	**29**		



Material Test Report

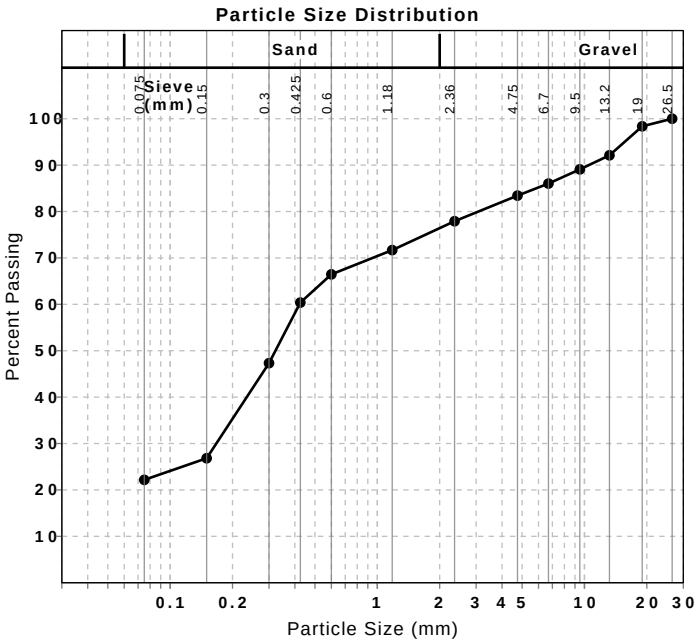
alliance
geotechnical & environmental solutions
Alliance Geotechnical Pty Ltd
10 Welder Road Seven Hills NSW 2147
PO Box 275, Seven Hills NSW 1730
Phone: 1800 288 188
Email: brett@allgeo.com.au

Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Brett Bellingham
Conformance Testing Manager
NATA Accredited Laboratory Number: 15100

Report Number: **14777-1**
Issue Number: 1
Date Issued: 12/07/2022
Client: Alliance Geotechnical
10 Welder Road, Seven Hills NSW 2147
Contact: Aaron Hong
Project Number: 14777
Project Name: Ausgrid Cable Project
Project Location: Alexandria to Kingsford Cable Project
Contractor: Ausgrid
Work Request: 19419
Sample Number: 22-19419A
Date Sampled: 29/05/2022
Dates Tested: 31/05/2022 - 06/06/2022
Sampling Method: Sampled by Client
The results apply to the sample as received
Sample Location: **A2KBH2, Depth: 0.8-1.0m**
Material: Clayey SAND, with gravel, brown

Particle Size Distribution (AS1289 3.6.1)			
Sieve	Passed %	Passing Limits	
26.5 mm	**100**		
19 mm	**98**		
13.2 mm	**92**		
9.5 mm	**89**		
6.7 mm	**86**		
4.75 mm	**83**		
2.36 mm	**78**		
1.18 mm	**72**		
0.6 mm	**66**		
0.425 mm	**60**		
0.3 mm	**47**		
0.15 mm	**27**		
0.075 mm	**22**		



Material Test Report

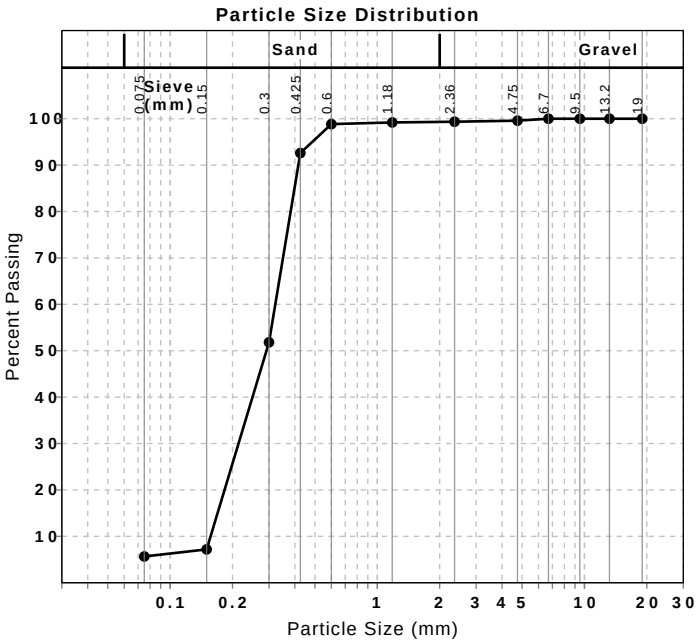
alliance
geotechnical & environmental solutions
Alliance Geotechnical Pty Ltd
10 Welder Road Seven Hills NSW 2147
PO Box 275, Seven Hills NSW 1730
Phone: 1800 288 188
Email: brett@allgeo.com.au

Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Brett Bellingham
Conformance Testing Manager
NATA Accredited Laboratory Number: 15100

Report Number: **14777-1**
Issue Number: 1
Date Issued: 12/07/2022
Client: Alliance Geotechnical
10 Welder Road, Seven Hills NSW 2147
Contact: Aaron Hong
Project Number: 14777
Project Name: Ausgrid Cable Project
Project Location: Alexandria to Kingsford Cable Project
Contractor: Ausgrid
Work Request: 19419
Sample Number: 22-19419C
Date Sampled: 29/05/2022
Dates Tested: 31/05/2022 - 06/06/2022
Sampling Method: Sampled by Client
The results apply to the sample as received
Sample Location: **A2KBH5, Depth: 0.8-1.0m**
Material: SAND, trace clay/silt, trace gravel, brown

Particle Size Distribution (AS1289 3.6.1)			
Sieve	Passed %	Passing Limits	
19 mm	**100**		
13.2 mm	**100**		
9.5 mm	**100**		
6.7 mm	**100**		
4.75 mm	**100**		
2.36 mm	**99**		
1.18 mm	**99**		
0.6 mm	**99**		
0.425 mm	**93**		
0.3 mm	**52**		
0.15 mm	**7**		
0.075 mm	**6**		



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Alliance Geotechnical Pty Ltd
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PO Box 275, Seven Hills NSW 1730
Phone: 1800 288 188
Email: brett@allgeo.com.au

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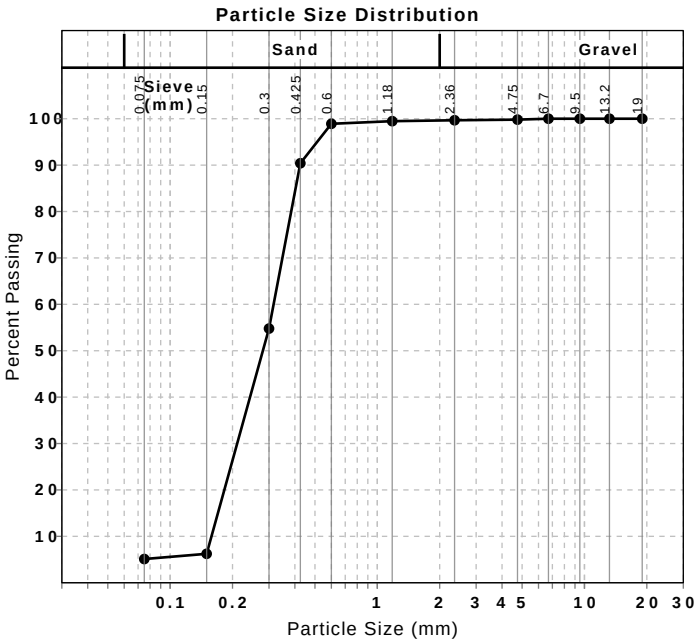
Approved Signatory: Brett Bellingham
Conformance Testing Manager
NATA Accredited Laboratory Number: 15100

Report Number: **14777-1**
Issue Number: 1
Date Issued: 12/07/2022
Client: Alliance Geotechnical
10 Welder Road, Seven Hills NSW 2147
Contact: Aaron Hong
Project Number: 14777
Project Name: Ausgrid Cable Project
Project Location: Alexandria to Kingsford Cable Project
Contractor: Ausgrid
Work Request: 19419
Sample Number: 22-19419E
Date Sampled: 29/05/2022
Dates Tested: 31/05/2022 - 06/06/2022
Sampling Method: Sampled by Client
The results apply to the sample as received
Sample Location: **A2KBH6, Depth: 0.6-0.8m**
Material: SAND, trace clay/silt, brown

Particle Size Distribution (AS1289 3.6.1)			
Sieve	Passed %	Passing Limits	
19 mm	**100**		
13.2 mm	**100**		
9.5 mm	**100**		
6.7 mm	**100**		
4.75 mm	**100**		
2.36 mm	**100**		
1.18 mm	**99**		
0.6 mm	**99**		
0.425 mm	**90**		
0.3 mm	**55**		
0.15 mm	**6**		
0.075 mm	**5**		



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PO Box 275, Seven Hills NSW 1730
Phone: 1800 288 188
Email: brett@allgeo.com.au

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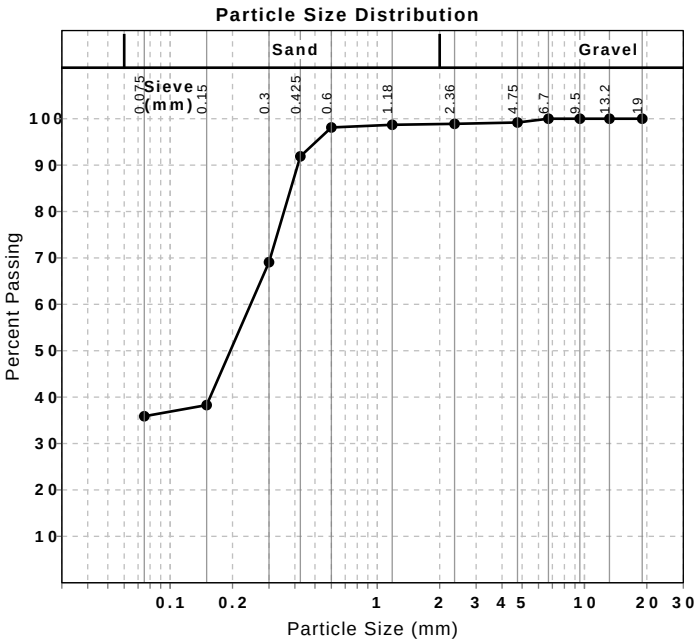
Approved Signatory: Brett Bellingham
Conformance Testing Manager
NATA Accredited Laboratory Number: 15100

Report Number: **14777-1**
Issue Number: 1
Date Issued: 12/07/2022
Client: Alliance Geotechnical
10 Welder Road, Seven Hills NSW 2147
Contact: Aaron Hong
Project Number: 14777
Project Name: Ausgrid Cable Project
Project Location: Alexandria to Kingsford Cable Project
Contractor: Ausgrid
Work Request: 19419
Sample Number: 22-19419H
Date Sampled: 29/05/2022
Dates Tested: 31/05/2022 - 06/06/2022
Sampling Method: Sampled by Client
The results apply to the sample as received
Sample Location: **A2KBH7, Depth: 1.6-1.8m**
Material: Sandy CLAY, dark brown

Particle Size Distribution (AS1289 3.6.1)			
Sieve	Passed %	Passing Limits	
19 mm	**100**		
13.2 mm	**100**		
9.5 mm	**100**		
6.7 mm	**100**		
4.75 mm	**99**		
2.36 mm	**99**		
1.18 mm	**99**		
0.6 mm	**98**		
0.425 mm	**92**		
0.3 mm	**69**		
0.15 mm	**38**		
0.075 mm	**36**		



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PO Box 275, Seven Hills NSW 1730
Phone: 1800 288 188
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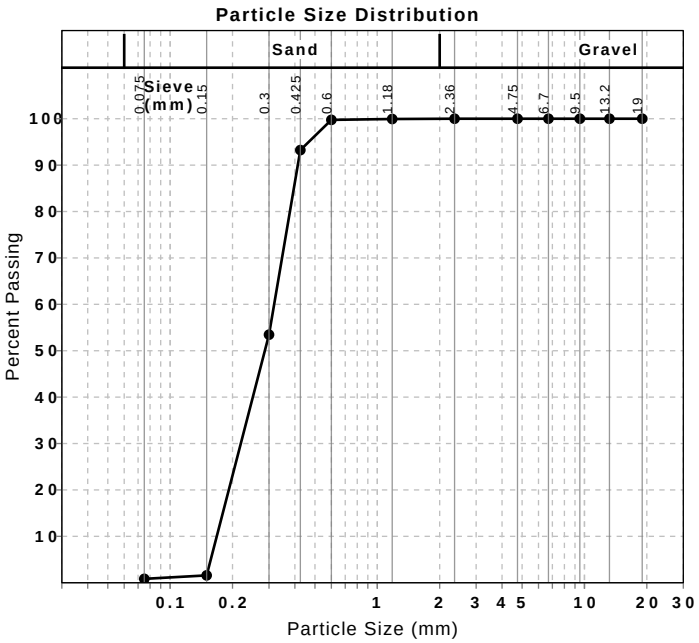
Approved Signatory: Brett Bellingham
Conformance Testing Manager
NATA Accredited Laboratory Number: 15100

Report Number: **14777-1**
Issue Number: 1
Date Issued: 12/07/2022
Client: Alliance Geotechnical
10 Welder Road, Seven Hills NSW 2147
Contact: Aaron Hong
Project Number: 14777
Project Name: Ausgrid Cable Project
Project Location: Alexandria to Kingsford Cable Project
Contractor: Ausgrid
Work Request: 19419
Sample Number: 22-19419I
Date Sampled: 29/05/2022
Dates Tested: 31/05/2022 - 06/06/2022
Sampling Method: Sampled by Client
The results apply to the sample as received
Sample Location: **A2KBH8, Depth: 0.6-0.8m**
Material: SAND, trace clay/silt, brown

Particle Size Distribution (AS1289 3.6.1)			
Sieve	Passed %	Passing Limits	
19 mm	**100**		
13.2 mm	**100**		
9.5 mm	**100**		
6.7 mm	**100**		
4.75 mm	**100**		
2.36 mm	**100**		
1.18 mm	**100**		
0.6 mm	**100**		
0.425 mm	**93**		
0.3 mm	**53**		
0.15 mm	**2**		
0.075 mm	**1**		



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10 Welder Road Seven Hills NSW 2147
PO Box 275, Seven Hills NSW 1730
Phone: 1800 288 188
Email: brett@allgeo.com.au

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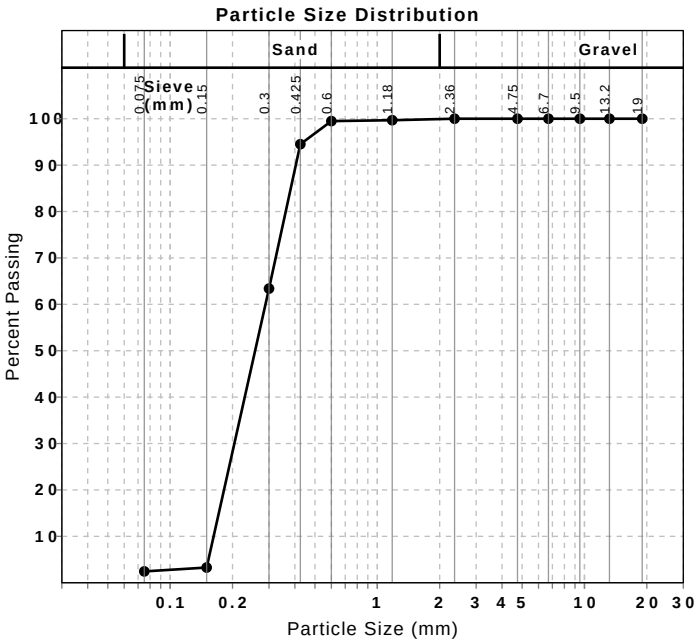
Approved Signatory: Brett Bellingham
Conformance Testing Manager
NATA Accredited Laboratory Number: 15100

Report Number: **14777-1**
Issue Number: 1
Date Issued: 12/07/2022
Client: Alliance Geotechnical
10 Welder Road, Seven Hills NSW 2147
Contact: Aaron Hong
Project Number: 14777
Project Name: Ausgrid Cable Project
Project Location: Alexandria to Kingsford Cable Project
Contractor: Ausgrid
Work Request: 19419
Sample Number: 22-19419K
Date Sampled: 29/05/2022
Dates Tested: 31/05/2022 - 06/06/2022
Sampling Method: Sampled by Client
The results apply to the sample as received
Sample Location: **A2KBH9, Depth: 0.9-1.2m**
Material: SAND, trace clay/silt, grey brown

Particle Size Distribution (AS1289 3.6.1)			
Sieve	Passed %	Passing Limits	
19 mm	**100**		
13.2 mm	**100**		
9.5 mm	**100**		
6.7 mm	**100**		
4.75 mm	**100**		
2.36 mm	**100**		
1.18 mm	**100**		
0.6 mm	**99**		
0.425 mm	**95**		
0.3 mm	**63**		
0.15 mm	**3**		
0.075 mm	**2**		



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PO Box 275, Seven Hills NSW 1730
Phone: 1800 288 188
Email: brett@allgeo.com.au

Report Number:	**14777-4**
Issue Number:	1
Date Issued:	29/07/2022
Client:	Alliance Geotechnical Pty Ltd
	8-10 Welder Road, Seven Hills NSW 2147
Contact:	Aaron Hong
Project Number:	14777
Project Name:	Ausgrid Cable Project
Project Location:	Alexandria to Kingsford Cable Project
Contractor:	Ausgrid
Work Request:	19954
Sample Number:	22-19954D
Date Sampled:	24/06/2022
Dates Tested:	01/07/2022 - 06/07/2022
Sampling Method:	Sampled by Client
	The results apply to the sample as received
Remarks:	Sample dates between 21/06/2022 to 24/06/2022
Sample Location:	**A2KBH10, Depth: 0.1-0.5m**
Material:	SAND, fine to medium grained, trace gravel, trace clay/silt, brown

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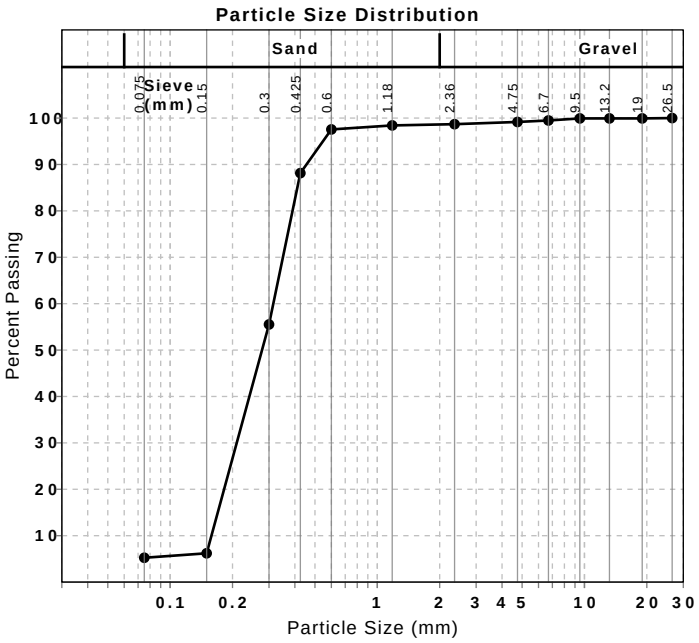
Approved Signatory: Brett Bellingham
Conformance Testing Manager
NATA Accredited Laboratory Number: 15100

Particle Size Distribution (AS1289 3.6.1)			
Sieve	Passed %	Passing Limits	
26.5 mm	**100**		
19 mm	**100**		
13.2 mm	**100**		
9.5 mm	**100**		
6.7 mm	**99**		
4.75 mm	**99**		
2.36 mm	**99**		
1.18 mm	**98**		
0.6 mm	**98**		
0.425 mm	**88**		
0.3 mm	**56**		
0.15 mm	**6**		
0.075 mm	**5**		



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PO Box 275, Seven Hills NSW 1730
Phone: 1800 288 188
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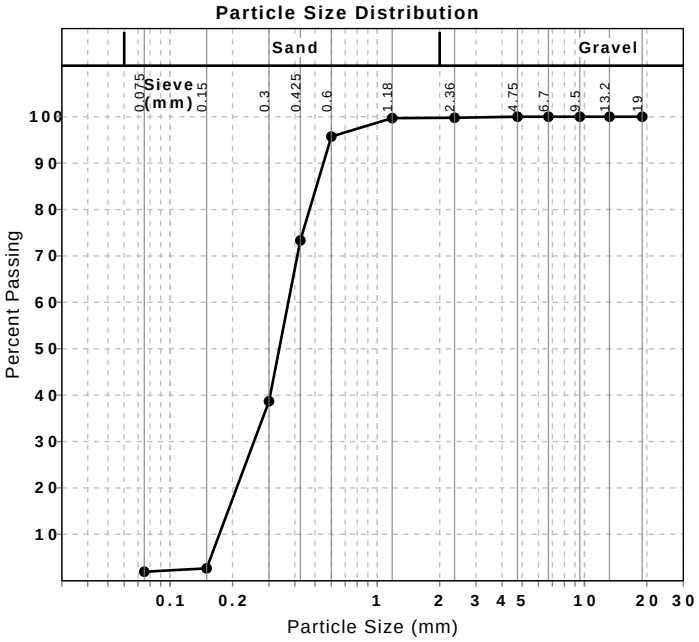
Approved Signatory: Brett Bellingham
Conformance Testing Manager
NATA Accredited Laboratory Number: 15100

Report Number: **14777-6**
Issue Number: 1
Date Issued: 29/07/2022
Client: Alliance Geotechnical Pty Ltd
8-10 Welder Road, Seven Hills NSW 2147
Contact: Aaron Hong
Project Number: 14777
Project Name: Ausgrid Cable Project
Project Location: Alexandria to Kingsford Cable Project
Contractor: Ausgrid
Work Request: 20103
Sample Number: 22-20103D
Date Sampled: 07/07/2022
Dates Tested: 18/07/2022 - 20/07/2022
Sampling Method: Sampled by Client
The results apply to the sample as received
Remarks: Sampled between 07/07/2022 and 13/07/2022
Sample Location: **A2KBH11, Depth: 3.9-4.2m**
Material: SAND, trace clay/silt, paler brown-yellow

Particle Size Distribution (AS1289 3.6.1)			
Sieve	Passed %	Passing Limits	
19 mm	**100**		
13.2 mm	**100**		
9.5 mm	**100**		
6.7 mm	**100**		
4.75 mm	**100**		
2.36 mm	**100**		
1.18 mm	**100**		
0.6 mm	**96**		
0.425 mm	**73**		
0.3 mm	**39**		
0.15 mm	**3**		
0.075 mm	**2**		



Material Test Report

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Alliance Geotechnical Pty Ltd
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PO Box 275, Seven Hills NSW 1730
Phone: 1800 288 188
Email: brett@allgeo.com.au

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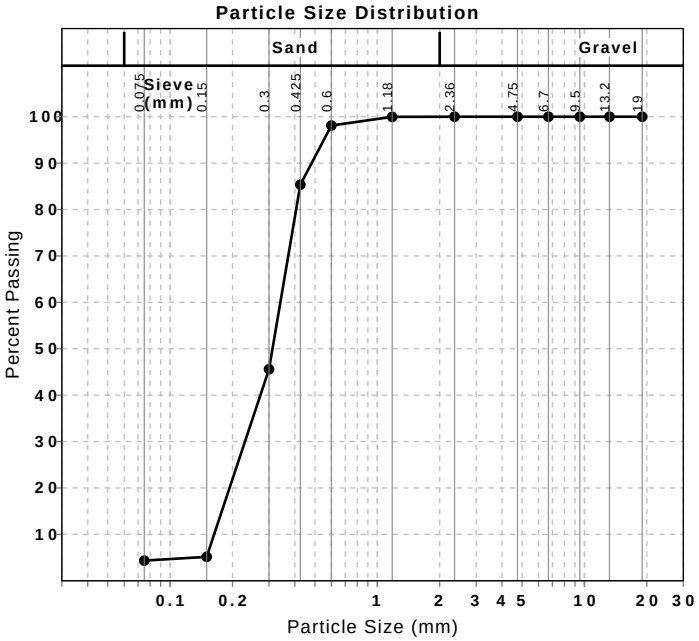
Approved Signatory: Brett Bellingham
Conformance Testing Manager
NATA Accredited Laboratory Number: 15100

Report Number: **14777-6**
Issue Number: 1
Date Issued: 29/07/2022
Client: Alliance Geotechnical Pty Ltd
8-10 Welder Road, Seven Hills NSW 2147
Contact: Aaron Hong
Project Number: 14777
Project Name: Ausgrid Cable Project
Project Location: Alexandria to Kingsford Cable Project
Contractor: Ausgrid
Work Request: 20103
Sample Number: 22-20103J
Date Sampled: 07/07/2022
Dates Tested: 18/07/2022 - 20/07/2022
Sampling Method: Sampled by Client
The results apply to the sample as received
Remarks: Sampled between 07/07/2022 and 13/07/2022
Sample Location: **A2KBH12, Depth: 4.2-4.5m**
Material: SAND, trace clay/silt, pale brown

Particle Size Distribution (AS1289 3.6.1)			
Sieve	Passed %	Passing Limits	
19 mm	**100**		
13.2 mm	**100**		
9.5 mm	**100**		
6.7 mm	**100**		
4.75 mm	**100**		
2.36 mm	**100**		
1.18 mm	**100**		
0.6 mm	**98**		
0.425 mm	**85**		
0.3 mm	**46**		
0.15 mm	**5**		
0.075 mm	**4**		



Material Test Report

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PO Box 275, Seven Hills NSW 1730
Phone: 1800 288 188
Email: brett@allgeo.com.au

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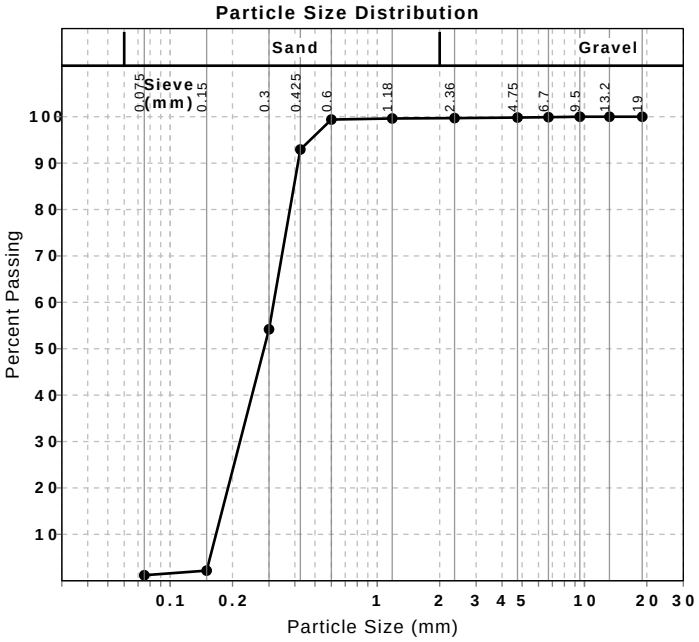
WORLD RECOGNISED ACCREDITATION

Approved Signatory: Brett Bellingham
Conformance Testing Manager
NATA Accredited Laboratory Number: 15100

Report Number: **14777-7**
Issue Number: 1
Date Issued: 25/08/2022
Client: Alliance Geotechnical Pty Ltd
8-10 Welder Road, Seven Hills NSW 2147
Contact: Aaron Hong
Project Number: 14777
Project Name: Ausgrid Cable Project
Project Location: Alexandria, Surry Hills & Waterloo
Contractor: Ausgrid
Work Request: 20780
Sample Number: 22-20780A
Date Sampled: 08/06/2022
Dates Tested: 24/08/2022 - 25/08/2022
Sampling Method: Sampled by Client
The results apply to the sample as received
Remarks: Sampled between 08/06/2022 to 10/06/2022
Sample Location: **A2KBH13, Depth: 4.5-5.0m**
Material: SAND, trace clay/silt, yellow

Particle Size Distribution (AS1289 3.6.1)			
Sieve	Passed %	Passing Limits	
19 mm	**100**		
13.2 mm	**100**		
9.5 mm	**100**		
6.7 mm	**100**		
4.75 mm	**100**		
2.36 mm	**100**		
1.18 mm	**100**		
0.6 mm	**99**		
0.425 mm	**93**		
0.3 mm	**54**		
0.15 mm	**2**		
0.075 mm	**1**		



Material Test Report

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10 Welder Road Seven Hills NSW 2147
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Phone: 1800 288 188
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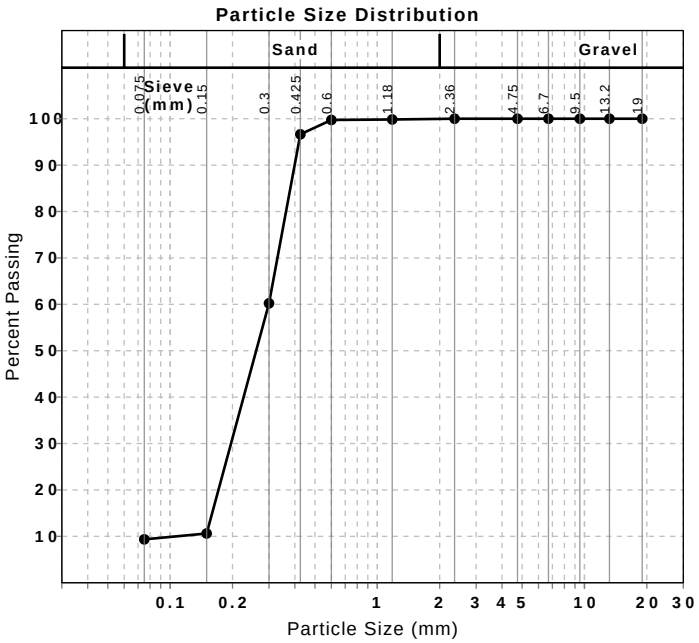
Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Brett Bellingham
Conformance Testing Manager
NATA Accredited Laboratory Number: 15100

Report Number: **14777-1**
Issue Number: 1
Date Issued: 12/07/2022
Client: Alliance Geotechnical
10 Welder Road, Seven Hills NSW 2147
Contact: Aaron Hong
Project Number: 14777
Project Name: Ausgrid Cable Project
Project Location: Alexandria to Kingsford Cable Project
Contractor: Ausgrid
Work Request: 19419
Sample Number: 22-19419M
Date Sampled: 29/05/2022
Dates Tested: 31/05/2022 - 06/06/2022
Sampling Method: Sampled by Client
The results apply to the sample as received
Sample Location: **A2KBH14, Depth: 0.7-0.9m**
Material: SAND, with clay/silt, grey

Particle Size Distribution (AS1289 3.6.1)			
Sieve	Passed %	Passing Limits	
19 mm	**100**		
13.2 mm	**100**		
9.5 mm	**100**		
6.7 mm	**100**		
4.75 mm	**100**		
2.36 mm	**100**		
1.18 mm	**100**		
0.6 mm	**100**		
0.425 mm	**97**		
0.3 mm	**60**		
0.15 mm	**11**		
0.075 mm	**9**		



Material Test Report

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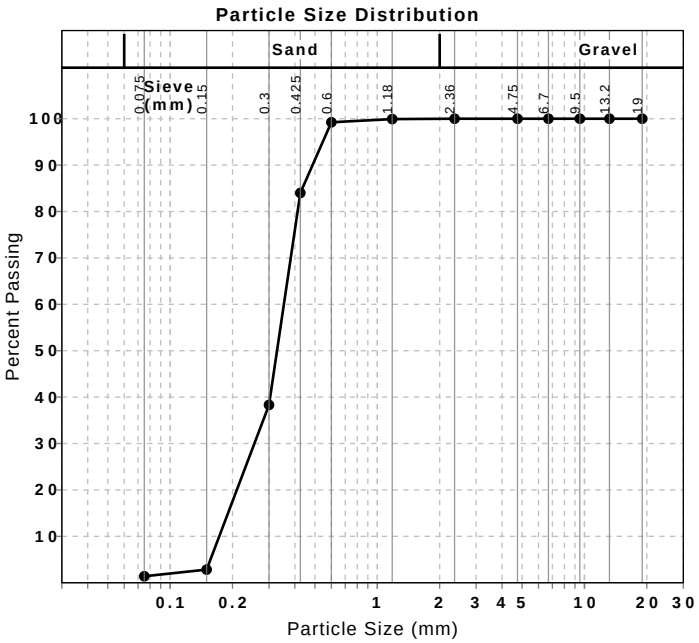
Conformance Testing Manager
NATA Accredited Laboratory Number: 15100

Report Number: **14777-1**
Issue Number: 1
Date Issued: 12/07/2022
Client: Alliance Geotechnical
10 Welder Road, Seven Hills NSW 2147
Contact: Aaron Hong
Project Number: 14777
Project Name: Ausgrid Cable Project
Project Location: Alexandria to Kingsford Cable Project
Contractor: Ausgrid
Work Request: 19419
Sample Number: 22-19419O
Date Sampled: 29/05/2022
Dates Tested: 31/05/2022 - 06/06/2022
Sampling Method: Sampled by Client
The results apply to the sample as received
Sample Location: **A2KBH15, Depth: 1.5-1.6m**
Material: SAND, trace clay/silt, grey

Particle Size Distribution (AS1289 3.6.1)			
Sieve	Passed %	Passing Limits	
19 mm	**100**		
13.2 mm	**100**		
9.5 mm	**100**		
6.7 mm	**100**		
4.75 mm	**100**		
2.36 mm	**100**		
1.18 mm	**100**		
0.6 mm	**99**		
0.425 mm	**84**		
0.3 mm	**38**		
0.15 mm	**3**		
0.075 mm	**1**		



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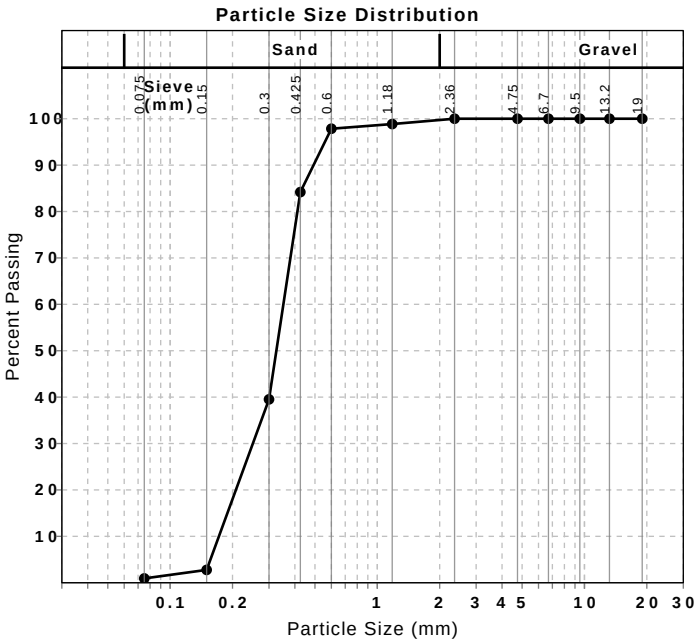
Conformance Testing Manager
NATA Accredited Laboratory Number: 15100

Report Number: **14777-1**
Issue Number: 1
Date Issued: 12/07/2022
Client: Alliance Geotechnical
10 Welder Road, Seven Hills NSW 2147
Contact: Aaron Hong
Project Number: 14777
Project Name: Ausgrid Cable Project
Project Location: Alexandria to Kingsford Cable Project
Contractor: Ausgrid
Work Request: 19419
Sample Number: 22-19419R
Date Sampled: 29/05/2022
Dates Tested: 31/05/2022 - 06/06/2022
Sampling Method: Sampled by Client
The results apply to the sample as received
Sample Location: **A2KBH16, Depth: 1.2-1.5m**
Material: SAND, trace clay/silt, brown

Particle Size Distribution (AS1289 3.6.1)			
Sieve	Passed %	Passing Limits	
19 mm	**100**		
13.2 mm	**100**		
9.5 mm	**100**		
6.7 mm	**100**		
4.75 mm	**100**		
2.36 mm	**100**		
1.18 mm	**99**		
0.6 mm	**98**		
0.425 mm	**84**		
0.3 mm	**40**		
0.15 mm	**3**		
0.075 mm	**1**		



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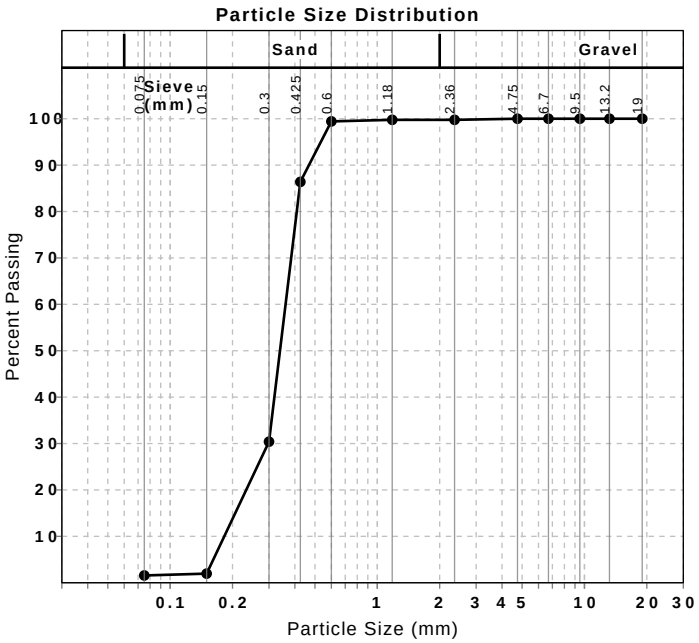
Approved Signatory: Brett Bellingham
Conformance Testing Manager
NATA Accredited Laboratory Number: 15100

Report Number: **14777-2**
Issue Number: 1
Date Issued: 12/07/2022
Client: Alliance Geotechnical
10 Welder Road, Seven Hills NSW 2147
Contact: Aaron Hong
Project Number: 14777
Project Name: Ausgrid Cable Project
Project Location: Alexandria to Kingsford Cable Project
Contractor: Ausgrid
Work Request: 19739
Sample Number: 22-19739G
Date Sampled: 10/06/2022
Dates Tested: 20/06/2022 - 24/06/2022
Sampling Method: Sampled by Client
The results apply to the sample as received
Sample Location: **A2KBH17, Depth: 1.2-1.4m**
Material: SAND, trace clay/silt

Particle Size Distribution (AS1289 3.6.1)			
Sieve	Passed %	Passing Limits	
19 mm	**100**		
13.2 mm	**100**		
9.5 mm	**100**		
6.7 mm	**100**		
4.75 mm	**100**		
2.36 mm	**100**		
1.18 mm	**100**		
0.6 mm	**99**		
0.425 mm	**86**		
0.3 mm	**30**		
0.15 mm	**2**		
0.075 mm	**2**		



Material Test Report

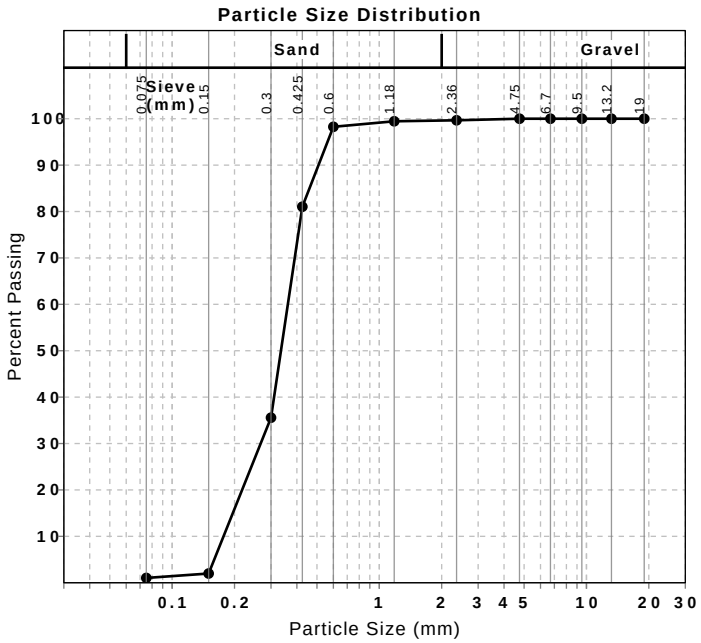
alliance
geotechnical & environmental solutions
Alliance Geotechnical Pty Ltd
10 Welder Road Seven Hills NSW 2147
PO Box 275, Seven Hills NSW 1730
Phone: 1800 288 188
Email: brett@allgeo.com.au

Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Brett Bellingham
Conformance Testing Manager
NATA Accredited Laboratory Number: 15100

Report Number: **14777-1**
Issue Number: 1
Date Issued: 12/07/2022
Client: Alliance Geotechnical
10 Welder Road, Seven Hills NSW 2147
Contact: Aaron Hong
Project Number: 14777
Project Name: Ausgrid Cable Project
Project Location: Alexandria to Kingsford Cable Project
Contractor: Ausgrid
Work Request: 19419
Sample Number: 22-19419T
Date Sampled: 29/05/2022
Dates Tested: 31/05/2022 - 06/06/2022
Sampling Method: Sampled by Client
The results apply to the sample as received
Sample Location: **A2KBH18, Depth: 1.6-2.0m**
Material: SAND, trace clay/silt, grey

Particle Size Distribution (AS1289 3.6.1)			
Sieve	Passed %	Passing Limits	
19 mm	**100**		
13.2 mm	**100**		
9.5 mm	**100**		
6.7 mm	**100**		
4.75 mm	**100**		
2.36 mm	**100**		
1.18 mm	**99**		
0.6 mm	**98**		
0.425 mm	**81**		
0.3 mm	**36**		
0.15 mm	**2**		
0.075 mm	**1**		



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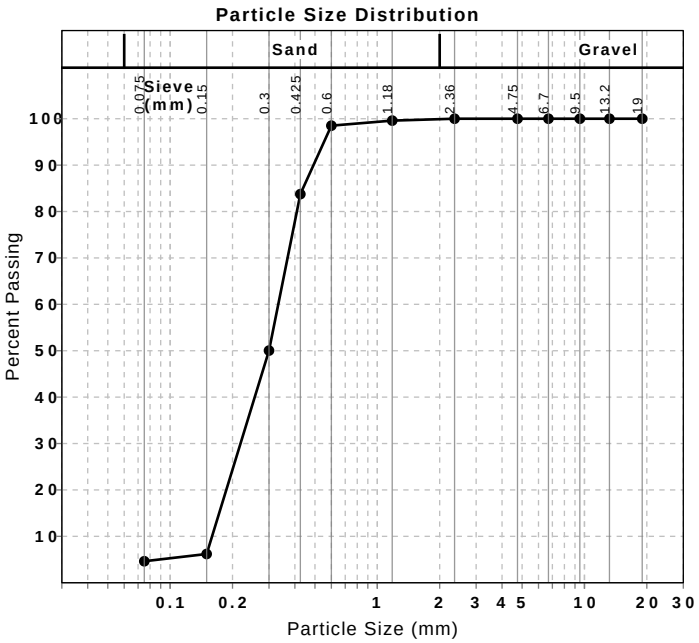
Alliance Geotechnical Pty Ltd
10 Welder Road Seven Hills NSW 2147
PO Box 275, Seven Hills NSW 1730
Phone: 1800 288 188
Email: brett@allgeo.com.au

Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Brett Bellingham
Conformance Testing Manager
NATA Accredited Laboratory Number: 15100

Report Number: **14777-1**
Issue Number: 1
Date Issued: 12/07/2022
Client: Alliance Geotechnical
10 Welder Road, Seven Hills NSW 2147
Contact: Aaron Hong
Project Number: 14777
Project Name: Ausgrid Cable Project
Project Location: Alexandria to Kingsford Cable Project
Contractor: Ausgrid
Work Request: 19419
Sample Number: 22-19419U
Date Sampled: 29/05/2022
Dates Tested: 31/05/2022 - 07/06/2022
Sampling Method: Sampled by Client
The results apply to the sample as received
Sample Location: **A2KBH19, Depth: 0.6-0.8m**
Material: SAND, trace clay/silt, brown grey

Particle Size Distribution (AS1289 3.6.1)			
Sieve	Passed %	Passing Limits	
19 mm	**100**		
13.2 mm	**100**		
9.5 mm	**100**		
6.7 mm	**100**		
4.75 mm	**100**		
2.36 mm	**100**		
1.18 mm	**100**		
0.6 mm	**99**		
0.425 mm	**84**		
0.3 mm	**50**		
0.15 mm	**6**		
0.075 mm	**5**		



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Alliance Geotechnical Pty Ltd
10 Welder Road Seven Hills NSW 2147
PO Box 275, Seven Hills NSW 1730
Phone: 1800 288 188
Email: brett@allgeo.com.au

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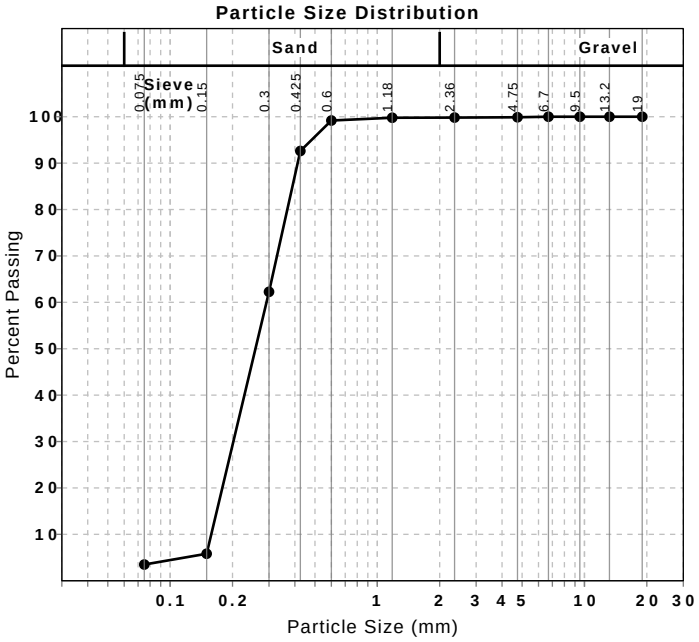
Approved Signatory: Brett Bellingham
Conformance Testing Manager
NATA Accredited Laboratory Number: 15100

Report Number:	**14777-7**
Issue Number:	1
Date Issued:	25/08/2022
Client:	Alliance Geotechnical Pty Ltd
	8-10 Welder Road, Seven Hills NSW 2147
Contact:	Aaron Hong
Project Number:	14777
Project Name:	Ausgrid Cable Project
Project Location:	Alexandria, Surry Hills & Waterloo
Contractor:	Ausgrid
Work Request:	20780
Sample Number:	22-20780B
Date Sampled:	08/06/2022
Dates Tested:	24/08/2022 - 25/08/2022
Sampling Method:	Sampled by Client
	The results apply to the sample as received
Remarks:	Sampled between 08/06/2022 to 10/06/2022
Sample Location:	**A2KBH20, Depth: 4.0-4.5m**
Material:	SAND, trace clay/silt, yellow

Particle Size Distribution (AS1289 3.6.1)			
Sieve	Passed %	Passing Limits	
19 mm	**100**		
13.2 mm	**100**		
9.5 mm	**100**		
6.7 mm	**100**		
4.75 mm	**100**		
2.36 mm	**100**		
1.18 mm	**100**		
0.6 mm	**99**		
0.425 mm	**93**		
0.3 mm	**62**		
0.15 mm	**6**		
0.075 mm	**3**		



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geotechnical & environmental solutions
Alliance Geotechnical Pty Ltd
10 Welder Road Seven Hills NSW 2147
PO Box 275, Seven Hills NSW 1730
Phone: 1800 288 188
Email: brett@allgeo.com.au

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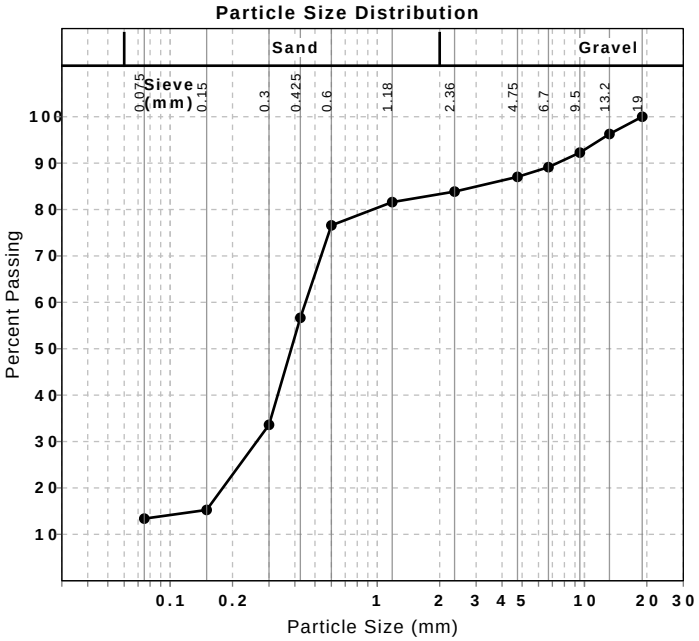
Approved Signatory: Brett Bellingham
Conformance Testing Manager
NATA Accredited Laboratory Number: 15100

Report Number: **14777-7**
Issue Number: 1
Date Issued: 25/08/2022
Client: Alliance Geotechnical Pty Ltd
8-10 Welder Road, Seven Hills NSW 2147
Contact: Aaron Hong
Project Number: 14777
Project Name: Ausgrid Cable Project
Project Location: Alexandria, Surry Hills & Waterloo
Contractor: Ausgrid
Work Request: 20780
Sample Number: 22-20780C
Date Sampled: 08/06/2022
Dates Tested: 24/08/2022 - 25/08/2022
Sampling Method: Sampled by Client
The results apply to the sample as received
Remarks: Sampled between 08/06/2022 to 10/06/2022
Sample Location: **A2KBH21, Depth: 4.9-5.2m**
Material: SAND, with gravel, with clay/silt, brown yellow

Particle Size Distribution (AS1289 3.6.1)			
Sieve	Passed %	Passing Limits	
19 mm	**100**		
13.2 mm	**96**		
9.5 mm	**92**		
6.7 mm	**89**		
4.75 mm	**87**		
2.36 mm	**84**		
1.18 mm	**82**		
0.6 mm	**77**		
0.425 mm	**57**		
0.3 mm	**34**		
0.15 mm	**15**		
0.075 mm	**13**		



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geotechnical & environmental solutions
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10 Welder Road Seven Hills NSW 2147
PO Box 275, Seven Hills NSW 1730
Phone: 1800 288 188
Email: brett@allgeo.com.au

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Approved Signatory: Brett Bellingham
Conformance Testing Manager
NATA Accredited Laboratory Number: 15100

Report Number: **14777-6**
Issue Number: 1
Date Issued: 29/07/2022
Client: Alliance Geotechnical Pty Ltd
8-10 Welder Road, Seven Hills NSW 2147
Contact: Aaron Hong
Project Number: 14777
Project Name: Ausgrid Cable Project
Project Location: Alexandria to Kingsford Cable Project
Contractor: Ausgrid
Work Request: 20103
Sample Number: 22-20103P
Date Sampled: 07/07/2022
Dates Tested: 18/07/2022 - 20/07/2022
Sampling Method: Sampled by Client
The results apply to the sample as received
Remarks: Sampled between 07/07/2022 and 13/07/2022
Sample Location: **A2KBH22, Depth: 4.0-4.5m**
Material: SAND, trace clay/silt, brown

Particle Size Distribution (AS1289 3.6.1)			
Sieve	Passed %	Passing Limits	
19 mm	**100**		
13.2 mm	**100**		
9.5 mm	**100**		
6.7 mm	**100**		
4.75 mm	**100**		
2.36 mm	**100**		
1.18 mm	**100**		
0.6 mm	**99**		
0.425 mm	**93**		
0.3 mm	**57**		
0.15 mm	**7**		
0.075 mm	**5**