

Appendix 3 Revised Acid Sulfate Soils Management Plan

1.0 Introduction

An Acid Sulfate Soils Management Plan (ASSMP) is required to accompany a development application for the Batemans Bay Regional Aquatic, Arts and Leisure Centre (the development). This ASSMP has been prepared in accordance with the NSW Acid Sulfate Soils Manual 1998.

2.0 Legislative and Policy Requirements

The *Protection of the Environment Operations Act 1997* makes it an offence to cause or permit the pollution of waters. The development has the potential to cause pollution of the adjoining wetlands through the exposure of acid sulfate soils.

Eurobodalla Local Environmental Plan 2012 (ELEP 2012) requires development consent for the carrying out of works described in the table below on land shown on the Acid Sulfate Soils Map as being of the class specified for those works.

Class of land	Works
1	Any works.
2	Works below the natural ground surface. Works by which the watertable is likely to be lowered.
3	Works more than 1 metre below the natural ground surface. Works by which the watertable is likely to be lowered more than 1 metre below the natural ground surface.
4	Works more than 2 metres below the natural ground surface. Works by which the watertable is likely to be lowered more than 2 metres below the natural ground surface.
5	Works within 500 metres of adjacent Class 1, 2, 3 or 4 land that is below 5 metres Australian Height Datum and by which the watertable is likely to be lowered below 1 metre Australian Height Datum on adjacent Class 1, 2, 3 or 4 land.

The subject land is predominantly mapped as having class 3 acid sulfate soils. A narrow strip of land is mapped as having class 2 acid sulfate soils, as shown in the map below.



Where development consent is required, ELEP 2012 states that such consent must not be granted unless an ASSMP has been prepared for the proposed works in accordance with the Acid Sulfate Soils Manual and has been provided to the consent authority.

The Acid Sulfate Soils Manual 1998 states that an ASSMP is required when testing for acid sulfate soils exceeds the action criteria in Table 4.4 (copied below).

Texture	Approx. Clay Content (%)	Sulfur Trail % Oxidisable Sulfur (S_{pos} or S_{Tos})	Acid Trail mol H^+ /tonne (TPA or TSA)
Coarse Texture Sands to Loamy Sands	<5	0.03	18
Medium Texture Sandy Loams to Light Clays	5-40	0.06	36
Fine Texture Clays and Silty Clays	>40	0.1	62

3.0 Proposed Works

The whole of the development, including car parking areas is within the land identified as having class 3 Acid Sulfate Soils. In the development area, excavations more than 1m below the natural ground surface will be required for the building foundations, the pool shells, rainwater tank and the grease arrestor trap. In most cases, the extent of excavation below 1m is relatively minor and in isolated locations.

In relation to the pools, the deepest part of the 25m pool is 1.8m below natural ground level and the water table in this location, from bore hole 1, is also 1.8m below natural ground level. In relation to the grease arrestor trap, to accommodate the falls required for pipes from the café to the trap, the excavation required is to -0.420m AHD (2.6m below natural ground level). In this location, from bore hole 5, the water table is at 0.7m AHD (1.5m below natural ground level). The grease arrestor trap is therefore approximately 1.1m below the water table.

For all structures near or below the water table, localised de-watering will be required to facilitate construction. The structures will be designed to resist uplift pressures, through the use of tension piles or concrete aprons. The structures will be designed to comply with Australian Standard 3735-2001 Concrete Structures for Retaining Liquids. As a result of these actions, the water table will not need to be lowered.

4.0 Site Investigations

Geo-technical investigations of the site were undertaken in May 2018 and in February 2019, including testing for acid sulfate soils. The final report of both investigations, dated June 2019 (included at Attachment 3), found that all sediments are strongly alkaline. There was no actual acidity in the test samples, however all sediments were deemed to be potentially acid sulfate soils. It was recommended that an Acid Sulfate Soil Management Plan be prepared for the project.

The table below from the geotechnical report shows that most samples exceeded the action criteria for the sulfur trail, but all samples were well below the action criteria for the acid trail.

Bore-hole	Depth (m)	Soil type			Sulfur Trail		Acid Trail	
			pH (KCl)	pH (H ₂ O ₂)	Action Criteria S _{pos} (%)	S _{pos} (%)	Action Criteria TSA	Mol H ⁺ /tonne TSA
BH1	4.0-4.45	Sandy Clayey Silt	9.0	7.9	0.06	0.681	36	<2
BH2	2.0-2.45	Sand, trace of silt	9.7	7.9	0.03	0.057	18	<2
BH3	1.0-1.45	Sand, trace of silt	9.6	8.0	0.03	0.028	18	<2
BH3	2.0-2.45	Sand, trace of silt	9.6	8.1	0.03	0.143	18	<2
BH3	6.0-6.45	Sandy Clayey Silt	8.7	7.8	0.06	1.04	36	<2
BH5	2.5-2.95	Sand, trace of silt	9.6	8.2	0.03	0.147	18	<2
BH6	5.0-5.45	Sand, trace of silt	9.7	8.0	0.03	0.130	18	<2
BH8	4.5-4.95	Sandy Clayey Silt	9.0	7.8	0.06	0.833	36	<2
BH9	4.5-4.95	Clayey Silt, trace of sand	8.8	7.7	0.06	1.05	36	<2
BH10	2.5-2.95	Sand, trace of silt	9.4	8.8	0.03	0.121	18	<2
BH10	5.5-5.95	Silty Sand / Clayey Sand	9.1	8.0	0.03	0.785	18	<2
BH10	7.5-7.95	Clayey Silt, trace of sand	8.9	7.9	0.06	0.622	36	<2

5.0 What are Acid Sulfate Soils?

“Acid sulfate soils is the common name given to naturally occurring soil and sediment containing iron sulfides” (Acid Sulfate Soils Manual 1998).

There are two types of acid sulfate soils – Potential Acid Sulfate Soils (PASS) and Actual Acid Sulfate Soils (AASS). PASS refers to the iron sulfides generally located beneath the water table in a layer of waterlogged soil, in an oxygen deficient environment. When exposed to air, the iron sulfides have the potential to generate sulfuric acid on contact with water, and they become AASS.

6.0 Acid Sulfate Soil Risks

The exposure of PASS to air and water, resulting in AASS has the potential to cause the following impacts:

- Pollution of groundwater and waterways
- Fish kills or fish disease
- Oyster damage and mortality
- Death or stunted growth of aquatic flora
- Release of heavy metals from sediments
- Adverse impacts on soil structure
- Social impacts, such as polluted drinking water
- Economic impacts, such as impacts on tourism, fishing and aquaculture industries
- Damage to infrastructure, such as corrosion of pipes and damage to building foundations.

7.0 Management and Monitoring Actions

The management and monitoring actions outlined in the table below aim to prevent the exposure of PASS, minimise the likelihood of soils becoming AASS and prevent any AASS from leaching into waterways.

Item	Action	Comments
1	Stage excavations to minimise extent of earthworks at any one time and to minimise the time PASS is exposed to air (in excavated areas and in stockpiles).	A Construction Staging Plan is to be developed by the contractor. The Plan shall demonstrate how the amount of excavated material will be minimised at any one time.
2	Inform workers of the management actions required to minimise risk of acid sulfate soils.	Daily site induction meetings during excavations should address the management actions.
3	Implement erosion and sedimentation control measures prior to excavation.	Erosion and sediment controls shall be maintained in good working order until the area is stabilised.
4	Visually inspect excavated material.	PASS may have some or all of the following characteristics: • A sulfurous or tar like smell • Contains blue or green material • Contains pale yellow staining or mottling • Water-logged soils, soft buttery blue grey or dark greenish muds • Mid to dark grey estuarine silty sands or sands • Dark grey to black to black bottom sediments of estuaries.
5	If PASS is identified in excavated material, immediately halt excavation, wet the excavation area and the excavated material and report to the site supervisor.	Keep a written record of reports identifying PASS and actions taken.
6	Store excavated material with PASS in a covered bin lined with heavy duty plastic or stockpile in a bunded area, separated from non-PASS stockpiles.	PASS bunds should have an impervious base and sides and be pre-lined to neutralise any leachate. All soil stockpiles shall be located more than 60m away from the adjoining wetland and any stormwater or drainage lines.
7	Moisten and cover bunded material.	Keeping the material moist minimises exposure of the soil to the air. Use a heavy duty plastic material to ensure the material remains air and watertight where possible. Weigh down the cover edges with sandbags or the like.
8	Where practical, treat the soil with a neutralising agent and reinstate PASS on site at the same depth as excavated.	Treat PASS by mixing in a fine grade agricultural lime or similar neutralising material in accordance with the ASSMAC 1998 guidelines. Reinstall PASS on the same day it is excavated.

9	If disposal of PASS is required, disposal shall comply with relevant EPA guidelines.	Refer to Part 4 of NSW EPA Waste Classification Guidelines 2014. Note: PASS must be received at the disposal site within 16 hours of being dug up.
10	If required, dewater excavated areas.	Water that has collected in PASS excavations should not be discharged to stormwater or allowed to flow into waterways. Removal of this water should be by a licensed liquid waste contractor to a suitably licensed waste facility.
11	Test excavated areas and excavated material	Testing of the excavated areas and excavated material must be undertaken within 3 hours of the excavation works. Field pH testing can be undertaken in accordance with the requirements of the Acid Sulfate Soils Manual. If the excavated area tests for AASS, remedial action must be undertaken immediately (see 13 below). If excavated material tests for AASS, disposal in accordance with the NSW EPA Waste Classification Guidelines 2014 must be undertaken.
12	Remediation of AASS found in excavated areas.	Remediate AASS in excavated areas by applying a fine grade agricultural lime or similar neutralising material in accordance with accepted practices. Retest the area following remediation.
13	Monitor excavated areas and the surrounding environment.	Regular testing of soils and water in the vicinity of the excavated area shall be undertaken during construction. It is recommended that tests be undertaken on a monthly basis. Written records of monitoring actions and results must be kept.

8.0 Contingencies

In the event that monitoring results identify the presence of AASS in soils or waterways, the following steps shall be taken.

- Step 1 Immediately cease works in the area affected and implement appropriate remediation actions to remove or neutralise the AASS. Suitable neutralising material must be kept on site at all times.
- Step 2 Retest the area affected.
- Step 3 Should the remediation action fail, the project must cease and appropriate action must be taken to restore the affected area to a condition equivalent to that prior to commencement of the project.