PROPOSED JOINT VENTURE DEVELOPMENT
OF
CHANNAR MINING AREA HAMERSLEY RANGE
WESTERN AUSTRALIA

PUBLIC ENVIRONMENTAL REPORT

PREPARED BY
CHANNAR MINING PTY LIMITED
FOR AND ON BEHALF OF THE PROPOSED
CHANNAR MINING JOINT VENTURE

SEPTEMBER 1987
The Environmental Protection Authority (EPA) invites people to make a submission on this proposal.

The Public Environmental Report (PER) for the proposed iron ore mine at Channar has been prepared by Channar Mining Pty. Limited in accordance with Western Australian Government procedures. The report will be available for comment for 6 weeks, beginning on 10 October, 1987 and finishing on 23 November, 1987.

Comments from government agencies and from the public will assist the EPA to prepare an Assessment Report in which it will make a recommendation to Government.

Following receipt of comments from government agencies and the public, the EPA will discuss the issues raised with the proponent, and may ask for further information. The EPA will then prepare its assessment report with recommendations to Government, taking into account issues raised in the public submissions.

Channar Mining Pty. Limited acts for and on behalf of the proposed Channar Mining Joint Venture. The Joint Venturers will enter into an agreement with the Government for the development of the iron ore resource.

WHY WRITE A SUBMISSION?

A submission is a way to provide information, express your opinion and put forward your suggested course of action, including any alternative approach. It is useful if you indicate any suggestions you have to improve the proposal.

All submissions received will be acknowledged.

DEVELOPING A SUBMISSION

You may agree or disagree, or comment on, the general issues discussed in the PER or with specific proposals. It helps if you give reasons for your conclusions, supported by relevant data. You may make an important contribution by suggesting ways to make the proposal environmentally more acceptable.

When making comments on specific proposals in the PER,

- clearly state your point of view;
- indicate the source of your information or argument if this is applicable, and
- suggest recommendations, safeguards or alternatives.

POINTS TO KEEP IN MIND

By keeping the following points in mind, you will make it easier for your submission to be analysed.
Attempt to list points so that the issues raised are clear. A summary of your submission is helpful. Refer each point to the appropriate section or chapter in the PER. If you discuss sections of the PER, keep them distinct and separate, so there is no confusion as to which section you are considering.

Attach any factual information you wish to provide and give details of the source. Make sure your information is accurate.

Please indicate whether your submission can be quoted, in part or in full, by the EPA in its Assessment Report.

REMEMBER TO INCLUDE:

Your name, address, date.
The closing date for submission is 23 November 1987
Submissions should be addressed to:

    The Chairman
    Environmental Protection Authority
    1 Mount Street
    PERTH WA 6000
    Attention: Ms D. Peggs
PUBLIC ENVIRONMENTAL REPORT

PROPOSED JOINT VENTURE DEVELOPMENT OF CHANNAR MINING AREA

HAMERSLEY RANGE, WESTERN AUSTRALIA

Prepared by Channar Mining Pty Limited
for and on behalf of the proposed Channar Mining Joint Venture
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1.0 INTRODUCTION

1.1 Proponent

The proponent is Channar Mining Pty. Limited for and on behalf of a Joint Venture to be known as the Channar Mining Joint Venture. The Joint Venturers are Channar Mining Pty. Limited and an Australian Subsidiary of the China Metallurgical Import and Export Corporation. The functional relationship of the Joint Venture partners and related organisations is shown in Figure 1.

1.2 Objective

The Environmental Protection Authority was informed of the details of the proposed development of certain Mining Leases, held by Hamersley Iron Pty Limited under existing State Agreement Acts, by a formal Notice of Intent submitted to the Department of Resources Development in June 1985.

The Environmental Protection Authority recommended that a Public Environmental Report should be provided by the Proponent. This report is intended to assist the Authority in assessment of the Environmental Management proposals required to be submitted by the proponent for the development of the new mining area.

The mining tenements that are the subject of the development are known as the Channar Mining Area. The location of Channar is shown in Figure 2. This area forms the eastern part of a number of Mining Leases held by Hamersley Iron Pty Limited and Mount Bruce Mining Pty Limited within the Hamersley Iron Province at Paraburdoo. Future development of the existing mine of Paraburdoo will eventually advance eastwards towards the Channar area.

Techniques for management of mining that are compatible with the regional environment have been progressively developed by Hamersley Iron during the period since the commencement of its operations in the Pilbara. With further experience in the region, refinement of environmental management will continue in the future.

The Channar Mining Area will be developed as a separate mine by Channar Mining Pty Limited (a subsidiary of Hamersley Holdings Limited) and a subsidiary of the China Metallurgical Import and Export Corporation.
CHANNAR MINING JOINT VENTURE

Ownership & Functions Relationship - Figure 1

- MMI
  - CMIEC CHINA
    - CMIEC AUSTRALIAN SUBSIDIARY
      - CHANNAR MINING PTY LIMITED
        - HAMERSLEY IRON PTY LIMITED
          - HAMERSLEY HOLDINGS
            - CRA
              - CMIEC

- CHANNAR MINING JOINT VENTURE
  - POLICY
    - CHANNAR MANAGEMENT SERVICES PTY LIMITED
      - MANAGEMENT
        - OPERATION
          - OWNERSHIP

* COMPANIES BEING INCORPORATED
LOCALITY MAP

SCALE 1:500 000

KILOMETRES

MINOR ROAD

MAJOR ROAD

Figure 2
under a new State Agreement between the Joint Venturers and the Government of the State of Western Australia. Hamersley Iron Pty. Limited will carry out most of the operational work for the Joint Venturers.

This Public Environmental Report provides information of the proposed mine in relation to the environment of the area in which it is to be developed. Measures will be proposed for the protection and management of the environment in respect of the activities of the Joint Venturers under the provisions of the proposed State Agreement.

1.3 Existing Mining and Infrastructure of Paraburdoo

The Paraburdoo mine is the second of the two mines developed by Hamersley Iron Pty Limited situated some 1100km north of Perth in the central southern section of the geological formation known as the Hamersley Iron Province of the Pilbara Region. Operations were initially commenced at Mount Tom Price in 1966. After several stages of expansion in production at that property the ore body at Paraburdoo approximately 80km by road to the south was developed into a mining operation in 1971.

High grade fines and lump ore products from these mines are transported by a Hamersley Iron owned and operated railway to the port of Dampier constructed by Hamersley Iron 300km to the north of Paraburdoo.

1.3.1 Power Supply

Electric power for the mine and adjacent town is supplied from the Hamersley Iron operated 120MW steam turbine power station located at the Port of Dampier. A 20MW gas turbine unit at Paraburdoo is linked for remote operation from the main generating station at Dampier and provides standby capacity for the 220kV power transmission system which serves Paraburdoo and Mount Tom Price.

1.3.2 Water Supply

The water supply for the mine and town of Paraburdoo was developed from an investigation of groundwater potential of the region originally commissioned by Hamersley Iron between 1968 and 1971.
The present supply is obtained from bores in two groundwater systems designated the Mine Wellfield and the Town Wellfield. Over the period of operation some production bores have been removed from service and additional bores have been drilled.

All water supplies are chlorinated and quality is routinely monitored in accordance with the licencing provisions.

The instrumentation and control system for management of the fields has been systematically improved since a review of production in 1977.

The water drawn from the borefields is supplied by pump stations at collector tanks adjacent to the Mine and Town sites. The discharges from the collector stations are interconnected to enable the two systems to be balanced.

A wellfield assessment report is prepared by Hamersley Iron's Consultants for submission to the Public Works Department annually in June.

The average production rates based on annual production flows are well below the licenced daily draw rates of 5230KL and 15 300KL for the Mine and the Town respectively. Peak daily demands, however, limit the ability to meet any significant base load increase from the existing installed capacity.

1.3.3 Paraburdoo Town

The township of Paraburdoo was built by Hamersley Iron to support the operations of the mine which was commissioned in 1972. Facilities include a district high school, hospital, hotel/motel, community centre, extensive sporting facilities, shopping centre, telecommunications, television and radio transmission and an all weather airstrip.

All roads are sealed and mains water, power and sewerage services are provided throughout the townsite.

Accommodation comprises three and four bedroom houses for married employees and serviced rooms with mess facilities for single employees. Construction of all
accommodation is of brick veneer with the exception of a small number of "Systembuilt" houses which are of factory formed sandwich wall panel design. Paraburdoo has 621 houses and accommodation in single quarters for a total of 392 people.

With the introduction of the Hamersley Home Ownership Scheme and transfer of the town to the Shire of West Pilbara in 1982, community involvement and responsibility for administration of the town has increased.

1.3.4 Transport

The all weather airstrip constructed and owned by Hamersley Iron is situated 10km to the north east of the townsite. It is equipped with navigational aids, a visual approach slope indication system and runway lighting.

In addition to commercial passenger traffic by Fokker Fellowship aircraft, a regular commuter service from Paraburdoo is operated for Hamersley Iron connecting with its other sites and light aircraft charter is available. Some light aircraft movements associated with regional pastoral leases also occur.

The pavement construction enables use by aircraft up to the DC9-30 Series.

Passenger movements over the past three years have averaged 25,000 per year.

The main road into Paraburdoo is from the North West Coastal Highway at Nanutarra 230km to the west and which is sealed to within 50km of the town. Equipment and supplies are transported to the mine and township by this route by road trains and other commercial road transport. Facilities do exist, however, to back load some goods by rail from Dampier at the coast. Fuel is supplied by this route from the Hamersley Iron terminal which is operated by the Shell Company of Australia Limited at the port of Dampier.

1.4 The Project Area

The Channar Mining Area is part of more extensive mining leases held by Hamersley Iron Pty Limited and Mount Bruce Mining Pty Limited respectively. The relevant areas are shown in Figure 3.
An overland conveyor will transport secondary crushed ore from Channar to the existing Paraburdoo mine. The conveyor will be located on an embankment with a sealed light vehicle access road. An existing unsealed road will be upgraded and used for the construction workforce until the sealed light vehicle access road is completed. The construction access road will then be modified and extended to transport large "off highway" trucks and plant from Channar to Paraburdoo mine (Figure 4).

A small area of land which is currently part of a Ministerial Reserve created in late 1984 lies on the route of the proposed conveyor and road corridors and this will be the subject of a lease application.

The Ministerial Reserve declared in 1984 extends along the southern boundary of the Channar Area. The south-western limit of the Hamersley Range National Park lies approximately 10km to the north-east. No other reserves or leases exist in the project area.

In addition to mining as described by this report mineral exploration by a number of developers is currently undertaken in the area and has occurred at various levels of activity throughout the region since the time of early European settlement. Other land users of the area are centred on the pastoral leases of Rocklea, Mininer and Turee Creek Stations. Over recent years the seasonal demands of tourists have increased.

1.5 The Proposed Development

The project development will provide facilities for mining over a period of approximately 22 years.

The development area covers five separate deposits of mineralization along a total distance of 12km which are identified as 64 East, Channar, Channar East, 84 East and 94 East.

1.5.1 Mining Operations

A mine plan has been based on commencing production from the Channar deposit at an annual rate of 3Mt/a of saleable ore products. This would then be increased to 10Mt/a by the 9th year. Ore grades and impurities vary throughout the deposits and dictate the sequence of extraction from the five deposits in the mine plan in order to maintain grade control. Ore from Channar would become part of the Hamersley blend with each of the parties involved in the project taking its share of the blended product for export to China.
1.5.2 Mine Plant and Services

A primary and secondary crusher will be located adjacent to the Channar deposit.

The system to transport the ore from the mine is by conveyor to the Paraburdoo plant. Surplus capacity in the Paraburdoo plant as well as rail, power and other infrastructure of the Hamersley Iron operations can be utilized enabling initial tonnages to be developed at a cost far lower than a complete new operation. Significant capital works for development of the new mining area will still, however, be required including mining equipment, crushing plant, ore transportation facilities, access roads, principal services (water, power, communications) accommodation and ancillary equipment.

The expected construction workforce of 500 persons will be accommodated in new construction camps. It is proposed to build two construction camps. The major camp will be located at Channar near the Turee Creek Pastoral Station with a smaller camp being located at Paraburdoo. The construction camp at Paraburdoo will be established on the site of the current construction camp.

2.0 EXISTING ENVIRONMENT

2.1 Climate

The climate of the southern Hamersley Range is arid with dominant elements usually nominated as temperature, rainfall, evaporation and thunderstorm activity.

Hamersley Iron has recorded climatological data in the Paraburdoo area since the time of early exploration activities. In 1970 temperature and rainfall readings were obtained at the exploration camp south of the present minesite. More detailed information including evaporation rates was recorded at the mine from 1972 when operations were commenced. A standard weather recording station was established at the townsite in 1979 and since 1980 it has reported as an official Bureau of Meteorology Station.
Some studies also have been conducted over limited periods for specific environmental projects such as air and ground temperature profiles to identify diurnal variations for interpretation of effects on seed germination and plant growth.

Maximum and minimum temperatures for summer (January) average 41°C and 26°C and for winter (July) the corresponding averages are 23°C and 11°C respectively.

Prolonged periods of high temperatures are common with temperatures in excess of 38°C (the "Century") experienced for more than 100 consecutive days each year. The maximum temperature of 48.9°C occurred in January 1971. By contrast the lowest temperature of 2.0°C was recorded in July 1983.

The humidity is characteristically low in the summer months but higher in winter. Evaporation rates are correspondingly high in summer and low in winter.

The annual average rainfall for the inland Pilbara region is usually quoted up to 300 or 400mm. For Paraburdoo the average from recorded data since 1970 is 286mm.

Rainfall is highly variable since it is influenced by the pattern of cyclonic activity that affects the coastal region. The major proportion of the rainfall for any year is usually produced by storms and rain bearing depressions associated with cyclones which dissipate on crossing the coast.

All areas in the 50km wide coastal region of Australia north of latitude 27°S are categorized as Tropical Cyclone Prone. The Paraburdoo area located 300km inland is not within this region and the principal effect of cyclone activity is on storm events and stream flow.

### 2.2 Soils

The Australian soil landscape regions described by Bettenay (Bettenay 1983) provides a very broad description of the soil groups. The project area lies within the Pilbara Province of the Western Region (II) of this soil landscape classification. The dominant soil types are described as lithosols, red clays and red-brown earths.

The Pilbara Province is divided into two distinct parts by the valley of the Fortescue River. To the north is the Chichester Range with predominantly shallow brown loams with basalt outcrops and beyond are plains of red-brown earths and coastal regions.
dominated by marshes with solonetzic soils. The larger area to the south of the Fortescue is the Hamersley Plateau which includes the Hamersley and Ophthalmia Ranges. Soils are characterized by shallow depth and high gravel content. The major soil features of the Hamersley Range are described as Red lithosols with frequent rock outcrops. Within the high valley plains are areas of plastic clays chiefly earthy and brown cracking clays (Uf6.71 and Ug 5.38, Northcote 1971).

The highly flocculated clay aggregates of some soils in the high level plains are naturally unstable and show tunnelling from collapse of structures through drainage.

The project area is in the south of the Pilbara Province and shows the additional characteristics of red and brown hard pan soils and red earths of the plains marginal to the Murchison Province to the south and the Carnarvon Province to the west.

The soil groups and erodability for these broad based classifications are given in Table 1.

<table>
<thead>
<tr>
<th>Principal Profile Form (Northcote 1971)</th>
<th>Great Soil Group</th>
<th>Soil Erodability (undisturbed soil)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uc 5.11</td>
<td>Sands</td>
<td>Extreme</td>
</tr>
<tr>
<td>Um 5.51</td>
<td>Lithosols</td>
<td></td>
</tr>
<tr>
<td>Dr 2.33</td>
<td>Red Earths</td>
<td>Low</td>
</tr>
<tr>
<td>Dr 2.32</td>
<td>Red Solodic Soil</td>
<td>Very Low</td>
</tr>
<tr>
<td>Um 5.52</td>
<td>Alluvial Soil/Lithosol</td>
<td></td>
</tr>
<tr>
<td>Uf 6.71</td>
<td>Plastic Clay</td>
<td>High</td>
</tr>
<tr>
<td>Ug 5.38</td>
<td>Brown Cracking Clay</td>
<td></td>
</tr>
<tr>
<td>Gu 2.12</td>
<td>Red Earth</td>
<td>Low</td>
</tr>
</tbody>
</table>

Differences in the parent material and weathering have given rise to the marked differences in the textures of the soil classes. Some soil studies have been undertaken on various occasions in the past by Hamersley Iron at Mount Tom Price and Paraburdoo for mine rehabilitation and engineering works.
Predictably a large variation in soil texture associated with deposition of different sized material has been identified. Soil structure varies between different areas but one of the more significant aspects for revegetation is the absence of the typical O, A1, A2, B and C horizon development. The amount of organic matter varies between location of soil types with hill slopes containing less than valleys.

2.3 Hydrology

In the original investigation of ground water potential for supplying the Paraburadoo operations the alluvial valley associated with the Turee Creek system to the south of the Channar Mining Area was considered. Development of a borefield in this general area is proposed.

The water requirements of 1,300ML per year estimated as the demand for the Channar project is expected to be available from a borefield in the general area of Turee Creek. Hamersley Iron has been granted an Exploratory Well licence under the Rights in Water and Irrigation Act. Further exploratory work needs to be undertaken in accordance with the licence.

Turee Creek drains a catchment of more than 5,900km² upstream of the project area. An early seismic survey was conducted across Turee Creek downstream of Maguire Gap approximately 25km west of Mount Channar. Another geophysical survey subsequently undertaken upstream of Maguire Gap indicated the presence of at least 120m depth of alluvium and exploratory drilling showed the potential of the system.

The alluvium is underlain by a dolomite sequence believed to be of the lower Duck Creek formation of the Wyloo Group. The basal part of the alluvium comprises a goethitic sequence common to major alluvial valleys in the region and which constitute a significant aquifer system.

Estimates of recharge for the system have been based on the only stream gauging station (P.H.D. Station 706004) in the Turee Creek catchment at Broken Springs which is 35km upstream from Mount Channar.

Most stream flow events are of short duration and often last only a few days at best. Records indicate the average number of streamflows per year seldom exceeds two.
The derived data from Broken Springs (Table 2) has been extrapolated to estimate the catchment from the area above Mount Channar which drains into the area of the proposed borefield.

An assessment of the potential yield of the system from commandable storage and recharge has been provided by the Consultants. These calculations are summarized in Table 3.

Samples of the water obtained in the early exploratory drilling near Mount Maguire in 1970 indicate the suitability for potable use and the similarity in chemical analysis with other supplies in the region (Table 4).

The feasibility for a surface storage system in the Paraburdoo area has in the past been investigated. A combination of low frequency and short duration of stream flow events with high potential evaporation makes surface storage even for conjunctive supply unattractive.

**TABLE 2 - STREAMFLOW STATISTICS**

<table>
<thead>
<tr>
<th>Gauging Station</th>
<th>Station 706004 (Turee Creek at Broken Springs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catchment Area</td>
<td>2050km²</td>
</tr>
<tr>
<td>Years of complete record</td>
<td>4</td>
</tr>
<tr>
<td>Peak discharge*</td>
<td>2600m³/sec</td>
</tr>
<tr>
<td>Mean annual runoff*</td>
<td>90 x 10⁶m³ (44mm)</td>
</tr>
<tr>
<td>Runoff as percentage of rainfall*</td>
<td>11%</td>
</tr>
<tr>
<td>Average number of flows per year</td>
<td>2.0</td>
</tr>
<tr>
<td>Range of number of flows per year</td>
<td>0 to 4</td>
</tr>
</tbody>
</table>

*All discharge and runoff figures are approximate. Both stations are unrated.*
### TABLE 3 - TUREE CREEK WELLFIELD

**COMMANDABLE STORAGE AND RECHARGE**

Aquifer Type: Alluvium, calcrete, Mount McGrath Formation.
Probable Individual Bore Yield: 500 - 1000 m$^3$/day.
Water Quality: Potable.
Commandable Storage: Assumed twenty metres of material drained.

<table>
<thead>
<tr>
<th>Specific Yield</th>
<th>Commandable Storage (m$^3$)</th>
<th>% Rainfall Entering Groundwater</th>
<th>Annual Recharge (m$^3$/Year)</th>
<th>Life of Supply (3.3 x 10$^6$ m$^3$/Year)</th>
<th>Average Annual Yield for Life of Twenty Yrs (m$^3$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2%</td>
<td>64 x 10$^6$</td>
<td>1%</td>
<td>20 x 10$^6$</td>
<td>23 x 10$^6$</td>
<td></td>
</tr>
<tr>
<td>3%</td>
<td>95 x 10$^6$</td>
<td>1%</td>
<td>20 x 10$^6$</td>
<td>25 x 10$^6$</td>
<td></td>
</tr>
<tr>
<td>5%</td>
<td>159 x 10$^6$</td>
<td>1%</td>
<td>20 x 10$^6$</td>
<td>28 x 10$^6$</td>
<td></td>
</tr>
<tr>
<td>2%</td>
<td>64 x 10$^6$</td>
<td>2%</td>
<td>40 x 10$^6$</td>
<td>43 x 10$^6$</td>
<td></td>
</tr>
<tr>
<td>3%</td>
<td>95 x 10$^6$</td>
<td>2%</td>
<td>40 x 10$^6$</td>
<td>43 x 10$^6$</td>
<td></td>
</tr>
<tr>
<td>5%</td>
<td>159 x 10$^6$</td>
<td>2%</td>
<td>40 x 10$^6$</td>
<td>48 x 10$^6$</td>
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<tr>
<td>2%</td>
<td>64 x 10$^6$</td>
<td>3%</td>
<td>60 x 10$^6$</td>
<td>63 x 10$^6$</td>
<td></td>
</tr>
<tr>
<td>3%</td>
<td>95 x 10$^6$</td>
<td>3%</td>
<td>60 x 10$^6$</td>
<td>65 x 10$^6$</td>
<td></td>
</tr>
<tr>
<td>5%</td>
<td>159 x 10$^6$</td>
<td>3%</td>
<td>60 x 10$^6$</td>
<td>68 x 10$^6$</td>
<td></td>
</tr>
<tr>
<td>Parameter</td>
<td>Bore WD1-8500 Mt. Maguire</td>
<td>Collector Tank 1 Paraburadoo</td>
<td>Hardey River Mt. Lionel Collector Tank Tom Price</td>
<td>Australian Dept. of Health Max. Desirable Criteria</td>
<td></td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>---------------------------</td>
<td>-------------------------------</td>
<td>-----------------------------------------------</td>
<td>---------------------------------------------------</td>
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</tr>
<tr>
<td>Total dissolved solids (by evaporation) mg/l</td>
<td>767</td>
<td>840</td>
<td>882</td>
<td>1500</td>
<td></td>
</tr>
<tr>
<td>Total hardness (As Ca CO₃) mg/l</td>
<td>370</td>
<td>428</td>
<td>525</td>
<td>600</td>
<td></td>
</tr>
<tr>
<td>Sodium mg/l</td>
<td>135</td>
<td>122</td>
<td>100</td>
<td>*</td>
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</tr>
<tr>
<td>Calcium mg/l</td>
<td>56</td>
<td>70</td>
<td>88</td>
<td>200</td>
<td></td>
</tr>
<tr>
<td>Magnesium mg/l</td>
<td>68</td>
<td>62</td>
<td>74</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td>Chloride mg/l</td>
<td>216</td>
<td>128</td>
<td>174</td>
<td>600</td>
<td></td>
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<tr>
<td>Bicarbonate mg/l</td>
<td>312</td>
<td>520</td>
<td>340</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>Carbonate mg/l</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>Sulphate mg/l</td>
<td>111</td>
<td>92</td>
<td>247</td>
<td>400</td>
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<tr>
<td>Nitrate mg/l</td>
<td>8.4</td>
<td>31</td>
<td>7</td>
<td>45</td>
<td></td>
</tr>
<tr>
<td>Fluoride mg/l</td>
<td>0.3</td>
<td>0.5</td>
<td>0.5</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>pH mg/l</td>
<td>8.35</td>
<td>7.</td>
<td>7.0</td>
<td>6.5-9.2</td>
<td></td>
</tr>
</tbody>
</table>

* No maxima specified
2.4 Flora

The vegetation of the Pilbara region has been mapped by Beard (Beard, 1975)

The southern Hamersley Ranges are located in the Eremaean Botanical Province. The Channar project area is within the Fortescue Botanical District (Pilbara Region), although the broad flats south of the Banded Iron Formation occur within the Ashburton Botanical District (Beard, 1975; Beard, 1980.)

Studies of the flora at Paraburdoo reflect a blending of the two influences, namely, the Hamersley Ranges and the Ashburton River Valley (Hamersley Iron, 1979). The main families in the area include Poaceae, Mimosaceae, Caesalpiniaceae, Fabaceae, Malvaceae, Myrtaceae and Goodeniaceae.

Collections at Paraburdoo and Mount Tom Price, by Hamersley Iron, had recorded over 50% of the 840 species which are known to occur in the Pilbara Region. As part of the ongoing mine rehabilitation works at both of the Company's properties knowledge of the flora of the region is continuing to be extended. This has been especially assisted through the incorporation of the Hamersley Iron herbarium collections into the Pilbara Regional Herbarium recently established at Karratha College and managed under the direction of the Department of Conservation and Land Management.

An initial scouting survey of the project area was made by Hamersley Iron's Consultant Botanist in January 1985. A reconnaissance for delineation of plant communities and opportunistic collection of flowering species was completed in April 1985.

From this preliminary field work planning for a detailed survey as required for Hamersley Iron's mine rehabilitation programme was specified and undertaken in 1985. As a new area for mine development the survey also reviewed the conservation status of the flora in the project area.

As a general description the vegetation on the ridges and slopes is dominated by a low tree steppe of scattered Eucalyptus spp. with an understorey principally of hummocks of Triodia pungens and T. wiseana. The valleys and flats are dominated by a mixture of low tree steppe of Eucalyptus spp. with an understorey of Triodia spp. interspersed with shrublands of Snakewood (Acacia xiphophylla), low woodlands of Mulga (Acacia aneura) and sparse shrublands of wattles (Acacia) and Chenopods. The minor waterways and creeks support a woodland of Coolibah (Eucalyptus coolibah), while major creeks
and water courses support the River Red Gum (Eucalyptus camaldulensis) and the paperbark Melaleuca glomerata.

2.5 Fauna

Faunal investigations in the Pilbara Region have concentrated on species inventory and some particular species studies (Texas Gulf Australia, 1979; Dunlop and Sawle, 1983; Majer, 1983a, Majer, 1983b). Additional avifaunal studies have been carried out in the vicinity of Mount Tom Price and Paraburdoo by J. Ford, under a grant from Hamersley Iron.

From a general review of the fauna of the Pilbara Region (Morris 1984) it has been noted that the vertebrate species are among the most diverse in the State.

In the same review some species of birds which have declined elsewhere in Australia are reported by contrast to be still common in the region. Migratory birds from Asia and Europe use the Pilbara as a staging point.

No comprehensive inventory study has been undertaken for the region in general and none specifically for the Paraburdoo area. In conjunction with the initial botanical inspection in January 1985 a consultant zoologist made a scouting survey to provide recommendations for a detailed fauna assessment. Surveys were then conducted in 1985 and 1986 to reflect seasonal variations.

3.0 PROJECT DESCRIPTION

3.1 Project Area

The Channar ore deposits outcrop over a distance of 12km and are represented diagrammatically by Figure 5. A pictorial view of the deposits is shown in Figure 6. The combination of creek channels and the dolerite dyke pattern has fragmented the original "crust" type mineralization into separate lenses. Some ore lenses extend below the plain level to the south.

The high grade ore bodies occur as the Dales Gorge and Joffre Members of the Brockman Iron Formation separated by the shale waste zone identified as the Whaleback Shale member. Most of the high grade lenses occupy simple limb positions of a complex fold pattern. The ore bodies are flatly dipping with surface outcropping or minimal coverage of cap rock. The mineralized strata generally around 40m in depth become overlain by shale to a maximum depth of 50 m.
Figure 5  ORE BODIES OF CHANNAR MINING AREA
Two sets of faults infilled by dolerite are a feature of the area. One set trends north east and the other strikes north west. Both appear mainly to be steep and tabular in nature and to be premineralization in age. The termination between ore and waste is normally quite sharp and the transition from waste to ore occurs over narrow intervals.

Shale bands occur as zones of low grade material within the orebody especially in the Dales Gorge Member.

Several types of lower grade ore are present in the general area occurring either above, within or flanking the high grade ore lenses. Some can be directly blended with the high grade ores.

3.2 Mining Practice and Material Management

The general conceptual mine plan is shown in Figure 7 which is based on transport of the primary crushed ore to the existing Paraburdoo plant by conveyor. Land disturbances by the conveyor, service roads, power lines and similar utilities will be minimized and measures for conservation management such as erosion control will be facilitated by construction of one main transport corridor.

Although the general mining methods will be similar to current practices at Paraburdoo (drilling and blasting followed by loader/truck operations) the structural and mineralization characteristics of the area will require the development of a mine plan involving a series of pits centred on the high grade ore.

Waste material not used in developing access to subsequent pits will necessitate formation of dumps. However, a large proportion of the waste material, will be required to form roads and develop access to subsequent mining areas through the life of the mine so that large waste dumps are not envisaged.

Where waste dumps are required they may generally be formed over the limits of the working pits since most benching will extend to the natural contour. Suitable waste dump locations will be chosen having regard to environmental and cost considerations.

The mining sequence will be constrained according to dictates of production control at the time of implementation of a particular pit design.

Predevelopment will be required to strip overburden and establish benches.
Blasting frequency and size of blast are dictated by bench face length and in accordance with the current mining practice of Hamersley Iron three blasts per week of up to 150,000 tonnes per blast can be taken as typical. Drill and blast activities are normally undertaken well ahead of digging requirements to allow for orderly movement of drills and adequate supply of broken stocks for blending purposes. Three months supply of drilled and broken stocks has been the normal Hamersley Iron practice.

Maintenance of mining equipment will be according to the established Maintenance Management System (M.M.S.) of Hamersley Iron operations. Field maintenance will be limited to breakdowns and minor servicing. Regular servicing of mobile equipment will be conducted in maintenance workshops of the Channar Mine Operations Centre but major servicing and overhauls will be carried out at the existing Paraburdoo base workshops.

The mining operation is to be on a continuous shift basis over 24 hours per day and 7 days per week. The total workforce numbers estimated for Channar will be 252 for a planned production of 10Mt/a.

3.3 Services

The principal demand for water in the development area will be associated with control of dust emission from benches and roads within the mine and initial conditioning of the ore. Some quantities will be required for drilling and to supply the various industrial and domestic needs of the Mine Operations Centre.

A total annual demand has been estimated as 1,300ML. It is proposed to supply this from a wellfield to be developed in the Turee Creek catchment area.

The annual water demand associated with the co-commitment for accommodation in the Paraburdoo townsite and ore processing through the Paraburdoo Plant is not expected to increase beyond the supply's current capacity.

Power to the Channar Mining Area will be supplied from the 220kV switchyard at Paraburdoo through a transmission line to be constructed within the proposed transport corridor.

The standard ammonium nitrate/fuel oil (ANFO) explosives will be supplied to the Channar operations from the existing bulk facility at Paraburdoo by truck along the transport corridor.
4.0 PROJECT BENEFITS

4.1 Market Development

Hamersley Iron has been a continuous supplier of iron ore to the Chinese steel industry since 1973. Development of the proposed project represents a consolidation and expansion for implementation of the policy of co-operation between Australia and China initiated by the Australian Federal Government and the Peoples Republic of China.

4.2 Development of Regional Resources and Infrastructure

Channar is a natural extension of the existing Paraburdoo mine.

Since the area is adjacent to established infrastructure increased utilization of installed capacity such as power generation, rail and port facilities can be achieved.

Employment opportunities will be created both through construction and operation phases of the project. Whilst the Channar Mining Joint Venture will employ some 252 persons when the operation reaches 10 Million tonnes per annum, this increase may be offset largely by a reduction in Hamersley Iron Pty. Limited personnel.

Overall employment numbers within Channar and existing Hamersley Operations, will depend not only on the level of sales to China, but on the sales volumes at the time in other markets.

5.0 ENVIRONMENTAL EFFECTS AND MANAGEMENT

5.1 General

Development of the Channar Mining Area will only nominally increase the resident population of Paraburdoo. Access to the mine will be by private road from the Paraburdoo mine.

5.2 Land Use and Management

Although mineralization of the project area necessitates a mine plan which will extend over a greater equivalent area than the existing Paraburdoo mining operations, total impact of the natural environment will be confined to limited specific areas of the ore bodies within the leases. Transport routes for haulage of ore and waste will be required to link the more diverse pit areas.
The topography of the area tends to constrain access routes between the existing mine and townsite to the corridor indicated for the conveyor route. Control by planning within this corridor for all services will minimize land disturbance.

Information on the geology and soil characteristics of the area has been obtained for engineering design and construction purposes and for correlation in the vegetation studies.

Material required for construction of roads, plant foundations and similar civil engineering works will necessitate formation of borrow pits in the area.

The quantities and specifications for this material will depend upon the findings of the site evaluation for engineering design.

The conveyor and sealed access road will be designed with culverts to allow the flow of water at appropriate intervals. The conveyor will have pedestrian crossings every 300 metres as well as three crossovers to allow maintenance vehicles and personnel to cross.

The Channar construction camp will be removed and the area rehabilitated at the conclusion of construction. Some of the Paraburdoo construction camp facilities will remain and may form part of a proposed caravan park.

5.3 Pollution Control

Established practices for control of dust emissions by use of water will be implemented in all phases of mining and ore handling.

The control of industrial wastes such as lubricating and other oils, industrial chemicals and solid wastes will be subject to the established practices of Hamersley Iron. These include disposal by incineration and sanitary landfill. It is not envisaged however that special or separate provisions will be required for industrial waste disposal sites to be established in the Channar Mining Area, other than those related to the limited domestic and industrial drainage associated with construction and the facilities of the Mine Operations Centre. Sewage will be treated in a packaged plant and refuse will be disposed of in a sanitary landfill site which will be selected to preclude possible contamination of groundwater or aquifer systems.
The Mines Regulation Act provides for control in the development area of conditions related to such factors as dust emission, noise and safety in the use of explosives. The existing bulk nitrate store at Paraburdoo will service the requirements of the new mining area for ANFO which will be delivered to the specific locations by on-site mixing trucks.

5.4 Mine Rehabilitation

Fauna studies undertaken for the Channar region to date indicate that no species of conservation concern exist in the project area.

Nomadic and migratory birds are unlikely to be affected to any measurable extent by mining, some species originally thought to be habitat specific are in fact dispersive and have the capacity to move into surrounding communities. Terrestrial mammals and snakes are uncommon. Most species have geographic distributions covering either the Pilbara, the Northern half of the State or in some cases most of Western Australia.

Regeneration of vegetation in disturbed areas in the Pilbara has been extensively studied by Hamersley Iron for more than 8 years. Techniques have been developed on the basis of particular selection of native plant species and seed preparation and have been recorded in Company reports, annual reports to the Department of Mines and in an Industry/Government Workshop hosted by Hamersley Iron (1984 Northern Australia Mine Rehabilitation Workshop).

Differences between climate and geomorphology of Mount Tom Price and Paraburdoo are reflected in the different requirements for regeneration of disturbed land in the two locations only 80km apart. Although the micro-climate for the Channar area is in this context expected to be similar to Paraburdoo the differences in geomorphology justified a survey of the vegetation to characterize the existing plant communities and identify the conditions most favourable for revegetation.

Mine pits and Waste dumps will be rehabilitated as final profiles are determined.

All areas disturbed in project construction and operations will be stabilised as soon as practicable and appropriate erosion control works erected wherever necessary.

Wherever practical topsoil and suitable subsoil will be removed from larger building sites, borrow areas and other disturbed areas for use in rehabilitation works.
Rehabilitation methods will be determined on a site specific basis following assessment of each disturbed area. All rehabilitation sites will be periodically assessed for establishment of vegetation, erosion control and sediment transport.

An induction programme will be conducted during construction and operations to promote environmental awareness among employees and contractors.

6.0 SOCIAL IMPACTS

6.1 Aboriginal Heritage

From local knowledge no surface indications existed of a traditional aboriginal association with the project area although archaeological sites had been recorded at various locations in the vicinity of Paraburdoo township and elsewhere in the region to the north.

A preliminary study of ethnographic associations and archaeological significance of the area within and surrounding the Channar development was commissioned in November 1984 (Strawbridge and Tonkinson 1984). Advice of the Consultants was accepted for a sampling survey for the area and this was completed in December 1984 (Kee, Strawbridge and Tonkinson 1985).

Hamersley Iron Pty. Limited was given permission to disturb Western Australian Museum Sites P5641.1 and P5635.1 and 2 pursuant to Section 18 of the Aboriginal Heritage Act. Recording of the scatter area has taken place and a sample collection was not required.

The construction and operation of the project by the Joint Venturers will be adequately supervised to ensure the provisions of the Act are compiled with.

6.2 Social

The proposed development is close to the existing township of Paraburdoo which has the space for the required extension of accommodation units and social infrastructure. Transfer of responsibility of the town to the Shire of West Pilbara has been completed so that Hamersley Iron has no direct administrative role. The Joint Venture would have access to all community facilities and would require to negotiate with the Shire for development of housing subdivision (if necessary) through the normal planning procedures.
The sixteen bed hospital has always been more than adequate to meet the needs of the community. Hamersley Iron has always assisted in recruitment of the services of medical practitioners when necessary.

Based on the current family ratios the existing District High School should be adequate.

All community and service facilities are adequate to cater for the small increase in permanent population and for the temporary population increase during the construction phase of the project.
The Joint Venturers programme for the management of the environment will include, the following:

1. The Joint Venturers will submit an environmental management programme for the protection and management of the environment to the State with its mining proposals in accordance with the proposed State Agreement.

2. The Joint Venturers will in accordance with the proposed State Agreement carry out a continuous programme to ascertain the effectiveness of measures taken for protection and rehabilitation of the environment and submit reports to the Minister responsible for the proposed State Agreement when reasonably required by the Minister.

3. Areas disturbed in project construction and operations will be stabilised as soon as practicable and appropriate erosion control works erected wherever necessary.

4. Dust control measures and workplace monitoring will be carried out in accordance with the Mines Regulations Act during operations.

5. An induction programme will be conducted during construction and operations to promote environmental awareness among employees and contractors.

6. Wherever practical topsoil and suitable subsoil will be removed from larger building sites, borrow areas and other disturbed areas for use in rehabilitation works.

7. Rehabilitation methods will be determined on a site specific basis following assessment of each disturbed area.

8. All rehabilitation sites will be periodically assessed for establishment of vegetation.

9. Sewage will be treated in a packaged plant and refuse will be disposed of in sanitary landfill sites which will be selected to preclude possible contamination of groundwater or aquifer systems.

10. Mine pits and waste dumps will be suitably rehabilitated as final profiles are determined.
11. The conveyor and sealed access road will be designed to allow the flow of water at appropriate intervals.

12. The Construction camp at Channar will be removed and the area rehabilitated at the conclusion of construction. The Construction camp at Paraburdoo will be rehabilitated when it is removed.

13. The Joint Venturers will comply with the provisions of the Rights in Water and Irrigation Act and the proposed State Agreement in regard to its water requirements.
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