
Guideline

Acid Sulfate Soil Management



Purpose

This document provides guidance on the identification and assessment of potential environmental risks associated with acid sulfate soils (ASS).

Scope

This guideline applies to Adelaide Airport, with particular reference to the delineated *Potential ASS risk zone* indicated on Figures 1 and 2.

Given the nature of potential ASS risks, guidance provided here is primarily directed at construction and development activities involving excavation of soils within the identified *Potential ASS risk zone*.

Definitions

Acid sulfate soils (ASS): the general term for soils, sediment or rock in the environment that contain elevated concentrations of metal sulfides (principally pyrite FeS_2 or monosulfides in the form of iron sulphide FeS), which generate acidic conditions when exposed to oxygen.

Actual acid sulphate soils (AASS): soils or sediments where iron sulfides or sulfidic material have been exposed to air and oxidised, resulting in highly acidic soil layers. AASS soils may exist naturally or may result from the oxidation of PASS when exposed to air.

Potential acid sulfate soils (PASS): Soils or sediments containing iron sulfides or sulfidic material, which *have not* been exposed to air and have consequently, not been oxidised and resulted in acid release.

Standing Water Level: the depth to groundwater below ground level (i.e. the surface).

Regulatory context

Activities within Adelaide Airport are regulated under the provisions of the Airport (Environment Protection) Regulations 1997 (AEPR 1997). Although no specific provisions for ASS are included in the AEPR 1997, the 'General duty to avoid polluting' confers an obligation to avoid or minimise any detrimental environmental impacts arising from ASS.

In the absence of specific ASS guidance in the AEPR 1997, reference is made to the SA EPA¹ *Guidelines: Site contamination – acid sulfate soil materials* and additional guidance documents listed under 'References and Additional Guidance' on page 3 of this guideline.

Potential ASS risk assessment

The potential ASS risk assessment process for proposed development and construction activities is summarised in the *Potential ASS risk assessment flowchart* (Figure 3 on Page 5). Individual steps in the Potential ASS risk assessment process are elaborated below.

Step 1: Potential ASS risk zone

The Atlas of Acid Sulfate Soils (CSIRO) has been used to delineate the lateral extent of potential ASS risks on Adelaide Airport (see the *Potential ASS risk zone* depicted in Figures 1 and 2).

The *Potential ASS risk zone* for Adelaide Airport corresponds with the area on the CSIRO Atlas that is indicative of soils with a **low probability of ASS occurrence**².

Remaining areas on the Airport, outside the *Potential ASS risk zone*, correspond with the CSIRO Atlas classification for soils with an **extremely low probability of ASS occurrence**.

Given the low probability of ASS occurrence indicated by the CSIRO Atlas, the *Potential ASS risk zone* is not intended to be used as a definite indicator of ASS risk but instead serves to demarcate the area within Adelaide Airport where further ASS risk assessment is required.

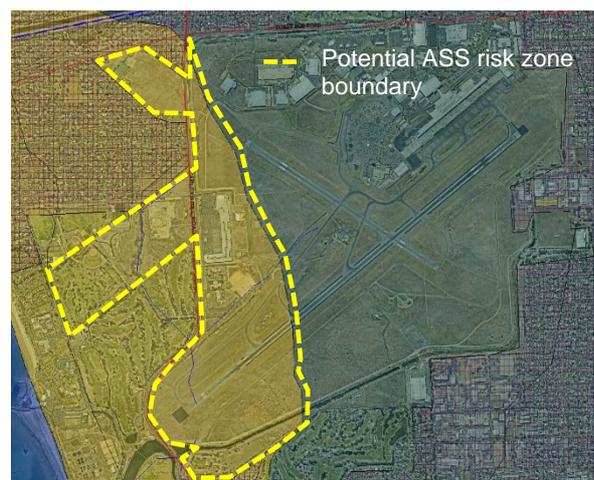


Figure 1. Adelaide Airport potential CSIRO ASS risk map overlay (enlargement in Figure 2).

Step 2: Volume of excavation spoil

In accordance with SA EPA guidance, it can be assumed that potential ASS risks do not exist where soil excavation volumes are <100m² fill excavation volumes are <500m² and average excavation depth is <0.5m below ground level.

Step 3: Vertical extent of potential ASS risks

Oxidation of PASS following soil excavation from depths below standing water level (SWL) is considered the principle potential ASS risk for soils within the Adelaide Airport *Potential ASS risk zone*.

Consequently, establishing whether proposed excavations extended below SWL³ represents a critical step in assessing potential ASS risks within the Adelaide Airport *potential ASS risk zone*.

Step 4: Undertake further risk assessment

Where the preceding assessment steps indicate that a proposed development may present potential ASS risks, further risk assessment is required, which may include:

- evaluation of existing soil and groundwater sampling data, relevant to the proposed development site; and
- soil and/or groundwater investigations within the proposed development site.

Risk assessments and any associated soil and groundwater investigations must be undertaken by a competent environmental professional⁴.

Assessment of potential ASS

Field tests and laboratory analytical methods exist for the assessment of potential ASS materials. Field ASS tests are generally used to provide preliminary indication of ASS conditions. Any field tests undertaken to assess potential ASS risks associated with proposed developments within the Adelaide Airport *Potential ASS risk zone* must be undertaken by a competent environmental professional⁴.

Similarly, any sampling of soil and/or groundwater undertaken for laboratory analysis of potential ASS must also be undertaken by a competent environmental professional.

For any ASS assessments carried out within Adelaide Airport Potential ASS risk zone, it is expected that:

- they are undertaken in accordance with the SA EPA *Guideline: Site Contamination - Acid sulfate soil materials*;
- and
- any analytical results are compared to the *Criteria for acid sulfate soil material* in Appendix C of the SA EPA Guidelines.

Additional information on ASS field and laboratory assessment is provided in the documents listed in the 'References and Additional Guidance' section below.

Requirement for an ASS Management Plan

When a risk assessment has identified potential ASS risks associated with a proposed development, a suitable ASS Management Plan must be developed by a competent environmental professional.

It is expected that ASS Management Plans will be developed in a manner consistent with the SA EPA *Guidelines: Site contamination – acid sulfate soil materials* and WA DER⁵ *Guideline: Treatment and management of soils and water in acid sulfate soil landscapes*, and will as a minimum include:

- a description of the existing environment within the proposed development site
- A summary of the proposed development and construction works and identify any potential impacts associated with ASS
- Detail of the proposed ASS management measures and remediation processes for all development and construction activities, including any contingency measures
- specification of the soil, surface water and groundwater monitoring program for assessing the efficacy of the ASS management measures and remediation.

Notes

1. South Australian Environment Protection Authority. As the airport is regulated under federal legislation, the SA EPA do not have direct jurisdiction over activities within the airport boundaries; however, where these activities have potential off-site impacts, the activities must comply with state environmental legislation. Given the close proximity of the Adelaide Airport *Potential ASS risk zone* to off-site surface water and groundwater receptors and the potential for ASS impacts to migrate off-site, state environmental legislation is applicable.
2. The *potential ASS risk zone* for Adelaide Airport corresponds with the area classified as a B3 type ASS risk on the CSIRO Atlas of Acid Sulfate Soils. A B3 risk is indicative of soils with a low probability of ASS occurrence. Similarly, areas outside the *potential ASS risk zone* for Adelaide Airport correspond with a C4 type ASS risk; representing soils with an extremely low probability of ASS occurrence.
3. Long-term and seasonal SWL variation may affect the validity of using existing SWL data (i.e. historical SWL data may not be representative of current conditions). Additionally, the required number of SWL data points must consider the size of the development area and the groundwater gradient.
4. A competent environmental professional (or Environmental Consultant) as defined in Schedule 9 of the National Environment Protection (Assessment of Site Contamination) Measure 1999 or in the SA EPA [Site Contamination Consultant Information Sheet \(EPA 665/14\)](#)
5. West Australia, Department of Environment Regulation (DER). Given the high incidence of ASS in WA (particularly along the Swan River in Perth) the WA DER guidance has for many years been considered the best available and forms the basis for guidance provided in a number of other jurisdictions.

References and Additional Guidance

Additional Guidance

[Guidelines: Site Contamination - Acid sulfate soil materials](#) (EPA 638/07), 2007. South Australian Environment Protection Authority.

[Acid Sulfate Soils Assessment Guidelines](#), 1998. Acid Sulfate Soils Management Advisory Committee, New South Wales.

[Acid Sulfate Soils: Laboratory Methods Guidelines](#), 2004. Queensland Department of Natural Resources, Mines and Energy.

[Identification and investigation of acid sulfate soils and acidic landscapes](#), June 2015. Department of Environment Regulation, Government of Western Australia.

[Queensland Acid Sulfate Soil Technical Manual: Soil Management Guidelines v4.0](#), 2014. Department of Science, Information Technology, Innovation and the Arts, Queensland Government.

[Treatment and management of soils and water in acid sulfate soil landscapes](#), June 2015. Department of Environment Regulation, Government of Western Australia.

References

[Airport \(Environment Protection\) Regulations 1997](#).

Atlas of Acid Sulfate Soils v2, 2011. CSIRO. In [Australian Soil Resource Information System](#) [Accessed: 9 May 2015]

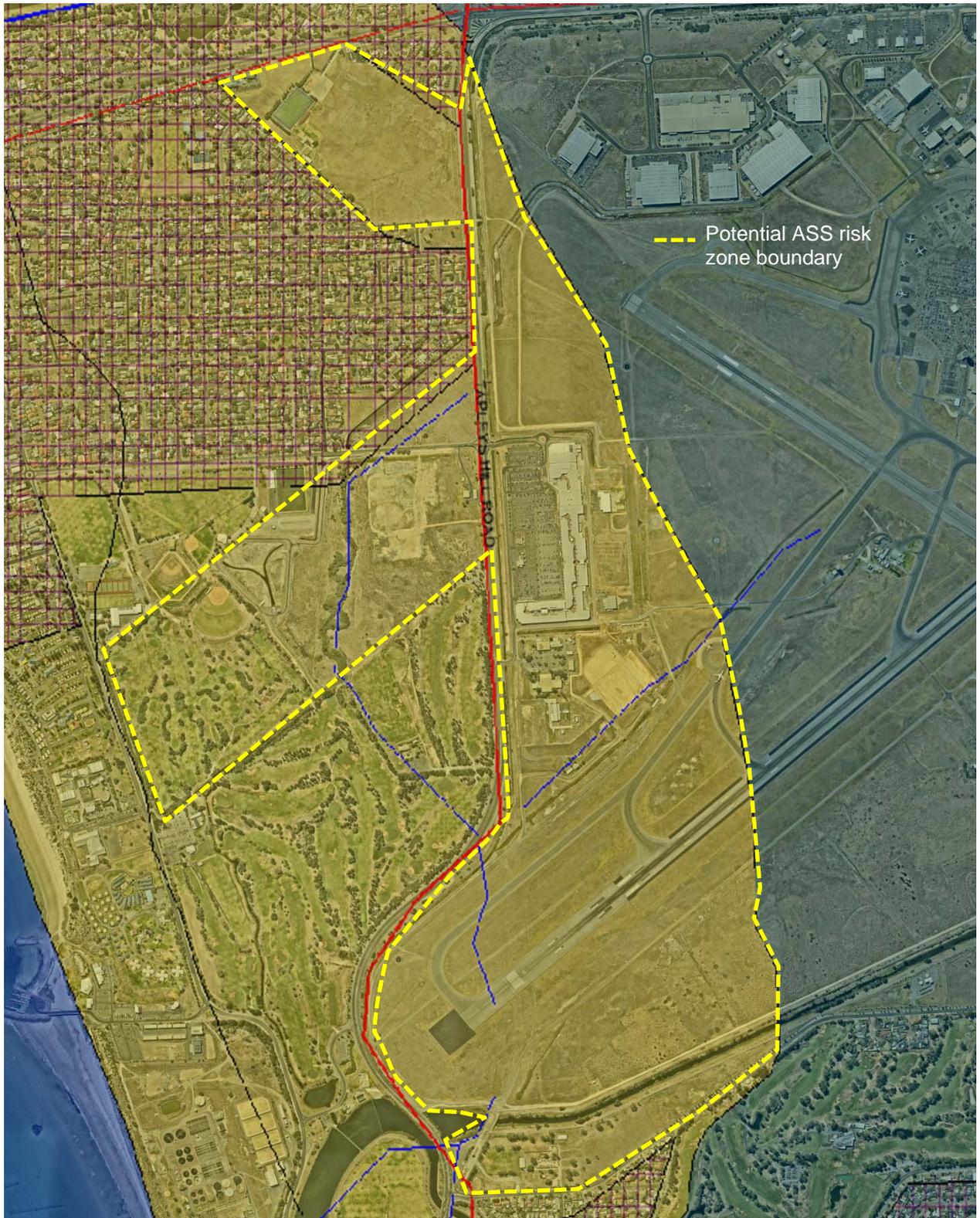


Figure 2. Adelaide Airport potential CSIRO ASS risk map overlay (enlargement)

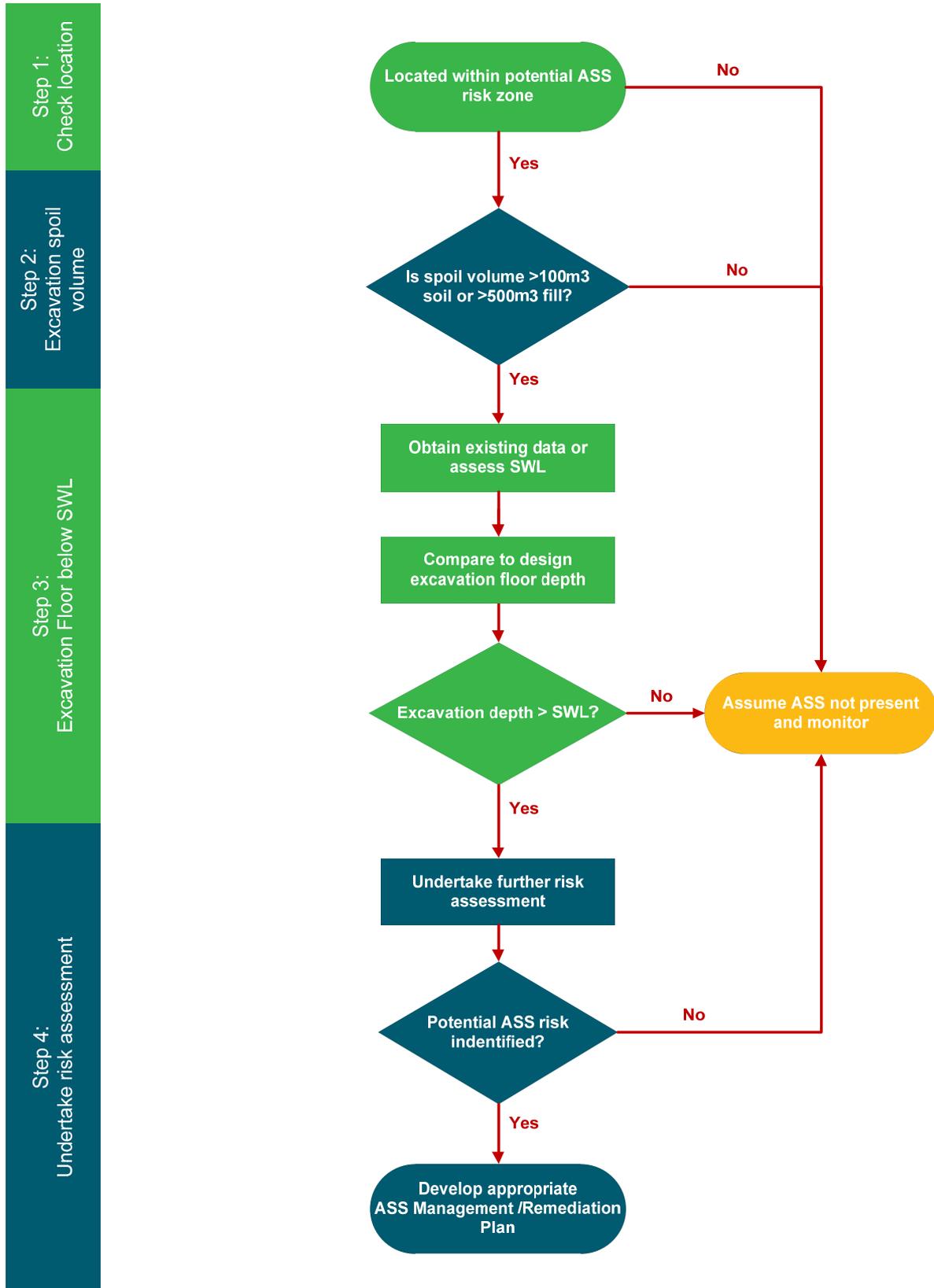


Figure 3. Potential ASS risk assessment flowchart

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