

**PORT OF AIRLIE MARINA DEVELOPMENT**

**Appendix E Acid Sulphate Soils Management  
Plan**

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## EMP (Acid Sulfate Soils) Construction Activities - Port of Airlie Development

<b>Element/Issue:</b>	<p><u>Acid Sulfate Soils</u> – The assessment and Treatment of some or all of approximately 550 000m<sup>3</sup> of material marked for excavation. PASS sediments are present in a 2 to 4m thick layer over most of the site. It is estimated that PASS spoil from excavations along the shoreline and in the open bay and channel will constitute about 200,000 m<sup>3</sup>.</p>
<b>Operational Policy</b>	<p>To minimise the impact resulting from:</p> <ul style="list-style-type: none"> <li>• acid soil conditions generated by disturbance of spoil which may contain PASS sediments;</li> <li>• use and/or disposal of the neutralised spoil material.</li> </ul>
<b>Statutory Requirements</b>	<p>General requirements of the:</p> <ul style="list-style-type: none"> <li>• <i>Environmental Protection Act, 1994;</i></li> <li>• <i>Environmental Protection (Water) Policy, 1997;</i></li> <li>• <i>State Planning Policy (SPP 2/02) - 'Planning and Managing Development Involving Acid Sulfate Soils'.</i></li> </ul>
<b>Performance Criteria:</b>	<p>No significant impacts on nearby marine receiving waters (or groundwater) resulting from the disturbance, transportation or deposition of PASS materials.</p> <p>In order to achieve this:</p> <ol style="list-style-type: none"> <li>1. any ASS/PASS materials that have been neutralised by the addition of agricultural lime shall have a TPA of &lt;4 moles H<sup>+</sup>/tonne</li> <li>2. The pH level of receiving waters near the site shall not drop by more than 0.2 units below an established 'base line' level <u>or</u> 6.5 (whichever is lower); <u>or</u> rise above 8.5.</li> <li>3. Groundwater quality parameters adopted will comply with the requirements of the ANZECC Guidelines relevant to Marine Environments.</li> </ol>
<b>ASS Assessment:</b>	<p><u>Sampling &amp; Testing Program</u></p> <p>An ASS assessment of the marine sediment profile(s) at the site must be undertaken prior to any construction. The assessment shall conform with the requirements of the current version of the QASSIT 'Guidelines for Sampling and Analysis of Lowland Acid Sulfate Soils in Queensland'.</p> <p>The investigation shall include:</p> <ul style="list-style-type: none"> <li>• the pushing of at least 37 sample bore holes to 1.0m below expected excavation depths (ie. ranging from ~2.0m (shoreline) to 6.0m (in the channel), using a barge mounted vibro-core sampling rig and/or a hand held piston type sampler, with samples taken at 0.25m intervals (approximately 600 samples);</li> <li>• initial screening of all samples shall be undertaken using the pHox test method; followed by</li> <li>• quantitative analysis of a representative number of samples to complete a 'staged' analysis program by either the POCAS or the Chromium Reducible Sulfur (S<sub>Cr</sub>) test method (approximately 150 samples).</li> <li>• sampling and testing of receiving waters for the following parameters to establish 'baseline action criteria' for potential impacts:- pH, EC, dissolved Aluminium, Iron &amp; Calcium levels, and Chloride : Sulphate ratio.</li> <li>• preparation of a 3D map of PASS sediments identified.</li> </ul>

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<b>Implementation Strategy:</b>	<p><u>Soil And Water Attributes Of The Site</u></p> <p>Preliminary ASS assessment of parts of the site have been undertaken. Assessment comprised sampling and screening of sediment samples to 2.0m depth in the inter-tidal area of the site; and up to 5.3m depth further out in Muddy Bay, supplemented by limited quantitative analysis and interpretation. Findings indicated FOS levels of up to 1.50% and the presence of consistent, high levels of fine calcareous material (shell fragments and finer coral debris, i.e. particle size 600 - 150µm).</p> <p>POCAS test results from work undertaken at nearby Point Mandalay, are understood to indicate similar FOS levels in the range 0.01 - 0.56%. Additional sediment samples taken in September 2002, also contained significant amounts of shell fragments and much finer calcareous material.</p> <p>Prior to construction, a comprehensive ASS assessment of the marine sediment profile(s) at the site must be undertaken (outlined herein).</p> <p>Prior to construction, groundwater monitoring wells (GMW) must be installed at two locations within the site of the treatment area, to facilitate monitoring of seasonable fluctuations of the permanent groundwater table height and groundwater quality. The data to be used to establish a 'baseline' for groundwater quality.</p> <p><u>Excavation / Construction Procedures</u></p> <p>Construction is to be undertaken entirely during the 'dry' season, to minimise negative impacts associated with construction of the Development. Excavations are to be undertaken in two parts :</p> <ol style="list-style-type: none"><li>1. Shallow excavations close to the shore, which are to be undertaken by first enclosing the area with sheetpiling, then gradually dewatering the enclosed area, then using conventional plant, (clam shell crane, excavators etc.) to undertake excavations. These activities will produce up to 100,000m<sup>3</sup> of spoil.</li><li>2. Deeper excavations in the channel and bay are to be undertaken by dredging (up to 6m depth) using a cutter / suction dredge(s). Which is expected to produce ~ 450,000m<sup>3</sup> of spoil.</li><li>3. Spoil from areas containing PASS sediments will be transferred immediately to a bunded Remediation Area, purpose built for storage and treatment of PASS spoil (about 200, 000m<sup>3</sup> of PASS spoil is anticipated).</li><li>4. All PASS spoil is to be dewatered prior to treatment, and the runoff pumped to a purpose built treatment basin for pH monitoring and if required treatment, prior to release.</li><li>5. Treated spoil will then be removed to appropriate areas of the site for use as fill or otherwise disposed of.</li></ol> <p><u>Remediation Area</u></p> <ol style="list-style-type: none"><li>1. An area of approximately 250m x 80m has been set aside for use as a Remediation / Treatment Area. This area shall be surrounded by an earth bund, designed with the following characteristics:<ul style="list-style-type: none"><li>▪ the bund wall(s) will be a minimum of 1.2m high, and battered no steeper than 1V:2H;</li><li>▪ constructed from 'clean', non-dispersive material with a Permeability (K) of &lt; 1x10<sup>-8</sup> m/sec;</li><li>▪ compacted to 97% of Standard Compactive Effort.</li></ul></li><li>2. The area will be designed to incorporate a number of 'cells' separated by internal bunds, each of sufficient size to accommodate the expected daily excavation quantities, (calculations of expected quantities should to incorporate a FOS of 1.5). Initial estimates of maximum daily excavation rates are 4000 to 5000m<sup>3</sup> per day.</li></ol>
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<p><b>Implementation Strategy (cont):</b></p>	<p>3. In addition a Treatment Basin is to be constructed, of sufficient size to accommodate water pumped from the treatment cells on a daily basis. The basin shall incorporate:</p> <ul style="list-style-type: none"> <li>▪ a lime 'slurry' mixing tank and dosing system for regulated dosing of retained waters as required; and</li> <li>▪ an automatic pH monitoring system.</li> </ul> <p><u>Management &amp; Remediation Procedures</u></p> <ol style="list-style-type: none"> <li>1. Based on the findings of the ASS Assessment to be undertaken prior to construction, excavated/dredged spoil shall be transferred to a purpose built Treatment Area and neutralised with agricultural lime in the manner outlined below, as soon as is practical.</li> <li>2. Prior to construction a detailed Site Based Management Plan should be prepared. This SBMP shall include specific design parameters for the Treatment Area and the individual 'cells' and water Treatment Basin.</li> <li>3. Spoil representative of one days operations (up to 5000m<sup>3</sup>), shall be placed in a bunded cell in the Treatment Area and dewatered. The treatment area would need to contain as a minimum 4 discrete treatment 'cells'.</li> <li>4. Run-off shall be pumped to the Treatment Basin for monitoring and if necessary treated to adjust the pH. Treatment and discharge of retained waters shall be undertaken regularly, to match pace with the on-going construction operation.</li> <li>5. Sufficient cells are to be constructed to allow rotation of the dewatering - treatment - validation process, while allowing construction operations to proceed at the desired pace.</li> <li>6. To enable a simplified approach to remediation, agricultural lime should be added to <u>all</u> spoil identified during assessment as containing PASS sediments.</li> <li>7. The lime application rate to be based on average unbuffered acidity levels for the entire depth of the excavated profile (incorporating a FOS of 2.0).</li> <li>8. Mixing of the lime may be undertaken using a combination of mechanical plant and hand tools as is appropriate to achieve thorough mixing. Lime to be used should be of high quality, and kept in a dry state.</li> <li>9. Following neutralisation, validation testing shall be undertaken at an appropriate rate. Samples shall be analysed by the TPA (Dent &amp; Bowman) or POCAS test method. As a minimum, 1 sample shall be taken from each day's remediation operations.</li> <li>10. Once results of validation testing are known and approved, the treated spoil should be removed for use in filling operations. If validation is not achieved the spoil is to be retained and remixed then re-sampled, and the validation process repeated. If validation is still not achieved, additional lime shall be added and the validation process again repeated.</li> </ol>
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<p><b>Implementation Strategy (cont):</b></p>	<p>11. Site management measures shall include:</p> <ul style="list-style-type: none"> <li>• Establishment of 'baseline' groundwater quality within the treatment area. This will involve monthly monitoring from two locations for the following criteria: - pH, EC, Dissolved Iron &amp; Aluminium) &amp; Chloride:Sulfate ratio.</li> <li>• Inspection and maintenance of soil bunds around each cell, the treatment pond and the whole Treatment Area.</li> <li>• Keeping a photographic record of the lime mixing procedure (to be retained for future reference).</li> <li>• Daily review of validation testing and water quality monitoring data records, during construction.</li> <li>• Rotation of the use of individual cells to ensure adequate storage and treatment area(s) is available to meet requirements of the construction program.</li> <li>• Adoption of mitigation strategies in the 'Corrective Action' section below, should remediation procedures fail to meet the 'Performance Criteria' outlined herein.</li> </ul>
<p><b>Monitoring:</b></p>	<p>The pH level of the water retained in the treatment basin shall be monitored using an automatic monitoring and data recording system.</p> <ol style="list-style-type: none"> <li>1. The system shall be recalibrated weekly and before any stoppages in the work program (ie. weekends, weather).</li> <li>2. Monitoring will be undertaken: <ul style="list-style-type: none"> <li>• Four times each working day, during the period of disturbance by an experienced operator,</li> <li>• the system employed will have an accuracy of not less than 0.1 pH units.</li> </ul> </li> </ol>
<p><b>Auditing:</b></p>	<p>Auditing requirements shall demonstrate implementation of agreed management strategies and compliance with the agreed performance criteria (outlined herein).</p> <p>Permanent records of the following activities shall be kept (and updated on a daily basis), to enable audit/review by means of a simple 'check list' or similar:</p> <ul style="list-style-type: none"> <li>• details of daily excavation activities,</li> <li>• quantities of spoil removed from each area of the site &amp; lime added,</li> <li>• water pH levels in the on-site treatment basin,</li> <li>• quantities of lime slurry added to retained water,</li> <li>• results of TPA verification tests undertaken,</li> <li>• any requests for 'Corrective Action' lodged,</li> <li>• changes to management procedures.</li> </ul>

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<p><b>Operational Status:</b></p>	<p>After completion of construction activities at the site, part of the Treatment / Remediation Area will be decommissioned.</p> <p>A smaller permanent treatment area incorporating a single 'cell' and small Treatment Basin is to be retained for use during regular maintenance dredging operations.</p> <p>The permanent Treatment Area shall to be operated in accordance with the requirements included herein.</p>
<p><b>Reporting:</b></p>	<p>A permanent record of all remediation activities including the requirements listed in the 'Auditing' section above, should be maintained. The site supervisor or appointed technical officer responsible shall report to the Project Manager on the performance of the EMP;</p> <ul style="list-style-type: none"> <li>• regularly on a weekly basis during construction operation, and</li> <li>• if requests for 'Corrective Action' are lodged or non-conformances with the EMP occur, then immediately;</li> <li>• on a monthly basis during on-going operation of the site.</li> </ul>
<p><b>Corrective Actions:</b></p>	<p>Should a failure to meet the 'Performance Criteria' outlined above occur, a request for Corrective Action shall be lodged and the operations ceased until the Performance Criteria are met. Outlined below are Corrective Action Responses (CAR) that may occur.</p> <ol style="list-style-type: none"> <li>1. If the pH level in the retained water falls outside the stated limits:             <ul style="list-style-type: none"> <li>• dose with hydrated lime slurry at a concentration that will adequately reduce the pH level (consult a suitably experienced technical officer and monitor pH level during the dosing process to ensure over dosing does not occur);</li> <li>• after a period of 2 hours or when the prescribed pH limits have been achieved the water may be released, and the CAR documented.</li> </ul> </li> <li>2. Should any breaches of bund walls be detected:             <ul style="list-style-type: none"> <li>• the affected 'cell' shall be emptied (into another complying cell), and the nonconforming bund wall repaired and inspected by a geotechnical engineer.</li> <li>• when the bund wall is again conforming to specification, the CAR shall be documented, and the 'cell' returned to operational status.</li> </ul> </li> </ol>

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