Hot briquetted iron project, Port Hedland

BHP Direct Reduced Iron Pty Ltd

Report and recommendations
of the Environmental Protection Authority

Environmental Protection Authority
Perth, Western Australia
Bulletin 784
June 1995

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 13 July, 1995.

Environmental Impact Assessment (EIA)

Process Timelines in weeks

Date	Timeline commences from receipt of full details of proposal by proponent	Time (weeks)
12/12/94	Proponent Document Released for Public Comment	5
16/01/95	Public Comment Period Closed	
06/02/95	Issues Raised During Public Comment Period Summarised by EPA and Forwarded to the Proponent	3
13/03/95	Proponent response to the issues raised received	5
29/06/95	EPA reported to the Minister for the Environment	15.5

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Contents

Contents (cont'd)

Contents (cont'd)

Page

Figures

Appendices

Summary and recommendations

This Bulletin is the Environmental Protection Authority's report and recommendations to the Minister for the Environment on the proposed Hot Briquetted Iron Project.

The proponent, BHP Direct Reduced Iron Pty Ltd (BHP-DRI), proposes to build and operate a Hot Briquetted Iron (HBI) plant, approximately 7.5 km south-west of Port Hedland. The plant will produce a nominal 2 Mtpa of iron briquettes, which can be used as a feedstock for electric arc furnaces in the steel making process.

The proponent referred the proposal to the Environmental Protection Authority on 17 August 1994 for assessment. The EPA set the level of assessment at Consultative Environmental Review (CER).

The Environmental Protection Authority has assessed the potential environmental impacts of the project, as described in the Consultative Environmental Review, and utilised additional information supplied by other government agencies, the public and the proponent. Additionally, officers of the Department of Environmental Protection had a meeting in Port Hedland with the Town of Port Hedland Council to provide information on the assessment process and procedures, and to discuss environmental issues of concern to the Council.

The main environmental issues relating to the project were identified as:

- impacts on mangroves;
- location of the project on storm surge and flood plain area;
- dust emissions;
- noise emissions;
- emissions of hydrogen sulphide ;
- disposal of solid wastes, particularly the residue storage impoundment;
- discharge of brine from the HBI cooling water system into the harbour;
- risk and hazard management;
- ballast water discharge;
- greenhouse gas emissions.

There was a high level of community concern regarding the potential dust impact from the HBI project, as a result of the existing dust problems associated with the BHP Iron Ore operations at Nelson Point and Finucane Island. The EPA considers that amenity of surrounding residents should be protected and recommends that the proponent be required to have a dust management programme in place and to operate the proposal using the best practice environmental management. The EPA also recommends that as a goal, the plant should be designed to the same standards of emission controls as would be necessary for an identical plant in the Kwinana area where ambient dust levels are controlled under the Kwinana Environmental Protection Policy (EPA, 1992) (Appendix 1). The EPA also foreshadows the possible development of an environmental protection policy for air quality for the Port Hedland region.

The EPA considers that the mangrove ecosystems of the Pilbara are nationally important because they are the only mangroves inhabiting a tropical-arid coastline in Australia, and that further losses of mangroves in the area must be minimised and rehabilitation should be undertaken. The EPA recommends that any direct loss of mangroves as a result of the project construction activities should be re-established, and that monitoring for changes to mangroves near the project area is required. The EPA will use recent information gained through the Semeniuk study on arid zone mangroves done for the Department of Resources Development, as well as information gained through assessing individual proposals to recast a policy position on mangroves.

The EPA has considered the potential flood risk to South Hedland and the risk of damage to the HBI plant and its facilities, resulting from flood and/or storm surge events, and finds the issue manageable.

In relation to noise and air emissions, and risk and hazards from the project, the EPA considers that the impacts are acceptable subject to the securing of a buffer zone of the dimensions described in the CER.

The issues of waste disposal, particularly the residue storage impoundment and the discharge of brine into the harbour, are considered manageable.

Greenhouse gas emissions and ballast water discharge are issues of national concern and should be managed as best as practicable and in the context of the current requirements or guidelines.

The Environmental Protection Authority has concluded that the proposal is acceptable on environmental grounds subject to the proponent's commitments and recommendations summarised as follows:

Recommendation Number	Summary of recommendations
1	**The Environmental Protection Authority recommends that the proposal be considered acceptable, subject to:** • **the Environmental Protection Authority's recommendations in this report; and** • **the proponent's consolidated list of environmental management commitments.**
2	**The Environmental Protection Authority recommends that the proponent have an Environmental Management Programme which will address the issues committed by the proponent, as well as the following in detail:** • **monitoring and management of dust;** • **monitoring of noise inside and outside a designated buffer zone;** • **monitoring of brine discharge;** • **re-establishing all direct loss of mangroves, monitoring indirect impacts on mangroves, and possible baseline monitoring for stygofauna;** • **management strategy for ballast water discharge;** • **annual auditing of greenhouse gas emissions; and** • **recycling viability study.**
2 Cont'd	**The EPA also recommends that the proponent be required to operate the proposal using the best practice environmental management. As a goal, the plant should be designed to the same standards of emission controls as would be necessary for an identical plant in the Kwinana area where ambient dust levels are controlled under the Kwinana Environmental Protection Policy (EPA, 1992) (Appendix 1).** **Should monitoring indicate that adverse effects have occurred or are occurring, the EPA recommends that the proponent undertake the necessary rectification measures.** **Reports of the results of monitoring programme should be submitted annually to the DEP, and will be made available to the public for comment.**

Recommendation Number	Summary of recommendations
3	With respect to the location of the project on floodplain and storm surge area, the EPA recommends that the proponent consult with the Water Authority, the Department of Transport and the Department of Minerals and Energy to seek their opinions on the adequacy of detailed engineering design, with respect to potential impacts on land including erosion, flooding (such as backflooding effects on South Hedland) resulting from the proposal, and flood and storm surge protection for critical components of the proposal (particularly the residue storage impoundment).
4	If the State Agreement Act does not secure a buffer zone for the proposal, then an alternative mechanism should be implemented.

1. Introduction and background

1.1 The purpose of this report

This report and recommendations provide the Environmental Protection Authority's (EPA) formal advice to the Minister for the Environment on the environmental acceptability of the proposed Hot Briquetted Iron (HBI) Project in Port Hedland.

1.2 The proposal

The proponent, BHP Direct Reduced Iron Pty Ltd (BHP-DRI), proposes to build and operate a Hot Briquetted Iron (HBI) plant of nominal capacity of 2 Mtpa, approximately 7.5 km south-west of Port Hedland (Figure 1).

The primary purpose of the project is to provide a downstream processing facility for iron ore extracted from the north west of Western Australia (WA) by BHP Iron Ore. This would fulfil part of the agreement between the State Government and BHP Minerals Pty Ltd and other BHP Iron Ore companies (CER), to further process iron ore to a stage of higher value, which would consequently increase the returns from the minerals mined in WA. The other purpose of the project is to provide feedstock, in the form of metallic iron briquettes, for an emerging South East Asian market, and to meet the growing demand from electric arc furnaces.

1.3 Assessment process

The proponent referred the proposal to the Environmental Protection Authority on 17 August 1994 for assessment. The EPA set the level of assessment at Consultative Environmental Review (CER) because of the potential for significant impacts on the environment and the local community. The CER was prepared in accordance with guidelines issued by the EPA. The CER also drew substantially on the findings of a range of environmental and engineering studies. During the environmental assessment of this proposal the EPA utilised information supplied by other government agencies, the public and the proponent.

1.4 Public involvement

BHP-DRI's Consultative Environmental Review was released for public comment over a five week period commencing 12 December 1995.

During the assessment, officers of the Department of Environmental Protection (DEP) met with the Town of Port Hedland Council to provide information on the assessment process and procedures, and to discuss environmental issues of concern to the Council. Two site inspections were carried out.

2. Summary description of proposal

Even though there have been some modifications to the proposal during the assessment process (the changes have been incorporated in this report), the proponent's CER document can be referred to for detailed description of the proposal.

2.1 Process description

The proposed HBI plant produces metallic iron briquettes through the direct reduction of iron ore fines using modified natural gas (containing carbon monoxide and hydrogen gas reducing agents). The gas stream is then recycled through a gas preparation, cleaning and recirculation system. The process is shown in Figure 2. The water and raw materials flow diagrams for the project are in Appendix 2.

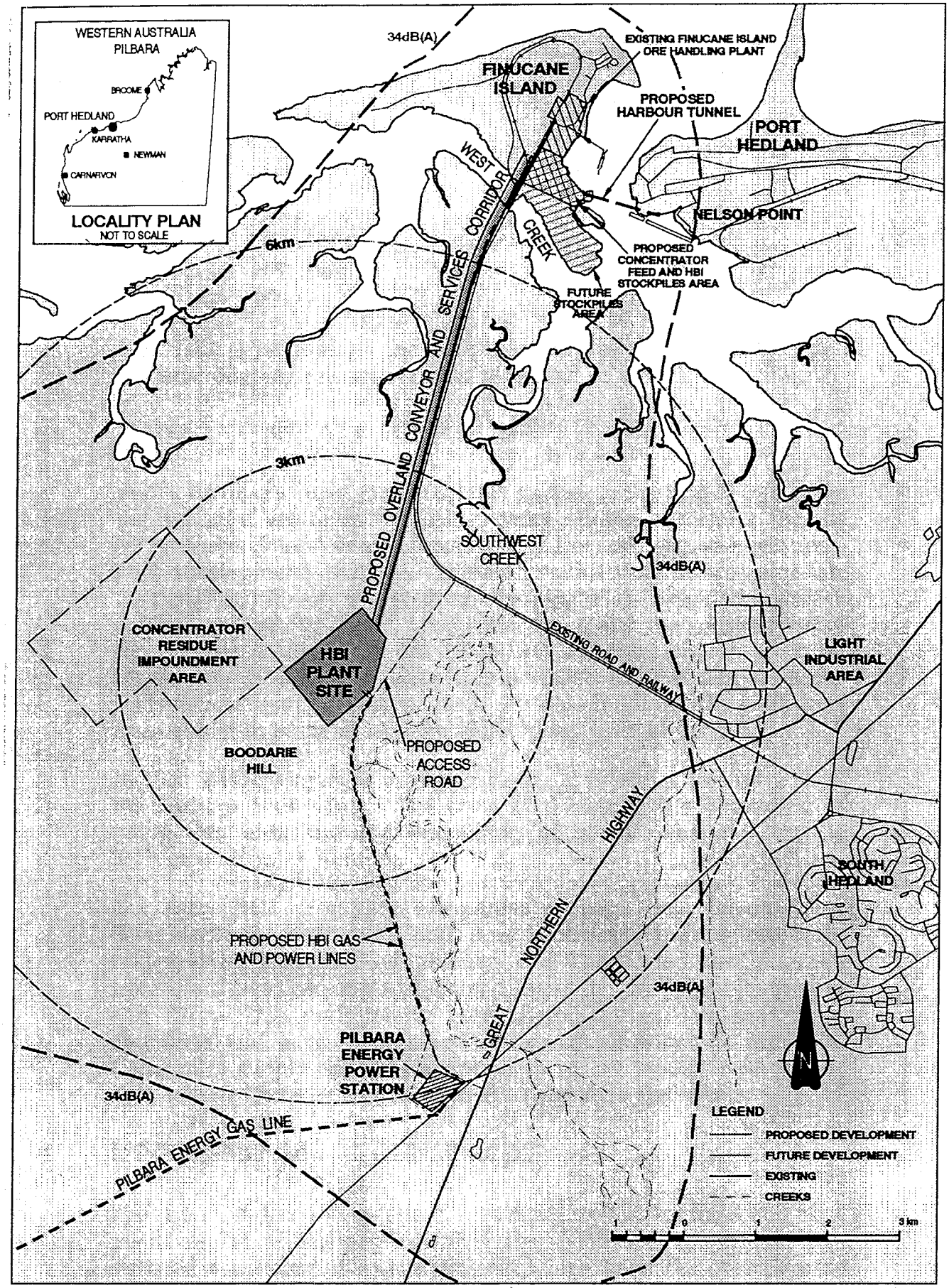

Figure 1. Site and infrastructure relationship, and noise buffer

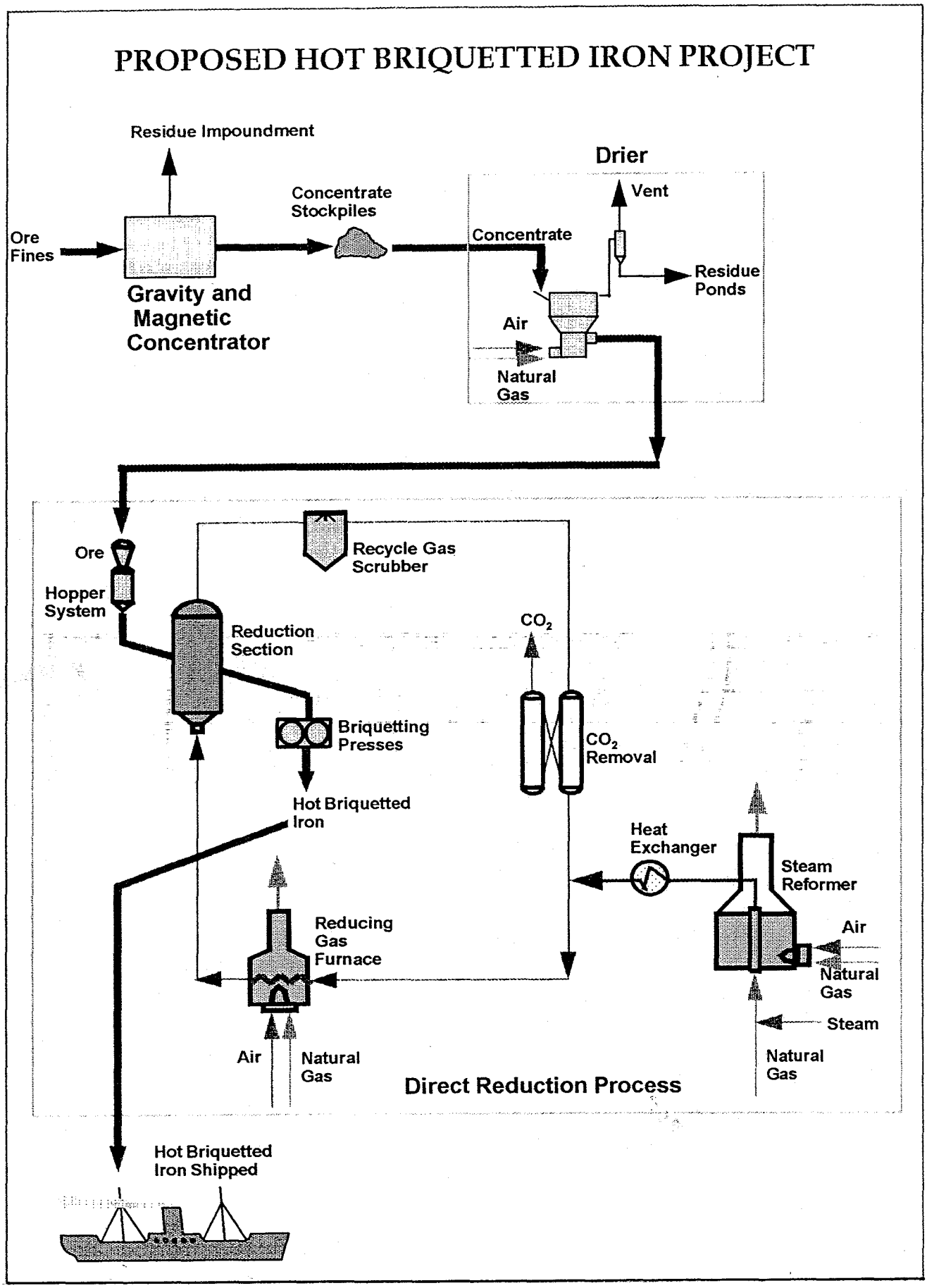

Figure 2. HBI process diagram

The nominal output of the plant is 2 Mtpa of iron briquettes, which may be increased to 4 Mtpa depending on future market requirements. This assessment is for the 2 Mtpa HBI plant only. The primary use of the briquettes is as a feed material for electric arc furnaces in the steel making process. The direct reduction process is a relatively low temperature (850°C) pyrometallurgical process which converts iron ore to metallic iron without passing through a molten phase. It was selected since it allows high grade iron ore fines to be utilised directly without the need for a pellet plant. In addition, environmental impacts are reduced since the process does not produce slags which require off-site disposal and does not require the stockpiling, handling and use of coal.

2.2 Project components

The iron ore fines would come from Nelson Point and Finucane Island (Figure 1) where BHP Iron Ore operates large iron ore stockpiling, processing and ship loading facilities. The iron ore fines would be transferred from Nelson Point to Finucane Island by a below-harbour tunnel conveyor system and from Finucane Island to the HBI plant site by an overland conveyor (Figure 1). A stockpile would be required at Finucane Island for blending and buffer storage. The tunnel project has been referred to the EPA as a separate proposal by BHP Iron Ore (Mt Newman Joint Venture), for which the level of assessment has been set at informal level. The tunnel is a separate project because it will service both existing iron ore customers and the HBI plant - a new customer.

The major elements of this proposal are:

Finucane Island (Figure 3)

- modification to the existing Finucane Island infrastructure to include a new stockpile area, widening of the wharf and upgrading the shiploader;
- a seawater intake system. Seawater, for use in the cooling water system, will be pumped to the HBI plant through a pipeline running adjacent to the conveyor. A parallel pipe will return used cooling water to the ocean.

Overland conveyor (Figure 4)

- an overland conveyor with a single continuous belt having the dual function of transporting iron ore from the new Finucane Island stockpiles to the HBI plant (7 km) on the lower strand and returning briquettes to Finucane Island for shipment on the upper strand;

Boodarie site (Figure 5 and 6)

- an HBI plant producing briquettes;
- a concentrator, located adjacent to the HBI plant, to beneficiate (improve) the iron ore fines prior to use in the direct reduction process;
- a residue storage impoundment for the disposal of the concentrator residue by solar drying and consolidation; and
- a natural gas pipeline and power transmission line running a distance of 5 km between the Pilbara Energy Pty Ltd power station and the HBI plant.

2.3 Site location and existing environment

The HBI plant site is located on the Boodarie Station Pastoral Lease in the Boodarie Hill site, which is currently used for grazing of beef cattle. The proposed site is adjacent to the northern boundary of the Boodarie Heavy Industrial Estate proposed by Landcorp and the Department of Resources Development, which is currently being assessed by the EPA at CER level. The HBI plant site is in a 1:100 year storm surge and 1:100 year flood plain (of South West Creek) area. Nelson Point, Finucane Island, Newman and Boodarie Hill were assessed for location of the

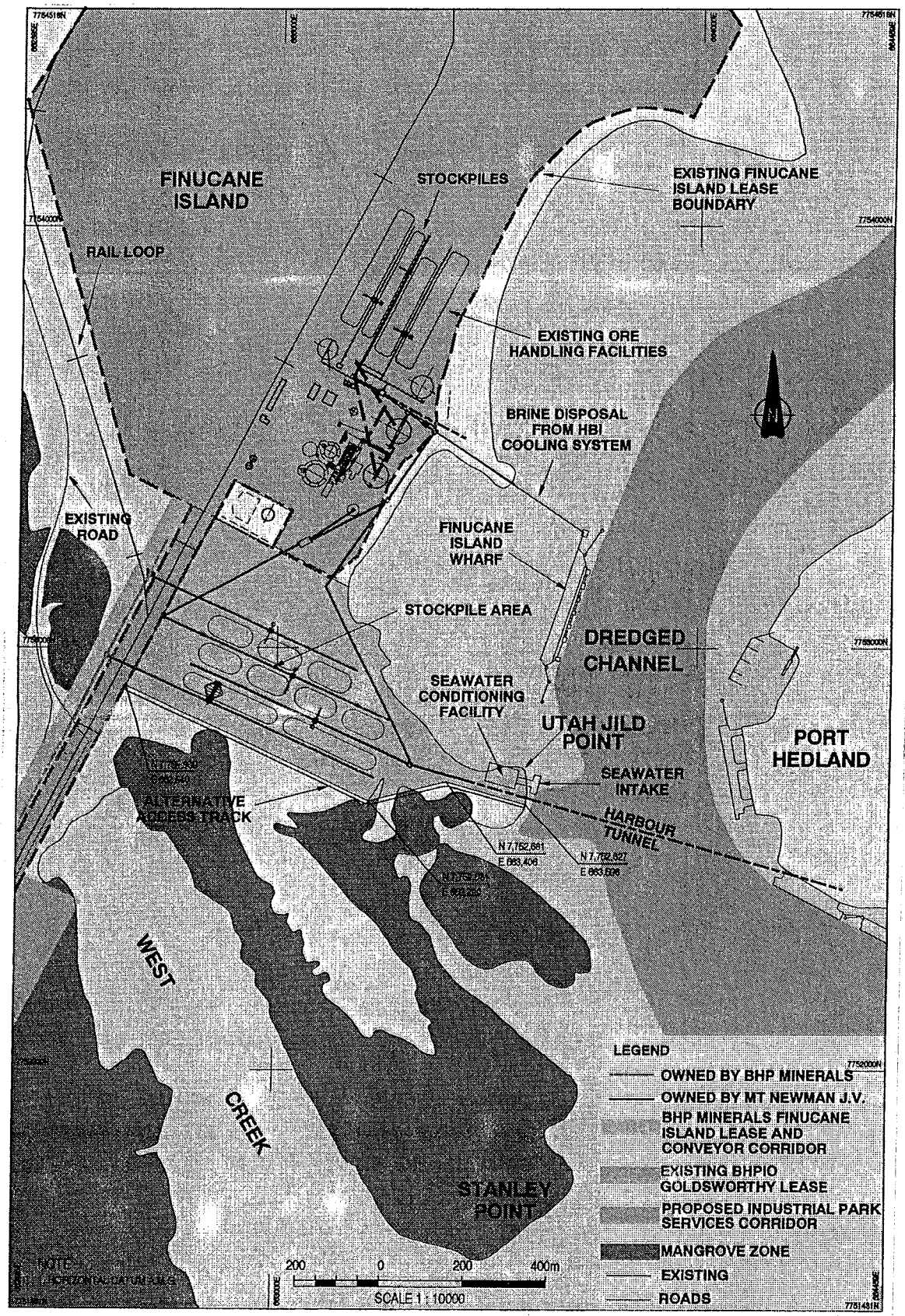

Figure 3. Finucane Island facilities

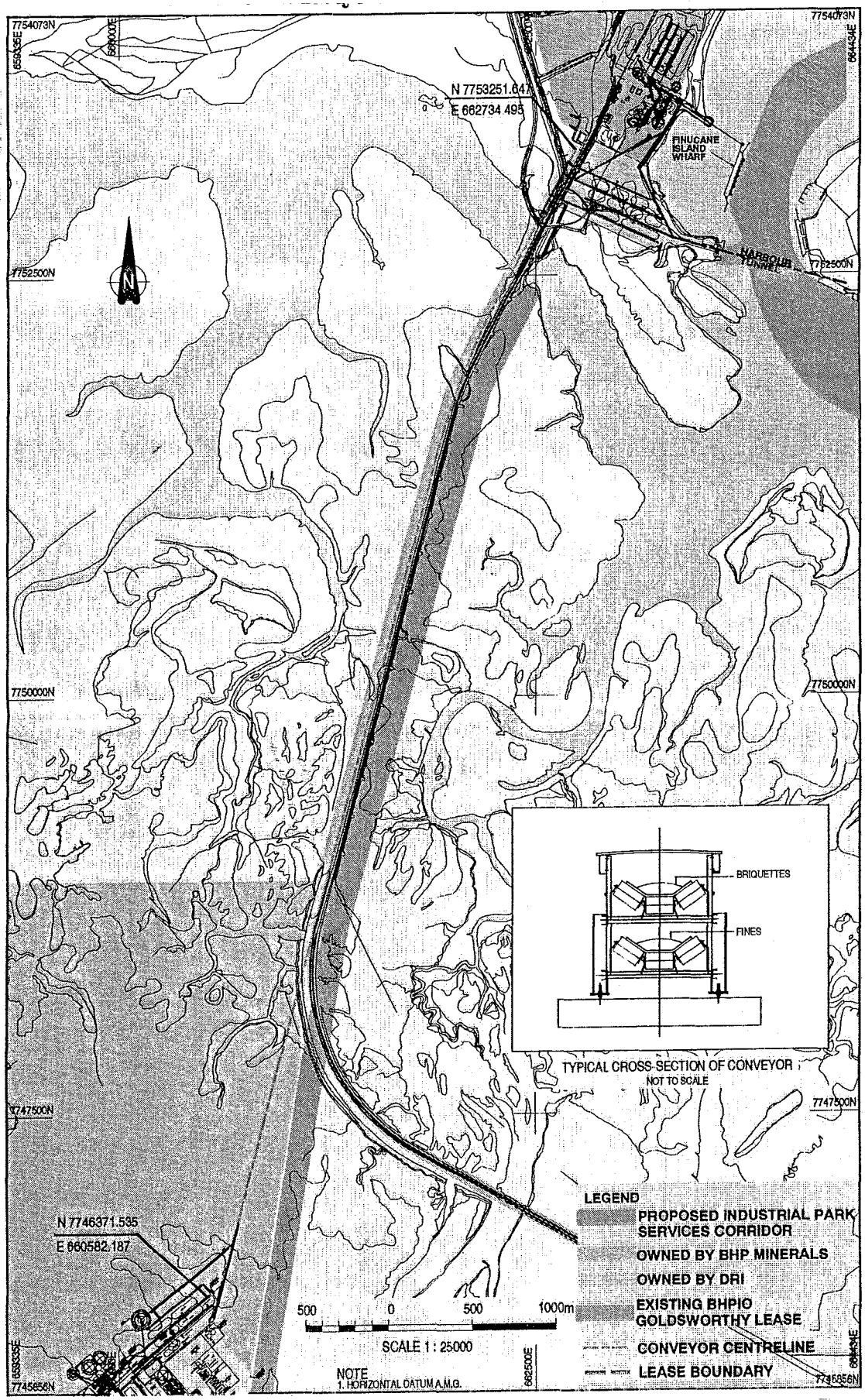

Figure 4. Overland conveyor

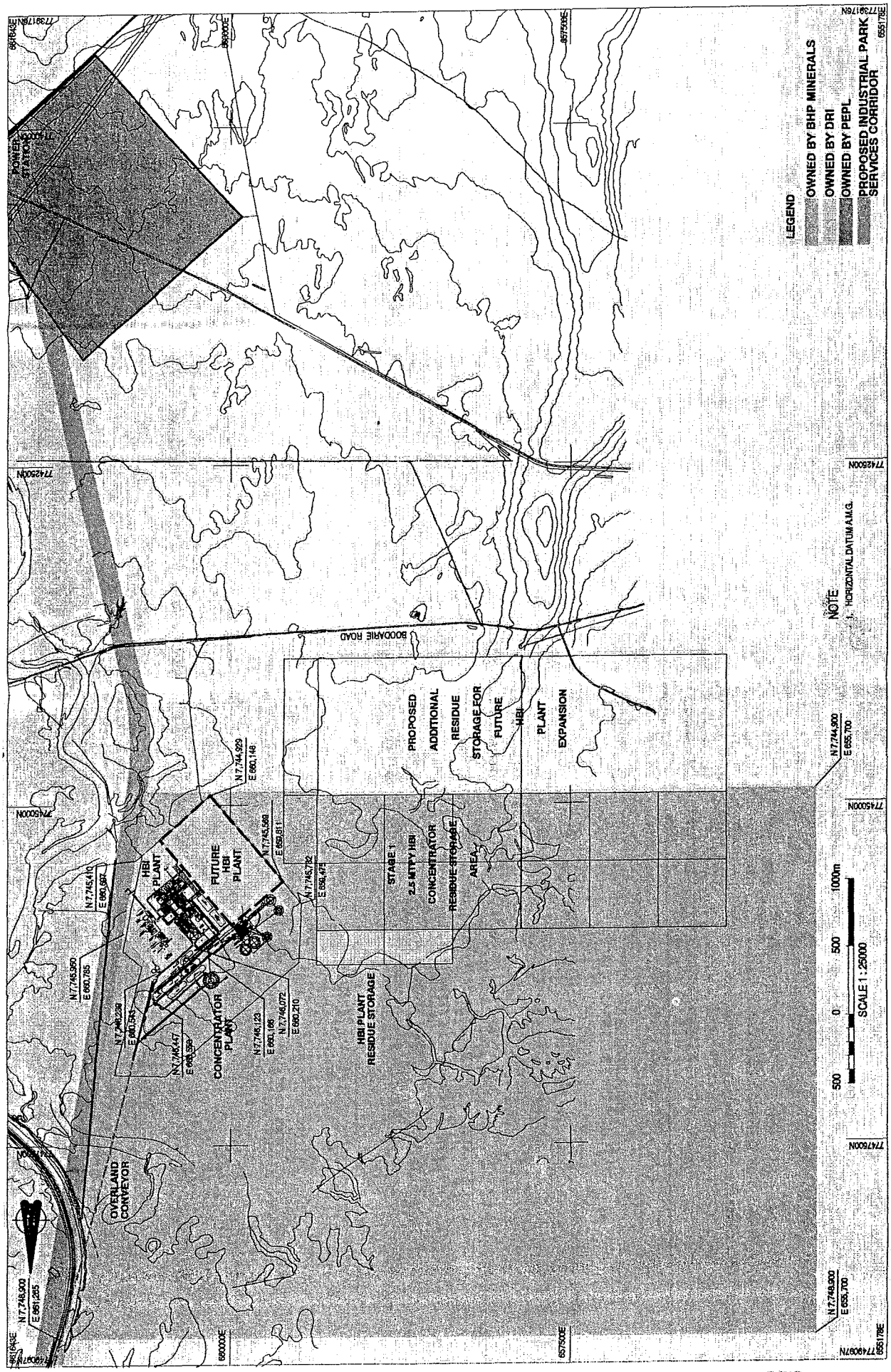

Figure 5. Boodarie facilities

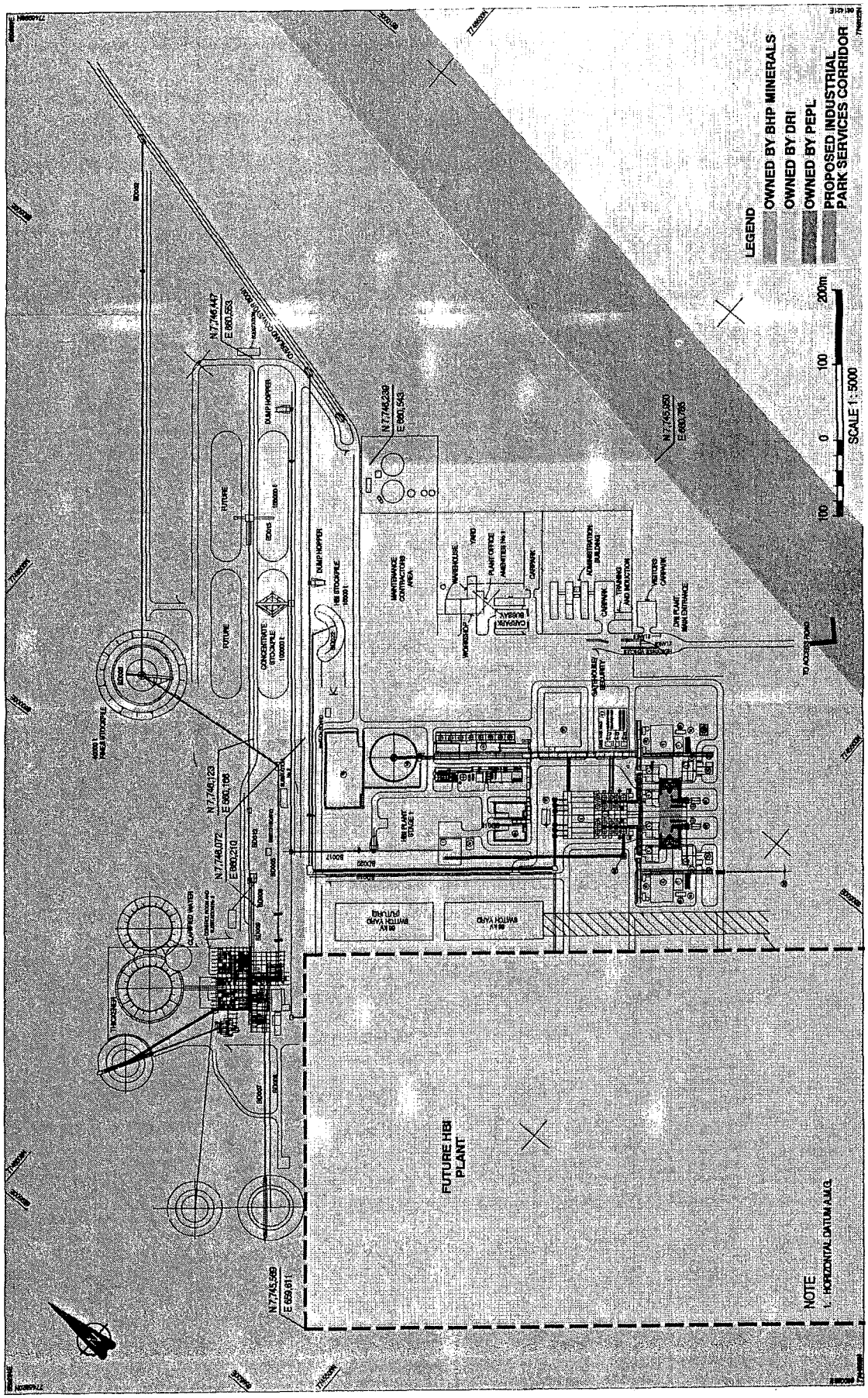

Figure 6. Boodarie site plan

HBI plant and concentrator. The Boodarie Hill site was selected as the preferred site on proximity to the port, energy supply, availability of feedstock, geotechnical and environmental considerations. Various stockpile locations were also assessed against a range of environmental, economic and materials handling issues.

Regionally, the project is located on the coastal plain which is a flat, low-lying tract 2 - 10 km wide, fringed to the north by mangroves, tidal creeks, salt flats, sand overlay and areas of low coastal dunes.

The elevation of the plant site slopes from about RL 9.0 (AHD) in the south to about RL 5.0 (AHD) in the north over a distance of approximately 2,000 m, an average slope of 1:500.

The coastal area from Finucane Island to the HBI plant site can be divided into three physiographic zones which run roughly parallel to the coast line (page 38 of CER and Figure 7):

- the coastal dune belt with dune and beach rock limestone;
- the coastal mud flats, mangrove and samphire flats, and silt and mud flats which are low-lying and subject to tidal inundation; and
- flood plain alluvium with low relief. The proposed HBI plant and concentrator are located on this flood plain.

Soils consist largely of sand, sand-clay and clay. Close to the coast are areas of saline muds and marine sands. Hard, red alkaline earths and Pindan soils occur in frequent patches further inland.

Lists of flora and fauna recorded or likely to occur in the project area are provided in Appendix B and C of the CER document.

2.4 Water supply

Fresh water supply alternatives considered for the project included the existing Water Authority of Western Australia (WAWA) supply system, the development of a new fresh or brackish water borefield and desalination using thermal or reverse osmosis. On the basis of availability and security of supply, development timing, environmental issues and costs, the existing WAWA system was preferred. The estimated fresh water demand is 2.35 Mm^3 per annum.

Seawater was selected for cooling at the HBI plant due to the availability of supply. This reduced the reliance on the Water Authority System and reduced costs that would have been borne through purchase or production of fresh water. The estimated sea water demand is 4.42 Mm^3 per annum.

Two options were considered for disposal of salt water cooling system brine. These were to either discharge to the harbour or disposal to Cargill Salt for use as a feed in the salt production operation. Even though using the brine for salt production appears to be the better resource solution, on the basis of cost/benefit analysis and environmental assessment, harbour disposal was proposed. About 1.48 Mm^3 per annum of concentrated salt water (4 times salinity of sea water) is discharged to the harbour.

2.5 Power and gas supply

The power requirements will normally be supplied by two gas turbine generator sets (32 MW each) located at the HBI plant site and running as a base load operation. The generators will be electrically linked with the Pilbara Energy Pty Ltd gas fired power station to allow flexibility for power draw. The gases discharged from the turbines will be used within the HBI process (ie as preheated air for the HBI furnaces) to improve overall thermal efficiency.

The natural gas pipeline will run between the Pilbara Energy Pty Ltd power station and the plant within a service corridor in common with the power transmission line (Figure 1). The pipeline will be buried.

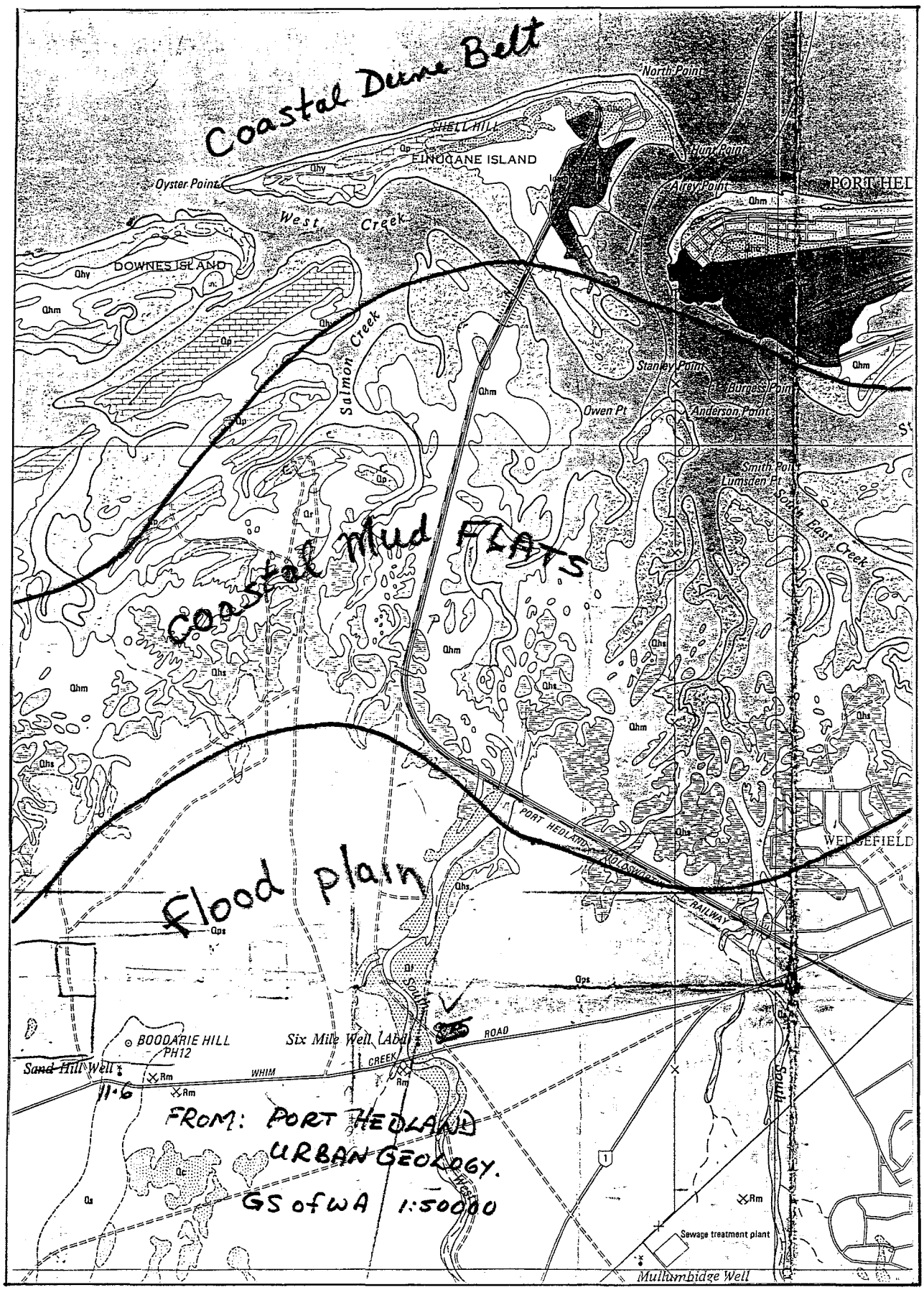

Figure 7. Physiographic zone

2.6 Workforce

Construction of the project is scheduled to start in mid 1995 with commissioning scheduled for early 1997. The plant will operate 365 days per year on 2 shifts of 12 hours each.

The construction phase of the project is estimated to employ up to 1200 people for approximately 20 months. The workforce will be housed in a new temporary camp in Boodarie.

The operations workforce is expected to be around 225 people and will be housed in Port Hedland.

3. Environmental impact assessment

3.1 General

Assessment process

The environmental impact assessment for this proposal followed the Environmental impact assessment administrative procedures 1993, as shown in the flow chart in Appendix 3. The summary of submissions and the proponent's response to those submissions appears in Appendix 4, and a list of submitters appears in Appendix 5. Additional information concerning public submissions is provided below.

Limitation

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

The EPA recognises that further studies and research may affect the conclusions. Accordingly, the EPA 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 EPA.

3.2 Public submissions

Comments were sought on the proposal from the public, community groups and local and State Government Authorities. The proponent's CER document was available for public comment for a period of five weeks between 12 December 1994 and 16 January 1995.

There were 36 submissions received, within the following categories:

- 19 individual letter submissions;
- 5 submissions from groups and organisations; and
- 12 submissions from State, local and other government agencies.

The principal environmental issues of concern in the submissions are:

Biophysical environment issues

- impacts on flora and fauna, including mangrove ecosystem; and
- site location in a storm surge and flood plain area.

Pollution issues

- dust emissions;
- noise emissions;
- air emissions including odour (hydrogen sulphide) ;
- disposal of solid wastes, particularly the residue storage impoundment;
- disposal of liquid wastes including discharge of brine (from the HBI cooling water system into the harbour), hazardous wastes (such as Vanadium pentoxide) and biological (sewage) wastes;
- risk and hazard management;
- ballast water discharge; and
- greenhouse gas emissions (carbon dioxide).

The EPA has considered the submissions received and the proponent's response to issues raised as part of the assessment of the proposal.

3.2.1 Synopsis of public submissions

The local community generally indicated its support for the proposal. However, some concern was expressed over the potential for the current dust problem in Port Hedland (due to the existing operations at Nelson Point and Finucane Island) to escalate with the introduction of the HBI plant. Submissions outlined that unless more stringent dust control measures were imposed on the HBI plant, the people at South Hedland and Wedgefield (Figure 1) would be faced with a similar dust problem to Port Hedland at present.

Many of the submissions expressed concern with the choice of the HBI plant site in a 1:100 year flood plain area which could cause potential backflooding to South Hedland. The submissions were also concerned with potential impacts of atmospheric emissions, particularly hydrogen sulphide on Wedgefield and South Hedland, nearby industry and aboriginal sites. Some submissions put forward an alternative location for the HBI plant which is about 5 - 7km south of the proposed site. The public was also concerned about potential impacts on the mangrove ecosystem and marine environment.

Some submissions expressed a view that the proponent did not provide sufficient information in the CER on the above issues and had consequently caused much uncertainty.

3.2.2 Social, economic and other issues raised in submissions

In considering the issues raised in public submissions for this proposal, the EPA considered that many issues were principally an expression of social concerns (eg: impact of increased iron ore mining on future generations, the need to establish permanent communities in the Pilbara, opportunity for local business and industry, employment of Aboriginal people) or issues not related to this proposal (existing dust problem from BHP Iron Ore's operations). The EPA has concluded that these issues are more appropriately addressed through other processes and other parts of government.

4. Evaluation of issues

The EPA has evaluated all the potential environmental issues identified in Section 3 of this report, based on existing information.

In undertaking this evaluation, the Environmental Protection Authority's general objective is that development should be sustainable in the long term.

Biophysical environment issues

4.1 Location of site on storm surge and flood plain area

4.1.1 Objective

The Environmental Protection Authority's objective is to ensure that industry is located where potential adverse environmental impacts can be avoided or managed.

4.1.2 Evaluation framework

Technical information

The Boodarie Hill site was selected for the HBI plant due to a number of considerations including its proximity to the port and energy supply, geotechnical and environmental considerations. It is about 5 km from the nearest South Hedland residential area and Wedgefield light industrial area, and the land is intended to be used for industrial development (ie the proposed Boodarie Heavy Industry Estate) by Landcorp and the Department of Resources Development. The site, however is in a 1:100 year storm surge and 1:100 year flood plain (ie South West Creek catchment) area.

A study was carried out to estimate the potential impact of the HBI project site on the flood characteristics of South West Creek, which includes hydrological modelling for the combined effects of rainfall and cyclonic storm surge (Davies & Associates, 1994). The hydraulic analysis was conducted over an 8 km length of the Creek extending from the coast upstream to about Great Northern Highway. This study was based on previous reports on Port Hedland storm surge predictions (Hubbert et al., 1991 and Smith & Hubbert, 1993). The results of the study indicate that there will be a slight localised backwater effect in the immediate vicinity of the HBI plant site and that the backwater will not adversely impact on other upstream facilities (SECWA Terminal Station and the Pilbara Energy power station). The 100 year storm surge level and the 100 year storm surge and rainfall event floodplain level at the Boodarie Hill site are shown in Figure 8. These levels are likely to change after the detailed study on storm surge and rainfall flooding is completed (Section 4.1.4).

The HBI plant site storm water drainage system will be designed in accordance with the Australian Rainfall and Run-off (Institute of Engineers, 1987) and will be sized to accommodate run-off from a 1:50 year rainfall event, which will achieve the following (CER, Section 4.15):

- diversion of overland flow around the plant site by incorporating a cut-off berm along the southern boundary of the site. This will reduce the potential for contamination and reducing the risk of flooding at the plant site;

- protection of the HBI plant, concentrator and associated facilities against rainfall induced flooding. It is proposed to locate the plant site on a pad constructed to a finished level above the estimated 1:100 year flood level; and

- separation of the storm water collection and discharge system at the plant site from the process water collection system.

The proponent has made a commitment to institute a surface monitoring program to detect changes to water quality and corrective action will be undertaken if unacceptable impacts are identified (Commitment 18 of Appendix 6).

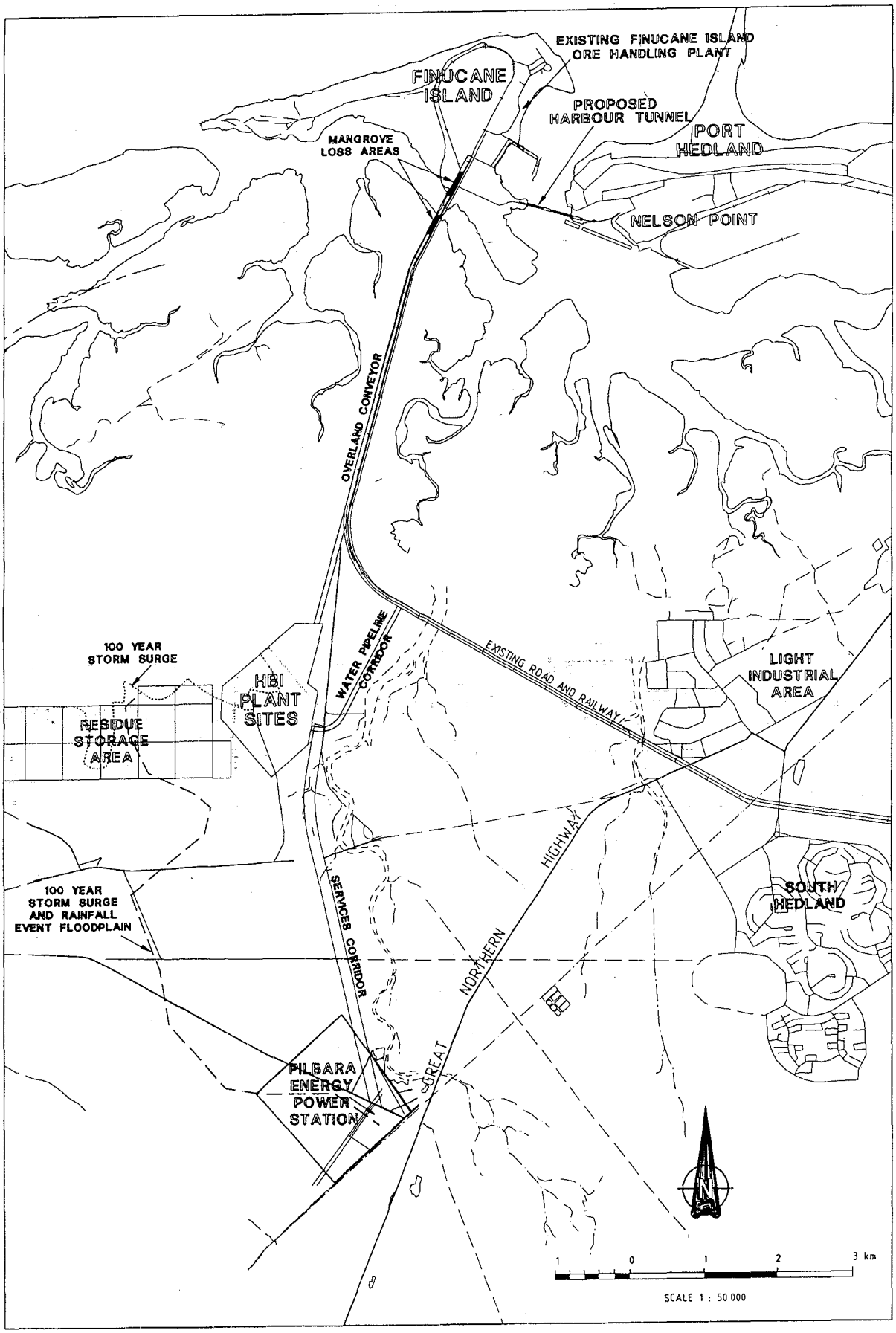

Figure 8. Storm surge/flood levels and location of mangrove clearing

Comments from key government agencies

The Water Authority provided the following comments:

> "The Water Authority considers that the methodology used by Jim Davies & Associates in assessing the hydrology and hydraulic details is acceptable. It would appear that the hydrological results may be conservative, based on other hydrology studies carried out in the area.
>
> The consultant's report indicates that backwater effects would not occur more than 2km upstream from the HBI plant site (ie. cross section XS 9; Figure 5 of consultant's report), even with a combined 100 year ARI rainfall and 100 year ARI surge event.
>
> The Water Authority recommends that the minimum foundation level be 0.5 m above the adjacent 100 year flood level.
>
> The earth training wall should be designed so that it does not breach or overtop, and that the side slopes of the embankments are sufficiently protected to avoid erosion from floodwaters."

The Water Authority also advised that the proposed design standard and criteria for the storm water drainage facilities are acceptable.

Even though the Department of Transport advised that it has not identified any problems with the proposal being located in the 1:100 year storm surge inundation area, based on the 1993 storm surge analysis (Smith & Hubbert, 1993), it provided the following comment:

> "The report by Davies concentrates on the effect the installation will have on the surrounding area. It does not consider the effect of flooding on the plant itself, and indeed this may not be a problem, but we have not been supplied with any levels of the finished project. The effects of flooding on the development was not addressed in the risk analysis in the CER. However given that there is a 69% probability that the 1:100 year return period storm surge event will be exceed every 100 years, it would be prudent to ask what the effect water levels in excess of the 100 year event would have on the proposal, to confirm that this is an appropriate design level".

4.1.3 Public Submissions

The submissions expressed concern with the location of the HBI plant (and the forthcoming Boodarie Heavy Industrial Site) on the current flood plain, which would change flooding patterns and most likely lead to the flooding of South Hedland and Wedgefield Light Industrial Site. Some submissions raised concern about the backflooding effects of the existing Goldsworthy railway (Finucane Island road/railway crossings) to South Hedland, resulting from "poor drainage design involving inadequate culverts under the railway to Finucane Island and a major creek diversion", and requested that a drainage study should be carried out on these effects. A submission from the Local Environment Affinity Force (LEAF) expressed a concern about inadequate storm water evacuation at South Creek, Middle Creek and South West Creek, and that the addition of the Boodarie rail depot, the spur railway lines and the road on the eastern side with their extra height would increase the possibility of backflooding into South Hedland during the next storm surge.

A submission from the Town of Port Hedland (Chapple Research, 1995) raised a number of issues relating to the consultant's hydrologic analysis (Davies & Associates, Nov 1994). The issues include lack of consideration on the backflooding of South Hedland and Wedgefield Light Industrial area resulting from the HBI proposal alone and from the combined effects of the HBI project, the transport corridor, the power plant and the proposed Heavy Industrial Site; the assumption on sheet flooding flow in contrast with the drainage study done by the same consultant for the Boodarie Heavy Industrial Site; no recognition of the railway embankment at South West Creek being inundated during the 50 and 100 year storm surge events; and no consideration of potential increase in rainfall resulting from the greenhouse effect.

Some submissions suggested that the HBI project should be moved to about 5 - 7 km south of the proposed site to avoid the storm surge and flood plain area, and also to minimise the

downwind impacts of atmospheric emissions on South Hedland (under the prevailing North Westerly wind).

4.1.4 Proponent's response

In response to the comment made by the Department of Transport, the proponent indicated (Appendix 4) that since it was identified in the Davies (Nov 1994) report that the 1:100 year flood level from South West Creek is higher than the storm surge level, the critical facilities of the plant will be designed to be protected from the effects of a 1:100 year event during the detailed design. The Bureau of Meteorology is currently carrying out studies of the consequences of the 1:100 and 1:50 storm surges as they affect Finucane Island and the Boodarie site, which are due for completion by end of June 1995.

In response to selected issues identified in the public submissions, the proponent provided the following information (Appendix 4):

- The results of the Davies study (Nov 1994) indicate that backwater effects due to the positioning of the HBI plant site on the edge of the South West Creek flood plain do not extend beyond approximately 2km upstream from the plant site. Hence no increased risk of flooding to South Hedland as a result of the proposed HBI plant site location is expected. Additional hydraulic analysis is being carried out by Jim Davies & Associates and a draft report is due for completion by end of May 1995.
- The proponent is not aware of any studies undertaken to assess the possibilities of flooding in South Hedland as a result of existing drainage arrangements relating to South Creek and South West Creek culverts, the railway embankment, the training wall/culvert along the railway overflowing from South West Creek. However the construction of the overland conveyor and service corridor as designed for the HBI plant are likely to improve area drainage. The HBI project will maintain the current flow pattern during major flood events (ie. the South West Creek flow is diverted by the Goldsworthy Railway embankment via a north-westward flowing drain). Where the conveyor and services cross the diversion drain, the conveyor will be elevated on trestles and a floodway will be constructed, with suitable scour protection, to pass these flood waters.
- As indicated in the CER, the HBI plant site was selected after due consideration of environmental, geotechnical, social and economic factors.

4.1.5 Evaluation

Based on the information supplied by the CER, the EPA understands that the HBI plant site itself at Boodarie Hill is a "greenfield site" with no unique environmental significance, limited amenity and that there would be few, if any, major potential problems with either a corridor or a buffer zone. The EPA, however, is concerned about the location of the project on a 1:100 year storm surge and 1:100 year flood plain area. The concern relates firstly, to potential flood risk to South Hedland and secondly, the risk of damage to the HBI plant and its facilities resulting from a combination of flood and/or storm surge events. Hence, appropriate engineering design and adequate provision for drainage of the proposed site to control flooding from the South West Creek are required. It is acknowledged that the proponent has carried out studies to evaluate the combined impact of cyclonic storm surge on the flood levels at the HBI plant site (pre and post project), and that further studies are being carried out to accurately determine the flood and storm surge levels and the impact of backflooding on South Hedland as a result of the proposal.

The EPA has taken into consideration advice from the Water Authority and the Department of Transport that the location of the proposal on a storm surge and flood plain area is acceptable and the resultant risks can be managed with appropriate engineering design. The EPA notes the Water Authority's recommendation on the minimum foundation level for the HBI plant site and the engineering design for the earth training wall, and believes that the proponent should take into consideration the Water Authority's recommendation.

With respect to the suggestion that the HBI project should be moved 5 - 7 km south of the proposed site to further minimise any potential impacts on South Hedland, the EPA's view is

that industry which has the potential for adverse impacts on people or the environment should only be located where its potential impacts can be managed. In general, many of the environmental issues associated with industry can be managed with appropriate siting and engineering. The EPA has taken into account the proponent's site selection criteria and regional planning consideration, and considers that the proposed site is acceptable and that issues such as waste disposal, noise, odour and air emissions from the proposal are manageable.

It is recommended that the proponent consult with the Water Authority and the Department of Transport to seek their opinions on the adequacy of detailed engineering design, with respect to potential impacts on land including erosion, flooding (such as backflooding effects on South Hedland) resulting from the proposal, and flood and storm surge protection for critical components of the proposal (Recommendation 3, Section 5).

4.2 Flora and fauna

4.2.1 Objective

The Environmental Protection Authority's objective is to protect flora and fauna in the Port Hedland region from harmful impacts associated with the development and operation of the HBI project.

4.2.2 Evaluation framework

Technical information

The project area lies within the Fortescue Botanical District of the Pilbara Region characterised by tree- and shrub-steppe communities (Eucalyptus trees, Acacia shrubs, *Triodia pungens* and *Triodia wiseana*). The Boodarie site has been affected by pastoral activities (grazing of beef stock).

A flora and fauna assessment of the project area was undertaken during 1994 (Mattiske Consulting, 1994). Lists of flora and fauna recorded or likely to occur in the project area are provided in Appendix B and C of the CER document. Descriptions of the fauna habitats and sampling sites are summarised in Appendix 7. The findings of the assessment include the following:

- no flora species which have been gazetted as Declared Rare Flora, pursuant to Sub-section 2 of Section 23F of the Wildlife Conservation Act (1950 - 1980) were located in the project area. None of the four priority vascular plants species classified under the "Declared Rare and Priority Flora List" (CALM, 1994) for the region were located during the survey, however they are considered likely to occur in the project area;
- the plant communities for the project area are well represented throughout the coastal Pilbara in a regional and local context. These are listed in Appendix 8, and shown in Figure 5.1 of the CER document;
- it is predicted that the major impacts from the project will be localised and relate to the expansion of the causeway to Finucane Island through the mangroves;
- nine shorebird species and the Rainbow Bee-eater listed under the Japan/Australia and China/Australia Agreements for the protection of migratory birds and their habitats (Appendix C of CER and Appendix 7);
- six birds (including shorebirds, Australian Bustard, Spotted Nightjar and Collared Kingfisher) and one native mammal (water- rat) classified in the "Reserve Species List of Animals"(CALM, 1994) are expected to occur in the projected area, and for which the impacts of any proposed development should be carefully considered (Appendix C of CER and Appendix 7). Since none of these species is restricted to the vicinity of the

project area, any impact which may occur from the project will be strictly local rather than regional; and

- three habitats within the projected area which are of significance to fauna are the mangrove and mudflat communities, the coastal limestone with *Ficus platypoda*, and the small isolated patches of woodland which occur in low lying sites (Appendix 7). Each of these habitats have the capacity to support a range of specified fauna not found in the surrounding country.

The CER states that approximately 500 ha of land will be cleared for the construction of the HBI plant, concentrator, initial residue impoundment, corridors and associated infrastructure. The major impact from the project will be on the West Creek mangroves through construction of a causeway for the pipelines and overland conveyor, which results in a loss of about 3 ha of mangroves (Figure 5.1, CER). Additionally, some of the low density stands of mangroves occurring intermittently along the western side of the Finucane Island railway will need to be cleared to facilitate construction. Some minimal vegetation clearing will be required for the proposed Finucane Island stockpile and the seawater intake facilities on Utah Point. The proponent has made a commitment to restrict the loss of mangroves to the minimum necessary for construction purposes and safe operation of infrastructure (Commitment 10 of Appendix 6).

Impacts on fauna will be comparatively small and localised in extent, and include loss of habitats resulting from land clearing and loss of mangroves during construction, and from human activities during the operation of the project. The proponent has made a commitment that discussions will be held with CALM on appropriate management techniques should species requiring conservation be located on the site (Commitment 14 of Appendix 6).

The proponent has indicated that an Environmental Management Plan will be developed and implemented prior to construction which will address issues such as monitoring, reporting and the control of declared species of flora and fauna (Commitment 3 of Appendix 6).

Comments from key government agencies

CALM provided the following comments relating to flora and fauna issues:

> "The CER (Section 5.4.2) notes that while not located during the survey, four CALM Priority List flora species are likely to occur in the project area. A more extensive search of the areas proposed for disturbance is warranted. The map of the vegetation associations (Figure 5.1 of the CER) appears creditable. The fauna survey sites are shown but these do not target the areas of potentially greatest interest such as the actual construction sites and the large stands of mangroves adjacent to West Creek."
>
> "Of the plant communities identified, PH-7 is of most interest, supporting the reptile species *Gehyra nana* and having the most bird species of the plant communities recorded for this survey. PH-7 is a coastal complex of *Acacia bivenosa* and *Ficus platypoda* over *Triodia pungens* and grasses on limestone. Ficus is fire sensitive and indicative of long unburnt sites, which in this case have been sheltered from the extensive inland fire-prone spinifex plains by salt marsh and mangroves. Proposed impact on PH-7 appears minimal but these sites should be highlighted and avoided. In particular, fires should not be allowed in these areas. It would be preferable for these PH-7 areas to be made "out of bounds";
>
> "While the direct impacts on mangal and salt flat would not appear to be excessive, Section 5.4.3 of the CER fails to mention the potential for iron ore dust settling on mangroves in the vicinity of West Creek and Finucane Island due to the presence of stockpiles and ore transport. Deterioration of mangrove health and vitality may lead to losses in the long term of considerably greater than the 3 ha proposed to be cleared. Commitment 8.13 (Commitment 13 of Appendix 6) partly addresses this concern. However, a commitment should be included to monitor dust levels and mangrove health to determine whether or not there is any need to initiate extra dust suppression actions, or if the proposed level of dust suppression will be adequate"; and

"Similarly, the possibility of the encroachment of weed species into areas disturbed by the project is not considered. This may have serious long term impacts upon the vegetation associations present in the area. The current distribution of exotic species listed in Appendix B *(Cenchrus ciliaris* and *Aerva javanica)* are now widespread on the Pilbara coast. However, other species (eg *Rumezvesicaruis, Cenchris echinatus)* may invade the area following the extensive earth works and roading that will be necessary. The proponent should make a commitment to washdown all earth moving equipment, and to control weeds not currently on the site that may be imported in soil or other material. Commitment 8.3 (CER) partly addresses this concern, mentioning only that declared species will be controlled. Many significant environmental weeds are not declared, but still cause serious environmental damage."

CALM also commented that in addition to dust loading on vegetation, weed invasion should be cited as a means by which fauna may possibly lost, as "weed invasion has the potential to impact habitat well beyond the initially disturbed site".

The Western Australian Museum made a submission in regard to the need to protect stygofauna, as follows :

"Part of the project site is over limestone containing groundwater with a TDS of 13 to 52 g/L (page 45 of CER). While it is accepted that the limestone unit is of special significance to terrestrial fauna, there has been no assessment for the presence of groundwater fauna despite the availability of a number of monitoring bores. As no groundwater fauna monitoring has been done then the statement that "corrective action will be taken if unacceptable impacts are identified" is meaningless in terms of stygofauna as no baseline will have been established for this most sensitive of fauna.

The above should be considered in the following context. A major groundwater fauna was recently identified inhabiting saline waters in north-western Australia containing an entire Class (*Remipedia*) and Order (*Thermosbaenacea: Crustacea*), as well as many genera, found nowhere else in the southern hemisphere. The fauna is closely allied with a similar fauna found only in the Canary Caribbean islands (attached references) and as such has attracted considerable international interest. The fauna was probably widespread across the emergent northwest shelf during the last iceage and may have first colonised Australia in suitable habitats bordering the Pilbara Craton. All developments on limestones should assess for stygofauna.

As such, sampling for stygofauna should be conducted for this project and if found, a monitoring program and management established."

4.2.3 Public submissions

Public submissions expressed concern about the potential impacts on the mangrove communities in the vicinity of West Creek and Finucane Island from iron ore dust emissions, chemical spillage, and the reclamation in the upper end of the western arm of West Creek. The submissions suggested that the widening of the causeway across West Creek be kept to a minimum to reduce the clearing of mangroves and that the proponent be required to replace the loss of 3 ha of mangroves (resulting from the construction of the project), by revegetating the mangroves somewhere else.

4.2.4 Proponent's response

With respect to the above concerns and comments on the flora and fauna issue, the proponent made the following responses (Appendix 4):

- the proponent has committed to implement CALM's recommendations and these will be addressed in the Environmental Management Plan (EMP) prior to the construction of the project (Commitment 3 of Appendix 6). The PH-7 areas referred to by CALM, however,

are outside the proposed project lease and as such are beyond the control of the proponent;

- extensive sub-surface investigation on the HBI plant and residue impoundment areas has shown that limestone is not present and no cracks or caves occur which would be the likely habitat for the stygofauna. The placement of clean fill to build the conveyor and service corridor to Finucane Island is the only potential impact to the habitat and even if stygofauna existed in the area, the impact is considered low. No monitoring for the stygofauna is planned;
- the HBI project operations will have no impact on the mangrove communities at Finucane Island and West Creek. Monitoring and management of possible impacts on the mangrove ecosystems will be addressed in the EMP;
- the proponent indicated that the causeway across West Creek would displace less than 0.2% of the tidal movement in the West Creek system, which is a very minor change to the prevailing hydrodynamic system, and hence, no unacceptable environmental impacts are expected. This is in response to the concern that any reduction in tidal prism, as a result of the reclamation of 1.7 ha of West Creek, may increase the sedimentation in the upper reaches and in turn could adversely affect mangroves currently growing in that area; and
- mangrove recolonisation will be encouraged in the West Creek causeway area. BHP is currently undertaking a large-scale mangrove re-establishment program in the East Creek area, and will apply the findings of this program to the recolonisation in the causeway area.

4.2.5 EPA's evaluation

Mangroves are fundamentally important in the biological production cycle of the coastline and are vital for the maintenance of the off-shore fisheries. The mangrove ecosystems of the Pilbara are nationally important because they are the only mangroves inhabiting a tropical-arid coastline in Australia, and the conservation of the bulk of the remaining mangrove ecosystems has a high priority (EPA, 1991). The EPA has concluded in previous assessments that no further significant loss of mangrove ecosystems from direct or indirect impacts would be environmentally acceptable (EPA, 1992). A study has been completed recently by the Semeniuk Research Group, on behalf of the Department of Resources Development, on the status of arid zone mangroves and the impacts of existing developments on mangroves in the Pilbara (a presentation to the EPA by Dr Vic Semeniuk, May 18, 1995).

The EPA will use recent information gained through the Semeniuk study as well as information gained through assessing individual proposals to recast a policy position on mangroves. The practical outcome of this policy position will be a definition of areas where industry and other coastal developments may establish with environmentally acceptable impacts on mangrove systems. The mangroves policy position in turn will contribute to the State of the Environment report.

The EPA recognises that development in the Port Hedland area to date has caused major clearing of mangroves and further losses of mangroves should be minimised and rehabilitation should be undertaken. This proposal will result in a direct loss of some 3 ha of West Creek mangroves due to construction of the causeway for the pipelines and overland conveyor (Figure 8). The EPA believes that the loss of this 3 ha of mangroves, even though small when comparing with approximately 1100 ha of mangroves inside the Port Hedland Harbour (Figure 5.1 of the CER, areas on the eastern side of the existing causeway), has to be viewed, not only in the context of the value of mangroves, but also in how much has been lost to date. There is also a potential indirect loss of mangroves resulting from the operation of the project including iron ore dust emissions (CALM's advice), and disturbance to natural tidal exchange. The EPA understands that the proponent has had initial success with the large-scale mangrove re-establishment program in the East Creek area, and will apply the findings of this program to the recolonisation in the West Creek causeway area.

Accordingly, the EPA recommends that, for this proposal, mangroves systems lost through direct impacts from construction activities should be re-established and the replacement area should be, as far as practicable, equal to or greater than that of the area lost.

The proponent should be required to monitor for changes to nearby mangroves to determine any indirect impact on mangrove systems resulting from the proposal, including dust emission and brine discharge. A monitoring report should be forwarded every year to the EPA until the Authority is satisfied that further changes to mangroves are unlikely. If the monitoring shows that any areas of the existing mangroves ecosystems have been or are adversely affected, the proponent should submit and implement a plan for the stabilisation and rehabilitation of affected areas to the satisfaction of the EPA .

The above recommendations should be addressed in an Environmental Management Programme.

With respect to the concern about stygofauna, it is noted that there are two conflicting views on the presence of limestone in the projected area (Appendix 4, Item 84). The EPA considers that the proponent should, within the site investigative work, show there is no porous substrate including limestone, porous shale deposit and gravels under the project area. If there is porous substrate present, the proponent should carry out a baseline monitoring for stygofauna in groundwater on the project site.

The EPA concludes that the flora and fauna issue is manageable, subject to the commitments given by the proponent, and Recommendation 2(iv) (Section 5).

Pollution issues

4.3 Dust emissions and air quality

4.3.1 Objective

The EPA's objective is to ensure the project dust contribution to the air shed from the HBI plant or stockpiles or any other part of the operations, is within agreed acceptable limits and standards, taking into account the concerns of the nearby residents and other industries and local government.

4.3.2 Evaluation framework

Technical information

The CER stated that particulate emissions from the proposal come from two main sources: stack emissions due to the operation of the HBI plant, and fugitive emissions from locations including stockpile areas at Finucane Island and the HBI site, conveying and transfer systems, road networks and general open or unpaved areas.

Stack emissions

The air dispersion modelling commissioned by the proponent for particulate emissions from stacks or point sources (Steedman Science & Engineering, 1994) indicates that the ground level concentrations of particulates would not exceed the criteria set for the Environmental Protection Policy (EPP) for Kwinana (EPA, 1992a), reproduced here as Appendix 1, given that the HBI plant's point source emissions are the only particulate emissions (as the Pilbara Energy Ltd (PEL) power station would only emit negligible amounts of particulates when operating on gas). The Kwinana EPP's criteria used by the proponent for the purpose of determining the impact of particulate stack emissions from the HBI plant was found to be acceptable by the

DEP. The air dispersion modelling did not include emissions from fugitive or non-point sources as these are difficult to quantify for modelling purposes.

The proponent has made a commitment that the HBI plant will include particulate removal to reduce discharge to the atmosphere from the stack emissions. In all cases the design will be based on control under the worst case conditions.

Fugitive emissions

Fugitive emissions are grouped into lift-off sources (eg. stockpiles and unsealed areas) and non-lift-off sources (eg. materials handling such as conveyors and transfer chutes, and vehicle movement). The CER also stated that, even though the estimation of fugitive emissions is difficult, the main causes, and therefore management of these emissions are well understood as a result of the dust improvement program (Dust Management Performance Improvement Program) currently in progress at Nelson Point and Finucane Island facilities:

> "Lift-off emissions from stockpiles and open areas occur when wind speeds exceed 6 m/s and the exposed surfaces are below the moisture content to inhibit lift-off. A major study by BHP Iron Ore was completed in 1992 which investigated the causes and solutions to stockpile lift-off (Halpern Glick Maunsell, 1993). The findings of this study formed the basis of the development of the world class automatic stockpile watering system at Nelson Point. This system was commissioned in mid 1994 and results have shown the effective minimisation of lift-off from material stockpiles.
>
> Emissions from the handling of materials generally occur when material is transferred from one process to another. These transfers include conveyor to conveyor (transfer point), conveyor to stockpile (stacking) and stockpile to conveyor (reclaiming).
>
> Transfer point emissions occur as a function of enclosure design and material moisture contents. Stacking and reclaiming emissions are related to material drop distances and moisture contents.
>
> Emissions from road systems are a function of the amount of material on the surface of the road and the number of vehicles travelling on that surface." (CER, Page 29).

The objective of the dust improvement program is to develop a works program for dust generation sources within BHP Iron Ore operations. The program involves assessing and ranking all dust sources in terms of their potential level of impact on the Port Hedland township, which will provide the overall direction for the implementation of the remedial program. This program has been referred to the EPA for assessment by the Department of Resources Development, and the level of assessment has been set at the CER level.

The control of dust during construction of services and industries is also of potential significance.

The proponent has proposed to control fugitive dust emissions from the project by the following dust control measures (CER, page 57):

Dust generation during operation will be managed by:

- use of water sprays on stockpiles;
- enclosing materials transfer points;
- rehabilitation or stabilisation of disturbed surfaces; and
- sealing of site roads.

Dust from construction activities will be managed by:

- keeping vegetation clearance to a practical minimum;
- avoidance of unnecessary machinery movements; and
- damping down with water trucks or sprays as necessary.

Comments from key government agency

The Department of Environmental Protection (DEP) has carried out a technical evaluation of the information provided by the proponent relating to dust emissions, and provided the following advice:

- the air dispersion modelling performed and its results, and the Kwinana EPP's criteria used by the proponent for the purpose of determining the impact of particulate stack emissions from the HBI plant was found to be acceptable by the DEP;
- for iron ore dust, it would be reasonable to expect that the amount of airborne dust (or concentrations) required to protect human amenity or quality of life of people would be less than that required to protect public health or vegetation. The DEP cannot advise a particular concentration of dust above which the amenity of people is unacceptably reduced, but suggests that the dust criteria for the Kwinana Environmental Protection Policy (EPA, 1992a) be used as a minimum goal for setting dust control measures for the HBI project, provided that the background dust levels do not exceed these criteria. The Kwinana Policy dust criteria (Appendix 1) indicate that concentration of airborne dust contributed by the project should not exceed the acute impact level of 1,000 micrograms per cubic metre (ug/m3) averaged over 15 minutes at the boundary of the premises. At residences, 90 micrograms per cubic metre, measured over 24 hour periods, should not be exceeded;
- not withstanding any dust standards or criteria, the proponent is required under the Environmental Protection Act 1986 to operate to a standard consistent with good engineering practice and environmental management to minimise dust emissions. The DEP finds the proposed fugitive dust control measures acceptable on the basis of the preliminary findings of the Dust Management Performance Improvement Program. These control measures should be reviewed and upgraded if required, at the completion of the assessment of the Dust Management Performance Improvement Program, and will be managed under Works Approval and Licence requirements under Part V of the Environmental Protection Act;
- given that there is approximately 5 km distance between the HBI site and South Hedland/Wedgefield areas, historical dust monitoring data and the implementation of the proponent's dust control measures, it is reasonable to conclude that the project will not greatly impact on these areas. It is not appropriate to compare the Esperance situation with the Port Hedland situation, as raised by many public submissions, with respect to the existing environment and the scale of the operations.

4.3.3 Public submissions

The majority of public submissions received by the EPA related to particulate emissions, especially the emissions of iron ore dust, as it was perceived to be the most important issue arising from the proposal. These submissions made reference to the existing dust problems inherent in Port Hedland which relate to fugitive dust emissions from BHP Iron Ore's operations at Nelson Point and Finucane Island facilities. The submissions expressed an apparent lack of confidence in the proponent's commitment on dust controls for the HBI project, as a result of the dust problems in Port Hedland. Some members of the local community believes that the existing dust problems are still unacceptable, in terms of adversely affecting the aesthetics of the area, the lifestyle, finance and health of the community in spite of the dust improvement program. The community is greatly concerned that the proposal may cause similar problems for the South Hedland and Wedgefield Light Industry areas, and may worsen the dust problem in Port Hedland. Many submissions indicated that with the strong winds present in the area, dust emissions could be carried a long way from the site to impact on Port Hedland, South Hedland and Wedgefield areas. Many submissions also indicated that the Esperance iron ore loading facility should be used as a model for the HBI project (for example, all stockpiles should be housed in sheds, all conveyors and transfer points should be fully enclosed).

The Town of Port Hedland's submission indicated that the current dust problems in Port Hedland appears to come mainly from the BHP Iron Ore's Finucane Island stockpiles (rather than from the larger Nelson Point stockpiles) under west and north-westerly winds. Hence, problems would be compounded by further stockpiling of iron ore fines in Finucane Island as a result of the HBI project. The same winds would also transport fugitive dust from the HBI plant site to South Hedland and Wedgefield areas. The submission indicated that the overland conveyor traversing 7 km of open country would be a significant source of dust emissions and should be fully enclosed. The submission also raised concern about potential dust problems from the concentrate residue storage impoundment caused by wind erosion. A number of recommendations were made in this submission relating to fugitive dust control measures, including enclosing of conveyors, transfer points and surge stockpiles, use of water sprays and dust suppression chemicals where appropriate, designing and siting of stockpiles to minimise wind effects, and wetting or suitable covering of the residue storage facilities.

4.3.4 Proponent's response

In response to concerns about dust emissions, the proponent provided the following information (Appendix 4):

- dust levels recorded at the monitoring station near Cook Point in Port Hedland are similar to those in the surrounding areas outside the impact of iron ore operations (approximately 50% of the National Health and Medical Council (NH&MRC, 1985) annual average guideline figure of 90 ug/m3 for total suspended particulates). Given that Cook Point is closer (approximately 2.5 km) to the Nelson Point operations than Wedgefield and South Hedland are to the proposed HBI site (approximately 5 km), and that the wind effects would be similar, it would be unlikely for dust from the HBI operations to impact on South Hedland or Wedgefield;
- dust management at Nelson Point and Finucane Island existing operations is the responsibility of BHP Iron Ore (the Mt Newman Joint Venture and the Goldsworthy Mining Associates Joint Venture respectively). The dust control measures as stated in the CER are expected to be sufficient to control dust emissions from the HBI operations. (As mentioned in Section 4.3.1, the dust improvement program for BHP Iron Ore's existing operations at Nelson Point and Finucane Island is currently being assessed by the EPA at the CER level);
- for the HBI project, the new iron ore stockpiles at Finucane Island and the HBI plant will be in the order of 0.2 - 0.4 and 0.09 - 0.14 million tonnes respectively, and will occupy 0.03 and 0.023 km^2 respectively. Dust control measures for these stockpiles will be similar to that of Nelson Point which includes an automated dust suppression system using water cannons and are expected to be effective;
- the proponent is committed to installing dust control systems sufficient to mitigate identified real environmental impacts from the operation of the overland conveyor. The control measures will include: enclosure of transfer points, belt cleaning station, pre-conditioning the ore with water and the use of surface dampening sprays along the conveyor to maintain the ore sufficiently damp at all times;
- the proponent has proposed to implement dust control measures as outlined in the "Materials Handling Flow Sheet - Proposed HBI Plant Port Hedland Dust Control" (Appendix 9). These dust control measures are based on the preliminary findings of the Dust Management Performance Improvement Program (BHP Iron Ore, Mid Point Review Presentation, February 1995);
- the proponent advised that baseline monitoring for dust has been established at South Hedland and Wedgefield and is already under way (one monitoring station at Pundulmarra College, South Hedland and the other at the BHP Goldsworthy rail service depot at Boodarie near Wedgefield) (Figure 1); and

- the proponent stated that, under Commitment 17 (Appendix 6), ambient air monitoring and corrective action will be taken to the satisfaction of the DEP with respect to fugitive dust emissions.

4.3.5 Evaluation

The EPA is conscious of the need to ensure that particulate emissions, both individually and cumulatively, do not cause unacceptable impacts in the area surrounding the site.

The potential for particulate emissions from the proposal to impact upon the surrounding environment, particularly the South Hedland, Wedgefield and Port Hedland areas, is of concern to the EPA. Because of the existing dust problems associated with the BHP Iron Ore operations at Nelson Point and Finucane Island, the high level of community concern regarding the potential dust impact from the HBI project is justifiable and should be considered. Furthermore, consideration should be given to the potential dust impacts on future projects which may locate on the Boodarie Heavy Industrial site adjacent to the HBI plant site.

The EPA notes that BHP Iron Ore Ltd is preparing a Consultative Environmental Review (CER) for managing regional dust issue around Port Hedland and which is yet to be assessed by the EPA.

For this proposal, the EPA recommends that the proponent be required to design and operate the proposal, using the best practice environmental management, so that impacts from dust emissions on the surrounding environment are acceptable. As a goal, the plant should be designed to the same standards of emission controls as would be necessary for an identical plant in the Kwinana area where ambient dust levels are controlled under the Kwinana Environmental Protection Policy (EPA, 1992a) (Recommendation 2(i), Section 5).

The proponent should also be required to prepare a dust management programme, in conjunction with the Town of Port Hedland, for approval by the Minister on advice from the DEP. The management programme should include monitoring (including baseline monitoring), review of the fugitive dust control measures, and management of dust in the context of protecting amenity of surrounding residents (Recommendations 2(i), Section 5).

The EPA considers that the dust issue (with respect to amenity) is manageable subject to the above recommendations and the commitments given by the proponent. The management of dust through conditions set under Works Approval and Licence Conditions required by Part V of the Environmental Protection Act should incorporate these recommendations. To ensure that adequate provision for dust control has been made and that it remains effective, the DEP should receive dust monitoring data and will require corrective action if unacceptable impacts are identified.

However, recognising the dust problems associated with existing industry, the local conditions of the Hedland region (eg. soils, dry tropical climate and ambient dust levels, particularly under easterly winds), and the likelihood of future industry development in the area, the EPA believes that regional air quality criteria should be developed based on specific local considerations. These criteria should be developed, for dust as well as for other atmospheric emissions such as oxides of nitrogen, in consultation with local government, government departments and agencies, industry (eg. salt, shipping, iron ore, light industry, other) in the Hedland area and with the public.

At some future time, noting the forthcoming CER for managing regional dust around Port Hedland, the EPA foreshadows the possible development of an environmental protection policy similar to those in place for air quality at Kwinana and Kalgoorlie.

4.4 Noise emissions

4.4.1 Objective

The EPA's objective is to ensure that noise emissions emanating from the project meet acceptable standards for noise on the surrounding environment.

4.4.2 Evaluation framework

Noise regulations

Noise levels for projects within Western Australia are subject to the Noise Abatement (Neighbourhood Annoyance) Regulations 1979, which are currently the prescribed standard for noise under the Environmental Protection Act 1986. These regulations specify the Assigned Outdoor Neighbourhood Noise Levels for various types of noise-receiving premises for different times of the day. In the case of predominantly residences, such as South Hedland, the Assigned Noise Levels would be 35-40 dB(A) at night (10.00 pm - 7.00 am); 40-45 dB(A) during the evening (7.00 pm - 10.00 pm) and on weekends/public holidays (7.00 am - 7.00 pm); and 45-50 dB(A) during weekdays (7.00 am - 7.00 pm).

The EPA will shortly be considering the draft Environmental Protection (Noise) Regulations 1995, currently being prepared by the DEP. The EPA's evaluation of noise impacts for the HBI project considers the draft regulations, since these are likely to be in force by the time of commencement of the project.

The draft regulations specify a method for determining the Maximum Allowable Noise Level for a noise-receiving location, based on the land use zonings and the presence of major roads around the receiving point. For a residence with no commercial or industrial zonings and with no major roads within 450 metres, the lowest of the Maximum Allowable Noise Levels would apply. These levels would be 35 dB(A) at night, 40 dB(A) during the evening and 45 dB(A) during the day, which are the same or some 5 dB(A) lower than the current regulations.

Technical information

The proponent undertook a study for noise emissions from the proposal (Sound and Vibration Technology, October 1994) and noise contours were developed from modelling of cumulative noise emissions from the HBI plant, concentrator, conveyor between the Boodarie site and Finucane Island, and the PEL power station. The results of the modelling indicated that for South Hedland, Port Hedland and Wedgefield Industrial areas, noise emissions from the proposal under normal operating conditions comply with the current draft noise regulation criteria. The exception could be on 2 or 3 occasions per year (lasting for about 5 minutes on each occasion) when emergency venting is likely to produce noise levels in excess of the criteria.

The proponent has made a number of commitments relating to noise issue in the CER (Commitments 12, 23, and 24, Appendix 6).

A noise buffer zone was also established for a worst case noise emission scenario. Figure 1 shows the 34 dB(A) buffer zone boundary. The proponent has indicated that it will apply for a buffer zone to exclude future residential development within this area under the State Agreement Act.

The CER indicates that it would be extremely unlikely for noise emission from construction activities to exceed the day time maximum permissible noise level at the closest residence. To ensure that noise emission from construction activities is controlled, noise levels will be monitored at the closest residences during the construction phase of the project (Commitment 12 of Appendix 6). Some increase in noise levels are expected as a result of increased vehicle movements.

The proponent has also submitted a report covering additional noise modelling (Sound and Vibration Technology, November 1994) to the DEP. The report indicated that the combined environmental noise emission of the HBI plant operations and the power station does not exceed 34 dB(A) at South Hedland.

Comments from key government agency

The DEP carried out a technical evaluation of the information presented in the CER document relating to noise emissions, and has provided the following comments:

- given that the predicted noise levels for the operation are just only within the criteria adopted, the proponent should ensure that all plant items purchased for this project will meet the sound power levels assumed for the noise modelling;
- the need for long term preservation of the large noise buffer zone around the project to ensure that the proponent can meet the noise emission criteria required by the DEP's current draft noise regulations;
- the commitment made by the proponent (Commitment 24) on noise monitoring should include environmental noise monitoring to ensure compliance with the current draft noise regulations; and
- the management of noise from emergency venting as proposed is acceptable.

In general, the DEP suggested that the noise impact study for the proposal was adequate in terms of accurately describing the likely noise emissions which could emanate from the proposed site, given that the impacts of traffic noise would be minimal.

4.4.3 Public submissions

Public submissions expressed concern about the potential noise impacts resulting from the operation of the proposal.

The concerns mainly relate to the potential noise level from emergency venting and the potential impacts on the proposed adjacent Boodarie Heavy Industrial Estate. Landcorp expressed concern about likely noise emission restrictions that could be imposed on future industry in the Boodarie Heavy Industrial Estate as a result of the HBI noise emissions.

4.4.4 Proponent's response

The proponent provided the following information (Appendix 4):

- the noise level from emergency venting would be similar to the sound of a jet aircraft engine at a distance of between 6 - 7 km from a residential area. The noise level will have minimal impacts as it will occur 2 - 3 times per year for up to 5 minutes each time. The community and employee education program committed by the proponent in the CER document will include information on this noise issue;
- as the possible occupiers of the Boodarie Heavy Industrial Estate are unknown, it is not possible to predict the impact, if any, that the proposal might have on their business;
- the proponent has made a commitment that all plant items purchased for this project will meet the sound power levels assumed for the noise modelling carried out by the consultant (Commitment 35, Appendix 6);
- the preliminary assessment indicated that impacts of traffic noise during the operation of the project would be minimal; and
- the proponent has recognised the need for a buffer zone to exclude residential development within this area under the State Agreement Act (yet to be finalised), not only as a noise buffer zone, but also to protect adjacent land uses to the HBI site from other environmental impacts such as air quality and risk.

4.4.5 Evaluation

Long term security for the buffer zone around the plant site is essential to maintain the environmental acceptability of the proposal, especially for noise (and dust) emissions. The proponent has identified a distance of 5 km as being necessary for noise compliance (CER), and has sought to have this addressed through the State Agreement Act being developed for the proposal. Should the State Agreement Act not secure the buffer zone, then the EPA considers that an alternative mechanism be implemented and the EPA advised of this. The EPA has recommended accordingly (Recommendation 4).

On advice from the DEP, the EPA further recommends that the proponent should prepare a management plan dealing with the following noise issue (Recommendation 2(ii)):

- monitoring noise inside and outside the designated buffer zone;
- rectification measures should monitoring indicate that adverse impacts have occurred or are occurring.

The EPA acknowledged Landcorp's concern about the likely noise emission restrictions that could be imposed on future industry in the Boodarie Heavy Industrial Estate, as a result of the HBI noise emissions, but considers that the issue of cumulative noise from industry expansion on Boodarie site (including the HBI project) should be addressed during the assessment of the Boodarie Heavy Industrial Estate proposal.

The EPA considers that the noise issue is manageable subject to the proponent's commitments, and the above recommendations (Recommendations 2(ii) and 4, Section 5).

4.5 Gaseous emissions (including odour) and air quality

4.5.1 Objective

The EPA's objective is to ensure that gaseous emissions (including odour) which result from the project conform to acceptable standards applied in the area surrounding the project site.

4.5.2 Evaluation framework

Technical information

Gaseous emissions from the proposal include sulphur dioxide, hydrogen sulphide, oxides of nitrogen and carbon dioxide. Emission of carbon dioxide will be evaluated under greenhouse gas emission (Section 4.10). The predicted stack emission levels are shown in Appendix 10.

An air dispersion modelling study was undertaken (Steedman Science & Engineering, October 1994) to assess the cumulative impact of airborne emissions from the proposal and the PEL power station under normal operating conditions, using the AUSPLUME dispersion model, the Victorian EPA regulatory model and a one year data base (using standard models developed by the DEP for the development of the Kwinana EPP (EPA, 1992)). The results of the study indicated that, with the exception of hydrogen sulphide, the ground level concentrations of sulphur dioxide and nitrogen dioxide would be well below the air quality objective proposed in the CER (pages 54 - 55). The maximum 3 minute ground level concentration of hydrogen sulphide was predicted to exceed the proposed air quality objective inside the proposed buffer zone (1 to 2km from the HBI plant).

Under abnormal process conditions, gaseous emissions would be incinerated by a hot flare, producing carbon dioxide, water vapour, and nitrogen (during plant start-ups and shutdowns), and sulphur dioxide (during compressor failure). Modelling using the DEP's screening model MAXMOD (Steedman, October 1994) indicated that the concentrations of sulphur dioxide under the flaring condition were well within the proposed air quality objective.

In the unlikely event that all hydrogen sulphide removal system pumps fail, there would be a potential for employees near the CO_2 removal stack or downwind being exposed to high concentration of hydrogen sulphide for a short period of time, and a potential for members of the public in South Hedland and Wedgefield, and employees of the PEL power station to be briefly exposed to low concentrations of hydrogen sulphide with detectable odour.

Comments from key government agencies

The DEP has carried out a technical evaluation of the information presented in the CER relating to air emissions, and provided the following comments:

- the proposed air quality objectives in the CER for sulphur dioxide, hydrogen sulphide, and oxides of nitrogen are acceptable;
- the negatively buoyant plume discharged from the CO_2 removal stack containing hydrogen sulphide (and any other negatively buoyant plumes in the plant) is of concern in terms of the modelling methodology, and potential offsite impacts including other future industries in the Boodarie Heavy Industrial Estate (this could pose occupational health impacts within the plant boundary as well); and
- odour is a difficult issue to manage as it relates to the sensitivity of each person, and is difficult to monitor at low concentrations, hence further modelling for hydrogen sulphide under the plant upset conditions is required.

4.5.3 Public submissions

Public submissions expressed concern about the potential impacts of gaseous air emissions from the proposal, particularly hydrogen sulphide, on the adjacent proposed Boodarie heavy industrial estate and other existing industry (eg Cargill Salt operation). One submission questioned the rationale for applying the Kwinana EPP limits to the project location.

4.5.4 Proponent's response

In response to the air emission issue, the proponent provided the following information (Appendix 4):

- the CO_2 removal stack is the only negatively buoyant stack in the HBI plant, and the proponent has proposed to emit this gas stream into the hot plume from the reducing furnace, thus resulting in an overall positive buoyant plume;
- the proponent has undertaken further air dispersion modelling for hydrogen sulphide and according to the modelling, detectable odours would not occur in more than once in 140 years at South Hedland as a result of plant upset conditions;
- accordingly, the proponent has made a commitment to take measures in the project design to minimise the odour impacts (Commitment 34, Appendix 6); and
- the proponent has also made a commitment that corrective action will be taken if emission standards are exceeded (Commitment 17, Appendix 6).

4.5.5 Evaluation

The EPA has considered the DEP's comments and recognises the potential odour impacts associated with CO_2 removal gas stream containing hydrogen sulphide. The EPA also notes that, in response to these comments, the proponent has proposed to redesign the stack configuration to eliminate the negatively buoyant plume, and has undertaken further modelling to determine the impacts of hydrogen sulphide under both normal and upset plant conditions. Consequently, the DEP has advised that the results of the modelling for gaseous emissions from the project is acceptable.

Accordingly, the EPA considers that the issue is manageable, subject to the commitments made by the proponent and Recommendation 2(viii) of Section 5.

4.6 Management of solid wastes

4.6.1 Objective

The EPA's objective is to ensure that all solid wastes should be minimised, and that environmental impacts resulting from disposal of solid wastes generated from the project are manageable.

4.6.2 Evaluation framework

Technical information

The type and quantity of solid wastes generated from the HBI plant and the concentrator are given in Appendix 11.

Concentrator residue storage impoundment

It is proposed to pump the concentrator residue (48% w/w slurry) in a storage impoundment west of the HBI plant. The concentrator residue consists mainly of low grade iron ore, silica, alumina and shales and a low concentration of polyacrylamide flocculant used in the thickening process. A hydrogeological and geotechnical investigation was carried out in the impoundment area. The site is underlain by a layered sequence of alluvial clayey sands. The clayey sands gradually become more consolidated with depth. Depth to groundwater at the site varies between 4-5 m below natural surface levels with a low gradient towards the coast. Groundwater is saline, varying between about 13,000 and 52,000 mg/L TDS.

The impoundment will be constructed in stages (CER, pages 31 to 33), and a schematic layout is shown in Figure 9. It is proposed that the ultimate height of the impoundment is 10-12 m above ground level, and the floor of the pit is about 1.5 m above the water table. An analysis indicates that seepage from the impoundment is negligible (a floor seepage loss in the range of 5 to 10 m3/ha/day is expected).

The proponent has made a commitment to rehabilitate the impoundment (CER, Commitment 8.3, page 33) by spreading topsoil (recovered from the stockpile) over areas and establishing local vegetation after each segment is filled in, as these areas of the impoundment are filled and decommissioned.

Other solid wastes

The proponent has indicated that recycling is the preferred option for disposing other solid wastes. If recycling is not viable, the proponent has proposed to dispose the wastes to an approved land fill or to the concentrator residue storage impoundment (non-hazardous wastes only).

Comments from key government agencies

The Department of Minerals and Energy (DOME) found that issues relating to the concentrator residue storage impoundment have been addressed satisfactorily and as practically possible by the proponent as can be at this feasibility and early design stage. DOME further provided the following comments:

> "The Geological Survey Division (DOME) fully endorses relocating the impoundment above the 1:100 year flood line and proposed the construction of a protecting embankment (levee or dyke) within the storm surge line.
>
> It may be worth noting at this stage that a 1:100 year flood line or contour does not necessarily represent the point or level at which total failure will take place and the result may only be, for example, that a structure fails to perform for some time. The design

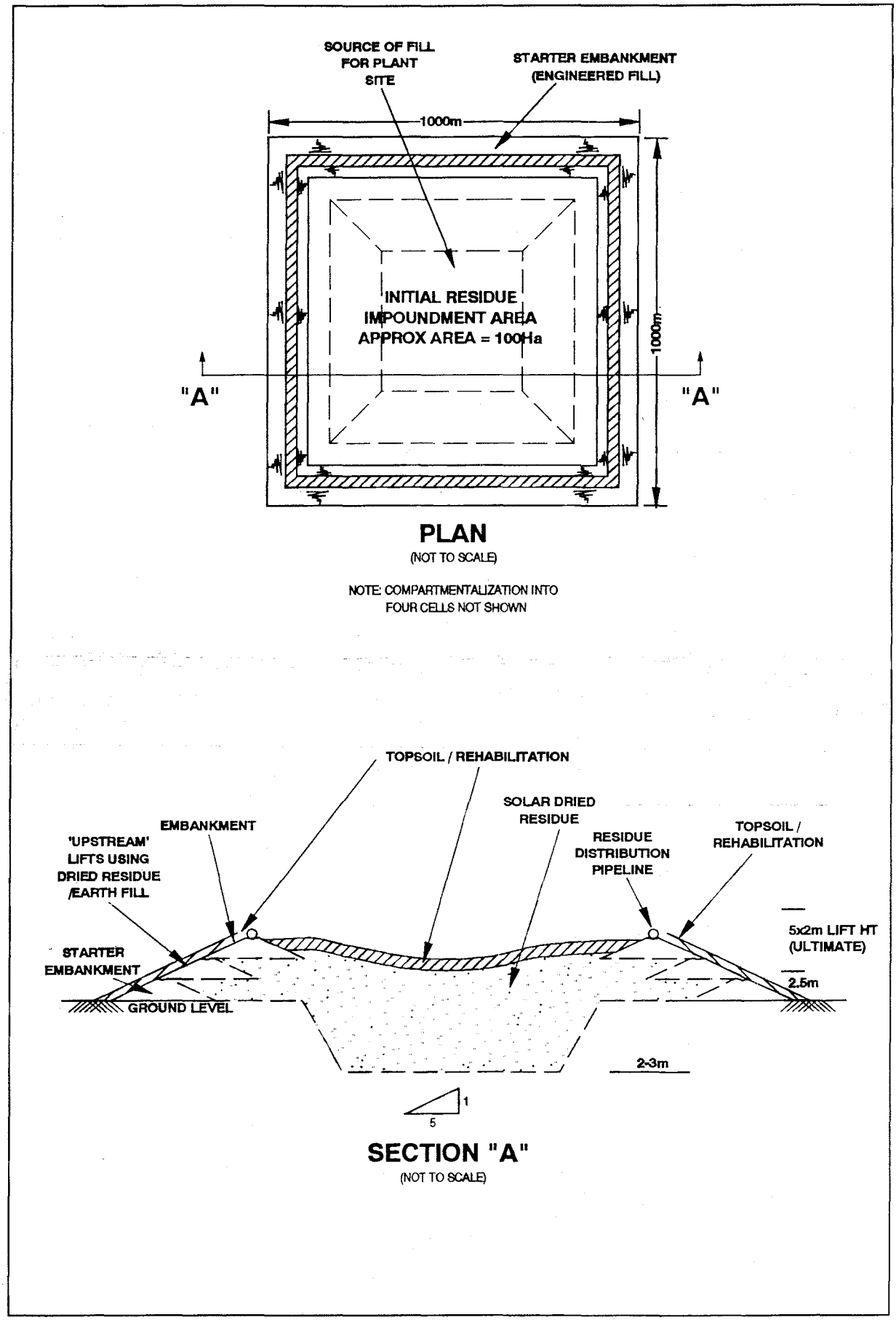

Figure 9. Schematic layout of concentrator residue storage impoundment

may assume that flood or storm surge water could come into contact with the structure, but the effects of this can be minimised by incorporating further designs into the structure such as the proposed embankment, embankment protection or the excavation of diversion channels.

In other words, being within a 1:100 year limit does not necessarily mean catastrophic failure will result if those predicted, usually statistically derived, levels are reached. However it is interesting to note that other structures, namely the HBI plant and concentrator will be located on a raised pad constructed using borrow material from the base of the proposed residue impoundment. Therefore, perhaps some future thought will be given to including simple toe protection to the residue impoundment starter embankment to minimise the effects of potential erosion from floodwaters (or cyclonic rain event)".

The Water Authority of Western Australia (WAWA) advised that:

"The Authority would recommend that the top of the embankment for the residue storage impoundment be constructed 0.5m above the adjacent 100 year flood level".

The Department of Resources Development (DRD) provided the following comments on the concentrator residue storage impoundment :

"As advised, DRD has agreed in principle with BHP that land to the north of latitude 7744000N (on the map provided) can be used for the HBI plant and associated residue storage ponds. DRD has said that land to the south of the 1:100 storm surge line is prime industrial quality and should not generally be used for waste storage purposes."; and

" Providing the tailings ponds are properly engineered, and given that they will be raised 14 metres (over the 60 year period) to reduced level (RL) 17.5 m, this should ensure efficient protection against storm surge.

In fact, the Nelson Point and Finucane Island iron ore stockpiles would be inundated by storm surge long before the top of the tailings pond walls is reached. In any event, the material contained in the ponds is inert and even if the ponds were inundated, say in a 1 in 150 year event, the additional environmental impact would be minimal. Considering that in such extreme circumstances mud, sediment and iron ore would be collected from a huge area around Port Hedland (and inland from the creeks) before being swept out to sea (as happened recently in the Murchison with Cyclone Bobby)".

The DEP indicated that, providing the residue storage impoundment is designed and managed in accordance with DOME and WAWA requirements, the disposal of other solid wastes from the project in the manner proposed is acceptable.

4.6.3 Public submissions

Public submissions expressed concern about the potential impacts of leakage or failure of the residue storage impoundment, with subsequent discharge of the contents into adjacent mangrove system. The submissions indicated that the concentrator residue should be classified as a mine tailings and the storage impoundment should be required to be properly engineered and located above any possible flood levels and separated from the groundwater by suitable barriers.

4.6.4 Proponent's response

The proponent's response to issues raised about the concentrator residue storage impoundment (Appendix 4) can be summarised as follows:

- operating experience by the proponent with iron rich fines indicates that the seepage from the impoundment will be environmentally benign;

- the residue will be contained behind engineered embankments, to cater for flood protection. The starter embankment will initially be 1 to 3 metre high. Topsoil stripped from the internal areas of the impoundment will be used for rehabilitation and for the HBI plant site fill. It is proposed to place the stripped material around the outside of the starter embankment to act as a buffer and erosion protection zone (about 20 m wide), which in time will be revegetated; and
- the residue impoundment will be designed and managed so that failure and subsequent discharge of residue will not occur under the design events. DOME and WAWA will be consulted to ensure that engineering design and statutory requirements are met (Commitment 32 of Appendix 6).

4.6.5 Evaluation

The EPA notes that the proponent has made a commitment to design and manage the residue impoundment to minimise leakage or failure of the impoundment and subsequent discharge of residue to the environment, and that DOME and WAWA will be consulted on further detailed engineering design . Since the residue storage area is subjected to both storm surge and flood events, the EPA recommends that the proponent seek expert opinions from these agencies to ensure the integrity of the residue impoundment.

The EPA believes that as part of the waste minimisation principle, the proponent should place emphasis on the recycling of wastes. Accordingly, the EPA recommends that the proponent be required to carry out a recycling viability study in the proponent's environmental management programme.

The EPA considers that the issue of solid waste disposal, particularly the concentrator residue storage impoundment, is manageable, subject to the commitments provided by the proponent, and the above recommendations (Recommendations 2(vii) and 3, Section 5.

4.7 Management of liquid waste

4.7.1 Objective

The EPA's objective is to encourage waste minimisation, including water conservation, recycling, minimising use of scarce freshwater, and sustainable use, and to ensure that environmental impacts resulting from disposal of liquid wastes associated with the project are manageable .

4.7.2 Evaluation framework

Technical information

The major aqueous discharges and the proposed disposal methods are detailed in Appendix 12.

Brine discharge

The brine from the HBI plant secondary cooling water system and demineralisation plant will be discharged into Port Hedland harbour in the vicinity of Finucane Island wharf. The CER document indicated that the discharge will be a maximum of 4°C above that of receiving waters, have a salinity of up to 4 times that of seawater (140 ppt), and will not contain any additional concentrations of heavy metals over the ambient intake concentrations. A much broader study has been carried out for the Port Hedland harbour environment to collect biophysical information (Halpern Glick Maunsell, 1993) and consequently, additional information is being collected with a view to quantifying physical, chemical and biological processes occurring in the harbour. The proponent has indicated that discharge of the brine just below the surface of the water and appropriate diffuser design is the preferred method of disposal, as this method

would result in maximum dilution of the brine both horizontally and vertically, hence minimal environmental impacts within the harbour. This is based on initial calculations (detailed modelling of the behaviour of the discharged brine has not been undertaken) carried out by the proponent to predict the behaviour of the discharge and the likely environmental impacts for both surface and bottom discharge methods (pages 48 to 50 of the CER).

The proponent has made a commitment to initiate a monitoring programme to allow the physical behaviour of the discharge to be quantified, and corrective action such as modification to the diffuser design, will be taken should unacceptable impacts be identified (Commitment 20 of Appendix 6).

Other discharges

The sewage generated will be directed to a biological treatment plant, and the effluent from the treatment plant will be reused in the process or used for reticulation of landscape vegetation.

Stormwater run-off from the site will be channelled into traps/settling ponds to retain sediments prior to release, via controlled outlets, to natural drainage systems. These traps will also be capable of retaining run-off during an emergency that may be physically or chemically different from that normal to flood events.

Oily waste and washdown water will be recycled where possible otherwise they would be reused or disposed of in an approved land fill site. The regenerant liquors, after neutralisation, will contain primarily sodium chloride with some calcium, magnesium, bicarbonate and sulphate ions, and are proposed to be disposed of with the brine from the HBI cooling system.

Other minor aqueous discharges include the Benfield system purge (CO_2 removal) solution (containing vanadium pentoxide, potassium formate and nitrite, diethanoamine, antifoam) and CO_2 desulphurisation purge liquors. The proponent has proposed to store the Benfield purge solution in a sealed evaporation pond and the dried residue will be suitably disposed of (see Section 4.7.4 below). The desulphurisation purge is a biological waste and options for disposal are being investigated including treatment in the site sewage treatment plant.

The proponent has made a commitment to install groundwater monitoring bores up and down hydraulic gradient of the impoundment and the plant site and take corrective action if unacceptable impacts are identified (Commitment 19 of Appendix 6).

Comments from key government agencies

The DEP undertook a technical evaluation of the discharge of brine into the harbour as proposed in the CER and provided the following comments with respect to marine impacts:

> "The analysis of the "brine" outfall is essentially sound and the behaviour of the dense brine plume is likely to be as it is predicted by the analysis, on the basis of the following assumptions:
>
> (1) the discharge will in fact be via a diffuser;
>
> (2) the effluent will contain nothing but brine; and
>
> (3) the oceanographic monitoring will be carried out as per the proponent's commitment (Commitment 20 of Appendix 6)".

The Department of Conservation and Land Management (CALM) provided the following comments on the proposed brine discharge:

> " The presence of mangroves approximately 1 km south of the outfall is noted in the CER, but there is no mention of any possible impacts. As there is no mention of prevailing current or winds, and only limited modelling of the behaviour of the discharged brine has been carried out, the potential affects of the input cannot be assessed. Further modelling of the passage and dilution of the brine in the waters surrounding the outfall should be encouraged".

The Water Authority considered that channelling stormwater run-off from the site into traps to retain sediment prior to clean water being released is not practical, as the retention time is unlikely to be adequate, and further advised that:

> "The retention time required for North west particle size is the problem. It is considered that these traps will only be effective in stopping some of the heavier particles. A possible method to address this issue is for a specific commitment and program to inspect the site after stormwater run-off events to identify and minimise further erosion and sediment transport off site".

With respect to the disposal of Benfield surge solution in a storage pond, the Water Authority commented as follows:

> "It is noted that concrete is proposed to be used for sealing the Benfield system purge solution storage pond. The concrete joints will need to be sealed with a suitable sealant. The top of the embankment for the purge solution storage pond be constructed 0.5 m above the adjacent 100 year flood level".

The Water Authority also recommended that the proponent should make a commitment to monitor and report on all site generated aqueous discharges (excluding stormwater run-off) to the environment.

4.7.3 Public submissions

Public submissions raised several concerns related to liquid waste disposal. The primary concern was the potential harmful impact the brine discharge could have on the marine environment, mangroves and terrestrial ecosystem, as a result of heavy metal contamination, of having higher temperature and salinity than seawater, or leakages from the pipelines.

The submissions expressed concerns about the suitability of effluent from the site sewage treatment plant for landscape irrigation in terms of its potential environmental, odour and health problems, and disposal of hazardous waste such as Benfield System purge containing vanadium salts.

4.7.4 Proponent's response

The proponent's response (Appendix 4) to the concerns expressed in the above public submissions is summarised as follows:

- to ensure that no additional heavy metals are discharged in the brine, the proponent has selected titanium plate and frame heat exchangers for the sea water service. Titanium is totally compatible with sea water and will not impart a heavy metal burden on the environment;
- the diffuser system will minimise the possible impact on marine life by having multiple outlets which allow significant dilution as the brine enters the sea water. It is expected that there will be no impact on mangroves in the vicinity of the brine outfall. The proponent has made a commitment to routinely monitor the brine discharge process and assess potential impacts (Commitment 20 of Appendix 6);
- owing to cooling effects of ambient temperatures, the differential between the temperature of the concentrated seawater and the temperature of the harbour water will be a maximum of 4°C. The cooling tower system will be designed to give a brine approximately 5°C hotter than the ambient wet bulb temperature;
- the brine pipelines will be designed, installed, operated and maintained in accordance with prevailing engineering standards and procedures to control the potential for leakage. In

the event of leakage occurring, appropriate action will be taken to rectify the situation, and the impact would be minimal;

- the biological sewage treatment plant will be a standard aerobic treatment system, either using the extended or intermittent aeration operation, and will comply with the conditions of licence. These plants are available from a number of vendors and the final selection of the plant is subject to detailed design. Notwithstanding that treated effluent is currently used widely in areas of low rainfall for land irrigation, the proponent will comply with standards applicable to the recycling. The potential for odours from the treatment plant and the irrigation of the treated effluent would be minimal;
- the Benfield purge solution will be collected in a tank then treated by thermal destruction (the preferred option with the vanadium salts being reused in the Benfield system), or by chemical precipitation (with the vanadium residue being disposed of by either recycling or to an approved landfill). The Benfield purge solution concrete pond or tank will be designed for flood protection and in consultation with WAWA (Commitment 33 of Appendix 6);
- the proponent has made a commitment to monitor and report on all site generated aqueous discharges (excluding stormwater run-off) to the environment, and in consultation with the Water Authority (Commitment 21, Appendix 6); and
- the Benfield surge solution concrete pond or tank, and the sediment traps for the stormwater run-off will be designed in consultation with the Water Authority (Commitment 33, Appendix 6).

4.7.5 Evaluation

The main consideration is safe disposal of liquid wastes, so that there is no significant pollution of surface run-off, groundwater or the ocean by spillage of process liquor or effluent within operational areas, or as a consequence of effluent disposal within or beyond the site.

With respect to the proposed brine discharge into the harbour, the DEP advised that analysis of the "brine" outfall is acceptable subject to further modelling and oceanographic monitoring to verify the behaviour of the brine plume. The issue of impacts on mangroves resulting from the brine discharge raised by CALM is addressed in Section 4.2.5 of this report.

The EPA has considered the commitments made by the proponent in the CER and during the assessment of the proposal, and finds disposal of other liquid wastes is manageable subject to these commitments.

Accordingly, the EPA concludes that the disposal of liquid wastes in the manner proposed is acceptable, subject to the commitments made by the proponent and Recommendation 2(iii) (Section 5). This recommendation requires the proponent to carry out the following with respect to the brine discharge:

- baseline monitoring at and around the brine outfall;
- monitoring at and around the brine outfall to verify that mixing is as predicted, and the brine does not contain harmful contaminants;
- rectification measures should monitoring indicate that mixing at the brine outfall is not as predicted, or adverse impacts have or are occurring;

4.8 Risk and hazards

4.8.1 Objective

The Environmental Protection Authority's objective is to ensure that surrounding residents and industry are not exposed to any undue risks and hazards from the operation of the project.

4.8.2 Evaluation framework

Technical information

The EPA has set down criteria for risks and hazards (EPA, 1992a) to protect surrounding residents from any development and to ensure that industries do not significantly impact on each other.

The proponent has carried out a qualitative risk assessment to identify hazards and the probability of the hazard affecting employees, the public or the natural environment, including the worst case outcome. For each hazard, the consequences are identified and control measures documented and referenced to operating documents (pages 69 to 72 of the CER). The identified significant hazards include exposures to noise and hydrogen sulphide during plant upset conditions, dust emissions, fire due to gas leak, explosion in a reactor train during maintenance, hazardous materials management, waste materials, occupational health and safety.

The proponent has supplied information to the DEP which indicated that risk management studies are undertaken on an ongoing basis as part of the design process. These include concept hazard analysis, preliminary Hazops and final Hazops. The proponent has indicated that a quantitative analysis will be carried out if required by the DEP.

Results were measured against EPA criteria for risks and hazards (Environmental Protection Authority, 1992a).

Comments from key government agencies

The Major Hazards Branch of the Department of Minerals and Energy (DOME) has carried out a technical evaluation of the information provided on risks and hazards associated with the project and provided the following advice:

> "A quantitative risk assessment (QRA) will not be required for this project due to the large distances (at least 5 km) from the residential areas. It is also expected that the EPA residential individual risk criteria will be met.
>
> From a comparison with the Compact Steel plant QRA, it is not expected that the $50x10^{-6}$ individual risk contour will cross the fence line.
>
> The main risks are from gaseous emissions of hydrogen sulphide, carbon monoxide, natural gas and hydrogen gas, and the resulting toxic effects or jet fires or explosions.
>
> As a result it is recommended that the proponent conduct a final HAZOP prior to commissioning and also include a hazardous zone classification for the plant."

4.8.3 Public submissions

Landcorp expressed concern about the acceptability of the risk assessment carried out by the proponent in relation to the adjacent Boodarie Heavy Industrial Estate. It believes that a quantitative risk assessment is required to adequately assess the environmental and social impacts of the project and its acceptability, in particular buffer shapes and sizes.

4.8.4 Proponent's response

In response to the above comments on risk and hazard issue, the proponent provided the following information (Appendix 4):

- the proponent will conduct a final HAZOP prior to commissioning of the HBI plant. The HBI plant will be divided into hazardous zones, such as no smoking zones and no naked flame zones, which will be identified as part of the HAZOP (Commitment 28 of Appendix 6); and
- in response to Landcorp's comment, the proponent stated that the air and noise modelling studies were used to establish the required buffer zone.

4.8.5 Evaluation

The Authority recognises that even though the proposed buffer zone was primarily considered for noise protection to residents, it would also provide additional protection against risk.

DOME advised that a quantitative risk assessment (QRA) is not required for this project due to the large distances (at least 5 km) from the residential areas, and that the EPA's criteria are expected to be met. The EPA, however is conscious that the establishment of the buffer zone is dependent on the issue being dealt with satisfactorily in the State Agreement Act which has yet to be finalised. Hence the EPA recommends that the issue of securing the buffer zone should be addressed in the Environmental Management Programme.

The EPA considers this issue is manageable subject to the noise buffer zone being provided (Recommendation 2(viii), Section 5), and the commitments made by the proponent.

4.9 Ballast water discharge

4.9.1 Objective

The EPA's objective is to ensure that ballast water discharged from ships associated with the project does not unacceptably impact upon the marine environment.

4.9.2 Evaluation framework

Technical information

The proponent has made a commitment that all vessels associated with the HBI project will comply with the "Voluntary Guidelines for Ballast Water and Sediment Discharge from Overseas Vessels Entering Australian Waters" (CER, Appendix D) or the "Draft Australian Ballast Water Management Strategy" (Commitment 27 of Appendix 6).

Comments from key government agencies

The DEP advised that the control of ballast water discharges is a Federal matter under the control of the Australian Quarantine Inspection Service (AQIS). The Inspection Service has introduced the "Voluntary Guidelines for Ballast Water and Sediment Discharge from Overseas Vessels Entering Australian Waters". The DEP also provided the following comments on this issue:

> "The voluntary guidelines generally recommend that ships exchange ballast water at sea "where practical" etc. Hence some ships do not exchange ballast water en route, do discharge biologically active water into ports, and still in effect "comply" with the voluntary guidelines. The proponent should ensure that all ships associated with the project can and will exchange ballast water in mid-ocean en route. It is understood that

the "Draft Australian Ballast Water Management Strategy" only applies to coastal vessels and not international vessels"; and

"At this time, the "Voluntary Guidelines for Ballast Water and Sediment Discharge from Overseas Vessels Entering Australian Waters" and the "Draft Australian Ballast Water Management Strategy" documents are still in the process of finalisation and have yet to be approved by the Australian Ballast Water Management Advisory Council".

4.9.3 Public submissions

The submissions expressed concern about the lack of effective legislation to protect the marine environment by thoroughly decontaminating ballast water carried by ships entering Australian waters. Hence, there is a need to establish baseline data and monitoring programs for all coastal areas covering both ports and offshore rigs.

Comments from the proponent

In response to the above comments, the proponent stated that all vessels associated with the HBI project will comply with the "Voluntary Guidelines for Ballast Water and Sediment Discharge from overseas vessels entering Australian waters" or the "Draft Australian Ballast Water Management Strategy" as proposed in the CER, and that the issue of control of ships rests with the ship agents and the Port Authority.

4.9.5 Evaluation

The problems associated with ships discharging ballast water into Australian ports has been of increasing concern, with the discovery of toxic dinoflagellates, a predatory starfish and possibly 30 to 50 other species introduced into Australian waters. The EPA recognises that the introduction of exotic marine organisms can have catastrophic effects on natural ecosystems and huge economic impacts on fisheries and mariculture. In contrast to chemical spills, the effects do not decline, but increase with time and are generally irreversible (ANZECC, 1995).

At this point in time, the EPA considers that any proposed discharge of ballast waters within the area controlled by the Port Hedland Port Authority must comply with the "Voluntary Guidelines for Ballast Water and Sediment Discharge from overseas vessels entering Australian waters" as a minimum requirement.

The EPA notes the proponent's commitment to ensure that all vessels associated with the HBI project will comply with the AQIS's "Voluntary Guidelines for Ballast water and sediment discharge from overseas vessels entering Australian waters" or the "Draft Australian Ballast Water Management Strategy".

However, in view of the DEP's advice that the above guidelines are still in the process of finalisation and have yet to be approved by the Australian Ballast Water Management Advisory Council, the EPA recommends that the proponent ensure that all vessels associated with the HBI project proposing to discharge ballast water within waters under the control by the Port Hedland Port Authority must comply with contemporary procedures of the Australian Quarantine Inspection Service (Recommendation 2(v), Section 5).

The EPA considers that the ballast water discharge issue is manageable subject to the above recommendation.

4.10 Greenhouse gas emission

4.10.1 Objective

The EPA's objective is to encourage industry to achieve the greenhouse strategy objectives including minimising waste, increasing energy efficiency

and reducing greenhouse gas emissions, as part of "best practice environmental management".

4.10.2 Evaluation framework

Technical information

The proponent advised that the HBI process produces less greenhouse gases than other iron production processes such as the conventional blast furnace. The HBI plant has been designed with a number of innovative heat integration concepts which minimise fuel consumption, and hence, CO_2 generation. These include, for example, the use of waste heat from the gas turbines as preheated air for the HBI furnaces. This reduces fuel consumption and CO_2 emissions by about 10%. Approximately 1.7 Mtpa of CO_2 will be released to the atmosphere by the HBI plant, less than 1% of the current national CO_2 production from fossil fuels.

Comments from key government agencies

The DEP advised that the "Greenhouse Strategy for Western Australia" (WA Greenhouse Co-ordination Council, 1991) outlines a series of measures (referred to as "no regrets" measures) to control greenhouse emissions, by encouraging energy efficiency in industry and domestically, promoting efficient transport systems, and developing renewable energy systems. The Greenhouse Strategy was revised by the Council and provided to Government in 1994 for endorsement, and is about to be released.

There are national approaches being developed to establish a greenhouse gas inventory, therefore it would be appropriate for the proponent at this time to undertake annual audits of all greenhouse gases emitted by the plant as part of the Environmental Management Plan, and to provide the results to the DEP. This would enable the DEP to monitor the emissions of greenhouse gases with a view to obtain an accurate inventory .

4.10.3 Public submissions

A few submissions expressed concern about the acceptability of the HBI plant contributing 1% increase in Australia's total CO2 emissions, in terms of Australia's international undertakings to reduce greenhouse gas emissions, and whether the proponent is going to compensate for this increase.

4.10.4 Proponent's response

The proponent's response (Appendix 4) includes the following comments:

> "In response to this global issue, BHP aims to reduce emissions of greenhouse gases per unit of production (in particular, carbon dioxide and methane) through increased energy efficiencies and more efficient use of fossil fuels in its production processes and other activities, where these programmes are technically and economically viable" (Commitment 36, Appendix 6).

4.10.5 Evaluation

The EPA recognises that, in recent years, there has been increasing concern about man-made emissions of greenhouse gases, particularly CO_2, and their possible effect on global warming and the resultant climatic changes. The EPA believes that formal guidelines or policy should be developed for industry in Western Australia to ensure that appropriate technology, engineering designs and other measures (such as tree-planting) are used, particularly in new developments, with a view to stabilise and reduce greenhouse emissions.

For the time being, the EPA recommends that the proponent should undertake annual audits of all greenhouse gases emitted by the plant as part of the Environmental Management Plan, and to provide the results to the DEP (Recommendation 2 (vi), Section 5).

The EPA considers that the project meets the Authority's objective on greenhouse emissions, subject to the above recommendation.

Furthermore, the proponent should participate in the Australian Government and Business of Australia management for voluntary greenhouse gas emission monitoring and reduction strategy as published by the Commonwealth in "Greenhouse 21C - A Plan for Action for a Sustainable Future" (Department of Environment, Sports and Territories, March 1995).

4.11 Other issues

The following issues were also raised in some submissions received. However, these issues are either minor environmental issues, or concerns which are more appropriately handled by other government processes.

Aboriginal and European Heritage sites

The Ngarda-Ngarli-Yarndu Regional Council of the Aboriginal and Torres Strait Islander Commission (ATSIC) expressed the following concern:

> "The CER does not reflect that the Regional Council's zoning plans have been readily adapted. It is believed by the Regional Council that some of the coastal areas and inlets are areas of Aboriginal significance.
>
> Areas of concerns are: Boodarie Landing, Salmon Creek, Middle Creek, Oyster Creek, Prawn Creek and Utah Point."

The Aboriginal Affairs Department raised the following concern:

> "It should be noted that at least three of the middens recorded in the CER (Section 6.2.1) are considered to be unusual and worthy of further study. It is preferable that these be avoided during construction of the stockpile areas, conveyor and pipeline."
>
> "There are extremely significant limestone engraving and midden sites recorded on West and South West Creeks, very close to the project areas. We are concerned about the possibility that these (and possibly other) sites may be indirectly impacted by the development".

The concerns of the Aboriginal Affairs Department relate, in particular, to the recreational use of South West Creek and Downes Island by construction workers (particularly if they are to be housed in a camp on the Boodarie Lease), and from the effects of iron ore dust and emissions such as sulphur dioxide, nitrogen dioxide, and hydrogen sulphide. That Department recommended that, in addition to commitments 8.2 and 8.7 (CER document), the proponent should take further measures to minimise indirect impact on sites of national significance which lie within 7 km of the proposed site, including:

- measures to ensure that the use of Aboriginal significant areas is strictly controlled, including induction for the workers, the introduction of penalties for damaging these areas, declaring some areas "out of bounds", physically restricting access to the sites, etc.;
- detailed modelling of the dispersion and ground level concentrations of airborne pollutants from the HBI, to be analysed by professional experts in rock art conservation;
- if concentrations are found to pose a threat to the Aboriginal sites on West and South West Creek, measures should be taken to remove this threat (such as raising the stack); and
- a comprehensive monitoring program should be conducted at the sites on West and South West Creeks. This should include a systematic initial survey of the engraving sites by professional rock art conservation experts so that future observations may be compared.

In addition to the commitments made relating to Aboriginal and European Heritage sites Commitments 8.2 and 8.7 of CER), the proponent responded to the above concerns that

(Appendix 4) emissions from the project would not pose a threat to the sites. However, air quality monitoring will be carried out and corrective action will be taken by the proponent if any adverse impacts are identified from the project affecting the limestone engravings and midden sites. The proponent has also had a meeting with the Regional Council of ATSIC to address the Council's concern.

In the light of the commitments made by the proponent regarding this issue, the EPA considers this issue to be manageable.

Rehabilitation

The EPA recognises the proponent 's commitment on rehabilitation (Commitment 8.3) and the general principles for rehabilitation as proposed in the CER (page 62) and considers this issue to be manageable.

Transport and storage of hazardous materials

Some submissions were concerned about the transport, storage and disposal of hazardous materials, particularly vanadium pentoxide (used as a catalyst in the Benfield system). The proponent indicated that the main statutory requirements are the Explosives and Dangerous Goods Regulations 1992 administered by DOME and relevant licence conditions.

The EPA considers that the issue of transport and storage of hazardous materials can be satisfactorily addressed through the Explosives and Dangerous Goods Regulations 1992 and relevant licence conditions and concludes that this issue is manageable.

Visual impacts

Since the proposed site for the project is in a relative flat area, some submissions expressed concern about the visual impacts of the project in the region, particularly the impacts associated with the large residue storage area, the overland conveyor and more stockpiles of iron ore.

The proponent advised that (Appendix 4) the visual impacts from the new stockpiles, the plant and the overland conveyor will be minimal. The residue impoundment will be rehabilitated to blend with the surrounding flora and topography.

The proponent has made no formal commitments with respect to the visual impacts of the project in the region.

The EPA notes the measures undertaken by the proponent to address this issue in the CER and considers this issue to be manageable.

Recreation

Local residents were concerned that further public access to recreational fishing spots, particularly Utah Point, a deep sea fishing spot for people who have no boat, will be denied as a result of the project. The proponent indicated that public access to Finucane Island and Hunt Point will remain, and alternative access points to deep water at Utah Point are being made available.

The EPA notes the proponent's response in relation to providing access to popular recreational areas and considers this issue to be manageable.

Greening of Hedland program

The Town of Port Hedland expressed concern that presently, some of BHP's spare water allocation is used for watering major ovals and reserves within Port Hedland and South Hedland townsites. This irrigation program would be seriously affected if all of the remaining water allocation is used for the project. The proponent has indicated that BHP's use of its existing total allocation should not affect the irrigation program. The EPA understands that the Water Authority has responded to the Town of Port Hedland on this issue. However, the EPA considers that this issue is best dealt with between the proponent and the Town of Port Hedland.

Social and economic impacts

The Regional Council of the Aboriginal and Torres Strait Islander Commission has sought the proponent "to implement an Aboriginal and Torres Strait Islander Employment Strategy, wherein this particular indigenous group of people will gain employment within all the stages of the project".

Other issues relating to the social and economic impacts have been responded to by the proponent (Appendix 4). Again, these concerns are best dealt with through government processes outside of the EPA's assessment of this proposal.

5. Conclusions and recommendations

Following consideration of environmental issues evaluated in Section 4 of this report, the EPA considers that, with the proponent's commitments and the EPA's recommendations, the proposed Hot Briquetted Iron Project can be managed within acceptable environmental levels and could proceed.

Future direction

Dust

Recognising the dust problems associated with existing industry, the local conditions of the Hedland region (eg. soils, dry tropical climate and ambient dust levels, particularly under easterly winds), and the likelihood of future industry development in the area, the EPA believes that regional air quality criteria should be developed based on specific local considerations. These criteria should be developed, for dust as well as for other atmospheric emissions such as oxides of nitrogen, in consultation with local government, government departments and agencies, industry (eg. salt, shipping, iron ore, light industry, other) in the Port Hedland area and with the public.

At some future time, noting the forthcoming CER by BHP Iron Ore Ltd for managing regional dust around Port Hedland, the EPA foreshadows the possible development of an environmental protection policy similar to those in place for air quality at Kwinana and Kalgoorlie.

Mangroves

While this proposal in itself affects a small proportion of mangroves in the Port Hedland area and which the EPA has recommended that in this case, the area is re-established, it has focussed attention again on the overall importance of arid zone mangrove systems. The EPA will use recent information gained through the Semeniuk study as well as information gained through assessing individual proposals to recast a policy position on mangroves. The practical outcome of this policy position will be a definition of areas where industry and other coastal developments may establish with environmentally acceptable impacts on mangrove systems. The mangroves policy position in turn will contribute to the State of the Environment report.

Buffer Zone

Long term security for the buffer zone around the plant site is essential to maintain the environmental acceptability of the proposal, especially for noise (and dust) emissions. The proponent has identified a distance of 5 km as being necessary for noise compliance (CER), and has sought to have this addressed through the State Agreement Act being developed for the proposal. Should the State Agreement Act not secure the buffer zone, then the EPA considers that an alternative mechanism be implemented and the EPA advised of this. The EPA has recommended accordingly (Recommendation 4).

Recommendation 1

The Environmental Protection Authority recommends that the proposal by the BHP Direct Reduced Iron Pty Ltd, to build and operate a Hot Briquetted Iron

plant of nominal capacity of 2 Mtpa in Port Hedland, be considered acceptable on environmental grounds, subject to:

- **the Environmental Protection Authority's recommendations in this report; and**
- **the proponent's consolidated list of environmental management commitments.**

Recommendation 2

The Environmental Protection Authority recommends that the proponent prepare an Environmental Management Programme (EMP). The proponent should submit the EMP to the DEP for approval prior to construction and subsequently implement it prior to commissioning where relevant. Whilst the proponent has committed in the CER to address some of the issues, the following issues need to be also addressed in detail:

(i) <u>Dust</u>

- **baseline monitoring of ambient dust outside the boundary of the project site, particularly at South Hedland and Wedgefield;**
- **management of dust to acceptable levels during construction, operation, maintenance and de-commissioning of the project, and be carried out in consultation with the Town of Port Hedland;**
- **monitoring and reviewing dust levels to verify the effectiveness of the dust control measures;**
- **rectification measures to be employed should monitoring indicate that adverse environmental impacts have occurred or are occurring;**

The Environmental Protection Authority also recommends that the proponent be required to operate the proposal using the best practice environmental management, so that particulate emissions from the site do not cause unacceptable impacts on the surrounding existing environment. As a goal, the plant should be designed to the same standards of emission controls as would be necessary for an identical plant in the Kwinana area where ambient dust levels are controlled under the Kwinana Environmental Protection Policy (EPA, 1992) (Appendix 1).

(ii) <u>Noise</u>

- **monitoring noise inside and outside the designated buffer zone;**
- **rectification measures should monitoring indicate that adverse impacts have occurred or are occurring;**

(iii) <u>Brine Discharge</u>

- **baseline monitoring at and around the brine outfall;**
- **monitoring at and around the brine outfall to verify that mixing is as predicted, and the brine does not contain harmful contaminants;**
- **rectification measures should monitoring indicate that mixing at the brine outfall is not as predicted, or adverse impacts have or are occurring;**

(iv) <u>Flora and Fauna</u>

- there should be no net loss of mangroves from the area and accordingly the 3 ha of mangroves lost be replaced. Recognising that there is a large-scale mangrove re-establishment program in the East Creek area, the proponent should apply the techniques and methods of this programme to recolonising the causeway area and the area should be as far as practical equal to or greater than the 3 ha lost during construction.
- monitoring changes to nearby mangroves;
- within the site investigative work, show there is no porous substrate under the project site, otherwise undertake a baseline monitoring for stygofauna in groundwater;
- rectification measures should monitoring indicate that adverse impacts have occurred or are occurring;

(v) Ballast Water Discharge

- management strategy to ensure that vessels associated with the project proposing to discharge ballast water within waters under the control by the Port Hedland Port Authority comply with contemporary procedures of the Australian Quarantine Inspection Service.

(vi) Greenhouse gas emissions

- annual auditing of all greenhouse gas emissions by the plant.

(vii) Waste Management

- recycling viability study.

Reports of the results of monitoring programmes should be submitted annually to the DEP for auditing, and will be made available to the public.

Recommendation 3

With respect to the location of the project on floodplain and storm surge area, the Environmental Protection Authority recommends that:

- the proponent consult with the Water Authority, the Department of Transport and the Department of Minerals and Energy, to seek their opinions on the adequacy of detailed engineering design, with respect to potential impacts on land including erosion, flooding (such as backflooding effects on South Hedland) resulting from the proposal, and flood and storm surge protection for critical components of the proposal (particularly the residue storage impoundment).

Recommendation 4

Long term security of the buffer zone around the plant site is essential to maintain the environmental acceptability of the proposal, especially noise and dust emissions. The proponent has identified a distance of 5 km as being necessary for noise compliance, and has sought to have this addressed through the State Agreement Act being developed for the proposal. The Environmental Protection Authority accordingly recommends that should the State Agreement Act not secure the buffer zone, an alternative mechanism be implemented and the EPA advised of this.

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 Consultative 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.

A schedule of environmental management commitments (June 1995) which will be audited by the Department of Environmental Protection is attached (see Appendix 6 of this report).

2 Implementation

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. Where, in the course of that detailed implementation, the proponent seeks to change those designs, specifications, plans or other technical material 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 Environmental Management Programme

An Environmental Management Programme is to be prepared and implemented to ensure that significant impacts on the environment resulting from the project are detected, reported on and managed promptly and correctly.

4-1 Prior to construction and in consultation with the Department of Environmental Protection and other appropriate government authorities, the proponent shall prepare an Environmental Management Programme which addresses, but is not limited to the following:

Dust

1 baseline monitoring of ambient dust outside the boundary of the project site, particularly at South Hedland and Wedgefield;

2 management of dust to acceptable levels during construction, operation, maintenance and de-commissioning of the project, and in consultation with the Town of Port Hedland;

3 monitoring and reviewing to verify the effectiveness of the dust control measures;

4 utilising the best practice environmental management ;

Noise

5 monitoring of noise inside and outside the designated buffer zone;

Brine Discharge

6 baseline monitoring at and around the brine outfall;

7 monitoring at and around the brine outfall to verify mixing, and the levels of contaminants;

Flora and Fauna

8 re-establishment of mangroves;

9 monitoring changes in nearby mangroves;

10 possible baseline monitoring for stygofauna in groundwater;

Ballast Water Discharge

11 management strategy to ensure that ballast water discharged from ships associated with the project comply with contemporary procedures by the Australian Quarantine Inspection Service ;

Greenhouse Gas Emissions

12 annual audits of all greenhouse gases emitted by the plant; and

Waste Management

13 recycling viability study.

4-2 The proponent shall implement the Environmental Management Programme required by condition 4-1 to the requirements of the Department of Environmental Protection on advice of appropriate government authorities.

4-3 In the event that monitoring or other observations show unacceptable environmental impacts, the proponent shall implement plans to mitigate these impacts.

5 Dust Management

5-1 The proponent shall operate the project using the best practice environmental management, so that particulate emissions from the site do not cause unacceptable impacts on the surrounding environment (See condition 4-1).

6 Flora and fauna

6-1 re-establishment of mangrove systems lost through direct impacts from construction activities. The replacement area should be the equivalent or exceed that of the area lost (See condition 4-1).

7 Flood Plain and Storm Surge Area Management

7-1 The proponent, in consultation with the Water Authority of WA and the Department of Transport on detailed engineering design, shall ensure that no adverse impact on lands, including erosion, flooding (such as backflooding effects on South Hedland) results from the proposal.

7-2 The proponent, in consultation with the Water Authority of WA, the Department of Transport and the Department of Minerals and Energy on detailed engineering design, shall ensure that adequate flood and storm surge protection for critical components of the proposal are provided.

8 Decommissioning

8-1 The proponent shall carry out the satisfactory decommissioning of the project, removal of installations and rehabilitation of the site and its environs.

8-2 At least six months prior to decommissioning, the proponent shall prepare a decommissioning and rehabilitation plan to achieve the objectives of condition 8-1.

8-3 The proponent shall implement the plan required by condition 8-2.

9 Time Limit on Approval

The environmental approval for the proposal is limited.

9-1 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 by way of a request for a change in the condition under Section 46 of the Environmental Protection Act. (On expiration of the five year period, further consideration of the proposal can only occur following a new referral to the Environmental Protection Authority.)

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.

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

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