



Policy Position

Acid Sulphate Soils and the *Contaminated Sites Act 2003*

Acid sulphate soils

Acid sulphate soils (ASS) are naturally occurring soils, sediments and peats that contain iron sulphides, predominantly in the form of pyrite materials. These soils are most commonly found in low-lying land bordering the coast or estuarine and saline wetlands, and freshwater groundwater-dependent wetlands throughout the State.

Acid sulphate soils are benign when in a waterlogged environment. However, when these soils are exposed to the atmosphere through lowering of the water table (temporarily or permanently) or by excavation, oxygen reacts with the iron sulphides in the soil. This oxidation reaction results in the production of sulphuric acid. The acid can cause a breakdown of the soil structure releasing aluminium and other metals, precipitates and nutrients, which remain in the soil until rainfall or groundwater flow is sufficient to leach them out. The acid and metals may then be mobilised into groundwater aquifers, and into nearby surface water bodies with adverse environmental and economic impacts.

Potential environmental and economic impacts include: contamination of groundwater resources by acid, arsenic, heavy metals and other contaminants, fish kills, loss of biodiversity in wetlands and waterways, loss of agricultural productivity; and corrosion of concrete and steel infrastructure by acidic soil and water.

The types of activities which may cause the oxidation of acid sulphate soils include, but may not be limited to:

- dewatering operations
- excavation or other soil disturbance
- groundwater abstraction for private or commercial water supplies
- groundwater level control by drainage
- dredging operations
- land use changes which alter the water balance.

Climatic factors (e.g. reduced rainfall) which alter the water balance may also contribute to the oxidation of ASS.

Definition of 'contaminated' under the *Contaminated Sites Act 2003*

The meaning of 'contaminated' under the *Contaminated Sites Act 2003* (CS Act) is as follows:

"contaminated", in relation to land, water or a site, means having a substance present in or on that land, water or site at above background concentrations that presents, or has the potential to present, a risk of harm to human health, the environment or any environmental value."

Contaminants of concern for sites impacted by the disturbance of ASS

The typical contaminants of concern on sites which have been impacted by the disturbance of ASS include:

- acidity in groundwater and/or surface water
- arsenic in groundwater and/or surface water
- aluminium in groundwater and/or surface water
- acidity in soils
- arsenic in soils.

The DEC guideline *Assessment Levels for Soil, Sediment and Water* (2003) contains assessment criteria for common contaminants in soil, sediments and waters. It does not contain assessment criteria for acidity. DEC has adopted the following assessment criteria for acidity to be used in the assessment of sites under the Act.

Table 1: Assessment criteria for acidity to be used in the assessment of sites under the *Contaminated Sites Act 2003*

Media	Groundwater or surface water	Soils or sediments
Contaminant	"Net" acidity	Titrateable actual acidity (TAA)
Method of derivation	Total acidity minus total alkalinity	SPOCAS ¹ or CRS ²
Trigger level ³	60 mg/L	0.20 %S
Units	mg/L CaCO ₃ equivalent	%Sulphur w/w equivalent

Acid sulphate soils and the *Contaminated Sites Act 2003*

The CS Act applies where substances are present at a site at above background concentrations that present, or have the potential to present, a risk of harm to human health, the environment or any environmental value.

Sites will be classified as a contaminated site under the *Contaminated Sites Act 2003* where ASS disturbance has resulted in concentrations of contaminants and/or a level of acidity within soils, sediments and waters that are above background concentrations and present, or have the potential to present, a risk of harm to human health, the environment or any environmental value.

The presence of naturally occurring ASS beneath a site, in an undisturbed state, in itself, does not represent "contamination".

Where groundwater has been impacted, DEC may classify the site as *contaminated –restricted use*, with advice that groundwater should not be abstracted for any purpose without testing to determine its suitability for intended use. This classification requires a memorial to be placed on the Certificate of Title, and requires owners to disclose the contamination to any potential purchaser, mortgagee or lessee of the property.

¹ SPOCAS Suite - Suspension Peroxide Oxidation Combined Acidity and Sulphate (SPOCAS) method is a self-contained acid base accounting test. It provides a measurement of the maximum oxidisable sulfur, Titrateable Actual Acidity (TAA) and Titrateable Peroxide Acidity (TPA) and the potential Acid Neutralising Capacity (ANC) present in the soil sample. The TPA result of SPOCAS represents a measure of the net acidity, effectively equivalent to the sum of the soil's potential sulphidic acidity and actual acidity. The calculated Titrateable Sulphidic Acidity (TSA) is the difference between TPA and TAA. The peroxide oxidisable sulphur content (S_{POS}) provides a measure of the maximum amount of potentially oxidisable sulphur in the soil sample and represents the sulphur trail.

² CRS - Chromium Reducible Sulphur Suite - The chromium reducible sulphur suite is a set of independent analytical methods each of which determines a component of the acid base account. Only the required components of the acid base account are measured using this approach. The initial step in the chromium reducible sulphur suite is to measure the reduced inorganic sulphur content (by the Chromium Reducible Sulphur (S_{CR}) method) to estimate the potential sulphidic acidity. Measurements of existing acidity {Titrateable Actual Acidity (TAA)} and ANC are also made.

Laboratory methods suitable for analysis of acid sulphate soils are fully described in the *Acid Sulphate Soils Laboratory Methods Guidelines* produced by the Queensland Department of Natural Resources, Mines and Energy, Queensland (Ahern *et al.*, 2004). These guidelines are available at <http://acidsulphatesoils.environment.wa.gov.au>.

³ Trigger level – level at or above which further investigation is required to assess potential risks to human health, the environment or any environmental value.

For further information on the site classification process, refer to the Fact Sheet “*Site Classifications – what do they mean?*” available at www.dec.wa.gov.au/contaminatedsites.

Responsibility for remediation for a site where contamination has been caused by the disturbance of ASS

Where a site is contaminated as a result of ASS disturbance, and the contamination is sufficiently severe that the site is classified as *contaminated – remediation required*, any decision regarding the responsibility for remediation⁴ of the site under the Act will consider all of the potential factors which may have contributed to the disturbance.

The presence of ASS beneath a site, in itself, does not represent ‘contamination’.

There is no need to report the site under the CS Act where a site has naturally occurring ASS which are undisturbed, and there is no other reason to believe that there are any substances present in or on that land, water or site at above background concentrations that present, or have the potential to present, a risk of harm to human health, the environment or any environmental value.

Need more information?

DEC has published a series of fact sheets and administrative and technical guidelines to assist with the assessment, management and remediation of contaminated sites in Western Australia; these are available from www.dec.wa.gov.au/contaminatedsites.

More information is available by mail from the address below or by calling the Contaminated Sites Section on 1300 762 982.

Contaminated Sites Section
Department of Environment and Conservation
Locked Bag 104
Bentley Delivery Centre WA 6983

⁴ Remediation is often interpreted as ‘cleaning’ or removing contamination, however the definition under the CS Act is much broader, encompassing any action taken to eliminate, limit, correct, contain, counteract, mitigate or remove any contaminant, or the negative effects of any contaminant on the environment or human health. Such actions can include restricting public access to water or soils at a site, the installation of below ground permeable reactive barriers to intercept and treat groundwater, or the removal of material for suitable treatment or safe disposal.