PROPOSED SILICON PROJECT AT KEMERTON

BARRACK MINES LIMITED

Report and Recommendations of the Environmental Protection Authority

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SUMMARY

In 1986 the W A Silicon Trust prepared an Environmental Review and Management Programme (ERMP) for the establishment of a silicon production process in Western Australia. The Environmental Protection Authority (EPA) assessed the proposal as environmentally acceptable, subject to commitments and recommendations outlined in EPA Bulletin 279 of May 1987.

In September 1987 the new owners of the project referred to the EPA a revised proposal, described in a Public Environmental Report (PER), to locate the charcoal retorts and silicon smelter at Picton, near Bunbury. The EPA assessed this proposal and found it environmentally acceptable subject to the commitments and recommendations outlined in EPA Bulletin 326 of March 1988. In its report the EPA noted that the nearby location of Kemerton was also environmentally acceptable.

On 31 March 1988 the Deputy Premier referred to the EPA a proposal for the possible relocation of the project to the Kemerton Industrial Area.

The EPA already had detailed knowledge of the Kemerton area, and the move had the support-in-principle of the local authority. In view of the extensive, detailed and public nature of the assessment process to date and the nature of the proposed location in an established industrial area, the EPA considered there was no need for further public input.

Within the Kemerton Indutrial Area the proponent considered three possible sites, but on subsequent analysis two of these were ruled out, one as too lowlying, and the other as being too restrictive for the proposed aluminium smelter. The EPA's assessment was therefore directed to the remaining site, in the south west corner of the Industrial Area.

SPECIFIC CONCERNS

DUST, NOISE & ODOUR

The EPA in Bulletin 326 recommended stringent standards to protect residents near to the plant site. These recommendations are equally applicable to the protection of residents near the Kemerton location. To meet these same standards the attenuation measures and controls necessary at Kemerton may be less than those required at Picton because of the greater distance from residents.

TRAFFIC

Traffic servicing the site was a relatively minor concern at Picton, but at Kemerton it is of more significance. It may be necessary to design and construct a new access road from the South Western Highway to Kemerton. This road would need to meet the standards of both the local authority and the EPA.

WATER MANAGEMENT

Insufficient details are available at present for the EPA adequately to assess plans for either the supply or the disposal of water. However based on experience with the aluminium smelter assessment and the SCM Chemicals assessment for the Kemerton area the Authority considers that unmanageable environmental impacts are unlikely to result. The EPA therefore recommends that these aspects of the proposal be referred to the EPA for assessment when more details are known.

ENVIRONMENTAL AMENITY

This was of significant concern at Picton, but at Kemerton, in an existing indutrial area with a larger buffer of managed parkland the EPA considers there will be no significant impact on the environmental amenity of nearby residents.

CONCLUSION

The EPA concludes that the project is environmentally acceptable at the proposed location at Kemerton and could be implemented subject to the proponent's commitments and the EPA's recommendations.

RECOMMENDATIONS

ACCEPTABILITY

Recommendation 1
The EPA concludes that the project as described in the Public Environmental Report is environmentally acceptable with the charcoal and silicon production facilities located at Kemerton as indicated in Figure 1 of this Assessment Report. The EPA recommends that the proposal could proceed subject to the Authority's recommendations in this Assessment Report and the commitments made by the proponent about the environmental management of the project including:

- minimising noise from the Moora quarry, controlling dust, and rehabilitating the site;

- funding postgraduate research into the use of tree hollows by fauna in the jarrah forest and the impact of the project, and modifying wood collection operations if significant impacts are detected;

- screening, landscaping and draining the plant site to the EPA's satisfaction, and developing a comprehensive fire suppression system and contingency plans;

- suppressing and collecting dust generated by materials conveyors;

- incinerating charcoal retort off-gases, passing furnace off-gases through a baghouse, and storing and transporting silica fume in sealed systems unless it has been pelletised;

- sampling the silica fume from furnace off-gases and submitting it to X-ray diffraction analysis to ensure that there is no crystalline silica present; and

- developing a comprehensive air, noise and waste monitoring programme for the plant site.

ROAD ACCESS TO THE PLANT

Recommendation 2
The EPA recommends that any proposal to upgrade significantly or re-route road access to the Kemerton Industrial Area should be to the satisfaction of the EPA and the local authority.(2.1.3)

DUST FROM THE FURNACE

Recommendation 3
The EPA recommends that the proponent be required to operate under the condition that direct venting of the furnace off-gases to the atmosphere without passing them through the baghouse is not permitted at any time. (2.2.1)

Recommendation 4
The EPA recommends that the proponent be required to ensure that ground level concentrations of silica fume in the surrounding residential areas do not exceed an annual average of 0.07 mg/m^3 and a 24-hour average of 0.10 mg/m^3 at any time.(2.2.2)

NOISE CONTROL

Recommendation 5
The EPA recommends that the proponent be required to ensure that the introduced noise from the project does not cause the noise in the surrounding residential areas to exceed 50dB(A) from 0700 to 1900 hours, 45dB(A) from 1900 to 2200 hours, and 40 dB(A) from 2200 to 0700 hours. These levels should not be viewed as normal operating levels for the plant. They are the legal upper limits above which action will be taken by the EPA. These levels should be reviewed after 12 month's normal operation of the plant or earlier if recommended by the EPA.(2.3.1)

Recommendation 6
The Company has proposed that some noise attenuation be deferred until after construction when operational measurements have proved it to be necessary. The EPA does not consider this acceptable. The Authority recommends that noise control be a fundamental design criterion, and that all attenuation considered necessary to meet EPA requirements be built-in during construction. (2.3.2)

Recommendation 7
The EPA recommends that the proponent be required to submit and implement plans to the satisfaction of the EPA for the effective attenuation of noise produced by all items of plant, including:

- outdoor mobile plant;
- vehicles transporting materials to and from the site;
- sawmilling and logsplitting operations;
- feed system for the charcoal retorts;
- gas handling system for the retorts and incinerator;
- charcoal screening system;
- outdoor conveyors;
- furnace feed systems;
- stinger and taphole shotgun;
- ladle cleaning, oxygen lance and mould breaker;
- product crushing and screening systems;
- fans and ducting for the control of general dust;
- baghouse and associated fans and ducting;
- compressed air supply;
- pumps for the supply and disposal of water; and
- electrical transformer. (2.3.2)

CONTROL OF ODOURS

Recommendation 8
The EPA recommends that the proponent be required to instal and operate the charcoal retorts, the retort off-gas incinerator and the wood waste incinerator so as to ensure that no offensive vapours or odours are detectable in residential areas adjacent to the Kemerton Industrial Area. (2.4)

PROTECTION OF ENVIRONMENTAL AMENITY

Recommendation 9
The EPA recommends that the proponent be required to convene regular meetings with the local authority for the purpose of promoting two-way communication. (2.5)

Recommendation 10
The EPA recommends that this proposal be scheduled under the definition of 'prescribed premises' in Regulations under the Environmental Protection Act 1986 for the purpose of setting fees on licences issued under the Act to more closely cover the cost to the EPA of monitoring the project. (2.5)

CONTROL OF IMPACTS DURING CONSTRUCTION

Recommendation 11
The EPA recommends that during construction of the plant the proponent and its contractors be required to:

. stabilise disturbed soil and take other appropriate measures to ensure that dust levels at the plant boundary do not exceed a 15 minute average of 1 mg/m^3; and

. take appropriate short term measures to control run-off and oil spills to the satisfaction of the EPA.(2.6.1)

EFFECT OF MINING ON RARE PLANT

Recommendation 12
The EPA recommends that the proponent be required to monitor the effect of mining activities on the population of *Regelia megacephala* on the minesite with a monitoring programme approved by the EPA before mining commences. (2.6.2)

EMISSIONS FROM OTHER CARBON SOURCES

Recommendation 13
The EPA recommends that, should the proponent wish to alter its operations to use reductants other than jarrah charcoal and jarrah woodchips in a proportion greater than 15% of the total reductant charge, it should be required to present detailed management plans to the satisfaction of the EPA, outlining the likely changes in emissions and proposed control procedures. (2.6.3)

MANAGEMENT OF WATER

Recommendation 14
The EPA recommends that the proponent be required to prepare and implement a detailed plan for the supply of water to the satisfaction of the EPA, and the Water Authority of WA before the commissioning of the plant. (2.6.4)

Recommendation 15
The EPA recommends that the proponent be required to prepare and implement a detailed management plan for the disposal of waste water and storm water to the satisfaction of the EPA, and the Water Authority of WA before the commissioning of the plant. (2.6.4)

GENERAL DUST CONTROL AT PLANT SITE

Recommendation 16
The EPA recommends that during operation of the plant the proponent be required to stabilise stockpiles and unsealed access roads on the plant site and take other appropriate measures to ensure that dust levels at the plant boundary do not exceed the level specified by the EPA. This level and the associated management measures required by the EPA will be set as part of the works approval process. (2.6.5)

HANDLING OF SILICA FUME

Recommendation 17
The EPA recommends that the proponent be required to prepare and implement a plan for the management and disposal of silica fume to the satisfaction of the EPA before commissioning of the plant. (2.6.6)

VISUAL IMPACT OF PLANT

Recommendation 18
The EPA recommends that the landscape and screening plan to which the Company is committed be required to be approved by the EPA before commissioning. (2.6.7)

1 INTRODUCTION

In September 1984 Agnew Clough Pty Ltd submitted to EPA a Notice of Intent for a proposal to establish a silicon production process in Western Australia, involving a charcoal plant at Coolup and a silicon smelter at Wundowie, treating quartzite ore mined at Moora.

That proposal was the subject of an Environmental Review and Management Programme (ERMP) prepared by the WA Silicon Trust and released by the EPA in January 1987 for a 10-week public review period. The EPA subsequently reported on the proposal, recommending that it was environmentally acceptable, subject to commitments by the proponent and additional recommendations by EPA. That assessment report, EPA Bulletin 279, was published in May 1987.

In August 1987, Barrack Mines Limited purchased the proposal from the WA Silicon Trust and shortly thereafter advised the EPA of a proposed change in location. Barrack established Barrack Silicon Pty Ltd, a wholly-owned subsidiary, which is the proponent for the present project.

The proponent prepared a Public Environmental Report (PER) which was released for a 9-week public review period closing on 29 January 1988. The EPA's assessment report, Bulletin 326, found the proposal at Picton environmentally acceptable subject to addtional commitments and recommendations.

On 31 March the Deputy Premier referred to the EPA a proposal for the possible location of the project within the Kemerton Industrial Area.

After considering three sites in the north, south east, and south west of the Kemerton area, the proponent advised the EPA that only one, the south west, was suitable. The proponent's analysis of the alternative sites is in Appendix C. It indicates that the south east site was considered too low-lying and the northern site would have placed unacceptable constrains on the proposed aluminium smelter.

In view of the substantial public review of the proposal at Wundowie and Picton, and the Authority's detailed knowledge of the Kemerton area the EPA considered that a further public review was not warranted. Rather the EPA conducted an internal assessment of which this is the report.

1.1 MINING

The mining operation is unchanged from that described in the PER. Location of the smelter at Kemerton, as for Picton, has made rail the preferred mode of transport for the quartzite. There will, however, be a different railside unloading location and a longer road transport link to truck ore from railside to the Kemerton plant site.

1.2 LOGGING

The wood supply operation is essentially unchanged, but the Kemerton location will require an upgrading of access from the South Western Highway to the plant site for transport of wood, ore silica fume and silicon metal, and the impact of traffic along that route will be significant.

1.3 CHARCOAL AND SMELTER OPERATIONS

The methods of operation of the charcoal retorts and the smelter furnaces are also unchanged from those described in the PER. The environmental impacts of those operations are essentially similar, but the greater distance from nearby residents may lessen the degree of control necessary to keep these impacts to acceptable levels.

1.4 ENVIRONMENTAL ISSUES

The environmental issues identified by the EPA in its consideration of the project were the same as those considered in the PER; however some issues took on a different significance at the Kemerton site and these were given special attention.

Mining operation
. ore transport.

Wood gathering operation
. traffic effects on all transport routes and at the site entrance.

Charcoal production operation
. noise ;
. gaseous emissions; and
. stormwater drainage.

Silicon production operation
. power supply;
. water supply and waste water management;
. emissions of silica fume; and
. noise.

General
. visual impact of the plant.

The major issues are addressed in Section 2 of this assessment report where the EPA's research and recommendations are presented.

2. ENVIRONMENTAL IMPACTS

The project has the potential for many environmental impacts. The proponent has adequately addressed some of these in commitments made in relation to the Picton location and up-dated in Appendix A of this report. Some other impacts are minor or at least straight-forward, and can be readily controlled under existing regulations or licensing procedures to ensure the environmental acceptability of the project. But there are other impacts which the EPA specifically addressed by recommendations in Bulletin 326 or which have taken on a new significance with the change of site.

2.1 ASSESSMENT OF PROPOSED SITE

The EPA has already given detailed consideration to the Kemerton area for the establishment of the proposed aluminium smelter (Bulletin 214) and the SCM Chloride Process Plant (Bulletin 283). Both these proposals were found to be environmentally acceptable, subject to certain conditions. The proposed location for the silicon smelter is within the general Kemerton industrial area, on land not required for those two developments. The precise boundaries of the proposed site are yet to be defined, but the EPA in its assessment has considered a locality in the south west corner of the Kemerton area, and expressed its recommendations for the control of impacts in terms of the effects on nearby residents. The locality is shown in Figure 1

2.1.1 Zoning and planning issues

These issues have been adequately addressed in Bulletins 214 and 283. As Figure 3 shows, the industry classification for the proposed site is Class II.

2.1.2 Adjacent land uses

Adjacent land uses beyond the boundary of the industrial area are adequately discussed in Bulletins 214 and 283. Figure 1 shows the location of the nearest residential concentrations in special rural zones north, east, and south west of the Kemerton Industrial Area. The proposed site does not impinge upon the heavy minerals deposit identified in Figure 6 of Bulletin 214.

With regard to the compatibility of the silicon smelter with the SCM plant and the proposed aluminium smelter no problems are anticipated. The ban on direct venting of off-gases from the furnaces and the low level of silica fume emissions permitted from the baghouse in the EPA's recommendations should ensure that fume is not a problem to the other plants. One option for the disposal of the small amount of process water from the silicon plant cooling system may be to make use of the SCM ocean outfall, subject to EPA approval.

2.1.3 Access to services

For the silicon smelter, like the aluminium smelter, access to a highly secure power supply is essential. In Appendix C of Bulletin 214 the EPA assessed SECWA's proposal for transmission line interconnections for the aluminium smelter and found them environmentally acceptable. The use of this approved route to supply power to the silicon smelter would be acceptable to the EPA as would the use of the existing power supply route to the area. The use of any other route would require assessment by the EPA.

The natural gas pipeline passes through the Kemerton area to the east of the SCM site, running approximately NNW-SSE. The project does not require access to gas, and the site does not impinge on the pipeline route.

Appendix D of Bulletin 214 examined other infrastructure requirements and concluded that an Eastern Services Corridor along a route which it labelled "Cactus" would be acceptable for railway access to the area. The silicon smelter proposal currently includes the use of road transport of ore from the rail siding. Were this rail access to proceed the silicon smelter would probably wish to make use of it.

Road access to the site is important for the transport of wood, ore, silica fume and silicon metal. It is likely that present road access from the east will need to be upgraded or a new road provided. The EPA should assess detailed proposals for road access when available. Road access following the approved "Cactus" corridor is likely to be acceptable to the EPA.

Recommendation 2

The EPA recommends that any proposal to upgrade significantly or re-route road access to the Kemerton Industrial Area should be to the satisfaction of the EPA and the local authority.

2.1.4 Topography

As Figure 1 shows, there is a major sand ridge which runs down the western edge of the Kemerton Industrial Area, screening it from the residences in the special rural developments to the southwest. The area proposed for the smelter is agricultural land of relatively poor quality some of which is uncleared but all of which has been grazed by livestock. The land is undulating and not subject to problems of a high water table.

2.1.5 Meteorology

In its assessment of developments at Kemerton the EPA has based its considerations on the same measurements taken at Glen Iris which were referred to in the Picton assessment report. The wind rose in Figure 2 of Appendix B of that report shows that the prevailing winds are predominantly (46%) from the SE quadrant, with another 28% coming from the west (WSW-NNW).

2.2 EMISSION OF SILICA DUST FROM THE FURNACES

2.2.1 Direct venting of the furnaces

The EPA recommended in the Picton assessment that there should be no direct venting of the furnaces. This recommendation was based on this being a reasonable requirement for a 'state of the art' plant, and accepted practice for at least one other silicon smelter. These reasons are not affected by the change of location to Kemerton, so the recommendation stands.

Recommendation 3

The EPA recommends that the Company be required to operate under the condition that direct venting of the furnace off-gases to the atmosphere without passing them through the baghouse is not permitted at any time.

2.2.2 Standards for dust emission

In the PER supplementary report on public health implications of silica fume the proponent has proposed operating to standards which would ensure that ground level concentrations of silica fume would not exceed an annual average of 0.07 mg/m^3 and a 24 hour average of 0.10 mg/m^3. The Health Department has endorsed these standards. The EPA accepts the figures as appropriate public health standards to apply to the impact of the plant on the surrounding residential areas.

Recommendation 4

The EPA recommends that the proponent be required to ensure that ground level concentrations of silica fume in the surrounding residential areas do not exceed an annual average of 0.07 mg/m^3 and a 24-hour average of 0.10 mg/m^3 at any time.

These standards should also ensure that the environment of the industrial area is appropriately protected from exposure to silica fume.

2.3 NOISE

The potential for noise generation was a significant issue for the plant at the Picton site. At Kemerton the plant will be further from nearby residents, as Figure 2 (a reproduction of Figure 27 from Bulletin 214) shows. While local weather conditions tend to transmit noise readily, the large sand ridge to the west of the site will offer a significant barrier for the closest residents.

2.3.1 Noise standards

The EPA's objective in controlling the noise generated by the plant is to ensure that the nearby residents have a noise environment appropriate to a residential area, whether the plant is located at Picton or Kemerton. To this end the EPA's recommended maximum noise levels for residential areas are unchanged from those in the Picton assessment report.

Recommendation 5

The EPA recommends that the proponent be required to ensure that the introduced noise from the project does not cause the noise in the surrounding residential areas to exceed 50dB(A) from 0700 to 1900 hours, 45dB(A) from 1900 to 2200 hours, and 40 dB(A) from 2200 to 0700 hours. These levels should not be viewed as normal operating levels for the plant. They are the legal upper limits above which action will be taken by the EPA. These levels should be reviewed after 12 month's normal operation of the plant or earlier if recommended by the EPA.

2.3.2 Noise control measures and their installation

As noted in the PER assessment report, the EPA is requiring that the attenuation be inbuilt so that residents are adequately protected.

Recommendation 6

The Company has proposed that some noise attenuation be deferred until after construction when operational measurements have proved it to be necessary. The EPA does not consider this acceptable. The Authority recommends that noise control be a fundamental design criterion, and that all attenuation considered necessary to meet EPA requirements be built-in during construction.

Recommendation 7

The EPA recommends that the Company be required to submit and implement plans to the satisfaction of the EPA for the effective attenuation of noise produced by all items of plant, including:

- outdoor mobile plant;
- vehicles transporting materials to and from the site;
- sawmilling and logsplitting operations;
- feed system for the charcoal retorts;
- gas handling system for the retorts and incinerator;
- charcoal screening system;
- outdoor conveyors and furnace feed systems;
- stinger and taphole shotgun;
- ladle cleaning, oxygen lance and mould breaker;
- product crushing and screening systems;
- fans and ducting for the control of general dust;
- baghouse and associated fans and ducting;
- compressed air supply;
- pumps for the supply and disposal of water; and
- electrical transformer.

The EPA believes that if the proponent's commitments and the EPA's recommendations with respect to noise are fully implemented the impact of noise from the plant will be environmentally acceptable.

2.4 ODOURS

As with noise, the EPA's requirement with odours is that the receiving environment be protected.

Recommendation 8

The EPA recommends that the proponent be required to instal and operate the charcoal retorts, the retort off-gas incinerator and the wood waste incinerator so as to ensure that no offensive vapours or odours are detectable in residential areas adjacent to the Kemerton Industrial Area.

If the proponent meets the above requirements the EPA considers that the project will be environmentally acceptable with regard to odours.

2.5 ENVIRONMENTAL AMENITY

The EPA is concerned that the environmental amenity of nearby residents is adequately protected and considers that this can best be achieved by a local EPA presence and by the promotion of effective communication between local residents, through the local authority, and the proponent.

Recommendation 9

The EPA recommends that the proponent be required to convene regular meetings with the local authority for the purpose of promoting two-way communication.

The EPA is required to provide services of auditing, pollution control, advice and liaison to the proponent, and accordingly the Authority seeks to set licence fees to cover at least some of those costs.

Recommendation 10

The EPA recommends that this proposal be scheduled under the definition of 'prescribed premises' in Regulations under the Environmental Protection Act 1986 for the purpose of setting fees on licences issued under the Act to more closely cover the cost to the EPA of monitoring the project.

At present these costs could be relatively high because the appropriate staff are all based in Perth and Kwinana. This project and other recent developments in the area have generated sufficient workload in the area to justify the establishment of an EPA regional office in Bunbury.

The EPA considers that if these recommendations are implemented, the environmental amenity of the surrounding residential areas will be preserved to a level consistent with the expectations of the establishment of the Kemerton Industrial Area.

2.6 OTHER CONSIDERATIONS

The EPA in its Picton assessment addressed a number of other considerations of lesser environmental significance. These issues are also relevant at Kemerton.

2.6.1 Impacts during construction

The EPA requires that construction activity be appropriately controlled to make the impact on nearby residents acceptable.

Recommendation 11

The EPA recommends that during construction of the plant the proponent and its contractors be required to:-

- stabilise disturbed soil and take other appropriate measures to ensure that dust levels at the plant boundary do not exceed a 15 minute average of 1 mg/m^3; and
- take appropriate short-term measures to control run-off and oil spills to the satisfaction of the EPA.

2.6.2 Rare plant on the minesite

The Moora minesite for the quartzite ore supports a plant of very restricted distribution. The plant has no common name, but its scientific name is *Regelia megacephala*. The EPA acknowledges the significance of *Regelia megacephala* and considers that monitoring of the population on the minesite is appropriate to ensure that any negative effects of the mining activity on the plant population can be measured and appropriate actions determined.

Recommendation 12

The EPA recommends that the proponent be required to monitor the effect of mining activities on the population of *Regelia megacephala* on the minesite with a monitoring programme approved by the EPA before mining commences.

2.6.3 Use of other reductants

The proponent currently plans to use small amounts of petroleum coke (petcoke) during startup of the furnace to help control the rate of the reaction. While use of the small amount proposed is not considered likely to present problems, with significant quantities there could be a need to control sulphur dioxide emissions. The EPA notes that any significant increase in the proportion of petcoke or any other non-charcoal reductant in the furnace charge would be subject to the provisions of Section 53 of the Environmental Protection Act 1986 which requires notification of significant changes of process. However, the EPA considers that for such changes of process additional assessment is warranted in view of the likelihood of undesirable emissions.

Recommendation 13

The EPA recommends that, should the proponent wish to alter its operations to use reductants other than jarrah charcoal and jarrah woodchips in a proportion greater than 15% of the total reductant charge, it should be required to present detailed management plans to the satisfaction of the EPA, outlining the likely changes in emissions and proposed control procedures.

2.6.4 Water management

The issue of water supply for the smelter has not yet been addressed in detail. It is not possible for the EPA to provide advice and recommendations until more information is available. However based on experience with the aluminium smelter assessment and the SCM Chemicals assessment for the Kemerton area the Authority considers that unmanageable environmental impacts are unlikely to result.

Recommendation 14

The EPA recommends that the proponent be required to prepare and implement a detailed plan for the supply of water to the satisfaction of the EPA, and the Water Authority of WA before the commissioning of the plant.

The EPA is confident that waste water management from the site can be addressed in an environmentally acceptable manner. One option would be the utilisation of SCM Chemicals Ltd's ocean outfall pipeline. However, the EPA requires more details before it can adequately assess the proposal.

Recommendation 15

The EPA recommends that the proponent be required to prepare and implement a detailed management plan for the disposal of waste water and storm water to the satisfaction of the EPA, and the Water Authority of WA before the commissioning of the plant.

2.6.5 Site dust management

The EPA is aware of the possibility of dust being generated from several product handling and storage areas and unsealed access roads and makes the following general recommendation with regard to dust.

Recommendation 16

The EPA recommends that during operation of the plant the proponent be required to stabilise stockpiles and unsealed access roads on the plant site and take other appropriate measures to ensure that dust levels at the plant boundary do not exceed the level specified by the EPA. This level and the associated management measures required by the EPA will be set as part of the works approval process.

2.6.6 Management of collected silica fume

The silicon furnaces generate a large volume of silica fume which is collected in the baghouse. The proponent intends to sell this fume, but the EPA requires specific details of the proponent's intentions for handling the fume, and storing and disposing of it if necessary.

Recommendation 17

The EPA recommends that the Company be required to prepare and implement a plan for the management and disposal of silica fume to the satisfaction of the EPA before commissioning of the plant.

2.6.7 Site screening and landscaping

The development of a landscape and screening plan is a specific commitment by the proponent, so it is not necessary for the EPA to apply a parallel condition. However, the plan needs to be satisfactory to the EPA and of a standard consistent with a properly planned and managed industrial estate. It should also take into account the possible establishment of the aluminium smelter and the use of flouride-tolerant species to act as a flouride sink on vacant land on the silicon plant site.

Recommendation 18

The EPA recommends that the landscape and screening plan to which the proponent is committed be required to be approved by the EPA before commissioning.

2.6.8 Compatibility with aluminium smelter

The local authority has expressed concern that the siting of the silicon smelter should not impact negatively upon the proposal for an aluminium smelter at Kemerton. The EPA considers that under the recommendations proposed in this report the silicon smelter is fully compatible with both the aluminium smelter and the SCM chloride process titanium dioxide plant.

The EPA's recommendations prohibit direct venting of furnace off-gases. The concentration of silica fume released by the plant will be required to satisfy stringent public health standards. At these low concentrations it is expected that there will be no measurable impact on surrounding industries. Silica fume is a highly inert substance, requiring very high temperatures to react with other substances. There is no possibility that silica fume could react in significant quantity with flourine, chlorine or sulphur dioxide in the atmosphere.

2.7 CONCLUSIONS

The EPA concludes that the major environmental issues of dust, noise and odours can be adequately addressed to ensure that the proposal is environmentally acceptable at the proposed location.

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FIGURES

Figure 1 Plant site in Kemerton Industrial Area

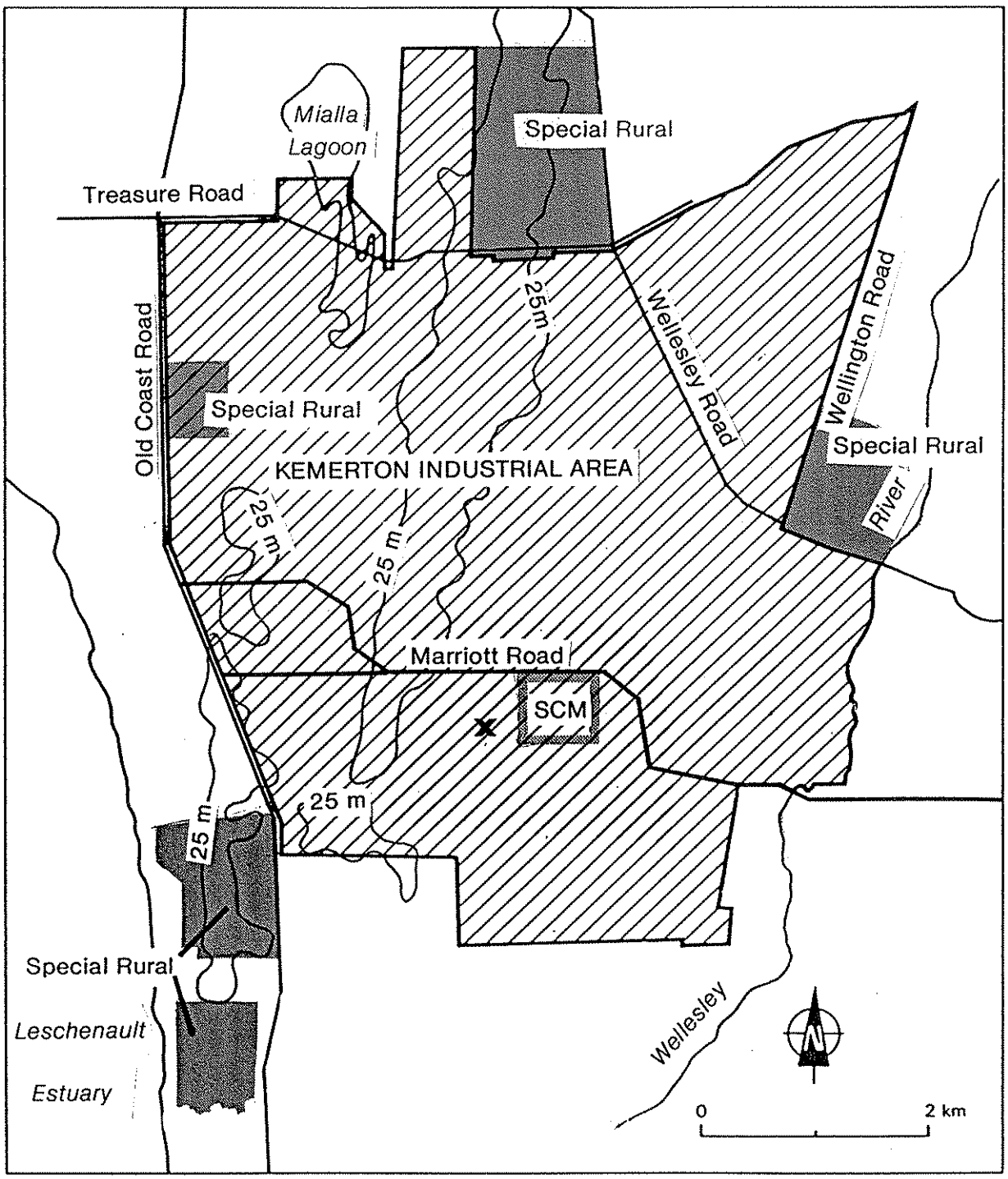


Figure 2 General Map showing location of Kemerton Industrial Area

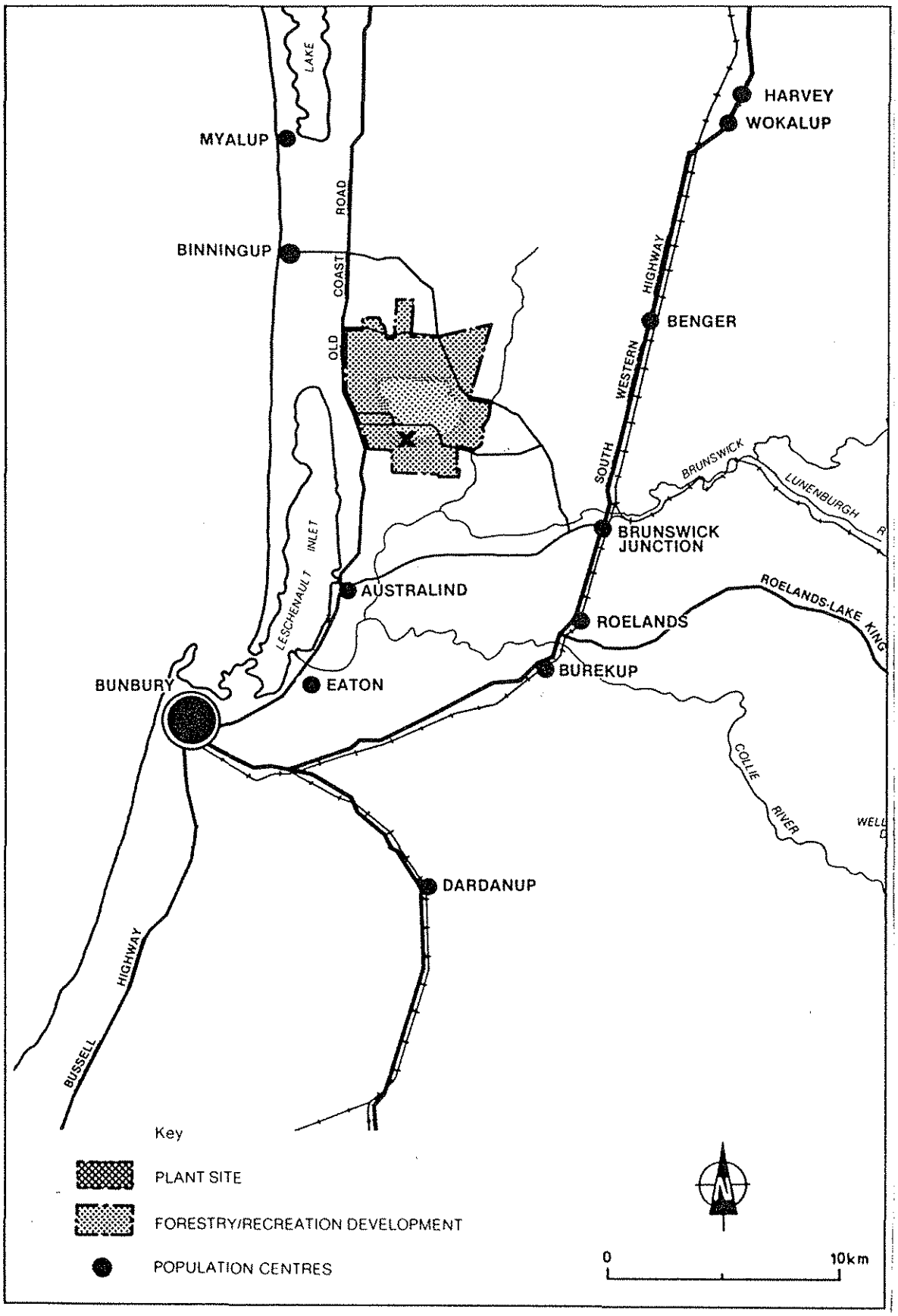
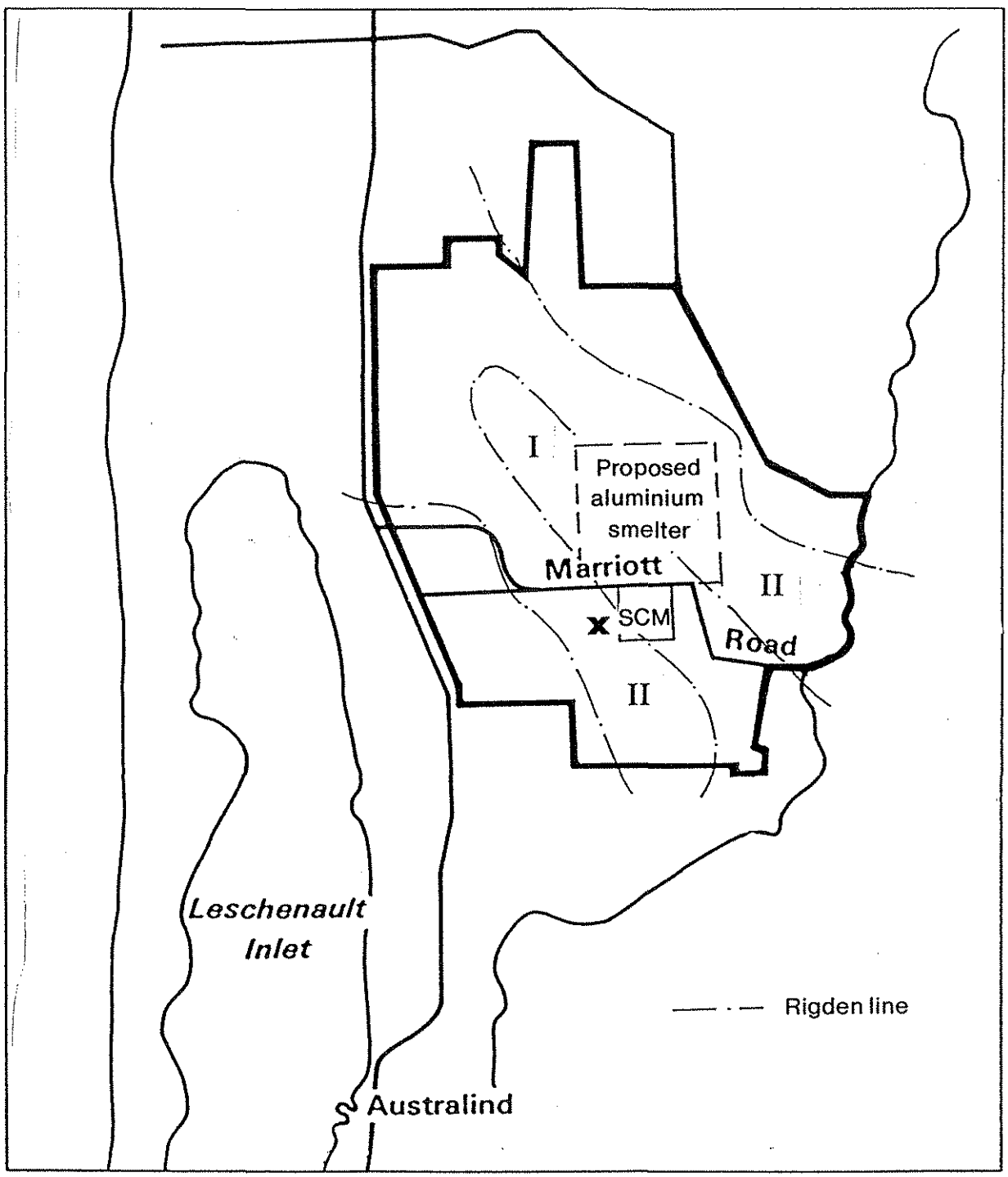


Figure 3 Map showing industrial classification of proposed site



APPENDIX A

PROPONENT'S LETTER CONFIRMING TRANSFER OF COMMITMENTS TO KEMERTON

BARRACK SILICON PTY. LTD.
(a wholly owned subsidiary of Barrack Mines Limited)

THIRD FLOOR, 22 MOUNT STREET,
PERTH, WESTERN AUSTRALIA, 6000
TELEPHONE: (09) 321 8199 FACSIMILE: (09) 321 4268

Our Ref: W3035/RAL/CLC

6 April 1988

Environmental Protection Authority
1 Mount Street
PERTH WA 6000

Attn: Mr R Field
Director
Evaluations Division

Dear Sir

COMMITMENTS RE KEMERTON SITE

Further to your verbal request earlier today, we are pleased to confirm that Barrack Silicon Pty Ltd is able to maintain the intent of all commitments presented to the EPA in our letter of 3 March 1988.

The exception to the above undertaking is that there were a number of site specific commitments which will not apply to the Kemerton site. The qualifications noted in our letter of 3 March, now apply to an even greater extent to the new site, given that very little design work has been completed on this site. The exceptions are as listed in the following points.

Points 3.1.2, 3.1.3

A site specific landscaping plan capable of tolerating the local environment adjacent to a chloride plant and opposite the future Aluminium Smelter, will be developed in consultation with CALM.

We do not consider it appropriate to retain the existing "bush" as it is sparse and unsuited to the local industrial environment, as noted above.

..../2

Point 3.1.4

Water is expected to be drawn from the Yarragadee Formation rather than the Leederville Formation. Clarification of the water supply source will be subject to discussion with WAWA and further investigation.

Point 3.1.6

A new drainage plan will be developed when survey information and site studies are completed. Generally, a similar standard of drainage is anticipated as proposed for the Picton site.

Point 3.3.1

The trucking corridors to this site over the first 5 years would be developed in consultation with MRD and CALM and subject to EPA approval. Otherwise, references to Picton and local features through out our list of commitments, should be amended to suit the Kemerton site.

We trust the above is adequate for your present purposes and would be pleased to further discuss any of the particular points if required.

Yours faithfully

D M SPRATT
GENERAL MANAGER OPERATIONS

APPENDIX B

PROPONENT'S COMMITMENTS

BARRACK SILICON PROJECT

ENVIRONMENTAL COMMITMENTS

MARCH 1988

1.0 PREAMBLE

Barrack Silicon Pty Ltd as proponent for the Barrack Silicon Project to be located at Picton undertakes to make various environmental commitments in relation to the project. This document outlines those commitments.

2.0 PUBLIC ENVIRONMENTAL REPORT

The proponent engaged consultants Maunsell & Partners to prepare a Public Environmental Report, dated November 1987. That report should be read in conjunction with this document.

3.0 ENVIRONMENTAL COMMITMENTS

3.1 Picton Site - General

3.2 Quartzite Supply

3.3 Wood Supply

3.4 Charcoal Production

3.5 Silicon Production

4.0 ATTACHMENTS

4.1 1:2000 General Arrangement

4.2 Wood Transport Corridors Figure 6.2

BARRACK SILICON PROJECT COMMITMENTS

3.1 PICTON SITE GENERAL

3.1.1 The proponent is committed to being a good corporate citizen and to complying with reasonable and justifiable EPA requirements, but in particular to the two main environmental issues of the project, dust emission and noise control.

3.1.2 Within the plant site the proponent is committed to the selective clearing of trees as indicated on the site GENERAL ARRANGEMENT drawing number 100-G-002 and the following extract from the earthworks specification.

"The Contractor shall give the Project Manager seven (7) days written notice of the intention to clear any "bush" from reserves so that the Project Manager may inspect the Site and determine which trees within the limit of clearing are to be preserved, and which are to be removed. No clearing shall commence until the Project Manager has indicated which trees are to be preserved."

3.1.3 It is the intention of the proponent to undertake an ongoing responsibility to improve landscaping and screening of the site within practicable and economic limits. Initially a 25 metre band of trees/shrubs will be planted adjacent to South-West Highway selection of species subject to the variability of the surficial water salinity. Careful selection of indigenous species will be undertaken.

3.1.4 The proponent has a licence from the Western Australian Water Authority (WAWA) to draw up to 1000 m^3/day of ground water from the "Leederville" aquifer and is committed to monitor/test bore water as required by WAWA. Adoption of a closed circuit water cooling circuits in the silicon process greatly help to conserve water usage. The proponent will optimize usage of plant water to its fullest practical extent.

3.1.5 In the event that runoff water is required to be treated, application will be made with EPA prior to discharge into nearby water courses. As appropriate the local authority and WAWA will be consulted should existing drains be used.

3.1.6 The wood stockpile and the plant site in general has a ground level graded to drainage falls into surface drains which in turn are routed to a stormwater sedimentation pond at the South Western corner of the Site designed to cater for a one in five year return period storm. Any overflow from this pond will flow into existing drains subject to application to EPA and availability determined by the local authority and/or WAWA.

3.1.7 The proponent is committed to the installation and maintenance of a first-aid vehicle, a fire tender, appropriate trained personnel and developing safety and contingency planning both during construction and operation of the project. Application annually will be made to the Minister for Emergency Services through the Bush Fires Board of Western Australia to operate fire risk areas of the plant during the high risk summer months of November through to March.

3.1.8 The proponent will develop a comprehensive air emission and atmospheric monitoring programme in consultation with the EPA, to establish the environmental impacts from the project's operation.

3.1.9 The proponent, in addition to seeking practicable and economic methods to consistently reduce noise emissions at their source, will routinely monitor the efficiency of silencers and noise attenuation equipment and will take remedial actions where necessary to maintain efficiency of same.

3.1.11 Solid wastes will be carefully monitored to maximise recycling and resale wherever possible. Solids requiring disposal will be collected and transported to an approved landfill and will be subject to control by EPA.

3.2 QUARTZITE SUPPLY

3.2.1 Quarrying operations will be managed to ensure minimum practicable noise disturbance to the surrounding environment and to that end quarrying operations will generally be restricted to the hours of 0600 to 1700 Monday to Friday, during annual mining campaigns not expected to exceed three to five months each year.

3.2.2 The contract quarry operators will be required to implement appropriate blasting techniques to achieve a maximum 115 dB peak linear limit. This may include the use of sequential timers or alternative approved methods of blast initiation.

3.2.3 Blasting activities will not proceed during periods when wind conditions would result in the transport of significant dust from such blasting operations towards the nearby vicinity of neighbouring farms.

3.2.4 With the exception of the first year of operations when the delayed timetable for the Project may necessitate a summer/autumn mining campaign, quarrying operations will be scheduled for the period mid August through mid-December when post winter moist soil conditions should assist in dust suppression and dust control around the mine site.

3.2.5 The proponent is committed to mine site rehabilitation in accordance with the requirements of the Department of Mines. This plan will include rehabilitation where practicable using local native vegetation. In addition the proponent will seek advice from CALM on the management of Regelia megacephala populations, including the practicality of establishing trial experimental plots to determine criteria for successful regrowth. Where there is a risk of direct impact of mining or service equipment on populations of Regelia megacephela these populations will be fenced off.

3.2.6 Haul roads will be selectively routed by the proponent to provide minimum disturbance to the environment. Dust suppression by water spray on haul roads and at the crushing plant will be implemented should significant dust occur. Tree-planting for screening purposes will be undertaken, in consultation with the farmer/landowner, where necessary and practicable.

3.2.7 Mining operations will leave some areas of inferior grade ore thereby preserving to some degree the visual amenity of the quartzite hills to the north of Moora.

3.2.8 Mining operations including drilling, excavating, quartz haulage and crushing and screening will include dust suppression and dust control measures designed to ensure compliance with occupational health statutes.

In particular drilling will be carried out by an airtrack drill fitted with a "filterclone" dust control system or similar, with separated dust being disposed of in accordance with the Mines Department requirements.

Fine mist water sprays will be installed at the receival hopper and crusher, and provision will be made to damp down muck piles, haulroads and stockpile areas to control fugitive dust.

3.2.9 Efforts will be made to recycle extracted waters to minimise water consumption where practicable.

3.3 WOOD SUPPLY

Wood supply to the Silicon Plant at Picton is a responsibility of the W.A. Department of Conservation and Land Management through its contract with the proponents to fall, extract, load, transport and deliver log timber onto the Picton site. The proponent will rely on CALM to meet its contractual obligations in relation to the following commitments.

3.3.1 Wood will be transported on 20m long articulated 70 tonne log haulage trucks. Proposed routes for the period 1989 - 1992 and for the period 1993 - 1998 are shown in Fig. 6.2. These routes are presently used by log haulage trucks.

Major transport corridors for the first 5 years would be along Pile Road, then Upper Ferguson Road, entering the South Western Highway near Dardanup.

3.3.2 Log haulage vehicles, immediately after entrance to the site, will be specifically diverted away from day to day traffic primarily for safety reasons. Timber will only be received at the plant site during daylight hours Monday to Friday, with possible extensions to Saturday if agreed between CALM and the proponents.

3.3.3 The proponent intends to purchase wood to produce charcoal from the Department of Conservation and Land Management (CALM) under the Government approved Department's General Working Plan No. 87. Wood deliveries by CALM will be contracted to be delivered directly to the Picton site. CALM has developed and is committed as is the proponent to the quarantine and hygiene procedures designed to minimize and reduce the risk of spreading jarrah dieback.

3.3.4 The proponent recognizes that the maintenance of flora and fauna within the State Forest is highly desirable. Currently there is no information on the use of tree hollows by fauna in the Jarrah forest so the proponent will fund and supervise with CALM a post graduate research project to evaluate these predictions and the effects of silvicultural practices specifically for the project. Information from this project will be made available to EPA within 3 years of the start of plant production.

3.3.5 If the research project detects any significant impact of the silicon project on fauna, wood collection operations will be more widely dispersed over the areas being cut for timber to reduce the effect subject to CALM approval. Alternatively some firewood trees and logs will be left in the forest to ensure niche retention.

3.3.6 The General Forest Working Plan No. 87 divides the forest into areas with different Management Priority Areas (MPA's). Subject to hygiene controls firewood extraction is permitted within MPA's however timber extraction from MPA's for recreation will not be carried out under this proposal.

3.3.7 Forest areas allocated to flora, fauna and landscape conservation are not available for timber extraction.

3.3.8 The proponent through CALM, is committed to the current silvicultural management practices for jarrah forests which will, wherever practicable, be enforced for wood produced for this project to provide optimal conditions for the growth of preferred young trees by reducing competition. The objective of the proponent is to ensure an economical supply of dry wood substance to the Project for the purposes of charcoal and silicon manufacture consistent with forest conservation through comprehensive long term strategy planning.

3.4 CHARCOAL PRODUCTION

3.4.1 The design of the overall docking mill complex is under review. The concept selected will incorporate systems designed to reduce noise levels in the vicinity of the complex, consistent with the proponents overall undertakings for control of noise as contained with the PER.

3.4.2 An incinerator will be incorporated by the proponent in the retort complex to combust volatile material in the rinse gas and pyroligneous vapour.

3.4.3 Retort loading arrangement consists of:

1) Upper retort door (swing gate design).
2) Lower retort door (slide gate design).

The system is designed to minimise gas release during charging of the retort.

3.4.4 The retort upper compartment will be operated slightly below atmospheric pressure as a further safeguard against accidental release of retort vapours.

3.4.5 Charcoal dust generated at the belt discharge chute into the furnace bins will be contained by a suppression system or dust collector and re-cycled back to the bin.

3.4.6 Transfer points on belt conveyors transporting charcoal will be fitted with dust suppression systems. The charcoal screen will be fitted with a dust collector, collected dust will be combined with charcoal fines from the screening operation.

3.4.7 The design of the waste wood handling system is under review; should an incinerator be utilised for burning wastes it will be of the "smokeless" refractory silo type.

3.4.8 The comprehensive fire suppression system for the charcoal process will consist of a water tank and pumping station which will feed a ring main and hydrant system around the charcoal retorts and docking mill area as well as the remainder of the plant. A sprinkler system will be installed for fire protection in the docking mill.

Personnel will be trained in fire-fighting procedures, equipment locations clearly marked and a fully operational fire tender will be maintained on site. Portable fire extinguishers and serviced hose reels will be located within the buildings as required.

3.4.9 Provision will be made for bleeding gas cooling water to a settling pond prior to further treatment. Washdown water will be fed through an oil separator prior to entering an evaporation pond or leach drain.

3.4.10 The retort controls will incorporate automatic shutdown system in the event of serious malfunction in shutdown mode top gases would continue to be passed through the high temperature incinerator until a stable cycle has been achieved.

3.5 SILICON PRODUCTION

3.5.1 The quartzite hopper, transfer point and conveyor system will be fitted with water mist sprays for dust suppression.

3.5.2 Each charcoal bin will be fitted with an emergency dumping gate, fitted to the lower section of bin, for use in case of spontaneous combustion of the charcoal.

3.5.3 The proponent will be exerting its best efforts to minimise and if practicable, eliminate the use of petcoke in its furnaces consistent with its commitment for safe and economical operations. The operation will be both environmentally and quality conscious.

3.5.4 The exhaust gas from each furnace and the entrained amorphous silica fume will be collected by the furnace and tapping area hoods and ducted through pre-collector/spark arrester units and a baghouse.

3.5.5 The fume will be discharged from the filter bags into sealed collection hoppers from where it will be pneumatically conveyed to storage silos. The fume will be discharged into sealed road vehicles or pelletised.

3.5.6 The proponent will introduce a programme for regularly sampling the fume and submitting the samples to X-ray diffraction analysis to detect any contamination by crystalline silica. (Public Health Implications Study p15).

3.5.7 The building housing the electric furnaces will be steel-clad. Appropriate ventilation and housekeeping measures will be adopted to ensure control and containment of dust within this building.

3.5.8 Waste water system is being reviewed. A disposal strategy for this waste water will be developed in consultation with the EPA after chemical analyses have been made.

3.5.9 The oxygen storage facility of approximately 6000 litres will be isolated from the heat of the furnace, and fire hydrants will be installed in the general area.

3.5.10 The baghouse system will have reserve capacity to deal with abnormal dust burdens.

3.5.11 A monitoring programme will be established around the plant. That programme will be designed after consultation with the EPA.

3.5.12 Silicon dust generated in the product treatment area will be collected via hoods and extraction fans and ducted to a baghouse. Residual dust levels will be regularly monitored to ensure that the control system is operating with the required efficiency.

3.5.13 Although no significant discharge of organics is predicted, samples of emissions will be collected during early operation of both furnaces and baghouses.

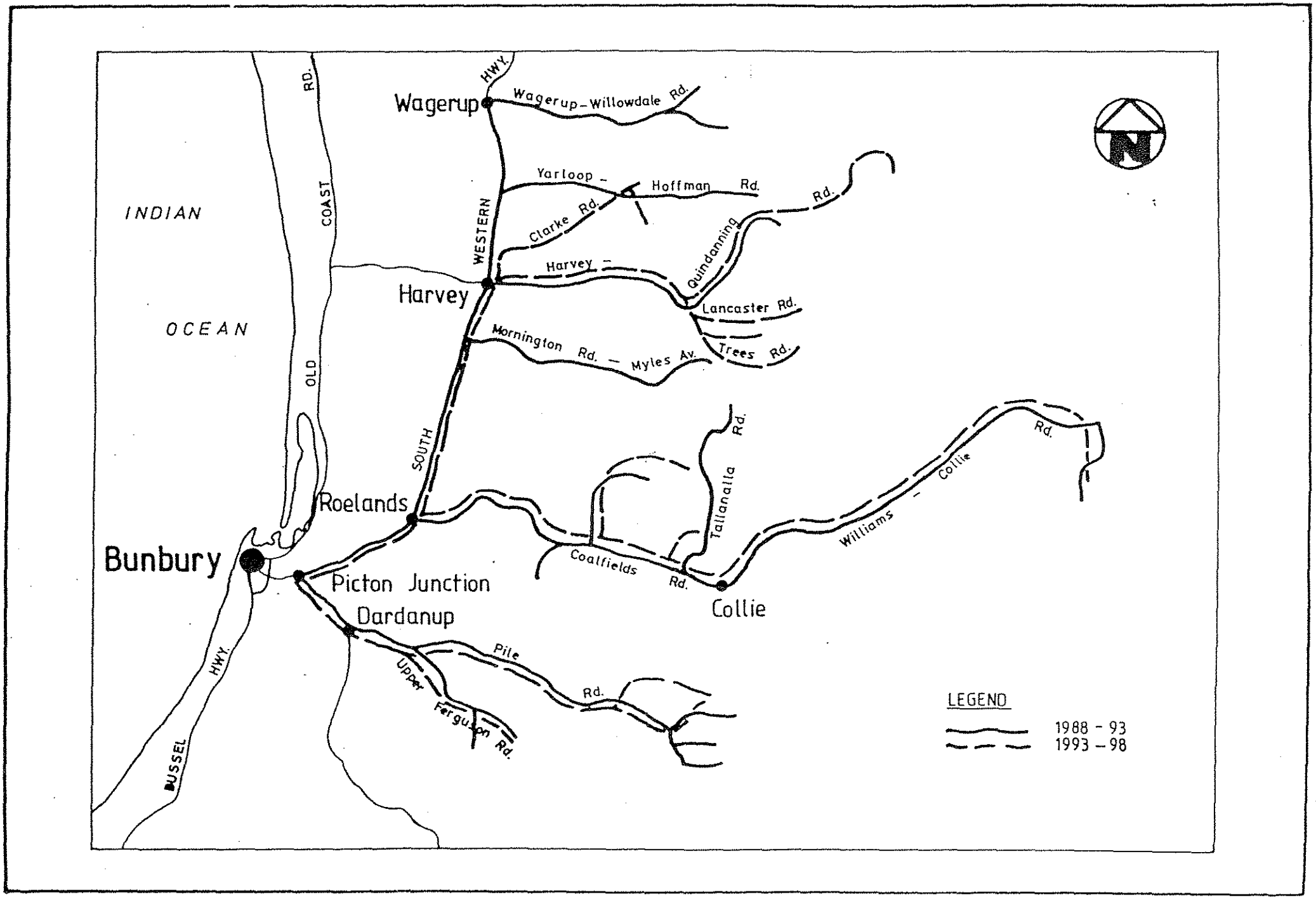
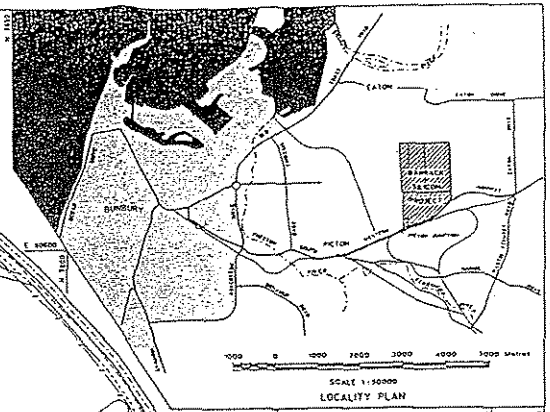


FIGURE 6.2 WOOD TRANSPORT CORRIDORS

DO NOT SCALE - IF IN DOUBT, ASK



POSSIBLE WASTE DUMP AREA

FUTURE WOODCHIP STOCKPILE

FUTURE DOCKED TIMBER STOCKPILE (250000)

INITIAL DOCKED TIMBER STOCKPILE (100000)

FUTURE RAILWAY ZONE

POSSIBLE LOG STORAGE AREA

WEIGHBRIDGE/GATEHOUSE

PUBLIC ACCESS ROAD (RT.3 WOAT)

NOTES

LEGEND

NATURAL VEGETATION RETAINED

D	7.2.98	PWC	ISSUED FOR APPROVAL
C	7.1.98	PWC	REDRAWN - ISSUED FOR APPROVAL/COMMENT
B	16.12.97	PWC	REDRAWN - REVISED AS PER COMMENTS
A	4.12.97	PWC	INITIAL ISSUE

DRAWING REVISIONS

APPROVALS

BHP Engineering Pty Ltd
The Forrest Center
221 St George's Terrace
Perth, W.A. 6000

BARRACK SILICON PTY. LTD.

BARRACK SILICON PROJECT
1:2000 GENERAL ARRANGEMENT

SCALE 1:2000 | 81 | DRG No 100-G-002 / D

APPENDIX C

PROPONENT'S ANALYSIS OF ALTERNATIVE SITES

BARRACK SILICON PTY. LTD.
(a wholly owned subsidiary of Barrack Mines Limited)

THIRD FLOOR, 22 MOUNT STREET,
PERTH, WESTERN AUSTRALIA, 6000
TELEPHONE: (09) 321 8199 FACSIMILE: (09) 321 4268

Our Ref: W3075/PB/CLC

11 April 1988

Mr J Malcolm
Environmental Protection Authority
1 Mount Street
PERTH WA 6000

Dear Jim

KEMERTON SITE SELECTION

Further to our recent discussions and site inspections, we would confirm that our preferred site within the industrial area of the Kemerton Community Park is that described previously as the "West" site that is: the balance of Lot 22 to the west and south of the SCM site. In order to provide 160 ha, the western boundary of this site would need to be moved to the west by approximately 400m.

Prior to reaching this conclusion, three possible sites in the area were examined in detail, giving full consideration to both engineering requirements and potential environmental constraints. A comparison of the different sites is summarised in the attached table.

The West site presents the best ground conditions and the most extensive buffer zone to the nearest residences. The latter is made particularly effective by virtue of the existence of major wooded ridges to the west and south west.

Whilst the North site may offer a lower earthworks cost than the East site, depending on the water table levels and the final site contours, the potential for complaints from the Ridgeview/Treasure Rd/Wellesley Road residential area is considered to be high, considering the flat topography, direct line of sight and prevailing wind conditions. The entire plant would be clearly visible from Wellesley and Treasure Roads.

However, this site could restrict any potential expansion of the Aluminium Smelter site, since the latter is effectively constrained by natural barriers to the west and east, and by the SCM site to the south.

..../2

The East site is totally unacceptable, considering the unsatisfactory nature of the ground and, hence, the high engineering costs involved, the restricted site area and the proximity to both residential housing and the Kemerton Community Park boundary. Specifically, extended delays of the order of one to two months would be involved in conducting detailed geotechnical and hydrogeotechnical studies on this site to determine its acceptability.

For further supporting information, we have appended a copy of a relevant report prepared by our consulting engineers, BHP Engineering.

Yours faithfully

DR P A BIBBY
OPERATIONS MANAGER

FACTOR	SITE WEST	NORTH	EAST
Location	Balance of Lot 22, to west and south of SCM site, with western boundary extended westwards by approximately 400 m	North of smelter site, bounded by Wellesley Road to east and ridge to west	East of SCM Site and SE of smelter site. Bounded by Park boundary on eastern side
Topography	Slowly undulating with major ridges off site to west and SW 13 - 20m AHD	Approximately two thirds flat with balance climbing into major ridge 14 - 40m AHD	Low lying, swampy ground, bisected by major drain leading to Wellesley River. Low ridge in NE Section. < 10 - 15m AHD
Flora	Scattered natural regrowth	Relatively clear on flat, with new pine plantation. Wooded ridge	Clear, with wooded ridge
Distance to nearest residence from likely furnace building location	1.9 km (Bilinga) 2.0 km (Australind Piggery) (Masked by major ridge)	1.5 km (Treasure Road) (Direct line of sight)	1.0 km (Juegenup) (Direct line of sight)
Distance to nearest residence from site boundary	1.2 km	800 m	550 m
Relationship of site to principal residential areas with respect to prevailing SE/SW winds	None	Potentially significant for Ridgeview/Treasure Rd development	None
Potential for noise complaints	Low	High	High
Construction - earthworks	Levelling required	Minimal levelling, except where ridge intrudes or filling required	Levelling of low ridge area, building up of swampy area
Construction - piling	Not required (cf SCM)	Not established	Major requirement
Water Supply	Probably available (cf SCM)	Not established	Probably available (cf SCM)

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Wang Tele/Com No. 09 324 1170
Facsimile No. 09 426 5670
Telex No. AA94499

Our Reference: LD:B422 JS:E211

BHP Engineering

8 April 1988

PB

Project Manager
Barrack Silicon Pty Ltd
3rd Floor
22 Mount Street
PERTH WA 6000

Attention: Mr R Leupen

Dear Sir

Please find attached a brief comparison of the three Kemerton sites. We recommend that Site No. 1 (the site adjacent to the SCM plant) be chosen.

Yours faithfully,

N. COLLUM

PROJECT MANAGER
BARRACK SILICON PROJECT

1768h/20

BARRACK SILICON PROJECT

KEMERTON SITES COMPARISON

		SITE NO. 1	SITE NO. 2	SITE NO.3
1.	Location	Lot 22, Marriot Road L shaped lot to the west and south of the SCM plant (under construction).	Lot 18, Wellesley Road and adjacent areas, located 2.5 km north of Marriot Road and on the west side of Wellesley Road.	Pt Lot 3, Marriot Road North east of the SCM plant, just north of Marriot Road and west of the 'Wellesley River drain'.
2.	Topography	Undulating residual dune country (approximately 10m elevation differences over the site). Varies from RL 13 to RL 23 similar to the Picton site. Heavily wooded in the region of the possible plant location.	Fairly level country typically RL 14–15 to the east rising to residual dune country to the west. Lightly vegetated pasture land to the east, heavily wooded to the west.	More level country typically at RL 15. Becomes swampy to the east (toward the 'Wellesley River drain'). Lightly vegetated (pasture land).
3.	Groundwater Level	Approximately 3–4 m below ground level. No special provisions required.	Approximately 1.5 m below ground level. Fill would be required over part of the site which could be obtained from the residual dunes to the west.	Approximately 0.8 m below ground level in summer time. This site would require extensive filling to be usable. The fill would have to be obtained from a borrow pit elsewhere adding to the cost.

		SITE NO. 1	SITE NO. 2	SITE NO.3
4.	Geotechnical Considerations	This site is expected to be similar to the Picton site with spread footings or sand being suitable.	Variable conditions are expected at this site. Reasonable conditions would be expected in the residual dunes however due to its being on the edge of swamp, these could easily be old sediment layers below the surface.	Very poor foundation conditions could be expected at this site due to the presence of organic deposits (swamp). Piling may well be required for all heavy foundations.
5.	Water Supply	As with the Picton site, there are three aquifers present. The surficial aquifer at the SCM site is from 3–4 m below ground down to 21–22 m below ground. At the other sites which are more level, low lying and closer to the Wellesley River, the groundwater level would be closer to the surface. It is capable of yielding 400–500 kl/day of water suitable for construction purposes only. It tends to be a yellow–brown colour due to the presence of organic leacheates. It is used extensively by local market gardeners/dairy farmers. The Leederville and Yarragadee aquifers are present similar to the Picton site and would be utilised. The Leederville is thinner than at Picton and the Yarragadee is much shallower. SCM have drilled 4 bores to both the Leederville and Yarragadee formations for the various water qualities they require. They requested 6000 kl/day but were granted a license for only 5000 kl/day. Use of groundwater is a problem in this area and WAWA have been restrictive with previous requests for allocations. About half of total resources are dedicated to the future power station/aluminium smelter project. In addition, Australind and Burekup draw groundwater in the area.		
6.	Wastewater Disposal	A wastewater disposal pipeline to the ocean is being built as part of the adjacent SCM plant. Wastewater (process and domestic) could be disposed of by pumping into this pipeline.	This site is too far away to pump wastewater to the SCM plant. On site disposal by recycling and evaporation ponds would be required. to the SCM plant pipeline.	On–site wastewater disposal for this site is a real problem due to the high ground water level. Wastewater could be pumped

		SITE NO. 1	SITE NO. 2	SITE NO.3
7.	Site Preparation	Due to the undulating nature of the country, some site preparation works would be required to produce a working surface for the main buildings. Extensive preparation of the log stockpile area would not be required because it is well above the groundwater level compared with the Picton site.	Considerable site preparation earthworks would probably be required on this site. The work would be similar to that at Picton, being excavation of the residual sands and filling the low lying areas.	Massive earthworks would be required at this site for buildings, stockpiles, roads etc. The fill would have to be imported.
8.	Proximity to Residential Areas	2.5 km from hobby farm area between the Old Coast Road and Leschenault Inlet.	1.0 km from farmlet area north of Fourteen Mile Road.	1.5 km from nearby farms.
9.	Proximity to SCM Plant	Close to the SCM plant. Attendant risk of chlorine release necessitates locating the furnace building toward the southwest of the site.	N/A	Prevailing south–westerly winds could blow chlorine or other airborne contaminants towards this site.
10.	Road Access	All sites have good road access from either Marriot or Wellesley Road. Marriot Road east of the sites may require some upgrading but this would be a Government responsibility. Site No. 1 could have separate light/heavy vehicle access easily arranged due to its L Shape.		
11.	Rail Access	Rail access to all sites is poor. All the sites are about the same distance from the railhead at Brunswick Junction.		

Figure 1 Plant site in Kemerton Industrial Area

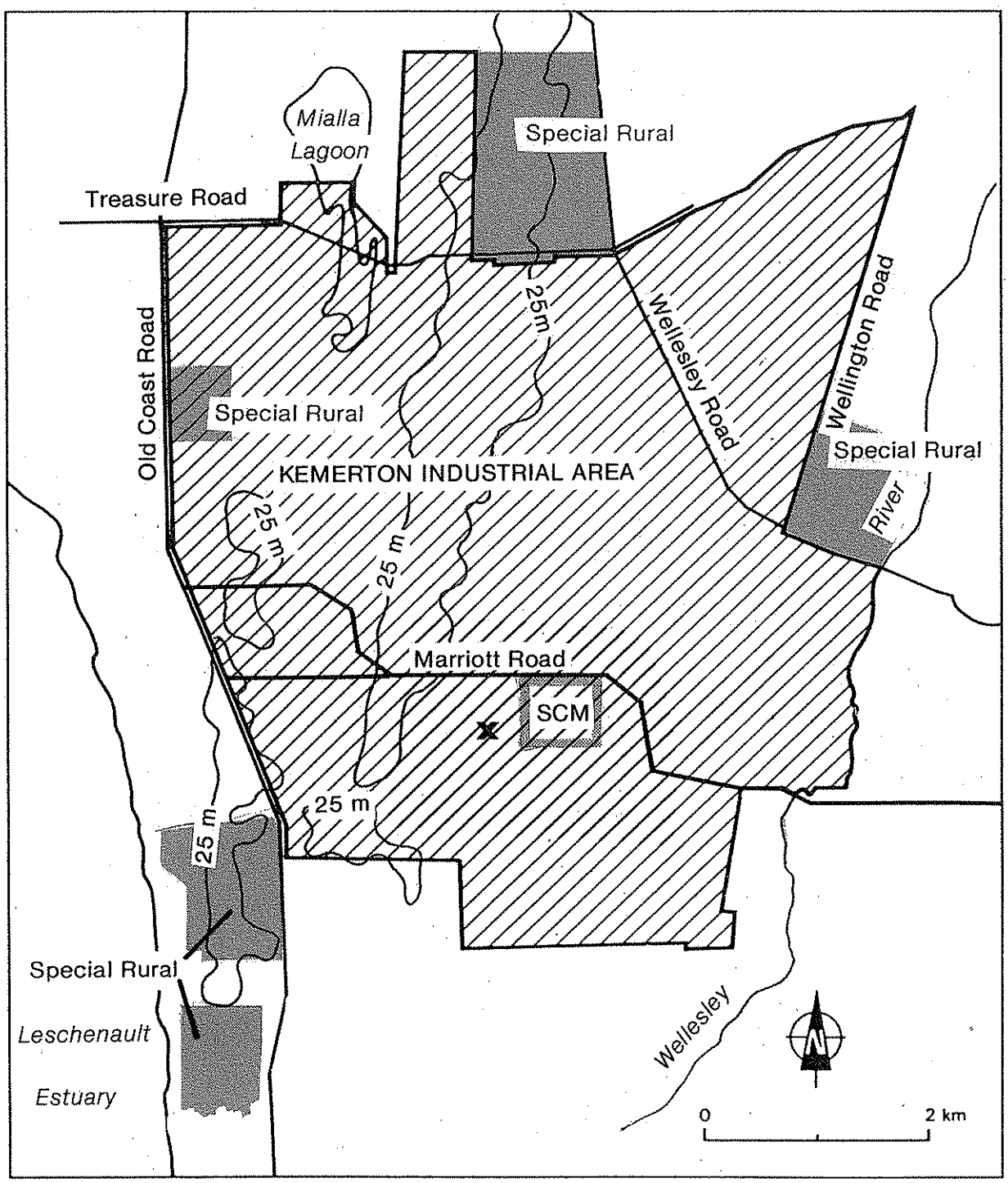

Figure 2 General Map showing location of Kemerton Industrial Area

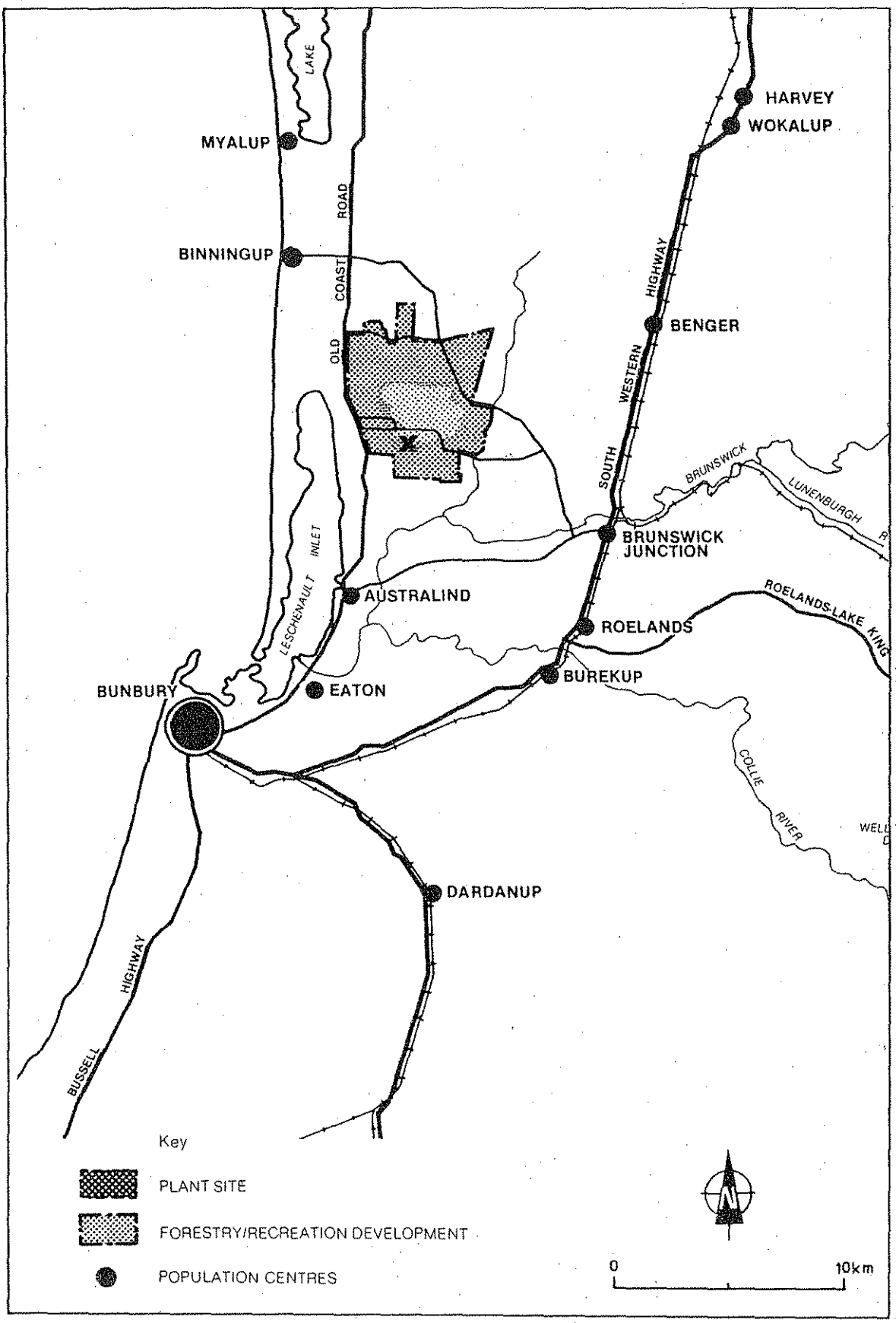

Figure 3 Map showing industrial classification of proposed site