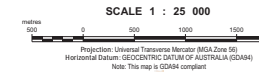


SPECIAL ACID SULFATE SOILS MAP

PINE RIVERS AREA



REFERENCE

ACID SULFATE SOILS (ASS)¹ ON RELATIVELY UNDISTURBED LAND

Depth	Depth Code	Depth to Actual Acid Sulfate Soil ² (pH < 4.5)	Depth to Strongly Acidic Soil Layer ³ (pH < 4.5 to 4.8)	Depth to Potential Acid Sulfate Soil ⁴
0 - 0.5m	0	A0	a0	S0
0.5 - 1m	1	A1	a1	S1
1 - 2m	2	A2	a2	S2
2 - 3m	3	A3	a3	S3
3 - 4m	4	A4	a4	S4
4 - 5m	5	A5	a5	S5
>5m	5+	A5+	a5+	S5+

- NOTE:
- The depth codes above imply that a predominance of profiles in the map unit fall within the nominated depth range.
 - Actual acid sulfate soil layers (designated with an A code) often overlie potential acid sulfate soil layers (designated with an S code). Where this occurs a map unit is coloured according to the depth of the upper surface of the 'actual' layer (A) and overlaid with yellow dots. An 'x' preceding the soil depth code e.g. **xA1** indicates a strong acid soil layer with field pH ranging from <4.0 to <4.5. This may or may not be a result of sulfide oxidation. While 'x' depth code is shown on the map, no colour is assigned to it.
 - In areas where there is varying depth to an ASS layer that cannot be separately mapped at the operative scale, two colours are used to designate the dominant depths. This appears as equal with striped colours, e.g. **SA1/2**.
 - 'SP' indicates sediments of Pleistocene age⁵, so that 'SPx' indicates sulfidic sediments (of Pleistocene age) deeper than 5m.
 - 'w' - Substratum indicates areas associated with *Acidobacteria* or wetlands and occasionally *Conium maculatum*. Oxidizable sulfur 'S' in surface layers may be highly variable and often exceeds the *Soil Chemistry* data. This map depicts sulfur from organic compounds and modern excretion of sulfur in a wet, organic rich environment. ASS typically occurs at depth. Where this occurs a map unit is coloured as per the actual or potential depth category and is overlaid with 'w' pattern.

- Land mapped at 1:100 000 scale where ASS occurs within 5m of the surface.
- Limited field assessment but occurs in a landscape position where there is a reasonable probability of ASS occurrence. This is usually land where the present use precludes any disturbance e.g. National Parks, Reserves etc., or land where accessibility is severely restricted.
- Disturbed land, e.g. Canal Estate, Marina, Aquaculture, Quarry, Urban, Industrial likely to contain ASS. (In some cases partial or full treatment may have been undertaken) Limited field investigation.

- 5m AHD⁶ CONTOUR - NORMAL LIMIT OF FIELD INVESTIGATION**
- The landward extent of mapping units typically represents the 5m AHD contour. It delineates the normal limit of field investigation of Holocene, estuarine sediments⁷ which form ASS. Holocene ASS may be present in some parts of the study area underlying alluvial deposits with surface elevations above 5m AHD, however limited assessment has been undertaken in these areas. These areas are indicated by blue hatching on the map. In other cases, the limit is at or below the 5m AHD contour. In the latter case, land between the ASS limit and the 5m contour is designated LP as explained below.

- LAND WITH A LOW PROBABILITY OF ACID SULFATE SOIL OCCURRENCE**
- Land between the 5m AHD contour and the outer limit⁸ of Holocene, estuarine ASS (as land <5m AHD) as mapped at this scale, with low probability of ASS occurrence⁹. Limited field investigation.
- Land <5m AHD with low or negligible probability of ASS occurrence⁹. Limited field assessment.

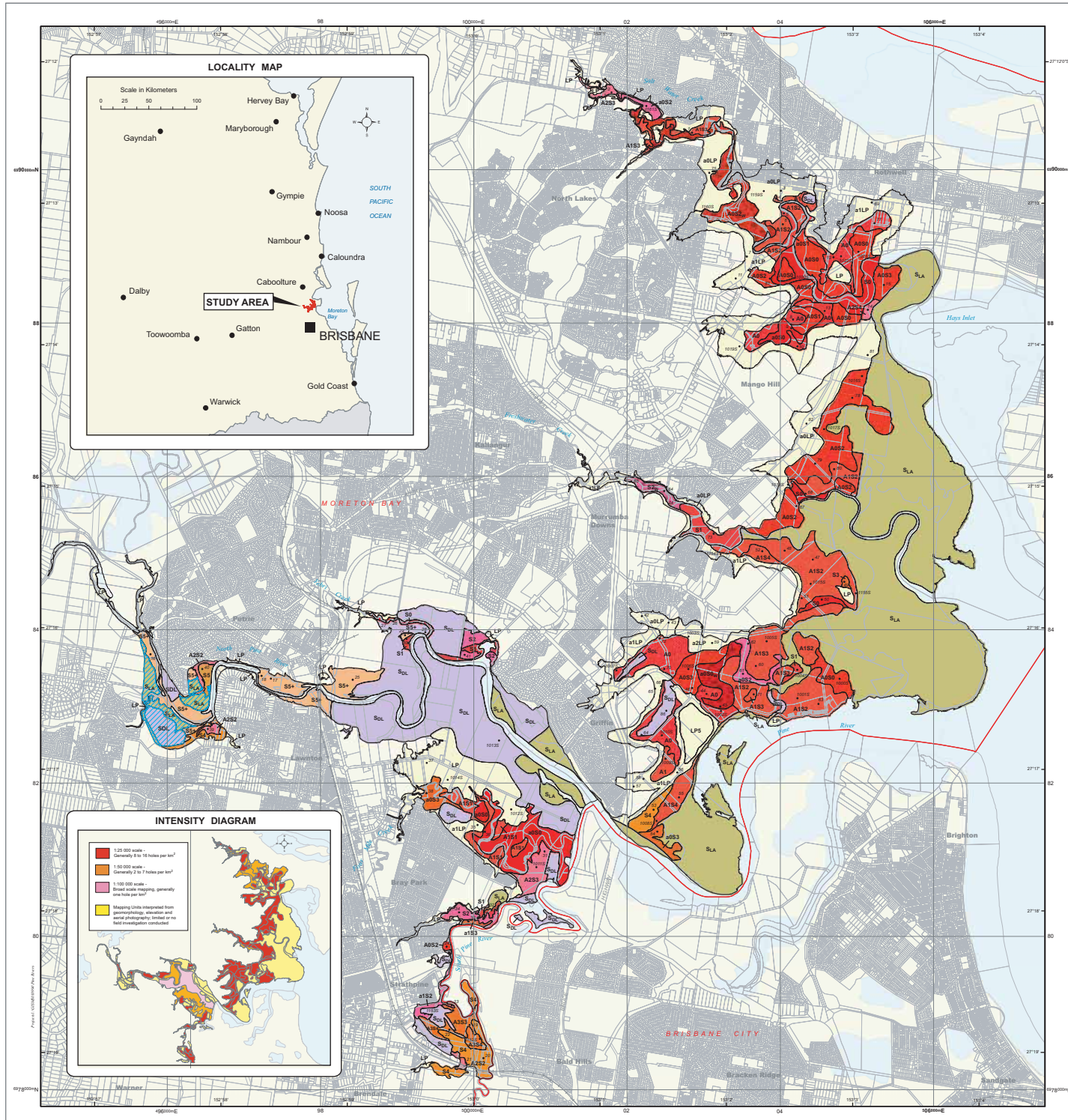
- LAND NOT ASSESSED**
- Land not assessed for ASS as part of this survey. It includes areas below 5m AHD likely to contain ASS which are not in the study area. These areas are identified separately on the 1:100 000 scale map Acid Sulfate Soils (Tweed Heads to Redcliffe, Map 1 (NRMA, 2002)). It may include non ASS land beyond the boundary established as the limit of Holocene, estuarine, sulfidic sediments⁷ not sufficient or no field testing was carried out¹⁰.

- ¹ Acid sulfate soil is the generic term used to define soils derived from estuarine sediments containing iron sulfides (pyrite) or containing the acidic products of the oxidation of sulfides. The term includes actual and potential acid sulfate soils. Unless used with the superscript P, the code 'S' implies sulfidic sediments of Holocene age. The superscript P implies sediments of Pleistocene age.
- ² An 'x' preceding the soil depth code indicates the probable depth to a soil layer or horizon where a field pH of <4.0 is first encountered. A field pH of 4.0 or less is used as an indicator of an Actual Acid Sulfate Soil (AASS) which has no visible acidity in the form of iron pyrites, ulmanite, iron or acid soils. Extensive areas with high actual acidity derived from sulfide oxidation may constitute a significant environmental hazard. Some soils with high organic matter may show low pH from organic acids. An 'x' preceding the depth code indicates the probable depth to a soil layer or horizon with field pH ranging from <4.0 to <4.5. This may or may not be a result of ASS oxidation.
- ³ An 'a' preceding the soil depth code indicates the probable depth to a Potential Acid Sulfate Soil (PASS) layer or horizon. PASS are soils where the oxidizable sulfur percentage exceeds the prescribed 'carbon cutoff' at which treatment is required if disturbed. Testing for oxidizable sulfur is conducted by the Total Oxidizable Sulfur (TOS) method, the Chromium Reducible Sulfur (CRS) method or the Permanganate Oxidation, Combined Acidic and Sulfidic (PACAS) method.
- ⁴ Oxidizable sulfur 'Action Criteria' that trigger treatment are currently: Sands, 0.05 5%; Loams to light clays, 0.06 5%; Medium to heavy clays, 0.1 5%. NOTE: For distances > 1000 metres the action criteria is 0.03% regardless of soil texture.
- ⁵ Limited or no field checking has been carried out in disturbed lands.
- ⁶ The reliability of elevation data is variable across the study area. AHD refers to Australian Height Datum.
- ⁷ The primary focus of ASS investigation in this study are the sulfidic sediments that were deposited in the Holocene epoch, that is, during the last 10 000 years. Experience in coastal estuarine mapping shows that similar, but much older sulfidic sediments of Pleistocene age can occur, ASS in a natural (unperturbed) state, being buried under other unmineralized sands or old, consolidated alluvium. They are far less common than the Holocene equivalents, and have been found beneath land whose surface is both above and below 5m AHD. Generally, Pleistocene sediments will be found at greater depths below the surface than equivalent Holocene sediments.
- ⁸ The outer boundary of Holocene estuarine ASS commonly occurs at the intersection with hard rock or other materials of non estuarine origin. It is either at the 5m contour or at lower elevation. This boundary is established using limited field checking at the boundary field, together with the use of contour lines and geological map boundaries. There is no field assessment beyond the 5m AHD contour level. It should be noted, however, that certain lithologies on land above 5m AHD may contain sulfidic material of non estuarine/Holocene origin. Additionally, much older estuarine, sulfidic sediments may occur at depth on land >5m AHD, as discussed in footnote 7 above.
- ⁹ CAUTION: It is not possible to accurately map the distribution of ASS adjacent to rivers and streams at the current mapping scale eg mangrove fringes. ASS may also be buried below alluvium of past and present stream channels some distance upstream of mapped areas.

- NOTE: This map should be used in conjunction with the accompanying report covering this area.
- Borehole locations where profiles were described in detail and samples taken for analysis. "S" represents sites undertaken as part of the previous South East Queensland 1:100 000 scale acid sulfate soils mapping.
 - Local Authority boundary.
 - Digital Coastal Database.

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LOCALITY MAP



INTENSITY DIAGRAM

