

MANAGING ACID SULFATE SOILS

1. PURPOSE

- To establish a consistent process and a specific protocol for managing Acid Sulphate Soils (ASS) in all areas of East Gippsland Water's (EGW) infrastructure.
- To raise awareness of EGW staff regarding potential impacts of ground disturbances where a potential ASS site has been identified.
- To have a process in place to ensure minimal environmental impact, OHS risks and ongoing protection of assets in associated with ASS
- To comply with our environmental obligations and legislative requirements.

This Standard Operating Procedure applies to all EGW staff and contractors undertaking work on EGW's behalf.

2. INTRODUCTION

Acid Sulphate Soil (ASS) occurs naturally in coastal and inland settings. These soils contain metal sulphide minerals, which, if drained, excavated or exposed to air, can react with oxygen and water to form sulphuric acid.

Undisturbed ASS does not present any risk. However if disturbed, ASS can create an acidic environment, which presents occupational health and safety risks (skin, eye irritation and burns), risks to assets (corrosion of steel and concrete infrastructure) and environmental damage (acidified soils and water, dead vegetation, dead fish etc). ASS can also lead to the release of other contaminants such as heavy metals when combined with acidic materials. The release of these contaminants can cause harm to plants and animals, and contaminate drinking water.

In East Gippsland, ASS is generally found in low lying areas within coastal plains or wetlands and along the edges of water bodies. This is termed Coastal Acid Sulphate Soils (CASS). Maps of potential CASS in EGW's region are located in **Appendix 1**.

NOTE: ASS and CASS are typically found within close proximity to inland and coastal water bodies. To this extent, it is likely that other planning and statutory overlays/ requirements may be required and considered in conjunction with implementation of this SOP i.e. Cultural Heritage Act 2006, Coastal Management Act 1995, Works on Waterways Permits etc. These other requirements may prevent or require additional approvals to undertake works or field investigation works (i.e. excavation) which should be assessed on a case by case basis.

3. ACRONYMS AND DEFINITIONS¹

ASS - Acid Sulphate Soil is any soil that contains sulfidic or sulphuric material. It encompasses Actual Acid Sulphate Soils (AASS) and Potential Acid Sulphate Soils (PASS).

¹ Victorian Coastal Acid Sulfate Soils Strategy, DSE (2009)



CASS - Coastal Acid Sulphate Soil is an acid sulphate soils (ASS) that has formed as a result of sea influence (excluding cyclic salt).

CSEM – Contractor Safety and Environment Management.

Environment Team – Manager Treatment Services, Treatment and Environment Systems Officer, Coordinator Environmental Services.

PASS - Potential Acid Sulphate Soil is any soil (coastal or inland) that contains metal sulphides (generally pyrite or iron sulphide) that is yet to oxidise and release sulfuric acid/metals.

AASS- Actual Acid Sulphate Soils is any soil that contains sulfuric acid. An indication that metal sulphides have been oxidised.

4. APPROVAL

Managing Director

5. RESPONSIBILITIES

All **EGW employees** are responsible for:

- operating in accordance with this SOP; and
- reporting any suspected or actual evidence of ASS to their supervisor without delay.

Managers/Team Leaders/Supervisors are responsible for ensuring that:

- relevant staff are trained in the requirements of this SOP; and
- reports of suspected or actual ASS are referred to the Environment Team to allow appropriate management action to be taken.

The **Environment Team** is responsible for:

- the provision of specialist support as required;
- reporting serious ASS related incidents to the Environmental Protection Authority (EPA) and the Department of Environment, Land, Water and Planning (DELWP) following consultation with Executive Management; and
- reviewing field safety and environmental practices.

Project Managers (including external service providers) are responsible for:

- Assessing each project for the risk of encountering ASS or PASS in accordance with EGW's Project Management Manual and other relevant forms and procedures;
- designing works to avoid or minimise environmental impacts and OHS risks in accordance with the relevant regulatory and legislative requirements;
- obtaining relevant regulatory approvals;
- ensuring that any EGW works involving ASS or PASS are identified and advised to the managers and team leaders responsible for the works; and
- ensuring that any contract works involving ASS or PASS are correctly identified in CSEM Form 2.1 and advised to the contractors involved in the works; and

- ensuring that ASS Management plans are developed and followed for projects deemed to have a high risk for disturbing ASS.

6. PROCEDURE- PLANNED WORKS

The following procedure outlines the steps that need to be taken to ensure the risk of ASS disturbance is considered and appropriately managed. The procedure is summarised in Figure 1.

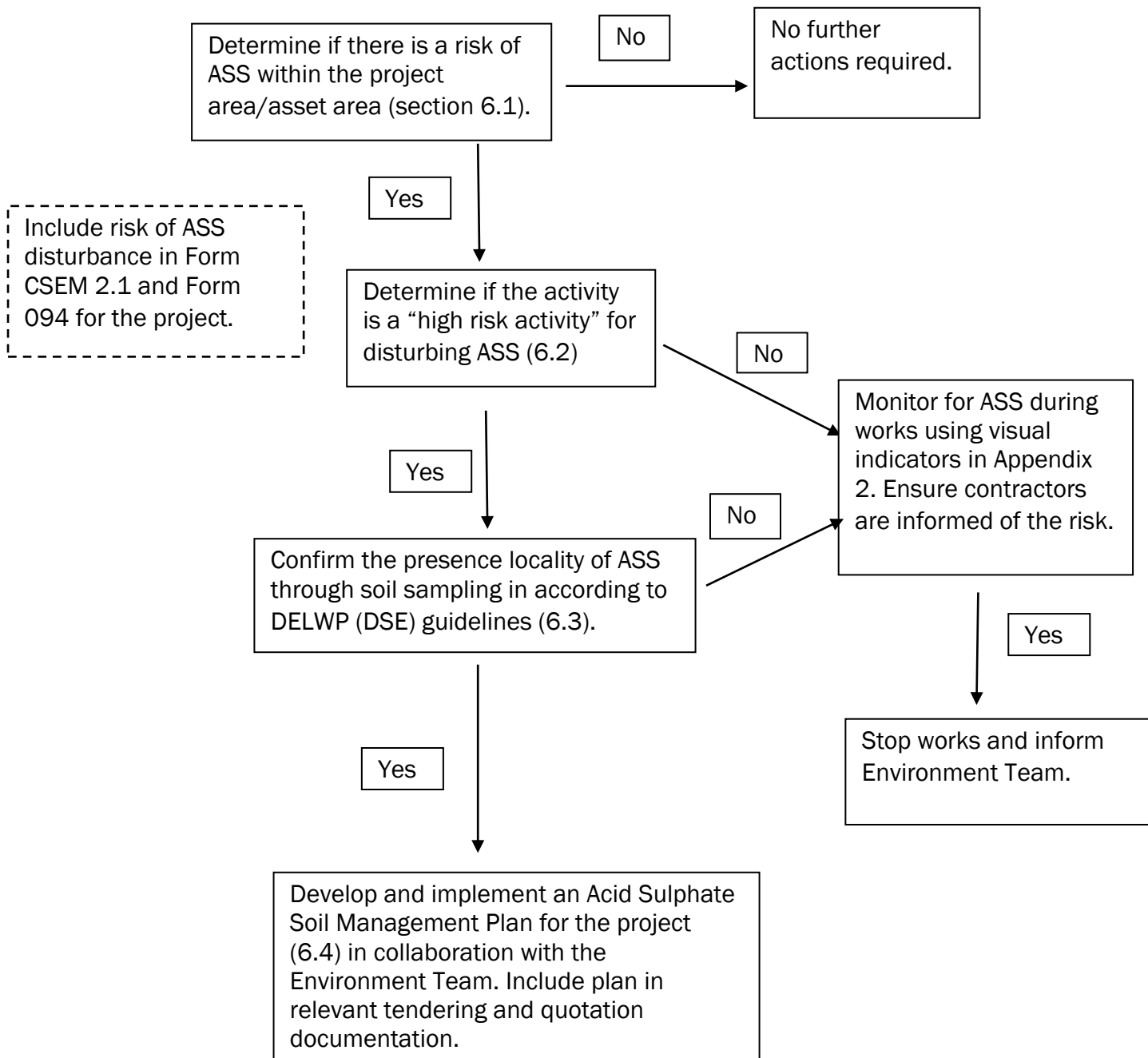


Figure 1: Summary of ASS Management Steps for planned works.

6.1 Determine if ASS is present within the project/asset area.

To determine if there is a risk of ASS within the area of the project the following identification methods should be followed:

a) Desktop Assessment.

Conduct a desktop assessment using the maps in **Appendix 1** or EGW's GIS. EGW has a CASS GIS overlay located under the Miscellaneous Layer (Figure 1).

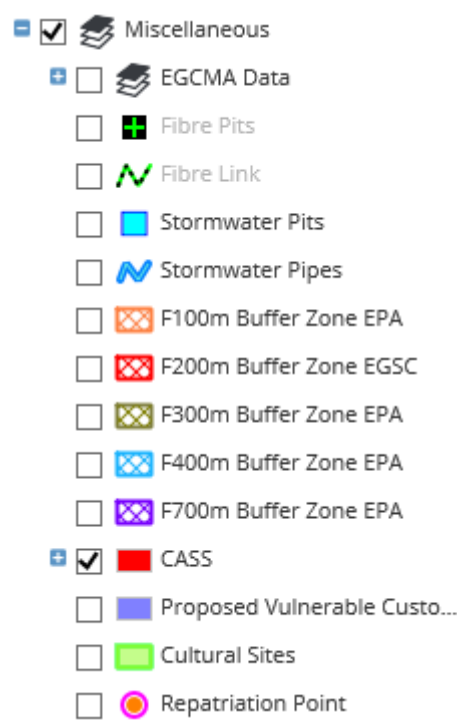


Figure 1: CASS overlay on EGW's GIS.

b) Site Inspection

Below is a list of environmental indicators that ASS could be present within the area. This can be determined through visual inspection of the environment or an asset in the proposed project area:

- Water with pH less than 4.
- Dead and bleached surrounding vegetation (can include aquatic).
- Unusually clean or milky blue-green water within or flowing from the area.
- Extensive iron stains on drain or pond surfaces, or iron stained water and ochre deposits.
- Dead fish.
- Corrosion of concrete and/or steel structures.
- Skin irritation after exposure to water.
- Land and soil at elevations of less than 5 mAHD and the natural ground surface is below 20 mAHD.
- Sediments and tidal lakes of marine origin.

- Coastal wetlands, swamps, waterlogged or scalded areas, inter-dune swales or coastal sand dunes.
- Area dominated by swamp tolerant plant species.

Visual indicators / examples of ASS disturbance are located in **Appendix 2**.

In the event of noticing any of the indicators above, stop work and notify your supervisor. In extreme events – where two or more indicators shown in the guide are present, notify the Environment Team without delay.

If a visual inspection or desktop assessment of the area does not suggest the presence of ASS, no management of ASS is required.

6.2 Determine if the activity has the potential to disturb ASS

The types of activities which EGW and/or EGW contractors undertake which may disturb ASS include, but are not limited to:

- Excavating soil.
- Filling land.
- Moving ASS horizontally or vertically.
- Temporarily or permanently dewatering soil containing ASS.
- Drilling for bores (vertical and directional).
- Infrastructure works – flood management, drainage works, water and sewer pipe installation.
- Water extraction.

High Risk Activities That May Disturb ASS

According to Victorian Best Practice Guide for Assessing and Managing Coastal Acid Sulphate Soils the following are considered high risk activities. The following activities may be undertaken by EGW and/or EGW contractors, or may be undertaken by other parties in regions in which EGW assets are located or our operations take place:

- Excavating soil/sediment (>1000 m³).
- Extracting or lowering groundwater.
- Filling land (more than 100m³ with an average depth of 0.5m) over *in situ* PASS.
- Planting vegetation (crops or plantation) that may potentially lower the water table.
- Coastal or inshore dredging.

If the project does not involve activities listed above, no formal ASS management plan is required. However the project manager should assess the risks on a case by case basis to determine if there is potential for environmental impact or damage to new or existing assets. Project managers should ensure that contractors are familiar with identifying ASS (Appendix 2) and have reporting procedures in place.

6.3 Confirm where ASS is found

Before developing an ASS Management Plan, conduct soil sampling to determine where ASS is present in the proposed project area. This should include a range of tests, including pH, pH-Fox, reaction rates, SPOCAS Suite and Chromium Suite. For an example refer to DOC/18/13658.

6.4 Engage a Suitably Qualified Consultant to develop an ASS Management Plan

Once it has been confirmed that the project involves a high risk activity that has the potential to disturb ASS, and the location of ASS is known, engage a suitably qualified consultant in developing an ASS Management Plan. This plan needs to be risk based, specific for the project, practical, in line with Department of Environment Land Water and Planning (DELWP) and Environment Protection Authority (EPA) Guidelines.

This plan must be sent to the Environment team for review and included in relevant tender/quotation documentation as a requirement of works to be implemented by the contractor during the project.

7. PROCEDURE-UNPLANNED WORKS

The following procedure relates to the management of ASS for unplanned works where ASS has the potential to be disturbed (Figure 2).

7.1 Determine if ASS is present within the Area.

Conduct a desktop assessment using the maps in Appendix 1 or EGW's GIS (refer to Section 6.1a). EGW has a CASS GIS overlay located under the Miscellaneous Layer (Figure 1).

7.2 Ensure appropriate materials are taken on site.

If the unplanned works require disturbance of soil (for example digging of a trench) ensure the following resources are taken on site:

- Agricultural Lime (Calcium Carbonate).
- Full protective clothing, safety glasses and appropriate gloves (See Section 8 on Safety around ASS).

7.3 Manage ASS Risks

Ensure disturbed/removed soil is not stockpiled close to a water way. Mix an appropriate amount of lime through soils as soon as soil removal is complete prior to returning the soil back into the ground. For advice on the amount of lime to add, contact EGW's Environment Team.

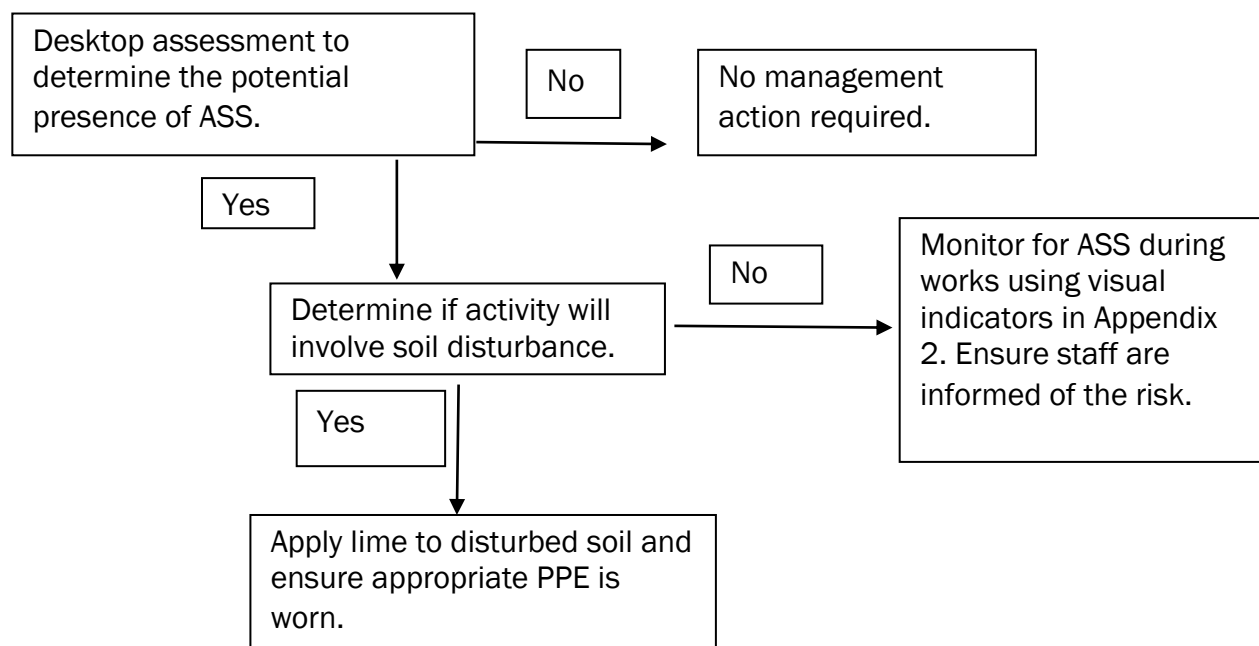


Figure 2: Summary of ASS Management Steps for unplanned works. .

8. SAFETY

7.1 Sulphuric acid

Acid sulphate soils contain metal sulphide minerals, which, if drained, excavated or exposed to air, can react with oxygen and water to form sulphuric acid.

Sulphuric acid is considered very corrosive to skin and eyes at concentrations greater than 15% in water causing severe burns and scarring. The acid is irritating to skin and eyes at concentrations between 5 and 15 % in water and may cause redness and soreness.

The corrosive properties of sulfuric acid are accentuated by its highly exothermic reaction with water. This can result in additional tissue damage to either skin or eyes due to dehydration and particularly secondary thermal damage due to the heat liberated by the reaction with water.

7.2 First Aid

7.2.1 Eyes

Immediately irrigate with fresh water for at least 15 minutes and ensure that eyelids are held open. Tilt the head to prevent any wash-water coming into contact with the unaffected eye. Seek immediate medical assistance, whilst continually rinsing the eye(s) with copious amounts of water.

7.2.2 Skin

Immediately wash contaminated skin with plenty of water for at least 15 minutes. Remove contaminated clothing and wash before reuse. If irritation persists, seek immediate medical attention, whilst continually rinsing the skin with copious amounts of water.

7.3 Safety management of ASS

Testing of soil samples in the coastal areas of East Gippsland have indicated that average concentrations of sulphuric acid are approximately 150ppm (0.015%), such that health effects as described above are unlikely. However, as soil sample test results are unlikely to be readily available in the field, it is best practice to assume that handling CASS is a high safety risk.

7.4 Handling ASS – Personal Protective Equipment (PPE)

If ASS is disturbed as per section 6.2 above, it is best practice to avoid any human contact with the soil. If contact is unavoidable, operators should wear full protective clothing, safety glasses and appropriate gloves (Neoprene or PVC).

9. TRAINING

All relevant staff and managers will be trained in this SOP.

10. REVIEW

This SOP will be reviewed every three years or when significant changes are required.

11. RECORDS

- Contractor Safety Environment Management (CSEM) Form 2.1 and F094
- Environment Management Systems (EMS) database

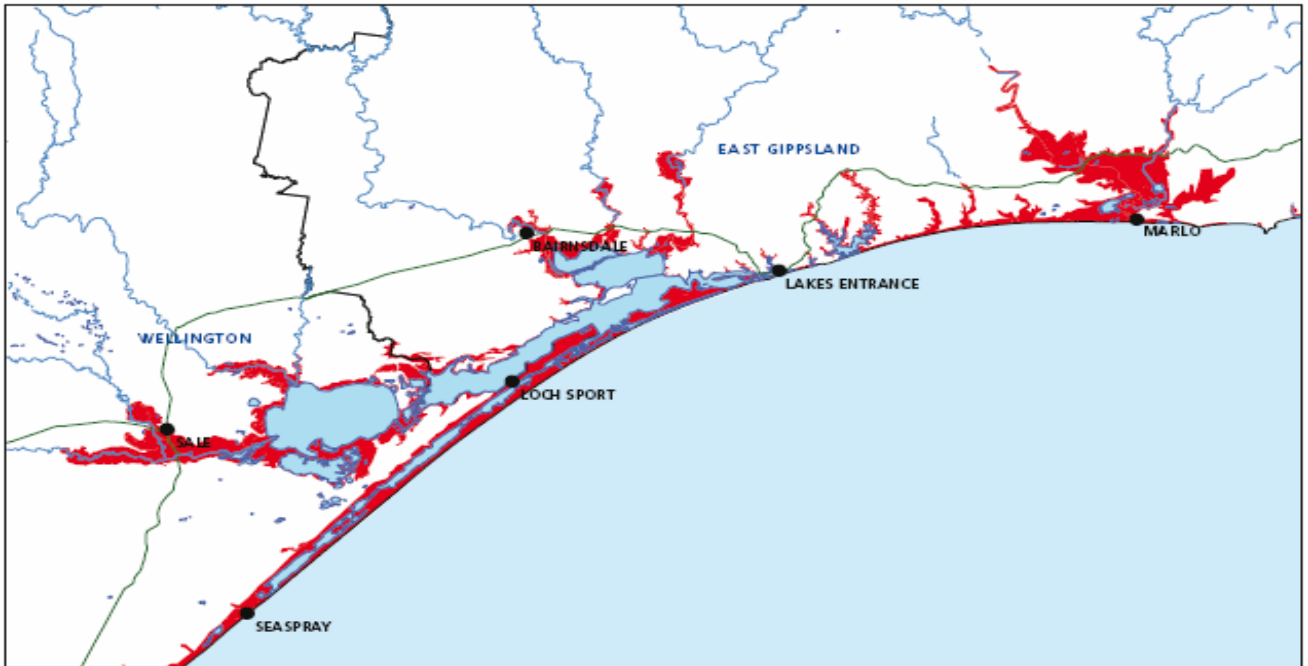
12. RELATED / REFERENCED DOCUMENTS

- EMS Manual
- SOP 003 Environmental Incident Response
- SOP 029 Chemical Spill Response
- EGW 063 “Spill Station” Chemical Spill Kit Use
- Victorian Coastal Acid Sulphate Soils Strategy - DSE July 2009 (EGW DOC/10/37161)
- Victorian Best Practice Guide for Assessing and Managing Coastal Acid Sulphate Soils - DSE October 2010 (EGW DOC/10/37162)
- EPA Information Bulletin – Publication 655.1 Acid Sulphate Soil and Rock 2009

Appendices:

1. Land in the East Gippsland Region with Potential to Contain CASS.
2. Visual Indicators / Examples of ASS Disturbance.
3. Flow Diagram for Victorian CASS Risk Identification Process

APPENDIX 1



Map 5 Gippsland Lakes

Prospective Land: land that has the potential to contain Coastal Acid Sulfate Soils



Map 6 East Coast

Prospective Land: land that has the potential to contain Coastal Acid Sulfate Soils

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APPENDIX 2

Visual Indicators / Examples of ASS Disturbance

Monosulphidic black ooze



Monosulphidic black ooze



Soil scald caused by disturbance of CASS



Exposed aggregate on a culvert in the Heart Morass. Dissolution of concrete structures helped detect disturbed CASS.



Marine deposits - Seaspray



Bleached soil – Heart Morass





East Gippsland **Water**

Bleached and iron stained soil



Dead vegetation

