Mid West Iron and Steel, Geraldton Steel Plant, Narngulu Industrial Estate, Geraldton

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Kingstream Resources NL

Report and recommendations
of the Environmental Protection Authority

Environmental Protection Authority
Perth, Western Australia
Bulletin 804
January 1996

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THE PURPOSE OF THIS REPORT
This report contains the Environmental Protection Authority's environmental assessment and recommendations to the Minister for the Environment on the environmental acceptability of the proposal.

Immediately following the release of the report there is a 14-day period when anyone may appeal to the Minister against the Environmental Protection Authority's report.

After the appeal period, and determination of any appeals, the Minister consults with the other relevant ministers and agencies and then issues his decision about whether the proposal may or may not proceed. The Minister also announces the legally binding Environmental Conditions which might apply to any approval.

APPEALS
If you disagree with any of the contents of the assessment report or recommendations you may appeal in writing to the Minister for the Environment outlining the environmental reasons for your concern and enclosing the appeal fee of $10.

It is important that you clearly indicate the part of the report you disagree with and the reasons for your concern so that the grounds of your appeal can be properly considered by the Minister for the Environment.

ADDRESS
Hon Minister for the Environment
12th Floor, Dumas House
2 Havelock Street
WEST PERTH WA 6005
CLOSING DATE
Your appeal (with the $10 fee) must reach the Minister's office no later than 5.00 pm on 23 January 1996.

Environmental Impact Assessment (EIA)
Process Timelines in weeks

Date	Timeline commences from receipt of full details of proposal by proponent	Time (weeks)
10/7/95	Proponent Document Released for Public Comment	8
4/9/95	Public Comment Period Closed	
2/10/95	Issues Raised During Public Comment Period Summarised by EPA and Forwarded to the Proponent	4
16/10/95	Proponent response to the issues raised received	2
9/1/96	EPA reported to the Minister for the Environment	12

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Summary and recommendations

The proponent, Kingstream Resources NL, proposes to develop a steel manufacturing plant within the Narngulu Industrial Estate, approximately 5km south-east of Geraldton.

This proposal has been assessed by the Environmental Protection Authority at the level of Public Environmental Review (PER).

During the assessment the Environmental Protection Authority sought expert advice from the Department of Environmental Protection and the Water Authority of Western Australia (WAWA), considered the input from public and other government agency submissions, and concluded that the main pollution and social surroundings issues relating to the proposal were:

Pollution issues

- noise;
- gaseous emissions (including greenhouse gases and odours);
- dust and particulate emissions;
- buffer zone;
- liquid and solid waste disposal; and
- protection of ground water.

Social surroundings issues

- light overspill.

The Environmental Protection Authority during its assessment has utilised the information given in the Public Environmental Review (PER), taken into account the advice of the above expert agencies, and has taken into account additional information supplied by other government agencies, the public and the proponent.

The Environmental Protection Authority has concluded that the proposal is environmentally acceptable subject to the proponent's commitments and recommendations in this assessment report.

The Environmental Protection Authority has also examined the need for the provision of a buffer zone around the steel plant, and around the Narngulu industrial area. The Environmental Protection Authority considers that the long term tenure of industry should not be compromised by inappropriate development near industrial estates, and considers that the Government should examine means by which a buffer can be established around the Narngulu Industrial Estate.

Should there be a significant increase in plant capacity in the future, the EPA may need to assess impacts associated with transportation infrastructure.

Recommendation Number	Summary of recommendations
1	Proposal is acceptable subject to the recommendations in this report, the proponent's commitments, and the Authority's proposed environmental conditions.
2	The Environmental Protection Authority recommends that the maximum noise levels be: (i) 50 dB(A) Slow between 0700 hours and 1900 hours Monday to Friday; (ii) 45 dB(A) Slow between 1900 hours and 2200 hours Monday to Saturday; (iii) 45 dB(A) Slow between 0700 hours and 2200 hours Sundays and Public Holidays; and (iv) 40 dB(A) Slow between 2200 hours and 0700 hours always; when measured: • at any point on or adjacent to other premises not occupied by the proponent and used for residential or other noise sensitive purposes; and • at a height between 1.2 metres and 1.5 metres above ground level and greater than 3.5 metres from any reflecting surface other than the ground.

Recommendation Number	Summary of recommendations
3	The Environmental Protection Authority recommends that the proponent prepare an Environmental Management Programme (EMP), which includes the following information, to the satisfaction of the Environmental Protection Authority on advice from the DEP: **1.** Noise • a monitoring and audit programme for noise emissions as a means of gauging the effectiveness of noise control measures and compliance with the maximum allowable noise levels (as detailed in Recommendation 2). **2.** Gaseous emissions (including greenhouse gases and odours) • a monitoring and audit programme for all gaseous and odorous emissions (stack and ambient), including greenhouse gases; • calculations of the greenhouse gas emissions (using methodology developed for Australia); and • the proponent shall use its best endeavours to assist in the achievement of the governments desired position regarding the generation of greenhouse gas emissions. **3.** Dust and particulate emissions • a monitoring and audit programme for all dust and particulate emissions (including fugitive dust) and the moisture content of all storage stockpiles as a means of gauging the effectiveness of dust control. **4.** Liquid and solid waste disposal • details of waste disposal approvals obtained from relevant government departments and how the proponent will implement any conditions of those approvals. **5.** Protection of ground water • efficient use and conservation of fresh water; • preferential use of brackish water; and • a monitoring and audit programme for ground water quality around the plant perimeter. **6.** Light overspill • details of management measures to ensure that light overspill from the plant and transfer facility near Mullewa does not exceed DEP requirements. Reports of the results of all monitoring programmes are to be submitted annually to the DEP for audit, and are to be made publicly available.
4	The Environmental Protection Authority recommends that the proponent incorporates low NO_X technology into the power station gas turbines prior to commissioning.

1. Introduction and background

1.1 The purpose of this report

This report and recommendations provide the Environmental Protection Authority's formal advice to the Minister for the Environment on the environmental acceptability of the proposed development of a steel manufacturing plant within the Narngulu Industrial Estate, approximately 5km south-east of Geraldton (Figure 1).

1.2 Background

The Mid West Iron and Steel Project (MWIS) was initiated by Kingstream Resources NL and Pavilly Pty Ltd in 1992. A pre-feasibility study of the project was carried out in 1992 during which the extent and quality of the ore body at Tallering Peak was assessed, various options for steel production were investigated, and the economic viability was evaluated. The pre-feasibility study indicated that a steel making project could be viable in the Mid West Region.

As a result, a more detailed full feasibility study was initiated in 1994. The full feasibility study involved the final selection of a site for the Geraldton Steel Plant (GSP) and the steel making (ie. process) technology, completion of assessments of the iron ore resource and preparation of a detailed plan for the iron ore mine; determination of a mode of transport for iron ore and other inputs and for the steel products; completion of all necessary arrangements for the provision of utilities; and the formation of a consortium with sufficient technical and other resources to enable the project to achieve the necessary finance and to proceed.

The full feasibility study also recognised the need to obtain all necessary approvals from the Commonwealth and State Governments. This included obtaining environmental approvals from the Government of Western Australia. The proponent's PER document is the basis for the application for environmental approval.

During the last decade, substantial innovations have been made in the processing of iron ore into steel. These innovations have resulted in smaller steel mills becoming economically viable. These mills also have considerably less adverse environmental impacts than traditional steel mills. These innovations include:

- the use of natural gas as a reductant for the conversion of iron ore into iron, eliminating the requirement for coke and sinter plants;
- the development of an electric arc furnace for the conversion of iron into liquid steel; and
- improvements in casting techniques such as continuous thin wall casting.

The proponent has incorporated appropriate technically proven innovations in the GSP.

1.3 The proposal

The MWIS Project involves the establishment of an iron ore mine at Tallering Peak, 70km north of Mullewa; transport of iron ore by road and rail to the GSP at Narngulu Industrial Estate near Geraldton; and transport of steel product by road from Narngulu to the Port of Geraldton for export. The mine at Tallering Peak was subject to assessment by the Department of Minerals and Energy via a Notice of Intent.

The proposal currently being assessed via this report is the GSP.

The locations of the various elements of the MWIS Project (which are all in the Mid-West Region of Western Australia) are shown in Figure 1.

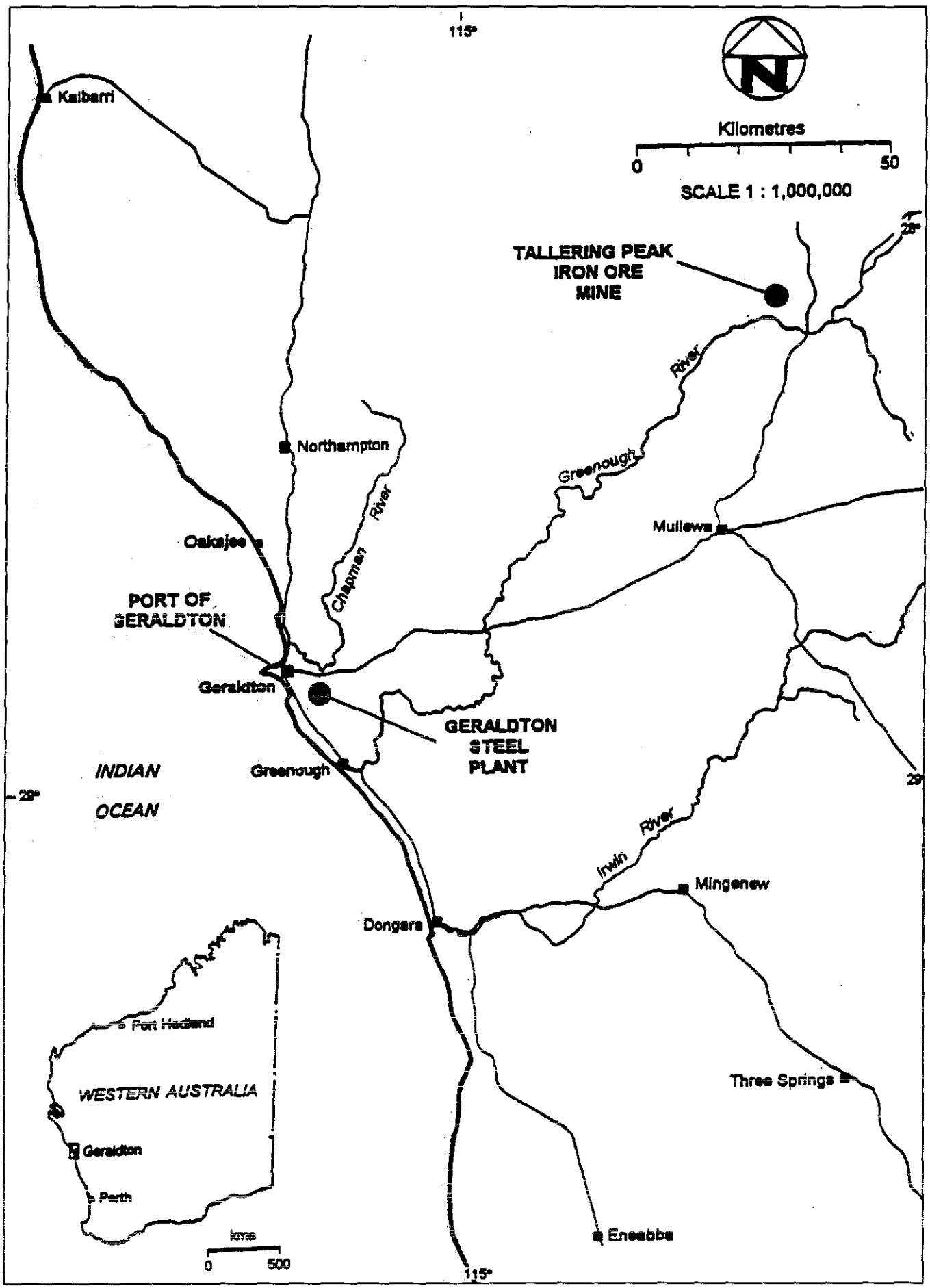


Figure 1. Regional location map, Narngulu Industrial Estate. (Source: Figure 1 of PER).

The GSP has several major components including a Pellet Plant which converts the iron ore to a state suitable for direct reduction; a Direct Reduction Plant using natural gas which converts iron ore to metallic iron of sufficient quality for steel making; an Electric Arc Furnace which produces liquid steel from the metallic iron plus other additives; a continuous caster which produces a thin wall slab; and a rolling mill which rolls the steel into the final product. The plant will produce 1.0 million tonnes of hot rolled steel coil each year.

The proposal also includes a gas-fired power station which will supply electricity to the GSP. The power station would, however, be owned and operated by an independent company.

1.4 Assessment process history

A flow chart of the Environmental Impact Assessment process is shown in Appendix 1. The proponent referred the proposal to the Environmental Protection Authority (EPA) on 12 September 1994 for assessment. The EPA set the level of assessment at Public Environmental Review (PER). During the environmental assessment of this proposal the EPA utilised information supplied by other government agencies, the public and the proponent.

The PER was prepared in accordance with guidelines issued by the EPA. Public consultation during the preparation of the document helped ensure that interested individuals and groups were aware of the proposal and in a position to provide informed comment. The PER document was released for public review for an eight week period ending on 4 September 1995. A summary of issues raised in public submissions was prepared and forwarded to the proponent, and the proponent's responses were taken into account during this EPA assessment. Additionally, officers of the DEP discussed environmental issues with interested members of the local community and relevant government departments.

This EPA Bulletin is provided as advice to the Minister for the Environment and is then published by the Minister. After a fourteen day appeal period, the Minister considers any appeals received and then sets Environmental Conditions relating to the proposal.

1.5 Structure of the report

This document has been divided into seven Sections. Section 1 describes the historical background to the proposal and its assessment while Section 2 briefly summarises the proposal (more detail is provided in the proponent's PER and in Appendix 4). Section 3 explains the method of assessment, provides an analysis of public submissions as well as highlighting from the topics identified from the guidelines, the proponent's documentation and public submissions, the issues warranting further evaluation by the Environmental Protection Authority.

Section 4 sets out the evaluation of the key environmental issues associated with the proposal. The sub-sections outline the objectives of the assessment, the likely effects of the proposal, the advice to Environmental Protection Authority from submissions, and the proponent's response to submissions. Then the adequacy of the response by the proponent is considered in terms of project modifications and environmental management commitments in achieving an acceptable outcome. The Environmental Protection Authority analysis and recommendations with respect to the identified issues are contained in this section. Where inadequacies are identified, recommendations are made to achieve the environmental assessment objective.

Section 5 summarises the conclusions and recommendations. Section 6 describes the recommended environmental conditions. References cited in this report are provided in Section 7.

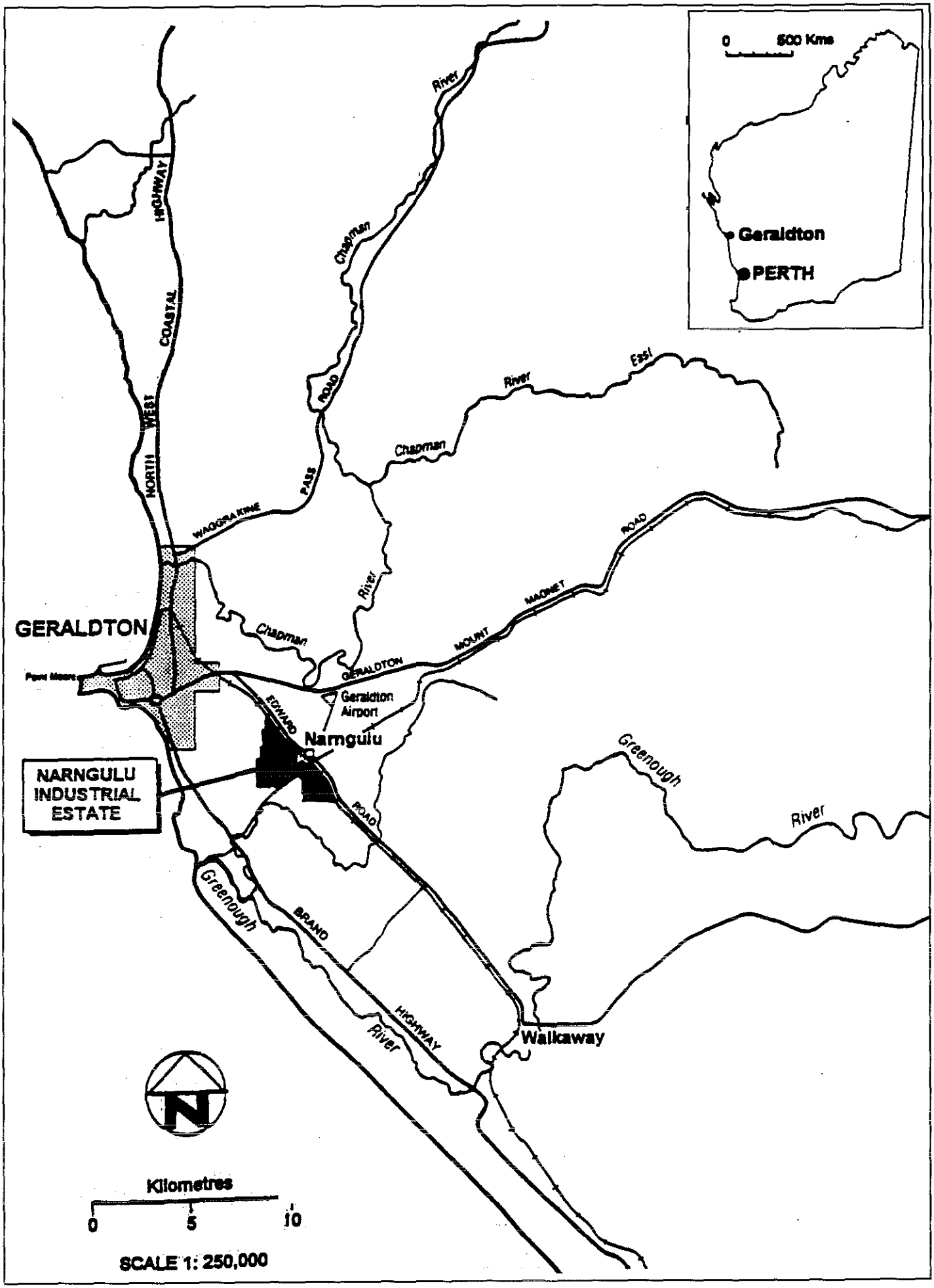


Figure 2. Location map, Geraldton Steel Plant. (Source: Figure 4 of the PER).

2. Summary description of proposal

2.1 Need for the proposal

The Geraldton Steel Plant is the only component of the Mid West Iron and Steel Project (MWIS) Project which is included in this proposal. The mine at Tallering Peak was subject to separate assessment by the Department of Minerals and Energy via a Notice of Intent.

The proponent's objective in developing the GSP within the Narngulu Industrial Estate is to generate significant export earnings through the sale of one million tonnes of steel each year. By adding value to the iron ore originating from the Tallering Peak mine, the proponent anticipates that earnings from the (MWIS) Project will be substantial and that it will provide major benefits in terms of revenues, expenditures and employment. These benefits will accrue at the national, state and especially the local level within the Mid West Region, the City of Geraldton and the Shire of Greenough.

2.2 Summary of proposal

The GSP will receive approximately 1.5 million tonnes of iron ore from the Tallering Peak minesite each year comprising 85% fines (less than 10mm size) and 15% lump ore (in the size range 10 - 30mm).

It will also receive about 260,000 tonnes of other solid materials per year including scrap steel, quicklime, limestone, alloys, refractory bricks, electrodes and other materials. Most of these will be imported through the Port of Geraldton.

The PER stated that the GSP will be designed to produce 1.0 million tonnes of steel each year for export through the Port of Geraldton.

The GSP will have several main components:

- a Pellet Plant in which iron ore is converted to pellets suitable for direct reduction;
- a Direct Reduction Plant (DRI) in which pellets and lump ore are converted to direct reduced iron using natural gas;
- a Melt Shop containing an Electric Arc Furnace and a Ladle Furnace and which produces liquid steel from the DRI plus other additives;
- a Compact Strip Production (CSP) Plant in which the liquid steel is cast into thin slabs;
- handling and storage facilities for incoming materials, for products at various stages of the process, and for outgoing rolled coil and wastes;
- an open cycle gas turbine Power Station;
- water and wastewater treatment facilities and cooling towers;
- a Cryogenic Oxygen Plant; and
- administration and maintenance facilities.

The GSP will be located in the Narngulu Industrial Estate immediately to the south of the Mineral Sands Separation Plant and Synthetic Rutile Plant operated by RGC Mineral Sands Ltd. The location has been selected because:

- its relative proximity to the minesite
- it is close to the Port of Geraldton through which the steel will be exported and raw materials to the GSP will be imported;
- sufficient land is immediately available;

- the site is zoned for industrial use and is part of an industrial estate where other heavy industries are located;
- there are easements to the site for water and gas supply;
- it is close to the City of Geraldton where it is expected that most of the workforce will live;
- it offers relatively low costs of establishment compared to other locations in the region.

The requirements of the GSP for services, and the sources of the services will be as follows:

- Water — 4.5Mm^3/yr from the Allanooka Borefield operated by the Water Authority of Western Australia;
- Natural Gas — 74TJ/day supplied through the Dampier - Perth natural gas pipeline located near Mungarra;
- Other gases — 4,200m^3/h of oxygen, 2,500m^3/h of nitrogen and 550m^3/h of argon will be produced by a Cryogenic Oxygen Plant associated with the GSP;
- Electricity — The average demand for electric power is estimated at 125MW with a maximum demand of 185MW. Electricity will be provided by the power station associated with the GSP.

The inputs and outputs of the GSP are summarised in Figure 3 and an overall process diagram is provided in Figure 4.

The proponent's detailed description of the proposal is provided in Appendix 4.

3. Identification of issues

3.1 Method of assessment

The purpose of environmental impact assessment is to determine whether a proposal is environmentally acceptable or under what conditions it could be made environmentally acceptable.

A set of administrative procedures has been defined (refer to flow chart in Appendix 1) in order to implement this method of assessment.

The first step in the method is to identify the environmental issues to be considered. A list of topics (or possible issues) is identified by the Environmental Protection Authority through the preparation of guidelines which are referred to relevant agencies for comment prior to being finalised.

In the next main step these topics are considered by the proponent in the Public Environmental Review (PER) both in terms of identifying potential impacts as well as making project modifications or devising environmental management strategies.

The PER is checked to ensure that each topic has been discussed in sufficient detail by the proponent prior to release for government agency and public comment. The submissions received are summarised by the Department of Environmental Protection on behalf of the Environmental Protection Authority. This process can add environmental issues which need to be evaluated in terms of the acceptability of potential environmental impact.

Proponents are invited to respond to the issues raised in submissions. Appendix 2 contains a summary of the issues raised in submissions and the proponent's response to those issues. A list of submitters appears as Appendix 3. Thirty five submissions were received, of which thirteen were from government agencies and twenty two from members of the public and conservation groups.

The proponent's revised commitments following their response appears in Appendix 5

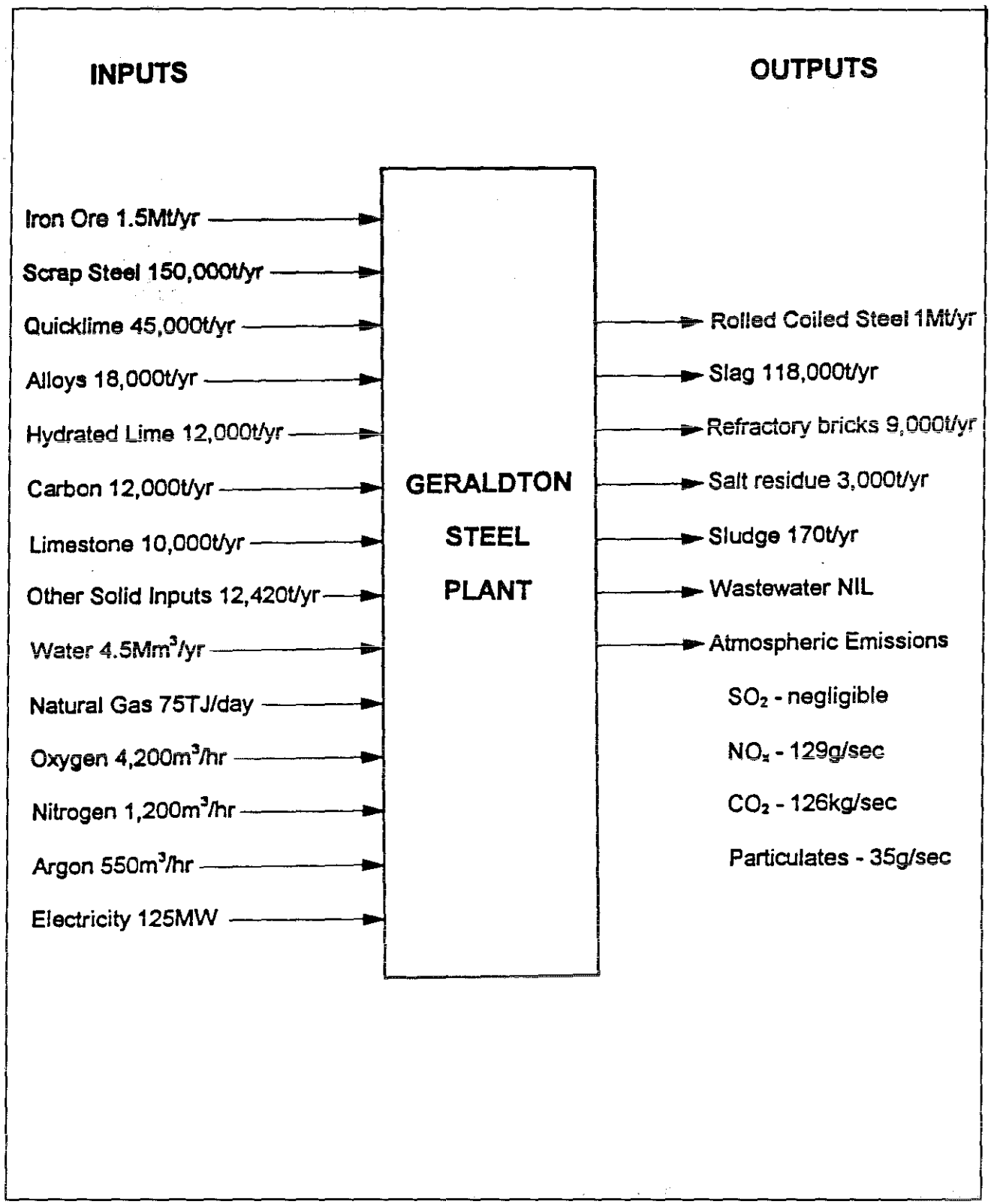


Figure 3. Summary of inputs and outputs, Geraldton Steel Plant. (Source: Figure A of the PER)

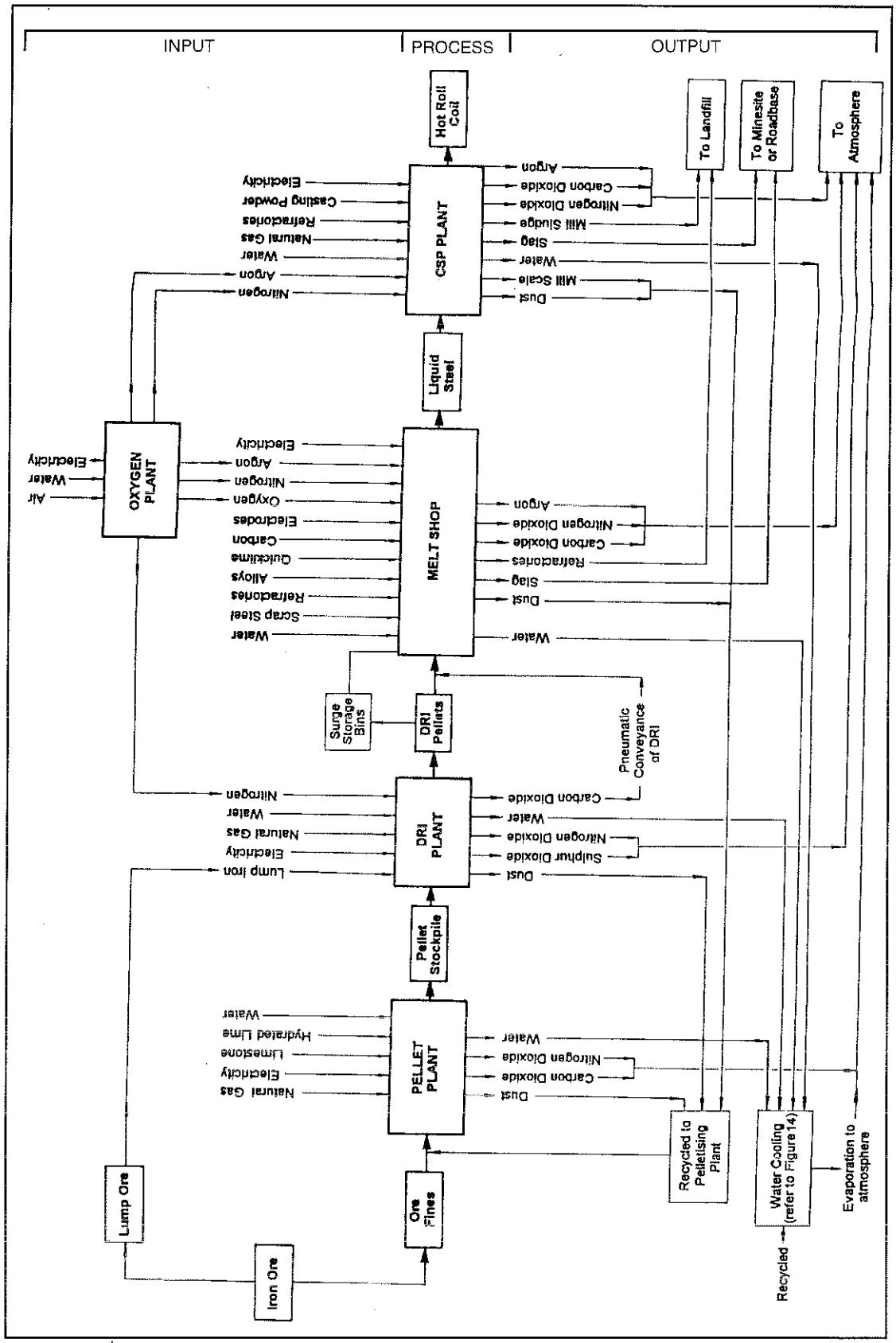


Figure 4. Overall process diagram, Geraldton Steel Plant. (Source: Figure 8 of the PER)

This information, namely the Guidelines, the proponent's PER, the submissions and the proponent's response provides the basis for identifying environmental issues and the extent of environmental impact which is then subjected to analysis for environmental acceptability. For each environmental issue, an objective is defined and where appropriate an evaluation framework identified.

The expected impact of the proposal, with due consideration to the proponent's commitments to environmental management, is then evaluated against the assessment objective. The Environmental Protection Authority then determines the acceptability of the impact. Where the proposal, as defined by the proponent has unacceptable environmental impacts, the Environmental Protection Authority can either advise the Minister for the Environment that the proposal is environmentally unacceptable, or make recommendations to ensure the environmental acceptability of the proposal.

Limitation

This evaluation has been undertaken using information currently available. The information has been provided by the proponent through preparation of the PER document (in response to guidelines issued by the Environmental Protection Authority), by Department of Environmental Protection officers utilising their own expertise and reference material, by utilising expertise and information from other State government agencies, information provided by members of the public, and by contributions from Environmental Protection Authority members.

The Environmental Protection Authority recognises that further studies and research may affect the conclusions. Accordingly, the Environmental Protection Authority considers that if the proposal has not been substantially commenced within five years of the date of this report, then such approval should lapse. After that time, further consideration of the proposal should occur only following a new referral to the Environmental Protection Authority.

3.2 Public and agency submissions

Comments were sought on the proposal from the public, community groups, as well as local and State government agencies. During the public submission period of 10 July 1995 to 4 September 1995, thirty five submissions were received. A summary of these submissions was forwarded to the proponent's consultant for response on behalf of the proponent. The consultant also received copies of the full submissions from each State Government agency.

Submissions received by the Environmental Protection Authority fell within the following categories:

- eighteen from individual members of the public;
- four from groups and organisations; and
- thirteen from State and other government agencies.

The Environmental Protection Authority has considered the submissions received and the proponent's response as part of the assessment of this proposal.

3.3 Review of topics

Nineteen topics were identified during the environmental impact assessment process, including those topics identified in the Environmental Protection Authority's Guidelines, subsequent consultations and in the submissions described above. These were:

Pollution topics

- noise;
- gaseous emissions (including greenhouse gases and odours);

- dust and particulate emissions;
- buffer zone;
- liquid and solid waste disposal;
- protection of ground water;
- water supply;
- Radio Frequency interference (RFI) from the electric arc furnace;
- environmental management during construction; and
- potential environmental impacts from changes in port infrastructure.

Social surroundings topics

- risks and hazards;
- visual impact of the proposed plant;
- community consultation;
- purchase of nearby properties by the proponent;
- road transportation impacts;
- socio-economic impacts (including housing, services, property values, tourism and employment);
- health impacts on surrounding residents;
- choice of location of the proposed plant; and
- impacts on the operations of Geraldton Airport.

The Environmental Protection Authority has reviewed these topics and from them, identified specific environmental issues which require evaluation. The balance of the topics are addressed adequately through the means identified in Table 1.

Whilst the topic of transport infrastructure is considered to be manageable, should there be a significant increase in plant capacity in the future, the EPA may need to assess impacts associated with transport.

4. Evaluation of environmental issues

The Environmental Protection Authority has considered the issues raised during the environmental impact assessment process including matters identified in public submissions. The Environmental Protection Authority has evaluated the key environmental issues identified in Table 1 (Section 3) of this report, based on existing information and advice from other Government agencies and public comments.

Pollution issues

4.1 Noise

4.1.1 Objective

The Environmental Protection Authority's objective is to ensure that the health and amenity of surrounding residents is not unduly affected by noise emissions emanating from the proposed GSP plant.

TOPICS	PROPOSAL CHARACTERISTICS	COMMENTS FROM GOVERNMENT AGENCIES	PUBLIC COMMENTS	IDENTIFICATION OF ISSUES
Pollution				
Noise	Operation of the plant could produce noise levels at nearby residences that may exceed existing and proposed noise standards.	Concerns about noise impacts from transfer facility, scrap metal transport, traffic and noise attenuation and monitoring to comply with noise regulations.	Concerns about noise at nearby residences in particular Narngulu town site and for shift workers. Queries accuracy of noise modelling.	The issue of noise emissions from the proposed plant requires further evaluation by the EPA.
Gaseous emissions (including greenhouse gases and odours).	Operation of the plant will generate odorous gases and large quantities of greenhouse gases.	Concerns expressed about NO_x levels and adequacy of emission controls, the adequacy of climatic data and cumulative air emissions. Need for greater consideration of greenhouse gases (CO_2), SO_2 and particulates.	Concern expressed about health effects, adequacy of emission controls, modelling under worst case conditions and the large quantity of greenhouse gases.	Gaseous emissions (including greenhouse gases and odours) require further evaluation by the EPA.
Dust and particulate emissions.	Operation of the plant will generate dust and particulate emissions.	Concern in relation to dust and particulate control at transfer station near Mullewa and stockpiles at Geraldton Port. Also concern about health effects associated with particle size (below 10 μm).	Concern about health effects of dust emissions and compliance with NHMRC guidelines.	Dust and particulate emissions (particularly monitoring requirements) require further evaluation by the EPA.
Buffer zone	There is no established buffer zone around the proposed site.	Requests for further information on the adequacy of buffer zone to manage noise, risk and air emissions and for consideration of a buy-out program for residences.	Concerns about adequacy of buffer zone in relation to plant effects and whether the proponent would secure an adequate buffer.	The need for a buffer zone around the proposed plant requires further evaluation by the EPA.
Liquid and solid waste disposal.	Operation of the plant will produce liquid and solid waste.	Concerns about the quantity of sludge, its composition (particularly its salt and oil content) and its suitability for landfill disposal. Also concerns about stockpile size and control of dust generation.	Concern about the potential impacts from salt leaching out of waste slag from the plant if it is used as road base or disposed of at the minesite.	Liquid and solid waste disposal requires further evaluation by the EPA.
Protection of ground water.	Operation of the plant, particularly disposal of waste water on to hot slag, has the potential to impact upon ground water.	Concern about groundwater contamination from salt leaching from slag and use of effluent for irrigation.	Concern about the possibility of ground water contamination occurring as a result of rain water leaching salt from plant slag, both at the plant and at the transfer facility and minesite.	Ground water protection requires further evaluation by the EPA.

Table 1. Identification of environmental issues requiring EPA evaluation.

TOPICS	PROPOSAL CHARACTERISTICS	COMMENTS FROM GOVERNMENT AGENCIES	PUBLIC COMMENTS	IDENTIFICATION OF ISSUES
Pollution				
Water supply	The project will use large quantities of fresh water.	Concern about the availability of sufficient water from Allenooka borefield and the effects on other users.	Concern about the ability of the Allenooka borefield to meet expected demand and potential effect on water availability for expansion of Geraldton.	Subsequent to the public review period, discussions between WAWA, the DEP and the EPA have clarified the fact that WAWA can supply sufficient water to meet the demands of the proposed plant and the Geraldton region as a whole. Accordingly, this issue requires no further evaluation by the EPA.
Radio Frequency Interference (RFI) from electric arc furnace.	Operation of the electric arc furnace has the potential to produce RF interference.	Concerns about Radio Frequency Interference (RFI) from the electric arc furnace.	None received.	Experience from similar facilities indicate no known interference. No further evaluation by EPA required.
Environmental management during construction.	Construction of the plant will necessitate the management of any environmental impacts which may arise.	None received.	Concern as to whether the proponent was aware that an Environmental Management Programme (EMP) should be prepared and submitted to the EPA prior to commencement of earthworks.	The proponent will be required to submit an EMP to the DEP and EPA prior to construction commencing which covers all stages of the project. Accordingly, this issue requires no separate evaluation by the EPA.
Potential environment impacts from changes in port infrastructure resulting from import and export of materials for the Geraldton Steel Plant.	The operation of the proposed plant will result in an increase in the quantity of materials moving through the port.	Concern that any new environmental impacts from the proposed plant on the Port of Geraldton should be considered.	No mention made in PER about potential environmental impacts from changes to port infrastructure due to the import and export of materials for the Geraldton Steel Plant. The PER did not indicate the intention or possibility of importing or exporting iron ore through the Port of Geraldton.	The proponent indicated that existing port facilities will be used, and that it presently has no intention of importing or exporting iron ore through the Port of Geraldton. This issue requires no further evaluation by the EPA.

Table 1. Identification of environmental issues requiring EPA evaluation. (cont'd)

TOPICS	PROPOSAL CHARACTERISTICS	COMMENTS FROM GOVERNMENT AGENCIES	PUBLIC COMMENTS	IDENTIFICATION OF ISSUES
Social				
Risks and hazards	Operation of the plant will introduce risks and hazards.	None received.	Concern about why a risk assessment had not been done for the proposed plant. Concern was also expressed about the proponent's basis for claiming that there is no need for a buffer zone, in the absence of a risk assessment. Submissions also inquire as to what assessments had been made of risks arising from an unexpected major plant breakdown resulting in the mass release of atmospheric contaminants, explosions or fire.	The EPA considers that this particular type of industry introduces a level of risk so low as to be acceptable to surrounding residents. Accordingly, this issue requires no further evaluation by the EPA.
Visual impact of the proposed plant.	The proposed plant will be highly visible to surrounding residents due to its size and height.	Concerns expressed about lighting impacts from plant at residences and from Mullewa transfer station.	Concern about visual impact of industrial facilities and light spill on nearby residents.	As the proposed plant will be located within an existing industrial estate on predominantly flat ground with very few residential properties nearby, this issue requires no further evaluation by the EPA. The issue of light overspill from the plant requires further evaluation by the EPA.
Community consultation.	The proponent was required to undertake adequate community consultation.	Shire of Mullewa stated that it will expect the proponent to continue extensive consultations with local authorities.	Concern about the proponent's intentions in consulting with local residents about plant impacts and about Narngulu becoming a major industrial estate.	The proponent has indicated that it has undertaken adequate community consultation. This issue requires no further evaluation by the EPA.
Purchase of nearby properties by the proponent.	The proponent has implemented measures to aid in the purchase of nearby properties.	CEPA stated that consideration should be given to a program of buy-out and relocation of nearby residents as they are too close to avoid adverse impacts from noise and gaseous emissions from the plant.	Public submissions expressed concern about the whole overall process of the proponent purchasing nearby properties.	This topic forms part of the issue of buffer zones. It requires no separate evaluation by the EPA.

Table 1. Identification of environmental issues requiring EPA evaluation. (cont'd)

TOPICS	PROPOSAL CHARACTERISTICS	COMMENTS FROM GOVERNMENT AGENCIES	PUBLIC COMMENTS	IDENTIFICATION OF ISSUES
Social				
Road transportation	Due to the expected increase in heavy vehicle traffic to and from the plant, surrounding roads will need to be upgraded and/or modified to cope. Operation of the plant will necessitate large numbers of truck movements along existing roads around the proposed site and to the Port of Geraldton.	Concerns that heavy vehicle movements will generate noise, dust and safety impacts. Concerns about the impacts of upgrading and the level of proponent assistance in costs and mitigation measures. Comparison with alternative routes requested.	Concern about the potential impacts from road transportation activities associated with the project such as increased noise, dust and traffic levels and safety.	This issue should be addressed by the appropriate local government authorities in conjunction with the proponent. This issue requires no further evaluation by the EPA. Should there be a very significant increase in plant capacity in the future, the EPA may need to reassess impacts associated with transportation.
Socio-economic impacts (including housing, services, property values, tourism and employment etc).	Construction and operation of the plant may impact upon housing, services, property values of surrounding residences, tourism and employment etc.	concern about the demands on local services particularly accommodation during construction and the honouring of the proponent's commitment to creating local opportunities.	Concern about the impacts of the proposal on property values, tourism and employment within the region.	this issue should be addressed by the relevant local government authorities and other government departments. This issue requires no further evaluation by the EPA.
Health impacts on surrounding residents.	The plant will produce significant quantities of gaseous and particulate emissions which have the potential to impact upon the health of surrounding residents.	Concern about the impacts of gaseous and particulate emissions on the health of surrounding residents particularly the effects of SO_2 on asthmatics.	Concern that plant emissions could exacerbate the high asthma rate in Geraldton.	Ambient environmental criteria take health effects into account. Specific aspects of this issue should be addressed by the Health Department of WA. This issue requires no further evaluation by the EPA.
Location of the proposed plant.	The proponent undertook a site selection process to determine the most suitable location for the proposed plant.	MFP concerned about parameters used by the proponent in identifying Narngulu as the best site for the proposed plant.	Concern as to how and why Narngulu was chosen by the proponent as the best location for the proposed plant. Concern was expressed about why the plant not located closer to the minesite and away from Geraldton.	The proponent has undertaken a site selection study. Any shortcomings in the site will be evaluated by the EPA under the various headings in Section 4 of this report. Hence the choice of location requires no further evaluation by the EPA as a separate topic.

Table 1. Identification of environmental issues requiring EPA evaluation. (cont'd)

TOPICS	PROPOSAL CHARACTERISTICS	COMMENTS FROM GOVERNMENT AGENCIES	PUBLIC COMMENTS	IDENTIFICATION OF ISSUES
Social				
Impacts on the operations of Geraldton Airport.	Construction of the plant will include a reactor tower which will be 92 m above ground level. As the proposed plant will be very close to Geraldton Airport, it could impact upon aircraft movements and safety.	Concern about hazard created by the plant for the operations of Geraldton Airport and the need for expert opinion on the degree on impact.	None received.	This issue should be addressed by the Civil Aviation Authority of Australia and the Shire of Greenough. This issue requires no further evaluation by the EPA.

Table 1. Identification of environmental issues requiring EPA evaluation. (cont'd)

4.1.2 Evaluation framework

Existing policy framework

The existing regulations are the Noise Abatement (Neighbourhood Annoyance) Regulations (1979). New Environmental Protection (Noise) Regulations are currently being prepared, and will replace the existing regulations.

The DEP has in the meantime developed a set of noise requirements which have been applied by the EPA to other operations in the State, such as the Tiwest synthetic rutile plant at Chandala and the Premier coal mine at Collie. Under these requirements, the maximum noise levels allowed are:

(i) 50 dB(A) Slow between 0700 hours and 1900 hours Monday to Friday;

(ii) 45 dB(A) Slow between 1900 hours and 2200 hours Monday to Saturday;

(iii) 45 dB(A) Slow between 0700 hours and 2200 hours Sundays and Public Holidays; and

(iv) 40 dB(A) Slow between 2200 hours and 0700 hours always.

These requirements were originally formulated as part of the development process for the new noise regulations.

The analysis below has been conducted in terms of the existing regulations.

Technical information

Under the current regulations, the acceptable levels of noise at residences in the vicinity of the proposed GSP are as follows:

- Narngulu Townsite - Residential zone: 40dB(A) at night, 50dB(A) during the day;
- residences on land zoned General Farming: 45dB(A) at night, 55dB(A) during the day; and
- residences on land zoned General Industry: 50dB(A) at night, 60dB(A) during the day.

Existing noise levels

The existing or ambient noise levels at Narngulu were measured over a one week period as part of the specialist assessment of noise emissions made by Herring Storer Acoustics (1995).

Noise emissions during the construction period

Noise will be generated during the construction period particularly by earthmoving and other machinery. The PER indicated that all construction contractors will be required to manage noise levels within acceptable limits. The management measures will include restriction of activities with high noise levels to daylight hours (7.00am to 7.00pm Monday to Friday, and 8.00am to 7.00pm on weekends) and a requirement that noise from stationary equipment does not exceed 85dB(A) at a distance of 1 metre.

Noise modelling

Noise modelling was used to indicate noise control measures which will need to be incorporated into the design of the GSP in order to ensure compliance with regulations.

The noise attenuation measures incorporated in the noise study were as follows:

- discharge silencers on the waste gas fans, feed end and discharge end de-dust fans of the pellet plant; the heater combustion air fan and reformer fan of the Direct Reduction Plant; and the de-dust fan of the Melt Shop;
- a 4m high solid wall around the outside of the scrap handling facility with unloading and handling of scrap only to occur during the day;
- construction of earth bunds along the southern and eastern side of the Pellet Plant and the eastern side of the CSP Plant;

- general building attenuation including internal absorptive lining particularly for the Melt Shop; and
- standard proprietary acoustic package installed by the manufacturer for the gas turbines in the Power Station.

Other noise attenuation measures could be used in place of the above to achieve the same level of noise attenuation. The final measures actually used in the GSP will be determined at the detailed design stage.

The scenarios modelled included calm conditions and a gentle wind of 2m/sec from the west. The modelling also included separate consideration of daytime and night-time operation of the GSP. The modelling indicates that the maximum noise levels during the 'worst-case' wind conditions of 2m/sec, at residences relatively close to the GSP, will be:

- the Narngulu township, houses in the General Farming zone close to the plant on the south side of Rudds Gully Road, and at houses very close to the plant in the General Industry zone on the north side of Rudds Gully Road: 40-45dB(A) during both day and night time conditions;
- at properties adjacent to the township, but within the General Industry zone: 40 to 45dB(A) at night and 45-50dB(A) during the day; and
- at some properties in the General Industry zone south of the Pellet Plant and north of Rudds Gully Road: 45-50dB(A) at all times.

At the Narngulu Townsite , the night-time noise levels during 'worst-case' wind conditions are predicted to be about 43dB(A) whereas the regulation level is 40dB(A). These worst-case conditions will occur about 5% of the time.

The proponent intends to incorporate additional noise attenuation measures, such as full enclosure of the ball mills (Pellet Plant), in the detailed design of the GSP to ensure compliance.

Monitoring of noise emissions

The PER indicated that Kingstream Resources NL will implement a monitoring program designed to provide regular data on noise emissions from the GSP. The nature of this monitoring program will be determined in consultation with the DEP.

Comments from key government agencies

The Department of Environmental Protection (DEP) carried out the following technical evaluation of the information presented in the May 1995 draft edition of the PER relating to noise emissions:

Noise from this plant will affect two groups of residences:

- those in the Narngulu township to the north-east of the proposed plant site, and
- those on larger rural land holdings to the south east of the proposed plant site.

There are three issues to consider in assessing the potential impact of noise from the proposed plant on these residences. These are:

- can compliance with the Noise Abatement (Neighbourhood Annoyance) Regulations be achieved? Note that these regulations are the current prescribed standards for the Environmental Protection Act but proposals to modify these regulations are in an advanced stage.
- can compliance with the proposed Environmental Protection (Noise) Regulations be achieved?
- the magnitude of the changes to the noise environment currently being experienced by the residents of the Narngulu township and the rural holdings should the plant be brought into operation.

Noise environment for residences in the Narngulu Township and Rudds Gully Road

Regulatory requirements and comparison with predicted values

Under the Noise Abatement (Neighbourhood Annoyance) Regulations these residences are all considered to best fit the description applicable to a category B2 neighbourhood - a residential premises in a neighbourhood comprising other residences with some commerce or some light industry, or with places of entertainment or public assembly, or with dense transportation. The existing regulatory requirements are summarised in Table 2 for calm conditions - these are met in all cases except for overnight for locations 3, 4, 5, 6 on Rudds Gully Road. Table 3 indicates that with a 2m/sec westerly breeze, the regulatory requirements are not met overnight and during the day for locations 3-6 and overnight for location 7 (Narngulu townsite).

Under calm conditions, the predicted noise levels meet the requirements of the proposed Environmental Protection (Noise) Regulations at all times. With a 2m/sec westerly breeze, most locations listed do not meet the requirements of the proposed regulations at night

The differences between the maximum allowable noise levels specified by the Noise Abatement (Neighbourhood Annoyance) Regulations and the Environmental Protection (Noise) Regulations arise from the requirement of the former regulations to use the existing land uses to assign a category and the requirement of the latter regulations to use the zoned land use to establish maximum allowable noise levels.

Significant changes in noise levels are predicted for the residences in Rudds Gully Road, should the project proceed.

Given the rural environment which the residents of Rudds Gully Road currently enjoy, it is unlikely that they will find the noise environment, once this plant commences operation, acceptable. They may be expected to complain, even in the knowledge that the plant was operating within the requirements of the regulations.

The Mid West Development Commission indicated concern about the intrusion on residents from noise at the transfer facility near Mullewa.

The City of Geraldton expressed concern about noise emissions from the power station and whether they are safe for workers and nearby residents.

Shire of Greenough expressed the following concerns:

- noise impacts from the delivery and movement of scrap metal on site;
- that the proponent should contribute to the cost of a suitably qualified officer to be employed by the Shire of Greenough to undertake an on-going monitoring program with respect to noise from the proposed plant;
- that the proponent give consideration to defining with a greater degree of certainty the methods of noise attenuation to be used in the proposed plant;
- that the proponent be required to incorporate into the detailed design of the plant sufficient noise attenuation measures and methods to ensure full compliance with noise regulations; and
- the impacts of traffic noise on residents living in proximity to Brand Highway.

Table 2. Allowable noise levels and predicted noise levels under CALM wind conditions.

Residence location	Noise Abatement (Neighbourhood Annoyance) Regulations		Environmental Protection (Noise) Regulations	
	Allowable noise level - dB(A)	Predicted noise level - dB(A)	Allowable noise level - dB(A)	Predicted noise level - dB(A)
Narngulu townsite 1	45 / 50 / 55	38 / NP / 38	42 / 47 / 52	38 / NP / 38
Narngulu townsite 2	45 / 50 / 55	34 / NP / 35	37 / 42 / 47	34 / NP / 35
Narngulu townsite 7	45 / 50 / 55	40 / NP / 40	41 / 46 / 51	40 / NP / 40
Rudds Gully Road 3 & 6	30 / 35 / 40	***39*** / NP / 40	47 / 52 / 57	39 / NP / 40
Rudds Gully Road 4 & 5	30 / 35 / 40	***38*** / NP / 39	40 / 45 / 50	38 / NP / 39

Table 3. Allowable noise levels and predicted noise levels with a 2M/SEC westerly wind.

Residence location	Noise Abatement (Neighbourhood Annoyance) Regulations		Environmental Protection (Noise) Regulations	
	Allowable noise level - dB(A)	Predicted noise level - dB(A)	Allowable noise level - dB(A)	Predicted noise level - dB(A)
Narngulu townsite 1	45 / 50 / 55	45 / NP / 45	42 / 47 / 52	***45*** / NP / 45
Narngulu townsite 2	45 / 50 / 55	40 / NP / 43	37 / 42 / 47	***40*** / NP / 43
Narngulu townsite 7	45 / 50 / 55	***47*** / NP / 50	41 / 46 / 51	***47*** / NP / 50
Rudds Gully Road 3 & 6	30 / 35 / 40	***43*** / NP / ***43***	47 / 52 / 57	43 / NP / 43
Rudds Gully Road 4 & 5	30 / 35 / 40	***43*** / NP / ***43***	40 / 45 / 50	***43*** / NP / 43

NOTES FOR TABLES 2 AND 3:

1. 45 / 50 / 55 indicates 45 dB(A) overnight, 50 dB(A) for evenings, weekends (Sunday only for Environmental Protection (Noise) Regulations) and public holidays, and 55 dB(A) weekdays.
2. NP indicates prediction of noise levels for this time period not made.
3. Noise levels in bold italics exceed maxima allowable.

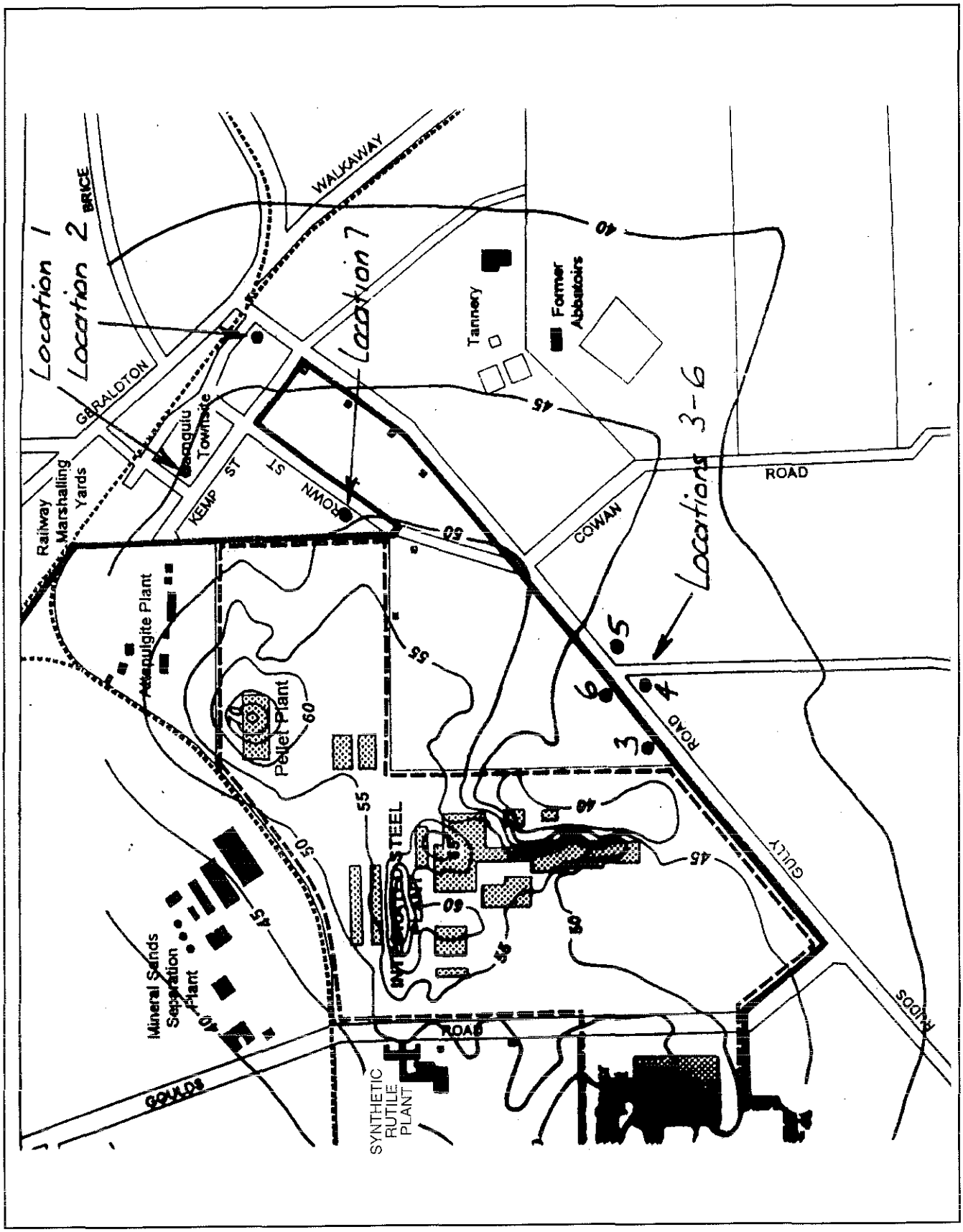


Figure 5. Noise contours for worst case daytime conditions with a 2m/sec westerly wind. (Source: Figure 20 of the May 1995 edition of the PER)

4.1.3 Public submissions

Public submissions expressed the following concerns:

- the impact of noise on nearby residents (including those living in Narngulu town site resulting from proximity of the proposed plant to these residents and the lack of a suitable buffer zone;
- the fact that noise levels at several nearby residences will exceed the levels allowed by the Noise Abatement (Neighbourhood Annoyance) Regulation 1979 and how the proponent would ensure that noise levels at these residences would comply with this regulation;
- noise emissions during the construction phase of the project and what measures the proponent would use to ensure that residents were not affected;
- daytime noise impacts on shift workers who need to sleep during the day;
- the impact of railway wagon noise;
- noise from the movement of scrap metal on site; and
- the accuracy of noise modelling being based on a maximum wind speed of 7km/hr when average wind speeds exceed this value.

4.1.4 Proponent's response

In response to the issues detailed in the public and government agency submissions, the proponent provided the following comments:

"Construction noise will be managed by restricting construction activities to daylight hours, by requiring contractors to ensure that all mobile equipment is well maintained and fitted with standard noise suppression equipment, and that all stationary equipment does not exceed a noise level of 85dB(A) at a distance of 1m (see Section 6.1.3 of the PER). These methods are standard for major construction sites and are generally found to be effective. The additional provision of providing the contact phone number for the site manager would enable any short term noise problem to be identified and remedied. In addition, Kingstream Resources NL has initiated discussions with the nearest neighbours to the site of the steel mill with a view to acquiring their properties. If this land acquisition program is successful, there will be no close neighbours who may be affected by construction noise."

"The most important potential sources of noise from the GSP are listed in Table 6.6 of the PER. The noise modelling has assumed that the level of noise from these sources will be controlled by standard measures and that no significant additional noise attenuation will be required. The standard measures will include enclosure of equipment in buildings, use of housings on all large fans, and the construction of earth bunds adjacent to some components of the plant to further attenuate noise. Considerable volumes of earth will be available from excavation of the foundations for the steel plant and the construction of bunds will also assist in screening the plant from nearby areas."

"The predicted noise levels comply with the Noise Abatement (Neighbourhood Annoyance) Regulations, 1979 at the nearest two residences on properties zoned for general farming. Under the Regulations, the acceptable levels of noise at these residences are 45dB(A) at night, and 55dB(A) during the day (Section 6.4.1 of the PER). The predicted noise levels during operation of the GSP at the locations are 40 to 45dB(A) during both day and night time conditions (Section 6.4.4 of the PER)."

"However, if the Minister for the Environment determines that further noise reduction is required, then this will be achieved in the detailed design of the GSP."

"Furthermore, Kingstream Resources NL has initiated discussions with the owners of the two residences in question and has indicated a willingness to purchase these properties following approval of the proposal. If these negotiations are successful, the residents will relocate and there will be no possibility of disturbance due to noise."

"It is intended that all rail operations will be limited to daylight hours. Moreover, only two trains will visit the site each day."

"The recognised noise criteria for trains at nearby residences are detailed in Section 7.2.4 of the PER and it is considered that these will be met at the nearest residences to the GSP. An earth bund will also be constructed inside the eastern boundary of the GSP site to further reduce train noise."

"The handling of scrap steel is recognised as one of the main potential sources of noise. Such operations will therefore be limited to daylight hours and all scrap will be unloaded into an underground lined pit in order to reduce the noise levels. This method of handling scrap steel has been adopted in the Rooty Hill Steel Plant located in the western suburbs of Sydney."

"If Kingstream Resources NL learns that noise levels associated with operation of the GSP are causing problems to nearby residents even though the noise levels are complying with the regulations, then it will use its best endeavours to co-operate with the residents in order to identify and remedy the source of disruptive noise."

"The predicted noise levels from the power plant will comply with occupational health requirements and will be safe for nearby residents. Standard proprietary acoustic packages will be installed by the manufacturers of the gas turbines."

"The noise levels from an industry like the GSP will be at their maximum during calm and light wind conditions as described in Section 6.4 of the PER. During stronger winds, the background noise levels increase substantially and mask the noise from the industry. The noise modelling in the PER therefore is based on calm conditions and conditions when there is a light westerly wind of 2m/sec. It is true that these "worst-case" wind conditions will not occur very often at Narngulu as wind speeds are generally higher."

"Kingstream Resources NL has made commitments in the PER that it will appoint an Environmental Manager who will be responsible for environmental management of the GSP, and that it will establish monitoring programs for atmospheric emissions and noise emissions. The Environmental Manager will be required to liaise with the Shire of Greenough and to provide the Shire with the results of the monitoring program on a regular basis. The Environmental Manager will also respond to any complaints received by the Shire."

"However, Kingstream Resources NL is prepared to discuss the question of the Shire employing its own environmental officer."

"The methods which will be used for noise attenuation are standard for industrial plants and include the housing of fans, placement of noisy equipment within buildings with cladding if necessary, and the construction of specific noise barriers such as concrete walls around the scrap handling area and similar locations where noise levels may be significant. It is also proposed to construct earthen bunds around some parts of the plant."

"A comprehensive description of the noise attenuation measures can only be provided through the detailed design of the plant and this phase can only occur after the full feasibility study has been completed and the environmental approval is in place. At this stage, Kingstream Resources NL has demonstrated through noise modelling studies which are included in the PER that the GSP can be designed so that it can comply with existing and proposed noise regulations."

"Kingstream Resources NL is committed to ensuring that the GSP includes sufficient noise attenuation methods to ensure full compliance with all noise regulations."

"Kingstream Resources NL will liaise with the Main Roads Department, the Shire of Greenough and the City of Geraldton regarding the level of service of Brand Highway and the need for, and nature of, any road improvements."

Commitments made by the proponent

With respect to noise emissions, the proponent has made the following environmental commitments:

- Kingstream Resources NL will incorporate specific noise attenuation measures in the detailed design of the GSP which will ensure that the requirements of the Environmental Protection Act, 1986 Regulations or any new Regulations with respect to noise are complied with. These measures will be to the satisfaction of the DEP. [Timing - detailed design phase of the Project].
- Kingstream Resources NL will implement regular noise monitoring studies to the satisfaction of the DEP in order to provide information relating to noise levels at nearby residences. The data from the studies will be reported to the Shire of Greenough and to the DEP and will be available to the public. [Timing - throughout the life of the Project].
- Kingstream Resources NL will, prior to construction, develop an Environmental Management Programme which will ensure that all emissions and ground level concentrations, as well as noise emissions, are within established criteria The Environmental Management Programme will include, but not be restricted to:
  - the development of suitable monitoring programmes; and
  - contingency plans should emissions exceed established criteria to reduce emission levels below those criteria.

  The results of the monitoring programmes will be reported to the Department of Environmental Protection and will be available to the public.

4.1.5 Evaluation

Following advice from the Department of Environmental Protection and the proponent's response to questions raised, the EPA considers that this issue is potentially manageable, although the proposed plant could exceed the criteria specified in both existing and proposed noise regulations under some circumstances at nearby residences. The EPA acknowledges the proponent's endeavours to purchase these properties in order to minimise any potential noise impacts, in view of the fact that there is no buffer zone around the proposed plant.

The EPA notes the commitments made by the proponent to incorporate specific noise attenuation measures in the detailed design of the plant and to implement regular noise monitoring studies to the satisfaction of the DEP. The EPA also has an expectation that all vehicles used for transporting goods to and from the proposed plant will be properly maintained in order to avoid unnecessary noise.

The provision of a suitable buffer zone is ultimately the responsibility of the State government and its relevant departments.

The EPA has developed a set of noise requirements which have been applied to other operations in the State, such as the Tiwest synthetic rutile plant at Chandala and the Premier coal mine at Collie. Should the proponent buy out the residences likely to be most affected by noise emanating from the plant, then it is expected that the project will meet the requirements outlined in the following recommendation.

The EPA recommends (Recommendation 2) that:

the maximum noise levels allowed be:

(i) 50 dB(A) Slow between 0700 hours and 1900 hours Monday to Friday;

(ii) 45 dB(A) Slow between 1900 hours and 2200 hours Monday to Saturday;

(iii) 45 dB(A) Slow between 0700 hours and 2200 hours Sundays and Public Holidays; and

(iv) 40 dB(A) Slow between 2200 hours and 0700 hours always;

when measured:

- at any point on or adjacent to other premises not occupied by the proponent and used for residential or other noise sensitive purposes; and
- at a height between 1.2 metres and 1.5 metres above ground level and greater than 3.5 metres from any reflecting surface other than the ground.

The EPA considers that should the project be operational prior to the repeal of the Noise Abatement (Neighbourhood Annoyance) Regulations (1979), the proponent should be exempt under Section 6 of the Environmental Protection Act 1986 from those regulations

Furthermore, the EPA also recommends that the proponent prepare an Environmental Management Plan which details the following information with respect to noise, to the satisfaction of the Environmental Protection Authority on advice from the DEP (Recommendation 3):

- a monitoring and audit programme for noise emissions as a means of gauging the effectiveness of noise control measures and compliance with the maximum allowable noise levels.

The EPA also recommends (Recommendation 3) that reports of the results of the monitoring programme should be submitted at appropriate times to the DEP for audit and that they should be made publicly available.

4.2 Gaseous emissions (including greenhouse gases and odours)

4.2.1 Objective

The Environmental Protection Authority's objective is to ensure that gaseous emissions, including greenhouse gases and odours, both individually and cumulatively, do not cause an environmental or human health problem in the area surrounding the proposed Geraldton Steel Plant. Moreover, the proponent must use all reasonable and practicable measures to minimise the discharge of wastes, including gases.

4.2.2 Evaluation framework

Existing policy framework

The EPA has promulgated two Environmental Protection Policies (EPPs) for atmospheric pollutants for the Kwinana and Kalgoorlie areas. The EPA uses the Kwinana EPP standards and limits as guidelines for the assessment of new industrial projects (where there are no existing sources) and for existing industrial plants which are seeking approval for modifications (Environmental Protection Authority, 1992b). These standards and limits, which are for sulphur dioxide and particulates, were used previously by the EPA in its assessment of the expansion of the Synthetic Rutile Plant at Narngulu (Environmental Protection Authority, 1989).

In the Kwinana EPP, a limit is defined as "a concentration not to be exceeded" and a standard is defined as "a concentration which it is desirable not to exceed". The standard is interpreted as the value which the ground level concentration must be below for 99.9% of the time. For one hourly averages this equates to the 9th highest hourly value predicted during a year being less than the standard.

The standards and limits for sulphur dioxide and particulates used in the EPP for the Kwinana policy area are summarised in Table 4.

Table 4. Standards and limits used in the EPP for the Kwinana Policy Area.

Species	Area	Averaging Period	Standard ($\mu g/m^3$)	Limit ($\mu g/m^3$)
Sulphur Dioxide	Industrial Estate	1 hour	700	1400
		24 hour	200	365
		Annual	60	80
	Residential	1 hour	350	700
		24 hour	125	200
		Annual	50	60
Particulates PM_{10}	Residential	24 hour	-	120
		Annual	-	40

The National Health and Medical Research Council (NH&MRC) guidelines require that the ambient concentration of nitrogen dioxide (NO_2) does not exceed 170ppm or $320\mu g/m^3$ (as a one hour average, and not to be exceeded more than once a month).

Guidelines for maximum concentrations of NO_x emissions from stacks and vents may also apply to industrial plants in addition to guidelines for ground level concentrations of NO_x emissions. The relevant (NH&MRC) guideline figure which is applicable to the proposed power station exhaust stacks (ie, for gas turbines greater than 10MW), is $0.07g/m^3$. Gas burners with low levels of NO_X production are available commercially.

Carbon dioxide is a greenhouse gas and worldwide industrial emissions are considered to be a major contributor to global warming. The Federal Government, in accordance with international agreements, has announced an intention to stabilise carbon dioxide emissions in Australia by the year 2000. The Commonwealth has urged a program of co-operative agreements between industry and the government to reduce greenhouse emissions.

The EPA provisional policy with respect to greenhouse gases recognises the significant contribution to greenhouse gases that large resource processing projects can make. Accordingly, the EPA considers that a proponent should:

1. calculate the greenhouse gas emissions for their project;
2. estimate the international offsets achieved by implementation of their proposal;
3. indicate the 'no-regrets' measures adopted to reduce greenhouse gas emissions; and
4. enter into a voluntary agreement with the State, in which they will commit to 'no regrets' measures and approaches to abate greenhouse gas emissions, and to enhance sinks.

Carbon dioxide emissions from the GSP will constitute approximately 1% of Australia's total carbon dioxide emissions, which is significant considering it will be produced by just one project. The levels of carbon dioxide from the GSP are given in Table 5.

'No regrets' refers to those measures for reduction of emissions of greenhouse gases. These include measures to increase energy efficiency, to protect and expand forests, and to limit the emissions of chlorofluorocarbons. To the extent that these efforts have a net benefit, or at least no net cost, in addition to addressing the enhanced greenhouse effect, they have become known as 'no regrets' options (Greenhouse Gas Coordination Council 1994).

Technical information

Nitrogen Dioxide

Nitrogen dioxide is a reddish brown gas which is soluble in water and is a strong oxidant. The major sources of man-made emissions to the atmosphere derive from the combustion of fossil fuels. In most situations, nitric oxide is emitted and is then transformed into nitrogen dioxide in

the atmosphere. At low concentrations, nitrogen dioxide can cause irritation of the mucous membranes and may cause or exacerbate respiratory problems such as asthma and bronchitis.

Nitrogen dioxide emissions from the GSP, listed in Table 5, are associated mainly with the Pellet Plant and the Power Station.

Sulphur Dioxide

Sulphur dioxide is a colourless gas which has a pungent odour and can irritate and be absorbed in the respiratory tract. The sensitivity of humans to sulphur dioxide varies considerably and asthmatics may suffer adverse reactions at quite low levels.

The gas also dissolves in moisture forming dilute sulphurous acid, which then forms sulphuric acid and sulphates, which can be readily absorbed onto small airborne particles. This increases the potential for adverse effects on humans and for environmental impacts such as leaf damage to plants and reduced water quality in wetlands.

Sulphur dioxide emissions from the proposed GSP will be low and will comprise a total of 0.45g/sec from two flues at the Direct Reduction Plant (Table 5).

Carbon Dioxide

Carbon dioxide is a greenhouse gas and worldwide industrial emissions are considered to be a major contributor to global warming.

Carbon dioxide emissions from the GSP will constitute approximately 1% of Australia's total Carbon dioxide emissions, which is significant considering it will be produced by a single project. The levels of carbon dioxide from the GSP are listed Table 5.

Odour

The PER stated that the GSP will not generate any odorous gases. Some direct reduction processes involve the injection of hydrogen sulphide (H_2S) into the reactor to prevent corrosion, and therefore generate H_2S emissions.

The PER also stated that the evaporation of wastewater on hot slag will not generate odour.

Comments from key government agencies

The Department of Environmental Protection (DEP) expressed concern about the quantity of greenhouse gases that the proposed plant would produce and what measures the proponent would use (such as sink compensation) to limit or compensate for their production. The DEP was also concerned that the proponent would not incorporate low NO_x technology in the power station gas turbines in an effort to reduce NO_x emissions. The DEP strongly advocated the use of low NO_x technology on the power station gas turbines as a means of limiting the production and subsequent impact of NO_x on the surrounding environment. The DEP indicated concern relating to the potential generation of odours from the evaporation of waste water by spraying it onto hot slag. The DEP also stated that the climatic data used in emissions modelling fell well short of what is normally required.

The Commonwealth Environment Protection Agency (C)EPA raised concerns about the shortcomings of only using 10.5 months of climatic data in the air emissions modelling for the proposed plant (gap in data for May to June). (C)EPA stated that further detailed investigation is required into the impacts of emissions, including particulates, as winds during this period blow towards Geraldton. (C)EPA also indicated that NHMRC guidelines may change in the near future and that this may have implications for the proposed plant. (C)EPA suggested that the proponent should be encouraged to fulfil the highest standards required.

The Mid West Development Commission stated that NO_x from the gas turbines is of concern to residents. It also stated that this matter requires further attention and that the proponent should provide emission control systems.

Table 5. Geraldton Steel Plant — Summary of Atmospheric Emissions Data.

					MASS FLUX			
Source	**Stack Height (m)**	**Emission Volume (m^3/sec)**	**Emission Temp (°C)**	**Stack Diameter (m)**	**SO_2 (g/sec)**	**NO_2 (g/sec)**	**Particu-lates (g/sec)**	**CO_2 (kg/sec)**
Pellet Plant								
Waste Gas	29	222	160	3.76	negl	25.0	7.0	13.74
Waste Gas	25	142	80	3.00	negl	19.6	5.5	11.63
Feed end de-dust	25	4.44	30	0.53	negl	negl	0.2	negl
Feed end de-dust	25	390.4	50	4.98	negl	negl	16.5	negl
DRI Plant								
CO_2 removal	75	3.77	45	0.49	negl	negl	negl	5.70
Reformer flue	40	71.9	180	2.14	0.064	6.2	negl	6.97
Heater flue	75	39.9	180	1,59	0.39	3.42	negl	42.28
De- dusting System	20	6.17	30	0.63	negl	negl	0.28	negl
Meltshop/CSP Plant Meltshop	30	500	130	5.64	negl	4.93	4.1	19.95
Power Station F6FA Gas Turbine (each)	25	475	600	4.0	negl	23.3	0.62	8.75
TOTAL					0.45	129.1	35.4	126.52

The City of Geraldton expressed the following concerns:

- that the data collected for modelling did not cover a full year;
- the impacts of easterly winds carrying emissions towards Geraldton;
- the impacts of the intermixing of gaseous emissions from the proposed plant with those from other industries;
- the production of harmful emissions from the discharge of waste water onto hot slag; and
- the impacts of SO_2 and CO_2 emissions.

The Ministry For Planning stated that there is a need for analysis of the cumulative impact of emissions from Narngulu.

The Shire of Greenough presented a very comprehensive submission which detailed the following concerns:

- the potential generation of odours (particularly H_2S) from the evaporation of waste water by spraying it onto hot slag;
- that the proponent should clarify the composition and quantity of residual reducing gas to be released from the reactor tower;
- the accuracy of data collected for modelling and the fact that it did not cover a full year;
- the impacts of easterly winds carrying emissions towards Geraldton;
- the lack of detail with respect to CO_2 emissions in the PER;

- that the proponent should indicate with more accuracy, the maximum ground level concentrations of atmospheric emissions at specific locations around the Geraldton/Greenough region in order that the effects can be more accurately determined;
- that the proponent, in conjunction with the EPA, should be requested to consider the establishment of an Environmental Protection Policy for the Narngulu area with respect to NO_2 emissions, in order to give clear guidelines for industry and relevant authorities to follow;
- that the proponent be requested to plot the contour levels of CO_2 for the region surrounding the plant, undertake further investigations with respect to the localised high concentrations of CO_2 at the plant and investigate means to reduce CO_2 emissions ahead of government legislation requiring it to do so;
- that the proponent further justify the accuracy of using the AUSTOX modelling technique given that an apparent high number of assumptions are made in the use of this model;
- that the proponent explain the terms upset conditions, shutdown and blow-offs and what the effects of each of these states are, if they were in fact individual states;
- that the proponent be required to reduce the proposed NO_x emission levels from the plants gas turbines to the recognised NHMRC guideline figure of $0.07g/m^3$; and
- that the proponent liaise with the DEP and the Shire of Greenough with the view to employing a qualified environmental health officer, paid for by the proponent, to undertake all monitoring required for the plant.

4.2.3 Public submissions

Public submissions expressed the following concerns in relation to gaseous emissions emanating from the proposed Geraldton Steel Plant:

- the impacts on the health of surrounding residents from gaseous emissions from the proposed plant;
- that the occurrence of cancer and asthma for Geraldton residents is above normal and that additional harmful emissions from the proposed plant would only exacerbate the problem;
- the fact that the data collected for air emissions modelling did not cover a full year and the implications this had on the accuracy of the results obtained;
- the proponent not incorporating specific emission control systems to control NO_x because of the additional cost;
- how the proponent would control NO_x emissions to prevent health impacts on nearby residents and how it could justify its decision not to use low NO_x technology;
- the impacts of the intermixing of gaseous emissions from the proposed plant with those from other industries;
- the effects that CO_2 could have on staff of the plant and neighbouring residents;
- whether the proponent aimed to control SO_2 emission from the plant to WHO standards so as to avoid concerns for asthmatics;
- whether atmospheric emissions would comply with statutory standards under upset conditions when malfunctions occurred;
- how the proponent would control air emissions and their potential impacts on Geraldton and residents in proximity to the plant;
- whether modelling had produced acceptable results for worst case scenarios, particularly under still conditions; and
- the large quantity of greenhouse gases that would be produced by the plant.

4.2.4 Proponent's response

In response to the issues detailed in the public and government agency submissions, the proponent provided the following comments:

"The implications of atmospheric emissions from the GSP are examined in detail in Section 6.2 of the PER and in the specialist report by WNI Science and Engineering (1995). The detailed studies indicate that the only atmospheric emissions of significance are nitrogen dioxide, particulates, and carbon dioxide. Furthermore, the levels of emissions are relatively low, and the ground level concentrations of emissions from the steel plant and from existing industries at Narngulu will be significantly lower than international guidelines for these types of emissions. The guidelines have been developed by the World Health Organisation, the National Health and Medical Research Council of Australia, and the United States Environmental Protection Agency and are designed to ensure that public health will not be affected even with long term exposure. The guidelines are conservative and are the most stringent of the internationally recognised criteria. Therefore, it is concluded that the GSP at Narngulu does not present any environmental or community health issues due to atmospheric emissions."

"The computer modelling of emissions from the GSP was based on the best available meteorological data. This included 10.5 months of data collected on the site of the steel mill by RGC Mineral Sands Ltd, and data collected at the proposed Oakajee Industrial Site. These monitoring stations provide the most comprehensive information relating to meteorological conditions relevant to atmospheric emissions modelling. However, the data were also supplemented by general meteorological recordings from Geraldton Airport and the Port of Geraldton."

"All of the regional information indicates that the primary data used for the atmospheric emissions modelling are reliable and that any errors in prediction will be minor. This is stated in Section 6.2 of the PER."

"Kingstream Resources NL has made a commitment in the PER that it will establish an atmospheric emissions monitoring program to the satisfaction of the DEP in order to ensure that all emissions and ground level concentrations are within established criteria (see Section 10 of the PER). This may include further modelling during the construction phase of the GSP if this is considered desirable by the DEP."

"The atmospheric emissions modelling considers a range of scenarios including still conditions. The modelling also predicts maximum ground level concentrations under any conditions and these maximum concentrations are then compared with the environmental criteria to determine their acceptability. The modelling of the atmospheric emissions for the GSP concluded that the ground level concentrations, when combined with the emissions from other industries of Narngulu, will be significantly less than the international criteria and therefore will not present any adverse health implications. Moreover, the atmospheric emissions modelling specifically included worst-case scenarios by assuming that the levels of sulphur dioxide and particulate emissions from the RGC Synthetic Rutile Plant would be at the licence maxima which are considerably higher than normal operating conditions. The atmospheric emissions will have no implications whatsoever for local fishing, agriculture, or any other industry, or any other activity in the Mid West Region."

"The modelling of nitrogen dioxide emissions from the GSP (PER Section 6.2.6) concluded that the one hourly average, maximum 24 hour and annual average concentrations would be 228, 49 and 7.1 mg/m^3. The corresponding air quality guidelines proposed for the Narngulu Industrial Estate are 320, 150 and 100 mg/m^3 respectively. The predicted ground level concentrations therefore are considerably lower than the guidelines. Therefore, it is suggested that the Minister for the Environment should not require expensive NO_x control systems to be fitted to the exhaust stacks for the gas turbines of the power station as this would not provide any additional benefit in terms of public health given the already excellent performance of the GSP."

"The comments in the PER relating to the control of NO_x emissions are not intended to infer that NO_x control should not be required simply because Narngulu is some 400km distant from

Perth. Rather, the PER states that the particular atmospheric emissions at Perth, which have led to a requirement for the fitting of NO_x control systems to gas turbines, do not occur in the Geraldton Region. Therefore, there are no reasons in terms of local meteorological conditions which indicate that such control systems are necessary."

"More importantly, the atmospheric emissions modelling included in the PER clearly demonstrates that the ground level concentrations of nitrogen dioxide surrounding the steel plant will be considerably lower than internationally recognised standards for the protection of public health. Kingstream Resources NL therefore considers that it would be unreasonable to require expensive NO_x control systems when these systems would have no demonstrable results in terms of public or occupational health. The company has this position because the control systems would impose an additional power generating cost which would substantially increase the overall annual operating costs of the steel plant and would therefore make it less viable. It is not the case that the Geraldton-Greenough area should be subjected to lower standards of atmospheric emissions than is acceptable in the Perth area. Rather, the same ground level criteria apply in both areas but additional technology may be necessary in the Perth area in order to comply with those standards."

"There will be no hydrogen sulphide gas emissions from the disposal of cooling water as the hot slag will contain very low levels of sulphur. The emissions will effectively comprise only water vapour (ie. steam)."

"The modelling of atmospheric emissions described in Section 6.2 of the PER included emissions from the existing synthetic rutile plant at Narngulu as well as the proposed GSP. In addition, it was assumed that the levels of emissions from the synthetic rutile plant would be at the licensed maxima rather than the normal operating conditions. The modelling therefore considered worst-case scenarios. In all cases, the results of the modelling clearly demonstrate that the ground level concentrations of atmospheric emissions will be significantly lower than internationally recognised criteria."

"The CO_2 emissions from the plant will not have any significant implications for workers or for neighbouring residents. The CO_2 is associated with the direct reduction plant and there are a number of these plants operating at various locations around the world. No adverse effects from either CO_2 or from carbon monoxide emissions have ever been recorded at any of these plants."

"Kingstream Resources NL considers that further modelling of the CO_2 emissions from the steel mill is not warranted as the modelling results to date indicate that the maximum ground level concentrations under worst case conditions are likely to be very low. The emissions are therefore of no significance in terms of public health."

"Kingstream Resources NL is committed to ensuring that the level of carbon dioxide emissions from the GSP are the lowest achievable by the direct reduction technology which will be used. Unfortunately all contemporary technologies for producing direct reduced iron generates carbon dioxide so these emissions are inherent in all steel mills."

"The methods used in the modelling of atmospheric emissions follow standard procedures for the application of the two computer models involved. The reliability of the results is considered to be sufficient for the purposes of environmental impact assessment. This is particularly the case as the results indicate that the ground level concentrations of all emissions will be significantly less than the most stringent internationally recognised criteria. This means that the predicted levels of emissions from the GSP could hypothetically be increased substantially before the criteria are exceeded. The company is therefore confident that the GSP will comply with the criteria."

"Some industrial plants can be subject to upset conditions when the level of atmospheric emissions may be considerably higher than during normal operations. However, steel plants of the type proposed are not likely to experience such upset conditions. The only situation in which emissions may increase above normal levels for short periods of time is during maintenance. This is explained in Sections 6.2.10 of the PER. During routine shut down of the direct reduction plant for maintenance, the gases in the reduction shaft must be vented. The

volume of gas is about 1,000m^3 and the mixture consists of hydrogen, carbon monoxide, carbon dioxide, water vapour, methane and nitrogen. The venting is rapid as the temperature of the gas at the start of the process is about 900°C. The volume of gas involved and the rate of venting will ensure that no significant ground level concentrations of gas will occur. Three maintenance ventings of the reduction shaft are anticipated each year."

"The level of SO_2 emissions from the GSP will be very low with a predicted total of 0.45g/sec (Table 6.1 of the PER). This is so low that it can be totally discounted as having any potential implications for asthmatics."

"The atmospheric emissions from the GSP will comply with the guidelines listed in the PER at all times. Kingstream Resources NL is not in a position to comment on whether other industries at Narngulu may exceed their licensed maximum emission levels. However, the atmospheric emissions modelling presented in the PER suggests that the licensed emission levels would need to be exceeded by a substantial amount in order for the maximum ground level concentrations to be higher than the criteria."

"The locations where the maximum predicted ground level concentrations of atmospheric emissions will occur are shown in Figures 16, 17 and 18 of the PER. The maximum concentrations vary according to the averaging period and the one hour, 24 hour and annual averages for each compound and for particulates are shown in the figures."

"Kingstream Resources NL would support the establishment of an Environmental Protection Policy for the Narngulu area and is prepared to assist in the development of such a policy."

Commitments made by the proponent

With respect to gaseous emissions and odours, the proponent made the following environmental commitment:

- Kingstream Resources NL will, prior to construction, develop an Environmental Management Programme which will ensure that all emissions and ground level concentrations, as well as noise emissions, are within established criteria The Environmental Management Programme will include, but not be restricted to:
  - the development of suitable monitoring programmes; and
  - contingency plans should emissions exceed established criteria to reduce emission levels below those criteria.

  The results of the monitoring programmes will be reported to the Department of Environmental Protection and will be available to the public.

4.2.5 Evaluation

Following advice from the Department of Environmental Protection and the proponent's response to questions raised, the EPA considers that this issue is potentially manageable. The EPA notes the commitment made by the proponent to implement an atmospheric emissions monitoring programme.

The EPA considers that for NO_x emissions, the current NHMRC guidelines should be used as an upper limit for assessing the performance of the proposed Geraldton Steel Plant. The EPA's view is that current technology can easily achieve lower emission levels than the limits in the NHMRC guidelines and considers that the proponent should use best engineering design and best practice management to better these limits. This is consistent with the EPA's view that proponents should use all reasonable and practicable measures to minimise the discharge of wastes, including gases. It is also appropriate that no single project use all the available 'space' in an airshed. The EPA notes that six new industries in the past twelve months have agreed to adopt low NO_x burner technology as best practice.

Carbon dioxide is a greenhouse gas and worldwide industrial emissions are considered to be a major contributor to global warming. The Federal Government, in accordance with international

agreements, has announced an intention to stabilise carbon dioxide emissions in Australia by the year 2000. The Commonwealth has urged a program of co-operative agreements between industry and the government to reduce greenhouse emissions.

The EPA recently considered greenhouse gas emission policies in general, including the approach taken by the Commonwealth government and the review undertaken by the DEP into the status of WA's approach.

The resultant EPA provisional policy recognises the significant contribution to greenhouse gases that large resource processing projects can make. Accordingly, the EPA considers that a proponent should:

1. calculate the greenhouse gas emissions for their project;
2. estimate the international offsets achieved by implementation of their proposal;
3. indicate the 'no-regrets' measures adopted to reduce greenhouse gas emissions; and
4. enter into a voluntary agreement with the State, in which they will commit to 'no regrets' measures and approaches to abate greenhouse gas emissions, and to enhance sinks.

The EPA considers that gaseous emissions from the proposed Geraldton Steel Plant would be manageable and acceptable, conditional upon:

- the proponent incorporating best available low NO_x technology into the power station gas turbines prior to commissioning (Recommendation 4); and
- the proponent preparing an Environmental Management Plan which details the following information with respect to gaseous emissions (including greenhouse gases and odours), to the satisfaction of the Environmental Protection Authority on advice from the DEP (Recommendation 3):
  - (1) a monitoring and audit programme for all gaseous and odorous emissions (stack and ambient), including greenhouse gases;
  - (2) calculations of the greenhouse gas emissions (using methodology developed for Australia); and
  - (3) the proponent shall use its best endeavours to assist in the achievement of the governments desired position regarding the generation of greenhouse gas emissions

The EPA also recommends (Recommendation 3) that reports of the results of the monitoring programme should be submitted at appropriate times to the DEP for audit and that they should be made publicly available.

4.3 Dust and particulate emissions

4.3.1 Objective

The Environmental Protection Authority's objective is to ensure that the health and amenity of surrounding residents is not unduly affected by dust and particulate emissions from the proposed Geraldton Steel Plant. To meet this objective, the proponent will have to comply with EPA's criteria on dust and particulates (Appendix 5).

4.3.2 Evaluation framework

Existing policy framework

The PER stated that all particulate emissions from the GSP will involve particles of less than 10µm diameter. The Clean Air Society of Australia and New Zealand (1994) has proposed ambient air quality standards of 120 and 40µg/m^3 for 24 hour and annual averages respectively for particulates in this category.

The WA Environmental Protection Policy (Atmospheric Wastes) (Kwinana), specifies an ambient dust limit (averaged over 24 hours) for land used predominantly for residential and rural purposes (Area C) of 150 $\mu g/m^3$ with a standard (a concentration which it is desirable not to exceed) of 90 $\mu g/m^3$.

Technical information

The PER indicated that there is the potential for dust to be generated during earthworks associated with construction of the GSP particularly during dry summer conditions. There will therefore be a requirement for all contractors responsible for earthworks to manage and suppress dust using water trucks or other forms of water spray. The PER also indicated that there will be no unstable areas within the complex following construction as the ground surface will be either paved or landscaped.

Suspended particulates include a wide range of organic and inorganic substances such as combustion particles, metal vapours and dust. The inhalation of fine particles with air over a long period of time has the potential to effect human health. Coarse (ie. larger) particles may not present a major health hazard but may cause irritation such as to the eyes. They may also create a dust nuisance.

The sources and levels of particulates emitted to the atmosphere from the proposed GSP are summarised in Table 6.1 of the PER. The PER stated that the emissions are mostly associated with the Pellet Plant and will be below 10µm in diameter.

Equipment for the control and extraction of particulates (dust) will be a major feature of the GSP. The management measures will include:

- enclosure of the iron unloading facilities at the rail head;
- enclosure of the storage facilities for stockpiles of iron ore;
- enclosure of all conveyor systems;
- dust extraction at the feed and discharge ends of the Pellet Plant by electrostatic precipitation or scrubbers;
- full enclosure of the handling of the direct reduced iron pellets; and
- dust extraction by baghouse from the Melt Shop.

The PER stated that the effectiveness of the dust control systems is illustrated by the performance of dust extraction systems in the Melt Shop. The dust emissions rate from the final extraction system (ie the baghouse) is estimated at 1.2kg of particulates every hour. In contrast, inputs from the Melt Shop to the baghouse may be at a maximum of 2,800kg/hr.

The baghouse attached to the Melt Shop will collect about 20kg of dust for every tonne of steel produced. This means approximately 20,000 tonnes of dust each year for 1 million tonnes of steel product. The composition of this dust is given in Table 6.5 of the PER.

Similarly, in the Pellet Plant all dust creating areas will be covered with hoods or casings and connected to dust extraction systems. These will maintain low ambient dust levels and provide clean working conditions.

The dust collected from the baghouse at the Melt Shop and from waste gas and de-dusting systems in the Pellet Plant will be recycled to produce pellets.

The PER indicated that the Synthetic Rutile Plant is believed to be the only existing industry within the Narngulu Industrial Estate which emits particulates which are less than 10µm in diameter. The levels of these emissions are listed in Table 6.2 of the PER.

The predicted maximum 24 hour and annual average concentration of particulates due to emissions from both the Synthetic Rutile Plant and the GSP are shown in Figure 18 and Table 6.3 of the PER. These are 23.9 and 5.0$\mu g/m^3$ respectively.

The Clean Air Society of Australia and New Zealand (1994) (CASANZ) has proposed ambient air quality standards of 120 and 40$\mu g/m^3$ for 24 hour and annual averages respectively for

particulates in this category and these have been used in the interpretation of the modelling results

The computer modelling of particulate emissions indicates that the peak level concentrations will be between four and eight times lower than the CASANZ standards.

The PER stated that the predicted levels of particulate emissions from the GSP therefore do not present environmental or community health issues.

Comments from key government agencies

The Department of Environmental Protection stated that dust and particulate control measures (which includes the implementation of a monitoring programme) at the plant appear to be appropriate and more than adequate to prevent impact on the nearest residences.

The Shire of Mullewa expressed concern about adequate dust suppression measures being used at the transfer facility near Mullewa. The Shire stated that watering of stockpiles may not be enough.

The Mid West Development Commission was concerned about dust impacts from the transfer facility near Mullewa.

The City of Geraldton detailed concerns as to what acceptable dust levels will be set at the proposed plant and stated that they should be zero level, as per Esperance. The City of Geraldton was also concerned about dust impacts from stockpiles.

The Shire of Greenough stated that it was concerned that the PER identified the fact that the plant will produce particulate emissions with a size below 10µm, and acknowledged that the inhalation of these emissions could potentially affect human health, yet failed to address what appears to be a problem.

4.3.3 Public submissions

The Conservation Council of WA Inc expressed concern about dust emissions from the plant creating problems for nearby residents .

Public submissions sought clarification, further information or expressed concern in relation to the following points:

- whether lead and other particulate emissions from the plant would exceed NHMRC guidelines;
- whether operation of the plant would produce particulate emissions with a particle size below 10µm (which are dangerous to human health as stated in the PER). Concern was expressed that if this was the case, how would the proponent resolve this issue;
- the impacts (including health) caused by dust and particulate emissions from the proposed plant;
- the control measures that would be taken by the proponent to ensure that the project will not cause unacceptable dust levels in the Narngulu region;
- the composition of dust emitted from the plant and related operations and whether it would be detrimental to the environment and to human health;
- whether the proponent could comment on the content of heavy metals in dust emissions from plant operations and relate this to potential health impacts (such as Itai-Itai disease) on local residents;
- whether the proponent sought advice from the Health Department of WA on the potential impact of both gaseous and particulate emissions from the proposed plant on the health and well being of surrounding residents;
- how the proponent justifies its understanding that the standards set by the Clean Air Society of Australia and New Zealand are applicable and appropriate for the plant; and

- that the proponent should aim to set dust emission levels for the plant at zero and provide additional information on what actual dust levels will be set at the plant .

One particularly substantial submission indicated that Table 6.1 (p38) of the PER stated that particulate emissions will be 35.4g/sec, which equates to more than 3 tonnes/day or more than 1100 tonnes/year. The composition of these emissions is provided in Table 6.5 (p44) and includes heavy metals accepted as dangerous to health such as lead and cobalt. On pages 43 and 44 of the PER it is stated that all particulate emissions will be below 10µm in diameter. Within the background information of Section 6.2.7 (p42) of the PER it states that "the inhalation of fine particles (less than 10µm in diameter) with air over a long period of time has the potential to affect human health".

Concern was expressed as to whether the proponent had given any consideration to potential health risks associated with these particulate emissions and how the proponent intended to eliminate or reduce this potential impact.

This submission also stated that the actual composition of particulate emissions by percentage mass is obscured as a percentage by volume in Table 6.5 (p44) of the PER, making it impossible to determine actual amounts of individual components of the emissions by mass. Heavier compounds such as PbO may appear to represent a small percentage of the total emissions by volume but could actually form a significant proportion of the total mass of particulates emitted. From the data presented it cannot be determined whether or not lead emissions exceed air quality guidelines recommended by the NHMRC of 1.5mg/m^3.

The submission sought further information and clarification as to whether or not NHMRC air quality guidelines will be met for all particulate emissions.

4.3.4 Proponent's response

In response to the issues detailed in the public and government agency submissions, the proponent provided the following comments:

"The ambient air quality standards for particulates of less than 10µm diameter proposed by CASANZ (1994) are proposed in the PER because they are the most recent and most stringent available."

"It is not possible to achieve zero emissions of particulates from any plant even with the use of the most modern dust control technology such as is proposed for the GSP. The levels of dust emissions from the GSP are summarised in Table 6.1 of the PER. The total quantity from all sources is estimated at 35.4g/sec."

"It is assumed in the PER that all of the particulate emissions from the GSP will be less than 10µm in diameter. In order to limit these emissions to acceptable levels, the GSP will include numerous dust collection systems. These are summarised in Section 6.2.7 of the PER and include full enclosure of all iron ore stockpiles and handling systems, and dust extraction systems in the pellet plant and melt shop."

"The atmospheric emissions modelling of particulates from the GSP and the existing synthetic rutile plant concluded that the maximum 24 hour and annual average ground level concentrations would be 23.9 and 5.0 mg/m^3 respectively. In comparison, the air quality standards for particulates of less than 10µm diameter recommended by the Clean Air Society of Australia and New Zealand (CASANZ) (1994) are 120 and 40 mg/m^3 respectively. The predicted ground level concentrations are therefore substantially lower than the recommended standards. The CASANZ Standards are proposed for Narngulu in the PER because they are the most recent available."

"The dust emitted from the GSP primarily originates from the crushing and processing of iron ore. Composition of the dust therefore reflects the composition of the parent rock. However, some dusts originate from other inputs to the steel making process, including scrap steel. The composition of this material can vary. Data on the composition of the dust are provided in Table 6.5 on page 44 of the PER. These may be taken as typical for most steel plants while the

components derived from iron ore will also be typical for all iron ore mining and crushing operations. There are of course many iron ore mines in Western Australia and a number of steel plants in other States. It is generally accepted that these operations do not present health problems either to workers or to nearby communities provided that the atmospheric emission guidelines are complied with. The guidelines are specifically designed to be conservative, as are the occupational health standards which have to be met in the plant itself. They also take account of the composition of the dust."

"Kingstream Resources NL reiterates that all of the relevant occupational health and environmental air quality guidelines considered relevant by the appropriate Government Agencies will be complied with by the GSP."

"Kingstream Resource NL has not directly sought advice from the Health Department of Western Australia on the potential impact of emissions as the atmospheric emissions modelling concludes that the ground level concentrations of all emissions will be significantly lower than internationally recognised criteria. These criteria have been developed by the World Health Organisation (WHO) and the National Health and Medical Research Council of Australia (NHMRC). These are the organisations to which the Health Department of Western Australia would refer. The Health Department also has the opportunity to provide advice directly to the EPA should it wish to do so."

"The modelling of particulate emissions from the steel plant provided in the PER demonstrates that the maximum ground level concentrations will be well below internationally recognised standards which are recommended for the protection of public health. The plant therefore will not have the potential to cause the health effects referred to in Section 6.2.7. Nevertheless, Kingstream Resources NL has made a commitment in the PER that it will establish a comprehensive atmospheric emissions monitoring program to the satisfaction of the Department of Environmental Protection and that it will provide the results of monitoring to the Shire of Greenough and to the general public. This monitoring program will include measurement of dust emissions."

Commitments made by the proponent

With respect to dust and particulate emissions, the proponent made the following environmental commitment:

- Kingstream Resources NL will, prior to construction, develop an Environmental Management Programme which will ensure that all emissions and ground level concentrations, as well as noise emissions, are within established criteria The Environmental Management Programme will include, but not be restricted to:
  - the development of suitable monitoring programmes; and
  - contingency plans should emissions exceed established criteria to reduce emission levels below those criteria.

  The results of the monitoring programmes will be reported to the Department of Environmental Protection and will be available to the public.

4.3.5 Evaluation

Following advice from Department of Environmental Protection and the proponent's response to questions raised, the EPA considers that this issue is potentially manageable. The EPA notes the commitments made by the proponent to establish an atmospheric emissions monitoring program in order to ensure that all emissions and ground level concentrations are within established criteria.

Notwithstanding the above, the EPA concludes that the proponent should prepare an Environmental Management Programme which details the following information with respect to

dust and particulate emissions, to the satisfaction of the Environmental Protection Authority on advice from the DEP (Recommendation 3):

- a monitoring and audit programme for all dust and particulate emissions (including fugitive dust) and the moisture content of all storage stockpiles as a means of gauging the effectiveness of dust control.

The EPA also recommends (Recommendation 3) that reports of the results of the monitoring programme should be submitted at appropriate times to the DEP for audit and that they should be made publicly available.

4.4 Buffer zone

4.4.1 Objective

The Environmental Protection Authority's objective is to ensure that the long term tenure of industry is not compromised by inappropriate development near to industry.

Should non-industrial activities such as residential housing (existing or proposed) be too close to industry, this can make it difficult for industry to ensure that impacts on such housing from its operations do not exceed environmental standards.

The Environmental Protection Authority considers that this can achieved by ensuring that a suitable buffer zone is established around the Geraldton Steel Plant.

4.4.2 Evaluation framework

Existing policy framework

The Environmental Protection Authority considers that buffer zones for heavy industry should be determined using appropriate modelling techniques for the principal potential impacts resulting from such industry. Comparison of the outcomes of such modelling with criteria for acceptable impacts then enables a determination of suitable buffer distances.

Technical information

The Narngulu Industrial Estate has a total area of 670ha of which 470ha is zoned for general industry and 200ha is zoned for noxious industries. The general layout and zoning of the estate and of the surrounding land is shown in Figure 5 of the PER.

Most of the land surrounding the Industrial Estate is zoned General Farming but there are smaller areas zoned for Public Utility (part of the proposed Meru landfill site) and for Special Rural use.

The Narngulu townsite is located adjacent to the eastern boundary of the Industrial Estate. Several private houses are also located within the Industrial Estate itself on land which is zoned for General Industry in the area shown in Figure 5 of the PER.

The Geraldton Airport is located approximately 1.5km to the east of the Industrial Estate and the intervening land largely comprises horticultural properties, some with private houses, and larger agricultural lots.

Comments from key government agencies

The Department of Environmental Protection stated that any buffer zone that is deemed necessary to manage noise or risk impacts will be sufficient for the purposes of managing atmospheric emissions as well.

The Ministry for Planning stated that the future of the Narngulu Townsite needs to be resolved, and that the existence of residential land uses in proximity to the proposed plant is undesirable.

The Commonwealth Environment Protection Agency stated that consideration should be given to a program of buy out and relocation of nearby residents as they are too close to avoid adverse impacts from noise and gaseous emissions from the plant.

The Shire of Greenough stated that the proponent should be required to address the issue of buffer zones around the plant in more detail to show the reasons for determining the extent of the buffer zones and the methods for their management. The Shire also indicated that the proponent should reassess the need for a buffer zone around the proposed plant once the results of the further studies, as suggested in the Shire's submission, are addressed in detail.

4.4.3 Public submissions

The Conservation Council of WA Inc expressed concern about the inadequate buffer zone around the plant.

Public submissions expressed concern about lack of a buffer zone around the plant and the potential problems this could cause to nearby residents such as excessive noise and problems from dust and harmful air emissions.

Public submissions also questioned the proponent's claim that the proposed plant does not require a buffer zone around it due to its design.

Concern was raised about why the proponent failed to state or refer to recognised criteria and statutory requirements for buffer zones in the PER. Submissions expressed concern as to whether the proponent intended to secure a buffer zone around the plant and if it was going to purchase nearby properties prior to construction.

4.4.4 Proponent's response

In response to the issues detailed in the public submissions, the proponent provided the following comments:

"Kingstream Resources NL does not intend to secure a buffer zone around the site of the GSP as the noise modelling and atmospheric emissions modelling for the PER concludes that there is no technical requirement for such a buffer. That is, the noise levels and ground level concentrations of atmospheric emissions beyond the plant boundaries will comply with all generally accepted guidelines, criteria and regulations. The criteria that are often used for determining appropriate buffer zones in the planning of industrial estates therefore are not relevant in this particular instance. There are no statutory requirements for buffer zones."

"However, Kingstream Resources NL recognises that it is not optimal for people to live close to major industry even if that industry can meet all of the statutory requirements relating to noise and atmospheric emissions. Kingstream Resources NL has therefore initiated discussions with people who live close to or own property near the proposed site of the GSP and has indicated a willingness to purchase their properties provided that a reasonable price can be negotiated. It has indicated a willingness to complete these purchases within a relatively short period following the approval of the project by the Minister for the Environment."

"Kingstream Resources NL has initiated discussions with the owners of land immediately adjacent to the proposed steel mill site and has offered to purchase these properties subject to the project proceeding and agreements regarding valuations. The company has taken this initiative because it considers that it is undesirable for present and potentially future residents to live in close proximity to the steel mill. It does not consider however, that the purchase of these properties is necessary in order to establish a buffer zone around the plant as acceptable noise levels and ground level concentrations of atmospheric emissions can be achieved within the plant boundaries."

"Kingstream Resources NL will reassess the need for a buffer zone around the GSP during the detailed design phase and subsequently during the operation of the plant. However, given the known environmental performance of steel plants of this nature and the modelling results

included in the PER, it is considered unlikely that there will ever be a technical requirement for a buffer zone around the plant."

"Kingstream Resources NL maintains that a buffer zone should only be required around an industrial plant if it is needed in order for the plant to achieve regulatory standards for atmospheric and noise emissions or for odour control purposes. The information presented in the PER indicates that the GSP can comply with all of the generally recognised criteria for ground level concentrations of atmospheric emissions and with the regulations relating to noise emissions within the boundaries of the plant site itself. Therefore, there are no technical reasons for the GSP to have a buffer zone external to its boundaries. Nevertheless, the company recognises that residents very close to the boundary of the GSP may perceive that their present lifestyle may be adversely affected even though the regulations are being complied with. The company has therefore initiated discussions with the immediate neighbours of the plant site and has indicated a willingness to purchase their properties subject to normal commercial considerations."

"Kingstream Resources NL considers that the proximity of the Narngulu Townsite to the industrial estate is not optimal in terms of strategic planning although the townsite does not present any environmental issues in terms of the steel mill operations. It considers that the future of the townsite is a matter for the State Government to resolve."

Commitments made by the proponent

The proponent has made no environmental commitment to establish a suitable buffer zone around the proposed Geraldton Steel Plant.

4.4.5 Evaluation

Following advice from Department of Environmental Protection and the proponent's response to questions raised, the EPA considers that this issue is potentially manageable. The EPA notes that the proponent has made no specific commitment to establish a suitable buffer zone around the proposed site. However, the EPA acknowledges the proponent's endeavours to purchase nearby properties that are most likely to be affected by noise from plant operations.

As indicated in section 4.1.5 of this report, the EPA considers that the issue of noise can be adequately managed. The EPA considers that buffer zones around industrial sites are a desirable method of protecting industry from the long term encroachment of non-industrial land uses, such as housing. Buffer zones are also one means of managing impacts (eg; noise, odour, risk, air pollution) from industry.

The EPA therefore considers that the Government should examine means by which a buffer can be established around the Narngulu Industrial Estate.

4.5 Liquid and solid waste disposal

4.5.1 Objective

The Environmental Protection Authority's objective is to encourage waste minimisation, recycling, minimising the use of scarce fresh water, and sustainable use, and to ensure that environmental impacts resulting from the disposal of liquid and solid wastes associated with the proposed Geraldton Steel Plant are manageable.

4.5.2 Evaluation framework

Existing policy framework

Liquid and solid wastes are to be managed in accordance with the requirements of local government authorities and relevant government departments. Sewerage systems are to be

approved by local government authorities, the Water Authority of Western Australia (WAWA) and the Health Department of WA.

Technical information

Liquid waste

The PER indicated that the majority of wastewater produced in the GSP will be blowdown water for cooling water circuits, although some wastewater would be blowdown from process circuits. The circulating water in the cooling and process circuits will be treated as required by coarse particle precipitation, clarification and filtration to enable it to be recirculated. Virtually all the make up water to the GSP will be discharged as water vapour from the cooling towers in the cooling water circuits. The blowdown will have an increased concentration of dissolved salts from the make up water plus corrosion and algae inhibitors introduced into the circulating water.

The blowdown water will be passed through an evaporator to produce an enriched saline solution and demineralised water. The demineralised water will be used as make up to the indirect cooling water circuit.

The PER stated that the enriched saline solution will be disposed of by spraying it onto hot slag deposited in the slag pit. The slag pit will have a sealed base to collect and recirculate any saline solution not evaporated when sprayed on the hot slag. The proponent anticipates that approximately 3,500 tonnes of salt will be produced each year, as a result of this liquid waste disposal operation.

Solid waste

The PER stated that a management plan for the collection and disposal of waste generated during the construction phase will be developed through consultation with the Shire of Greenough. This plan will seek to direct waste to recycling wherever possible (eg. scrap metal, and waste oil from machinery) but when this is not practical, the waste will be directed to approved landfills.

Types of solid wastes

The PER provided a detailed breakdown of the solid wastes that would be produced by the GSP. The solid wastes will comprise the following:

- slag from the EAF and CSP Plant 118,000t/yr
- used refractory bricks from the EAF, LF and CSP Plant 9,000t/yr
- CSP Plant scale 20,000t/yr
- CSP Plant sludge 170t/yr
- salts from evaporation of wastewater 3,500t/yr
- sulphur on activated carbon from CO_2 removal 55t/yr on 200t carbon
- desulphurisation catalyst 21t/yr
- decomposition product of amine solution 26t/yr

Slag

The composition of the slag will vary depending on the composition of scrap metal used for steel making but is expected to be approximately as follows:

- CaO 36.70%
- FeO 25.28%
- SiO_2 21.00%
- MgO 7.99%
- Al_2O_3 4.35%

- MnO 0.10%
- P_2O_5 0.10%
- Others 2.30%

Refractories

The majority of the refractories will be high alumina bricks or conventional fire clay bricks. Typical compositions are:

- heavy duty fire clay bricks

  SiO_2 54%

  Al_2O_3 40%
- high alumina bricks

  Al_2O_3 50-85%

  Balance SiO_2

CSP Plant Scale

The scale from the CSP Plant has a high iron content generally of more than 70% and less than 4% silica, alumina, lime and magnesia.

CSP Plant Sludge

The smaller particles of mill scale are generally referred to as mill sludge. The sludge contains 30 to 40% iron and has an oil content from two to 25%. The oil derives from equipment used in the steel plant.

Salts from evaporation of wastewater

The evaporation of wastewater on the hot slag will leave a residue of salts. As the wastewater is bore water from the Allenooka Borefield, the residue will be a concentration of typical salts in drinking water and especially sodium chloride.

Sulphur from CO_2 Removal

The desulphuriser associated with carbon dioxide removal in the Direct Reduction Plant will generate 55t of sulphur on 200t of carbon each year.

Spent Desulphurisation Catalyst

The spent catalyst comprises about 20% zinc sulphide (ZnS) and 80% zinc oxide (ZnO).

Amine Solution

This comprises the amine solution with activated carbon and impurities.

Solid Waste Disposal

The PER indicated that solid waste from the plant will be disposed of in various ways as follows:

- Slag. The use of slag as a road base is being investigated. If this proves possible then it is probable that the slag will be used for this purpose. If it is not possible to use the slag, it will be transported to the mine site at Tallering Peak and disposed of into the mine waste dump. Some of the slag will be contaminated with salts from the evaporation of wastewater at a ratio of approximately 3% and this may limit its use. The process of disposal at the mine site, dust management, and rehabilitation of the waste dump are described in the NOI for the Tallering Peak iron ore mine (Alan Tingay & Associates and Signet Engineering Pty Ltd, 1995).
- Refractory Bricks. Disposed of in the mine waste dump at Tallering Peak.
- CSP Plant Scale. Recycled to steel making process.

- CSP Plant Sludge. Disposed of into an approved landfill or at the Tallering Peak minesite. The potential for processing and recycling of the sludge will be investigated.
- Salts from Wastewater. See Slag above.
- Sulphur. Recycled.
- Spent Catalyst. Returned to catalyst supplier.
- Amine Solution Residues. Returned to supplier.

Comments from key government agencies

The Department of Environmental Protection indicated the impact of transporting waste slag back to the mine site needs to be addressed, particularly with respect to measures to prevent fugitive dust emissions.

The Shire of Mullewa expressed concern about the constituents of plant sludge and disposal location. The Council indicated that it wishes to be consulted in this regard.

The Mid West Development Commission voiced concern about plant sludge not being suitable for landfill disposal or at the mine site due to its potentially high oil content.

The City of Geraldton expressed concern about the quantity of solid waste which would be stockpiled on site at any one time.

The Shire of Greenough highlighted concerns about the potential environmental impacts associated with the disposal of salt contaminated slag at the mine site or its use as road base. The Shire stated that the proponent should clarify whether the slag stockpiles will be covered or open and what measures would be put in place to prevent dust generation. The Shire also sought further details of the quantities, types, composition and environmental impacts in relation to the use of landfill sites for the disposal of plant sludge and sewage treatment plant. The Shire suggested that the proponent should provide further details about the quantities, the method and proposed route of transport of the materials referred to in the PER as spent catalyst and amine solution residue. The Shire also indicated that the proponent should further discuss the issue of liquid and solid waste disposal with it and that it should prepare a waste management plan with the Shire of Greenough, the City of Geraldton and the Geraldton/Greenough Regional Council before construction and after commissioning.

4.5.3 Public submissions

Public submissions expressed concern about the potential impacts from salt leaching out of waste slag from the plant if it is used as road base or disposed of back at the mine site. Submissions also indicated concerns about the quantity of solid waste which would be stockpiled on site at any one time and whether stockpiles would have any dust impacts. One submission, which termed the slag to be produced by the plant as a highly toxic slurry, expressed concern as to how it would be disposed of at the mine site.

4.5.4 Proponent's response

In response to the issues detailed in the public and government agency submissions, the proponent provided the following comments:

"Kingstream Resources NL is very keen to find a productive use for the slag wastes and intends to continue to explore its potential as road base."

"The solid wastes associated with the GSP are documented in Section 6.7 of the PER. There is no "slurry" and none of the solid wastes can be considered as toxic."

"The solid wastes will be removed from the GSP site on a regular basis as they are produced. For example, it will be possible to load slag from the plant on a daily basis into trains for transport back to the mine site. Therefore, it is considered that the total quantity of waste stockpiled on the site at any time will not exceed 2,500 tonnes. The stockpiles will not be

associated with any dust as the primary wastes are heavy materials which will not be prone to atmospheric dispersion."

"There will be no fugitive dust emissions from waste slag as the material will generally have a particle size which is too heavy for atmospheric dispersion."

"The slag stockpile is likely to be open rather than enclosed. The slag is a glass-like substance with no potential for the generation of dust. The slag will also not be allowed to accumulate in significant quantities as it will be removed on a regular basis for disposal at the mine site unless a productive use for it can be found. In the latter case, a specific slag stockpile area will be designated. There are no environmental implications associated with the storage, transport or disposal of slag."

"Kingstream Resources NL intends to investigate further the composition of the GSP plant sludge during the detailed design phase. This material has been designated for landfill disposal because it will contain residual quantities of hydrocarbons. However, the level of hydrocarbons may be quite low and it may be possible to treat the material in some way prior to disposal. Full details will be provided to all relevant State Government Agencies and to the Shire of Greenough in any application for landfill disposal. Alternatively, it is possible that these wastes may be entirely suitable for disposal within the waste dump at the Tallering Peak mine site."

"It is recognised that the disposal of any waste material into an approved landfill site will require the approval of the City of Geraldton, the Shire of Greenough and the Geraldton Greenough Regional Council. The exact requirements for landfill disposal have not been determined at this stage and therefore a worst case scenario is presented in the PER. This scenario involves the disposal of all plant sludge (170t/yr) into landfill. The feasibility of treating this material to reduce the oil content is not known at this stage but will be investigated. If treatment is possible the sludge may best be disposed of with other plant wastes at the Tallering Peak mine site."

"Details of the catalyst and amine solution are provided on page 52 of the PER. These materials are not toxic and are required in relatively small quantities. They do not require any special handling or transport procedures."

Commitments made by the proponent

With respect to liquid waste disposal, the proponent has made no specific environmental commitment.

With respect to solid waste disposal, the proponent has made the following environmental commitment:

- Kingstream Resources NL will investigate opportunities for the use of solid wastes generated by the GSP. [Timing - prior to and during the operation of the GSP].

4.5.5 Evaluation

Following advice from the Department of Environmental Protection and the proponent's response to questions raised, the EPA considers that this issue is potentially manageable. The EPA notes the commitment made by the proponent to investigate opportunities for the use of solid wastes generated by the proposed plant. The proponent should also investigate whether the potential for salt contamination of the slag (through evaporation of waste water) will constrain the opportunities for the use or disposal of the solid wastes.

Notwithstanding the above, the EPA concludes that the proponent should prepare an Environmental Management Programme which details the following information with respect to liquid and solid waste disposal, to the satisfaction of the Environmental Protection Authority on advice from the DEP (Recommendation 3):

- details of waste disposal approvals obtained from relevant government departments and how the proponent will implement any conditions of those approvals.

4.6 Protection of groundwater

4.6.1 Objective

The Environmental Protection Authority's objective is to protect the beneficial uses of ground water from potential impacts resulting from activities associated with the proposed Geraldton Steel Plant.

4.6.2 Evaluation framework

Existing policy framework

The EPA's policy is for proposals to meet the requirements of the Draft Western Australian Water Quality Guidelines for Fresh and Marine Waters (EPA Bulletin 711, October 1993).

Technical information

Water Requirements

The PER stated that the Geraldton Steel Plant will require a water supply of approximately 13,600m^3/day or 4.5 million cubic metres per year (Mm^3/yr). The water is required for cooling purposes and for various process needs such as de-scaling of the steel in the rolling mill. The water requirement of each major component of the plant is as follows:

• Pellet Plant	0.49
• DRI Plant	1.77
• Melt Shop	0.43
• CSP Plant	1.36
• Oxygen Plant	0.05
• Other	0.04
Sub Total	4.14
10% Contingency	0.41
TOTAL	4.55Mm^3/yr

Water Supply Alternatives

Three options have been considered for the supply of water. These are:

- exclusive use of fresh (potable) water,
- use of brackish (non-potable) groundwater for cooling purposes with potable water used for all other requirements, and
- use of seawater for cooling purposes with potable water used for all other requirements.

The proponent decided that all of the water supply to the proposed plant would be of potable quality. The PER stated that while it is known that extensive aquifers containing brackish ground water occur in the Geraldton region, proving that there is an adequate resource within a short distance of the Narngulu Industrial Estate would require a potentially time consuming exploration and test pumping program. Similarly, the use of seawater for cooling purposes would require the definition of a pipeline route for seawater uptake and discharge and consideration of the additional environmental factors which are involved.

The PER indicated that the Water Authority of Western Australia (WAWA) has advised that potable water can be supplied to the plant at the standard rates that major consumers are

charged. Currently WAWA obtains potable water for the Geraldton area from the Allanooka Borefield approximately 47km to the south-east of the Narngulu Industrial Estate and it is delivered to Geraldton via a 600mm diameter pipeline passing immediately to the east of the Estate. A recent draft Ground water Management Plan prepared by WAWA indicated that the sustainable yield of the ground water resources at Allanooka is 28.7Mm^3/yr of which 8.5Mm^3/yr is currently used for public water supply.

The PER stated that as WAWA will be supplying water to the plant, it will be responsible for the expansion of the Allanooka Borefield and for increasing the capacity of the existing pipeline or for installing a new pipeline to the Narngulu Industrial Estate should this be necessary.

Groundwater

The PER contends that the proposed plant will have no impact on groundwater at Narngulu either during construction or operation. Ground water in the area is about 24m below ground level, and generally has a salinity level of 2000 - 3000mg/L of total dissolved solids (TDS).

The plant also will not store any wastewater or other effluent in ponds from which infiltration to ground water could occur nor will there be any discharge of wastewater to ground. All tanks used for the storage of fuels or other liquids will be fully bunded.

Comments from key government agencies

The Department of Environmental Protection (DEP) expressed concern about the proponent indicating in the PER that the disposal of saline waste water by spraying it onto hot slag contained within a lined pit would not result in ground water contamination. The DEP stated that at some stage this pit would need to be emptied and the contaminated slag within it might need to be stored elsewhere prior to being transported back to the mine site. The DEP was concerned about whether the possibility of ground water contamination occurring as a result of rain water leaching salt from the slag in this particular situation or via disposal at the mine site had been examined by a hydrogeologist.

The Mid West Development Commission indicated a concern about salt ingress into ground water from slag if it is used as road base or if it is disposed of at the mine site.

The City of Geraldton expressed concern about what assurances and provision would be put in place to guarantee that there will never be contamination of the water table from the plant.

The Shire of Greenough detailed concerns about the potential impact on ground water from the use of sterilised effluent water from the sewerage treatment plant for trickle irrigation of trees and shrubs around the plant. The Shire was also concerned about the proponent needing to describe and substantiate in more detail the location and depth of ground water beneath the proposed site.

4.6.3 Public submissions

Public submissions were concerned about the possibility of ground water contamination occurring as a result of rain water leaching salt from plant slag, both at the plant and at the transfer facility and mine site.

4.6.4 Proponent's response

In response to the issues detailed in the public and government agency submissions, the proponent provided the following comments:

"The salt-contaminated slag in the evaporation pit will be removed periodically by front end loader and will be placed immediately into trucks or rail wagons for backhaul to the mine site. If rail wagons are used, the salt-contaminated slag will be placed in a specifically bunded location at the transfer facility north of Mullewa from where it will be directly loaded onto trucks."

"This system of handling the contaminated slag will ensure that there is absolutely no possibility of ground water contamination either at Narngulu or at the transfer facility."

"Subsequent to the preparation of the PER, an initial geotechnical assessment of the site of the GSP was made by Soil & Rock Engineering Pty Ltd. This investigation included drilling six boreholes to depths ranging from 10m to 25m below ground level. Piezometers were installed in three of these boreholes to enable ongoing collection of data on ground water conditions beneath the site. Shortly after installation in mid June 1995, the water table in these three bores was at 10m, 17m and 15m below ground level. On 1 July 1995, the ground water levels recorded were 14.5m, 17m and 15.8m below the surface. Although these ground water levels are higher than was predicted in the PER on the basis of other local data, there are no implications for ground water contamination because the GSP will not involve the disposal of any liquid wastes through ground and all oil storage and similar facilities will be fully contained."

"Kingstream Resources NL is prepared to install monitoring bores on the site of the GSP if required by the Minister for the Environment but it maintains that the potential for ground water pollution is so low that such bores are not really warranted."

"The specific sewage treatment system has not been selected at this stage. However, it is envisaged that a system equivalent to the bioMAX process will be used. This system involves anaerobic and aerobic treatment of the waste followed by chlorination and with the further option of ultra-violet light treatment. The treated effluent from the system meets the stringent standards set down by the Health Department of Western Australia for above ground disposal of waste water by sprinkler irrigation on landscaped and garden areas. Further details will be provided to the Shire when a preferred system has been selected by Kingstream Resources NL. It will be appropriate to discuss monitoring requirements at that stage."

Commitments made by the proponent

With respect to the protection of ground water, the proponent made no specific commitment.

4.6.5 Evaluation

Following advice from Department of Environmental Protection and the proponent's response to questions raised, the EPA considers that this issue is potentially manageable. The EPA notes that the proponent has made no specific commitment in relation to the protection of ground water. The EPA considers that the proponent should, where feasible, use brackish water in preference to fresh water.

The EPA concludes that the proponent should prepare an Environmental Management Programme which details the following information with respect to the conservation of fresh water, the preferential use of brackish water, and the protection of ground water, to the satisfaction of the Environmental Protection Authority on advice from the DEP (Recommendation 3):

- efficient use and conservation of fresh water;
- preferential use of brackish water; and
- a monitoring and audit programme for ground water quality around the plant perimeter.

The EPA also recommends (Recommendation 3) that reports of the results of the monitoring programme should be submitted at appropriate times to the DEP for audit and that they should be made publicly available.

4.7 Visual impacts/Light overspill

4.7.1 Objective

The Environmental Protection Authority's objective is to ensure that the visual amenity of the region is not unduly affected by the proposed GSP, and that potential impacts from light overspill can be managed.

4.7.2 Evaluation framework

Existing policy framework

The Environmental Protection Authority recognises that heavy industrial facilities often comprise tall structures. Designated industrial estates can therefore be expected to house tall structures. The EPA is concerned to ensure that light overspill into surrounding areas is minimised.

Technical information

The GSP will comprise various large structures and buildings, including the Direct Reduction Plant (92m high), the Melt Shop/CSP Plant buildings (38m), and the Pellet Plant (34m).

In general, the overall appearance of the buildings and structures in the GSP will be similar to those of the Mineral Sands Separation Plant and Synthetic Rutile Plants operated by RGC Minerals Ltd in the Narngulu Industrial Estate. All of the structures will feature lighting at night.

An assessment of the visibility of the GSP from surrounding areas was made in the PER by determining the visibility of the existing Synthetic Rutile Plant from a number of localities to the north, east, south and west of the Narngulu Industrial Estate.

The PER stated that the GSP will be most visible from the south-west, south and south-east. Very few people live in these sectors and most of these are within the General Industry zone of the Narngulu Industrial Estate. The existing Mineral Sands Separation Plant and Synthetic Rutile Plant are also prominent from these sectors.

The views of the GSP from these locations will also be moderated by landscape planting and vegetation around the boundaries of the GSP but the scale of the GSP will mean that it is unavoidably prominent.

From the Narngulu residential area the complex will mostly not be visible. Similarly, from the west (Ocean Ridge and Wandina Heights) the complex will be mostly obscured and in the distance. If houses are built on the ridge overlooking the Narngulu Industrial Estate however, the GSP will be very visible and prominent as will all of the existing industrial plants in the Industrial Estate.

From the north the GSP mostly will be obscured by the existing industrial plants.

Comments from key government agencies

The Shire of Mullewa expressed concern about the intrusion on residents from lighting at the transfer facility near Mullewa.

The Mid West Development Commission indicated a concern about the intrusion on residents from lighting at the transfer facility near Mullewa.

The Shire of Greenough expressed concern about the potential impact of light spill from the proposed plant on surrounding residents and the intrusion of lighting from the transfer facility near Mullewa.

4.7.3 Public submissions

Public submissions were concerned about how the proponent would address visual impacts from the plant, especially plumes from stacks, in view of the fact that no buffer zone has been proposed for the plant. Submissions indicated concern over the fact that the proponent regarded visual impacts as being acceptable on the basis that only very few residents will be affected by the construction of the plant. Submissions highlighted concern about what assessment had been made by the proponent of light emissions impacting on nearby residents and what measures would be used the attenuate light emissions from the plant. Submissions also indicated that the proximity of the proposed plant to residential properties will cause visual pollution as the buildings will intrude on the skyline of these properties.

The Conservation Council of WA Inc indicated that it was concerned about problems caused by light spill on nearby residents.

4.7.4 Proponent's response

In response to the issues detailed in the public and government agency submissions, the proponent provided the following comments:

"The visual impact of the GSP will be significantly reduced due to screening by surrounding industries, existing topographic and vegetation, and by landscape treatments. These matters are discussed in Section 6.8 of the PER. The only plumes which are likely to be visible will comprise water vapour (steam)."

"The development of a buffer zone around the GSP would not promote any further benefits in terms of reducing the visibility of the plant."

"It is generally the case that a visual impact which affects a large number of residents is considered to be more significant than an impact which affects only a few. The comment is made in the PER, therefore, that the GSP will not have any significant visual impact partly because it will only be visible from a few nearby residences. It is recognised, however, that the visual intrusion at some of these residences could be significant. Landscape treatments are proposed in order to reduce this potential impact."

"Kingstream Resources NL has also commenced negotiations with the owners of all of the properties from where the plant will be visible and has indicated a willingness to purchase their land provided that satisfactory commercial arrangements can be negotiated. If this initiative is successful, the issue of visibility of the GSP will not arise."

"It is also recognised that light spill from the plant could be significant as it will continue to operate at night time. However, it needs to be recognised that there are existing light emissions from the major industries which are already operating in the southern part of the Narngulu Industrial Estate and that the GSP will become part of this light environment. Measures designed to reduce the light emissions will also be adopted, including the shrouding of major spotlights and floodlights. Again, the purchase of nearby properties will eliminate this potential issue altogether."

Commitments made by the proponent

With respect to visual impact, the proponent made the following commitment:

Kingstream Resources NL will establish landscape plantings around the perimeters of the GSP site adjacent to roads and small property holdings. The landscape treatment will be developed in consultation with the Shire of Greenough and will be to the satisfaction of the DEP. [Timing - prior to and during construction of the GSP].

4.7.5 Evaluation

Following advice from Department of Environmental Protection and the proponent's response to questions raised, the EPA considers that this issue is potentially manageable. The EPA notes

the commitment made by the proponent in relation to establishing landscape plantings around the perimeters of the plant site adjacent to roads and small property holdings. The EPA also acknowledges the proponent's endeavours to purchase nearby properties. These are those which are most likely to be affected by light overspill from the proposed plant. The EPA considers that visible plumes from stacks will be adequately addressed through the management of gaseous and particulate emissions.

Notwithstanding the above, the EPA concludes that the proponent should prepare an Environmental Management Programme which details the following information with respect to light overspill, to the satisfaction of the Environmental Protection Authority on advice from the DEP (Recommendation 3):

- details of management measures to ensure that light overspill from the plant and transfer facility near Mullewa does not exceed DEP requirements.

5. Conclusions and recommendations

5.1 Summary of issues

Table 1 summarised the process used by the Environmental Protection Authority to evaluate the topics raised during the environmental impact assessment process. The table identifies the topics and the proposal characteristics in relation to the topic. The comments received from Government agencies and the public are then evaluated in the process of the identification of issues.

The remaining issues, as identified in Table 6, warranting further evaluation by the Environmental Protection Authority are:

- noise;
- gaseous emissions (including greenhouse gases and odours);
- dust and particulate emissions;
- buffer zones;
- liquid and solid waste disposal;
- protection of ground water; and
- light overspill.

The EPA considers that compliance and continuous improvement are an important part of the management of all projects. Accordingly, the EPA considers that in each year following the commencement of construction, the proponent shall prepare an audit of the performance of the Environmental Management Programme referred to in Recommendation 3 (below). In particular the audit should show rectification and improvement measures if required.

Each five years following the commencement of construction, the proponent shall prepare a major review of the following:

- environmental protection, including but not limited to consideration of the environmental objectives;
- the audit of performance against the environmental objectives; and
- the audit of the performance of the Environmental Management Programme.

These environmental objectives shall include but not be limited to those identified by the EPA in this assessment report and account for operating experience and new knowledge.

ISSUES	OBJECTIVE	EVALUATION FRAMEWORK	PROPONENT'S COMMITMENTS	EPA RECOMMENDS
Pollution				
Noise	To ensure that the health and amenity of surrounding residents is not unduly affected by noise emissions emanating from the GSP (Geraldton Steel Plant).	Noise levels to comply with the same criteria as established for the synthetic rutile plant at Chandale and the Premier coal mine at Collie	Specific noise attenuation measures will be incorporated in the detailed design of the plant which will ensure that the requirements of the Environmental Protection Act, 1986 Regulations or any new Regulations with respect to noise are complied with. These measures will be to the satisfaction of the DEP. Regular noise monitoring studies will be implemented to the satisfaction of the DEP in order to provide information relating to noise levels at nearby residences. The data from the studies will be reported to the Shire of Greenough and to the DEP and will be available to the public.	The EPA recommends that the maximum noise levels be: (i) 50 dB(A) Slow between 0700 hours and 1900 hours Monday to Friday; (ii) 45 dB(A) Slow between 1900 hours and 2200 hours Monday to Saturday; (iii) 45 dB(A) Slow between 0700 hours and 2200 hours Sundays and Public Holidays; and (iv) 40 dB(A) Slow between 2200 hours and 0700 hours always; when measured: • at any point on or adjacent to other premises not occupied by the proponent and used for residential or other noise sensitive purposes; and • at a height between 1.2 metres and 1.5 metres above ground level and greater than 3.5 metres from any reflecting surface other than the ground.
Gaseous emissions (including greenhouse gases and odours).	To ensure that gaseous emissions, including greenhouse gases and odours, both individually and cumulatively, do not cause environmental or human health problems. The proponent must use all reasonable and practicable measures to minimise the discharge of wastes, including gases.	Ambient gaseous emission levels at nearest residences to comply with the relevant standards of the Environmental Protection Policy (EPP) for Kwinana, provisional EPA policy on greenhouse gases and NHMRC and other appropriate guidelines.	Establish an atmospheric emissions monitoring program to determine whether all emissions and ground level concentrations are within established criteria. Results will be reported to the DEP and will be available to the public. The construction and operation of the GSP is to conform with environmental conditions and regulations as determined by the Minister for Environment.	The EPA recommends that the proponent must incorporate best practice low NO_X systems on the power station gas turbines prior to commissioning. Environmental Management Programme to include: • a monitoring and audit programme for all gaseous and odorous emissions (stack and ambient), including greenhouse gases; • calculations of the greenhouse gas emissions (using methodology developed for Australia); and • the proponent shall use its best endeavours to assist in the achievement of the governments desired position regarding the generation of greenhouse gas emissions.

Table 6. Summary of Environmental Protection Authority recommendations.

ISSUES	OBJECTIVE	EVALUATION FRAMEWORK	PROPONENT'S COMMITMENTS	EPA RECOMMENDS
Pollution				
Dust and particulate emissions.	To ensure that the health and amenity of surrounding residents is not unduly affected by dust and particulate emissions from the GSP.	Ambient dust levels at nearest residences to comply with the requirements of the ambient standards that are consistent with the Environmental Protection Policy (EPP) for Kwinana.	Establish an atmospheric emissions monitoring program to determine whether all emissions and ground level concentrations are within established criteria. The results of the monitoring program will be reported to the DEP and will be available to the public.	Proponent's Environmental Management Programme to include a monitoring and audit programme for all dust and particulate emissions (including fugitive dust) and the moisture content of storage stockpiles as a means of gauging the effectiveness of dust control.
Buffer zone	To protect the long term interests of industry from encroachment by surrounding land uses.	The GSP should have a buffer zone around it.	The proponent has made no environmental commitment to establish a suitable buffer zone around the proposed GSP.	No recommendation made. A suggestion has been made to Government regarding development of a buffer zone.
Liquid and solid waste disposal.	To protect both surface and groundwater resources from potential impacts from liquid and solid waste disposal operations associated with the GSP.	Liquid and solid wastes are to be managed in accordance with the requirements of local government authorities and relevant government departments. Sewerage systems are to be approved by appropriate state and local government authorities.	Proponent will investigate opportunities for the use of solid wastes generated by the GSP.	The EPA recommends that the proponent's EMP should include details of waste disposal approvals obtained from relevant government departments, and a requirement to implement any conditions of those approvals.
Protection of groundwater.	To protect the beneficial uses of groundwater from potential impacts resulting from activities associated with the GSP.	Potential impacts from construction and operational activities identified. Groundwater monitoring requirements also identified.	The proponent made no specific commitment.	The EPA recommends that the proponent's EMP include the efficient use and conservation of fresh water, the preferential use of brackish water, and a monitoring and audit programme for groundwater quality around the plant perimeter.
Social				
Light overspill	To ensure that the aesthetics of the region are not unduly affected by the proposed GSP, and that potential impacts from light overspill can be managed.	Potential visual impacts from operation of the GSP identified.	Kingstream Resources NL will establish landscape plantings around the perimeters of the GSP site adjacent to roads and small property holdings. The landscape treatment will be developed in consultation with the Shire of Greenough and will be to the satisfaction of the DEP.	The EPA recommends that the proponents EMP include details of management measures to ensure that light overspill from the plant and transfer facility near Mullewa does not exceed DEP requirements.

Table 6. Summary of Environmental Protection Authority recommendations.(cont'd)

5.2 Specific recommendations

The Environmental Protection Authority concludes that this proposal is environmentally acceptable, provided that the proponent's commitments, the recommendations of this report and the Environmental Conditions detailed in Section 6 are implemented.

The Environmental Protection Authority is satisfied that, using information currently available, the following recommendations may be made to the Minister for the Environment.

Recommendation 1

The Environmental Protection Authority concludes that the proposal by Kingstream Resources NL to construct and operate the Geraldton Steel Plant within the Narngulu Industrial Estate near Geraldton, is environmentally acceptable subject to the satisfactory completion of an EMP, successful implementation of the proponent's commitments and adoption of the EPA's recommendations.

In reaching this conclusion, the Environmental Protection Authority identified the main environmental factors requiring consideration to be:

- noise;
- buffer zones;
- gaseous emissions (including greenhouse gases and odours);
- dust and particulate emissions;
- liquid and solid waste;
- protection of ground water; and
- visual impact.

The Environmental Protection Authority believes that these issues can be potentially managed by the commitments made by the proponent (refer to Appendix 5) and the recommendations made by the EPA. Accordingly, the Environmental Protection Authority recommends that the proposal could proceed as described in the Public Environmental Review, subject to the proponent's commitments to environmental management and the following recommendations of the Environmental Protection Authority.

Recommendation 2

The Environmental Protection Authority recommends that: the maximum noise levels be:

(i) 50 dB(A) Slow between 0700 hours and 1900 hours Monday to Friday;

(ii) 45 dB(A) Slow between 1900 hours and 2200 hours Monday to Saturday;

(iii) 45 dB(A) Slow between 0700 hours and 2200 hours Sundays and Public Holidays; and

(iv) 40 dB(A) Slow between 2200 hours and 0700 hours always;

when measured:

- at any point on or adjacent to other premises not occupied by the proponent and used for residential or other noise sensitive purposes; and
- at a height between 1.2 metres and 1.5 metres above ground level and greater than 3.5 metres from any reflecting surface other than the ground.

Recommendation 3

The Environmental Protection Authority recommends that the proponent prepare an Environmental Management Programme (EMP), which includes the following information, to the satisfaction of the Environmental Protection Authority on advice from the DEP:

1. Noise

- a monitoring and audit programme for noise emissions as a means of gauging the effectiveness of noise control measures and compliance with the maximum allowable noise levels (as detailed in Recommendation 2).

2. Gaseous emissions (including greenhouse gases and odours)

- a monitoring and audit programme for all gaseous and odorous emissions (stack and ambient), including greenhouse gases;
- calculations of the greenhouse gas emissions (using methodology developed for Australia); and
- the proponent shall use its best endeavours to assist in the achievement of the governments desired position regarding the generation of greenhouse gas emissions

3. Dust and particulate emissions

- a monitoring and audit programme for all dust and particulate emissions (including fugitive dust) and the moisture content of all storage stockpiles as a means of gauging the effectiveness of dust control.

4. Liquid and solid waste disposal

- details of waste disposal approvals obtained from relevant government departments and how the proponent will implement the conditions of these approvals.

5. Protection of ground water

- efficient use and conservation of fresh water;
- preferential use of brackish water; and
- a monitoring and audit programme for ground water quality around the plant perimeter.

6. Light overspill

- details of management measures to ensure that light overspill from the plant and the transfer facility near Mullewa does not exceed DEP requirements.

Reports of the results of all monitoring programmes are to be submitted annually to the DEP for audit, and are to be made publicly available.

Recommendation 4

The Environmental Protection Authority recommends that the proponent incorporates low NO_x technology into the power station gas turbines prior to commissioning.

6. Recommended environmental conditions

Based on the assessment of this proposal and recommendations in this report, the Environmental Protection Authority considers that the following Recommended Environmental Conditions are appropriate.

1 Proponent Commitments

The proponent has made a number of environmental management commitments in order to protect the environment.

1-1 In implementing the proposal, the proponent shall fulfil the commitments made in the Public Environmental Review and in response to issues raised following public submissions; provided that the commitments are not inconsistent with the conditions or procedures contained in this statement.

The Department of Environmental Protection will audit the implementation of the proponent's environmental management commitments, which were published in Environmental Protection Authority Bulletin 804 (Appendix 5).

2 Implementation

Changes to the proposal which are not substantial may be carried out with the approval of the Minister for the Environment

Changes to the proposal which are not substantial may be carried out with the approval of the Minister for the Environment.

2-1 Subject to these conditions, the manner of detailed implementation of the proposal shall conform in substance with that set out in any designs, specifications, plans or other technical material submitted by the proponent to the Environmental Protection Authority with the proposal.

2-2 Where, in the course of that detailed implementation referred to in condition 2-1, the proponent seeks to change the designs, specifications, plans or other technical material submitted to the Environmental Protection Authority in any way that the Minister for the Environment determines, on the advice of the Environmental Protection Authority, is not substantial, those changes may be effected.

3 Proponent

These conditions legally apply to the nominated proponent.

3-1 No transfer of ownership, control or management of the project which would give rise to a need for the replacement of the proponent shall take place until the Minister for the Environment has advised the proponent that approval has been given for the nomination of a replacement proponent. Any request for the exercise of that power of the Minister shall be accompanied by a copy of this statement endorsed with an undertaking by the proposed replacement proponent to carry out the project in accordance with the conditions and procedures set out in the statement.

4 Noise

4-1 The proponent shall manage and operate the premises such that noise levels do not exceed:

(i) 50 dB(A) Slow between 0700 hours and 1900 hours Monday to Friday;

(ii) 45 dB(A) Slow between 1900 hours and 2200 hours Monday to Saturday;

(iii) 45 dB(A) Slow between 0700 hours and 2200 hours Sundays and Public Holidays; and

(iv) 40 dB(A) Slow between 2200 hours and 0700 hours always;

when measured:

(1) at any point on or adjacent to other premises not occupied by the proponent and used for residential or other noise sensitive purposes; and

(2) at a height between 1.2 metres and 1.5 metres above ground level and greater than 3.5 metres from any reflecting surface other than the ground.

5 Environmental Management Programme

For sound environmental management, a comprehensive Environmental Management Programme is required.

5-1 Prior to commissioning, the proponent shall prepare an Environmental Management Programme, to the requirements of the Environmental Protection Authority on the advice of the Department of Environmental Protection.

This Environmental Management Programme shall address, but not be limited to the following:

Noise

1 a monitoring and audit programme for noise emissions as a means of gauging the effectiveness of noise control measures and compliance with the requirements of Condition 4.

Gaseous emissions (including greenhouse gases and odours)

2 a monitoring and audit programme for all gaseous and odorous emissions (stack and ambient), including greenhouse gases;

3 calculations of the greenhouse gas emissions (using methodology developed for Australia); and

4 the proponent shall use its best endeavours to assist in the achievement of the governments desired position regarding the generation of greenhouse gas emissions.

Dust and particulate emissions

5 a monitoring and audit programme for all dust and particulate emissions (including fugitive dust) and the moisture content of all storage stockpiles as a means of gauging the effectiveness of dust control.

Liquid and solid waste disposal

6 details of waste disposal approvals obtained from relevant government authorities and how the conditions of those approvals will be implemented.

Protection of groundwater

7 efficient use and conservation of fresh water;

8 preferential use of brackish water; and

9 a monitoring and audit programme for ground water quality at the plant perimeter.

Visual impact

10 details of management measures to ensure that light overspill from the plant and the transfer facility near Mullewa does not exceed Department of Environmental Protection requirements.

Results

11 results of monitoring programmes are to be submitted annually to the Department of Environmental Protection for audit, and are to be made publicly available.

Performance audit

12 the Environmental Management Programme will have an annual performance audit of the environmental objectives, and allow for continuous improvement as new operational procedures and knowledge are developed.

5-2 The proponent shall make the Environmental Management Programme required by condition 5-1 available for public review at appropriate times.

5-3 The proponent shall implement the Environmental Management Programme required by Condition 5-1.

6 Incorporation of Low NO_x Technology

6-1 The proponent shall incorporate low NO_x technology into the power station gas turbines prior to commissioning, to the requirements of the Minister on advice of the Environmental Protection Authority.

7 Decommissioning

7-1 The proponent shall carry out the satisfactory decommissioning of the project, removal of installations and rehabilitation of the site and its environs.

7-2 To achieve the objectives of condition 7-1, at least six months prior to decommissioning, the proponent shall prepare a decommissioning and rehabilitation plan.

7-3 The proponent shall implement the plan required by condition 7-2.

8 Time Limit on Approval

The environmental approval for the proposal is limited.

8-1 If the proponent has not substantially commenced the project within five years of the date of this statement, then the approval to implement the proposal as granted in this statement shall lapse and be void. The Minister for the Environment shall determine any question as to whether the project has been substantially commenced.

Any application to extend the period of five years referred to in this condition shall be made before the expiration of that period to the Minister for the Environment.

Where the proponent demonstrates to the requirements of the Minister for the Environment on advice of the Department of Environmental Protection that the environmental parameters of the proposal have not changed significantly, then the Minister may grant an extension not exceeding five years.

9 Performance Review

9-1 Each year following the commencement of construction, the proponent shall prepare an audit of the performance of the Environmental Management Programme referred to in condition 5-1 and in particular the audit shall show rectification and improvement measures where required.

The annual audit shall be presented to the Department of Environmental Protection acting on behalf of the Environmental Protection Authority.

9-2 Each five years following the commencement of construction, the proponent shall prepare a major review of the following:

1. environmental protection, including but not limited to consideration of the environmental objectives;
2. the audit of performance against these objectives; and
3. the audit of the performance of the Environmental Management Programme referred to in condition 5-1;

to the requirements of the Environmental Protection Authority on advice of the Department of Environmental Protection.

These environmental objectives shall include but not be limited to those identified by the Environmental Protection Authority in the assessment report (Environmental Protection Authority Bulletin 804) and account for operating experience and new knowledge.

The environmental objectives may be changed by the Environmental Protection Authority following the review.

10 Compliance Auditing

To help determine environmental performance, periodic reports on progress in implementation of the proposal are required.

10-1 The proponent shall submit periodic Progress and Compliance Reports, in accordance with an audit programme prepared by the Department of Environmental Protection in consultation with the proponent.

Procedure

1 Unless otherwise specified, the Department of Environmental Protection is responsible for assessing compliance with the conditions contained in this statement and for issuing formal clearance of conditions.

2 Where compliance with any condition is in dispute, the matter will be determined by the Minister for the Environment.

3 The Environmental Protection Authority will undertake a detailed review of the proposal and the results of the Environmental Management Programme referred to in Condition 5-1 after the first five years following commencement of construction.

Note

1 The proponent is required to apply for a Works Approval and Licence for this project under the provisions of Part V of the Environmental Protection Act.

7. References

Alan Tingay & Associates. 1994. Deep Water Port at Point Moore. Public Environmental Review, Volume 1. Port of Geraldton Authority.

Alan Tingay & Associates, Halpern Glick Maunsell, and Lancon Resources. 1993. A Planning, Engineering, Landscape, and Environmental Study of the Narngulu Industrial Estate at Geraldton. Narngulu Industrial Committee.

Alan Tingay & Associates and Signet Engineering Pty Ltd. 1995. Mid West Iron and Steel Project - Tallering Peak Iron Ore Mine Notice of Intent. Kingstream Resource N.L.

AMC Mineral Sands Limited. 1989. Narngulu Synthetic Rutile Plant Expansion. Public Environmental Report.

Appleyard, S.J. 1990. Inspection of the Proposed Meru Landfill Site, Victoria Locations 2227, 2268. Geological Survey of Western Australia.

Australian Bureau of Statistics. 1995. 1991 Census of Population and Housing - Expanded Community Profile. Australian Bureau of Statistics Catalogue No.†27225. Western Australian Local Government Area 6020 Mullewa pp 1-36.

Centre for Applied Mathematical Modelling. 1994. Emergency Response and Preparedness Model, Technical Description. Centre for Applied Mathematical Modelling, Monash University, Melbourne.

Clean Air Society of Australia and New Zealand. 1994. Summary of Air Pollution Prevention Regulations in Effect in Australia and New Zealand. p44.

Dames and Moore. 1990. Kwinana Heavy Industry Economic Impact Study. Report Prepared for Confederation of Western Australian Industry.

Dye, R. A., Van Vreeswyk, A.M.E. & Moore G.A. 1990. Geraldton Rural - Residential Land Capability Study. Land Resources Series Number 4. Western Australian Department of Agriculture.

Environmental Protection Authority of Victoria. 1985. Calculation Procedure: Approved Procedure Under Schedule E of State Environmental Protection Policy (The Air Environment). Environmental Protection Authority of Victoria, Publication 210.

Environmental Protection Authority of Western Australia. 1989. Proposed Synthetic Rutile Plant Expansion. Narngulu Industrial Estate, Geraldton. Report and Recommendations for the Environmental Protection Authority. Bulletin 410.

Environmental Protection Authority of Western Australia. 1993. Air Quality Guidelines: A Discussion Paper on Proposed Ambient Air Quality Guidelines for Western Australia.

Environmental Protection Authority of Western Australia. 1992. Development of an Environmental Protection Policy for Air Quality at Kwinana. Environmental Protection Authority, Perth, Western Australia. Bulletin 644.

Greenhouse Coordination Council. 1994. Revised Greenhouse Strategy for Western Australia 1994.

Halpern Glick Maunsell. 1995. Mid West Iron and Steel Project Transport Study - Interim Report. Signet Engineering Pty Ltd.

Herring Storer Acoustics. 1995. Noise Impact Study - Mid West Iron and Steel Complex Narngulu, WA.

LandCorp. 1994. Public Environmental Review - Oakajee Industrial Park, Geraldton.

Signet Engineering Pty Ltd. 1994. Initial Assessment of Alternative Process Plant Locations. Report Prepared for Kingstream Resources N.L.

State Energy Commission of Western Australia. 1990. Proposed Collie Power Station - Response to Public Submission Contained in Environmental Protection Authority Bulletin 472, November 1992.

Steedman Science and Engineering. 1993. Air Quality Impact - Proposed Heavy Industrial Site at Oakajee. Unpublished Report for LandCorp.

Uloth & Associates Pty Ltd. 1988. Geraldton Regional Road Study, Traffic Forecasting and Operational Evaluation. State Planning Commission.

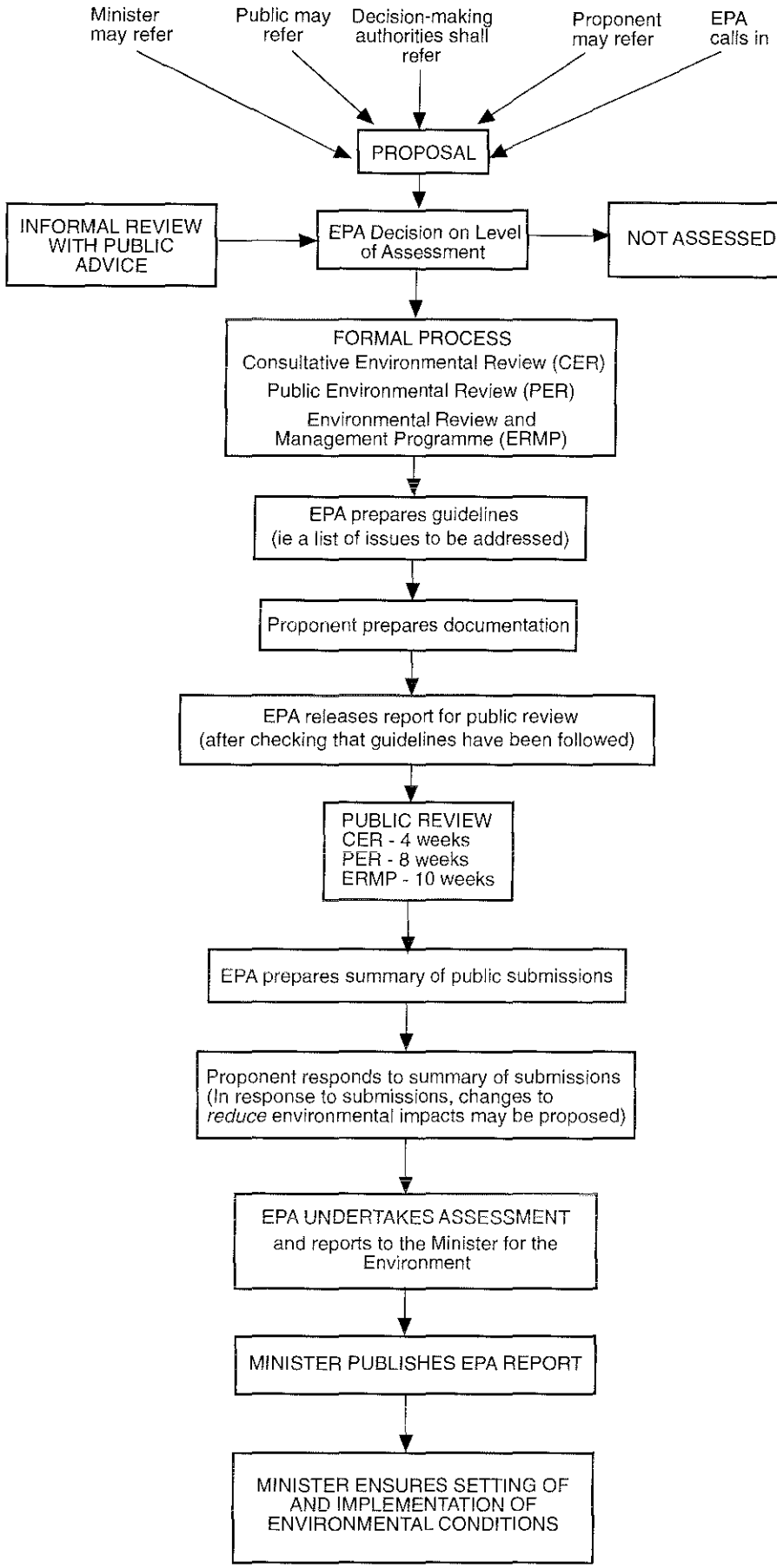
United States Environmental Protection Authority. 1977. Quality Assurance Handbook for Air Pollution Measurement Systems. Volume 2, Ambient Air Specific Methods, Environmental Protection Agency Research, Triangle Park, North Carolina.

WNI Science and Engineering. 1995. Air Quality Assessment - Proposed Mid West Iron and Steel Complex at Narngulu.

World Health Organisation. 1987. Air Quality Guidelines for Europe. Copenhagen.

Appendix 1

Environmental impact assessment flow chart


Minister may refer
Public may refer
Decision-making authorities shall refer
Proponent may refer
EPA calls in
PROPOSAL
INFORMAL REVIEW WITH PUBLIC ADVICE
EPA Decision on Level of Assessment
NOT ASSESSED
EPA decides within 28 days. Anybody may appeal to the Minister within 14 days on level set; Minister may direct higher level but not vice versa
FORMAL PROCESS
Consultative Environmental Review (CER)
Public Environmental Review (PER)
Environmental Review and Management Programme (ERMP)
DMA cannot allow implementation unless either no formal assessment or the Minister Authorises. Process not suspended
EPA prepares guidelines (ie a list of issues to be addressed)
Draft guidelines usually issued within 14 days of first meeting of proponent
Proponent prepares documentation
EPA releases report for public review (after checking that guidelines have been followed)
PUBLIC REVIEW
CER - 4 weeks
PER - 8 weeks
ERMP - 10 weeks
EPA prepares summary of public submissions
EPA usually completes summary in 2-3 weeks
Proponent responds to summary of submissions (In response to submissions, changes to *reduce* environmental impacts may be proposed)
EPA UNDERTAKES ASSESSMENT and reports to the Minister for the Environment
Report release often 3-5 weeks after receipt of response to submissions
MINISTER PUBLISHES EPA REPORT
Any body may appeal on EPA report to Minister within 14 days. Minister may remit to EPA or take appeal into consideration when setting conditions
MINISTER ENSURES SETTING OF AND IMPLEMENTATION OF ENVIRONMENTAL CONDITIONS
Proponent may appeal on conditions within 14 days of issue

Appendix 2

Summary of submissions and proponent's response to questions

1. NOISE

1.1 The construction phase of the proposed plant is expected to be of the order of three years. Concern has been expressed over the construction-related noise and the fact that this will be managed by the site manager being contacted by affected residents.

What other means of addressing the issue of construction noise can the proponent provide so that residents are not affected in the first instance?

Construction noise will be managed by restricting construction activities to daylight hours, by requiring contractors to ensure that all mobile equipment is well maintained and fitted with standard noise suppression equipment, and that all stationary equipment does not exceed a noise level of 85dB(A) at a distance of 1m (see Section 6.1.3 of the PER). These methods are standard for major construction sites and are generally found to be effective. The additional provision of providing the contact phone number for the site manager will enable any short term noise problem to be identified and remedied. In addition, Kingstream Resources NL has initiated discussions with the nearest neighbours to the site of the steel mill with a view to acquiring their properties. If this land acquisition program is successful, there will be no close neighbours who may be affected by construction noise.

1.2 What are the potential sources of noise from the plant and related operations? How does the proponent propose to control the impact of noise from these?

The most important potential sources of noise from the GSP are listed in Table 6.6 of the PER. The noise modelling has assumed that the level of noise from these sources will be controlled by standard measures and that no significant additional noise attenuation will be required. The standard measures will include enclosure of equipment in buildings, use of housings on all large fans, and the construction of earth bunds adjacent to some components of the plant to further attenuate noise. Considerable volumes of earth will be available from excavation of the foundations for the steel plant and the construction of bunds will also assist in screening the plant from nearby areas.

1.3 It has been stated that the predicted noise levels at two residences (zoned within general farming) as detailed in the PER exceed acceptable levels as prescribed under the Noise Abatement (Neighbourhood Annoyance Regulation 1979) (refer to Submission 1).

Can the proponent clarify how it intends to ensure that noise levels "comply" with current noise regulations?

The predicted noise levels comply with the Noise Abatement (Neighbourhood Annoyance) Regulations, 1979 at the nearest two residences on properties zoned for general farming. Under the Regulations, the acceptable levels of noise at these residences are 45dB(A) at night, and 55dB(A) during the day (Section 6.4.1 of the PER). The predicted noise levels during operation of the GSP at the locations are 40 to 45dB(A) during both day and night time conditions (Section 6.4.4 of the PER).

However, if the Minister for the Environment determines that further noise reduction is required, then this will be achieved in the detailed design of the GSP.

Furthermore, Kingstream Resources NL has initiated discussions with the owners of the two residences in question and has indicated a willingness to purchase these properties following approval of the proposal. If these negotiations are successful, the residents will relocate and there will be no possibility of disturbance due to noise.

1.4 It has been suggested that the spur line for the rail wagons unloading facility in less than 50m from the certain residents.
What assessments have been made of the impact of intrusive noise emissions resulting from operations such as the accidental dropping of scrap and shunting of rail wagons, etc?

It is intended that all rail operations will be limited to daylight hours. Moreover, only two trains will visit the site each day.

The recognised noise criteria for trains at nearby residences are detailed in Section 7.2.4 of the PER and it is considered that these will be met at the nearest residences to the GSP. An earth bund will also be constructed inside the eastern boundary of the GSP site to further reduce train noise.

The handling of scrap steel is recognised as one of the main potential sources of noise. Such operations will therefore be limited to daylight hours and all scrap will be unloaded into an underground lined pit in order to reduce the noise levels. This method of handling scrap steel has been adopted in the Rooty Hill Steel Plant located in the western suburbs of Sydney.

1.5 As many residents are employed on shift work, necessitating daylight hours sleep, how does the proponent intend to control noise levels during the day in order to minimise the impacts on these people?

If Kingstream Resources NL learns that noise levels associated with operation of the GSP are causing problems to nearby residents even though the noise levels are complying with the regulations, then it will use its best endeavours to co-operate with the residents in order to identify and remedy the source of disruptive noise.

1.6 Will predicted noise levels from the power plant be safe for workers and nearby residents?

The predicted noise levels from the power plant will comply with occupational health requirements and will be safe for nearby residents. Standard proprietary acoustic packages will be installed by the manufacturers of the gas turbines.

1.7 Noise emission predictions appear to have been calculated using a maximum windspeed of $7kmh^{-1}$. It has been stated that the average windspeeds in the region are never less than $7kmh^{-1}$ and usually vary between $15kmh^{-1}$ to gusts of $180kmh^{-1}$.

Can the proponent comment on this in light of the fact that winds can exacerbate noise levels from the GSP?

The noise levels from an industry like the GSP will be at their maximum during calm and light wind conditions as described in Section 6.4 of the PER. During stronger winds, the background noise levels increase substantially and mask the noise from the industry. The noise modelling in the PER therefore is based on calm conditions and conditions when there is a light westerly wind of 2m/sec. It is true that these "worst-case" wind conditions will not occur very often at Narngulu as wind speeds are generally higher.

2. ATMOSPHERIC EMISSIONS

2.1 How does the company propose to control air emissions and the potential impacts on the Geraldton townsite and residents in close proximity?

It has been stated that the occurrence of cancer and asthma among Geraldton residents is above normal. How does the proponent propose to control air emissions emanating from the proposed Plant so as not to exacerbate this problem?

The implications of atmospheric emissions from the GSP are examined in detail in Section 6.2 of the PER and in the specialist report by WNI Science and Engineering (1995). The detailed studies indicate that the only atmospheric emissions of significance are nitrogen dioxide, particulates, and carbon dioxide. Furthermore, the levels of emissions are relatively low, and the ground level concentrations of emissions from the steel plant and from existing industries at Narngulu will be significantly lower than international guidelines for these types of emissions. The guidelines have been developed by the World Health Organisation, the National Health and Medical Research Council of Australia, and the United States Environmental Protection Agency and are designed to ensure that public health will not be affected even with long term exposure. The guidelines are conservative and are the most stringent of the internationally recognised criteria. Therefore, it is concluded that the GSP at Narngulu does not present any environmental or community health issues due to atmospheric emissions.

2.2 In relation to computer modelling of emission levels from the GSP, the data collected for wind modelling does not cover a full year (data has not been collected for two windiest months of the year).

Does the proponent agree that this could lead to inaccurate predictions? If so, will the proponent conduct further modelling which incorporates wind data for a full year?

The computer modelling of emissions from the GSP was based on the best available meteorological data. This included 10.5 months of data collected on the site of the steel mill by RGC Mineral Sands Ltd, and data collected at the proposed Oakajee Industrial Site. These monitoring stations provide the most comprehensive information relating to meteorological conditions relevant to atmospheric emissions modelling. However, the data were also supplemented by general meteorological recordings from Geraldton Airport and the Port of Geraldton.

All of the regional information indicates that the primary data used for the atmospheric emissions modelling are reliable and that any errors in prediction will be minor. This is stated in Section 6.2 of the PER.

Kingstream Resources NL has made a commitment in the PER that it will establish an atmospheric emissions monitoring program to the satisfaction of the DEP in order to ensure that all emissions and ground level concentrations are within established criteria (see Section 10 of the PER). This may include further modelling during the construction phase of the GSP if this is considered desirable by the DEP.

2.3 It has been stated that during still conditions, nitrogen dioxide, carbon dioxide, sulphur and argon emissions will form a blanket over the Narngulu area.

Can the proponent comment on this and has the atmospheric emission modelling produced acceptable results for worse case scenarios?

What effect will air emissions from the GSP have on the local fishing industry?

The atmospheric emissions modelling considers a range of scenarios including still conditions. The modelling also predicts maximum ground level concentrations under any conditions and these maximum concentrations are then compared with the environmental criteria to determine their acceptability. The modelling of the atmospheric emissions for the GSP concluded that the ground level concentrations, when combined with the emissions from other industries of Narngulu, will be significantly less than the international criteria and therefore will not present any adverse health implications. Moreover, the atmospheric emissions modelling specifically included worst-case scenarios by assuming that the levels of sulphur dioxide and particulate emissions from the RGC Synthetic Rutile Plant would be at the licence maxima which are considerably higher than normal operating conditions. The atmospheric emissions will have no implications whatsoever for local fishing, agriculture, or any other industry, or any other activity in the Mid West Region.

2.4 **How will the proponent control NO_x emissions from the plant so as to prevent unacceptable impacts on local residents?**

The PER indicates that in light of the fact that specific emission control systems would add about $3.2m to production costs each year, the proponent should not be required to implement these.

Can the proponent justify this decision keeping in mind the potential health impacts on local residents exposed to noxious emissions from the plant operations?

The modelling of nitrogen dioxide emissions from the GSP (PER Section 6.2.6) concluded that the one hourly average, maximum 24 hour and annual average concentrations would be 228, 49 and 7.1 mg/m^3. The corresponding air quality guidelines proposed for the Narngulu Industrial Estate are 320, 150 and 100 mg/m^3 respectively. The predicted ground level concentrations therefore are considerably lower than the guidelines. Therefore, it is suggested that the Minister for the Environment should not require expensive NO_x control systems to be fitted to the exhaust stacks for the gas turbines of the power station as this would not provide any additional benefit in terms of public health given the already excellent performance of the GSP.

2.5 **The PER indicates that particles below 10µm are dangerous to human health. Will operations related to any part of the project produce emissions containing such particles? If so, how will the proponent resolve this issue.**

What control measures will be taken by the proponent to ensure that the project will not cause unacceptable dust levels in the Narngulu region?

What is the composition of dust emitted from the GSP and related operations? Are these detrimental to the environment and to human health?

It has been stated that the inhalation of dust containing heavy metals could increase the risk of Itai-Itai disease which results in skeletal deformation, fracture and eventual collapse.

Can the proponent comment on the content of heavy metals in dust emissions from plant operations and relate this to potential health impacts (such as Itai-Itai disease) on local residents?

Table 6.1 (p38) states that particulate emissions will be 35.4g/sec, which equates to more than 3 tonnes/day or more than 1100 tonnes/year. The composition of these emissions is provided in Table 6.5 (p44) and includes heavy metals accepted as dangerous to health such as lead and cobalt. On pages 43 and 44 of the PER it is stated that all particulate emissions will be below 10mm in diameter. Within the background information of Section 6.2.7 (p42) of the PER it states that "the inhalation of fine particles (less than 10mm in diameter) with air over a long period of time has the potential to affect human health".

Has the proponent given any consideration to potential health risks associated with these particulate emissions?

How does the proponent intend to eliminate or reduce this potential impact?

The actual composition of particulate emissions by percentage mass is obscured as a percentage by volume in Table 6.5 (p44) making it impossible to determine actual amounts of individual components of the emissions by mass. Heavier compounds such as PbO may appear to represent a small percentage of the total emissions by volume but could actually form a significant proportion of the total mass of particulates emitted. From the data presented it cannot be determined whether or not lead emissions exceed air quality guidelines recommended by the NHMRC of 1.5mg/m^3.

Can the proponent provide this information and clarify whether or not NHMRC air quality guidelines will be met for all particulate emissions?

It is assumed in the PER that all of the particulate emissions from the GSP will be less than 10mm in diameter. In order to limit these emissions to acceptable levels, the GSP will include numerous dust collection systems. These are summarised in Section 6.2.7 of the PER and include full enclosure of all iron ore stockpiles and handling systems, and dust extraction systems in the pellet plant and melt shop.

The atmospheric emissions modelling of particulates from the GSP and the existing synthetic rutile plant concluded that the maximum 24 hour and annual average ground level concentrations would be 23.9 and 5.0 mg/m^3 respectively. In comparison, the air quality standards for particulates of less than 10mm diameter recommended by the Clean Air Society of Australia and New Zealand (CASANZ) (1994) are 120 and 40 mg/m^3 respectively. The predicted ground level concentrations are therefore substantially lower than the recommended standards. The CASANZ Standards are proposed for Narngulu in the PER because they are the most recent available.

The dust emitted from the GSP primarily originates from the crushing and processing of iron ore. Composition of the dust therefore reflects the composition of the parent rock. However, some dusts originate from other inputs to the steel making process, including scrap steel. The composition of this material can vary. Data on the composition of the

dust are provided in Table 6.5 on page 44 of the PER. These may be taken as typical for most steel plants while the components derived from iron ore will also be typical for all iron ore mining and crushing operations. There are of course many iron ore mines in Western Australia and a number of steel plants in other States. It is generally accepted that these operations do not present health problems either to workers or to nearby communities provided that the atmospheric emission guidelines are complied with. The guidelines are specifically designed to be conservative, as are the occupational health standards which have to be met in the plant itself. They also take account of the composition of the dust.

Kingstream Resources NL reiterates that all of the relevant occupational health and environmental air quality guidelines considered relevant by the appropriate Government Agencies will be complied with by the GSP.

2.6 Has the proponent sought advice from the Health Department of WA on the potential impact of both gaseous and particulate emissions from the proposed plant on the health and well being of surrounding residents? If not, why not?

Kingstream Resource NL has not directly sought advice from the Health Department of Western Australia on the potential impact of emissions as the atmospheric emissions modelling concludes that the ground level concentrations of all emissions will be significantly lower than internationally recognised criteria. These criteria have been developed by the World Health Organisation (WHO) and the National Health and Medical Research Council of Australia (NHMRC). These are the organisations to which the Health Department of Western Australia would refer. The Health Department also has the opportunity to provide advice directly to the EPA should it wish to do so.

2.7 How does the proponent justify its understanding that the standards set by the Clean Air Society of Australia and New Zealand are applicable and appropriate for the GSP?

The ambient air quality standards for particulates of less than 10mm diameter proposed by CASANZ (1994) are proposed in the PER because they are the most recent and most stringent available.

2.8 Dust emission levels for the plant should be set (aimed to be) at zero. What dust levels will be set at the GSP?

It is not possible to achieve zero emissions of particulates from any plant even with the use of the most modern dust control technology such as is proposed for the GSP. The levels of dust emissions from the GSP are summarised in Table 6.1 of the PER. The total quantity from all sources is estimated at 35.4g/sec.

2.9 When the solid wastes are cooled with water are there any harmful gaseous wastes such as hydrogen sulphide emitted to the atmosphere? Has expert advice been obtained on this matter?

There will be no hydrogen sulphide gas emissions from the disposal of cooling water as the hot slag will contain very low levels of sulphur. The emissions will effectively comprise only water vapour (ie. steam).

2.10 Will the gases emitted from the plant, when mixed with gases from other industries, cause any harmful emissions?

What effects does the levels of CO_2 have on staff of the plant and neighbouring residents?

The modelling of atmospheric emissions described in Section 6.2 of the PER included emissions from the existing synthetic rutile plant at Narngulu as well as the proposed GSP. In addition, it was assumed that the levels of emissions from the synthetic rutile plant would be at the licensed maxima rather than the normal operating conditions. The modelling therefore considered worst-case scenarios. In all cases, the results of the modelling clearly demonstrate that the ground level concentrations of atmospheric emissions will be significantly lower than internationally recognised criteria.

The CO_2 emissions from the plant will not have any significant implications for workers or for neighbouring residents. The CO_2 is associated with the direct reduction plant and there are a number of these plants operating at various locations around the world. No adverse effects from either CO_2 or from carbon monoxide emissions have ever been recorded at any of these plants.

2.11 Has the proponent aimed to control SO_2 emission from the plant to WHO standards so as to avoid concerns for asthmatics?

The level of SO_2 emissions from the GSP will be very low with a predicted total of 0.45g/sec (Table 6.1 of the PER). This is so low that it can be totally discounted as having any potential implications for asthmatics.

2.12 It is understood that low NO_x burners are now normal industry practice and are commonly available. The EPA's view is that current technology can easily achieve lower emission limits than the NHMRC guidelines.

Does the proponent intend to use best practice technology to ensure that the emission of NO_x does not exceed the NHMRC guidelines?

See response to 2.4.

2.13 While an assessment has been made of atmospheric emissions of Kingstream's plant in combination with emissions from existing plants under normal working conditions, it is a matter of record that RGC experience considerable malfunction of atmospheric emission control mechanisms.

Under such circumstances, will atmospheric emissions comply with statutory standards?

The atmospheric emissions from the GSP will comply with the guidelines listed in the PER at all times. Kingstream Resources NL is not in a position to comment on whether other industries at Narngulu may exceed their licensed maximum emission levels. However, the atmospheric emissions modelling presented in the PER suggests that the licensed emission levels would need to be exceeded by a substantial amount in order for the maximum ground level concentrations to be higher than the criteria.

3. BUFFER ZONE

3.1 Does the proponent intend to secure a buffer zone around the project area? If not, why not, and if so, what considerations will be taken into account in order to ensure that the buffer zone protects the local residents from unacceptable environmental impacts associated with the project?

Why was there no reference made to recognised criteria and statutory requirements for buffer zones in the PER, particularly with respect to determining an appropriately sized buffer zone around the proposed plant?

In previous discussions with residents the proponent has indicated that it would purchase nearby properties as there is effectively no buffer zone around the proposed site. Will the proponent purchase these properties prior to construction commencing as a means of ameliorating potential impacts in the residents in question? If not, why not?

Kingstream Resources NL does not intend to secure a buffer zone around the site of the GSP as the noise modelling and atmospheric emissions modelling for the PER concludes that there is no technical requirement for such a buffer. That is, the noise levels and ground level concentrations of atmospheric emissions beyond the plant boundaries will comply with all generally accepted guidelines, criteria and regulations. The criteria that are often used for determining appropriate buffer zones in the planning of industrial estates therefore are not relevant in this particular instance. There are no statutory requirements for buffer zones.

However, Kingstream Resources NL recognises that it is not optimal for people to live close to major industry even if that industry can meet all of the statutory requirements relating to noise and atmospheric emissions. Kingstream Resources NL has therefore initiated discussions with people who live close to or own property near the proposed site of the GSP and has indicated a willingness to purchase their properties provided that a reasonable price can be negotiated. It has indicated a willingness to complete these purchases within a relatively short period following the approval of the project by the Minister for the Environment.

4. WATER REQUIREMENTS

4.1 Clarification is requested in relation to the GSP's annual water requirement of 13600kL/day or 4.5 million kL/year as stated in the PER. Assuming that the plant will operate for 365 days/year, a daily requirement of 13600kL/day equates to 4.96 million kL/year. Can an explanation for this discrepancy be provided?

Has the proponent confirmed with WAWA that the sustainable yield of groundwater from the Allanooka borefield is in fact 28.7 million kL/year as stated in the PER?

Does this figure refer to the Allanooka borefield specifically or to the Allanooka Subarea, which is much larger?

Does the proponent have contingency plans in place if WAWA is unable to supply the required amount of water for the steel plant?

Have alternative sources of potable/brackish water been investigated? If not, why not?

The estimate of the annual requirement for water is based on 330 operating days each year rather than 365.

WAWA has confirmed that the water requirement can be met from Allanooka but that the borefield will have to be expanded. Discussions have been held between Kingstream Resources NL and WAWA to determine the works program necessary to

establish the water supply. The company also intends to carry out its own exploration program to determine whether any brackish groundwater resources are available closer to Narngulu. The use of a closer water supply would result in significantly lower operating costs for the steel plant. It is intended that this exploration program will commence in 1996.

5. GROUNDWATER CONTAMINATION

5.1 The proponent has indicated in the PER that the disposal of saline wastewater by spraying it onto hot slag contained within a lined pit will not result in groundwater contamination. However, at some stage this pit will need to be emptied and the contaminated slag within it will need to be temporarily stored elsewhere prior to being transported back to the mine site.

Has the possibility of groundwater contamination occurring as a result of rainwater leaching salt from the slag in this particular situation been examined by a hydrogeologist? How will it be prevented?

Groundwater contamination could occur at the transfer facility north west of Mullewa and at the mine site at Tallering Peak as a result of rainwater leaching salt from the slag that would be stored at both locations. Has this possibility been examined by a hydrogeologist? How will it be prevented?

The salt-contaminated slag in the evaporation pit will be removed periodically by front end loader and will be placed immediately into trucks or rail wagons for backhaul to the mine site. If rail wagons are used, the salt-contaminated slag will be placed in a specifically bunded location at the transfer facility north of Mullewa from where it will be directly loaded onto trucks.

This system of handling the contaminated slag will ensure that there is absolutely no possibility of groundwater contamination either at Narngulu or at the transfer facility.

6. SOLID WASTES

6.1 The PER indicates that slag will be transported back to the mine site. How will the "highly toxic slurry" be disposed of? What effect will its disposal have on groundwater supplies?

The solid wastes associated with the GSP are documented in Section 6.7 of the PER. There is no "slurry" and none of the solid wastes can be considered as toxic.

6.2 What quantity of solid wastes will be stockpiled on site at any time? Will the stockpiles have any dust impacts?

The solid wastes will be removed from the GSP site on a regular basis as they are produced. For example, it will be possible to load slag from the plant on a daily basis into trains for transport back to the mine site. Therefore, it is considered that the total quantity of waste stockpiled on the site at any time will not exceed 2,500 tonnes. The stockpiles will not be associated with any dust as the primary wastes are heavy materials which will not be prone to atmospheric dispersion.

6.3 How does the proponent intend to control fugitive dust emissions from trucks transporting waste slag back to the mine site?

There will be no fugitive dust emissions from waste slag as the material will generally have a particle size which is too heavy for atmospheric dispersion.

7. TRANSPORT OF MATERIALS

7.1 In section 7.2.4 of the PER, environmental and social issues considered along the transport route are confined to the impacts on housing and residents. No mention is made of the potential impacts on flora and fauna during upgrading and operation of this transport corridor. Has the proponent considered these impacts? Why has the proponent not discussed these impacts in the PER? How will the proponent prevent potential impacts from occurring?

The upgrading of the road system may include widening and the redesign of certain intersections. Kingstream Resources NL considers that all of these works can be contained within existing road reserves and it should not be necessary to disturb any natural vegetation or fauna habitats along the routes. The potential impacts were not discussed in the PER for this reason.

7.2 It has been stated that the ores to be processed will be transported as a "dust" and hence could escape into the winds, which for this region can be very strong and gusty at times. Dust emissions could also become a problem during loading and unloading of the ore as the unloading area is within 500m of the Narngulu townsite and within 250m of a certain residence within the Industrial Zone to the east on Rudds Gully Road.

What controls does the proponent intend to implement so as to avoid unacceptable impacts associated with the above operations?

All transport of iron ore from the mine site will be in covered trucks or covered rail wagons. The material will be sprayed with water at the transfer facility north of Mullewa if necessary to mitigate dust. At the GSP the rail wagons will bottom dump into a hopper and the ore will then be transported by covered conveyor into a covered stockpile. All other ore handling at the GSP will also use enclosed equipment in order to control dust emissions. The control of dust will be a management priority and the level of dust emissions predicted in the PER is considered to be readily achievable.

7.3 How will the proposed operations affect the current level of traffic and related noise impacts at and around Geraldton and Narngulu?

How does the proponent intend to address these issues as well as the issue of dust impacts due to traffic activities?

An increase in the level of traffic in the Narngulu region could result in an increase in risks and hazards associated with the transportation of materials to and from the project area. If this were the case, how does the proponent propose to address the issue of traffic hazards and the associated risks involved?

It has been stated that the Shire of Greenough has agreed that the road junction at Rudds Road and Kemp Street is inadequate for large traffic movements, as is presently occurring. Should this intersection become a major traffic hazard if the project were to proceed, would the proponent seek to be involved in undertaking modifications to make this intersection safe?

The level of road traffic associated with the GSP is documented in Section 7 of the PER. It is proposed that the traffic will travel along Rudds Gully Road, Brand Highway, Portway and Marine Terrace to and from the Port of Geraldton. The maximum number of truck movements will be in the order of 18/hr or one truck passing each way along this route every six minutes.

The implications of this additional traffic on the road system and the need for road improvements such as intersection work, road widening and resurfacing is a matter that will need to be determined by Kingstream Resources NL in association with the Main Roads Department, the City of Geraldton and the Shire of Greenough. Preliminary discussions on these improvements have commenced and it is expected that road planning will become a priority immediately following the approval of the project by the Minister for the Environment.

It is expected that the additional traffic will not significantly affect the level of noise along most of the route except Rudds Gully Road between Goulds Road and Brand Highway.

There will be no dust impacts due to road traffic as the trucks will either be carrying materials which are not liable to generate dust or will be covered.

7.4 **One of the major concerns of Narngulu residents living along Rudds Gully Road is the fact that the project will see large haulage lorries passing along this road, "once every four minutes, day and night, for almost three years during construction. This does not take into account the additional traffic associated with construction workers and other services." Residents currently experience constant vibrations, together with exhaust emissions and dust when the trucks pass their houses. Does the proponent believe that these concerns are justified? If not, why not, and if so, how does the proponent intend to address such impacts on local residents?**

The truck movements on Rudds Gully Road will all occur between Goulds Road and the Brand Highway. They will therefore not affect people living in the Narngulu townsite or along Rudds Gully Road between Walkaway Road and Goulds Road.

There are only a few houses near Rudds Gully Road to the west of Goulds Road and Kingstream Resources NL intends to address any issues which may be associated with traffic noise through direct discussions with the people who may be affected.

7.5 **One of the proposed routes for products is the Brand Highway. How would this affect the homes in the Tarcoola, Wandina, Tarcoola Beach, Ocean Ridge, Sovereign Waters and future development in the area?**

The additional truck traffic associated with the GSP will not affect the level of service of Brand Highway. Therefore there should be no effect on people living in any of the locations along the highway. The need for improvements to the highway such as widening will be discussed with the Main Roads Department, the City of Geraldton and the Shire of Greenough.

7.6 **A suggested option for transportation of products to port is to re-route north-bound heavy traffic and Kingstream traffic by building a new road east of the Tarcoola hill, on the ample unused land available. Does this seem a viable option for the proponent to pursue? Why?**

The truck traffic between the GSP and the Port of Geraldton will use the most direct route available for heavy traffic as this would reduce transport time and operating costs.

7.7 A key potential impact on the City of Geraldton is the proposed haulage route from the GSP along Brand highway and Portway to the port. The key impacts/issues due to this are noise, safety for motorists, cyclists and pedestrians, and severance caused by volume and frequency of truck movements. Has the proponent considered the possibility of limitation of days/hours of cartage?

Options for scheduling transport between the GSP and the Port of Geraldton will be subject of discussions between Kingstream Resources NL and the Main Roads Department, City of Geraldton and the Shire of Greenough. The need for road improvements and the responsibilities for those improvements will also be determined through these discussions.

7.8 Could the proponent elaborate on the impacts of anticipated additional traffic flow due to staff and service vehicles to and from the plant and what routes will be taken, ie number of shift workers, shift change times, other vehicles servicing the plant?

The GSP will probably operate on a 3 x 8 hour shift basis, ie. midnight to 8.00am, 8.00am to 4.00pm, and 4.00pm to midnight. The number of workers during each shift will be virtually the same and will be in the order of 150 people. It is probable therefore that about 100 private vehicles will travel to and away from the plant for each shift change. The main routes taken will probably be along Brand Highway and Rudds Gully Road or from the north along the Walkaway Road. The number of other vehicles servicing the plant is likely to be relatively few compared to truck movements to and from the Port of Geraldton.

7.9 Could the proponent elaborate on the types of trucks required to cart products from port to the GSP, the frequency, the nature of solid inputs, storage locations and the impacts related to all of the above?

It is probable that the majority of trucks used to transport materials between the GSP and the Port of Geraldton will be semi-trailers with a maximum carrying capacity in the order of 20 tonnes. However, it is possible that heavier vehicles may be used for some cargoes if these are deemed suitable by the relevant road transport authorities. Steel product will be transported in heavier trucks although these will probably be semi-trailers which are designed to take very heavy loads.

The predicted number of trucks involved in this transport is described in Section 7.3.1 of the PER and will involve a maximum average of 18 truck movements per hour over a 12 hour day. The solid inputs are described in Section 5.2 of the PER and include scrap steel, quick lime, alloys, hydrated lime, carbon, limestone, refractory bricks, and some other materials. The handling, storage and loading of these inputs at the Port of Geraldton will be determined by the Kingstream Resources NL in association with the Geraldton Port Authority.

7.10 Has the proponent considered the feasibility of using rail carting between the port and GSP?

Kingstream Resources NL has considered the feasibility of using trains to cart steel and other materials between the Port of Geraldton and the GSP. However, the use of trains over such a short distance is not considered to be practical given the loading and unloading times and the difficulties of materials handling at the port end.

8. PROJECT LOCATION

8.1 There is a need to resolve the future of the Narngulu Townsite which is currently zoned Single Residential in the Shire of Greenough's Town Planning Scheme No. 4. The existence of residential land uses in proximity of the proposed steel mill is undesirable. How will the proponent address this important issue?

Kingstream Resources NL has initiated discussions with the owners of land immediately adjacent to the proposed steel mill site and has offered to purchase these properties subject to the project proceeding and agreements regarding valuations. The company has taken this initiative because it considers that it is undesirable for present and potentially future residents to live in close proximity to the steel mill. It does not consider however, that the purchase of these properties is necessary in order to establish a buffer zone around the plant as acceptable noise levels and ground level concentrations of atmospheric emissions can be achieved within the plant boundaries.

Kingstream Resources NL considers that the proximity of the Narngulu Townsite to the industrial estate is not optimal in terms of strategic planning although the townsite does not present any environmental issues in terms of the steel mill operations. It considers that the future of the townsite is a matter for the State Government to resolve.

8.2 Has the proponent considered alternative sites for the Plant (eg Moonyoonooka, Eradu etc), and if so why have these not been considered suitable?

Of the 7 locations shown in the PER, Tallering Peak should be considered the ideal choice. The costs of extending the rail link from Mullewa to Tallering Peak could be offset by eliminating the need for road trains between the mine site, Mullewa, Narngulu and the port. The ore could be mined and processed on the spot and the products railed directly to the port.

Does the proponent see this as a better alternative? Why?

It has been stated that Kojarena is an ideal location for a heavy industry site, mainly because it is located 30-32km east of Geraldton. Has the proponent considered this site as a viable alternative? If not, why not?

Kingstream Resources NL evaluated seven locations for the Geraldton Steel Plant before selecting the Narngulu Industrial Estate. Information on the evaluation of alternative sites is provided in Section 3 of the PER. Narngulu was selected as the preferred site because it offered substantially lower establishment and/or operating costs than all of the other locations except one, and because land already zoned for heavy industry is available there. The time required to secure and rezone land elsewhere close to Geraldton could severely affect the viability of the proposal.

Tallering Peak is not suitable as a location for the steel plant as the cost of supplying the necessary infrastructure to this location would be very substantial. The transport costs would also be higher if the steel plant were located at Tallering Peak as there is a higher cost in transporting steel than iron ore.

Kojarena was not considered as a possible location for the steel plant but it is equivalent to Eradu which was evaluated. Such locations to the east of Geraldton may provide lower establishment costs as they are relatively close to the Dampier to Perth Gas Pipeline but they would involve significantly higher operating costs. More importantly,

land zoned for industrial purposes is not available at any other location apart from Narngulu, as stated above.

8.3 Is the proponent aware that the establishment of the GSP at Narngulu will leave no other areas immediately available for secondary industries which may develop from the introduction of the steel plant?

Kingstream Resources NL is aware that the GSP will take up most of the currently available land within the Narngulu Industrial Estate. However, some of the land which it intends to acquire from LandCorp will not be required for the initial steel plant and it is the intention that this be used for further downstream processing as opportunities develop in the future. The company has also initiated discussions with small landowners within the Industrial Estate with a view to acquiring these properties. This land will also be available for secondary industry should there be a requirement.

Finally, Kingstream Resources NL has had discussions with the Shire of Greenough, Department of Resources Development (DRD) and LandCorp on the subject of further industrial development at Narngulu and it is understood that Government Agencies are considering further land acquisitions in the area.

9. VISUAL IMPACTS

9.1 In light of the fact that no buffer zone has been proposed for the site, how does the proponent intend to address the issue of visual impacts of the project, especially in relation to smoke plumes emitted from plant stacks?

The PER documents the recognition of the visual impacts of the GSP on the appearance of the area. However, residents have expressed concern over the fact that such impacts are regarded by the proponent as being acceptable on the basis of there being few people living in areas affected by this. Does the proponent feel this concern is justified? Why?

What assessment has been made for light emissions impacting on residential houses, particularly those situated on or close to boundaries of the plant?

What measures are planned for the attenuation of light emission beyond the boundaries of the plant?

The visual impact of the GSP will be significantly reduced due to screening by surrounding industries, existing topographic and vegetation, and by landscape treatments. These matters are discussed in Section 6.8 of the PER. The only plumes which are likely to be visible will comprise water vapour (steam).

The development of a buffer zone around the GSP would not promote any further benefits in terms of reducing the visibility of the plant.

It is generally the case that a visual impact which affects a large number of residents is considered to be more significant than an impact which affects only a few. The comment is made in the PER, therefore, that the GSP will not have any significant visual impact partly because it will only be visible from a few nearby residences. It is recognised, however, that the visual intrusion at some of these residences could be significant. Landscape treatments are proposed in order to reduce this potential impact.

Kingstream Resources NL has also commenced negotiations with the owners of all of the properties from where the plant will be visible and has indicated a willingness to purchase their land provided that satisfactory commercial arrangements can be negotiated. If this initiative is successful, the issue of visibility of the GSP will not arise.

It is also recognised that light spill from the plant could be significant as it will continue to operate at night time. However, it needs to be recognised that there are existing light emissions from the major industries which are already operating in the southern part of the Narngulu Industrial Estate and that the GSP will become part of this light environment. Measures designed to reduce the light emissions will also be adopted, including the shrouding of major spotlights and floodlights. Again, the purchase of nearby properties will eliminate this potential issue altogether.

10. GERALDTON AIRPORT

10.1 The intention of the local Greenough Shire is to expand the Geraldton Airport to promote the region as a training ground for overseas pilots. This will lead to an increase in air traffic in the vicinity of the plant.

Can the proponent comment on the potential for aerial accidents due to plant structures eg chimney stacks?

All of the structures associated with the GSP are considerably below the altitude at which aircraft can be expected to operate around Geraldton Airport either for standard aviation or for training purposes. It is considered that the potential for an aerial accident due to the plant structures is extremely remote and is not significantly different from the risk posed by existing industries.

10.2 The likely impacts on the operation of the existing airport and proposals for its expansion/upgrading have not been adequately dealt with, particularly as the airport has previously been considered as the major obstacle for expansion of the Narngulu Industrial Area. Has the proponent considered these implications, and if so, how will any potential impacts be eliminated?

Kingstream Resources NL considers that the steel mill should not constrain the operation of the existing airport nor any proposals for its expansion or upgrading. This position is based on advice received from specialist consultants in aviation and airport requirements. The company is not aware of any reason why the airport should unduly constrain the expansion of the Narngulu area.

10.3 The PER states that the Civil Aviation Authority of Australia (CAA) considers that the proposed steel plant would be an obstacle to Geraldton Airport operations. How does the proponent intend to address this potential conflict of land use if the CAA objects to the structure after it is built?

Kingstream Resources has sought advice from specialist consultants and from Civil Aviation Authority (CAA) on the implications of the steel plant to aviation operations at Geraldton Airport. To date, the advice received is that the steel plant should not give rise to any significant limitations on aircraft operations. The company therefore considers that the potential conflict referred to in this submission is most unlikely to eventuate.

11. GERALDTON PORT

11.1 The PER does not indicate the intention or possibility of importing or exporting iron ore through the Port of Geraldton. Can it be confirmed that this will not occur?

At this stage, there is no intention to import or export iron ore through the Port of Geraldton. If such a possibility arises in the future it will be referred to the EPA as a separate proposal.

11.2 No mention is made in the PER of the potential impacts on the environment from changes to port infrastructure as a result of the Geraldton Steel Plant. Has the proponent given consideration to this point of concern?

Exports and imports through the Port of Geraldton associated with the GSP will use either berth No. 5 or No. 6 in the existing harbour. Transport to and from the port will be by road and the level of traffic may make some road improvements desirable. However, the increase in port operations, the level of truck transport and any road improvements are not considered to have any significant environmental implications apart from noise levels along certain sections of Portway if truck transport occurs routinely at night. These localised elevated noise levels are likely to be occurring at present from existing traffic. The management of noise is therefore considered to be a matter for relevant State Government Agencies, the City of Geraldton, and certain port users to resolve.

12. SOCIAL IMPLICATIONS

12.1 A major concern amongst residents living in close proximity to the proposed plant is the effect that the project will have on the value of properties at Narngulu. Would the proponent agree that a consequence of siting the GSP at Narngulu would be a devaluation of properties in the region? If not, why not, and if so, does the proponent feel obligated to compensate affected residents?

Kingstream Resources NL does not agree that the siting of the GSP at Narngulu will lead to a devaluation of properties in the region. The Narngulu Industrial Estate has been zoned for industrial purposes for many years and all prospective purchasers of land in the region will recognise that the estate is the location of existing major industries and that further major industries are likely to want to establish there. Indeed, a number of the residential properties at Narngulu are on land which is zoned for General Industry. On the contrary, it is considered that the value of properties at Narngulu is likely to increase over time due to increased demand for industrial land. There will also be people who wish to live close to their place of employment.

12.2 How will the plant operations directly/indirectly impact upon the established cray-fishing industry off Geraldton?

The plant operations will have no direct or indirect impacts upon the cray-fishing industry of Geraldton. The site of the steel mill is remote from the coast and the steel mill will not be associated with any discharge of waste material or emissions which could affect the marine environment.

12.3 Could the proponent comment on the potential effects of establishing further heavy industry near Geraldton on the tourism and the employment it provides for "Mid-Westerners"?

Kingstream Resources NL considers that the development of further heavy industry near Geraldton is not likely to have any negative impact on tourism provided that industry complies with all of the relevant environmental guidelines and criteria. In fact, tours of heavy industry facilities can provide an additional component to the attractions of the region to tourists. This is exemplified in the Pilbara Region where many tourists visit the iron ore operations as well as the many scenic attractions of the area. The growth of tourism and the development of industry are not incompatible and there is absolutely no reason why the Mid West Region should not benefit from both.

13. OTHER ISSUES

13.1 Certain residents have expressed their concern about not being adequately informed of the siting of a major steel production plant at their door-step and the related impacts upon their quality of life once the plant was commissioned.

Does the proponent feel that the residents of Narngulu were adequately consulted/informed about the possibility for the area to become a major industrial estate, prior to their settling at Narngulu?

A summary of the meetings which Kingstream Resources NL has initiated in the Mid West Region to date is provided in Section 1.7.2 of the PER. At least four meetings were held with the Council of the Shire of Greenough between August 1994 and August 1995 and three meetings specifically with residents of Narngulu. The company has also had several meetings with individual residents at Narngulu to discuss their own particular concerns.

A Notice of Meeting was provided to all householders in the Narngulu area for two of the meetings which were held at the Shire of Greenough. At the second of these meetings, just prior to the release of the PER, only six people attended.

13.2 Does the proponent intend to consult widely with the community on issues relevant to the proposal and the potential impacts on local residents and their lifestyles?

Kingstream Resources NL intends to continue its public consultation program throughout the life of the project and will liaise with the Shire of Greenough and with local ratepayer groups or resident groups as part of this program.

13.3 It has been stated that the proponent's investigations into the environmental impacts resulting from the proposal via computer modelling, research data, analysis of results, etc, has been conducted so as to reach desired outcomes, eg buffer zones becoming low priority. How does the proponent respond to this comment?

It is correct that environmental considerations have been an important component of the planning of the GSP. It is considered that this approach has led to the plant having an improved environmental performance than otherwise may have been the case. However, the environmental design only involved such matters as the inclusion of comprehensive dust control measures and arranging the plant layout to reduce noise emissions. There has been absolutely no manipulation of computer modelling, research data or analysis of results in order to reach desired outcomes. All of these types of studies have been carried out independently by expert consultants.

13.4 Why is there no risk assessment for the proposed GSP project?

In the absence of a risk assessment, what is the proponent's basis for claiming that there is no need for the provision of a buffer zone?

What assessments have been made of risks arising from unexpected major plant breakdown resulting in mass release of atmospheric contaminants, explosions or fire?

What assessments have been made of risks arising from malfunction of adjacent plants?

The PER does not include a risk assessment as it is generally recognised that steel plants of the type proposed are not associated with significant levels of public risk. This is reflected by the fact that the EPA did not require a risk assessment in its guidelines for the PER. Nevertheless, risk management will be an integral part of the detailed design of the GSP and Kingstream Resources NL will meet the requirements of all relevant Government Agencies with respect to risk management at that time.

13.5 Radio Frequency

What level of Radio Frequency Interference (RFI) is expected to be radiated from the proposed Plant? What are the frequencies at which this radiation will predominate?

Could you provide information on other sources of RFI, eg radios used for communication or control?

What measures will be taken to screen such radiation?

Steel plants of the type proposed are not known to be associated with radio frequency interference. A number of such plants operate around the world and several are within or very close to suburban areas. As far as Kingstream Resources NL is aware, no interference has been associated with any of these plants. For example, an electric arc furnace is part of the Rooty Hill Steel Plant operated by BHP in the western suburbs of Sydney.

13.6 Is the proponent aware that an Environmental Management Program should be prepared and submitted to the EPA for approval prior to commencement of earthworks?

Kingstream Resources NL is aware that an Environmental Management Program (EMP) for construction of the GSP will need to be completed and approved by the EPA prior to the commencement of earthworks. It is the intention that this EMP will be completed within two months of the date of approval of the GSP by the Minister for the Environment. At this stage, it is anticipated that earthworks will commence in July 1996 at the earliest.

13.7 Will results of monitoring of dust, gases and liquid emissions at the GSP be made public in regular media releases?

The results of all monitoring studies carried out by Kingstream Resources NL for the GSP and at the Tallering Peak mine site will be made public and will be available to the media.

13.8 Is the proponent aware that under a DEP operating licence, verification of predicted source emissions to ensure that there are no impacts due to atmospheric discharges is required of the proponent?

Kingstream Resources NL is committed to ensuring that all of its operations comply with the conditions of its environmental approval. This will include monitoring of all source emissions.

RESPONSE BY KINGSTREAM RESOURCES NL TO QUESTIONS RAISED BY THE SHIRE OF GREENOUGH ON THE GERALDTON STEEL PLANT PUBLIC ENVIRONMENTAL REVIEW

1. INTRODUCTION

The Shire of Greenough has indicated in principle support for the proposed Geraldton Steel Plant (GSP). At the same time, the Council and staff representing residents at the Shire of Greenough have prepared a detailed submission on the Public Environmental Review (PER) for the GSP prepared by Kingstream Resources NL. The purpose of the submission was to seek answers to "questions of concern to the Council and its ratepayers and to highlight areas which are considered to need further explanation, clarification or justification and to raise matters which the Council sees will require further negotiations with the proponent and commitment from them to ensure that such a project may take place in line with the Council's planning objectives".

The present document provides a response by Kingstream Resources NL to the questions raised by the Shire in its submission. As requested by the Shire, the responses comprise further explanation of the proposal and commitments to further negotiations to resolve matters which are not necessarily environmental in nature but which arise from the establishment of a major new industry.

In the text below the comments and recommendations in the Shire's submission are provided together with the responses from Kingstream Resources NL.

2. COMMENTS, RECOMMENDATIONS, AND RESPONSES

Issue 1:

2. The Geraldton Steel Plant (GSP).

The first paragraph on page iii states "It will also receive about 260,000 tonnes of other solid inputs per year including scrap steel, quicklime, limestone, alloys, refractory bricks, electrodes and other materials. The majority of these will be imported through the Port of Geraldton."

COMMENT: This raises a number of questions such as what are the frequency of deliveries from the Port, what types of trucks are to be used - it is assumed that the configuration of these trucks will be different from those that deliver the final steel coils - which route will these trucks be taking, what impact will they have on the existing roads and adjoining residential areas. It also raises the concerns as to how the scrap materials are to be stored on the site and what noise this will create and how such noise will be dealt with. The comment "other materials" raises some concerns - what are these materials and what impacts will they have.

RECOMMENDATION: It is possible that these points are covered further in the report however, the recommendation is given at this point to avoid omission in so much that it is recommended that further details be given by the proponent on the questions raised.

Response 1:

Transport details to and from the Port of Geraldton are provided in Section 7 of the PER. The maximum number of truck movements will be in the order of 18 per hour, 12 hours per day, 7 days per week. The proposed route is Goulds Road, Rudds Gully Road, Brand Highway, Portway and Marine Terrace. The discussion in the PER of the existing and predicted traffic levels on these roads concludes that the level of service on each road will not be affected by transport associated with the GSP. However, it is recognised that there is a need for road improvements in order to better accommodate the proposed truck traffic. Such improvements will include upgrade of the intersection of Rudds Gully Road and Brand Highway, possible increase in the width of Brand Highway, and possible increase in the width of Portway. It is also recognised that negotiations are required between Kingstream Resources NL, relevant State Government Agencies, the Shire of Greenough and the City of Geraldton in order to define the specific road improvement requirements and responsibilities for those improvements. It is the intention that these negotiations will occur following approval for the project from the Minister for the Environment.

At this stage, it is envisaged that conventional semi-trailers will be used for the transport of inputs from the Port of Geraldton to the GSP although heavier vehicles may be used for some bulk commodities if approved by the relevant authorities. The transport of steel to the port will require specially constructed trailers but the dimensions of the vehicles are not likely to differ significantly from those of semi-trailers.

Scrap steel imported to the GSP will be stored in a specific location which is identified in the PER. The steel will be unloaded into a lined pit below ground level and the pit will also be surrounded on three sides by a concrete wall or similar structure. The pit and walls are specifically included in the proposal for noise reduction purposes.

The "other materials" mentioned in the summary are all identified in the main text of the PER.

Issue 2:

3.1 Construction

The last line in the first paragraph states "there will be no impact on local groundwater which is generally about 24m below ground level"

COMMENT: This statement should be supported by detailed test results which would justify the depth and the quality of the water and protection methods to be introduced to substantiate that no impact will occur.

RECOMMENDATION: Again, it is possible that these points are covered in the report in further detail however to avoid omission it is recommended that details be provided by the proponent to substantiate this claim.

Response 2:

Subsequent to the preparation of the PER, an initial geotechnical assessment of the site of the GSP was made by Soil & Rock Engineering Pty Ltd. This investigation included drilling six boreholes to depths ranging from 10m to 25m below ground level. Piezometers were installed in three of these boreholes to enable ongoing collection of

data on groundwater conditions beneath the site. Shortly after installation in mid June 1995, the water table in these three bores was at 10m, 17m and 15m below ground level. On 1 July 1995, the groundwater levels recorded were 14.5m, 17m and 15.8m below the surface. Although these groundwater levels are higher than was predicted in the PER on the basis of other local data, there are no implications for groundwater contamination because the GSP will not involve the disposal of any liquid wastes through ground and all oil storage and similar facilities will be fully contained.

Kingstream Resources NL is prepared to install monitoring bores on the site of the GSP if required by the Minister for the Environment but it maintains that the potential for groundwater pollution is so low that such bores are not really warranted.

Issue 3:

3.2 Atmospheric Emissions

This statement should be supported by detailed data within the body of the report to substantiate this statement.

RECOMMENDATION: That details be provided by the proponent in the body of the report to substantiate this statement.

Response 3:

Details of atmospheric emissions are provided in Section 2 of the PER.

Issue 4:

3.3 Noise

This clause states "These maximum noise levels generally comply with existing and proposed environmental regulations."

COMMENT: The term "generally" appears to be loose in its usage and raises the question as to what does not comply and what is to be done about the non-compliance. The report covers this point in detail and further comment will be given at the appropriate section.

Response 4:

Comments on questions relating to noise are provided in subsequent sections of this document.

Issue 5:

3.4 Wastewater

This clause states "The waste stream will be sprayed onto hot slag to evaporate the remaining water leaving a salt residue on the slag."

COMMENT: It is known that traditionally the use of water to cool slag causes the release of odorous hydrogen sulphide gases. The body of the report should cover this point in detail.

RECOMMENDATION: That the report cover in detail the use of the wastewater to cool the hot slag and the release of gases from this process.

Response 5:

The evaporation of blow down water onto a component of the hot slag wastes will not generate significant quantities of hydrogen sulphide as there will be very little if any sulphur compounds in the slag wastes. Details of the composition of the slag are provided in Section 6.7.2 of the PER.

Issue 6:

This section also states "Effluent from the sewage treatment plant will be sterilised and the water used for trickle irrigation of the shrubs and trees on the boundaries of the lots."

COMMENT: It is important that the report covers this point in detail in relation to the method of treatment and the possible effect on the ground water situation.

RECOMMENDATION: The report is to contain details on the methods of treatment of the effluent sewerage intended to be used on the trickle irrigation of plants and trees at this site, and the proponent build in some monitoring of the treatment system to ensure that acceptable levels are maintained for this proposed use.

Response 6:

The specific sewage treatment system has not been selected at this stage. However, it is envisaged that a system equivalent to the bioMAX process will be used. This system involves anaerobic and aerobic treatment of the waste followed by chlorination and with the further option of ultra-violet light treatment. The treated effluent from the system meets the stringent standards set down by the Health Department of Western Australia for above ground disposal of wastewater by sprinkler irrigation on landscaped and garden areas. Further details will be provided to the Shire when a preferred system has been selected by Kingstream Resources NL. It will be appropriate to discuss monitoring requirements at that stage.

Issue 7:

3.5 Solid Waste

This clause in part states "Most of the slag will not be contaminated with salt and may be used as road base or may be disposed of at the mine site if a use cannot be found for it."

COMMENT: This issue needs to be talked through further with the Shire of Greenough to ascertain its suitability for road base and the method of stockpiling the material use.

RECOMMENDATION: That the proponent negotiates further with the Shire of Greenough to ascertain the acceptability of the solid waste as a road base material.

Response 7:

Kingstream Resources NL is very keen to find a productive use for the slag wastes and intends to continue to explore its potential as road base.

Issue 8:

This section also states "CSP Plant sludge and sewage treatment plant sludge will be disposed of in designated landfill areas."

COMMENT: Further details will need to be provided on this matter to ascertain the quantities to be deposited, the types and composition of the sludge and any problems from the environmental point of view in relation to the use of landfill sites. There is also a need to ascertain the most suitable site for such disposal.

RECOMMENDATION: That the proponent undertake further investigations with respect to the disposal of the CSP plant sludge and sewage treatment plant sludge and in particular define the quantities, types and composition of the material and the suitability of the disposal site for the materials to be deposited.

Response 8:

Kingstream Resources NL intends to investigate further the composition of the GSP plant sludge during the detailed design phase. This material has been designated for landfill disposal because it will contain residual quantities of hydrocarbons. However, the level of hydrocarbons may be quite low and it may be possible to treat the material in some way prior to disposal. Full details will be provided to all relevant State Government Agencies and to the Shire of Greenough in any application for landfill disposal. Alternatively, it is possible that these wastes may be entirely suitable for disposal within the waste dump at the Tallering Peak mine site.

Issue 9:

3.2 Geraldton Airport

The comments made in this section do raise some concerns in relation to the current and continued operation of the Airport and as such these points will be raised in detail in relation to the relevant section of the report.

4. Transport

This section states in part "In this case, the number of truck movements is estimated at 12 per hour, 12 hours per day, 7 days per week or 6 per hour, 24 hours per day, 7 days per week.

COMMENT: The concern is that both options are available and as they each have differing impacts on the amenity of the areas through which the vehicles pass it is difficult to determine adequate conditions to cover both options.

RECOMMENDATION: The Proponent should be requested to determine more precisely the option to be used, or the frequency of each option if both are to be utilised at differing times and the impacts of each of the surrounding areas. It is also recommended that the Council, in conjunction with the Proponent and other relevant parties, should actively pursue the construction of the Southern transport corridor to the Geraldton Port as a matter of high priority in order to a alleviate any detrimental impact from the increased traffic numbers on the residential areas adjoining the proposed transport route as defined in the report.

Response 9:

It is not possible at this stage to determine whether haulage operations will occur continuously or be restricted to 12 hours per day. However, it is considered that product is likely to be hauled to the port on a 12 hour daily basis and stockpiled at the port pending shipment. Imports through the Port of Geraldton are likely to be campaign hauled on a 24 hour basis until the full cargo has been discharged. In determining the potential implications of road transport, it has been assumed that the maximum truck

levels of 18 truck movements per hour based on a 12 hour day operation will apply. This in effect presents a "worst case" scenario.

Issue 10:

This report also states "The combined truck movements to and from the Port of Geraldton will not reduce the level of service of the roads involved although some improvements will be required".

COMMENT: There is some concern from Council as to the impact that this development will have on the safety and serviceability of roads in the immediate area of the Steel Mill and the proposed transport route to the Port. This matter will be discussed in detail in relation to the specific section of the Report and specific recommendations offered at that point in this submission.

Response 10:

See Response 1 above.

Issue 11:

This report also states "Noise levels from the overall increase in traffic on Portway including truck movements associated with the GSP are also likely to exceed recognised standards at some residences close to the road."

COMMENT: It is considered that the effect of traffic noise will not only be detrimental to residential areas close to Portway but will also have a detrimental effect on the residential areas and residences all along the proposed route.

RECOMMENDATION: It is recommended that the Council in association with the Proponents and other relevant parties should actively pursue the construction of the southern transport corridor to the Geraldton Port as a matter of high priority in order to alleviate any detrimental impact from the increased traffic numbers on the existing residential areas adjoining the proposed transport route as defined in the report.

Response 11:

Kingstream Resources NL endorses the proposal for a southern transport corridor to the Port of Geraldton. The company's position is that while the existing road system can sustain the level of traffic associated with the GSP, better access to the Port of Geraldton would be a major benefit to port users in general and to the general public. However, the company considers that the determination of regional road systems is a matter primarily for Government and Local Authorities to determine.

Issue 12:

5. Social Implications

COMMENT: The question is raised by this clause with respect to the effect of such an influx of temporary people into the region on the existing Tourism industry. It is critical that the use of the existing accommodation facilities within the immediate region are not used to the detriment of tourists. It is considered that if this was allowed to happen then the long term effect on the tourism industry for the Geraldton/Greenough region would be detrimental.

RECOMMENDATION: That the proponent liaise closely with the Shire of Greenough and the City of Geraldton to address the effects that such an influx of temporary

workers will have on the Tourism industry in this region and develop a strategy to house these workers in such a way as to not be a detriment to the Tourism industry and in such a way as to further enhance the accommodation facilities for future tourist usage.

Response 12:

Kingstream Resources NL is committed to liaising closely with the Shire of Greenough and the City of Geraldton on the management of the construction phase of the GSP and in particular, on the provision of accommodation and services for the construction workforce. At this stage, the company considers that it will be necessary to establish a construction camp either on the site of the GSP or at another suitable location nearby given the large number of workers which may be involved. This is a matter which cannot be fully determined at this stage because it will involve major construction contractors and these have not yet been selected.

Issue 13:

Figure A - Geraldton Steel Plant Summary of Inputs and Outputs

COMMENT: It is realised that the diagram is representative of the inputs and outputs in relation to the Steel Mill operation in the most simplistic form however, it is considered that the breakdown of the category of "Other Solid Inputs 12,420t/yr" should be listed in detail in order to clearly explain the types of products being imported to the site. It is also considered that the quantities of SO_2 should be spelt out in actual figures rather than negligible. These points are suggested in this manner as it is considered that the Figure will be an easy way for the general public to comprehend the total picture in one viewing and as such should raise no major questions by having items omitted.

RECOMMENDED: That the Figure A contained within the PER be amended to spell out in full the actual amounts and types of "Other Solid Inputs" and remove the work "negligible" next to SO_2 and insert the actual amount of SO_2 output.

Response 13:

All inputs to the GSP are itemised in Section 5 of the PER. The SO_2 emissions from the plant are specified in Section 6.2.5 of the PER and will total an estimated 0.45gm/sec. In contrast, the licensed maximum SO_2 emission from the existing synthetic rutile plant at Narngulu is 55gm/sec (i.e. more than 100 times higher than the total emissions from the GSP).

Issue 14:

The second paragraph of the report states "significant export earnings" and "these earnings will be substantial and will be among the highest for any single industry in WA."

COMMENT: It is considered that actual amounts and comparisons with other industry earnings should be included into the report to place this proposal into a better perspective in relating to other industry in the State.

RECOMMENDATION: That the report be modified to give comparative figures with respect to actual earnings in relation to other industries in the State in order to place the economic importance of this application into a better perspective.

Response 14:

Kingstream Resources NL did not provide further details of the benefits of the project in the PER because it did not consider it appropriate to emphasise these benefits in a

document which is intended to specifically deal with environmental considerations and performance. However, a more detailed explanation of the economic implications of the project is currently being prepared and will be provided to the Shire of Greenough when it becomes available.

Issue 15:

The fifth paragraph on Page 9 indicates that the payment of rates to the Shire of Greenough will be an advantage to the Shire.

COMMENT: It is pointed out that the land presently does not attract rates and as the Shire currently uses the unimproved capital value system of rating the establishment of this proposal onto this land will have negligible effect on the rate revenue to the Shire.

RECOMMENDATION: That the proponent explain further how the proposal is of major benefit to the Shire of Greenough in terms of rate revenue when the land will only attract a small amount of rates.

Response 15:

Kingstream Resources NL had not considered the system of rating used by the Shire of Greenough in its understanding that it would be liable for the payment of rates. In this respect, the company expects to be treated in the equivalent manner to other industries located in the Shire. However, the company considers that the overall benefits flowing to the Shire from the establishment of the GSP will be substantial even if the rates payment continues to be relatively low.

Issue 16:

The seventh paragraph on Page 9 states "The peak construction workforce during the period will be approximately 1,200 people."

COMMENT: It is considered that the timing and duration of the peak workforce should be indicated more accurately in order that a better understanding of the impact of the development phase on such things such as traffic management, accommodation etc., can be made.

RECOMMENDATION: That the proponent be requested to indicated the workforce requirements at each stage of the development program in order that accurate assessment can be made on the impact of the development stage on traffic management issues and accommodation etc.

Response 16:

The staging of the construction workforce will be determined during the detailed design and planning phase for the GSP. This is expected to occur during the first half of 1996. Consultations with the Shire of Greenough, City of Geraldton, and State Government Agencies will occur at that time to ensure that the influx of people associated with the construction of the GSP is comprehensively managed.

Issue 17:

The last line on Page 9 of the report states "Direct employment 600"

COMMENT: This line is repeated on the top of page 10 however, the amount has not been included into the total on page 10.

RECOMMENDATION: The report should be amended to exclude the reference to "Direct employment 600" on page 9 as it is an obvious error.

Response 17:

The typographical error on the bottom of page 9 of the PER has been noted and will be corrected in any further editions of the document.

Issue 18:

The last paragraph on page 10 of the report states "The project will also provide improvements to infrastructure and services in the City of Geraldton and in the Shires of Greenough and Mullewa which will be of benefit to the general community."

COMMENT: It is agreed that the development will have a major impact on the existing infrastructure within the region and it will be necessary that the proponent will be required to contribute to the improvement of things which are directly affected by this application. However, it is considered that the proponent should specify what they intend to provide in the way of improvements specifically within the report. In the absence of these things being specified there should be a requirement for them to negotiate further with the relevant Local Authority to reach agreement for the types of improvements required on account of this application.

RECOMMENDATION: That the proponent be required to specify the actual improvements envisaged to the existing infrastructure and services within the City of Geraldton and the Shires of Greenough and Mullewa in the report.

Response 18:

Kingstream Resources NL considers that the improvements to infrastructure and services which will flow from the GSP will include identification and development of additional water resources, improvements to roads, provision of the capacity for additional electricity supply for either industrial or general use, and similar benefits which are likely to flow on from employment and redevelopment of support industries. These matters will be the subject of detailed discussions between the proponent and Local Authorities and State Government Agencies following approval of the GSP by the Minister for the Environment.

Issue 19:

4.2 Layout of the GSP

COMMENT: The last paragraph on Page 19 indicates that the proposed Steel Plant is to be located on a number of existing lots. A standard development requirement of the Shire of Greenough is that all development should be located on the one title.

RECOMMENDATION: That the proponent be required to amalgamate all the parcels incorporating the total development into one lot to ensure that all the development is contained on the one parcel of land under the one ownership.

Response 19:

Kingstream Resources NL is prepared to amalgate the lots comprising the site of the GSP and to comply with the requirements of the Shire of Greenough.

Issue 20:

4.4 Pellet Plant

COMMENT: In paragraph two of item 4.4 on page 20 the proponent refers to a "ball mill" - some concerns are raised as to the noise emanating from this part of the operation and whether it will be able to be controlled to an acceptable limit. The further chapters of the report do deal with the issue of noise and specifically highlight the levels from the individual components of the mill. It appears that the noise levels are acceptable overall, however it should be a requirement that the noise levels are contained to acceptable limits.

RECOMMENDED: That the proponent be required to meet the recognised acceptable noise levels for all parts of the operation of this steel mill in relation to noise affect on adjoining properties.

Response 20:

Kingstream Resources NL will comply with all relevant legislation and associated regulations pertaining to occupational and environmental noise levels.

Issue 21:

COMMENT: The last paragraph on page 21 of the report states "the hardened pellets, on discharge from the furnace, are transferred to a pellet storage stockpile." - It is unclear from reading the report whether these pellets are stored under cover or how they are transferred to storage and from storage to the next step in the operation. It is considered important that this point be covered in detail as it is to be located in close proximity to residential uses.

RECOMMENDATION: That the proponent be requested to clarify the total process in detail in relation to the storage of the hardened pellets i.e. explain how the pellets are stored and transferred to and from the storage position.

Response 21:

The iron pellets will be transported to and from stockpiles on covered conveyors. They will be loaded onto a conveyor from the stockpile by mechanical means such as front-end loader. The pellets are not considered to be a source of dust and therefore it will be possible to store them in an open stockpile area. However, Kingstream Resources NL will ensure that this stockpile is enclosed if any significant dust is associated with pellet handling.

Issue 22:

4.5 Direct Reduction Plant

COMMENT: In paragraph 6 on page 22 of the report is states "The hydrogen and carbon monoxide components of the reducing gas react with the oxygen in the pellets and lump ore to form water vapour and carbon dioxide respectively which are discharged through the top of the reactor with residual reducing gas." It is unclear from this report as to what the actual residual reducing gas consists of and whether it is of any concern to the amenity of the surrounding area.

RECOMMENDATION: That the proponent be requested to clarify the composition and quantities of the "Residual Reducing Gas" to be released to the atmosphere from the top of the reactor.

Response 22:

The residual reducing gas comprises carbon monoxide and hydrogen which has not combined with oxygen from the iron ore pellets to form carbon dioxide and water vapour. The quantities of these gases which are emitted to the atmosphere are not significant.

Issue 23:

4.6 Melt Shop
4.6.1 Electric Arc Furnace - EAF

COMMENT: In paragraph 8 on page 23 of the report is states "The meltdown of direct reduced iron and scrap steel in the EAF will occur in a basic environment as this process produces a cleaner and more consistent quality steel and assists in the removal of residual sulphur from the melt. It is unclear from the report whether the "residual sulphur" forms part of the slag referred to further in that same paragraph or is a separate product. Also it appears that the quantities of this residual sulphur are not listed in the report and whether they are a concern to the environment.

RECOMMENDATION: That the proponent clarify the situation with respect of the "Residual Sulphur" mentioned in clause 4.6.1 as to whether it forms part of the slag, how is it disposed of and the likely effect of this product on the environment.

Response 23:

The residual sulphur referred to may arise from scrap steel which is added to the melt. The reduced iron pellets which form the main part of the melt will not generate sulphur as there are no significant levels of sulphur compounds in the parent rock from Tallering Peak. The level of residual sulphur from the scrap steel will depend on the nature of the scrap steel used and will vary. This sulphur will be chemically bonded in the slag and will be at low levels. There is therefore no potential for environmental effects.

Issue 24:

COMMENT: Paragraph 4 on page 24 of the report states "The electrodes are raised form the melt, the furnace is tilted, and the slag poured out into a slag pot which is emptied by a mobile slag transporter into a slag stockpile." This raises the question as to whether the slag stockpile is a covered stockpile or not. Figure 9 in the report indicates that it is to be a slag "yard" - this suggests that it will be open. What provisions are to be taken in this process to ensure that a dust problem does not occur from this stockpile.

RECOMMENDATION: The proponent be requested to clarify whether the slag stockpiles are to be covered and if not, what measures are to be put in place to ensure a dust problem is not created by open storage. Also the quantities of the slag stockpiles are to be given in order that a better assessment of the impact these stockpiles will have on the surrounding area can be made.

Response 24:

The slag stockpile is likely to be open rather than enclosed. The slag is a glass-like substance with no potential for the generation of dust. The slag will also not be allowed to accumulate in significant quantities as it will be removed on a regular basis for disposal at the mine site unless a productive use for it can be found. In the latter case, a

specific slag stockpile area will be designated. There are no environmental implications associated with the storage, transport or disposal of slag.

Issue 25:

5. Inputs to the GSP
5.2 Other Solid Inputs

COMMENT: It is considered that the configuration of the trucks used to carry the steel coils will be of a different configuration to those that carry the scrap steel from the Port to the steel mill. Given that this is the case, it is felt that the introduction of 150,000t/yr of scrap steel alone through the Port will have a significant effect on the traffic flows along the proposed transport route. The proponent does not include the traffic quantities into the report for this or other solid inputs to the GSP.

RECOMMENDATION: That the proponent explain in more detail the anticipated traffic volumes needed to carry the solid inputs from the port to the steel mill in order that the full impact of the increase in traffic can be assessed by the relevant authorities.

Response 25:

See Response 1.

Issue 26:

5.3 Storage Requirements

COMMENTS: The last paragraph on page 28 states "The storage capacities are based on all solid inputs, other than iron ore, being delivered through the Port of Geraldton. It is possible once more detailed technical requirements area available and subject to suitable commercial arrangements, that some of the solid inputs may be obtained from within Western Australia and delivered to the GSP by road and rail. This applies particularly to scrap steel, limestone and lime products, and possibly refractories and some alloys. If these inputs are sourced in Western Australia, the storage capacities may be reduced."

It is considered important that there is a more detailed description given for the two scenarios as the impacts are somewhat different in the case of bringing the solids through the Port versus Road and Rail import. With such quantities coming into the plant some clearer indication as to the storage requirements on the site for each of these items is required.

RECOMMENDATION: That the proponent be required to detail the differing scenarios with respect to importing solid inputs through the Port of Geraldton versus the import by road and rail. Also the proponent be required to indicate clearly the on site storage requirements for the solid inputs once they are delivered to the site.

Response 26:

Kingstream Resources NL is not in a position to determine the exact storage areas required for solid inputs to the GSP as definite suppliers are yet to be selected. The assumption was made in the PER that all of the solid inputs will be delivered through the Port of Geraldton in order to develop a "worst case" road transport associated with large volume deliveries by ship. If some of the solid inputs are supplied from within Western Australia, then smaller quantities will be delivered to the GSP per unit time and fewer trucks will be involved.

The precise site storage requirements will be defined during the detailed design phase.

Issue 27:

Table 5.1

COMMENT: The table indicates that scrap is to be in an open storage yard. The concern with respect to this method is the potential for this to create an unacceptable level of noise during the delivery and moving around of the scrap steel. The report does not seem to cover this point in detail or how the issue is to be addressed.

The table also indicates that the slag is to be stored in an open stock pile. This raises two questions which are not detailed in the report and these are firstly, what size will the stockpile be at any one time and what impact will it have on surrounding properties. Secondly, it is assumed that the slag will be cooled at the point of the stockpile which if this is the case and given that the Proponent is intending to use water as a coolant, there is a potential for the emission of odorous hydrogen sulphide gases. What effect will this have on the surrounding properties and have alternate methods of cooling been explored, such as air cooling, which can minimise the odorous emissions and effectively eliminate odours beyond 500m from the handling point. What protection is to be offered for the ground from the leaching of water containing a high salt content.

RECOMMENDATION: That the proponent be required to provide various details sufficient to answer the concerns raised in the above comment.

Response 27:

The scrap steel will be delivered into a below ground lined storage pit and will be removed from the pit and transported to the melt shop by magnetic crane. The below ground storage will be surrounded by a concrete wall on three sides and all scrap handling will be restricted to day time operations. The scrap steel storage facility has been designed specifically to reduce noise to acceptable levels and is equivalent to the storage and handling methods proposed at the Rooty Hill Steel Plant in the western suburbs of Sydney.

The comments relating to slag have been answered in other responses above.

Issue 28:

5.4.1 Water Supply Alternatives

COMMENT: The second main paragraph under this heading on page 30 of the report states "Similarly, the use of seawater for cooling purposes would require the definition of a pipeline route for seawater uptake and discharge and consideration of the additional environmental factors which are involved.

RECOMMENDATION: That the proponent be requested to negotiate further with the Shire of Greenough and the City of Geraldton and other relevant authorities to actively pursue the introduction of the southern transport and service corridor from Narngulu to the Geraldton Port which could make provisions for such services as seawater pipelines, etc.

Response 28:

Kingstream Resources NL is prepared to co-operate with the Shire of Greenough and City of Geraldton in any approach to Government which could lead to the introduction of the southern transport and service corridor from Narngulu to the Port of Geraldton.

Hypothetically such a corridor could be used for seawater intake and discharge. However, Kingstream Resources NL considers that the use of seawater for cooling purposes and, in particular, the discharge of cooling water to the marine environment, is likely to be contentious. Therefore, it would prefer to use brackish or potable groundwater resources for cooling purposes.

Issue 29:

COMMENT: The third main paragraph under this heading on page 30 states "a recent draft Groundwater Management Plan prepared by WAWA indicated that the sustainable yield of the groundwater resources at Allenooka (sic) is 28.7Mm^3/y of which 8.5Mm^3/yr is currently used for public water supply. The GSP requirement is estimated at 4.5Mm^3/yr as described in Section 5.4.1...". This comment is given to place the scale of this proposal into some perspective and to indicate the impact this project will have on the future expansion of the Geraldton/Greenough region. Presently the water usage stated is for a population close to 30,000 people. It could be possible that the known water from this field will cater for a population of up to 70,000 people on current water usage and allow another project of this magnitude to be built in the region and draw water from the field. Already approaches have been made to Council to consider a similar project in the vicinity of Narngulu. It is considered that this type of development places a large responsibility on the Water Authority to seek expansion of the existing Allenooka Borefield or locate other sufficient and suitable water supplies to cater for the ongoing increase in development which will spin off from this type of project.

RECOMMENDATION: That the Water Authority of WA immediately instigate further exploration for water sources to cater for the supply of the Geraldton/Greenough region given the demands being placed on the existing water resources by the proposed developments in the region.

Response 29:

Kingstream Resources NL has commenced discussions with the Water Authority with the intention of developing an exploration program for new water sources closer to Narngulu than the present Allenooka borefield. The company would prefer to use a brackish groundwater resource if available, but at this stage needs to retain the option of using potable water from the Allenooka basin.

Issue 30:

6.1 Development of the Site
6.1.3 Noise

COMMENT: If the management measures are to include only the restriction of activities with high noise levels to daylight hours and a requirement that noise from stationary equipment does not exceed 85dB(A) at a distance of 1m it is considered that the Council will be left in a position to react to complaints as breaching these limits occur. As Council does not employ officers trained in noise monitoring at this point in time, it is felt that a more suitable arrangement should be put in place for the construction phase and the longer term to enable closer monitoring of the operation and development phase to take place.

RECOMMENDATION: It is considered that the proponent should contribute to the cost of a suitably qualified officer to be employed by the Shire of Greenough to undertake an ongoing monitoring program with respect to noise from the steel mill.

Response 30:

Kingstream Resources NL has made commitments in the PER that it will appoint an Environmental Manager who will be responsible for environmental management of the GSP, and that it will establish monitoring programs for atmospheric emissions and noise emissions. The Environmental Manager will be required to liaise with the Shire of Greenough and to provide the Shire with the results of the monitoring program on a regular basis. The Environmental Manager will also respond to any complaints received by the Shire.

However, Kingstream Resources NL is prepared to discuss the question of the Shire employing its own environmental officer.

Issue 31:

6.1.4 Waste Disposal

COMMENT: It is considered essential that the proponent liaise with the Geraldton Greenough Regional Council in relation to the disposal of any waste products from the steel mill operation. This Council is presently in control of all waste management in the Geraldton/Greenough region.

RECOMMENDATION: That the proponent be required to further discuss an prepare a waste management plan with the Shire of Greenough, City of Geraldton and the Geraldton/Greenough Regional Council for both the construction phase and operation phase of the steel mill.

Response 31:

Kingstream Resources NL recognises that the Geraldton Greenough Regional Council is responsible for the control of all waste management in the Geraldton-Greenough Region and fully intends to liaise with that Council in determining the specific details of solid waste disposal for both the construction and operational phases of the steel mill.

Issue 32:

6.1.6 Landscaping

COMMENTS: It will be necessary for the applicants to submit a landscape plan to the Council as part of the development approval process as required by the Council's Town Planning Scheme and the proposed areas for landscaping and the types of plants etc. will be required to be shown on that plan.

RECOMMENDATION: That the proponent be required to submit a detailed landscape plan for the entire development site at the time of seeking development approval from the Shire of Greenough.

Response 32:

Kingstream Resources NL notes the Council's requirement to submit a detailed landscape plan for the entire development site as part of the application for development approval.

Issue 33:

6.1.7 Groundwater

COMMENTS: The first paragraph under this heading on page 34 states "The GSP will have no impact on groundwater at Narngulu either during construction or operation. Groundwater in the area is known to be about 24m below ground level which is considerably lower than the deepest foundations for any part of the plant."

It does not appear from the report that the proponent has substantiated that the groundwater is to this actual depth in this location.

The second paragraph under this section on page 34 states "The GSP also will not store any wastewater or other effluent in ponds from which infiltration to groundwater could occur nor will there be any discharge of wastewater to ground." This raises the question as to where the wastewater will be disposed. This is not outlined in detail in the report.

The final paragraph under this section on page 34 states "Finally, all tanks used for the storage of fuels or other liquids will be fully bunded so that there is no possibility of groundwater contamination in the event of any tank failure."

It is considered that the proponent should outline in more detail the methods to be used in the storage of fuels etc, in order that this may be assessed more accurately.

RECOMMENDATION: The proponent be required to outline and substantiate in more detail the location of and depth of groundwater in the vicinity of the proposed steel mill, the methods of waste water disposal and the methods to be used to store fuels and other liquids on the steel mill site.

Response 33:

More recent information relating to the groundwater levels beneath the steel mill site is provided in Response 2.

The only wastewater from the steel mill will be blow down from the cooling circuits. This wastewater will be disposed of onto a component of the hot slag wastes and will evaporate.

The details of all bunds will be developed in the detailed design phase and will then be made available to the Shire of Greenough and to relevant Government Agencies.

Issue 34:

6.2 Atmospheric Emissions

COMMENTS: Throughout this section it comes across that all the atmospheric emissions relating to the Steel mill in this case are estimates only. It seems difficult to understand that equipment and an operation so high tech as the steel mill operation cannot produce figures which are somewhat more accurate than estimates. In order to overcome the potential problems which is believed will arise from the use of estimates versus the actual it is considered that the proponent should contribute to the employment of a suitably qualified Environmental Officer to continually monitor the progress of the plant once it is operable.

RECOMMENDATION: That the proponent be required to contribute to the cost of the employment of an Environmental Officer by the Shire of Greenough to continually

monitor the atmospheric emissions from the steel mill once it is operating in order to introduce an independent method of assessment and management of problems.

Response 34:

See Response 30 above.

Issue 35:

6.2.2 Meteorological Conditions (Air Quality Data)

COMMENTS: It appears that the accuracy of the information gathered in respect of the Meteorological Data is questionable due to the comparatively short period of data collection, the omission of a period of collection from May to September (which includes a malfunction of the data collection instruments), and the substituting of data from Oakajee which is considered to compound the error factor due to its differing wind strengths. It is also interesting to note that during the period in which the actual data was not collected, i.e. May to September is the period when the wind strengths from the south through to the north-east predominate. These are the winds that could carry any atmospheric emission over the existing residential areas of Geraldton or Greenough.

It is recognised that generally a minimum of one year of meteorological data is required to include seasonal variations in the calculations, however, longer periods of weather data improve the usefulness and accuracy of the dispersion estimates.

RECOMMENDATION: That the proponent be required to undertake further monitoring of Meteorological Conditions at the Narngulu area to improve the accuracy of the effects of the steel mill emissions on the existing residential areas of the Geraldton Greenough Region.

Response 35:

Site specific data on meteorological conditions at Narngulu will continue to be collected by the meteorological station established by RGC Mineral Sands. Kingstream Resources NL understands that these data will be made available and this will enable the predictions of ground level concentrations resulting from atmospheric emissions to be refined if necessary. However, it is emphasised that the regional meteorological data used for the modelling presented in the PER are considered to be very reliable and that additional site specific data are not likely to generate results which are significantly different.

Issue 36:

6.2.3 Atmospheric Emissions Models

COMMENTS: Paragraph three under this section on page 36 states in part "Atmospheric emissions... from tall stacks or very buoyant sources... and then be brought rapidly to the ground at some down wind distance..."

"This process... can lead to high ground level concentrations at a particular down wind point for several hours."

"For short stacks and less buoyant plumes, the plume will be trapped beneath the boundary layer. This again can lead to higher ground level concentrations than otherwise would occur..."

Whilst there is substantial detail in the report on the emissions relating to other gases emitted from the steel mill there is an absence of the same detail with respect to the CO_2 and the dust particles.

CO_2 has been modelled using the AUSTOX model however, it doesn't answer clearly the problems raised in the abovementioned clauses. That is, where will the concentrations come to ground, what quantities will be found at the ground in these locations and how is the proponent anticipating overcoming the problems caused by this occurrence.

All other gases of concern are plotted as contour maps in the Appendix to the report. This is not the case with respect of the CO_2 emissions.

There also seems to be a disregard for the effects of the particulates emitted from the steel mill. It is a known fact that the DISPMOD computer model does not have the capabilities to model the loss of particulates as a result of dry deposition. A recognised computer program which can model thee effects is a model known as AUSPLUME. DISPMOD computer model is an acceptable model to assess and quantify the sulphur dioxide and nitrogen dioxide emissions.

RECOMMENDATION: That the proponent be required to undertake further detailed studies on the CO_2 emissions from the steel mill and to also undertake further computer modelling of the particulate emissions from the steel mill. It is further recommended that the proponent be required to establish a monitoring program, in conjunction with the Shire of Greenough, to continually monitor source emissions for sulphur dioxide, oxides of nitrogen, carbon dioxide and particulates emitted from the steel mill.

It is also recommended that the proponent be required to establish additional monitoring of ambient dust concentrations at the boundary periodically and further augment this with dust deposition gauges at critical locations (e.g. residences) so that annual rates of dust deposition can be monitored. These recommended actions could be carried out as part of the duties of the Environmental Officer employed by the Shire of Greenough, and paid for by the proponent.

Response 36:

Kingstream Resources NL considers that further modelling of the CO_2 emissions from the steel mill is not warranted as the modelling results to date indicate that the maximum ground level concentrations under worst case conditions are likely to be very low. The emissions are therefore of no significance in terms of public health.

Kingstream Resources NL also considers that the computer modelling of the particulate emissions from the steel mill is reliable and emphasises that the modelling has involved accepted methods and procedures.

The company is committed to establishing an atmospheric emissions monitoring program and the results of this program will be made available to the Shire of Greenough and to the general public. This monitoring program will include all of the compounds referred to and particulates.

Issue 37:

6.2.5 Sulphur Dioxide
Existing Sulphur Dioxide Emissions at Narngulu
Table 6.2

COMMENTS: Taking into account the comments in the background section on page 38 of the report with respect to the fact that SO_2 can irritate and can be absorbed in the respiratory tract and may result in asthmatics suffering adverse reactions it is considered that all due care be taken in ensuring that the effects from any SO_2 emissions are kept to a minimal.

There is a comparison drawn between the existing Synthetic Rutile Plant in terms of SO_2 emissions and the proposed steel mill. In doing so however, there is an error between the last line of paragraph two on page 39 under this section and the Table 6.2. The paragraph refers to 55mg/sec whilst the Table 6.2 refers to 55g/sec source strength of the SO_2 - the table indicates the Licensed maximum is 55g/sec. These figures need to be corrected to ensure a comparison can be drawn accurately.

RECOMMENDATION: That the proponent correct the discrepancy in licensed maximum source strength between Table 6.2 and the wording in paragraph two on page 39 in order that a more accurate assessment can be made of the effects.

Response 37:

The SO_2 emissions from the steel plant are estimated at 0.45gm/sec. This quantity is considered to be negligible and may be compared with the licensed maximum which may be emitted by the synthetic rutile plant of 55gm/sec. The error in paragraph 2 of page 39 is noted and it is confirmed that 55gm/sec is the correct value.

Issue 38:

Table 6.3

COMMENTS: This table indicates the maximum ground level concentrations of atmospheric emissions from industries at Narngulu and more particularly refers to "Maximum Predicted at Any Location" - This raises the question as to where these maximum levels will be experienced. It is felt that this point should be clarified further.

RECOMMENDATION: That the proponent be requested to indicate with more accuracy the maximum ground level concentration of atmospheric emissions at specific locations around the Geraldton Greenough region in order that the effects can be more accurately determined.

Response 38:

The locations where the maximum predicted ground level concentrations of atmospheric emissions will occur are shown in Figures 16, 17 and 18 of the PER. The maximum concentrations vary according to the averaging period and the one hour, 24 hour and annual averages for each compound and for particulates are shown in the figures.

Issue 39:

6.2.6 Nitrogen Dioxide

COMMENTS: Again recognition is given to the fact that "At low concentrations, nitrogen dioxide can cause irritation of the mucous membranes and may cause or exacerbate respiratory problems such as asthma and bronchitis."

Presently Narngulu experiences negligible amounts of nitrogen dioxide from existing sources according to Table 6.3 of the report. It is proposed to emit a further 129.1g/sec into the atmosphere from the steel mill in total and the points of concentration are predominantly 500m to the north-east of the industrial estate. This places the main

points of concentration within the existing Special Rural zone of Eastlyn and over the Geraldton Airport and a recognised secondary lower maximum at Mount Fairfax.

The report points out that the EPA have not set any limits and standards for nitrogen dioxide emissions under the Environmental Protection Policy however the proponent has used National Health & Medical Research Council guidelines.

It is felt that as the proposed steel mill is located in close proximity to a major residential area in Geraldton and Greenough and given the potential problems which may result from this gas then an Environmental Protection Policy should be considered for Narngulu in order to give a site specific set of guidelines for Proponents to follow.

RECOMMENDATION: That the proponent in conjunction with the EPA, be requested to consider the establishment of an Environmental Protection Policy for the Narngulu area in respect of the emission of nitrogen dioxide in order to give clearer guidelines for the industry and relevant Authorities to follow.

Response 39:

Kingstream Resources NL would support the establishment of an Environmental Protection Policy for the Narngulu area and is prepared to assist in the development of such a policy.

Issue 40:

6.2.7 Suspended Particulates
Particulate Emissions from the proposed GSP

COMMENTS: Whilst this section deals quite simply with the emission of dust particles into the atmosphere it is pointed out that the total steel mill process will in fact emit some 35.4g/sec of particulates in to the atmosphere and as stated in paragraph one of this section on page 43 "The emissions are mostly associated with the Pellet Plant and will be below 10 microns in diameter."

The last paragraph on page 42 of the report states "The inhalation of fine particles (less than 10 microns in diameter) with air over a long period of time has the potential to affect human health." The report goes on to say that larger particles "may also create a dust nuisance."

What the report fails to do on this matter is to address what appears to be a problem.

RECOMMENDATION: That the proponent be required to establish additional monitoring of ambient dust concentrations at the boundary periodically and further augment this with dust deposition gauges at critical locations (e.g. residential areas) so that annual rates of dust deposition can be monitored. This recommended course of action should be carried out as part of the duties of the Environmental Health Officer employed by the Shire of Greenough and paid for by the proponent.

Response 40:

The modelling of particulate emissions from the steel plant provided in the PER demonstrates that the maximum ground level concentrations will be well below internationally recognised standards which are recommended for the protection of public health. The plant therefore will not have the potential to cause the health effects referred to in Section 6.2.7. Nevertheless, Kingstream Resources NL has made a commitment in the PER that it will establish a comprehensive atmospheric emissions monitoring program to the satisfaction of the Department of Environmental Protection and that it

will provide the results of monitoring to the Shire of Greenough and to the general public. This monitoring program will include measurement of dust emissions.

Issue 41:

6.2.8 Carbon Dioxide

COMMENTS: Whilst the levels of carbon dioxide are tabulated in the report the actual effect on specific locations within the immediate region are not shown in the report by way of contour maps as are the other emissions. As there is proposed to be a plume density of equal to or greater than air density it would appear that some form of cloud would be visible in this case and therefore it would be critical that the visibility over the airport is retained at all times.

As carbon dioxide is a greenhouse gas and is a major contributor to global warming and given the large quantities being emitted from this steel it is considered that the proponent should give further consideration to reducing the amounts of this gas being emitted to the atmosphere. It does not seem to be a good corporate citizen approach to simply say that there are no standards at present and therefore large quantities will be until the rules change. Why not explore the avenue of reducing the amounts ahead of time and hence building up a better image to the public as a responsible Company.

RECOMMENDATION: That the proponent be requested to plot the contour levels of carbon dioxide for the immediate region outside of the plant, based on the modelling undertaken to date and to indicate acceptable levels of carbon dioxide. It is also recommended that the proponent be required to undertake further investigations with respect to the localised high concentrations of carbon dioxide at the direct reduction plant. It is also suggested that the proponent give serious consideration to the possibility of investigating the reduction of carbon dioxide emissions into the atmosphere ahead of Government legislation requiring them to do it.

Response 41:

Comments on CO_2 emissions are provided in Response 37 above. Kingstream Resources NL is committed to ensuring that the level of carbon dioxide emissions from the GSP are the lowest achievable by the direct reduction technology which will be used. Unfortunately all contemporary technologies for producing direct reduced iron generates carbon dioxide so these emissions are inherent in all steel mills.

Issue 42:

6.2.9 Stack Emissions

COMMENTS: The fourth paragraph under this section on page 46 of the report raises some concerns when read in conjunction with the attached report from WNI Science & Engineering. It gives one reading the report the impression that, as the plant is located some 400km from Perth the use of control methods are believed to be unjustified and the incurring of an additional $3.2 million to achieve a guideline with respect to the oxides of Nitrogen emissions from the gas turbine should not be required, it does not really matter that these guidelines be met.

It is considered that the matter of oxides of nitrogen emissions from the gas turbine being three times higher than the relevant guideline should not be accepted. Obviously guidelines are in place for some logical reason and given the fact that such excesses are able to be treated by control methods using steam injection to decrease exhaust temperatures and guidelines can be met the question arises as to why

Geraldton/Greenough should be subjected to a lesser standard than would be acceptable in the Perth area.

RECOMMENDATION: That the proponent be required to reduce the proposed oxides of nitrogen (NO_x) emissions level from the gas turbine exhaust stacks to the recognised AEC/NHMRC (1986) guideline figure of $0.07g/m^3$ for turbines greater than 10MW.

Response 42:

The comments in the PER relating to the control of NO_x emissions are not intended to infer that NO_x control should not be required simply because Narngulu is some 400km distant from Perth. Rather, the PER states that the particular atmospheric emissions at Perth, which have led to a requirement for the fitting of NO_x control systems to gas turbines, do not occur in the Geraldton Region. Therefore, there are no reasons in terms of local meteorological conditions which indicate that such control systems are necessary.

More importantly, the atmospheric emissions modelling included in the PER clearly demonstrates that the ground level concentrations of nitrogen dioxide surrounding the steel plant will be considerably lower than internationally recognised standards for the protection of public health. Kingstream Resources NL therefore considers that it would be unreasonable to require expensive NO_x control systems when these systems would have no demonstrable results in terms of public or occupational health. The company has this position because the control systems would impose an additional power generating cost which would substantially increase the overall annual operating costs of the steel plant and would therefore make it less viable. It is not the case that the Geraldton-Greenough area should be subjected to lower standards of atmospheric emissions than is acceptable in the Perth area. Rather, the same ground level criteria apply in both areas but additional technology may be necessary in the Perth area in order to comply with those standards.

Issue 43:

6.2.11 Monitoring of Atmospheric Emissions

COMMENTS: As pointed out previously in this submission it is considered that a qualified Environmental Health Officer should be employed by the Shire of Greenough, paid for by the proponent, to undertake all monitoring exercises in order that a level of independence and therefore credibility can be given to the monitoring.

RECOMMENDATION: That the proponent liaise with the Department of Environmental Protection and the Shire of Greenough with a view to the Shire employing a qualified Environmental Health Officer, paid for by the proponent, to undertake all monitoring required for the steel mill operation.

Response 43:

Kingstream Resources NL has made a commitment in the PER that it will establish a comprehensive atmospheric emissions monitoring program to the satisfaction of the Department of Environmental Protection.

Issue 44:

6.3 Odour

COMMENTS: The second paragraph under this section on page 47 states "The evaporation of wastewater on hot slag also will not generate odour."

It is traditionally recognised in steel mills that the water cooling of slag causes the release of odorous hydrogen sulphide gases. The question arises as to what makes this operation any different to the traditional approach.

RECOMMENDATION: That the proponent identify the emissions from the cooling of slag with water and if considered necessary that alternative methods be explored to cooling the slag which do not emit gases such as hydrogen sulphide.

Response 44:

The evaporation of cooling water on hot slag is not expected to generate odour because there will not be significant levels of sulphur compounds in either the slag or the water. This situation differs from some other steel mills in which the iron ore used for steel making may contain significant quantities of sulphur.

Issue 45:

6.4.4 Noise Modelling

COMMENTS: It is considered that whilst the noise levels can be attained to an acceptable level it would give the application a better degree of acceptability if the actual methods of noise attenuation were specified early in the process instead of waiting to the design stage. This would give residents in the nearby area some surety as to the methods being employed and they could assess the likely impacts with more certainty.

RECOMMENDATION: That the proponent give consideration to defining with a greater degree of certainty the methods of noise attenuation to be used in the GSP.

Response 45:

The methods which will be used for noise attenuation are standard for industrial plants and include the housing of fans, placement of noisy equipment within buildings with cladding if necessary, and the construction of specific noise barriers such as concrete walls around the scrap handling area and similar locations where noise levels may be significant. It is also proposed to construct earthen bunds around some parts of the plant.

A comprehensive description of the noise attenuation measures can only be provided through the detailed design of the plant and this phase can only occur after the full feasibility study has been completed and the environmental approval is in place. At this stage, Kingstream Resources NL has demonstrated through noise modelling studies which are included in the PER that the GSP can be designed so that it can comply with existing and proposed noise regulations.

Issue 46:

Table 6.6

COMMENTS: The level of the noise emanating from the scrap stockpile are constant at 111dB(A) and are quite high in relation to other activities. However, it is also noted that overall the operation will meet the acceptable noise level requirements and the proponent has indicated some modifications to allow full compliance with the requirements.

RECOMMENDED: That the proponent be required to incorporate into the detailed design of the steel mill sufficient noise attenuation methods to ensure full compliance with the noise requirements.

Response 46:

Kingstream Resources NL is committed to ensuring that the GSP includes sufficient noise attenuation methods to ensure full compliance with all noise regulations.

Issue 47:

6.4.6 Monitoring of Noise Emissions

COMMENTS: The proponent has indicated that they will implement a monitoring program designed to provide regular data on noise emissions from the GSP. It is considered that this could be included into the duties of the Environmental Health Officer recommended to be employed by the Shire of Greenough and paid for by the applicant.

RECOMMENDATION: That the Shire of Greenough employ a qualified Environmental Health Officer, paid for by the proponent to monitor noise emissions from the GSP and the proponent be requested to establish in conjunction with the Shire of Greenough a suitable monitoring program to effectively monitor and document noise emanating from the GSP.

Response 47:

Kingstream Resources NL has made a commitment in the PER to implement a comprehensive noise monitoring program to the satisfaction of the Department of Environmental Protection. The company considers that this program should be the responsibility of its own environmental staff however, it is prepared to discuss this matter further with the Shire of Greenough.

Issue 48:

6.5 Buffer Zones

COMMENTS: With the need to address the emission of certain gases and particulates further, as outlined in this submission, it may be necessary that a buffer zone be defined when the results of the additional modelling, etc. is carried out.

RECOMMENDATION: That the proponent reassess the need for a buffer zone around the proposed GPS once the results of the further studies as suggested in this submission are assessed in detail.

Response 48:

Kingstream Resources NL will reassess the need for a buffer zone around the GSP during the detailed design phase and subsequently during the operation of the plant. However, given the known environmental performance of steel plants of this nature and the modelling results included in the PER, it is considered unlikely that there will ever be a technical requirement for a buffer zone around the plant.

Issue 49:

6.7.3 Solid Waste Disposal

COMMENTS: The suggestion that CSP Plant Sludge could be disposed of into approved landfill sites will require the approval of the City of Geraldton, the Shire of Greenough and the Geraldton/Greenough Regional Council.

The reference to "Spent Catalyst and Amine Solution Residues being returned to the supplier" raises the question as to what are these products exactly, where is the supplier and how are these products to be returned (i.e. by truck, rail or ship).

RECOMMENDATION: That the proponent be requested to explain further to types of products referred to as "Spent Catalyst" and "Amine Solution Residue", the quantities involved in these products and the method and proposed route of transport of these products to the suppliers.

Response 49:

It is recognised that the disposal of any waste material into an approved landfill site will require the approval of the City of Geraldton, the Shire of Greenough and the Geraldton Greenough Regional Council. The exact requirements for landfill disposal have not been determined at this stage and therefore a worst case scenario is presented in the PER. This scenario involves the disposal of all plant sludge (170t/yr) into landfill. The feasibility of treating this material to reduce the oil content is not known at this stage but will be investigated. If treatment is possible the sludge may best be disposed of with other plant wastes at the Tallering Peak mine site.

Details of the catalyst and amine solution are provided on page 52 of the PER. These materials are not toxic and are required in relatively small quantities. They do not require any special handling or transport procedures.

Issue 50:

6.8 Visual Analysis

COMMENTS: In the first paragraph on page 54 of the report it states that "All of the structures will feature lighting at night".

Given the size of these structures some concern is expressed at the issue of light spill to the surrounding residences and whether this can be controlled to an extent that it is not a problem for those residents.

RECOMMENDATION: That the proponent explain how the light overspill to the adjoining residences will be controlled so that it is not creating a reduction in the amenity of the adjoining residential area.

Response 50:

Light spill will be managed by directing flood lights onto the locations where they are specifically required and through the use of light shrouds if it appears that these will be of benefit. However, the GSP will be lit at night in a similar way to the synthetic rutile plant and therefore will produce a light halo. It is considered that the plant is sufficiently distant from the Narngulu residential area, and that there is sufficient intervening screening vegetation and topography, for this light halo not to have any effect on the residents.

Issue 51:

6.9 The Geraldton Airport

COMMENTS: From the heights of the various towers in this complex as given in clause 6.8 of the report it can be seen that three of the towers protrude above the Obstacle Limitation Service (OLS).

These are as follows: The Reactor Tower by 34.3m
The CO_2 Removal Tower by 17.3m
The Heater Stack Structure by 17.3m.

Therefore the report is somewhat misleading in the fact that it focuses only on the Reactor Tower of the direct reduction plant.

The report states that the proposed plant stack structure - will not effect instrument approach landings at Geraldton Airport - will intrude into the obstacle limitation surface (OLS) by 34.3m, however the effect of this on aircraft operation safety can be minimised by lighting. The CAA have deferred assessment on the effect of this obstacle until it is built. This is a ludicrous situation and from the Shire of Greenough's point of view as the airport owner, operator and as the "appropriate authority" to determine the effects of the structures, Council has a dilemma in that it cannot receive a definitive assessment from the CAA prior to the structure being constructed. If this development is approved and it imposes significant restrictions on the operation of the Airport, then this would adversely affect the regions accessibility to aircraft and would be most undesirable.

The intrusion of the obstacles into the OLS appears to be significant and it is considered that an expert opinion on its effect on safety and regularity of Airport operations should be received by Council, paid for by the Proponent prior to Council giving its approval to the development.

RECOMMENDATION: That the proponent be required to engage an expert, at their expense, to ascertain the impact of the various structures which breach the OLS surrounding the Geraldton Airport on the safety and regularity of Airport operations and the findings of this study be provided to the Shire of Greenough and the CAA for there consideration prior to the approval being granted to the steel mill.

Response 51:

The reactor tower, CO_2 removal tower and heater stack are all part of the direct reduction plant and therefore can be considered as one item in terms of the obstacle limitation surface around Geraldton Airport. Kingstream Resources NL has engaged specialist consultants to advise it and the Shire of Greenough on the implications of these structures in terms of aircraft operations and they have advised that they consider that no modifications to those operations should be required. However, ultimately this is a matter for the Civil Aviation Authority (CAA) to determine. The company is committed to work with the Shire of Greenough to examine this matter further and is prepared to commission further expert advice if deemed necessary.

Issue 52:

7. Transport of Iron Ore, Steel and Other Inputs
7.3 Transport To and From the Port of Geraldton
7.3.1 Truck Movements
7.3.2 Transport Route

COMMENTS: Two Council roads are significantly affected by the proposed development viz:

1. Rudds Gully Road

Rudds Gully Road is a two lane sprayed sealed unkerbed rural type road with a seal width of 6.2m and shoulder width of 1.5m. Historical traffic data is not available and a counting program has commenced.

The estimated current traffic west of Goulds Road is 300+ vehicles per day. The road is currently in good condition and has a speed zoning of 110km/hr.

The haul route section of this road (Goulds Road to Brand Highway) has a length of 3.3km. The transport of products from the GSP to the Port is expected to require 144 road train trips per day, that is 288 truck movements per day. The transported materials from the Port (in different vehicles) will generate a further 72 return trips per day or 144 truck movements per day, therefore the additional heavy vehicle traffic on Rudds Gully Road will be in the order of 432 movements per day.

This increase in heavy vehicle traffic will reduce the level of service on this road and, subject to a more detailed analysis, require:

- An increase in seal width,
- Increase in shoulder width,
- Reduced speed zoning,
- Possibly pavement strengthening.

It is considered that Council should advise the Proponent that a contribution towards the upgrading of Rudds Gully Road will be required.

RECOMMENDATION: That the proponent be advised that a contribution towards the upgrading of Rudds Gully Road will be a requirement of development approval.

2. Goulds Road

Goulds Road is a two lane sprayed seal unkerbed industrial local distributor road in Narngulu with a seal width of 7.4m and a shoulder width nominally 1.5m. The road is in fair condition only, it was resealed in 1991 and although the surface is intact and water proof it is quite rough as a result of previous pot hole repair work. In addition the pavement strength, and hence the pavement life is suspect.

Most recent traffic counts are:

- August 1990 - 1,481 vehicles per day (north end)
- August 1991 - 922 vehicles per day (north end)

The road has a current speed zoning of 90km/hr. The haul route section of Goulds Road is not specifically defined in the PER. From Figure 23 it appears the haul route could include up to 1km of the south end of Goulds Road.

Additional traffic created by the GSP will be 432 heavy vehicle movements per day at the south end plus light vehicles generated by commuting workers and service vehicles travelling to and from the plant from Geraldton.

Assuming when the GSP is operating the staff is 460 and average 2 persons per vehicle, then the additional light traffic generated on Gould Road will be in the order of 460 vehicle movements per day. Subject to a more detailed analysis it is anticipated that upgrading of Goulds Road is warranted.
Subject to pavement testing, sections of the road may require reconstruction in the 5 years following construction of the GSP.

If pavement testing indicates the pavement is sound then a hotmix overlay may be required to rectify the surface roughness of the road and perhaps add to strength.

Shoulder reconstruction and widening will be required.

Improved intersection at Rudds Gully/Goulds Road, and at Goulds Road/Geraldton/Walkaway Road.

It is considered therefore that a contribution from the proponent towards the upgrading of Goulds Road is justified.

RECOMMENDATION: That the proponent be required to contribute to the upgrading to Goulds Road to the satisfaction of the Shire of Greenough at the development approval stage.

Response 52:

Kingstream Resources NL notes the position of the Shire of Greenough that it should contribute to any necessary upgrading of Rudds Gully Road and Goulds Road. The company is not opposed to this position in principle but considers that the requirements for road improvements and the sources of necessary funding should be determined through negotiation between itself, the relevant Local Authorities, and the State Government.

It should be noted that the information presented in the comment above with respect to the number of truck movements associated with the GSP on Rudds Gully Road, is incorrect. The information presented in the PER refers to truck movements (i.e. return trips) whereas the comment assumes that it refers to one-way traffic. The actual numbers of truck movements are therefore 50% less than those provided in the comments. The total number of truck movements between the GSP and the Port of Geraldton is estimated to be an average of 216 per day based on a 12 hour operation, 7 days per week. Nevertheless, the road improvements suggested in the comment are still likely to be necessary. The figures presented in the comment referring to Goulds Road are also incorrect in the same way.

Issue 53:

BRAND HIGHWAY

The increase in heavy vehicle traffic movements on the Brand Highway through the residential areas of Tarcoola Beach and Wandina may impact adversely on residents as regards noise and safe turning manoeuvres off the Highway. It is suggested that these concerns be brought to the attention of the proponent for consideration by the appropriate authority - Main Roads Western Australia.

RECOMMENDATION: That the proponent be required to liaise with the Main Roads WA to upgrade the Brand Highway as required to maintain an acceptable level of service, safety and amenity for the residents in the localities of Tarcoola Beach and Wandina.

Response 53:

Kingstream Resources NL will liaise with the Main Roads Department, the Shire of Greenough and the City of Geraldton regarding the level of service of Brand Highway and the need for, and nature of, any road improvements.

Issue 54:

GERALDTON/WALKAWAY ROAD

The Geraldton/Walkaway Road is now the responsibility of the Main Roads Department. It is suggested that the increase in traffic generated by the GSP will have an impact on the level of service on the Geraldton/Walkaway Road necessitating perhaps pavement widening for queuing capacity at the Goulds Road intersection, reduction in speed zoning and perhaps some attention to alleviate the roughness of the road. It is suggested that the Council raise these concerns with the proponent for action by the appropriate authority - Main Roads WA.

RECOMMENDATION: That the proponent be required to liaise with the Main Roads WA to upgrade the Geraldton/Walkaway Road as required to maintain an acceptable level of service.

Response 54:

Kingstream Resources NL will liaise with the Main Roads Department and the Shire of Greenough with respect to the need for upgrading of the Geraldton-Walkaway Road to accommodate worker related traffic. It is not proposed to use this road for transport of products or inputs to and from the steel plant.

Issue 55:

The report states in paragraph seven on page 62 that "The Highway is bounded by General Farming land to the east and coastal dunes to the west until it enters the City of Geraldton, where it is bounded on both sides by residential and commercial areas.

This statement is inaccurate as the land to the north of Verita Road on the east side of the highway is presently zoned for residential and is being developed as such and the land on the west side of the highway to the north of the southern end of Glendinning Road is developed as residential. neither of these areas are within the City of Geraldton and in fact, are some 6 to 7km from the City boundary.

It is also pointed out that Council presently has development plans for the residential development over all the land either side of the highway as far south as Rudds Gully Road.

RECOMMENDATION: That the report be corrected to more accurately describe the residential areas adjacent to the Brand Highway in the localities of Tarcoola Beach and Wandina.

Response 55:

The pending development of residential areas southwards along the Brand Highway is noted and will be taken into account in discussions between Kingstream Resources NL and the Main Roads Department.

Issue 56:

7.4.1 Methods of Transport

COMMENTS: The last paragraph under this section on page 64 of the report states that plant sludge and sewage sludge will be transported by truck to a landfill area operated by a statutory authority.

RECOMMENDATION: That the proponent be required to liaise with the Geraldton/Greenough Regional Council to ascertain an appropriate location for the depositing of plant sludge and sewage sludge from the GSP.

Response 56:

Kingstream Resources NL will liaise with the Geraldton-Greenough Regional Council to ascertain appropriate locations for the disposal of plant sludge and sewage sludge from the GSP.

Issue 57:

Social Implications

COMMENTS: In the first paragraph of this section on page 66 the report states "Kingstream Resources NL and Pavilly Pty Ltd intend to carry out extensive consultations with local authorities (City of Geraldton, Shire of Greenough and Shire of Mullewa), with relevant Federal and State Government agencies, and with community groups following completion of the feasibility study."

It is unclear what this paragraph actually refers to and what is meant by extensive consultation - what is the purpose of the discussions. If some agreements are to be made and contributions given by the proponent then these should be documented so that all parties are clear as to each others obligations etc.

RECOMMENDATION: That the proponent be requested to clarify the meaning of and the reasons behind the need to extensively consult with the various bodies as outlined in the introduction to part 8 of the report and document any points that are agreed to through any such consultation process.

Response 57:

Kingstream Resources NL has held a series of meetings with the Shire of Greenough, local residents, and other parties in the Mid West Region in order to explain the nature and implications of the Mid West Iron and Steel Project to date. The comment in the PER is intended as a commitment to continue this process. The company considers that following the completion of the full feasibility study and the granting of environmental approval, the next phase of liaison with the Shire of Greenough should concentrate on specific negotiations regarding such matters as improvements to roads, environmental monitoring, waste disposal, and other issues raised in the submission by the Shire. The company also considers that the resolution of these matters will require the involvement also of the Government of Western Australia both directly and through its agencies.

Issue 58:

8.3.4 Temporary Accommodation

COMMENTS: Accommodation within the Geraldton/Greenough region is somewhat seasonal and as a result there is a concern that if the accommodation of workers through the construction phase means the use of the majority of the regions facilities for a two to three year period this may have a long term detrimental effect on the tourist industry within the region. It is considered that both the City and the Shire have put an enormous amount of work into the promotion of the region as a tourist destination and would be reluctant to see these efforts wasted if when tourists arrive in the region they cannot find suitable accommodation because it is all taken up by "temporary" workers on the GSP.

Two possible scenarios come to mind in this situation and these are:

- To build additional accommodation for the additional workers either as a stand alone complex or as an addition to an existing tourist resort or facility to house the additional temporary workers;

  The stand alone complex could be used at a later date by the community as a community facility.

  The addition to an existing tourist facility or resort would mean that the temporary workers could be housed without interrupting the available tourist accommodation and at the end of the construction phase the additional facility could be taken over by the owner of the resort of facility or others to be additional tourist accommodation.

  RECOMMENDATION: That the proponent be made aware of the need to protect the existing and potential tourist trade for the Geraldton/Greenough region and give consideration to the options mentioned above.

Response 58:

Kingstream Resources NL notes the suggestions made in this comment. At this stage, the company considers that it will probably be necessary to construct specific accommodation for the majority of the workforce although extensive use of available accommodation may be used during peak construction employment. The company is prepared to discuss opportunities for the extension of existing tourism accommodation with current owners and operators. The company considers that the whole strategy for workforce accommodation will require detailed discussions with the Shire of Greenough in order to achieve the best outcome.

Issue 59:

Appendix 1 EPA Guidelines

COMMENTS: Under item 4 Proposed Location the issue of stormwater runoff does not appear to have been discussed in the report. As there would be a need to seal a large area within the plant site to reduce dust problems there will be a corresponding stormwater disposal problem which will need to be addressed.

RECOMMENDATION: That the proponent document in detail the method of stormwater runoff collection or disposal on the site of the GSP.

Response 59:

It is envisaged that stormwater management will be achieved through the direction of all runoff from paved areas, roofs, etc., into basins which will allow percolation into the soil profile. The collection of runoff in this manner will also permit water sampling should this be deemed necessary.

Issue 60:

7 Site Potential Environmental Impacts and Management

COMMENTS: It is considered that the proponent has not adequately addressed the requirement to "describe the rationale for determining the buffer zones around the steel mill and the power station, as they are required. And to "describe how these buffer zones would be managed."

RECOMMENDATION: That the proponent be required to address the issue of buffer zones around the GSP in more detail to show the reasons for determining the extent of the buffer zones and the methods of management of these buffer zones.

Response 60:

Kingstream Resources NL maintains that a buffer zone should only be required around an industrial plant if it is needed in order for the plant to achieve regulatory standards for atmospheric and noise emissions or for odour control purposes. The information presented in the PER indicates that the GSP can comply with all of the generally recognised criteria for ground level concentrations of atmospheric emissions and with the regulations relating to noise emissions within the boundaries of the plant site itself. Therefore, there are no technical reasons for the GSP to have a buffer zone external to its boundaries. Nevertheless, the company recognises that residents very close to the boundary of the GSP may perceive that their present lifestyle may be adversely affected even though the regulations are being complied with. The company has therefore initiated discussions with the immediate neighbours of the plant site and has indicated a willingness to purchase their properties subject to normal commercial considerations.

Issue 61:

7.1 Gas Emissions and Odours

COMMENTS: It is believed that the proponent has not addressed this section fully as there is still a need to provide further details in relation to the emission of odorous gases emanating from the evaporative disposal of wastewater via the quenching of hot slag.

RECOMMENDATION: That the proponent should address the issue of odorous gases emanating from the evaporative disposal of wastewater via the quenching of hot slag in more detail as outlined earlier in this submission.

Response 61:

Responses to comments from the Shire on the evaporation of cooling water on hot slag have been provided above.

Issue 62:

7.5 Site Management

COMMENTS: It is considered that the proponent has not adequately addressed the issue of the management of stormwater runoff on this site.

RECOMMENDATIONS: That the proponent be required to detail the management of the stormwater runoff from the development of the proposed steel mill.

Response 62:

See Response 59.

Issue 63:

7.6 Buffer Zone

COMMENTS: See the comments given under the heading (7 Site, Potential Environmental Impacts and Management) above and the subsequent recommendation.

(Appendix B Air Quality Assessment Proposed Mid West Iron & Steel Complex At Narngulu WNI Science & Engineering)
(2 Air Quality Data)
(2.1 Availability)

COMMENTS: The last paragraph under this section on page 3 of the Appendix explains that a two month gap in the data collection was filled in the use of data from Oakajee. The EPA Guidelines suggest that it is not acceptable given the fact that this steel mill is to be developed in close proximity to existing residential areas and more particularly in view of the fact that the missing months have the predominant winds which could carry gases, odours or particulates over the residential areas of Geraldton and Greenough.

RECOMMENDATION: That the proponent undertake further studies to gather additional data to reduce the error factor to a more acceptable level.

Response 63:

The meteorological data which were used for the modelling of ground level concentrations of atmospheric emissions from the GSP are considered to provide a very high level of confidence for the results of that study. The monitoring study for atmospheric emissions which will be implemented as part of the GSP will provide precise data on ground level concentrations and will also include site specific meteorological data. At the time of production of the PER only 10 months of site specific meteorological data were available but these data indicate that the local meteorological conditions are not significantly different from regional conditions. The use of regional data is therefore appropriate.

Issue 64:

2.3 Air Quality Parameters

COMMENTS: The comments made in the above item are relevant under this section also as the degree of error is even further added to by the fact that the instruments malfunctioned for a two month period in addition to the period of two months of missing data i.e. a total of four months 15 May to 9 September not taken into account.

RECOMMENDATION: As above in the previous recommendation.

Response 64:

See Response 63.

Issue 65:

3.3 AUSTOX

COMMENTS: It appears that a lot of assumptions are taken into account in the use of this modelling method. The questions arise as to the ultimate accuracy of the results received from this type of modelling and maybe further detailed study need to be undertaken to achieve a greater degree of accuracy.

RECOMMENDATION: That the proponent justify further the accuracy of using the AUSTOX modelling technique given that an apparent high number of assumptions are made in the use of this model.

Response 65:

The methods used in the modelling of atmospheric emissions follow standard procedures for the application of the two computer models involved. The reliability of the results is considered to be sufficient for the purposes of environmental impact assessment. This is particularly the case as the results indicate that the ground level concentrations of all emissions will be significantly less than the most stringent internationally recognised criteria. This means that the predicted levels of emissions from the GSP could hypothetically be increased substantially before the criteria are exceeded. The company is therefore confident that the GSP will comply with the criteria.

Issue 66:

4 Plant Emissions
4.1 Steel Complex

COMMENTS: The comments given in the first paragraph on page 10 of the technical report indicate a total disregard for the fact that people in this region have as much right to enjoy a clean and safe environment as do the people who live in Perth. The fact that the installation is to be located some 400km from Perth is not considered to be a sound reason for accepting NO_x emissions three times higher than the guidelines for turbines greater than 10MW particularly when control methods are available and have been in use in the Perth area.

RECOMMENDATION: That the proponent be required to introduce control methods on the gas fired turbine which will reduce the NO_x emissions to the $0.07g/m^{-3}$ guideline for turbines greater than 10MW.

Response 66:

See Response 42.

Issue 67:

COMMENTS: The second paragraph on pate 10 of this technical report refers to "Upset condition", "Shutdown" and "blow offs". It is difficult to ascertain from the report whether they are all independent situations and if so what gases are emitted in each case. The report does not give the duration of a "Blow-off" nor what gases are emitted during this state and what are the effects and where are these effects to be noticed.

RECOMMENDATIONS: That the proponent be requested to further explain the terminology of "Upset Conditions", "Shutdown" and "Blow-offs" and what the effects of each of these states are if they are in fact individual states.

Response 67:

Some industrial plants can be subject to upset conditions when the level of atmospheric emissions may be considerably higher than during normal operations. However, steel plants of the type proposed are not likely to experience such upset conditions. The only situation in which emissions may increase above normal levels for short periods of time is during maintenance. This is explained in Sections 6. 2. 10 of the PER. During routine shut down of the direct reduction plant for maintenance, the gases in the reduction shaft must be vented. The volume of gas is about $1{,}000m^3$ and the mixture consists of hydrogen, carbon monoxide, carbon dioxide, water vapour, methane and nitrogen. The venting is rapid as the temperature of the gas at the start of the process is

about 900∞C. The volume of gas involved and the rate of venting will ensure that no significant ground level concentrations of gas will occur. Three maintenance ventings of the reduction shaft are anticipated each year.

Issue 68:

9 Heavier Than Air CO_2 Plume

COMMENTS: The effect of CO_2 on the workers needs to be studied further and remedies to this problem be suggested.

RECOMMENDATION: The proponent be required to undertake further studies to determine the effect the ground concentration of CO_2 will have on the workers in the buildings and offer remedies to the problem.

Response 68:

Kingstream Resources NL has made enquires with the producers of direct reduction plants and with operators of such plants and has been advised that no problems relating to carbon dioxide or carbon monoxide emissions in terms of occupational or public health have been reported. It would appear therefore that the probability of high levels of these gases close to the direct reduction plant is extremely low. Workplace monitoring will be incorporated in the atmospheric monitoring program in order to assess the levels of carbon dioxide and to enable these levels to be compared with the relevant standards.

Issue 69:

COMMENTS: The quantities on CO_2 emitted from the steel mill are quite large and given the fact that CO_2 is a recognised Greenhouse gas it is considered that the report should indicate what effect these quantities are likely to have on the Greenhouse issue. It is also considered that the proponent should take a positive approach to the matter of seeking a method to reduce the CO_2 emissions from the steel mill even though there are no forced levels to adhere to at this point in time.

RECOMMENDATION: That the proponent, in the interests of better public relations actively pursue the introduction of methods to reduce substantially the CO_2 emissions from the proposed steel mill ahead of Government requirements, restrictions, taxes or guidelines.

Response 69:

Kingstream Resources NL intends to actively pursue methods for the reduction of CO_2 emissions from the GSP.

Issue 70:

Figures 6.1 - 6.12 and Figures 7.1 - 7.18

COMMENTS: All of these figures present a contour map of various situations but they contain no value to the individual contour and therefore in the absence of this information are totally meaningless.

RECOMMENDATION: That the proponent be requested to include the contour values and units of measure into figures 6.1- 6.12 and 7.1 - 7.18 inclusive in the technical report.

Response 70:

The figures referred to in the specialist report by WNI Science and Engineering show contours of the ground level concentrations of atmospheric emissions in mg/m^3. This is indicated in the key in each figure.

Appendix 3

List of submitters

1. Mr/Mrs/Ms K A Shenn
2. Mrs R Tetlow
3. Mr/Mrs/Ms S Sawyer & G Cairn
4. Mrs/Ms A Rennie
5. Mr/Mrs.Ms Talit M A & J E Paul
6. Mr A J van de Velde
7. Mr/Mrs/Ms A Otterburn
8. Mr/Mrs/Ms A N Bishop
9. Mr/Mrs C & J Hanson
10. Mr/Mrs M & J Lollo
11. Mr/Mrs/Ms G C Gorman, P & N Major, W Klor, JSC & VJ Lee (Group Submission)
12. Mr/Mrs P & N Major
13. Mrs/Ms E Hosken
14. Mr/Mrs G & D Raymond
15. Mr W C Shelley
16. Mrs/Ms P Shelley
17. Mr R Speed
18. Mr E Neumann
19. Mrs N Neumann
20. Narngulu Residents Asscociation (Group Submission)
21. Active Community Environmentalists (Group Submission)
22. Conservation Council of Western Australia Inc (Group Submission)
23. Water Authority of Western Australia (Mid West Region)
24. Department of Defence
25. Main Roads Western Australia
26. Ministry for Planning Western Australia (Western Australian Planning Commission)
27. Office of Waste Management
28. Shire Of Mullewa
29. Mid West Development Commission
30. City of Geraldton
31. Shire of Greenough
32. Department of Agriculture Western Australia
33. Commonwealth EPA (CEPA)
34. Australian Heritage Commission
35. Australian Nature Conservation Agency

Appendix 4

Proponent's Project Description

From PER chapters 3, 4, 5 and 7.

3. THE LOCATION OF THE GSP

3.1 Evaluation of Alternatives

3.1.1 Capital and Operating Costs

Seven potential locations for the GSP in the Mid-West Region were originally investigated by Signet Engineering Pty Ltd in 1994. The locations are shown in Figure 3 and were:

- Narngulu;
- Moonyoonooka;
- Oakajee;
- Eradu;
- Mullewa West;
- Mullewa North; and
- Tallering Peak.

These locations were selected on the basis that they were either in the vicinity of Geraldton, or were located on the main transport route between Geraldton and Tallering Peak.

The primary comparisons between the locations were made in terms of the estimated costs, which are:

- the supply and construction of the GSP;
- infrastructure requirements, including provision of utilities;
- transport of solid bulk products to and from the GSP during operation; and
- labour and administration costs associated with sourcing and maintaining the operations and maintenance workforce at each location.

Approximately $800 million of the estimated costs associated with the GSP do not vary according to the site location, such as the supply of major process equipment.

The cost comparison of the seven locations is summarised in Table 3.1. The estimated costs were based on a throughput of 700,000tpa of steel product and a 20 year operating life. The estimated capital, operating, and net present cost (NPC) differentials are given relative to the GSP being located at Narngulu, as this is the closest location to Geraldton.

The proximity of each location to existing sources of infrastructure influences establishment costs considerably. For example, the capital costs at Eradu are the lowest for all of the locations principally because the main Dampier to Perth gas pipeline is located in this area and only a short lateral gas pipeline is required to service the location. Conversely, Oakajee, and especially the locations at Mullewa and Tallering Peak, are more distant from existing sources of infrastructure and therefore involve relatively high establishment costs.

Table 3.1. Differential costs of the GSP at seven locations in the mid west region

Location	Unit	Narngulu	Moon-yoo-nooka	Oakajee	Eradu	Mullewa West	Mullewa North	Tallering Peak
Capital Cost Differential	$M	Base	-2.7	+15.5	-17.5	+56.7	+80.8	+66.3
Operating Cost Differential	$M/yr	Base	-0.54	+3.45	+2.0	+3.60	+3.83	+2.77
NPC at 5% Discount Differential	$M	Base	-8.0	+49.8	+5.5	+87.8	+111.5	+87.6

Operating costs which vary at each location are:

- transport costs for haulage of solid products;
- delivery costs for the supply of utilities; and
- labour costs.

Transport costs were derived from rates provided by either road haulage companies or by Westrail. The rates are usually determined on a tonnage per kilometre basis. Transport costs for iron ore are lower than transport costs for steel. Therefore costs will be lower the closer the GSP is located to the port. The exception to this is Oakajee, which is to the north of Geraldton. Iron ore would have to be transported to this location through Geraldton and then steel would be transported back to the port for export.

The costs associated with the delivery of natural gas and electricity were assumed to remain unchanged at each location. However, delivery costs for the supply of water increase as the distance of the location from the water source increases.

Eradu has the lowest water costs as it is the closest location to Casuarina where a new borefield could be developed to supply the water requirements of the GSP. Costs for water at Mullewa West, Mullewa North and Tallering Peak are high due to the distance of these locations from the nearest potential source of water at Casuarina. Hydrogeological investigations available at the time of the investigation indicated that there is little likelihood of obtaining the water requirements closer to these eastern locations. For the locations of Narngulu, Moonyoonooka and Oakajee, water would be obtained from the Allenooka Borefield.

Factors influencing labour costs are:

i) Travelling allowances and increased training due to a higher labour turnover at sites east of Eradu relative to sites closer to Geraldton.

ii) Provision of housing subsidies, relocation expenses and training costs for labour turnover, as well as rates and maintenance on accommodation infrastructure at Mullewa West and Mullewa North.

iii) Provision of catering, janitorial services and personnel transport at Tallering Peak.

A comparison of the estimated operating cost differentials of all locations when compared to Narngulu indicates that Mullewa West and Mullewa North have the highest operating costs followed by Oakajee. The higher cost differential associated with Oakajee is due to this location not being on the direct transport route between the mine and the port and to higher costs associated with the delivery of services.

3.1.2 Net Present Costs

Net Present Cost (NPC) is an indicator which allows an economic comparison of values at a particular discount rate. The NPC differential is a single value which combines the capital costs differentials and the operating cost differentials over the lifespan of the Project at a discount rate deemed appropriate for the evaluation.

Comparing the NPC differentials to Narngulu which is taken as the base case due to its proximity to Geraldton, Moonyoonooka is the least cost option. This is followed by Narngulu and then Eradu. There is a significant increase in the NPC differentials between these three locations and the other locations at Oakajee, Mullewa West, Mullewa North and Tallering Peak.

3.1.3 Discussion and Conclusion

The assessment of potential locations for the GSP demonstrated there is an economic benefit to the Project in locations close to Geraldton and on the transport route between Tallering Peak and the Port of Geraldton.

Following the issue of the assessment, Kingstream Resources NL and Pavilly Pty Ltd arranged for Stage 1 of the public consultation program (described in Section 1.7 of this PER) to commence. This focussed on the advantages and disadvantages of Narngulu, Moonyoonooka and Eradu in land planning, social and environmental management terms and provided an opportunity for community input into the selection of the location of the GSP.

After this process, Kingstream Resources NL and Pavilly Pty Ltd selected the Narngulu Industrial Estate as the location for the GSP.

The decision was based on:

- the relatively low estimated costs at this location;
- the existing zoning of the land for industrial use;
- the immediate availability of the land from LandCorp;
- the existence of easements to the location for water and natural gas supply;
- the proximity of the location to Geraldton; and
- an indication that the majority of people in the Shire of Greenough and the City of Geraldton would accept the GSP being built in the Narngulu Industrial Estate provided that this location was shown to be environmentally acceptable.

Since the completion of the assessment, the throughput of the GSP has increased from 700,000tpa to 1,000,000tpa of steel product. However, the capital and operating cost differentials for the various locations have generally increased proportionally.

With regard to infrastructure and utilities, the only change of substance is that electricity supply has changed from overhead transmission lines from Mungarra Power Station in the original assessment to a power station as an integral part of the GSP and consequently an increase in size of the natural gas supply pipeline to each location. The net effect of these changes is that the significant difference in the NPC differentials between the three locations of Narngulu, Moonyoonooka and Eradu and the remaining four locations increases. Thus the economic benefit in locating the GSP close to Geraldton remains unchanged.

3.2 The Narngulu Industrial Estate

3.2.1 Location of the Estate

The GSP will be located in the Narngulu Industrial Estate. The Estate is in the Shire of Greenough and is situated approximately 5km to the south-east of the boundaries of the City of Geraldton. The regional location is shown in Figure 4.

3.2.2 Area, Zoning and Surrounding Land Use

The Narngulu Industrial Estate has a total area of 670ha of which 470ha is zoned for general industry and 200ha is zoned for noxious industries. The general layout and zoning of the estate and of the surrounding land is shown in Figure 5.

Most of the land surrounding the Industrial Estate is zoned General Farming but there are smaller areas zoned for Public Utility (part of the proposed Meru landfill site) and for Special Rural use.

The Narngulu townsite which is zoned Residential is located adjacent to the eastern boundary of the Industrial Estate. Several private houses are also located within the Industrial Estate itself on land which is zoned General Industry in the area shown in Figure†5.

The Geraldton Airport is located approximately 1.5km to the east of the Industrial Estate and the intervening land largely comprises horticultural properties, some with private houses, and larger agricultural lots.

3.2.3 Existing Industries in the Estate

The Narngulu Industrial Estate currently contains about 50 lots ranging in size from about 0.2ha to about 89.9ha. Fifteen of the blocks are occupied by functioning industries (1993 figure), two are occupied by inoperative industries, and several of the small lots adjacent to Rudds Gully Road have houses on them. The remainder of the lots are vacant, or are reserved for services or other Government requirements.

The existing industries in the Industrial Estate comprise a Mineral Sands Separation Plant and a Synthetic Rutile Plant both of which are operated by RGC Mineral Sands Ltd, an Attapulgite Plant operated by Mallina Holdings Ltd, and a variety of relatively small plants such as sand blasting operations, earthmoving and haulage contractors, and car wreckers.

The locations of the existing large industries adjacent to the site of the GSP are shown in Figure 5.

3.2.4 Existing Infrastructure

The existing infrastructure servicing the Narngulu Industrial Estate has been documented by Alan Tingay & Associates et al (1993). This infrastructure is illustrated in Figure 6 and is summarised below.

The existing external road system around the Industrial Estate provides good access from Geraldton via the Geraldton-Walkaway Road (Edwards Road) and good access from the south by Rudds Gully Road which intersects the Brand Highway.

The Industrial Estate itself is serviced internally by Goulds Road. This road has a wider than usual 40m road reserve and therefore has the potential to be upgraded should this be required. In the future, the Industrial Estate may also be served by a new main road network comprising

the so-called Geraldton to Mt Magnet Road to the north of the Estate, and the realigned Brand Highway to the west.

Also to the north of the Industrial Estate, Meru Road is identified in the Greenough Shire Town Planning Scheme (TPS) No. 4 as an important future regional road which will provide an east-west link from the future realignment of the Brand Highway to the northern section of Goulds Road.

The major regional railway marshalling yard is also located immediately adjacent to and east of the Narngulu Industrial Estate. Railways connecting into this marshalling yard include the narrow gauge line from Mullewa and the line connecting with the Port of Geraldton both of which are shown in Figure 6. The railway line from Mullewa is of particular relevance to the MWIS Project as it will be used for transport of iron ore from Mullewa to the GSP.

A railway line also extends from the marshalling yard into the Narngulu Industrial Estate to the Mineral Sands Separation Plant and Synthetic Rutile Plant operated by RGC Mineral Sands Ltd. This line is located in close proximity to the proposed location of the GSP.

The water supply to the Narngulu Industrial Estate is sourced from the Allenooka Borefield which is located approximately 47km to the south-east (Figure 3). This borefield also supplies the City of Geraldton. The main supply pipeline from the borefield follows Edwards Road adjacent to the Industrial Estate and comprises a 600mm diameter steel water main.

The Water Authority of Western Australia (WAWA) has advised that the Allenooka Borefield has a potential yield of about 28 million cubic metres each year (Mm3/yr) and that the current demand from the City of Geraldton and surrounding region is in the order of 8 to 8.5Mm3/yr.

The electricity supply to the Narngulu Industrial Estate is provided by two 33kV overhead lines which connect to the Geraldton substation in Eighth Street. The substation is connected to the Mungarra Power Station which is located to the south-east of the Industrial Estate (Figure 3). The Mungarra Power Station is connected to the State electricity grid operated by Western Power.

Natural gas is supplied to the Narngulu Industrial Estate by Alinta Gas through a high pressure pipeline which connects with the Dampier to Perth gas pipeline which is located to the east of the Mungarra Power Station (Figure 3). The gas reticulation within the Industrial Estate is shown in Figure†6 and includes a high pressure pipeline along Goulds Road.

Drainage and sewerage facilities within the Narngulu Industrial Estate are provided by the individual industries operating there.

3.3 The GSP Site

3.3.1 Location and Area

The proposed location for the GSP is on Lot 1277, Part Lot 13 and Lot 6 in the Narngulu Industrial Estate as shown in Figure 5. Lot 1277 has an area of 64ha and is bounded to the west by Goulds Road, to the south by Rudds Gully Road, to the east by small allotments including some private houses which are on land zoned for General Industry, and to the north by the Mineral Sands Separation Plant operated by RGC Mineral Sands.

Part Lot 13 has an area of 26.5ha and is located adjacent to, and to the north-east of, Lot 1277. This lot is bounded to the north by the Attapulgite Plant operated by Mallina Holdings Ltd and by the Mineral Sands Separation Plant, to the east by an undeveloped Recreation Reserve, and to the south by the small allotments which are zoned for General Industry.

The power station will be located on the other side of Goulds Road on Lot 6. This lot has an area of approximately 40ha, and is bounded to the north by the Synthetic Rutile Plant, to the east by Goulds Road, and to the west and south by allotments zoned for General Farming.

3.3.2 Ownership

Kingstream Resources NL and Pavilly Pty Ltd, the proponent of the MWIS Project, have an option to purchase Lot 1277, Part Lot 13, and Lot 6 within the Narngulu Industrial Estate from their present owner, LandCorp. LandCorp is the operating name of the Western Australian Land Authority (WALA). WALA was established by a specific act of Parliament in 1992 which brought together the land development activities previously carried out by the Industrial Lands Development Authority, the Joondalup Development Corporation, and the original LandCorp (which formerly only dealt with residential land).

The purpose of LandCorp is to provide land, infrastructure, and associated facilities to meet the social and economic development needs of the community. To achieve this purpose LandCorp co-ordinates the development of land in Western Australia in accordance with Government policies and objectives. One of the principal functions of LandCorp is to supply appropriately located, zoned, and serviced sites to industry in order to generate employment opportunities and to assist economic growth.

3.3.3 Environmental Features

The Narngulu Industrial Estate is located on a relatively flat area with an elevation between 20m and 22m AHD. A tributary of the Greenough River is located about 1km to the south of the Estate but there is no surface drainage from the Estate to the river. A monitoring bore constructed by RGC Mineral Sands Ltd in the northern section of the Industrial Estate located brackish groundwater at a depth of approximately 24m. The Geological Survey of Western Australia also located groundwater of between 2,000 and 3,000mg/L total dissolved salts at depths from 15m to 22m under the nearby proposed Meru landfill site (Appleyard, 1990). The direction of groundwater flow is to the west.

The Department of Agriculture has published a Rural/Residential land capability study for the Geraldton region which includes the Narngulu Industrial Estate (Dye et al, 1990). According to this assessment, most of the area zoned for General Industry is part of the Bootenal Alluvial Plain which has been formed by deposits from the Greenough River. The plain is described as gently undulating with well developed red duplex soils grading into deep, red uniform sands. There are also some small isolated sandy rises overlying limestone at varying depths. The area zoned for Noxious Industry to the south of Rudds Gully Road mainly comprises a ridge formed of Tamala Limestone overlain by deep yellow-brown siliceous sand. Limestone rock is evident in the eroded stock holding paddocks in this area.

According to the land capability study, the soil types and landform of the Industrial Estate are generally suitable for the development of industry. In particular, the proposed location for the GSP has a moderate potential for wind erosion, low potential for water erosion, high microbial purification ability, moderate to high absorption ability, high ease of excavation, fair to good foundation soundness, no slope instability risk, no flood hazard, moderate suitability for dam construction, and is well drained (i.e. not prone to waterlogging).

Rainfall and temperature data for Geraldton which are representative of conditions at Narngulu are illustrated in Figure 7 while wind patterns for the Narngulu Industrial Estate are shown in Figure 15.

The natural vegetation on Lot 1277, Part Lot 13 and Lot 6, has been removed and the land is now used for sheep grazing and crop production. There are therefore no significant habitats for vertebrate fauna.

4. DESCRIPTION OF THE GSP

4.1 General Description

The major components of the GSP are illustrated in Figure 8 and comprise:

- a Pellet Plant in which the iron ore fines are converted to pellets suitable for direct reduction;
- a Direct Reduction Plant in which the pellets and lump ore are converted to direct reduced iron using natural gas as the reductant;
- a Melt Shop containing an Electric Arc Furnace (EAF) and a Ladle Furnace (LF). The direct reduced iron pellets together with various additives are heated in the EAF to create liquid steel, and further adjustments to the composition of the liquid steel are then made in the LF;
- a Compact Strip Production Plant (CSP) in which the liquid steel is cast in thin slabs then, while still hot, rolled into a coil;
- handling and storage facilities for incoming materials (iron ore in the form of both lump and fines, scrap steel, various additives including quicklime, ferro-alloys and carbon), for products at various stages of the process (pellets, direct reduced iron), and outgoing rolled coil, slag and miscellaneous wastes;
- an open cycle gas turbine Power Station;
- Water and wastewater treatment facilities and cooling towers.
- a Cryogenic Oxygen Plant; and
- administration and maintenance facilities.

Certain of the major components will be totally enclosed, such as the Melt Shop and CSP Plant while others will be partially enclosed for process or environmental reasons. Components such as the oxygen plant, water treatment facilities and cooling towers are standard industrial structures.

The layout of the GSP and each of its major components are described in more detail below.

4.2 Layout of the GSP

The GSP occupies Lot 1277, Part Lot 13 and Lot 6 within the Narngulu Industrial Estate. The layout is shown in Figure 9. The unloading facility for iron ore delivered from the Tallering Peak mine is on a short spurline from the Westrail marshalling yards and is on the boundary between Lot 1277 and Part Lot†13. Immediately to the east on Part Lot 13 is an enclosed shed for the iron ore stockpiles and adjacent to this is the pellet stockpile. To the north of these stockpiles, also on Part Lot 13, is the Pellet Plant.

The major components of the GSP are located on Lot 1277. These comprise:

- the Direct Reduction Plant in the north-west corner of the lot;
- the Melt Shop immediately to the east of the Direct Reduction Plant; and
- the CSP Plant immediately south of, and connected to, the Melt Shop.

Lot 1277 also includes water and wastewater treatment facilities and water cooling towers for the GSP, a large de-dusting plant immediately north of the Melt Shop, the oxygen plant and storage yards for scrap metal and slag waste.

The Power Station and associated switchyard and power compensation equipment is located on Lot 6.

4.3 Iron Ore Receival and Storage

The iron ore delivered from the Tallering Peak mine will comprise 85% fines with a size less than 10mm and 15% lump in the size range 10 to 30mm. These materials will be delivered by train and will enter the GSP site via the Westrail marshalling yards. The unloading facility will be within an enclosed shed. The bottom dumping rail wagons will discharge the iron ore into a below ground receival hopper linked to an enclosed conveyor system which will transfer the ore to covered storage sheds. The fines and lump will be delivered in separate train lots and the unloading and conveying system will be arranged to ensure separation of the iron ore materials.

Recovery equipment and a further enclosed conveyor system will transfer the iron ore fines from the storage shed into the Pellet Plant.

4.4 Pellet Plant

In the Pellet Plant the iron ore fines are converted into spherical pellets. The process is illustrated in Figure 10 and essentially comprises two steps: formation of green pellets, and subsequent hardening of these pellets.

Iron ore fines are conveyed from the stockpile facilities into the Pellet Plant, and are directed into ball mills. Binding materials, such as clay, lime or organic binders are also added. A ball mill is a large cylinder filled with steel balls. As the cylinder rotates, the weight of the moving metal pulverises the iron ore fines and binding materials.

Water is added to the ground materials which are then fed into disc pelletising machines. As the discs rotate, a balling action occurs which causes the ground material to agglomerate into "green" (unfired) pellets.

The green pellets are of low strength and have to be hardened for use in the Direct Reduction Plant. The green pellets are discharged over the lip of the rotating disc and pass through sizing equipment where undersize and oversize pellets are returned to the pelletising machines. Green pellets of the required size (9mm to 15mm diameter) are conveyed onto a travelling grate which carries them at a constant rate through a furnace for hardening. The furnace has four principal zones, in which drying, pre-heating, firing and cooling occur in sequence.

The drying stage has two components: updraft drying, and downdraft drying.

In updraft drying, the pellets are dried using air recycled from the later stages of pellet cooling. Air, at a temperature of approximately 300°C, is diverted from the cooling zone to the updraft drying zone. Here it is passed through the pellet bed in an upward direction, which cools the air to a temperature of approximately 50°C. The air then passes through a dust extraction system before being discharged from the plant.

The pellets are then moved by the travelling grate into the downdraft drying zone. Here, air is recycled from the pre-heating and firing zones, and is passed through the pellets in a downwards direction. The air temperature prior to drying is approximately 350°C, and drops to approximately 120°C as it passes through the pellet bed. The air passes through the dust extraction system before being discharged from the plant.

The next stage of hardening involves the pre-heating and firing of the green pellets. Hot air, at a temperature of approximately 850°C, is redirected from the cooling process into the firing and pre-heating zone by a hood which is located above the cooling zone. The hot air is then mixed with hot combustion gases which raise the temperature to 1100°C in the preheating zone and 1300°C in the firing zone. This gas/air mixture is produced in combustion chambers located on both sides of the furnace and is directed by two fans through the pellets.

The hotter portion of the air leaving these zones, which is at a temperature of approximately 350°C, is then redirected into the downdraft drying zone as described above, while the cooler portion which is at a temperature of approximately 120°C passes through the dust extraction system and is discharged to the atmosphere.

Once the pellets have been hardened by firing, they pass into the cooling zone. Here, air from outside the plant is forced in an upward direction through the pellets, causing the pellets to cool. The air stream is heated during the cooling process, and is split into two streams due to pressure differences caused by the hot pellets. The hotter stream is redirected into the firing and pre-heating process, and the cooler air stream is redirected for updraft drying.

The hardened pellets, on discharge from the furnace, are transferred to a pellet storage stockpile.

4.5 Direct Reduction Plant

In the direct reduction process, oxygen in the pellets and lump iron ore is removed to produce direct reduced iron with an iron content of approximately 90%.

The direct reduction process which will be used in the GSP is known as HYL III. In this particular process, a reducing gas is first produced in a natural gas/steam reformer and then this gas is passed through the pellets and lump iron ore to produce the direct reduced iron. The process is illustrated in Figure 11.

Process Description

In the reformer, natural gas is converted into water vapour, carbon monoxide and hydrogen. The natural gas is pre-heated to approximately 370°C, and mixed with superheated steam. The steam/gas mixture is then pre-heated to a temperature of approximately 620°C, and is fed into the radiation section of the reformer where it is reduced to water vapour, carbon monoxide, and hydrogen in the presence of a nickel based catalyst. This occurs at a temperature of 830°C and a pressure of 7.8 bar.

The reformed gas is transferred to a steam generator, where its temperature drops to about 300°C. The gas is then cooled further in a cooling tower to remove excess water and is then reheated prior to being used in the ore reduction process.

The conversion of iron ore into iron, which involves the removal of oxygen from the iron ore, occurs in a shaft furnace type reactor. Pellets and lump ore in the ratio of 85% pellets and 15% lump ore are transferred by covered conveyor belts from storage sheds and are fed into the top of the reactor. While it would be advantageous to use all lump ore in the reactor, the lump ore is not strong enough and breaks down during the reduction process. This is the reason for using hardened pellets. However, a small percentage of lump ore assists in reducing the tendency of the pellets to stick together during the reduction process.

The reducing gas, which is at a temperature of approximately 930°C, is injected into the reactor at the bottom of the reducing zone and passes up the reactor shaft in counter flow to the descending pellets and lump ore. The hydrogen and carbon monoxide components of the reducing gas react with the oxygen in the pellets and lump ore to form water vapour and carbon

dioxide respectively which are discharged through the top of the reactor with residual reducing gas.

The combined gases leave the top of the reactor at a temperature of about 400°C. This top gas is then passed through a scrubber, where it is cooled to a temperature of approximately 40°C. The scrubber also removes any dust and water which has formed as a reduction product. The gas is then diverted through a carbon dioxide removal system, which removes excess carbon dioxide. The cleaned gas is then mixed with new reduction gas and recycled through the reactor shaft. The excess carbon dioxide is used to pneumatically convey the direct reduced iron to the Electric Arc Furnace (EAF), and is then discharged to the atmosphere through the Melt Shop dust collection system.

The reduced pellets and lump ore are continuously discharged from the bottom of the reactor shaft at a temperature of approximately 600°C. From here, the direct reduced iron is pneumatically conveyed (using the excess carbon dioxide) directly to the EAF. When it is not possible to feed the reduced iron to the EAF, such as during maintenance, it is directed to two refractory lined (high temperature) holding bins which have a total storage capacity of approximately 20 hours' production.

4.6 Melt Shop

4.6.1 Electric Arc Furnace (EAF)

In the EAF, direct reduced iron together with scrap steel and other additives is converted into liquid steel. The process is illustrated in Figure 12.

The formation of liquid steel is a batch process in which up to 160 tonnes of liquid steel is formed and discharged from the EAF in an average time (tap to tap time) in the order of 70 minutes for cold direct reduced iron, and 60 minutes for hot direct reduced iron.

The batch process commences with a charging bucket containing weighed amounts of scrap steel, alloys such as ferromanganese and ferrosilicon, and carbon being positioned above the open EAF. The charge is then dropped into the furnace.

The roof and electrodes are then placed on the furnace and the electric power turned on. An electric current is directed down a graphite electrode towards the charge in the base of the furnace. The current then arcs from the electrode to the charge, passes through the charge and then arcs up to another electrode. Heat is generated by the arcs through the resistance to the electric current between the electrodes and the charge.

When the electric power is turned on, direct reduced iron at a temperature of approximately 600°C and lime are fed continuously into the EAF through a feed pipe. The flow of direct reduced iron into the EAF is interrupted only when the furnace is being charged with scrap steel and other additives, or when tapping occurs.

The heat generated from the arcs begins to melt the charge, forming a pool of molten metal in the base of the furnace. The remainder of the charge is melted from the bottom up by heat convection from the pool of molten metal and heat from the arcs. Heating of the charged material is continued until it is completely melted, and then the melt is superheated to a temperature of approximately 1630°C.

Acidic and basic processes can be used in the production of liquid steel. The melt-down of direct reduced iron and scrap steel in the EAF will occur in a basic environment as this process produces a cleaner and more consistent quality steel and assists in the removal of residual sulphur from the melt. During melt-down, impurities in the liquid steel rise to the surface and

form a layer on top of the liquid steel. This layer is referred to as the slag, and is basic in composition due to the addition of lime during charging.

Oxygen is introduced through a lance into the EAF during melt-down. The lance is a water-cooled tube and oxygen is blasted at high pressure into the melt. The oxygen reacts with carbon, introduced into the melt in the original charge, to form carbon monoxide gas. The formation of carbon monoxide produces a bubbling effect within the melt. This is referred to as the ìcarbon boilî and is an essential feature of the steel making process as it promotes stirring within the melt to assist in separating the slag and the steel. It also eliminates temperature and concentration gradients within the liquid steel, as well as some of the hydrogen and nitrogen present in the melt.

The injection of oxygen into the EAF also assists in the melt-down process due to the heat generated as the oxygen burns. Carbon is the principal element removed by the oxygen, but other elements which are present in minor quantities such as silicon, manganese, phosphorus and chromium are also removed.

When the melt has reached the required temperature the power is turned off and the roof removed to enable tapping to be performed. The tapping process involves the separation of the slag from the molten metal. The electrodes are raised from the melt, the furnace is tilted, and the slag poured out into a slag pot which is emptied by a mobile slag transporter into a slag stockpile.

The furnace is then tilted in the opposite direction to that for slag tapping, and the liquid steel is drained from the furnace into a ladle using a slide valve at the bottom of the furnace. This allows the separation of any remaining slag from the pure metal. Tapping takes approximately three minutes.

The process is then repeated.

Gas and dust are extracted from the EAF while it is in operation via an off take in the roof. After extraction, sufficient excess air is drawn into the off take to ensure all combustible elements of the gas are burnt in a combustion chamber. Following burning, the gas passes through a natural draft gas cooler and then is directed to a central dry type bag filter plant where dust is removed before the gas is released to the atmosphere. Other gases emitted from the Melt Shop during the process are collected in a canopy in the roof of the Melt Shop building and are ducted to a central filter plant. The collected dust is stored in a silo from where it is periodically transported to the Pellet Plant for conversion to pellets.

4.6.2 Ladle Furnace (LF)

The LF is essentially a mini-EAF and is used to free the EAF for further melting. Temperature adjustment and trimming occurs in the LF. Trimming refers to the addition of alloys in order to obtain the required steel grade. Argon is also bubbled through the melt to ensure that the liquid steel is homogenous.

Following temperature adjustment and trimming the liquid steel is transferred in the ladle to the CSP Plant.

4.7 Compact Strip Production (CSP) Plant

The CSP process is illustrated in Figure 13. There are three major components of the CSP Plant which are installed in line, namely the Caster, Equalising Furnace and Rolling Mill. These are further described below.

4.7.1 Caster

Liquid steel is transferred to the casting floor in the ladle which is placed by overhead crane in a ladle turret. The ladle turret can carry two full ladles, each ladle having a capacity of up to 160 tonnes. On the casting floor, the liquid steel is poured at a controlled rate from the ladle through a refractory shroud into a tundish. The shroud prevents the metal stream from absorbing oxygen and minimises heat losses.

The tundish is a liquid metal reservoir and distribution system, and is essentially a rectangular box of about 30 tonne capacity with a nozzle located in the bottom. Tundishes are heated prior to use to minimise heat losses from the liquid steel during the start of a casting sequence.

Liquid steel flows from the tundish at a controlled rate into a mould which forms it into a cast slab. The mould is a box type structure made of a copper alloy and with water passages for circulating cooling water to absorb and remove heat from the solidifying steel.

During casting the mould vibrates and casting powder is added. The use of flux powders and vibration of the mould result in the production of thin cast slabs with excellent surface quality. Slab casting speed is between 2.8m and 5.5m per second.

Beneath the mould are rollers which guide the strand of the hot solidifying slab as it emerges.

The slabs are cast in lengths of approximately 48m, about 50mm thick and between 900mm and 1500mm wide.

4.7.2 Equalising Furnace

Temperature gradients that develop in the slab during the casting process are removed in the equalising furnace. As the slab is solidified, the edges cool more rapidly than the middle and this variability in temperature must be eliminated prior to rolling. The equalising furnace is about 185m long and can be used as buffer storage to temporarily hold up to three slabs as well as to equalise the temperature of each slab.

Each slab enters the furnace at a temperature of approximately 1050°C and leaves the furnace at a uniform temperature of approximately 1100°C with a tolerance of 10°C throughout the slab. Scale develops on the surface of the slab while it is in the furnace.

4.7.3 Rolling Mill

After leaving the equalising furnace the slab passes through a rotary shear which removes rough edges and then through a de-scaler where high pressure water dislodges the scale that formed on the slab surface in the equalising furnace.

The slab then moves through an edge reheating system which re-establishes temperature gradients across it. It then enters the Rolling Mill.

The Rolling Mill is made up of a series of six rolling stands with vertical edgers. The vertical edgers have two functions. They prevent the horizontal spread of the slab beyond the desired width, and they can also be used to reduce the width of the slabs without altering the size of the rolling stands. Each stand contains two small diameter work rollers and two large backup rollers which support the work rollers. The Rolling Mill will roll a slab of 50mm thickness and average width of 1250mm to a nominated final thickness between 1.2mm and 12mm. At this stage the steel is referred to as a strip.

As the hot strip leaves the Rolling Mill it passes onto the run-out table where it is cooled to meet the desired metallurgical requirements (known as a laminar cooling). The laminar cooling

section has a number of normal and fine water spray sections, both top and bottom, which can be selectively switched on and off to obtain the optimum cooling rate as required.

The cooled strip is then directed into a pinch roll unit which feeds it to the down-coiler. In this, the strip is bent in a downwards direction and rolled to produce a coil.

Each roll is banded to prevent it from uncoiling, and weighed. The rolled coils weigh up to 27 tonnes for a 1500mm wide coil and average 22.5 tonnes. An identification code and information in relation to the characteristics of the strip are placed on the side and the roll is then moved to a storage area where it takes approximately two days to cool to ambient temperature. It is then ready for shipment.

4.8 The Power Station

It is expected that the Power Station will comprise 3 operating 70mW open cycle frame 6FA gas turbines. The basic performance specifications for each of these gas turbines are:

- Continuous Output 70,140kW
- Heat Rate 10,529kJ/kWh
- Gas Consumption 738.5GJ/hr
- Turbine/Generator Speed 5,235/3,000rpm
- Unit Efficiency 34.1%

Each gas turbine unit has basic dimensions of about 36m by 7m by 10m high, with a 30m high exhaust stack.

Power compensation equipment and a switchyard will be located adjacent to the Power Station.

4.9 The Cryogenic Oxygen Plant

The Oxygen Plant will produce high purity oxygen, nitrogen and argon from the atmosphere. Air in the atmosphere comprises approximately 78% nitrogen by volume and 21% oxygen by volume with the remainder made up of argon, water vapour, carbon dioxide and traces of rare gases.

Air is initially filtered, and then passed into an air compressor. Carbon dioxide and water vapour are then removed by passing the compressed air through a bed of activated alumina and a molecular sieve, which absorb the water and carbon dioxide respectively.

The cleaned air is cooled until it liquefies and then moves into an air separation column, where the separation of oxygen, nitrogen and argon is achieved. The column contains a series of perforated trays. The gas stream rises up the column and passes through the perforated trays on which a layer of liquid is maintained. The bubbles of gas passing through the trays are separated into oxygen and the remaining components of air. The oxygen combines with the liquid on the trays, which cascades down towards the bottom of the column. The remaining components continue moving up the column.

The liquid in the bottom of the column has a concentrated liquid oxygen purity in excess of 99.5%. This liquid is then pumped through a liquid oxygen pump, which raises its pressure. It is then directed back through the heat exchanger, where it is converted to a gas for use in the GSP.

The nitrogen which has risen to the top of the air separation column has a concentration purity of approximately 99.99%. The nitrogen is heated to ambient temperature in a heat exchanger prior to being directed for use in the GSP.

Argon is removed from the middle section of the air separation column and is then directed for use in the Melt Shop.

5. INPUTS TO THE GSP

5.1 Iron Ore

About 1.5M tonnes of high grade iron ore will be delivered each year from the Tallering Peak mine site to the GSP. This ore will comprise 85% fines of less than 10mm size and 15% lump in the size range 10 to 30mm. The crushing and screening of the iron ore to these specifications will occur at the mine site.

A typical assay of the high grade ore as mined is as follows:

- Fe 64% (65% after crushing and desliming)
- SiO_2 3%
- Al_2O_3 2%
- LOI 1 to 1.5%
- TiO_2 0.2%
- P 0.02%
- S 0.01%
- CaO 0.01%

5.2 Other Solid Inputs

Other solid inputs to the GSP are as follows:

• Scrap steel	150,000t/yr
• Quicklime	45,000t/yr
• Alloys	18,000t/yr
• Hydrated Lime	12,000t/yr
• Carbon	12,000t/yr
• Limestone	10,000t/yr
• Refractory bricks	9,000t/yr
• Electrodes	2,800t/yr
• Casting Powder	500t/yr
• Hydraulic Fluid, Oil and Grease	120t/yr
TOTAL	259,420t/yr

The uses of the major commodities listed above are described in Section 4.

5.3 Storage Requirements

The methods of storage of the solid inputs to the GSP and the capacity of each storage facility are listed in Table 5.1.

The storage capacities are based on all solid inputs, other than iron ore, being delivered through the Port of Geraldton. It is possible once more detailed technical requirements are available and subject to suitable commercial arrangements, that some of the solid inputs may be obtained from within Western Australia and delivered to the GSP by road and rail. This applies particularly to scrap steel, limestone and lime products, and possibly refractories and some alloys. If these inputs are sourced in Western Australia, the storage capacities may be reduced.

Table 5.1. Geraldton Steel Plant storage details

Material	Storage Description	Storage Capacity (tonnes)
Pellet Plant		
Fines Ore	Covered stockpile	8,000
Limestone	Covered bin	2,000
Hydrated Lime	Covered bin	2,400
DRI Plant		
Lump Ore	Covered stockpile	2,500
Pellets	Open stockpile	8,000
Melt Shop & CSP Plant		
Reduced Iron	Refractory lined bins	2 at 1,300
Scrap	Open scrap yard	30,000
Quicklime	Covered bin	9,000
Alloys	Bins	3,600
Carbon	Covered bins	2,400
Refractory Bricks	Covered warehouse	2,000
Slag	Open stock pile	3,500
Finished Coils	Covered warehouse	40,000

5.4 Water

5.4.1 Water Requirements of the GSP

The GSP will require a water supply of approximately 13,600m³/day or 4.5†million cubic metres per year (Mm³/yr). The water is required for cooling purposes and for various process needs such as de-scaling of the steel in the Rolling Mill. The water requirement of each major component of the GSP is as follows:

• Pellet Plant	0.49
• DRI Plant	1.77
• Melt Shop	0.43
• CSP Plant	1.36
• Oxygen Plant	0.05
• Other	0.04

	Sub Total 4.14
10% Contingency	0.41

TOTAL	4.55Mm3/yr
	=========

The use of water in the GSP is shown in Figure 14.

5.4.2 Water Supply Alternatives

Three options have been considered for the supply of water to the GSP. These are:

Exclusive use of fresh (potable) water,

Use of brackish (non-potable) groundwater for cooling purposes with potable water used for all other requirements, and

Use of seawater for cooling purposes with potable water used for all other requirements.

For the purposes of the feasibility study for the MWIS Project, it has been decided that all of the water supply to the GSP will be of potable quality. While it is known that extensive aquifers containing brackish groundwater occur in the Geraldton region, proving that there is an adequate resource within a short distance of the Narngulu Industrial Estate would require a potentially time consuming exploration and test pumping program. Similarly, the use of seawater for cooling purposes would require the definition of a pipeline route for seawater uptake and discharge and consideration of the additional environmental factors which are involved.

The Water Authority of Western Australia (WAWA) has advised that potable water can be supplied to the GSP at the standard rates that major consumers are charged. Currently WAWA obtains potable water for the Geraldton area from the Allenooka Borefield approximately 47km to the south-east of the Narngulu Industrial Estate and it is delivered to Geraldton via a 600mm diameter pipeline passing immediately to the east of the Estate. A recent draft Groundwater Management Plan prepared by WAWA indicated that the sustainable yield of the groundwater resources at Allenooka is 28.7Mm^3/yr of which 8.5Mm^3/yr is currently used for public water supply. The GSP requirement is estimated at 4.5Mm^3/yr as described in Section 5.4.1.

As WAWA will be supplying water to the GSP, it will be responsible for the expansion of the Allenooka Borefield and for increasing the capacity of the existing pipeline or for installing a new pipeline to the Narngulu Industrial Estate should this be necessary.

5.5 Natural Gas

5.5.1 Natural Gas Requirements of the GSP

The natural gas requirement for the GSP is estimated to be approximately 74 terajoules (TJ) per day. The use of gas in the GSP is as follows:

Pellet Plant	3.8
DRI Plant	31.3
Melt Shop	0.6
CSP Plant	4.0
Power Station	34.3
TOTAL	74.0TJ/day

The main uses of natural gas in the GSP are the direct reduction process and as fuel in the Power Station.

5.5.2 Supply of Natural Gas

Natural gas will be supplied to the GSP at Narngulu from the main Dampier-Perth Natural Gas Pipeline. The location of the main pipeline is shown in Figure 3. There is an existing gas lateral pipeline from this main pipeline to the Narngulu Industrial Estate. The route is also shown in Figure 3. An additional gas pipeline will be installed.

5.6 Other Gas Requirements of the GSP

Oxygen, nitrogen and argon are also required as inputs to the GSP. Oxygen is used in the EAF to produce the 'carbon boil' (Section 4.6.1), nitrogen is used for purging systems, and argon is used in the Ladle Furnace to equalise the temperature of the melt. The volumes of gas required are listed in Table 5.2

Table 5.2 Geraldton Steel Plant gas requirements other than natural gas.

	Oxygen	Nitrogen	Argon
Direct Reduction Plant	NR	1200m³/hr	NR
Melt Shop:			
Electric Arc Furnace	4200m³/hr	1200m³/hr	NR
Ladle Furnace	NR		300m³/hr
Caster	NR	100m³/hr	250m³/hr

NR = not required

These gases will be produced on site in the Cryogenic Oxygen Plant described in Section†4.9. The location of this plant is shown in Figure 9.

5.7 Electricity

5.7.1 Electricity Requirements of the GSP

The average demand for electric power for the GSP is estimated at 125 megawatts (MW) and the estimated peak load is 185MW. The use of electric power in the complex will be as follows:

• Pellet Plant	5
• Direct Reduction Plant	5
• Melt Shop	87
• CSP Plant	18
• Oxygen Plant	3
• Auxiliaries	7
TOTAL	125MW

The main users of electricity are the EAF and the LF in the Melt Shop and the roll drives in the CSP Plant. The Melt Shop and CSP Plant are described in Sections 4.6 and 4.7 of the PER.

5.7.2 Electricity Supply

Electricity will be supplied to the GSP by a Power Station with an installed generating capacity of 200MW. The Power Station is described in Section 4.8.

7. TRANSPORT OF IRON ORE, STEEL AND OTHER INPUTS

7.1 Introduction

The transport requirements for the GSP have been assessed in detail by Halpern Glick Maunsell Pty Ltd (1995). The requirements can be considered in two sections:

Transport of materials between the Tallering Peak mine site and the GSP at Narngulu, and

Transport of materials between the GSP and the Port of Geraldton.

Approximately 1.5M tonnes of iron ore will be transported from the Tallering Peak mine to the GSP each year. The majority (85%) of the ore will be fines (less than 10mm particle size), and the remainder (15%) lump ore (between 10mm to 30mm particle size). Waste products

produced at the GSP will also be backhauled to the mine site for disposal, and in particular slag and refractory bricks. The quantities involved are in the order of 118,000t/yr of slag and 9,000t/yr of bricks. Further details are provided in Section 6.7.1.

One million tonnes of rolled coiled steel will be produced at the GSP each year. This will be transported to the Port of Geraldton for export. Approximately 260,000t/yr of solid inputs, other than iron ore, are required for the iron and steel making process as listed in Section 5.2. The PER is based on all solid inputs being delivered through the Port of Geraldton although in reality some may be sourced from within Western Australia.

7.2 Transport of Iron Ore

7.2.1 Methods of Transport and Handling

Iron ore will be transported from the mine site to the GSP in two stages:

i) By road between the mine site to a Transfer Facility north of Mullewa, and
ii) By rail from the Transfer Facility to the GSP.

At the mine site, the ore will be loaded into triple road-trains, which consist of a prime mover and three articulated trailers, with a carrying capacity of approximately 80 tonnes. The trucks will be loaded by driving under an overhead bin, which will open at the bottom, discharging ore into the trailers.

The trucks will then travel to a Transfer Facility located approximately 2km to 3km north-west of the town of Mullewa. The precise location will be determined in consultation with the Mullewa Shire Council and local land owners but it is assumed that it will be in the vicinity of the refuse tip.

The trucks will discharge their loads to form piles adjacent to a rail siding and will pick up waste which has been railed from the GSP for transport back to the mine site. The railway will be extended from near Mullewa to the siding.

It is estimated that the road haulage will involve up to 120 truck movements per day (i.e. 60 each way), with trucks operating 24 hours per day and 7 days per week (i.e. 5 truck movements every hour).

Two trains per day will be used to transport the iron ore from the Transfer Facility at Mullewa to the GSP at Narngulu (i.e. 4 train movements). Each train will comprise 2 locomotives with 46 bottom dump wagons, with each wagon having a capacity of 53 tonnes (i.e. a maximum of about 2400t of ore will be transported by each train). The wagons will be loaded from the stockpiles using a front-end loader.

The trains will unload at the GSP into a bottom reclaim hopper, enclosed in a shed. Iron ore will be transferred from the hopper to enclosed stockpiles using covered conveyors. The location of the unloading facility at the GSP is shown in Figure 9.

7.2.2 The Transfer Facility

The Transfer Facility north-west of Mullewa will comprise a stockpile served by a straight rail siding with enough double track for the locomotives to disconnect and re-position at the front end of the train. The siding will incorporate a viaduct which will enable the waste material returned from the GSP to be dumped from the rail wagons while the loading of iron ore is taking place.

The surface of the facility will be sealed with the railway down one side. One area of the facility will be allocated for the storage of lump ore, another for storage of fines ore, and one for waste material. Each of these areas will be alongside the railway line.

Trucks arriving from the mine site will approach the lump or fines storage area and then tip their loads as close as possible to the railway track. The trucks will then pull away and return to the mine unless they are designated to backhaul waste.

A front-end-loader will be used to load the trains, to move ore closer to the train loading zone, and to manipulate the stockpiles.

The waste materials backhauled from the GSP will be bottom dumped from the railwagons at the viaduct into a below ground hopper. A belt feeder will then convey the waste onto a conveyer belt which will transport it above ground to a conical stockpile.

The Transfer Facility will incorporate a drainage system including silt traps. The prevailing winds at Mullewa are mostly from the south-west, south and the south-east and therefore there is little potential for dust to blow towards the town of Mullewa which is to the south-east.

The facility would operate 24 hours a day and will require lighting.

7.2.3 Transport Route

Traffic between the Tallering Peak mine site and Mullewa will use the existing Carnarvon-Mullewa Road. Traffic accessing the Transfer Facility will use an access road from the Carnarvon-Mullewa Road. Access between Tallering Peak and the Carnarvon-Mullewa Road is currently provided by dirt tracks, and the Carnarvon-Mullewa Road itself is sealed for the first 16km north of Mullewa and thereafter is gravel surfaced.

In order to accommodate transport between Mullewa and the mine site, it will be necessary to upgrade the existing Carnarvon-Mullewa Road to a sealed all weather road with heavier pavement. It is anticipated that the road will be 10m wide with a sealed width of approximately 8m with some passing lanes provided. It will also be necessary to construct a crossing (bridge or culverts) across the Greenough River and to upgrade culverts as required at creek crossings.

New sealed access roads will also be established between the Carnarvon-Mullewa Road and the Tallering Peak mine site and to the Transfer Facility.

The main land use along the Carnarvon-Mullewa Road is pastoral or general farming. However, the "A" Class Urawa Nature Reserve and a "C" Class Reserve for the purpose of conservation of flora and fauna, are located adjacent to the western boundary of the road.

It will also be necessary to construct a rail spur line about 4km long between the existing rail line and the proposed Transfer Facility. This spur line will pass through general farming land to the west of Mullewa.

The existing railway line between Narngulu and Mullewa passes near the small town of Moonyoonooka and through the small town of Eradu (Figure 24). Land on either side of the railway is either used for general farming, or is uncleared native bush.

The track is maintained at a standard to support 16 tonne axle loads and would require upgrading to permit 19 tonne axle loads. It is envisaged that the upgrading will occur progressively over a number of years.

The trains will enter Narngulu on the existing railway line, and discharge of the ore will occur on a new spur line. This will be constructed on land owned by Kingstream Resources NL and Pavilly Pty Ltd that is currently zoned for industrial purposes. The existing rail currently

passes through general farming land and next to the Narngulu townsite before entering the Narngulu Marshalling Yards.

7.2.4 Environmental and Social Implications

It is not anticipated that there will be any issues associated with the transport of iron ore from the minesite to the Transfer Facility given the absence of houses along the transport route. The trucks will not impact on Mullewa residents as they will not enter the town. The Carnarvon-Mullewa Road will readily accommodate the increased number of trucks as it is not subject to large traffic volumes at present (average 54 vehicles per day, peak 70 vehicles per day). Upgrading of the existing road to a sealed road will provide benefits in terms of safety and will have no significant impacts on the existing environment.

Iron ore will be stockpiled at the Transfer Facility in open stockpiles and dust may be generated from these and during unloading of trucks, and loading of trains. It may therefore be necessary to implement dust suppression strategies, such as watering the stockpiles during strong winds.

Lights at the Transfer Facility may also need to be shrouded to reduce its visibility at night.

All transport of iron ore from the minesite to the GSP will be in covered road trailers or rail wagons, which will prevent dust emissions.

The number of trains along the line between Mullewa and Narngulu is currently a maximum of four per day, all of which are associated with grain transport. The addition of four extra train movements per day (one every six hours) is not expected to cause a significant impact on residents at Mullewa, Eradu, Moonyoonooka or Narngulu.

Herring Storer Acoustics (1995) estimates that the noise levels associated with existing and predicted train movements on the Mullewa to Narngulu railway at a distance of 15m are:

- existing four train movements LA_{eq} 24 hour 49dB(A); LA_{max} 88dB(A); and
- predicted eight train movements LA_{eq} 24 hour 52dB(A); LA_{max} 88dB(A).

The recognised criteria for train noise at residences are:

- LA_{eq} 24 hour 55dB(A); and
- LA_{max} 80dB(A).

These criteria are based on the State Pollution Control Council of NSW Environmental Noise Control Manual (1988), Part J "Rail Traffic Noise" Guidelines for Planning Levels. The maximum acceptable levels are set down as 5dB(A) above the criteria values.

Although the LA_{max} noise level predicted for trains on the Mullewa to Narngulu railway exceeds the recognised criteria, the predicted levels are based on a distance between the railway line and the nearest house of 15m. Houses are only close to the railway line at Eradu and at Narngulu but the majority are likely to be more than 15m away and the noise level will therefore be less. At both locations the existing maximum noise level associated with train movements is estimated to be 88dB(A) and this will not change as a result of the additional train movements associated with the GSP. At Eradu, the average noise level associated with trains during each 24 hour period may increase by up to 3dB(A) at the closest houses to the railway line. At Narngulu, the increase in the average noise level associated with trains will be less as there are considerably more train movements at this location.

The unloading of iron ore at the GSP will occur within covered areas to prevent dust. Additional dust suppression measures, such as the use of water sprays, will also be implemented if necessary.

7.3 Transport To and From the Port of Geraldton

7.3.1 Truck Movements

Steel will be transported to the Port of Geraldton by trucks with a total capacity of up to 55 tonnes, although the average load will be 46 tonnes. The heaviest and average loads are based on two coils with maximum and average strip widths of 1500mm and 1250mm respectively. The coils will be loaded at the GSP onto trucks using a forklift and also will be removed by forklift at the Port of Geraldton. Each truck will probably be a double road-train with special trailers suitable for transporting the coils. The coiled steel will be stockpiled on reclaimed land behind Berth No. 6 until it is shipped.

It is estimated that the transport of 1,000,000t/yr of steel to the Port will involve 6 truck movements each hour over a 24 hour period or 12 truck movements each hour over a 12 hour period.

Other inputs to the GSP, which are described in Section 5.2, will be imported through the Port of Geraldton. From here the inputs will be transported to the GSP on trucks. The method of loading the inputs onto the trucks will be determined by the nature of the product. For the delivery of 260,000t/yr of materials from the Port of Geraldton, the number of truck movements (assuming that conventional semi-trailers are used) is estimated to be on average in the order of 6 per hour, 12 hours per day, 7 days per week.

However, as deliveries will be made to the Port in ships involving substantial tonnages, it is probable that campaign haulage will be undertaken involving an increased number of truck movements over short periods.

7.3.2 Transport Route

The preferred route for the transport of the steel product to the Port of Geraldton is via Rudds Gully Road, Brand Highway, Portway and Marine Terrace. Solid inputs to the GSP from the Port will also use this route in reverse. The route is shown in Figure 24.

Rudds Gully Road is a two lane, single carriageway road bounded on both sides by general farming areas. Brand Highway is a single carriageway rural highway between the intersection of Rudds Gully Road and Ackland Street, which is within the City of Geraldton limits. Between Ackland Street and the Rotary, Brand Highway is a four lane divided road.

The Highway is bounded by general farming land to the east and coastal dunes to the west until it enters the City of Geraldton, where it is bounded on both sides by residential and commercial areas.

Portway is a two lane, single carriageway that carries mainly Port related traffic between Marine Terrace and Fitzgerald Street. Between Fitzgerald Street and the Rotary the traffic also includes a large proportion of cars and light vehicles which access residential and commercial areas mainly to the north but also to the south of Portway.

From Portway vehicles access Berth No. 6 via Marine Terrace. Marine Terrace is a two lane, single carriageway which carries predominantly Port related traffic, but also a limited amount of local traffic to the residential areas, caravan parks and beaches at the west end of Point Moore.

7.3.3 Environmental and Social Implications

The transport of steel product to the Port and solid inputs from the Port to the GSP will involve increased traffic along the transport route. The increase in traffic, however, is not substantial in

terms of predicted traffic levels on the Brand Highway and Portway without the GSP traffic. Uloth & Associates (1988), in an independent study of traffic in Geraldton, predicted that the number of vehicle movements (i.e. two-way traffic) during peak hour on these two roads in the year 2011 would be:

- Brand Highway 1,600 including 160 heavy vehicle movements.
- Portway 1,000 including 400 heavy vehicle movements.

The number of heavy vehicle movements associated with the GSP on these two roads in peak hour is estimated at 18. This represents a 9% increase of the predicted number of heavy vehicle movements on Brand Highway and a 4% increase of the predicted number of heavy vehicle movements on Portway.

The implications of traffic levels on driving conditions given the type of road involved, is assessed in terms of levels of service. For the Brand Highway, both of the projected traffic levels (without and with GSP traffic) fall within level of service A. This level of service is defined as:

> "A condition of free flow in which individual drivers are virtually unaffected by the presence of others in the traffic stream. The freedom to select desired speeds and to manoeuvre within the traffic stream is extremely high, and the general level of comfort and convenience provided is excellent."

For Portway both of the traffic levels fall within a level of service C but are approaching a level of service D. Level of service C is defined as:

> "In the zone of stable flow, but most drivers are restricted to some extent in their freedom to select their desired speed and to manoeuvre within the traffic stream. The general level of comfort and convenience declines noticeably at this level."

Level of Service D is defined as:

> "Close to the limit of stable flow and approaching unstable flow. All drivers are severely restricted in their freedom to select their desired speed and to manoeuvre within the traffic stream. The general level of comfort and convenience is poor, and small increases in traffic flow will generally cause operational problems."

This means that the predicted level of traffic on Portway in the year 2011 even without any trucks associated with the GSP will generate poor driving conditions. It is likely therefore that improvements in the design of the road such as additional lanes will be required to provide for the predicted increase in traffic. The traffic associated with the GSP will add to this potential problem but in itself will not reduce the predicted poor level of service without improvements to Portway.

An estimate of the increased noise levels due to truck movements associated with the GSP has been made by Herring Storer Acoustics (1995).

This assessment concluded that the noise emission from the future traffic level on Portway in the year 2011, without GSP traffic, will exceed acceptable levels. The Department of Main Roads in Western Australia has a design guideline of 63dB(A) for traffic noise in "quiet areas". The DEP, however, has indicated that it considers that traffic noise should not exceed 58dB(A) during any hour between 11pm and 6am. The predicted noise levels in 2011 from general traffic is 70dB(A) during the daytime and 63dB(A) during the night.

When GSP traffic is added to the general predicted traffic level there is very little change in the noise level as the number of additional truck movements each hour is relatively few.

The implication of truck movements associated with the GSP on Rudds Gully Road is not known as there are no data on existing traffic levels. It is assumed however, that at present relatively few trucks use this road and that therefore 18 truck movements an hour will be a substantial increase. These truck movements will be between Goulds Road and the Brand Highway and there are a few houses along this route. Kingstream Resource NL and Pavilly Pty Ltd therefore will liaise with the Shire of Greenough to determine whether any specific road improvements may be considered necessary or desirable on this road.

7.4 Transport of Waste Products

7.4.1 Methods of Transport

The main waste products to be disposed of from the GSP will be slag and used refractory bricks, totalling about 126,000t/yr.

The slag and used bricks will be loaded onto the trains by front-end loader for transport to the Transfer Facility near Mullewa. The handling of slag and bricks at the Transfer Facility is described in Section 7.2.2. From the Transfer Facility the slag and bricks will be transported to the mine site at Tallering Peak in the road-trains used to transport iron ore.

Other solid waste products from the GSP, other than waste products returned to suppliers, will be about 180t/yr of CSP Plant sludge and sewage sludge from the sewage treatment plant. This will be transported by truck to a landfill area operated by a statutory authority.

7.4.2 Transport Route

Slag and used refractory bricks will be transported along the railway from the GSP to the Transfer Facility north of Mullewa and then along the road from the transfer station to the Tallering Peak mine. This route is described in Section 7.2.3.

7.4.3 Environmental and Social Implications

The transport of slag and used refractory bricks from the GSP to the Tallering Peak mine site will not impact on residents either at Narngulu or Mullewa. The transport of slag and used bricks will not increase traffic volumes, as the waste materials will be hauled in trains that are returning to the Transfer Facility at Mullewa, or in trucks returning from the Transfer Facility back to the mine site. Slag and used refractory bricks are consolidated materials, therefore the loading and unloading of these wastes will not generate dust.

The transport of CSP Plant sludge and sewage sludge will require one truck every six weeks. The number of truck movements therefore is not significant.

Appendix 5

Proponent's consolidated list of commitments

1. Kingstream Resources NL and Pavilly Pty Ltd will ensure that the Geraldton Steel Plant is designed and constructed in accordance with the descriptions provided in this PER. [Timing - prior to and during construction].

2. Kingstream Resources NL and Pavilly Pty Ltd will ensure that the construction and operation of the GSP conforms with environmental conditions and regulations as determined by the Minister for Environment. [Timing - prior to construction and during the life of the Project].

3. Kingstream Resources NL and Pavilly Pty Ltd will continue to liaise with local communities, local authorities, and government agencies to provide information about the MWIS Project and in order to promote benefits to the Mid-West Region. [Timing - prior to construction and during the life of the Project].

4. Kingstream Resources NL and Pavilly Pty Ltd will appoint an Environmental Manager who will be responsible for environmental management of the construction and operation of the GSP. [Timing - prior to construction].

5. Kingstream Resources NL and Pavilly Pty Ltd will establish an atmospheric emissions monitoring program to the satisfaction of the DEP in order to ensure that all emissions and ground level concentrations are within established criteria The results of the monitoring program will be reported to the DEP and will be available to the public. [Timing - throughout the life of the Project].

6. Kingstream Resources NL and Pavilly Pty Ltd will incorporate specific noise attenuation measures in the detailed design of the GSP which will ensure that the requirements of the Environmental Protection Act, 1986 Regulations or any new Regulations with respect to noise are complied with. These measures will be to the satisfaction of the DEP. [Timing - detailed design phase of the Project].

7. Kingstream Resources NL and Pavilly Pty Ltd will implement regular noise monitoring studies to the satisfaction of the DEP in order to provide information relating to noise levels at nearby residences. The data from the studies will be reported to the Shire of Greenough and to the DEP and will be available to the public. [Timing - throughout the life of the Project].
8. Kingstream Resources NL and Pavilly Pty Ltd will investigate opportunities for the use of solid wastes generated by the GSP. [Timing - prior to and during the operation of the GSP].

9. Kingstream Resources NL and Pavilly Pty Ltd will establish landscape plantings around the perimeters of the GSP site adjacent to roads and small property holdings. The landscape treatment will be developed in consultation with the Shire of Greenough and will be to the satisfaction of the DEP. [Timing - prior to and during construction of the GSP].

10. Kingstream Resources NL and Pavilly Pty Ltd will liaise with the Shire of Greenough regarding aircraft operations at Geraldton Airport. [Timing - prior to construction].