Proposal to Change Mining Methods of Eneabba South Operation from Dry Mining to Dredging

Western Australia Associated Minerals Consolidated Limited

Report and Recommendations
of the
Environmental Protection Authority

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Summary

Associated Minerals Consolidated Limited has submitted a proposal to change mining methods of the Eneabba south operation from dry mining to dredging.

This would involve the establishment of a dredge pond in existing mining pits from which a suction cutter dredge would progress along a prescribed mining path followed by a floating wet concentrator plant.

Tailings would be stacked behind the operations allowing rehabilitation of mined out areas to be carried out progressively as the dredge operation proceeds.

Rehabilitation would involve re-establishment of native plant species over disturbed areas in the same manner that is applied to existing dry mining operations.

In initially considering the Company's proposal the Authority determined that the potential for environmental impact would be required to be formally assessed under Part IV of the Environmental Protection Act, 1986.

Upon assessment of the Notice of Intent that was prepared by the Company it was determined by the Authority that the change from dry mining methods to dredging at the south Eneabba mining operations is environmentally acceptable and makes the following recommendations.

Recommendation

The Environmental Protection Authority has concluded that the proposal to change from dry mining to dredging at Eneabba is environmentally acceptable and recommends that it could proceed subject to:

- **the proponent abiding by the commitments in the Notice of Intent and subsequent correspondence (Appendix A to this Report). The Company's commitments are to undertake investigations of the surficial aquifer to ensure that areas will be closed off as soon as possible after mining and to rehabilitate and revegetate the tailings; and**

- **mining operation being carried out in accordance with the provisions for the protection and management of the environment in the Mineral Sands (Western Titanium) Agreement Act and the Mineral Sands (Allied Eneabba Agreement Act (as amended). These provisions ensure that the Company carries out a programme of investigation and research, to ascertain the effectiveness of its measures to protect the environment. Under the Agreements a Mineral Sands Rehabilitation Co-ordinating Committee (including EPA representation) has been established, which monitors the rehabilitation situation at Eneabba and advises the Minister for Minerals and Energy.**

1. BACKGROUND

Following the discovery of high grade mineral sands deposits at Eneabba in 1970, three companies commenced mining operations in the period from 1972 to 1976. All three mining companies elected to adopt conventional dry mining techniques and transport dry material to separate wet concentrator plants located within each company's project area. All mining, processing and rehabilitation activities were carried out individually.

With variations in market demands for heavy mineral products, one of the operating companies has closed and Allied Eneabba Limited has merged with Associated Minerals Consolidated Limited. As a result of this merger there has been a rationalization of the ore-bodies allowing the mining operations to be combined and hence increasing the efficiency of both mining and rehabilitation activities.

Under the current method of dry mining the remaining proven ore reserves in the Southern Eneabba mineral leases have been estimated to be economic for up to six years. It was also reported that continuation of dry mining would result in considerable low grade reserves left unmined.

The introduction of dredging techniques would reduce the existing cut-off grade allowing larger quantities of ore to be extracted economically, thereby maximising recovery of the mineral resource.

The mining operations are currently being carried out in accordance with the Mineral Sands (Western Titanium) Agreement Act and the Mineral Sands (Allied Eneabba) Agreement Act.

2. THE PROPOSAL

Associated Minerals Consolidated Limited has submitted a proposal to change mining methods of the Eneabba south operation from dry mining to dredging.

This would involve the initial establishment of a dredge pond in existing mining pits. A conventional suction cutter dredge would be used to supply a floating wet concentrator plant to separate heavy mineral concentrate from sand and clay tailings. Some auxiliary dry mining would continue to be carried out in conjunction with dredging operations.

The dredge/concentrator stacks coarse tailings immediately behind the concentrator to construct a series of bund walls which creates a series of slimes and tailings disposal ponds in the mined out areas along the dredge path. The slimes (discharged clay fraction) would be deposited first and allowed to settle prior to progressively, being covered by coarse sand tailings. Decant water from the tailings slurry would gravitate through an overflow pipe sequence back to the dredge pond. These areas would be progressively rehabilitated with native vegetation, as presently required for dry mining operations.

3. ENVIRONMENTAL ASSESSMENT

In considering the Company's initial proposal the Authority determined that the potential for environmental impact was such that the proposal would require assessment under Part IV of the Environmental Protection Act, 1986, and that the level of assessment would be Notice of Intent.

A Notice of Intent has been submitted by the Company addressing the environmental aspects of the proposal and making commitments for ongoing environmental monitoring and management programmes to be applied to the operations.

ENVIRONMENTAL ISSUES

In its assessment of the proposal the Authority considered the following as the major issues:

Water management and effects of dredge water seepage on the surficial aquifer and adjacent vegetation;

Sand tailings and slimes disposal;

Rehabilitation; and

Encroachment of dredging operations on conservation reserves areas.

It was reported in the Notice of Intent, that water losses under current mining methods average at about 750 litres per tonne. When the dredging operation has commenced the net operating area subject to water usage will reduce from the current operating area which involves scattered tailings sequences. Thus, water losses by evaporation and seepage are expected to be reduced.

A possible source of increased seepage will be at the dredge face. Although this is not expected to be substantial the Company has undertaken to monitor surficial aquifer levels adjacent to the dredge pond. The ground water mound created by the dredge pond is expected to fall away fairly rapidly as the dredge progresses due to the high permeability of the sand overlying the surficial aquifer.

Slimes and coarse sand tailings will be disposed of in ponds progressively constructed in the wake of mining operations. The slimes will be deposited first and allowed to settle prior to the coarse sand tailing being deposited evenly over the top of the slimes. The continuous advance of the dredge pond requires a new tailings pond to be constructed every sixty days. This rate of advance would allow for smaller dams than would be required for dry mining operations, hence reducing the amount of slimes that are built up over a period of time. This along with the placement of sand tailings over the slimes would allow for these areas to be re-contoured almost immediately.

Rehabilitation of re-contoured mining areas would be undertaken in the same manner that is applied to existing dry mining operations.

Topsoil will be stripped in two layers immediately ahead of dredging operations. The first cut topsoil containing the plant propagules and the majority of the organic matter would be immediately respread on areas undergoing rehabilitation or used within 12 months. Approximately 20% of the second cut topsoil may be used to construct side levees for the dredge pond and the rest will be stockpiled to the side of the dredge path for later re-spreading. Topsoil used in construction of levees would also be reclaimed for re-spreading. Other aspects of the rehabilitation would remain unchanged. Following re-spreading of the two layers of topsoil the area would then be sown with a light cover crop and a complex native seed mix, and mulched with vegetation cut from the mine path, for stabilisation and

additional seed. All of these operations would be carried out in the late summer/autumn months for maximum establishment. Tailings areas completed between June and December each year would be held over and rehabilitated the following season. Therefore, as mining and tailings disposal would continue all year, and rehabilitation would be confined to only part of the year, the area open would fluctuate.

Selected nursery stock would be planted on second year rehabilitation. Maintenance procedures involving additional mulching, seeding and nursery stock would be carried out on rehabilitated areas from year two onwards as required. Development of the regenerating vegetation would be monitored with the electronic botanical data management system developed by the Company. Progress of the rehabilitation programme and the Company's research and investigations would be reported in the Interim and Triennial Reports required under the Agreement Acts.

In its assessment of this proposal the Authority noted that the dredging operations would impinge on two Class "C" reserves for the protection of flora and fauna. Existing dry mining operation are located with one of the reserves (31030) under conditions agreed to by the National Parks and Nature Conservation Authority as the vested Authority for these reserves.

The Company is currently negotiating for access to Reserve 27886 through the Department of Mines and Department of Resources Development in liaison with the National Parks and Nature Conservation Authority.

5. CONCLUSION

Upon assessment of Associated Minerals Consolidated Limited's proposal the Authority concluded that the proposed operation would allow progressive rehabilitation at a faster rate and that the proposal would be environmentally acceptable as proposed in the Notice of Intent.

The Authority has further concluded that the existing mechanisms for environmental protection and management established under the two Agreement Acts covering the mineral sands operations are appropriate for the environmental management of this proposal. A summary of these mechanisms is contained in Appendix B of this Report.

APPENDIX A

LIST OF ENVIRONMENTAL COMMITMENTS

1. The Company will undertake further investigations of the surficial aquifer.

   ie measure the gradient of the existing mound in aquifer from east to west.

2. The Company will ensure that areas will be closed off as soon as they can be released from mining and services; thus reducing the amount of area open.

3. Tailings will be rehabilitated and revegetated.

APPENDIX B

ENVIRONMENTAL MANAGEMENT OF ASSOCIATED MINERALS CONSOLIDATED MINERAL SANDS MINING OPERATIONS AT ENEABBA

1. Background - AMC's Obligations under the ratified Agreement Act

Clause 5 of the Mineral Sands (Western Titanium) Agreement, requires the Company (AMC) to submit detailed proposals on every aspect of the project for Ministerial approval. In 1977, the then Minister for Industrial Development approved AMC's proposals.

Clause 8 (1) of the Agreement Act requires the Company to "carry out a continuous programme of investigation and research including monitoring and the study of sample areas to ascertain the effectiveness of the measures it is taking pursuant to its approved proposals for the protection and management of the environment".

Furthermore, Clause 8 (2) of the Agreement Act requires the Company "at yearly intervals commencing from the date when the Company's proposals are approved, to submit an interim report to the Minister concerning investigations and research carried out and at 3 yearly intervals commencing from such date submit a detailed report to the Minister on the result of the investigations and research during the previous 3 years".

Additionally, the Minister may within two months of the receipt of the detailed report notify the Company that additional detailed proposals are required to be submitted in respect of all or any of the matters the subject of the detailed report (Clause 8 (3)).

2. Objectives

The long-term rehabilitation objective is to re-establish a range of indigenous plant associations on rehabilitated areas which, in time, would develop through seral stages to functioning ecosystems incorporating a high level of plant diversity commensurate with the vegetation type being re-established.

The objective of rehabilitation assessment procedures and criteria is to aid the determination of success in achieving the rehabilitation objective by the Company to the level where the rehabilitation work can be considered to be completed and the Company relieved of its responsibility for the assessed area.

3. Monitoring of AMC's Environmental Management Procedures

To assess and monitor the management of the Eneabba environment, the WA Government established the Mineral Sands Agreements Rehabilitation Co-ordinating Committee (MSARCC) in June 1977. It was intended that the Committee be the vehicle for co-ordinating the advice of the various Government Departments involved, to the now Minister for Minerals and Energy. The need to provide this co-ordinated advice was identified as arising from the procedures of regular reporting by AMC and the subsequent requirement for the Company's rehabilitation programmes to be formally approved by the Minister.

The broad objectives of the MSARCC are:

(a) to provide co-ordinated advice to the Minister on rehabilitation of the mine sites at Eneabba;

(b) to monitor the rehabilitation situation at Eneabba;

(c) to facilitate the provision of advice to the Minister from the Government Departments involved;

(d) to be available for consultation and assistance to the companies as rehabilitation work progresses.

The Committee comprises representation from:

Department of Resources Development
Department of Agriculture
Department of Conservation and Land Management
Department of Mines
Environmental Protection Authority

The MSARCC twice yearly inspects the Company's rehabilitation, research and general environmental management techniques as reported in the Annual and in particular Triennial Reports. To date, three Triennial Reports have been submitted by AMC - in 1980, 1983 and 1986. In general, the Triennial Reports provide an opportunity for the Company to update existing rehabilitation and research procedures and incorporate new technical developments, by way of proposals for the next triennium. This leads to an ongoing prescription for environmental management to which the Company is committed. This is subject to Ministerial approval.

Copies of the Annual and Triennial Reports are sent to all relevant Government Departments for response. The MSARCC reviews the reports and the Departmental comments and advises the Minister on any conditions under which approval should be given.