Upgrade to Cammeray Public School Geotechnical Investigation Report

Upgrade to Cammeray Public School

68 Palmer Street, Cammeray NSW 2062

Prepared for: NSW Department of Education

A201023.0772.01_A_v3f| Date: 28 February 2025

NSW GOVERNMENT Education School Infrastructure

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1 Introduction

1.1 General Information

ADE Consulting Group Pty Ltd (ADE) was engaged by the Department of Education (DoE) to undertake a intrusive geotechnical investigation (IGI) report in relation to the upgrade for Cammeray Public School.

This IGI has been prepared to support a Review of Environmental Factors (REF) for the Department of Education (DoE) for the upgrade of the Cammeray Public School (CPS) (the "activity"). The purpose of the REF is to assess the potential environmental impacts of the activity prescribed by State Environmental Planning Policy (Transport and Infrastructure) 2021 (T&I SEPP) as "development permitted without consent" on land carried out by or on behalf of a public authority under Part 5 of the Environmental Planning and Assessment Act 1979 (EP&A Act). The activity is to be undertaken pursuant to Chapter 3, Part 3.4, Section 3.37 of the T&I SEPP and in consideration of the stakeholder and community participation plan. The proposed activity is for upgrades to the existing CPS at 68 Palmer Street, Cammeray NSW 2062 (the site).

The purpose of this report is to preliminarily assess the subsurface conditions of the proposed work area to support the design layout development only. The school is located at 68 Palmer Street, Cammeray NSW 2062. A Site Plan showing the proposed building footprint and borehole locations is presented in **Appendix I.**

The proposed activity involves upgrades to the existing CPS, including the following:

- Construction of 4 new permanent teaching spaces in a two-storey building incorporating 2 general learning spaces and 2 practical activity areas
- New egress lift and stairs for access to all building levels
- External covered walkways connecting the new building to the existing school network
- Landscaping and external works including compensatory planting
- Upgrades to site infrastructure and services to support the new buildings
- 50 bicycle parking spaces

The intent of the activity is to provide 4 permanent teaching spaces (PTS) plus 2 practical activity areas (PAA) across a two-storey addition, adjoining Building E. This will result in CPS retaining the capacity of a 'large' school (553-1,000 students) under EFSG (SINSW Education Facilities Standards and Guidelines).

ADE was provided with the following information to assist with the geotechnical investigation:

- Drawing titled "9009 - Detail & Level - Rev A - 68 Palmer Street Cammeray", prepared by SDG Pty Ltd and dated 4th October 2023.

ADE previously prepared a Preliminary Geotechnical Desktop Study (PGDS) report (reference no. A201023.0722.00_A_v1f) dated 01/11/2023) for the proposed infrastructure development. Fieldwork for the IGI was carried out on 12/01/2024 and consisted of drilling 5 boreholes. The IGI aimed to assess the subsurface condition of the proposed work area and provide geotechnical comments and recommendations for the design phase. This report presents the inferred subsurface condition, assessed salinity conditions, observation of groundwater levels, excavation conditions, geotechnical recommendations of support measures and retaining wall design parameters, foundation design parameters, site classification to AS2870 and seismic classification and earthquake parameters.

1.2 REF Checklist

Table 1 and Table 2 below summarise all relevant REF checklist items addressed in this IGI report and provide section references for review.

Table 1: REF Review Checklist – General Requirements

Requirement	Y	N	N/A	Comments & Report Reference
General requirements				
Regulatory requirements • Does the **IGI** include details of: ○ the proposed activity?	☒	☐	☒	Refer Section 1 'Introduction' of this IGI Report
○ need for the activity?	☒	☐	☐	
○ relevant planning policies, including relevant indicative layout plans, masterplans, strategic plans or Voluntary Planning Agreements apply to the site?	☒	☐	☐	
○ how proposal relates to relevant legislation and policies?	☒	☐	☐	
○ related approvals required?	☒	☐	☐	
○ relevant determining authority (i.e. the NSW Department of Education)	☒	☐	☐	
• a description of the site (including address and lot/DP) and surrounding environment using text and plans/photos including details the environmental features and planning constraints?	☒	☐	☐	Refer Section 2.1 'Site Description' of this IGI Report
• an assessment of potential impacts of the proposal?	☒	☐	☐	Refer Section 5.12 'Cumulative Impact Assessment' in this IGI Report
• a statement certifying that the contents are true and correct?	☒	☐	☐	Refer Section 8 'Limitations' of this IGI Report 'This report does not provide a complete assessment of the geotechnical status of the site, and it is limited to the scope defined herein"
• a statement that the proposed activity qualifies as development without consent?	☒	☐	☐	Refer Section 1 'Introduction' of this IGI Report
• a schedule of mitigation measures that are specific and deliverable?	☒	☐	☐	Refer Section 5.13 'Mitigation Measures' of this IGI Report

Table 2: REF review Checklist – Soil and Water

Requirement	Y	N	N/A	Comments & Report Reference
Soil and Water				
If the site is mapped as, or has otherwise been identified, as having salinity potential, does the geotechnical report consider impacts from salinity and set out measures to mitigate impacts (i.e. Salinity Management Plan) so that they would not be significant?	☐	☐	☒	Refer Section 5.9 "Soil Aggressivity" and 5.10 "Soil Salinity" of this IGI Report
If the site is mapped as, or has otherwise been identified as having acid sulfate soils (ASS) potential, does the geotechnical report consider impacts from ASS and set out measures to mitigate impacts (i.e. ASS Management Plan) so that they would not be significant?	☐	☐	☒	The report concluded that based on observations of soil texture and type, site conditions and results from field screening tests, that Actual Acid Sulfate Soils (AASS) and Potential Acid Sulfate Soils (PASS) are not considered likely at the site.

1.3 Scope of Work

In summary, the IGI work generally comprised the following:

- Preparation and approval of a Safety, Health, Environment, and Safe Work Method Statement (SHEWMS) prior to undertaking works
- A site walkover inspection was carried out prior to the commencement of the investigation
- Prior to commencing the fieldwork, underground services were electromagnetically scanned and identified by an accredited service locator
- In total, 5 boreholes identified as BH01 to BH05 were drilled within the proposed development area. Boreholes were drilled using an auger attached with a tungsten carbide (TC) bit. Locations of the boreholes are presented in **Appendix I** to this report.
- One Standard Penetration Test (SPT) was carried out in each borehole at depths ranging from approximately 0.4m to 0.7m due to shallow bedrock (auger refusal) encountered within a 1m depth below the existing ground level at the time of investigation.
- Experienced geotechnical engineer from ADE was present full-time onsite during the fieldwork to set out the borehole locations, direct the drilling subcontractors, log the subsurface profile in accordance with Australian Standard AS1726-2017, and collect soil samples for testing
- Upon drilling completion, the boreholes were reinstated by using cuttings from the boreholes drilling, followed by concrete grouting to flush with adjacent ground level approximately
- Geotechnical borehole logs were prepared and attached in **Appendix II** along with Report Explanation Notes, which describe the investigation techniques adopted and define the logging terms and symbols used
- Selected soil samples were tested with the following laboratory tests:
    - Two samples were tested with Particle Size Distribution (PSD) tests, including Hydrometer
    - Three samples were tested with Soil Aggressivity and Salinity tests
- Preparation of this IGI report of the proposed work area.

2 Background

2.1 Site Description

CPS is located at 68 Palmer Street, Cammeray on the northern side of Palmer Road, bound by Palmer Street to the south, Bellevue Street to the east and Miller Street to the west. The site has an area of 1.36 ha and comprises 11 allotments, legally described as:

- Lot 11 DP 837836
- Lot 1 DP 316130
- Lot 1 DP 316706
- Lot 1 DP 123406
- Lot 2 DP 174370
- Lot 1 DP 174370
- Lot 4 Sec 35 DP 758790
- Lot 5 Sec 35 DP 758790
- Lot 66 DP 1049613
- Lot 3 DP 571310
- Lot 4 DP 571310

The site currently comprises an existing co-education primary (K-6) public school with 6 permanent buildings, 3 demountable structures, covered walkways linked at multiple levels, play areas, on-grade parking, sports court, covered outdoor learning area (COLA) and vegetation/green spaces with mature trees.

The existing school buildings are clustered towards the southern portion of the site and comprise both single and 2 storey buildings. The northern portion of the site contains the sports court, vegetable garden and play equipment. The north-western portion of the site is heavily vegetated with trees of high landscape significance that are protected with fencing.

The site is identified as a locally listed heritage item (I0019) under Schedule 5 Environmental Heritage pursuant to the North Sydney Local Environmental Plan 2013 (NSLEP). The school is also identified in the Plateau Heritage Conservation Area (HCA) (Part 2 Schedule 5 of the NSLEP). The school is listed on the Department of Education (DoE) Section 170 Heritage Conservation Register as 'Cammeray Public School'. The site is approximately 115m from a State heritage item (I0004) being the electricity substation at 143 Bellevue Street and in close proximity to locally heritage listed items.

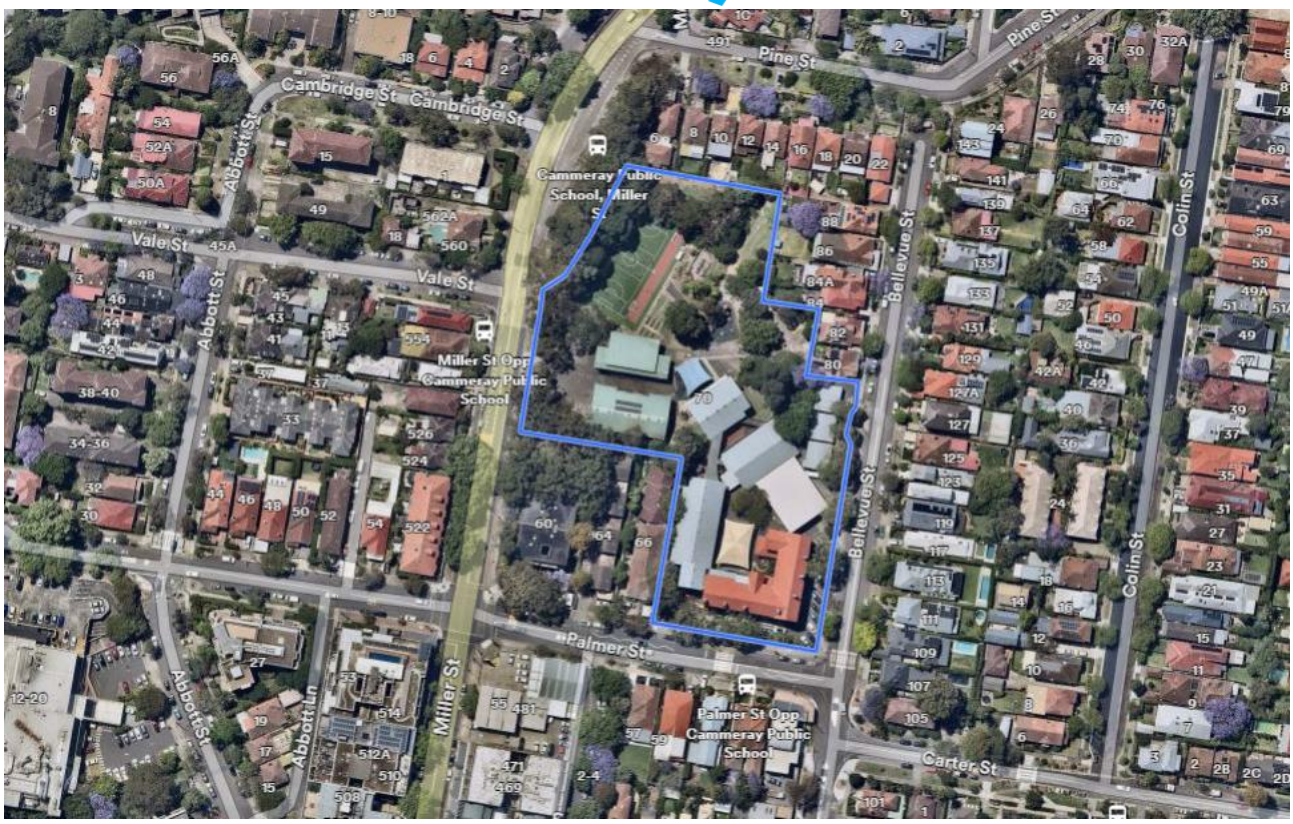

Figure 1: Aerial image of the site, outline in blue (Source: NearMap, taken 30th of October 2024)

The site is an irregularly shape land that encompasses a total area of approximately 1.3 ha. The main administration block is located most southernly to the site near the car park and a gate along Palmer Street. A row of demountable buildings and a busway are on the eastern side along Bellevue Street**. Figure 1** presents the current demountable structure, while **Figures 2 and 3** delineate the areas marked for proposed borehole drilling.

Figure 2: View of an existing demountable at the proposed development

Figure 3: View of existing gate to carpark entry from Miller Street

Figure 4: View of marked borehole locations marked within the proposed development area

2.2 Regional Geology

Reference to the 1:100 000 Sydney Geological Sheet 9130, first edition from Geological Survey of NSW (1983) indicates that the site is underlain by **Rh** and **Rwa**, part of Wianamatta Group and Triassic aged. The Rh is Hawkesbury Sandstone, described as "medium to coarse-grained quartz sandstone, very minor shale and laminate lenses", and the Rwa is Ashfield Shale, described as "black to dark-grey shale and laminite". Figure 5 shows the excerpt of the local geology from the Sydney Geological Map below.

Figure 5: The Local Geological Map showing the School Location

3 Fieldwork Results

3.1 Subsurface Conditions

A summary of subsurface materials encountered during the investigation is presented in **Table 1** below. Reference should be made to the attached borehole logs in **Appendix II** of this report.

Table 3: Summary of Subsurface Profile

Unit	Details	Depth (m)				
		BH01	BH02	BH03	BH04	BH05
Unit 1	Asphalt	0.0 – 0.05	0.0 – 0.05	0.0 – 0.05	0.0 – 0.1	0.0 – 0.05
	Road-base Concrete	0.05 – 0.15	0.05 – 0.15	0.05 – 0.15	0.1 – 0.2	0.05 – 0.15
Unit 2	SAND, fine to medium grained, brown with red, with sandstone gravels, loose	0.15 – 0.5	0.15 – 0.3	0.15 – 0.3	0.2 – 0.3	0.15 – 0.25
Unit 3	SAND, fine to medium grained, pale brown and yellow/red, with clay, medium dense to dense		0.3 – 0.7	0.3 – 0.5		–
	SAND, fine to medium grained, pale brown with red, with sandstone fragments, dense	0.5-0.8	0.7 – 1.0	–	0.3 – 0.5	–
Unit 4	SANDSTONE , fine to medium, red pale grey/white, extremely weathered, extremely low strength	0.8 – 1.5	1.0 – 1.2	0.5 – 1.2	0.5 – 1.0	0.25 – 1.2

3.2 Groundwater

No groundwater was encountered in all boreholes during the borehole drilling. However, groundwater levels may occur or change due to rainfall, seasonal changes, or damage to underground services. Groundwater tables can also be at a deeper depth, and groundwater seepage can occur at bedrock defects.

4 Laboratory Testing

The ground profile was inferred to be mainly composed of granular materials, such as sands, which are unlikely to be subject to potential swelling or shrinkage due to moisture content changes. Instead, the engineering properties of granular materials are typically governed by the particle size distribution (PSD). Therefore, PSD tests were undertaken on soil samples recovered from the boreholes. Additional laboratory tests, including soil aggressivity and salinity, were carried out to inform the subsequent structural design of the proposed school upgrade. A summary of the laboratory test results is presented in **Tables 2 to 4** below. The laboratory test reports are enclosed in **Appendix III**.

Table 4: Results of PSD Test

Test Location	Depth (m bgl)	Material Description	Gravel (%)	Sand (%)	Fines (%)
BH01	0.5 – 0.8	SAND	0	70	30
BH03	0.4	SAND	0	64	36

Table 5: Results of Soil Aggressivity Tests

Test Location	Depth (m)	pH	Chloride (mg/kg)	Sulphate as SO_4 (mg/kg)	Resistivity (ohm.cm)
BH01	0.7	4.9	10	69	16,000
BH03	0.4	5.6	34	93	12,000
BH05	0.3	7.6	<10	<10	41,000

Table 6: Results of Soil Salinity Test

Test Location	Depth (m)	Soil Type	Electrical Conductivity (µS/cm)	Factor	Saturated Extracted (dS/m)
BH01	0.7	SAND	64	17	1.1
BH03	0.4	SAND	86	17	1.5
BH05	0.3	SAND	24	17	0.5

Note: Saturated Extracted Electrical Conductivity is calculated in accordance with "Site Investigation for Urban Salinity" published by Department of Land Water Conservation (2002). Following salinity class is adopted from the Table 6.2:

- Non-saline <2
- Slightly saline 2–4
- Moderately saline 4–8
- Very saline 8–16
- Highly saline >16

5 Comments and Recommendations

5.1 Site Preparation and Excavation

The required site preparation will generally involve surface stripping and ground levelling. The excavation is likely expected to encounter a thin layer of pavement (Unit 1), underlain by fill (Unit 2) identified as SAND, and residual soil (Unit 3) described as Sand. Weathered bedrock (Unit 4) will likely be encountered at depths ranging from 0.25m to 0.8m below ground level (bgl) approximately. The bedrock was assessed to be extremely weathered and extremely low strength SANDSTONE. It was deemed to be excavatable by normal earthmoving plants.

It is recommended that the materials classified as in Units 1, 2, and 3 within the footprint of the proposed structures be removed, including grubbing out of tree roots if present. If required, the excavated areas can be backfilled with suitably engineered fill materials to the designed subgrade level.

Any fill, deleterious/surplus material (if present) such as timber, concrete, rubble, and other unsuitable materials should be identified and disposed of off-site. The inferred Units 3 or 4 materials within the bulk earthworks area can be stripped, stockpiled and considered for reuse in accordance with Australia Standard AS3798-2007 Earthworks. Reuse of the site-won materials should be contamination-free.

5.2 Engineered Fill

Placement and compaction of engineered fill material for any support of structure foundations construction should comply with the following requirements, but not limited to:

- Engineered fill material should be placed in layers of not more than 200mm loose thickness for compaction
- Compaction of the engineered fill should achieve a Standard Maximum Dry Density (SMDD) of a minimum 98% and moisture condition to ±2% of the Standard Optimum Moisture Content (SOMC)
- Earthworks should be carried out under Level 1 Geotechnical Supervision in accordance with AS3798-2007 “Guidelines on Earthworks for Commercial and Residential Developments”.

5.3 Excavation Support

5.3.1 Temporary Batter Slope

Open cutting, temporary batter slope or bench should not be deeper than 1.5m below existing ground level, with at least 3m setback from adjacent structures and site boundaries. The recommended temporary batter slope gradient to facilitate the construction activities are summarised in **Table 5**.

An experienced geotechnical engineer should inspect any open excavation, battered slope, or benches as soon as they are excavated to confirm the stability. Should any excavation deeper than 1.5m, no sufficient space for off-setting from the existing structures/ site boundary, or battered slope or benches are deemed not suitable, an appropriate retaining structure shall be considered prior to commencement of the excavation and be installed to facilitate the excavation.

Table 5: Recommended Temporary Batter Slope

Subsurface Materials	Temporary Batter (Horizontal: Vertical)
Units 1, 2, and 3 (up to 1.5m depth)	2.0: 1.0
Unit 4	1.0: 1.0

All temporary batters should be backfilled once the construction work has been completed. The backfilling should comply with section “5.2 Engineered Fill” of this report.

5.3.2 Retaining System

If excavation requires more than 1.5m depth, an appropriate retaining wall design, e.g. embedded pile retaining wall, gravity retaining structures or equivalent retaining system, shall be considered for excavation support. Should a pile retaining structure be adopted, which would need to be socketed into competent bedrock and extended below the proposed bulk excavation level, subject to assessment by a suitably qualified geotechnical engineer.

5.3.3 Design Parameters

The geotechnical design parameters provided in **Table 6** and **Table 7** are recommended for the design of general excavation support.

Table 6: Inferred Geotechnical Design Parameters

Subsurface Materials	Unit Weight y (kN/m^3)	Effective Cohesion c' (kPa)	Friction Angle f' (°)	Elasticity Modulus E (MPa)	Poisson Ratio v'
Unit 2	15	0	29	10	0.3
Unit 3	17 - 19	0	34 - 39	20 - 30	0.3
Unit 4	24	250	45	1500	0.25

Table 7: Inferred Earth Pressure Coefficients

Subsurface Materials	At-Rest Earth Pressure (K_o)	Active Earth Pressure (K_a)	Passive Earth Pressure (K_P)
Unit 2	0.52	0.35	2.88
Unit 3	0.37-0.44	0.23-0.28	3.54-4.4
Unit 4	1	1	1

5.4 Groundwater Management

No groundwater seepage was observed during the borehole drilling investigation. However, it would be prudent to install a suitable number of groundwater wells by considering the proposed engineering structures or future construction activities to assess and monitor the presence of groundwater at the proposed work area prior to construction. If groundwater is encountered, a Groundwater Management Plan (GMP) should be prepared and implemented during the construction phase.

5.5 Surface Water

An appropriate design of surface drainage system shall be developed and installed to divert surface runoff, reduce scour erosion and reduce the risk of flooding the proposed work area during construction and for permanent purpose. Additionally, sediment control measures, including fencing along the construction boundary to avoid sediment migration blocking any existing drains, should be implemented prior to construction.

5.6 Site Classification

The existing fill present on site likely extends to about 0.5m bgl. In accordance with Australian Standard, AS 2870-2011 "Residential slabs and footings", the site can be classified as "Class A", as "*Most sand and rock sites with little or no ground movement from moisture changes*". This is subject to the removal of the existing pavement materials and fill, and the proposed foundation system will be founded on either residual soil described as SAND or Sandstone bedrock.

5.7 Foundations

Considering the existing extremely weathered bedrock stratum located at a shallow depth, likely equal to or less than 1m depth below ground, shallow foundation systems, such as pad or strip footings can be considered. A summary of geotechnical design parameters for shallow foundation design inferred from the subsurface conditions is presented in **Table 8**.

Table 8: Summary of Geotechnical Foundation Design Parameters

Subsurface Materials	Ultimate End Bearing (kPa)	Serviceability End Bearing (kPa)
Unit 1	–	–
Unit 2	100	30
Unit 3	300	100
Unit 4	3,000	1,000

Notes:

- Assumes a minimum embedment depth of at least 0.5 m into the relevant bearing stratum.

In addition, foundation settlement analysis with respect to the localised subgrade conditions shall be carried out to assess the potential risks of impacting the proposed superstructures due to excessive ground settlement or differential settlement.

5.8 Earthquake Classification

The existing bedrock is inferred to be at a shallow depth less than or at about 1m below ground. Assuming the proposed structure foundations will be founded on the existing bedrock, the site is classified as "Class Be" (Rock Site) in accordance with AS1170.4 – Structural Design Actions - Part 4: Earthquake Actions in Australia for the design and construction of the proposed foundation system. The Hazard Factor (Z) is recommended to 0.08 based on the site location.

5.9 Soil Aggressivity

Based on the results of the soil aggressivity tests undertaken on the residual soil samples from the boreholes it indicated that the Sulphate and Chloride contents of the samples were found to be less than 100mg/kg (100 ppm). The pH values of the samples ranged from 4.9 to 7.6, and resistivity was greater than 12,000 ohm centimetres. Therefore, the residual soil samples are classified as "Moderate" aggressive to concrete piles and "Mild" aggressive to steel piles, in accordance with the criteria for concrete and steel piling exposure classifications provided in Tables 6.4.2(C) and 6.5.2(C) of AS2159-2009 "Piling-Design and Installation".

5.10 Soil Salinity

The electrical conductivity test results undertaken on the residual soil from the boreholes indicated the site was "non-saline".

5.11 Pavement Desing Parameter

Proposed pavement designs are recommended to be founded on the existing subgrade consisting of Unit 3 or 4 materials inferred to be medium to dense SAND or weathered SANDSTONE. To reduce the risk of damaging the existing pavement, no CBR sample was collected from this round of geotechnical investigation. Nevertheless, a typical California Bearing Ratio (CBR) of 10.0% is recommended for these subgrade materials' preliminary pavement design purposes. An appropriate number of CBR tests shall be carried out on samples recovered from the proposed subgrade level to validate this assumed CBR value. Any existing pavement or fill materials shall be removed prior to the pavement construction.

5.12 Cumulative Impact Assessment

We refer to the results of the limited scope of geotechnical and detailed site investigations undertaken at this school site by ADE (Refer Detailed Site Investigation Report 'A101023.0722 Cammeray DSI v2' dated 20 February 2025). The report concluded that based on observations of soil texture and type, site conditions and results from field screening tests, that Actual Acid Sulfate Soils (AASS) and Potential Acid Sulfate Soils (PASS) are of low probability at the site. Further, the site is mapped as being in a non-saline area according to the NSW Office of Water.

The proposed school infrastructures will likely be supported by typical shallow foundations, bored pile foundations or a combination of both. Construction of these foundation types is unlikely to generate

significant noise and vibration, subject to the construction methodology and machinery to be nominated by future construction contractors.

The proposed work area is within the well-developed school property. From a geotechnical perspective, we do not anticipate significant social or visual impact or adverse effects on the existing biodiversity.

5.13 Mitigation Measures

The potential project environmental risks and recommended mitigation measures are summarised in **Table 9** below:

Table 7: Summary of Mitigation Measures

Mitigation Name	Aspect/Section	Mitigation Measure	Reason for Mitigation Measure
Noise and Vibration Monitoring	Noise Monitoring, Vibration, Operational Noise	Shallow foundations and bored pile foundations are unlikely to generate significant noise and vibration	Noise and vibration assessment is outside the scope of the IGI, however use of these techniques can reduce noise and vibration impact on surrounding areas
Groundwater Management	Groundwater	Encountering groundwater will depend on the completion of the detailed design and foundation type proposed for the building structures. If shallow foundations are used, groundwater will unlikely be encountered. If deep foundations such as piles are used, groundwater will likely be encountered during piling excavation. Foundations and piles must be sufficiently dewatered to prevent groundwater infiltration and reduce risk of slope instability. A Groundwater Management Plan (GMP) is recommended to be prepared and implemented during the construction phase (outside the scope of the IGI).	Reduce risk of slope instability, prevent groundwater infiltration to excavation or piles. Identify procedure for disposal of water
Settlement analysis	Structural Analysis	After selection of the foundation system, it is recommended to carry out a settlement analysis to confirm the total and differential settlements are within the tolerance.	Analysis to be carried out to determine if total and differential settlements are within the design tolerance
Removal of soft and unsuitable soils	Earthworks	All loose/soft soil within the footprint of proposed structures to be removed, including grubbing out of tree roots, if present. These layers may be backfilled with suitably engineered fill layers to the designed subgrade level. Any fill unsuitable for re-use, deleterious/surplus material (if present) such as timber, concrete, rubble, should be identified and disposed off-site.	Must be carried out in accordance with AS3798-2007 "Guidelines on Earthworks for Commercial and Residential Developments"

Table 8: *Summary of Mitigation Measures Continued.*

Mitigation Name	Aspect/Section	Mitigation Measure	Reason for Mitigation Measure
Foundation validation	Earthworks	Validation of the foundation should be completed by an experienced geotechnical engineer	Identify locations of soft or unsuitable material and remediate prior to backfilling and construction of foundations

6 Conclusion

No significant adverse ground conditions were observed based on the limited scope of geotechnical investigations undertaken at the proposed work area. The proposed infrastructure upgrades by the Department of Education should consider the geotechnical recommendations provided in this report during the design phase. Key recommendations are listed below, but not limited for general reference:

- All pavement, fill, and loose/soft soil within the footprint of the proposed structures shall be removed, including grubbing out of tree roots, if present.
- Earthwork shall be carried out in accordance with AS3798-2007 “Guidelines on Earthworks for Commercial and Residential Developments”.
- Open cutting shall not be deeper than 1.5m below the existing ground surface, and at least a 3m offset distance from any existing structures or work boundary should be provided.
- Should excavations be required at a depth of more than 1.5m, embedded pile retaining wall systems should be considered prior to commencement of the excavation.
- For Lot Classification, the proposed work area can be classified as “Class A”, subject to the removal of Units 1 and 2 materials, and the proposed foundation systems are to be founded on Units 3 or 4 materials.
- Considering the existing extremely weather bedrock was inferred to be at shallow depth, likely less than/at around 1m below the existing ground surface, shallow foundation systems, such as pad footing or strip footing to be founded on Unit 4 is considered feasible.
- An earthquake classification of “Class Be” (rock site) can be considered, subject to the proposed foundation systems being directly founded on Unit 4 materials.
- A suitably qualified geotechnical engineer shall be engaged to provide input and assess the proposed excavation, retaining wall and foundation design before the construction stage.
- Settlement analysis of the proposed foundation system, including total and differential settlement estimations, shall be carried out and assessed to determine whether it would cause any adverse impact to the supporting superstructures.
- Geotechnical assessment of subgrade materials and end-bearing capacity assessment for any working platforms for construction plant and validation of foundation materials shall be undertaken by an experienced geotechnical engineer.
- A project-specific Construction Quality Control plan shall be developed by considering the advice and recommendations provided by suitably qualified geotechnical engineers prior to the commencement of construction.

ADE recommends that a suitably qualified geotechnical engineer shall be involved and consulted for professional geotechnical advice throughout the design phase to reduce the potential geotechnical risks related to the proposed school infrastructure upgrade.

7 References

- Sydney 1:100 000 Geological Sheet 9130, first edition from Geological Survey of NSW (1983), Geological Survey of New South Wales, Sydney
- B.G Look – Handbook of Geotechnical Investigation and Design Tables (Pub 2007)
- Standards Australia, Australian Standards (AS) 1726-2017 Geotechnical Site Investigations (Pub 2nd May 2017)
- Standards Australia, Australian Standards (AS) 2870-2011 Residential slabs and footings. (Pub 17th January 2011)
- Standards Australia, Australian Standards (AS) 2159-2009 Piling – Design and installation. (Pub 4th November 2009)
- Standards Australia, Australian Standards (AS) 3798-2007 Guidelines on earthworks for commercial and residential developments. (Pub 12th March 2007)
- Pells, P.J.N, Douglas D.J, Rodway, B, Thorne C, McManon B.K – Design Loadings for Foundations on Shale and Sandstone in the Sydney Region. Australian Geomechanics Journal, 1978Guide to Residential Slabs and Footings in Saline Environments CCAA T56-2005
- Department of Infrastructure, Planning and Natural Resources "Salinity Potential in Western Sydney 2002".
- Site Investigation for Urban Salinity, Department of Land and Water Conservation 2002.

8 Limitations

This report has been prepared for use by the Client who has commissioned the works in accordance with the project brief only and has been based on information provided by the Client. The advice herein relates only to this project and all results, conclusions and recommendations made should be reviewed by a competent and experienced person with experience in geotechnical investigations, before being used for any other purpose.

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This report does not provide a complete assessment of the geotechnical status of the site, and it is limited to the scope defined herein. Should information become available regarding conditions at the site (e.g., conditions exposed at the site during earthworks varying significantly with the results within this report), ADE reserves the right to review the report in the context of the additional information.

ADE's professional opinions are based upon its professional judgment, experience, training, and results from analytical data. In some cases, further testing and analysis may be required, thus producing different results and/or opinions. ADE has limited investigation to the scope agreed upon with its client.

This report has been written with the intent of providing information on the site subsurface to the client for design purposes. Subsurface conditions relevant to the works undertaken by the client should be assessed by a competent contractor who can make their interpretation of the data represented within this report.

Subsurface conditions will always vary within a worksite and the extremes of these variations cannot be defined by exhaustive investigations, and as such, the measurements and values obtained within this result may not be representative of these extremes.

Appendix I – Borehole Location Plan

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no	description	drawn	approved	date
1		AC	SB	04-12-2023

drawn	AC
approved	SB
date	04-12-2023
scale	1:350
original size	A3

client: Schools Infrastructure NSW

project: Cammeray Public School 68 Palmer Street, Cammeray NSW, Australia

title: Proposed sampling locations

project no:	figure no:	rev:
A101023.0722 (Cammeray)	1	1

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Appendix II – Borehole Logs and Explanatory Notes

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NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : BH01

FILE / JOB NO : A201023.0722.01
SHEET : 1 OF 1

CLIENT : School Infrustructure NSW PROJECT : Cammeray Public School
LOCATION : 68 Palmer Street, Cammeray NSW

POSITION : SURFACE ELEVATION : ANGLE FROM HORIZONTAL : 90°

RIG TYPE : Drill Rig MOUNTING : Track CONTRACTOR : Matrix Drilling DRILLER :

DATE STARTED : 12/1/2024 DATE COMPLETED : 12/1/2024 DATE LOGGED : 12/1/2024 LOGGED BY : MCM CHECKED BY : JK

DRILLING						MATERIAL					
PROGRESS: DRILLING & CASING	PROGRESS: WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m) RL (m AHD)	GRAPHIC LOG	GROUP SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
			Not Encountered		0.0			Asphalt 0.05m			PAVEMENT
								Roadbase material 0.15m	D		
AD/T					0.2			FILL SAND: fine to medium grained, red-brown, with sandstone gravels.	M	L	FILL
					0.4			0.50m			
				0.70m SPT 1 20/80mm HB N=R	0.6		SP-SC	SAND: fine to medium grained, pale brown and yellow, with clay.	M	VD	RESIDUAL SOIL
					0.8			0.80m			
								SANDSTONE: fine to medium, red-brown, pale grey, extremely weathered, extremely low strength.	D to M		ROCK
					1.0						
					1.2						
					1.4			1.50m			
								Hole Terminated at 1.50 m TC bit refusal			
					1.6						
					1.8						
					2.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

ADE 2.00.01.LIB.GLB Log IS AU BOREHOLE 2A A201023.0722.01.GPJ <<DrawingFile>> 19/2/2024 17:30 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: ADE 2.00.0 2023-12-01 Prj: ADE 2.00.0 2023-12-01

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : BH02

FILE / JOB NO : A201023.0722.01
SHEET : 1 OF 1

CLIENT : School Infrustructure NSW PROJECT : Cammeray Public School
LOCATION : 68 Palmer Street, Cammeray NSW

POSITION : SURFACE ELEVATION : ANGLE FROM HORIZONTAL : 90°

RIG TYPE : Drill Rig MOUNTING : Track CONTRACTOR : Matrix Drilling DRILLER :

DATE STARTED : 12/1/2024 DATE COMPLETED : 12/1/2024 DATE LOGGED : 12/1/2024 LOGGED BY : MCM CHECKED BY : JK

DRILLING						MATERIAL					
PROGRESS: DRILLING & CASING	PROGRESS: WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m) RL (m AHD)	GRAPHIC LOG	GROUP SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
AD/T			Not Encountered	0.50m SPT 1 5,7,9 N=16	0.0			Asphalt 0.05m			PAVEMENT
								Roadbase material	D		
								0.15m FILL SAND: fine to medium grained, red-brown, with sandstone gravels.	M	L	FILL
					0.2			0.30m			
								SAND: fine to medium grained, red-brown, with clay.			RESIDUAL SOIL
					0.4		SP-SC			MD	
					0.6			0.70m	M		
								SAND: fine to medium grained, red-brown, with sandstone gravels.			
				0.95m	0.8		SW			MD	
					1.0			1.00m SANDSTONE: fine to medium, red-brown and pale grey, extremely weathered, extremely low strength.	D to M		ROCK
					1.2			1.20m Hole Terminated at 1.20 m TC bit refusal			
					1.4						
					1.6						
					1.8						
					2.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

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NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : BH03

FILE / JOB NO : A201023.0722.01
SHEET : 1 OF 1

CLIENT : School Infrustructure NSW PROJECT : Cammeray Public School
LOCATION : 68 Palmer Street, Cammeray NSW

POSITION : SURFACE ELEVATION : ANGLE FROM HORIZONTAL : 90°

RIG TYPE : Drill Rig MOUNTING : Track CONTRACTOR : Matrix Drilling DRILLER :

DATE STARTED : 12/1/2024 DATE COMPLETED : 12/1/2024 DATE LOGGED : 12/1/2024 LOGGED BY : MCM CHECKED BY : JK

DRILLING						MATERIAL					
PROGRESS: DRILLING & CASING	PROGRESS: WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m) RL (m AHD)	GRAPHIC LOG	GROUP SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
AD/T			Not Encountered	0.50m SPT 1 HB N=R	0.0			Asphalt 0.05m			PAVEMENT
								Roadbase material	D		
					0.2			0.15m FILL SAND: fine to medium grained, red-brown, with sandstone gravels.	M		FILL
								0.30m SAND: fine to medium grained, red-brown, with clay.	M	MD	RESIDUAL SOIL
					0.4		SP-SC	0.50m			
					0.6			SANDSTONE: fine to medium, red-brown and pale grey, extremely weathered, extremely low strength.	D to M		ROCK
					0.8						
					1.0			1.00m SANDSTONE: fine to medium, pale grey, extremely weathered, extremely low strength.			
					1.2			1.20m Hole Terminated at 1.20 m TC bit refusal			
					1.4						
					1.6						
					1.8						
					2.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

ADE 2.00.01.LIB.GLB Log IS AU BOREHOLE 2A A201023.0722.01.GPJ <<DrawingFile>> 19/2/2024 17:30 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: ADE 2.00.0 2023-12-01 Prj: ADE 2.00.0 2023-12-01

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : BH04

FILE / JOB NO : A201023.0722.01
SHEET : 1 OF 1

CLIENT : School Infrustructure NSW PROJECT : Cammeray Public School
LOCATION : 68 Palmer Street, Cammeray NSW

POSITION : SURFACE ELEVATION : ANGLE FROM HORIZONTAL : 90°

RIG TYPE : Drill Rig MOUNTING : Track CONTRACTOR : Matrix Drilling DRILLER :

DATE STARTED : 12/1/2024 DATE COMPLETED : 12/1/2024 DATE LOGGED : 12/1/2024 LOGGED BY : MCM CHECKED BY : JK

DRILLING						MATERIAL					
PROGRESS: DRILLING & CASING	PROGRESS: WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m) RL (m AHD)	GRAPHIC LOG	GROUP SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
AD/T			Not Encountered		0.0			Asphalt			PAVEMENT
								0.10m Roadbase material	D		
					0.2			0.20m FILL SAND: fine to medium grained, red-brown, with sandstone gravels.	M		FILL
								0.30m SAND: fine to medium grained, red-brown, with clay.	M	VD	RESIDUAL SOIL
				0.40m SPT 1 10/20mm HB N=R	0.4		SP-SC	0.50m			
					0.6			SANDSTONE: fine to medium, red-brown and pale grey, extremely weathered, extremely low strength.	D to M		ROCK
					0.8						
					1.0			1.00m Hole Terminated at 1.00 m TC bit refusal			
					1.2						
					1.4						
					1.6						
					1.8						
					2.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

ADE 2.00.01.LIB.GLB Log IS AU BOREHOLE 2A A201023.0722.01.GPJ <<DrawingFile>> 19/2/2024 17:30 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: ADE 2.00.0 2023-12-01 Prj: ADE 2.00.0 2023-12-01

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : BH05

FILE / JOB NO : A201023.0722.01
SHEET : 1 OF 1

CLIENT : School Infrustructure NSW PROJECT : Cammeray Public School
LOCATION : 68 Palmer Street, Cammeray NSW

POSITION : SURFACE ELEVATION : ANGLE FROM HORIZONTAL : 90°

RIG TYPE : Drill Rig MOUNTING : Track CONTRACTOR : Matrix Drilling DRILLER :

DATE STARTED : 12/1/2024 DATE COMPLETED : 12/1/2024 DATE LOGGED : 12/1/2024 LOGGED BY : MCM CHECKED BY : JK

DRILLING						MATERIAL					
PROGRESS: DRILLING & CASING	PROGRESS: WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m) RL (m AHD)	GRAPHIC LOG	GROUP SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
AD/T			Not Encountered	0.50m SPT 1 11,10/20mm HB N=R	0.0			Asphalt 0.05m			PAVEMENT
								Roadbase materials	D		
								0.15m FILL SAND: fine to medium grained, red-brown, with sandstone gravels.	M		FILL
					0.2			0.25m SANDSTONE: fine to medium, red-brown and pale grey, extremely weathered, extremely low strength.	D to M		ROCK
					0.4						
					0.6						
					0.8						
					1.0						
					1.2			1.20m Hole Terminated at 1.20 m TC bit refusal			
					1.4						
					1.6						
					1.8						
					2.0						

See Explanatory Notes for details of abbreviations & basis of descriptions.

ADE 2.00.01.LIB.GLB Log IS AU BOREHOLE 2A A201023.0722.01.GPJ <<DrawingFile>> 19/2/2024 17:30 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: ADE 2.00.0 2023-12-01 Prj: ADE 2.00.0 2023-12-01

EXPLANATORY NOTES

Soil and rock descriptions on the logs are generally in accordance with the recommendations of AS1726-2017 Geotechnical Site Investigation.

The order in which descriptions are provided on the logs is as follows:

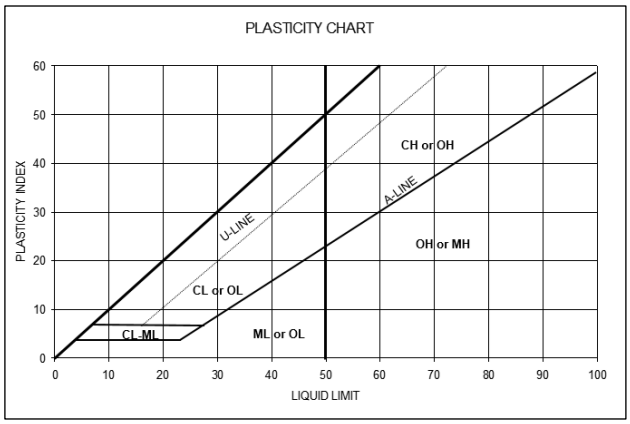
1. SOIL NAME AND GROUP SYMBOLS

Major Divisions		Symbol	Description
COARSE GRAINED SOILS More than 65% of soil excluding oversized fraction is greater than 0.075mm	**GRAVEL** More than 50% of coarse fraction is >2.36mm	GW	Well-graded gravels, gravel-sand mixtures, wide range in grain size and substantial amounts of all intermediate sizes, little or no fines
		GP	Poorly graded gravels, gravel-sand mixtures, predominantly one size or range of sizes with some intermediate sizes missing, little or no fines
		GM	With appreciable amount of non-plastic fines, zero to medium dry strength (gravel-sand-silt mixtures)
		GC	With appreciable amount of plastic fines, medium to high dry strength (gravel-sand-clay mixtures)
	SAND More than 50% of coarse fraction is <2.36mm	SW	Wide range in grain size and substantial amounts of all intermediate sizes, not enough fines to bind coarse grains, no dry strength (Well graded sands, gravelly sands, little or no fines)
		SP	Predominantly one size or range of sizes with some intermediate sizes missing, not enough fines to bind coarse grains, no dry strength (Poorly graded sands and gravelly sands; little or no fines, uniform sands)
		SM	With appreciable amount of non-plastic fines, zero to medium dry strength (silty sands, sand-silt mixtures)
		SC	With appreciable amount of plastic fines, medium to high dry strength (clayey sands, sand-clay mixtures)
FINE GRAINED SOILS More than 35% of soil excluding oversized fraction is less than 0.075mm	Liquid Limit <50%	ML	Inorganic silts of low plasticity (very fine sands, rock flour, sandy clays, silty clays)
		CL, CI	Inorganic clays of low to medium plasticity (gravelly clays, sandy clays, silty clays)
		OL	Organic silts and organic silty clays of low plasticity
	Liquid Limit >50%	MH	Inorganic silts of high plasticity
		CH	Inorganic clays of high plasticity
		OH	Organic clays of medium to high plasticity
	Highly organic soil	PT	Peat muck and other highly organic soils

2. PARTICLE SIZE CHARACTERISTICS

Fraction	Components	Sub Division	Size (mm)
	Boulders		>200
	Cobbles		63 - 200
Coarse grained soil	Gravel	Coarse	19 - 63
		Medium	6.7 - 19
		Fine	2.36 - 6.7
	Sand	Coarse	0.6 - 2.36
		Medium	0.21 - 0.6
		Fine	0.075 - 0.21
Fine grained soil	Silt		0.002 - 0.075
	Clay		<0.002

3. PLASTICITY PROPERTIES



4. MINOR COMPONENTS

Coarse Grained Soils		Fine Grained Soils	
% Fines	Modifier	% Coarse	Modifier
<5	Omit or use 'trace'	<15	Omit or use 'trace'
5 - 12	Describe as 'with clay/silt' as applicable	15 - 30	Describe as 'with sand/gravel' as applicable
>12	Prefix soil as 'silty/clayey' as applicable	>30	Prefix soil as 'sandy/gravelly' as applicable

5. MOISTURE CONDITION

Field Identification			
Symbol	**Cohesive soils**	**Symbol**	**Granular soils**
w<PL	Hard and friable – Moisture Content of soils is less than the plastic limit	D	No Cohesion, dry to the touch and free running
w=PL	Feels cool, darkened in colour, can be moulded – Moisture Content is equal to plastic limit	M	Feels cool, darkened in colour, no visible water, tends to cohere
w>PL	Feels cool, darkened in colour, usually soft – Moisture Content is greater than plastic limit	W	Feels cool, darkened in colour, tend to cohere, and visible free water. Usually from below water table

Moisture content of cohesive soils shall be described in relation to plastic limit (PL) for the soils with dry of PL (w<PL); near PL (w=PL); and wet of PL (w>PL). Moisture content of non-cohesive (granular) soils shall be described as dry (D), moist (M), wet (w)

6. DENSITY

Term	Very Loose	Loose	Medium Dense	Dense	Very Dense
Symbol	VL	L	MD	D	VD
SPT (N)	0 - 4	4 - 10	10 - 30	30 - 50	>50
DCP	0 - 1	1 - 3	3 - 8	8 - 15	>15
Density Index (%)	<15	15 - 35	35 - 65	65 - 85	>85

7. CONSISTENCY

Term	Very Soft	Soft	Firm	Stiff	Very Stiff	Hard
Symbol	VS	S	F	St	Vst	H
SPT (N)	0 - 2	2 - 4	4 - 8	8 - 15	15 - 30	>30
DCP	0 - 1	1 - 2	2 - 3	3 - 7	7 - 12	>12
Undrained Shear Strength (kPa)	<12	12 - 25	25 - 50	50 - 100	100 - 200	>200

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ROCK DESCRIPTION - EXPLANATORY NOTES

1. STRENGTH

Term	Log Symbol	Point Load Index IS_{50} (MPa)	Field Guide
Very Low	VL	0.03 - 0.1	Material crumbles under firm blows with sharp end of pick; can be pealed with a knife; too hard to cut a triaxial sample by hand. SPT will refuse. Pieces up to 3 cm thick can be broken by finger pressure. Sandstone is 'sugary' and friable
Low	L	0.1 - 0.3	Easily scored with a knife; indentations 1 mm to 3 mm show in the specimen with firm blows of the pick point; has dull sound under hammer. A piece of core 150 m long x 40 mm Φ may be broken by hand. Sharp edges of core may be friable and break during handling
Medium	M	0.3 - 1	Readily scored with a knife; piece of core 150 mm long x 50mm Φ can be broken by hand with difficulty
High	H	1 - 3	Can be slightly scratched with a knife. A piece of core 150 mm long x 50 mm Φ cannot be broken by unaided hands but can be broken with a single blow, rock rings under hammer
Very High	VH	3 - 10	Cannot scratch with a knife. Hand specimen breaks with pick after more than one blow, rock rings under hammer
Extremely High	EH	>10	Specimen requires many blows with geo-pick to break through intact material, rock rings under hammer

2. WEATHERING

Classification	Symbol	Description
Residual Soil	RS	Soil derived from the weathering of rock; the mass structure and substance fabric are no longer evident; the soil has not been significantly transported.
Extremely Weathered	XW	Rock is weathered to such an extent that it has 'soil' properties, that is, it either disintegrates or can be remoulded, in water. Fabric of original rock still visible.
Distinctly Weathered	HW	Rock strength usually changed by weathering. The rock may be highly discoloured, usually be iron staining. Porosity may be increased by leaching or may be decreased due to deposition of weathering products in pores. In some environments it is convenient to subdivide into Highly Weathered (HW) and Moderately Weathered (MW), with the degree of alteration typically less for MW.
	MW	
Slightly Weathered	SW	Rock is partially discoloured with staining along joints but shows little or no change of strength from fresh rock.
Fresh Rock	FR	Rock shows no sign of decomposition or staining.

3. COMMON DEFECTS IN ROCK MASS

Type	Symbol	Description
Parting	Pt	A surface or crack across which the rock has little or no tensile strength. Parallel or sub-parallel to layering. May be open or closed.
Joint	Jt	A surface or crack with no apparent shear displacement and across which the rock has little or no tensile strength. May be open or closed.
Shear Zone	Sz	Zone of rock material with roughly parallel near planar, curved or undulating boundaries cut by closely spaced joints, shear surface or other defects. Some of the defects are usually curved and intersect to divide the mass into lenticular or wedge-shaped blocks.
Clay Seam	Cs	Seam of soil material with roughly parallel almost planar boundaries, composed of clay.
Crushed Seam Zone	Cz	Seam of material with roughly parallel almost planar boundaries, composed of disorientated, usually angular fragment of the host rock, which may be more weathered than the host rock.
Infilled Seam	Se	Seam of soil material with distinct roughly parallel planar boundaries formed by the migration of soil into an open cavity or joint and must be defined by colour and USC symbols. Infilled seams less than 1 mm thick may be described as a veneer or coating on a joint surface.
Extremely Weathered Seam / Zone	Ewz	Seam of soil material, often with gradational boundaries. Formed by weathering of the rock material in place.

4. DEFECTS SHAPES AND CHARACTERISTICS

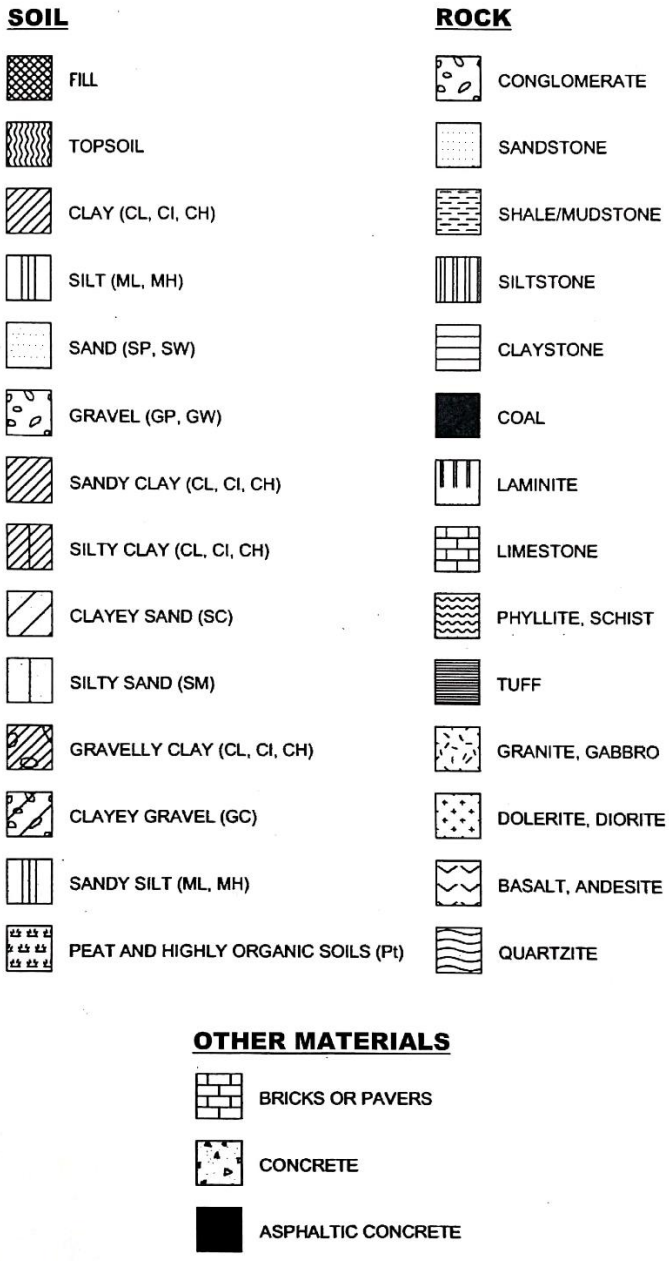
Characteristics	Description
Thickness	Measured in mm normal to the plane of the defect (mm.t).
Inclination	Measured in an exposure as a dip and strike or dip and dip direction. In core measured as an angle from a plane normal to the core axis.
Surface Shape	Described defect surface shape as either: - Planar (Pl) – defect forms a continuous plane without variation in orientation - Curved (Cu) – defect has a gradual change in orientation - Undulating (Un) – a defect has wavy surface - Stepped (St) – a defect has one or more well defined steps. - Irregular (Ir) – a defect with many sharp changes of orientation
Surface Roughness	A description of the defect plane described as: - Rough (Ro)– many small surface irregularities. - Smooth (Sm) – smooth to touch. Few or no surface irregularities. - Polished (Po) – shiny or sheen smooth surface inconsistent with parent rock - Slickensided (Sl) – Grooved or striated surface, usually polished.
Coating	Described defect coating as either: - Clean (Cl) – no visible coating - Stained (St) – no visible coating but surfaces are discoloured - Veneer (Ve) – a visible coating soil or mineral substance, but usually unable to be measured (usually <1 mm), may be called patchy veneer. - Coating (Co) – a visible coating of soil or mineral up to 1mm thick. Thicker soil materials shall be described using appropriate defect terms (e.g. in-filled seam). Thicker rock strength material shall be described as a vein.
Spacing	Measurement of the distance between defects of the same set.

LOG SYMBOLS AND ABREVIATIONS

1. DRILLING AND EXCAVATION METHODS

HA	Hand Auger	**RAB**	Rotary Air Blast	**NMLC**	Diamound Core: 52mm
DT	Diatube Coring	**RC**	Reverse Circulation	**HQ**	Diamound Core: 63mm
NDD	Non-destructive Digging	**PT**	Push Tube	**HMLC**	Diamound Core: 63mm
AD	Auger Driling (ADV: V-Bit; ADT: TC-Bit)	**CT**	Cable Tool Rig	**BH**	Tractor Mounted Backhoe
ADH	Hollow Auger	**JET**	Jetting	**EX**	Tracked Hydraulic Excavator
RD	Rotary blade or drag bit	**WB**	Washbore or Bailer	**EE**	Existing Excavation
RT	Rotary Tricone bit	**NQ**	Diamound Core: 47mm	**HAND**	Excavated by Hand Methods

2. GRAPHIC SYMBOL LEGENDS FOR SOIL AND ROCK



Appendix III – Laboratory Test Results

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Material Test Report

Report Number: **A201023.0722.01-1**
Issue Number: 1
Date Issued: 01/02/2024
Client: School Infrastructure NSW

Project Number: A201023.0722.01
Project Name: Geotechnical Investigation for the Proposed Infrastructure Development
Project Location: Cammeray Public School, Palmer Street, Cammeray NSW, 2062
Work Request: 7422
Sample Number: 24-7422A
Client Sample #: BH1
Date Sampled: 12/01/2024
Dates Tested: 17/01/2024 - 18/01/2024
Sampling Method: AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method: AS 1289.1.1 - Sampling and Preparation of Soils
Remarks: Reference: A201023.0722.01 PI, LS, PSD - BH1, BH3
Sample Location: **Depth: 0.5-0.8 m**

ADE Consulting Group Pty Ltd
Construction and Material Testing Laboratory
Unit 1, 68-72 Asquith Street Silverwater NSW 2128
Phone: (02) 9648 6669

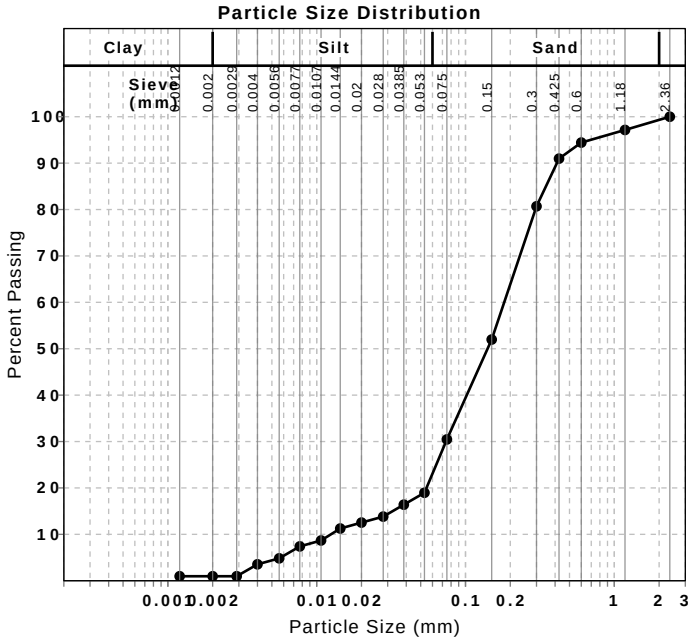
Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Ashwin Tatikonda
CMT manager
NATA Accredited Laboratory Number: 21005

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried / Air Dried / Natural / Unknown		
Preparation Method	Wet Sieve / Dry Sieve / Both Sieves / Unknown		
Liquid Limit (%)	20		
Plastic Limit (%)	17		
Plasticity Index (%)	**3**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.1		
Linear Shrinkage (%)	2.5		
Cracking Crumbling Curling	None		

Particle Size Distribution (AS 1289 3.6.1)			
Sieve	Passed %	Passing Limits	
75 mm			
63 mm			
53 mm			
37.5 mm			
26.5 mm			
19 mm			
13.2 mm			
9.5 mm			
6.7 mm			
4.75 mm			
2.36 mm	**100**		
1.18 mm	**97**		
0.6 mm	**94**		
0.425 mm	**91**		
0.3 mm	**81**		
0.15 mm	**52**		
0.075 mm	**30**		



Fine Analysis Using a Hydrometer (AS 1289 3.6.3)	
Particle Size (mm)	Passed %
0.0530	**19.0**
0.0385	**16.4**
0.0280	**13.8**
0.0200	**12.5**
0.0144	**11.2**
0.0107	**8.7**
0.0077	**7.4**
0.0056	**4.8**
0.0040	**3.5**
0.0029	**1.0**
0.0020	**1.0**
0.0012	**1.0**

Fine Analysis using a Hydrometer (AS 1289 3.6.3)	
Method of Dispersion	Mechanical Device
Loss in Pretreatment	

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Results relate only to the items tested/sampled.

Material Test Report

Report Number: **A201023.0722.01-1**
Issue Number: 1
Date Issued: 01/02/2024
Client: School Infrastructure NSW

Project Number: A201023.0722.01
Project Name: Geotechnical Investigation for the Proposed Infrastructure Development
Project Location: Cammeray Public School, Palmer Street, Cammeray NSW, 2062
Work Request: 7422
Sample Number: 24-7422B
Client Sample #: BH3
Date Sampled: 12/01/2024
Dates Tested: 17/01/2024 - 18/01/2024
Sampling Method: AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method: AS 1289.1.1 - Sampling and Preparation of Soils
Remarks: Reference: A201023.0722.01 PI, LS, PSD - BH1, BH3
Sample Location: **Depth: 0.40m**

ADE Consulting Group Pty Ltd
Construction and Material Testing Laboratory
Unit 1, 68-72 Asquith Street Silverwater NSW 2128
Phone: (02) 9648 6669
Accredited for compliance with ISO/IEC 17025 - Testing

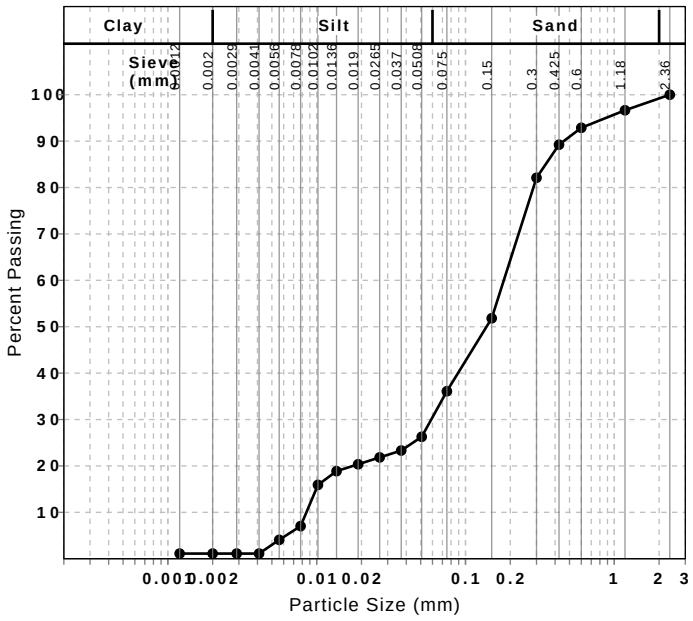
Approved Signatory: Ashwin Tatikonda
CMT manager
NATA Accredited Laboratory Number: 21005

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	22		
Plastic Limit (%)	20		
Plasticity Index (%)	**2**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.1 / AS 1289.3.1.2 / AS 1289.3.9.1 / AS 1289.3.9.2		
Linear Shrinkage (%)	2.0		
Cracking Crumbling Curling	None		

Particle Size Distribution (AS 1289 3.6.1)			
Sieve	Passed %	Passing Limits	
75 mm			
63 mm			
53 mm			
37.5 mm			
26.5 mm			
19 mm			
13.2 mm			
9.5 mm			
6.7 mm			
4.75 mm			
2.36 mm	**100**		
1.18 mm	**97**		
0.6 mm	**93**		
0.425 mm	**89**		
0.3 mm	**82**		
0.15 mm	**52**		
0.075 mm	**36**		

Particle Size Distribution



Fine Analysis Using a Hydrometer (AS 1289 3.6.3)	
Particle Size (mm)	Passed %
0.0508	**26.3**
0.0370	**23.3**
0.0265	**21.8**
0.0190	**20.4**
0.0136	**18.9**
0.0102	**15.9**
0.0078	**7.0**
0.0056	**4.1**
0.0041	**1.1**
0.0029	**1.1**
0.0020	**1.1**
0.0012	**1.1**

Fine Analysis using a Hydrometer (AS 1289 3.6.3)	
Method of Dispersion	Mechanical Device
Loss in Pretreatment	

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Results relate only to the items tested/sampled.

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customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 341553

Client Details

Client	ADE CONSULTING GROUP PTY LTD
Attention	Murali Muralitharan
Address	Unit 6, 7 Millenium Court, Silverwater, NSW, 2128

Sample Details

Your Reference	**A201023.0722.01-Cammeray Public School**
Number of Samples	3 Soil
Date samples received	15/01/2024
Date completed instructions received	15/01/2024

Analysis Details

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

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

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

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	22/01/2024
Date of Issue	22/01/2024

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

Results Approved By
Diego Bigolin, Inorganics Supervisor
Loren Bardwell, Development Chemist

Authorised By
Nancy Zhang, Laboratory Manager

Misc Inorg - Soil				
Our Reference		341553-1	341553-2	341553-3
Your Reference	UNITS	BH1	BH3	BH5
Depth		0.7	0.4	0.3
Date Sampled		12/01/2024	12/01/2024	12/01/2024
Type of sample		Soil	Soil	Soil
Date prepared	-	18/01/2024	18/01/2024	18/01/2024
Date analysed	-	18/01/2024	18/01/2024	18/01/2024
pH 1:5 soil:water	pH Units	4.9	5.6	7.6
Electrical Conductivity 1:5 soil:water	µS/cm	64	86	24
Chloride, Cl 1:5 soil:water	mg/kg	10	34	<10
Sulphate, SO4 1:5 soil:water	mg/kg	69	93	<10
Resistivity in soil*	ohm m	160	120	410

ESP/CEC				
Our Reference		341553-1	341553-2	341553-3
Your Reference	UNITS	BH1	BH3	BH5
Depth		0.7	0.4	0.3
Date Sampled		12/01/2024	12/01/2024	12/01/2024
Type of sample		Soil	Soil	Soil
Date prepared	-	19/01/2024	19/01/2024	19/01/2024
Date analysed	-	19/01/2024	19/01/2024	19/01/2024
Exchangeable Ca	meq/100g	0.8	3.5	2.1
Exchangeable K	meq/100g	0.2	0.2	0.1
Exchangeable Mg	meq/100g	0.6	2.0	1.8
Exchangeable Na	meq/100g	<0.1	0.1	<0.1
Cation Exchange Capacity	meq/100g	1.7	5.8	4.1
ESP	%	[NT]	3	[NT]

Method ID	Methodology Summary
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA latest edition, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-002	Conductivity and Salinity - measured using a conductivity cell at 25°C in accordance with APHA latest edition 2510 and Rayment & Lyons.
Inorg-002	Conductivity and Salinity - measured using a conductivity cell at 25oC in accordance with APHA 22nd ED 2510 and Rayment & Lyons. Resistivity is calculated from Conductivity (non NATA). Resistivity (calculated) may not correlate with results otherwise obtained using Resistivity-Current method, depending on the nature of the soil being analysed.
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA latest edition, 4110-B. Waters samples are filtered on receipt prior to analysis. Alternatively determined by colourimetry/turbidity using Discrete Analyser.
Metals-020	Determination of exchangeable cations and cation exchange capacity in soils using 1M Ammonium Chloride exchange and ICP-OES analytical finish.

QUALITY CONTROL: Misc Inorg - Soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			18/01/2024	[NT]	[NT]	[NT]	[NT]	18/01/2024	[NT]
Date analysed	-			18/01/2024	[NT]	[NT]	[NT]	[NT]	18/01/2024	[NT]
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	[NT]	[NT]	[NT]	[NT]	101	[NT]
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	<1	[NT]	[NT]	[NT]	[NT]	101	[NT]
Chloride, Cl 1:5 soil:water	mg/kg	10	Inorg-081	<10	[NT]	[NT]	[NT]	[NT]	95	[NT]
Sulphate, SO4 1:5 soil:water	mg/kg	10	Inorg-081	<10	[NT]	[NT]	[NT]	[NT]	103	[NT]
Resistivity in soil*	ohm m	1	Inorg-002	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]

QUALITY CONTROL: ESP/CEC					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			19/01/2024	[NT]	[NT]	[NT]	[NT]	19/01/2024	[NT]
Date analysed	-			19/01/2024	[NT]	[NT]	[NT]	[NT]	19/01/2024	[NT]
Exchangeable Ca	meq/100g	0.1	Metals-020	<0.1	[NT]	[NT]	[NT]	[NT]	104	[NT]
Exchangeable K	meq/100g	0.1	Metals-020	<0.1	[NT]	[NT]	[NT]	[NT]	116	[NT]
Exchangeable Mg	meq/100g	0.1	Metals-020	<0.1	[NT]	[NT]	[NT]	[NT]	102	[NT]
Exchangeable Na	meq/100g	0.1	Metals-020	<0.1	[NT]	[NT]	[NT]	[NT]	102	[NT]

Result Definitions

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

Quality Control Definitions

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

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

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

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

Laboratory Acceptance Criteria

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

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

Spikes for Physical and Aggregate Tests are not applicable.

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

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

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

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

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

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

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

Measurement Uncertainty estimates are available for most tests upon request.

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

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

Report Comments

ESP: Where the exchangeable Sodium is less than the PQL and CEC is less than 10meq/100g, the ESP cannot be calculated.

Further details regarding ADE's Services are available via

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