13 November 2009

EQUINIX SY3 DATA CENTRE, MASCOT

Acid Sulfate Soil Management Plan

Submitted to:
ARUP
Level 10, 201 Kent Street
Sydney NSW 2000

REPORT

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APPENDICES

1.0 INTRODUCTION

Golder Associates (Golder) has been commissioned by ARUP Pty Ltd, on behalf of Equinix Australia, to prepare this Acid Sulfate Soil Management Plan (ASSMP) for the proposed Equinix SY3 data centre building development. The site is located at 639 Gardeners Road, Mascot, on the south-eastern corner of the intersection formed with Gardeners Road and Bourke Street (refer Figure 1 – Site Locality Plan).

This plan is based on the proposed Site redevelopment excavation works and the results of geotechnical and environmental site investigations completed by Golder including a Geotechnical Investigation Factual Report ref. 097622082-005 Rev1 dated 11 September 2009 and a combined Phase 1 and Phase 2 contamination report, ref. 097622082-006 Rev0 dated 7 September 2009. The project involves demolishing the existing warehouse on the site and the construction of a new three-story building. The extent of the new building in relation to existing site boundaries is shown on Figure 2 – Test Location Plan.

This ASSMP was prepared in general accordance with the scope of work developed in Golder proposal P97623179-001 dated 19 October 2009.

2.0 OBJECTIVES AND SCOPE

We understand that Council requires an ASSMP for the development as part of their planning and approval regulations, based on the identification of the Site as being located on Class 1 land (where consent is required for any works) or Class 2 land (where consent is required for works below the ground surface or works by which the water table is likely to be lowered) if more than one tonne of soil is disturbed. The plan is based on the subsurface information derived from the Golder Associates investigations referenced above and on the NSW Acid Sulfate Soil Management Advisory Committee guidelines 1998 (ASSMAC guidelines).

This plan details the specific acid sulfate soil (ASS) investigations and materials management to be carried out in association with earthworks for the proposed Site redevelopment.

The objectives of this management plan are to meet project approval requirements and commitments regarding the on site handling of acid sulfate soils, waste soil disposal and groundwater. The plan focuses on early detection of potential ASS impacts through the monitoring of excavations to enable appropriate soil handling, reuse or disposal, surface water and groundwater management.

The ASSMP includes procedures for management of excavated acid sulfate soils, if encountered, to minimise environmental impacts and to enable off-site disposal of waste soil in accordance with the NSW DECCW guidelines. The plan includes procedures for:

- Further subsurface investigations for presence of actual and potential acid sulfate soils;
- Management of excavated materials (stockpiles), excavations and storage and treatment procedures to enable waste classification and landfill disposal of surplus materials (soil and groundwater) and to minimise impacts from acid sulfate materials retained on site; and
- Advise on OH&S issues and PPE required for conducting the works;

The management recommendations for ASS are based on:

- NSW Acid Sulfate Soils Management Advisory Committee guidelines, 1998 (ASSMAC guidelines); and
- NSW DECC's Waste Classification Guidelines 2009, Part 4 Acid Sulfate Soils.

The proposed management of acid sulfate materials is in general accordance with the following four general procedures:

1) Identification of Acid Sulfate Materials;
2) Environmental Impact Assessment;
3) Management Planning Process; and
4) Selection and implementation of Controls.

3.0 PROPOSED SITE DEVELOPMENT WORKS AND POTENTIAL ACID SULFATE SOILS

The extent of the new building in relation to existing site boundaries is shown on Figure 2 – Test Location Plan.

The main site activities that will generate excavated soil and potentially disturb or expose acid sulfate soils (if present), requiring management, include the following:

- drainage structures such as sewer or stormwater pipes and pits or trenches for power/ data cables;
- building foundations such as a shallow footings, building slabs and bored/ CFA piles;
- excavations for buried tanks;
- dewatering of excavations;
- water disposal; and
- re-use of excavated soils under the new building or in landscaping.

We note that:.

- Groundwater levels will be an issue for excavations below about 1 or 2 m depth (depending on seasonal variation of groundwater level and prevailing weather conditions during construction).
- The potential for acidic ground conditions to develop as a result of actual acid sulfate soils (if encountered) may increase the aggressivity of the soil and groundwater to buried steel and concrete elements.

4.0 SITE GEOLOGY AND HYDROGEOLOGY

4.1 Desktop Investigations

Selected results from the desktop study (refer factual geotechnical report 097622082-005 for further details) are presented below:

- The site is generally flat. To the south of the site is the Equinix SY2 building. The underground Airport Rail link runs to the west of the site along the Bourke Street alignment.
- The Botany Sands present at the Site vary in density with depth and may contain lenses of peat and clay of various thicknesses. According to the Geological Series Sheet 9130 (Edition 1) 1983, the site is underlain by medium to fine grained marine sands with podsols (peat). Published data on the Botany Basin indicate that the sands are interbedded with peat and non organic clay layers. The peat lenses are generally closer to the surface and clay and silt layers are deeper. These fine grained lenses form impervious boundaries which result in perched aquifers being formed. The deeper fine grained silt and clay deposits were laid down in paleochannels formed in an estuarine environment of fluctuating sea levels. As a result of the meandering paleochannels and the topography at the time of deposition the thickness and depth of these impervious layers vary across the Basin. The interspersed peat layers in the upper portion of the basin deposits were formed due to lagoonal areas forming at the time of deposition. As a result these peat lenses thicknesses and continuity are also variable across the Basin.
- The Botany Bay Acid Sulfate Soil Risk Map (Soil Conservation of NSW, June 1995) indicates the Site is located on an area of disturbed terrain with an elevation approximately 2-4 m AHD and that these areas included filled terrain and reclaimed swamps. The map key indicates these areas require investigation for acid sulfate potential. The map also indicates bottom sediments with high probability of acid sulfate risks associated with Alexandra Canal (Sheas Creek) located west of the Site.
- The Australian Soil Resource Information System (CSIRO 2006) indicates there is a low probability of acid sulfate soils occurring at the Site.
- The Soil Conservation Service 1:100,000 Landscape Series Sheet (9130) indicates that the site soils are of the Tuggerah Group and are of aeolion origin. The soils are non-cohesive, highly permeable and exhibit a permanently high water table.
- Groundwater levels have been assessed from published information and from nearby site investigations conducted by Golder Associates. At present, we estimate the groundwater level to be about 2.5m below ground surface, but due to scaling and seasonal effects this could vary locally by a metre or so. Data from the nearby Airport Rail Line boreholes indicate that the depth to groundwater varies between about 2 and 3m.
- The groundwater bore records from the Department of Water and Energy provided no information on the depth to groundwater in the vicinity of the Site (for wells GW013331, GW027248, GW040219 and GW108497). However, groundwater was encountered at nearby boreholes drilled for the Airport link tunnel at approximately 2m and is at 1.5m at Mascot Station.
- The site is located within Zone 2 of the Botany groundwater management area. The use of groundwater for domestic purposes in Zone 2 has been banned. Industrial users of groundwater in Zone 2 are required to test their borewater at least annually and report the analysis results to the Department of Natural Resources and the Department of Environment, Climate Change and Water (DECCW).
- Policies prepared by Council and other public authorities which apply to the site includes Clause 30A of Botany LEP 1995 – Acid Sulfate Soils;

4.2 Subsurface Conditions from Intrusive Site Investigations

A total of thirteen sampling locations were excavated in the Study Area to a maximum depth of 7.2m below ground level. Sample locations are presented on Figure 2.

Subsurface conditions encountered during the borehole investigation can be generally described as an approximately 200mm thick concrete slab covering the majority of the site, underlain by silty sand fill with sandstone and igneous gravel, with some debris such as glass, rubber and other material to a depth of up to 1m. Natural material including sand and silty sand with lenses of clayey peat/ organic clay were present below the fill material.

A tabulation of the subsurface conditions inferred from the CPTs and boreholes is provided in Table 1 below. Refer to the Golder investigation report for borehole logs and geological cross sections).

Table 1: Inferred Subsurface Conditions

Unit	Approximate Depth (m)	Approximate RL (AHD, m)	Inferred Description
Unit 1: FILL	0 to 1	6 to 5	Approximately 200mm thick concrete slab covering the majority of the site, underlain by silty sand fill with sandstone and igneous gravel, with some debris such as glass, rubber and other.
Unit 2: Very loose Silty SAND	1 to 2	5 to 4	A layer of very loose silty sand, mainly present on the eastern side of the site.
Unit 3: Medium dense to dense SAND	2 to 9	4 to -3	Medium dense to dense sand, with zones of very dense and loose. Interbedded with approximately 0.1m thick lenses of clayey peat/ organic clay. The lenses are generally continuous over the site at 1 – 2m vertical spacing, with some discontinuous lenses.
Unit 4: Very dense SAND	9 to 11.5	-3 to -5.5	Very dense sand interbedded with a peaty clay lens across the eastern half of the site
Unit 5: Very loose to loose inferred Sandy SILT	11.5 to 12.5	-5.5 to -6.5	Very loose to loose inferred sandy silt is present beneath the very dense sand. Thickness varies across the site but is in the order of a metre.
Unit 6: Interbedded very dense sand and stiff clay	12.5 to 15	-6.5 to -9	Very dense sand interbedded with inferred very stiff to hard clay lenses.
Unit 7: Residual Clay grading to weathered shale	15 to >22	-9 to <-16	Generally very stiff to hard residual clay grading to weathered rock. Inferred to be a weathered shale profile.

4.3 Groundwater Levels and Soil Permeability

Groundwater was encountered across the site at depths varying from 1.8 and 2.4m. A standpipe was installed at BH/CPT04 and groundwater there was measured at 2.22 m below ground level approximately 24 hours after installation of the peizometer. The prevailing weather conditions at the time of the site investigation and in the prior few weeks were dry. The groundwater levels are shown on the borehole and CPT logs in the geotechnical investigation report.

A constant head test was carried out in HA01 to assess the permeability of the subsurface material above the water table using a permeameter, in accordance with the method provided in AS/NZ1547:2000. The results of the test are provided in Section 4.3 of the geotechnical investigation report. Calculations from the results of the constant head test indicate a soil permeability of approximately 7.3×10^{-7} ms^{-1}. This is at the lower end of typical permeabilities expected for silty sands, and is lower than the ranges predicted by the Airport Link investigation. It may be representative of the higher silt content of the near-surface soils.

Selected samples were sent to a NATA accredited laboratory to assess aggressivity of the soil and groundwater to buried concrete and steel elements. The results are summarised in Table 2 below.

Table 2: Aggressivity Laboratory Test Results

Location	Depth (m)	pH	Sulfate (mg/L)	Chloride (mg/L)	Conductivity (µS/cm)
BH/CPT03	1.4 -1.8	5.4	28	<100	55
BH/CPT07	0.25 – 0.45	7.5	<25	<100	160
BH/CPT09	2.35 – 2.45	7.4	32	<100	110
BH/CPT04 (groundwater)		6.6	47	34	320

5.0 ACID SULFATE SOIL IDENTIFICATION

5.1 Acid Sulfate Soil (ASS)

Acid sulfate soils (ASS) are sediments and soils containing iron sulfide minerals (pyrite), which generate sulfuric acid when exposed to oxygen in the atmosphere. For every tonne of sulfide material that completely oxidizes, 1.6 tonne of pure sulfuric acid is produced. This sulfuric acid can drain into waterways and cause severe short term and long term socio-economic and environmental impacts.

ASS in Australia are commonly found in Holocene sediments below 5 m AHD and may be deeply deposited and covered by other sediments. They are formed under specific conditions and are usually found in coastal floodplains, rivers and creeks. They are commonly preserved in an un-oxidised state by virtue of being beneath the water table or within the phreatic zone of moisture-laden soil (capillary water) immediately above the water table. The presence of water within these soils restricts their access to air/oxygen, so that the sulfide remains in a reduced state until exposed.

ASS includes actual acid sulfate soils and potential acid sulfate soils, and are commonly found in the same soil profile.

5.2 Actual Acid Sulfate Soils

Actual acid sulfate soils (AASS) are soils containing highly acidic soil horizons or layers resulting from the aeration of soil materials that contain(ed) iron sulfides (ie. soils that have been exposed to air and have generated acid).

5.3 Potential Acid Sulfate Soils

Potential acid sulfate soils (PASS) contain iron pyrite that is stable in an unoxidised state but becomes a concern if exposed to air, resulting in production of sulfuric acid by oxidation.

5.4 Sampling and Field Screening

To identify potential and actual acid sulfate materials in excavated material and within excavation surfaces, soil and sediment sampling and screening (for ASS) should be carried out during construction works such as:

- during the recovery of soils, sediment or groundwater from trench excavations and piling works
- during general cut and fill works.

Field screening for Potential Acid Sulfate Soils is to be conducted on the samples using analysis of soil pH before and after peroxide oxidation in accordance with the methodology presented in the Acid Sulfate Soils Manual (ASSMAC, 1998). A copy of the method is included in Appendix A. Indicators for presence of acid sulfate soils include:

- Yellow colouring on soils (jarosite);
- A change in colour of the sample or release of sulfur odours following peroxide treatment;
- Moderate or strong reaction to peroxide (effervescence);
- Substantial drop in pH following peroxide treatment; and
- Sample pH after peroxide oxidation of less than 3.5.

5.5 Laboratory Analysis and Lime Requirements

Selected samples (which give the highest positive results for field PASS screening) should be submitted to a NATA Accredited laboratory for analysis of Peroxide Oxidation Combined Acidity and Sulfate (sPOCAS). Presence of alkaline buffering capacity such as carbonate sources (e.g. shell grit) can mask potential oxidized pH reductions during field screening testing and the laboratory analysis is required to confirm the presence or absence of acid sulfate materials. Laboratory sPOCAS analysis also provides the lime requirement (calcium carbonate addition rate) or neutralisation of net soil acidity. A field safety factor of 1.5 should be applied to the liming requirement rate reported by the laboratory.

5.6 Timing

The identification of acid sulfate materials, lime requirements for neutralisation treatment and waste classification should be carried out within the shortest period of time achievable, to enable rapid treatment and disposal of surplus material to a licensed landfill. This will require a member of the environment team to be present during excavation and storage of material so samples can be screened and submitted to the laboratory for a 24 hour turnaround time for laboratory reports.

6.0 IMPACT ASSESSMENT

Acidification of excavated material can result in acidified drainage water and mobilisation of contaminants in the solid materials, particularly heavy metals. To prevent this, there are a number of management procedures integral to this management plan. The basis of this plan is to focus on early detection of any ASS impact through the monitoring of excavation / construction works and lime treatment to neutralise acidic or potentially acidic soils and drainage water. The following sections of this plan provide spoil management options in case acidity risks are identified in these materials.

Based on the results of the previous investigations, the risks associated with acid sulfate materials are likely to be low and limited to the excavation, handling and storage stages prior to neutralisation by liming. However, during construction planning an ASS impact risk assessment should be conducted to ensure that individual work elements that could potentially disturb ASS have procedures and contingencies in place to minimise potential environmental impacts.

7.0 MANAGEMENT PLANNING AND PROCEDURES

7.1 General Management Considerations

It is anticipated that acid sulfate material risks will be low for the construction activities based on the previous site investigations. However, assessment of excavated materials and water is to be conducted during construction due to potential presence of unidentified ASS and PASS. The following sections provide spoil management options in case acidity risks are identified in these materials. The following sections contain general information from the ASMMAC guidelines relevant to the Site.

Acidification of excavated material can result in acidified drainage water and mobilisation of contaminants in the solid materials, particularly heavy metals. To prevent this, there should be a number of contingency measures in put in place during construction in conjunction with this management plan.

The basis of this plan is to focus on early detection of any ASS impact through the monitoring of excavation / construction works and lime treatment to neutralise acidic or potentially acidic soils and drainage water.

7.2 Management Structure and Responsibilities

The project team site induction for all personnel will include a component on potential contamination and acid sulfate soils in excavated materials. This induction, or toolbox talks, may include (but not be limited to):

- Overview of the requirements of this Plan;
- Environmental and occupational health and safety measures for handling potentially contaminated material;
- Detail on Site environmental controls (eg, stormwater and stockpile controls, dust suppression); and
- Provide information on acid sulfate soil issues, dust management, sediment containment, decontamination procedures, exposure minimisation.

7.3 Management Strategy Options

There is a range of strategies available for the management/handling/treatment of acid sulfate soils disturbed during site excavation works. These techniques are included here to outline the broad approaches which could be adopted should ASS be identified during construction works.

Broadly, the strategies available include:

(a) Avoidance - this is the most environmentally benign strategy. Areas where ASS are present are either avoided altogether (total avoidance) or the works are adjusted so that the more severe areas are left undisturbed (partial avoidance).

(b) Oxidation prevention - this approach relies on the fact that Potential Acid Sulfate Soil (PASS) is innocuous if it is not allowed to oxidise. There are a number of ways to prevent the oxidation of PASS including avoidance (refer above), water content control, in situ capping, or excavation and removal to an anoxic disposal site elsewhere (commonly burial below the water table).

(c) Acid neutralisation - this approach relies on the insitu neutralisation of acid that may be produced on oxidation or acidity that is already present. Specific techniques that can be employed to achieve this include the addition of alkaline agents to the soil profile (eg agricultural lime or calcium carbonate) or soil profile mixing (in specific cases where a soil layer in the profile has a high neutralising capacity).

(d) Leachate treatment - this treatment method allows for the oxidation and leaching of PASS in stockpiles and involves collection and treatment of acidic runoff. Because the process allows the production of acidic leachate that is potentially strongly acidic, it requires careful control and monitoring. A low permeability base is required to prevent percolation into groundwater and the process could require contingencies to accommodate rainfall/flood events. This method is applicable to sands but may not be an appropriate treatment procedure for silts and clays due the low permeability of these soils which results in lengthy drying times.

(e) Pyrite separation - as pyrite is the component in ASS that produces acid on oxidation the acid producing potential of the soil can be reduced by the hydraulic removal of the pyrite. This solution requires that the fine fraction of a material, containing the pyrite, is removed using sluicing or hydrocycloning while the material is kept wet and unoxidised. This strategy is complementary to dredging and is generally not suited to fine textured, low permeability sediments such as clays.

(f) Disposal to landfill - the PASS may be removed and disposed at an appropriate landfill. Prior to transport and landfill disposal the PASS would be neutralised by the addition of lime.

7.4 Activity Specific Management Strategy

Where excavation into acid sulfate soil is unavoidable, treatment of excavated material and water will be required for neutralisation of actual or potential acidity. Strategies including “partial avoidance”, “oxidation prevention” and “acid neutralisation” should be adopted including:

- Minimising removal of acid sulfate soils;
- Minimise exposure time and maintain moisture in excavated PASS;
- Materials excavation, storage and containment (sealed bins or stockpiles on a bunded impervious pad), immediate screening for acid sulfates, laboratory analysis for lime requirement and waste classification including treatment (liming) of soil and sediment.

A contingency plan for acid sulfate soils management is control of the discharge of water from the excavated material and from excavations. The immediate action associated with water quality protection is to prevent discharge, identify acidity sources and ensure neutralising the acidity is carried out immediately.

Where excavation into potential ASS is unavoidable, the most applicable and cost effective management methodology for the activities subject to this plan is generally Item (c) as described in Section 7.3 above: Acid Neutralisation – excavation and addition of a liming agent.

Lime requirements for excavated material disposed of to landfill are to be determined for each stockpile of material produced. Lime requirements based on volumes of excavated material and sPOCAS test results for stockpile samples are presented in Appendix B.

If the treated material is to be disposed of to a licensed landfill, waste classification is required based on results of sample analyses in accordance with the NSW DECC’s *Waste Classification Guidelines* 2009. Details of the neutralisation treatment carried out and results of pH analyses should be provided to the landfill as part of the materials waste classification reports, before disposal is approved by the landfill operator.

The on-site dewatering and acid neutralising treatment of material will require a number of environmental controls including drainage water management which are outlined in Section 8 below. Following dewatering the solid material should be neutralised (if required) and either reused or classified for off site disposal.

The acidity and quality of water recovered during dewatering can be assessed for suitability for use in dust suppression or release to an irrigation area. If acidic or contaminated, the water will require neutralisation and/or off-site disposal to a liquid waste facility if contaminated.

Once excavated, acidic ASS management should include:

- Item (c): Acid Neutralisation – excavation, addition of a liming agent; and
- Item (f): Disposal of neutralised material to a Landfill - licensed to accept ASS as “General Solid Waste”

Disposal of untreated PASS below the water table (to prevent oxidation) at a licensed landfill is an option if such a facility is available during Site excavation works. The Kurnell landfill currently provides this option and requires same day transport of excavated material and pH monitoring of excavated material.

Based on the strategy of neutralisation of acidity and off-site disposal of material to licensed landfills, it is considered that risks associated with acid sulfate materials are low and are limited to the initial excavation, handling and storage stages prior to transport to the disposal facility or neutralisation of material retained. The principal contingency plan for acid sulfate soils management is control of the discharge of water from the excavated material and from excavations. The immediate action associated with water quality protection is to prevent discharge, identify acidity sources and ensure neutralising the acidity is carried out immediately.

7.5 Occupational Health and Safety

All personnel conducting work or entering the work area will wear required personal protective equipment (PPE) including cotton long sleeve shirts and pants, safety boots, hard hat, and safety reflective vest or equivalent. Gloves and eye protection should also be worn when handling or performing tests on excavated soil and groundwater.

8.0 MATERIAL HANDLING, TREATMENT AND ENVIRONMENTAL CONTROLS

8.1 Materials Handling and Storage

The objective of excavated materials management and monitoring will be early detection of any acidity and implementation of the following procedures for on-site mitigation.

After excavation of material requiring management of acid sulfate soil, a number of management controls should be put in place as outlined below:

- Stockpiles and bins identified or suspected of being ASS will be separated from spoil not suspected of being ASS, and labelled;
- No soil is to be stockpiled on the Site without appropriate environmental controls. Excavated material will be placed within plastic lined skip bins or be placed as small stockpiles within a lined and bunded area;
- Shape and cover soil in bins and stockpiles with plastic sheet to prevent drainage of rain water through the material. Suspected and known acid sulfate soil material should be kept moist and covered with plastic sheet or rain-proof tarpaulin to prevent drainage through of rain water through the material;
- Collect, retain and test any water that flows through the stockpiles or bins, for pH;
- Prevent release of acidic or contaminated water to the drainage alignments. Water retention by bunding around the stockpiles (or bins) and lining or sealing of the ground surface should be carried out to prevent runoff or infiltration of water affected by the material. Lining options include HDPE membrane or compacted clay. In the case of bins or small stockpiles, several layers of plastic sheeting or tarpaulin may be sufficient. The lined area should form a bund and grade to a collection point for recovery and treatment of drainage water;
- Carry out neutralisation treatment of soil with lime to prevent drainage of potentially acidic water from excavated soil or from the trench to the surrounding subsurface or water ways by addition of lime at the appropriate rate based on sample sPOCAS (suspension Peroxide Oxidation Combined Acidity and Sulfate) analyses. This treatment should include the mixing of lime a soon as possible following identification of lime requirements (kg lime/ tonne soil). Mixing procedures should achieve an even blending of the lime throughout the soil, to the extent practicable. Appendix B includes a guide to quantities of lime to apply based on results for oxidisable sulfur percentage (Spos) obtained from the sPOCAS sample analysis results and the quantities of excavated material to be treated;
- Surface water run off from surrounding areas will be directed away from excavated materials and trenches and through sediment controls such as filter socks, hay bales or equivalent measures;
- Collect and test for pH, any water that infiltrates and drains from the neutralised material within the skip bins or stockpiles.
- Additional assessment should be carried out if materials are suspected to require treatment from areas that were not previously identified as requiring management. Appendix A and Sections 5.0 and 7.0 above provide information on carrying out additional investigations for identification and treatment of acid sulfate soils.
- The licensed landfill should be consulted regarding their requirements for validation testing of treated material (pH tests on limed material) to confirm neutralisation of acidity prior to transport of the waste.

8.2 Water Quality Monitoring

8.2.1 Surface Water Monitoring

The immediate action associated with water quality protection is to prevent discharge, identify acidity sources and ensure neutralising the acidity is carried out immediately.

Surface water runoff from rainfall should not be exposed to actual or potential acid sulfate soils. Should surface water come into contact with ASS stockpiles or an excavation into ASS, the surface water should be collected and, prior to disposal, tested for pH. If the pH is less than pH 6.5, the water should be treated before use or disposal. An alkalinity booster such as dilute sodium hydroxide should be used. pH monitoring following mixing of small doses should be carried to achieve a pH in the range of 6.5 to 8.5.

Lime treatment of the perimeter of excavations and stockpiled soils to intercept acidic seepage water should be considered.

If ASS impacted excavations fill with water, a sample should be taken to establish the pH, total suspended solids and other potential contaminants prior to disposal of the water. Water in excavations should not be released to water ways and the provisions of the *Protection of the Environment Operations Act 1997* must be considered.

8.2.2 Groundwater Monitoring

The pH of the groundwater in excavations should be monitored. If impacted, groundwater should be collected for treatment.

8.2.3 Dewatering Monitoring

Any water forming in (or collected from) and excavation within ASS should be tested regularly for pH. If the pH is less than 6.5 the water should be neutralised before disposal.

8.2.4 Reporting

Reports should be prepared to demonstrate conformance with management objectives. These reports should be prepared to cover all monitoring during excavation works including details of any non-conformance with this Management Plan and of all corrective action taken to maintain performance requirements. Records of ASS management activities should be maintained and be available for review by relevant authorities on request.

9.0 LIMITATIONS

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We would be pleased to answer any questions about this important information.

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GOLDER ASSOCIATES PTY LTD

Ian McLennan
Senior Environmental Scientist

Shane Doyle
Senior Environmental Scientist

IM/SPD/im

A.B.N. 64 006 107 857

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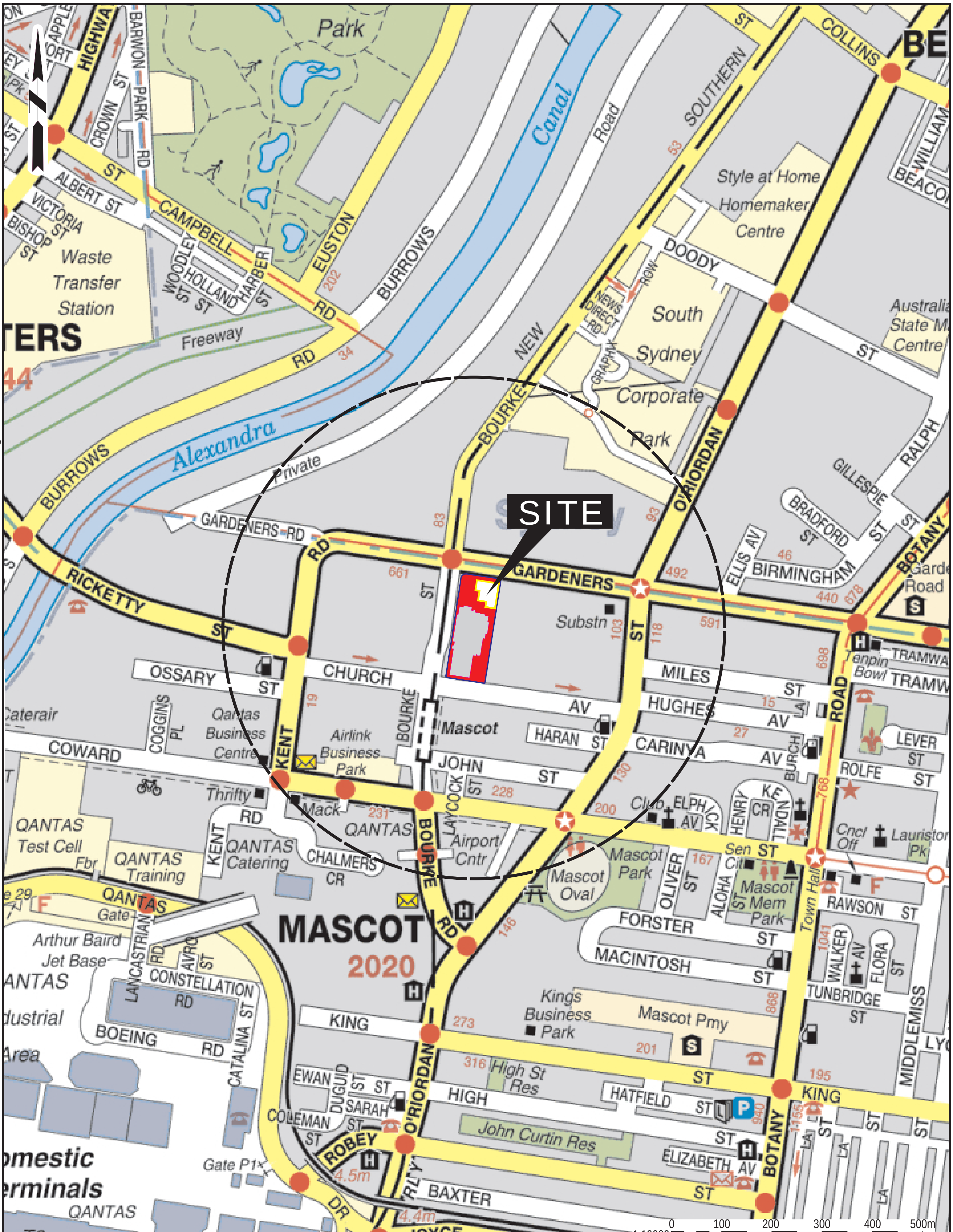

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Golder Associates www.golder.com GOLDER ASSOCIATES PTY LTD	CLIENT ARUP		PROJECT COMBINED PHASE I & 2 INVESTIGATION					
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	CHECKED SPD	DATE 07.09.2009						
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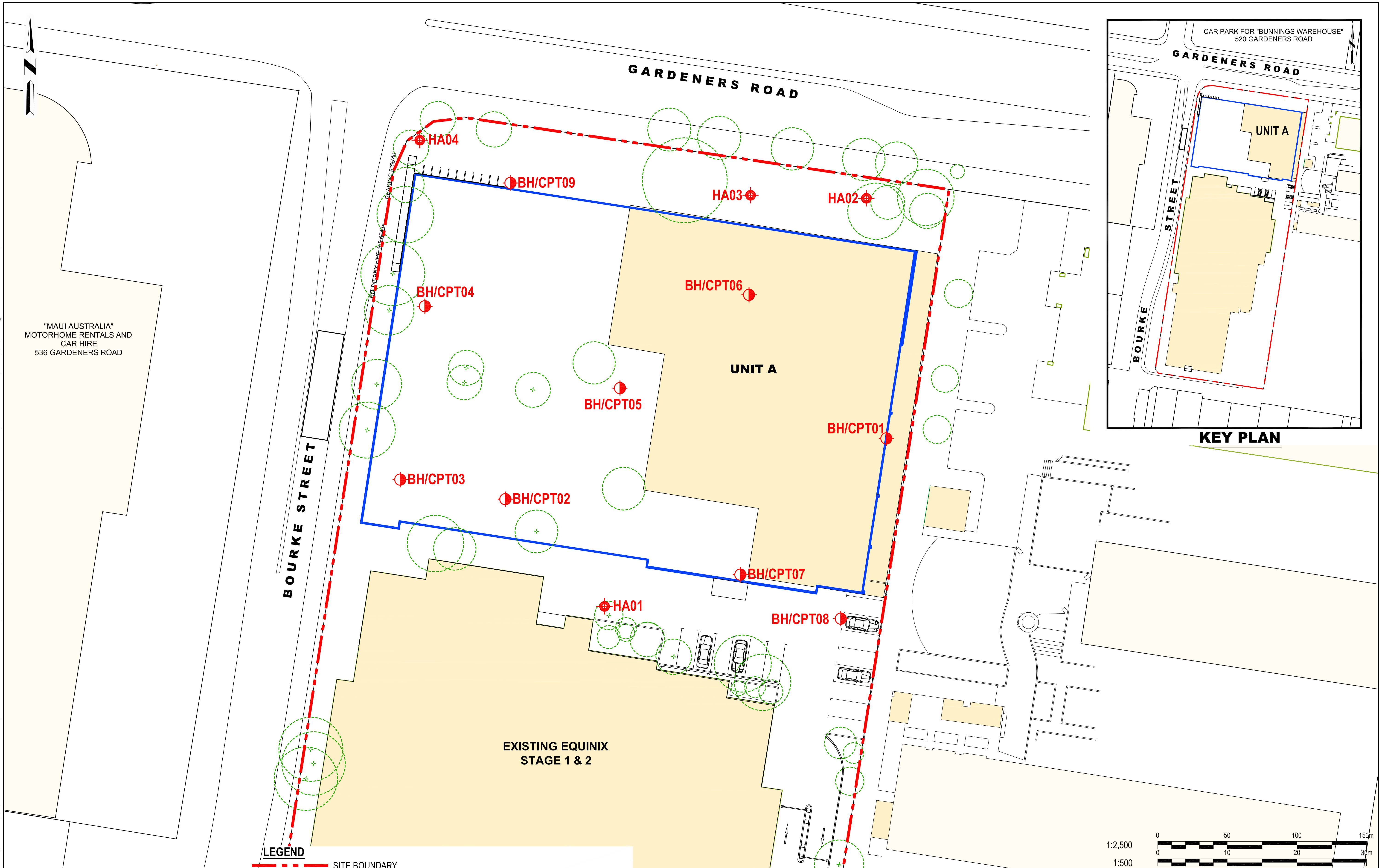

LEGEND

- SITE BOUNDARY
- EXISTING BUILDING FOOTPRINT
- OUTLINE OF PROPOSED SY3 BUILDING FOOTPRINT
- TREES
- BH/CPT01 COMBINED BOREHOLE / CPT SAMPLE LOCATION (GOLDER, AUGUST 2009)
- HA01 HAND AUGER SAMPLE LOCATION (GOLDER, AUGUST 2009)

Source: Building Application Dwg 86541 100, 09026, Drawing 001, Issue 2

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CLIENT: ARUP		PROJECT: COMBINED PHASE I & II INVESTIGATION	
DRAWN: HC	DATE: 28.08.2009	TITLE: EQUINIX SY3 DATA CENTRE, MASCOT TEST LOCATION PLAN	
CHECKED: SPD	DATE: 07.09.2009		
SCALE: 1:500 (MAIN), 1:2500 (KEY)	A3	PROJECT No: 097622082 · DOC No: 008 · DOC TYPE: R · FIGURE No: F0002 · REV No: 0	FIGURE 2

Plot Date: 7 September 2009 Time:4:55:14 PM By: Campbell, Helen Path: J:\geo\2009\097622082_Arup_Mascot\Technical Doc\CADD\FIGURES - File Name:097622082_006_R_F0002_REV0.dwg

APPENDIX A

Acid Sulfate Soil Indicators and Field Screening Procedures

FIELD SCREENING FOR ACID SULFATE SOILS

Aims

To provide a procedure for assessing whether laboratory testing is required to confirm the presence of acid sulfate soils.

Equipment

- pH meter;
- 4.0 Calibration solution;
- Distilled water;
- Latex gloves;
- General Laboratory Grade hydrogen peroxide (glass bottle); and
- 7.0 Calibration solution;
- pH meter calibration and operation sheet;
- Waste liquid storage bottle;
- Plastic spoons;
- Polystyrene cups.

Testing Method

1) Calibrate the pH meter with the pH 7.0 and pH 4.0 solutions as described in the pH meter calibration and operation sheet.
2) Mix distilled water and soil in a polystyrene cup at a ratio of 5:1 (Distilled Water:Soil), for example 20ml of distilled water to 4mg of soil. Use the dedicated distilled water syringe (labeled) to measure out the water quantity and use a disposable plastic spoon to measure out soil and mix into water (note: each sample should have its own dedicated spoon to minimise cross contamination);
3) Measure pH of the mixture of soil and water mix in the cup using the calibrated pH meter and note down the measurement in the screening log sheet (note: try to calibrate the pH meter between each sample measurement). On the screening log sheet this measurement phase is called pHf);
4) Add hydrogen peroxide to the mixture at an equal quantity to the amount of water in the mixture (e.g. 20ml water=20ml hydrogen peroxide). **Please note that hydrogen peroxide is**
5) **a dangerous liquid and should not come into contact with any part of the body, always wear latex gloves when handling hydrogen peroxide and immediately wash any of the liquid off if you come into contact with it;**
6) Leave the mixture for 30 minutes to allow the hydrogen peroxide to oxidise any sulphide minerals in the soil;
7) Re-calibrate the pH meter as described in Part 2 and re-test the sample. Note down the measurement in the pHfox column of the screening log sheet. The difference between the pHf and pHfox potentially indicates the amount of oxidising metals in the sample, which can produce acid.

For reporting procedures and details of the samples to take note of, see the accompanying table and notes section.

Criteria for Defining Potential Acid Sulfate Soils (PASS) through the Screening Process

The NSW Acid Sulfate Soils Management Advisory Committee (ASSMAC) Acid Sulfate Soils Assessment Guidelines state that a positive screening test may include one or preferably more of the following:

1. Change in colour of the soil from grey tones to brown tones;
2. Effervescence;
3. The release of sulfur smelling gases such as sulfur dioxide or hydrogen sulfide;
4. A lowering of the soil pH by at least one unit (e.g. drop from 7.0 to 6.0 or lower); and
5. A final pH <3.5 and preferable <3.0.

If several characteristics are noted (particularly significant lowering of pH), laboratory Peroxide Oxidation Combined Acidity and Sulfate (POCAS) testing may be required to confirm PASS .

ACID SULFATE SOILS (PREM TEST) (Sydney) SNT038

Project Number
Project Location:
Date:

Performed By: Date:
Checked By: Date:

Sample Number	Sample Depth (m)	Sample Date	Soil Description	Components (S / J / R)	pH_f	pH_{fox}	Reaction Number (1-5)	Comments	POCAS Required

Notes
Soil Description – primary components e.g sand, clayey sand, sandy silt, sandy clay
Components – S = shell; J = jarosite (yellow mottling); R = roots
Reaction Number – 0: No reaction; 1. Slight bubbling; 2. Some bubbling; 3. Raised bubbling; 4. Bubbles filling part of cup; 5. Bubbles come out of cup

APPENDIX B

Lime Quantities based on Oxidisable Sulfur Content and Quantity of Soil to be Neutralised

6.3 Treatment Categories and Liming Rates

Treatment categories are distributed into four levels of treatment as follows:

L	Low treatment level: <0.1 t lime	M	Medium treatment level: >0.1 to 1t lime
H	High Treatment level: >1 to 5t lime	VH	Very High treatment: >5 tonne lime

Treatment categories and lime required to treat a weight of disturbed acid sulfate soils will be based on soil analysis. The table presented below has been taken form the ASMAC guidelines (table 4.5). The tonnes of lime required to fully treat the total weight / volume of AS can be read from the table at the intersection of the weight of disturbed soil with the soil sulfur (column). Where exact weight or soil analysis figure does not appear in the heading of the row or column, use the next highest value.

Disturbed Soil (tonnes)	Soil Analysis – Oxidisable Sulfur (S %) or equivalent TPA/TAA													
	0.03	**0.06**	**0.1**	**0.2**	**0.4**	**0.6**	**0.8**	**1.0**	**1.5**	**2**	**2.5**	**3**	**4**	**5**
1	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.1	0.1	0.1	0.1	0.2	0.2
5	0.05	0.05	0.05	0.05	0.1	0.1	0.2	0.2	0.4	0.5	0.6	0.7	0.9	1.2
10	0.05	0.05	0.05	0.1	0.2	0.3	0.4	0.5	0.7	0.9	1.2	1.4	1.9	2.3
15	0.05	0.05	0.1	0.1	0.3	0.4	0.6	0.7	1.1	1.4	1.8	2.1	2.8	3.5
20	0.05	0.1	0.1	0.2	0.4	0.6	0.7	0.9	1.4	1.9	2.3	2.8	3.7	4.7
25	0.05	0.1	0.1	0.2	0.5	0.7	0.9	1.2	1.8	2.3	2.9	3.5	4.7	5.9
35	0.05	0.1	0.2	0.3	0.7	1.0	1.3	1.6	2.5	3.3	4.1	4.9	6.6	8.2
50	0.1	0.1	0.2	0.5	0.9	1.4	1.9	2.3	3.5	4.7	5.9	7.0	9.4	11.7
75	0.1	0.2	0.4	0.7	1.4	2.1	2.8	3.5	5.3	7.0	8.8	10.5	14.0	17.6
100	0.1	0.3	0.5	0.9	1.9	2.8	3.7	4.7	7.0	9.4	11.7	14.0	18.7	23.4
200	0.3	0.6	0.9	1.9	3.7	5.6	7.5	9.4	14.0	18.7	23.4	28.1	37.5	46.8
500	0.7	1.4	2.3	4.7	9.4	14.0	18.7	23.4	35.1	46.8	58.5	70.2	93.6	117.1
750	1.1	2.1	3.5	7.0	14.0	21.1	28.1	35.1	52.7	70.2	87.8	105.3	140.5	175.6
1,000	1.4	2.8	4.7	9.4	18.7	28.1	37.5	46.8	70.2	93.6	117.1	140.5	187.3	234.1
2,000	2.8	5.6	9.4	18.7	37.5	56.2	74.9	93.6	140.5	187.3	234.1	280.9	374.6	468.2
5,000	7.0	14.0	23.4	46.8	93.6	140.5	187.3	234.1	351.2	468.2	585.3	702.3	936.4	1170.5
10,000	14.0	28.1	46.8	93.6	187.3	280.9	374.6	468.2	702.3	936.4	1170.5	1404.6	1872.8	2341.0

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Africa	+ 27 11 254 4800
Asia	+ 852 2562 3658
Australasia	+ 61 3 8862 3500
Europe	+ 356 21 42 30 20
North America	+ 1 800 275 3281
South America	+ 55 21 3095 9500

solutions@golder.com
www.golder.com

Golder Associates Pty Ltd
124 Pacific Highway
St. Leonards New South Wales 2065
Australia
T: +61 2 9478 3900

Golder Associates