Mining of titanium minerals, 2km south of Yarloop

Cable Sands (WA) Pty Ltd

Report and recommendations of the Environmental Protection Authority

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Contents **Page**

Summary

This report is to provide the Environmental Protection Authority (EPA) advice and recommendations to the Minister for the Environment on the environmental factors relevant to the proposal to develop a titanium minerals mine located approximately 2 kilometres south of the town of Yarloop.

The proponent Cable Sands (WA) Pty Ltd proposes to mine within an area covered by Mining Leases 70/49, 70/937 and 70/938 (pending), located on cleared private land and on "C" Class Reserve 31900, which contains two locally and regionally significant remnant vegetation communities.

It is the EPA's opinion that the following are the environmental factors relevant to the proposal:

(a) vegetation community types 3b and 20b;
(b) noise;
(c) groundwater;
(d) dust; and
(e) radiation.

The conditions and procedures, in the EPA's opinion, to which the proposal should be subject if implemented are in summary:

(a) Reserve 31900 should be excluded from further clearing and mining;
(b) the proponent's commitments should be made enforceable; and
(c) the proponent should be required to implement an environmental management system.

The EPA submits the following recommendations:

Recommendation 1

That the Minister for the Environment note the relevant environmental factors and EPA objectives set for each factor (Section 3).

Recommendation 2

That mining and further clearing of vegetation be excluded from Reserve 31900.

Recommendation 3

That subject to the satisfactory implementation of the EPA's recommended conditions and procedures (Section 4), including the proponent's environmental management commitments, the proposal can be modified and managed to meet the EPA's objectives.

Recommendation 4

That the Minister for the Environment imposes the conditions and procedures set out in Section 4 of this report. The implementation of the Minister's conditions and procedures are to be audited by the Department of Environmental Protection.

Recommendation 5

That the Shire of Harvey establish an alternative site outside Reserve 31900 for rubbish disposal and sand excavation purposes to ensure protection of the significant conservation values of Reserve 31900.

Recommendation 6

That existing activities in Reserves 31900 and 31901 cease immediately and that Reserves 31900, 31901 and A22307 be vested in the National Parks and Nature Conservation Authority for conservation purposes.

1. Introduction and background

This report is to provide the Environmental Protection Authority (EPA) advice and recommendations to the Minister for the Environment on the environmental factors relevant to the proposal to mine a deposit of titanium minerals, located two kilometres south of Yarloop.

The proposal to mine on Mining Leases 70/49, 70/937 and 70/938 (pending) was referred to the EPA in May 1996 and the level of assessment was set at Consultative Environmental Review (CER). The CER report (Cable Sands (WA) Pty Ltd, 1996a) hereafter called the CER, prepared was made available for public review between 8 July 1996 to 5 August 1996.

Further details on the proposal are given in Section 2 of this report. Section 3 discusses environmental factors relevant to the proposal.

Conditions and procedures to which the proposal should be subject if the Minister determines that it may be implemented are set out in Section 4. Section 5 presents the EPA's recommendations to the Minister for the Environment.

Appendix 1 provides figures relating to the proposal. A list of people and organisations that made submissions is included in Appendix 2, and references are listed in Appendix 3.

2. The proposal

The proposal to develop a titanium minerals mine on Mining Leases 70/49, 70/937 and 70/938 (pending) is described in the CER.

The proposal is to mine an ore body located on Reserve 31900 and private property (Location 816 Vol 1521 Fol 978, Location 3156 Vol 405 Fol 195, Location 3156 Vol 1405 Fol 196 and Location 3156 Vol 1212 Fol 744) within the Shire of Harvey. The ore body consists of two occurrences of heavy mineral concentrate separated by the Waterous Formation Creek, and adjacent to Black Rock Road.

The location of the proposal is shown in Appendix 1: Figure 1, Appendix 1: Figure 2 shows the existing land reservations and Appendix 1: Figure 3 shows the existing and pending mining leases. A summary of the proposal is outlined in Table 1.

Table 1 Summary of the proposal

Proposal aspect	Description
Life of project (mine production)	55 months
Size of ore body	682 000 tonnes
Area of disturbance	100 hectares
Ore mining rate • maximum • average	 • 200 000 tonnes per year • 160 000 tonnes per year
Background gamma radiation levels • maximum • average	 • 0.52 µGrey per hour • 0.16 ∓ 0.08 µGrey per hour
Water supply • source • maximum hourly requirement • maximum annual requirement	 • Yarloop borefield, shallow aquifer • 180 cubic metres • 1 000 000 cubic metres
Heavy mineral concentrate transport • truck movements (maximum)	 • 75 return truck loads per week

Mining is proposed to commence following the completion of the proponent's current mining operation at Waroona. Conventional earthmoving machinery, such as scrapers, loaders and bulldozers will be used to dry mine the ore body, with mining commencing north of Black Rock Road and progressing to the southern side of the road approximately twenty months later. All heavy mineral concentrate will be transported by road to the proponent's existing secondary processing plant at North Shore, Bunbury.

No changes were made to the proposal during the assessment process.

3. Environmental factors

3.1 Relevant environmental factors

It is the EPA's opinion, giving appropriate consideration to the submissions and material referenced in Appendices 2 and 3, that the following are the environmental factors relevant to the proposal:

(a) vegetation community types 3b and 20b;
(b) noise;
(c) groundwater;
(d) dust; and
(e) radiation.

These relevant environmental factors are discussed in Sections 3.2 to 3.6 of this report.

3.2 Vegetation community types 3b and 20b

Aspects of vegetation community types 3b and 20b

A description of the remnant vegetation communities within the proposal area is included in the CER. This description is based upon the findings of a study carried out by Environmental Survey & Management Pty Ltd and reported in the CER. The proposal will impact directly on an area of remnant vegetation located within "C" Class Reserve 31900. This remnant vegetation comprises two locally and regionally significant communities:

- Type 3b - *Eucalyptus calophylla - E. marginata* woodland on sandy clay soils, and
- Type 20b - Eastern *Banksia Attenuata* and/or *E. marginata* woodlands.

The mining proposal would result in the permanent destruction of 6 hectares of type 3b vegetation. Mining would not directly impact type 20b vegetation.

These vegetation communities are broadly associated with the Forrestfield vegetation complex which coincides with the presence of the Ridge Hill Shelf landform (Department of Conservation and Environment, 1980). The Department of Environmental Protection estimates that for the Forrestfield complex 92-98% of the original bushland has been cleared.

Assessment

The area considered for assessment of this relevant environmental factor is the Ridge Hill Shelf, as described in Department of Conservation and Environment, 1980. This area coincides with the Forrestfield vegetation complex with which the two remnant vegetation communities (types 3b and 20b) are associated.

The EPA's objective in regard to this environmental factor is to "ensure that the abundance, diversity, geographic distribution and productivity of the vegetation community types 3b and 20b are protected".

The EPA notes that two regionally significant vegetation communities occur within the Forrestfield complex (community types 3b and 20b) and that one (community type 3b) will be directly affected by the proposal.

Through the EPA's System 6 Update Programme, community type 3b has been recognised as being "threatened or poorly reserved"[1] requiring interim protection and community type 20b is considered to be "endangered"[2].

Recently, two methods have been developed to assess the removal of remnant vegetation. These methods can be used to test proposals against EPA objectives for vegetation community types 3b and 20b and are discussed below.

- Method 1

  The application of essential criteria established in the *Urban Bushland Strategy* (Government of Western Australia, 1995) indicates that all the remnant native vegetation within Reserve 31900 should be protected as it has regional and local significance.

  It is the Government's aim to conserve a minimum of 10% of each vegetation complex, with the vegetation complex being regionally reserved in not less than 5 separate areas.

  It is estimated that 92-98% of the Forrestfield complex (of which vegetation community types 3b and 20b are associated) has already been cleared, and is represented in only 3 conservation reserves (Table 2). According to this criteria the area should be protected.

Table 2 Conservation reserves containing vegetation communities 3b and 20b

Reserve	Area of 3b (hectares)	Area of 20b (hectares)
Kooljerrenup Nature Reserve	36	
Cardup Nature Reserve	6	32
Serpentine National Park	14	
Total	**56 hectares**	**32 hectares**

- Method 2

  A second method was developed by Safstrom and Craig, 1996 for the EPA.

  The application of representation criteria established for the clearing of agricultural lands (Safstrom and Craig, 1996) indicates that all the remnant native vegetation within Reserve 31900 should be retained as both community types 3b and 20b have local importance.

  The criteria indicates that remnant vegetation should be retained if, within a 15 km radius, there is less than 20% of the original plant community in National Parks or Nature Reserves vested in the NPNCA, or in Crown land or remnant vegetation scheme covenants.

  Within a 15 km radius of Reserve 31900 Ridge Hill Shelf vegetation is not represented in any National Park or Nature Reserve vested in the NPNCA, and whilst there are 5 Crown land reserves containing one or both of these communities, these reserves are not for the purposes of protecting conservation values. It is estimated that within a 15 km radius only 11.5% of the original Ridge Hill Shelf vegetation remains today, and collectively the 5 Crown land reserves in Yarloop constitute the largest remnant (Table 3).

  By these estimates the total remaining vegetation and vegetation protected for conservation are less than the criteria. According to this criteria the area should be protected.

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[1] *If a community is known from only one National Park or Nature Reserve it is considered poorly reserved (since it is susceptible to catastrophe)* (Gibson et al, 1984).

[2] *A community in danger of severe modification or destruction throughout its range, if casual factors continue operating* (Gibson et al, 1984).

Table 3 Crown land reserves containing vegetation communities 3b and 20b, within 15 km of the proposal area

Reserve	Purpose and Vesting	Area of 3b (hectares)	Area of 20b (hectares)
A23307	National Park, unvested	13	-
31901	Sand pit, Main Roads Western Australia	10	6
31900	Sand pit, rubbish tip, Shire of Harvey	8	5
16681	Rifle range, unvested	13	-
3672	Timber reserve, Department of Conservation and Land Management	3	-
Total		**47 hectares**	**11 hectares**

Having particular regard to:

(a) 2-8% of the original occurrence of vegetation community types 3b and 20b on the Ridge Hill Shelf remains;

(b) the largest remaining area of good quality vegetation types 3b and 20b is located in Reserves 31900, 31901 and A22307;

(c) the proposal clearing 6 hectares of vegetation type 3b from within Reserve 31900; and

(d) the methods to assess the removal of remnant vegetation indicating that the proposal fails the tests,

it is the EPA's opinion that the mining in Reserve 31900 would compromise its objective to ensure that the abundance, diversity, geographic distribution and productivity of the vegetation community types 3b and 20b are protected. For the EPA's objective to be met, the proposal would need to be modified to exclude mining in Reserve 31900.

3.3 Noise

Aspects of noise

Adverse noise impacts are potentially associated with the development of any mining proposal. Dry mining using earth moving equipment will generate noise. An additional noise source will be the trucking of the heavy mineral concentrate from the mine past existing residences neighbouring the proposal boundary on Black Rock Road, and along South Western Highway.

The CER details the background noise levels recorded at the nearest residence during March 1996, but excludes consideration of tonal and frequency elements. Noise management measures are also detailed in the CER.

Assessment

The area considered for the assessment of this relevant environmental factor is the area within one kilometre of the boundary defined by Mining Leases 70/49, 70/937 and 70/938 (pending), and includes those residences and roads within this area. This is the area that noise levels must be managed to meet statutory requirements and acceptable standards.

The EPA's objective in regard to this environmental factor is to "ensure that the noise levels generated by the proposal meet statutory requirements and acceptable standards".

With specific reference to road traffic noise, the EPA notes that currently there are no statutory regulations governing road traffic noise, but that its past assessment of a range of proposals involving this factor provides a policy framework for considering this. Main Roads Western Australia has a policy that traffic noise at residential locations should be restricted to an L_{10} 18 hour of 63dB(A) wherever practicable. The Department of Environmental Protection considers that this level should be 58dB(A) wherever practicable, and that the instantaneous (maximum)

levels should not exceed 80dB(A) but preferably should be close to 65dB(A) (Environmental Protection Authority, 1996c).

In conjunction with controls administered by the Shire of Harvey and Main Roads Western Australia, the EPA considers the noise effects on neighbouring residences from truck movements to and from the site can be managed through the measures included in the proponent's commitments.

With reference to noise management in general, the EPA also notes the proponent's commitments to develop and implement a noise monitoring and management programme incorporating predictive modelling and management options, as part of the Company's environmental monitoring and management programme. The EPA believes that adequate controls exist under the pollution control provisions of the *Environmental Protection Act 1986* to control noise associated with the mine.

Having particular regard to:

(a) the controls administered by the Shire of Harvey and Main Roads Western Australia with respect to road transport;

(b) the proponent's commitments to develop and implement a noise monitoring and management programme incorporating predictive modelling and management options; and

(c) the *Noise Abatement (Neighbourhood Annoyance) Regulations 1979,*

it is the EPA's opinion that its objective for noise is unlikely to be compromised by the proposal.

3.4 Groundwater

Aspects of groundwater

Groundwater abstraction for mining use and the dewatering of the mine area have the potential to lower local groundwater levels and impact on other groundwater users and indigenous vegetation in the area.

The proponent estimates in the CER that the proposal will require approximately 1 000 000 m^3 of groundwater annually for processing purposes and dust control.

The borefield is located approximately 3 kilometres west of the proposed mine site along Brockman Road (Appendix 1: Figure 2), and consists of five bores extracting groundwater from a depth of approximately 50 metres (Cable Sands (WA) Pty Ltd, 1996b).

The Water and Rivers Commission (WRC) advised that the shallow water table aquifer in the area is about 30 metres thick and composed mainly of clayey sediments, and is therefore low yielding. At 50 metres depth, the proposed borefield is likely to draw from the semi confined Leederville Formation aquifer. The water in this aquifer is likely to be of marginal quality with a salinity (Total Dissolved Solids) between 1 500 and 2 000 mg/L (A.Kern, pers. comm.).

The WRC also advised that as the extraction will be from a confined (artesian) aquifer, it will be subject to the controls of the *Rights in Water and Irrigation Act 1914* (R Hammond, pers. comm.).

As the proposal is based on dry mining the proponent expects any requirement for dewatering to be minimal.

Assessment

The area considered for assessment of this relevant environmental factor is the area within a 4 kilometre radius of the bore field. This is the area where groundwater levels could be affected by pumping.

The EPA's objective in regard to this environmental factor is to "ensure that groundwater quantity is adequately maintained so that indigenous vegetation is not threatened and that the supply to uses is maintained".

The proponent's response to submissions indicates that most farmers in the vicinity of the borefield rely on the irrigation water supply and not groundwater and that farming bores tend to abstract ground water at a shallower depth than the proponent's bores. This is confirmed by the WRC.

On the basis of the proponent's activities of a similar nature at Waroona, the proponent does not anticipate that the rate of groundwater abstraction will affect either local indigenous vegetation or other users. The WRC considers that it is unlikely that pumping from the Leederville Formation will affect the shallow water table in the vicinity.

The EPA notes that the borefield extraction will be subject to controls of the *Rights in Water and Irrigation Act 1914* and that the proponent has made a commitment to monitor groundwater usage. In the event that over pumping of the aquifer occurs and adverse impacts are detected, the EPA considers that the licence allocations should be reviewed by the WRC.

With reference to mine dewatering, the EPA considers that no mining should occur below the groundwater level within the mine area.

Having particular regard to:

(a) the proponent's proposed depth of groundwater extraction and the expectation that this is unlikely to significantly affect the shallow water table;

(b) farmers and other users relying predominantly on the irrigation scheme and the shallow aquifer for water supply;

(c) the proponent's commitment to monitor water usage and groundwater levels from the borefield throughout the mine life, and to prepare an environmental monitoring and management programme relating to all environmental aspects; and

(d) the fact that the extraction will be subject to controls of the *Rights in Water and Irrigation Act 1914*, and if adverse impact are detected that allocations would be reviewed by WRC;

it is the EPA's opinion that its objective for groundwater is unlikely to be compromised by the proposal.

3.5 Dust

Aspects of dust

Construction and operational mining activities, materials transport and handling, stockpiles and unsealed roads have the potential to generate dust. The proposal area boundary neighbours two existing and inhabited residences.

Dust management measures have been outlined by the proponent in the CER, and include wetting down of haulage roads, vegetating stockpiles, establishing, enhancing and maintaining vegetation screens, and minimising the area disturbed at any one time.

Statutory requirements for dust management are included in Part V of the *Environmental Protection Act 1986* and the *Mining Act 1978*.

Assessment

The area considered for assessment of this relevant environmental factor is the proposal area and surrounding properties. This is the area that dust levels must be controlled to meet the ambient air quality guideline of 1 000 $\mu g/m^3$ (15 minute average) and ambient air quality standard of 90 $\mu g/m^3$ (24 hour average).

The EPA's objective in regard to this environmental factor is to "ensure that the dust levels generated by the proposal meet statutory requirements and acceptable standards".

The EPA notes the proponent's commitments to dust management, including the preparation of a dust monitoring and management programme, and the existing statutory requirements relating to dust management.

Having particular regard to:

(a) the requirements of Part V of the *Environmental Protection Act 1986* ;

(b) the requirements of the *Mining Act 1978;* and

(c) the proponent's commitments to implementing dust management procedures,

it is the EPA's opinion that its objective for dust is unlikely to be compromised by the proposal.

3.6 Radiation

Aspects of radiation

Mining of heavy mineral concentrate will remove the majority of the elements contributing to the current background levels of gamma radiation.

Commitments to manage post-mining gamma radiation levels are outlined by the proponent in the CER.

Mining and radiation level management must be in accordance with the requirements of the relevant State government authorities, in particular the Department of Minerals and Energy and the Health Department of Western Australia.

Assessment

The area considered for assessment of this relevant environmental factor is the proposal area and the transport haulage route. This is the area within which radiation levels must be controlled to meet acceptable standards.

The EPA's objective in regard to this environmental factor is to "ensure that radiological impacts to the public and the environment are kept as low as reasonably achievable and comply with acceptable standards".

The EPA notes the proponent's commitments to manage post-mining gamma radiation levels to below pre-mining levels, and to undertake a post-mining gamma radiation survey.

The EPA also notes the statutory requirements established under the *Radiation Safety Act 1975* and the *Radiation Safety (General) Regulations 1983, Mine Safety and Inspection Act 1994 and the Explosives and Dangerous Goods Act 1961* relating to the management of radiation levels.

Having particular regard to:

(a) the proponent's commitment to manage post-mining gamma radiation levels to below pre-mining levels and to undertake a post-mining gamma radiation survey;

(b) the requirements of the *Mine Safety and Inspection Act 1994* and the *Explosives and Dangerous Goods Act 1961* administered by the Department of Minerals and Energy; and

(c) the requirements of the *Radiation Safety Act 1975* and the *Radiation Safety (General) Regulations 1983*, administered by the Health Department of Western Australia,

it is the EPA's opinion that its objective for radiation is unlikely to be compromised by the proposal.

4. Conditions and procedures

In the EPA's opinion, the proposal should be subject to the following conditions and procedures if implemented.

4.1 Conditions

In the EPA's opinion, the proposal should be subject to the following conditions if implemented:

(a) Reserve 31900 should be excluded from mining and further clearing;

(b) the proponent's commitments set out in the CER and as subsequently modified during the assessment process, should be made enforceable;

(c) should mine dewatering be required, a dewatering management plan should be developed, with particular reference to the remnant vegetation. This plan should meet the requirements of the EPA on advice from the WRC and the Department of Environmental Protection; and

(d) the proponent should be required to prepare and implement an environmental management plan and environmental management procedures in order to implement the proposals and manage the relevant environmental factors to ensure the EPA's objectives (Section 3) are met. The plan should adopt quality assurance principles (such as those adopted in Australian Standards ISO 9000 series) and environmental management principles (such as those adopted in the voluntary Australian Standards ISO 14000 [draft] series), with appropriate monitoring and auditing to ensure compliance with this condition.

These conditions should apply if the proposal is implemented, and their implementation audited by the Department of Environmental Protection.

4.2 Procedures

In the EPA's opinion, the proposal should be subject to the following procedures if implemented:

Reserve 31900

The EPA notes the local and regional significance of the remnant vegetation communities found in Reserve 31900. To ensure protection of the significant conservation values of the Reserve, it is the EPA's opinion that:

(a) the Shire of Harvey should cease rubbish disposal and excavation activities in Reserve 31900 immediately;

(b) the Shire of Harvey should establish an approved (planning and environmental approval required) alternative rubbish disposal site outside Reserve 31900; and

(c) Reserve 31900 should be vested in the NPNCA for conservation purposes, as a matter of priority.

Reserve 31901 and A22307

The EPA also notes the local and regional significance of the remnant vegetation communities found in the neighbouring Reserves 31901 and A22307. To ensure protection of the significant conservation values of these Reserves, it is the EPA's opinion that:

(a) the existing activities in Reserve 31901 should cease immediately; and

(b) Reserve 31901 and A22307 should be vested in the NPNCA for conservation purposes, as a matter of priority.

These procedures should apply if the proposal is implemented.

5. Recommendations

The EPA submits the following recommendations:

Recommendation 1

That the Minister for the Environment note the relevant environmental factors and EPA objectives set for each factor (Section 3).

Recommendation 2

That mining and further clearing of vegetation be excluded from Reserve 31900.

Recommendation 3

That subject to the satisfactory implementation of the EPA's recommended conditions and procedures (Section 4), including the proponent's environmental management commitments, the proposal can be modified and managed to meet the EPA's objectives.

Recommendation 4

That the Minister for the Environment imposes the conditions and procedures set out in Section 4 of this report. The implementation of the Minister's conditions and procedures are to be audited by the Department of Environmental Protection.

Recommendation 5

That the Shire of Harvey establish an alternative site outside Reserve 31900 for rubbish disposal and sand excavation purposes to ensure protection of the significant conservation values of Reserve 31900.

Recommendation 6

That existing activities in Reserves 31900 and 31901 cease immediately and that Reserves 31900, 31901 and A22307 be vested in the National Parks and Nature Conservation Authority for conservation purposes.

Table 4. Summary of relevant factors, objectives, proponent commitments and EPA's opinions.

Relevant factor	EPA objective	Proponent's commitments	EPA's opinion
1. Vegetation community types 3b and 20b	To ensure that the abundance, diversity, geographic distribution and productivity of the vegetation community types 3b and 20b are protected.	Monitoring and management addressed in proponent's commitments, include: (a) Minimise area of Reserve 31900 impacted to the orebody as far as practical. (b) To restrict access to areas of Reserve 31900 not involved in mining. (c) To locate infrastructure and plant on cleared land.	Mining in Reserve 31900 is likely to compromise the EPA's objective to ensure that locally and regionally significant vegetation communities are adequately protected.
2. Noise	To ensure that the noise levels generated by the proposal meet statutory requirements and acceptable standards.	Monitoring and management addressed in proponent's commitments. EMMP to address predictive modelling, monitoring and management.	The project is unlikely to compromise the EPA's objective to protect the amenity of nearby residents from noise impacts.
3. Groundwater	To ensure that groundwater quantity is adequately maintained so that indigenous vegetation is not threatened and that the supply to uses is maintained.	Monitoring and management addressed in proponent's commitments. If mine dewatering is required, proponent will monitor surrounding vegetation, and if necessary provide supplementary water. EMMP to address monitoring and management.	The project is unlikely to compromise the EPA's objective to maintain groundwater quantity.
4. Dust	To ensure that the dust levels generated by the proposal meet statutory requirements and acceptable standards.	Monitoring and management addressed in proponent's commitments. EMMP to address monitoring and management.	The project is unlikely to compromise the EPA's objective to protect surrounding land user amenity, health and welfare from dust emissions.
5. Radiation	To ensure that radiological impacts to the public and the environment are kept as low as reasonably achievable and comply with acceptable standards	Use of approved procedures for handling process materials. To keep surface radiation levels below the pre-mining levels. Monitor rehabilitated area to verify that the radiation levels are no greater than pre mining.	The project is unlikely to compromise the EPA's objective to protect the public and the environment from radiological impacts.

Appendix 1

Figures

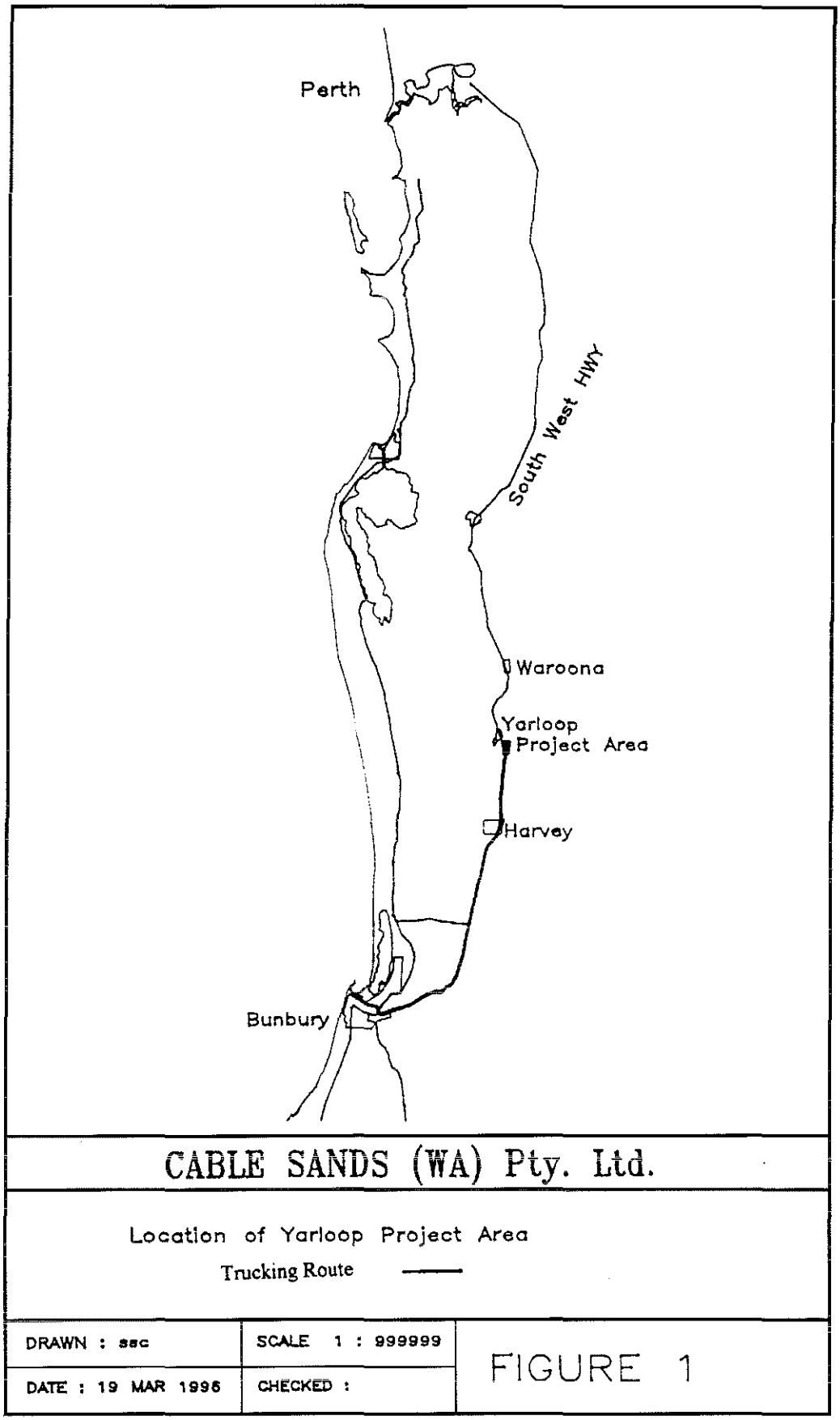

Figure 1. Location map. (Source: Cable Sands (WA) Pty Ltd, 1996a.)

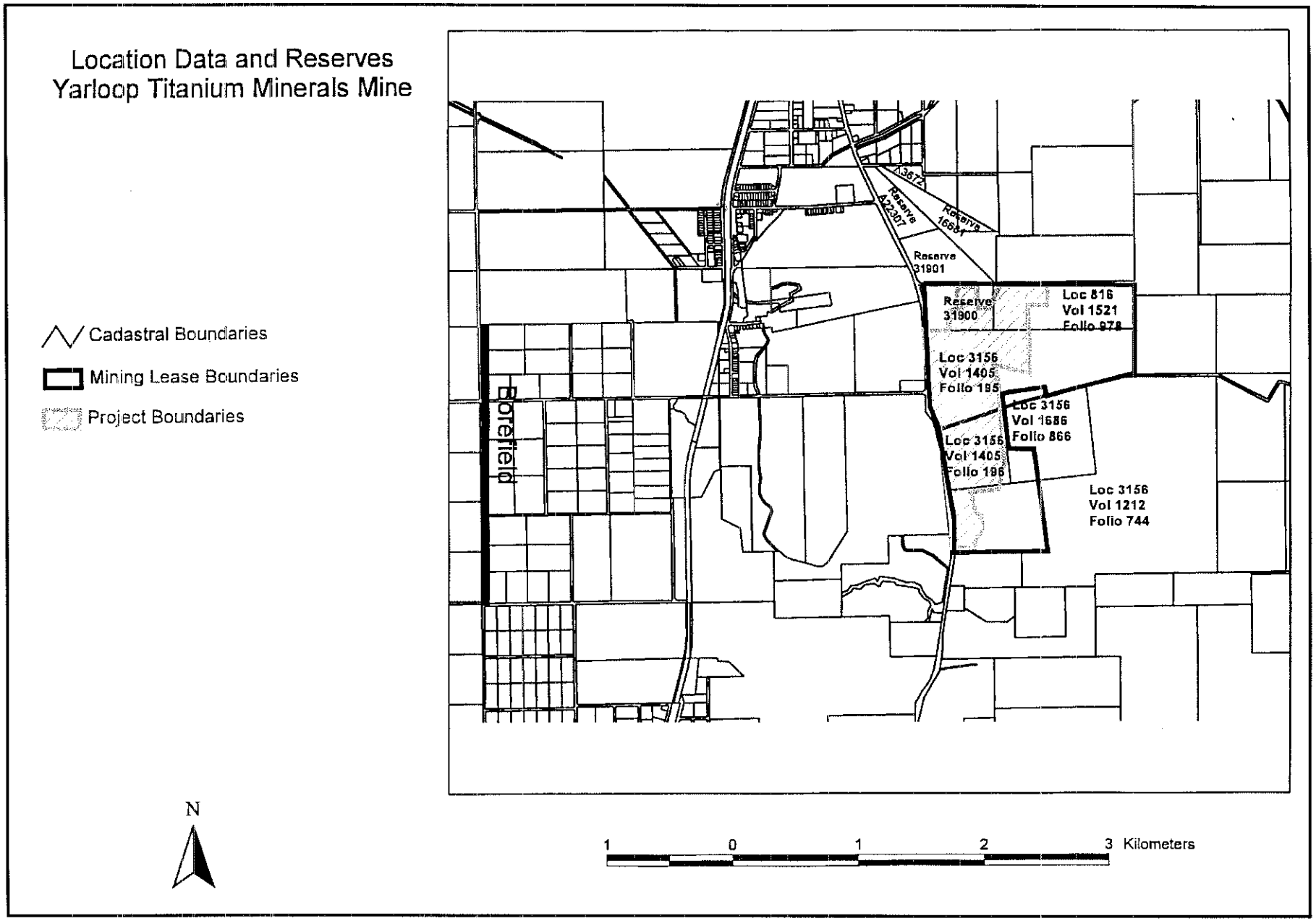

Figure 2. Location data and existing land reservations (Department of Environmental Protection, 1996)

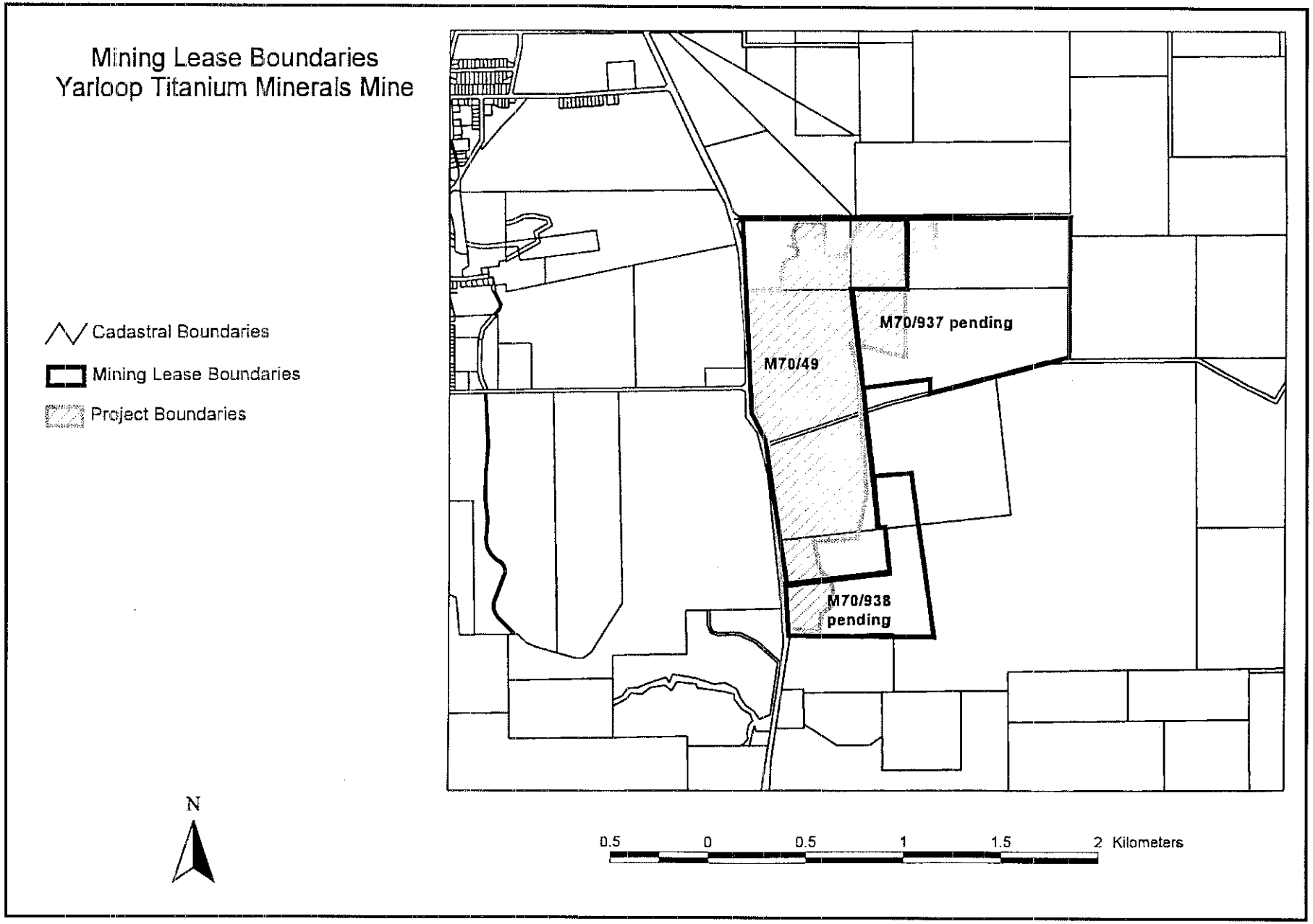

Figure 3. Mining lease boundaries (Department of Environmental Protection, 1996)

Appendix 2

List of submitters

State and local government agencies:

- Department of Conservation and Land Management
- Department of Environmental Protection
- Shire of Harvey
- Health Department of Western Australia
- Main Roads Western Australia
- Department of Minerals and Energy
- Waters and Rivers Commission

Member of the public:

- Conservation Council of Western Australia Inc
- Mr P Eckersley

Appendix 3

References

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