# Additional Geotechnical and Acid Sulfate Soil Assessment

Proposed Sand Quarry at 3631 Nelson Bay Road, Bobs Farm, NSW

Final Report

P2511038JR09V01

April 2026

Prepared for Newcastle Sand C/- ADW Johnson

environmental science & engineering

## Project Details

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|---|---|
| **Report Title** | Additional Geotechnical and Acid Sulfate Soil Assessment: Proposed Sand Quarry at 3631 Nelson Bay Road, Bobs Farm, NSW |
| **Client** | Newcastle Sand C/- ADW Johnson |
| **Document** | P2511038JR09V01 |
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## Document History

| Issue | Issue Date | Status | Description / Comment | Author | Reviewer | Approved |
|---|---|---|---|---|---|---|
| **1.** | 27/03/2026 | Draft | Additional Geotechnical and Acid Sulfate Soil Assessment | MB | WB | GT |
| **2.** | 24/04/2026 | Final | Final release after addressing client comments | MB | WB | GT |
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# 1 Introduction & Background

## 1.1 Overview

Martens and Associates (**MA**) have been engaged by ADW Johnson on behalf of Newcastle Sand to carry out an additional geotechnical and acid sulfate soil (**ASS**) assessment to support a State Significant Development Application (**SSDA**), SSD-99860959, to the NSW Department of Planning Housing and Infrastructure (**DPHI**) for the proposed sand quarry at 3631 Nelson Bay Road, Bobs Farm, NSW ('**the Site**').

This assessment was undertaken in general accordance with the agreed scope of work outlined in MA's proposal P2511038BC03V04 dated 25 February 2026.

## 1.2 Proposed Development

Based on quarry development plan prepared by VGT Environmental Compliance Solutions Pty Ltd (VGT, 2026), quarry extraction works will occur outside a minimum 15 m buffer zone adjacent to the site boundaries with the exception of the southern and central eastern quarry boundaries. The proposed quarry development will include:

- Preliminary works, including: provision of access roads and an intersection with Nelson Bay Road; setting up of screening operations, settling pond, water recycling and wash plant, loading ramp, weighbridge and construction of ancillary structures.
- Clearing of topsoil and stockpiling, for use as part of quarry rehabilitation works.
- Extraction of aeolian sands in fifteen stages (Stages 1 to 15) to approximately 0.7 m above groundwater table, using conventional excavation/extraction techniques, and stockpiling for later use for various purposes. Extraction of the current stage and rehabilitation of the preceding completed stage will be undertaken concurrently.

Sand extraction will involve processing to separate fines from the feed material via screen with:

- Sand screen to sieve product.
- Process wastewater and fines shall be discharged to a settling pond.

Proposed development plans are shown in Appendix B.

## 1.3 Assessment Purpose

The purpose of this additional geotechnical and ASS assessment is to support a **SSDA** and to address geotechnical engineering related items of the Secretary's Environmental Assessment Requirements (**SEARs**) dated 18 December 2025, in particular Items 8 – Land Resources.

## 1.4 Previous Assessments

### 1.4.1 Overview

MA previously completed a range of engineering assessments for a former SSD which included excavation of sand below the water table. We understand that this SSD was withdrawn, and the proposed new SSD doesn't include excavation of sand below the water table. Reference has been made to the findings of the following previous assessments where necessary.

### 1.4.2 Previous Geotechnical and ASS Assessment

A geotechnical and ASS assessment was previously carried out by MA in June 2015 to support a former SSDA. The findings and recommendations of the geotechnical and ASS assessment was presented in MA's report 'Preliminary Geotechnical and Acid Sulfate Soils Assessment: Proposed Sand Quarry – Bobs Farm, NSW', referenced P1303897JR02V02, dated 5 June 2015 (MA, 2015).

A summary of the investigation scope of work included in MA, 2015 is presented below:

- Drilling of eight boreholes (BH101 to BH108) up to 13.0 metres below ground level (**mbgl**). Refer Appendix C for borehole logs.
- DCP testing at six locations. Refer Appendix D for DCP test results.
- Installation of data loggers and groundwater monitoring in five monitoring wells (MW1 to MW5) installed by VGT in 2013.
- Collection of twenty-one soil samples for laboratory testing for ASS risk purposes (sPOCAS). Only fifteen of the twenty-one soil samples tested were taken from ground surface to 1 m below proposed excavation level (i.e. above 2 mAHD) discussed in this report.
- Collection of twenty-one soil samples for laboratory salinity (EC, pH) testing.
- Collection of six soil samples for laboratory dispersivity testing.

### 1.4.3 Supplementary ASS Assessment

A supplementary ASS assessment was previously undertaken by MA in July 2020. The results of the supplementary ASS assessment was presented in MA's report 'Supplementary Acid Sulfate Soil Assessment: Proposed Sand Quarry – 3631 Nelson Bay Road, Bobs Farm, NSW', referenced P1303897JR06V01, dated 1 July 2020 (MA, 2020a).

A summary of the investigation scope of work included in the supplementary ASS assessment undertaken by MA between 18 September 2019 and 2 October 2019 is presented below:

- Drilling of nine boreholes (BH401 to BH409) to a maximum depth of 38.0 mbgl (refer Appendix C for borehole logs).

- Installation and development of four groundwater monitoring wells (MW101 to MW104). Refer Appendix C for monitoring well logs.
- Laboratory analysis of eighty-five soil samples for ASS field screening ($pH_f$ and $pH_{fox}$) and sPOCAS testing of fifty soil samples. Only thirty-two soil samples tested for field screening and twenty-three for sPOCAS testing were taken from ground surface to 1 m below proposed excavation level (i.e. above 2 mAHD) discussed in this report.

### 1.4.4 Previous ASS management Plan

An ASS management plan (**ASSMP**) was previously prepared by MA to provide guidance on environmental management of ASS as a result of site soil disturbance during extraction. Recommendations were provided for appropriate management of ASS to minimise or negate ASS risk. The ASSMP was presented in MA's report 'Acid Sulfate Soil Management Plan: Proposed Sand Quarry – 3631 Nelson Bay Road, Bobs Farm, NSW', referenced P1303897JR07V01, dated 6 November 2020 (MA, 2020b).

# 2 Investigation Scope and Laboratory Testing

## 2.1 Additional Scope of Works

Additional field investigations conducted by VGT on 12 March 2026 included:

- Drilling of three boreholes (BH201 to BH203) via truck mounted hydraulic drill rig to approximately 14.0 mbgl (refer Appendix C for borehole logs by VGT).
- Installation of three groundwater monitoring wells (MW201 to MW203) where boreholes were drilled (refer Appendix C for monitoring well logs by VGT).

Investigation locations are shown on Map 02, Appendix A.

## 2.2 Additional Laboratory Testing

Thirty-nine soil samples from BH201 to BH203 were tested by VGT Environmental Compliance Solutions and Laboratories, a National Association of Testing Authorities (NATA) accredited laboratory for ASS field screening ($pH_f$ and $pH_{fox}$). Sixteen of these samples were tested for chromium reducible sulfur ($S_{CR}$) analysis.

# 3 Site Details and Subsurface Conditions

## 3.1 General Site Details

General Site details are summarised in Table 1.

**Table 1:** Summary of general Site details (based on desktop reviews, site walkover and field investigations).

| Item | Description / Comment |
|---|---|
| Property address | 3631 Nelson Bay Road, Bobs Farm, NSW. |
| Lot / DP | Lot 254 DP753204. |
| LGA | Port Stephens Council (**'Council'**) |
| Site description | The southern portion of the site is currently used for agricultural purposes (primarily olive and fig plantations) with a small proportion of this area occupied by farm sheds and two dwellings. An electrical transmission line easement (poles and wires) cuts across the eastern and western boundary in the southern portion of the site. The remainder of the site is undeveloped native bushland apart from some vehicle access tracks. |
| Current land use | Rural residential and agriculture. |
| Proposed land use | Extractive industry (quarry). |
| Surrounding land uses | Rural-residential allotments border the site to the north, west and southwest. Nelson Bay Road borders the site to the southeast, with Worimi National Park located on the southern side of Nelson Bay Road. The Australian Shark and Ray Centre is located along the western end of the northern site boundary. |
| Topography<br>(Map 03, Appendix A) | The northern and western portion of the site is comprised of moderately to steeply undulating dune sequences with grades typically between 2 and 50 %. The southern and eastern portion of the site comprises predominantly flat and near level land.<br>The site has a predominantly south easterly aspect, with some areas sloping to the north, west or southwest. Slopes are low (typically 0 – 5 %) in the eastern portion of the site and higher (typically 10 – 50 %) over the remainder of the site, where dune knolls are located.<br>Site elevations range from approximately 35 mAHD at a knoll crest in the northwest of the site to approximately 2 mAHD at a depression in the north. The lower eastern portion of the site has typical elevations of between 2 and 8 mAHD. |
| Expected geology and soil | The Newcastle and Port Stephens 1:100,000 Geological Series Sheet 9232 indicates that the site is underlain by Quaternary Holocene sand (stable dunes). The area to the north of the site (beyond the northern boundary) is underlain by estuarine sands, silts and clays derived from deposition within Tilligerry Creek. The area to the south of the site (southern side of Nelson Bay Road) is underlain by Quaternary Holocene sands derived from older beach deposition and covered by low level windblown dunes.<br>The NSW Environment and Heritage eSPADE (2019) website identifies the site as having soils of the:<br>• Bobs Farm Landscape to the northern of the site, consisting of very poorly drained humic gleys. |

| Item | Description / Comment |
|---|---|
| | • Boyce Track Landscape at the central portion of the site, consisting of deep, very well drained weakly developed podzols.<br>• Hawks Nest Landscape at the southern portion of the site, consisting of deep (>300 cm), well drained podzols on dunes with deep (>300 cm) minor acid peats / siliceous sands in swampy swales |
| Drainage | The majority of the site drains southeast towards Nelson Bay Road and ultimately Stockton Beach. A small portion to the northwest drains northwards towards Tilligerry Creek. |
| Vegetation | Approximately 75% of the site consists of uncleared tall open forest dominated by the canopy species *Eucalyptus pilularis* (Blackbutt) and *Angophora costata* (Smooth-barked Apple). The remaining low lying areas near Nelson Bay Road comprise olive and fig plantations. |

## 3.2 Expected Subsurface Conditions

Based on the findings of VGT (2026), MA (2015) and MA (2020a), the Site is underlain by the four general soil units / layers. A generalised description of these soil units is presented below, from youngest to oldest:

- Unit 1: Very loose grey organic sand with rootlets (topsoil), typically less than 0.4 m thick across the site.
- Unit 2: Aeolian sand comprising:

  Unit 2A: Very loose and loose light grey/grey aeolian sand, typically 1.2 m thick across the site.

  Unit 2B: Loose and medium dense orange/yellow aeolian sand, with minor dense layers, typically 8.7 m thick across the site, and very loose sand in dune knolls in the western end of the site (DCP105).
- Unit 3: Medium dense marine sand and clayey sand with organic content, below ground water level likely derived from the paleo tidal zone of Tilligerry Creek. This unit is likely to be encountered in lenses across the site given that it was only intercepted in BH102 and BH103 by MA and BH1 to BH5 by VGT from levels ranging between approximately 3.9 m and -1.8 m AHD.
- Unit 4: Dense light brown/grey marine sand, containing minor heavy mineral bands, below the groundwater table from levels ranging between approximately 3.0 m and -4.4 m AHD.

An interpretation of the depositional history of the units is summarised below from oldest to youngest.

- Unit 4: Marine beach sands derived from Stockton Beach are deposited across the site.

- Unit 3: Tidal zone of Tilligerry Creek extends across the site and deposits organic rich sands, silts and clays in low-lying areas.
- Unit 2: Tilligerry Creek tidal zone regresses with localised erosion of Unit 3 sands. Aeolian sands from Stockton Beach transgress across the site in a north westerly direction (dominant wind direction).
- Unit 1: Recent stabilisation of dunes by vegetation, mainly consisting of grasses and trees, and development of a thin surface layer of organic-containing topsoil.

Borehole logs are included in Appendix C.

# 4 Groundwater

## 4.1 Preliminary Groundwater Assessment

### 4.1.1 Groundwater Bore Search

A review of NSW Department of Primary Industries-Water (DPI-Water) groundwater bore database indicates two groundwater bores with available groundwater data is located within 1 km of the Site. Standing water level (SWL) data is summarised in Table 2.

**Table 2:** Registered bore data within 1 km of the Site.

| Bore ID | Approx. Distance from Site (m) / Direction | Surface Elevation [1] | SWL (mbgl / mAHD) | Water Bearing Zone Geology |
|---|---|---|---|---|
| GW056098 | 320 / northeast of eastern most corner | 10 mAHD | 3.0 / 7.0 | Clayey sand – 3.0 to 7.0 mbgl |
| GW067296 | 672 / north of eastern most corner | 10 mAHD | 0.5 / 9.5 | Unconsolidated / No Information provided |

**Notes:**
[1] Surface level estimated from Mecone Mosaic (2026).

### 4.1.2 Borehole Observations

Groundwater inflow was encountered in BH201, BH202 and BH203 undertaken by VGT at 4.0 mAHD, 3.1 mAHD and 2.8 mAHD, respectively.

### 4.1.3 Groundwater Monitoring

Continuous groundwater monitoring with the data loggers in the newly and previously installed monitoring wells were undertaken over a several monitoring periods.

### 4.1.4 Monitoring Results

Details of the groundwater monitoring results are presented in MA report referenced P2511038JR07V02, dated April 2026 (MA, 2026). Key findings presented in MA, 2026 are summarised below:

- Median groundwater elevations during the monitoring period ranged between 1.4 mAHD and 3.4 mAHD, corresponding depths to groundwater of approximately 2.6 mbgl and 15.1 mbgl, depending on local ground surface elevation.
- Relatively shallow groundwater was generally observed in low lying areas of the Site.
- Likely high groundwater conditions (90$^{th}$ percentile) ranged between approximately 1.6 mAHD to 3.8 mAHD over the monitoring period.

- Groundwater levels have gradually declined by approximately 0.5 m to 1.0 m since monitoring commenced in November 2025.

We note that a minimum 0.7 m buffer will be maintained between the extraction base level and the groundwater table across the quarry footprint.

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# 5 Acid Sulfate Soils Assessment

## 5.1 Guidelines

This ASS assessment was undertaken in general accordance with the following guidelines:

- Acid Sulfate Soil Management Advisory Committee (1998), Acid Sulfate Soil Manual, referred to as ASSMAC (1998).
- Qld Natural Resources, Mines and Energy (2004) Acid Sulfate Soil Laboratory Methods Guidelines.

## 5.2 Acid Sulfate Soils Risk Map Classification

The Port Stephens Council acid sulfate soils (ASS) risk map classifies the majority of the site as Class 4 land, with a small area of Class 3 land located in the northern part of the site. The site location relative to the ASS risk mapping is shown on Map 01 in Appendix A.

Under the ASS risk map provisions, further assessment is generally required for works on Class 3 land that extend beyond 1 m below ground level or are likely to lower the groundwater table by more than 1 m below natural ground surface, and for works on Class 4 land that extend beyond 2 m below ground level or are likely to lower the groundwater table by more than 2 m below natural ground surface.

The proposed quarry development involves staged extraction to a minimum 0.7 m above the groundwater table, which varies across the site. Based on the current quarry design, excavation is understood to remain above the groundwater table, with no below-water table extraction proposed. Notwithstanding this, as the proposed works are expected to extend beyond the nominal depth criteria for mapped ASS land, a site-specific ASS assessment was undertaken to evaluate the potential for ASS to be encountered within the proposed excavation profile.

## 5.3 Geomorphic Setting

The likelihood of ASS occurrence at a site is a function of various geomorphic parameters, in particular those listed in Table 3 as derived from ASSMAC (1998). Each is an indicator that ASS may be present onsite.

**Table 3:** Site geomorphic features indicative of ASS.

| Geomorphic Feature | Present On Site? |
|---|---|
| Holocene sediments. | Yes |
| Soil horizons less than 5 mAHD. | Yes |
| Marine / estuarine sediments or tidal lakes. | Yes |
| Coastal wetland; backwater swamps; waterlogged or scalded areas; inter-dune swales or coastal sand dunes (i.e. deep excavation is required). | Yes |
| Dominant vegetation is mangroves, reeds, rushes and other swamp or marine tolerant species. | Likely |

| Geomorphic Feature | Present On Site? |
|---|---|
| Geologies containing sulfide bearing material / coal deposits or former marine shales/sediments. | Unlikely |
| Deep older (Holocene or Pleistocene) estuarine sediments > 10 mbgl (if deep excavation or drainage is proposed). | Possible, but not a primary consideration for the current excavation proposal |

The geomorphic setting indicates that the site contains several characteristics commonly associated with potential ASS occurrence. On this basis, laboratory assessment of selected soil samples was considered warranted to determine whether ASS are likely to be present within the proposed excavation profile.

## 5.4 Previous ASS Investigations

Previous ASS investigations relevant to the site were completed by MA in 2015 and 2020. The 2015 investigation formed part of a broader preliminary geotechnical and ASS assessment for the proposed sand quarry, while the 2020 investigation comprised a supplementary ASS assessment undertaken to provide additional targeted ASS investigations.

The 2015 assessment was prepared for an earlier quarry concept that differed materially from the current proposal. At that time, the proposed development included staged extraction including deeper excavation to approximately 16 m below the groundwater table by dredging. The 2020 supplementary ASS assessment was likewise prepared in the context of the earlier deeper quarry concept.

Accordingly, while the 2015 and 2020 investigations provide useful site specific ASS data, both reports were prepared for a quarry concept involving substantially deeper excavation, including below-water table extraction, than is currently proposed. The historical data has therefore been reviewed in the context of the current proposal, which is understood to involve staged sand extraction to maintain a minimum 0.7 m clearance between the extraction base level and the groundwater table (see Section 5.4.1).

### 5.4.1 Relevance of Historical ASS Data

The current quarry proposal is understood to involve staged extraction of sand up to approximately 0.7 m above the groundwater table, with excavation intended to remain above the groundwater table. Accordingly, not all historical ASS data is considered directly relevant to the current development. In particular, laboratory results from deeper horizons associated with the earlier below water-table extraction concept are not considered relevant to the current proposal.

For the purposes of the current assessment, the historical ASS data has been reviewed with regard to the revised excavation depth. A conservative approach has been adopted, whereby historical results from soil horizons at approximately 2 mAHD and above were considered relevant to the current proposal. This approach provides a buffer below the anticipated quarry floor and allows for a cautious assessment of the potential for ASS to be encountered during the proposed extraction works. On this basis, a total of 38

historical soil samples from the previous investigations were identified as relevant to the current assessment.

## 5.5 Current Investigation Data

In addition to the previous ASS investigations, more recent field investigations were undertaken by VGT on 12 March 2026. These works included drilling of three boreholes (BH201 to BH203) to approximately 14.0 mbgl and installation of three groundwater monitoring wells (MW201 to MW203) at the borehole locations. Investigation locations are shown on Map 02, Appendix A.

A total of 30 soil samples from the 2026 investigation (from 2 mAHD and above) were selected for field screening using pHF and pHFOX methods, with 12 samples subsequently selected for Chromium Reducible Sulfur (**SCR**) testing. These more recent results provide additional information regarding the potential presence and distribution of ASS within soil horizons relevant to the current quarry proposal and have been considered together with the relevant historical ASS data in the assessment presented below at Section 5.6.

## 5.6 ASS Field Screening

### 5.6.1 Criteria

Available field screening data, including field pH ($pH_f$) and oxidised pH ($pH_{fox}$), was reviewed against the following general screening criteria from ASSMAC (1998):

i. An initial soil pH ($pH_f$) < 4.0 indicated existing acidity and is consistent with actual acid sulfate soil **(AASS)**.

ii. An oxidised soil pH ($pH_{fox}$) < 3.0 is considered a strong screening indicator of potential acid sulfate soil (**PASS**).

iii. Where $pH_f - pH_{fox} > 1$ and:

   a. $pH_{fox}$ is 3.0 - 4, there is a strong indication of PASS.

   b. $pH_{fox}$ of 4 - 5 is neither a positive or negative indicator of potential PASS.

   c. $pH_{fox} > 5$, with little to no drop in pH, the soil is considered to have low net acid generation potential and is unlikely to represent PASS.

### 5.6.2 Results

A tabulated summary of field screening results from the historical and current investigations is provided in Appendix E.

No $pH_f$ results of less than 4.0 were identified in the reviewed dataset, indicating that the field screening did not identify widespread existing acidity consistent with AASS within the soil horizons considered relevant to the current proposal.

Notwithstanding the above, a number of samples recorded $pH_{fox}$ values of less than 3.0, and many samples also exhibited a $pH_f$ – $pH_{fox}$ reduction of greater than 1 pH unit In particular:

- 12 of 77 samples across both investigation data sets reported a $pH_{fox}$ value of <3.0.
- More than half of the screened samples reported a pH drop of more than 1 pH with up to 30 of those samples reporting a $pH_{fox}$ value of between <3 – 4.

In accordance with the criteria outlined in Section 5.6.1, these results are consistent with the possible presence of oxidisable sulfides and indicate that PASS may be present in parts of the soil profile. Such indicators were identified in both the historical and more recent datasets, including within some horizons above the interpreted excavation limit for the current quarry proposal. On this basis, laboratory assessment of selected samples was considered necessary.

## 5.7 Laboratory Testing

### 5.7.1 ASS Action Criteria

It is anticipated that substantially more than 1,000 tonnes of soil will be disturbed during the proposed quarry extraction works. Accordingly, ASSMAC (1998) action criteria for disturbance of >1,000 tonnes of material are relevant to the current proposal.

In general terms, where laboratory results exceed the applicable action criteria, management measures are required, typically in the form of an Acid Sulfate Soil Management Plan (**ASSMP**) or other appropriate ASS management framework.

For the purposes of this assessment, the relevant action criteria for coarse to medium textured soils are presented in Table 4.

**Table 4:** Action criteria for disturbance of coarse texture soil.

| Texture | Amount of soil disturbance | Sulfur Trail ($S_{cr}$ / $S_{pos}$) | | Acid Trail | |
|---|---|---|---|---|---|
| | | %S | mol H+/tonne | Titratable Actual Acidity (%S) | Titratable Actual Acidity (mol H+/tonne) |
| Coarse / Medium | > 1000 tonnes | 0.03 | 18 | 0.03 | 18 |

### 5.7.2 Results

A tabulated summary of laboratory results relevant to the current proposal is provided in Appendix E.

Review of the relevant historical laboratory data indicates that most samples did not exceed the applicable action criteria for coarse to medium textured soils. However, a limited number of historical samples did report elevated sulfur and/or acidity values above the adopted action criteria. The principal historical exceedances included:

- 3897/BH401/13.8–14.2 (2.5 mAHD), which reported elevated sulfur and acidity values, including TSA of 130 mol H+/t, sPOS of 0.19%S, net acidity excluding ANC of 120 mol H+/t, and a liming rate of 9.4 kg/t;
- 3897/MW104/9.5 (approximately 6.0 mAHD), which reported TSA of 320 mol H+/t, sPOS of 0.35%S, net acidity excluding ANC of 220 mol H+/t, and a liming rate of 16 kg/t; and
- 3897/MW104/10.5 (5.0 mAHD), which reported TSA of 44 mol H+/t, sPOS of 0.08%S, net acidity excluding ANC of 50 mol H+/t, and a liming rate of 3.7 kg/t.

A small number of additional historical samples also reported elevated peroxide-derived acidity and/or sulfur values above the adopted action criteria, including 3897/BH402/0.4–0.6 and 3897/BH408/0.2–0.3.

By comparison, the more recent 2026 SCR dataset did not identify exceedances of the adopted action criteria within the soil horizons considered relevant to the current proposed excavation depth (above 2mAHD).

## 5.8 Discussion

The laboratory dataset indicates that isolated historical exceedances of the adopted action criteria are present within the broader upper soil profile considered relevant to the current quarry proposal. However, these exceedances do not appear to be widespread across the site.

The more significant historical exceedances were associated with a limited number of samples, including BH401/13.8–14.2, MW104/9.5 and MW104/10.5. These samples indicate that PASS material may occur locally within parts of the profile above the conservative 2 mAHD review level. However, other historical samples that reported elevated peroxide derived acidity, such as BH402/0.4–0.6 and BH408/0.2–0.3, were accompanied by comparatively low sulfur speciation, net acidity and liming demand. These results suggest that some of the shallower historical responses may be less significant or not representative of a laterally continuous ASS horizon.

The more recent 2026 investigation provides an additional line of evidence directly relevant to the current quarry proposal. While field screening identified some indicators consistent with possible oxidisable sulfides, the subsequent SCR testing of relevant horizons did not identify exceedances of the adopted action criteria. In general, the recent laboratory data reported comparatively low sulfur values, low net acidity and low liming demand. This more recent dataset does not reproduce the stronger historical exceedances within the soil horizons considered relevant to the current proposal.

On the basis of available data, there are indications that localised / isolated PASS may be present in parts of the soil profile relevant to the current proposal. Accordingly, while a broad site-wide ASS treatment response does not appear warranted, a targeted ASS management plan (**ASSMP**) will be required.

# 6 Geotechnical Assessment

## 6.1 Preliminary Geotechnical Material Properties and design parameters

Preliminary geotechnical soil strength, estimated from visual assessment, DCP test results and rate of auger advancement (V-bit), using our experience from similar environments, are provided in Table 5.

A typical increase in soil density was observed corresponding with age of deposition or overburden pressure. An exception to this general trend are two cone shaped sand dunes (between BH105 and BH106), found to consist of loose to very loose sands from surface to about 10.05 mbgl.

Owing to varying conditions, design of footings should consider conditions at actual location. For preliminary assessment, an allowable end bearing pressure of 50 kPa may be adopted for shallow footings founding on loose and medium dense (or bedded) sand subject to >1 m above groundwater table; to at least 2 × width of footing below foundation level; and embedment of >0.75 m in the unit. Preliminary earth pressures for retaining wall design of Ka = 0.4 and Kp = 2.8 may be adopted for aeolian sands and Ka = 0.3 and Kp = 3.3 for marine sands.

**Table 5:** Preliminary estimates of soil strength properties.

| Unit | Description[1] | $Y_{dry}$[2] (kN/m$^3$) | $Y_{sat}$[3] (kN/m$^3$) | $\phi'$[4] (°) | E[5] (MPa) |
|---|---|---|---|---|---|
| Unit 1: Organic Sand | Very Loose | 14 | 17 | 23 | 2 |
| Unit 2A: Aeolian Sand | Very Loose or Loose[6] | 14 | 17 | 25 | 3 |
| Unit 2B: Aeolian Sand | Loose | 15 | 18 | 27 | 5 |
| | Medium Dense | 17 | 20 | 32 | 15 |
| Unit 3: Marine Organic Sandy Clay/Clayey Sand | Loose or Medium Dense[6] | 17 | 20 | 30 | 10 |
| | Soft | 15 | 17 | - | 5 |
| Unit 4: Marine Sand | Loose, Medium Dense and Dense[6] | 19 | 21 | 36 | 30 |

**Notes:**

[1] Typical density. Refer to borehole logs (Appendix C) for full soil description details.

[2] Dry unit weight (+/- 2kN/m$^3$).

[3] Saturated unit weight (+/- 2kN/m$^3$).

[4] Effective friction angle (+/-2°).

[5] Effective elastic modulus (based on visual assessment, +/- 10 %).

[6] Assumed average value for unit.

## 6.2 Safe Excavation Batter

Proposed extraction of sand resources will need to take into consideration long-term stability of the excavation perimeter, such that impact on buffer zones of adjacent land is limited. To this extent, it is suggested that an average batter slope of not greater than 18°

(about 1V:3H) be adopted. This can be revisited once operations proceed and exposed excavations are monitored. However, should the batter grade steeper than 1V:3H be adopted, a slope stability analysis may need to be undertaken.

## 6.3 Risk Assessment

A geotechnical hazard risk assessment for the proposed works has been completed in accordance with the qualitative risk matrices provided in Section 7 of the AGS (2007) guidelines. Four forms of slope movement are considered likely at the site: translational slide, rotational slide, soil creep and lateral spread. Soil creep and gross instability (slide) are considered most likely to impact or be impacted by the proposed development. A summary of a risk assessment for these hazards is presented in Table 6. The assessment is based on treatment measures, recommended in this report and shown in Table 6 as a minimum, having been implemented.

**Table 6:** Summary of slope instability risk assessment, based on AGS (2007).

| Description | Treatment Measures | Likelihood[1] | Risk to Life | | Risk to Property | |
|---|---|---|---|---|---|---|
| | | | Established Probability[2] | Risk | Consequence | Risk |
| Soil creep | Maintain vegetation of undeveloped areas.<br>Maintain good site drainage. | Possible[1] | $5.35 \times 10^{-7}$ | Tolerable | Minor | Low |
| Gross Instability (slide) | Good hill slope engineering practice.<br>Maintain good site drainage.<br>Do not load crest of excavation batter.<br>Limit vibrations near batters.<br>Do not over-steepen batters (maximum batter slope of not greater than 18° i.e. about 1V:3H). | Unlikely[1] | $8.20 \times 10^{-7}$ | Tolerable | Moderate | Low |

**Notes:**

[1] Based on 'treated' site conditions.

[2] Annual probability of loss of life of an individual most at risk.

Based on AGS, the risk is considered acceptable. However, we point out that it is the responsibility of the client and stakeholders to ultimately decide whether the risk is acceptable.

## 6.4 Recommendations

### 6.4.1 Existing Infrastructure

The edge of the proposed sand quarry excavation is offset approximately 15 m from Nelson Bay Road. The deepest proposed excavation nearest Nelson Bay Road will be approximately 5 mbgl.

Should the recommended maximum batter slope angles be adopted, the excavation will be located outside the zone of influence of Nelson Bay Road (estimated by extending down 30° from the edge of Nelson Bay Road). If excavation extends into the zone of influence, then these excavations should take into consideration requirements of the NSW Department of Planning and Environment (DoPE) and RMS *Development Near Rail Corridors and Busy Roads – Interim Guideline, 2008)*. Alternatively, batter angles may need to be further reduced.

### 6.4.2 New Infrastructure

Owing to varying subsurface conditions across the site and with depth, foundation design for new infrastructure should consider conditions at actual locations. However, allowable end bearing pressures of 50 kPa may be adopted for preliminary design of high-level lightly loaded footings founding on loose and medium dense (or better) sand respectively, subject to a minimum cover of 1 m to the groundwater table; uniform foundation conditions to a depth of at least twice the least footing dimension below foundation level and a minimum embedment of 0.75 m. Preliminary retaining wall designs, should they be required, may be carried out using a triangular pressure distribution and adopting active and passive earth pressure coefficients of Ka = 0.4 and Kp = 2.8 respectively for aeolian sands and Ka = 0.3 and Kp = 3.3 respectively for marine sands.

### 6.4.3 Construction Considerations

Stage one quarrying of the soil profile would most likely involve stripping topsoil and root affected sand (Unit 1) by dozer and/or excavator. Subsequent quarrying of Units 2 and 3 will likely also be carried out by dozer/ excavator. Stockpiling of all topsoil on site should be considered for using as part of quarry rehabilitation. A minimum of 0.7 m clearance should be maintained between the extraction base level and the groundwater table to minimise adverse impact on trafficability.

Table 7 provides recommendations for consideration during construction and expected quarrying operations.

**Table 7:** Recommendations for consideration in construction and mining operations.

| Item | Recommendations |
|---|---|
| Excavations and Vibrations | All excavation work should be completed with reference to the Code of Practice 'Excavation Work', dated March 2020 by Safe Work Australia.<br><br>Excessive vibrations in the vicinity of any open sand excavation should be avoided to limit the risk of vibration-induced slope movement. Slopes below groundwater, if any, are particularly sensitive to vibrations. |
| Working Platforms, where required | Working platforms will be required where high localised loading is expected.<br><br>Engineer to design working platforms, particularly where adjacent to crest of excavations or natural batters. |
| Trafficability and Access | Trafficability on exposed sand closer to the groundwater table is likely to be poor. Excavation of the site may be limited to the use of tracked machinery.<br><br>Crushed concrete or aggregate should be placed along access and haul roads to facilitate site access by dump trucks and utility vehicles. Further assessment of subgrade e.g. CBR conditions be carried out for pavement thickness design of longer term access roads. |
| Soil Erosion Control | Sand quarrying should be performed in a manner that reduces the risk of soil erosion and sedimentation on neighbouring lands by water or wind. Site vegetation should only be cleared as quarrying progresses and maintained where possible. Surface drainage should be directed away from the crest of batters and batter slopes should be kept vegetated or covered to limit erosion.<br><br>Erosion of soil stockpiles should be limited by providing erosion control measures such as bunding and cover, e.g. geotextile or plastic sheeting. |

# 7 Impact on Soil Resources

## 7.1 Soil Salinity Assessment

### 7.1.1 Observed Site Conditions

Field observations did not identify obvious evidence of the presence of saline soils at the site:

- Vegetation growth appeared healthy and uninhibited.
- No water marks or salt crystals were observed on the ground surface.
- Site surface drainage appeared generally good at the time of inspection.

### 7.1.2 Laboratory Test Results

Laboratory salinity test results presented in MA, 2015 are summarised in Table 8. Laboratory certificates are provided in Appendix F.

**Table 8:** Salinity test results.

| Sample ID[1] | EC(1:5) (dS/m) | ECe (dS/m)[2] | Salinity Class Indication[3] |
|---|---|---|---|
| 3897/101/2.5 | 0.01 | 0.17 | Non - Saline |
| 3897/101/8.5 | 0.01 | 0.17 | Non - Saline |
| 3897/101/13.0 | 0.02 | 0.34 | Non - Saline |
| 3897/102/2.5 | 0.01 | 0.17 | Non - Saline |
| 3897/102/5.0 | 0.05 | 0.85 | Non - Saline |
| 3897/102/7.0 | 0.02 | 0.34 | Non - Saline |
| 3897/103/2.5 | 0.01 | 0.17 | Non - Saline |
| 3897/103/8.0 | 0.02 | 0.34 | Non - Saline |
| 3897/103/10.0 | 0.02 | 0.34 | Non - Saline |
| 3897/104/2.5 | 0.01 | 0.17 | Non - Saline |
| 3897/104/10.0 | 0.01 | 0.17 | Non - Saline |
| 3897/105/2.5 | 0.01 | 0.17 | Non - Saline |
| 3897/105/10.0 | 0.01 | 0.17 | Non - Saline |
| 3897/106/5.5 | 0.01 | 0.17 | Non - Saline |

| Sample ID[1] | EC(1:5) (dS/m) | ECe (dS/m)[2] | Salinity Class Indication[3] |
|---|---|---|---|
| 3897/106/10.0 | 0.01 | 0.17 | Non - Saline |
| 3897/107/5.5 | 0.01 | 0.17 | Non - Saline |
| 3897/107/10.0 | 0.01 | 0.17 | Non - Saline |
| 3897/108/2.5 | 0.04 | 0.68 | Non - Saline |
| 3897/108/5.5 | 0.03 | 0.51 | Non - Saline |
| 3897/108/8.5 | 0.05 | 0.85 | Non - Saline |
| 3897/108/13.0 | 0.03 | 0.51 | Non - Saline |

**Notes**:

[1] Project#/Borehole#/Depth (m BGL)

[2] Based on EC to ECe multiplication factor of 17 (Table 6.1) in Department of Land and Water Conservation (2002) Guidelines.

[3] Based on Table 6.2 of Department of Land and Water Conservation (2002) where ECe <2 dS/m = Non-Saline, ECe of 2-4 dS/m = Slightly Saline, ECe of 4-8 dS/m = Moderately Saline, ECe of 8-16 dS/m = Very Saline, ECe of >16 dS/m = Highly Saline.

Results indicate tested sands are non – saline with ECe values <2 dS/m for all samples tested.

## 7.2 Soil Dispersivity Assessment

### 7.2.1 Observed Site Conditions

Field observations did not identify obvious evidence of the presence of dispersive soils at the site.

### 7.2.2 Laboratory Testing

Laboratory dispersion test results presented in MA, 2015 are summarised in Table 9. Laboratory certificates are provided in Appendix F.

**Table 9:** Dispersion test results.

| Sample ID[1] | Dispersion Index | Dispersivity[2] |
|---|---|---|
| 3897/101/13.0 | 0 | Negligible/aggregated |
| 3897/102/5.0 | 1 | Slight |
| 3897/102/7.0 | 0 | Negligible/aggregated |
| 3897/103/8.0 | 4 | Slight |
| 3897/108/5.5 | 1 | Slight |

| Sample ID[1] | Dispersion Index | Dispersivity[2] |
|---|---|---|
| 3897/108/13.0 | 0 | Negligible/aggregated |

**Notes:**

[1] Project#/Borehole#/Depth (mbgl)

[2] Based on Table 2.24 of Interpreting Soil Test Results, What Do All The Numbers Mean (2007).

Results indicate tested sands containing clays have negligible/aggregated to slight dispersibility with dispersion index values ranging from 0 to 4.

## 7.3 Soil Aggressivity Assessment

The results of laboratory analysis of electrical conductivity and pH (Table 8) of the soils were compared with criteria presented in Tables 6.4.2 (C) and 6.5.2 (C) of AS2159-2009. The results indicate these soils to have the following classification:

Soils above groundwater:

- Mildly aggressive to concrete
- Non-aggressive to steel

Soils below groundwater:

- Moderately aggressive to concrete
- Moderate to Mildly aggressive to steel

## 7.4 Conclusions

We conclude that:

- No specific management is required associated with soil salinity.
- Use of soil materials will need to consider moderate aggressivity.
- No specific management is required associated with soil dispersion.

# 8 Limitations

This report is a preliminary geotechnical and acid sulfate soils assessment. Occasionally sub-surface soil conditions in areas of the site not investigated may be found to be different from those expected. This can also occur with groundwater conditions, especially after climatic changes. Should, during site works, soil or water conditions be found to be significantly different to those detailed in this report, works shall cease immediately and the new conditions should be addressed by Martens & Associates to determine implications before recommencement.

# 9 References


Ahern C R, Stone, Y, and Blunden B (1998) *Acid Sulfate Soils Assessment Guidelines*, published by the Acid Sulfate Soil Management Advisory Committee, Wollongbar, NSW, Australia (ASSMAC,1998).

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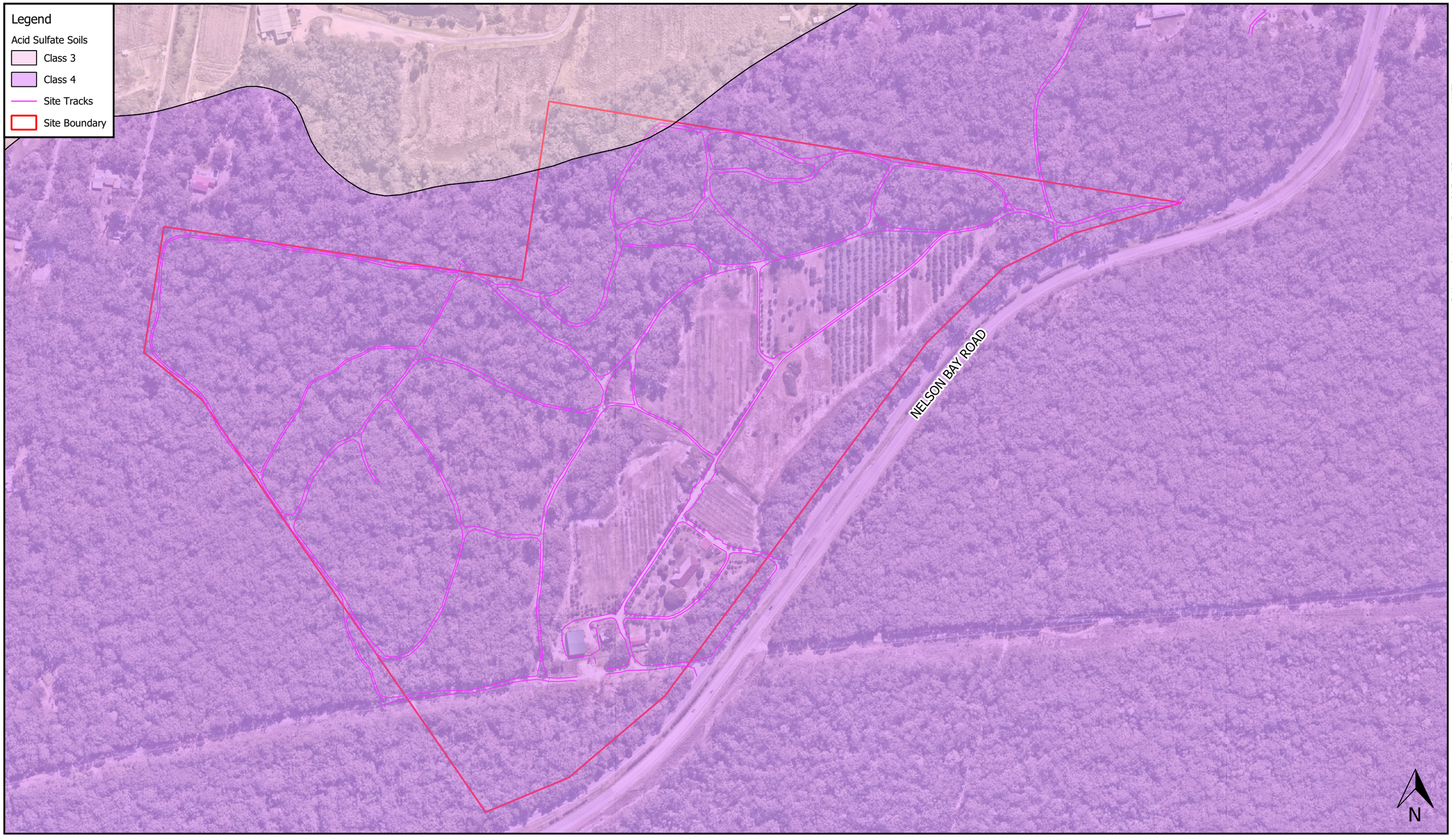
# 10 Appendix A – Maps and Figures




0 40 80 120 160 200 m

1:4000 @ A3

Notes: Aerial imagery from Nearmap (2019)

Map Title / Figure:

# ASS Risk Map

| | |
|---|---|
| Map 01 | Map |
| 51 Nelson Bay Road, Bobs Farm, NSW | Site |
| Proposed Sand Quarry | Project |
| Site Investigations | Sub-Project |
| Ammos Resource Management Pty Ltd | Client |
| 01/07/2020 | Date |

martens
Environment | Water | Geotechnics | Civil | Projects



Project No: P1303897 Model: P1303897QGS01 Projection: MGA Map Set: MS01-R02




Project No: P2511038 Map Set: MS05-R01 EPSG: 7856

0 40 80 120 160 200 m

1:4000 @ A3

Viewport

Notes:
- Aerial from Nearmap (2025).
- Site Boundary from NSW DCS Spatial services (2025).

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Environment | Water | Geotechnics | Civil | Projects

Map Title / Figure:

# Investigation Testing Plan

| | |
|---|---|
| Map 02 | Map |
| 3631 Nelson Bay Road, Bobs Farm, NSW | Site |
| Proposed Sand Quarry Development | Project |
| Additional Geotechnical and Acid Sulfate Soil Assessment | Sub-Project |
| ADW Johnson | Client |
| 24/04/2026 | Date |


0 40 80 120 160 200 m

1:4000 @ A3

Viewport

Notes:
- Aerial from Nearmap (2025).
- Site Boundary from NSW DCS Spatial services (2025).
- CONTOURS FROM Elvis LIDAR (2012).

martens
**Environment | Water | Geotechnics | Civil | Projects**

Map Title / Figure:
# Topography

| | |
|---|---|
| Map 03 | Map |
| 3631 Nelson Bay Road, Bobs Farm, NSW | Site |
| Proposed Sand Quarry Development | Project |
| Additional Geotechnical and Acid Sulfate Soil Assessment | Sub-Project |
| ADW Johnson | Client |
| 24/04/2026 | Date |

Project No: P2511038 Map Set: MS05-R01 EPSG: 7856

# 11 Appendix B – Proposed Plans

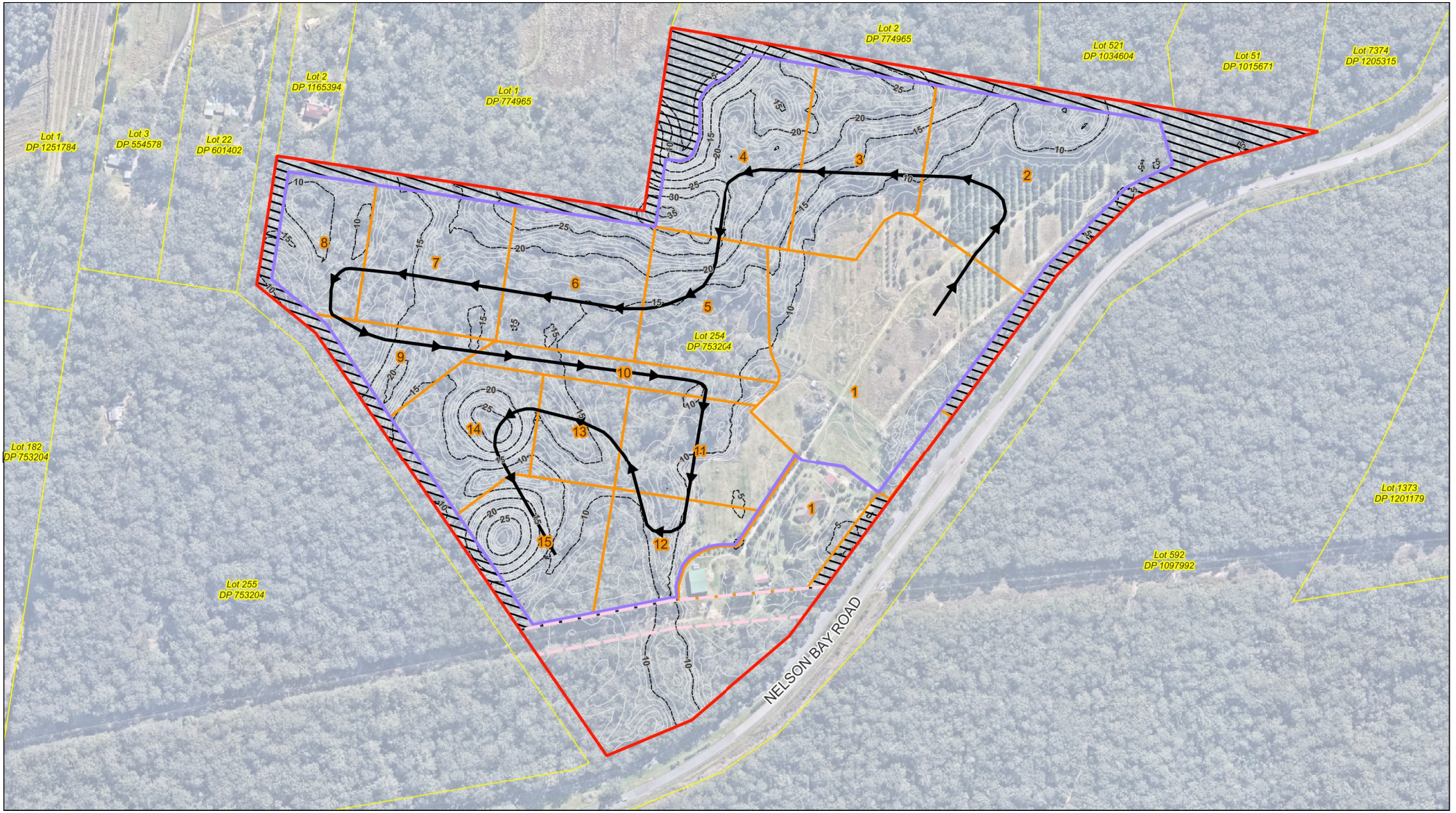
| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Plan of:** | **Bobs Farm Sand Quarry Proposal - Proposed Extraction Stages** | **Location:** | 3631 Nelson Bay Road, Bobs Farm, NSW | **Source:** | Nearmap 24/07/2025 | **Plan By:** | SK |
| **Figure:** | **Three** | **Council:** | Port Stephens | **Survey:** | 2025 Centurion Survey Pty Ltd | **Project Manager:** | GT |
| **Version/ Date:** | V2 10/03/2026 | **Tenure:** | Not Applicable | **Projection:** | GDA2020/MGA Zone 56 EPSG:7856 | | |
| **Our Ref:** | 12786_BF_ProposedExtractionStages2026_Q003_V2_F3 | **Client:** | Newcastle Sand | **Contour Interval:** | 1m | | |

N

0 25 50 75 100 m

vgt environmental compliance solutions and laboratories

This figure may be based on third party data which has not been verified by vgt and may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and vgt does not warrant its accuracy.




## Legend

- Lot Boundaries
- Project Boundary
- Buffers
- Electricity Easement

Existing Topography
- 5m
- 1m

**Proposed Stages**
- Top of Final Cut
- Extraction Path

Stage Boundaries
- 1-15

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Plan of:** | **Bobs Farm Sand Quarry Proposal - Site Plan** | **Location:** | 3631 Nelson Bay Road, Bobs Farm, NSW | **Source:** | Nearmap 24/07/2025 | **Plan By:** | SK |
| **Figure:** | **One** | **Council:** | Port Stephens | **Survey:** | Centurion 2025 | **Project Manager:** | GT |
| **Version/ Date:** | V1 10/04/2026 | **Tenure:** | Not Applicable | **Projection:** | GDA2020/MGA Zone 56 EPSG:7856 | | |
| **Our Ref:** | 12786_BF_SitePlan2026_Q001_V1_F1 | **Client:** | Newcastle Sand | **Contour Interval:** | Not Applicable | | |

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0 100 200 m

## Legend

- Project Boundary
- Sand Extraction Boundary
- Processing & Sales Area
- Buffers
- Stage 1 Works Area
- Electricity Easement
- New Acceleration Lane
- Deceleration Lane
- Light Vehicle Only Access (Existing)
- Potential Acoustic Barrier
- Potential Acoustic Barrier to Processing Area


Note:
1. Access to / from the site will be via a new Left in Left out intersection.
2. No right turns onto Nelson Bay Road are proposed.
3. Marsh Road is not to be used by sand haulage trucks.
4. All Southbound trucks to utilise Port Stephens Drive Roundabout to turn around for Southbound deliveries.

Glass Sand
2,000t

Grey
Sand
300t

Landscape
Sand
600t

Civil
Sand
600t

Washed
Sand
6,000t

Washed
Sand
6,000t

Fines

Water
Recycling

Screen 2

Washplant

Feed
Dump
Station

Screen 1

Wheel Wash

Surge
Feed
2,000t

Washed
White
300t

Overload
Tip off

Hardstand

Fuel
Cell

Fuel
Bay

4.
2.
5.
3.
1.

Weighbridge

Exit Hold Area

Office

16 x Car parks

106

NELSON BAY ROAD

# 12 Appendix C – Borehole Logs

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **CLIENT** | Ammos Resource Management Pty Ltd | COMMENCED | 29/07/14 | COMPLETED | 29/07/14 | **REF** | **BH101** |
| **PROJECT** | Acid Sulphate Soils & Geotechnical Assessment | LOGGED | GMT/BR | CHECKED | RE | Sheet | 1 of 1 |
| **SITE** | 3631, 3679 & 3721 Nelson Bay Rd & 774 Marsh Rd, Bobs Farm, NSW | GEOLOGY | Aeolian Sand | VEGETATION | NA | PROJECT NO. | P1303897 |
| **EQUIPMENT** | 4WD Truck Mounted Hydraulic Auger | EASTING | NA | RL SURFACE | Approx 11m AHD | | |
| **EXCAVATION DIMENSIONS** | Ø95mm X 13.0m depth | NORTHING | NA | ASPECT | South South West | SLOPE | 5% |

| EXCAVATION DATA | | | | | | MATERIAL DATA | | | | | SAMPLING & TESTING | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| METHOD | SUPPORT | WATER | MOISTURE | DEPTH (M) | DRILLING RESISTANCE (L M H R) | GRAPHIC LOG | CLASSIFICATION | MATERIAL DESCRIPTION (SOIL NAME, plasticity or particle characteristics, colour, secondary and minor components, moisture condition, consistency/relative density, ROCK NAME, grain size, texture/fabric, colour, strength, weathering.) | CONSISTENCY | DENSITY INDEX | TYPE | DEPTH (M) | RESULTS AND ADDITIONAL OBSERVATIONS |
| V | Nil | N | M | 0.2 | | | SP | SAND - Medium grained, light grey/grey, with minor organics, rootlets. | | VL | | | - TOPSOIL<br>- AEOLIAN |
| | | | | 1.0 | | | SP | SAND - Medium grained, light yellow/white. | | VL | | | 1.0 |
| | | | | 1.5 | | | | Grading to | | | | | - AEOLIAN |
| | | | | 2.0 | | | | | | | | | 2.0 |
| | | | | | | | | | | | A | 2.5 | 3897/101/ 2.5 |
| | | | | 3.0 | | | SP | light brown/orange/ light yellow. | | L | | | 3.0 |
| | | | | 4.0 | | | | | | | | | 4.0 |
| | | | | 4.5 | | | | Grading to | | | | | - AEOLIAN |
| | | | | 5.0 | | | | | | MD | | | 5.0 |
| | | | | | | | | | | | A | 5.5 | 3897/101/ 5.5 |
| | | | | 6.0 | | | | | | | | | 6.0 |
| V | Nil | N | M | 7.0 | | | | | | | | | 7.0 |
| | | | | 8.0 | | | | | | | | | 8.0 |
| | | | | | | | | | | | A | 8.5 | 3897/101/ 8.5 |
| | | | | 9.0 | | | SP | light yellow/white. | | L | | | 9.0 |
| | | | | 10.0 | | | | | | | A | 10.0 | 3897/101/ 10.0 |
| | | 11.0 ▽ | | 11.0 | | | | | | | | | - Groundwater at ~11.0m. |
| | | Y | W | 12.0 | | | | | | | | | 12.0 |
| | | | | 13.0 | | | | | | | A | 13.0 | 3897/101/ 13.0 |
| | | | | | | | | Borehole terminated at 13.0m in sand. | | | | | |
| | | | | 14.0 | | | | | | | | | 14.0 |
| | | | | 15.0 | | | | | | | | | 15.0 |
| | | | | 16.0 | | | | | | | | | 16.0 |
| | | | | 17.0 | | | | | | | | | 17.0 |
| | | | | 18.0 | | | | | | | | | 18.0 |

EQUIPMENT / METHOD
N Natural exposure
X Existing excavation
BH Backhoe bucket
HA Hand auger
S Spade
CC Concrete Corer
V V-Bit
TC Tungsten Carbide Bit
PT Push tube

SUPPORT
SH Shoring
SC Shotcrete
RB Rock Bolts
Nil No support

WATER
N None observed
X Not measured
▽ Water level
◁ Water outflow
▷ Water inflow

MOISTURE
D Dry
M Moist
W Wet
Wp Plastic limit
Wl Liquid limit

DRILLING RESISTANCE
L Low
M Moderate
H High
R Refusal

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

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

SAMPLING & TESTING
A Auger sample
B Bulk sample
U Undisturbed sample
D Disturbed sample
M Moisture content
Ux Tube sample (x mm)

pp Pocket penetrometer
S Standard penetration test
VS Vane shear
DCP Dynamic cone penetrometer
FD Field density
WS Water sample

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
Y USCS
N Agricultural

EXCAVATION LOG TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

Quality Sheet No. 4

martens



MARTENS & ASSOCIATES PTY LTD
20 George St, Hornsby, NSW 2077 Australia
Phone: (02) 9476 9999 Fax: (02) 9476 8767
mail@martens.com.au WEB: http://www.martens.com.au

**Engineering Log - Borehole**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **CLIENT** | Ammos Resource Management Pty Ltd | **COMMENCED** | 29/07/14 | **COMPLETED** | 29/07/14 | **REF** | **BH102** |
| **PROJECT** | Acid Sulphate Soils & Geotechnical Assessment | **LOGGED** | GMT/BR | **CHECKED** | RE | **Sheet** | 1 of 1 |
| **SITE** | 3631, 3679 & 3721 Nelson Bay Rd & 774 Marsh Rd, Bobs Farm, NSW | **GEOLOGY** | Aeolian Sand | **VEGETATION** | NA | **PROJECT NO.** | P1303897 |
| **EQUIPMENT** | 4WD Truck Mounted Hydraulic Auger | **EASTING** | NA | **RL SURFACE** | Approx 6m AHD | | |
| **EXCAVATION DIMENSIONS** | Ø95mm X 10.0m depth | **NORTHING** | NA | **ASPECT** | South East | **SLOPE** | 2% |

| EXCAVATION DATA | | | | | | MATERIAL DATA | | | | SAMPLING & TESTING | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| METHOD | SUPPORT | WATER | MOISTURE | DEPTH (M) | DRILLING RESISTANCE (L M H R) | GRAPHIC LOG | CLASSIFICATION | MATERIAL DESCRIPTION<br>SOIL NAME, plasticity or particle characteristics, colour, secondary and minor components, moisture condition, consistency/relative density,<br>ROCK NAME, grain size, texture/fabric, colour, strength, weathering. | CONSISTENCY | DENSITY INDEX | TYPE | DEPTH (M) | RESULTS AND ADDITIONAL OBSERVATIONS |
| V | Nil | N | M | 0.3 | | | SP | SAND - Medium grained, grey/black, minor organics and rootlets. | | VL | | | - TOPSOIL |
| | | | | | | | | | | | | | - AEOLIAN |
| V | Nil | N | M | 1.0 | | | SP | SAND - Medium grained, light grey/yellow/white. | | L | A | 1.5 | 3897/102/ 1.5 |
| | | | | 2.0 | | | | | | | | | - AEOLIAN |
| | | | | | | | SP | Grading to orange/brown. | | L | A | 2.5 | 3897/102/ 2.5 |
| | | | | 3.0 | | | | | | | | | |
| | | 3.5 ▽ | | 3.5 | | | | | | | | | - Groundwater at ~3.5m. |
| | | | | | | | | Grading to | | | | | - AEOLIAN |
| | | | | 4.0 | | | | | | | A | 4.0 | 3897/102/ 4.0 |
| V | Nil | Y | W | 4.9 | | | SP | yellow/white. | | VL | | | |
| | | | | 5.0 | | | | | | | A/B | 5.0 | 3897/102/ 5.0 - MARINE |
| V | Nil | Y | W | 6.0 | | | SC | Clayey SAND - Medium grained, grey with sandy clay layers, dark grey. | | MD | | | |
| | | | | 6.5 | | | | | | | | | - MARINE |
| | | | | 7.0 | | | | | | | A/B | 7.0 | 3897/102/ 7.0 |
| | | | | | | | | | | | A | 7.5 | 3897/102/ 7.5 |
| | | | | 8.0 | | | | | | | | | |
| V | Nil | Y | W | | | | SP | SAND - Medium grained, light grey, inferred dense. | | D | | | |
| | | | | | | | | | | | A | 8.5 | 3897/102/ 8.5 |
| | | | | 9.0 | | | | | | | | | |
| | | | | 10.0 | | | | | | | A | 10.0 | 3897/102/ 10.0 |
| | | | | | | | | Borehole terminated at 10.0m in sand. | | | | | |
| | | | | 11.0 | | | | | | | | | |
| | | | | 12.0 | | | | | | | | | |
| | | | | 13.0 | | | | | | | | | |
| | | | | 14.0 | | | | | | | | | |
| | | | | 15.0 | | | | | | | | | |
| | | | | 16.0 | | | | | | | | | |
| | | | | 17.0 | | | | | | | | | |
| | | | | 18.0 | | | | | | | | | |

EQUIPMENT / METHOD
N Natural exposure
X Existing excavation
BH Backhoe bucket
HA Hand auger
S Spade
CC Concrete Corer
V V-Bit
TC Tungsten Carbide Bit
PT Push tube

SUPPORT
SH Shoring
SC Shotcrete
RB Rock Bolts
Nil No support

WATER
N None observed
X Not measured
▽ Water level
◁ Water outflow
▷ Water inflow

MOISTURE
D Dry
M Moist
W Wet
Wp Plastic limit
Wl Liquid limit

DRILLING RESISTANCE
L Low
M Moderate
H High
R Refusal

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

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

SAMPLING & TESTING
A Auger sample
B Bulk sample
U Undisturbed sample
D Disturbed sample
M Moisture content
Ux Tube sample (x mm)
pp Pocket penetrometer
S Standard penetration test
VS Vane shear
DCP Dynamic cone penetrometer
FD Field density
WS Water sample

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
Y USCS
N Agricultural

EXCAVATION LOG TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

Quality Sheet No. 4

martens



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**Engineering Log - Borehole**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **CLIENT** | Ammos Resource Management Pty Ltd | **COMMENCED** | 29/07/14 | **COMPLETED** | 29/07/14 | **REF** | **BH103** |
| **PROJECT** | Acid Sulphate Soils & Geotechnical Assessment | **LOGGED** | GMT/BR | **CHECKED** | RE | **Sheet** | 1 of 1 |
| **SITE** | 3631, 3679 & 3721 Nelson Bay Rd & 774 Marsh Rd, Bobs Farm, NSW | **GEOLOGY** | Aeolian Sand | **VEGETATION** | NA | **PROJECT NO.** | P1303897 |
| **EQUIPMENT** | 4WD Truck Mounted Hydraulic Auger | **EASTING** | NA | **RL SURFACE** | Approx 9m AHD | | |
| **EXCAVATION DIMENSIONS** | Ø95mm X 10.0m depth | **NORTHING** | NA | **ASPECT** | East | **SLOPE** | 2% |

| EXCAVATION DATA | | | | | | MATERIAL DATA | | | | SAMPLING & TESTING | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| METHOD | SUPPORT | WATER | MOISTURE | DEPTH (M) | DRILLING RESISTANCE (L M H R) | GRAPHIC LOG | CLASSIFICATION | MATERIAL DESCRIPTION<br>SOIL NAME, plasticity or particle characteristics, colour, secondary and minor components, moisture condition, consistency/relative density,<br>ROCK NAME, grain size, texture/fabric, colour, strength, weathering. | CONSISTENCY | DENSITY INDEX | TYPE | DEPTH (M) | RESULTS AND ADDITIONAL OBSERVATIONS |
| V | Nil | N | M | 0.2 | | | SP | SAND - Medium grained, dark grey, some organics, rootlets. | | VL | | | - TOPSOIL |
| | | | | 0.9 | | | SP | | | L | A/B | 0.5 | 3897/103/ 0.5 - AEOLIAN |
| | | | | 1.0 | | | | SAND - Medium grained, light grey. | | | | | - AEOLIAN 1.0 |
| | | | | | | | | Grading to | | L | A/B | 1.5 | 3897/103/ 1.5 |
| | | | | 2.0 | | | | | | | | | 2.0 |
| | | | | | | | | | | | A | 2.5 | 3897/103/ 2.5 |
| | | | | 3.0 | | | SP | yellow/orange. | | MD | | | 3.0 |
| V | Nil | N | M | 4.0 | | | | | | | A | 4.0 | 3897/103/ 4.0 4.0 |
| | | | | 4.8 | | | | | | | | | |
| | | | | 5.0 | | | | Grading to | | | | | - AEOLIAN 5.0 |
| | | | | | | | | | | | A | 5.5 | 3897/103/ 5.5 |
| | | | | 6.0 | | | | | | | | | 6.0 |
| | | 6.8 ▽ | | | | | SP | yellow/white. | | L | | | - Groundwater at 6.8m. |
| | | | | 7.0 | | | | | | | A/B | 7.0 | 3897/103/ 7.0 7.0 |
| | | Y | W | | | | | | | | A | 7.5 | 3897/103/ 7.5 |
| | | | | 8.0 | | | | | | | A | 8.0 | 3897/103/ 8.0 8.0 |
| V | Nil | Y | W | | | | SP | SAND - With minor organics, medium grained, inferred medium dense, dark brown. | | MD | | | - MARINE |
| | | | | 8.5 | | | | | | | | | - MARINE |
| | | | | 9.0 | | | | | | | | | 9.0 |
| V | Nil | Y | W | | | | SP | SAND - Medium grained, inferred medium dense, brown/light brown. | | MD | | | |
| | | | | 10.0 | | | | | | | A/B | 10.0 | 3897/103/ 10.0 10.0 |
| | | | | | | | | Borehole terminated at 10.0m in sand. | | | | | |
| | | | | 11.0 | | | | | | | | | 11.0 |
| | | | | 12.0 | | | | | | | | | 12.0 |
| | | | | 13.0 | | | | | | | | | 13.0 |
| | | | | 14.0 | | | | | | | | | 14.0 |
| | | | | 15.0 | | | | | | | | | 15.0 |
| | | | | 16.0 | | | | | | | | | 16.0 |
| | | | | 17.0 | | | | | | | | | 17.0 |
| | | | | 18.0 | | | | | | | | | 18.0 |

EQUIPMENT / METHOD
N Natural exposure
X Existing excavation
BH Backhoe bucket
HA Hand auger
S Spade
CC Concrete Corer
V V-Bit
TC Tungsten Carbide Bit
PT Push tube

SUPPORT
SH Shoring
SC Shotcrete
RB Rock Bolts
Nil No support

WATER
N None observed
X Not measured
▽ Water level
◁ Water outflow
▷ Water inflow

MOISTURE
D Dry
M Moist
W Wet
Wp Plastic limit
Wl Liquid limit

DRILLING RESISTANCE
L Low
M Moderate
H High
R Refusal

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

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

SAMPLING & TESTING
A Auger sample
B Bulk sample
U Undisturbed sample
D Disturbed sample
M Moisture content
Ux Tube sample (x mm)
pp Pocket penetrometer
S Standard penetration test
VS Vane shear
DCP Dynamic cone penetrometer
FD Field density
WS Water sample

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
Y USCS
N Agricultural

EXCAVATION LOG TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

Quality Sheet No. 4

martens



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**Engineering Log - Borehole**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **CLIENT** | Ammos Resource Management Pty Ltd | **COMMENCED** | 30/07/14 | **COMPLETED** | 30/07/14 | **REF** | **BH104** |
| **PROJECT** | Acid Sulphate Soils & Geotechnical Assessment | **LOGGED** | GMT/BR | **CHECKED** | RE | **Sheet** | 1 of 1 |
| **SITE** | 3631, 3679 & 3721 Nelson Bay Rd & 774 Marsh Rd, Bobs Farm, NSW | **GEOLOGY** | Aeolian Sand | **VEGETATION** | NA | **PROJECT NO.** | P1303897 |
| **EQUIPMENT** | 4WD Truck Mounted Hydraulic Auger | **EASTING** | NA | **RL SURFACE** | 27m AHD | | |
| **EXCAVATION DIMENSIONS** | Ø95mm X 10.0m depth | **NORTHING** | NA | **ASPECT** | South South West | **SLOPE** | 2% |

| EXCAVATION DATA | | | | | | MATERIAL DATA | | | | SAMPLING & TESTING | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| METHOD | SUPPORT | WATER | MOISTURE | DEPTH (M) | DRILLING RESISTANCE (L M H R) | GRAPHIC LOG | CLASSIFICATION | MATERIAL DESCRIPTION<br>SOIL NAME, plasticity or particle characteristics, colour, secondary and minor components, moisture condition, consistency/relative density,<br>ROCK NAME, grain size, texture/fabric, colour, strength, weathering. | CONSISTENCY | DENSITY INDEX | TYPE | DEPTH (M) | RESULTS AND ADDITIONAL OBSERVATIONS |
| V | Nil | N | M | 0.2 | | | SP | SAND - Medium grained, dark grey/grey, minor organics. | | MD | | | - TOPSOIL |
| | | | | | | | SP | SAND - Medium grained, light grey/grey. | | L | A | 0.5 | 3897/104/ 0.5 - AEOLIAN |
| | | | | 1.0 | | | | | | | | | 1.0 |
| | | | | 1.2 | | | | Grading to | | | | | - AEOLIAN |
| | | | | 2.0 | | | | | | | | | 2.0 |
| | | | | | | | SP | orange/brown. | | L | A | 2.5 | 3897/104/ 2.5 |
| | | | | 3.0 | | | | | | | | | 3.0 |
| | | | | 3.5 | | | | Grading to | | | | | - AEOLIAN |
| | | | | 4.0 | | | | | | | | | 4.0 |
| V | Nil | N | M | | | | | | | | | | |
| | | | | 5.0 | | | SP | yellow/brown. | | L | A | 5.5 | 3897/104/ 5.5 |
| | | | | 6.0 | | | | | | | | | 6.0 |
| | | | | 7.0 | | | | Grading to | | | | | - AEOLIAN |
| | | | | 8.0 | | | | | | | | | 8.0 |
| | | | | | | | SP | light yellow white. | | L | | | |
| | | | | 9.0 | | | | | | | | | 9.0 |
| | | | | | | | | | | MD | | | |
| | | | | 10.0 | | | | | | | A | 10.0 | 3897/104/ 10.0 10.0 |
| | | | | | | | | Borehole terminated at 10.0m in sand. | | | | | |
| | | | | 11.0 | | | | | | | | | 11.0 |
| | | | | 12.0 | | | | | | | | | 12.0 |
| | | | | 13.0 | | | | | | | | | 13.0 |
| | | | | 14.0 | | | | | | | | | 14.0 |
| | | | | 15.0 | | | | | | | | | 15.0 |
| | | | | 16.0 | | | | | | | | | 16.0 |
| | | | | 17.0 | | | | | | | | | 17.0 |
| | | | | 18.0 | | | | | | | | | 18.0 |

EQUIPMENT / METHOD
N Natural exposure
X Existing excavation
BH Backhoe bucket
HA Hand auger
S Spade
CC Concrete Corer
V V-Bit
TC Tungsten Carbide Bit
PT Push tube

SUPPORT
SH Shoring
SC Shotcrete
RB Rock Bolts
Nil No support

WATER
N None observed
X Not measured
Water level
Water outflow
Water inflow

MOISTURE
D Dry
M Moist
W Wet
Wp Plastic limit
Wl Liquid limit

DRILLING RESISTANCE
L Low
M Moderate
H High
R Refusal

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

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

SAMPLING & TESTING
A Auger sample
B Bulk sample
U Undisturbed sample
D Disturbed sample
M Moisture content
Ux Tube sample (x mm)
pp Pocket penetrometer
S Standard penetration test
VS Vane shear
DCP Dynamic cone penetrometer
FD Field density
WS Water sample

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
Y USCS
N Agricultural

EXCAVATION LOG TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

Quality Sheet No. 4

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**Engineering Log - Borehole**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **CLIENT** | Ammos Resource Management Pty Ltd | **COMMENCED** | 30/07/14 | **COMPLETED** | 30/07/14 | **REF** | **BH105** |
| **PROJECT** | Acid Sulphate Soils & Geotechnical Assessment | **LOGGED** | GMT/BR | **CHECKED** | RE | **Sheet** | 1 of 1 |
| **SITE** | 3631, 3679 & 3721 Nelson Bay Rd & 774 Marsh Rd, Bobs Farm, NSW | **GEOLOGY** | Aeolian Sand | **VEGETATION** | NA | **PROJECT NO.** | P1303897 |
| **EQUIPMENT** | 4WD Truck Mounted Hydraulic Auger | **EASTING** | NA | **RL SURFACE** | Approx 15m AHD | | |
| **EXCAVATION DIMENSIONS** | Ø95mm X 10.0m depth | **NORTHING** | NA | **ASPECT** | East | **SLOPE** | 2-4% |

| EXCAVATION DATA | | | | | | MATERIAL DATA | | | | | SAMPLING & TESTING | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| METHOD | SUPPORT | WATER | MOISTURE | DEPTH (M) | DRILLING RESISTANCE (L M H R) | GRAPHIC LOG | CLASSIFICATION | MATERIAL DESCRIPTION<br>SOIL NAME, plasticity or particle characteristics, colour, secondary and minor components, moisture condition, consistency/relative density,<br>ROCK NAME, grain size, texture/fabric, colour, strength, weathering. | CONSISTENCY | DENSITY INDEX | TYPE | DEPTH (M) | RESULTS AND ADDITIONAL OBSERVATIONS |
| V | Nil | N | M | 0.3 | | | SP | SAND - Medium grained, dark grey, minor organics. | | L | | | - TOPSOIL |
| | | | | | | | | | | | A | 0.5 | 3897/105/ 0.5 - AEOLIAN |
| | | | | 1.0 | | | SP | SAND - Medium grained, light grey/orange. | | L | | | 1.0 |
| | | | | 1.5 | | | | Grading to | | | | | - AEOLIAN |
| | | | | 2.0 | | | | | | L | | | 2.0 |
| | | | | | | | SP | brown/orange. | | | | | |
| | | | | | | | | | | VL | A | 2.5 | 3897/105/ 2.5 |
| | | | | 3.0 | | | | Grading to | | | | | - AEOLIAN 3.0 |
| | | | | 4.0 | | | | | | | | | 4.0 |
| V | Nil | N | M | 5.0 | | | | | | | | | 5.0 |
| | | | | | | | | | | | A | 5.5 | 3897/105/ 5.5 |
| | | | | 6.0 | | | | | | | | | 6.0 |
| | | | | | | | SP | light yellow/white. | | VL | | | |
| | | | | 7.0 | | | | | | | | | 7.0 |
| | | | | 8.0 | | | | | | | | | 8.0 |
| | | | | 9.0 | | | | | | | | | 9.0 |
| | | | | 10.0 | | | | | | | A | 10.0 | 3897/105/ 10.0 10.0 |
| | | | | | | | | Borehole terminated at 10.0m in sand. | | | | | |
| | | | | 11.0 | | | | | | | | | 11.0 |
| | | | | 12.0 | | | | | | | | | 12.0 |
| | | | | 13.0 | | | | | | | | | 13.0 |
| | | | | 14.0 | | | | | | | | | 14.0 |
| | | | | 15.0 | | | | | | | | | 15.0 |
| | | | | 16.0 | | | | | | | | | 16.0 |
| | | | | 17.0 | | | | | | | | | 17.0 |
| | | | | 18.0 | | | | | | | | | 18.0 |

EQUIPMENT / METHOD
N Natural exposure
X Existing excavation
BH Backhoe bucket
HA Hand auger
S Spade
CC Concrete Corer
V V-Bit
TC Tungsten Carbide Bit
PT Push tube

SUPPORT
SH Shoring
SC Shotcrete
RB Rock Bolts
Nil No support

WATER
N None observed
X Not measured
Water level
Water outflow
Water inflow

MOISTURE
D Dry
M Moist
W Wet
Wp Plastic limit
Wl Liquid limit

DRILLING RESISTANCE
L Low
M Moderate
H High
R Refusal

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

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

SAMPLING & TESTING
A Auger sample
B Bulk sample
U Undisturbed sample
D Disturbed sample
M Moisture content
Ux Tube sample (x mm)

pp Pocket penetrometer
S Standard penetration test
VS Vane shear
DCP Dynamic cone penetrometer
FD Field density
WS Water sample

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
Y USCS
N Agricultural

EXCAVATION LOG TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

Quality Sheet No. 4

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**Engineering Log - Borehole**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **CLIENT** | Ammos Resource Management Pty Ltd | **COMMENCED** | 30/07/14 | **COMPLETED** | 30/07/14 | **REF** | **BH106** |
| **PROJECT** | Acid Sulphate Soils & Geotechnical Assessment | **LOGGED** | GMT/BR | **CHECKED** | RE | **Sheet** | 1 of 1 |
| **SITE** | 3631, 3679 & 3721 Nelson Bay Rd & 774 Marsh Rd, Bobs Farm, NSW | **GEOLOGY** | Aeolian Sand | **VEGETATION** | NA | **PROJECT NO.** | P1303897 |
| **EQUIPMENT** | 4WD Truck Mounted Hydraulic Auger | **EASTING** | NA | **RL SURFACE** | Approx 20m AHD | | |
| **EXCAVATION DIMENSIONS** | Ø95mm X 10.0m depth | **NORTHING** | NA | **ASPECT** | South South West | **SLOPE** | 2% |

| EXCAVATION DATA | | | | | | MATERIAL DATA | | | | SAMPLING & TESTING | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| METHOD | SUPPORT | WATER | MOISTURE | DEPTH (M) | DRILLING RESISTANCE (L M H R) | GRAPHIC LOG | CLASSIFICATION | MATERIAL DESCRIPTION<br>SOIL NAME, plasticity or particle characteristics, colour, secondary and minor components, moisture condition, consistency/relative density, ROCK NAME, grain size, texture/fabric, colour, strength, weathering. | CONSISTENCY | DENSITY INDEX | TYPE | DEPTH (M) | RESULTS AND ADDITIONAL OBSERVATIONS |
| V | Nil | N | M | 0.3 | | | SP | SAND - Medium grained, beige. | | VL | | | - TOPSOIL |
| | | | | | | | | | | L | A | 0.5 | 3897/106/0.5 - AEOLIAN |
| | | | | 1.0 | | | | | | | | | |
| | | | | 1.5 | | | | | | MD | | | |
| | | | | 2.0 | | | | | | | | | |
| | | | | | | | | | | | A | 2.5 | 3897/106/2.5 |
| | | | | 3.0 | | | | | | L | | | |
| | | | | 4.0 | | | | | | | | | |
| V | Nil | N | M | 5.0 | | | SP | SAND - Medium grained, yellow tending to light yellow between 2.5m trace mineral bands <5mm thick, dark grey | | MD | | | |
| | | | | | | | | | | | A | 5.5 | 3897/106/5.5 |
| | | | | 6.0 | | | | | | | | | |
| | | | | 7.0 | | | | | | | | | |
| | | | | 8.0 | | | | | | | | | |
| | | | | 9.0 | | | | | | | | | |
| | | | | 10.0 | | | | | | | A | 10.0 | 3897/106/10.0 |
| | | | | | | | | Borehole terminated at 10.0m in sand. | | | | | |
| | | | | 11.0 | | | | | | | | | |
| | | | | 12.0 | | | | | | | | | |
| | | | | 13.0 | | | | | | | | | |
| | | | | 14.0 | | | | | | | | | |
| | | | | 15.0 | | | | | | | | | |
| | | | | 16.0 | | | | | | | | | |
| | | | | 17.0 | | | | | | | | | |
| | | | | 18.0 | | | | | | | | | |

EQUIPMENT / METHOD
N Natural exposure
X Existing excavation
BH Backhoe bucket
HA Hand auger
S Spade
CC Concrete Corer
V V-Bit
TC Tungsten Carbide Bit
PT Push tube

SUPPORT
SH Shoring
SC Shotcrete
RB Rock Bolts
Nil No support

WATER
N None observed
X Not measured
Water level
Water outflow
Water inflow

MOISTURE
D Dry
M Moist
W Wet
Wp Plastic limit
Wl Liquid limit

DRILLING RESISTANCE
L Low
M Moderate
H High
R Refusal

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

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

SAMPLING & TESTING
A Auger sample
B Bulk sample
U Undisturbed sample
D Disturbed sample
M Moisture content
Ux Tube sample (x mm)
pp Pocket penetrometer
S Standard penetration test
VS Vane shear
DCP Dynamic cone penetrometer
FD Field density
WS Water sample

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
Y USCS
N Agricultural

EXCAVATION LOG TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

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**Engineering Log - Borehole**

Quality Sheet No. 4

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **CLIENT** | **Ammos Resource Management Pty Ltd** | **COMMENCED** | 30/07/14 | **COMPLETED** | 30/07/14 | **REF** | **BH107** |
| **PROJECT** | **Acid Sulphate Soils & Geotechnical Assessment** | **LOGGED** | GMT/BR | **CHECKED** | RE | **Sheet** | **1 of 1** |
| **SITE** | **3631, 3679 & 3721 Nelson Bay Rd & 774 Marsh Rd, Bobs Farm, NSW** | **GEOLOGY** | Aeolian Sand | **VEGETATION** | NA | **PROJECT NO.** | P1303897 |
| **EQUIPMENT** | 4WD Truck Mounted Hydraulic Auger | **EASTING** | NA | **RL SURFACE** | Approx 6m AHD | | |
| **EXCAVATION DIMENSIONS** | Ø95mm X 10.0m depth | **NORTHING** | NA | **ASPECT** | South East | **SLOPE** | 2% |

| EXCAVATION DATA | | | | | | MATERIAL DATA | | | | SAMPLING & TESTING | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| METHOD | SUPPORT | WATER | MOISTURE | DEPTH (M) | DRILLING RESISTANCE (L M H R) | GRAPHIC LOG | CLASSIFICATION | MATERIAL DESCRIPTION<br>SOIL NAME, plasticity or particle characteristics, colour, secondary and minor components, moisture condition, consistency/relative density, ROCK NAME, grain size, texture/fabric, colour, strength, weathering. | CONSISTENCY | DENSITY INDEX | TYPE | DEPTH (M) | RESULTS AND ADDITIONAL OBSERVATIONS |
| V | Nil | N | M | 0.2 | | | SP | SAND - Medium grained, minor organics and rootlets. | | VL | | | - TOPSOIL<br>- AEOLIAN |
| | | | | 1.0 | | | | | | | | | 1.0 |
| | | | | 2.0 | | | SP | SAND - Medium grained, light brown/yellow/orange. | | L | | | 2.0 |
| | | | | 3.0 | | | | | | | | | 3.0 |
| | | N | M | 4.0 | | | | | | | | | 4.0 |
| | | 4.5 ▽ | | | | | | Grading to | | | | | - MARINE<br>- Hole collapsed groundwater back to 4.5m. |
| V | Nil | Y | W | 5.0 | | | | | | | | | 5.0 |
| | | | | | | | | | | | A/B | 5.5 | 3897/107/5.5 |
| | | | | 6.0 | | | | | | | | | 6.0 |
| | | | | | | | | | | L | | | |
| | | | | 7.0 | | | SP | yellow/light grey. | | | A | 7.0 | 3897/107/7.0 7.0 |
| | | | | 8.0 | | | | | | | | | 8.0 |
| | | | | | | | | | | | A | 8.5 | 3897/107/8.5 |
| | | | | 9.0 | | | | | | MD | | | 9.0 |
| | | | | 10.0 | | | | | | | A | 10.0 | 3897/107/10.0 10.0 |
| | | | | | | | | Borehole terminated at 10.0m in sand. | | | | | |
| | | | | 11.0 | | | | | | | | | 11.0 |
| | | | | 12.0 | | | | | | | | | 12.0 |
| | | | | 13.0 | | | | | | | | | 13.0 |
| | | | | 14.0 | | | | | | | | | 14.0 |
| | | | | 15.0 | | | | | | | | | 15.0 |
| | | | | 16.0 | | | | | | | | | 16.0 |
| | | | | 17.0 | | | | | | | | | 17.0 |
| | | | | 18.0 | | | | | | | | | 18.0 |

EQUIPMENT / METHOD
N Natural exposure
X Existing excavation
BH Backhoe bucket
HA Hand auger
S Spade
CC Concrete Corer
V V-Bit
TC Tungsten Carbide Bit
PT Push tube

SUPPORT
SH Shoring
SC Shotcrete
RB Rock Bolts
Nil No support

WATER
N None observed
X Not measured
▽ Water level
◁ Water outflow
▷ Water inflow

MOISTURE
D Dry
M Moist
W Wet
Wp Plastic limit
Wl Liquid limit

DRILLING RESISTANCE
L Low
M Moderate
H High
R Refusal

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

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

SAMPLING & TESTING
A Auger sample
B Bulk sample
U Undisturbed sample
D Disturbed sample
M Moisture content
Ux Tube sample (x mm)
pp Pocket penetrometer
S Standard penetration test
VS Vane shear
DCP Dynamic cone penetrometer
FD Field density
WS Water sample

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
Y USCS
N Agricultural

EXCAVATION LOG TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

Quality Sheet No. 4

martens



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***Engineering Log - Borehole***

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **CLIENT** | **Ammos Resource Management Pty Ltd** | **COMMENCED** | 29/07/14 | **COMPLETED** | 29/07/14 | **REF** | **BH108** |
| **PROJECT** | **Acid Sulphate Soils & Geotechnical Assessment** | **LOGGED** | GMT/BR | **CHECKED** | RE | **Sheet** | **1 of 1** |
| **SITE** | **3631, 3679 & 3721 Nelson Bay Rd & 774 Marsh Rd, Bobs Farm, NSW** | **GEOLOGY** | Aeolian Sand | **VEGETATION** | NA | **PROJECT NO.** | P1303897 |
| **EQUIPMENT** | 4WD Truck Mounted Hydraulic Auger | **EASTING** | NA | **RL SURFACE** | Approx 6m AHD | | |
| **EXCAVATION DIMENSIONS** | Ø95mm X 13.0m depth | **NORTHING** | NA | **ASPECT** | East | **SLOPE** | 0-2% |

| EXCAVATION DATA | | | | | | MATERIAL DATA | | | | SAMPLING & TESTING | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| METHOD | SUPPORT | WATER | MOISTURE | DEPTH (M) | DRILLING RESISTANCE (L M H R) | GRAPHIC LOG | CLASSIFICATION | MATERIAL DESCRIPTION<br>SOIL NAME, plasticity or particle characteristics, colour, secondary and minor components, moisture condition, consistency/relative density, ROCK NAME, grain size, texture/fabric, colour, strength, weathering. | CONSISTENCY | DENSITY INDEX | TYPE | DEPTH (M) | RESULTS AND ADDITIONAL OBSERVATIONS |
| V | Nil | N | M | 0.4 | | | SP | SAND - Medium grained, grey/light grey, minor organics. | | VL | | | - TOPSOIL |
| | | | | | | | SP | SAND - Medium grained, light grey. | | VL | A | 0.5 | 3897/108/0.5 - AEOLIAN |
| | | | | 1.0 | | | | Grading to | | | | | - AEOLIAN |
| | | | | 2.0 | | | SP | light grey and brown. | | L | | | |
| | | | | | | | | | | | A | 2.5 | 3897/108/2.5 |
| | | 3.5 ▽ | | 3.0 | | | | | | | | | |
| | | | | 3.5 | | | | | | | | | - Groundwater at 3.5m. |
| | | | | | | | | Grading to | | | | | - MARINE |
| | | | | 4.0 | | | SP | brown. | | MD | | | |
| | | | | 5.0 | | | | | | | A | 5.5 | 3897/108/5.5 |
| | | | | 6.0 | | | | Grading to | | | | | - MARINE |
| V | Nil | Y | W | 7.0 | | | | | | L | | | |
| | | | | 8.0 | | | | | | | A | 8.5 | 3897/108/8.5 |
| | | | | 9.0 | | | SP | grey. | | | | | |
| | | | | 10.0 | | | | | | | | | |
| | | | | 11.0 | | | | | | MD | | | |
| | | | | 12.0 | | | | | | | | | |
| | | | | 13.0 | | | | | | | A | 13.0 | 3897/108/13.0 |
| | | | | | | | | Borehole terminated at 13.0m in sand. | | | | | |
| | | | | 14.0 | | | | | | | | | |
| | | | | 15.0 | | | | | | | | | |
| | | | | 16.0 | | | | | | | | | |
| | | | | 17.0 | | | | | | | | | |
| | | | | 18.0 | | | | | | | | | |

EQUIPMENT / METHOD
N Natural exposure
X Existing excavation
BH Backhoe bucket
HA Hand auger
S Spade
CC Concrete Corer
V V-Bit
TC Tungsten Carbide Bit
PT Push tube

SUPPORT
SH Shoring
SC Shotcrete
RB Rock Bolts
Nil No support

WATER
N None observed
X Not measured
▽ Water level
◁ Water outflow
▷ Water inflow

MOISTURE
D Dry
M Moist
W Wet
Wp Plastic limit
Wl Liquid limit

DRILLING RESISTANCE
L Low
M Moderate
H High
R Refusal

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

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

SAMPLING & TESTING
A Auger sample
B Bulk sample
U Undisturbed sample
D Disturbed sample
M Moisture content
Ux Tube sample (x mm)
pp Pocket penetrometer
S Standard penetration test
VS Vane shear
DCP Dynamic cone penetrometer
FD Field density
WS Water sample

CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION
Y USCS
N Agricultural

EXCAVATION LOG TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

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**Engineering Log - Borehole**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| CLIENT | Ammos Resource Management Pty Ltd | | COMMENCED | 01/10/2019 | COMPLETED | 01/10/2019 | **REF BH401** |
| PROJECT | Supplementary Acid Sulfate Soils Assessment | | LOGGED | DI | CHECKED | JF | Sheet 1 OF 2 |
| SITE | 3631 Nelson Bay Road, Bobs Farm, NSW | | GEOLOGY | Quaternary | VEGETATION | None | PROJECT NO. P1303897 |
| EQUIPMENT | | 4WD truck-mounted hydraulic drill rig | EASTING | 151.999298 | RL SURFACE | 16.11 m | DATUM AHD |
| EXCAVATION DIMENSIONS | | Ø100 mm x 18.50 m depth | NORTHING | -32.774238 | ASPECT | Northeast | SLOPE <5% |

| Drilling | | | | | Sampling | | Field Material Description | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| METHOD | PENETRATION RESISTANCE | WATER | DEPTH (metres) | DEPTH RL | SAMPLE OR FIELD TEST | RECOVERED | GRAPHIC LOG | USCS / ASCS CLASSIFICATION | SOIL/ROCK MATERIAL DESCRIPTION | MOISTURE CONDITION | CONSISTENCY DENSITY | STRUCTURE AND ADDITIONAL OBSERVATIONS |
| | | | | 16.11 | 3897/BH401/0.0-0.2/S/1 D 0.00 m | | | SP | SAND; fine to medium grained; dark grey and grey; with silt. | | | AEOLIAN DEPOSITS |
| | | | | | 3897/BH401/0.4-0.6/S/1 D 0.40 m | | | | | | | |
| | | | 1 | | 3897/BH401/0.9-1.1/S/1 D 0.90 m | | | | | | | |
| | | | | *1.20* 14.91 | | | | | Dark brown and brown. | | | |
| | | | | | 3897/BH401/1.4-1.6/S/1 D 1.40 m | | | | | | | |
| | | | 2 | | 3897/BH401/1.9-2.1/S/1 D 1.90 m | | | | | | | |
| | | | | | 3897/BH401/2.4-2.6/S/1 D 2.40 m | | | | | | | |
| | | | | *2.80* 13.31 | | | | | Brown, no silt. | | | |
| | | | 3 | | 3897/BH401/2.9-3.1/S/1 D 2.90 m | | | | | | | |
| | | | | | 3897/BH401/3.4-3.6/S/1 D 3.40 m | | | | | | | |
| | | | | *3.80* 12.31 | | | | | Pale brown and brown. | | | |
| | | | 4 | | 3897/BH401/3.9-4.1/S/1 D 3.90 m | | | | | | | |
| | | | | *4.60* 11.51 | | | | | Pale brown. | | | |
| AD/V | L | | 5 | | 3897/BH401/4.8-5.2/S/1 D 4.80 m | | | | | D - M | | |
| | | | 6 | | 3897/BH401/5.8-6.2/S/1 D 5.80 m | | | | | | | |
| | | | 7 | | 3897/BH401/6.8-7.2/S/1 D 6.80 m | | | | | | | |
| | | | 8 | | 3897/BH401/7.8-8.2/S/1 D 7.80 m | | | | | | | |
| | | | 9 | | 3897/BH401/8.8-9.2/S/1 D 8.80 m | | | | | | | |
| | | | | | 3897/BH401/9.8-10.2/S/1 D 9.80 m | | | | | | | |

EXCAVATION LOG TO BE READ IN CONJUCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS



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***Engineering Log - BOREHOLE***

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| CLIENT | Ammos Resource Management Pty Ltd | | COMMENCED | 01/10/2019 | COMPLETED | 01/10/2019 | **REF BH401** |
| PROJECT | Supplementary Acid Sulfate Soils Assessment | | LOGGED | DI | CHECKED | JF | Sheet 2 OF 2 |
| SITE | 3631 Nelson Bay Road, Bobs Farm, NSW | | GEOLOGY | Quaternary | VEGETATION | None | PROJECT NO. P1303897 |
| EQUIPMENT | | 4WD truck-mounted hydraulic drill rig | EASTING | 151.999298 | RL SURFACE | 16.11 m | DATUM AHD |
| EXCAVATION DIMENSIONS | | Ø100 mm x 18.50 m depth | NORTHING | -32.774238 | ASPECT | Northeast | SLOPE <5% |

| Drilling | | | | | Sampling | | Field Material Description | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| METHOD | PENETRATION RESISTANCE | WATER | DEPTH (metres) | DEPTH RL | SAMPLE OR FIELD TEST | RECOVERED | GRAPHIC LOG | USCS / ASCS CLASSIFICATION | SOIL/ROCK MATERIAL DESCRIPTION | MOISTURE CONDITION | CONSISTENCY DENSITY | STRUCTURE AND ADDITIONAL OBSERVATIONS |
| AD/V | L | 01/10/19 | 11 | | 3897/BH401/10.8-11.2/S/1 D 10.80 m | | | SP | SAND; fine to medium grained; dark grey and grey; with silt. | | | AEOLIAN DEPOSITS |
| | | | | *11.40* 4.71 | | | | | Pale brown and orange. | D - M | | |
| | | | 12 | | 3897/BH401/11.8-12.2/S/1 D 11.80 m | | | | | | | |
| | | | | *12.60* 3.51 | | | | | Pale brown and pale grey. | | | |
| | | | 13 | | 3897/BH401/12.8-13.2/S/1 D 12.80 m | | | | | | | |
| | | | | *13.60* 2.51 | | | | CL | Sandy CLAY; low plasticity; dark grey; fine to medium grained sand. | M | | MARINE DEPOSITS<br>13.60: H2S odour. |
| | | | 14 | | 3897/BH401/13.8-14.2/S/1 D 13.80 m | | | | | M (>PL) | | |
| | | | 15 | | 3897/BH401/14.8-15.2/S/1 D 14.80 m | | | | | | | |
| | | | | *15.40* 0.71 | | | | SP | SAND; fine to medium grained; dark grey, grey and pale yellow; trace clay. | | | |
| | | | 16 | *16.00* 0.11 | 3897/BH401/15.8-16.2/S/1 D 15.80 m | | | SP | SAND; fine to medium grained; grey. | | | |
| | | | 17 | | 3897/BH401/17.0/S/1 D 17.00 m | | | | | W | | |
| | | | 18 | | 3897/BH401/18.0/S/1 D 18.00 m | | | | | | | |
| | | | | *18.50* | | | | | Hole Terminated at 18.50 m (Target depth reached) | | | |
| | | | 19 | | | | | | | | | |

EXCAVATION LOG TO BE READ IN CONJUCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS



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***Engineering Log - BOREHOLE***

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| CLIENT | Ammos Resource Management Pty Ltd | | COMMENCED | 01/10/2019 | COMPLETED | 01/10/2019 | **REF BH402** |
| PROJECT | Supplementary Acid Sulfate Soils Assessment | | LOGGED | WB | CHECKED | JF | Sheet 1 OF 3 |
| SITE | 3631 Nelson Bay Road, Bobs Farm, NSW | | GEOLOGY | Quaternary | VEGETATION | None | PROJECT NO. P1303897 |
| EQUIPMENT | | 4WD truck-mounted hydraulic drill rig | EASTING | 151.998852 | RL SURFACE | 12.92 m | DATUM AHD |
| EXCAVATION DIMENSIONS | | Ø100 mm x 30.00 m depth | NORTHING | -32.775189 | ASPECT | East | SLOPE <5% |

| Drilling | | | | | Sampling | | Field Material Description | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| METHOD | PENETRATION RESISTANCE | WATER | DEPTH (metres) | DEPTH RL | SAMPLE OR FIELD TEST | RECOVERED | GRAPHIC LOG | USCS / ASCS CLASSIFICATION | SOIL/ROCK MATERIAL DESCRIPTION | MOISTURE CONDITION | CONSISTENCY DENSITY | STRUCTURE AND ADDITIONAL OBSERVATIONS |
| | | | | 12.92 | 3897/BH402/0.0-0.2/S/1 D 0.00 m | | | SP | TOPSOIL: SAND; fine to medium grained; dark grey and grey; with silt. | | | TOPSOIL |
| | | | | | 3897/BH402/0.4-0.6/S/1 D 0.40 m | | | | | | | |
| | | | | *0.60* 12.32 | | | | | | | | |
| | | | | 12.22 | | | | | SAND; fine to medium grained; dark grey, grey and pale grey; trace silt. Pale brown and grey. | | | AEOLIAN DEPOSITS |
| | | | 1 | | 3897/BH402/0.9-1.1/S/1 D 0.90 m | | | | | | | |
| | | | | *1.20* 11.72 | | | | | Dark brown and brown; with silt. | | | |
| | | | | | 3897/BH402/1.4-1.6/S/1 D 1.40 m | | | | | | | |
| | | | | *1.80* 11.12 | | | | | Brown, dark brown and orange. | | | |
| | | | 2 | | 3897/BH402/1.9-2.1/S/1 D 1.90 m | | | | | | | |
| | | | | | 3897/BH402/2.4-2.6/S/1 D 2.40 m | | | | | | | |
| | | | | *2.70* 10.22 | | | | | Brown and pale brown; trace silt. | | | |
| | | | 3 | | 3897/BH402/2.9-3.1/S/1 D 2.90 m | | | | | | | |
| | | | | | 3897/BH402/3.4-3.6/S/1 D 3.40 m | | | | | | | |
| | | | | *3.80* 9.12 | | | | | Pale brown; no silt. | | | |
| | | | 4 | | 3897/BH402/3.9-4.1/S/1 D 3.90 m | | | | | | | |
| AD/V | L | | 5 | | 3897/BH402/4.8-5.2/S/1 D 4.80 m | | | | | D - M | | |
| | | | 6 | | 3897/BH402/5.8-6.2/S/1 D 5.80 m | | | | | | | |
| | | | 7 | | 3897/BH402/6.8-7.2/S/1 D 6.80 m | | | | | | | |
| | | | | *7.50* 5.42 | | | | | Pale brown and pale yellow. | | | |
| | | | 8 | | 3897/BH402/7.8-8.2/S/1 D 7.80 m | | | | | | | |
| | | | 9 | | 3897/BH402/8.8-9.2/S/1 D 8.80 m | | | | | | | |
| | | | | | 3897/BH402/9.8-10.2/S/1 D 9.80 m | | | | | | | |

EXCAVATION LOG TO BE READ IN CONJUCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS



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***Engineering Log - BOREHOLE***

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| CLIENT | Ammos Resource Management Pty Ltd | | COMMENCED | 01/10/2019 | COMPLETED | 01/10/2019 | **REF BH402** |
| PROJECT | Supplementary Acid Sulfate Soils Assessment | | LOGGED | WB | CHECKED | JF | Sheet 2 OF 3 |
| SITE | 3631 Nelson Bay Road, Bobs Farm, NSW | | GEOLOGY | Quaternary | VEGETATION | None | PROJECT NO. P1303897 |
| EQUIPMENT | | 4WD truck-mounted hydraulic drill rig | EASTING | 151.998852 | RL SURFACE | 12.92 m | DATUM AHD |
| EXCAVATION DIMENSIONS | | Ø100 mm x 30.00 m depth | NORTHING | -32.775189 | ASPECT | East | SLOPE <5% |

| Drilling | | | | | Sampling | | Field Material Description | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| METHOD | PENETRATION RESISTANCE | WATER | DEPTH (metres) | *DEPTH* RL | SAMPLE OR FIELD TEST | RECOVERED | GRAPHIC LOG | USCS / ASCS CLASSIFICATION | SOIL/ROCK MATERIAL DESCRIPTION | MOISTURE CONDITION | CONSISTENCY DENSITY | STRUCTURE AND ADDITIONAL OBSERVATIONS |
| AD/V | | | | *10.40* 2.52 | | | | | SAND; fine to medium grained; dark grey, grey and pale grey; trace silt. | D - M | | AEOLIAN DEPOSITS |
| | | | | | | | | SP | SAND; fine to medium grained; dark grey; with clay. | | | MARINE DEPOSITS |
| | | | 11 | | 3897/BH402/10.8-11.2/S/1 D 10.80 m | | | | | | | |
| | | | | | 3897/BH402/11.2-12.2/S/1 D 11.20 m | | | | | | | |
| | | | 12 | | | | | | | | | |
| | | | 13 | | 3897/BH402/12.8-13.2/S/1 D 12.80 m | | | | | | | |
| WB | | | | | | | | | | | | 13.20: Mud drilling started. |
| | | | 14 | *14.00* -1.08 | | | | SP | SAND; fine to medium grained; grey; trace clay; trace grey seam. | | | |
| | L | | | | 3897/BH402/14.15/S/1 D 14.15 m | | | | | | | |
| | | | 15 | | | | | | | M - W | | |
| | | | | | 3897/BH402/15.5-15.65/S/1 D 15.50 m | | | | | | | |
| | | | 16 | | | | | | | | | |
| | | | 17 | *17.00* -4.08 | 3897/BH402/17.0-17.15/S/1 D 17.00 m | | | SP | SAND; fine to medium grained; grey. | | | |
| | | | 18 | | | | | | | | | |
| | | | | | 3897/BH402/18.5-18.65/S/1 D 18.50 m | | | | | | | |
| | | | 19 | | | | | | | | | |

EXCAVATION LOG TO BE READ IN CONJUCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS



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***Engineering Log - BOREHOLE***

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| CLIENT | Ammos Resource Management Pty Ltd | | COMMENCED | 01/10/2019 | COMPLETED | 01/10/2019 | **REF BH402** |
| PROJECT | Supplementary Acid Sulfate Soils Assessment | | LOGGED | WB | CHECKED | JF | Sheet 3 OF 3 |
| SITE | 3631 Nelson Bay Road, Bobs Farm, NSW | | GEOLOGY | Quaternary | VEGETATION | None | PROJECT NO. P1303897 |
| EQUIPMENT | | 4WD truck-mounted hydraulic drill rig | EASTING | 151.998852 | RL SURFACE | 12.92 m | DATUM AHD |
| EXCAVATION DIMENSIONS | | Ø100 mm x 30.00 m depth | NORTHING | -32.775189 | ASPECT | East | SLOPE <5% |

| Drilling | | | | | Sampling | | Field Material Description | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| METHOD | PENETRATION RESISTANCE | WATER | DEPTH (metres) | *DEPTH* RL | SAMPLE OR FIELD TEST | RECOVERED | GRAPHIC LOG | USCS / ASCS CLASSIFICATION | SOIL/ROCK MATERIAL DESCRIPTION | MOISTURE CONDITION | CONSISTENCY DENSITY | STRUCTURE AND ADDITIONAL OBSERVATIONS |
| | | | | *20.50*<br>-7.58 | 3897/BH402/20.5/S/1<br>D 20.50 m | | | SP | SAND; fine to medium grained; grey.<br>Trace coarse grained quartz minerals; trace clay seam. | | | |
| | | | 21 | | | | | | | | | |
| | | | 22 | | 3897/BH402/22.0/S/1<br>D 22.00 m | | | | | | | |
| | | | 23 | | | | | | | | | |
| | | | | *23.50*<br>-10.58 | 3897/BH402/23.5/S/1<br>D 23.50 m | | | SP | SAND; fine to medium grained; grey; trace quartz minerals. | | | |
| | | | 24 | | | | | | | | | |
| WB | L | | 25 | *25.00*<br>-12.08 | 3897/BH402/25.0/S/1<br>D 25.00 m | | | SP | SAND; fine to medium grained; grey. | M - W | | |
| | | | 26 | | | | | | | | | |
| | | | | | 3897/BH402/26.5/S/1<br>D 26.50 m | | | | | | | |
| | | | 27 | | | | | | | | | |
| | | | 28 | *28.00*<br>-15.08 | 3897/BH402/28.0/S/1<br>D 28.00 m | | | | Trace subrounded gravels. | | | |
| | | | 29 | | | | | | | | | |
| | | | | *30.00* | 3897/BH402/29.8-30/S/1<br>D 29.80 m | | | | Hole Terminated at 30.00 m<br>(Target depth reached) | | | |

EXCAVATION LOG TO BE READ IN CONJUCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

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**Engineering Log - BOREHOLE**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| CLIENT | Ammos Resource Management Pty Ltd | | COMMENCED | 02/10/2019 | COMPLETED | 02/10/2019 | **REF BH403** |
| PROJECT | Supplementary Acid Sulfate Soils Assessment | | LOGGED | DI | CHECKED | JF | Sheet 1 OF 2 |
| SITE | 3631 Nelson Bay Road, Bobs Farm, NSW | | GEOLOGY | Quaternary | VEGETATION | Grass | PROJECT NO. P1303897 |
| EQUIPMENT | | 4WD truck-mounted hydraulic drill rig | EASTING | 152.001559 | RL SURFACE | 10 m | DATUM AHD |
| EXCAVATION DIMENSIONS | | Ø100 mm x 18.00 m depth | NORTHING | -32.776706 | ASPECT | East | SLOPE <5% |

| Drilling | | | | | Sampling | | Field Material Description | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| METHOD | PENETRATION RESISTANCE | WATER | DEPTH (metres) | DEPTH RL | SAMPLE OR FIELD TEST | RECOVERED | GRAPHIC LOG | USCS / ASCS CLASSIFICATION | SOIL/ROCK MATERIAL DESCRIPTION | MOISTURE CONDITION | CONSISTENCY DENSITY | STRUCTURE AND ADDITIONAL OBSERVATIONS |
| | | | | 10.00 | 3897/BH403/0.0-0.2/S/1 D 0.00 m | | | SP | TOPSOIL: SAND; fine to medium grained; grey; trace roots and silt. | | | TOPSOIL |
| | | | | *0.30* 9.70 | 3897/BH403/0.4-0.6/S/1 D 0.40 m | | | SP | SAND; fine to medium grained; grey and pale grey. | | | AEOLIAN DEPOSITS |
| | | | | *0.90* 9.10 | 3897/BH403/0.9-1.1/S/1 D 0.90 m | | | | Grey and pale brown. | | | |
| | | | 1 | *1.30* 8.70 | 3897/BH403/1.4-1.6/S/1 D 1.40 m | | | | Dark brown and brown; with silt. | | | |
| | | | | | 3897/BH403/1.9-2.1/S/1 D 1.90 m | | | | | | | |
| | | | 2 | | 3897/BH403/2.4-2.6/S/1 D 2.40 m | | | | | | | |
| | | | | *2.70* 7.30 | | | | | Brown; trace silt. | | | |
| | | | 3 | | 3897/BH403/2.9-3.1/S/1 D 2.90 m | | | | | | | |
| | | | | | 3897/BH403/3.4-3.6/S/1 D 3.40 m | | | | | | | |
| | | | 4 | | 3897/BH403/3.9-4.1/S/1 D 3.90 m | | | | | D - M | | |
| AD/V | L | | 5 | | 3897/BH403/4.8-5.2/S/1 D 4.80 m | | | | | | | |
| | | | | *5.60* 4.40 | | | | | Brown and pale brown; no silt. | | | |
| | | | 6 | | 3897/BH403/5.8-6.2/S/1 D 5.80 m | | | | | | | |
| | | | | *6.50* 3.50 | | | | SP | SAND; fine to medium grained; dark grey and black; with silt; trace organic matter. | | | MARINE DEPOSITS |
| | | | 7 | | 3897/BH403/6.8-7.2/S/1 D 6.80 m | | | | | | | |
| | | | | *7.60* 2.40 | | | | | Dark brown and grey. | | | |
| | | | 8 | | 3897/BH403/7.8-8.2/S/1 D 7.80 m | | | | | | | 8.50: Mud drilling started. |
| | | | 9 | | 3897/BH403/8.8-9.2/S/1 D 8.80 m | | | | | | | |
| | | ▽ | | *9.40* 0.60 | | | | | Dark brown. | M - W | | |
| | | | | | 3897/BH403/9.8-10.2/S/1 D 9.80 m | | | | | | | |

EXCAVATION LOG TO BE READ IN CONJUCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS



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***Engineering Log - BOREHOLE***

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| CLIENT | Ammos Resource Management Pty Ltd | | COMMENCED | 02/10/2019 | COMPLETED | 02/10/2019 | **REF BH403** |
| PROJECT | Supplementary Acid Sulfate Soils Assessment | | LOGGED | DI | CHECKED | JF | Sheet 2 OF 2 |
| SITE | 3631 Nelson Bay Road, Bobs Farm, NSW | | GEOLOGY | Quaternary | VEGETATION | Grass | PROJECT NO. P1303897 |
| EQUIPMENT | | 4WD truck-mounted hydraulic drill rig | EASTING | 152.001559 | RL SURFACE | 10 m | DATUM AHD |
| EXCAVATION DIMENSIONS | | Ø100 mm x 18.00 m depth | NORTHING | -32.776706 | ASPECT | East | SLOPE <5% |

| Drilling | | | | | Sampling | | Field Material Description | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| METHOD | PENETRATION RESISTANCE | WATER | DEPTH (metres) | *DEPTH* RL | SAMPLE OR FIELD TEST | RECOVERED | GRAPHIC LOG | USCS / ASCS CLASSIFICATION | SOIL/ROCK MATERIAL DESCRIPTION | MOISTURE CONDITION | CONSISTENCY DENSITY | STRUCTURE AND ADDITIONAL OBSERVATIONS |
| WB | L | | 11 | *11.00* -1.00 | | | | SP | SAND; fine to medium grained; dark grey and black; with silt; trace organic matter. | M - W | | MARINE DEPOSITS |
| | | | | | | | | SP | SAND; fine to medium grained; grey; no silt. | | | |
| | | | 12 | | 3897/BH403/11.5/S/1 D 11.50 m | | | | | | | |
| | | | 13 | | 3897/BH403/13.0/S/1 D 13.00 m | | | | | | | |
| | | | 14 | | | | | | | | | |
| | | | 15 | | 3897/BH403/14.5/S/1 D 14.50 m | | | | | | | |
| | | | 16 | | 3897/BH403/16.0/S/1 D 16.00 m | | | | | | | |
| | | | 17 | | | | | | | | | |
| | | | 18 | *18.00* | 3897/BH403/17.5/S/1 D 17.50 m | | | | Hole Terminated at 18.00 m (Target depth reached) | | | |
| | | | 19 | | | | | | | | | |

EXCAVATION LOG TO BE READ IN CONJUCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS



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***Engineering Log - BOREHOLE***

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| CLIENT | Ammos Resource Management Pty Ltd | | COMMENCED | 25/09/2019 | COMPLETED | 25/09/2019 | **REF BH404** |
| PROJECT | Supplementary Acid Sulfate Soils Assessment | | LOGGED | WX | CHECKED | JF | Sheet 1 OF 3 |
| SITE | 3631 Nelson Bay Road, Bobs Farm, NSW | | GEOLOGY | Quaternary | VEGETATION | Grass | PROJECT NO. P1303897 |
| EQUIPMENT | | 4WD truck-mounted hydraulic drill rig | EASTING | 151.999298 | RL SURFACE | 5.55 m | DATUM AHD |
| EXCAVATION DIMENSIONS | | Ø100 mm x 21.00 m depth | NORTHING | -32.774238 | ASPECT | West | SLOPE <2% |

| Drilling | | | | | Sampling | | Field Material Description | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| METHOD | PENETRATION RESISTANCE | WATER | DEPTH (metres) | DEPTH RL | SAMPLE OR FIELD TEST | RECOVERED | GRAPHIC LOG | USCS / ASCS CLASSIFICATION | SOIL/ROCK MATERIAL DESCRIPTION | MOISTURE CONDITION | CONSISTENCY DENSITY | STRUCTURE AND ADDITIONAL OBSERVATIONS |
| AD/V | | | | 5.55 | 3897/BH404/0.0-0.2/S/1 D 0.00 m | | | SP | SAND; fine to medium grained; grey and dark grey. | | | AEOLIAN DEPOSITS |
| | | | | *0.40* 5.15 | 3897/BH404/0.5/S/1 D 0.50 m | | | | Grey. | | | |
| | | | | *0.80* 4.75 | | | | | Pale grey. | | | |
| | | | 1 | | 3897/BH404/1.0/S/1 D 1.00 m | | | | | | | |
| | | | | *1.20* 4.35 | | | | | Grey brown. | | | |
| | | | | | 3897/BH404/1.5/S/1 D 1.50 m | | | | | | | |
| | | | | *1.80* 3.75 | | | | | Brown. | | | |
| | | | 2 | | 3897/BH404/2.0/S/1 D 2.00 m | | | | | D | | |
| | | | | | 3897/BH404/2.5/S/1 D 2.50 m | | | | | | | |
| | | | 3 | *3.00* 2.55 | 3897/BH404/3.0/S/1 D 3.00 m | | | | Yellow dark brown. | | | |
| | | | | *3.50* 2.05 | 3897/BH404/3.5/S/1 D 3.50 m | | | | Yellow brown. | | | |
| | | | 4 | *4.00* 1.55 | 3897/BH404/4.0/S/1 D 4.00 m | | | | Grey brown. | | | |
| | | | | | 3897/BH404/4.5/S/1 D 4.50 m | | | | | | | |
| | | | | *4.80* 0.75 | | | | CI-CH | Silty CLAY; medium to high plasticity; dark grey; with sand. | M (>PL) | | ALLUVIUM |
| | L | | 5 | | 3897/BH404/5.0/S/1 D 5.00 m | | | | | | | |
| | | | | *5.30* 0.25 | | | | SP | SAND; fine to medium grained; dark grey. | | | MARINE DEPOSITS |
| | | | | | 3897/BH404/5.5/S/1 D 5.50 m | | | | | | | |
| WB | | | 6 | | 3897/BH404/6.0/S/1 D 6.00 m | | | | | | | |
| | | | 7 | | | | | | | | | |
| | | | | *7.50* -1.95 | 3897/BH404/7.5/S/1 D 7.50 m | | | SP | SAND; fine to medium grained; grey. | W | | |
| | | | 8 | | | | | | | | | |
| | | | 9 | | 3897/BH404/9.0/S/1 D 9.00 m | | | | | | | |

EXCAVATION LOG TO BE READ IN CONJUCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS



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***Engineering Log - BOREHOLE***

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| CLIENT | Ammos Resource Management Pty Ltd | | COMMENCED | 25/09/2019 | COMPLETED | 25/09/2019 | **REF BH404** |
| PROJECT | Supplementary Acid Sulfate Soils Assessment | | LOGGED | WX | CHECKED | JF | Sheet 2 OF 3 |
| SITE | 3631 Nelson Bay Road, Bobs Farm, NSW | | GEOLOGY | Quaternary | VEGETATION | Grass | PROJECT NO. P1303897 |
| EQUIPMENT | | 4WD truck-mounted hydraulic drill rig | EASTING | 151.999298 | RL SURFACE | 5.55 m | DATUM AHD |
| EXCAVATION DIMENSIONS | | Ø100 mm x 21.00 m depth | NORTHING | -32.774238 | ASPECT | West | SLOPE <2% |

| Drilling | | | | | Sampling | | Field Material Description | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| METHOD | PENETRATION RESISTANCE | WATER | DEPTH (metres) | DEPTH RL | SAMPLE OR FIELD TEST | RECOVERED | GRAPHIC LOG | USCS / ASCS CLASSIFICATION | SOIL/ROCK MATERIAL DESCRIPTION | MOISTURE CONDITION | CONSISTENCY DENSITY | STRUCTURE AND ADDITIONAL OBSERVATIONS |
| WB | | | 11 | | 3897/BH404/10.5/S/1 D 10.50 m | | | SP | SAND; fine to medium grained; grey. | | | |
| | | | 12 | *12.00* -6.45 | 3897/BH404/12.0/S/1 D 12.00 m | | | SP | SAND; medium grained; grey. | | | |
| | | | 13 | | 3897/BH404/13.5/S/1 D 13.50 m | | | | | | | |
| | | | 14 | | | | | | | | | |
| | L | | 15 | *15.00* -9.45 | 3897/BH404/15.0/S/1 D 15.00 m | | | SP | SAND; fine to medium grained; grey. | W | | |
| | | | 16 | | 3897/BH404/16.5/S/1 D 16.50 m | | | | | | | |
| | | | 17 | | | | | | | | | |
| | | | 18 | | 3897/BH404/18.0/S/1 D 18.00 m | | | | | | | |
| | | | 19 | | | | | | | | | |
| | | | | *19.50* -13.95 | 3897/BH404/19.5/S/1 D 19.50 m | | | SP | SAND; fine to medium grained; brown and pale grey. | | | |

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***Engineering Log - BOREHOLE***

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| CLIENT | Ammos Resource Management Pty Ltd | | COMMENCED | 25/09/2019 | COMPLETED | 25/09/2019 | **REF BH404** |
| PROJECT | Supplementary Acid Sulfate Soils Assessment | | LOGGED | WX | CHECKED | JF | Sheet 3 OF 3 |
| SITE | 3631 Nelson Bay Road, Bobs Farm, NSW | | GEOLOGY | Quaternary | VEGETATION | Grass | PROJECT NO. P1303897 |
| EQUIPMENT | | 4WD truck-mounted hydraulic drill rig | EASTING | 151.999298 | RL SURFACE | 5.55 m | DATUM AHD |
| EXCAVATION DIMENSIONS | | Ø100 mm x 21.00 m depth | NORTHING | -32.774238 | ASPECT | West | SLOPE <2% |

| Drilling | | | | | Sampling | | Field Material Description | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| METHOD | PENETRATION RESISTANCE | WATER | DEPTH (metres) | *DEPTH* RL | SAMPLE OR FIELD TEST | RECOVERED | GRAPHIC LOG | USCS / ASCS CLASSIFICATION | SOIL/ROCK MATERIAL DESCRIPTION | MOISTURE CONDITION | CONSISTENCY DENSITY | STRUCTURE AND ADDITIONAL OBSERVATIONS |
| WB | L | | 21 | *21.00* -15.45 | 3897/BH404/20.9-21.0/S71 D 20.90 m | | | SP | SAND; fine to medium grained; brown and pale grey. | W | | |
| | | | | | | | | | Pale grey and pale brown.<br>Hole Terminated at 21.00 m<br>(Target depth reached) | | | |
| | | | 22 | | | | | | | | | |
| | | | 23 | | | | | | | | | |
| | | | 24 | | | | | | | | | |
| | | | 25 | | | | | | | | | |
| | | | 26 | | | | | | | | | |
| | | | 27 | | | | | | | | | |
| | | | 28 | | | | | | | | | |
| | | | 29 | | | | | | | | | |

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***Engineering Log - BOREHOLE***

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| CLIENT | Ammos Resource Management Pty Ltd | | COMMENCED | 27/09/2019 | COMPLETED | 27/09/2019 | **REF BH405** |
| PROJECT | Supplementary Acid Sulfate Soils Assessment | | LOGGED | WX | CHECKED | JF | Sheet 1 OF 3 |
| SITE | 3631 Nelson Bay Road, Bobs Farm, NSW | | GEOLOGY | Quaternary | VEGETATION | None | PROJECT NO. P1303897 |
| EQUIPMENT | | 4WD truck-mounted hydraulic drill rig | EASTING | 152.001997 | RL SURFACE | 10.7 m | DATUM AHD |
| EXCAVATION DIMENSIONS | | Ø100 mm x 26.00 m depth | NORTHING | -32.7748957 | ASPECT | East | SLOPE <5% |

| Drilling | | | | | Sampling | | Field Material Description | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| METHOD | PENETRATION RESISTANCE | WATER | DEPTH (metres) | DEPTH RL | SAMPLE OR FIELD TEST | RECOVERED | GRAPHIC LOG | USCS / ASCS CLASSIFICATION | SOIL/ROCK MATERIAL DESCRIPTION | MOISTURE CONDITION | CONSISTENCY DENSITY | STRUCTURE AND ADDITIONAL OBSERVATIONS |
| | | | | 10.70 | | | | SM | TOPSOIL: Silty SAND; fine grained; grey and dark grey; trace roots. | | | TOPSOIL |
| | | | | *0.30* 10.40 | 3897/BH405/0.2/S/1 D 0.20 m | | | SP | SAND; fine grained; grey and dark grey. | | | AEOLIAN DEPOSITS |
| | | | | | 3897/BH405/0.5/S/1 D 0.50 m | | | | | | | |
| | | | 1 | | 3897/BH405/1.0/S/1 D 1.00 m | | | | | | | |
| | | | | *1.30* 9.40 | | | | SP | SAND; fine grained; grey and brown. | | | |
| | | | | | 3897/BH405/1.5/S/1 D 1.50 m | | | | | | | |
| | | | 2 | *2.00* 8.70 | 3897/BH405/2.0/S/1 D 2.00 m | | | SP | SAND; fine grained; brown. | | | |
| | | | | | 3897/BH405/2.5/S/1 D 2.50 m | | | | | | | |
| | | | 3 | | 3897/BH405/3.0/S/1 D 3.00 m | | | | | | | |
| | | | | | 3897/BH405/3.5/S/1 D 3.50 m | | | | | | | |
| | | | 4 | | 3897/BH405/4.0/S/1 D 4.00 m | | | | | | | |
| | | | | | 3897/BH405/4.5/S/1 D 4.50 m | | | | | | | |
| | L | | 5 | | 3897/BH405/5.0/S/1 D 5.00 m | | | | | M | | |
| | | | 6 | *6.00* 4.70 | 3897/BH405/6.0/S/1 D 6.00 m | | | | Fine grained, brown and pale brown. | | | |
| | | | 7 | | 3897/BH405/7.0/S/1 D 7.00 m | | | | | | | |
| | | | 8 | *8.00* 2.70 | 3897/BH405/8.0/S/1 D 8.00 m | | | | Yellow brown, pale brown. | | | |
| | | | 9 | *9.00* 1.70 | 3897/BH405/9.0/S/1 D 9.00 m | | | SP | SAND; fine grained; brown and pale grey. | | | |
| WB | | | | | | | | | | | | |

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***Engineering Log - BOREHOLE***

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| CLIENT | Ammos Resource Management Pty Ltd | | COMMENCED | 27/09/2019 | COMPLETED | 27/09/2019 | **REF BH405** |
| PROJECT | Supplementary Acid Sulfate Soils Assessment | | LOGGED | WX | CHECKED | JF | Sheet 2 OF 3 |
| SITE | 3631 Nelson Bay Road, Bobs Farm, NSW | | GEOLOGY | Quaternary | VEGETATION | None | PROJECT NO. P1303897 |
| EQUIPMENT | | 4WD truck-mounted hydraulic drill rig | EASTING | 152.001997 | RL SURFACE | 10.7 m | DATUM AHD |
| EXCAVATION DIMENSIONS | | Ø100 mm x 26.00 m depth | NORTHING | -32.7748957 | ASPECT | East | SLOPE <5% |

| Drilling | | | | | Sampling | | Field Material Description | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| METHOD | PENETRATION RESISTANCE | WATER | DEPTH (metres) | *DEPTH* RL | SAMPLE OR FIELD TEST | RECOVERED | GRAPHIC LOG | USCS / ASCS CLASSIFICATION | SOIL/ROCK MATERIAL DESCRIPTION | MOISTURE CONDITION | CONSISTENCY DENSITY | STRUCTURE AND ADDITIONAL OBSERVATIONS |
| WB | L | | 11 | | 3897/BH405/10.5/S/1 D 10.50 m | | | SP | SAND; fine grained; brown and pale grey. | | | |
| | | | 12 | | 3897/BH405/12.0/S/1 D 12.00 m | | | | | | | |
| | | | 13 | *13.00* -2.30 | | | | SP | SAND; fine to medium grained; grey; coarse grained sand; some quartz; | | | MARINE DEPOSITS |
| | | | | | 3897/BH405/13.5/S/1 D 13.50 m | | | | | | | |
| | | | 14 | | | | | | | | | |
| | | | 15 | *15.00* -4.30 | 3897/BH405/15.0/S/1 D 15.00 m | | | SP | SAND; fine to coarse grained; grey; subrounded quartz grained; well graded. | M | | |
| | | | 16 | | | | | | | | | |
| | | | 17 | | | | | | | | | |
| | | | | | 3897/BH405/17.5/S/1 D 17.50 m | | | | | | | |
| | | | 18 | | | | | | | | | |
| | | | 19 | | 3897/BH405/19.0/S/1 D 19.00 m | | | | | | | |

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***Engineering Log - BOREHOLE***

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| CLIENT | Ammos Resource Management Pty Ltd | | COMMENCED | 27/09/2019 | COMPLETED | 27/09/2019 | **REF BH405** |
| PROJECT | Supplementary Acid Sulfate Soils Assessment | | LOGGED | WX | CHECKED | JF | Sheet 3 OF 3 |
| SITE | 3631 Nelson Bay Road, Bobs Farm, NSW | | GEOLOGY | Quaternary | VEGETATION | None | PROJECT NO. P1303897 |
| EQUIPMENT | | 4WD truck-mounted hydraulic drill rig | EASTING | 152.001997 | RL SURFACE | 10.7 m | DATUM AHD |
| EXCAVATION DIMENSIONS | | Ø100 mm x 26.00 m depth | NORTHING | -32.7748957 | ASPECT | East | SLOPE <5% |

| Drilling | | | | | Sampling | | Field Material Description | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| METHOD | PENETRATION RESISTANCE | WATER | DEPTH (metres) | *DEPTH* RL | SAMPLE OR FIELD TEST | RECOVERED | GRAPHIC LOG | USCS / ASCS CLASSIFICATION | SOIL/ROCK MATERIAL DESCRIPTION | MOISTURE CONDITION | CONSISTENCY DENSITY | STRUCTURE AND ADDITIONAL OBSERVATIONS |
| | | | | *20.50* | | | | SP | SAND; fine to coarse grained; grey; subrounded quartz grained; well graded. | | | |
| | | | | -9.80 | 3897/BH405/20.5/S/1 D 20.50 m | | | SP | SAND; fine to coarse grained; subrounded to rounded; grey; including quartz and possible volcanic material/igneous gravels. | | | |
| | | | 21 | | | | | | | | | |
| | | | 22 | | 3897/BH405/22.0/S/1 D 22.00 m | | | | | | | |
| WB | L | | 23 | | | | | | | M | | |
| | | | 24 | | | | | | | | | |
| | | | 25 | | 3897/BH405/25.0/S/1 D 25.00 m | | | | | | | |
| | | | 26 | *26.00* | | | | | Hole Terminated at 26.00 m (Target depth reached) | | | |
| | | | 27 | | | | | | | | | |
| | | | 28 | | | | | | | | | |
| | | | 29 | | | | | | | | | |

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***Engineering Log - BOREHOLE***

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| CLIENT | Ammos Resource Management Pty Ltd | | COMMENCED | 01/10/2019 | COMPLETED | 01/10/2019 | **REF BH406** |
| PROJECT | Supplementary Acid Sulfate Soils Assessment | | LOGGED | DI | CHECKED | JF | Sheet 1 OF 2 |
| SITE | 3631 Nelson Bay Road, Bobs Farm, NSW | | GEOLOGY | Quaternary | VEGETATION | None | PROJECT NO. P1303897 |
| EQUIPMENT | | 4WD truck-mounted hydraulic drill rig | EASTING | 151.99946 | RL SURFACE | 16.7 m | DATUM AHD |
| EXCAVATION DIMENSIONS | | Ø100 mm x 15.50 m depth | NORTHING | -32.773773 | ASPECT | South | SLOPE 5-10% |

| Drilling | | | | | Sampling | | Field Material Description | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| METHOD | PENETRATION RESISTANCE | WATER | DEPTH (metres) | DEPTH RL | SAMPLE OR FIELD TEST | RECOVERED | GRAPHIC LOG | USCS / ASCS CLASSIFICATION | SOIL/ROCK MATERIAL DESCRIPTION | MOISTURE CONDITION | CONSISTENCY DENSITY | STRUCTURE AND ADDITIONAL OBSERVATIONS |
| AD/V | L | | 1 | 16.70 | 3897/BH406/0.0-0.2/S/1 D 0.00 m | | | SP | TOPSOIL: SAND; fine to medium grained; grey and dark grey; with silt; trace organic material. | | | TOPSOIL |
| | | | | | 3897/BH406/0.4-0.6/S/1 D 0.40 m | | | | | | | |
| | | | | *0.70* 16.00 | | | | SP | SAND; fine to medium grained; pale brown and grey; predominantly quartz; subrounded to rounded grained. | | | AEOLIAN DEPOSITS |
| | | | | | 3897/BH406/0.9-1.1/S/1 D 0.90 m | | | | | | | |
| | | | | *1.20* 15.50 | | | | | Brown and pale brown. | | | |
| | | | | | 3897/BH406/1.4-1.6/S/1 D 1.40 m | | | | | | | |
| | | | 2 | *1.80* 14.90 | 3897/BH406/1.9-2.1/S/1 D 1.90 m | | | | Dark brown and brown; trace silt. | | | |
| | | | | *2.20* 14.50 | | | | | Dark brown, brown and trace orange. | | | |
| | | | | | 3897/BH406/2.4-2.6/S/1 D 2.40 m | | | | | | | |
| | | | 3 | | 3897/BH406/2.9-3.1/S/1 D 2.90 m | | | | | | | |
| | | | | | 3897/BH406/3.4-3.6/S/1 D 3.40 m | | | | | | | |
| | | | 4 | | 3897/BH406/3.9-4.1/S/1 D 3.90 m | | | | | | | |
| | | | | *4.40* 12.30 | | | | | Brown and pale brown; no silt. | | | |
| | | | 5 | | 3897/BH406/4.8-5.2/S/1 D 4.80 m | | | | | D - M | | |
| | | | 6 | | 3897/BH406/5.8-6.2/S/1 D 5.80 m | | | | | | | |
| | | | | *6.60* 10.10 | | | | | Pale brown. | | | |
| | | | 7 | | 3897/BH406/6.8-7.2/S/1 D 6.80 m | | | | | | | |
| | | | | *7.40* 9.30 | | | | | Pale brown and yellow. | | | |
| | | | 8 | | 3897/BH406/7.8-8.2/S/1 D 7.80 m | | | | | | | |
| | | | 9 | | 3897/BH406/8.8-9.2/S/1 D 8.80 m | | | | | | | |
| | | | | | 3897/BH406/9.8-10.2/S/1 D 9.80 m | | | | | | | |

EXCAVATION LOG TO BE READ IN CONJUCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS



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***Engineering Log - BOREHOLE***

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| CLIENT | Ammos Resource Management Pty Ltd | | COMMENCED | 01/10/2019 | COMPLETED | 01/10/2019 | **REF BH406** |
| PROJECT | Supplementary Acid Sulfate Soils Assessment | | LOGGED | DI | CHECKED | JF | Sheet 2 OF 2 |
| SITE | 3631 Nelson Bay Road, Bobs Farm, NSW | | GEOLOGY | Quaternary | VEGETATION | None | PROJECT NO. P1303897 |
| EQUIPMENT | | 4WD truck-mounted hydraulic drill rig | EASTING | 151.99946 | RL SURFACE | 16.7 m | DATUM AHD |
| EXCAVATION DIMENSIONS | | Ø100 mm x 15.50 m depth | NORTHING | -32.773773 | ASPECT | South | SLOPE 5-10% |

| Drilling | | | | | Sampling | | Field Material Description | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| METHOD | PENETRATION RESISTANCE | WATER | DEPTH (metres) | DEPTH RL | SAMPLE OR FIELD TEST | RECOVERED | GRAPHIC LOG | USCS / ASCS CLASSIFICATION | SOIL/ROCK MATERIAL DESCRIPTION | MOISTURE CONDITION | CONSISTENCY DENSITY | STRUCTURE AND ADDITIONAL OBSERVATIONS |
| AD/V | L | | 11 | | 3897/BH406/10.8-11.2/S71 D 10.80 m | | | SP | SAND; fine to medium grained; pale brown and grey; predominantly quartz; subrounded to rounded grained. | D - M | | AEOLIAN DEPOSITS |
| | | | 12 | | 3897/BH406/11.8-12.2/S71 D 11.80 m | | | | | | | |
| | | | 13 | | 3897/BH406/12.8-13.2/S71 D 12.80 m | | | | | | | |
| | | | 14 | | 3897/BH406/13.8-14.2/S71 D 13.80 m | | | | | | | |
| | | | | *14.60* 2.10 | | | | | Pale brown, yellow and pale grey. | | | |
| | | | 15 | | 3897/BH406/14.8-15.2/S71 D 14.80 m | | | | | M | | |
| | | | | *15.50* | | | | | Hole Terminated at 15.50 m (Target depth reached) | | | |
| | | | 16 | | | | | | | | | |
| | | | 17 | | | | | | | | | |
| | | | 18 | | | | | | | | | |
| | | | 19 | | | | | | | | | |

EXCAVATION LOG TO BE READ IN CONJUCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS



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***Engineering Log - BOREHOLE***

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| CLIENT | Ammos Resource Management Pty Ltd | | COMMENCED | 01/10/2019 | COMPLETED | 01/10/2019 | **REF BH407** |
| PROJECT | Supplementary Acid Sulfate Soils Assessment | | LOGGED | DI | CHECKED | JF | Sheet 1 OF 2 |
| SITE | 3631 Nelson Bay Road, Bobs Farm, NSW | | GEOLOGY | Quaternary | VEGETATION | Shrubs | PROJECT NO. P1303897 |
| EQUIPMENT | | 4WD truck-mounted hydraulic drill rig | EASTING | 151.999882 | RL SURFACE | 16.7 m | DATUM AHD |
| EXCAVATION DIMENSIONS | | Ø100 mm x 14.50 m depth | NORTHING | -32.774472 | ASPECT | Southeast | SLOPE 5-10% |

| Drilling | | | | | Sampling | | Field Material Description | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| METHOD | PENETRATION RESISTANCE | WATER | DEPTH (metres) | DEPTH RL | SAMPLE OR FIELD TEST | RECOVERED | GRAPHIC LOG | USCS / ASCS CLASSIFICATION | SOIL/ROCK MATERIAL DESCRIPTION | MOISTURE CONDITION | CONSISTENCY DENSITY | STRUCTURE AND ADDITIONAL OBSERVATIONS |
| AD/V | L | | 1 | 16.70 | 3897/BH407/0.0-0.2/S/1 D 0.00 m | | | SP | TOPSOIL: SAND; medium grained; grey and dark grey; trace shrubs and roots. From 0.3m: No roots. | | | TOPSOIL |
| | | | | *0.30* 16.40 | 3897/BH407/0.4-0.6/S/1 D 0.40 m | | | SP | SAND; medium grained; grey and dark grey. | | | AEOLIAN DEPOSITS |
| | | | | *0.70* 16.00 | 3897/BH407/0.9-1.1/S/1 D 0.90 m | | | | Pale grey; fine to medium grained. | | | |
| | | | 2 | *1.30* 15.40 | 3897/BH407/1.4-1.6/S/1 D 1.40 m | | | | Dark brown and yellow brown. | | | |
| | | | | *2.20* 14.50 | 3897/BH407/1.9-2.1/S/1 D 1.90 m | | | | Yellow and pale brown. | | | |
| | | | 3 | | 3897/BH407/2.4-2.6/S/1 D 2.40 m | | | | | | | |
| | | | | | 3897/BH407/2.9-3.1/S/1 D 2.90 m | | | | | | | |
| | | | 4 | | 3897/BH407/3.4-3.6/S/1 D 3.40 m | | | | | | | |
| | | | | *4.40* 12.30 | 3897/BH407/3.9-4.1/S/1 D 3.90 m | | | | Pale yellow and pale brown; majority of sand is subrounded to rounded quartz grained. | | | |
| | | | 5 | | 3897/BH407/4.8-5.2/S/1 D 4.80 m | | | | | D - M | | |
| | | | 6 | | 3897/BH407/5.8-6.2/S/1 D 5.80 m | | | | | | | |
| | | | 7 | | 3897/BH407/6.8-7.2/S/1 D 6.80 m | | | | | | | |
| | | | 8 | | 3897/BH407/7.8-8.2/S/1 D 7.80 m | | | | | | | |
| | | | 9 | | 3897/BH407/8.8-9.2/S/1 D 8.80 m | | | | | | | |
| | | | | | 3897/BH407/9.8-10.2/S/1 D 9.80 m | | | | | | | |

EXCAVATION LOG TO BE READ IN CONJUCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS



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**Engineering Log - BOREHOLE**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| CLIENT | Ammos Resource Management Pty Ltd | | COMMENCED | 01/10/2019 | COMPLETED | 01/10/2019 | **REF BH407** |
| PROJECT | Supplementary Acid Sulfate Soils Assessment | | LOGGED | DI | CHECKED | JF | Sheet 2 OF 2 |
| SITE | 3631 Nelson Bay Road, Bobs Farm, NSW | | GEOLOGY | Quaternary | VEGETATION | Shrubs | PROJECT NO. P1303897 |
| EQUIPMENT | | 4WD truck-mounted hydraulic drill rig | EASTING | 151.999882 | RL SURFACE | 16.7 m | DATUM AHD |
| EXCAVATION DIMENSIONS | | Ø100 mm x 14.50 m depth | NORTHING | -32.774472 | ASPECT | Southeast | SLOPE 5-10% |

| Drilling | | | | | Sampling | | Field Material Description | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| METHOD | PENETRATION RESISTANCE | WATER | DEPTH (metres) | DEPTH RL | SAMPLE OR FIELD TEST | RECOVERED | GRAPHIC LOG | USCS / ASCS CLASSIFICATION | SOIL/ROCK MATERIAL DESCRIPTION | MOISTURE CONDITION | CONSISTENCY DENSITY | STRUCTURE AND ADDITIONAL OBSERVATIONS |
| AD/V | L | | 11 | | 3897/BH407/10.8-11.2/S71 D 10.80 m | | | SP | SAND; medium grained; grey and dark grey. | D - M | | AEOLIAN DEPOSITS |
| | | | 12 | | 3897/BH407/11.8-12.2/S71 D 11.80 m | | | | | | | |
| | | | | *12.60* 4.10 | | | | | Grey. | | | 12.60: Possible marine. |
| | | | 13 | | 3897/BH407/12.8-13.2/S71 D 12.80 m | | | | | M | | |
| | | | 14 | *14.00* 2.70 | 3897/BH407/13.8-14.2/S71 D 13.80 m | | | | Grey, yellow grey, with brown; trace silt. | | | 14.00: Organic odour. |
| | | | | *14.50* | | | | | Hole Terminated at 14.50 m (Target depth reached) | | | |
| | | | 15 | | | | | | | | | |
| | | | 16 | | | | | | | | | |
| | | | 17 | | | | | | | | | |
| | | | 18 | | | | | | | | | |
| | | | 19 | | | | | | | | | |

EXCAVATION LOG TO BE READ IN CONJUCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS



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***Engineering Log - BOREHOLE***

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| CLIENT | Ammos Resource Management Pty Ltd | | COMMENCED | 25/09/2019 | COMPLETED | 25/09/2019 | **REF BH408** |
| PROJECT | Supplementary Acid Sulfate Soils Assessment | | LOGGED | HN/WB | CHECKED | JF | |
| SITE | 3631 Nelson Bay Road, Bobs Farm, NSW | | GEOLOGY | Quaternary | VEGETATION | None | Sheet 1 OF 4 |
| | | | | | | | PROJECT NO. P1303897 |
| EQUIPMENT | | 4WD truck-mounted hydraulic drill rig | EASTING | 152.002581 | RL SURFACE | 23.11 m | DATUM AHD |
| EXCAVATION DIMENSIONS | | Ø100 mm x 38.00 m depth | NORTHING | -32.773177 | ASPECT | Southeast | SLOPE <5% |

| Drilling | | | | | Sampling | | Field Material Description | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| METHOD | PENETRATION RESISTANCE | WATER | DEPTH (metres) | *DEPTH* RL | SAMPLE OR FIELD TEST | RECOVERED | GRAPHIC LOG | USCS / ASCS CLASSIFICATION | SOIL/ROCK MATERIAL DESCRIPTION | MOISTURE CONDITION | CONSISTENCY DENSITY | STRUCTURE AND ADDITIONAL OBSERVATIONS |
| | | | | 23.11 | | | | SM | TOPSOIL: Silty SAND; fine grained; dark grey; trace roots. | | | TOPSOIL |
| | | | | | 3897/BH408/0.2-0.3/S/1 D 0.20 m | | | | | | | |
| | | | | *0.50* | | | | | | | | |
| | | | | 22.61 | 3897/BH408/0.5-0.6/S/1 D 0.50 m | | | | Brown and grey. | | | |
| | | | | *0.70* | | | | | | | | |
| | | | | 22.41 | | | | SP | SAND; fine grained; brown. | | | AEOLIAN DEPOSITS |
| | | | 1 | | 3897/BH408/1.0-1.1/S/1 D 1.00 m | | | | | | | |
| | | | | | 3897/BH408/1.5-1.6/S/1 D 1.50 m | | | | | | | |
| | | | 2 | | 3897/BH408/2.0-2.1/S/1 D 2.00 m | | | | | | | |
| | | | | | 3897/BH408/2.5-2.6/S/1 D 2.50 m | | | | | | | |
| | | | 3 | | 3897/BH408/3.0-3.1/S/1 D 3.00 m | | | | | | | |
| | | | | | 3897/BH408/3.5-3.6/S/1 D 3.50 m | | | | | | | |
| | | | 4 | | 3897/BH408/4.0-4.1/S/1 D 4.00 m | | | | | | | |
| | | | | | 3897/BH408/4.5-4.6/S/1 D 4.50 m | | | | | | | |
| AD/V | L | | | *5.00* | | | | | | | | |
| | | | 5 | 18.11 | 3897/BH408/5.0-5.1/S/1 D 5.00 m | | | | Pale brown. | | | |
| | | | | | 3897/BH408/5.5-5.6/S/1 D 5.50 m | | | | | | | |
| | | | 6 | | 3897/BH408/6.0-6.1/S/1 D 6.00 m | | | | | | | |
| | | | 7 | | 3897/BH408/7.0-7.1/S/1 D 7.00 m | | | | | | | |
| | | | 8 | | 3897/BH408/8.0-8.1/S/1 D 8.00 m | | | | | | | |
| | | | | *9.00* | 3897/BH408/8.9-9.0/S/1 | | | | | | | |
| | | | 9 | 14.11 | D 8.90 m | | | SP | SAND; fine grained; pale brown, yellow brown. | | | |
| | | | | | 3897/BH408/9.9-10.0/S/1 | | | | | | | |

EXCAVATION LOG TO BE READ IN CONJUCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS



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***Engineering Log - BOREHOLE***

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| CLIENT | Ammos Resource Management Pty Ltd | | COMMENCED | 25/09/2019 | COMPLETED | 25/09/2019 | **REF BH408** |
| PROJECT | Supplementary Acid Sulfate Soils Assessment | | LOGGED | HN/WB | CHECKED | JF | Sheet 2 OF 4 |
| SITE | 3631 Nelson Bay Road, Bobs Farm, NSW | | GEOLOGY | Quaternary | VEGETATION | None | PROJECT NO. P1303897 |
| EQUIPMENT | | 4WD truck-mounted hydraulic drill rig | EASTING | 152.002581 | RL SURFACE | 23.11 m | DATUM AHD |
| EXCAVATION DIMENSIONS | | Ø100 mm x 38.00 m depth | NORTHING | -32.773177 | ASPECT | Southeast | SLOPE <5% |

| Drilling | | | | | Sampling | | Field Material Description | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| METHOD | PENETRATION RESISTANCE | WATER | DEPTH (metres) | *DEPTH* RL | SAMPLE OR FIELD TEST | RECOVERED | GRAPHIC LOG | USCS / ASCS CLASSIFICATION | SOIL/ROCK MATERIAL DESCRIPTION | MOISTURE CONDITION | CONSISTENCY DENSITY | STRUCTURE AND ADDITIONAL OBSERVATIONS |
| AD/V | | | 11 | | D 9.90 m<br>3897/BH408/10.9-11.0/S71<br>D 10.90 m | | | SP | SAND; fine grained; pale brown, yellow brown. | | | 11.50: Mud drilling started on 26/09/2019. |
| WB | L | | 12 | *12.50*<br>10.61 | 3897/BH408/12.5-12.7/S71<br>D 12.50 m | | | | Yellow brown. | | | |
| | | | 13 | | | | | | | | | |
| | | | 14 | *14.00*<br>9.11 | 3897/BH408/14.0-14.2/S71<br>D 14.00 m | | | | Pale yellow brown. | | | |
| | | | 15 | | | | | | | | | |
| | | | | | 3897/BH408/15.5-15.7/S71<br>D 15.50 m | | | | | | | |
| | | | 16 | | | | | | | | | |
| | | | 17 | *17.00*<br>6.11 | 3897/BH408/17.0-17.2/S71<br>D 17.00 m | | | | Dark yellow. | | | |
| | | | 18 | | | | | | | | | |
| | | | | | 3897/BH408/18.5-18.7/S71<br>D 18.50 m | | | | | | | |
| | | | 19 | | | | | | | | | |

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***Engineering Log - BOREHOLE***

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| CLIENT | Ammos Resource Management Pty Ltd | | COMMENCED | 25/09/2019 | COMPLETED | 25/09/2019 | **REF BH408** |
| PROJECT | Supplementary Acid Sulfate Soils Assessment | | LOGGED | HN/WB | CHECKED | JF | Sheet 3 OF 4 |
| SITE | 3631 Nelson Bay Road, Bobs Farm, NSW | | GEOLOGY | Quaternary | VEGETATION | None | PROJECT NO. P1303897 |
| EQUIPMENT | | 4WD truck-mounted hydraulic drill rig | EASTING | 152.002581 | RL SURFACE | 23.11 m | DATUM AHD |
| EXCAVATION DIMENSIONS | | Ø100 mm x 38.00 m depth | NORTHING | -32.773177 | ASPECT | Southeast | SLOPE <5% |

| Drilling | | | | | Sampling | | Field Material Description | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| METHOD | PENETRATION RESISTANCE | WATER | DEPTH (metres) | *DEPTH* RL | SAMPLE OR FIELD TEST | RECOVERED | GRAPHIC LOG | USCS / ASCS CLASSIFICATION | SOIL/ROCK MATERIAL DESCRIPTION | MOISTURE CONDITION | CONSISTENCY DENSITY | STRUCTURE AND ADDITIONAL OBSERVATIONS |
| WB | L | | 21 | | 3897/BH408/20.5-20.7/S71<br>D 20.50 m | | | SP | SAND; fine grained; pale brown, yellow brown. | | | |
| | | | 22 | | 3897/BH408/22.0-22.2/S71<br>D 22.00 m | | | | | | | |
| | | | 23 | | 3897/BH408/23.5-23.7/S71<br>D 23.50 m | | | | | | | |
| | | | 24 | | | | | | | | | |
| | | | 25 | | 3897/BH408/25.0-25.2/S71<br>D 25.00 m | | | | | | | |
| | | | 26 | *26.00*<br>-2.89 | | | | | Pale grey. | | | |
| | | | 27 | | 3897/BH408/26.5-26.7/S71<br>D 26.50 m | | | | | | | |
| | | | 28 | | 3897/BH408/28.0-28.2/S71<br>D 28.00 m | | | | | | | |
| | | | 29 | | 3897/BH408/29.5-29.7/S71<br>D 29.50 m | | | | | | | |

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***Engineering Log - BOREHOLE***

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| CLIENT | Ammos Resource Management Pty Ltd | | COMMENCED | 25/09/2019 | COMPLETED | 25/09/2019 | **REF BH408** |
| PROJECT | Supplementary Acid Sulfate Soils Assessment | | LOGGED | HN/WB | CHECKED | JF | Sheet 4 OF 4 |
| SITE | 3631 Nelson Bay Road, Bobs Farm, NSW | | GEOLOGY | Quaternary | VEGETATION | None | PROJECT NO. P1303897 |
| EQUIPMENT | | 4WD truck-mounted hydraulic drill rig | EASTING | 152.002581 | RL SURFACE | 23.11 m | DATUM AHD |
| EXCAVATION DIMENSIONS | | Ø100 mm x 38.00 m depth | NORTHING | -32.773177 | ASPECT | Southeast | SLOPE <5% |

| Drilling | | | | | Sampling | | Field Material Description | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| METHOD | PENETRATION RESISTANCE | WATER | DEPTH (metres) | *DEPTH* RL | SAMPLE OR FIELD TEST | RECOVERED | GRAPHIC LOG | USCS / ASCS CLASSIFICATION | SOIL/ROCK MATERIAL DESCRIPTION | MOISTURE CONDITION | CONSISTENCY DENSITY | STRUCTURE AND ADDITIONAL OBSERVATIONS |
| | | | 31 | | 3897/BH408/31.0-31.2/S/1<br>D 31.00 m | | | SP | SAND; fine grained; pale brown, yellow brown. | | | |
| | | | 32 | *32.00*<br>-8.89 | | | | SP | SAND; fine grained; grey. | | | MARINE DEPOSITS |
| | | | | | 3897/BH408/32.5-32.7/S/1<br>D 32.50 m | | | | | | | |
| | | | 33 | | | | | | | | | |
| WB | L | | 34 | *34.00*<br>-10.89 | 3897/BH408/34-34.2/S/1<br>D 34.00 m | | | | Fine grained; grey. | | | |
| | | | 35 | | | | | | | | | |
| | | | | *35.70*<br>-12.59 | 3897/BH408/35.5-37.7/S/1<br>D 35.50 m | | | | Fine to medium grained (mostly fine grained); grey. | | | |
| | | | 36 | | | | | | | | | |
| | | | 37 | | | | | | | | | |
| | | | | *37.50*<br>-14.39 | | | | | Fine to medium grained (mostly medium grained); trace shell fragments. | | | |
| | | | | *38.00* | 3897/BH408/37.8-38.0/S/1<br>D 37.80 m | | | | | | | |
| | | | 38 | | | | | | Hole Terminated at 38.00 m<br>(Target depth reached) | | | |
| | | | 39 | | | | | | | | | |

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***Engineering Log - BOREHOLE***

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| CLIENT | Ammos Resource Management Pty Ltd | | COMMENCED | 20/09/2019 | COMPLETED | 20/09/2019 | **REF BH409** |
| PROJECT | Supplementary Acid Sulfate Soils Assessment | | LOGGED | WX | CHECKED | JF | Sheet 1 OF 3 |
| SITE | 3631 Nelson Bay Road, Bobs Farm, NSW | | GEOLOGY | Quaternary | VEGETATION | None | PROJECT NO. P1303897 |
| EQUIPMENT | | 4WD truck-mounted hydraulic drill rig | EASTING | 152.004581 | RL SURFACE | 7.32 m | DATUM AHD |
| EXCAVATION DIMENSIONS | | 24.50 m depth | NORTHING | -32.773304 | ASPECT | Southeast | SLOPE <2% |

| Drilling | | | | | Sampling | | Field Material Description | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| METHOD | PENETRATION RESISTANCE | WATER | DEPTH (metres) | DEPTH RL | SAMPLE OR FIELD TEST | RECOVERED | GRAPHIC LOG | USCS / ASCS CLASSIFICATION | SOIL/ROCK MATERIAL DESCRIPTION | MOISTURE CONDITION | CONSISTENCY DENSITY | STRUCTURE AND ADDITIONAL OBSERVATIONS |
| AD/T | | | | 7.32 | 3897/BH409/0.0-0.1/S/1 D 0.00 m | | | SP | SAND; medium grained; grey brown. | | | AEOLIAN DEPOSITS |
| | | | | | 3897/BH409/0.5/S/1 D 0.50 m | | | | | | | |
| | | | 1 | | 3897/BH409/1.0/S/1 D 1.00 m | | | | | | | |
| | | | | | 3897/BH409/1.5/S/1 D 1.50 m | | | | | | | |
| | | | | *1.90* 5.42 | | | | | | | | |
| | | | 2 | | 3897/BH409/2.0/S/1 D 2.00 m | | | | Brown. | | | |
| | | | | *2.20* 5.12 | | | | | Orange brown. | | | |
| | | | | | 3897/BH409/2.5/S/1 D 2.50 m | | | | | D | | |
| | | | | *2.80* 4.52 | | | | | Dark orange brown. | | | |
| | | | 3 | | 3897/BH409/3.0/S/1 D 3.00 m | | | | | | | |
| | | | | | 3897/BH409/3.5/S/1 D 3.50 m | | | | | | | |
| | | | 4 | *4.10* 3.22 | 3897/BH409/4.0/S/1 D 4.00 m | | | | Orange brown. | | | |
| | | | | | 3897/BH409/4.5/S/1 D 4.50 m | | | | | | | |
| WB | L | 20/09/19 | 5 | | | | | | | | | |
| | | | | *5.50* 1.82 | | | | | Pale grey yellow. | | | |
| | | | 6 | | 3897/BH409/6.0-6.2/S/1 D 6.00 m | | | | | | | |
| | | | | *6.50* 0.82 | | | | SC | Clayey SAND; fine to medium grained; dark grey. | | | MARINE DEPOSITS |
| | | | 7 | | | | | | | | | |
| | | | | | 3897/BH409/7.5-7.7/S/1 D 7.50 m | | | | | W | | |
| | | | 8 | *8.50* -1.18 | | | | SP | SAND; fine to medium grained; grey. | | | |
| | | | 9 | | 3897/BH409/9.0-9.2/S/1 D 9.00 m | | | | | | | |
| | | | | *10.00* | | | | | | | | |

EXCAVATION LOG TO BE READ IN CONJUCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS



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***Engineering Log - BOREHOLE***

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| CLIENT | Ammos Resource Management Pty Ltd | | COMMENCED | 20/09/2019 | COMPLETED | 20/09/2019 | **REF BH409** |
| PROJECT | Supplementary Acid Sulfate Soils Assessment | | LOGGED | WX | CHECKED | JF | Sheet 2 OF 3 |
| SITE | 3631 Nelson Bay Road, Bobs Farm, NSW | | GEOLOGY | Quaternary | VEGETATION | None | PROJECT NO. P1303897 |
| EQUIPMENT | | 4WD truck-mounted hydraulic drill rig | EASTING | 152.004581 | RL SURFACE | 7.32 m | DATUM AHD |
| EXCAVATION DIMENSIONS | | 24.50 m depth | NORTHING | -32.773304 | ASPECT | Southeast | SLOPE <2% |

| Drilling | | | | | Sampling | | Field Material Description | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| METHOD | PENETRATION RESISTANCE | WATER | DEPTH (metres) | *DEPTH* RL | SAMPLE OR FIELD TEST | RECOVERED | GRAPHIC LOG | USCS / ASCS CLASSIFICATION | SOIL/ROCK MATERIAL DESCRIPTION | MOISTURE CONDITION | CONSISTENCY DENSITY | STRUCTURE AND ADDITIONAL OBSERVATIONS |
| | | | | -2.68 | | | | SP | SAND; fine to medium grained; grey. Pale grey. | | | |
| | | | | | 3897/BH409/10.5-10.7/S/1 D 10.50 m | | | | | | | |
| | | | 11 | | | | | | | | | |
| | | | | | 3897/BH40912-12.2/S/1 D 12.00 m | | | | | | | |
| | | | 12 | | | | | | | | | |
| | | | 13 | | | | | | | | | |
| | | | | | 3897/BH409/13.5-13.7/S/1 D 13.50 m | | | | | | | |
| | | | 14 | | | | | | | | | |
| WB | L | | 15 | | 3897/BH409/15-15.2/S/1 D 15.00 m | | | | | W | | |
| | | | 16 | | | | | | | | | |
| | | | | | 3897/BH409/16.5-16.7/S/1 D 16.50 m | | | | | | | |
| | | | 17 | | | | | | | | | |
| | | | | *18.00* | | | | | | | | |
| | | | 18 | -10.68 | 3897/BH409/18-18.2/S/1 D 18.00 m | | | | Medium to coarse grained. | | | |
| | | | 19 | | | | | | | | | |
| | | | | | 3897/BH409/19.5-19.7/S/1 D 19.50 m | | | | | | | |

EXCAVATION LOG TO BE READ IN CONJUCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS



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***Engineering Log - BOREHOLE***

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| CLIENT | Ammos Resource Management Pty Ltd | | COMMENCED | 20/09/2019 | COMPLETED | 20/09/2019 | **REF BH409** |
| PROJECT | Supplementary Acid Sulfate Soils Assessment | | LOGGED | WX | CHECKED | JF | Sheet 3 OF 3 |
| SITE | 3631 Nelson Bay Road, Bobs Farm, NSW | | GEOLOGY | Quaternary | VEGETATION | None | PROJECT NO. P1303897 |
| EQUIPMENT | | 4WD truck-mounted hydraulic drill rig | EASTING | 152.004581 | RL SURFACE | 7.32 m | DATUM AHD |
| EXCAVATION DIMENSIONS | | 24.50 m depth | NORTHING | -32.773304 | ASPECT | Southeast | SLOPE <2% |

| Drilling | | | | | Sampling | | Field Material Description | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| METHOD | PENETRATION RESISTANCE | WATER | DEPTH (metres) | DEPTH RL | SAMPLE OR FIELD TEST | RECOVERED | GRAPHIC LOG | USCS / ASCS CLASSIFICATION | SOIL/ROCK MATERIAL DESCRIPTION | MOISTURE CONDITION | CONSISTENCY DENSITY | STRUCTURE AND ADDITIONAL OBSERVATIONS |
| WB | L | | 21 | 21.00<br>-13.68 | 3897/BH409/21-21.2/S/1<br>D 21.00 m | | | SP | SAND; fine to medium grained; grey. | W | | |
| | | | 22 | | | | | | Grey. | | | |
| | | | | | 3897/BH409/22.5-22.7/S/1<br>D 22.50 m | | | | | | | |
| | | | 23 | | | | | | | | | |
| | | | 24 | | 3897/BH409/24-24.2/S/1<br>D 24.00 m | | | | | | | |
| | | | | 24.50 | | | | | Hole Terminated at 24.50 m<br>(Target depth reached) | | | |
| | | | 25 | | | | | | | | | |
| | | | 26 | | | | | | | | | |
| | | | 27 | | | | | | | | | |
| | | | 28 | | | | | | | | | |
| | | | 29 | | | | | | | | | |

EXCAVATION LOG TO BE READ IN CONJUCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

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***Engineering Log - BOREHOLE***

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| CLIENT | Ammos Resource Management Pty Ltd | | COMMENCED | 18/09/2019 | COMPLETED | 18/09/2019 | **REF MW101** |
| PROJECT | Supplementary Acid Sulfate Soils Assessment | | LOGGED | WX | CHECKED | JF | Sheet 1 OF 2 |
| SITE | 3631 Nelson Bay Road, Bobs Farm, NSW | | GEOLOGY | Quaternary | VEGETATION | Grass | PROJECT NO. P1303897 |
| EQUIPMENT | | 4WD truck-mounted hydraulic drill rig | EASTING | 152.0046 | RL SURFACE | 6.5 m | DATUM AHD |
| EXCAVATION DIMENSIONS | | Ø100 mm x 17.95 m depth | NORTHING | -32.774565 | ASPECT | Northeast | SLOPE <2% |

| Drilling | | | | | Sampling | | Field Material Description | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| METHOD | PENETRATION RESISTANCE | WATER | DEPTH (metres) | DEPTH RL | SAMPLE OR FIELD TEST | RECOVERED | GRAPHIC LOG | USCS / ASCS CLASSIFICATION | SOIL/ROCK MATERIAL DESCRIPTION | MOISTURE CONDITION | CONSISTENCY DENSITY | PIEZOMETER DETAILS ID MW101 Static Water Level |
| AD/T | L | 19/09/19 | 0 | 0.10<br>6.40 | 3897/MW101/0.0-0.1/S/1<br>D 0.00 m | | | SP<br>SP | TOPSOIL: SAND; medium grained; grey black; trace organics and rootlets.<br>SAND; medium grained; pale grey. | | | Concrete<br>Bentonite |
| | | | | | 3897/MW101/0.5/S/1<br>D 0.50 m | | | | | | | |
| | | | 1 | 0.90<br>5.60 | 3897/MW101/1.0/S/1<br>D 1.00 m | | | | Dark orange brown. | | | |
| | | | | 1.50<br>5.00 | 3897/MW101/1.5/S/1<br>D 1.50 m | | | | Orange brown. | | | |
| | | | 2 | 1.90<br>4.60 | 3897/MW101/2.0/S/1<br>D 2.00 m | | | | Orange yellow brown. | D | | |
| | | | | 2.30<br>4.20 | 3897/MW101/2.5/S/1<br>D 2.50 m | | | | Yellow-brown. | | | |
| | | | 3 | 3.00<br>3.50 | 3897/MW101/3.0/S/1<br>D 3.00 m | | | | Brown. | | | |
| | | | | 3.50<br>3.00 | 3897/MW101/3.5/S/1<br>D 3.50 m | | | | Yellow-brown. | | | |
| | | | 4 | | 3897/MW101/4.0/S/1<br>D 4.00 m | | | | | | | |
| | | | | 4.70<br>1.80 | 3897/MW101/4.5/S/1<br>D 4.50 m | | | | Dark yellow-brown. | M | | |
| | | | 5 | 5.00<br>1.50 | | | | | Dark grey. | | | Casing |
| | | | | | SPT 5.70-5.85 m<br>8 | | | | | | | |
| | | | 6 | | 3897/MW101/5.7-6.0/S/1<br>D 5.70 m | | | | | | | |
| | | | 7 | 7.00<br>-0.50 | | | | | Grey. | | | |
| | | | | | 3897/MW101/7.3-7.5/S/1<br>D 7.30 m | | | | | W | | |
| | | | 8 | | | | | | | | | |
| | | | | 8.50<br>-2.00 | | | | | Pale grey. | | | |
| | | | 9 | | 3897/MW101/8.8-9.0/S/1<br>D 8.80 m | | | | | | | Sand |
| | | | | 10.00 | | | | | | | | |

EXCAVATION LOG TO BE READ IN CONJUCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

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**Engineering Log - TEST**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| CLIENT | Ammos Resource Management Pty Ltd | | COMMENCED | 18/09/2019 | COMPLETED | 18/09/2019 | **REF MW101** |
| PROJECT | Supplementary Acid Sulfate Soils Assessment | | LOGGED | WX | CHECKED | JF | Sheet 2 OF 2 |
| SITE | 3631 Nelson Bay Road, Bobs Farm, NSW | | GEOLOGY | Quaternary | VEGETATION | Grass | PROJECT NO. P1303897 |
| EQUIPMENT | | 4WD truck-mounted hydraulic drill rig | EASTING | 152.0046 | RL SURFACE | 6.5 m | DATUM AHD |
| EXCAVATION DIMENSIONS | | Ø100 mm x 17.95 m depth | NORTHING | -32.774565 | ASPECT | Northeast | SLOPE <2% |

| Drilling | | | | | Sampling | | Field Material Description | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| METHOD | PENETRATION RESISTANCE | WATER | DEPTH (metres) | DEPTH RL | SAMPLE OR FIELD TEST | RECOVERED | GRAPHIC LOG | USCS / ASCS CLASSIFICATION | SOIL/ROCK MATERIAL DESCRIPTION | MOISTURE CONDITION | CONSISTENCY DENSITY | PIEZOMETER DETAILS ID MW101 Static Water Level |
| AD/T | L | | 11 | -3.50 | 3897/MW101/10.3-10.5/S/1 D 10.30 m | | | SP | SAND; medium grained; pale grey. Pale grey white. | | | Sand |
| | | | | *11.50* -5.00 | | | | | Pale grey. | | | Casing |
| | | | 12 | | 3897/MW101/11.8-12/S/1 D 11.80 m | | | | | | | Screen |
| | | | 13 | | 3897/MW101/13.3-13.5/S/1 D 13.30 m | | | | | | | |
| | | | 14 | | | | | | | W | | |
| | | | 15 | | 3897/MW101/14.8-15/S/1 D 14.80 m | | | | | | | |
| | | | 16 | | | | | | | | | |
| | | | 17 | | 3897/MW101/16.3-16.5/S/1 D 16.30 m | | | | | | | |
| | | | 18 | *17.95* | | | | | Hole Terminated at 17.95 m | | | |
| | | | 19 | | | | | | | | | |

EXCAVATION LOG TO BE READ IN CONJUCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS



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**Engineering Log - TEST**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| CLIENT | Ammos Resource Management Pty Ltd | | COMMENCED | 23/09/2019 | COMPLETED | 24/09/2019 | **REF MW102** |
| PROJECT | Supplementary Acid Sulfate Soils Assessment | | LOGGED | HN | CHECKED | JF | Sheet 1 OF 4 |
| SITE | 3631 Nelson Bay Road, Bobs Farm, NSW | | GEOLOGY | Quaternary | VEGETATION | Grass | PROJECT NO. P1303897 |
| EQUIPMENT | | 4WD truck-mounted hydraulic drill rig | EASTING | 152.003608 | RL SURFACE | 26 m | DATUM AHD |
| EXCAVATION DIMENSIONS | | Ø100 mm x 30.00 m depth | NORTHING | -32.771901 | ASPECT | Northeast | SLOPE <2% |

| Drilling | | | | | Sampling | | Field Material Description | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| METHOD | PENETRATION RESISTANCE | WATER | DEPTH (metres) | DEPTH RL | SAMPLE OR FIELD TEST | RECOVERED | GRAPHIC LOG | USCS / ASCS CLASSIFICATION | SOIL/ROCK MATERIAL DESCRIPTION | MOISTURE CONDITION | CONSISTENCY DENSITY | PIEZOMETER DETAILS ID Static Water Level MW102 |
| AD/T | | | | 26.00 | | | | SM | Silty SAND; fine to medium grained; grey and dark grey; trace roots. | | | Concrete |
| | | | | | 3897/MW102/0.2-0.3/S/1 D 0.20 m | | | | | | | Bentonite |
| | | | | *0.50* | | | | | | | | |
| | | | | 25.50 | 3897/MW102/0.5-0.6/S/1 D 0.50 m | | | SP | SAND; fine to mediume grained; brown; trace silt; trace roots. | | | |
| | | | 1 | | 3897/MW102/1.0-1.1/S/1 D 1.00 m | | | | | | | |
| | | | | *1.30* | | | | | | | | |
| | | | | 24.70 | | | | | Pale brown with some grey. | | | |
| | | | | *1.50* | | | | | | | | |
| | | | | 24.50 | 3897/MW102/1.5-1.6/S/1 D 1.50 m | | | | No silt; no roots. | D / M | | |
| | | | 2 | | 3897/MW102/2.0-2.1/S/1 D 2.00 m | | | | | | | |
| | | | | *2.50* | | | | | | | | |
| | | | | 23.50 | 3897/MW102/2.5-2.6/S/1 D 2.50 m | | | | Brown and grey. | | | |
| | | | 3 | | 3897/MW102/3.0-3.1/S/1 D 3.00 m | | | | | | | |
| | | | | *3.50* | | | | | | | | |
| | | | | 22.50 | 3897/MW102/3.5-3.6/S/1 D 3.50 m | | | | Brown. | | | |
| | | | | *4.00* | | | | | | | | Sand |
| | | | 4 | 22.00 | 3897/MW102/4.0-4.1/S/1 D 4.00 m | | | | Pale brown. | | | |
| | | | | | 3897/MW102/4.5-4.6/S/1 D 4.50 m | | | | | | | |
| WB | L | | 5 | | | | | | | | | |
| | | | | | SPT 5.50-5.95 m 0,0,0 N=0 3897/MW102/5.5-5.95/S/1 D 5.50 m | | | | | | | Casing |
| | | | 6 | | | | | | | M | | |
| | | | | *7.00* | | | | | | | | |
| | | | 7 | 19.00 | SPT 7.00-7.45 m 0,0,0 N=0 3897/MW102/7.0-7.45/S/1 D 7.00 m | | | | Brown and grey. | | | |
| | | | 8 | | | | | | | | | |
| | | | | *8.50* | | | | | | | | |
| | | | | 17.50 | SPT 8.50-8.95 m 0,0,0 N=0 3897/MW102/8.5-8.95/S/1 D 8.50 m | | | | Pale brown. | | | |
| | | | 9 | | | | | | | | | Screen |

EXCAVATION LOG TO BE READ IN CONJUCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS



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**Engineering Log - TEST**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| CLIENT | Ammos Resource Management Pty Ltd | | COMMENCED | 23/09/2019 | COMPLETED | 24/09/2019 | **REF MW102** |
| PROJECT | Supplementary Acid Sulfate Soils Assessment | | LOGGED | HN | CHECKED | JF | Sheet 2 OF 4 |
| SITE | 3631 Nelson Bay Road, Bobs Farm, NSW | | GEOLOGY | Quaternary | VEGETATION | Grass | PROJECT NO. P1303897 |
| EQUIPMENT | | 4WD truck-mounted hydraulic drill rig | EASTING | 152.003608 | RL SURFACE | 26 m | DATUM AHD |
| EXCAVATION DIMENSIONS | | Ø100 mm x 30.00 m depth | NORTHING | -32.771901 | ASPECT | Northeast | SLOPE <2% |

| Drilling | | | | | Sampling | | Field Material Description | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| METHOD | PENETRATION RESISTANCE | WATER | DEPTH (metres) | *DEPTH* RL | SAMPLE OR FIELD TEST | RECOVERED | GRAPHIC LOG | USCS / ASCS CLASSIFICATION | SOIL/ROCK MATERIAL DESCRIPTION | MOISTURE CONDITION | CONSISTENCY DENSITY | PIEZOMETER DETAILS ID MW102 Static Water Level |
| WB | L | | 11 | | SPT 10.00-10.45 m 0,0,0 N=0 3897/MW102/10.0-10.45/S/1 D 10.00 m | | | SP | SAND; fine to mediume grained; brown; trace silt; trace roots. | | | |
| | | | 12 | | SPT 11.50-11.95 m 0,0,0 N=0 3897/MW102/11.5-11.95/S/1 D 11.50 m | | | | | | | Screen |
| | | | 13 | | SPT 13.00-13.45 m 0,0,0 N=0 3897/MW102/13.0-13.45/S/1 D 13.00 m | | | | | | | |
| | | | 14 | | | | | | | | | |
| | | | 15 | | SPT 14.50-14.95 m 0,0,0 N=0 3897/MW102/14.5-14.95/S/1 14.50 m | | | | | M | | Sand |
| | | | 16 | | SPT 16.00-16.45 m 0,0,0 N=0 3897/MW102/16.0-16.45/S/1 D 16.00 m | | | | | | | |
| | | | 17 | | | | | | | | | |
| | | | 18 | | SPT 17.50-17.95 m 0,0,0 N=0 3897/MW102/17.5-17.95/S/1 D 17.50 m | | | | | | | |
| | | | 19 | | SPT 19.00-19.45 m 0,0,0 N=0 3897/MW102/19.0-19.45/S/1 D 19.00 m | | | | | | | |

EXCAVATION LOG TO BE READ IN CONJUCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS



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***Engineering Log - TEST***

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| CLIENT | Ammos Resource Management Pty Ltd | | COMMENCED | 23/09/2019 | COMPLETED | 24/09/2019 | **REF MW102** |
| PROJECT | Supplementary Acid Sulfate Soils Assessment | | LOGGED | HN | CHECKED | JF | Sheet 3 OF 4 |
| SITE | 3631 Nelson Bay Road, Bobs Farm, NSW | | GEOLOGY | Quaternary | VEGETATION | Grass | PROJECT NO. P1303897 |
| EQUIPMENT | | 4WD truck-mounted hydraulic drill rig | EASTING | 152.003608 | RL SURFACE | 26 m | DATUM AHD |
| EXCAVATION DIMENSIONS | | Ø100 mm x 30.00 m depth | NORTHING | -32.771901 | ASPECT | Northeast | SLOPE <2% |

| Drilling | | | | | Sampling | | Field Material Description | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| METHOD | PENETRATION RESISTANCE | WATER | DEPTH (metres) | DEPTH RL | SAMPLE OR FIELD TEST | RECOVERED | GRAPHIC LOG | USCS / ASCS CLASSIFICATION | SOIL/ROCK MATERIAL DESCRIPTION | MOISTURE CONDITION | CONSISTENCY DENSITY | PIEZOMETER DETAILS ID MW102 Static Water Level |
| WB | L | | 21 | | SPT 20.50-20.95 m 0,0,0 N=0 3897/MW102/20.5-20.95/S/1 D 20.50 m | | | SP | SAND; fine to mediume grained; brown; trace silt; trace roots. | | | |
| | | | 22 | | SPT 22.00-22.45 m 0,0,0 N=0 3897/MW102/22.0-22.45/S/1 D 22.00 m | | | | | | | Screen |
| | | | 23 | | SPT 23.50-23.95 m 0,0,0 N=0 3897/MW102/23.5-23.95/S/1 D 23.50 m | | | | | | | |
| | | | 24 | | | | | | | | | Sand |
| | | | 25 | | SPT 25.00-25.45 m 0,0,0 N=0 3897/MW102/25.0-25.45/S/1 D 25.00 m | | | | | M | | |
| | | | 26 | | | | | | | | | |
| | | | 27 | *26.90* -0.90 | SPT 26.50-26.95 m 0,0,0 N=0 3897/MW102/26.5-26.95/S/1 D 26.50 m | | | | Dark grey. | | | |
| | | | | *27.50* -1.50 | | | | SC | Clayey SAND; fine to medium grained; dark grey. | | | |
| | | | 28 | | SPT 28.00-28.45 m 0,0,0 N=0 3897/MW102/28.0-28.45/S/1 D 28.00 m | | | | | | | |
| | | | 29 | | | | | | | | | |
| | | | | *30.00* | SPT 29.50-29.95 m 0,0,0 N=0 3897/MW102/29.5-29.95/S/1 | | | | Hole Terminated at 30.00 m | | | |

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**Engineering Log - TEST**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| CLIENT | Ammos Resource Management Pty Ltd | | COMMENCED | 23/09/2019 | COMPLETED | 24/09/2019 | **REF MW102** |
| PROJECT | Supplementary Acid Sulfate Soils Assessment | | LOGGED | HN | CHECKED | JF | Sheet 4 OF 4 |
| SITE | 3631 Nelson Bay Road, Bobs Farm, NSW | | GEOLOGY | Quaternary | VEGETATION | Grass | PROJECT NO. P1303897 |
| EQUIPMENT | | 4WD truck-mounted hydraulic drill rig | EASTING | 152.003608 | RL SURFACE | 26 m | DATUM AHD |
| EXCAVATION DIMENSIONS | | Ø100 mm x 30.00 m depth | NORTHING | -32.771901 | ASPECT | Northeast | SLOPE <2% |

| Drilling | | | | | Sampling | | Field Material Description | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| METHOD | PENETRATION RESISTANCE | WATER | DEPTH (metres) | *DEPTH* RL | SAMPLE OR FIELD TEST | RECOVERED | GRAPHIC LOG | USCS / ASCS CLASSIFICATION | SOIL/ROCK MATERIAL DESCRIPTION | MOISTURE CONDITION | CONSISTENCY DENSITY | PIEZOMETER DETAILS ID Static Water Level MW102 |
| | | | | | D 29.50 m | | | | | | | |
| | | | 31 | | | | | | | | | |
| | | | 32 | | | | | | | | | |
| | | | 33 | | | | | | | | | |
| | | | 34 | | | | | | | | | |
| | | | 35 | | | | | | | | | |
| | | | 36 | | | | | | | | | |
| | | | 37 | | | | | | | | | |
| | | | 38 | | | | | | | | | |
| | | | 39 | | | | | | | | | |

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***Engineering Log - TEST***

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| CLIENT | Ammos Resource Management Pty Ltd | | COMMENCED | 27/09/2019 | COMPLETED | 30/09/2019 | **REF MW103** |
| PROJECT | Supplementary Acid Sulfate Soils Assessment | | LOGGED | WB | CHECKED | JF | Sheet 1 OF 4 |
| SITE | 3631 Nelson Bay Road, Bobs Farm, NSW | | GEOLOGY | Quaternary | VEGETATION | None | PROJECT NO. P1303897 |
| EQUIPMENT | | 4WD truck-mounted hydraulic drill rig | EASTING | 152.001364 | RL SURFACE | 31.5 m | DATUM AHD |
| EXCAVATION DIMENSIONS | | Ø100 mm x 38.00 m depth | NORTHING | -32.773299 | ASPECT | Northeast | SLOPE <2% |

| Drilling | | | | | Sampling | | Field Material Description | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| METHOD | PENETRATION RESISTANCE | WATER | DEPTH (metres) | DEPTH RL | SAMPLE OR FIELD TEST | RECOVERED | GRAPHIC LOG | USCS / ASCS CLASSIFICATION | SOIL/ROCK MATERIAL DESCRIPTION | MOISTURE CONDITION | CONSISTENCY DENSITY | PIEZOMETER DETAILS ID MW103 Static Water Level |
| AD/T | | | 0 | 31.50 | | | | SP | TOPSOIL: SAND; fine grained; dark grey; trace roots. | | | Concrete |
| | | | | *0.20* 31.30 | 3897/MW103/0.2/S/1 D 0.20 m | | | SP | SAND; fine grained; dark grey. | | | MW103 |
| | | | | | 3897/MW103/0.5/S/1 D 0.50 m | | | | | | | |
| | | | 1 | *1.00* 30.50 | 3897/MW103/1.0/S/1 D 1.00 m | | | | Grey. | | | |
| | | | | *1.30* 30.20 | | | | | Brown and some grey. | | | |
| | | | | | 3897/MW103/1.5/S/1 D 1.50 m | | | | | | | |
| | | | 2 | *1.80* 29.70 | 3897/MW103/2.0/S/1 D 2.00 m | | | | Brown. | | | |
| | | | | | 3897/MW103/2.5/S/1 D 2.50 m | | | | | | | |
| | | | 3 | | 3897/MW103/3.0/S/1 D 3.00 m | | | | | | | |
| | | | | *3.50* 28.00 | 3897/MW103/3.5/S/1 D 3.50 m | | | | Brown; trace roots. | | | |
| | | | 4 | *4.00* 27.50 | 3897/MW103/4.0/S/1 D 4.00 m | | | | Brown and yellow-brown. | | | |
| | | | | | 3897/MW103/4.5/S/1 D 4.50 m | | | | | | | |
| | | | 5 | | | | | | | M | | Casing |
| | | | | | 3897/MW103/5.5/S/1 D 5.50 m | | | | | | | |
| | | | 6 | | | | | | | | | |
| | | | | | 3897/MW103/6.5/S/1 D 6.50 m | | | | | | | |
| | | | 7 | | | | | | | | | |
| | | | | *7.50* 24.00 | 3897/MW103/7.5/S/1 D 7.50 m | | | | Pale brown and yellow-brown. | | | |
| | | | 8 | | | | | | | | | |
| | | | | | 3897/MW103/8.5/S/1 D 8.50 m | | | | | | | |
| | | | 9 | | | | | | | | | |
| | | | | | 3897/MW103/9.5/S/1 D 9.50 m | | | | | | | Backfill Cuttings |

EXCAVATION LOG TO BE READ IN CONJUCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS



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**Engineering Log - TEST**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| CLIENT | Ammos Resource Management Pty Ltd | | COMMENCED | 27/09/2019 | COMPLETED | 30/09/2019 | **REF MW103** |
| PROJECT | Supplementary Acid Sulfate Soils Assessment | | LOGGED | WB | CHECKED | JF | Sheet 2 OF 4 |
| SITE | 3631 Nelson Bay Road, Bobs Farm, NSW | | GEOLOGY | Quaternary | VEGETATION | None | PROJECT NO. P1303897 |
| EQUIPMENT | | 4WD truck-mounted hydraulic drill rig | EASTING | 152.001364 | RL SURFACE | 31.5 m | DATUM AHD |
| EXCAVATION DIMENSIONS | | Ø100 mm x 38.00 m depth | NORTHING | -32.773299 | ASPECT | Northeast | SLOPE <2% |

| Drilling | | | | | Sampling | | Field Material Description | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| METHOD | PENETRATION RESISTANCE | WATER | DEPTH (metres) | *DEPTH* RL | SAMPLE OR FIELD TEST | RECOVERED | GRAPHIC LOG | USCS / ASCS CLASSIFICATION | SOIL/ROCK MATERIAL DESCRIPTION | MOISTURE CONDITION | CONSISTENCY DENSITY | PIEZOMETER DETAILS ID Static Water Level MW103 |
| AD/T | | | 11 | | 3897/MW103/10.5/S/1 D 10.50 m | | | SP | SAND; fine grained; dark grey. | | | |
| | | | 12 | | 3897/MW103/11.5/S/1 D 11.50 m | | | | | | | Backfill Cuttings |
| | | | 13 | | 3897/MW103/13.5/S/1 D 13.50 m | | | | | | | |
| | | | 14 | | 3897/MW103/14.5/S/1 D 14.50 m | | | | | | | |
| | | | 15 | | | | | | | M | | |
| | | | 16 | | 3897/MW103/16/S/1 D 16.00 m | | | | | | | |
| | | | 17 | | | | | | | | | |
| | | | | *17.50* 14.00 | 3897/MW103/17.5/S/1 D 17.50 m | | | | Pale brown, yellow-brown, some dark grey. | | | |
| | | | 18 | | | | | | | | | |
| | | | 19 | *19.00* 12.50 | 3897/MW103/19/S/1 D 19.00 m | | | | Pale brown and yellow-brown. | | | Bentonite |

EXCAVATION LOG TO BE READ IN CONJUCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS



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***Engineering Log - TEST***

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| CLIENT | Ammos Resource Management Pty Ltd | | COMMENCED | 27/09/2019 | COMPLETED | 30/09/2019 | **REF MW103** |
| PROJECT | Supplementary Acid Sulfate Soils Assessment | | LOGGED | WB | CHECKED | JF | Sheet 3 OF 4 |
| SITE | 3631 Nelson Bay Road, Bobs Farm, NSW | | GEOLOGY | Quaternary | VEGETATION | None | PROJECT NO. P1303897 |
| EQUIPMENT | | 4WD truck-mounted hydraulic drill rig | EASTING | 152.001364 | RL SURFACE | 31.5 m | DATUM AHD |
| EXCAVATION DIMENSIONS | | Ø100 mm x 38.00 m depth | NORTHING | -32.773299 | ASPECT | Northeast | SLOPE <2% |

| Drilling | | | | | Sampling | | Field Material Description | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| METHOD | PENETRATION RESISTANCE | WATER | DEPTH (metres) | DEPTH RL | SAMPLE OR FIELD TEST | RECOVERED | GRAPHIC LOG | USCS / ASCS CLASSIFICATION | SOIL/ROCK MATERIAL DESCRIPTION | MOISTURE CONDITION | CONSISTENCY DENSITY | PIEZOMETER DETAILS ID MW103 Static Water Level |
| AD/T | | | 21 | *20.50* 11.00 | 3897/MW103/20.4-20.5/S/1 D 20.40 m | S/1 | | SP | SAND; fine grained; dark grey. | M | | |
| | | | | | | | | | Pale brown and grey. | | | |
| | | | 22 | *21.50* 10.00 | 3897/MW103/21.7/S/1 D 21.70 m | | | SP | SAND; fine grained; pale brown, yellow-brown and some grey. | | | |
| | | | 23 | | 3897/MW103/23.2/S/1 D 23.20 m | | | | | | | |
| | | | 24 | | | | | | | | | Sand |
| | | | 25 | | 3897/MW103/24.7/S/1 D 24.70 m | | | | | W | | |
| | | | 26 | *26.00* 5.50 | 3897/MW103/26.2/S/1 D 26.20 m | | | SP | SAND; fine grained; brown, yellow-brown and pale brown. | | | |
| | | | 27 | | | | | | | | | |
| | | | 28 | | 3897/MW103/27.7/S/1 D 27.70 m | | | | | | | |
| | | | 29 | | 3897/MW103/29.2/S/1 D 29.20 m | | | | | | | Sand |
| | | | | | | | | | | | | Screen |

EXCAVATION LOG TO BE READ IN CONJUCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

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**Engineering Log - TEST**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| CLIENT | Ammos Resource Management Pty Ltd | | COMMENCED | 27/09/2019 | COMPLETED | 30/09/2019 | **REF MW103** |
| PROJECT | Supplementary Acid Sulfate Soils Assessment | | LOGGED | WB | CHECKED | JF | Sheet 4 OF 4 |
| SITE | 3631 Nelson Bay Road, Bobs Farm, NSW | | GEOLOGY | Quaternary | VEGETATION | None | PROJECT NO. P1303897 |
| EQUIPMENT | | 4WD truck-mounted hydraulic drill rig | EASTING | 152.001364 | RL SURFACE | 31.5 m | DATUM AHD |
| EXCAVATION DIMENSIONS | | Ø100 mm x 38.00 m depth | NORTHING | -32.773299 | ASPECT | Northeast | SLOPE <2% |

| Drilling | | | | | Sampling | | Field Material Description | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| METHOD | PENETRATION RESISTANCE | WATER | DEPTH (metres) | *DEPTH* RL | SAMPLE OR FIELD TEST | RECOVERED | GRAPHIC LOG | USCS / ASCS CLASSIFICATION | SOIL/ROCK MATERIAL DESCRIPTION | MOISTURE CONDITION | CONSISTENCY DENSITY | PIEZOMETER DETAILS ID MW103 Static Water Level |
| AD/T | | | 31 | *30.50* 1.00 *31.00* 0.50 | 3897/MW103/30.7/S/1 D 30.70 m | | | SP | SAND; fine grained; brown, yellow-brown and pale brown. | | | |
| | | | | | | | | SP | SAND; fine grained; pale brown, yellow-brown and some pale grey; trace organics (wood fragments in pale grey material). | | | |
| | | | | | | | | SC | Clayey SAND; fine grained; grey; trace shell fragments. | | | |
| | | | 32 | | 3897/MW103/32.2/S/1 D 32.20 m | | | | | | | |
| | | | 33 | | | | | | | | | Sand |
| | | | | *33.70* -2.20 | 3897/MW103/33.7/S/1 D 33.70 m | | | SP | SAND; fine to medium grained; grey. | W | | Screen |
| | | | 34 | | | | | | | | | |
| | | | 35 | *35.20* -3.70 | 3897/MW103/35.2/S/1 D 35.20 m | | | SP | SAND; fine grained; grey. | | | |
| | | | 36 | | | | | | | | | |
| | | | | | 3897/MW103/36.7/S/1 D 36.70 m | | | | | | | |
| | | | 37 | | | | | | | | | |
| | | | 38 | *38.00* | | | | | Hole Terminated at 38.00 m | | | |
| | | | 39 | | | | | | | | | |

EXCAVATION LOG TO BE READ IN CONJUCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS



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***Engineering Log - TEST***

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| CLIENT | Ammos Resource Management Pty Ltd | | COMMENCED | 30/09/2019 | COMPLETED | 01/10/2019 | **REF MW104** |
| PROJECT | Supplementary Acid Sulfate Soils Assessment | | LOGGED | WX | CHECKED | JF | Sheet 1 OF 3 |
| SITE | 3631 Nelson Bay Road, Bobs Farm, NSW | | GEOLOGY | Quaternary | VEGETATION | None | PROJECT NO. P1303897 |
| EQUIPMENT | | 4WD truck-mounted hydraulic drill rig | EASTING | 151.998887 | RL SURFACE | 12 m | DATUM AHD |
| EXCAVATION DIMENSIONS | | Ø100 mm x 26.00 m depth | NORTHING | -32.773046 | ASPECT | South | SLOPE 5-10% |

| Drilling | | | | | Sampling | | Field Material Description | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| METHOD | PENETRATION RESISTANCE | WATER | DEPTH (metres) | *DEPTH* RL | SAMPLE OR FIELD TEST | RECOVERED | GRAPHIC LOG | USCS / ASCS CLASSIFICATION | SOIL/ROCK MATERIAL DESCRIPTION | MOISTURE CONDITION | CONSISTENCY DENSITY | PIEZOMETER DETAILS |
| AD/T | | | 0 | 12.00 | 3897/MW104/0.1-0.2/S/1 D 0.00 m | | | SP | TOPSOIL: SAND; fine to medium subrounded to rounded grained; dark grey and grey; with silt; trace organic material. | D - M | | ID MW104 Static Water Level |
| | | | | | 3897/MW104/0.4-0.5/S/1 D 0.40 m | | | | | | | |
| | | | 1 | | 3897/MW104/0.1-0.2/S/1 D 1.00 m | | | | | | | |
| | | | | *1.20* 10.80 | | | | SP | SAND; fine to medium grained; brown, grey and dark grey; no organics; trace silt. | | | |
| | | | | | 3897/MW104/1.5/S/1 D 1.50 m | | | | | | | |
| | | | 2 | | 3897/MW104/2.0/S/1 D 2.00 m | | | | | | | |
| | | | | *2.20* 9.80 | | | | | Dark grey and dark brown; with silt. | | | |
| | | | | | 3897/MW104/2.5/S/1 D 2.50 m | | | | | | | |
| | | | | *2.80* 9.20 | | | | | Dark brown. | | | |
| | | | 3 | | 3897/MW104/3.0/S/1 D 3.00 m | | | | | | | |
| | | | | | 3897/MW104/3.5/S/1 D 3.50 m | | | | | | | |
| | | | | *3.70* 8.30 | | | | | Orange-dark brown; trace silt. | | | |
| | | | 4 | | 3897/MW104/4.0/S/1 D 4.00 m | | | | | | | |
| | | | | *4.20* 7.80 | | | | | Orange and pale brown, no silt. | | | |
| | | | | | 3897/MW104/4.5/S/1 D 4.50 m | | | | | | | |
| | | | 5 | | 3897/MW104/5.0/S/1 D 5.00 m | | | | | M | | |
| | | | | | 3897/MW104/5.5/S/1 D 5.50 m | | | | | | | |
| | | | 6 | | | | | | | | | |
| | | | | *6.20* 5.80 | | | | | Pale brown and yellow. | | | |
| | | | | | 3897/MW104/6.5/S/1 D 6.50 m | | | | | | | |
| | | | 7 | | | | | | | | | |
| | | | | | 3897/MW104/7.5/S/1 D 7.50 m | | | | | | | |
| | | | 8 | | | | | | | | | |
| | | | | | 3897/MW104/8.5/S/1 D 8.50 m | | | | | | | |
| | | | 9 | | | | | | | | | |
| | | | | *9.10* 2.90 | | | | | Pale grey. | W | | |
| | | | | *9.40* 2.60 | | | | CI | Sandy Silty CLAY; medium plasticity; dark brown; fine to medium grained sand; trace organic material. | M (>PL) | | |

PIEZOMETER DETAILS: MW104 — Concrete; Backfill Cuttings; Casing

EXCAVATION LOG TO BE READ IN CONJUCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

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**Engineering Log - TEST**

| | | | | | | |
|---|---|---|---|---|---|---|
| CLIENT | Ammos Resource Management Pty Ltd | COMMENCED | 30/09/2019 | COMPLETED | 01/10/2019 | **REF MW104** |
| PROJECT | Supplementary Acid Sulfate Soils Assessment | LOGGED | WX | CHECKED | JF | Sheet 2 OF 3 |
| SITE | 3631 Nelson Bay Road, Bobs Farm, NSW | GEOLOGY | Quaternary | VEGETATION | None | PROJECT NO. P1303897 |
| EQUIPMENT | 4WD truck-mounted hydraulic drill rig | EASTING | 151.998887 | RL SURFACE | 12 m | DATUM AHD |
| EXCAVATION DIMENSIONS | Ø100 mm x 26.00 m depth | NORTHING | -32.773046 | ASPECT | South | SLOPE 5-10% |

| Drilling | | | | | Sampling | | Field Material Description | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| METHOD | PENETRATION RESISTANCE | WATER | DEPTH (metres) | DEPTH RL | SAMPLE OR FIELD TEST | RECOVERED | GRAPHIC LOG | USCS / ASCS CLASSIFICATION | SOIL/ROCK MATERIAL DESCRIPTION | MOISTURE CONDITION | CONSISTENCY DENSITY | PIEZOMETER DETAILS ID Static Water Level |
| AD/T | | | | *10.20* 1.80 | | | | CI | | | | MW104 |
| | | | | | | | | SP | SAND; fine to medium grained; grey. | | | |
| | | | | | 3897/MW104/10.5/S/1 D 10.50 m | | | | | | | |
| | | | 11 | | | | | | | | | Backfill Cuttings |
| | | | | | 3897/MW104/11.5/S/1 D 11.50 m | | | | | | | |
| | | | 12 | | | | | | | | | |
| | | | | | 3897/MW104/12.5/S/1 D 12.50 m | | | | | | | |
| | | | 13 | | | | | | | | | |
| | | | | | 3897/MW104/14.0-14.5/S/1 D 14.00 m | | | | | | | Bentonite |
| | | | 15 | | | | | | | W | | |
| | | | | | 3897/MW104/15.75-16.27/S/1 D 15.75 m | | | | | | | |
| | | | 16 | | | | | | | | | |
| | | | 17 | | | | | | | | | Screen |
| | | | | | 3897/MW104/17.25/S/1 D 17.25 m | | | | | | | |
| | | | 18 | | | | | | | | | Sand |
| | | | | | 3897/MW104/18.75/S/1 D 18.75 m | | | | | | | |
| | | | 19 | | | | | | | | | |

EXCAVATION LOG TO BE READ IN CONJUCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS

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**Engineering Log - TEST**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| CLIENT | Ammos Resource Management Pty Ltd | | COMMENCED | 30/09/2019 | COMPLETED | 01/10/2019 | **REF MW104** |
| PROJECT | Supplementary Acid Sulfate Soils Assessment | | LOGGED | WX | CHECKED | JF | Sheet 3 OF 3 |
| SITE | 3631 Nelson Bay Road, Bobs Farm, NSW | | GEOLOGY | Quaternary | VEGETATION | None | PROJECT NO. P1303897 |
| EQUIPMENT | | 4WD truck-mounted hydraulic drill rig | EASTING | 151.998887 | RL SURFACE | 12 m | DATUM AHD |
| EXCAVATION DIMENSIONS | | Ø100 mm x 26.00 m depth | NORTHING | -32.773046 | ASPECT | South | SLOPE 5-10% |

| Drilling | | | | | Sampling | | Field Material Description | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| METHOD | PENETRATION RESISTANCE | WATER | DEPTH (metres) | DEPTH RL | SAMPLE OR FIELD TEST | RECOVERED | GRAPHIC LOG | USCS / ASCS CLASSIFICATION | SOIL/ROCK MATERIAL DESCRIPTION | MOISTURE CONDITION | CONSISTENCY DENSITY | PIEZOMETER DETAILS ID MW104 Static Water Level |
| AD/T | | | 21 | | 3897/MW104/20.25/S/1 D 20.25 m | | | SP | SAND; fine to medium grained; grey. | | | Sand |
| | | | | *21.75* -9.75 | 3897/MW104/21.75/S/1 D 21.75 m | | | SP | SAND; fine grained; grey. | | | |
| | | | 22 | | | | | | | | | |
| | | | 23 | | 3897/MW104/23.25/S/1 D 23.25 m | | | | | W | | Screen |
| | | | 24 | | | | | | | | | |
| | | | 25 | | 3897/MW104/24.75/S/1 D 24.75 m | | | | | | | |
| | | | 26 | *26.00* | | | | | Hole Terminated at 26.00 m | | | |
| | | | 27 | | | | | | | | | |
| | | | 28 | | | | | | | | | |
| | | | 29 | | | | | | | | | |

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***Engineering Log - TEST***

# Hole ID: BH201

## PASS Drillhole Log



## Project: Bobs Farm PASS Drilling

Date: 12/03/2026
E: 406593.7
N: 6373284.488
Job No.: 12789
Logged By: VGT
Driller: Total Drilling
Address: Nelson Bay Road, Bobs Farm NSW
Client: Civitas Lifestyle Pty Ltd
Sampler: MM

vgt environmental compliance solutions and laboratories

SPT = Standard Penetration Test

| DEPTH (m) | RL | GRAPHIC LOG | LITHOLOGY | DESCRIPTION | SAMPLE DESCRIPTION | $pH_F$ TEMP | $pH_F$ | $pH_{FOX}$ TEMP | $pH_{FOX}$ | pH DIFFERENCE | REACTION RATING $pH_{FOX}$ | FIZZ TEST FOR CARBONATES | POTENTIAL ASS? | CHROMIUM REDUCIBLE SULFUR (moles $H^+$/t) | NET ACIDITY INC. ANC (moles $H^+$/t) | LIMING RATE INC. ANC (kg $CaCO_3$/t) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | | | | | | | | |
| 0.5 | 11 | | Sand | Grey, fmg, very well sorted, rounded, high sphericity, few coal fragments | Solid Flight Auger | 23.9 | 4.6 | 25.1 | 2.7 | 1.9 | No reaction | N - non calcareous | Yes | 5 | 11 | 0.8 |
| 1 | | | | | | | | | | | | | | | | |
| 1.5 | 10 | | Sand | Blue grey, mg, well sorted, rounded, high sphericity, few coal fragments | SPT (1.00-1.45m) | 24.6 | 6.1 | 25.6 | 3.4 | 2.7 | M - Medium reaction | N - non calcareous | Inconclusive | 5 | 6 | <0.75 |
| | | | | | Solid Flight Auger | 24.4 | 5.8 | 25.6 | 4.2 | 1.6 | M - Medium reaction | N - non calcareous | Inconclusive | | | |
| 2 | | | | | | | | | | | | | | | | |
| 2.5 | 9 | | Sand | Grey, mg, well sorted, rounded, high sphericity, moisture present and clay | Solid Flight Auger | 24.6 | 5.5 | 25.3 | 3.2 | 2.2 | L - Low reaction | N - non calcareous | Inconclusive | | | |
| | | | | | SPT (2.50-2.95m) | 24.5 | 4.8 | 24.8 | 3 | 1.9 | L - Low reaction | N - non calcareous | Yes | 5 | 13 | 1 |

## Project: Bobs Farm PASS Drilling

Date: 12/03/2026 | Job No.: 12789 | Address: Nelson Bay Road, Bobs Farm NSW
E: 406593.7 | Logged By: VGT | Client: Civitas Lifestyle Pty Ltd
N: 6373284.488 | Driller: Total Drilling | Sampler: MM

vgt environmental compliance solutions and laboratories

SPT = Standard Penetration Test

| DEPTH (m) | RL | GRAPHIC LOG | LITHOLOGY | DESCRIPTION | SAMPLE DESCRIPTION | $pH_f$ TEMP | $pH_F$ | $pH_{FOX}$ TEMP | $pH_{FOX}$ | pH DIFFERENCE | REACTION RATING $pH_{FOX}$ | FIZZ TEST FOR CARBONATES | POTENTIAL ASS? | CHROMIUM REDUCIBLE SULFUR (moles $H^+$/t) | NET ACIDITY INC. ANC (moles $H^+$/t) | LIMING RATE INC. ANC (kg $CaCO_3$/t) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | | | | | | | | | | | | | | | | |
| 3.5 | 8 | | Sand | Dark brown, fg, very well sorted, rounded, high sphericity, moisture and clays present binding particles together | Solid Flight Auger | 24.5 | 5 | 24.9 | 4.2 | 0.8 | No reaction | N - non calcareous | Inconclusive | 5 | 11 | 0.8 |
| 4 | | | | | | | | | | | | | | | | |
| 4.5 | 7 | | Sand | Brown, fg, very well sorted, rounded, high sphericity, moisture, dirt and clays present binding particles together | SPT (4.00-4.45m) | 24.6 | 5.2 | 25.6 | 3.3 | 1.9 | No reaction | N - non calcareous | Inconclusive | <3 | 13 | 1 |
| | | | | | Solid Flight Auger | 24.5 | 5.6 | 25.5 | 3.8 | 1.8 | No reaction | N - non calcareous | Inconclusive | | | |
| 5 | | | | | | | | | | | | | | | | |
| 5.5 | 6 | | Sand | Brown, fg, very well sorted, rounded, high sphericity, moisture and clays present binding particles together | Solid Flight Auger | 24.4 | 6 | 25.5 | 3.9 | 2.1 | No reaction | N - non calcareous | Inconclusive | 8 | 15 | 1 |

## Project: Bobs Farm PASS Drilling

Date: 12/03/2026
E: 406593.7
N: 6373284.488
Job No.: 12789
Logged By: VGT
Driller: Total Drilling
Address: Nelson Bay Road, Bobs Farm NSW
Client: Civitas Lifestyle Pty Ltd
Sampler: MM

vgt environmental compliance solutions and laboratories

SPT = Standard Penetration Test

| DEPTH (m) | RL | GRAPHIC LOG | LITHOLOGY | DESCRIPTION | SAMPLE DESCRIPTION | $pH_F$ TEMP | $pH_F$ | $pH_{FOX}$ TEMP | $pH_{FOX}$ | pH DIFFERENCE | REACTION RATING $pH_{FOX}$ | FIZZ TEST FOR CARBONATES | POTENTIAL ASS? | CHROMIUM REDUCIBLE SULFUR (moles $H^+$/t) | NET ACIDITY INC. ANC (moles $H^+$/t) | LIMING RATE INC. ANC (kg $CaCO_3$/t) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6 | | | | | | | | | | | | | | | | |
| 6.5 | 5 | | Sand | Dark cream, fg, very well sorted, rounded, high sphericity, clean, moisture present | Solid Flight Auger | 24.4 | 6.1 | 24.7 | 4.3 | 1.8 | No reaction | N - non calcareous | Inconclusive | | | |
| 7 | | | | | SPT (7.00-7.45m) | 24.2 | 6.5 | 24.4 | 4.5 | 2 | No reaction | N - non calcareous | Inconclusive | 5 | 9 | <0.75 |
| 7.5 | 4 | | Sand | Cream, fg, very well sorted, rounded, very high sphericity, clean, water table at approx. 7.54m | Solid Flight Auger | 24.4 | 6.4 | 24.5 | 4.9 | 1.5 | L - Low reaction | N - non calcareous | Inconclusive | | | |
| 8 | | | | | | | | | | | | | | | | |
| 8.5 | 3 | | Sand | Dark cream, fg, well sorted, rounded, high sphericity, clean, very moist/damp | Solid Flight Auger | 21.7 | 6.1 | 23.3 | 5.1 | 1 | No reaction | N - non calcareous | No | | | |

## Project: Bobs Farm PASS Drilling

Date: 12/03/2026
E: 406593.7
N: 6373284.488
Job No.: 12789
Logged By: VGT
Driller: Total Drilling
Address: Nelson Bay Road, Bobs Farm NSW
Client: Civitas Lifestyle Pty Ltd
Sampler: MM

vgt environmental compliance solutions and laboratories

SPT = Standard Penetration Test

| DEPTH (m) | RL | GRAPHIC LOG | LITHOLOGY | DESCRIPTION | SAMPLE DESCRIPTION | $pH_F$ TEMP | $pH_F$ | $pH_{FOX}$ TEMP | $pH_{FOX}$ | pH DIFFERENCE | REACTION RATING $pH_{FOX}$ | FIZZ TEST FOR CARBONATES | POTENTIAL ASS? | CHROMIUM REDUCIBLE SULFUR (moles $H^+$/t) | NET ACIDITY INC. ANC (moles $H^+$/t) | LIMING RATE INC. ANC (kg $CaCO_3$/t) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 9 | | | | | | | | | | | | | | | | |
| 9.5 | 2 | | | | | | | | | | | | | | | |
| 10 | | | Sand | Cream, mg, well sorted, rounded, high sphericity, wet, mud drilling | SPT (10-10.45m) | 22.4 | 6.4 | 23.8 | 6.2 | 0.2 | No reaction | N - non calcareous | No | | | |
| 10.5 | 1 | | | | | | | | | | | | | | | |
| 11 | | | | | | | | | | | | | | | | |
| 11.5 | 0 | | Sand | Grey, fg, very well sorted, well rounded, moderate to high | SPT (11.50-11.95m) | 22.7 | 6.3 | 38.9 | 1.7 | 4.6 | X - Extreme | N - non calcareous | Yes | 170 | 190 | 14 |

## Project: Bobs Farm PASS Drilling

Date: 12/03/2026
E: 406593.7
N: 6373284.488
Job No.: 12789
Logged By: VGT
Driller: Total Drilling
Address: Nelson Bay Road, Bobs Farm NSW
Client: Civitas Lifestyle Pty Ltd
Sampler: MM

vgt environmental compliance solutions and laboratories

SPT = Standard Penetration Test

| DEPTH (m) | RL | GRAPHIC LOG | LITHOLOGY | DESCRIPTION | SAMPLE DESCRIPTION | $pH_F$ TEMP | $pH_F$ | $pH_{FOX}$ TEMP | $pH_{FOX}$ | pH DIFFERENCE | REACTION RATING $pH_{FOX}$ | FIZZ TEST FOR CARBONATES | POTENTIAL ASS? | CHROMIUM REDUCIBLE SULFUR (moles $H^+$/t) | NET ACIDITY INC. ANC (moles $H^+$/t) | LIMING RATE INC. ANC (kg $CaCO_3$/t) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | sphericity, wet, odour, mud drilling | | | | | | | reaction | | | | | |
| 12 | | | | | | | | | | | | | | | | |
| 12.5 | -1 | | | | | | | | | | | | | | | |
| 13 | | | | | | | | | | | | | | | | |
| 13.5 | -2 | | Sand | Light grey, vffg, very well sorted, well rounded, very high sphericity, wet, very high clay content, mud drilling | SPT (13.50-13.95m) | 22.8 | 6.4 | 38.2 | 1.8 | 4.6 | M - Medium reaction | N - non calcareous | Yes | | | |

**Hole ID: BH202** | **PASS Drillhole Log** | Page: 1 of 5

## Project: Bobs Farm PASS Drilling

Date: 12/03/2026 | Job No.: 12789 | Address: Nelson Bay Road, Bobs Farm NSW
E: 406258.525 | Logged By: VGT | Client: Civitas Lifestyle Pty Ltd
N: 6373084.851 | Driller: Total Drilling | Sampler: MM

vgt environmental compliance solutions and laboratories

SPT = Standard Penetration Test

| DEPTH (m) | RL | GRAPHIC LOG | LITHOLOGY | DESCRIPTION | SAMPLE DESCRIPTION | $pH_f$ TEMP | $pH_F$ | $pH_{FOX}$ TEMP | $pH_{FOX}$ | pH DIFFERENCE | REACTION RATING $pH_{FOX}$ | FIZZ TEST FOR CARBONATES | POTENTIAL ASS? | CHROMIUM REDUCIBLE SULFUR (moles $H^+$/t) | NET ACIDITY INC. ANC (moles $H^+$/t) | LIMING RATE INC. ANC (kg $CaCO_3$/t) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 – 0.5 | 9 | | Sand | Grey, mg, very well sorted, rounded, high sphericity, dirty with few organics | Solid Flight Auger | 24.4 | 4 | 26.3 | 2.4 | 1.6 | No reaction | N - non calcareous | Yes | 5 | 15 | 1 |
| 1 – 1.5 | 8 | | Sand | Tan, fmg, very well sorted, rounded, high sphericity, clean | Solid Flight Auger | 24.3 | 5 | 25.3 | 3.3 | 1.8 | No reaction | N - non calcareous | Inconclusive | 5 | 12 | 0.9 |
| 2 – 2.5 | 7 | | Sand | Tan, fmg, very well sorted, rounded, high sphericity | Solid Flight Auger | 24.2 | 5.4 | 24.7 | 4.1 | 1.3 | No reaction | N - non calcareous | Inconclusive | | | |

## Project: Bobs Farm PASS Drilling

Date: 12/03/2026
E: 406258.525
N: 6373084.851
Job No.: 12789
Logged By: VGT
Driller: Total Drilling
Address: Nelson Bay Road, Bobs Farm NSW
Client: Civitas Lifestyle Pty Ltd
Sampler: MM

vgt environmental compliance solutions and laboratories

SPT = Standard Penetration Test

| DEPTH (m) | RL | GRAPHIC LOG | LITHOLOGY | DESCRIPTION | SAMPLE DESCRIPTION | $pH_f$ TEMP | $pH_F$ | $pH_{FOX}$ TEMP | $pH_{FOX}$ | pH DIFFERENCE | REACTION RATING $pH_{FOX}$ | FIZZ TEST FOR CARBONATES | POTENTIAL ASS? | CHROMIUM REDUCIBLE SULFUR (moles $H^+$/t) | NET ACIDITY INC. ANC (moles $H^+$/t) | LIMING RATE INC. ANC (kg $CaCO_3$/t) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | | | | | | | | | | | | | | | | |
| 3.5 | 6 | | Sand | Tan, mg, very well sorted, rounded, high sphericity, very clean | Solid Flight Auger | 24.1 | 5.4 | 24.3 | 4.4 | 1 | No reaction | N - non calcareous | Inconclusive | 5 | 7 | <0.75 |
| 4 | | | | | | | | | | | | | | | | |
| 4.5 | 5 | | Sand | Cream, mg, well sorted, rounded, moderate to high sphericity, moist, some organics present | Solid Flight Auger | 23.9 | 5.9 | 24.1 | 4.6 | 1.3 | No reaction | N - non calcareous | Inconclusive | 5 | 8 | <0.75 |
| 5 | | | | | | | | | | | | | | | | |
| 5.5 | 4 | | Sand | Cream, mg, well sorted, rounded, moderate to high sphericity, dirty, moist | Solid Flight Auger | 23.6 | 5.9 | 23.9 | 4.2 | 1.7 | No reaction | N - non calcareous | Inconclusive | | | |

## Project: Bobs Farm PASS Drilling

Date: 12/03/2026
E: 406258.525
N: 6373084.851
Job No.: 12789
Logged By: VGT
Driller: Total Drilling
Address: Nelson Bay Road, Bobs Farm NSW
Client: Civitas Lifestyle Pty Ltd
Sampler: MM

vgt environmental compliance solutions and laboratories

SPT = Standard Penetration Test

| DEPTH (m) | RL | GRAPHIC LOG | LITHOLOGY | DESCRIPTION | SAMPLE DESCRIPTION | $pH_f$ TEMP | $pH_F$ | $pH_{FOX}$ TEMP | $pH_{FOX}$ | pH DIFFERENCE | REACTION RATING $pH_{FOX}$ | FIZZ TEST FOR CARBONATES | POTENTIAL ASS? | CHROMIUM REDUCIBLE SULFUR (moles $H^+$/t) | NET ACIDITY INC. ANC (moles $H^+$/t) | LIMING RATE INC. ANC (kg $CaCO_3$/t) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6 | | | | | | | | | | | | | | | | |
| 6.5 | 3 | | Sand | Light grey, fmg, very well sorted, well rounded, high sphericity, wet, water table at approx. 6.35m | Solid Flight Auger | 22.8 | 5.6 | 23.5 | 4.3 | 1.3 | No reaction | N - non calcareous | Inconclusive | | | |
| 7 | | | | | | | | | | | | | | | | |
| 7.5 | 2 | | Sand | Brown, fmg, very well sorted, well rounded, high sphericity, wet and dirty | Solid Flight Auger | 20.6 | 5.8 | 23.1 | 5.2 | 0.6 | No reaction | N - non calcareous | No | | | |
| 8 | | | | | | | | | | | | | | | | |
| 8.5 | 1 | | Sand | Brown, fg, very well sorted, well rounded, high sphericity, wet and very dirty | Solid Flight Auger | 20.4 | 5.3 | 22.6 | 5.2 | 0.1 | No reaction | N - non calcareous | No | | | |

## Project: Bobs Farm PASS Drilling

Date: 12/03/2026
E: 406258.525
N: 6373084.851
Job No.: 12789
Logged By: VGT
Driller: Total Drilling
Address: Nelson Bay Road, Bobs Farm NSW
Client: Civitas Lifestyle Pty Ltd
Sampler: MM

vgt environmental compliance solutions and laboratories

SPT = Standard Penetration Test

| DEPTH (m) | RL | GRAPHIC LOG | LITHOLOGY | DESCRIPTION | SAMPLE DESCRIPTION | $pH_f$ TEMP | $pH_F$ | $pH_{FOX}$ TEMP | $pH_{FOX}$ | pH DIFFERENCE | REACTION RATING $pH_{FOX}$ | FIZZ TEST FOR CARBONATES | POTENTIAL ASS? | CHROMIUM REDUCIBLE SULFUR (moles $H^+$/t) | NET ACIDITY INC. ANC (moles $H^+$/t) | LIMING RATE INC. ANC (kg $CaCO_3$/t) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 9 | | | | | | | | | | | | | | | | |
| 9.5 | 0 | | | | | | | | | | | | | | | |
| 10 | | | Sand | Cream, fmg, well sorted, well rounded, very high sphericity, wet, mud drilling | SPT (10.00-10.45m) | 20.7 | 5.9 | 22.3 | 5 | 0.9 | No reaction | N - non calcareous | Inconclusive | | | |
| 10.5 | -1 | | | | | | | | | | | | | | | |
| 11 | | | | | | | | | | | | | | | | |
| 11.5 | -2 | | Sand | Browny cream, fmg, well sorted, well rounded, very high | SPT (11.50-11.95m) | 20.8 | 5.9 | 29.7 | 1.9 | 4 | M - Medium | N - non calcareous | Yes | 22 | 24 | 2 |

## Project: Bobs Farm PASS Drilling

Date: 12/03/2026 Job No.: 12789 Address: Nelson Bay Road, Bobs Farm NSW
E: 406258.525 Logged By: VGT Client: Civitas Lifestyle Pty Ltd
N: 6373084.851 Driller: Total Drilling Sampler: MM

vgt environmental compliance solutions and laboratories

SPT = Standard Penetration Test

| DEPTH (m) | RL | GRAPHIC LOG | LITHOLOGY | DESCRIPTION | SAMPLE DESCRIPTION | $pH_f$ TEMP | $pH_F$ | $pH_{FOX}$ TEMP | $pH_{FOX}$ | pH DIFFERENCE | REACTION RATING $pH_{FOX}$ | FIZZ TEST FOR CARBONATES | POTENTIAL ASS? | CHROMIUM REDUCIBLE SULFUR (moles $H^+$/t) | NET ACIDITY INC. ANC (moles $H^+$/t) | LIMING RATE INC. ANC (kg $CaCO_3$/t) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | sphericity, dirty and wet, mud drilling | | | | | | | reaction | | | | | |
| 12 | | | | | | | | | | | | | | | | |
| 12.5 | -3 | | | | | | | | | | | | | | | |
| 13 | | | | | | | | | | | | | | | | |
| 13.5 | -4 | | Sand | Grey, mg, moderate sorting, subrounded, high sphericity, wet, mud drilling | SPT (13.00-13.95m) | 21.2 | 5.8 | 34 | 1.7 | 4.1 | M - Medium reaction | N - non calcareous | Yes | | | |

**Hole ID: BH203** | **PASS Drillhole Log** | Page: 1 of 3

**Project: Bobs Farm PASS Drilling**

Date: 12/03/2026 | Job No.: 12789 | Address: Nelson Bay Road, Bobs Farm NSW
E: 406530.307 | Logged By: VGT | Client: Civitas Lifestyle Pty Ltd
N: 6373025.851 | Driller: Total Drilling | Sampler: MM

vgt environmental compliance solutions and laboratories

SPT = Standard Penetration Test

| DEPTH (m) | RL | GRAPHIC LOG | LITHOLOGY | DESCRIPTION | SAMPLE DESCRIPTION | $pH_f$ TEMP | $pH_F$ | $pH_{ox}$ TEMP | $pH_{ox}$ | pH DIFFERENCE | REACTION RATING $pH_{ox}$ | FIZZ TEST FOR CARBONATES | POTENTIAL ASS? | CHROMIUM REDUCIBLE SULFUR (moles $H^+$/t) | NET ACIDITY INC. ANC (moles $H^+$/t) | LIMING RATE INC. ANC (kg $CaCO_3$/t) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 6 | | Sand | Dark brown, fg, moderate to well sorted, rounded, high sphericity, dirty with organics beween grains | Solid Flight Auger | 25 | 7.4 | 25.6 | 5 | 2.4 | No reaction | N - non calcareous | No | | | |
| 0.5 | | | | | | | | | | | | | | | | |
| 1 | 5 | | Sand | Dark brown, fg, very well sorted, rounded, high sphericity, dirty with organics between grains | Solid Flight Auger | 24.6 | 5.2 | 25.2 | 3.8 | 1.4 | No reaction | N - non calcareous | Inconclusive | 5 | 9 | <0.75 |
| 1.5 | | | | | | | | | | | | | | | | |
| 2 | 4 | | Sand | Brown grey, fmg, poorly sorted, rounded, high sphericity, dirty with organics between grains, few mg pebbles present | Solid Flight Auger | 24.6 | 7.2 | 26.6 | 5.2 | 2 | M - Medium reaction | N - non calcareous | No | | | |
| 2.5 | | | | | SPT (2.50-2.95m) | 24.5 | 6.9 | 25.9 | 5.2 | 1.7 | M - Medium reaction | N - non calcareous | No | 5 | <5 | <0.75 |

**Hole ID: BH203** | **PASS Drillhole Log** | Page: 2 of 3

**Project: Bobs Farm PASS Drilling**

Date: 12/03/2026 | Job No.: 12789 | Address: Nelson Bay Road, Bobs Farm NSW
E: 406530.307 | Logged By: VGT | Client: Civitas Lifestyle Pty Ltd
N: 6373025.851 | Driller: Total Drilling | Sampler: MM

vgt environmental compliance solutions and laboratories

SPT = Standard Penetration Test

| DEPTH (m) | RL | GRAPHIC LOG | LITHOLOGY | DESCRIPTION | SAMPLE DESCRIPTION | $pH_f$ TEMP | $pH_F$ | $pH_{fox}$ TEMP | $pH_{fox}$ | pH DIFFERENCE | REACTION RATING $pH_{fox}$ | FIZZ TEST FOR CARBONATES | POTENTIAL ASS? | CHROMIUM REDUCIBLE SULFUR (moles $H^+$/t) | NET ACIDITY INC. ANC (moles $H^+$/t) | LIMING RATE INC. ANC (kg $CaCO_3$/t) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | | | | | | | | | | | | | | | | |
| 3.5 | 3 | | Sand | Brown grey, mg, Well sorted, very well rounded, moderate to high sphericity, very wet/sloshy, water table at approx. 3.6m | Solid Flight Auger | 22.3 | 6.9 | 24.5 | 5.4 | 1.5 | L - Low reaction | N - non calcareous | No | | | |
| 4 | 2 | | Sand | Dark brown, mg, well sorted, rounded, moderate to high sphericity, wet/supersaturated with dirt present | SPT (4.00-4.45m) | 20.9 | 6.1 | 24.1 | 5.3 | 0.7 | L - Low reaction | N - non calcareous | No | | | |
| 4.5 | | | | | | | | | | | | | | | | |
| 5 | 1 | | | | | | | | | | | | | | | |
| 5.5 | | | Sand | Brown, mg, well sorted, rounded, moderate to high sphericity, wet with few organics including roots | SPT (5.50-5.95m) | **21.2** | **6.6** | **23.8** | **5.6** | **1** | **No reaction** | **N - non calcareous** | **No** | 5 | 5 | <0.75 |

**Hole ID: BH203** | **PASS Drillhole Log** | Page: 3 of 3

**Project: Bobs Farm PASS Drilling**

Date: 12/03/2026 | Job No.: 12789 | Address: Nelson Bay Road, Bobs Farm NSW
E: 406530.307 | Logged By: VGT | Client: Civitas Lifestyle Pty Ltd
N: 6373025.851 | Driller: Total Drilling | Sampler: MM

vgt environmental compliance solutions and laboratories

SPT = Standard Penetration Test

| DEPTH (m) | RL | GRAPHIC LOG | LITHOLOGY | DESCRIPTION | SAMPLE DESCRIPTION | $pH_f$ TEMP | $pH_F$ | $pH_{fox}$ TEMP | $pH_{fox}$ | pH DIFFERENCE | REACTION RATING $pH_{fox}$ | FIZZ TEST FOR CARBONATES | POTENTIAL ASS? | CHROMIUM REDUCIBLE SULFUR (moles $H^+$/t) | NET ACIDITY INC. ANC (moles $H^+$/t) | LIMING RATE INC. ANC (kg $CaCO_3$/t) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6 | | | | | | | | | | | | | | | | |
| | 0 | | | | | | | | | | | | | | | |
| 6.5 | | | | | | | | | | | | | | | | |
| 7 | | | Sand | Grey brown, fmg, well sorted, very well rounded, high sphericity, clean | SPT (7.00-7.45m) | 20.6 | 6.5 | 24.4 | 3.1 | 3.4 | L - Low reaction | N - non calcareous | Inconclusive | | | |
| | -1 | | | | | | | | | | | | | | | |

# 13 Appendix D – DCP Test Results

# Dynamic Cone Penetrometer Test Log Summary

martens consulting engineers since 1989
6 / 37 Leighton Place, Hornsby, NSW 2159, Ph: (02) 9476 9999 Fax: (02) 9476 8767, mail@martens.com.au,

| | | | |
|---|---|---|---|
| **Site** | 51 Nelson Bay Road, Bobs Farm | | |
| **Client** | AMMOS Resource Management Pty Ltd | | |
| **Logged by** | GMT/BR | **Date Logged** | 29/07/2014 |
| **Checked by** | RE | **Date Checked** | |
| **Comments** | | | |

**TEST DATA**

| Depth Interval (m) | DCP 101 | DCP 102 | DCP 103 | DCP 104 | DCP 105 | DCP 106 | | |
|---|---|---|---|---|---|---|---|---|
| **0.15** | 1 | 1 | 1 | 5 | 1 | 1 | | |
| **0.30** | 1 | 2 | 2 | 4 | 2 | 2 | | |
| **0.45** | 2 | 3 | 4 | 4 | 2 | 3 | | |
| **0.60** | 1 | 5 | 4 | 5 | 3 | 3 | | |
| **0.75** | 1 | 4 | 4 | 4 | 4 | 4 | | |
| **0.90** | 1 | 5 | 3 | 5 | 4 | 5 | | |
| **1.05** | 1 | 3 | 3 | 6 | 2 | 5 | | |
| **1.20** | 2 | 4 | 3 | 5 | 3 | 5 | | |
| **1.35** | 3 | 6 | 4 | 5 | 3 | 6 | | |
| **1.50** | 2 | 4 | 4 | 5 | 3 | 8 | | |
| **1.65** | 4 | 4 | 5 | 5 | 2 | 9 | | |
| **1.80** | 4 | 3 | 4 | 5 | 2 | 6 | | |
| **1.95** | 4 | 3 | 4 | 5 | 2 | 6 | | |
| **2.10** | 4 | 5 | 5 | 5 | 2 | 6 | | |
| **2.25** | 4 | 4 | 6 | 4 | 2 | 7 | | |
| **2.40** | 3 | 7 | 10 | 3 | 2 | 8 | | |
| **2.55** | 3 | 4 | 15 | 3 | 2 | 7 | | |
| **2.70** | 3 | 5 | 16 | 5 | 2 | 6 | | |
| **2.85** | 4 | 3 | 14 | 5 | 2 | 5 | | |
| **3.00** | 4 | 5 | 13 | 5 | 2 | 5 | | |
| **3.15** | 4 | 4 | 14 | 5 | 3 | 5 | | |
| **3.30** | 3 | 4 | 13 | 8 | 3 | 6 | | |
| **3.45** | 3 | 4 | 10 | 8 | 2 | 6 | | |
| **3.60** | 4 | 1 | 8 | 7 | 3 | 6 | | |
| **3.75** | 5 | 2 | 10 | 6 | 3 | 7 | | |
| **3.90** | 5 | 1 | 10 | 4 | 2 | 7 | | |
| **4.05** | 6 | 1 | 9 | 4 | 2 | 7 | | |
| **4.20** | 5 | 1 | 8 | 3 | 2 | 6 | | |
| **4.35** | 10 | 2 | 8 | 4 | 3 | 8 | | |
| **4.50** | 13 | 2 | 8 | 3 | 2 | 12 | | |
| **4.65** | 12 | 2 | 8 | 3 | 2 | 9 | | |
| **4.80** | 9 | 3 | 9 | 4 | 2 | 9 | | |
| **4.95** | 9 | 7 | 8 | 4 | 2 | 12 | | |
| **5.10** | 11 | 8 | 8 | 5 | 2 | 12 | | |
| **5.25** | 9 | 8 | 8 | 5 | 2 | 15 | | |
| **5.40** | 6 | 11 | 7 | 6 | 3 | 12 | | |
| **5.55** | 6 | 12 | 8 | 7 | 3 | 15 | | |
| **5.70** | 5 | 15 | 7 | 5 | 3 | 11 | | |
| **5.85** | 6 | 16 | 7 | 6 | 3 | 17 | | |
| **6.00** | 6 | 19 | 8 | 7 | 3 | 22 | | |
| **6.15** | 6 | 21 | 8 | 9 | 3 | 19 | | |
| **6.30** | 5 | 24 | 8 | 9 | 3 | 18 | | |
| **6.45** | 6 | 25 | 8 | 9 | 2 | 16 | | |
| **6.60** | 5 | 26 | 7 | 8 | 3 | 25 | | |
| **6.75** | 6 | 25 | 5 | 7 | 3 | 20 | | |
| **6.90** | 5 | 30 | 4 | 7 | 3 | 27 | | |
| **7.05** | 6 | Terminiated | 5 | 6 | 3 | 30 | | |
| **7.20** | 5 | @ | 5 | 6 | 3 | 25 | | |
| **7.35** | 5 | 6.9 m | 9 | 5 | 4 | 15 | | |
| **7.50** | 6 | | 8 | 7 | 4 | 20 | | |
| **7.65** | 7 | | 9 | 5 | 4 | 17 | | |
| **7.80** | 7 | | 18 | 7 | 4 | 17 | | |
| **7.95** | 7 | | 25 | 4 | 4 | 18 | | |
| **8.10** | 8 | | 30 | 5 | 3 | 11 | | |
| **8.25** | 9 | | 18 | 10 | 4 | 9 | | |
| **8.40** | 9 | | 22 | 10 | 4 | 18 | | |
| **8.55** | 8 | | 40 | 12 | 4 | 15 | | |
| **8.70** | 9 | | Terminiated | 11 | 4 | 21 | | |
| **8.85** | 9 | | @ | 13 | 4 | 18 | | |
| **9.00** | 12 | | 8.55 m | 16 | 5 | 14 | | |
| **9.15** | 11 | | | 12 | 3 | 10 | | |
| **9.30** | 7 | | | 18 | 4 | 12 | | |
| **9.45** | 10 | | | 18 | 5 | 25 | | |
| **9.60** | 10 | | | 25 | 5 | 35 | | |
| **9.75** | 9 | | | 20 | 5 | 39 | | |
| **9.90** | 6 | | | 26 | 5 | 40 | | |
| **10.05** | 7 | | | 29 | 5 | Terminiated | | |
| **10.20** | 8 | | | Terminiated | Terminiated | @ | | |
| **10.35** | 8 | | | @ | @ | 9.9 m | | |
| **10.50** | 8 | | | 10.05 m | 10.05 m | | | |
| | Terminiated | | | | | | | |
| | @ | | | | | | | |
| | 10.5 m | | | | | | | |
| | | | | | | | | |

# 14 Appendix E – ASS Analytical Results

# Table C1 - ASS Field Screening Results

Method based on Acid Sulfate Soil Manual (ASSMAC, 1998)

Method ST-50 V05 Revised 30.04.2018

martens

Suite 201, 20 George Street, Hornsby, NSW 2077 Ph: (02) 9476 9999 Fax: (02)

## PROJECT DETAILS

| | | | |
|---|---|---|---|
| **Client:** | Ammos Resource Management Pty Ltd | | |
| **Project:** | Acid Sulfate Soils Field Screening | Date: | 1/07/2020 |
| **Sampling Site:** | Nelson Bay Road, Bobs Farm, NSW | Job Number: | P1303897 |
| **Sample Date:** | 22/09/2019 - 02/10/2019, 29/07/2014 - 30/07/2017 | Sampled By: | WX/DI/WB |

## SAMPLE DETAILS / TEST RESULTS

| Sample ID (mbgl) | Sample Depth (mAHD) | $pH_f$ | $pH_{fox}$ | Reaction | ΔpH | Potential Classification |
|---|---|---|---|---|---|---|
| Criteria | | ≤4.0 | <3.5 | | >1 pH unit decrease | |
| BH401/1.40-1.60 | 14.50 | 5.6 | 4 | Slight | **1.6** | Neutral PASS |
| BH401/3.90-4.10 | 12.50 | 5.8 | **3.1** | Slight | **2.7** | **PASS** |
| BH401/7.80-8.20 | 8.50 | 6.1 | 4 | Slight | **2.1** | Neutral PASS |
| BH401/12.80-13.20 | 3.50 | 6.4 | 4 | Slight | **2.4** | Neutral PASS |
| BH401/13.80-14.20 | 2.50 | 6.3 | **1.9** | High | **4.4** | **PASS** |
| BH402/0.40-0.60 | 12.50 | 4.4 | **1.1** | Slight | **3.3** | **PASS** |
| BH402/2.90-3.10 | 10.00 | 5.4 | **3.1** | Slight | **2.3** | **PASS** |
| BH402/6.80-7.20 | 5.50 | 5.8 | **3.3** | Slight | **2.5** | **PASS** |
| BH403/1.90-2.10 | 5.00 | 5 | **3.4** | Moderate | **1.6** | **PASS** |
| BH404/2.00 | 3.50 | 5.4 | **3.1** | Slight | **2.3** | **PASS** |
| BH405/1.50 | 9.00 | 5.1 | **2.1** | Slight | **3** | **PASS** |
| BH405/3.00 | 7.50 | 5.7 | **3.1** | Slight | **2.6** | **PASS** |
| BH405/8.00 | 2.50 | 5.8 | **3.3** | Slight | **2.5** | **PASS** |
| BH406/3.90-4.10 | 12.50 | 5.6 | **2.7** | Slight | **2.9** | **PASS** |
| BH406/4.80-5.20 | 11.50 | 5.8 | **3.1** | Slight | **2.7** | **PASS** |
| BH407/3.40-3.60 | 12.00 | 4.5 | **2** | Slight | **2.5** | **PASS** |
| BH407/3.90-4.10 | 11.50 | 4.8 | **2.8** | Slight | **2** | **PASS** |
| BH407/11.80-12.20 | 3.50 | 5.7 | 4.3 | Slight | **1.4** | Neutral PASS |
| BH408/0.20-0.30 | 23.00 | 4.1 | **1.5** | Slight | **2.6** | **PASS** |
| BH408/1.50-1.60 | 21.50 | 5.7 | 3.9 | Slight | **1.8** | **Likely PASS** |
| BH408/3.50-3.60 | 19.50 | 5.9 | 4.3 | Slight | **1.6** | Neutral PASS |
| BH409/3.50 | 4.00 | 5.2 | **2.7** | Slight | **2.5** | **PASS** |
| MW101/2.50 | 4.50 | 5.7 | 3.7 | Slight | **2** | **Likely PASS** |
| MW101/4.50 | 2.50 | 6.1 | 3.7 | Slight | **2.4** | **Likely PASS** |
| MW102/0.50-0.60 | 22.50 | 5.5 | **3.1** | Slight | **2.4** | **PASS** |
| MW102/2.50-2.60 | 20.50 | 5.3 | **3.2** | Slight | **2.1** | **PASS** |
| MW102/4.50-4.60 | 18.50 | 5.9 | 4.4 | Slight | **1.5** | Neutral PASS |
| MW103/2.00 | 27.50 | 5.3 | **3.3** | Slight | **2** | **PASS** |
| MW103/4.00 | 25.50 | 5.5 | 3.9 | Slight | **1.6** | Neutral PASS |
| MW104/0.40-0.50 | 15.00 | 4.3 | **2.5** | Slight | **1.8** | **PASS** |
| MW104/9.50 | 6.00 | 6 | **1.6** | High | **4.4** | **PASS** |
| MW104/10.50 | 5.00 | 6.1 | **1.8** | Vigorous | **4.3** | **PASS** |
| Results below from MA 2015 ASS investigation | | | | Results below from MA 2015 ASS investigation | | |
| **Sample ID (mbgl)** | **Sample Depth (mAHD)** | **$pH_{kcl}$** | **$pH_{fox}$** | **Reaction** | **ΔpH** | **Potential Classification** |
| **Criteria** | | **≤4.0** | **<3.5** | | **>1 pH unit decrease** | |
| BH101/2.5 | 8.50 | 5 | 4.4 | NA | NA | NA |
| BH101/8.5 | 2.50 | 5.6 | 4.3 | NA | NA | NA |
| BH102/2.5 | 2.50 | 4.6 | 3.5 | NA | NA | NA |
| BH103/2.5 | 7.50 | 5.4 | 4.2 | NA | NA | NA |
| BH104/2.5 | 26.50 | 5 | 4.5 | NA | NA | NA |

# Table C1 - ASS Field Screening Results

Method based on Acid Sulfate Soil Manual (ASSMAC, 1998)

Method ST-50 V05 Revised 30.04.2018

martens

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**PROJECT DETAILS**

| | | | |
|---|---|---|---|
| **Client:** | Ammos Resource Management Pty Ltd | | |
| **Project:** | Acid Sulfate Soils Field Screening | Date: | 1/07/2020 |
| **Sampling Site:** | Nelson Bay Road, Bobs Farm, NSW | Job Number: | P1303897 |
| **Sample Date:** | 22/09/2019 - 02/10/2019, 29/07/2014 - 30/07/2017 | Sampled By: | WX/DI/WB |

**SAMPLE DETAILS / TEST RESULTS**

| Sample ID (mbgl) | Sample Depth (mAHD) | $pH_f$ | $pH_{fox}$ | Reaction | ΔpH | Potential Classification |
|---|---|---|---|---|---|---|
| **Criteria** | | **≤4.0** | **<3.5** | | **>1 pH unit decrease** | |
| BH104/10.0 | 19.00 | 5.7 | 5 | NA | NA | NA |
| BH105/2.5 | 9.50 | 5.2 | 3.9 | NA | NA | NA |
| BH105/10.0 | 2.00 | 5.5 | 5.5 | NA | NA | NA |
| BH106/5.5 | 14.50 | 5.6 | 5.1 | NA | NA | NA |
| BH106/10.0 | 10.00 | 5.2 | 4.7 | NA | NA | NA |
| BH108/2.5 | 3.50 | 4.5 | **3.4** | NA | NA | **PASS** |
| MW3 | 12.50 to 11.50 | 4.8 | 3.9 | NA | NA | **PASS** |
| MW3 | 6.50 to 5.50 | 5.4 | 4.5 | NA | NA | NA |
| MW4 | +5.5 to +3.0 | 5.2 | 4.3 | NA | NA | NA |
| MW4 | +3.3 to +2.5 | 5.3 | 4.5 | NA | NA | NA |
| MW5 | +2.0 to +1.0 | 5.5 | 4.5 | NA | NA | NA |

# Table C2 - ASS Laboratory Test Results Interpretation

Method based on Acid Sulfate Soil Manual (ASSMAC, 1998)
Method ST-50 V05 Revised 30.04.2018

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**PROJECT DETAILS**

**Client:** Ammos Resource Management Pty Ltd
**Project:** Acid Sulfate Soils sPOCAS Assessment
**Sampling Site:** 51 Nelson Bay Road, Bobs Farm, NSW
**Sample Date:** 18/09/2019 to 2/10/2019, 29/07/2019 - 30/07/2019

Assessment Date: 1/07/2020
Job Number: P1303897
Sampled By: WX/DI/WB

**SAMPLE DETAILS / TEST RESULTS**

| Sample ID (mbgl) | Sample Depth (mAHD) | Infered Texture | pH KCL | Sulfur Trail | | | Acid Trail | | | | ASS - Acid Base Accounting | | | | Liming Rate without ANCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | TSA | | sPOS | TAA | | TPA | | Net Acidity (acidity units) | Net Acidity (sulfur units) | Net Acidity excluding ANC (acidity units) | Net Acidity excluding ANC (sulfur units) | |
| | | | | mole H+/t | %S | %S | mole H+/t | %S | mole H+/t | %S | mole H+/t | %S | mole H+/t | %S | kg/t |
| ASSMAC Criteria >1000 t disturbance | | | <4 | 18 | 0.03 | 0.03 | 18 | 0.03 | 18 | 0.03 | | | 18 | 0.03 | |
| Yellow columns represent aeolian sand | | | | Brown columns represents clayey sand / sandy clay layer | | | | Grey column represent marine sands | | | | | | | |
| 3897/BH401/1.4-1.6 | 14.5 | Course | 4.8 | <5 | <0.01 | <0.005 | 16 | **0.03** | 12 | 0.02 | 16 | 0.03 | 16 | 0.026 | **1.2** |
| 3897/BH401/3.4-3.6 | 12.5 | Course | 5.3 | <5 | <0.01 | <0.005 | <5 | <0.01 | <5 | <0.01 | <5 | <0.01 | <5 | <0.01 | <0.75 |
| 3897/BH401/7.8-8.2 | 8.5 | Course | 5.4 | <5 | <0.01 | <0.005 | <5 | <0.01 | <5 | <0.01 | <5 | <0.01 | <5 | <0.01 | <0.75 |
| 3897/BH401/12.8-13.2 | 3.5 | Course | 5.5 | <5 | <0.01 | <0.005 | <5 | <0.01 | 5 | <0.01 | <5 | <0.01 | <5 | <0.01 | <0.75 |
| 3897/BH401/13.8-14.2 | 2.5 | Fine | 4.8 | **130** | **0.2** | **0.19** | <5 | <0.01 | **130** | **0.21** | 120 | 0.2 | **120** | **0.2** | **9.4** |
| 3897/BH402/0.4-0.6 | 12.5 | Course | 4.5 | **28** | **0.04** | 0.007 | <5 | <0.01 | **30** | **0.05** | 7 | 0.01 | 6.9 | 0.011 | <0.75 |
| 3897/BH402-2.9-3.1 | 10 | Course | 5.2 | <5 | <0.01 | <0.005 | <5 | <0.01 | <5 | <0.01 | <5 | <0.01 | <5 | <0.01 | <0.75 |
| 3897/BH402/6.8-7.2 | 5.5 | Course | 5.5 | <5 | <0.01 | <0.005 | <5 | <0.01 | <5 | <0.01 | <5 | <0.01 | <5 | <0.01 | <0.75 |
| 3897/BH403/1.9-2.1 | 5 | Course | 4.8 | <5 | <0.01 | <0.005 | 9 | 0.01 | 10 | 0.02 | 9 | 0.02 | 9.3 | 0.015 | <0.75 |
| 3897/BH403/5.8-6.2 | 1 | Course | 5.2 | <5 | <0.01 | <0.005 | <5 | <0.01 | <5 | <0.01 | <5 | <0.01 | <5 | <0.01 | <0.75 |
| 3897/BH405/1.5 | 9 | Course | 4.8 | <5 | <0.01 | <0.005 | <5 | <0.01 | <5 | <0.01 | <5 | <0.01 | <5 | <0.01 | <0.75 |
| 3897/BH405/8.0 | 2.5 | Course | 5.4 | <5 | <0.01 | <0.005 | <5 | <0.01 | <5 | <0.01 | <5 | <0.01 | <5 | <0.01 | <0.75 |
| 3897/BH406/3.9-4.1 | 12.5 | Course | 5.1 | <5 | <0.01 | <0.005 | <5 | <0.01 | <5 | <0.01 | <5 | <0.01 | <5 | <0.01 | <0.75 |
| 3897/BH407/3.4-3.6 | 12 | Course | 4.7 | 6 | 0.01 | <0.005 | <5 | <0.01 | 10 | 0.02 | <5 | <0.01 | <5 | <0.01 | <0.75 |
| 3897/BH407/11.8-12.2 | 3.5 | Course | 5.5 | <5 | <0.01 | <0.005 | <5 | <0.01 | <5 | <0.01 | <5 | <0.01 | <5 | <0.01 | <0.75 |
| 3897/BH408/0.2-0.3 | 23 | Course | **3.8** | **120** | **0.19** | <0.005 | 11 | 0.02 | **130** | **0.2** | 11 | 0.02 | 11 | 0.018 | **0.86** |
| 3897/BH409/3.5 | 4 | Course | 5 | 5 | <0.01 | <0.005 | 5 | <0.01 | 10 | 0.02 | 5 | <0.01 | 5 | <0.01 | <0.75 |
| 3897/MW101/2.5 | 4.5 | Course | 5.4 | <5 | <0.01 | <0.005 | <5 | <0.01 | <5 | <0.01 | <5 | <0.01 | <5 | <0.01 | <0.75 |
| 3897/MW101/4.5 | 2.5 | Course | 5.4 | <5 | <0.01 | <0.005 | <5 | <0.01 | <5 | <0.01 | <5 | <0.01 | <5 | <0.01 | <0.75 |
| 3897/MW102/2.5-2.6 | 20.5 | Course | 5 | 5 | <0.01 | <0.005 | <5 | <0.01 | 8 | 0.01 | <5 | <0.01 | <5 | <0.01 | <0.75 |
| 3897/MW103/2 | 27.5 | Course | 4.9 | 5 | <0.01 | <0.005 | 5 | <0.01 | 10 | 0.02 | 5 | <0.01 | 5 | <0.01 | <0.75 |
| 3897/MW104/9.5 | 6 | Fine | 5.1 | **320** | **0.51** | **0.35** | <5 | <0.01 | **320** | **0.51** | 220 | 0.35 | **220** | **0.35** | **16** |
| 3897/MW104/10.5 | 5 | Course | 5.1 | **44** | **0.07** | **0.08** | <5 | <0.01 | **45** | **0.07** | 50 | 0.08 | **50** | **0.08** | **3.7** |
| Results below from MA 2015 ASS investigation | | | | Results below from MA 2015 ASS investigation | | | | Results below from MA 2015 ASS investigation | | | | Results below from MA 2015 ASS investigation | | | |
| 3897/101/2.5 | 8.5 | Course | 5 | 0.005 | <0.01 | 0.005 | 5 | <0.01 | 5 | <0.01 | <10 | NA | NA | NA | <0.75 |
| 3897/101/8.5 | 2.5 | Course | 5.6 | 0.005 | <0.01 | 0.005 | <5 | <0.01 | 5 | <0.01 | <10 | NA | NA | NA | <0.75 |
| 3897/102/2.5 | 2.5 | Course | 4.6 | 0.005 | <0.01 | 0.005 | 10 | 0.02 | 5 | <0.01 | **12** | NA | NA | NA | 0.9 |
| 3897/103/2.5 | 7.5 | Course | 5.4 | 0.005 | <0.01 | 0.005 | 5 | <0.01 | 5 | <0.01 | <10 | NA | NA | NA | <0.75 |
| 3897/104/2.5 | 26.5 | Course | 5 | 0.005 | <0.01 | 0.005 | 5 | <0.01 | 5 | <0.01 | <10 | NA | NA | NA | <0.75 |
| 3897/104/10.0 | 19 | Course | 5.7 | 0.005 | <0.01 | 0.005 | <5 | <0.01 | 5 | <0.01 | <10 | NA | NA | NA | <0.75 |
| 3897/105/2.5 | 9.5 | Course | 5.2 | 0.005 | <0.01 | 0.005 | 5 | <0.01 | 5 | <0.01 | <10 | NA | NA | NA | <0.75 |
| 3897/105/10.0 | 2 | Course | 5.5 | 0.005 | <0.01 | 0.005 | <5 | <0.01 | 5 | <0.01 | <10 | NA | NA | NA | <0.75 |
| 3897/106/5.5 | 14.5 | Course | 5.6 | 0.005 | <0.01 | 0.005 | <5 | <0.01 | 5 | <0.01 | <10 | NA | NA | NA | <0.75 |
| 3897/106/10.0 | 10 | Course | 5.2 | 0.005 | <0.01 | 0.005 | <5 | <0.01 | 5 | <0.01 | <10 | NA | NA | NA | <0.75 |
| 3897/108/2.5 | 3.5 | Course | 4.5 | 0.005 | 0.02 | 0.005 | 10 | 0.02 | **22** | **0.04** | **10** | NA | NA | NA | 0.75 |
| 3897/BH03/12.5 to 11.5 | 11.5 | Course | 4.8 | <0.005 | 0.03 | <0.005 | 10 | 0.02 | **30** | 0.02 | **10** | NA | NA | NA | 0.75 |

# Table C2 - ASS Laboratory Test Results Interpretation

Method based on Acid Sulfate Soil Manual (ASSMAC, 1998)
Method ST-50 V05 Revised 30.04.2018

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**PROJECT DETAILS**

**Client:** Ammos Resource Management Pty Ltd
**Project:** Acid Sulfate Soils sPOCAS Assessment
**Sampling Site:** 51 Nelson Bay Road, Bobs Farm, NSW
**Sample Date:** 18/09/2019 to 2/10/2019, 29/07/2019 - 30/07/2019

Assessment Date: 1/07/2020
Job Number: P1303897
Sampled By: WX/DI/WB

**SAMPLE DETAILS / TEST RESULTS**

| Sample ID (mbgl) | Sample Depth (mAHD) | Infered Texture | pH KCL | Sulfur Trail | | | Acid Trail | | | | ASS - Acid Base Accounting | | | | Liming Rate without ANCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | TSA | | sPOS | TAA | | TPA | | Net Acidity (acidity units) | Net Acidity (sulfur units) | Net Acidity excluding ANC (acidity units) | Net Acidity excluding ANC (sulfur units) | |
| | | | | mole H+/t | %S | %S | mole H+/t | %S | mole H+/t | %S | mole H+/t | %S | mole H+/t | %S | kg/t |
| ASSMAC Criteria >1000 t disturbance | | | <4 | 18 | 0.03 | 0.03 | 18 | 0.03 | 18 | 0.03 | | | 18 | 0.03 | |
| 3897/BH03/+6.5 to +5.5 | 5.5 | Course | 5.4 | <0.005 | <0.01 | <0.005 | <5 | <0.01 | <5 | <0.01 | <10 | NA | NA | NA | <0.75 |
| 3897/BH04/+5.5 to +3.0 | 3 | Course | 5.2 | <0.005 | 0.02 | <0.005 | 5 | <0.01 | 17 | <0.01 | <10 | NA | NA | NA | <0.75 |
| 3897/BH04/+3.3 to +2.5 | 3.3 to 2.5 | Course | 5.3 | <0.005 | 0.02 | <0.005 | <5 | <0.01 | 17 | <0.01 | <10 | NA | NA | NA | <0.75 |

**Notes:**
1. Material type based on field texture assessment or laboratory report.
2. Total Actual Acidity. Highlighted values exceed ASSMAC (1998) action criteria.
3. Total Potential Acidity. Highlighted values exceed ASSMAC (1998) action criteria.
4. Percentage net acid soluble sulfur. Highlighted values exceed ASSMAC (1998) action criteria.
5. From laboratory test results (refer to laboratory test certificates). Calculated using a FOS of 1.5.

# ASS Laboratory Test Results Interpretation

Method based on Acid Sulfate Soil Manual (ASSMAC, 1998)
Method ST-50 V05 Revised 30.04.2018

martens

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## PROJECT DETAILS

| | | | |
|---|---|---|---|
| **Client:** | Newcastle Sand C/- ADW Johnson | Page: | 1 of 2 |
| **Project:** | Acid Sulfate Soils Assessment | Assessment Date: | 17/03/2026 |
| **Sampling Site:** | Proposed Sand Quarry at 3631 Nelson Bay Road, Bobs Farm, NSW | Job Number: | P2511038 |
| **Sample Date:** | 12/03/2026 | Sampled By: | VGT |

## SAMPLE DETAILS / TEST RESULTS

| Sample Location | Sample Depth (mbgl) | Sample Depth (mAHD) | Inferred Texture | pH Measurements | | Sulfur Trail | ASS - Acid Base Accounting | Liming Rate |
|---|---|---|---|---|---|---|---|---|
| | | | | $pH_F$ | $pH_{Fox}$ | Chromium Reducible Sulfur (acidity units) | Net Acidity (acidity units) | |
| | | | | pH Units | pH Units | mole H+/t | mole H+/t | kg/t |
| ASSMAC Criteria >1000 t disturbance | | | | <4 | <3.5 | 18 | 18 | |
| BH201 | 0.0 - 1.0 | 11.45 – 10.45 | Coarse | 4.6 | **2.7** | 5 | 11 | 0.8 |
| BH201 | 1.0 - 2.0 | 10.45 – 9.45 | Coarse | 5.8 | 4.2 | | | |
| BH201 | 1.0 - 1.45 | 10.45 – 10.0 | Coarse | 6.1 | **3.4** | 5 | 6 | <0.75 |
| BH201 | 2.0 - 3.0 | 9.45 – 8.45 | Coarse | 5.5 | **3.2** | | | |
| BH201 | 2.5 - 2.95 | 8.95 – 8.5 | Coarse | 4.8 | **3** | 5 | 13 | 1 |
| BH201 | 3.0 - 4.0 | 8.45 – 7.45 | Coarse | 5 | 4.2 | 5 | 11 | 0.8 |
| BH201 | 4.0 - 5.0 | 7.45 – 6.45 | Coarse | 5.6 | 3.8 | | | |
| BH201 | 4.0 - 4.45 | 7.45 – 7.0 | Coarse | 5.2 | **3.3** | <3 | 13 | 1 |
| BH201 | 5.0 - 6.0 | 6.45 – 5.45 | Coarse | 6 | 3.9 | 8 | 15 | 1 |
| BH201 | 5.5 - 5.95 | 5.95 – 5.5 | Coarse | 6 | 3.9 | | | |
| BH201 | 6.0 - 7.0 | 5.45 – 4.45 | Coarse | 6.1 | 4.3 | | | |
| BH201 | 7.0 - 8.0 | 4.45 – 3.45 | Coarse | 6.4 | 4.9 | | | |
| BH201 | 7.0 - 7.45 | 4.45 – 4.0 | Coarse | 6.5 | 4.5 | 5 | 9 | <0.75 |
| BH201 | 8.0 - 9.0 | 3.45 – 2.45 | Coarse | 6.1 | 5.1 | | | |
| BH201 | 8.5 - 8.95 | 2.95 – 2.5 | Coarse | 6.5 | 4.8 | | | |
| BH201 | 10.0 - 10.45 | 1.45 – 1.0 | Coarse | 6.4 | 6.2 | | | |
| BH201 | 11.5 - 11.95 | (-0.05) – (-0.5) | Coarse | 6.3 | **1.7** | **170** | **190** | 14 |
| BH201 | 13.0 - 13.45 | (-1.55) – (-2.0) | Coarse | 6.4 | **1.8** | | | |

**Notes:**

1. Material type based on field texture assessment or laboratory report.
2. Total Actual Acidity. Highlighted values exceed ASSMAC (1998) action criteria.
3. Chromium Reducible Sulfur. Highlighted values exceed ASSMAC (1998) action criteria.
4. Percentage net acid soluble sulfur. Highlighted values exceed ASSMAC (1998) action criteria.
5. From laboratory test results (refer to laboratory test certificates). Calculated using a FOS of 1.5.

# ASS Laboratory Test Results Interpretation

Method based on Acid Sulfate Soil Manual (ASSMAC, 1998)
Method ST-50 V05 Revised 30.04.2018

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## PROJECT DETAILS

| | | | |
|---|---|---|---|
| **Client:** | Newcastle Sand C/- ADW Johnson | Page: | 2 of 2 |
| **Project:** | Acid Sulfate Soils Assessment | Assessment Date: | 17/03/2026 |
| **Sampling Site:** | Proposed Sand Quarry at 3631 Nelson Bay Road, Bobs Farm, NSW | Job Number: | P2511038 |
| **Sample Date:** | 12/03/2026 | Sampled By: | VGT |

## SAMPLE DETAILS / TEST RESULTS

| Sample Location | Sample Depth (mbgl) | Sample Depth (mAHD) | Inferred Texture | pH Measurements | | Sulfur Trail | ASS - Acid Base Accounting | Liming Rate |
|---|---|---|---|---|---|---|---|---|
| | | | | $pH_F$ | $pH_{Fox}$ | Chromium Reducible Sulfur (acidity units) | Net Acidity (acidity units) | |
| | | | | pH Units | pH Units | mole H+/t | mole H+/t | kg/t |
| ASSMAC Criteria >1000 t disturbance | | | | <4 | <3.5 | 18 | 18 | |
| BH202 | 0.0 - 1.0 | 9.42 – 8.42 | Coarse | **4** | **2.4** | 5 | 15 | 1 |
| BH202 | 1.0 - 2.0 | 8.42 – 7.42 | Coarse | 5 | **3.3** | 5 | 12 | 0.9 |
| BH202 | 2.0 - 3.0 | 7.42 – 6.42 | Coarse | 5.4 | 4.1 | | | |
| BH202 | 3.0 - 4.0 | 6.42 – 5.42 | Coarse | 5.4 | 4.4 | 5 | 7 | <0.75 |
| BH202 | 4.0 - 5.0 | 5.42 – 4.42 | Coarse | 5.9 | 4.6 | 5 | 8 | <0.75 |
| BH202 | 5.0 - 6.0 | 4.42 – 3.42 | Coarse | 5.9 | 4.2 | | | |
| BH202 | 6.0 - 7.0 | 3.42 – 2.42 | Coarse | 5.6 | 4.3 | | | |
| BH202 | 7.0 - 8.0 | 2.42 – 1.42 | Coarse | 5.8 | 5.2 | | | |
| BH202 | 8.0 - 9.0 | 1.42 – 0.42 | Coarse | 5.3 | 5.2 | | | |
| BH202 | 10.0 - 10.45 | (-0.58) – (-1.03) | Coarse | 5.9 | 5 | | | |
| BH202 | 11.5 - 11.95 | (-2.08) – (-2.53) | Coarse | 5.9 | **1.9** | **22** | **24** | 2 |
| BH202 | 13.0 - 13.45 | ( -3.58)– (-4.03) | Coarse | 5.8 | **1.7** | | | |
| BH203 | 0.0 - 1.0 | 6.4 – 5.4 | Coarse | 7.4 | 5 | | | |
| BH203 | 1.0 - 2.0 | 5.4 – 4.4 | Coarse | 5.2 | 3.8 | 5 | 9 | <0.75 |
| BH203 | 1.0 - 1.45 | 5.4 – 4.95 | Coarse | 7.1 | 5 | | | |
| BH203 | 2.0 - 3.0 | 4.4 – 3.4 | Coarse | 7.2 | 5.2 | | | |
| BH203 | 2.5 - 2.95 | 3.9 – 3.45 | Coarse | 6.9 | 5.2 | 5 | <5 | <0.75 |
| BH203 | 3.0 - 4.0 | 3.4 – 2.4 | Coarse | 6.9 | 5.4 | | | |
| BH203 | 4.0 - 4.45 | 2.4 – 1.95 | Coarse | 6.1 | 5.3 | | | |
| BH203 | 5.5 - 5.95 | 0.9 – 0.45 | Coarse | 6.6 | 5.6 | 5 | 5 | <0.75 |
| BH203 | 7.0 - 7.45 | (-0.6) – (-1.05) | Coarse | 6.5 | **3.1** | | | |

**Notes:**

1. Material type based on field texture assessment or laboratory report.

2. Total Actual Acidity. Highlighted values exceed ASSMAC (1998) action criteria.

3. Chromium Reducible Sulfur. Highlighted values exceed ASSMAC (1998) action criteria.

4. Percentage net acid soluble sulfur. Highlighted values exceed ASSMAC (1998) action criteria.

5. From laboratory test results (refer to laboratory test certificates). Calculated using a FOS of 1.5.

# 15 Appendix F – Laboratory Test Certificates

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
enquiries@envirolabservices.com.au
www.envirolabservices.com.au

# CERTIFICATE OF ANALYSIS 96132

**Client:**

**Martens & Associates Pty Ltd**
6/37 Leighton Place
Hornsby
NSW 2077

**Attention:** Ben Rose, Gray Taylor

**Sample log in details:**

| | | | |
|---|---|---|---|
| Your Reference: | **P1303897, Bobs Farm** | | |
| No. of samples: | 5 waters | | |
| Date samples received / completed instructions received | 23/08/13 | / | 23/08/13 |

*This report replaces the previous R00 report due to the addition of pH results*

**Analysis Details:**

Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
***Please refer to the last page of this report for any comments relating to the results.***

**Report Details:**

| | | | |
|---|---|---|---|
| Date results requested by: / Issue Date: | 30/08/13 | / | 8/01/14 |
| Date of Preliminary Report: | Not issued | | |

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

**Results Approved By:**

Jacinta Hurst
Laboratory Manager

| Ion Balance<br>Our Reference:<br>Your Reference<br>Date Sampled<br>Type of sample | UNITS<br>----------<br>---------- | 96132-1<br>3897/GMB01<br>22/08/2013<br>water | 96132-2<br>3897/GMB02<br>22/08/2013<br>water | 96132-3<br>3897/GMB03<br>22/08/2013<br>water | 96132-4<br>3897/GMB04<br>22/08/2013<br>water | 96132-5<br>3897/GMB05<br>22/08/2013<br>water |
|---|---|---|---|---|---|---|
| Date prepared | - | 24/08/2013 | 24/08/2013 | 24/08/2013 | 24/08/2013 | 24/08/2013 |
| Date analysed | - | 24/08/2013 | 24/08/2013 | 24/08/2013 | 24/08/2013 | 24/08/2013 |
| Calcium - Dissolved | mg/L | 20 | 13 | 1.9 | 1.0 | 7.3 |
| Potassium - Dissolved | mg/L | 47 | 57 | 2.2 | 1.6 | 9.7 |
| Sodium - Dissolved | mg/L | 28 | 23 | 32 | 26 | 22 |
| Magnesium - Dissolved | mg/L | 16 | 13 | 4.0 | 3.2 | 7.8 |
| Hydroxide Alkalinity ($OH^-$) as $CaCO_3$ | mg/L | <5 | <5 | <5 | <5 | <5 |
| Bicarbonate Alkalinity as $CaCO_3$ | mg/L | 7 | 7 | 8 | <5 | 19 |
| Carbonate Alkalinity as $CaCO_3$ | mg/L | <5 | <5 | <5 | <5 | <5 |
| Total Alkalinity as $CaCO_3$ | mg/L | 7 | 7 | 8 | <5 | 19 |
| Sulphate, SO4 | mg/L | 77 | 57 | 11 | 9 | 25 |
| Chloride, Cl | mg/L | 88 | 37 | 54 | 43 | 40 |
| Ionic Balance | % | 6.1 | 27 | -1.3 | 1.9 | 4.4 |

| Miscellaneous Inorganics | | | | | | |
|---|---|---|---|---|---|---|
| Our Reference: | UNITS | 96132-1 | 96132-2 | 96132-3 | 96132-4 | 96132-5 |
| Your Reference | ---------- | 3897/GMB01 | 3897/GMB02 | 3897/GMB03 | 3897/GMB04 | 3897/GMB05 |
| Date Sampled | ---------- | 22/08/2013 | 22/08/2013 | 22/08/2013 | 22/08/2013 | 22/08/2013 |
| Type of sample | | water | water | water | water | water |
| Date prepared | - | 24/08/2013 | 24/08/2013 | 24/08/2013 | 24/08/2013 | 24/08/2013 |
| Date analysed | - | 24/08/2013 | 24/08/2013 | 24/08/2013 | 24/08/2013 | 24/08/2013 |
| pH | pH Units | 5.3 | 5.4 | 5.6 | 5.2 | 6.0 |
| Electrical Conductivity | µS/cm | 500 | 490 | 250 | 190 | 270 |
| Total Dissolved Solids (grav) | mg/L | 310 | [NA] | [NA] | [NA] | [NA] |
| Total Suspended Solids | mg/L | 32 | [NA] | [NA] | [NA] | [NA] |
| NOx as N in water | mg/L | 16 | 21 | 0.01 | <0.005 | 0.86 |
| TKN in water | mg/L | 1.9 | 2.3 | 0.5 | 0.3 | 1.7 |
| Ammonia as N in water | mg/L | 0.24 | 0.78 | 0.45 | 0.064 | 0.65 |
| Nitrate as N in water | mg/L | 16 | 21 | 0.015 | <0.005 | 0.85 |

| Metals in Water - Dissolved | | | | | | |
|---|---|---|---|---|---|---|
| Our Reference: | UNITS | 96132-1 | 96132-2 | 96132-3 | 96132-4 | 96132-5 |
| Your Reference | ---------- | 3897/GMB01 | 3897/GMB02 | 3897/GMB03 | 3897/GMB04 | 3897/GMB05 |
| Date Sampled | ---------- | 22/08/2013 | 22/08/2013 | 22/08/2013 | 22/08/2013 | 22/08/2013 |
| Type of sample | | water | water | water | water | water |
| Date digested | - | 26/08/2013 | 26/08/2013 | 26/08/2013 | 26/08/2013 | 26/08/2013 |
| Date analysed | - | 26/08/2013 | 26/08/2013 | 26/08/2013 | 26/08/2013 | 26/08/2013 |
| Phosphorus - Dissolved | mg/L | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |

| Metals in Waters - Acid extractable | | | | | | |
|---|---|---|---|---|---|---|
| Our Reference: | UNITS | 96132-1 | 96132-2 | 96132-3 | 96132-4 | 96132-5 |
| Your Reference | ---------- | 3897/GMB01 | 3897/GMB02 | 3897/GMB03 | 3897/GMB04 | 3897/GMB05 |
| Date Sampled | ---------- | 22/08/2013 | 22/08/2013 | 22/08/2013 | 22/08/2013 | 22/08/2013 |
| Type of sample | | water | water | water | water | water |
| Date prepared | - | 26/08/2013 | 26/08/2013 | 26/08/2013 | 26/08/2013 | 26/08/2013 |
| Date analysed | - | 27/08/2013 | 27/08/2013 | 27/08/2013 | 27/08/2013 | 27/08/2013 |
| Phosphorus - Total | mg/L | 0.1 | <0.05 | <0.05 | <0.05 | 0.07 |

| Method ID | Methodology Summary |
|---|---|
| Metals-020 ICP-AES | Determination of various metals by ICP-AES. |
| Inorg-006 | Alkalinity - determined titrimetrically in accordance with APHA 22nd ED, 2320-B. |
| Inorg-081 | Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA 22nd ED, 4110 -B. |
| Inorg-041 | Gravimetric determination of the total solids content of water using APHA 22nd ED 2540B. |
| Inorg-001 | pH - Measured using pH meter and electrode in accordance with APHA 22nd ED, 4500-H+. |
| Inorg-002 | Conductivity and Salinity - measured using a conductivity cell and dedicated meter, in accordance with APHA 22nd ED 2510 and Rayment & Lyons. |
| Inorg-018 | Total Dissolved Solids - determined gravimetrically. The solids are dried at 180+/-5oC. |
| Inorg-019 | Suspended Solids - determined gravimetrcially by filtration of the sample, in accordance with APHA 22nd ED, 2540-D. The samples are dried at 104+/-5oC. |
| Inorg-055 | Nitrate - determined colourimetrically based on EPA353.2 and APHA 22nd ED NO3- F. Soils are analysed following a water extraction. |
| Inorg-062 | TKN - determined colourimetrically based on APHA 22nd ED 4500 Norg. |
| Inorg-057 | Ammonia - determined colourimetrically based on EPA350.1 and APHA 22nd ED 4500-NH3 F, Soils are analysed following a KCl extraction. |

| QUALITY CONTROL<br>Ion Balance | UNITS | PQL | METHOD | Blank | Duplicate Sm# | Duplicate results<br>Base ll Duplicate ll %RPD | Spike Sm# | Spike % Recovery |
|---|---|---|---|---|---|---|---|---|
| Date prepared | - | | | 26/08/2013 | 96132-5 | 24/08/2013 \|\| 24/08/2013 | LCS-W3 | 26/08/2013 |
| Date analysed | - | | | 26/08/2013 | 96132-5 | 24/08/2013 \|\| 24/08/2013 | LCS-W3 | 26/08/2013 |
| Calcium - Dissolved | mg/L | 0.5 | Metals-020 ICP-AES | <0.5 | 96132-5 | 7.3 \|\| 7.2 \|\| RPD: 1 | LCS-W3 | 93% |
| Potassium - Dissolved | mg/L | 0.5 | Metals-020 ICP-AES | <0.5 | 96132-5 | 9.7 \|\| 9.8 \|\| RPD: 1 | LCS-W3 | 96% |
| Sodium - Dissolved | mg/L | 0.5 | Metals-020 ICP-AES | <0.5 | 96132-5 | 22 \|\| 23 \|\| RPD: 4 | LCS-W3 | 93% |
| Magnesium - Dissolved | mg/L | 0.5 | Metals-020 ICP-AES | <0.5 | 96132-5 | 7.8 \|\| 7.8 \|\| RPD: 0 | LCS-W3 | 94% |
| Hydroxide Alkalinity ($OH^-$) as $CaCO_3$ | mg/L | 5 | Inorg-006 | <5 | 96132-5 | <5 \|\| [N/T] | [NR] | [NR] |
| Bicarbonate Alkalinity as $CaCO_3$ | mg/L | 5 | Inorg-006 | <5 | 96132-5 | 19 \|\| [N/T] | [NR] | [NR] |
| Carbonate Alkalinity as $CaCO_3$ | mg/L | 5 | Inorg-006 | <5 | 96132-5 | <5 \|\| [N/T] | [NR] | [NR] |
| Total Alkalinity as $CaCO_3$ | mg/L | 5 | Inorg-006 | <5 | 96132-5 | 19 \|\| [N/T] | LCS-W3 | 104% |
| Sulphate, SO4 | mg/L | 1 | Inorg-081 | <1 | 96132-5 | 25 \|\| [N/T] | LCS-W3 | 99% |
| Chloride, Cl | mg/L | 1 | Inorg-081 | <1 | 96132-5 | 40 \|\| [N/T] | LCS-W3 | 90% |
| Ionic Balance | % | | Inorg-041 | [NT] | 96132-5 | 4.4 \|\| [N/T] | [NR] | [NR] |

| QUALITY CONTROL<br>Miscellaneous Inorganics | UNITS | PQL | METHOD | Blank | Duplicate Sm# | Duplicate results<br>Base ll Duplicate ll %RPD | Spike Sm# | Spike % Recovery |
|---|---|---|---|---|---|---|---|---|
| Date prepared | - | | | 24/08/2013 | 96132-1 | 24/08/2013 \|\| 24/08/2013 | LCS-W1 | 24/08/2013 |
| Date analysed | - | | | 24/08/2013 | 96132-1 | 24/08/2013 \|\| 24/08/2013 | LCS-W1 | 24/08/2013 |
| pH | pH Units | | Inorg-001 | [NT] | 96132-1 | 5.3 \|\| 5.3 \|\| RPD: 0 | LCS-W1 | 102% |
| Electrical Conductivity | µS/cm | 1 | Inorg-002 | <1 | 96132-1 | 500 \|\| 490 \|\| RPD: 2 | LCS-W1 | 102% |
| Total Dissolved Solids (grav) | mg/L | 5 | Inorg-018 | <5 | 96132-1 | 310 \|\| [N/T] | LCS-W1 | 95% |
| Total Suspended Solids | mg/L | 5 | Inorg-019 | <5 | 96132-1 | 32 \|\| [N/T] | LCS-W1 | 95% |
| NOx as N in water | mg/L | 0.005 | Inorg-055 | <0.005 | 96132-1 | 16 \|\| 15 \|\| RPD: 6 | LCS-W1 | 90% |
| TKN in water | mg/L | 0.1 | Inorg-062 | <0.1 | 96132-1 | 1.9 \|\| 1.9 \|\| RPD: 0 | LCS-W1 | 96% |
| Ammonia as N in water | mg/L | 0.005 | Inorg-057 | <0.005 | 96132-1 | 0.24 \|\| 0.23 \|\| RPD: 4 | LCS-W1 | 116% |
| Nitrate as N in water | mg/L | 0.005 | Inorg-055 | <0.005 | 96132-1 | 16 \|\| 15 \|\| RPD: 6 | LCS-W1 | 90% |

| QUALITY CONTROL<br>Metals in Water - Dissolved | UNITS | PQL | METHOD | Blank | Duplicate Sm# | Duplicate results<br>Base II Duplicate II %RPD | Spike Sm# | Spike % Recovery |
|---|---|---|---|---|---|---|---|---|
| Date digested | - | | | 26/08/2013 | 96132-5 | 26/08/2013 \|\| 26/08/2013 | LCS-W3 | 26/08/2013 |
| Date analysed | - | | | 26/08/2013 | 96132-5 | 26/08/2013 \|\| 26/08/2013 | LCS-W3 | 26/08/2013 |
| Phosphorus - Dissolved | mg/L | 0.05 | Metals-020 ICP-AES | <0.05 | 96132-5 | <0.05 \|\| <0.05 | LCS-W3 | 91% |

| QUALITY CONTROL<br>Metals in Waters - Acid extractable | UNITS | PQL | METHOD | Blank | Duplicate Sm# | Duplicate results<br>Base II Duplicate II %RPD | Spike Sm# | Spike % Recovery |
|---|---|---|---|---|---|---|---|---|
| Date prepared | - | | | 26/08/2013 | [NT] | [NT] | LCS-W1 | 26/08/2013 |
| Date analysed | - | | | 26/08/2013 | [NT] | [NT] | LCS-W1 | 26/08/2013 |
| Phosphorus - Total | mg/L | 0.05 | Metals-020 ICP-AES | <0.05 | [NT] | [NT] | LCS-W1 | 97% |

| QUALITY CONTROL<br>Ion Balance | UNITS | Dup. Sm# | Duplicate<br>Base + Duplicate + %RPD |
|---|---|---|---|
| Date prepared | - | 96132-1 | 24/08/2013 \|\| 24/08/2013 |
| Date analysed | - | 96132-1 | 24/08/2013 \|\| 24/08/2013 |
| Calcium - Dissolved | mg/L | 96132-1 | 20 \|\| [N/T] |
| Potassium - Dissolved | mg/L | 96132-1 | 47 \|\| [N/T] |
| Sodium - Dissolved | mg/L | 96132-1 | 28 \|\| [N/T] |
| Magnesium - Dissolved | mg/L | 96132-1 | 16 \|\| [N/T] |
| Hydroxide Alkalinity ($OH^-$) as $CaCO_3$ | mg/L | 96132-1 | <5 \|\| <5 |
| Bicarbonate Alkalinity as $CaCO_3$ | mg/L | 96132-1 | 7 \|\| 7 \|\| RPD: 0 |
| Carbonate Alkalinity as $CaCO_3$ | mg/L | 96132-1 | <5 \|\| <5 |
| Total Alkalinity as $CaCO_3$ | mg/L | 96132-1 | 7 \|\| 7 \|\| RPD: 0 |
| Sulphate, SO4 | mg/L | 96132-1 | 77 \|\| [N/T] |
| Chloride, Cl | mg/L | 96132-1 | 88 \|\| [N/T] |
| Ionic Balance | % | 96132-1 | 6.1 \|\| [N/T] |

**Report Comments:**

Sample#2:The mass inbalance may be caused by other ions that have not been measured.

| | |
|---|---|
| Asbestos ID was analysed by Approved Identifier: | Not applicable for this job |
| Asbestos ID was authorised by Approved Signatory: | Not applicable for this job |

| | | |
|---|---|---|
| INS: Insufficient sample for this test | PQL: Practical Quantitation Limit | NT: Not tested |
| NA: Test not required | RPD: Relative Percent Difference | NA: Test not required |
| <: Less than | >: Greater than | LCS: Laboratory Control Sample |

**Quality Control Definitions**

**Blank**: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.

**Duplicate**: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.

**Matrix Spike** : A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

**LCS (Laboratory Control Sample)** : This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

**Surrogate Spike:** Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

**Laboratory Acceptance Criteria**

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.
Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.
Spikes for Physical and Aggregate Tests are not applicable.
For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics and 10-140% for SVOC and speciated phenols is acceptable.

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

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

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consulting engineers since 1989

# SOIL ANALYSIS CHAIN OF CUSTODY FORM

| Additional Testing | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Name** | 3897 – bobs farm | | | | | | | | | | | | |
| **Martens Contact Officer** | Ben Rose | | | | | | **Contact Email** | brose@martens.com.au | | | | | |
| **Sampling and Shipping** | **Sample Date** | 29/07/2014 + 30/07/2014 | | **Dispatch Date** | | | 1/08/2014 | **Turnaround Time** | | Standard | | | |
| | **Our Reference** | P1303897JCOC01V01 | | | | | **Shipping Method (X)** | **Hand** | | **Post** | | **Courier** | X |
| | **On Ice (X)** | X | **No Ice (X)** | | **Other (X)** | | | | | | | | |
| **Laboratory** | | | | | | | | | | | | | |
| **Name** | EnviroLab | | | | | | | | | | | | |
| **Sample Delivery Address** | 12 Ashley Street, Chatswood | | | | | | | | | | | | |
| **Delivery Contact** | **Name** | Aileen | | **Phone** | 9910 6200 | | **Fax** | | **Email** | | | | |
| **Please Send Report By (X)** | **Post** | | **Fax** | | **Email** | X | **Reporting Email Address** | brose@martens.com.au (please cc rerni@martens.com.au) | | | | | |

**Analysis**

| | Sample ID | Spocus | EC | Dispersion (emerson crumb) |
|---|---|---|---|---|
| 1) | 3897/101/2.5✓ | X | X | |
| 2) | ✓3897/101/8.5 | X | X | |
| 3) | 3897/101/13.0 | X | X | x |
| 4) | ✓3897/102/2.5 | X | X | |
| 5) | ✓3897/102/5.0 | X | X | x |
| 6) | ✓3897/102/7.0 | X | X | x |
| 7) | ✓3897/103/2.5 | X | X | |
| 8) | ✓3897/103/8.0 | X | X | x |
| 9) | ✓3897/103/10.0 | X | X | |
| 10) | ✓3897/104/2.5 | X | X | |

ENVIROLAB

Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200

Job No: 114013

Date Received: 1/8/14
Time Received: 14:30
Received by: PT
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

**Head Office**
Unit 6 / 37 Leighton Place
Hornsby NSW 2077, Australia
**Ph** 02 9476 9999 **Fax** 02 9476 8767

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MARTENS & ASSOCIATES P/L
ABN 85 070 240 890 ACN 070 240 890

ACEA The Association of Consulting Engineers Australia

# SOIL ANALYSIS CHAIN OF CUSTODY



| | Sample ID | Spocus | EC | Dispersion (emerson crumb) |
|---|---|---|---|---|
| 11) | √3897/104/10.0 | X | X | |
| 12) | √3897/105/2.5 | X | X | |
| 13) | √3897/105/10.0 | X | X | |
| 14) | √3897/106/5.5 | X | X | |
| 15) | √3897/106/10.0 | X | X | |
| 16) | √3897/107/5.5 | X | X | |
| 17) | √3897/107/10.0 | X | X | |
| 18) | √3897/108/2.5 | X | X | |
| 19) | √3897/108/5.5 | X | X | X |
| 20) | √3897/108/8.5 | X | X | |
| 21) | √3897/108/13.0 | X | X | x |

| | |
|---|---|
| | |

11403

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
enquiries@envirolabservices.com.au
www.envirolabservices.com.au

# CERTIFICATE OF ANALYSIS 114013

**Client:**

**Martens & Associates Pty Ltd**
6/37 Leighton Place
Hornsby
NSW 2077

**Attention:** Ben Rose

**Sample log in details:**

| | | | |
|---|---|---|---|
| Your Reference: | **3897, Bobs Farm** | | |
| No. of samples: | 21 Soils | | |
| Date samples received / completed instructions received | 01/08/2014 | / | 01/08/2014 |

**Analysis Details:**

Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
***Please refer to the last page of this report for any comments relating to the results.***

**Report Details:**

| | | | |
|---|---|---|---|
| Date results requested by: / Issue Date: | 11/08/14 | / | 11/08/14 |
| Date of Preliminary Report: | Not Issued | | |

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**Results Approved By:**

Jacinta Hurst
Laboratory Manager

| Miscellaneous Inorg - soil | | | | | | |
|---|---|---|---|---|---|---|
| Our Reference: | UNITS | 114013-1 | 114013-2 | 114013-3 | 114013-4 | 114013-5 |
| Your Reference | ---------- | 3897/101 | 3897/101 | 3897/101 | 3897/102 | 3897/102 |
| Depth | ---------- | 2.5 | 8.5 | 13.0 | 2.5 | 5.0 |
| Type of sample | | Soil | Soil | Soil | Soil | Soil |
| Date prepared | - | 04/08/2014 | 04/08/2014 | 04/08/2014 | 04/08/2014 | 04/08/2014 |
| Date analysed | - | 05/08/2014 | 05/08/2014 | 05/08/2014 | 05/08/2014 | 05/08/2014 |
| Electrical Conductivity 1:5 soil:water | µS/cm | 13 | 10 | 16 | 13 | 50 |

| Miscellaneous Inorg - soil | | | | | | |
|---|---|---|---|---|---|---|
| Our Reference: | UNITS | 114013-6 | 114013-7 | 114013-8 | 114013-9 | 114013-10 |
| Your Reference | ---------- | 3897/102 | 3897/103 | 3897/103 | 3897/103 | 3897/104 |
| Depth | ---------- | 7.0 | 2.5 | 8.0 | 10.0 | 2.5 |
| Type of sample | | Soil | Soil | Soil | Soil | Soil |
| Date prepared | - | 04/08/2014 | 04/08/2014 | 04/08/2014 | 04/08/2014 | 04/08/2014 |
| Date analysed | - | 05/08/2014 | 05/08/2014 | 05/08/2014 | 05/08/2014 | 05/08/2014 |
| Electrical Conductivity 1:5 soil:water | µS/cm | 24 | 4 | 15 | 19 | 7 |

| Miscellaneous Inorg - soil | | | | | | |
|---|---|---|---|---|---|---|
| Our Reference: | UNITS | 114013-11 | 114013-12 | 114013-13 | 114013-14 | 114013-15 |
| Your Reference | ---------- | 3897/104 | 3897/105 | 3897/105 | 3897/106 | 3897/106 |
| Depth | ---------- | 10.0 | 2.5 | 10.0 | 5.5 | 10.0 |
| Type of sample | | Soil | Soil | Soil | Soil | Soil |
| Date prepared | - | 04/08/2014 | 04/08/2014 | 04/08/2014 | 04/08/2014 | 04/08/2014 |
| Date analysed | - | 05/08/2014 | 05/08/2014 | 05/08/2014 | 05/08/2014 | 05/08/2014 |
| Electrical Conductivity 1:5 soil:water | µS/cm | 5 | 7 | 4 | 12 | 4 |

| Miscellaneous Inorg - soil | | | | | | |
|---|---|---|---|---|---|---|
| Our Reference: | UNITS | 114013-16 | 114013-17 | 114013-18 | 114013-19 | 114013-20 |
| Your Reference | ---------- | 3897/107 | 3897/107 | 3897/108 | 3897/108 | 3897/108 |
| Depth | ---------- | 5.5 | 10.0 | 2.5 | 5.5 | 8.5 |
| Type of sample | | Soil | Soil | Soil | Soil | Soil |
| Date prepared | - | 04/08/2014 | 04/08/2014 | 04/08/2014 | 04/08/2014 | 04/08/2014 |
| Date analysed | - | 05/08/2014 | 05/08/2014 | 05/08/2014 | 05/08/2014 | 05/08/2014 |
| Electrical Conductivity 1:5 soil:water | µS/cm | 8 | 10 | 36 | 32 | 47 |

| Miscellaneous Inorg - soil | | |
|---|---|---|
| Our Reference: | UNITS | 114013-21 |
| Your Reference | ---------- | 3897/108 |
| Depth | ---------- | 13.0 |
| Type of sample | | Soil |
| Date prepared | - | 04/08/2014 |
| Date analysed | - | 05/08/2014 |
| Electrical Conductivity 1:5 soil:water | µS/cm | 30 |

| sPOCAS<br>Our Reference:<br>Your Reference<br>Depth<br>Type of sample | UNITS<br>----------<br>---------- | 114013-1<br>3897/101<br>2.5<br>Soil | 114013-2<br>3897/101<br>8.5<br>Soil | 114013-3<br>3897/101<br>13.0<br>Soil | 114013-4<br>3897/102<br>2.5<br>Soil | 114013-5<br>3897/102<br>5.0<br>Soil |
|---|---|---|---|---|---|---|
| Date prepared | - | 4/8/2014 | 4/8/2014 | 4/8/2014 | 4/8/2014 | 4/8/2014 |
| Date analysed | - | 4/8/2014 | 4/8/2014 | 4/8/2014 | 4/8/2014 | 4/8/2014 |
| pH $_{kcl}$ | pH units | 5.0 | 5.6 | 5.4 | 4.6 | 4.8 |
| TAA pH 6.5 | moles $H^+$/t | 5 | <5 | <5 | 10 | 10 |
| s-TAA pH 6.5 | %w/w S | <0.01 | <0.01 | <0.01 | 0.02 | 0.02 |
| pH $_{Ox}$ | pH units | 4.4 | 4.3 | 5.7 | 3.5 | 2.1 |
| TPA pH 6.5 | moles $H^+$/t | <5 | <5 | <5 | <5 | 190 |
| s-TPA pH 6.5 | %w/w S | <0.01 | <0.01 | <0.01 | <0.01 | 0.30 |
| TSA pH 6.5 | moles $H^+$/t | <5 | <5 | <5 | <5 | 180 |
| s-TSA pH 6.5 | %w/w S | <0.01 | <0.01 | <0.01 | <0.01 | 0.29 |
| ANC$_E$ | %$CaCO_3$ | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| a-ANC$_E$ | moles $H^+$/t | <5 | <5 | <5 | <5 | <5 |
| s-ANC$_E$ | %w/w S | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| S$_{KCl}$ | %w/w S | <0.005 | <0.005 | <0.005 | <0.005 | 0.02 |
| S$_P$ | %w/w | <0.005 | <0.005 | <0.005 | <0.005 | 0.28 |
| S$_{POS}$ | %w/w | <0.005 | <0.005 | <0.005 | <0.005 | 0.26 |
| a-S$_{POS}$ | moles $H^+$/t | <5 | <5 | <5 | <5 | 170 |
| Ca$_{KCl}$ | %w/w | <0.005 | <0.005 | <0.005 | <0.005 | 0.06 |
| Ca$_P$ | %w/w | 0.007 | <0.005 | 0.009 | 0.007 | 0.06 |
| Ca$_A$ | %w/w | 0.005 | <0.005 | 0.009 | <0.005 | <0.005 |
| Mg$_{KCl}$ | %w/w | <0.005 | <0.005 | <0.005 | <0.005 | 0.014 |
| Mg$_P$ | %w/w | 0.005 | <0.005 | 0.005 | 0.007 | 0.016 |
| Mg$_A$ | %w/w | <0.005 | <0.005 | <0.005 | 0.006 | <0.005 |
| Fineness Factor | - | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |
| a-Net Acidity | moles $H^+$/t | <10 | <10 | <10 | 12 | 180 |
| Liming rate | kg $CaCO_3$/t | <0.75 | <0.75 | <0.75 | 0.90 | 13 |
| a-Net Acidity without ANCE | moles $H^+$/t | NA | NA | NA | NA | NA |
| Liming rate without ANCE | kg $CaCO_3$/t | NA | NA | NA | NA | NA |

| sPOCAS<br>Our Reference:<br>Your Reference<br>Depth<br>Type of sample | UNITS<br>----------<br>---------- | 114013-6<br>3897/102<br>7.0<br>Soil | 114013-7<br>3897/103<br>2.5<br>Soil | 114013-8<br>3897/103<br>8.0<br>Soil | 114013-9<br>3897/103<br>10.0<br>Soil | 114013-10<br>3897/104<br>2.5<br>Soil |
|---|---|---|---|---|---|---|
| Date prepared | - | 4/8/2014 | 4/8/2014 | 4/8/2014 | 4/8/2014 | 4/8/2014 |
| Date analysed | - | 4/8/2014 | 4/8/2014 | 4/8/2014 | 4/8/2014 | 4/8/2014 |
| pH $_{kcl}$ | pH units | 5.1 | 5.4 | 5.0 | 5.4 | 5.0 |
| TAA pH 6.5 | moles $H^+$/t | 7 | 5 | 5 | <5 | 5 |
| s-TAA pH 6.5 | %w/w S | 0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| pH $_{Ox}$ | pH units | 2.7 | 4.2 | 2.5 | 3.3 | 4.5 |
| TPA pH 6.5 | moles $H^+$/t | 47 | <5 | 25 | 12 | <5 |
| s-TPA pH 6.5 | %w/w S | 0.08 | <0.01 | 0.04 | 0.02 | <0.01 |
| TSA pH 6.5 | moles $H^+$/t | 40 | <5 | 20 | 10 | <5 |
| s-TSA pH 6.5 | %w/w S | 0.06 | <0.01 | 0.03 | 0.02 | <0.01 |
| ANC$_E$ | %$CaCO_3$ | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| a-ANC$_E$ | moles $H^+$/t | <5 | <5 | <5 | <5 | <5 |
| s-ANC$_E$ | %w/w S | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| S$_{KCl}$ | %w/w S | 0.01 | <0.005 | <0.005 | <0.005 | <0.005 |
| S$_P$ | %w/w | 0.10 | <0.005 | 0.05 | 0.04 | <0.005 |
| S$_{POS}$ | %w/w | 0.1 | <0.005 | 0.05 | 0.04 | <0.005 |
| a-S$_{POS}$ | moles $H^+$/t | 60 | <5 | 30 | 26 | <5 |
| Ca$_{KCl}$ | %w/w | 0.01 | <0.005 | 0.01 | <0.005 | <0.005 |
| Ca$_P$ | %w/w | 0.01 | <0.005 | 0.01 | 0.02 | <0.005 |
| Ca$_A$ | %w/w | <0.005 | <0.005 | <0.005 | 0.014 | <0.005 |
| Mg$_{KCl}$ | %w/w | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| Mg$_P$ | %w/w | <0.005 | <0.005 | <0.005 | 0.014 | <0.005 |
| Mg$_A$ | %w/w | <0.005 | <0.005 | <0.005 | 0.013 | <0.005 |
| Fineness Factor | - | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |
| a-Net Acidity | moles $H^+$/t | 67 | <10 | 35 | 28 | <10 |
| Liming rate | kg $CaCO_3$/t | 5.0 | <0.75 | 2.6 | 2.1 | <0.75 |
| a-Net Acidity without ANCE | moles $H^+$/t | NA | NA | NA | NA | NA |
| Liming rate without ANCE | kg $CaCO_3$/t | NA | NA | NA | NA | NA |

| sPOCAS<br>Our Reference:<br>Your Reference<br>Depth<br>Type of sample | UNITS<br>----------<br>---------- | 114013-11<br>3897/104<br>10.0<br>Soil | 114013-12<br>3897/105<br>2.5<br>Soil | 114013-13<br>3897/105<br>10.0<br>Soil | 114013-14<br>3897/106<br>5.5<br>Soil | 114013-15<br>3897/106<br>10.0<br>Soil |
|---|---|---|---|---|---|---|
| Date prepared | - | 4/8/2014 | 4/8/2014 | 4/8/2014 | 4/8/2014 | 4/8/2014 |
| Date analysed | - | 4/8/2014 | 4/8/2014 | 4/8/2014 | 4/8/2014 | 4/8/2014 |
| pH $_{kcl}$ | pH units | 5.7 | 5.2 | 5.5 | 5.6 | 5.2 |
| TAA pH 6.5 | moles $H^+$/t | <5 | 5 | <5 | <5 | <5 |
| s-TAA pH 6.5 | %w/w S | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| pH $_{Ox}$ | pH units | 5.0 | 3.9 | 5.5 | 5.1 | 4.7 |
| TPA pH 6.5 | moles $H^+$/t | <5 | <5 | <5 | <5 | <5 |
| s-TPA pH 6.5 | %w/w S | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| TSA pH 6.5 | moles $H^+$/t | <5 | <5 | <5 | <5 | <5 |
| s-TSA pH 6.5 | %w/w S | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| $ANC_E$ | % $CaCO_3$ | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| a-$ANC_E$ | moles $H^+$/t | <5 | <5 | <5 | <5 | <5 |
| s-$ANC_E$ | %w/w S | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| $S_{KCl}$ | %w/w S | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| $S_P$ | %w/w | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| $S_{POS}$ | %w/w | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| a-$S_{POS}$ | moles $H^+$/t | <5 | <5 | <5 | <5 | <5 |
| $Ca_{KCl}$ | %w/w | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| $Ca_P$ | %w/w | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| $Ca_A$ | %w/w | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| $Mg_{KCl}$ | %w/w | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| $Mg_P$ | %w/w | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| $Mg_A$ | %w/w | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| Fineness Factor | - | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |
| a-Net Acidity | moles $H^+$/t | <10 | <10 | <10 | <10 | <10 |
| Liming rate | kg $CaCO_3$/t | <0.75 | <0.75 | <0.75 | <0.75 | <0.75 |
| a-Net Acidity without ANCE | moles $H^+$/t | NA | NA | NA | NA | NA |
| Liming rate without ANCE | kg $CaCO_3$/t | NA | NA | NA | NA | NA |

| sPOCAS<br>Our Reference:<br>Your Reference<br>Depth<br>Type of sample | UNITS<br>----------<br>----------<br> | 114013-16<br>3897/107<br>5.5<br>Soil | 114013-17<br>3897/107<br>10.0<br>Soil | 114013-18<br>3897/108<br>2.5<br>Soil | 114013-19<br>3897/108<br>5.5<br>Soil | 114013-20<br>3897/108<br>8.5<br>Soil |
|---|---|---|---|---|---|---|
| Date prepared | - | 4/8/2014 | 4/8/2014 | 4/8/2014 | 4/8/2014 | 4/8/2014 |
| Date analysed | - | 4/8/2014 | 4/8/2014 | 4/8/2014 | 4/8/2014 | 4/8/2014 |
| pH $_{kcl}$ | pH units | 5.2 | 5.2 | 4.5 | 5.3 | 5.2 |
| TAA pH 6.5 | moles $H^+$/t | 5 | 5 | 10 | 5 | 5 |
| s-TAA pH 6.5 | %w/w S | <0.01 | <0.01 | 0.02 | <0.01 | <0.01 |
| pH $_{Ox}$ | pH units | 6.3 | 4.0 | 3.4 | 5.2 | 2.8 |
| TPA pH 6.5 | moles $H^+$/t | <5 | <5 | 22 | <5 | 35 |
| s-TPA pH 6.5 | %w/w S | <0.01 | <0.01 | 0.04 | <0.01 | 0.06 |
| TSA pH 6.5 | moles $H^+$/t | <5 | <5 | 12 | <5 | 30 |
| s-TSA pH 6.5 | %w/w S | <0.01 | <0.01 | 0.02 | <0.01 | 0.05 |
| ANC$_E$ | %$CaCO_3$ | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| a-ANC$_E$ | moles $H^+$/t | <5 | <5 | <5 | <5 | <5 |
| s-ANC$_E$ | %w/w S | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| S$_{KCl}$ | %w/w S | <0.005 | <0.005 | <0.005 | <0.005 | 0.008 |
| S$_P$ | %w/w | <0.005 | <0.005 | <0.005 | 0.01 | 0.06 |
| S$_{POS}$ | %w/w | <0.005 | <0.005 | <0.005 | 0.01 | 0.06 |
| a-S$_{POS}$ | moles $H^+$/t | <5 | <5 | <5 | 7 | 36 |
| Ca$_{KCl}$ | %w/w | <0.005 | <0.005 | 0.006 | <0.005 | <0.005 |
| Ca$_P$ | %w/w | 0.02 | <0.005 | 0.006 | 0.01 | <0.005 |
| Ca$_A$ | %w/w | 0.016 | <0.005 | <0.005 | 0.009 | <0.005 |
| Mg$_{KCl}$ | %w/w | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| Mg$_P$ | %w/w | 0.005 | <0.005 | <0.005 | 0.013 | <0.005 |
| Mg$_A$ | %w/w | 0.005 | <0.005 | <0.005 | 0.010 | <0.005 |
| Fineness Factor | - | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |
| a-Net Acidity | moles $H^+$/t | <10 | <10 | 10 | 12 | 41 |
| Liming rate | kg $CaCO_3$/t | <0.75 | <0.75 | 0.75 | 0.93 | 3.1 |
| a-Net Acidity without ANCE | moles $H^+$/t | NA | NA | NA | NA | NA |
| Liming rate without ANCE | kg $CaCO_3$/t | NA | NA | NA | NA | NA |

| sPOCAS | | |
|---|---|---|
| Our Reference: | UNITS | 114013-21 |
| Your Reference | ---------- | 3897/108 |
| Depth | ---------- | 13.0 |
| Type of sample | | Soil |
| Date prepared | - | 4/8/2014 |
| Date analysed | - | 4/8/2014 |
| pH $_{kcl}$ | pH units | 5.2 |
| TAA pH 6.5 | moles $H^+$/t | <5 |
| s-TAA pH 6.5 | %w/w S | <0.01 |
| pH $_{Ox}$ | pH units | 2.8 |
| TPA pH 6.5 | moles $H^+$/t | 35 |
| s-TPA pH 6.5 | %w/w S | 0.06 |
| TSA pH 6.5 | moles $H^+$/t | 32 |
| s-TSA pH 6.5 | %w/w S | 0.05 |
| ANC$_E$ | % $CaCO_3$ | <0.05 |
| a-ANC$_E$ | moles $H^+$/t | <5 |
| s-ANC$_E$ | %w/w S | <0.05 |
| S$_{KCl}$ | %w/w S | <0.005 |
| S$_P$ | %w/w | 0.06 |
| S$_{POS}$ | %w/w | 0.05 |
| a-S$_{POS}$ | moles $H^+$/t | 35 |
| Ca$_{KCl}$ | %w/w | <0.005 |
| Ca$_P$ | %w/w | <0.005 |
| Ca$_A$ | %w/w | <0.005 |
| Mg$_{KCl}$ | %w/w | <0.005 |
| Mg$_P$ | %w/w | <0.005 |
| Mg$_A$ | %w/w | <0.005 |
| Fineness Factor | - | 1.5 |
| a-Net Acidity | moles $H^+$/t | 37 |
| Liming rate | kg $CaCO_3$/t | 2.8 |
| a-Net Acidity without ANCE | moles $H^+$/t | NA |
| Liming rate without ANCE | kg $CaCO_3$/t | NA |

| Method ID | Methodology Summary |
|---|---|
| Inorg-002 | Conductivity and Salinity - measured using a conductivity cell at 25oC in accordance with APHA 22nd ED 2510 and Rayment & Lyons. |
| Inorg-064 | sPOCAS determined using titrimetric and ICP-AES techniques. Based on Acid Sulfate Soils Laboratory Methods Guidelines, Version 2.1 - June 2004. |

| QUALITY CONTROL<br>Miscellaneous Inorg - soil | UNITS | PQL | METHOD | Blank | Duplicate Sm# | Duplicate results<br>Base II Duplicate II %RPD | Spike Sm# | Spike % Recovery |
|---|---|---|---|---|---|---|---|---|
| Date prepared | - | | | 04/08/2014 | 114013-1 | 04/08/2014 \|\| 04/08/2014 | LCS-1 | 04/08/2014 |
| Date analysed | - | | | 05/08/2014 | 114013-1 | 05/08/2014 \|\| 05/08/2014 | LCS-1 | 05/08/2014 |
| Electrical Conductivity 1:5 soil:water | µS/cm | 1 | Inorg-002 | <1 | 114013-1 | 13 \|\| 12 \|\| RPD: 8 | LCS-1 | 103% |
| QUALITY CONTROL<br>sPOCAS | UNITS | PQL | METHOD | Blank | Duplicate Sm# | Duplicate results<br>Base II Duplicate II %RPD | Spike Sm# | Spike % Recovery |
| Date prepared | - | | | 4/8/2014 | 114013-1 | 4/8/2014 \|\| 4/8/2014 | LCS-1 | 4/8/2014 |
| Date analysed | - | | | 4/8/2014 | 114013-1 | 4/8/2014 \|\| 4/8/2014 | LCS-1 | 4/8/2014 |
| pH $_{kcl}$ | pH units | | Inorg-064 | [NT] | 114013-1 | 5.0 \|\| 4.9 \|\| RPD: 2 | LCS-1 | 92% |
| TAA pH 6.5 | moles $H^+$/t | 5 | Inorg-064 | <5 | 114013-1 | 5 \|\| 5 \|\| RPD: 0 | LCS-1 | 121% |
| s-TAA pH 6.5 | %w/w S | 0.01 | Inorg-064 | <0.01 | 114013-1 | <0.01 \|\| <0.01 | [NR] | [NR] |
| pH $_{Ox}$ | pH units | | Inorg-064 | [NT] | 114013-1 | 4.4 \|\| 4.9 \|\| RPD: 11 | LCS-1 | 96% |
| TPA pH 6.5 | moles $H^+$/t | 5 | Inorg-064 | <5 | 114013-1 | <5 \|\| <5 | LCS-1 | 90% |
| s-TPA pH 6.5 | %w/w S | 0.01 | Inorg-064 | <0.01 | 114013-1 | <0.01 \|\| <0.01 | [NR] | [NR] |
| TSA pH 6.5 | moles $H^+$/t | 5 | Inorg-064 | <5 | 114013-1 | <5 \|\| <5 | LCS-1 | 89% |
| s-TSA pH 6.5 | %w/w S | 0.01 | Inorg-064 | <0.01 | 114013-1 | <0.01 \|\| <0.01 | [NR] | [NR] |
| $ANC_E$ | % $CaCO_3$ | 0.05 | Inorg-064 | <0.05 | 114013-1 | <0.05 \|\| <0.05 | [NR] | [NR] |
| a-$ANC_E$ | moles $H^+$/t | 5 | Inorg-064 | <5 | 114013-1 | <5 \|\| <5 | [NR] | [NR] |
| s-$ANC_E$ | %w/w S | 0.05 | Inorg-064 | <0.05 | 114013-1 | <0.05 \|\| <0.05 | [NR] | [NR] |
| $S_{KCl}$ | %w/w S | 0.005 | Inorg-064 | <0.005 | 114013-1 | <0.005 \|\| <0.005 | LCS-1 | 100% |
| $S_P$ | %w/w | 0.005 | Inorg-064 | <0.005 | 114013-1 | <0.005 \|\| <0.005 | LCS-1 | 91% |
| $S_{POS}$ | %w/w | 0.005 | Inorg-064 | <0.005 | 114013-1 | <0.005 \|\| <0.005 | LCS-1 | 89% |
| a-$S_{POS}$ | moles $H^+$/t | 5 | Inorg-064 | <5 | 114013-1 | <5 \|\| <5 | LCS-1 | 90% |
| $Ca_{KCl}$ | %w/w | 0.005 | Inorg-064 | <0.005 | 114013-1 | <0.005 \|\| <0.005 | LCS-1 | 93% |
| $Ca_P$ | %w/w | 0.005 | Inorg-064 | <0.005 | 114013-1 | 0.007 \|\| 0.006 \|\| RPD: 15 | [NR] | [NR] |
| $Ca_A$ | %w/w | 0.005 | Inorg-064 | <0.005 | 114013-1 | 0.005 \|\| 0.005 \|\| RPD: 0 | [NR] | [NR] |
| $Mg_{KCl}$ | %w/w | 0.005 | Inorg-064 | <0.005 | 114013-1 | <0.005 \|\| <0.005 | LCS-1 | 94% |
| $Mg_P$ | %w/w | 0.005 | Inorg-064 | <0.005 | 114013-1 | 0.005 \|\| 0.009 \|\| RPD: 57 | [NR] | [NR] |
| $Mg_A$ | %w/w | 0.005 | Inorg-064 | <0.005 | 114013-1 | <0.005 \|\| 0.008 | [NR] | [NR] |
| $S_{HCl}$ | %w/w S | 0.005 | Inorg-064 | <0.005 | [NT] | [NT] | [NR] | [NR] |
| $S_{NAS}$ | %w/w S | 0.005 | Inorg-064 | <0.005 | [NT] | [NT] | [NR] | [NR] |

**Client Reference: 3897, Bobs Farm**

| QUALITY CONTROL<br>sPOCAS | UNITS | PQL | METHOD | Blank | Duplicate Sm# | Duplicate results<br>Base ll Duplicate ll %RPD | Spike Sm# | Spike % Recovery |
|---|---|---|---|---|---|---|---|---|
| a-$S_{NAS}$ | moles $H^+$/t | 5 | Inorg-064 | <5 | [NT] | [NT] | [NR] | [NR] |
| s-$S_{NAS}$ | %w/w S | 0.01 | Inorg-064 | <0.01 | [NT] | [NT] | [NR] | [NR] |
| Fineness Factor | - | 1.5 | Inorg-064 | <1.5 | 114013-1 | 1.5 \|\| 1.5 \|\| RPD: 0 | [NR] | [NR] |
| a-Net Acidity | moles $H^+$/t | 10 | Inorg-064 | <10 | 114013-1 | <10 \|\| <10 | LCS-1 | 91% |
| Liming rate | kg $CaCO_3$/t | 0.75 | Inorg-064 | <0.75 | 114013-1 | <0.75 \|\| <0.75 | LCS-1 | 90% |
| a-Net Acidity without ANCE | moles $H^+$/t | 10 | Inorg-064 | <10 | 114013-1 | NA \|\| NA | [NR] | [NR] |
| Liming rate without ANCE | kg $CaCO_3$/t | 0.75 | Inorg-064 | <0.75 | 114013-1 | NA \|\| NA | [NR] | [NR] |

| QUALITY CONTROL<br>Miscellaneous Inorg - soil | UNITS | Dup. Sm# | Duplicate<br>Base + Duplicate + %RPD | Spike Sm# | Spike % Recovery |
|---|---|---|---|---|---|
| Date prepared | - | 114013-11 | 04/08/2014 \|\| 04/08/2014 | LCS-2 | 04/08/2014 |
| Date analysed | - | 114013-11 | 05/08/2014 \|\| 05/08/2014 | LCS-2 | 05/08/2014 |
| Electrical Conductivity 1:5 soil:water | µS/cm | 114013-11 | 5 \|\| 5 \|\| RPD: 0 | LCS-2 | 102% |

| QUALITY CONTROL<br>sPOCAS | UNITS | Dup. Sm# | Duplicate<br>Base + Duplicate + %RPD | Spike Sm# | Spike % Recovery |
|---|---|---|---|---|---|
| Date prepared | - | 114013-11 | 4/8/2014 \|\| 4/8/2014 | LCS-2 | 4/8/2014 |
| Date analysed | - | 114013-11 | 4/8/2014 \|\| 4/8/2014 | LCS-2 | 4/8/2014 |
| pH $_{kcl}$ | pH units | 114013-11 | 5.7 \|\| 5.6 \|\| RPD: 2 | LCS-2 | 93% |
| TAA pH 6.5 | moles $H^+$/t | 114013-11 | <5 \|\| <5 | LCS-2 | 113% |
| s-TAA pH 6.5 | %w/w S | 114013-11 | <0.01 \|\| <0.01 | [NR] | [NR] |
| pH $_{Ox}$ | pH units | 114013-11 | 5.0 \|\| 4.8 \|\| RPD: 4 | LCS-2 | 106% |
| TPA pH 6.5 | moles $H^+$/t | 114013-11 | <5 \|\| <5 | LCS-2 | 83% |
| s-TPA pH 6.5 | %w/w S | 114013-11 | <0.01 \|\| <0.01 | [NR] | [NR] |
| TSA pH 6.5 | moles $H^+$/t | 114013-11 | <5 \|\| <5 | LCS-2 | 81% |
| s-TSA pH 6.5 | %w/w S | 114013-11 | <0.01 \|\| <0.01 | [NR] | [NR] |
| $ANC_E$ | % $CaCO_3$ | 114013-11 | <0.05 \|\| <0.05 | [NR] | [NR] |
| a-$ANC_E$ | moles $H^+$/t | 114013-11 | <5 \|\| <5 | [NR] | [NR] |
| s-$ANC_E$ | %w/w S | 114013-11 | <0.05 \|\| <0.05 | [NR] | [NR] |
| $S_{KCl}$ | %w/w S | 114013-11 | <0.005 \|\| <0.005 | LCS-2 | 106% |
| $S_P$ | %w/w | 114013-11 | <0.005 \|\| <0.005 | LCS-2 | 88% |
| $S_{POS}$ | %w/w | 114013-11 | <0.005 \|\| <0.005 | LCS-2 | 83% |
| a-$S_{POS}$ | moles $H^+$/t | 114013-11 | <5 \|\| <5 | LCS-2 | 83% |

| QUALITY CONTROL sPOCAS | UNITS | Dup. Sm# | Duplicate Base + Duplicate + %RPD | Spike Sm# | Spike % Recovery |
|---|---|---|---|---|---|
| $Ca_{KCl}$ | %w/w | 114013-11 | <0.005 \|\| <0.005 | LCS-2 | 100% |
| $Ca_{P}$ | %w/w | 114013-11 | <0.005 \|\| <0.005 | [NR] | [NR] |
| $Ca_{A}$ | %w/w | 114013-11 | <0.005 \|\| <0.005 | [NR] | [NR] |
| $Mg_{KCl}$ | %w/w | 114013-11 | <0.005 \|\| <0.005 | LCS-2 | 98% |
| $Mg_{P}$ | %w/w | 114013-11 | <0.005 \|\| <0.005 | [NR] | [NR] |
| $Mg_{A}$ | %w/w | 114013-11 | <0.005 \|\| <0.005 | [NR] | [NR] |
| Fineness Factor | - | 114013-11 | 1.5 \|\| 1.5 \|\| RPD: 0 | [NR] | [NR] |
| a-Net Acidity | moles $H^+$/t | 114013-11 | <10 \|\| <10 | LCS-2 | 84% |
| Liming rate | kg $CaCO_3$/t | 114013-11 | <0.75 \|\| <0.75 | LCS-2 | 83% |
| a-Net Acidity without ANCE | moles $H^+$/t | 114013-11 | NA \|\| NA | [NR] | [NR] |
| Liming rate without ANCE | kg $CaCO_3$/t | 114013-11 | NA \|\| NA | [NR] | [NR] |

| QUALITY CONTROL sPOCAS | UNITS | Dup. Sm# | Duplicate Base + Duplicate + %RPD |
|---|---|---|---|
| Date prepared | - | 114013-21 | 4/8/2014 \|\| 4/8/2014 |
| Date analysed | - | 114013-21 | 4/8/2014 \|\| 4/8/2014 |
| $pH_{kcl}$ | pH units | 114013-21 | 5.2 \|\| 5.3 \|\| RPD: 2 |
| TAA pH 6.5 | moles $H^+$/t | 114013-21 | <5 \|\| <5 |
| s-TAA pH 6.5 | %w/w S | 114013-21 | <0.01 \|\| <0.01 |
| $pH_{Ox}$ | pH units | 114013-21 | 2.8 \|\| 2.9 \|\| RPD: 4 |
| TPA pH 6.5 | moles $H^+$/t | 114013-21 | 35 \|\| 22 \|\| RPD: 46 |
| s-TPA pH 6.5 | %w/w S | 114013-21 | 0.06 \|\| 0.04 \|\| RPD: 40 |
| TSA pH 6.5 | moles $H^+$/t | 114013-21 | 32 \|\| 20 \|\| RPD: 46 |
| s-TSA pH 6.5 | %w/w S | 114013-21 | 0.05 \|\| 0.03 \|\| RPD: 50 |
| $ANC_E$ | % $CaCO_3$ | 114013-21 | <0.05 \|\| <0.05 |
| a-$ANC_E$ | moles $H^+$/t | 114013-21 | <5 \|\| <5 |
| s-$ANC_E$ | %w/w S | 114013-21 | <0.05 \|\| <0.05 |
| $S_{KCl}$ | %w/w S | 114013-21 | <0.005 \|\| 0.007 |
| $S_P$ | %w/w | 114013-21 | 0.06 \|\| 0.05 \|\| RPD: 18 |
| $S_{POS}$ | %w/w | 114013-21 | 0.05 \|\| 0.04 \|\| RPD: 22 |
| a-$S_{POS}$ | moles $H^+$/t | 114013-21 | 35 \|\| 25 \|\| RPD: 33 |
| $Ca_{KCl}$ | %w/w | 114013-21 | <0.005 \|\| <0.005 |
| $Ca_{P}$ | %w/w | 114013-21 | <0.005 \|\| <0.005 |
| $Ca_{A}$ | %w/w | 114013-21 | <0.005 \|\| <0.005 |

| QUALITY CONTROL sPOCAS | UNITS | Dup. Sm# | Duplicate Base + Duplicate + %RPD |
|---|---|---|---|
| $Mg_{KCl}$ | %w/w | 114013-21 | <0.005 \|\| <0.005 |
| $Mg_{P}$ | %w/w | 114013-21 | <0.005 \|\| <0.005 |
| $Mg_{A}$ | %w/w | 114013-21 | <0.005 \|\| <0.005 |
| $S_{HCl}$ | %w/w S | [NT] | [NT] |
| $S_{NAS}$ | %w/w S | [NT] | [NT] |
| a-$S_{NAS}$ | moles $H^+$/t | [NT] | [NT] |
| s-$S_{NAS}$ | %w/w S | [NT] | [NT] |
| Fineness Factor | - | 114013-21 | 1.5 \|\| 1.5 \|\| RPD: 0 |
| a-Net Acidity | moles $H^+$/t | 114013-21 | 37 \|\| 27 \|\| RPD: 31 |
| Liming rate | kg $CaCO_3$/t | 114013-21 | 2.8 \|\| 2.1 \|\| RPD: 29 |
| a-Net Acidity without ANCE | moles $H^+$/t | 114013-21 | NA \|\| NA |
| Liming rate without ANCE | kg $CaCO_3$/t | 114013-21 | NA \|\| NA |

**Report Comments:**

| | |
|---|---|
| Asbestos ID was analysed by Approved Identifier: | Not applicable for this job |
| Asbestos ID was authorised by Approved Signatory: | Not applicable for this job |

| | | |
|---|---|---|
| INS: Insufficient sample for this test | PQL: Practical Quantitation Limit | NT: Not tested |
| NA: Test not required | RPD: Relative Percent Difference | NA: Test not required |
| <: Less than | >: Greater than | LCS: Laboratory Control Sample |

## Quality Control Definitions

**Blank**: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.

**Duplicate**: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.

**Matrix Spike** : A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

**LCS (Laboratory Control Sample)** : This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

**Surrogate Spike:** Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

## Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.
Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.
Spikes for Physical and Aggregate Tests are not applicable.
For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics and 10-140% for SVOC and speciated phenols is acceptable.

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

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

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# CERTIFICATE OF ANALYSIS 95948

**Client:**

**Martens & Associates Pty Ltd**
6/37 Leighton Place
Hornsby
NSW 2077

**Attention:** Gray Taylor

**Sample log in details:**

| | |
|---|---|
| Your Reference: | **P12303897, Bobs Farm** |
| No. of samples: | 27 Soils |
| Date samples received / completed instructions received | 21/08/2013 / 21/08/2013 |

**Analysis Details:**

Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
***Please refer to the last page of this report for any comments relating to the results.***

**Report Details:**

| | |
|---|---|
| Date results requested by: / Issue Date: | 29/08/13 / 28/08/13 |
| Date of Preliminary Report: | Not Issued |

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

**Results Approved By:**

Jacinta Hurst
Laboratory Manager

| sPOCAS<br>Our Reference:<br>Your Reference<br>Depth<br>Type of sample | UNITS<br>----------<br>---------- | 95948-1<br>3897/BH03<br>+12.5 to +11.5<br>Soil | 95948-2<br>3897/BH03<br>+6.5 to +5.5<br>Soil | 95948-3<br>3897/BH03<br>+1.5 to +0.5<br>Soil | 95948-4<br>3897/BH03<br>-0.5 to -1.1<br>Soil | 95948-5<br>3897/BH03<br>-1.3 to -1.5<br>Soil |
|---|---|---|---|---|---|---|
| Date prepared | - | 22/08/2013 | 22/08/2013 | 22/08/2013 | 22/08/2013 | 22/08/2013 |
| Date analysed | - | 22/08/2013 | 22/08/2013 | 22/08/2013 | 22/08/2013 | 22/08/2013 |
| pH $_{kcl}$ | pH units | 4.8 | 5.4 | 5.6 | 5.6 | 5.4 |
| TAA pH 6.5 | moles $H^+$/t | 10 | <5 | <5 | <5 | 10 |
| s-TAA pH 6.5 | %w/w S | 0.02 | <0.01 | <0.01 | <0.01 | 0.02 |
| pH $_{Ox}$ | pH units | 3.9 | 4.5 | 4.5 | 4.4 | 3.2 |
| TPA pH 6.5 | moles $H^+$/t | 30 | <5 | <5 | 10 | 250 |
| s-TPA pH 6.5 | %w/w S | 0.05 | <0.01 | <0.01 | 0.02 | 0.40 |
| TSA pH 6.5 | moles $H^+$/t | 20 | <5 | <5 | 7 | 240 |
| s-TSA pH 6.5 | %w/w S | 0.03 | <0.01 | <0.01 | 0.01 | 0.38 |
| $ANC_E$ | % $CaCO_3$ | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| a-$ANC_E$ | moles $H^+$/t | <5 | <5 | <5 | <5 | <5 |
| s-$ANC_E$ | %w/w S | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| $S_{KCl}$ | %w/w S | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| $S_P$ | %w/w | <0.005 | <0.005 | <0.005 | <0.005 | 0.08 |
| $S_{POS}$ | %w/w | <0.005 | <0.005 | <0.005 | <0.005 | 0.08 |
| a-$S_{POS}$ | moles $H^+$/t | <5 | <5 | <5 | <5 | 51 |
| $Ca_{KCl}$ | %w/w | <0.005 | <0.005 | <0.005 | <0.005 | 0.12 |
| $Ca_P$ | %w/w | <0.005 | <0.005 | <0.005 | <0.005 | 0.13 |
| $Ca_A$ | %w/w | <0.005 | <0.005 | <0.005 | <0.005 | 0.014 |
| $Mg_{KCl}$ | %w/w | <0.005 | <0.005 | <0.005 | <0.005 | 0.15 |
| $Mg_P$ | %w/w | <0.005 | <0.005 | <0.005 | <0.005 | 0.16 |
| $Mg_A$ | %w/w | <0.005 | <0.005 | <0.005 | <0.005 | 0.009 |
| Fineness Factor | - | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |
| a-Net Acidity | moles $H^+$/t | 10 | <10 | <10 | <10 | 61 |
| Liming rate | kg $CaCO_3$/t | 0.75 | <0.75 | <0.75 | <0.75 | 4.6 |
| a-Net Acidity without ANCE | moles $H^+$/t | NA | NA | NA | NA | NA |
| Liming rate without ANCE | kg $CaCO_3$/t | NA | NA | NA | NA | NA |

| sPOCAS<br>Our Reference:<br>Your Reference<br>Depth<br>Type of sample | UNITS<br>----------<br>---------- | 95948-6<br>3897/BH03<br>-1.3<br>Soil | 95948-7<br>3897/BH03<br>-3.1<br>Soil | 95948-8<br>3897/BH03<br>-13<br>Soil | 95948-9<br>3897/BH04<br>+5.5 to +3.0<br>Soil | 95948-10<br>3897/BH04<br>+3.3 to +2.5<br>Soil |
|---|---|---|---|---|---|---|
| Date prepared | - | 22/08/2013 | 22/08/2013 | 22/08/2013 | 22/08/2013 | 22/08/2013 |
| Date analysed | - | 22/08/2013 | 22/08/2013 | 22/08/2013 | 22/08/2013 | 22/08/2013 |
| pH $_{kcl}$ | pH units | 5.2 | 4.5 | 5.3 | 5.2 | 5.3 |
| TAA pH 6.5 | moles $H^+$/t | 10 | 17 | <5 | 5 | <5 |
| s-TAA pH 6.5 | %w/w S | 0.02 | 0.03 | <0.01 | <0.01 | <0.01 |
| pH $_{Ox}$ | pH units | 2.7 | 2.3 | 3.3 | 4.3 | 4.5 |
| TPA pH 6.5 | moles $H^+$/t | 460 | 360 | 27 | 17 | 17 |
| s-TPA pH 6.5 | %w/w S | 0.74 | 0.58 | 0.04 | 0.03 | 0.03 |
| TSA pH 6.5 | moles $H^+$/t | 450 | 340 | 25 | 12 | 15 |
| s-TSA pH 6.5 | %w/w S | 0.73 | 0.55 | 0.04 | 0.02 | 0.02 |
| ANC$_E$ | %$CaCO_3$ | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| a-ANC$_E$ | moles $H^+$/t | <5 | <5 | <5 | <5 | <5 |
| s-ANC$_E$ | %w/w S | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| S$_{KCl}$ | %w/w S | 0.005 | 0.06 | <0.005 | <0.005 | <0.005 |
| S$_P$ | %w/w | 0.14 | 0.56 | 0.03 | <0.005 | <0.005 |
| S$_{POS}$ | %w/w | 0.13 | 0.51 | 0.03 | <0.005 | <0.005 |
| a-S$_{POS}$ | moles $H^+$/t | 84 | 320 | 18 | <5 | <5 |
| Ca$_{KCl}$ | %w/w | 0.15 | 0.04 | <0.005 | <0.005 | <0.005 |
| Ca$_P$ | %w/w | 0.15 | 0.03 | <0.005 | <0.005 | <0.005 |
| Ca$_A$ | %w/w | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| Mg$_{KCl}$ | %w/w | 0.15 | 0.044 | <0.005 | <0.005 | <0.005 |
| Mg$_P$ | %w/w | 0.13 | 0.036 | <0.005 | <0.005 | <0.005 |
| Mg$_A$ | %w/w | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| Fineness Factor | - | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |
| a-Net Acidity | moles $H^+$/t | 94 | 330 | 21 | <10 | <10 |
| Liming rate | kg $CaCO_3$/t | 7.0 | 25 | 1.5 | <0.75 | <0.75 |
| a-Net Acidity without ANCE | moles $H^+$/t | NA | NA | NA | NA | NA |
| Liming rate without ANCE | kg $CaCO_3$/t | NA | NA | NA | NA | NA |

| sPOCAS<br>Our Reference:<br>Your Reference<br>Depth<br>Type of sample | UNITS<br>----------<br>---------- | 95948-11<br>3897/BH04<br>+0.8 to +0.5<br>Soil | 95948-12<br>3897/BH04<br>-0.5 to -1.5<br>Soil | 95948-13<br>3897/BH04<br>-2.5 to -3.0<br>Soil | 95948-14<br>3897/BH04<br>-6.0 to -7.5<br>Soil | 95948-15<br>3897/BH04<br>-11.0 to -13.5<br>Soil |
|---|---|---|---|---|---|---|
| Date prepared | - | 22/08/2013 | 22/08/2013 | 22/08/2013 | 22/08/2013 | 22/08/2013 |
| Date analysed | - | 22/08/2013 | 22/08/2013 | 22/08/2013 | 22/08/2013 | 22/08/2013 |
| pH $_{kcl}$ | pH units | 4.9 | 5.3 | 5.5 | 5.3 | 5.4 |
| TAA pH 6.5 | moles $H^+$/t | 10 | 5 | <5 | <5 | <5 |
| s-TAA pH 6.5 | %w/w S | 0.02 | <0.01 | <0.01 | <0.01 | <0.01 |
| pH $_{Ox}$ | pH units | 3.8 | 4.4 | 4.4 | 3.4 | 3.8 |
| TPA pH 6.5 | moles $H^+$/t | 37 | 12 | 17 | 27 | 20 |
| s-TPA pH 6.5 | %w/w S | 0.06 | 0.02 | 0.03 | 0.04 | 0.03 |
| TSA pH 6.5 | moles $H^+$/t | 27 | 7 | 16 | 26 | 19 |
| s-TSA pH 6.5 | %w/w S | 0.04 | 0.01 | 0.03 | 0.04 | 0.03 |
| ANC$_E$ | %$CaCO_3$ | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| a-ANC$_E$ | moles $H^+$/t | <5 | <5 | <5 | <5 | <5 |
| s-ANC$_E$ | %w/w S | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| S$_{KCl}$ | %w/w S | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| S$_P$ | %w/w | <0.005 | <0.005 | <0.005 | 0.03 | 0.02 |
| S$_{POS}$ | %w/w | <0.005 | <0.005 | <0.005 | 0.02 | 0.02 |
| a-S$_{POS}$ | moles $H^+$/t | <5 | <5 | <5 | 14 | 11 |
| Ca$_{KCl}$ | %w/w | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| Ca$_P$ | %w/w | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| Ca$_A$ | %w/w | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| Mg$_{KCl}$ | %w/w | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| Mg$_P$ | %w/w | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| Mg$_A$ | %w/w | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| Fineness Factor | - | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |
| a-Net Acidity | moles $H^+$/t | 10 | <10 | <10 | 16 | 12 |
| Liming rate | kg $CaCO_3$/t | 0.75 | <0.75 | <0.75 | 1.2 | 0.93 |
| a-Net Acidity without ANCE | moles $H^+$/t | NA | NA | NA | NA | NA |
| Liming rate without ANCE | kg $CaCO_3$/t | NA | NA | NA | NA | NA |

| sPOCAS<br>Our Reference:<br>Your Reference<br>Depth<br>Type of sample | UNITS<br>----------<br>---------- | 95948-16<br>3897/BH04<br>-13.5 to -12.1<br>Soil | 95948-17<br>3897/BH05<br>+8.5 to +8.0<br>Soil | 95948-18<br>3897/BH05<br>+2.0 to +1.0<br>Soil | 95948-19<br>3897/BH05<br>+0.0 to -0.5<br>Soil | 95948-20<br>3897/BH05<br>+0.0 to -1.0<br>Soil |
|---|---|---|---|---|---|---|
| Date prepared | - | 22/08/2013 | 22/08/2013 | 22/08/2013 | 22/08/2013 | 22/08/2013 |
| Date analysed | - | 22/08/2013 | 22/08/2013 | 22/08/2013 | 22/08/2013 | 22/08/2013 |
| pH $_{kcl}$ | pH units | 5.4 | 5.5 | 5.5 | 4.4 | 5.3 |
| TAA pH 6.5 | moles $H^+$/t | <5 | <5 | <5 | 7 | 5 |
| s-TAA pH 6.5 | %w/w S | <0.01 | <0.01 | <0.01 | 0.01 | <0.01 |
| pH $_{Ox}$ | pH units | 3.7 | 4.6 | 4.5 | 3.4 | 4.5 |
| TPA pH 6.5 | moles $H^+$/t | 20 | 7 | 12 | 47 | 7 |
| s-TPA pH 6.5 | %w/w S | 0.03 | 0.01 | 0.02 | 0.08 | 0.01 |
| TSA pH 6.5 | moles $H^+$/t | 17 | 5 | 10 | 40 | <5 |
| s-TSA pH 6.5 | %w/w S | 0.03 | <0.01 | 0.02 | 0.06 | <0.01 |
| ANC$_E$ | %$CaCO_3$ | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| a-ANC$_E$ | moles $H^+$/t | <5 | <5 | <5 | <5 | <5 |
| s-ANC$_E$ | %w/w S | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| S$_{KCl}$ | %w/w S | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| S$_P$ | %w/w | 0.02 | <0.005 | <0.005 | <0.005 | <0.005 |
| S$_{POS}$ | %w/w | 0.02 | <0.005 | <0.005 | <0.005 | <0.005 |
| a-S$_{POS}$ | moles $H^+$/t | 10 | <5 | <5 | <5 | <5 |
| Ca$_{KCl}$ | %w/w | <0.005 | <0.005 | <0.005 | 0.005 | <0.005 |
| Ca$_P$ | %w/w | <0.005 | <0.005 | <0.005 | 0.005 | <0.005 |
| Ca$_A$ | %w/w | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| Mg$_{KCl}$ | %w/w | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| Mg$_P$ | %w/w | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| Mg$_A$ | %w/w | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| S$_{HCl}$ | %w/w S | [NT] | [NT] | [NT] | <0.005 | [NT] |
| S$_{NAS}$ | %w/w S | [NT] | [NT] | [NT] | <0.005 | [NT] |
| a-S$_{NAS}$ | moles $H^+$/t | [NT] | [NT] | [NT] | <5 | [NT] |
| s-S$_{NAS}$ | %w/w S | [NT] | [NT] | [NT] | <0.01 | [NT] |
| Fineness Factor | - | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |
| a-Net Acidity | moles $H^+$/t | 12 | <10 | <10 | <10 | <10 |
| Liming rate | kg $CaCO_3$/t | 0.92 | <0.75 | <0.75 | <0.75 | <0.75 |
| a-Net Acidity without ANCE | moles $H^+$/t | NA | NA | NA | NA | NA |
| Liming rate without ANCE | kg $CaCO_3$/t | NA | NA | NA | NA | NA |

| sPOCAS<br>Our Reference:<br>Your Reference<br>Depth<br>Type of sample | UNITS<br>----------<br>---------- | 95948-21<br>3897/BH05<br>-1.1 to -1.5<br>Soil | 95948-22<br>3897/BH05<br>-1.5 to -2.0<br>Soil | 95948-23<br>3897/BH05<br>-2.5 to -3.0<br>Soil | 95948-24<br>3897/BH05<br>-5.0<br>Soil | 95948-25<br>3897/BH05<br>-5.5<br>Soil |
|---|---|---|---|---|---|---|
| Date prepared | - | 22/08/2013 | 22/08/2013 | 22/08/2013 | 22/08/2013 | 22/08/2013 |
| Date analysed | - | 22/08/2013 | 22/08/2013 | 22/08/2013 | 22/08/2013 | 22/08/2013 |
| pH $_{kcl}$ | pH units | 5.7 | 5.6 | 5.6 | 5.9 | 7.9 |
| TAA pH 6.5 | moles $H^+$/t | <5 | <5 | <5 | 5 | <5 |
| s-TAA pH 6.5 | %w/w S | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| pH $_{Ox}$ | pH units | 4.5 | 4.6 | 4.4 | 2.2 | 4.1 |
| TPA pH 6.5 | moles $H^+$/t | 5 | <5 | <5 | 1,500 | 120 |
| s-TPA pH 6.5 | %w/w S | <0.01 | <0.01 | <0.01 | 2.4 | 0.19 |
| TSA pH 6.5 | moles $H^+$/t | <5 | <5 | <5 | 1,500 | 120 |
| s-TSA pH 6.5 | %w/w S | <0.01 | <0.01 | <0.01 | 2.4 | 0.19 |
| $ANC_E$ | %$CaCO_3$ | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| a-$ANC_E$ | moles $H^+$/t | <5 | <5 | <5 | <5 | <5 |
| s-$ANC_E$ | %w/w S | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| $S_{KCl}$ | %w/w S | <0.005 | <0.005 | <0.005 | 0.13 | 0.09 |
| $S_P$ | %w/w | <0.005 | <0.005 | <0.005 | 2.8 | 1.5 |
| $S_{POS}$ | %w/w | <0.005 | <0.005 | <0.005 | 2.6 | 1.4 |
| a-$S_{POS}$ | moles $H^+$/t | <5 | <5 | <5 | 1,600 | 870 |
| $Ca_{KCl}$ | %w/w | <0.005 | <0.005 | <0.005 | 0.32 | 0.39 |
| $Ca_P$ | %w/w | <0.005 | <0.005 | <0.005 | 0.39 | 1.5 |
| $Ca_A$ | %w/w | <0.005 | <0.005 | <0.005 | 0.075 | 1.2 |
| $Mg_{KCl}$ | %w/w | <0.005 | <0.005 | <0.005 | 0.23 | 0.14 |
| $Mg_P$ | %w/w | <0.005 | <0.005 | <0.005 | 0.28 | 0.16 |
| $Mg_A$ | %w/w | <0.005 | <0.005 | <0.005 | 0.048 | 0.014 |
| Fineness Factor | - | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |
| a-Net Acidity | moles $H^+$/t | <10 | <10 | <10 | 1,600 | 370 |
| Liming rate | kg $CaCO_3$/t | <0.75 | <0.75 | <0.75 | 120 | 28 |
| a-Net Acidity without ANCE | moles $H^+$/t | NA | NA | NA | NA | NA |
| Liming rate without ANCE | kg $CaCO_3$/t | NA | NA | NA | NA | NA |

| sPOCAS<br>Our Reference:<br>Your Reference<br>Depth<br>Type of sample | UNITS<br>----------<br>---------- | 95948-26<br>3897/BH05<br>-6.5<br>Soil | 95948-27<br>3897/BH05<br>-7.5<br>Soil |
|---|---|---|---|
| Date prepared | - | 22/08/2013 | 22/08/2013 |
| Date analysed | - | 22/08/2013 | 22/08/2013 |
| pH $_{kcl}$ | pH units | 7.0 | 8.1 |
| TAA pH 6.5 | moles $H^+$/t | <5 | <5 |
| s-TAA pH 6.5 | %w/w S | <0.01 | <0.01 |
| pH $_{Ox}$ | pH units | 2.2 | 2.9 |
| TPA pH 6.5 | moles $H^+$/t | 820 | 67 |
| s-TPA pH 6.5 | %w/w S | 1.3 | 0.11 |
| TSA pH 6.5 | moles $H^+$/t | 820 | 67 |
| s-TSA pH 6.5 | %w/w S | 1.3 | 0.11 |
| $ANC_E$ | % $CaCO_3$ | <0.05 | <0.05 |
| a-$ANC_E$ | moles $H^+$/t | <5 | <5 |
| s-$ANC_E$ | %w/w S | <0.05 | <0.05 |
| $S_{KCl}$ | %w/w S | 0.08 | 0.01 |
| $S_P$ | %w/w | 1.6 | 0.22 |
| $S_{POS}$ | %w/w | 1.5 | 0.21 |
| a-$S_{POS}$ | moles $H^+$/t | 960 | 130 |
| $Ca_{KCl}$ | %w/w | 0.37 | 0.07 |
| $Ca_P$ | %w/w | 0.54 | 0.10 |
| $Ca_A$ | %w/w | 0.17 | 0.030 |
| $Mg_{KCl}$ | %w/w | 0.19 | 0.016 |
| $Mg_P$ | %w/w | 0.23 | 0.022 |
| $Mg_A$ | %w/w | 0.039 | 0.006 |
| Fineness Factor | - | 1.5 | 1.5 |
| a-Net Acidity | moles $H^+$/t | 870 | 88 |
| Liming rate | kg $CaCO_3$/t | 65 | 6.6 |
| a-Net Acidity without ANCE | moles $H^+$/t | NA | NA |
| Liming rate without ANCE | kg $CaCO_3$/t | NA | NA |

| Method ID | Methodology Summary |
|---|---|
| Inorg-064 | sPOCAS determined using titrimetric and ICP-AES techniques. Based on Acid Sulfate Soils Laboratory Methods Guidelines, Version 2.1 - June 2004. |

| QUALITY CONTROL<br>sPOCAS | UNITS | PQL | METHOD | Blank | Duplicate Sm# | Duplicate results<br>Base ll Duplicate ll %RPD | Spike Sm# | Spike % Recovery |
|---|---|---|---|---|---|---|---|---|
| Date prepared | - | | | 22/08/2013 | 95948-1 | 22/08/2013 \|\| 22/08/2013 | LCS-1 | 22/08/2013 |
| Date analysed | - | | | 22/08/2013 | 95948-1 | 22/08/2013 \|\| 22/08/2013 | LCS-1 | 22/08/2013 |
| pH kcl | pH units | | Inorg-064 | [NT] | 95948-1 | 4.8 \|\| 4.8 \|\| RPD: 0 | LCS-1 | 95% |
| TAA pH 6.5 | moles $H^+$/t | 5 | Inorg-064 | <5 | 95948-1 | 10 \|\| 7 \|\| RPD: 35 | LCS-1 | 129% |
| s-TAA pH 6.5 | %w/w S | 0.01 | Inorg-064 | <0.01 | 95948-1 | 0.02 \|\| 0.01 \|\| RPD: 67 | [NR] | [NR] |
| pH Ox | pH units | | Inorg-064 | [NT] | 95948-1 | 3.9 \|\| 4.0 \|\| RPD: 3 | LCS-1 | 99% |
| TPA pH 6.5 | moles $H^+$/t | 5 | Inorg-064 | <5 | 95948-1 | 30 \|\| 12 \|\| RPD: 86 | LCS-1 | 103% |
| s-TPA pH 6.5 | %w/w S | 0.01 | Inorg-064 | <0.01 | 95948-1 | 0.05 \|\| 0.02 \|\| RPD: 86 | [NR] | [NR] |
| TSA pH 6.5 | moles $H^+$/t | 5 | Inorg-064 | <5 | 95948-1 | 20 \|\| 5 \|\| RPD: 120 | LCS-1 | 101% |
| s-TSA pH 6.5 | %w/w S | 0.01 | Inorg-064 | <0.01 | 95948-1 | 0.03 \|\| <0.01 | [NR] | [NR] |
| $ANC_E$ | % $CaCO_3$ | 0.05 | Inorg-064 | <0.05 | 95948-1 | <0.05 \|\| <0.05 | [NR] | [NR] |
| a-$ANC_E$ | moles $H^+$/t | 5 | Inorg-064 | <5 | 95948-1 | <5 \|\| <5 | [NR] | [NR] |
| s-$ANC_E$ | %w/w S | 0.05 | Inorg-064 | <0.05 | 95948-1 | <0.05 \|\| <0.05 | [NR] | [NR] |
| $S_{KCl}$ | %w/w S | 0.005 | Inorg-064 | <0.005 | 95948-1 | <0.005 \|\| <0.005 | LCS-1 | 83% |
| $S_P$ | %w/w | 0.005 | Inorg-064 | <0.005 | 95948-1 | <0.005 \|\| <0.005 | LCS-1 | 79% |
| $S_{POS}$ | %w/w | 0.005 | Inorg-064 | <0.005 | 95948-1 | <0.005 \|\| <0.005 | LCS-1 | 79% |
| a-$S_{POS}$ | moles $H^+$/t | 5 | Inorg-064 | <5 | 95948-1 | <5 \|\| <5 | LCS-1 | 79% |
| $Ca_{KCl}$ | %w/w | 0.005 | Inorg-064 | <0.005 | 95948-1 | <0.005 \|\| <0.005 | LCS-1 | 89% |
| $Ca_P$ | %w/w | 0.005 | Inorg-064 | <0.005 | 95948-1 | <0.005 \|\| <0.005 | [NR] | [NR] |
| $Ca_A$ | %w/w | 0.005 | Inorg-064 | <0.005 | 95948-1 | <0.005 \|\| <0.005 | [NR] | [NR] |
| $Mg_{KCl}$ | %w/w | 0.005 | Inorg-064 | <0.005 | 95948-1 | <0.005 \|\| <0.005 | LCS-1 | 87% |
| $Mg_P$ | %w/w | 0.005 | Inorg-064 | <0.005 | 95948-1 | <0.005 \|\| <0.005 | [NR] | [NR] |
| $Mg_A$ | %w/w | 0.005 | Inorg-064 | <0.005 | 95948-1 | <0.005 \|\| <0.005 | [NR] | [NR] |
| $S_{HCl}$ | %w/w S | 0.005 | Inorg-064 | <0.005 | [NT] | [NT] | [NR] | [NR] |
| $S_{NAS}$ | %w/w S | 0.005 | Inorg-064 | <0.005 | [NT] | [NT] | [NR] | [NR] |
| a-$S_{NAS}$ | moles $H^+$/t | 5 | Inorg-064 | <5 | [NT] | [NT] | [NR] | [NR] |
| s-$S_{NAS}$ | %w/w S | 0.01 | Inorg-064 | <0.01 | [NT] | [NT] | [NR] | [NR] |
| Fineness Factor | - | 1.5 | Inorg-064 | <1.5 | 95948-1 | 1.5 \|\| 1.5 \|\| RPD: 0 | [NR] | [NR] |
| a-Net Acidity | moles $H^+$/t | 10 | Inorg-064 | <10 | 95948-1 | 10 \|\| <10 | LCS-1 | 81% |
| Liming rate | kg $CaCO_3$/t | 0.75 | Inorg-064 | <0.75 | 95948-1 | 0.75 \|\| <0.75 | LCS-1 | 80% |

| QUALITY CONTROL<br>sPOCAS | UNITS | PQL | METHOD | Blank | Duplicate Sm# | Duplicate results<br>Base II Duplicate II %RPD | Spike Sm# | Spike % Recovery |
|---|---|---|---|---|---|---|---|---|
| a-Net Acidity without ANCE | moles $H^+$/t | 10 | Inorg-064 | <10 | 95948-1 | NA \|\| NA | [NR] | [NR] |
| Liming rate without ANCE | kg $CaCO_3$/t | 0.75 | Inorg-064 | <0.75 | 95948-1 | NA \|\| NA | [NR] | [NR] |

| QUALITY CONTROL<br>sPOCAS | UNITS | Dup. Sm# | Duplicate<br>Base + Duplicate + %RPD | Spike Sm# | Spike % Recovery |
|---|---|---|---|---|---|
| Date prepared | - | 95948-11 | 22/08/2013 \|\| 22/08/2013 | LCS-2 | 22/8/2013 |
| Date analysed | - | 95948-11 | 22/08/2013 \|\| 22/08/2013 | LCS-2 | 22/8/2013 |
| pH $_{kcl}$ | pH units | 95948-11 | 4.9 \|\| 4.9 \|\| RPD: 0 | LCS-2 | 94% |
| TAA pH 6.5 | moles $H^+$/t | 95948-11 | 10 \|\| 7 \|\| RPD: 35 | LCS-2 | 113% |
| s-TAA pH 6.5 | %w/w S | 95948-11 | 0.02 \|\| 0.01 \|\| RPD: 67 | [NR] | [NR] |
| pH $_{Ox}$ | pH units | 95948-11 | 3.8 \|\| 3.8 \|\| RPD: 0 | LCS-2 | 93% |
| TPA pH 6.5 | moles $H^+$/t | 95948-11 | 37 \|\| 37 \|\| RPD: 0 | LCS-2 | 102% |
| s-TPA pH 6.5 | %w/w S | 95948-11 | 0.06 \|\| 0.06 \|\| RPD: 0 | [NR] | [NR] |
| TSA pH 6.5 | moles $H^+$/t | 95948-11 | 27 \|\| 30 \|\| RPD: 11 | LCS-2 | 101% |
| s-TSA pH 6.5 | %w/w S | 95948-11 | 0.04 \|\| 0.05 \|\| RPD: 22 | [NR] | [NR] |
| $ANC_E$ | % $CaCO_3$ | 95948-11 | <0.05 \|\| <0.05 | [NR] | [NR] |
| a-$ANC_E$ | moles $H^+$/t | 95948-11 | <5 \|\| <5 | [NR] | [NR] |
| s-$ANC_E$ | %w/w S | 95948-11 | <0.05 \|\| <0.05 | [NR] | [NR] |
| $S_{KCl}$ | %w/w S | 95948-11 | <0.005 \|\| <0.005 | LCS-2 | 87% |
| $S_P$ | %w/w | 95948-11 | <0.005 \|\| <0.005 | LCS-2 | 86% |
| $S_{POS}$ | %w/w | 95948-11 | <0.005 \|\| <0.005 | LCS-2 | 86% |
| a-$S_{POS}$ | moles $H^+$/t | 95948-11 | <5 \|\| <5 | LCS-2 | 86% |
| $Ca_{KCl}$ | %w/w | 95948-11 | <0.005 \|\| <0.005 | LCS-2 | 91% |
| $Ca_P$ | %w/w | 95948-11 | <0.005 \|\| <0.005 | [NR] | [NR] |
| $Ca_A$ | %w/w | 95948-11 | <0.005 \|\| <0.005 | [NR] | [NR] |
| $Mg_{KCl}$ | %w/w | 95948-11 | <0.005 \|\| <0.005 | LCS-2 | 88% |
| $Mg_P$ | %w/w | 95948-11 | <0.005 \|\| <0.005 | [NR] | [NR] |
| $Mg_A$ | %w/w | 95948-11 | <0.005 \|\| <0.005 | [NR] | [NR] |
| Fineness Factor | - | 95948-11 | 1.5 \|\| 1.5 \|\| RPD: 0 | [NR] | [NR] |
| a-Net Acidity | moles $H^+$/t | 95948-11 | 10 \|\| <10 | LCS-2 | 87% |
| Liming rate | kg $CaCO_3$/t | 95948-11 | 0.75 \|\| <0.75 | LCS-2 | 86% |
| a-Net Acidity without ANCE | moles $H^+$/t | 95948-11 | NA \|\| NA | [NR] | [NR] |
| Liming rate without ANCE | kg $CaCO_3$/t | 95948-11 | NA \|\| NA | [NR] | [NR] |

| QUALITY CONTROL sPOCAS | UNITS | Dup. Sm# | Duplicate Base + Duplicate + %RPD |
|---|---|---|---|
| Date prepared | - | 95948-21 | 22/08/2013 \|\| 22/08/2013 |
| Date analysed | - | 95948-21 | 22/08/2013 \|\| 22/08/2013 |
| pH $_{kcl}$ | pH units | 95948-21 | 5.7 \|\| 5.6 \|\| RPD: 2 |
| TAA pH 6.5 | moles $H^+$/t | 95948-21 | <5 \|\| <5 |
| s-TAA pH 6.5 | %w/w S | 95948-21 | <0.01 \|\| <0.01 |
| pH $_{Ox}$ | pH units | 95948-21 | 4.5 \|\| 4.5 \|\| RPD: 0 |
| TPA pH 6.5 | moles $H^+$/t | 95948-21 | 5 \|\| <5 |
| s-TPA pH 6.5 | %w/w S | 95948-21 | <0.01 \|\| <0.01 |
| TSA pH 6.5 | moles $H^+$/t | 95948-21 | <5 \|\| <5 |
| s-TSA pH 6.5 | %w/w S | 95948-21 | <0.01 \|\| <0.01 |
| ANC$_E$ | % $CaCO_3$ | 95948-21 | <0.05 \|\| <0.05 |
| a-ANC$_E$ | moles $H^+$/t | 95948-21 | <5 \|\| <5 |
| s-ANC$_E$ | %w/w S | 95948-21 | <0.05 \|\| <0.05 |
| S$_{KCl}$ | %w/w S | 95948-21 | <0.005 \|\| <0.005 |
| S$_P$ | %w/w | 95948-21 | <0.005 \|\| <0.005 |
| S$_{POS}$ | %w/w | 95948-21 | <0.005 \|\| <0.005 |
| a-S$_{POS}$ | moles $H^+$/t | 95948-21 | <5 \|\| <5 |
| Ca$_{KCl}$ | %w/w | 95948-21 | <0.005 \|\| <0.005 |
| Ca$_P$ | %w/w | 95948-21 | <0.005 \|\| <0.005 |
| Ca$_A$ | %w/w | 95948-21 | <0.005 \|\| <0.005 |
| Mg$_{KCl}$ | %w/w | 95948-21 | <0.005 \|\| <0.005 |
| Mg$_P$ | %w/w | 95948-21 | <0.005 \|\| <0.005 |
| Mg$_A$ | %w/w | 95948-21 | <0.005 \|\| <0.005 |
| S$_{HCl}$ | %w/w S | [NT] | [NT] |
| S$_{NAS}$ | %w/w S | [NT] | [NT] |
| a-S$_{NAS}$ | moles $H^+$/t | [NT] | [NT] |
| s-S$_{NAS}$ | %w/w S | [NT] | [NT] |
| Fineness Factor | - | 95948-21 | 1.5 \|\| 1.5 \|\| RPD: 0 |
| a-Net Acidity | moles $H^+$/t | 95948-21 | <10 \|\| <10 |
| Liming rate | kg $CaCO_3$/t | 95948-21 | <0.75 \|\| <0.75 |
| a-Net Acidity without ANCE | moles $H^+$/t | 95948-21 | NA \|\| NA |
| Liming rate without ANCE | kg $CaCO_3$/t | 95948-21 | NA \|\| NA |

**Report Comments:**

| | |
|---|---|
| Asbestos ID was analysed by Approved Identifier: | Not applicable for this job |
| Asbestos ID was authorised by Approved Signatory: | Not applicable for this job |

| | | |
|---|---|---|
| INS: Insufficient sample for this test | PQL: Practical Quantitation Limit | NT: Not tested |
| NA: Test not required | RPD: Relative Percent Difference | NA: Test not required |
| <: Less than | >: Greater than | LCS: Laboratory Control Sample |

**Quality Control Definitions**

**Blank**: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.

**Duplicate**: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.

**Matrix Spike** : A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

**LCS (Laboratory Control Sample)** : This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

**Surrogate Spike:** Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

**Laboratory Acceptance Criteria**

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.
Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.
Spikes for Physical and Aggregate Tests are not applicable.
For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics and 10-140% for SVOC and speciated phenols is acceptable.

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ABN 82 125 442 382

# ANALYSIS REPORT SOIL

| | | | |
|---|---|---|---|
| **Project No:** | **EW140521** | **Date of Issue:** | **14/08/2014** |
| Customer: | Envirolab Services | Report No: | 1 |
| Address: | 12 Ashley St<br>Chatswood NSW 2067 | Date Received: | 5/08/2014 |
| | | Matrix: | Soil |
| Attention: | Aileen Hie | Location: | 114013 |
| Phone: | 02 9910 6200 | Sampler ID: | Client Supplied |
| Fax: | 02 9910 6201 | Date of Sampling: | 22/07/2014 |
| Email: | ahie@envirolabservices.com.au | Sample Condition: | Acceptable |

Comments: Dispersion Index ranges from 0 – 16, with 0 being not dispersive and 16 being completely dispersive.

Results apply to the samples as submitted. All pages of this report have been checked and approved for release.

Signed: Stephanie Cameron
Operations Manager

**PROFICIENT LAB**
**Visit www.aspac-australasia.com to view our certification details.**

East West is certified by the Australian-Asian Soil & Plant Analysis Council to perform various soil and plant tissue analysis. The tests reported herein have been performed in accordance with our terms of accreditation.
This report must not be reproduced except in full and EWEA takes no responsibility of the end use of the results within this report.
This analysis relates to the sample submitted and it is the client's responsibility to make certain the sample is representative of the matrix to be tested.
Samples will be discarded one month after the date of this report. Please advise if you wish to have your sample/s returned.

*Results you can rely on.*

# ANALYSIS REPORT

## Project No: Location: 114013

| Test Parameter | Method Reference | Units | Sample ID | 114013-3 | 114013-5 | 114013-6 | 114013-8 |
|---|---|---|---|---|---|---|---|
| | | | Depth cm | - | - | - | - |
| | | | LOR | 140521-1 | 140521-2 | 140521-3 | 140521-4 |
| Dispersion Index | *Loveday & Pyle* | *%* | *na* | 0 | 1 | 0 | 4 |

# ANALYSIS REPORT

## Project No: 140521 Location: 114013

| Test Parameter | Method Reference | Units | Depth cm LOR | Sample ID - 140521-5 | Sample ID - 140521-6 |
|---|---|---|---|---|---|
| | | | | 114013-19 | 114013-21 |
| Dispersion Index | *Loveday & Pyle* | *%* | *na* | 1 | 0 |

This Analysis Report shall not be reproduced except in full without the written approval of the laboratory.

NB: LOR is the Lowest Obtainable Reading.

DOCUMENT END

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**ABN 77 621 943 600**
**NATA Accreditation 20375**
Unit 4, 30 Glenwood Drive Thornton NSW 2322|
**P:** (02) 4028 6412 | **E:** lab@vgt.com.au | **www.vgt.com.au**

# Report Number: 19655

Date Issued: 12/03/2026 Revision Number: 01

## Site/Job: Bobs Farm PASS - BH201

Client: Civitas Lifestyle Pty ltd
Address PO Box 1011
Newcastle NSW2300
Contact Darren Williams

The following sample(s) were sampled and tested on dates listed in this report:

| Client Sample Reference | Date Sampled | Lab ID | Matrix | General Comments |
|---|---|---|---|---|
| BH201 (0 - 1 m) | 23/02/2026 | 19655/1 | Sand | Grey, fmg, ery well sorted, rounded, high sphericity, few coal fragments |
| BH201 (1 - 2 m) | 23/02/2026 | 19655/2 | Sand | Blue grey, mg, well sorted, rounded, high sphericity, few coal fragments |
| BH201 (1 -1.45 m) | 23/02/2026 | 19655/3 | Sand | Blue grey, mg, well sorted, rounded, high sphericity, few coal fragments |
| BH201 (2 - 3 m) | 23/02/2026 | 19655/4 | Sand | Grey, mg, well sorted, rounded, high sphericity, moisture present and clay |
| BH201 (2.5 - 2.95 m) | 23/02/2026 | 19655/5 | Sand | Grey, mg, well sorted, rounded, high sphericity, moisture present and clay |
| BH201 (3 - 4 m) | 23/02/2026 | 19655/6 | Sand | Dark brown, fg, very well sorted, rounded, high sphericity, moisture and clays present binding particles together |
| BH201 (4 - 5 m) | 23/02/2026 | 19655/7 | Sand | Brown, fg, very well sorted, rounded, high sphericity, moisture, dirt and clays present binding particles together |
| BH201 (4 - 4.45 m) | 23/02/2026 | 19655/8 | Sand | Brown, fg, very well sorted, rounded, high sphericity, moisture, dirt and clays present binding particles together |
| BH201 (5 - 6 m) | 23/02/2026 | 19655/9 | Sand | Brown, fg, very well sorted, rounded, high sphericity, moisture and clays present binding particles together |
| BH201 (5.5 - 5.95 m) | 23/02/2026 | 19655/10 | Sand | Brown, fg, very well sorted, rounded, high sphericity, moisture and clays present binding particles together |
| BH201 (6 - 7 m) | 23/02/2026 | 19655/11 | Sand | Dark cream, fg, very well sorted, rounded, high sphericity, clean, moisture present |
| BH201 (7 - 8 m) | 23/02/2026 | 19655/12 | Sand | Cream, fg, Very well sorted, rounded, very high sphericity, clean, water table at approx. 7.54 |
| BH201 (7 -7.45 m) | 23/02/2026 | 19655/13 | Sand | Cream, fg, Very well sorted, rounded, very high sphericity, clean |
| BH201 (8 - 9 m) | 24/02/2026 | 19655/14 | Sand | Dark cream, fg, well sorted, rounded, high sphericity, clean, very moist/ damp |
| BH201 (8.5 - 8.95 m) | 23/02/2026 | 19655/15 | Sand | Dark cream, fg, well sorted, rounded, high sphericity, clean, very moist/ damp |
| BH201 (10 - 10.45 m) | 24/02/2026 | 19655/16 | Sand | Cream, mg, well sorted, rounded, high sphericity, wet, mud drilling |
| BH201 (11.5 - 11.95 m) | 24/02/2026 | 19655/17 | Sand | Grey, fg, very well sorted, well rounded, mod - high sphericity, wet, odour, mud drilling |
| BH201 (13 - 13.45 m) | 24/02/2026 | 19655/18 | Sand | Light grey vffg, very well sorted, well rounded, very high sphericity, wet, very high clay content, mud drilling |

The sample(s) have been tested as received and results relate specifically to the samples tested.

The following reports are included:

- Test Report
- Sampling Report
- Chain of Custody (if available)

Authorised by:

Anthony Crane
Laboratory Manager

Liane Peyra
Technical Officer

Results have been approved and report finalised on 12/03/2026.

## Test Report Number: 19655

Date Issued: 12/03/2026 Revision No: 01

# Results

| Potential Acid Sulphate Soil Screen (PASS) | Method | Lab ID<br>Sample Date<br>Sample ID | 19655/1<br>23/02/2026<br>BH201 (0 - 1 m) | 19655/2<br>23/02/2026<br>BH201 (1 - 2 m) | 19655/3<br>23/02/2026<br>BH201 (1 -1.45 m) | 19655/4<br>23/02/2026<br>BH201 (2 - 3 m) | 19655/5<br>23/02/2026<br>BH201 (2.5 - 2.95 m) |
|---|---|---|---|---|---|---|---|
| Date Tested | (NASSG) 2018 | -- | 23/2/2026 | 23/2/2026 | 23/2/2026 | 23/2/2026 | 23/2/2026 |
| $pH_F$ Temp | (NASSG) 2018 | °C | 23.9 | 24.4 | 24.6 | 24.6 | 24.5 |
| $pH_F$ | (NASSG) 2018 | pH units | 4.6 | 5.8 | 6.1 | 5.5 | 4.8 |
| $pH_{FOX}$ Temp | (NASSG) 2018 | °C | 25.1 | 25.6 | 25.6 | 25.3 | 24.8 |
| $pH_{FOX}$ | (NASSG) 2018 | pH units | **2.7** | **4.2** | **3.4** | **3.2** | **3.0** |
| pH Difference | (NASSG) 2018 | pH units | 1.9 | 1.6 | 2.7 | 2.2 | 1.9 |
| Reaction Rating $pH_{FOX}$ | (NASSG) 2018 | | No reaction | M - Medium reaction | M - Medium reaction | L - Low reaction | L - Low reaction |
| Fizz Test for Carbonates | (NASSG) 2018 | | N - non calcareous | N - non calcareous | N - non calcareous | N - non calcareous | N - non calcareous |
| Potential ASS? | (NASSG) 2018 | | Yes | Inconclusive | Inconclusive | Inconclusive | Yes |

| Potential Acid Sulphate Soil Screen (PASS) | Method | Lab ID<br>Sample Date<br>Sample ID | 19655/6<br>23/02/2026<br>BH201 (3 - 4 m) | 19655/7<br>23/02/2026<br>BH201 (4 - 5 m) | 19655/8<br>23/02/2026<br>BH201 (4 - 4.45 m) | 19655/9<br>23/02/2026<br>BH201 (5 - 6 m) | 19655/10<br>23/02/2026<br>BH201 (5.5 - 5.95 m) |
|---|---|---|---|---|---|---|---|
| Date Tested | (NASSG) 2018 | -- | 23/2/2026 | 23/2/2026 | 23/2/2026 | 23/2/2026 | 23/2/2026 |
| $pH_F$ Temp | (NASSG) 2018 | °C | 24.5 | 24.5 | 24.6 | 24.4 | 24.8 |
| $pH_F$ | (NASSG) 2018 | pH units | 5.0 | 5.6 | 5.2 | 6.0 | 6.0 |
| $pH_{FOX}$ Temp | (NASSG) 2018 | °C | 24.9 | 25.5 | 25.6 | 25.5 | 25.7 |
| $pH_{FOX}$ | (NASSG) 2018 | pH units | **4.2** | **3.8** | **3.3** | **3.9** | **3.9** |
| pH Difference | (NASSG) 2018 | pH units | 0.8 | 1.8 | 1.9 | 2.1 | 2.1 |
| Reaction Rating $pH_{FOX}$ | (NASSG) 2018 | | No reaction | No reaction | No reaction | No reaction | L - Low reaction |
| Fizz Test for Carbonates | (NASSG) 2018 | | N - non calcareous | N - non calcareous | N - non calcareous | N - non calcareous | N - non calcareous |
| Potential ASS? | (NASSG) 2018 | | Inconclusive | Inconclusive | Inconclusive | Inconclusive | Inconclusive |

| Potential Acid Sulphate Soil Screen (PASS) | Method | Lab ID<br>Sample Date<br>Sample ID | 19655/11<br>23/02/2026<br>BH201 (6 - 7 m) | 19655/12<br>23/02/2026<br>BH201 (7 - 8 m) | 19655/13<br>23/02/2026<br>BH201 (7 -7.45 m) | 19655/14<br>24/02/2026<br>BH201 (8 - 9 m) | 19655/15<br>23/02/2026<br>BH201 (8.5 - 8.95 m) |
|---|---|---|---|---|---|---|---|
| Date Tested | (NASSG) 2018 | -- | 23/2/2026 | 23/2/2026 | 23/2/2026 | 25/2/2026 | 23/2/2026 |
| $pH_F$ Temp | (NASSG) 2018 | °C | 24.4 | 24.4 | 24.2 | 21.7 | 21.8 |
| $pH_F$ | (NASSG) 2018 | pH units | 6.1 | 6.4 | 6.5 | 6.1 | 6.5 |
| $pH_{FOX}$ Temp | (NASSG) 2018 | °C | 24.7 | 24.5 | 24.4 | 23.3 | 24.2 |
| $pH_{FOX}$ | (NASSG) 2018 | pH units | **4.3** | **4.9** | **4.5** | 5.1 | **4.8** |

| Potential Acid Sulphate Soil Screen (PASS) | Method | Lab ID<br>Sample Date<br>Sample ID<br>Units | 19655/11<br>23/02/2026<br>BH201 (6 - 7 m) | 19655/12<br>23/02/2026<br>BH201 (7 - 8 m) | 19655/13<br>23/02/2026<br>BH201 (7 -7.45 m) | 19655/14<br>24/02/2026<br>BH201 (8 - 9 m) | 19655/15<br>23/02/2026<br>BH201 (8.5 - 8.95 m) |
|---|---|---|---|---|---|---|---|
| pH Difference | (NASSG) 2018 | pH units | 1.8 | 1.5 | 2.0 | 1.0 | 1.8 |
| Reaction Rating $pH_{FOX}$ | (NASSG) 2018 | | No reaction | L - Low reaction | No reaction | No reaction | L - Low reaction |
| Fizz Test for Carbonates | (NASSG) 2018 | | N - non calcareous | N - non calcareous | N - non calcareous | N - non calcareous | N - non calcareous |
| Potential ASS? | (NASSG) 2018 | | Inconclusive | Inconclusive | Inconclusive | No | Inconclusive |

| Potential Acid Sulphate Soil Screen (PASS) | Method | Lab ID<br>Sample Date<br>Sample ID<br>Units | 19655/16<br>24/02/2026<br>BH201 (10 - 10.45 m) | 19655/17<br>24/02/2026<br>BH201 (11.5 - 11.95 m) | 19655/18<br>24/02/2026<br>BH201 (13 - 13.45 m) |
|---|---|---|---|---|---|
| Date Tested | (NASSG) 2018 | -- | 25/2/2026 | 25/2/2026 | 25/2/2026 |
| $pH_F$ Temp | (NASSG) 2018 | °C | 22.4 | 22.7 | 22.8 |
| $pH_F$ | (NASSG) 2018 | pH units | 6.4 | 6.3 | 6.4 |
| $pH_{FOX}$ Temp | (NASSG) 2018 | °C | 23.8 | 38.9 | 38.2 |
| $pH_{FOX}$ | (NASSG) 2018 | pH units | 6.2 | **1.7** | **1.8** |
| pH Difference | (NASSG) 2018 | pH units | 0.2 | 4.6 | 4.6 |
| Reaction Rating $pH_{FOX}$ | (NASSG) 2018 | | No reaction | X - Extreme reaction | M - Medium reaction |
| Fizz Test for Carbonates | (NASSG) 2018 | | N - non calcareous | N - non calcareous | N - non calcareous |
| Potential ASS? | (NASSG) 2018 | | No | Yes | Yes |

| Chromium Reducible Sulfur | Method | Lab ID<br>Sample Date<br>Sample ID<br>Units | 19655/1<br>23/02/2026<br>BH201 (0 - 1 m) | 19655/3<br>23/02/2026<br>BH201 (1 -1.45 m) | 19655/5<br>23/02/2026<br>BH201 (2.5 - 2.95 m) | 19655/6<br>23/02/2026<br>BH201 (3 - 4 m) | 19655/8<br>23/02/2026<br>BH201 (4 - 4.45 m) |
|---|---|---|---|---|---|---|---|
| Chromium Reducible Sulfur | EXT | moles H+/t | 5 | 5 | 5 | 5 | <3 |
| Net Acidity including ANC | EXT | moles H+/t | 11 | 6 | 13 | 11 | 13 |
| Liming rate including ANC | EXT | kg CaCO3/t | 0.80 | <0.75 | 1.00 | 0.80 | 1.00 |

| Chromium Reducible Sulfur | Method | Lab ID<br>Sample Date<br>Sample ID<br>Units | 19655/9<br>23/02/2026<br>BH201 (5 - 6 m) | 19655/13<br>23/02/2026<br>BH201 (7 -7.45 m) | 19655/17<br>24/02/2026<br>BH201 (11.5 - 11.95 m) |
|---|---|---|---|---|---|
| Chromium Reducible Sulfur | EXT | moles H+/t | 8 | 5 | **170** |
| Net Acidity including ANC | EXT | moles H+/t | 15 | 9 | 190 |
| Liming rate including ANC | EXT | kg CaCO3/t | 1.00 | <0.75 | 14.00 |

## Report Comments:

Guideline applied - **National Acid Sulfate Soils Guidance - Sampling and identification methods manual June 2018**.

When considering the pass or fail of tests the measurement of uncertainty of each parameter must be considered.

https://www.vgt.com.au/measurement-uncertainty

Location Analysed : External Laboratory

EXT : tests by Envirolab NATA Acc 2901 Report No. 403246

[NT]: Not tested

# Sampling Report Number: 19655

Date Issued: 12/03/2026 Revision No: 01

Sampling Conditions: 23/02 & 24/02 Fine Sunny 32°C

| Lab ID | Client Sample Reference | Sampler | Date Sampled | Method of Sampling | Pre-treatment / Preservation |
|---|---|---|---|---|---|
| 19655/1 | BH201 (0 - 1 m) | M.Mavin | 23/02/2026 1:56 PM | NASSG June 2018 | Frozen in situ |
| 19655/2 | BH201 (1 - 2 m) | M.Mavin | 23/02/2026 2:14 PM | NASSG June 2018 | Frozen in situ |
| 19655/3 | BH201 (1 -1.45 m) | M.Mavin | 23/02/2026 2:12 PM | NASSG June 2018 | Frozen in situ |
| 19655/4 | BH201 (2 - 3 m) | M.Mavin | 23/02/2026 2:23 PM | NASSG June 2018 | Frozen in situ |
| 19655/5 | BH201 (2.5 - 2.95 m) | M.Mavin | 23/02/2026 2:21 PM | NASSG June 2018 | Frozen in situ |
| 19655/6 | BH201 (3 - 4 m) | M.Mavin | 23/02/2026 2:28 PM | NASSG June 2018 | Frozen in situ |
| 19655/7 | BH201 (4 - 5 m) | M.Mavin | 23/02/2026 2:41 PM | NASSG June 2018 | Frozen in situ |
| 19655/8 | BH201 (4 - 4.45 m) | M.Mavin | 23/02/2026 2:38 PM | NASSG June 2018 | Frozen in situ |
| 19655/9 | BH201 (5 - 6 m) | M.Mavin | 23/02/2026 2:55 PM | NASSG June 2018 | Frozen in situ |
| 19655/10 | BH201 (5.5 - 5.95 m) | M.Mavin | 23/02/2026 2:53 PM | NASSG June 2018 | Frozen in situ |
| 19655/11 | BH201 (6 - 7 m) | M.Mavin | 23/02/2026 3:01 PM | NASSG June 2018 | Frozen in situ |
| 19655/12 | BH201 (7 - 8 m) | M.Mavin | 23/02/2026 3:28 PM | NASSG June 2018 | Frozen in situ |
| 19655/13 | BH201 (7 -7.45 m) | M.Mavin | 23/02/2026 3:11 PM | NASSG June 2018 | Frozen in situ |
| 19655/14 | BH201 (8 - 9 m) | M.Mavin | 24/02/2026 7:40 AM | NASSG June 2018 | Frozen in situ |
| 19655/15 | BH201 (8.5 - 8.95 m) | M.Mavin | 23/02/2026 2:46 PM | NASSG June 2018 | Frozen in situ |
| 19655/16 | BH201 (10 - 10.45 m) | M.Mavin | 24/02/2026 9:13 AM | NASSG June 2018 | Frozen in situ |
| 19655/17 | BH201 (11.5 - 11.95 m) | M.Mavin | 24/02/2026 9:36 AM | NASSG June 2018 | Frozen in situ |
| 19655/18 | BH201 (13 - 13.45 m) | M.Mavin | 24/02/2026 10:06 AM | NASSG June 2018 | Frozen in situ |

| Lab ID | Client Sample Reference | Sampling Observations |
|---|---|---|
| 19655/1 | BH201 (0 - 1 m) | Solid Flight Auger |
| 19655/2 | BH201 (1 - 2 m) | Solid Flight Auger |
| 19655/3 | BH201 (1 -1.45 m) | Standard Penetration Test |
| 19655/4 | BH201 (2 - 3 m) | Solid Flight Auger |
| 19655/5 | BH201 (2.5 - 2.95 m) | Standard Penetration Test |
| 19655/6 | BH201 (3 - 4 m) | Solid Flight Auger |
| 19655/7 | BH201 (4 - 5 m) | Solid Flight Auger |
| 19655/8 | BH201 (4 - 4.45 m) | Standard Penetration Test |
| 19655/9 | BH201 (5 - 6 m) | Solid Flight Auger |
| 19655/10 | BH201 (5.5 - 5.95 m) | Standard Penetration Test |
| 19655/11 | BH201 (6 - 7 m) | Solid Flight Auger |
| 19655/12 | BH201 (7 - 8 m) | Solid Flight Auger |
| 19655/13 | BH201 (7 -7.45 m) | Standard Penetration Test |
| 19655/14 | BH201 (8 - 9 m) | Solid Flight Auger |
| 19655/15 | BH201 (8.5 - 8.95 m) | Standard Penetration Test |
| 19655/16 | BH201 (10 - 10.45 m) | Standard Penetration Test |

| Lab ID | Client Sample Reference | Sampling Observations |
|---|---|---|
| 19655/17 | BH201 (11.5 - 11.95 m) | Standard Penetration Test |
| 19655/18 | BH201 (13 - 13.45 m) | Standard Penetration Test |

Sampling procedures have been approved and report finalised on 12/03/2026.

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**NATA Accreditation 20375**
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# Report Number: 19666

Date Issued: 12/03/2026 Revision Number: 01

## Site/Job: Bobs Farm PASS - BH202

Client: Civitas Lifestyle Pty ltd
Address PO Box 1011
Newcastle NSW2300
Contact Darren Williams

The following sample(s) were sampled and tested on dates listed in this report:

| Client Sample Reference | Date Sampled | Lab ID | Matrix | General Comments |
|---|---|---|---|---|
| BH202 (0 - 1 m) | 24/02/2026 | 19666/1 | Sand | Grey, mg, very well sorted, rounded, high sphericity, dirty w with few organics |
| BH202 (1 - 2 m) | 24/02/2026 | 19666/2 | Sand | Tan, fmg, very well sorted, rounded, high sphericity, clean |
| BH202 (2 - 3 m) | 24/02/2026 | 19666/3 | Sand | Tan, fmg, very well sorted, rounded, high sphericity |
| BH202 (3 - 4 m) | 24/02/2026 | 19666/4 | Sand | Tan, mg, very well sorted, rounded, high sphericity, very clean |
| BH202 (4 - 5 m) | 24/02/2026 | 19666/5 | Sand | Cream, mg, well sorted, rounded, mod - high sphericity, moist, some organics present |
| BH202 (5 - 6 m) | 24/02/2026 | 19666/6 | Sand | Cream, mg, well sorted, rounded, mod - high sphericity, dirty, moist |
| BH202 (6 - 7 m) | 24/02/2026 | 19666/7 | Sand | Light grey, fmg, very well sorted, well rounded, high sphericity, wet |
| BH202 (7 - 8 m) | 24/02/2026 | 19666/8 | Sand | Brown, fmg, very well sorted, well rounded, high sphericity, wet and dirty |
| BH202 (8 - 9 m) | 24/02/2026 | 19666/9 | Sand | Brown, fg, very well sorted, well rounded, high sphericity, wet and very dirty |
| BH202 (10 - 10.45 m) | 24/02/2026 | 19666/10 | Sand | Cream, fmg, well sorted, well rounded, very high sphericity, wet, mud drilling |
| BH202 (11.5 - 11.95 m) | 24/02/2026 | 19666/11 | Sand | Browny cream, fmg, well sorted, well rounded, very high sphericity, dirty and wet, mud drilling |
| BH202 (13 - 13.45 m) | 24/02/2026 | 19666/12 | Sand | Grey, mg, moderate sorting, subrounded, high sphericity, wet, mud drilling |

The sample(s) have been tested as received and results relate specifically to the samples tested.

The following reports are included:

- Test Report
- Sampling Report
- Chain of Custody (if available)

Authorised by:

Anthony Crane
Laboratory Manager

Liane Peyra
Technical Officer

Results have been approved and report finalised on 12/03/2026.

## Test Report Number: 19666

Date Issued: 12/03/2026 Revision No: 01

# Results

| Potential Acid Sulphate Soil Screen (PASS) | Method | Lab ID<br>Sample Date<br>Sample ID<br>Units | 19666/1<br>24/02/2026<br>BH202 (0 - 1 m) | 19666/2<br>24/02/2026<br>BH202 (1 - 2 m) | 19666/3<br>24/02/2026<br>BH202 (2 - 3 m) | 19666/4<br>24/02/2026<br>BH202 (3 - 4 m) | 19666/5<br>24/02/2026<br>BH202 (4 - 5 m) |
|---|---|---|---|---|---|---|---|
| Date Tested | (NASSG) 2018 | -- | 25/2/2026 | 25/2/2026 | 25/2/2026 | 25/2/2026 | 25/2/2026 |
| $pH_F$ Temp | (NASSG) 2018 | °C | 24.4 | 24.3 | 24.2 | 24.1 | 23.9 |
| $pH_F$ | (NASSG) 2018 | pH units | 4.0 | 5.0 | 5.4 | 5.4 | 5.9 |
| $pH_{FOX}$ Temp | (NASSG) 2018 | °C | 26.3 | 25.3 | 24.7 | 24.3 | 24.1 |
| $pH_{FOX}$ | (NASSG) 2018 | pH units | **2.4** | **3.3** | **4.1** | **4.4** | **4.6** |
| pH Difference | (NASSG) 2018 | pH units | 1.6 | 1.8 | 1.3 | 1.0 | 1.3 |
| Reaction Rating $pH_{FOX}$ | (NASSG) 2018 | | No reaction | No reaction | No reaction | No reaction | No reaction |
| Fizz Test for Carbonates | (NASSG) 2018 | | N - non calcareous | N - non calcareous | N - non calcareous | N - non calcareous | N - non calcareous |
| Potential ASS? | (NASSG) 2018 | | Yes | Inconclusive | Inconclusive | Inconclusive | Inconclusive |

| Potential Acid Sulphate Soil Screen (PASS) | Method | Lab ID<br>Sample Date<br>Sample ID<br>Units | 19666/6<br>24/02/2026<br>BH202 (5 - 6 m) | 19666/7<br>24/02/2026<br>BH202 (6 - 7 m) | 19666/8<br>24/02/2026<br>BH202 (7 - 8 m) | 19666/9<br>24/02/2026<br>BH202 (8 - 9 m) | 19666/10<br>24/02/2026<br>BH202 (10 - 10.45 m) |
|---|---|---|---|---|---|---|---|
| Date Tested | (NASSG) 2018 | -- | 25/2/2026 | 25/2/2026 | 25/2/2026 | 25/2/2026 | 25/2/2026 |
| $pH_F$ Temp | (NASSG) 2018 | °C | 23.6 | 22.8 | 20.6 | 20.4 | 20.7 |
| $pH_F$ | (NASSG) 2018 | pH units | 5.9 | 5.6 | 5.8 | 5.3 | 5.9 |
| $pH_{FOX}$ Temp | (NASSG) 2018 | °C | 23.9 | 23.5 | 23.1 | 22.6 | 22.3 |
| $pH_{FOX}$ | (NASSG) 2018 | pH units | **4.2** | **4.3** | 5.2 | 5.2 | **5.0** |
| pH Difference | (NASSG) 2018 | pH units | 1.7 | 1.3 | 0.6 | 0.1 | 0.9 |
| Reaction Rating $pH_{FOX}$ | (NASSG) 2018 | | No reaction | No reaction | No reaction | No reaction | No reaction |
| Fizz Test for Carbonates | (NASSG) 2018 | | N - non calcareous | N - non calcareous | N - non calcareous | N - non calcareous | N - non calcareous |
| Potential ASS? | (NASSG) 2018 | | Inconclusive | Inconclusive | No | No | Inconclusive |

| Potential Acid Sulphate Soil Screen (PASS) | Method | Lab ID<br>Sample Date<br>Sample ID<br>Units | 19666/11<br>24/02/2026<br>BH202 (11.5 - 11.95 m) | 19666/12<br>24/02/2026<br>BH202 (13 - 13.45 m) |
|---|---|---|---|---|
| Date Tested | (NASSG) 2018 | -- | 25/2/2026 | 25/2/2026 |
| $pH_F$ Temp | (NASSG) 2018 | °C | 20.8 | 21.2 |
| $pH_F$ | (NASSG) 2018 | pH units | 5.9 | 5.8 |
| $pH_{FOX}$ Temp | (NASSG) 2018 | °C | 29.7 | 34.0 |
| $pH_{FOX}$ | (NASSG) 2018 | pH units | **1.9** | **1.7** |
| pH Difference | (NASSG) 2018 | pH units | 4.0 | 4.1 |

| Potential Acid Sulphate Soil Screen (PASS) | Method | Lab ID<br>Sample Date<br>Sample ID<br>Units | 19666/11<br>24/02/2026<br>BH202 (11.5 - 11.95 m) | 19666/12<br>24/02/2026<br>BH202 (13 - 13.45 m) |
|---|---|---|---|---|
| Reaction Rating $pH_{FOX}$ | (NASSG) 2018 | | M - Medium reaction | M - Medium reaction |
| Fizz Test for Carbonates | (NASSG) 2018 | | N - non calcareous | N - non calcareous |
| Potential ASS? | (NASSG) 2018 | | Yes | Yes |

| Chromium Reducible Sulfur | Method | Lab ID<br>Sample Date<br>Sample ID<br>Units | 19666/1<br>24/02/2026<br>BH202 (0 - 1 m) | 19666/2<br>24/02/2026<br>BH202 (1 - 2 m) | 19666/4<br>24/02/2026<br>BH202 (3 - 4 m) | 19666/5<br>24/02/2026<br>BH202 (4 - 5 m) | 19666/11<br>24/02/2026<br>BH202 (11.5 - 11.95 m) |
|---|---|---|---|---|---|---|---|
| Chromium Reducible Sulfur | EXT | moles H+/t | 5 | 5 | 5 | 5 | 22 |
| Net Acidity including ANC | EXT | moles H+/t | 15 | 12 | 7 | 8 | 24 |
| Liming rate including ANC | EXT | kg CaCO3/t | 1.00 | 0.90 | <0.75 | <0.75 | 2.00 |

## Report Comments:

Guideline applied - **National Acid Sulfate Soils Guidance - Sampling and identification methods manual June 2018**.

When considering the pass or fail of tests the measurement of uncertainty of each parameter must be considered.

https://www.vgt.com.au/measurement-uncertainty

Location Analysed : External Laboratory

EXT : tests by Envirolab NATA Acc 2901 Report No. 403246

[NT]: Not tested

# Sampling Report Number: 19666

Date Issued: 12/03/2026 Revision No: 01

Sampling Conditions: 24/02 Fine Sunny 32°C

| Lab ID | Client Sample Reference | Sampler | Date Sampled | Method of Sampling | Pre-treatment / Preservation |
|---|---|---|---|---|---|
| 19666/1 | BH202 (0 - 1 m) | M.Mavin | 24/02/2026 12:22 PM | NASSG June 2018 | Frozen in situ |
| 19666/2 | BH202 (1 - 2 m) | M.Mavin | 24/02/2026 12:24 PM | NASSG June 2018 | Frozen in situ |
| 19666/3 | BH202 (2 - 3 m) | M.Mavin | 24/02/2026 12:27 PM | NASSG June 2018 | Frozen in situ |
| 19666/4 | BH202 (3 - 4 m) | M.Mavin | 24/02/2026 12:31 PM | NASSG June 2018 | Frozen in situ |
| 19666/5 | BH202 (4 - 5 m) | M.Mavin | 24/02/2026 12:35 PM | NASSG June 2018 | Frozen in situ |
| 19666/6 | BH202 (5 - 6 m) | M.Mavin | 24/02/2026 12:40 PM | NASSG June 2018 | Frozen in situ |
| 19666/7 | BH202 (6 - 7 m) | M.Mavin | 24/02/2026 12:46 PM | NASSG June 2018 | Frozen in situ |
| 19666/8 | BH202 (7 - 8 m) | M.Mavin | 24/02/2026 12:52 PM | NASSG June 2018 | Frozen in situ |
| 19666/9 | BH202 (8 - 9 m) | M.Mavin | 24/02/2026 1:02 PM | NASSG June 2018 | Frozen in situ |
| 19666/10 | BH202 (10 - 10.45 m) | M.Mavin | 24/02/2026 2:24 PM | NASSG June 2018 | Frozen in situ |
| 19666/11 | BH202 (11.5 - 11.95 m) | M.Mavin | 24/02/2026 2:44 PM | NASSG June 2018 | Frozen in situ |
| 19666/12 | BH202 (13 - 13.45 m) | M.Mavin | 24/02/2026 3:38 PM | NASSG June 2018 | Frozen in situ |

| Lab ID | Client Sample Reference | Sampling Observations |
|---|---|---|
| 19666/1 | BH202 (0 - 1 m) | Solid Flight Auger |
| 19666/2 | BH202 (1 - 2 m) | Solid Flight Auger |
| 19666/3 | BH202 (2 - 3 m) | Solid Flight Auger |
| 19666/4 | BH202 (3 - 4 m) | Solid Flight Auger |
| 19666/5 | BH202 (4 - 5 m) | Solid Flight Auger |
| 19666/6 | BH202 (5 - 6 m) | Solid Flight Auger |
| 19666/7 | BH202 (6 - 7 m) | Solid Flight Auger |
| 19666/8 | BH202 (7 - 8 m) | Solid Flight Auger |
| 19666/9 | BH202 (8 - 9 m) | Solid Flight Auger |
| 19666/10 | BH202 (10 - 10.45 m) | Standard Penetration Test |
| 19666/11 | BH202 (11.5 - 11.95 m) | Standard Penetration Test |
| 19666/12 | BH202 (13 - 13.45 m) | Standard Penetration Test |

Sampling procedures have been approved and report finalised on 12/03/2026.

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# Report Number: 19654

Date Issued: 12/03/2026 Revision Number: 01

## Site/Job: Bobs Farm PASS - BH203

Client: Civitas Lifestyle Pty ltd
Address PO Box 1011
Newcastle NSW2300
Contact Darren Williams

The following sample(s) were sampled and tested on dates listed in this report:

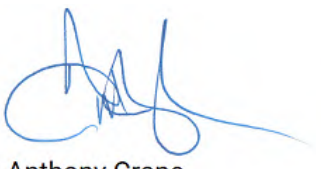
| Client Sample Reference | Date Sampled | Lab ID | Matrix | General Comments |
|---|---|---|---|---|
| BH203 (0.0-1.0 m) | 23/02/2026 | 19654/1 | Sand | Dark brown, fg, mod - well sorted, rounded, high sphericity, dirty with organics beween grains |
| BH203 (1.0 -2.0 m) | 23/02/2026 | 19654/2 | Sand | Dark brown, fg, very well sorted, rounded, high sphericity, dirty with organics between grains |
| BH203 (1.0 - 1.45 m) | 23/02/2026 | 19654/3 | Sand | Dark brown, fg, very well sorted, rounded, high sphericity, dirty with organics between grains |
| BH203 (2.0 - 3.0 m) | 23/02/2026 | 19654/4 | Sand | Brown grey, fmg, poorly sorted, rounded, high sphericity, dirty with organics between grains, few mg pebbles present |
| BH203 (2.5 - 2.95 m) | 23/02/2026 | 19654/5 | Sand | Brown grey, fmg, Poorly sorted, rounded, high sphericity, dirty with organics between grains, few mg pebbles present |
| BH203 (3.0 - 4.0 m) | 23/02/2026 | 19654/6 | Sand | Brown grey, mg, Well sorted, very well rounded, mod - high sphericity, very wet/ sloshy |
| BH203 (4.0 - 4.45 m) | 23/02/2026 | 19654/7 | Sand | Dark brown, mg, well sorted, rounded, mod - high sphericity, wet/ supersaturated with dirt present |
| BH203 (5.5 - 5.95 m) | 23/02/2026 | 19654/8 | Sand | Brown, mg, well sorted, rounded, mod - high sphericity, wet with few organics inlcuding roots |
| BH203 (7.0 - 7.45 m) | 23/02/2026 | 19654/9 | Sand | Grey brown, fmg, well sorted, very well rounded, high sphericity, clean |

The sample(s) have been tested as received and results relate specifically to the samples tested.

The following reports are included:

- Test Report
- Sampling Report
- Chain of Custody (if available)

Authorised by:



Anthony Crane
Laboratory Manager

Liane Peyra
Technical Officer

Results have been approved and report finalised on 12/03/2026.

## Test Report Number: 19654

Date Issued: 12/03/2026 Revision No: 01

# Results

| Potential Acid Sulphate Soil Screen (PASS) | Method | Lab ID<br>Sample Date<br>Sample ID<br>Units | 19654/1<br>23/02/2026<br>BH203 (0.0-1.0 m) | 19654/2<br>23/02/2026<br>BH203 (1.0 -2.0 m) | 19654/3<br>23/02/2026<br>BH203 (1.0 - 1.45 m) | 19654/4<br>23/02/2026<br>BH203 (2.0 - 3.0 m) | 19654/5<br>23/02/2026<br>BH203 (2.5 - 2.95 m) |
|---|---|---|---|---|---|---|---|
| Date Tested | (NASSG) 2018 | -- | 23/2/2026 | 23/2/2026 | 23/2/2026 | 23/2/2026 | 23/2/2026 |
| $pH_F$ Temp | (NASSG) 2018 | °C | 25.0 | 24.6 | 25.0 | 24.6 | 24.5 |
| $pH_F$ | (NASSG) 2018 | pH units | 7.4 | 5.2 | 7.1 | 7.2 | 6.9 |
| $pH_{FOX}$ Temp | (NASSG) 2018 | °C | 25.6 | 25.2 | 27.0 | 26.6 | 25.9 |
| $pH_{FOX}$ | (NASSG) 2018 | pH units | 5.0 | 3.8 | 5.0 | 5.2 | 5.2 |
| pH Difference | (NASSG) 2018 | pH units | 2.4 | 1.4 | 2.1 | 2.0 | 1.7 |
| Reaction Rating $pH_{FOX}$ | (NASSG) 2018 | | No reaction | No reaction | M - Medium reaction | M - Medium reaction | M - Medium reaction |
| Fizz Test for Carbonates | (NASSG) 2018 | | N - non calcareous | N - non calcareous | N - non calcareous | N - non calcareous | N - non calcareous |
| Potential ASS? | (NASSG) 2018 | | No | Inconclusive | No | No | No |

| Potential Acid Sulphate Soil Screen (PASS) | Method | Lab ID<br>Sample Date<br>Sample ID<br>Units | 19654/6<br>23/02/2026<br>BH203 (3.0 - 4.0 m) | 19654/7<br>23/02/2026<br>BH203 (4.0 - 4.45 m) | 19654/8<br>23/02/2026<br>BH203 (5.5 - 5.95 m) | 19654/9<br>23/02/2026<br>BH203 (7.0 - 7.45 m) |
|---|---|---|---|---|---|---|
| Date Tested | (NASSG) 2018 | -- | 23/2/2026 | 23/2/2026 | 23/2/2026 | 23/2/2026 |
| $pH_F$ Temp | (NASSG) 2018 | °C | 22.3 | 20.9 | 21.2 | 20.6 |
| $pH_F$ | (NASSG) 2018 | pH units | 6.9 | 6.1 | 6.6 | 6.5 |
| $pH_{FOX}$ Temp | (NASSG) 2018 | °C | 24.5 | 24.1 | 23.8 | 24.4 |
| $pH_{FOX}$ | (NASSG) 2018 | pH units | 5.4 | 5.3 | 5.6 | 3.1 |
| pH Difference | (NASSG) 2018 | pH units | 1.5 | 0.7 | 1.0 | 3.4 |
| Reaction Rating $pH_{FOX}$ | (NASSG) 2018 | | L - Low reaction | L - Low reaction | No reaction | L - Low reaction |
| Fizz Test for Carbonates | (NASSG) 2018 | | N - non calcareous | N - non calcareous | N - non calcareous | N - non calcareous |
| Potential ASS? | (NASSG) 2018 | | No | No | No | Inconclusive |

| Chromium Reducible Sulfur | Method | Lab ID<br>Sample Date<br>Sample ID<br>Units | 19654/2<br>23/02/2026<br>BH203 (1.0 -2.0 m) | 19654/5<br>23/02/2026<br>BH203 (2.5 - 2.95 m) | 19654/8<br>23/02/2026<br>BH203 (5.5 - 5.95 m) |
|---|---|---|---|---|---|
| Chromium Reducible Sulfur | EXT | moles H+/t | 5 | 5 | 5 |
| Net Acidity including ANC | EXT | moles H+/t | 9 | <5 | 5 |
| Liming rate including ANC | EXT | kg CaCO3/t | <0.75 | <0.75 | <0.75 |

## Report Comments:

Guideline applied - **National Acid Sulfate Soils Guidance - Sampling and identification methods manual June 2018**.

When considering the pass or fail of tests the measurement of uncertainty of each parameter must be considered.

https://www.vgt.com.au/measurement-uncertainty

Field Analysis conducted onsite at Stockton Quarry

EXT : tests by Envirolab NATA Acc 2901 Report No. 403246

[NT]: Not tested

# Sampling Report Number: 19654

Date Issued: 12/03/2026 Revision No: 01

Sampling Conditions: Fine 32°C

| Lab ID | Client Sample Reference | Sampler | Date Sampled | Method of Sampling | Pre-treatment / Preservation |
|---|---|---|---|---|---|
| 19654/1 | BH203 (0.0-1.0 m) | M.Mavin | 23/02/2026 9:06 AM | NASSG June 2018 | Frozen in situ |
| 19654/2 | BH203 (1.0 -2.0 m) | M.Mavin | 23/02/2026 9:14 AM | NASSG June 2018 | Frozen in situ |
| 19654/3 | BH203 (1.0 - 1.45 m) | M.Mavin | 23/02/2026 | NASSG June 2018 | Frozen in situ |
| 19654/4 | BH203 (2.0 - 3.0 m) | M.Mavin | 23/02/2026 9:22 AM | NASSG June 2018 | Frozen in situ |
| 19654/5 | BH203 (2.5 - 2.95 m) | M.Mavin | 23/02/2026 | NASSG June 2018 | Frozen in situ |
| 19654/6 | BH203 (3.0 - 4.0 m) | M.Mavin | 23/02/2026 9:35 AM | NASSG June 2018 | Frozen in situ |
| 19654/7 | BH203 (4.0 - 4.45 m) | M.Mavin | 23/02/2026 | NASSG June 2018 | Frozen in situ |
| 19654/8 | BH203 (5.5 - 5.95 m) | M.Mavin | 23/02/2026 11:01 AM | NASSG June 2018 | Frozen in situ |
| 19654/9 | BH203 (7.0 - 7.45 m) | M.Mavin | 23/02/2026 11:36 AM | NASSG June 2018 | Frozen in situ |

| Lab ID | Client Sample Reference | Sampling Observations |
|---|---|---|
| 19654/1 | BH203 (0.0-1.0 m) | Solid Flight Auger |
| 19654/2 | BH203 (1.0 -2.0 m) | Solid Flight Auger |
| 19654/3 | BH203 (1.0 - 1.45 m) | Standard Pressure Test |
| 19654/4 | BH203 (2.0 - 3.0 m) | Solid Flight Auger |
| 19654/5 | BH203 (2.5 - 2.95 m) | Standard Pressure Test |
| 19654/6 | BH203 (3.0 - 4.0 m) | Solid Flight Auger |
| 19654/7 | BH203 (4.0 - 4.45 m) | Standard Pressure Test |
| 19654/8 | BH203 (5.5 - 5.95 m) | Standard Pressure Test |
| 19654/9 | BH203 (7.0 - 7.45 m) | Standard Pressure Test |

Sampling procedures have been approved and report finalised on 12/03/2026.