Twynam Property Group

Preliminary Acid Sulfate Soils Assessment: Lot 30 DP1198692, Mundamia, NSW.



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All enquiries regarding this project are to be directed to the Project Manager.



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1 Scope of Work

1.1 Overview

This report documents the findings of a preliminary acid sulfate soils (ASS) assessment undertaken at Lot 30 DP1198692, Jonsson Rd, Mundamia ('the site'). The assessment was commissioned by the Client, Twynam Property Group, to address a request from NSW Department of Planning.

The assessment has been undertaken with reference to NSW Acid Sulfate Soil Management Advisory Committee (ASSMAC, 1998) guidelines.

1.2 Proposed Development

At the time of reporting, the following details regarding components of the development proposal were available:

- o Proposed sub-division into approximately 360 residential allotments.
- o Internal road network with associated stormwater drainage.
- Sewerage, water, power and gas infrastructure to service the development.

1.3 Objectives

The study objective was to undertake a preliminary ASS assessment of the site.

1.4 Scope of Work

Scope of work included:

- o Site walkover.
- Drilling of 11 boreholes (BH301 BH311) with representative soil sample collection.
- Laboratory analysis of 16 soil samples.
- Preparation of a report in general accordance with ASSMAC (1998).



2 Site Location and Setting

Site background information is summarised in Table 1 with site location shown in Attachment A.

Table 1: Site background information

| Site address | George Evans Rd, Mundamia, NSW and 58 Jonnson Rd, Mundamia. |
|--------------------------------|--|
| Lot and DP (Title Information) | Lot 30 DP1198692. |
| Zoning | 1(d) 'General Rural'. |
| Local government area (LGA) | Shoalhaven City Council. |
| Current land use | Rural residential / agricultural / livestock grazing. |
| Proposed land use | Residential. |
| Surrounding land uses | Predominantly rural with some rural residential allotments to the west and north, residential developments to the south east. |
| Geology and soil landscapes | Nowra Sandstone, a subgroup of the Megalong Conglomerate Group geology. Nowra Soil Landscape consisting of moderately deep (50 – 100cm) brown podzolic soils on crests/upper slopes, with yellow earths or yellow podzolic soils on mid slopes, lower slopes and drainage depressions. |
| Topography and drainage | Elevations across the site range from 36 – 70 mAHD with a general fall to the east/north east. |
| Groundwater | No free groundwater was observed during excavation of boreholes 301 to 311 completed for the ASS assessment. However, certain soil layers from BHs 305 and 309 were noted as being moist enough to be indicative of potentially holding groundwater. MA's Hydrogeological Assessment (2011) for the site found ephemeral water tables in areas of shallow soil and less ephemeral water tables in areas of deeper soil. In both cases the water table was perched within soil above the underlying sandstone rock. |



3 Preliminary Acid Sulfate Soils Assessment

3.1 Desktop Review

3.1.1 Acid Sulfate Soils Mapping

Review of Shoalhaven City Council's ASS mapping indicates that the site is classified as 'no known occurrence' of ASS.

3.1.2 Geomorphic Setting

The likelihood of ASS occurrence at a site is a function of various geomorphic parameters, in particular those listed in Table 2 (ASSMAC, 1998). Each is an indicator that ASS is likely to be present on-site. Two of the seven geomorphic features listed are present or possibly present on the site. Therefore, the geomorphic setting of the site indicates that actual or potential ASS may be present.

Table 2: Geomorphic features indicative of acid sulfate soils.

| Geomorphic Feature | Present on site? |
|---|-------------------------|
| Holocene sediments | No |
| Soil horizons less than 5 m AHD | No |
| Marine / estuarine sediments or tidal lakes | No |
| Coastal wetland; backwater swamps; waterlogged or scaled areas; interdune swales or coastal sand dunes. | Yes – waterlogged soils |
| Dominant vegetation is mangroves, reeds, rushes and other swamp or marine tolerant species. | No |
| Geologies containing sulphide bearing material / coal deposits or former marine shales/sediments | Possible |
| Deep older (Pleistocene) estuarine sediments | No |

3.2 Soil Sampling and Laboratory Analysis

3.2.1 Soil Sampling Regime

Based on a total developable site area of approximately 30.6 ha, ASSMAC (1998) guidelines recommend 62 boreholes as an appropriate number of sampling boreholes for the site. A total of 11 boreholes were excavated for the preliminary ASS assessment which was considered appropriate for preliminary screening purposes given the site's



elevation is well above 5 mAHD (36 – 70 mAHD), the majority of geomorphic features indicated that ASS is unlikely to be present on the site, the site is not mapped to contain ASS soils and the site contains residual soils overlying sandstone bedrock.

A total of 16 soil samples from the 11 boreholes were selected to cover a range of locations and depths and submitted to laboratory for Peroxide Oxidation Combined Acidity and Sulfate (sPOCUS) analysis.

3.2.2 Results

Laboratory results/ASSMAC (1998) action criteria interpretation are summarised in Attachment C with the complete laboratory report provided in Attachment D. Results are summarised as follows:

- o Actual Acid Sulfate Soil (AASS) was found for two samples (BH301, depth 2.50 m and BH309, depth 1.75 m).
- o Potential ASS (PASS) found for 11 samples.
- Neither PASS or ASS found for three samples.

Results exceeded the action criteria for 13 of the 16 samples and therefore in accordance with ASSMAC (1998), a detailed management plan should be prepared. The shallowest sample depth which exceeded action criteria was 0.1 m.

We note that ASSMAC (1998) action criteria interpretation assumed less than 1,000 tonnes of soil will be disturbed.

3.2.3 Conclusion

Soils meeting the ASSMAC (1998) tests for AASS and PASS are present on the site. If it is accepted ASSMAC (1998) applies, then a detailed management plan is required. Importantly, the site soils are residual and overly sandstone, therefore the origin of soil acidity is likely the underlying geology. Consultation with NSW OEH's ASS expert Dr Mitch Tulau (per communication, 24.03.2014) suggests that ASSMAC (1998) guidelines do not apply to this site with residual soil landscapes. Given the fact that soils are presently in the aerobic zone of the soil profile, it is unlikely that disturbance of those soils will result in any environmental impacts. Given these considerations it is not reasonable to assume disturbance of the soils on the site will result in any impacts. It is therefore recommended that, while application of ASSMAC (1998) may conclude a management plan is required, further to recent consultation with NSW OEH ASS expert, the site context of a residual soil leads to the conclusion that excavation of the material will not lead to adverse impacts and therefore a management plan is not essential to ensure protection.



4 Limitations

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 ASS implications before recommencement.



5 References

Department of Conservation and Land Management (incorporating the Soil Conservation Service of NSW), Soil Landscapes of the Kiama 1:100,000 Sheet.

Geologic Survey of NSW, Department of Minerals and Energy (1991), Geological Series 1:100,000, Wollongong Sheet.

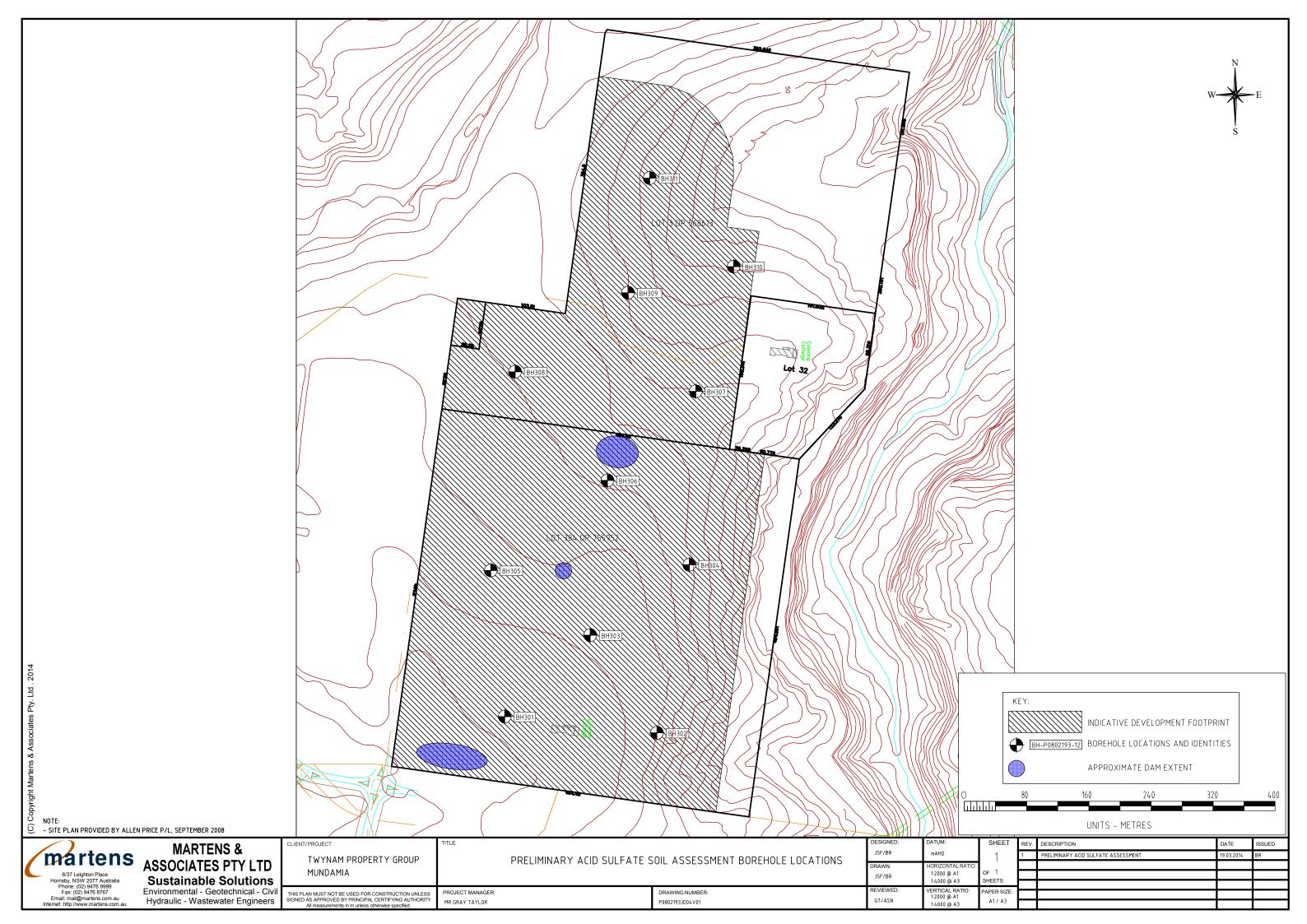
Martens and Associates (2011), Hydrogeological Assessment: Proposed sub-dvision, Mundamia Release Area, Mundamia, NSW, report REF: P1002761JR01V02.

NSW Acid Sulfate Soil Management Advisory Committee (1998), Acid Sulfate Soil Manual.



6 Attachment A – Site Plan/Borehole Locations





7 Attachment B – Borehole Logs



| CLI | EN | Γ | T۱ | wynam | Propert | y Group |) | | COMMENCED | 6/3/14 | | COMPLETED | 6/3/14 | | | | REF | BH | I301 |
|--|--|--|--|--|--|-------------------------|----------------------------|---|---|---|---|---|--|--------------------------------|---------------------|--|---------------------------|--------------------|---|
| PRO | ΟJΕ | СТ | A | cid Sulf | ate Soil | s Asses | sme | ent | LOGGED | BR | | CHECKED | GT | | | | Sheet 1 | | |
| SIT | E | | Lo | ot 3 DP | 568613 | and Lot | 384 | DP755952 | GEOLOGY | Nowra Sandston | е | VEGETATION | Grass | | | | PROJECT | NO. P0802 | 193 |
| EQUI | PMEI | NT | | | Truck mou | nted hydraul | ic aug | er | EASTING | NA | | RL SURFACE | . NA | | | | | | |
| | | | | NSIONS | | 2.5m depth | | | NORTHING | NA | | ASPECT | North | East | | | SLOPE | 1-2% | |
| | EX | CAV | /AT | ION DA | | | | MA | TERIAL DA | NTA | | | | | SA | MPLIN | G & TES | STING | |
| METHOD | SUPPORT | WATER | MOISTURE | DEPTH (M) | L PENETRATION H RESISTANCE | GRAPHIC LOG | CLASSIFICATION | Soil type, texture, structure, reparticle characteristics, org | PTION OF STR. mottling, colour, pl anics, secondary a intamination, odou | asticity, rocks, oxid | dation, ents, | CONSISTENCY | DENSITY INDEX | TYPE | DEPTH (M) | Al | | ULTS AND OBSERV | |
| ٧ | Nil | N | М | 0.2 | | × × × × × × × × × | SP | SAND - Fine to m | nedium graine ightly moist. | ed, light browr | ١, | | | Α | 0.1 | 2193/30 | 1/0.1 | | _ |
| V | Nil | N | М | - - - 0.7 | | | SC | | SAND - Yellov s to layer belo | | | | | Α | 0.5 | 2193/30 | 1/0.5 | | - - - |
| | | | | - - 1.0 - - | | P | | SANDSTONE - Me | | | | | | A | 0.75 | 2193/30 | 1/0.75 | | _ 1.0 _ _ |
| V | Nil | Z | М | | | P | EL | extremely weathe clayey sand prop colour with sand | erties, tends | to red orange | 9 | | | A | 2.0 | 2193/30 | | | - - - - 2.0 |
| ٧ | Nil | N | М | 2.5 | | , S P . | EL | SANDSTONE - l extremely weathe sugary grains | red, extremel | y low strength | | | | A | 2.5 | 2193/30 | 1/2.5 | | - |
| | | | | | | | | Borehole terminat stren | ed at 2.5m or igth sandston | | w | | | | | | | | - |
| | | | | 3.0 | | | | | | | | | | | | | | | 3 <u>.0</u> - - |
| | | | | _ _ _ _ | | | | | | | | | | | | | | | - - - - |
| | | | | 4.0 - - - - 4.5 | | | | | | | | | | | | | | | 4.0 - - - - 4.5 |
| N X BH H E C V TC | Na Ex Ba Ha Ex Cor V-B | itural of distingtions of the contraction of the co | expos g exca e buck ger or e Core | sure SH avation SC ket RE Nil | JPPORT I Shoring Shotcrete Rock Bol No suppo | ts 🅎 Wat | e obse measu er leve | rved D Dry L Lo red M Moist M Mo. I W Wet H Hig Wp Plastic limit R Re low WI Liquid limit | ow VS oderate S gh F ofusal St VSt H | Very Soft VL Soft L Firm MD Stiff D | Very Loose Loose Medium De Dense Very Dense | e A Aug B Bull ense U Und D Dist M Mois Ux Tub | ING & TE er sample s sample isturbed sample urbed sample e sample ronmenta | sample mple ent (x mm | pp S VS DC | Standard Vane she P Dynam penetro Field der S Water sa | ic cone meter isity | SYME SOIL Y N | SIFICATION BOLS AND DESCRIPTION USCS Agricultural |
| | Spa | uu | | | E | XCAVATION | ON LO | OG TO BE READ IN CONJU | JNCTION WITH | I ACCOMPANY | ING REPO | ORT NOTES | AND A | BBRE | VIATI | ONS | | | |
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| — | PROJECT Acid Sulfate Soils Assessment | | | | | | | | nt. | LOGGED | 6/3/14 BR | | CHECKED | GT | 14 | | | REF | BH30 |)2 |
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| SIT | | -61 | + | | | | | | DP755952 | GEOLOGY | Nowra Sand | Istone | VEGETATION | _ | 88 | | | Sheet 1 o | F 1 | |
| - | IPME | NT | | JI J DF | _ | | nted hydraul | | | EASTING | NA NA | asione . | RL SURFA | _ | | | | PROJECT NO. | F0002193 | |
| - | | | DIMEN | ISIONS | | | 1.1m depth | | | NORTHING | NA | | ASPECT | Eas | t_ | | | SLOPE | 2-4% | |
| | EX | CA\ | /ATI | ON DA | TA | | | | М | IATERIAL DA | ATA | | • | | | SA | MPLIN | G & TESTI | NG | |
| МЕТНОВ | SUPPORT | WATER | MOISTURE | ОЕРТН (М) | L PENETRATION | H RESISTANCE | GRAPHIC LOG | CLASSIFICATION | Soil type, texture, structure particle characteristics, o fill, | contamination, odo | lasticity, rocks and minor coi ur. | | CONSISTENCY | DENSITY INDEX | TYPE | DEPTH (M) | A | RESUL' DDITIONAL O | | DNS |
| ٧ | Nil | N | D | 0.15 | | | × * * × × × | SM | | orown, rootlets. | | ed, | | | А | 0.1 | 2193/30 | 02/0.1 | | - |
| V | Nil | N | М | _ _ 0.4 | | | | sc | CLAYEY SAND | - Yellow brown | n, slightly i | moist. | | | A | 0.3 | 2193/30 | 02/0.3 | | - |
| v | Nil | N | М | - - | | | | SP | SAND - With so orar | ome quartz gra nge/yellow brov | | mm, | | | A | 0.5 | 2193/30 | 02/0.5 | | - - |
| V | Nii N M 1.0 SANDST EL SANDST extren | | | | | | | | | ellow, light grey nered, extreme ns, clayey sand | ly low stre | ngth, | | | А | 1.0 | - Sandst vicinity 2193/30 | one outcrops in in of borehole. 02/1.0 | mmediate | 1 <u>.(</u> |
| N | V NII N M 1.0 EL SANDSTONE extremely sugary V bit re 2.0 3.0 | | | | | | | | MOISTURE PEN | Low VS | SISTENCY Very Soft | DENSITY VL Very Loc | ose A A | ıger sam | | pp | | enetrometer | CLASSIFIC | AND |
| X B H E C V | H Ba A Ha E) C Co V-l | xisting ackhoo and au acavat acrete Bit | g exca e buck iger or e Core | vation S et R N | C Sho B Roo il No | tcrete k Bolt | x Not s ₩ Wat | measu ter leve ter outfl | red M Moist M I el W Wet H H Wp Plastic limit R F low WI Liquid limit | Moderate S High F Refusal St VSt H | Soft Firm Stiff Very Stiff Hard Friable | L Loose MD Medium I D Dense VD Very Dense | Dense U U D D se M M Ux T | ulk samp ndisturbe sturbed : pisture co ube samp | le d sample sample | e VS Do n) FI ble W | Standard S Vane sho CP Dynam penetro D Field der /S Water sa | penetration test ear iic cone ometer nsity | Y USC: | CRIPTION |
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| - | TE | | L | ot 3 DP | _ | | | 4 DP755952 | GEOLOGY | Nowra Sands | stone | VEGETAT | _ | | | | PROJECT N | IO. P0802193 | 1 |
| - | UIPME | | | | | unted hydra | | uger | EASTING | NA | | RL SURFA | _ | | | | | T | |
| EX | | | | NSIONS | | (1.1m depth | 1 | N. | NORTHING IATERIAL D | NA ATA | | ASPECT | Nor | th North I | | | SLOPE | 1-2% TING | |
| H | | CA | VAI | ION DA | _ | (2) | z | | IATERIAL D | AIA | | > | × | | 3 <i>P</i> | MIPLIN | IG & IES | TING | |
| METHOD | SUPPORT | WATER | MOISTURE | DEPTH (M) | ENETRATION RESISTANCE | GRAPHIC LOG | CLASSIFICATION | DESCF Soil type, texture, structur particle characteristics, c fill, | e, mottling, colour, organics, secondary contamination, odd | plasticity, rocks, and minor com | oxidation, ponents, | CONSISTENCY | DENSITY INDEX | TYPE | DEPTH (M) | A | | ULTS AND OBSERVAT | IONS |
| v | Nil | N | D | - - 0.4 | | × × × × × × × × × × × × × × × × × × × | ML | SILT - Trace of | gravels 5-15n rootlets. | nm, light bro | own, | | | A | 0.1 | 2193/30 | 03/0.1 | | - - - |
| V | Nil | N | D | - - 0.7 | | | sw | | th some grave rained, yellow | | | | | A | 0.5 | 2193/30 | 03/0.5 | | - |
| V | Nil | N | D | - - 1.0 | | P1 9 | VL | SANDSTONE - weather | Light grey, ex red, very low s | | ighly | | | A | 1.0 | - Sandsi vicinity 2193/30 | tone outcrops of borehole. 03/1.0 | in | - - 1 <u>.0</u> |
| \vdash | | 1 | | 1.1 | | (4 %) | | V bit refu | sal at 1.1m or | very low | | | | | | | | | |
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| - | SITE | | | Lo | t 3 DP5 | | | | 384 E | DP755952 | GEOLOGY | Nowra San | dstone | VEGETATI | _ | ss | | | PROJECT | IO. P08021 | 93 |
| Н | QUIP | | | IMEN | SIONS | | d Aug nmØ | ger X 0.55m depti | 1 | | EASTING NORTHING | NA NA | | RL SURFA | Eas | t | | | SLOPE | 0-2% | |
| f | | | | | ON DA | | 111110 | X 0.00m depa | • | MA | TERIAL DA | | | 7.0. 20. | Luc | | SA | | G & TES | | |
| | МЕТНОВ | SUPPOR | WATER | MOISTURE | DEPTH(M) | PENETRATION | # RESISTANCE | GRAPHIC LOG | CLASSIFICATION | DESCRII Soil type, texture, structure, reparticle characteristics, orga | PTION OF STR | ATA asticity, rocks | s, oxidation, mponents, | CONSISTENCY | DENSITY INDEX | TYPE | DEPTH(M) | | | ULTS AND | |
| | 1 AH | lil l | N | М | - - - | | | | sc | CLAYEY SAND - Med minor clay o | dium grained content, oranç | , trace fin ge/brown. | e gravels, | | | А | 0.2 | 2193/30 | 04/0.2 | | - - - - |
| | | | | | 0.55 | | | | | | erminated at 0 | | | | | | | | | | |
| | | IIDA 45 | | | | | | | | MOIOTURE | TO THE STATE OF TH | 0.075 | DENOTE | | 21.11.5 | | | | | | |
| | N X BH HA E CC V TC | Natu Exis Back Hand Exca Cond V-Bit | ural e sting shoe d aug avato rrete sten | xposu excav bucke er | re SH ration SC et RE Nil | Sh Ro | RT oring otcrei ck Bo supp | te X Not⊪ olts ∇7 Wat | e obser measur er level er outfle | ved D Dry L Lo ed M Moist M M W Wet H Hig Wp Plastic limit R Re ow WI Liquid limit | w VS oderate S gh F fusal St VSt H | SISTENCY Very Soft Soft Firm Stiff Very Stiff Hard Friable | DENSITY VL Very Loos L Loose MD Medium D D Dense VD Very Dens | se A A B B Jense U U D D Le M M Ux T | uger sam ulk sampl ndisturbe isturbed s oisture co ube samp | e d sample sample | pp S VS D() FE e W | Standard S Vane sho CP Dynam penetro D Field der S Water sa | ic cone meter sity | SYME SOIL | SIFICATION OLS AND DESCRIPTION USCS Agricultural |
| | | | | | | | | EXCAVATION | ON LC | G TO BE READ IN CONJU | INCTION WITH | H ACCOMF | PANYING REPO | ORT NOTE | S AND | ABBRE\ | VIATIO | ONS | | | |
| 1 | | | _ |) | | | | | | | MARTENS & | ASSOCIAT | ES PTY LTD | | | | | .: | orin | | |

| — | PROJECT Acid Sulfate Soils Assessment | | | | | | | | | |) BR | | CHECKED | | 73/14 GT | | | REF | BH305 |) |
|---------------------------------|---------------------------------------|--|---|---|---|--|----------------|---|--|---|--|---|--|---|---|---------------|--|-----------------------------|---------------------------|--------------|
| SI | | -01 | +- | | | | | 4 DP755 | 952 | GEOLOG | | Sandstone | VEGETAT | - - | Grass | | | Sheet 1 PROJECT NO | of 1 . P0802193 | |
| _ | JIPME | NT | | | | nounted hyd | | | | EASTING | 3 NA | | RL SURFA | ACE N | IA | | | | | |
| EXC | | | | SIONS | | Ø X 2.5m de | th | | | NORTHI | | | ASPECT | ١ | lorth North | | | SLOPE | 2% | |
| МЕТНОВ | SUPPORT | WATER | MOISTURE | DEPTH (M) | M PENETRATION H | GRAPHIC LOG | CLASSIFICATION | Soil ty partic | pe, texture, struc cle characteristic | CRIPTION OF ture, mottling, co s, organics, seco fill, contamination | STRATA lour, plasticity, ondary and min | rocks, oxidation, or components, | CONSISTENCY | DENSITY INDEX | TYPE | DEPTH (M) | | | TS AND | i |
| ٧ | Nil | N | М | - 0.2 | | × × × × × × | × SI | ı S | ILTY SAND | - Fine to me | edium grair | ed, grey. | | | А | 0.1 | 2193/30 | 05/0.1 | | |
| ٧ | Nil | N | М | 0.35 | | | SI | | | e to medium | | | | | | | | | | |
| v | Nil Nil | N N | M | - 0.5 - | | | CI | | gr SANDSTON xtremely we | OY CLAY - Your ades to layed IE - Red orange athered, extrandy clay programs. | er below. nge and lig remely low | ht grey, | | | A | 0.6 | 2193/30 | 05/0.6 | | |
| V | Nil | N | М | 0.8 - 1.0 - 1.2 | | | CI | | SANDY C | LAY - Orang wn and light | je brown, b | | | | A | 1.0 | 2193/30 | 05/1.0 | | 1 <u>.</u> (|
| ٧ | Nil | N | М | | | | CI | | | Y - Light gre mottling gon | | nottled, | | | A | 1.5 | 2193/30 | | | 2.0 |
| v | Nil | N | M/W | 2.1 | | | SC SC | : | CLAYEY S possil | SAND - Light bly holding g | grey, very roundwate | moist, r. | | | A | 2.5 | 2193/30 | 05/2.5 | | |
| | OLUE | MENT | ME | - - - - - - - - - - - - - - - - - - - | TIEDO DE | WA | | | | ninated at 2. | | | SAM | DI INC | * TESTIN | | | | CLASSIEIDATI | 4 |
| N X E H E C V | I N. H Ba IA Ha C Co V-I C Tui | atural existing ackhood and au excaval encrete Bit ngster | expose g exca e buck uger tor e Core | sure Savation Savet R | EUPPORT EH Shorir C Shotc EB Rock lil No su | ng N I rete X I Bolts <u>Ψ</u> ipport — | | served D sured M vel W Wp utflow WI | | l High | CONSISTEN VS Very St S Soft F Firm St Stiff VSt Very St H Hard F Friable | oft VL Very Lo L Loose MD Medium D Dense | oose A A B I I Dense U I D I I D I I D I I D I I D I I D I I D I I D I | Auger s Bulk sar Undistu Disturbe Moisture Tube sa | mple rbed samp ed sample content imple (x m | ble V m) F | Standard S Vane shown penetro D Field dealer VS Water sa | nic cone ometer nsity | Y USCS N Agricultu | D PTION |
| | Sp | | | | | EXCAV | TION | LOG TO BE | E READ IN CO | ONJUNCTION | WITH ACC | OMPANYING RE | PORT NOT | ES AN | | - | | | | |
| | | | 7 | | | | | | | | | CIATES PTY LTD | | Ť | | | • | | | |

| | EIN. | | + | | | - | y Group | | | COMMENCEL | | | COMPLETED | | | | | KEF | BH306 |
|-------------------------------------|--|--|--|---|-------------------|---|------------------------------------|--|--|--|--|--|--|--|---|----------------------------------|--|---|--|
| PR | | СТ | Ac | id Sulf | ate | Soil | s Asses | sme | nt | LOGGED | BR | | CHECKED | GT | | | | Sheet 1 o | |
| SIT | E | | Lo | t 3 DP | 568 | 3613 a | and Lot | 384 | DP755952 | GEOLOGY | Nowra San | dstone | VEGETATION | Grass | | | | PROJECT NO. | P0802193 |
| EQU | PME | NT | | | На | and Auge | er | | | EASTING | NA | | RL SURFACE | . NA | | | | | |
| EXC | AVAT | ION D | IMEN | SIONS | 10 | 0mmØ ک | C 0.7m depth | | | NORTHING | NA | | ASPECT | East | | | | SLOPE | 1-2% |
| | EX | CAV | /ATI | ON DA | | | | | M <i>A</i> | ATERIAL D | ATA | | | | | SA | MPLING | 3 & TESTI | NG |
| МЕТНОВ | SUPPORT | WATER | MOISTURE | DEPTH (M) | 1 | M PENETRATION H RESISTANCE | GRAPHIC LOG | CLASSIFICATION | Soil type, texture, structure, r particle characteristics, org | PTION OF STI mottling, colour, p anics, secondary ontamination, odd | lasticity, rocks and minor co | s, oxidation, mponents, | CONSISTENCY | DENSITY INDEX | TYPE | DEPTH (M) | Αſ | | TS AND DBSERVATIONS |
| | Nil | N | | 0.05 | Ħ | \blacksquare | `.×.`×` | SM | SILTY SAND | - Medium gr | ained san | d, | | | Α | 0.1 | 2193/306 | 2/0.1 | |
| НА | Nil | N | М | 0.15 | | | | SC | | vn/dark brow | | /] | | | A | 0.1 | 2193/300 | 5/ U. I | _ |
| | | | | - | | | | | CLAYEY SAND - Me | edium graine t brown/brow | | rounded, | | | Α | 0.3 | 2193/306 | s/n 3 | - |
| НА | Nil | N | М | | | | | sc | CLAYEY SAND - | | coarse gra | ined, | | | | | | | - - - |
| НА | Nil | N | М | 0.7 | | | PR | Rs | SANDSTONE grey/orange mottle | - Medium/co ed residual s | arse grain oil (clayey | ed, sand). | | | A | 0.6 | 2193/306 | 6/ 0.6 | _ |
| | | | | | | | | | | erminated at veathered sa | | | | | | | | | - 100 |
| | | | | <u>4.0</u> - - | | | | | | | | | | | | | | | 4.0 - - |
| | | | | - 4.5 | | | | | | | | | | | | | | | 4.5 |
| N Bi H/ E C(V T(| Na Ex H Ba Ha Ex C Coi V-E | itural e kisting ckhoe nd aug cavato ncrete Bit gsten | / MET exposu excav bucke ger | THOD SI Ire SI eation So et RI Ni | H S C S B F | PORT Shorting Shotcrete Rock Bol No suppo | ts <u>▼</u> Wat ort | e obse measu ter leve ter outf ter inflo | rved D Dry L Lo red M Moist M M I W Wet H Hi wp Plastic limit R Re low WI Liquid limit | w VS oderate S gh F effusal St VSt H H F | NSISTENCY Very Soft Soft Firm Stiff Very Stiff Hard Friable | DENSITY VL Very Loose L Loose MD Medium D D Dense VD Very Dens | se A Aug B Bulk lense U Unc D Dist e M Moi Ux Tub E Envi | ING & TE er sample c sample listurbed s turbed sar sture conf e sample ronmenta | sample mple cent (x mm) I sample (JAR) | pp S VS DC FD PII | S Vane sheat CP Dynamic penetror Field dens S Water sar D Photo lor | penetration test ar c cone neter iity | CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION Y USCS N Agricultural |
| | | | | | | | | | | MARTENS & | ASSOCIAT | ES PTY LTD | | 1 | _ | | . . | | |

| [| CLIE | NT | | Tw | /ynam | Pro | pe | rty Grou | р | | | COMMENCED | 6/3/14 | | COMPLET | ED | 6/3/14 | | | | REF | E | 3H30 | 7 |
|----------|--|--|---|----------|--------------------------------|----------------------------|---------------------------|------------------------------|------------------------------|------------------------|---|--------------------------------------|---|--|-------------------------------------|--|---|------------------------|----------------------------|---|--------------------------|--------|---|-------------|
| - | PRO | | т | Ac | id Sulfa | ate | So | ils Asse | ssm | ent | | LOGGED | BR | | CHECKED |) | GT | | | | Sheet 1 | | | - |
| - | SITE | | | Lo | t 3 DP5 | _ | | and Lot | 384 | DP7 | 755952 | GEOLOGY | Nowra San | dstone | VEGETAT | - | Grass | | | | PROJECT | NO. P | 0802193 | |
| Н | QUIP | | | /ENS | IONS | | nd Au | iger Ø X 0.25m der | oth | | | EASTING NORTHING | NA NA | | RL SURFA ASPECT | | NA North We | est | | | SLOPE | 0-2 | 0% | |
| F | | | | | ON DAT | | | 7 X U.ZUM GC | , di i | | MA | ATERIAL D | | | 7.0. 20. | | I TOTAL WE | ,,,, | SAI | | G & TES | _ | | |
| | METHOD | SUPPOR | WATER | MOISTURE | DEPTH(M) | UCIT ACTENCE | FENETRATION RESISTANCE | GRAPHIC LOG | CLASSIFICATION | \$ | DESCRII Soil type, texture, structure, ri | PTION OF STE | RATA asticity, rocks | s, oxidation, mponents, | CONSISTENCY | DENSITY INDEX | | TYPE | DEPTH (M) | | RES | SULTS | | ıs |
| Ī | A N | lil | N | D 0 | 0.1 | | | * * * | × sm | | SILTY SAN | ND - Medium | grained. | | | | | | | | | | | |
| Ī | A A | lil | N | М | | | | | SP | | SAND - Medium g | | | | | | | А | 0.2 | 2193/30 | | | | |
| ŀ | | + | - | | 0.25 | | | | | - | (1-40mm, 25%), ora | erminated at (| | contents. | | | | Α | 0.25 | 2193/30 | 7/ 0.25 | | | |
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| L | | | | | 1.5 | | | | | | | | | | | | | | | | | | | 4. <u>5</u> |
| | N X BH HA E CC V TC | Natu Exis Back Hand Exca Conci V-Bit | ral exp ting ex hoe be auge vator rete C | er | re SH ation SC RB Nil | JPPC I Sh S Ro No | noring notcre ock E | ete X No solts ∇ W | ne obs t meas ater lev | sured vel utflow | D Dry L Lo | ow VS oderate S gh F efusal St VSt H | SISTENCY Very Soft Soft Firm Stiff Very Stiff Hard Friable | DENSITY VL Very Loose L Loose MD Medium D D Dense VD Very Dens | se A A B E Dense U U D [G M N Ux 1 | Auger s Bulk sa Undistu Disturb Moistur Tube si | urbed sam led sampl re content ample (x r mental sa | nple le t mm) | S VS DCI FD WS | Standard Vane she P Dynam penetro Field den Water sa | ic cone meter sity | test S | CLASSIFICAT SYMBOLS AN SOIL DESCRI Y USCS N Agricultu | ID PTION |
| t | <u> </u> | Jµa0€ | | _ | | | | EXCAVAT | ION L | OG T | O BE READ IN CONJU | JNCTION WITH | H ACCOMF | PANYING REPO | ORT NOTE | ES AN | ND ABBI | REV | IATIO | NS | | | | |
| <u> </u> | | | | _ | | | | | | | | MARTENS & | | | | T | | | | | orin | - I | | |

| CLIEN | | _ | | | y Group | | 4 | COMMENCED | 0/3/14 | | JMPLE I ED | | | | | BH308 | |
|------------------------|--|---|-------------------------------------|--------------------------|---|---|---|---|--|------------------|---|---------------|---|-------------------------------|---|---------------------------------------|---------------|
| PROJE | СТ | +- | | | s Asses | | | LOGGED | BR | | IECKED | GT | | | Sheet ' | | |
| SITE | | Lo | ot 3 DP | | | | DP755952 | GEOLOGY | Nowra Sandstone | | GETATION | | | | PROJECT | NO. P0802193 | |
| EQUIPME | | | | | nted hydraul | ic aug | er | EASTING | NA | | SURFACE | _ | | | 1 | 1 | |
| EXCAVAT | | | | | 2.0m depth | | | NORTHING | NA TA | AS | PECT | North E | | CAR | SLOPE | 1-2% | |
| SUPPORT N | WATER | MOISTURE | DEPTH (M) | PENETRATION H RESISTANCE | GRAPHIC LOG | CLASSIFICATION | DESCRII Soil type, texture, structure, particle characteristics, org | PTION OF STR. mottling, colour, pi janics, secondary a ontamination, odou | ATA asticity, rocks, oxice | dation, ents, | CONSISTENCY | DENSITY INDEX | | DEPTH (M) | | STING SULTS AND AL OBSERVATIONS | |
| V Nil | N | М | - 0.2 | | × × × × × × × × × | SM | SILTY SAND - Fin | ne to medium | grained, brow | n. | | | А | 0.1 | 2193/308/0.1 | | - |
| V Nil | N | М | - - - 0.6 | | | sc | CLAYEY S | SAND - Yellov | v brown. | | | | A | 0.4 | 2193/308/0.4 | | |
| V Nil | N | М | _ _ _ _ 1.0 | | | SW | SAND - Trace of yellow bi | gravels 5-10n rown, slightly | | nd | | | A | 0.7 | 2193/308/0.7 | | - - 1.0 |
| V Nil | N | М | - - 1.5 | | | CL | SANDY CLAY - Trace | e of gravels, r | ed brown and | grey. | | | A | 1.5 | 2193/308/1.5 | | - |
| V Nil | N | М | - - - 2.0 | | 7 P 7 P 7 P 7 P 7 P 7 P 7 P 7 P 7 P 7 P | VL | SANDSTONE - Re weathered, very lo | ed brown, ext ow strength, o properties. | remely to high clayey sand lik | nly e | | | A | 2.0 | 2193/308/2.0 | | 2.0 |
| | | | | | | | strer | al at 2.0m on | e. | | | | | | | | 3.0 |
| X E: BH Ba HA Ha | atural xisting ickhoe and au ccavat ncrete Bit ngster | expos g exca e buck iger or e Core | ure Si- vation S(et Ri Ni | 3 Rock Bol I No suppo | ts <u>▼</u> Wat ort ▼ Wat ▶ Wat | e obse measu er leve er outf er inflo | rved D Dry L Lored M Moist M M. I W Wet H Hi. Wp Plastic limit R Reflow WI Liquid limit | ow VS oderate S gh F efusal St VSt H F | Very Soft VL Soft L Firm MD Stiff D Very Stiff VD Hard Friable | | A Aug B Bulk e U Und D Dist M Mois Ux Tub E Envir | | ample nple ent (x mm) sample (JAR) | S S VS DCF FD WS PID | Pocket penetrometer Standard penetration Vane shear b Dynamic cone penetrometer Field density Water sample Photo Ionization De | Y USCS N Agricultur | TION |

| PROJECT Acid Sulfriate Solid Assessment Confere Research Conference Con | CLI | EN | Γ | Τν | wynam | Prope | erty G | roup |) | | COMMENCED | 6/3/14 | | COMPLETE | 6/3/1 | 4 | | | REF | Bŀ | 1309 | |
|--|---------|------------|----------------|---------------|------------------------------|----------------------------|----------------|-------------------|-----------------|---|--------------------------------------|----------------------------------|-------------------|-----------------|----------------------|----------------------|-----------|---------------------------|---------------|-----------|--------------|---|
| SOUTH COLUMN SOUT | PRO | ΟJΕ | СТ | A | cid Sulf | ate S | oils A | sses | sme | ent | LOGGED | BR | | CHECKED | GT | | | | | | | |
| Martinary Mart | SIT | E | | Le | ot 3 DP | 56861 | 3 and | Lot | 384 | DP755952 | GEOLOGY | Nowra Sandstone |) | VEGETATIO | N Gras | s | | | PROJECT N | NO. P0802 | 2193 | |
| SAMPLING & TESTING | | | | | | Truck m | ounted h | ydraul | ic aug | er | | | | | E NA | | | | | | | |
| No. 10 10 10 10 10 10 10 1 | | | | | | | X 1.8m | depth | | | | | | ASPECT | East | | | | | | | \dashv |
| N | | EX | CAV | /AI | ION DA | | | | | M <i>A</i> | ATERIAL DA | ATA . | | | | | SA | MPLIN | G & TES | TING | | _ |
| No. | METHOD | SUPPORT | WATER | MOISTURE | DEPTH (M) | L PENETRATION H RESISTANCE | « | GRAPHIC LOG | CLASSIFICATION | Soil type, texture, structure, particle characteristics, org | mottling, colour, planics, secondary | asticity, rocks, oxid | lation, ents, | CONSISTENCY | DENSITY INDEX | TYPE | DEPTH (M) | Al | | | | |
| No | ٧ | Nil | N | М | _ 0.2 | | (× (× | × × × × × × | ML | 5 | SILT - Grey. | | | | | А | 0.1 | 2193/30 | 9/0.1 | | | |
| V No N N M M | > | Nil | Ν | М | 0.4 | | | | 1 | SAND - Fine | to medium gra | ained, grey. | | | | A | 0.3 | 2193/30 | 9/0.3 | | | - |
| SANDY CLAY - Grey, light brown and red brown mottled, tending to predominantly red after approximately 1.25m. V. No. 10, 10, 11, 12, 13, 14, 15, 15, 15, 15, 15, 15, 15, 15, 15, 15 | ٧ | Nil | Z | М | _ _ 0.7 | | | | sc | CLAYEY SAND | - Light brown, | slightly moist. | - | | | A | 0.5 | 2193/30 | 9/0.5 | | | - |
| V N N N N M | > | Nil | Z | М | - - 1.0 - - - | | | | CL | mottled, tending | to predomina | intly red after | wn | | | | | | | | | 1.0 |
| SANDY CLAY - Light grey, possibly moist engury. V bit refusal at 1.8m on sandstone (assumed). | V | Nii | N | M | | | _ | | CI | | | | | | | A | 1.75 | 2193/30 | 9/1.75 | | | \dashv |
| COURSENT METHOD SUPPORT Notes and Most Ture PENETRATION CONSISTENCY DENSITY N. Returnal exposure S h Shoring N. Not measured M. Moderal Penetral Notes and Society Will be a served by the served of the served by the served of the served by the served of the served by | V | INII | IN | IVI | 1.8 | | 19 | P / | CL. | SANDY CLAY - Lig to be indicative of | ht grey, possi holding groun | bly moist enou d water, sugar | ugh ry. / | | | | | | | | | \dashv |
| N Natural exposure SH Shoring N None observed D Dry L Low VS Very Soft L Loose B B Bulk sample S Standard penetration test S Solt L Loose B B Bulk sample S Standard penetration test S Solt L Loose B B Bulk sample S Standard penetration test S Solt D D Dry Water level W Wet High F Firm MD Medium Dense U Undisturbed sample VS Vanes shear C C Concrete Corer V V-Bit T C Tungsten Carbide Bit S Spade EXCAVATION LOG TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT NOTES AND Abgreather S Standard penetration test S Solt L Loose B B Bulk sample S Standard penetration test S Solt DESCRIPTION SOLD DESCRIPTION WITH ACCOMPANYING REPORT NOTES AND Abgreather S Standard penetration test S Sold Description S | | | | | 3.0 | | | | | | | | | | | | | | | | | 2.0 - - - - 3.0 - - - - - - - - - - - - - - - - - - - |
| HA Hand auger E Excavator CC Concrete Corer V V-Bit TC Tungsten Carbide Bit S Spade EXCAVATION LOG TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS Wp Plastic limit R Refusal St Stiff D Dense VSt Very Stiff VD Very Dense M Moisture content penetrometer penetromet | N X | Na Ex | tural disting | expos exca | ure Sh vation SC | H Shorin | ig N rete X | Non- | e obse measu | erved D Dry L Lo rred M Moist M M | ow VS oderate S | Very Soft VL Soft L | Very Loo Loose | se A Au B Bu | ger samp k sample | ole e | pp S | Standard | penetration t | SYM | BOLS AND | |
| CC Concrete Cover V V-Bit TC Tungsten Carbide Bit S Spade EXCAVATION LOG TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS LY Tube sample (x mm) FD Field density N Agricultural E Environmental sample (JAR) PID Photo Ionization Detector EXCAVATION LOG TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS | HA | Ha Ex | nd au cavat | ger or | Nil | | pport | | | Wp Plastic limit R Re | efusal St | Stiff D | Dense | D Dis | turbed s | ample | | CP Dynam | ic cone | Y | USCS | |
| TC Tungsten Carbide Bit Spade (JAR) PID Photo Ionization Detector S Spade EXCAVATION LOG TO BE READ IN CONJUNCTION WITH ACCOMPANYING REPORT NOTES AND ABBREVIATIONS | CC V | Cor V-B | ncrete Bit | Core | | | | | | | Н | Hard | . S. y Deils | Ux Tu | oe sampl | le (x mm tal samp | le W |) Field der S Water sa | isity mple | | Agricultural | |
| | | | | Carb | ide Bit | | | | | | | | | | | (JAR) | PI | D Photo Io | | ector | | |
| | | | | | | | EXCA | VATIO | ON LO | OG TO BE READ IN CONJU | | | | PORT NOTE | S AND | ABBRE | VIAT | IONS | | | | _ |

| | | | | | | | y Group | | | | | COMINEN | | | COMPLET | |)/ I *+ | | | KEF | BH310 |
|-------------------------------------|---|--|----------|----------------------------------|---------------|---|-------------|---|-------------------------------------|--|----------------------------|---|--|---|------------------------------------|--|----------------------------|----------------------------------|--|---|--|
| | OJE | СТ | _ | | | | s Asses | | | | | LOGGED | BR | | CHECKED | - | | | | Sheet 1 o | |
| SIT | | | Lo | t 3 DP5 | _ | | nd Lot | 384 | DP75 | 5952 | | GEOLOGY | | andstone | VEGETAT | | ass | | | PROJECT NO. | P0802193 |
| | IPMEN | | | | | d Auger | | | | | | EASTING | | | RL SURFA | | | | T. | | |
| EXC | | | DIMENS | | _ | mmØ X | 0.08m dept | :h | | | | NORTHIN | | | ASPECT | No | rth | | | SLOPE | 3-5% |
| | EX | CAV | ATI | ON DA | | | | - | | | MA | TERIAL | . DATA | | | | | SA | MPLING | 3 & TESTI | NG |
| МЕТНОБ | SUPPORT | WATER | MOISTURE | DEPTH (M) | L PENETRATION | RESISTANCE | GRAPHIC LOG | CLASSIFICATION | So pa | E il type, texture, s article characteri | tructure, n stics, orga | PTION OF nottling, colo anics, second ntamination, | ur, plasticity, ro dary and minor | cks, oxidation, components, | CONSISTENCY | DENSITY INDEX | TYPE | DEPTH (M) | Αſ | RESUL ODITIONAL C | TS AND BSERVATIONS |
| НА | Nil | N | М | 0.08 | | | × × × | SM | | SILTYS | AND - I | Medium r | ounded gra | ained, | | | А | 0.05 | 2193/310 - Minor on | 0/ 0.05 | |
| | | | - | - - - | | | | | | | hole te | | at 0.08m o sandstone. | | | | | | | | - - - |
| | | | - | - | | | | | | | | | | | | | | | | | - - - - |
| | | | - | - 1.0 | | | | | | | | | | | | | | | | | - 1 <u>.0</u> |
| | | | - | - - - | | | | | | | | | | | | | | | | | - - - |
| | | | - | - | | | | | | | | | | | | | | | | | <u>-</u> |
| | | | | - - | | | | | | | | | | | | | | | | | - - |
| | | | <u>-</u> | | | | | | | | | | | | | | | | | | <u>-</u> 2.0 |
| | | | - | - | | | | | | | | | | | | | | | | | - - |
| | | | - | - - - | | | | | | | | | | | | | | | | | <u>-</u> - |
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| | | | | 3.0 - | | | | | | | | | | | | | | | | | 3 <u>.0</u> – |
| | | | - | - - | | | | | | | | | | | | | | | | | - - - |
| | | | - | - | | | | | | | | | | | | | | | | | - |
| | | | | - - - | | | | | | | | | | | | | | | | | - - - |
| | | | | <u>4.0</u> – | | | | | | | | | | | | | | | | | 4 <u>.0</u> _ |
| | | | | - - - | | | | | | | | | | | | | | | | | - - |
| | | | | 4.5 | | | | | | | | | | | | | | | | | 4.5 |
| N Bi H/ E C(V T(| Na Ex H Bad A Had Exd C Cor V-B | atural e xisting ckhoe ind aug cavato ncrete Bit igsten | | re SH ation SC t RE Nil | Sh Ro | ORT loring lotcrete lock Bolts suppoi | s 🅎 Wa | e obse measu ter leve ter outf | erved [red \ el \ low \ | MOISTURE D Dry Moist W Met W Plastic limit WI Liquid limit | L Lo | w oderate h fusal | CONSISTENC VS Very Soft S Soft F Firm St Stiff VSt Very Stiff H Hard F Friable | VL Very Lo L Loose MD Medium D Dense | ose A B I Dense U D D I nse M I Ux | Auger sar Bulk samp Undisturb Disturbed Moisture Tube sam | ole ed sample sample | pr S V: D: FI e W | S Vane shea CP Dynamic penetron D Field dens S Water san | penetration test ar c cone neter sity | CLASSIFICATION SYMBOLS AND SOIL DESCRIPTION Y USCS N Agricultural |
| | | | | | | Е | XCAVATI | ON LO | OG TO | BE READ IN | CONJU | NCTION V | VITH ACCO | MPANYING REI | PORT NOTI | ES AND | ABBRE | VIATIO | ONS | | |
| | | |) | | | | | | | | | MARTEN | S & ASSOCI | ATES PTY LTD | | | F | nc | vino. | orina | Log - |

| CL | .IEN | Т | Т | wynam | Pro | pert | y Group |) | | COMMENCED | 6/3/14 | co | MPLETED | 6/3/14 | | | | REF B | 3H311 |
|------------------|--|--|--|-------------------------------------|--|-------------------------------------|--|---|--|---|--|------------------------|--|--|---|--|--|--|--------|
| PF | OJE | СТ | Α | cid Sulf | ate : | Soil | s Asses | sme | ent | LOGGED | BR | СНІ | ECKED | GT | | | | Sheet 1 of 1 | _ |
| SI | | | L | ot 3 DP5 | 686 | 13 a | and Lot | 384 | DP755952 | GEOLOGY | Nowra Sandstone | VE | GETATION | Grass | | | | PROJECT NO. PO | 802193 |
| - | JIPME | | | | | l Auge | | | | EASTING | NA | | SURFACE | NA | | | | | |
| EXC | | | | ION DA | | nmØ > | < 1.0m depth | | M | NORTHING ATERIAL DA | NA | ASI | PECT | East | | 64 | | G & TESTING | |
| \vdash | | CA | AI | ION DA | | | | z | IVIA | ATERIAL DA | AIA . | | | J | | SA | INIPLIN | G & TESTING | |
| METHOD | SUPPORT | WATER | MOISTURE | DEPTH (M) | L W PENETRATIO | H RESISTANCE | GRAPHIC LOG | CLASSIFICATION | Soil type, texture, structure, particle characteristics, org | PTION OF STR mottling, colour, pla anics, secondary a ontamination, odou | asticity, rocks, oxidation, and minor components, | | CONSISTENCY | DENSITY INDEX | TYPE | DEPTH(M) | A | RESULTS A DDITIONAL OBSE | |
| НА | | N | М | 0.08 | | | ^ × * × ^ | ML | ORGANIC SILTY SA | ND - Fine gra | ained, grey/brown. | | | | A | 0.15 | 2193/31 | 1/0.15 | - |
| HA | Nil | N | М | 0.25 | | | | SP | SAND - Fine to me | edium grained | , rounded, grey. | | | | | 0.10 | 2100,0 | | - |
| НА | Nil | N | М | 0.45 | | | | SP | SAND - Medium gr | ained, rounde | d, brown/orange. | | | | | | | | - |
| НА | Nil | N | М | _ _ | | | | CL | SANDY CLAY trace angular fine | - Medium gra to medium g gold/orange. | nined sands, rained gravels, | | | | Α | 0.6 | 2193/31 - Clay co | 1/0.6 ntent increasing with de | epth. |
| НА | Nil | N | М | - | | | | CL | CLAY - Medium grain mottle | ed rounded sa | | n | | | | 4.0 | 0400/04 | 4/4.0 | - |
| | | | | 1.0 | | | | | Parahala tarmin | atad at 1 0m | on stiff alova | | | | Α | 1.0 | 2193/31 | 17/1.0 | 1.0 |
| | | | | - | | | | | Borehole termin | alcu al I.UIII | on sun clays. | | | | | | | | - |
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| | | | | 4.5 | | | | | | | | | | | | | | | 4.5 |
| N E H E | N Ni K E BH Ba HA Ha E E CC Co V-I | atural of xisting ackhoe and au accavate oncrete Bit angsten | expos exca buck ger or Core | ure SF vation SC et RE Nil | JPPOR H Sho C Sho B Roo I No | oring otcrete ck Bol suppo | ts <u>▼</u> Wate ort ▼ Wate ► Wate | e obse measu er leve er outf er inflo | erved D Dry L Lo med M Moist M M el W Wet H Hi Wp Plastic limit R Ro low WI Liquid limit | ow VS oderate S gh F efusal St VSt H F | Soft L Loos Firm MD Medi Stiff D Dens Very Stiff VD Very I Hard Friable | um Dense e Dense | e U Undis D Distu M Moist Ux Tube E Enviro | r sample sample sturbed s rbed sar ture cont sample onmental | sample mple tent (x mm) I sample (JAR) | pp S VS DC FC W: PII | Standard S Vane she CP Dynam penetro D Field der S Water sa D Photo lo | penetrometer S' penetration test Si per cone penetration test Si per cone penetration test Si per cone penetration test Si pen | _ |
| \vdash | | | - | | | E | =XCAVATI(| ON LO | OG TO BE READ IN CONJU | | ASSOCIATES PTY I | | NOTES A | and Ae | BBRE\ | /IATIC | JNS | . - | |

8 Attachment C – Laboratory Results Summary



SPOCUS LABORATORY TEST INTERPRETATION FORM



6/37 Leighton Place, Hornsby, NSW 2077, Ph: (02) 9476 9999 Fax: (02) 9476 8767, mail@martens.com.au, www.martens.com.au

Client Tynam Property Group Page No. 1 of 1 Project Acid Sulfate Soils Assessment Date 18.03.2014 Sampling Site Lot 3 DP 568613 and Lot 384 DP 755952 Proceedure ST-50

P0802193 Sample History Sampled on 06.03.2014 Job Number

> Sampled By BR/GT

Assumed Parameters

Gs - Specific gravity (g/cm³)

NA

M - Exposed soil mass (t)

NA

| Borehole | Sample Depth (m) | Material Type ¹ | pH _{KCL} ² | pH _{ox} ³ | TPA (mol H+/t) ⁴ | TSA (mol H+/t) ⁵ | S _{POS} (%S oxidisable) ⁶ | Assessment ⁷ | Liming Rate (kg CaCO ₃ /t) |
|------------|---------------------|----------------------------------|--------------------------------|-------------------------------|--------------------------------|--------------------------------|--|---|--|
| | | (F) Fine grained. > 40 % clay. | | < 3.5 = PASS | 62 | 62 | 0.100 | TPA, TSA, S _{POS} > criteria = PASS. | |
| Assessment | Criteria | (M) Medium grained. 5-40 % clay. | ≤ 4 = AASS | $pHK_{CL}-pH_{OX}>1 =$ | 36 | 36 | 0.060 | Exposed soil >1000t, use coarse grained | |
| | | (C) Coarse grained. < 5 % Clay. | | PASS | 18 | 18 | 0.030 | material criteria. | |
| BH301 | 0.50 | М | 4.7 | 4.3 | 41 | 21 | <0.005 | PASS | 1.50 |
| BH301 | 2.50 | М | 4.0 | 4.6 | 69 | <5 | <0.005 | AASS | 5.50 |
| BH302 | 0.30 | М | 4.8 | 3.6 | 36 | 21 | <0.005 | PASS | 1.20 |
| BH303 | 0.10 | М | 4.8 | 3.1 | 41 | 14 | 0.05 | PASS | 4.50 |
| BH303 | 0.50 | С | 4.8 | 3.4 | 81 | 56 | 0.01 | PASS | 2.40 |
| BH304 | 0.20 | М | 4.6 | 4.3 | 26 | <5 | <0.005 | NA | 1.70 |
| BH305 | 1.00 | М | 4.4 | 4.2 | 61 | 16 | 0.01 | PASS | 3.90 |
| BH305 | 2.50 | М | 4.2 | 4.8 | 41 | <5 | <0.005 | PASS | 3.60 |
| BH306 | 0.30 | М | 4.5 | 3.8 | 66 | 36 | 0.03 | PASS | 3.80 |
| BH307 | 0.20 | С | 4.6 | 4.2 | 94 | 59 | 0.02 | PASS | 3.50 |
| BH308 | 1.50 | М | 4.8 | 4.4 | 29 | <5 | <0.005 | NA | 1.90 |
| BH309 | 0.50 | М | 5.0 | 4.6 | 9 | <5 | 0.01 | NA | 1.70 |
| BH309 | 1.75 | М | 4.0 | 4.3 | 71 | <5 | <0.005 | AASS | 5.50 |
| BH310 | 0.05 | С | 6.3 | 3.8 | <5 | <5 | 0.02 | PASS | 0.87 |
| BH311 | 0.60 | М | 4.4 | 4.2 | 56 | 9 | 0.006 | PASS | 3.90 |
| BH311 | 1.00 | F | 4.3 | 4.3 | 66 | <5 | <0.005 | PASS | 4.90 |

<u>Notes</u>

- 1. Material type based on field texture assessment or laboratory report
- 2. Field or laboratory pH can be used here. Change header if field pH used.
- 3. Post peroxide oxidation pH
- 4. Total Potential Acidity
- 5. Total Sulfidic Acidity
- 6. Percentage oxidisable sulphur
- 7. NA = not AASS or PASS, AASS = Actual Acid Sulfate Soil, PASS = Potential Acid Sulfate Soil

9 Attachment D – Laboratory Report





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 106204

Client:

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

Attention: Ben Rose

Sample log in details:

Your Reference: ASS- Mundamia (2193)

No. of samples: 16 soils

Date samples received / completed instructions received 07/03/14 / 07/03/14

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: 17/03/14 / 17/03/14

Date of Preliminary Report: Not issued

NATA accreditation number 2901. This document shall not be reproduced except in full.

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

Results Approved By:

Jacinta/Hurst Laboratory Manager



| sPOCAS | | | | | | |
|----------------------------|-------------------------|------------|------------|------------|------------|------------|
| Our Reference: | UNITS | 106204-1 | 106204-2 | 106204-3 | 106204-4 | 106204-5 |
| Your Reference | | 2193/301 | 2193/301 | 2193/302 | 2193/303 | 2193/303 |
| Depth | | 0.5 | 2.5 | 0.3 | 0.1 | 0.5 |
| Date Sampled | | 06/03/2014 | 06/03/2014 | 06/03/2014 | 06/03/2014 | 06/03/2014 |
| Type of sample | | soil | soil | soil | soil | soil |
| Date prepared | - | 10/03/2014 | 10/03/2014 | 10/03/2014 | 10/03/2014 | 10/03/2014 |
| Date analysed | - | 10/03/2014 | 10/03/2014 | 10/03/2014 | 10/03/2014 | 10/03/2014 |
| pH ка | pH units | 4.7 | 4.0 | 4.8 | 4.8 | 4.8 |
| TAA pH 6.5 | moles H+/t | 20 | 72 | 15 | 27 | 25 |
| s-TAA pH 6.5 | %w/w S | 0.03 | 0.12 | 0.02 | 0.04 | 0.04 |
| pH ox | pH units | 4.3 | 4.6 | 3.6 | 3.1 | 3.4 |
| TPApH6.5 | moles H ⁺ /t | 41 | 69 | 36 | 41 | 81 |
| s-TPA pH 6.5 | %w/w S | 0.07 | 0.11 | 0.06 | 0.07 | 0.13 |
| TSA pH 6.5 | moles H ⁺ /t | 21 | <5 | 21 | 14 | 56 |
| s-TSA pH 6.5 | %w/w S | 0.03 | <0.01 | 0.03 | 0.02 | 0.09 |
| ANCE | %CaCO3 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| a-ANCe | moles H ⁺ /t | <5 | <5 | <5 | <5 | <5 |
| s-ANCe | %w/w S | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Skci | %w/w S | 0.01 | 0.02 | <0.005 | <0.005 | 0.02 |
| Sp | %w/w | 0.01 | 0.02 | <0.005 | 0.05 | 0.03 |
| Spos | %w/w | <0.005 | <0.005 | <0.005 | 0.05 | 0.01 |
| a-Spos | moles H ⁺ /t | <5 | <5 | <5 | 33 | 7 |
| Саксі | %w/w | 0.02 | <0.005 | 0.01 | 0.07 | 0.009 |
| Сар | %w/w | 0.02 | <0.005 | 0.01 | 0.06 | 0.01 |
| Сад | %w/w | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| Mg kcı | %w/w | 0.007 | 0.010 | 0.006 | 0.022 | 0.006 |
| Mg₽ | %w/w | 0.007 | 0.010 | 0.006 | 0.025 | 0.007 |
| MgA | %w/w | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| Shci | %w/w S | [NT] | 0.023 | [NT] | [NT] | [NT] |
| Snas | %w/w S | [NT] | <0.005 | [NT] | [NT] | [NT] |
| a-Snas | moles H ⁺ /t | [NT] | <5 | [NT] | [NT] | [NT] |
| s-Snas | %w/w S | [NT] | <0.01 | [NT] | [NT] | [NT] |
| Fineness Factor | - | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |
| a-Net Acidity | moles H ⁺ /t | 20 | 73 | 16 | 60 | 32 |
| Liming rate | kg CaCO3/t | 1.5 | 5.5 | 1.2 | 4.5 | 2.4 |
| a-Net Acidity without ANCE | moles H ⁺ /t | NA | NA | NA | NA | NA |
| Liming rate without ANCE | kg CaCO3/t | NA | NA | NA | NA | NA |

| | | | <u> </u> | | <u> </u> | <u> </u> |
|--|-------------------------|---|---|---|---|--|
| sPOCAS Our Reference: Your Reference Depth Date Sampled Type of sample | UNITS | 106204-6 2193/304 0.2 06/03/2014 soil | 106204-7 2193/305 1.0 06/03/2014 soil | 106204-8 2193/305 2.5 06/03/2014 soil | 106204-9 2193/306 0.3 06/03/2014 soil | 106204-10 2193/307 0.2 06/03/2014 soil |
| Date prepared | - | 10/03/2014 | 10/03/2014 | 10/03/2014 | 10/03/2014 | 10/03/2014 |
| Date analysed | - | 10/03/2014 | 10/03/2014 | 10/03/2014 | 10/03/2014 | 10/03/2014 |
| pH ка | pH units | 4.6 | 4.4 | 4.2 | 4.5 | 4.6 |
| TAA pH 6.5 | moles H ⁺ /t | 22 | 45 | 47 | 30 | 35 |
| s-TAA pH 6.5 | %w/w S | 0.04 | 0.07 | 0.08 | 0.05 | 0.06 |
| pH ox | pH units | 4.3 | 4.2 | 4.8 | 3.8 | 4.2 |
| TPA pH 6.5 | moles H ⁺ /t | 26 | 61 | 41 | 66 | 94 |
| s-TPA pH 6.5 | %w/w S | 0.04 | 0.1 | 0.07 | 0.11 | 0.15 |
| TSA pH 6.5 | moles H ⁺ /t | <5 | 16 | <5 | 36 | 59 |
| s-TSA pH 6.5 | %w/w S | <0.01 | 0.03 | <0.01 | 0.06 | 0.09 |
| ANCE | %CaCO₃ | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| a-ANCE | moles H ⁺ /t | <5 | <5 | <5 | <5 | <5 |
| s-ANCe | %w/w S | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| SkCI | %w/w S | <0.005 | 0.02 | 0.02 | 0.02 | <0.005 |
| Sp | %w/w | <0.005 | 0.03 | 0.01 | 0.05 | 0.02 |
| Spos | %w/w | <0.005 | 0.01 | <0.005 | 0.03 | 0.02 |
| a-Spos | moles H ⁺ /t | <5 | 6 | <5 | 20 | 12 |
| Саксі | %w/w | <0.005 | 0.007 | <0.005 | <0.005 | 0.005 |
| Сар | %w/w | <0.005 | 0.006 | <0.005 | <0.005 | 0.005 |
| Сад | %w/w | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| M gkcı | %w/w | 0.005 | 0.019 | 0.010 | 0.007 | 0.008 |
| МдР | %w/w | <0.005 | 0.020 | 0.010 | 0.007 | 0.010 |
| MgA | %w/w | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| Shci | %w/w S | [NT] | 0.024 | 0.015 | [NT] | [NT] |
| Snas | %w/w S | [NT] | <0.005 | <0.005 | [NT] | [NT] |
| a-Snas | moles H ⁺ /t | [NT] | <5 | <5 | [NT] | [NT] |
| s-Snas | %w/w S | [NT] | <0.01 | <0.01 | [NT] | [NT] |
| Fineness Factor | - | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |
| a-Net Acidity | moles H ⁺ /t | 22 | 52 | 47 | 50 | 47 |
| Liming rate | kg CaCO3/t | 1.7 | 3.9 | 3.6 | 3.8 | 3.5 |
| a-Net Acidity without ANCE | moles H ⁺ /t | NA | NA | NA | NA | NA |
| Liming rate without ANCE | kg CaCO3/t | NA | NA | NA | NA | NA |

| -DOCAS | | T | | T | | T |
|----------------------------|-------------------------|------------|------------|------------|------------|------------|
| sPOCAS Our Reference: | UNITS | 106204-11 | 106204-12 | 106204-13 | 106204-14 | 106204-15 |
| Your Reference | | 2193/308 | 2193/309 | 2193/309 | 2193/310 | 2193/311 |
| Depth | | 1.5 | 0.5 | 1.75 | 0.05 | 0.6 |
| Date Sampled | | 06/03/2014 | 06/03/2014 | 06/03/2014 | 06/03/2014 | 06/03/2014 |
| Type of sample | | soil | soil | soil | soil | soil |
| Date prepared | - | 10/03/2014 | 10/03/2014 | 10/03/2014 | 10/03/2014 | 10/03/2014 |
| Date analysed | - | 10/03/2014 | 10/03/2014 | 10/03/2014 | 10/03/2014 | 10/03/2014 |
| pH ка | pH units | 4.8 | 5.0 | 4.0 | 6.3 | 4.4 |
| TAA pH 6.5 | moles H ⁺ /t | 25 | 12 | 72 | <5 | 47 |
| s-TAA pH 6.5 | %w/w S | 0.04 | 0.02 | 0.12 | <0.01 | 0.08 |
| рН оҳ | pH units | 4.4 | 4.6 | 4.3 | 3.8 | 4.2 |
| TPApH6.5 | moles H ⁺ /t | 29 | 9 | 71 | <5 | 56 |
| s-TPA pH 6.5 | %w/w S | 0.05 | 0.01 | 0.11 | <0.01 | 0.09 |
| TSA pH 6.5 | moles H+/t | <5 | <5 | <5 | <5 | 9 |
| s-TSA pH 6.5 | %w/w S | <0.01 | <0.01 | <0.01 | <0.01 | 0.01 |
| ANCE | %CaCO₃ | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| a-ANCe | moles H ⁺ /t | <5 | <5 | <5 | <5 | <5 |
| s-ANCe | %w/w S | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Skci | %w/w S | 0.05 | <0.005 | 0.02 | <0.005 | 0.02 |
| SP | %w/w | 0.05 | 0.02 | 0.02 | 0.02 | 0.03 |
| Spos | %w/w | <0.005 | 0.01 | <0.005 | 0.02 | 0.006 |
| a-Spos | moles H ⁺ /t | <5 | 10 | <5 | 10 | <5 |
| Саксі | %w/w | 0.01 | 0.06 | 0.007 | 0.17 | 0.03 |
| Сар | %w/w | 0.01 | 0.06 | <0.005 | 0.20 | 0.03 |
| Сал | %w/w | <0.005 | <0.005 | <0.005 | 0.032 | <0.005 |
| Мдксі | %w/w | 0.023 | 0.013 | 0.025 | 0.026 | 0.018 |
| MgP | %w/w | 0.023 | 0.014 | 0.027 | 0.038 | 0.018 |
| MgA | %w/w | <0.005 | <0.005 | <0.005 | 0.012 | <0.005 |
| Shci | %w/w S | [NT] | [NT] | 0.021 | [NT] | 0.018 |
| SNAS | %w/w S | [NT] | [NT] | <0.005 | [NT] | <0.005 |
| a-S _{NAS} | moles H ⁺ /t | [NT] | [NT] | <5 | [NT] | <5 |
| s-Snas | %w/w S | [NT] | [NT] | <0.01 | [NT] | <0.01 |
| Fineness Factor | - | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |
| a-Net Acidity | moles H ⁺ /t | 26 | 22 | 73 | 12 | 51 |
| Limingrate | kg CaCO3/t | 1.9 | 1.7 | 5.5 | 0.87 | 3.9 |
| a-Net Acidity without ANCE | moles H ⁺ /t | NA | NA | NA | NA | NA |
| Liming rate without ANCE | kg CaCO3/t | NA | NA | NA | NA | NA |

| sPOCAS | | |
|----------------------------|-------------------------|-------------------|
| Our Reference: | UNITS | 106204-16 |
| Your Reference | | 2193/311 |
| Depth Date Sampled | | 1.0 06/03/2014 |
| Type of sample | | soil |
| Date prepared | _ | 10/03/2014 |
| Date analysed | _ | 10/03/2014 |
| pH kd | pH units | 4.3 |
| TAA pH 6.5 | moles H ⁺ /t | 65 |
| • | %w/w S | 0.10 |
| s-TAA pH 6.5 | | 4.3 |
| pH ox | pH units | |
| TPApH6.5 | moles H ⁺ /t | 66 |
| s-TPA pH 6.5 | %w/w S | 0.11 |
| TSA pH 6.5 | moles H ⁺ /t | <5 |
| s-TSA pH 6.5 | %w/w S | <0.01 |
| ANCE | %CaCO₃ | <0.05 |
| a-ANCe | moles H ⁺ /t | <5 |
| s-ANCe | %w/w S | <0.05 |
| Skci | %w/w S | 0.04 |
| Sp | %w/w | 0.04 |
| Spos | %w/w | <0.005 |
| a-Spos | moles H+/t | <5 |
| Саксі | %w/w | 0.006 |
| Сар | %w/w | 0.005 |
| Сал | %w/w | <0.005 |
| Мgксı | %w/w | 0.020 |
| MgP | %w/w | 0.019 |
| MgA | %w/w | <0.005 |
| Shci | %w/w S | 0.031 |
| Snas | %w/w S | <0.005 |
| a-Snas | moles H ⁺ /t | <5 |
| s-Snas | %w/w S | <0.01 |
| Fineness Factor | - | 1.5 |
| a-Net Acidity | moles H+/t | 65 |
| Limingrate | kg CaCO3/t | 4.9 |
| a-Net Acidity without ANCE | moles H ⁺ /t | NA |
| Liming rate without ANCE | kg CaCO3/t | NA |

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

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| | | Cilc | nt Referenc | C. A. | SS- Mundam | iia (2193) | | |
|-----------------|----------------------------|-------|-------------|----------------|------------------|----------------------------|-----------|---------------------|
| QUALITYCONTROL | UNITS | PQL | METHOD | Blank | Duplicate Sm# | Duplicate results | Spike Sm# | Spike % Recovery |
| sPOCAS | | | | | | Base II Duplicate II % RPD | | , |
| Date prepared | - | | | 10/03/2 014 | 106204-1 | 10/03/2014 10/03/2014 | LCS-1 | 10/03/2014 |
| Date analysed | - | | | 10/03/2 014 | 106204-1 | 10/03/2014 10/03/2014 | LCS-1 | 10/03/2014 |
| pH kd | pH units | | Inorg-064 | [NT] | 106204-1 | 4.7 4.8 RPD:2 | LCS-1 | 96% |
| TAA pH 6.5 | moles H ⁺ /t | 5 | Inorg-064 | <5 | 106204-1 | 20 20 RPD:0 | LCS-1 | 121% |
| s-TAA pH 6.5 | %w/w S | 0.01 | Inorg-064 | <0.01 | 106204-1 | 0.03 0.03 RPD:0 | [NR] | [NR] |
| pH ox | pH units | | Inorg-064 | [NT] | 106204-1 | 4.3 4.5 RPD:5 | LCS-1 | 106% |
| TPApH6.5 | moles H ⁺ /t | 5 | Inorg-064 | <5 | 106204-1 | 41 29 RPD: 34 | LCS-1 | 103% |
| s-TPA pH 6.5 | %w/w S | 0.01 | Inorg-064 | <0.01 | 106204-1 | 0.07 0.05 RPD: 33 | [NR] | [NR] |
| TSA pH 6.5 | moles H ⁺ /t | 5 | Inorg-064 | <5 | 106204-1 | 21 9 RPD:80 | LCS-1 | 102% |
| s-TSA pH 6.5 | %w/w S | 0.01 | Inorg-064 | <0.01 | 106204-1 | 0.03 0.01 RPD: 100 | [NR] | [NR] |
| ANCE | % CaCO3 | 0.05 | Inorg-064 | <0.05 | 106204-1 | <0.05 <0.05 | [NR] | [NR] |
| a-ANCE | moles H ⁺ /t | 5 | Inorg-064 | <5 | 106204-1 | <5 <5 | [NR] | [NR] |
| s-ANCe | %w/w S | 0.05 | Inorg-064 | <0.05 | 106204-1 | <0.05 <0.05 | [NR] | [NR] |
| Skci | %w/w S | 0.005 | Inorg-064 | <0.005 | 106204-1 | 0.01 0.01 RPD: 0 | LCS-1 | 97% |
| Sp | %w/w | 0.005 | Inorg-064 | <0.005 | 106204-1 | 0.01 0.01 RPD: 0 | LCS-1 | 93% |
| Spos | %w/w | 0.005 | Inorg-064 | <0.005 | 106204-1 | <0.005 <0.005 | LCS-1 | 92% |
| a-Spos | moles H ⁺ /t | 5 | Inorg-064 | <5 | 106204-1 | <5 <5 | LCS-1 | 93% |
| Саксі | %w/w | 0.005 | Inorg-064 | <0.005 | 106204-1 | 0.02 0.03 RPD: 40 | LCS-1 | 101% |
| Сар | %w/w | 0.005 | Inorg-064 | <0.005 | 106204-1 | 0.02 0.02 RPD:0 | [NR] | [NR] |
| CaA | %w/w | 0.005 | Inorg-064 | <0.005 | 106204-1 | <0.005 <0.005 | [NR] | [NR] |
| Мдксі | %w/w | 0.005 | Inorg-064 | <0.005 | 106204-1 | 0.007 0.006 RPD:15 | LCS-1 | 99% |
| Mg₽ | %w/w | 0.005 | Inorg-064 | <0.005 | 106204-1 | 0.007 0.007 RPD:0 | [NR] | [NR] |
| MgA | %w/w | 0.005 | Inorg-064 | <0.005 | 106204-1 | <0.005 <0.005 | [NR] | [NR] |
| Shci | %w/w S | 0.005 | Inorg-064 | <0.005 | [NT] | [NT] | [NR] | [NR] |
| Snas | %w/w S | 0.005 | Inorg-064 | <0.005 | [NT] | [NT] | [NR] | [NR] |
| a-Snas | moles H ⁺ /t | 5 | Inorg-064 | <5 | [NT] | [NT] | [NR] | [NR] |
| s-Snas | %w/w S | 0.01 | Inorg-064 | <0.01 | [NT] | [NT] | [NR] | [NR] |
| Fineness Factor | - | 1.5 | Inorg-064 | <1.5 | 106204-1 | 1.5 1.5 RPD:0 | LCS-1 | 94% |
| a-Net Acidity | moles H ⁺ /t | 10 | Inorg-064 | <10 | 106204-1 | 20 21 RPD:5 | LCS-1 | 93% |
| Liming rate | kg CaCO3 | 0.75 | Inorg-064 | <0.75 | 106204-1 | 1.5 1.6 RPD:6 | [NR] | [NR] |

| | | 0110 | 110 1101010110 | · | oo manaam | ia (±100) | | |
|-------------------------------|----------------------------|------|----------------|-------|------------------|---------------------------|-----------|---------------------|
| QUALITYCONTROL | UNITS | PQL | METHOD | Blank | Duplicate Sm# | Duplicate results | Spike Sm# | Spike % Recovery |
| sPOCAS | | | | | | Base II Duplicate II %RPD | | |
| a-Net Acidity without ANCE | moles H ⁺ /t | 10 | Inorg-064 | <10 | 106204-1 | NA NA | [NR] | [NR] |
| Liming rate without ANCE | kg CaCO3 | 0.75 | Inorg-064 | <0.75 | 106204-1 | NA NA | [NR] | [NR] |

Report Comments:

Asbestos ID was analysed by Approved Identifier:

Asbestos ID was authorised by Approved Signatory:

Not applicable for this job

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

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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