R8000 NEW AIR COMBAT CAPABILITY (NACC) FACILITIES PROJECT, RAAF BASE WILLIAMTOWN
MANAGEMENT PLAN - ACID SULPHATE SOIL

27/11/2015 | REVISION NO: 6
### Plan Revision Status

<table>
<thead>
<tr>
<th>Date</th>
<th>Revision (in numbers)</th>
<th>Purpose and Summary of Amendments</th>
<th>Reviewed by</th>
<th>Approved by</th>
</tr>
</thead>
<tbody>
<tr>
<td>19/09/2014</td>
<td>1</td>
<td>Initial Draft</td>
<td></td>
<td></td>
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<tr>
<td>15/10/2014</td>
<td>2</td>
<td>For Construction</td>
<td></td>
<td></td>
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<tr>
<td>11/11/2014</td>
<td>3</td>
<td>Incorporated SEMs review comments</td>
<td></td>
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<tr>
<td>16/03/2015</td>
<td>3</td>
<td>Quarterly review. No changes.</td>
<td></td>
<td></td>
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<tr>
<td>22/06/2015</td>
<td>4</td>
<td>Quarterly review. Updated template.</td>
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<tr>
<td>22/09/2015</td>
<td>5</td>
<td>Quarterly review.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>27/11/2015</td>
<td>6</td>
<td>Quarterly review. Minor changes</td>
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1. OBJECTIVES

This Plan details Acid Sulphate Soil management measures to control the risk of contamination of soil, aquatic ecosystems and groundwater by sulfidic sediment or low pH water as a result of NACC Facilities Project Williamtown construction activities.

2. KEY MANAGEMENT ISSUES

Port Stephens Council ASS planning map indicates a risk of encountering ASS in excavations deeper than 2m below ground surface.

The Lower Hunter River Catchment ASS risk map show a low probability of encountering ASS within 3m of the natural ground surface. ASS field testing conducted as part of the projects geotechnical investigations also indicated a low risk for encountering ASS within 3m of the ground surface across the project footprint.

As very little of the construction activity will require excavation deeper than 3m there is considered to be a low risk of encountering ASS. However whilst small, there is still a risk that ASS material will be encountered.

There are two main types of Acid Sulphate Soils:

Potential Acid Sulphate Soils (PASS)

The iron sulphides are generally located beneath the water table in a layer of waterlogged soil. This layer can be clay, loam or sand, and is often dark grey and soft (buttery and gel like to touch). These soils are located in an oxygen deficient environment (water prevents oxygen in the air reacting with the iron sulphides when located below the water table). The sulphides in the PASS oxidise once exposed to air with the potential to generate sulphuric acid on contact with water. Oxygenated water can also cause oxidation reactions where water is pumped into a shallow, oxygen deficient aquifer.

Actual Acid Sulphate Soils (AASS)

When the iron sulphides are exposed to air and have oxidised, they are known as actual acid sulphate soils. While some compounds in the soil (e.g. calcium carbonate) can provide buffering to help neutralise acidic conditions, the remaining acid moves through the soil on contact with water and can impact on the surrounding soil, and the underlying groundwater. Where AASS is stockpiled there is potential that rain events could result in impact to surface waters if runoff is not managed. AASS may also have some potential acidity remaining within the soils especially if they are of a fine grain (i.e. clays). AASS typically has a low pH value (<4.0) and may contain mobile dissolved metals such as aluminium which can be toxic to aquatic animals and plants.

Construction activities can cause the oxidation of PASS material which in turn can result in environmental impacts. Some of the causes are:

- Excavation and exposure of PASS material.
- Exposure of subsurface PASS material due to dewatering activities.
- Settlement - Discharge of sub-surface water as a result of settlement and reduction in available pore space (during settlement water is ‘squeezed’ out of the soil material), producing acidic leachate where it flows through oxidised AASS.
- Embankment settlement can depress the underlying material with respect to the water table. In some circumstances heave at the toe of the embankment by displacement may raise PASS material above the water table.
- Oxidation of pyrite in imported fill material.

Should any of the above causes eventuate, the following impacts may result:

- Release of aluminium, nutrients and heavy metals (particularly arsenic) stored within the soil matrix;
- Death or stunted growth of aquatic flora and fauna;
- Deoxygenation of waterways leading to suffocation of fish and other aquatic animals;
- Mass mortalities of microscopic organisms;
- Increased light penetration due to water clarity;
- Loss of habitat;
- Persistent iron coatings; and
- Damage to infrastructure e.g. Corrosion of concrete, limestone.
3. SITE ACTIONS

An assessment of the potential for the exposure of acid sulphate soils on the site has been completed. This assessment concluded that it is unlikely that acid sulphate soils will be encountered. However, the site still has the potential to contain undiscovered areas of these soils. This document aims to outline the initial identification and management of these materials if they are encountered on the project.

The field pH of these type of soils in their undisturbed state is pH 4 or more and may be neutral or alkaline. However, they pose a considerable environmental risk when disturbed, as they will become severely acidic when exposed to air and oxidised.

Any lowering of the watertable or excavation that removes the watertable that protects potential acid sulfate soils will result in their aeration and the exposure of iron sulfide sediments by drainage or excavation to oxygen will generate sulfuric acid.

The oxidation of iron sulfide sediments in potential acid sulfate soils results in actual acid sulfate soils.

Should acid sulphate soils be identified during the works then a comprehensive management plan will be developed setting out: how the extraction will be staged to minimise impacts; the quality controls to ensure operator reliability;

- the management of the excavated material, its temporary storage, treatment and use;
- the leachate and sediment control procedures and protocols
- contingency measures in case unexpected acid related incidents occur;
- monitoring program.

### Acid Sulfate Soil Identification and Management Procedure

<table>
<thead>
<tr>
<th>Item</th>
<th>Required Action</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Visually inspect material being excavated (See attached photographs)</td>
<td>Potentially contaminated material may have all or some of the following characteristics. Have a sulphurous or tar like smell when excavated. May contain blue or green material. May contain pale yellow staining or mottling within the excavated material. Water-logged soils, soft buttery blue grey or dark greenish grey muds. Mid to dark grey estuarine silty sands or sands. Dark grey to black to black bottom sediments of estuaries.</td>
</tr>
<tr>
<td>2</td>
<td>If potentially Acid Sulphate Soils are identified in the excavation or in material being removed, immediately halt excavation and contact Lend Lease Supervisor</td>
<td></td>
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<tr>
<td>3</td>
<td>Immediately bund material excavated whilst awaiting confirmation on material type.</td>
<td>ASS bunds should have an impervious base, and be bunded with a sump to collect potentially acid leachate. Consider preliming under the stockpile to neutralise leachate.</td>
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<tr>
<td>4</td>
<td>Undertake visual assessment and testing to determine if materials are acid sulphate soils.</td>
<td>Field pH and Indicator test screening SPOCAS or equivalant to confirm liming requirements Appoint specialist consultant to assess the results and advise on management options</td>
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</table>
4. MANAGEMENT PLAN MINIMUM STANDARDS

The site management plan should include but not be limited to the following:

<table>
<thead>
<tr>
<th>Identify suitable stockpile locations on site</th>
<th>Locate stockpiles away from adjacent water bodies and perimeter road drains and on site silt drains</th>
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<tbody>
<tr>
<td>Bund excavated ASS and potentially contaminated material to collect contaminated run-off.</td>
<td>Testing and treatment plan should be consistent with the Acid Sulphate Soils Management Advisory Committee (ASSMAC) Acid Sulphate Soils Manual</td>
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<tr>
<td>Obtain samples of material from stockpiles for testing to determine whether disposal or reuse.</td>
<td>See below for test and reuse requirements.</td>
</tr>
<tr>
<td>Test material to determine treatment rates, develop a treatment plan for approval by the Contract Manager’s Environmental Representative. Agree treatment or disposal options with Contract Manager.</td>
<td>Testing and treatment plan should be consistent with the Acid Sulphate Soils Management Advisory Committee (ASSMAC) Acid Sulphate Soils Manual</td>
</tr>
<tr>
<td>For audit purposes, stockpile test results must be accurately linked with the size of the excavation from which the excavated material was taken.</td>
<td>See below for disposal requirements</td>
</tr>
<tr>
<td>Inspect excavation sides and record visual observations of material type, extent and location. Mark-up an overall site plan to show a cumulative record of the location of areas from which soil has been removed, including the identifying reference for the soil and location of the sampling and validation points.</td>
<td>Maintain plans and results up to date for auditing as required.</td>
</tr>
<tr>
<td>Material tracking plans and soil samples results to be available for inspection by the appropriate people at all times.</td>
<td>If immediate off-site disposal is required, procedures outlined within the document Waste Classification Guidelines, Part 4: Acid Sulphate Soils (NSW EPA 2014) must be implemented.</td>
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</table>

**Disposal of ASS to be as per Environmental Protection Authority requirements**

Ensure all required validation testing is complete before disposal offsite.

Disposal of treated PASS: After treatment, the soil should be sampled with chemically analysis undertaken in general accordance with Part 1 of the NSW EPA Waste Classification Guidelines (NSW EPA, 2014) AASS must be treated by the generator of the waste before it can be disposed offsite. Treatment should be in accordance with the neutralising techniques outlined in the Acid Sulphate Soil Manual

Following neutralisation, the generator of the waste must
### Soil Testing Regime If Required

<table>
<thead>
<tr>
<th>Material</th>
<th>Testing for Reuse or Disposal</th>
<th>Classification, Disposal and Reuse</th>
<th>Validation Testing</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acid Sulfate Soils</td>
<td>General screen test as 1 sample per 200m³, or per batch if necessary, whichever is the least.</td>
<td>Provided Acid Sulfate Soils is uncontaminated, dispose to landfill with EPA approved Environmental Management Plan in place for management of waste Acid Sulfate Soils.</td>
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<td>The particular landfill selected for disposal of Acid Sulfate Soils has an EPA approved EMP in place for acceptance of Acid Sulfate Soils.</td>
</tr>
</tbody>
</table>
| Potentially Contaminated Acid Sulfate Soils | Minimum sample rate 1 per 50m³  
Conduct general screen testing.  
If contaminated, further testing as per EPA and landfill requirements. | If classification as Low Level Contaminated Soils (LLCS) or contaminated soils, dispose to licensed landfill under a Waste transport Certificate using a licensed contractor. | EPA Auditor screen at 1 in 20 samples or as decided by the assessor.  
General Screen test at normal rate of 1 in 10 samples. | Based on test results and observations during the initial part of works, the testing regime may be reduced in discussion with the appointed Auditor. |

Note. Where soil testing shows presence of PFC’s specific Waste Classification will be required by the NSW EPA prior to disposal. See the Contaminated Soil and Water Management Plan for details.

5. **PERFORMANCE MEASURES**

The material will be managed so that:
- the sulfuric material is not able to be oxidised
- the sulfuric material may oxidise under controlled situation will all leachate produced neutralised or
- the sulfuric material is separated out and managed by one of the methods above.

6. **MONITORING AND REPORTING**

Monitoring is most important when dealing with acid sulfate material and the Plan will detail the requirements and reporting procedure in accordance with

7. **CORRECTIVE ACTIONS**

The Subcontractor shall review and analyse the cause of detected System Defect and develop a corrective action to prevent recurrence.

The Subcontractor shall advise the General Foreman, by way of the non-conformance report procedure, the corrective action and the preventative action taken to correct the non-conformance.

All corrective and preventative action taken by the Subcontractor will be carried out by and at the cost of the Subcontractor.
If such corrective and preventative action leads to further non-conformance, any further action shall be subject to approval by the General Foreman in consultation with the EH&S Manager.

The Subcontractor shall also advise the General Foreman of the causes of non-conformances and what changes are proposed to the Subcontractor’s procedures to prevent a recurrence of the cause of the non-conformance.

For additional information refer to System Defect procedures refer to the Project Management Plans.
Examples of Excavated Material Containing Acid Sulphate Soils