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Acid Sulfate Management Plan

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84 Gavenlock Road

Mardi, NSW, 2259

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REPORT DISTRIBUTION

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Executive Summary

Raw Earth Environmental Pty Ltd (Raw Earth) were engaged to conduct an Acid Sulfate Soil Investigation (ASSI) at the property located at 84 Gavenlock Road, Mardi NSW 2259 (referred to herein as 'the site'). The site is described as Lot 9 Section 4 DP 3368 and comprises an approximate total area of 133,000 m². The investigation area is located on the north-west portion of the site and comprises an approximate total area of 8,250 m².

The Site Location Plan is shown in Figure 1, in the **Appendix A**. The site is located approximately 15.5 km north-east of Gosford Central Business District (CBD), within the Local Government Area of Central Coast Council (CCC). This report has been prepared to support a State Significant Development Application (SSDA) to CCC. This report has been prepared to investigate subsurface conditions and the Acid Sulfate Soil (ASS) conditions at the site.

Raw Earth understands that the proposed K-12 school development at the site includes the construction of an additional building with three (3) wings on the north-west portion of the site. Information provided to Raw Earth by the client indicates that as part of the project, bulk earthworks will consist of up to 2460 m³ of in situ soils disturbed to a maximum depth of 1.8 m bgl. Acid sulfate soil (ASS) risk mapping presented in the CCC Local Environment Plan (LEP), 2022 shows the site as having Class 4 and Class 5 ASS risk. In accordance with the provisions of the CCC LEP (2022), an ASS Management Plan (ASSMP) is required for works at the proposed depth below the natural ground surface. An ASS investigation and treatment for Class 4 and 5 ASS risk areas relates to soils being disturbed greater than the 2m in depth mark.

As part of the in situ ASS investigation undertaken on site on 22nd August 2023, six hand auger locations were advanced to approximately 2.5 m below ground level (m bgl) across the investigation area. Soils encountered generally consisted of topsoils followed by natural sands of medium grain sized to approximately 0.75 m bgl to 2.0 m bgl, followed by natural clays noted to be fine in texture, dry, medium density with a low plasticity index until 2.5 m bgl.

As the total volume of soils to be excavated exceeds the 1,000 tonnes volume and considering that the site is situated in Class 4 and 5 ASS risk areas, the adopted action criteria obtained from the NASSSIMM (2018) and the former ASSMAC (1998) guidelines is ≥ 0.03 % S-equiv and ≥ 18 mol H+/t for soils greater than the 2m mark.

Initial field pH results obtained from the NATA accredited laboratory (SGS – NATA accreditation no: 2562(4354) indicate naturally low, acidic pH soils across site, ranging from 5.0 to 5.5 pH units. In addition to this, the chemical field pH (pHf) reaction results once soils were exposed to hydrogen peroxide exposure (pHfox) was reported as being greater than 1 pH unit in several field pH samples, indicating the presence of potential acid sulfate soils (PASS). Results reported for the Chromium Reducible Sulfur (CRS) analysis selected for ten samples across the six boreholes indicate that ASS in the form of Titratable Actual Acidity (TAA) has been detected at 20 moles H+/T, marginally exceeding the action criteria of 18 moles H+/T and 0.03 %w/w S at HA01_2.25 (20 moles H+/T & 0.034 %w/w S), HA02_2.5 (20 moles H+/T & 0.032 %w/w S), HA03_2.5 (20 moles H+/T & 0.036 %w/w S) and HA06_2.25 (20 moles H+/T & 0.034 %w/w S). This indicates that actual acid sulfate soils (AASS) are present in soils at these locations across these depth ranges.

This ASSMP presents the treatment works and management procedures to be adopted during the proposed earthworks associated with the development for soils excavated past the 2m mark only (considering the site is situated in Class 4 and 5 ASS risk area).

Should any dewatering works be required on site during bulk earthworks, management measures for dewatering should be incorporated into a dewatering management plan (DMP).

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1 Introduction

1.1 Background

Raw Earth Environmental Pty Ltd (Raw Earth) were engaged to conduct an Acid Sulfate Soil (ASS) investigation at the property located at 84 Gavenlock Road, Mardi NSW 2259 (referred to herein as 'the site'). The site is described as Lot 9 Section 4 DP 3368. The investigation area is located on the north-west portion of the site and comprises an approximate total area of 8,250 m².

The Site Location Plan is shown in Figure 1, in the **Appendix A**. The site is located approximately 15.5 km north-east of Gosford Central Business District (CBD), within the Local Government Area of Central Coast Council (CCC).

This report has been prepared to support a State Significant Development Application (SSDA) to CCC. This ASS Management Plan (ASSMP) has been prepared to investigate subsurface conditions and the Acid Sulfate Soil (ASS) conditions at the site.

Raw Earth understands that the proposed K-12 school development at the site includes the construction of an additional building with three (3) wings on the north-west portion of the site. Information provided to Raw Earth by the client indicates that as part of the project, bulk earthworks will consist of up to 2460 m³ of in situ soils disturbed to a maximum depth of 1.8 m below ground level (m bgl).

Acid sulfate soil (ASS) risk mapping presented in the CCC Local Environment Plan (LEP) (2022) (shows the site as having Class 4 and Class 5 ASS risk. In accordance with the provisions of the CCC LEP (2022), an ASS Management Plan (ASSMP) is required for works at the proposed depth below the natural ground surface. An ASS investigation and treatment for Class 4 and 5 ASS risk areas relates to soils being disturbed greater than the 2m in depth mark.

1.2 Acid Sulfate Soils

Acid Sulfate Soil (ASS) is the common name given to soils containing iron sulfides. When exposed to oxygen through lowering of surrounding groundwater or excavation, air drawn into the soils can cause oxidation of the iron sulfides, producing sulfuric acid.

ASS typically occurs in low-lying coastal areas with historically high organic matter. Runoff from exposed ASS areas may find its way to stormwater, groundwater and eventually into natural aquatic environments. The acidic runoff may lower the pH of receiving waters, increase the concentration of metals and reduce the natural buffering capacity of the receiving waters.

There are two basic types of ASS: Actual Acid Sulfate Soils (AASS) and Potential Acid Sulfate Soils (PASS). AASS are soils in which some sulfides have already been oxidised. PASS are soils in which the sulfides have not yet been oxidised (i.e., they contain oxidisable sulfur). AASS and PASS can coexist. Hence, AASS environments may already be acidic and an ongoing source acid generation.

In anaerobic conditions (such as below the water table), PASS do not pose an environmental threat, however if conditions change (such as during dewatering or excavation), the sulfides can oxidise and form sulfuric acid (and release metals such as aluminium at toxic concentrations) which can then enter groundwater and/or surface water. Developments involving excavation or dewatering must establish the presence and extent of ASS down the soil profile, as works may intercept ASS horizons and pose risks to both human and ecological health.

Exposure of PASS to oxygen, even for a short period of time, can result in the continued oxidisation of pyrite (FeS_2) through the exchange of electrons between Fe^{2+} and Fe^{3+}. This reaction, which can produce sulfuric acid (H_2SO_4), can continue in the absence of oxygen (re-saturated sediments) resulting in the same environmental impact as could be expected should excavated materials be exposed to the atmosphere.

1.3 Objectives

The objectives of the ASSMP were as follows:

- To minimise the potential for inappropriate material handling through accurate identification of ASS;
- To manage ASS material so that the potential for environmental harm is minimised;
- To minimise lowering of the groundwater table, due to dewatering, in areas of PASS;
- To minimise the potential for adverse environmental impact due to handling, storage and application of hazardous materials related to the treatment of ASS; and,
- To ensure awareness of all personnel involved in the proposed development works, of the requirements of this ASSMP and its objectives and management.

2 Scope of Works

To complete this ASSMP, Raw Earth undertook the following scope of works:

- A desktop review of the following sources:
    - Published geology maps;
    - Real Water NSW Bore reports;
    - Local council GIS layers including lot description and land zoning; and,
    - NSW ePlanning Spatial Viewing GIS layers including hydrology and Acid Sulfate Soil Risk Mapping.
- An intrusive ASS site investigation including the following:
    - Advancement of six (6) boreholes using a hand auger and solid stem auger to a maximum depth of 2.5 m below ground level (m bgl);
    - Collection of soil samples at 0.25 m intervals, to a maximum depth of 2.5 m bgl;
    - Soil logging at all borehole locations; and,
    - Laboratory analysis of eighteen (18) soil samples at a National Association of Testing Authority (NATA) accredited laboratory for field pH and CRS analysis from the 2.0 m mark onwards, considering the site is situated in a Class 4 and 5 ASS risk area;
- Preparation of this ASSMP Report, documenting our findings and management requirements in relation to ASS and the proposed development.

3 Regulatory Framework

This ASSMP was undertaken in accordance with the following regulatory framework and guidelines:

- Dear SE, Ahern CR 2013, O'Brien LE, Dobos SK, McElnea AE, Moore NG and Watling KM *"Queensland Acid Sulfate Soil Technical Manual: Soil Management Guidelines",* Department of Science, Information Technology, Innovation and the Arts, Queensland Government, June 2014.
- Department of Agriculture and Water Resources, *National Acid Sulfate Soils Sampling and Identification Methods Manual*, 2018;
- National Environment Protection (Assessment of Site Contamination) Measure 1999, *Schedule B1 – Guideline on Investigation Levels for Soil and Groundwater,* 2013;
- National Environment Protection (Assessment of Site Contamination) Measure 1999, *Schedule B2 – Guideline on Site Characterisation*, 2013;
- NSW Department of Planning and Environment, *State Environmental Planning Policy (Resilience and Hazards)* Chapter 4, 2022;
- NSW Environmental Protection Authority, *Contaminated Land Management, Guidelines for the NSW Site Auditor Scheme (3rd Edition)*, 2017;
- NSW Environmental Protection Authority, *Consultants Reporting on Contaminated Land, Contaminated Land Guidelines*, 2020;
- NSW Environmental Protection Authority, *Guidelines on the Duty to Report Contamination under Contaminated Land Management Act*, 1997;
- NSW Environmental Protection Authority, Resources Recovery Order under Part 9, Clause 93 of the Protection of the Environment Operations (Waste) Regulation 2014, The excavated natural material order, 2014;
- NSW Environmental Protection Authority, *Sampling Design Guidelines,* 2022;
- NSW Environmental Protection Authority, *Waste Classification Guidelines Part 1: Classifying Waste*, 2014;
- NSW Office of Environment & Heritage, *Guidelines for Consultants Reporting on Contaminated Sites*, 2011; and
- Protection of the Environment Operations (Waste) Regulations, 2014.
- Stone Y, Ahern CR and Blunden B (1998) "Acid Sulfate Soil Manual, 1998", New South Wales Acid Sulfate Soil Management Advisory Committee, August 1998.

4 Site Condition and Environmental Setting

4.1 Site Identification

A Site Location Plan is shown in Figure 1, with a detailed Site Layout Plan shown in Figure, **Appendix A**. A summary of the Site Details is shown below in **Table 1**.

Table 1: Site Details	
Site Address	84 Gavenlock Road, Mardi NSW 2559
Lot Description	Lot 9 Section 4 DP 3368
Site Location Map	Figure 1, **Appendix A**
Site Photographs	**Appendix C**
Site Investigation Area (m²)	8,250 m².
Local Government Council	Central Coast Council
Current Land Use	R2: Low Density Residential and C3: Environmental Management
Surrounding Land Use	R1: General Residential and C2: Environmental Conservation and Management,
Previous Land Use	Education

4.2 Surrounding Land use

A summary of surrounding features and/or land uses noted during a review of desktop information and the site inspected is provided in **Table 2** below.

Table 2: Surrounding Land Use	
North	Residential properties zoned as R1 and vacant bushland zoned as RE2 and C2 located adjacent and beyond.
East	Commercial properties zoned as IN2 and B6 located across Gavenlock Road with commercial properties and vacant grassland zoned as IN1 and RE1.
South	Residential properties zoned as R1 and vacant bushland zoned as RE2 located adjacent and beyond
West	Residential properties zoned as R1 adjacent, with vacant bushland and water infrastructure zoned as C2 and SP2.
Abbreviations (NSW Department of Planning and Environment): R1: General Residential C2: Environmental Conservation and Environmental Management IN2: Light Industrial B6: Enterprise Corridor	

RE1: Public Recreation
RE2: Private Recreation
SP2: Infrastructure

4.3 Geology

The Geological Map of Gosford-Lake Macquarie (Geological Series Sheet 9131, 1st Edition, Scale 1:100,000, D.J. Jones, D.C. Uren and R.R. Hughes, 2015) published by the NSW Geological Survey, indicates the site is underlain by Quaternary gravel and sand as well as Triassic Patonga Siltstone consisting of red-brown claystone and pale grey sandstone.

4.4 Hydrogeology

A search of the WaterNSW Portal was conducted on 18th September 2023, which identified one (1) registered groundwater bore approximately 500 m of the site. Details of these bores are summarised below in **Table 3**. The Bore Map and Bore Report are attached in **Appendix D**.

Table 3: Groundwater Bore Information

Bore ID	Bore Location	Total Depth (m)	Lithology	Screen Depth (m)	Standing Water Level (m)
GW054807	500 m south	11.50	Sand underlain by clay	-	-

-= Details not provided on WaterNSW

4.5 Hydrology

A search of Google Earth was undertaken on 18th September 2023, the closest off-site surface water receptor is a tributary to Mardi Creek, which is located approximately 700 m south-west.

4.6 Topography

A review of Google Earth undertaken on 18th September 2023, indicates the topography of the investigation area slopes down from the south to the north of the ranging from 10 m to 14 m above sea level.

4.7 Acid Sulfate Soils

A search of the CCC Local and Environmental Plan (LEP) 2022 was undertaken on 18th September 2023, to identify if ASS are a risk at the site. The investigation area is categorised as Class 4 and Class 5. The central and northern portions of the investigation area is categorised as Class 4, and the southern portion of the investigation area is categorised as Class 5. ASS within Class 4 areas is typically found below two (2) meters of the natural ground surface and ASS is not typically found within Class 5 areas.

Development consent is required for the carrying out of works within the following Class ASS Category:

- Class 4:
    - Works more than 2 m below the natural ground surface; and,
    - Works by which the water table is likely to be lowered more than 2 m below the natural ground surface.
- Class 5:

- Works within 500 metres of adjacent Class 1, 2, 3 or 4 land that is below 5 metres Australian Height Datum and by which the water table is likely to be lowered below 1 metre Australian Height Datum on adjacent Class 1, 2, 3 or 4 land.

5 ASS Investigation

Raw Earth conducted an ASS intrusive soil investigation on the 22nd August 2023. Sample locations for the site are presented in Figure 3, **Appendix A**. A total of six (6) boreholes was advanced across the site, targeting the proposed building footprints using a hand auger and drill rig to a depth of 2.5 m bgl. Site works undertaken are considered adequate to assess the site conditions in accordance with the NASSSIMM (2018) and the former ASSMAC (1998) guidelines. Photographs are documented in the photolog in **Appendix C**, while borehole logs are presented in **Appendix E**.

5.1 Soil Sampling Methodology

To assess the potential for ASS at the site, Raw Earth implemented a targeted-based soil investigation program which included the following:

- Drilling of six (6) boreholes using a hand auger and drill rig, bores were extended to 2.5 m bgl;
- Collection of eleven (11) soil samples in each borehole. The samples were collected at 0.0 m, 0.25 m, 0.5 m, 0.75 m, 1.0 m, 1.25 m, 1.5 m, 1.75 m, 2.0 m, 2.25 m and 2.50 m;
- The soil profile was observed at each sampling location with soil descriptions made in accordance with the Unified Classification System; and,
- Laboratory analysis of samples collected from the site by a National Association of Testing Authorities (NATA) accredited laboratory for the following:
    - 12x Chromium Suite; and,
    - 18x pH Field and Fox.
- Soil samples were collected directly from the surface or from the auger and placed in laboratory prepared 250mL soil jars, labelled and placed on ice in an esky for transport under chain of custody (COC) to a NATA accredited laboratory for the analysis of the COPC.

5.2 Action Criteria

ASS Action criteria for was adopted in accordance with the NASSSIMM (2018) and the former ASSMAC (1998) guidelines and with reference to the anticipated disturbance of > 1000 tonnes of soil. The adopted screening criteria and actions levels for the determination of PASS/ASS are presented in **Table 4** below.

***Table 4*: Screening criteria and action levels as defined in the Acid Sulfate Soils Manual (ASSMAC 1998)**				
pH field	**pH fox**	**pH Δ**	**Net Acidity (%S)**	**Net Acidity (moles H^+/T)**
≤ 4	≤ 3.5	> 1	0.03	18

5.3 Site Inspection

The subsurface lithology was noted to be variable across the investigation area. Fill material was not present in any of the boreholes within the investigation area. Soils encountered generally consisted of topsoils followed by natural sands of medium grain sized to approximately 0.75 m bgl to 2.0 m bgl,

followed by natural clays noted to be fine in texture, dry, medium density with a low plasticity index until 2.5 m bgl.

A number of field observations were noted during the ASSI as summarised in **Table 5** below.

Table 5: Field Observations	
	Field Observations
Filling	Fill material was not encountered in any borehole location during the investigation.
Surface cover	The investigation area was covered entirely by grass and vegetation, with exception to the centre of the site which was occupied by a surface water body.
Staining	No hydrocarbon staining was observed in any borehole location during the investigation.
Odours	Moderate sulphuric odours were observed within BH04 and BH05. Mild sulphuric odours were observed within BH06.
Waste/ rubble	No waste or rubble was observed within the investigation area during the investigation.
Water Inflow	Groundwater was encountered in HA04, HA05 and HA06.

5.3.1 Groundwater

Groundwater was encountered in the three (3) boreholes HA04, HA05 and HA06 during drilling at depths of 2.4 m, 2.1 m and 2.0 m bgl respectively during the investigation. Upon completion of drilling, boreholes were left open for a short period of time and groundwater had risen to 2.2 m, 1.5 m and 1.5 m bgl respectively. Raw Earth is unsure as to whether groundwater would have not stabilised within this limited observation period.

6 Soil Analytical Results

The contaminant concentrations reported have been summarised against the adopted NASSSIMM (2018) and the former ASSMAC (1998) action criterion, and are presented in in Table A1, **Appendix B**. The NATA endorsed laboratory results and chain of custody documentation are provided in **Appendix F.**

As the total volume of soils to be excavated exceeds the 1,000 tonnes volume and considering that the site is situated in Class 4 and 5 ASS risk areas, the adopted action criteria obtained from the NASSSIMM (2018) and the former ASSMAC (1998) guidelines is ≥ 0.03 % S-equiv and ≥ 18 mol H+/t for soils greater than the 2m mark.

Initial field pH results as reported by the laboratory indicate that potential acid sulfate soils (PASS) is present across several samples relating to the acidic pH soils across site, ranging from 5.0 to 5.5 pH units. In addition to this, the chemical field pH (pHf) reaction results once soils were exposed to hydrogen peroxide exposure (pHfox) was reported as being greater than 1 pH unit in several field pH samples

Laboratory results reported as part of the Chromium Reducible Sulfur (CRS) analysis indicated the presence of actual acid sulfate soils (AASS) due to exceedances of the screening criterion for Titratable Actual Acidity (TAA) of 18 mol H+/T and 0.03 %w/w S in the following samples:

- Sample HA01_2.25 was reported above the action criteria at 21 moles H+/T and 0.034 %w/w S;
- Sample HA02_2.50 was reported above the action criteria at 20 moles H+/T and 0.032 %w/w S;
- Sample HA03_2.50 was reported above the action criteria at 22 moles H+/T and 0.036 %w/w S; and,
- Sample HA06_2.25 was reported above the action criteria at 21 moles H+/T and 0.034 %w/w S.

In summary, these results indicate both the presence of PASS and AASS at site within soils greater than the 2.0 m mark.

7 Discussion and Conclusion

Raw Earth) were engaged to conduct an ASSI at the property located at 84 Gavenlock Road, Mardi NSW 2259. The site is described as Lot 9 Section 4 DP 3368 and comprises an approximate total area of 133,000 m². The investigation area is located on the north-west portion of the site and comprises an approximate total area of 8,000 m². Raw Earth understands that the proposed school development at the site, includes the construction of an additional building with three(3) wings on the north-west portion of the site.

The site is currently a high school. The investigation area is located on the north-west portion of the high school and is predominantly grassland. The investigation area is convex in shape with a surface water body and associated vegetation including reeds and rushes present in the centre of the investigation area. The remainder of the site consists of grassland and vegetation, with multiple gardens beds and irrigation systems along the south-east portion of the site to grow vegetables.

Development consent is required for the carrying out of works within the following Class ASS Category:

- Class 4:
    - Works more than 2 m below the natural ground surface; and,
    - Works by which the water table is likely to be lowered more than 2 m below the natural ground surface.
- Class 5:
    - Works within 500 metres of adjacent Class 1, 2, 3 or 4 land that is below 5 metres Australian Height Datum and by which the water table is likely to be lowered below 1 metre Australian Height Datum on adjacent Class 1, 2, 3 or 4 land.

This Acid Sulfate Soil Management Plan (ASSMP) been prepared to support the proposed redevelopment works being undertaken at site. The investigation included the advancement of six (6) boreholes to 2.5 m bgl with the laboratory analysis of twelve (12) Chromium Suite and eighteen (18) pH field and pH fox. Fill material was not present in any of the borehole locations during the investigation. Soils encountered as part of the in sit soils investigation generally consisted of topsoils followed by natural sands of medium grain sized to approximately 0.75 m bgl to 2.0 m bgl, followed by natural clays noted to be fine in texture, dry, medium density with a low plasticity index until 2.5 m bgl.

Laboratory results reported as part of the Chromium Reducible Sulfur (CRS) analysis indicated the presence of actual acid sulfate soils (AASS) due to exceedances of the screening criterion for Titratable Actual Acidity (TAA) of 18 mol H+/T and 0.03 %w/w S in the following samples:

- Sample HA01_2.25 was reported above the action criteria at 21 moles H+/T and 0.034 %w/w S;
- Sample HA02_2.50 was reported above the action criteria at 20 moles H+/T and 0.032 %w/w S;
- Sample HA03_2.50 was reported above the action criteria at 22 moles H+/T and 0.036 %w/w S; and,
- Sample HA06_2.25 was reported above the action criteria at 21 moles H+/T and 0.034 %w/w S.

In summary, these results indicate both the presence of PASS and AASS at site within soils greater than the 2.0 m mark.

Initial field pH results as reported by the laboratory indicate that potential acid sulfate soils (PASS) is present across several samples relating to the acidic pH soils across site, ranging from 5.0 to 5.5 pH units. In addition to this, the chemical field pH (pHf) reaction results once soils were exposed to hydrogen peroxide exposure (pHfox) was reported as being greater than 1 pH unit in several field pH samples. Due to the laboratory results and field indicators of ASS observed during the site investigation, the site requires management of ASS for proposed disturbances greater than 2.0 m.

8 Environmental Responsibilities and Roles

8.1 Overview

The Principal Contractor (PC) is responsible for choosing a project manager tasked with implementing the management requirements of this ASSMP. The appointed project manager will have responsibility for ensuring that all employees, subcontractors, and persons involved with the proposed works are familiar with the requirements of the ASSMP.

A copy of this ASSMP must be kept by Council and a copy must always also be kept by the PC onsite and accessible to all site personnel.

Successful implementation of this ASSMP relies upon support from and compliance by all involved parties. Such responsibilities are detailed below.

8.2 Appointed Project Manager

- Review and monitor environmental performance at regular worksite meetings.
- Required to be notified of any major environmental incidents and review the management procedures in place to deal with such occurrences.
- Monitor non-compliance and review management procedures if problem persists.
- Ensure that appropriate and adequate resources are allocated to allow for effective implementation and maintenance of the ASSMP, in particular the excavation, treatment and validation of excavated ASS.

8.3 Principal Contractor's Site Supervisor/ Foreman

- Facilitate the reporting of incidents that may impact on the surrounding environment.
- Manage neutralisation actions to correct incidents of environmental non-compliance.
- Ensure that all staff are aware of and understand their responsibilities under the ASSMP.
- Identify any environmental training requirements.

8.4 Principal Contractor's Environmental Officer

- Provide guidance and advice to staff regarding ASS management requirements.
- Monitor statutory requirements and ensure compliance.
- Where necessary, coordinate and/or assist in the response to environmental incidents.
- Maintain records of treatment, including verification testing of treated soils.
- Report all incidents with the potential to cause serious environmental harm to the Project Manager and where necessary, to the NSW EPA.

9 Dewatering

The site is low-lying situated between roughly five (5) metres above sea level. Groundwater was encountered in the three (3) boreholes HA04, HA05 and HA06 during drilling at depths of 2.4 m, 2.1 m and 2.0 m bgl respectively during the investigation. As such, groundwater is likely to be encountered during the proposed excavations.

If the groundwater table is required to be lowered in for form of dewatering works to keep the excavation area dry, a Dewatering Management Plan is required to be established for site, of which will look to address the potential for in situ ASS to be exposed should the groundwater table be lowered.

10 Neutralisation Treatment of Excavated Soil

10.1 Volume of Material Requiring Treatment

Information provided to Raw Earth Environmental by the client indicates that the following construction activities will involve subsurface soil disturbance:

- Excavation of an area comprising of approximately 2460 m^3.

As such, up to roughly 2460 m^3 of soil will be disturbed to a maximum depth of 1.8 m bgl.

10.2 Application Rates for Neutralising Agent

The laboratory analysis has determined a liming application rate (with a safety factor of 1.5) based on the results of the CRS analysis.

Comparison of CRS results presented in **Table 6**, with the geologic profile recorded during the sampling program (**refer to borehole logs, Appendix C**), indicate that soil material disturbed from below a depth of 1.8 m BGL must be neutralised with lime at the rate set out in **Table 6**.

It is assumed that any spoil generated will undergo mixing during the excavation process. As such, for the management of spoil, the average liming rate has been calculated for the overall material with a safety factor of 1.5.

Table 6 Summary of Liming Rate

Treatment Unit	Depth Interval (m bgl)	Liming Rate (kg/ $CaCO_3$/ t DW)	Typical soils
All Material	2.0 m bgl onwards	1.7 kg CaCO3/T	Sandy Silty Clay

All material excavated from these depths (i.e., from 2.0 m onwards) should be treated using the specified liming rate stated above. If a variation from the liming rate is proposed, further field investigations will be required. If sub-surface conditions vary significantly from those observed during this investigation excavation should cease and qualified personnel engaged to assess the site conditions, including laboratory testing to confirm the concentrations of any contaminants observed.

Aglime is to comprise >98% calcium carbonate by weight with a particle size <0.5 mm. This material typically has a neutralising value (NV) of 98%. If there is any variation in the NV of the aglime used, the application rate may need to be recalculated.

If differing soil units are encountered during the excavation program, a duly qualified environmental consultant should be engaged to determine the required liming neutralisation rate.

10.3 Treatment Option 1- In Situ Mixing of Excavated Soil

For treatment Option 1, aglime is to be progressively added to in-situ soils (0.3 m layers) within the excavation pit. The aglime is to be mixed into the upper portion of the soil to be removed (via the excavator) prior to excavation.

Treated soil is to be stockpiled on a pad constructed as follows:

- Adequate sediment and erosion measures in place to prevent surface water flow entering the pad stockpile area.
- Surface water drainage from the pad is directed back to the open excavation only.
- Validation of treatment material is to occur in accordance with **Section 11**.

10.4 Treatment Option 2- Offsite Management of ASS Material

If ASS material cannot practically be managed onsite, 'clean' untreated ASS material can be transferred to a suitably licensed facility for remediation. On the basis that approximately 250 mm of topsoil has already been cut and managed offsite.

10.5 Treatment Option 3- Ex-Situ Treatment

If excavated soil is to be treated on a treatment pad, the treatment pad should be constructed prior to commencement of excavation.

Material should be moved to the nominated treatment area(s) within 24 hours of exposure.

Prior to commencement of excavation, the treatment area must be appropriately constructed to intercept any material that may cause environmental harm to the surrounding environments (e.g. acid leachate collection systems and sediment traps around the treatment pad). Multiple treatment areas may be required for different portions of the excavation to allow for effective onsite treatment and validation before removal. Refer to Section 10.8 for the Option 3, Ex Situ Treatment pad design.

10.6 Leachate Capture

The entire liming pad (treatment area) is to be constructed with a perimeter bund wall, no less than the height and width of the treatment area. The bund wall should be constructed using fine-grained and non-dispersive material (clay) and should be compacted to be as impermeable as possible. The leachate collection point should be constructed as a sump that is of sufficient size to store a Q_{10} storm event (1:10 year ARI).

It may be more efficient and effective to have a sump of limited size that is fitted with a pump with a float trigger. Water would then be pumped from the smaller (concrete pit style) sump to a portable plastic water tank. This tank could then be emptied by a wastewater contractor, or the water treated and released in accordance with the relevant legislative guidelines.

10.7 Leachate Treatment

Water and leachate collected in the sump should be monitored using a calibrated pH meter prior to the commencement of work, and following the completion of work, each day for 14-21 days after the completion of works. All pH measurements should be recorded.

Should water in the sump have a pH falling outside the ANZECC & ARMCANZ (2000) trigger value appropriate for the receiving watercourse, the water should be buffered using an accepted chemical neutralisation agent, (commonly superfine agricultural aglime). Additional treatment may be required where other parameters such as turbidity (high iron "floc") exceed the trigger values.

Standard application rates for the treatment of water and leachate are presented in **Table 7**.The table indicates the amount of neutralising agent required to raise the pH of the water to neutral (7.0 pH units). For example, if the leachate has low salinity and a pH of 3.5, 16 kg of aglime would be required to neutralise 1ML of water.

Table 7 has been provided as a guide only. Depending on the chemistry of the water, additional neutralising agent may be required to obtain a pH of 7.0. Regular pH testing of the water should also be undertaken to monitor changes in pH during any dosing operations.

Table 7: Neutralisation Rates for Leachate

Water pH	H+ (mol/L)	H+ (mol/ML)	Aglime to Neutralise 1 ML	Hydrated Aglime to Neutralise 1 ML	Sodium Bicarbonate to Neutralise 1 ML
			Kilograms Required		
0.5	0.316	316228	15824	11716	26574
1.0	0.1	100000	5004	3705	8403
1.5	0.032	31623	1582	1172	2657
2.0	0.01	10000	500	371	840
2.5	0.0032	3162	158	117	266
3.0	0.001	1000	50	37	84
3.5	0.00032	316	16	12	27
4.0	0.0001	100	5	4	8.4
4.5	0.000032	32	1.6	1.17	2.66
5.0	0.00001	10	0.5	0.37	0.84
5.5	0.0000032	3.2	0.16	0.12	0.27
6.0	0.000001	1.0	0.05	0.037	0.08
6.5	0.00000032	0.3	0.016	0.012	0.027

10.8 Liming Pad Design

If excavated soil is to be treated on a treatment pad, the treatment pad should be constructed prior to commencement of excavation.

The liming pad (treatment area) should be constructed in an area that is not to be disturbed during the excavation and filling processes. If this is not possible, the treatment area may need to be relocated as excavation works progress.

Basic Design

The liming pad should be constructed so the base of the pad is composed of compacted fine-grained material, so as to produce as impermeable foundation as possible. Ideally a clay liner, no less than 300 mm thick, should be placed on the base of the pad. The base of the pad should slope gently (2 – 5%) so as to allow water/leachate to drain to a designated collection point. A leachate collection system, as described above, should be constructed.

Guard Layer

The base of the liming pad should be dusted with aglime at a rate determined using the following equation:

Guard layer (kg/m^2) = 0.2 x thickness of layer to be treated (m) x average liming rate (kg/tonne).

- The aglime for the guard layer should be spread using an aglime/fertilizer spreader (tractor-towed) to ensure the base of the pad is evenly covered, prior to the placement of the material requiring treatment.

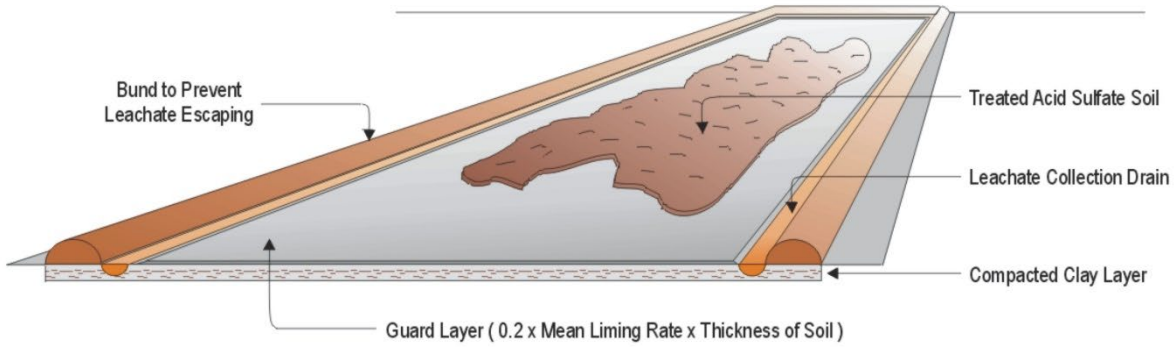

Figure 1: Treatment Pad Design

10.9 Mixing of Neutralising Agent on Treatment Pad

The following section describes the techniques that can be implemented if mixing of aglime is to occur on a treatment pad.

The material excavated should be placed on the liming pad in a layer no greater than 300 mm in thickness.

Ideally, the soils/sediments should be allowed to partially dry prior to attempting to mix the neutralising agent. If the soils are too moist, the neutralising agent will not be evenly distributed throughout the soils and pockets of aglime and untreated PASS will form within the stockpile.

There are several ways to mix the neutralising agent into the materials to be treated, all of which have positive and negative aspects. Common mixing methods are described in **Table 8**.

Although it is recognised that the most likely method that will be used on this particular site is an excavator, the most efficient and effective method of mixing neutralising agents, from those listed in **Table 6**, is the tractor-towed disc-plough. Provided the soils are dry to moist, the disc plough is ideal, however should water be present, and the soils comprise of cohesive material (clays), the excavator is likely to be more efficient (however not as effective) in mixing the neutralising agent through the soils.

No less than three (3) passes will be required to mix the neutralising agent through the soil. The effectiveness of the mixing process is contingent on the methodology of mixing.

Table 8: Common Mixing Methods (Liming Agent)

Method	Positive Factors	Negative Factors
Tractor-towed disc plough	• Allows thorough mixing of aglime and constant turning of soil to ensure aglime distribution is even. • Works well on dry soils.	• Requires a tractor, which may have no other use on site. • Can require relatively large areas to enable treatment, as tractor will require turning space.
Rubber tyred vehicles	• Able to utilise any idle machinery to drive over the aglime/soil mixture to mix materials together.	• Often results in pockets of aglime forming in the soils. •
Excavator	• Can utilise idle excavators to mix aglime with soils. • Works well on moist/wet soils.	• Requires specialised (longer) teeth to allow soils to be ripped deeply, allowing aglime to be mixed more thoroughly. • Can result in the formation of aglime pockets in the soils.
Grader	• Can utilise idle machinery on site. • Allows some churning of soil/aglime mix by inclining blade and using tines.	• Can result in pockets of aglime developing. • Can result in damage to low permeability liner beneath the liming pad.
Pug Mill	• Allows high aglime dosage rates. • Guaranteed thorough mixing of neutralising material and soil.	• Additional plant required at high mobilisation cost.

10.10 Dusting of Exposed Excavation Surfaces

If left untreated after excavation, the exposed ASS in excavation faces may oxidise over time, causing an acidic environment. In addition, any acid produced during exposure may corrode concrete and other structures constructed within the excavations. It is therefore critically important to neutralise the exposed surfaces (base and walls) of excavations into ASS, to minimise drying out and reduce the potential for ASS and/or PASS to produce acid leachate.

Dusting of exposed surfaces of excavations should be carried out at a rate of not less than 1 kg of fine aglime per m^2 of exposed soil surface.

10.11 Short Term Stockpiling and Exposure

Table 9 presents information regarding the short-term stockpiling of soils within the treatment area without liming for neutralisation.

Table 9: Indicative Maximum Periods for Short-Term Stockpiling of Untreated ASS				
Type of Material		**Duration of stockpiling**		
Texture range	**Approx clay content (%)**	**Days**		**Hours**
Coarse texture: Sands to loamy sands	≤ 5	Overnight	or	18 hours
Medium texture: Sandy loams to light clays	5-40	2½ days	or	70 hours
Fine texture: Medium to heavy clays and silty clays	≥ 40	2½ days	or	70 hours
Coarse texture: Sands to loamy sands	≤ 5	Overnight	or	18 hours

Source: Queensland Acid Sulfate Soil Technical Manual: Soil Management Guidelines, Department of Natural Resources and Mines, Brisbane, 2014.

Additional measures to measures to minimise any impacts of stockpiled untreated material include the following:

- Covering the stockpiled material with impervious material such as black plastic to prevent ingress by rainfall;
- Ensure surface water run-off does not enter the stockpile material.

10.12 Waste Tracking

Waste tracking must be undertaken by the contractor and provided in a final report to the Project Manager, as per the requirements outlined in **Section 10.**

11 Validation of Treated Soils

11.1 Environmental Testing of Treated Soils

The PC will be responsible for ensuring that any validation sampling and analysis of aglime treated soil undertaken is conducted by a suitably qualified person, and in a manner that will demonstrate, with acceptable confidence, that sufficient aglime has been mixed into the ASS, to provide an adequate buffer, such that the material meets the criteria set out in **Error! Reference source not found.**.

Validation sampling locations will be selected, as approved by the Site Supervisor/Foreman, such that a representative distribution for sample locations is achieved for the treated soil.

Validation sampling and analysis will be undertaken at a frequency that will demonstrate that satisfactory neutralisation has taken place. The frequency of soil validation sampling and analysis will be:

- One (1) sample per 1000 m^3 of remediated soil (low risk material).

11.2 Sampling Technique

A suitably qualified Engineer/Scientist shall collect ten representative sub-samples to produce one (1) representative (composite) sample from each 1000 m^3 of treated soil, in accordance with the following requirements:

- Approximately 250 g of soil must be collected from at least 10 representative locations, evenly distributed through the 1000 m^3 of treated spoil; and
- Where the soil is cohesive, the sample must be homogenised in a large stainless bowl or similar, and a representative sample taken from the homogenised material.

11.3 Laboratory Analysis

Acid sulfate soil net acidity for treatment verification must be undertaken by a third-party laboratory accredited by the National Association of Testing Authorities (NATA) for the required testing on all material that has been treated. Southern Cross University's Environmental Analysis Laboratory (EAL) can perform the required testing.

11.4 Validation Reporting

The principal contractor is responsible for ensuring that a suitably qualified Engineer/Scientist prepares an ASS Neutralisation Certification Report ('ASSNCR') suitable for submission to Clarence Valley Council. The report will demonstrate that the excavated and treated soil has been sufficiently neutralised and meets the criteria presented in **Error! Reference source not found.**.

The ASSNCR will include, but not be limited to, the following information:

- Summary table of analytical results for each soil stockpile and the results of validation analysis;
- Plan of earthworks stockpile locations, showing:
  - Sample identification numbers;
  - Location of validation sampling.

By submitting the ASSNCR to the Superintendent for review, the contractor is deemed to be stating to the Superintendent that all information presented in the ASSNCR is true and accurate and that the remediation and validation of the ASS soils is of sufficient quality that the contractor is certifying that remediation, as defined under the contract, has been satisfactorily completed.

If the Superintendent considers that the ASSNCR does not provide sufficient evidence to demonstrate that satisfactory remediation has been achieved, or is of unsatisfactory quality, the Superintendent shall notify the contractor in writing, outlining the deficiencies in the ASSNCR and any corrective actions to be undertaken before approval by the Superintendent will be further considered. The contractor must immediately undertake such corrective action to the ASSNCR.

11.5 Neutralisation Criteria

The criteria presented in **Table 10** will be used to ensure that the excavated material has been sufficiently neutralised. The criteria have been drawn from the ASSMAC (1998) guidelines and further detail provided from Dear *et al* (2014).

Verification testing is deemed to have been successful, for medium to fine material when the following is achieved:

- No single sample shall exceed a net acidity of 18 mol H^+/tonne (0.03% S).
- If any single sample is between 0 and 18 mol H^+/tonne (0.00 to 0.03% S), then the average of any four spatially adjacent samples (including the exceeding sample) shall have an average net acidity of zero or less.

Table 10: Action Limits for Treatment

ASS Soil Texture	Clay Content %	< 1000 Tonnes Disturbed		> 1000 Tonnes Disturbed	
		Sulfur Content % w/w	Acid Trail mol H^+/ tonne	Sulfur Content % w/w	Acid Trail mol H^+/ tonne
Coarse (sand & gravel)	< 5	0.03	18	0.03	18
Medium (sandy loam - light clay)	5 - 40	0.06	36		

12 Limitations

Raw Earth Environmental Pty Ltd (Raw Earth) understands to the best of our knowledge, the information within this report is accurate at the date of issue. However, due to the irregularity and dynamic nature of subsurface conditions, soil and groundwater characteristics are capable of change over a short period of time. No warranties, expressed or implied, are made. The contents of this report must be read in full.

If the unexpected finds of materials suspected to be hazardous or toxic occur, all site works must cease, and Raw Earth must be immediately contacted for further instruction.

Raw Earth performed the services in a manner consistent with the normal level of care and expertise exercised by members of the environmental consulting profession. There is no investigation thorough enough to dismiss a particular material, which presently or in the future is considered hazardous at the site. Regulatory criteria are subject to change, where concentrations of a particular contaminant currently considered low, could be subject to review and fall under different regulatory standards and criteria and may require remediation in the future.

The results of this assessment are based on a desktop review of available information and regulatory criteria identified at the time of the site inspection. Raw Earth will not be liable to revise the report to account for any changes in site characteristics, regulatory requirements, assessment criteria or the availability of additional information, subsequent to the issue date of this report. The scope and period of Raw Earths' services are subject to restrictions and limitations. Raw Earth did not perform a complete assessment of all possible conditions that may exist at the site.

Raw Earth takes no responsibility or liability for errors in any data obtained from scientific laboratories, regulatory agencies, statements from sources outside of Raw Earth, or developments resulting from situations outside the scope of this project.

All conclusions and recommendations regarding the site are the opinion of Raw Earth. Opinions are judgements, which are based on our understanding and interpretation of current regulatory standards and should not be construed as legal opinions.

We trust the information contained within this document meets your requirements. Should you have any queries, please do not hesitate to contact the Raw Earth.

13 References

- Dear SE, Ahern CR 2014, O'Brien LE, Dobos SK, McElnea AE, Moore NG and Watling KM "Queensland Acid Sulfate Soil Technical Manual: Soil Management Guidelines", Department of Science, Information Technology, Innovation and the Arts, Queensland Government, June 2014.
- Department of Agriculture and Water Resources, National Acid Sulfate Soils Sampling and Identification Methods Manual, 2018;
- Google Earth, https://www.google.com/earth.
- National Environment Protection Measures (NEPM), Schedule B1 – Guideline on Investigation Levels for Soil and Groundwater, 2013.
- National Environment Protection Measures (NEPM), Schedule B2 – Guideline on Site Characterisation, 2013.
- Nearmaps, https://nearmaps.com.au.
- NSW Department of Planning and Environment, State Environmental Planning Policy (Resilience and Hazards) Chapter 4, 2022;
- SEED, The Central Resource for Sharing and Enabling Environmental Data in NSW, https://datasets.seed.nsw.gov.au/dataset/acid-sulfate-soils-risk.
- Stone, Y, Ahern C R and Blunden 1998, "The Acid Sulfate Soils Manual", Acid Sulfate Soils Management Advisory Committee (ASSMAC), August 1998.
- Sullivan, L, Ward, N, Toppler, N and Lancaster, G 2018, National Acid Sulfate Soils guidance: National acid sulfate soils sampling and identification methods manual, Department of Agriculture and Water Resources, Canberra ACT. CC BY 4.0.

14 Abbreviations

Abbreviation	Full Description
ASSS	Actual Acid Sulfate Soils
ASS	Acid Sulfate Soils
ASSMAC	Acid Sulfate Soil Management Advisory Committee (NSW)
ASSMP	Acid Sulfate Soil Management Plan
CCC	Central Coast Council
COC	Chain of Custody
CRS	Chromium Reducible Sulfur
Ha	Hectare
LEP	Local Environmental Plan
M bgl	Meters Below Ground Level
NASSIMM	National Acid Sulfate Soils Sampling and Identification Methods Manual
NEPC	National Environmental Protection Council
NEPM	National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended in 2013)
NSW EPA	New South Wales Environment Protection Authority
PASS	Potential Acid Sulfate Soils
QA/QC	Quality Assurance and Quality Control
TAA	Titratable Actual Acidity

Appendix A: Figures

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Site location

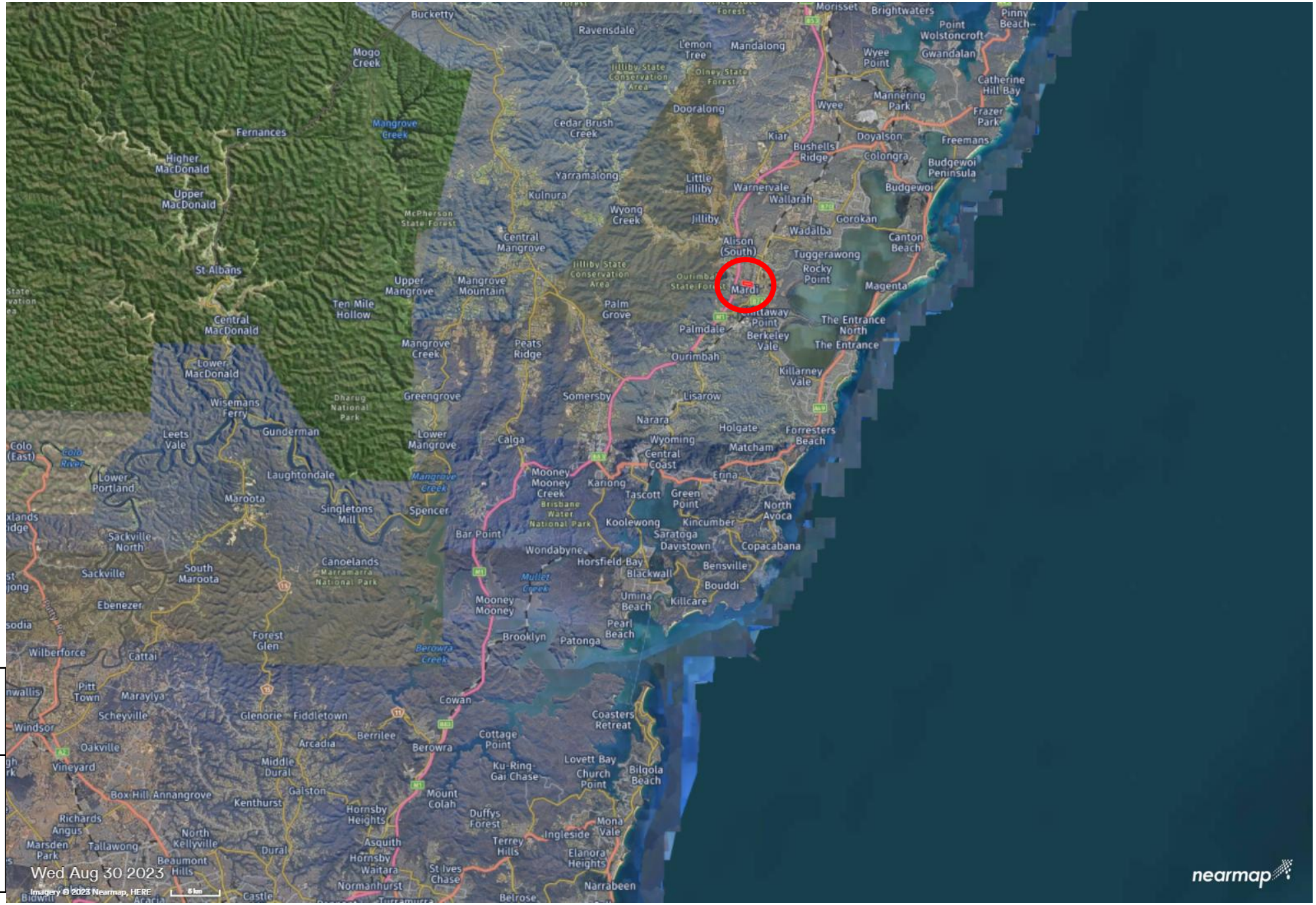

Figure 1:
Site Location Plan

Project:
Acid Sulfate Soil Investigation:
84 Gavenlock Road, Tuggerah
NSW 2259

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Site Boundary

Investigation Area

Figure 2:
Site Layout Plan

Project:
Acid Sulfate Soil Investigation:
84 Gavenlock Road, Tuggerah NSW 2259

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Investigation Area

Borehole Location

Figure 3:
Sampling Plan

Project:
Acid Sulfate Soil Investigation:
84 Gavenlock Road, Tuggerah NSW 2259

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Site Boundary

Investigation Area

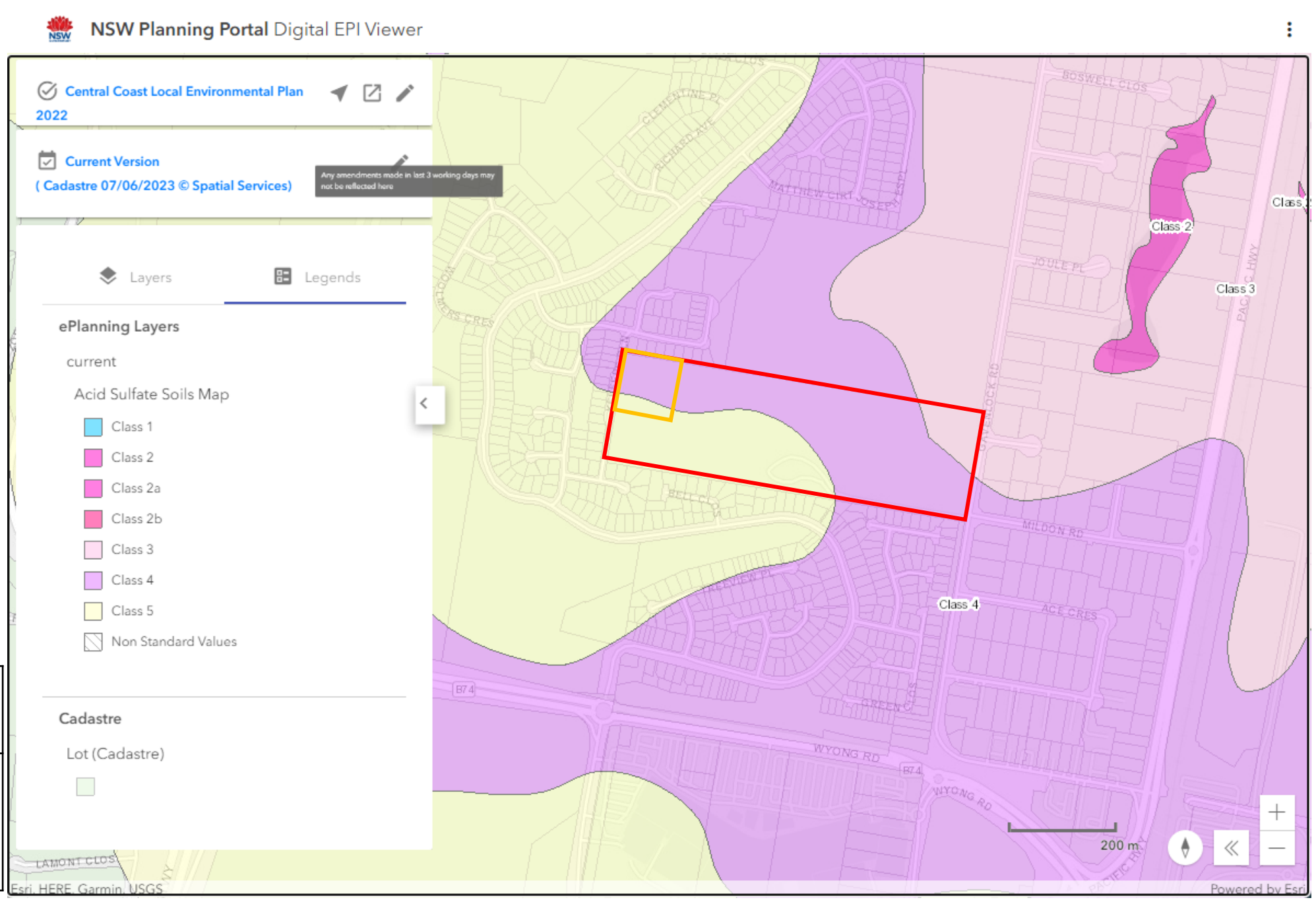

Figure 4:
Acid Sulphate Soils Map

Project:
Acid Sulfate Soil Investigation:
84 Gavenlock Road, Tuggerah
NSW 2259

Appendix B: Tables

Table 1A: Laboratory Results

Acid Sulfate Soil Investigation
Eileen O'Connor School
84 Gavenlock Road, Tuggerah NSW 2259
S00182

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		Field pH for Acid Sulfate Soil				TAA (Titratable Actual Acidity)					Chromium Reducible Sulfur		Chromium Suite Net Acidity Calculations						
		pHf	pHfox	Reaction Rate (pHfox)	pH Difference	pH KCl	Titratable Actual Acidity	Titratable Actual Acidity (TAA) moles H+/tonne	Titratable Actual Acidity (TAA) S%w/w	Sulphur (SKCl)	Chromium Reducible Sulfur (CRS)	Chromium Reducible Sulfur (CRS)	s-Net Acidity	a-Net Acidity	Liming Rate	Verification s-Net Acidity	a-Net Acidity without ANCBT	Liming Rate without ANCBT	s-Net Acidity without ANC
		pH Units	pH Units	No unit	pH Units	pH Units	kg H2SO4/T	moles H+/T	%w/w S	%w/w	%	moles H+/T	%w/w S	moles H+/T	kg CaCO3/T	%w/w S	moles H+/T	kg CaCO3/T	%w/w S
EQL		0	0	0	-10	0	0.25	5	0.01	0.005	0.005	5	0.005	5	0.1	-20	5	0.1	0.005
CRS Trigger Values (soils greater than 1,000 tonnes to be disturbed)		≤4	≤3.5		>1			18	0.03										
Field ID	**Date**																		
HA01_1.75	**22 Aug 2023**	5.3	4.8	1	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA01_2.25	**22 Aug 2023**	5.3	4.3	1	1.0	4.9	0.98	**21**	**0.034**	-	<0.005	<5	0.034	21	1.6	0.00	21	1.6	0.034
HA01_2.5	**22 Aug 2023**	5.2	3.6	1	**1.6**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA02_1.5	**22 Aug 2023**	5.2	4.6	3	0.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA02_2.0	**22 Aug 2023**	5.3	4.8	1	0.4	5.2	0.74	15	0.024	-	<0.005	<5	0.024	15	N/A	0.00	15	N/A	0.024
HA02_2.5	**22 Aug 2023**	5.3	4.3	1	1.0	4.8	0.98	**20**	**0.032**	-	<0.005	<5	0.032	20	1.5	0.00	20	1.5	0.032
HA03_1.5	**22 Aug 2023**	5.5	4.3	1	**1.2**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA03_2.0	**22 Aug 2023**	5.4	4.5	1	0.9	5.1	0.74	15	0.024	-	<0.005	<5	0.024	15	N/A	0.00	15	N/A	0.024
HA03_2.5	**22 Aug 2023**	5.4	4.3	1	1.0	5.2	0.98	**22**	**0.036**	-	<0.005	<5	0.036	22	1.7	0.00	22	1.7	0.036
HA04_1.25	**22 Aug 2023**	5.1	3.8	1	**1.3**	5.8	0.61	14	0.022	-	<0.005	<5	0.022	14	N/A	0.00	14	N/A	0.022
HA04_1.75	**22 Aug 2023**	5.0	3.7	1	**1.4**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA04_2.25	**22 Aug 2023**	5.0	4.5	1	0.6	5.6	0.74	16	0.026	-	<0.005	<5	0.026	16	N/A	0.00	16	N/A	0.026
HA05_1.5	**22 Aug 2023**	5.4	4.0	1	**1.3**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HA05_2.0	**22 Aug 2023**	5.1	4.0	1	**1.1**	6.0	0.49	11	0.018	-	<0.005	<5	0.018	11	N/A	0.00	11	N/A	0.018
HA05_2.5	**22 Aug 2023**	5.1	3.8	1	**1.3**	5.4	0.74	16	0.026	-	<0.005	<5	0.026	16	N/A	0.00	16	N/A	0.026
HA06_1.25	**22 Aug 2023**	5.2	3.9	1	**1.3**	5.0	0.86	19	0.030	-	<0.005	<5	0.030	19	1.4	0.00	19	1.4	0.030
HA06_1.75	**22 Aug 2023**	5.1	3.9	1	**1.2**	6.0	0.43	10	0.016	-	<0.005	<5	0.016	10	N/A	0.00	10	N/A	0.016
HA06_2.25	**22 Aug 2023**	5.0	3.8	1	**1.2**	4.9	0.98	**21**	**0.034**	-	<0.005	<5	0.034	21	1.6	0.00	21	1.6	0.034

Notes
_ - = Not analysed
NA - No liming rate applied

Appendix C: Site Photographs

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Photo 1: Site overview of the north-west corner of the site, the surface water body is on the right-hand side.

Photo 2: Site overview of the south-west corner of the site

Photo 3: Site overview of the eastern portion of the site, vegetable gardens are on the right-hand side and the surface water body is on the left-hand side

Photo 4: Site overview of the northern boundary of the investigation area, the surface water body is on the right-hand side

Photo 5: Representative shallow soils encountered in HA01, predominantly sand

Photo 6: Representative deeper soils encountered in HA01, predominantly clay

Photo 7: Representative shallow soils encountered in HA02, predominantly sand

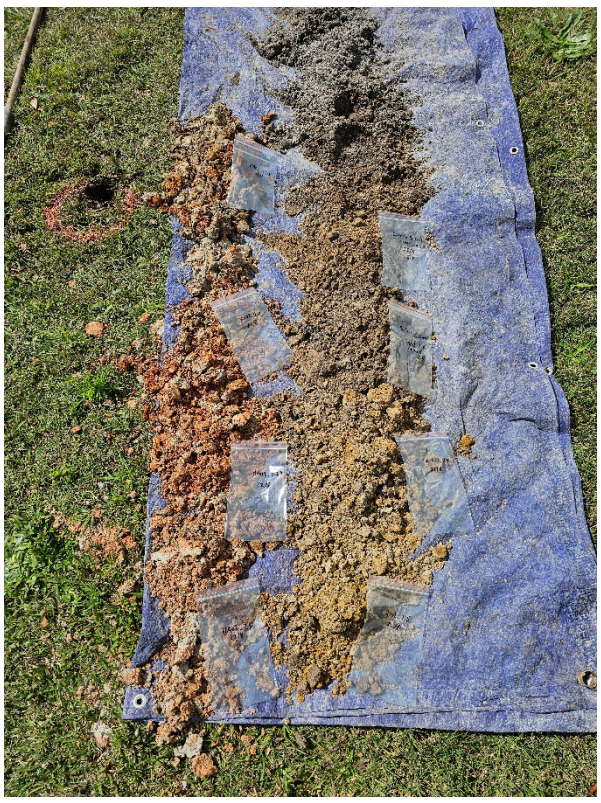

Photo 8: Representative deeper soils encountered in HA01, predominantly clay

Photo 9: Drilling process of HA04

Photo 10: Representative shallow soils encountered in HA04, predominantly sand

Photo 11: Representative shallow soils encountered in HA05, predominantly sand

Photo 12: Representative shallow soils encountered in HA06, predominantly sand

Appendix D: Groundwater Bore Map and Reports

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Site location

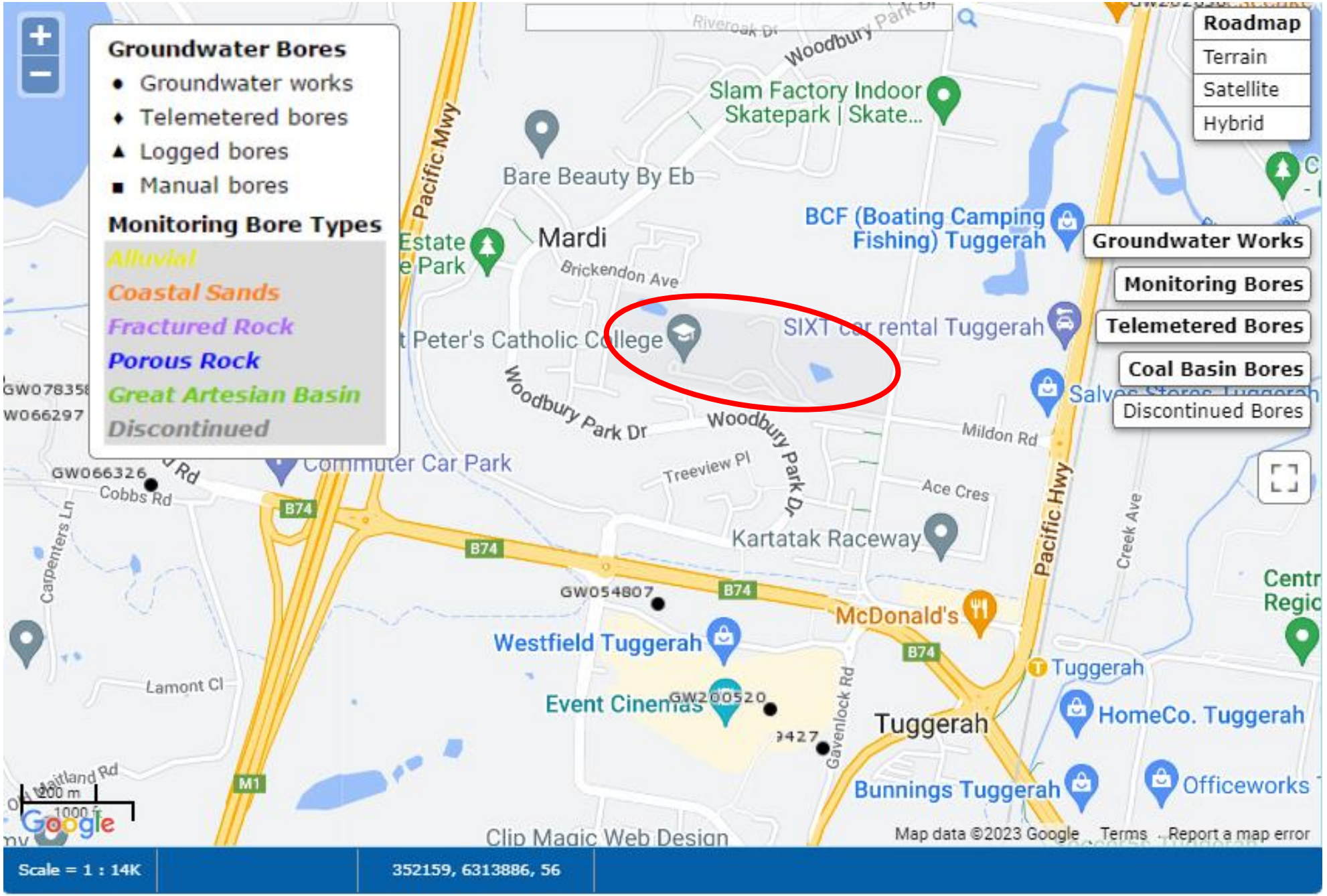


Figure 1:
Site Location Plan

Project:
Acid Sulfate Soil Investigation:
84 Gavenlock Road, Tuggerah
NSW 2259

Appendix E: Borehole Logs

ENVIRONMENTAL BOREHOLE HA01

RAW EARTH ENVIRONMENTAL

PROJECT NUMBER S00182
PROJECT NAME Eileen O'Connor School
CLIENT Stanton Dahl Architects
ADDRESS 84 Gavenlock Road, Tuggerah, NSW, 2259

DRILLING DATE 22/08/2023
DRILLING COMPANY Raw Earth Environmental
DRILLER Jack Young
DRILLING METHOD Hand Auger
TOTAL DEPTH 2.5 m

COORDINATES -33.300683, 151.410205
COORD SYS
SURFACE ELEVATION N/A
LOGGED BY Thulitha Senevirathne
CHECKED BY Jack Young

COMMENTS

Depth (m)	Samples	Graphic Log	Material Description	Moisture	Consistency	Additional Observations
	HA01_0.0		TOPSOIL: Gravelly SAND: Dark brown, fine to medium grained sand, angular to sub-angular gravels.	Dry	Loose	
			NATURAL: Gravelly SAND: Pale grey, fine to medium grained sand, angular to sub-angular gravels		Loose	
	HA01_0.25					
0.5	HA01_0.5					
	HA01_0.75		NATURAL: CLAY: Pale brown and pale grey, low plasticity		Stiff	
1	HA01_1.0					
	HA01_1.25					
1.5	HA01_1.5		NATURAL: Sandy Silty CLAY: Pale brown and pale grey. Fine to medium grained sand. Low to medium plasticity		Soft	
	HA01_1.75					
2	HA01_2.0					
	HA01_2.25					
2.5	HA01_2.5					
			Termination Depth at: 2.5m			

Disclaimer This log is intended for environmental not geotechnical purposes.
produced by ESlog.ESdat.net on 13 Oct 2023

ENVIRONMENTAL BOREHOLE HA02

RAW EARTH ENVIRONMENTAL

PROJECT NUMBER S00182
PROJECT NAME Eileen O'Connor School
CLIENT Stanton Dahl Architects
ADDRESS 84 Gavenlock Road, Tuggerah, NSW, 2259

DRILLING DATE 22/08/2023
DRILLING COMPANY Raw Earth Environmental
DRILLER Jack Young
DRILLING METHOD Hand Auger
TOTAL DEPTH 2.5 m

COORDINATES -33.300757, 151.409910
COORD SYS
SURFACE ELEVATION N.A
LOGGED BY Thulitha Senevirathne
CHECKED BY Jack Young

COMMENTS

Depth (m)	Samples	Graphic Log	Material Description	Moisture	Consistency	Additional Observations
	HA02_0.0		TOPSOIL: Gravelly SAND: Dark brown, fine to medium grained sand. Angular to sub-angular gravels.	Dry	Loose	
			NATURAL: Gravelly SAND: Pale grey, fine to medium grained sand, angular to sub-angular gravels		Loose	
	HA02_0.25					
0.5	HA02_0.5					
	HA02_0.75					
			NATURAL: CLAY: Pale brown and pale grey, low plasticity		Stiff	
1	HA02_1.0					
	HA02_1.25					
	HA02_1.5					
1.5			NATURAL: Sandy Silty CLAY: Pale brown and pale grey. Fine to medium grained sand. Low to medium plasticity		Soft	
	HA02_1.75					
	HA02_2.0					
2	HA02_2.25					
	HA02_2.5					
2.5			Termination Depth at: 2.5m			

ENVIRONMENTAL BOREHOLE HA03

RAW EARTH ENVIRONMENTAL

PROJECT NUMBER S00182
PROJECT NAME Eileen O'Connor School
CLIENT Stanton Dahl Architects
ADDRESS 84 Gavenlock Road, Tuggerah, NSW, 2259

DRILLING DATE 22/08/2023
DRILLING COMPANY Raw Earth Environmental
DRILLER Jack Young
DRILLING METHOD Hand Auger
TOTAL DEPTH 2.5 m

COORDINATES -33.300634, 151.409621
COORD SYS
SURFACE ELEVATION N.A
LOGGED BY Thulitha Senevirathne
CHECKED BY Jack Young

COMMENTS

Depth (m)	Samples	Graphic Log	Material Description	Moisture	Consistency	Additional Observations
	HA03_0		TOPSOIL: Gravelly SAND: Dark brown, fine to medium grained sand, angular to sub-angular gravels.	Dry	Loose	
			NATURAL: Gravelly SAND: Pale grey, fine to medium grained sand, angular to sub-angular gravels		Dense	
	HA03_0.25					
0.5	HA03_0.5					
	HA03_0.75					
1	HA03_1.0					
	HA03_1.25		NATURAL: CLAY: Pale brown and pale grey, low plasticity		Soft	
1.5	HA03_1.5					
	HA03_1.75		NATURAL: Sandy silty CLAY: Pale grey and pale brown, low plasticity, fine to medium grain sand		Stiff	
2	HA03_2.0					
	HA03_2.25					
2.5	HA03_2.5					
			Termination Depth at: 2.5m			

ENVIRONMENTAL BOREHOLE HA04

RAW EARTH ENVIRONMENTAL

PROJECT NUMBER S00182
PROJECT NAME Eileen O'Connor School
CLIENT Stanton Dahl Architects
ADDRESS 84 Gavenlock Road, Tuggerah, NSW, 2259

DRILLING DATE 22/08/2023
DRILLING COMPANY Raw Earth Environmental
DRILLER Jack Young
DRILLING METHOD Hand Auger
TOTAL DEPTH 2.5 m

COORDINATES -33.300496, 151.409950
COORD SYS
SURFACE ELEVATION N.A
LOGGED BY Thulitha Senevirathne
CHECKED BY Jack Young

COMMENTS

Depth (m)	Samples	Graphic Log	Material Description	Moisture	Consistency	Additional Observations
	HA04_0		TOPSOIL: Gravelly SAND: Dark brown, fine to medium grained sand, angular to sub-angular gravels.	Dry	Loose	
	HA04_0.25		NATURAL: Silty SAND: Pale grey and dark grey, fine to medium grained sand.		Dense	
0.5	HA04_0.5		NATURAL: SAND: Pale to dark grey, fine to medium grained sand.			
	HA04_0.75					
1	HA04_1.0					Moderate sulfuric odour
	HA04_1.25					
1.5	HA04_1.5					
	HA04_1.75					
2	HA04_2.0					
	HA04_2.25		NATURAL: Sandy silty CLAY: Pale grey and pale brown, low plasticity, fine to medium grain sand	Moist	Stiff	
2.5	HA04_2.5					
			Termination Depth at: 2.5m			

Disclaimer This log is intended for environmental not geotechnical purposes.

produced by ESlog.ESdat.net on 13 Oct 2023

ENVIRONMENTAL BOREHOLE HA05

PROJECT NUMBER S00182
PROJECT NAME Eileen O'Connor School
CLIENT Stanton Dahl Architects
ADDRESS 84 Gavenlock Road, Tuggerah, NSW, 2259

DRILLING DATE 22/08/2023
DRILLING COMPANY Raw Earth Environmental
DRILLER Jack Young
DRILLING METHOD Hand Auger
TOTAL DEPTH 2.5 m

COORDINATES -33.300247, 151.409943
COORD SYS
SURFACE ELEVATION N.A
LOGGED BY Thulitha Senevirathne
CHECKED BY Jack Young

COMMENTS

Depth (m)	Samples	Graphic Log	Material Description	Moisture	Consistency	Additional Observations
	HA05_0		TOPSOIL: Gravelly SAND. Dark brown, fine to medium grained sand, angular to sub-angular gravels	Dry	Loose	
			NATURAL: SAND: Pale brown & pale to dark grey, fine to medium grained sand			
	HA05_0.25					
0.5	HA05_0.5					
	HA05_0.75				Dense	
1	HA05_1.0					Moderate sulfuric odour
				Moist		
	HA05_1.25					
1.5	HA05_1.5					
	HA05_1.75					
				Wet		
2	HA05_2.0					
			NATURAL: Sandy silty CLAY: Pale grey and pale brown, low plasticity, fine to medium grain sand		Stiff	
	HA05_2.25					
2.5	HA05_2.5					
			Termination Depth at: 2.5m			

ENVIRONMENTAL BOREHOLE HA06

RAW EARTH ENVIRONMENTAL

PROJECT NUMBER S00182
PROJECT NAME Eileen O'Connor School
CLIENT Stanton Dahl Architects
ADDRESS 84 Gavenlock Road, Tuggerah, NSW, 2259

DRILLING DATE 22/08/2023
DRILLING COMPANY Raw Earth Environmental
DRILLER Jack Young
DRILLING METHOD Hand Auger
TOTAL DEPTH 2.5 m

COORDINATES -33.300247, 151.410260
COORD SYS
SURFACE ELEVATION N.A
LOGGED BY Thulitha Senevirathne
CHECKED BY Jack Young

COMMENTS

Depth (m)	Samples	Graphic Log	Material Description	Moisture	Consistency	Additional Observations
0	HA06_0		TOPSOIL: Gravelly SAND. Dark grey, fine to medium grained sand. Angular to sub-angular gravels. Organic Material (grasses, roots etc.) interspersed throughout.	Dry	Loose	
					Dense	
	HA06_0.25		NATURAL: SAND: Pale brown & pale to dark grey, fine to medium grained sand			
0.5	HA06_0.5					
	HA06_0.75					
1	HA06_1.0					
	HA06_1.25			Moist		Mild sulfuric odour
1.5	HA06_1.5					
	HA06_1.75			Wet		
			NATURAL: Sandy silty CLAY: Pale grey and pale brown, low plasticity, fine to medium grain sand		Stiff	
2	HA06_2.0					
	HA06_2.25					
2.5	HA06_2.5					
			Termination Depth at: 2.5m			

Appendix F: NATA Endorsed Laboratory Transcripts

CHAIN OF CUSTODY

RAW EARTH ENVIRONMENTAL PTY LTD
Address: 4/71 Centennial Circuit, Byron Bay NSW 2481
Phone:
Project Manager: Jack
Jack.V@rawearthenvironmental.com.au
Lucas@

LABORATORY DETAILS
Lab. Name: SGS
Lab. Address:
Contact Name:
Tel:
Fax:
Preliminary Report by:
Final Report by:
Lab Quote No:

Sampled By: Joe
REE Project No:
Project Name: Eileen School
Page: 1 of 4

Specifications: STD TAT

	Yes / No
1. TAT required	
3. Is any sediment layer present in waters to be excluded from extractions?	
4. Is extraneous material removed from samples to be reported as per NEPM S 1.1)?	
5. Special storage requirements:	
6. Low reporting limits required for groundwaters?	

Analysis Request

Lab I.D. Number	Sample ID	Sample Date	Matrix	Preservation: Filtered	Preservation: Acid	Preservation: Ice	Container (No. & type)	pH, EC & Alk Fab	Chromium Suite	Other: ON HOLD
	HA01_0.0	22/8	Soil			✓	Bag			
	HA01_0.25							✓		
	HA01_0.5									
	HA01_0.75									
	HA01_1.0									
	HA01_1.25									
	HA01_1.5									
1	HA01_1.75							✓		
	HA01_2.0									
2	HA01_2.25							✓	✓	
3	HA01_2.5							✓		
	HA02_0.0									
	HA02_0.25									
	HA02_0.5							✓		
	HA02_0.75									
	HA02_1.0							✓		
	HA02_1.25									
4	HA02_1.5							✓		
	HA02_1.75									
5	HA02_2.0	↓	↓			↓	↓	✓	✓	

SGS EHS Sydney COC
SE252775

Lab Report No.
Esky ID

Relinquished by: Jack Signed: Date:
Received by: Signed: Date:
Relinquished by: Signed: Date:
Received by: G.F Signed: Date: 23/08/23 9:53am

Attach to cooler with tape about

CHAIN OF CUSTODY

RAW EARTH ENVIRONMENTAL PTY LTD
Address: 4/71 Centennial Circuit, Byron Bay NSW 2481
Phone:
Project Manager:

LABORATORY DETAILS
Lab. Name:
Lab. Address:
Contact Name:
Tel:
Fax:
Preliminary Report by:
Final Report by:
Lab Quote No:

Sampled By: J.O.E
REE Project No:
Project Name: Eileen School
Page: 2 of 9

Specifications:

	Yes / No
1. TAT required	
3. Is any sediment layer present in waters to be excluded from extractions?	
4. Is extraneous material removed from samples to be reported as per NEPM S1.1?	
5. Special storage requirements	
6. Low reporting limits required for groundwaters?	

Analysis Request

Lab I.D. Number	Sample ID	Sample Date	Matrix	Preservation: filtered	Preservation: acid	Preservation: ice	Container (No. & type)	pH Field/pH Fx	Chromium Suite	ON HOLD	Other
	HA01_2.25	22/8	Soil			✓	Bag	✓	✓		
6	HA02_1.5							✓	✓		
	HA03_0.0										
	HA03_0.25										
	HA03_0.5										
	HA03_0.75										
	HA03_1.0										
	HA03_1.25										
7	HA02_1.5							✓			
	HA03_1.75										
8	HA03_2.0							✓	✓		
	HA03_2.25										
9	HA01_2.5							✓	✓		
	HA04_0.0										
	HA04_0.25										
	HA04_0.5										
	HA04_0.75										
	HA04_1.0										
10	HA04_1.25							✓	✓		
	HA04_1.5	↓	↓			✓	↓				

Lab Report No.
Esky ID

Relinquished by: Signed: Date:
Received by: Signed: Date:

Relinquished by: Signed: Date:
Received by: G-T Signed: Date: 23/08/23 9:55 am

Attach to sample cooler with tie/taped shut

CHAIN OF CUSTODY

RAW EARTH

RAW EARTH ENVIRONMENTAL PTY LTD
Address: 7/1 Centennial Circuit, Byron Bay NSW 2481
Phone:
Project Manager:

LABORATORY DETAILS
Lab. Name:
Lab. Address:
Contact Name:
Tel:
Fax:
Preliminary Report by:
Final Report by:
Lab Quote No:

Sampled By:
EEE Project No:
Project Name:
Page 3 of 4

Specifications:

	Yes / No
1. TAT required	
3. Is any sediment layer present in waters to be excluded from extractions?	
4. Is extraneous material removed from samples to be reported as per NEPM 5.1.13:	
5. Special storage requirements:	
6. Low reporting limits required for groundwater?	

Lab I.D. Number	Sample ID	Sample Date	Matrix	Preservation: filtered	Preservation: acid	Preservation: ice	Container (No. & type)	Analysis Request: pH Field /pH Lab	Analysis Request: Chromium Suite	Analysis Request: Other: Asbestos
11	HA04_1.75	22/8	Soil			✓	Bag	✓		
	HA04_2.0							✓		
12	HA04_2.25							✓	✓	
	HA04_2.5									
	HA05_0.0									
	HA05_0.25									
	HA05_0.5									
	HA05_0.75									
	HA05_1.0									
	HA05_1.25									
13	HA05_1.50							✓		
	HA05_1.75									
14	HA05_2.0							✓	✓	
	HA05_2.25									
15	HA05_2.5							✓	✓	
	HA06_0.0									
	HA06_0.25									
	HA06_0.30									
	HA06_0.75									
	HA06_1.0									

Lab Report No.
Esky ID

Relinquished by:
Signed:
Date:

Received by:
Signed:
Date:

Relinquished by:
Signed:
Date:

Received by: G.F
Signed:
Date: 23/08/23
9:55am

Attach to sample cooler with lid taped shut

CHAIN OF CUSTODY

RAW EARTH ENVIRONMENTAL

RAW EARTH ENVIRONMENTAL PTY LTD		LABORATORY DETAILS	
Address: 4/71 Centennial Circuit, Byron Bay NSW 2481	Phone:	Lab. Name:	Fax:
Project Manager:		Lab. Address:	Preliminary Report by:
		Contact Name:	Final Report by:
		Tel:	Lab Quote No:

Sampled by: | REE Project No: | Project Name: | Page: 4 of 4

Specifications:

	Yes /No
1. TAT required	
3. Is any sediment layer present in waters to be excluded from extractions?	
4. % extraneous material removed from samples to be reported as per NEPM 5.1.1?	
5. Special storage requirements:	
6. Low reporting limits required for groundwaters?	

Lab I.D. Number	Sample ID	Sample Date	Matrix	Preservation: filtered	Preservation: acid	Preservation: ice	Container (No. & type)	Analysis Request: pH Field/pH Bag	Analysis Request: Chromium Suite	Other: on-hold
B16	HA06-1.25	22/8	Soil			✓	Bag	✓	✓	
B17	HA06-1.5	↓	↓			↓	↓	✓	✓	
	HA06-1.75									
B18	HA06-2.0							✓	✓	
	HA06-2.25									
	HA06-2.5	↓								

Lab Report No. | Eurofins ID

Relinquished by:	Signed:	Date:	Relinquished by:	Signed:	Date:
Received by:	Signed:	Date:	Received by: G.T	Signed:	Date: 23/08/22 09:55

Attach to sample cooler with lid taped shut.

SAMPLE RECEIPT ADVICE

SE252775

CLIENT DETAILS

Contact	Jack Young
Client	RAW EARTH ENVIRONMENTAL
Address	4/71 CENTENNIAL CIRCUIT BYRON BAY NSW 2481
Telephone	0435 126 066
Facsimile	(Not specified)
Email	jack.y@rawearthenvironmental.com.au
Project	**Eileen School**
Order Number	(Not specified)
Samples	18

LABORATORY DETAILS

Manager	Huong Crawford
Laboratory	SGS Alexandria Environmental
Address	Unit 16, 33 Maddox St Alexandria NSW 2015
Telephone	+61 2 8594 0400
Facsimile	+61 2 8594 0499
Email	au.environmental.sydney@sgs.com
Samples Received	Wed 23/8/2023
Report Due	Wed 30/8/2023
SGS Reference	**SE252775**

SUBMISSION DETAILS

This is to confirm that 18 samples were received on Wednesday 23/8/2023. Results are expected to be ready by COB Wednesday 30/8/2023.
Please quote SGS reference SE252775 when making enquiries. Refer below for details relating to sample integrity upon receipt.

Sample counts by matrix	18 Soil	Type of documentation received	COC
Date documentation received	23/8/2023	Samples received in good order	Yes
Samples received without headspace	N/A	Sample temperature upon receipt	-0.8°C
Sample container provider	Client	Turnaround time requested	Standard
Samples received in correct containers	Yes	Sufficient sample for analysis	Yes
Sample cooling method	Ice	Samples clearly labelled	Yes
Complete documentation received	Yes		

Unless otherwise instructed, water and bulk samples will be held for one month from date of report, and soil samples will be held for two months.

COMMENTS

Chromium Suite subcontracted to SGS Cairns, 2/58 Comport St, Portsmith QLD 4870, NATA Accreditation Number: 2562, Site Number: 3146.
47 samples have been placed on hold as no tests have been assigned for them by the client. These samples will not be processed.

SAMPLE RECEIPT ADVICE

SE252775

CLIENT DETAILS

Client RAW EARTH ENVIRONMENTAL

Project Eileen School

SUMMARY OF ANALYSIS

No.	Sample ID	Acid Neutralising Capacity (ANC)	Chromium Reducible Sulfur (CRS)	Chromium Suite Net Acidity Calculations	Field pH for Acid Sulphate Soil	HCl Extractable S, Ca and Mg in Soil/Solids ICP OES	Moisture Content	TAA (Titratable Actual Acidity)
001	HA01_1.75	-	-	-	4	-	-	-
002	HA01_2.25	6	2	7	4	1	1	5
003	HA01_2.5	-	-	-	4	-	-	-
004	HA02_1.5	-	-	-	4	-	-	-
005	HA02_2.0	6	2	7	4	1	1	5
006	HA02_2.5	6	2	7	4	1	1	5
007	HA03_1.5	-	-	-	4	-	-	-
008	HA03_2.0	6	2	7	4	1	1	5
009	HA03_2.5	6	2	7	4	1	1	5
010	HA04_1.25	6	2	7	4	1	1	5
011	HA04_1.75	-	-	-	4	-	-	-
012	HA04_2.25	6	2	7	4	1	1	5
013	HA05_1.5	-	-	-	4	-	-	-
014	HA05_2.0	6	2	7	4	1	1	5
015	HA05_2.5	6	2	7	4	1	1	5
016	HA06_1.25	6	2	7	4	1	1	5
017	HA06_1.75	6	2	7	4	1	1	5
018	HA06_2.25	6	2	7	4	1	1	5

The above table represents SGS' interpretation of the client-supplied Chain Of Custody document.
The numbers shown in the table indicate the number of results requested in each package.
Please indicate as soon as possible should your request differ from these details .
Testing as per this table shall commence immediately unless the client intervenes with a correction .

ANALYTICAL REPORT

Accreditation No. 2562

CLIENT DETAILS

Contact	Jack Young
Client	RAW EARTH ENVIRONMENTAL
Address	3/17 Tasman Way Byron Bay BYRON BAY NSW 2481
Telephone	0435 126 066
Facsimile	(Not specified)
Email	jack.y@rawearthenvironmental.com.au
Project	**Eileen School**
Order Number	(Not specified)
Samples	18

LABORATORY DETAILS

Manager	Huong Crawford
Laboratory	SGS Alexandria Environmental
Address	Unit 16, 33 Maddox St Alexandria NSW 2015
Telephone	+61 2 8594 0400
Facsimile	+61 2 8594 0499
Email	au.environmental.sydney@sgs.com
SGS Reference	**SE252775 R0**
Date Received	23/8/2023
Date Reported	30/8/2023

COMMENTS

Accredited for compliance with ISO/IEC 17025 - Testing. NATA accredited laboratory 2562(4354).

Chromium Suite subcontracted to SGS Cairns, 2/58 Comport St, Portsmith QLD 4870, NATA Accreditation Number: 2562, Site Number: 3146. Report No. CE168903.

SIGNATORIES

Dong LIANG
Metals/Inorganics Team Leader

Huong CRAWFORD
Production Manager

Field pH for Acid Sulphate Soil [AN104] Tested: 24/8/2023

PARAMETER	UOM	LOR	HA01_1.75 SOIL - 22/8/2023 SE252775.001	HA01_2.25 SOIL - 22/8/2023 SE252775.002	HA01_2.5 SOIL - 22/8/2023 SE252775.003	HA02_1.5 SOIL - 22/8/2023 SE252775.004	HA02_2.0 SOIL - 22/8/2023 SE252775.005
pHf	pH Units	-	5.3	5.3	5.2	5.2	5.3
pHfox	pH Units	-	4.8	4.3	3.6	4.6	4.8
Reaction Rate (pHfox)*	No unit	-	1	1	1	3	1
pH Difference*	pH Units	-10	0.5	1.0	1.6	0.6	0.4

PARAMETER	UOM	LOR	HA02_2.5 SOIL - 22/8/2023 SE252775.006	HA03_1.5 SOIL - 22/8/2023 SE252775.007	HA03_2.0 SOIL - 22/8/2023 SE252775.008	HA03_2.5 SOIL - 22/8/2023 SE252775.009	HA04_1.25 SOIL - 22/8/2023 SE252775.010
pHf	pH Units	-	5.3	5.5	5.4	5.4	5.1
pHfox	pH Units	-	4.3	4.3	4.5	4.3	3.8
Reaction Rate (pHfox)*	No unit	-	1	1	1	1	1
pH Difference*	pH Units	-10	1.0	1.2	0.9	1.0	1.3

PARAMETER	UOM	LOR	HA04_1.75 SOIL - 22/8/2023 SE252775.011	HA04_2.25 SOIL - 22/8/2023 SE252775.012	HA05_1.5 SOIL - 22/8/2023 SE252775.013	HA05_2.0 SOIL - 22/8/2023 SE252775.014	HA05_2.5 SOIL - 22/8/2023 SE252775.015
pHf	pH Units	-	5.0	5.0	5.4	5.1	5.1
pHfox	pH Units	-	3.7	4.5	4.0	4.0	3.8
Reaction Rate (pHfox)*	No unit	-	1	1	1	1	1
pH Difference*	pH Units	-10	1.4	0.6	1.3	1.1	1.3

PARAMETER	UOM	LOR	HA06_1.25 SOIL - 22/8/2023 SE252775.016	HA06_1.75 SOIL - 22/8/2023 SE252775.017	HA06_2.25 SOIL - 22/8/2023 SE252775.018
pHf	pH Units	-	5.2	5.1	5.0
pHfox	pH Units	-	3.9	3.9	3.8
Reaction Rate (pHfox)*	No unit	-	1	1	1
pH Difference*	pH Units	-10	1.3	1.2	1.2

Moisture Content [AN002] Tested: 28/8/2023

PARAMETER	UOM	LOR	HA01_2.25 SOIL - 22/8/2023 SE252775.002	HA02_2.0 SOIL - 22/8/2023 SE252775.005	HA02_2.5 SOIL - 22/8/2023 SE252775.006	HA03_2.0 SOIL - 22/8/2023 SE252775.008	HA03_2.5 SOIL - 22/8/2023 SE252775.009
% Moisture	%w/w	0.5	16	11	12	11	12

PARAMETER	UOM	LOR	HA04_1.25 SOIL - 22/8/2023 SE252775.010	HA04_2.25 SOIL - 22/8/2023 SE252775.012	HA05_2.0 SOIL - 22/8/2023 SE252775.014	HA05_2.5 SOIL - 22/8/2023 SE252775.015	HA06_1.25 SOIL - 22/8/2023 SE252775.016
% Moisture	%w/w	0.5	9.1	14	9.3	9.8	11

PARAMETER	UOM	LOR	HA06_1.75 SOIL - 22/8/2023 SE252775.017	HA06_2.25 SOIL - 22/8/2023 SE252775.018
% Moisture	%w/w	0.5	12	14

TAA (Titratable Actual Acidity) [AN219] Tested: 28/8/2023

PARAMETER	UOM	LOR	HA01_2.25 SOIL - 22/8/2023 SE252775.002	HA02_2.0 SOIL - 22/8/2023 SE252775.005	HA02_2.5 SOIL - 22/8/2023 SE252775.006	HA03_2.0 SOIL - 22/8/2023 SE252775.008	HA03_2.5 SOIL - 22/8/2023 SE252775.009
pH KCl*	pH Units	-	4.9	5.2	4.8	5.1	5.2
Titratable Actual Acidity	kg H2SO4/T	0.25	0.98	0.74	0.98	0.74	0.98
Titratable Actual Acidity (TAA) moles H+/tonne	moles H+/T	5	20	15	20	15	20
Titratable Actual Acidity (TAA) S%w/w	%w/w S	0.01	0.03	0.02	0.03	0.02	0.03
Sulphur (SKCl)	%w/w	0.005	-	-	-	-	-

PARAMETER	UOM	LOR	HA04_1.25 SOIL - 22/8/2023 SE252775.010	HA04_2.25 SOIL - 22/8/2023 SE252775.012	HA05_2.0 SOIL - 22/8/2023 SE252775.014	HA05_2.5 SOIL - 22/8/2023 SE252775.015	HA06_1.25 SOIL - 22/8/2023 SE252775.016
pH KCl*	pH Units	-	5.8	5.6	6.0	5.4	5.0
Titratable Actual Acidity	kg H2SO4/T	0.25	0.61	0.74	0.49	0.74	0.86
Titratable Actual Acidity (TAA) moles H+/tonne	moles H+/T	5	12	15	10	15	17
Titratable Actual Acidity (TAA) S%w/w	%w/w S	0.01	0.02	0.02	0.02	0.02	0.03
Sulphur (SKCl)	%w/w	0.005	-	-	-	-	-

PARAMETER	UOM	LOR	HA06_1.75 SOIL - 22/8/2023 SE252775.017	HA06_2.25 SOIL - 22/8/2023 SE252775.018
pH KCl*	pH Units	-	6.0	4.9
Titratable Actual Acidity	kg H2SO4/T	0.25	0.43	0.98
Titratable Actual Acidity (TAA) moles H+/tonne	moles H+/T	5	9	20
Titratable Actual Acidity (TAA) S%w/w	%w/w S	0.01	0.01	0.03
Sulphur (SKCl)	%w/w	0.005	-	-

Chromium Reducible Sulfur (CRS) [AN217] Tested: 28/8/2023

PARAMETER	UOM	LOR	HA01_2.25 SOIL - 22/8/2023 SE252775.002	HA02_2.0 SOIL - 22/8/2023 SE252775.005	HA02_2.5 SOIL - 22/8/2023 SE252775.006	HA03_2.0 SOIL - 22/8/2023 SE252775.008	HA03_2.5 SOIL - 22/8/2023 SE252775.009
Chromium Reducible Sulfur (Scr)	%	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chromium Reducible Sulfur (Scr)	moles H+/T	5	<5	<5	<5	<5	<5

PARAMETER	UOM	LOR	HA04_1.25 SOIL - 22/8/2023 SE252775.010	HA04_2.25 SOIL - 22/8/2023 SE252775.012	HA05_2.0 SOIL - 22/8/2023 SE252775.014	HA05_2.5 SOIL - 22/8/2023 SE252775.015	HA06_1.25 SOIL - 22/8/2023 SE252775.016
Chromium Reducible Sulfur (Scr)	%	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chromium Reducible Sulfur (Scr)	moles H+/T	5	<5	<5	<5	<5	<5

PARAMETER	UOM	LOR	HA06_1.75 SOIL - 22/8/2023 SE252775.017	HA06_2.25 SOIL - 22/8/2023 SE252775.018
Chromium Reducible Sulfur (Scr)	%	0.005	<0.005	<0.005
Chromium Reducible Sulfur (Scr)	moles H+/T	5	<5	<5

Chromium Suite Net Acidity Calculations [AN220] Tested: 28/8/2023

PARAMETER	UOM	LOR	HA01_2.25 SOIL - 22/8/2023 SE252775.002	HA02_2.0 SOIL - 22/8/2023 SE252775.005	HA02_2.5 SOIL - 22/8/2023 SE252775.006	HA03_2.0 SOIL - 22/8/2023 SE252775.008	HA03_2.5 SOIL - 22/8/2023 SE252775.009
s-Net Acidity	%w/w S	0.005	0.034	0.024	0.032	0.024	0.036
a-Net Acidity	moles H+/T	5	21	15	20	15	22
Liming Rate*	kg CaCO3/T	0.1	1.6	NA	1.5	NA	1.7
Verification s-Net Acidity*	%w/w S	-20	0.00	0.00	0.00	0.00	0.00
a-Net Acidity without ANCBT*	moles H+/T	5	21	15	20	15	22
Liming Rate without ANCBT*	kg CaCO3/T	0.1	1.6	NA	1.5	NA	1.7
s-Net Acidity without ANC	%w/w S	0.005	0.034	0.024	0.032	0.024	0.036

PARAMETER	UOM	LOR	HA04_1.25 SOIL - 22/8/2023 SE252775.010	HA04_2.25 SOIL - 22/8/2023 SE252775.012	HA05_2.0 SOIL - 22/8/2023 SE252775.014	HA05_2.5 SOIL - 22/8/2023 SE252775.015	HA06_1.25 SOIL - 22/8/2023 SE252775.016
s-Net Acidity	%w/w S	0.005	0.022	0.026	0.018	0.026	0.030
a-Net Acidity	moles H+/T	5	14	16	11	16	19
Liming Rate*	kg CaCO3/T	0.1	NA	NA	NA	NA	1.4
Verification s-Net Acidity*	%w/w S	-20	0.00	0.00	0.00	0.00	0.00
a-Net Acidity without ANCBT*	moles H+/T	5	14	16	11	16	19
Liming Rate without ANCBT*	kg CaCO3/T	0.1	NA	NA	NA	NA	1.4
s-Net Acidity without ANC	%w/w S	0.005	0.022	0.026	0.018	0.026	0.030

PARAMETER	UOM	LOR	HA06_1.75 SOIL - 22/8/2023 SE252775.017	HA06_2.25 SOIL - 22/8/2023 SE252775.018
s-Net Acidity	%w/w S	0.005	0.016	0.034
a-Net Acidity	moles H+/T	5	10	21
Liming Rate*	kg CaCO3/T	0.1	NA	1.6
Verification s-Net Acidity*	%w/w S	-20	0.00	0.00
a-Net Acidity without ANCBT*	moles H+/T	5	10	21
Liming Rate without ANCBT*	kg CaCO3/T	0.1	NA	1.6
s-Net Acidity without ANC	%w/w S	0.005	0.016	0.034

METHOD	METHODOLOGY SUMMARY
AN002	The test is carried out by drying (at either 40°C or 105°C) a known mass of sample in a weighed evaporating basin. After fully dry the sample is re-weighed. Samples such as sludge and sediment having high percentages of moisture will take some time in a drying oven for complete removal of water.
AN014	This method is for the determination of soluble sulfate (SO4-S) by extraction with hydrochloric acid. Sulphides should not react and would normally be expelled. Sulfate as Sulfur is determined by ICP.
AN104	pHF is determined on an extract of approximately 2g of as received sample in approximately 10 mL of deionised water with pH determined after standing 30 minutes.
AN104	pHFox is determined on an extract of approximately 2g of as received sample with a few mLs of 30% hydrogen peroxide (adjusted to pH 4.5 to 5.5) with the extract reaction being rated from slight to extreme, with pH determined after reaction is complete and extract has cooled. Referenced to ASS Laboratory Methods Guidelines , method 23Af-Bf, 2004. 0 No Reaction 1 Slight Reaction 2 Moderate Reaction 3 Strong/High Reaction 4 Extreme/Vigorous Reaction (gas evolution and heat generation)
AN214	Acid Neutralising Capacity (ANC)or Neutralising Value (NV): The crushed or as received sample is reacted with excess normal acid (HCl) and then back titrated with standard sodium hydroxide to determine the acid consumed . The result is expressed as kg H2SO4/tonne or %CaCO3. Based on AS4969-13.
AN217	Dried pulped sample is mixed with acid and chromium metal in a rapid distillation unit to produce hydrogen sulfide (H2S) which is collected and titrated with iodine (I2(aq)) to measure SCR.
AN219	Dried pulped sample is extracted for 4 hours in a 1 M KCl solution. The ratio of sample to solution is 1:40. The extract is titrated for acidity. Calcium, magnesium, and sulfur are determined by ICP-AES.
AN220	Chromium Suite: Scheme for the calculation of net acidities and liming rates using a Fineness Factor of 1.5.

FOOTNOTES

*	NATA accreditation does not cover the performance of this service.	-	Not analysed.	UOM	Unit of Measure.
		NVL	Not validated.	LOR	Limit of Reporting.
**	Indicative data, theoretical holding time exceeded.	IS	Insufficient sample for analysis.	↑↓	Raised/lowered Limit of Reporting.
		LNR	Sample listed, but not received.		
***	Indicates that both * and ** apply.				

Unless it is reported that sampling has been performed by SGS, the samples have been analysed as received.
Solid samples expressed on a dry weight basis.

Where "Total" analyte groups are reported (for example, Total PAHs, Total OC Pesticides) the total will be calculated as the sum of the individual analytes, with those analytes that are reported as <LOR being assumed to be zero. The summed (Total) limit of reporting is calculated by summing the individual analyte LORs and dividing by two. For example, where 16 individual analytes are being summed and each has an LOR of 0.1 mg/kg, the "Totals" LOR will be 1.6 / 2 (0.8 mg/kg). Where only 2 analytes are being summed, the " Total" LOR will be the sum of those two LORs.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

If reported, measurement uncertainty follow the ± sign after the analytical result and is expressed as the expanded uncertainty calculated using a coverage factor of 2, providing a level of confidence of approximately 95%, unless stated otherwise in the comments section of this report.

Results reported for samples tested under test methods with codes starting with ARS-SOP, radionuclide or gross radioactivity concentrations are expressed in becquerel (Bq) per unit of mass or volume or per wipe as stated on the report. Becquerel is the SI unit for activity and equals one nuclear transformation per second.
Note that in terms of units of radioactivity:

a. 1 Bq is equivalent to 27 pCi
b. 37 MBq is equivalent to 1 mCi

For results reported for samples tested under test methods with codes starting with ARS-SOP, less than (<) values indicate the detection limit for each radionuclide or parameter for the measurement system used. The respective detection limits have been calculated in accordance with ISO 11929.

The QC and MU criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: www.sgs.com.au/en-gb/environment-health-and-safety.

STATEMENT OF QA/QC PERFORMANCE

SE252775 R0

CLIENT DETAILS

Contact	Jack Young
Client	RAW EARTH ENVIRONMENTAL
Address	3/17 Tasman Way Byron Bay BYRON BAY NSW 2481
Telephone	0435 126 066
Facsimile	(Not specified)
Email	jack.y@rawearthenvironmental.com.au
Project	**Eileen School**
Order Number	(Not specified)
Samples	18

LABORATORY DETAILS

Manager	Huong Crawford
Laboratory	SGS Alexandria Environmental
Address	Unit 16, 33 Maddox St Alexandria NSW 2015
Telephone	+61 2 8594 0400
Facsimile	+61 2 8594 0499
Email	au.environmental.sydney@sgs.com
SGS Reference	**SE252775 R0**
Date Received	23 Aug 2023
Date Reported	30 Aug 2023

COMMENTS

All the laboratory data for each environmental matrix was compared to SGS' stated Data Quality Objectives (DQO). Comments arising from the comparison were made and are reported below.

The data relating to sampling was taken from the Chain of Custody document.
This QA/QC Statement must be read in conjunction with the referenced Analytical Report.
The Statement and the Analytical Report must not be reproduced except in full.

All Data Quality Objectives were met (within the SGS Alexandria Environmental laboratory).

SAMPLE SUMMARY

Sample counts by matrix	18 Soil	Type of documentation received	COC
Date documentation received	23/8/2023	Samples received in good order	Yes
Samples received without headspace	N/A	Sample temperature upon receipt	-0.8°C
Sample container provider	Client	Turnaround time requested	Standard
Samples received in correct containers	Yes	Sufficient sample for analysis	Yes
Sample cooling method	Ice	Samples clearly labelled	Yes
Complete documentation received	Yes		

HOLDING TIME SUMMARY

SE252775 R0

SGS holding time criteria are drawn from current regulations and are highly dependent on sample container preservation as specified in the SGS "Field Sampling Guide for Containers and Holding Time" (ref: GU-(AU)-ENV.001). Soil samples guidelines are derived from NEPM "Schedule B(3) Guideline on Laboratory Analysis of Potentially Contaminated Soils". Water sample guidelines are derived from "AS/NZS 5667.1 : 1998 Water Quality - sampling part 1" and APHA "Standard Methods for the Examination of Water and Wastewater" 21st edition 2005.

Extraction and analysis holding time due dates listed are calculated from the date sampled, although holding times may be extended after laboratory extraction for some analytes. The due dates are the suggested dates that samples may be held before extraction or analysis and still be considered valid.

Extraction and analysis dates are shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria. If the sampled date is not supplied then compliance with criteria cannot be determined. If the received date is after one or both due dates then holding time will fail by default.

Field pH for Acid Sulphate Soil — **Method: ME-(AU)-[ENV]AN104**

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
HA01_1.75	SE252775.001	LB288998	22 Aug 2023	23 Aug 2023	19 Sep 2023	24 Aug 2023	19 Sep 2023	30 Aug 2023
HA01_2.25	SE252775.002	LB288998	22 Aug 2023	23 Aug 2023	19 Sep 2023	24 Aug 2023	19 Sep 2023	30 Aug 2023
HA01_2.5	SE252775.003	LB288998	22 Aug 2023	23 Aug 2023	19 Sep 2023	24 Aug 2023	19 Sep 2023	30 Aug 2023
HA02_1.5	SE252775.004	LB288998	22 Aug 2023	23 Aug 2023	19 Sep 2023	24 Aug 2023	19 Sep 2023	30 Aug 2023
HA02_2.0	SE252775.005	LB288998	22 Aug 2023	23 Aug 2023	19 Sep 2023	24 Aug 2023	19 Sep 2023	30 Aug 2023
HA02_2.5	SE252775.006	LB288998	22 Aug 2023	23 Aug 2023	19 Sep 2023	24 Aug 2023	19 Sep 2023	30 Aug 2023
HA03_1.5	SE252775.007	LB288998	22 Aug 2023	23 Aug 2023	19 Sep 2023	24 Aug 2023	19 Sep 2023	30 Aug 2023
HA03_2.0	SE252775.008	LB288998	22 Aug 2023	23 Aug 2023	19 Sep 2023	24 Aug 2023	19 Sep 2023	30 Aug 2023
HA03_2.5	SE252775.009	LB288998	22 Aug 2023	23 Aug 2023	19 Sep 2023	24 Aug 2023	19 Sep 2023	30 Aug 2023
HA04_1.25	SE252775.010	LB288998	22 Aug 2023	23 Aug 2023	19 Sep 2023	24 Aug 2023	19 Sep 2023	30 Aug 2023
HA04_1.75	SE252775.011	LB288998	22 Aug 2023	23 Aug 2023	19 Sep 2023	24 Aug 2023	19 Sep 2023	30 Aug 2023
HA04_2.25	SE252775.012	LB288998	22 Aug 2023	23 Aug 2023	19 Sep 2023	24 Aug 2023	19 Sep 2023	30 Aug 2023
HA05_1.5	SE252775.013	LB288998	22 Aug 2023	23 Aug 2023	19 Sep 2023	24 Aug 2023	19 Sep 2023	30 Aug 2023
HA05_2.0	SE252775.014	LB288998	22 Aug 2023	23 Aug 2023	19 Sep 2023	24 Aug 2023	19 Sep 2023	30 Aug 2023
HA05_2.5	SE252775.015	LB288998	22 Aug 2023	23 Aug 2023	19 Sep 2023	24 Aug 2023	19 Sep 2023	30 Aug 2023
HA06_1.25	SE252775.016	LB288998	22 Aug 2023	23 Aug 2023	19 Sep 2023	24 Aug 2023	19 Sep 2023	30 Aug 2023
HA06_1.75	SE252775.017	LB288998	22 Aug 2023	23 Aug 2023	19 Sep 2023	24 Aug 2023	19 Sep 2023	30 Aug 2023
HA06_2.25	SE252775.018	LB288998	22 Aug 2023	23 Aug 2023	19 Sep 2023	24 Aug 2023	19 Sep 2023	30 Aug 2023

Surrogate results are evaluated against upper and lower limit criteria established in the SGS QA/QC plan (Ref: MP-(AU)-[ENV]QU-022). At least two of three routine level soil sample surrogate spike recoveries for BTEX/VOC are to be within 70-130% where control charts have not been developed and within the established control limits for charted surrogates. Matrix effects may void this as an acceptance criterion. Water sample surrogate spike recoveries are to be within 40-130%. The presence of emulsions, surfactants and particulates may void this as an acceptance criterion.

Result is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

No surrogates were required for this job.

Blank results are evaluated against the limit of reporting (LOR), for the chosen method and its associated instrumentation, typically 2.5 times the statistically determined method detection limit (MDL).

Result is shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria.

No method blanks were required for this job.

Duplicates are calculated as Relative Percentage Difference (RPD) using the formula: RPD = | OriginalResult - ReplicateResult | x 100 / Mean
The RPD is evaluated against the Maximum Allowable Difference (MAD) criteria and can be graphically represented by a curve calculated from the Statistical Detection Limit (SDL) and Limiting Repeatability (LR) using the formula: MAD = 100 x SDL / Mean + LR
Where the Maximum Allowable Difference evaluates to a number larger than 200 it is displayed as 200.

RPD is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

NOTE: The RPD reported is calculated from the unrounded data for the original and replicate result. Manual calculation of the RPD from the rounded data reported may give a different calculated RPD.

Field pH for Acid Sulphate Soil — **Method: ME-(AU)-[ENV]AN104**

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE252775.010	LB288998.012	pHf	pH Units	-	5.1	5.1	30	1
		pHfox	pH Units	-	3.8	4.2	30	10
SE252775.018	LB288998.021	pHf	pH Units	-	5.0	5.0	30	0
		pHfox	pH Units	-	3.8	3.9	30	3

Laboratory Control Standard (LCS) results are evaluated against an expected result, typically the concentration of analyte spiked into the control during the sample preparation stage, producing a percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA /QC plan (Ref: MP-(AU)-[ENV]QU-022). For more information refer to the footnotes in the concluding page of this report.

Recovery is shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria.

Sample Number	Parameter	Units	LOR

MATRIX SPIKES

SE252775 R0

Matrix Spike (MS) results are evaluated as the percentage recovery of an expected result, typically the concentration of analyte spiked into a field sub -sample during the sample preparation stage. The original sample's result is subtracted from the sub-sample result before determining the percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA/QC plan (ref: MP-(AU)-[ENV]QU-022). For more information refer to the footnotes in the concluding page of this report.

Recovery is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

No matrix spikes were required for this job.

MATRIX SPIKE DUPLICATES

SE252775 R0

Matrix spike duplicates are calculated as Relative Percent Difference (RPD) using the formula: RPD = | OriginalResult - ReplicateResult | x 100 / Mean

The original result is the analyte concentration of the matrix spike. The Duplicate result is the analyte concentration of the matrix spike duplicate.

The RPD is evaluated against the Maximum Allowable Difference (MAD) criteria and can be graphically represented by a curve calculated from the Statistical Detection Limit (SDL) and Limiting Repeatability (LR) using the formula: MAD = 100 x SDL / Mean + LR

Where the Maximum Allowable Difference evaluates to a number larger than 200 it is displayed as 200.

RPD is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

No matrix spike duplicates were required for this job.

Samples analysed as received.

Solid samples expressed on a dry weight basis.

QC criteria are subject to internal review according to the SGS QA/QC plan and may be provided on request or alternatively can be found here: https://www.sgs.com.au/~/media/Local/Australia/Documents/Technical Documents/MP-AU-ENV-QU-022 QA QC Plan.pdf

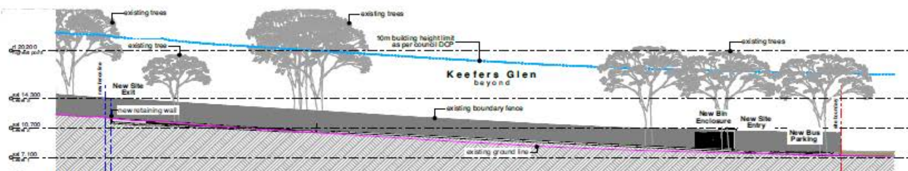
*	NATA accreditation does not cover the performance of this service.
**	Indicative data, theoretical holding time exceeded.
***	Indicates that both * and ** apply.
-	Sample not analysed for this analyte.
IS	Insufficient sample for analysis.
LNR	Sample listed, but not received.
LOR	Limit of reporting.
QFH	QC result is above the upper tolerance.
QFL	QC result is below the lower tolerance.
①	At least 2 of 3 surrogates are within acceptance criteria.
②	RPD failed acceptance criteria due to sample heterogeneity.
③	Results less than 5 times LOR preclude acceptance criteria for RPD.
④	Recovery failed acceptance criteria due to matrix interference.
⑤	Recovery failed acceptance criteria due to the presence of significant concentration of analyte (i.e. the concentration of analyte exceeds the spike level).
⑥	LOR was raised due to sample matrix interference.
⑦	LOR was raised due to dilution of significantly high concentration of analyte in sample.
⑧	Reanalysis of sample in duplicate confirmed sample heterogeneity and inconsistency of results.
⑨	Recovery failed acceptance criteria due to sample heterogeneity.
⑩	LOR was raised due to high conductivity of the sample (required dilution).
†	Refer to relevant report comments for further information.

Appendix G: Design Plan

01 **Section 01**
1:200

02 **Section 02**
1:200

03 **Section 03**
1:200



04 **Section 04**
1:200

Legend (elevation & sections)

afd	aluminium framed glazed door suite
afw	aluminium framed window
dms	decorative metal screen
dp	downpipe
eg	eaves gutter
egl	existing groundline
fb	face brickwork
lwc	lightweight cladding
mdr	metal deck roof
rw	retaining wall

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All dimensions to be verified on site and any discrepancies referred to architect for determination. figured dimensions to take precedence over scaled dimensions.

Rev	Issue	Date
01	DA - Issue for Client	25.05.2023
02	DA - Issue for review	30.05.2023
03	DA - Issue to Consultants	29.06.2023
04	Issue for Client Review	08.08.2023
05	Issue to QS	08.09.2023

Stanton Dahl Architects

CATHOLIC SCHOOLS Broken Bay

Eileen O'Connor School

for the Catholic Schools Office, Broken Bay Diocese

84 Gavenlock Road, Tuggerah, NSW

Drawn; RW
Checked; DM
Plot date; 8/9/23

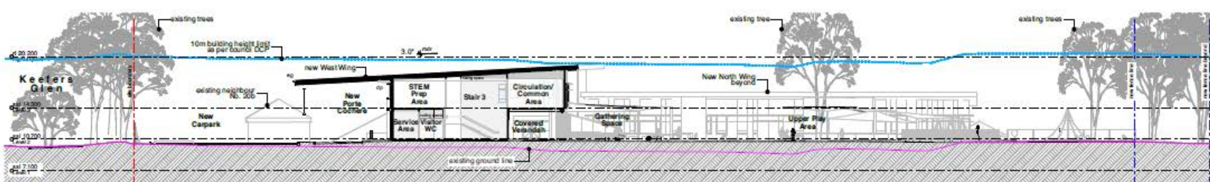
Scale;1:200 annoted @A1

Project No; 2637.20

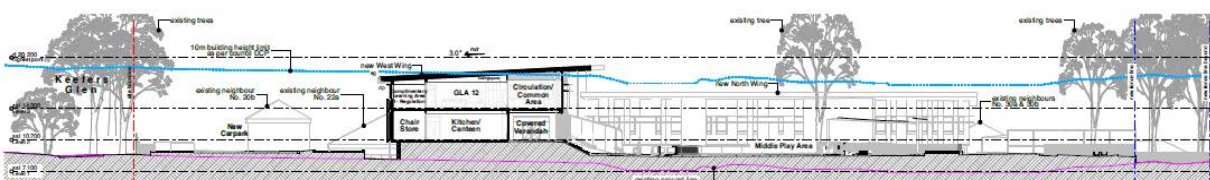
Drawing No; A0331 Revision #; 05

Sections
Sections 01

01 **Section 05**
1:200



02 **Section 06**
1:200



03 **Section 07**
1:200

04 **Section 08**
1:200

Legend (elevation & sections)

afd	aluminium framed glazed door suite
afw	aluminium framed window
dms	decorative metal screen
dp	downpipe
eg	eaves gutter
egl	existing groundline
fb	face brickwork
lwc	lightweight cladding
mdr	metal deck roof
rw	retaining wall

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84 Gavenlock Road, Tuggerah, NSW

Drawn; RW
Checked; DM
Plot date; 8/9/23

Scale;1:200 annoted @A1

Project No; 2637.20

Drawing No; A0332 Revision #; 05

Sections
Sections 02