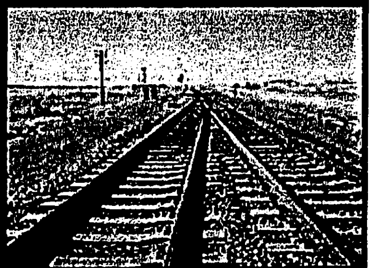
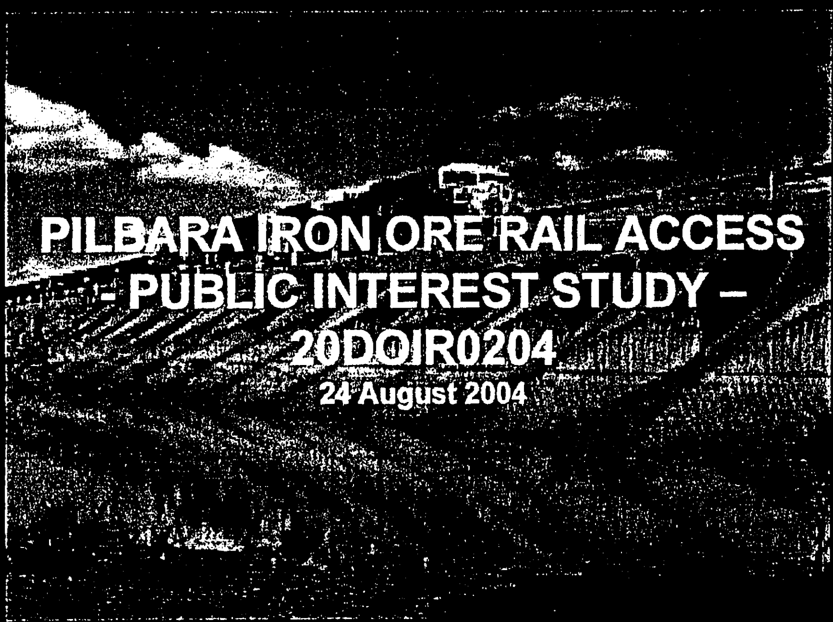
Department of
Industry and Resources

Department for Planning and Infrastructure

Government of Western Australia





PILBARA IRON ORE RAIL ACCESS - PUBLIC INTEREST STUDY - 20DOIR0204

24 August 2004

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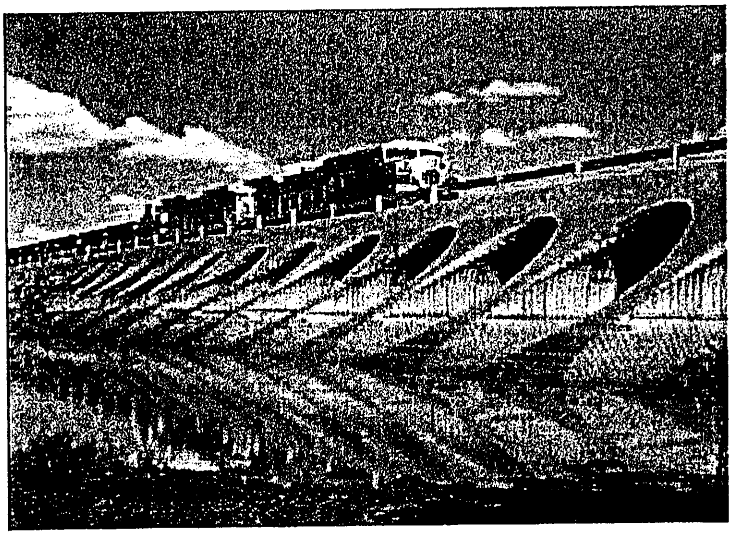


1. INTRODUCTION

The Department of Industry and Resources (DOIR) and Department of Planning & Infrastructure (DPI) commissioned a study by Evans & Peck Pty Ltd to:

"Investigate the public and private costs and benefits of implementing an effective open access regime in the Pilbara iron ore rail systems, in the context of the global iron ore market."

The scope of the study is set out as the brief in DOIR document 20DIR0204, *(The scope definition is included in Appendix 2 to this report.)*

The study was undertaken in the context of the Western Australian State Government's stated objective:

> ***"The Government wishes to see the Pilbara iron ore industry capitalise on rapid growth in iron ore demand and increase its share of the global market."***

This objective was used as the study focus by the Evans & Peck team.

The study team consists of experienced practitioners from a number of disciplines relevant to the study. These disciplines are:

- Geology
- Iron Ore Marketing
- Mineral Economics
- Railway Engineering
- Iron Ore Strategic Development
- Government Access Regimes

Appendix 2 provides detail of individual team members' experience.

The Objective:

"The Government wishes to see the Pilbara iron ore industry capitalise on rapid growth in iron ore demand and increase its share of the global market."

The Questions:

To address the study brief Evans & Peck analysed the Pilbara Iron ore industry and sought answers to the following questions:

- *How does the Pilbara fit into future world iron ore market demand?*
- *Will a growing market accommodate new Pilbara producers?*
- *Will the new smaller producers improve industry and public returns by challenging the oligopolistic behaviour of the existing producers?*
- *Do existing and proposed new producers have access to resources of sufficient quantity and quality to supply the projected demand?*
- *What is the role and significance of the new smaller Pilbara producers in the global iron ore industry?*
- *What is the capacity of the existing Pilbara iron ore rail system and its likely developable capacity?*
- *Is lack of access to rail constraining iron ore production in the Pilbara?*
- *Is there a need for the construction of a new third rail system and what are the implications of it?*
- *Will benefits to be gained from enforcing iron ore rail open access exceed the cost?*
- *Is the prize worth the fight, or is the public interest better served by encouraging development of the industry in its present form?*

1.1. FINDINGS

The Pilbara and the World Iron Ore Market

- In 2004, the Pilbara iron ore industry is an $8bn industry and pays $400m royalties to the State Government.
- The Pilbara supplies 40% of the world seaborne iron ore trade.
- The Pilbara iron ore industry is expected to double in size over the next ten years.
- The iron ore market in China has grown at 26% per annum since 2001 and will continue, albeit at reduced rates, for the next 10 years.

Pilbara Mining

- Pilbara existing producers are planning to increase production capacity from the current level of 210mtpa to 325mtpa by 2007, which will increase their current market share from 40% to 41% of world market and 38% to 45% of the Chinese market.
- Potential new Pilbara producers can not commence production before 2007 with initial production and sales rates of 5 to 10 mtpa.

Pilbara Reserves

- Pilbara reserves are capable of supplying in excess of 400mpta on a sustainable basis (60 years at 400mpta on current identified resource base) if suitable blends of iron ore products are sourced and sold.
- The two existing producers control 90% of the identified resource.
- Existing producers and Hope Downs can meet all projected demand scenarios up to 2020.
- Existing producers and Hope Downs can meet the low-case demand scenario up to 2030+.
- An open access regime for the transport of iron ore will maximize long term resource exploitation, by facilitating blending from iron ore deposits held by existing producers, and by improving the viability of more remote deposits.

Iron Ore Sales

- New smaller producers will not increase long-term Pilbara absolute sales volumes (although there may be short-term timing differences).
- Potential new producers are too small to have a measurable competitive impact.
- New producers will be too small to impact medium to long-term pricing trends.

Pilbara Rail Capacity

- Rail capacity traditionally has expanded to meet the next 5 year conservative growth forecast.
- Existing rail is not a constraint to current supply of Pilbara iron ore.
- Existing rail can be expanded to meet projected demand.
- Existing rail can ultimately be dual tracked to remove any constraint.
- A third rail is technically not required and is a misallocation of capital and unnecessary environment costs.

Pilbara Rail Access

- Existing producers strongly oppose granting 3rd party access to their rail systems on the grounds of disruption, capacity and competitive advantage.
- An open access rail system will provide significant long-term benefits to existing producers if they use each other's rail networks to maximize exploitation of their resources.
- The most favourable outcome for the State and existing iron ore producers can be achieved if the rail access issue is focused on providing carriage of goods, rather than access for independently owned rolling stock to existing railway tracks.

Oligopolistic Producers

- Existing producers are structured as an oligopoly. Buyers tend towards Oligopsonystic behavior. There is no evidence that existing producers deliberately constrain sales volume.

1.2. Conclusions and Recommendations

CONCLUSIONS

1. **Existing Outlook:** The existing Pilbara Iron Ore industry is robust. It is effectively competing in the world market and existing producers are increasing capacity to meet demand. The industry must retain a competitive advantage to ensure longevity of operations with the subsequent public benefits, especially ongoing employment and State royalties.

2. **Short Term Outlook:** In the short term (less than 5 years) there is no material increase in public benefit in providing new potential iron ore producers with open access to existing Pilbara railways. An open access regime will not significantly increase short term annual quantity of iron ore sales from the Pilbara

3. **Long Term:** In the longer term (10 plus years) there is significant potential public to be realised by promoting an open access regime between producers. This has the potential to:

   - Improve world competitiveness by reducing rail transport costs (conservatively estimated to have an after-tax present value worth $500 million) and, more importantly,

   - Extend the life of the Pilbara resource base by maximising blending opportunities between mines and producers. If this expansion is only 10% of the existing resource base it would extend iron ore production by at least six years and slow the decline in quality of iron ore exported from the Pilbara.

4. **Open Access Benefits:** The majority of direct benefits from an open access regime will flow to existing producers who control 90% of identified resources. The more effective utilisation of both natural and capital resources will decrease adverse environmental impact from railway construction and mine development.

Oligopolistic Producers: Existing producers are exporters. Oligopolistic rent flows to the State and as such is to the public benefit. The oligopoly provides an effective counter to the buyer oligopsony

RECOMMENDATIONS

1. Care should be taken to ensure the existing Pilbara Iron Ore industry is not destabilised. Open access considerations should apply only to the provision of a rail transport service, not open access for third party rolling stock to the railway tracks.

2. Growth of the industry should be encouraged by developing the existing rail networking not a third rail to optimise utilisation and efficiency and minimise adverse environmental and heritage impact.

3. Open access to the entire network should be Government Policy because of Public and Private sector benefits. The private benefits will be gained primarily by the existing producers who need to be made aware of potential benefits from an open access regime.

4. Open access rail systems should be developed through Government policy combining intervention and incentives designed to facilitate bilateral commercial agreements.

5. The State access regime should be via either:

   - Direct Commercial Negotiations; or

   - State Agreement framework

   but establishing Generic Frameworks under State or National regimes should not be attempted.

6. A consultative body should be established by the State and industry to develop efficient utilisation of the Pilbara iron ore industry infrastructure. This body should focus on establishing, within five years, a working agreement that enables existing and new iron ore producers to benefit from use of each other's infrastructure and within ten years an operating open access system.

7. An independent party should be appointed to head the consultative body referred to in point 6 above.

8. Although outside the Scope of the study it is also recommended that policy is developed to address Port and Power access and capacity to meet expected production growth.

2. LIKELY FUTURE IRON ORE DEMAND AND SUPPLY

2.1. DEMAND

The growth of the Japanese, South Korean and Taiwanese economies has been remarkable, not only for rapidity and duration but also because, unlike the Western economies of the 18th and 19th centuries, the growth occurred despite a lack of readily available mineral resources. These South East Asian 'tiger economies' depend heavily on the availability of imported materials, such as coal and iron ore.

- Demand for iron ore is based on demand for steel.
- Demand for steel is a function of economic growth (global, regional, and country) and Government policy, (infrastructure development).
- World crude steel production growth has been variously forecast to increase from 1.1 to 2.3% pa for the next ten years compared with annual growth of 2.1% since 1991.

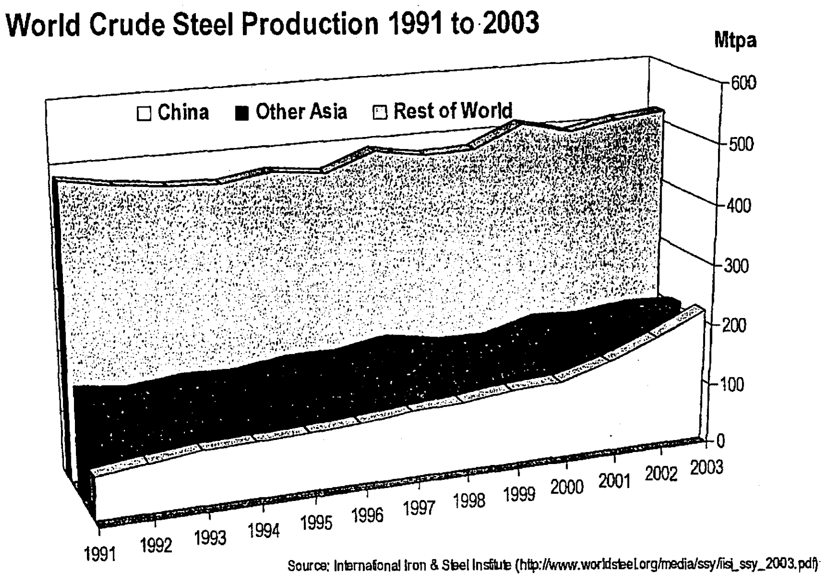
In the last decade the economic growth rates of the major South East Asian steel producers, (first Japan (1992), then South Korea and Taiwan (1997)) have slowed.

The new economic growth engine is China. Table 2.1 demonstrates China's growth rate measured by steel production.

Table 2.1 World Crude Steel Production

Production (Mtpa)	China	Other Asia	Rest of World	Total
1991	71	176	487	734
2003	220	208	517	945
Tonnage Change	149	32	30	211

% of World Production	China	Other Asia	Rest of World	Total
1991	10%	24%	66%	100%
2003	23%	22%	55%	100%



Graph 2.1 World Crude Steel Production Growth 1991 - 2003.

World crude steel production has increased from 734 Mt in 1991 to 945 Mt in 2003, an increase of 211 Mt, or 29%.

- *71%, or 149 Mt, of that increase occurred in China where production increased from 71 Mt in 1991 to 220 Mt in 2003.*
- *In 13 years China has moved from 10% of global crude steel production to 23%.*

China is the most important source of growth in global crude steel production and will remain so for at least the next decade.

2.2. CHINA DEMAND

- China is the world's largest producer of iron ore (261 Mt in 2003). China's domestic iron ore industry has current reserves of approx 25 billion tonnes averaging 32% Fe, suitable for approx 25 years production at current rates. (Source: Jose Serna's paper Feb 2004). It is however low grade and expensive to produce.
- The majority of the increased China demand for iron ore is met by imports.
- In 1991 China imported 19 Mt of iron ore. In 2003 China imported 148 Mt of iron ore.
- For January to April 2004 China's iron imports have increased to an annualised rate of 205 Mt, which makes it the worlds largest iron ore importer.

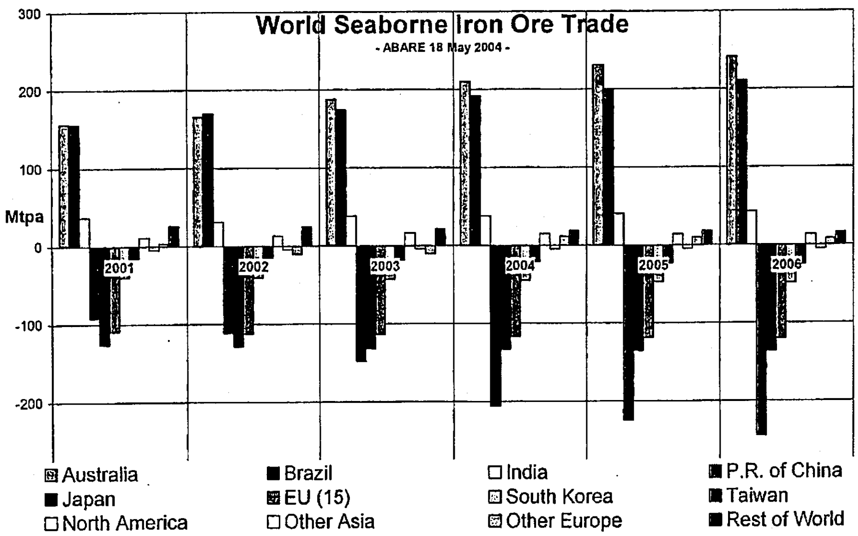
Table 2.2 Chinese Iron Ore Consumption by Source

Year	Supplied Iron Ore Volume						Output	
	Domestic		Imported		Total		Crude Steel	
	Mt	% change	Mt	% change	Mt	% change	Mt	% change
2000	224	-5.6	70	+26.6	294	+0.5	127	+2.6
2001	217	-3.1	92	+31.9	309	+5.2	151	+18.6
2002	231	+6.6	111	+20.8	343	+10.9	182	+20.4
2003	261	+12.8	148	+30.1	409	+19.4	220	+21.1
2004								
Jan - April	*82*		*69*		*151*		*82*	
2004 (Annualised)	245	-6.0	205	38.3	450	10.1	246	11.5

Source: Tex Report July 2004 N.b. Figures may not tally due to rounding differences

Table 2.2 demonstrates China's increasing reliance on imported iron ore.

2.3. FUTURE DEMAND



Graph 2.2 World Iron Ore Demand and Supply Abare 18 May 2004

World Iron Ore Demand

World Iron ore demand from 2001 to 2006 is shown in Graph 2.2. It compares the supplies by the exporters with the demands of importers

Most remarkable is the forecast increase in Chinese demand from less than 100 million tonnes (mt) in 2001 to over 240 mt in 2006

Our market study showed that the driver of growth in world iron ore demand is the booming Chinese steel manufacturing industry Few commentators are prepared to forecast China's economic outlook beyond 2010. Generally GDP growth rates of 7.5% to 8.0% are considered probable until 2010 with more conservative numbers of 5% or less being used for the next decade.

Growth rates of 8.0% are not seen as sustainable for the long term. With growth rates of 2.5% to 5%, China is expected to require Iron ore imports of a minimum of 350mtpa before 2020.

A review of historic steel consumption per capita is another means of predicting where increased steel consumption will occur. Traditionally, steel consumption is low in countries of low economic activity with consumption increasing as countries grow in economic prosperity. Asia, as a region, can be expected to provide the primary growth opportunities for steel consumption and iron ore production in the coming decades.

History demonstrates that annual export volumes will vary both up and down. However, over the past decade iron ore exports from the Pilbara have risen every year. The short term forecast (5 years) indicates that exports will continue growth through 2010 with a possibility of world oversupply between 2006 and 2009 depending on China's growth rate (Investec, June 2004). Based on forecasts for continuous world economic growth for the next several decades, continued growth in iron ore exports from the Pilbara can be assumed.

China is the growth engine. Will this last and for how long?

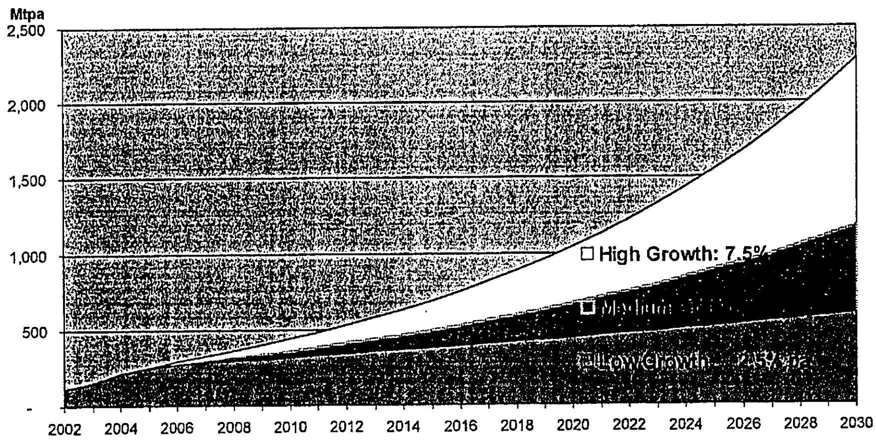
- *China, which was already the world's largest steel producer, overtook Japan as the world's largest importer of iron ore. in 2003*
- *In 2003, China imported 148mt compared with 111mt in 2002.*
- *China's imports are estimated to reach 245mt in 2006.*
- *Since 2001, Chinese iron ore import growth has averaged 26% pa.*
- *The rest of the world market grew at a rate of 0.8% over the last 10 years.*
- *The demand growth opportunity for Pilbara iron ore is growth in the Chinese market.*

Demand growth based on these observations has been modelled into our quantitative study (*section 7.2*). The study investigated a range of Chinese growth scenarios from 2005 through to 2030, when Chinese import levels varied from 600 to 2,200 mtpa.

Chinese domestic iron ore supplies are seen to be at near maximum production capacity.

- Iron ore for additional Chinese steel production will be entirely from imported ore. Therefore the rate of growth of iron ore imports will be greater than the rate of growth in steel production by the ratio of :

$$\text{Iron ore Import Growth\%} = \text{Steel Production Growth\%} \times \frac{\text{(Total Iron Ore Consumed)}}{\text{(Imported Iron Ore Consumed)}}$$



Graph 2.3 Chinese Demand Scenarios for Imported Iron Ore at varied GDP Growth Rates

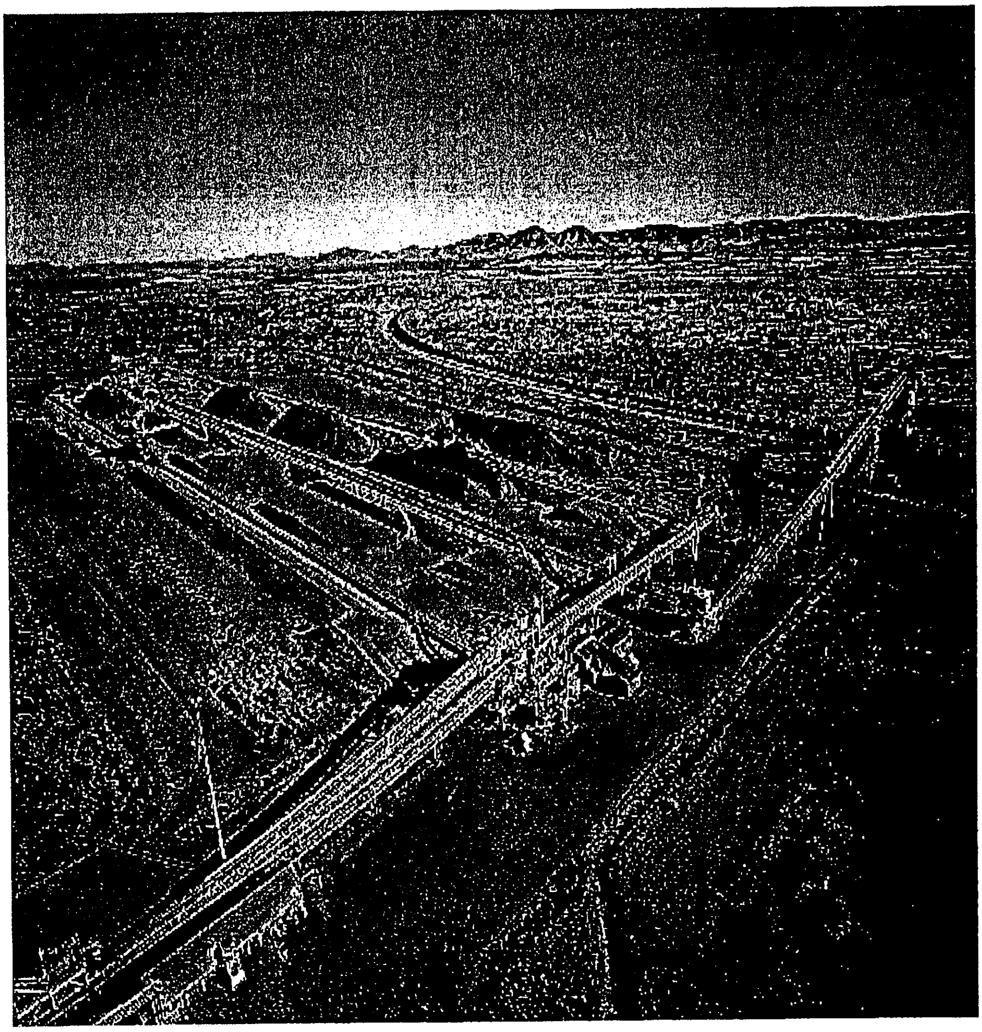
Constraints on Chinese domestic iron ore capacity and quality mean growth of iron ore imports will be at a greater rate than the growth in steel production.

Changes in Product Demand and Drivers of Change

There is another significant factor that will influence supply and demand for particular types of iron ore. China, as the world's largest iron ore producer, produces primarily magnetite. A significant section of the Chinese Steel Industry is based on magnetite as a feedstock for domestic pellet plants. Domestic sintering technology and practice is also based on magnetite as the primary iron ore feedstock.

As the more economic domestic magnetite resources are depleted production will begin to fall. China will increasingly seek to import magnetite concentrate to partially replace 'lost' domestic production. Australia, including the Pilbara, is a potential supply source for this material.

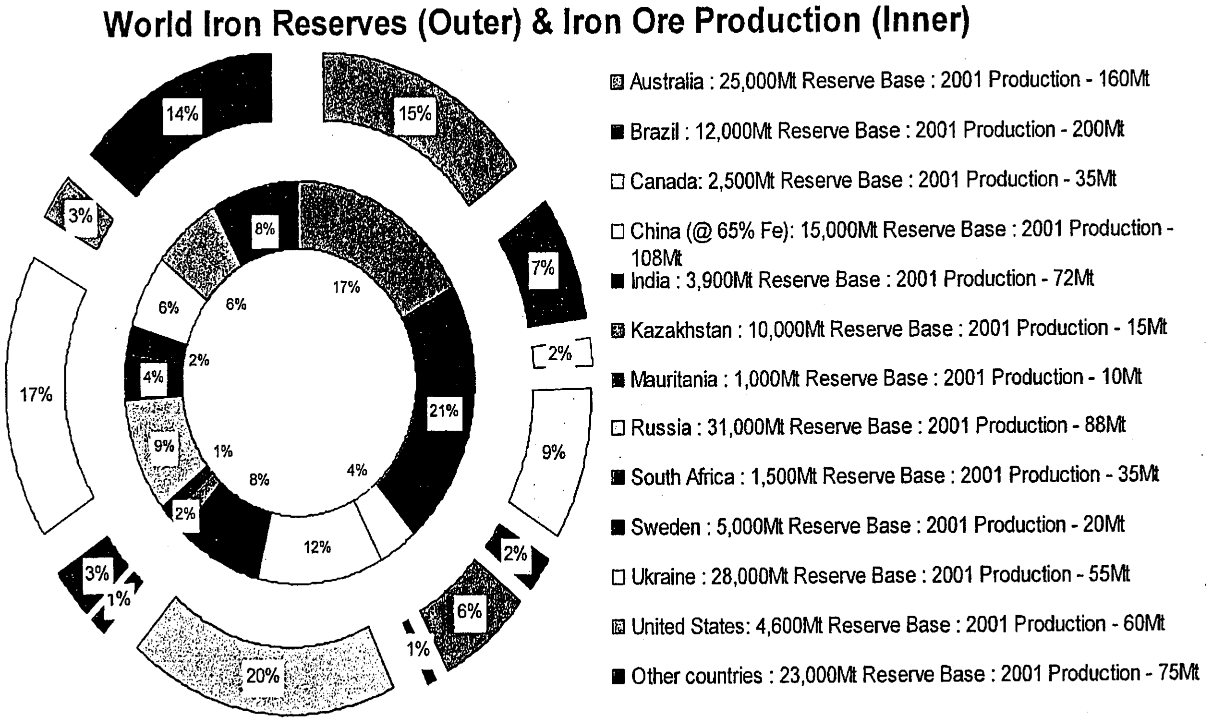
Magnetite requires far more processing than the direct shipping the iron ores currently exported from the Pilbara. Capital costs will be proportionately greater and energy requirements will rise significantly and return on investment will decrease. Magnetite exploitation will remain low in the Pilbara hierarchy of development and is not envisaged in the time frame (25 years) of this study.



Stockpiling and Train Loading Facilities, West Angelas

2.4. SUPPLY

The Pilbara is a globally significant source of iron ore; it is the world's largest source of iron ore that has reliable and economic access to the seaborne market illustrated on Graph 2.2.



Graph 2.4 World Iron Reserves (source: US Geologic Survey)

Australia is shown as having 15% of the world's iron ore, a 25,000 million tonne reserve base. Of that over 23,400 million tonnes (93%) is located in the Pilbara.

The Pilbara is an ideal ore supply source for the Asian market:

> geographic proximity, high quality ores, efficient, stable and competitive supply companies, stable political and economic environment, skilled and motivated work force and first class infrastructure.

Pilbara iron ore producers have been exporting iron ore to East Asian countries since the mid-1960's. Their customers have become increasingly reliant on Pilbara iron ore

The existing Australian producers are expanding capacity.

Table 2.3 Pilbara Iron Ore Production Mtpa

	Historic		Forecast			
	2002	2003	2004	2005	2006	2007
Rio Tinto	101	110	125	138	162	180
BHPBIO	74	84	102	116	120	145
Total	175	194	227	254	282	325
Total Pilbara Production Growth	19	19	33	27	28	43
Capacity expansion plans announced by existing Pilbara producers exceed 45% of ABARE's forecast increases in Chinese iron ore demand						
45% China Import Growth	8.5	16.7	26	8.1	9	19
Sources:						
Merryl Lynch, AsiaPac Steel Sector, April 2004: ABARE, May 2004						

2.4.1. PAST, PRESENT AND FUTURE - Role of the Pilbara Producers

(For a description of Pilbara iron ore bodies and classification refer to Section 4)

PAST

- Initial Pilbara development was a combination of the export of direct shipping grade lump and fines supplemented by pellets based on Hematite Fines of Hamersley Iron (HI) and Limonitic fines of Robe River (RR).
- The hematite resources of BHP, HI and Goldsworthy Mining Limited (GML) were exploited along with the Robe River JV lower grade pisolites.
- Growth in demand for iron ore saw the development of other ore deposits to both meet market demand for: lower alumina ores, lower priced ore, increased fines to lump ratio on delivered product, and development based on decreasing reserves. Dwindling hematite supplies has resulted in development of lower Fe and higher fines Marra Mamba ores.

PRESENT

- *All three Pilbara producers have developed Marra Mamba deposits that will be the focus of future production.*
- *Pilbara producers are taking advantage of a high demand market to introduce previously unacceptable products, e.g. high phosphorus (P) fines, and previously 'Off-Spec' (high Al_2O_3 and SiO_2) fines ores.*

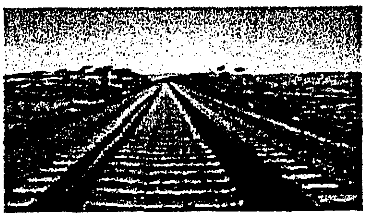
FUTURE

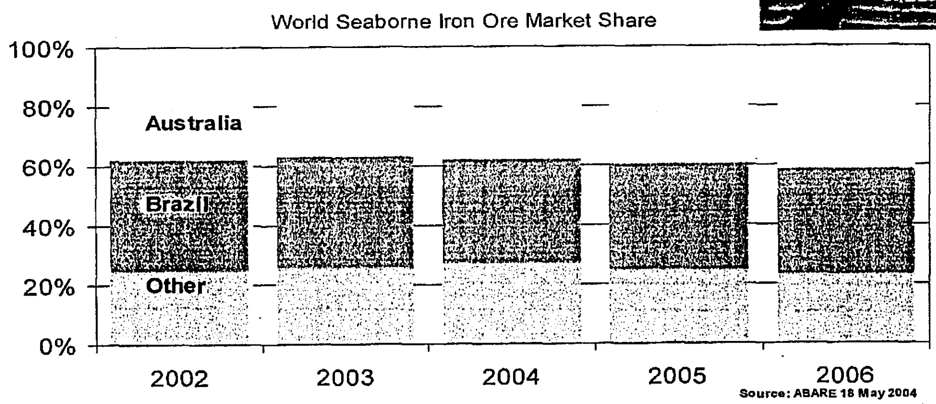
- Quality issues vary from company to company and deposit to deposit.
- The future for the Pilbara will see the gradual replacement of hematite ores with a combination of Marra Mamba and pisolite ores.
- Future ore supplies will be lower in grade than ores mined and shipped in the past. Fe content is down; Phosphorous content is up and will continue to rise.
- Steel mills have traditionally sought the 'top quality' material, refusing lower grade material on the basis "we cannot use". Current high demand is seeing use and acceptance of lower grade ores, which will be necessary for the long-term future of the Pilbara.
- Acceptance of ore with higher level of phosphorus will enable development of extensive deposits (more than 8,000 Million tonnes) of +60% Fe ore in the Central Pilbara.

Market Shares

ABARE forecast that Australian market share of World Seaborne Trade will increase from 38% to 41% over the period 2002 to 2006.

Over the same period, China's iron ore import rate is expected to grow by 90mtpa.





Graph 2.5: Pilbara Producers' Market Share

Competition

In the period 2003 to 2007, the two existing Pilbara producers will lift production capacity by 131mtpa or 67% to a total 325mtpa and CVRD (Brazil) will lift production by 70mtpa or 41% to a total 240mtpa.

Despite strong sales tonnage growth Australia's market share of the Chinese market has declined.

We feel that the expansion programmes currently being implemented by the existing Pilbara producers and the probable entry of Hope Downs will enable Australian producers to regain and retain a 45% market share

Table 2.4: Major Producers' Expansion plans

Producer	From 2003	To 2007	Change mtpa
RIO TINTO	110	180	70
BHPBIO	84	145	61
CVRD	170	240	70
Total	364	565	201

In addition, Kumba in South Africa has announced plans to expand production by 20mtpa by 2009. The Pilbara will play a pivotal role in satisfying both the short and longer-term Chinese demand for iron ore.

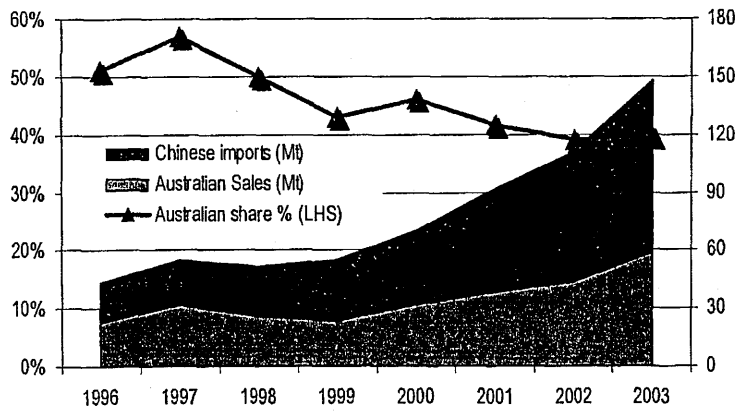
The iron ore demand of the last 18 months has demonstrated to Chinese and other significant consumers of the necessity for strong alliances with producers as a means of ensuring stability of supply. The alliances are attractive to producers seeking guaranteed sales to underpin expansion investment.

Recent agreements between Chinese Steel groups and BHPBIO and Rio Tinto iron ore are testimony to this new approach:

▪ RIO Tinto	Baoshan	20yrs	@ 5.0mtpa
	Wuhan	25yrs	@ 2.5mtpa
▪ BHPBIO	Wheelarra JV	25yrs	@ 12mtpa
	(Wugang, Magang, Shagang, Tanggang)		

▪ Rio Tinto announced a further 40 mtpa of alliances on 25 June 2004

In response to China's demand growth, the existing Pilbara producers are expanding production and increasing market share.



Graph 2.6: Australia's Role in Chinese Iron Ore Imports (Source ABARE May 2004)

***Three Growth Scenarios** (From Graph 2.3)*

- *In the China **low** growth case, the resource capacity of the existing Pilbara producers plus Hope Downs will exceed all demand growth to and beyond 2030.*
- *In **medium** and **high** growth cases, the existing Pilbara producers, BHP Billiton Iron Ore Ltd. (BHPBIO) and Rio Tinto Ltd. (RIO) plus Hope Downs have sufficient resource to maintain demand growth and market share until 2020. After that, Pilbara production levels of approximately 400 mtpa will be maintained but market share will slip. (See graphs 7.1, 7.2, 7.3).*

Table 2.3 and Graph 2.6 illustrate Australian Share of the Chinese market.

2.4.2. Long-term suitability of the current product mix

The export product mix will vary on the basis of suppliers exporting the grades the market will stand. Increasing amounts of Marra Mamba ore relative to the total export quantity will be sold. High P (phosphorous) Brockman and pisolite ores will be developed as supplementary products simply because these products will be the longer term future for one or other of the existing Pilbara producers. Whilst these products may be unattractive to the market today, steel-making techniques will be modified to permit and promote the use of these currently unattractive products.

- Developments in de-phosphorisation technology will make relatively high Fe, high phosphorus material preferable to lower Fe ores that have high Al_2O_3 and SiO_2 levels. High Al_2O_3 and SiO_2 levels increase energy consumption during the iron making process.

2.5. Alternative Iron Making Technologies

Development of alternative iron making technologies is anticipated to have a positive effect on Pilbara iron ore production. The longer-term outlook for ore quality from the Pilbara is for decreasing Fe units and increasing levels of phosphorous.

Alternative iron making technologies, (Finex, HiSmelt and others) are based on versions of direct smelting, particularly of fines with high impurity levels. Ores with higher impurity levels have traditionally been cheaper than high-grade low-impurity ores. However, as the long-term availability of high-grade ores is limited, technologies that can efficiently utilise lower grade ores will become more commonly employed.

2.6. Iron Ore Development Hierarchy

The chemical characteristics of Pilbara ores are inferior to those of Brazilian ores. Pilbara ore has two main advantages over Brazilian ore; firstly lower shipping costs into the Asian Pacific market and secondly a higher proportion of direct charge (lump) ore which saves on sintering costs.

There have been a series of development phases for different products from the Pilbara.

2.6.1. 1965 to 1990: Brockman Ores

The overall grade and quality of iron ore sold from the Pilbara has declined over the past 30 years. Iron (Fe) grades have declined, alumina, silica and phosphorus levels have all increased and the proportion of lump to fines ore has also declined. This trend will continue, as the high quality Brockman ores from Tom Price and Whaleback become an increasingly less significant proportion of iron ore exports.

2.6.2. 1975 to 1998: Pisolite Ores

These ores have a relatively lower Fe with higher alumina and silica levels than Brockman ores. However they have very low phosphorus levels and the high Loss On Ignition (LOI) means that their Fe levels increase to levels of 62% or greater when they are calcined.

Pisolites were first mined by the Robe River Joint venture in the early 1970's. The high LOI and ease of mining meant these pisolites were primarily intended for use as feedstock for the production of blast furnace grade iron ore pellets. The pellet plants were oil fired. Rising oil prices and low productivity rendered the pellet plants uneconomic by the late 1970's.

Robe continued to produce pisolites for sale as a low price direct shipping ore. BHPBIO opened their pisolite ore Yandi mine in the early 1990's and Hamersley commissioned their Yandicoogina pisolite ore mine in the late 1990's. By 2003 pisolite ore accounted for over one third of total iron ore sales from the Pilbara.

2.6.3. 1996 to Present: Marra Mamba Ores

Marra Mamba ores are readily distinguishable from Brockman ores by their yellow, rather than dark red, colour. In its chemical specifications Marra Mamba ore typically falls between Brockman and pisolite ore. Marra Mamba produces a lower proportion of lump ore than Brockman material.

Dust is the major issue with Marra Mamba ore. Over 25% of Marra Mamba ore is less than 0.5mm.

BHP first produced Marra Mamba ore as a separate product in the early to mid 1990's. Customers proved unwilling to accept it due to dust control issues.

Subsequently both BHPBIO (Ore body 28) and Hamersley (Marandoo) mined Marra Mamba but only to blend into their Brockman ores, at an agreed maximum of 16%.

Depletion of the lower phosphorus Brockman ores has encouraged both iron ore producers and customers to develop modified materials handling methods to incorporate Marra Mamba ores into their blast furnace blends. Robe River's West Angelas mine was commissioned in late 2001 / early 2002 and was the first successful major development of a mine dedicated to producing an unblended Marra Mamba ore. West Angelas will produce and sell in excess of 20 millions tonnes during the 2004 calendar year and has recently undergone a 5 Mtpa capacity expansion to 25Mtpa. BHPBIO's Mining Area C Mine was commissioned in late 2003 with a rated capacity of 20 Mtpa of Marra Mamba ore and is readily expandable to 30 Mtpa.

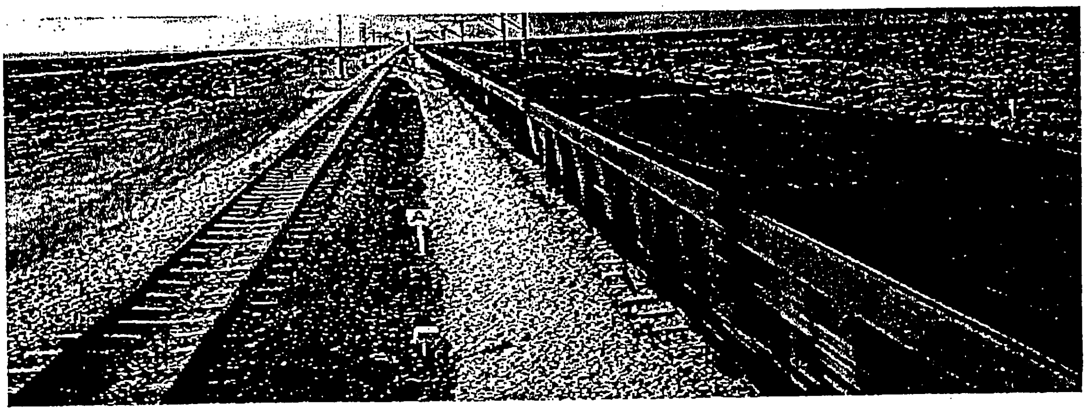
Hancock Prospecting and Kumba have formed a joint venture to develop the Hope Downs Marra Mamba deposits. Planned production will commence at 5mtpa expanding to 25mtpa.

2.6.4. 2010 to 2020: The Next Stage

The next generation of Pilbara iron ore products will be determined by the ability of iron producers to utilise higher phosphorus feedstock. The products will either be:

- High Fe, high phosphorus (typical of the 4,200 million tonnes of +62% Fe Rhodes Ridge Jimblebar material) or,
- Low Fe with medium phosphorus levels (50% Fe Mindy Mindy, Mt Nicholas ore which is then beneficiated to 58% Fe).

Higher Fe ores will provide better value in use, despite needing to be blended with lower phosphorus ores, such as the Robe and Yandi pisolites or Brazilian ores. Additionally, ore from the Rhodes Ridge, Giles Mini, and Bakers South areas will contain in excess of 40% low phosphorus lump. Processing in plants similar to the Paraburdoo fines processing plant can most probably economically reduce the fines' phosphorus levels.



Railway Siding – Hamersley rail line

In our opinion the next generation of products will come from the higher Fe, higher phosphorus deposits managed by Rio Tinto and BHPBIO. These products will be either sold concurrently to or blended with the lower phosphorus pisolite and Marra Mamba ores.

To determine the need for third party and open access rail systems in the Pilbara it is necessary to predict the most likely manner and sequence of development in the region over the next 25 years. When undertaking this exercise *only the development needs of the iron ore industry were considered* and the new mine development hierarchy was assessed as follows:

BHPBIO.

- The production from the Mt Newman area out to Jimblebar will be more or less stable with a decline in volume and grade over time. No major development of capacity will occur.
- Yandi/Marillana Ck – there is some room for expansion of CID/pisolite production and possibly more ore yet to be discovered/reported from this area. BHPBIO's share of this area is not large – Rio has the majority, therefore BHPBIO will not be expanding output from these mines.
- MAC – this is where BHPBIO will source their future resource/reserve and production increases. The potential for extra tonnage to be defined from this area is quite significant. BHPBIO will use this area for further developments and capacity – mostly Marra Mamba and high P Brockman.

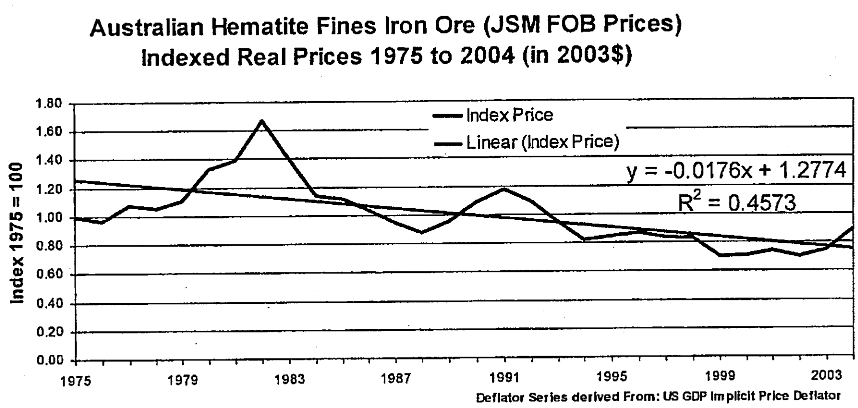
2.7. Price

The pricing outlook for Pilbara producers

- Current Pilbara producers are insulating themselves against discounting from new entrants. Rapid increase in production capacity is providing a massive sales base from which to operate.
- Any new producer will immediately be relegated to a medium to small producer even if starting at 20Mtpa (Hope Downs JV or Fortescue Metals Group). The alliances the current Pilbara producers have forged with customers, and will continue to forge, will provide further pricing insulation.
- The largest bull run in iron ore prices was during the 1989-1991 up-cycle, when prices rose 42%. 1980-82 saw prices rise 18% and most recently from 1995 to 1998 prices rose 17%. Merrill Lynch expects that prices will increase 47% during the current 2003 to 06 period.
- A price correction is possible in 2007 given strong supply response and appropriate lead times. *If that correction occurs* then prices are likely to fall 5% in 2007, and for 2-3 years thereafter following the 2006 peak.
- Delivered iron ore prices in Asia have historically traded at a premium to those in Europe, but are now closer. This shift is believed to reflect the emergence of Brazil as a swing supplier and greater market integration.

Long Term Trend

Iron ore prices have fallen at a trend rate of 1.8% a year over the last 30 years (based on published Japanese Steel Mills (JSM) FOB prices for Brockman Fines deflated by the US Implicit Price Deflator) see graph 2.7 below. Some analysts expect this trend to reverse, either due to the supply-demand balance issues or a reversal in cost trends.



Graph 2.7: Indexed Real Prices – Australian Hematite Fines – JSM FOB Prices

The authors expect Chinese imports to increase to 245Mt by 2006 and over 400Mt by 2015. Such a shift in both relative and absolute terms will sooner or later impact pricing structures and mechanisms.

China will no doubt assume an increased role in the determination of the reference price. A key concern to the iron ore Industry is whether the Chinese Steel Industry will mature to become a responsible participant in the setting of appropriate reference prices that ensure stable supply and quality

The challenge facing the oligopolistic pricing control of BHPBIO, Rio Tinto, and CVRD, will be to manage iron ore prices to ensure they provide satisfactory returns on recent investment and, at the same time keep prices at levels sufficiently low to maintain barriers to entry.

- *Despite the current spurt in demand, we see the existing producers (mainly Rio, BHPBIO, CVRD, Kumba) expanding capacity to meet demand and thereby sustaining a demand/supply balance and maintaining price levels within the current pricing trends.*
- *Price should not see a sustained variance from the long-term trend, and we do not see a new, smaller producer having a discernible impact on that trend. The new producers will be price takers.*
- *There will be year-to-year fluctuation about the trend. The buyers may use new producers as leverage against the large producers. This will cause short term but unsustained downward pressure on prices.*
- *For the purposes of this study the authors have assumed the lon-term pricing trend will continue. In our opinion new Pilbara producers will not impact this long term trend.*

2.8. OLIGOPOLIES AND OLIGOPSONIES

The seaborne iron ore market is one in which: meets the requirements for an oligopolistic market::

- A small number of large producers supply the majority of the market and
- There are major barriers to entry for new entrants – high capital costs and limited availability of iron ore.

Professor Philip Maxwell, Head of the School of Mineral Economics at Curtin University, prepared a paper for this study examining the behavior and role of the major iron ore producers to determine their impact on local, state and national economies. Professor Maxwell also looked at the demand side of the market and commented on the oligopsonystic nature or the seaborne iron ore market.

The following points have been extracted from that paper, which is included as appendix 5 to this report.:

Oligopolies

During the period 1960 to 2001, world iron ore production grew 0.9% per annum with a diminishing growth trend. The world's major producers for the market consolidated into three main suppliers who in 2003 supplied 74% of world seaborne demand:

- *CVRD in Brazil*
- *Rio Tinto Iron Ore*
- *BHPBIO Iron*

With this arrangement of suppliers, the iron ore industry exhibits classic oligopolistic characteristics, namely:

- *Concentration of suppliers: over 70% of the world seaborne trade is produced by only three producers*
- *Substantial barriers to entry for potential new producers*
  - *Limited access to high quality iron ore resources*
  - *High cost of infrastructure (rail, port, power, social)*
  - *Lack of scale of production*
  - *Lack of product range and blending capability.*

The iron ore industry displays the following non-monopolistic behaviours:

- *Pilbara and Brazilian producers compete with themselves and against recycling and product substitution.*
- *Efficiencies have improved over the four decades of production enabling economic production in the face of long-term price decline.*
- *Individual producers have been attempting to maximise market share in both rising and falling markets, rather than attempting to control supply.*

Oligopsonies

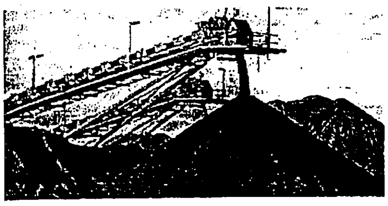
The buyers in turn, particularly the Japanese Steel Mills (JSM) from 1960 to 2000, banded together for the purpose of annual price setting and to agree sources of supply.

The JSM negotiated as a group of buyers or an oligopsony. As a result the prices have been more competitive and volume less constrained.

Strong iron ore prices since 2001 reflect the increase in Chinese demand (price increases were 9% in 2003 and 18% in 2004) and a strong swing of market power to the producers. The growing market offers three opportunities:

- *Established producers can increase their market share if they move rapidly to meet increased demand. The existing Pilbara producers have been rapidly increasing capacity since 2001.*
- *New iron ore producers may be able to enter the market, if conservative management practices by established producers leave increased demand unsatisfied. Hence the opportunity and activity of two potential new Pilbara producers, the Hope Downs Joint Venture and Fortescue Mining Group.*
- *Buyers, particularly oligopsonystic buyers, will encourage new producers in an attempt to reduce the strength of the oligopoly producers and the price.*

  These efforts will be tempered by the need of the steel mill buyers to maintain reliability of supply.



The oligopoly provides an effective counter to the buyer oligopsony.

As the entire Pilbara iron ore production is exported, the oligolopolistic structure of the industry arguably benefits the public interests of Western Australia and Australia at the cost of the overseas iron ore consumers.

3. PILBARA IRON ORE DEPOSITS:

Ownership, Location and Strategic Importance

3.1. INTRODUCTION

The presently exploited iron ore deposits of the Pilbara region comprise direct shipping ores derived from:

- Enrichment of the Proterozoic Brockman and Marra Mamba Iron Formations;
- Detritals deposits derived from the accumulation of erosion products of the enriched Brockman and Marra Mamba Iron Formations (IF);
- Enrichment of banded iron-formations or BIFs within the Archaean Granite-Greenstone Terrane (GGT) of the Pilbara Craton;
- Ores of the chemico-sedimentary deposits of the Robe pisolite, referred to as Channel Iron Deposits or CIDs by operators in the Eastern Hamersley region.

Planned and possible near future developments are also based on such iron resources. Other future iron ore production may eventuate from beneficiation and concentration of magnetite from the unenriched iron-formations of the Pilbara.

Development of the Pilbara iron ore industry in the 1960's was based on the exploitation of the high-grade, premium ore deposits of Mt Goldsworthy, Mt Whaleback and Mt Tom Price. This was later followed by the successful exploitation and marketing of the lower grade Robe pisolite deposits of the Pannawonica area during the early 1970's.

The merits of ores derived from the enrichment of the Marra Mamba IF were slow to be recognised. These ores were initially produced as blending ores; it was only during the early 2000's that these ores were successfully produced for shipment as discrete products, commencing with West Angelas in 2001/02.

More than 3.6 billion tonnes of iron ore has been produced in Western Australia, the larger part of this has its origins in the Pilbara region.

Substantial depletion of the premium ores has taken place since iron ore production began in the Pilbara in the 1960's. Their replacement and export growth has been supported by the increased exploitation of the Robe pisolite/CID and Marra Mamba ores with contribution from detritals resources.

3.2. ORE TYPES OF THE HAMERSLEY AND PILBARA IRON PROVINCES.

The following discussion of ore types, especially of the BIF-derived iron ores, is in terms of their product type or category as generally applied in the commercial area. For a more detailed discussion of the geological categorisation and classification of the bif-derived ores reference should be made to Harmsworth, 1990.

The principal ore types of the Hamersley and Pilbara Iron Provinces are:

- BIF-derived enrichment ores and their erosional products (scree/detritals);
- Robe pisolite/CID chemico-sedimentary pisolitic iron deposits;
- Unenriched banded iron-formation of the Hamersley Group and Granite-Greenstone Terrane.

3.2.1. BIF Enrichment Iron Ores.

Enrichment of the Brockman and Marra Mamba iron formations and the banded iron-formations of the GGT by supergene and/or hypogene processes created a wide range of ore types and related ore qualities.

The BIF enrichment ores are classified broadly according to their iron mineralogy, diluent chemistry (primarily Al_2O_3 and P). The ore types as described in a recent DOIR Report (Preston, In prep.) are:

a) *"<u>Premium Brockman ores</u> provide the high quality, low phosphorus lump ore product on which the reputation of the Pilbara iron ore industry for the production of quality product was based. Essentially hematite, these ores provide a high proportion of lump (approximately 55%) with good chemical characteristics (high Fe, low Al_2O_3, low P), physically strong and highly reducible in the blast furnace. The fine ore product is not as desirable in the market because of high alumina content in the natural form (about 2.5% Al_2O_3,) and a comparatively low iron content (62-63%Fe), although sintering characteristics are generally good and ultrafines content limited. Production mainly comes from Mt Tom Price and Mt Whaleback.*

b) *<u>Low to medium phosphorus Brockman ores</u> are exploited at Paraburdoo and Channar. Comparatively higher phosphorus levels have made them predominantly referred to as blending ores for use with premium Brockman ores. They are largely hematite ores and produce a lump proportion of 45-50%, of perhaps very slightly inferior in strength to the premium ore. Successful lowering of alumina in the fines product has been achieved by the removal of the ultrafines fraction.*

c) *<u>Marra Mamba ores</u> are mixed hematite and ochreous goethite ores that can produce a wide range of physical characteristics, from 100% fine ore (Orebody 29 at Newman) to products comprising up to about 45% lump of similar qualities to Brockman ore. Generally the range is considered to be 25-35% lump fraction. The lump ore is often more friable than Brockman ores, but again may vary between orebodies and within orebodies. Marra Mamba fines have distinctly lower alumina content than Brockman fines, in the range 1.5-1.8% Al_2O_3, despite generally higher ultrafines contents. This makes them an ideal counterbalance in the fine ore blends, which, together with the screening of ultrafines from Brockman ores, has brought blend grades down to 1.92.0% Al_2O_3, from previous levels up to 2.5-2.6% Al_2O_3. Iron grades of Marra Mamba ores are marginally below those of Brockman ore grades.*

d) *<u>High phosphorus Brockman ores</u> are defined as those containing greater than 0.12% P and are not marketable at present. They are mixed hematite-goethite ores, generally of slightly lower grades than other Brockman ores, and produce a lower proportion of lump with relatively lower physical strength characteristics.*

e) *<u>Detrital ores</u> are the scree-forming, erosional derivatives being exploited adjacent to Brockman (and Marra Mamba - author's note) ore ridges mainly for their high-grade lump ore fraction. Much of the ensuing fines is low grade and unmarketable. Detrital operations have generally been seen as supplementary lump ore supplies and not as providing a significant long-term base-load tonnage.*

f) *Ores in <u>Granite-Greenstone Terranes</u> are generally of smaller extent than the Hamersley Basin ores described above. They can be found widely distributed in enriched banded iron formations throughout the western Yilgarn (Murchison & Southern Cross) and northern Pilbara regions. The northern Pilbara ores are generally referred to as Goldsworthy-type ores. The products are reasonably similar to Brockman blended products and are thus priced similarly. The fines fraction, however, has considerably lower alumina content, with some selective production utilised on occasions to provide specialised high silica products. Limited resources remain in the north Pilbara".*

3.2.2. Robe Pisolite or Channel Iron Deposits.

The pisolitic iron deposits, classified as Robe pisolites in the Western Pilbara and Channel Iron Deposits in the Eastern Pilbara, are Tertiary valley-fill deposits of varying chemistry and mineralogy. There is close relation between host rock type and the chemistry and mineralogy of the adjacent pisolites.

The pisolitic ores are described in a recent DOIR publication (Preston, In prep.) as follows:

"Robe pisolite/Channel Iron Deposits (CID) ores produce mostly fines product of hematite-goethite content. They are secondary, chemical accumulations in Tertiary river and flood channels of the Pilbara surface. Market demand has shown strong growth, after many years of limited use in sinter blends. Despite low iron contents in the natural state (57.5-59% Fe), on a calcined basis the contents are equivalent to other high-grade ores of the Pilbara. Loss-on-ignition of the pisolites is around 10%.

The more recent Yandi ore channel developments of BHPBIO and Hamersley Iron has significantly lower alumina contents than most other Pilbara ores, thus adding to their favour".

3.2.3. Potential Future Ores.

In the USA, following the depletion of the direct shipping ores of the Mesabi Range of Minnesota and Upper Peninsula of Michigan and again in the Labrador Trough of Canada, mining and beneficiation of low-grade magnetite rich ores provided replacement high-grade ores for the North American steel industry.

It is possible to foresee development of beneficiation and concentration of magnetite-rich banded iron-formation in the Pilbara region and elsewhere in Western Australia as the depletion of the direct shipping ores progresses or is driven by demand.

The Brockman and Marra Mamba Iron Formations as well as the GGT banded iron-formations are potential targets for such developments if:

- Crude ore grades of >25% Fe are identified along with very significant resource volumes;
- Depth of oxidation is limited;
- Liberation is possible at > 45μm;
- Grinding work index and therefore energy consumption is acceptable (GWI would probably be <16);
- Acceptable SiO_2 levels in concentrates can be achieved (SiO_2 <3% would most probably be desirable).

Immense volumes of potentially beneficiable magnetite ores are available in the Pilbara region. However deep oxidation profiles in most areas and the very fine-grained nature of the magnetite indicates a probable high capital/operating cost operation that will require some further positive movement in ore price in order to support development.

3.3. Iron Ore Reserves and Iron Resources of the Pilbara Region.

Identified and reported iron ore reserves and iron resources of the Pilbara region reported in this study have been developed from public domain information obtained from company quarterly and annual reports (Anon, 2003a; Anon, 2003b; Anon, 2004a; Anon, 2004b; Anon., 2002), company presentations (Arran, 2003; Tipper, 2004) and brochures augmented by data from the current Minedex database provided by DOIR.

Rio Tinto and BHPBIO control nearly 85% of the identified iron resource base and FMG and the Hope Downs JV a little over 10%. *Five other combined ventures share the remaining 5%.*

The reported iron ore reserve and iron resource status or the Pilbara region is summarised by ore type in Table 3.1, and by company in Table 3.2 below.

Table 3.1: Summary of Pilbara Iron Ore Reserves and Iron Resources (Direct shipping ores only).

	Reserves		Resources		Reserves & Resources	
Ore Type	**Mt**	**%**	**Mt**	**%**	**Mt**	**%**
Brockman	1,549	39	7,647	41	9,196	41
Marra Mamba	1,298	32	5,926	32	7,224	32
GGT*	21	1	72	0	93	0
Proterozioc BIF	0	0		0	0	0
Robe Pisolite / CID	1,152	29	4,855	26	6,007	27
Total	**4,020**		**18,500**		**22,520**	

** bif enrichment in Granite-Greenstone Terrane*
n.b. percentage totals may not add to 100% due to rounding

It is doubtful that these tables represent the true picture of total iron resources and reserves of the region for the following reasons:

- *Many company resource statements have been modified to exclude resources identified in the 1960's and 1970's, the estimates for which do not now meet JORC reporting standards;*
- *Company exploration progresses according to needs and funding, hence many iron deposits have been drilled in a limited fashion but not sufficient to report a resource. Completion of resource definition drilling and resource estimating may not be completed until the deposit is identified for development some years in the future.*

Thus, it can be assumed that there is a significant unreported resource base, largely in the control of the major tenement holders that will augment the already reported resource base.

Table 3.2. Summary of Iron Ore Reserves and Iron Resources in the Pilbara Region by Company.

	Reserves		Resources		Reserves & Resources	
Company/Joint Venture	**Mt**	**%**	**Mt**	**%**	**Mt**	**%**
RioTinto	1,433	36%	11,220	61%	12,653	56%
BHPBIO & Partners	2,137	53%	5,181	28%	7,318	32%
Total Existing Producers	**3,570**	**89%**	**16,401**	**89%**	**19,971**	**89%**
Hope Downs JV	450	11%	454	2%	904	4%
FMG & Partners	0	0%	1,177	6%	1,177	5%
Hancock & Wirght	0	0%	73	0%	73	0%
Bexfan Pty Ltd	0	0%	105	1%	105	0%
Diamond Rose	0	0%	32	0%	32	0%
Others	0	0%	258	1%	258	1%
Total Direct Shipping Ore	**4,020**		**18,500**		**22,520**	

n.b. percentage totals may not add to 100% due to rounding differences

More detailed reserve and resource data is included in Appendix 4.

Identified and reported direct shipping iron ore reserves and iron resources in the Pilbara total 4.1 billion tonnes of reserves and 19.4 billion tonnes of resources. Added to which is the beneficiable magnetite resource of Mineralogy Limited of 4.05 billion tonnes, which represents a small fraction of the potentially available ore of this type.

In the present operational regime the ***high Phosphorus Brockman*** *ores contribute little, if any, to the ore production from the Pilbara.*

Their P grades of >0.12% P have prevented serious consideration of their exploitation. However, ***these are the ores of the future Pilbara*** *as the high-grade premium ores are depleted.*

Significant quantities of these ores exist in the resource inventories of BHPBIO and Rio Tinto operations as well as some of the smaller ventures.

The identified reserves and resources of direct shipping ores are dominated by Brockman ores (all categories). Marra Mamba and Robe pisolite/CID ores rank almost equal second with GGT and detritals ores being minor components of the ore inventory of this region.

If the Brockman ores are subdivided into Low-medium P and High P groups, the distinction changes to the extent that the Brockman low-medium P ores, Brockman high P ores, Marra Mamba ores and Robe pisolite/CID ores rank almost equally in terms of net reserve and resource volume.

3.4. Proposed New Iron Mine Developments.

A number of new iron mining ventures are in various stages of planning and development, they include:

- The Hope Downs Marra Mamba development;
- The FMG development of the Mt Nicholas / Christmas Creekand adjacent Marra Mamba ores;
- The Fortescue magnetite development (Mineralogy Ltd).

REFERENCES

Bates, R.L. and Jackson, J.A., 1980. Glossary of Geology. American Geological Institute., Falls Church, Virginia.

Harmsworth, R.A., Kneeshaw, M., Morris, R.C., Robinson, C.J. and Shrivastava, P.K. (Editor), 1990. BIF-derived iron ores of the Hamersley Province. Geology of the Mineral Deposits of Australia and Papua-New Guinea., 1. AusIMM, Melbourne.

4. SMALLER PRODUCERS' ROLE AND SIGNIFICANCE IN THE GLOBAL IRON ORE INDUSTRY

The potential new Pilbara producers described in sections 3.3 and 3.4 control less than 10% of the identified reserves and resources in the region. The deposits they have claimed are less accessible, of lower quality and are more expensive to mine and process than deposits controlled by Rio Tinto and BHPBIO.

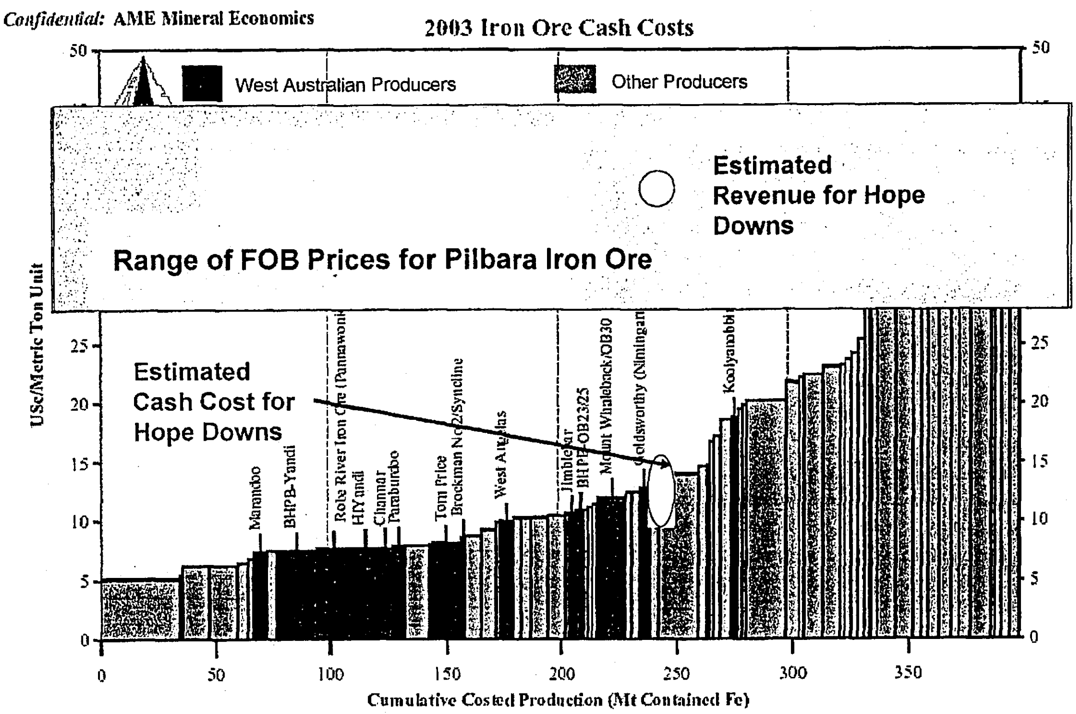
The primary opportunity for smaller producers is seen as providing supply options relative to security of supply. The recent 2003/2004 cyclone season demonstrated the fallibility of steel mills' reliance on the Pilbara. As ships queued for many days to secure cargoes, customers desperately searched the world for alternative 'prompt' supplies. The net effect of the experience in Feb/March 2004 has been for Chinese end-users to seek alternative investment opportunities in smaller independent producers. New Pilbara producers using an open access rail system would not solve this problem.

Industry buyers and sellers see new Pilbara producers as a potential means of providing downward pressure on prices.

The study team's opinion is that downward pressure would be sporadic but because of low volumes relative to the existing producers there would be no material impact on long-term price trends.

- *No small producer in Australia is able to compete 'head-to-head' with the existing big two producers. Smaller producers will not have the same economies of scale available to the larger producers and will have higher production costs as is shown by the placement of the estimated Hope Downs cash production cost and revenue on graph 4.1 below:*
- *Smaller producers will always be "price-takers" (at best).*
- *Smaller implies smaller reserves and so limited ability to influence pricing or trade patterns in any significant manner.*
- *Smaller producers have the potential for development of boutique products for niche markets, likely end-user/consumer/trader involvement as opposed to pure merchant mine operation.*
- *Smaller producers face different economic realities to the existing big producers, economic survival based on small-scale super-efficient operations, niche products and niche markets.*
- *Smaller producers may bring 'small size' innovation 'new' customer development and increased competitive tension to the current oligopoly.*
- *Graph 4.1 demonstrates that Hope operations are viable but being small will be vulnerable to price and production volume changes.*

Graph 4.1 2003 Iron Ore Cash Costs



4.1. Cost of Production

The previous graph demonstrates the relatively low cash costs of the major iron ore producers. The graph compares FOB cash costs (in red) for Western Australian producers with the range of revenues received for various Pilbara iron ores. Pilbara producers' production costs in 2003 were well below the sales revenue price, the cash costs being only about a quarter of revenue.

When contrasted to the AME graph prepared in 1998 (not included in this report) the first thing that becomes apparent is that Australian producers no longer occupy the lowest cost positions, CVRD has radically reduced production costs since privatisation.

It follows that:

- Existing producers are economically sustainable
- Existing producers are world competitive, but less competitive than they were 5 years ago
- Existing producers have the cash cost buffer to absorb short term price fluctuations
- New producers should be able to operate profitably.

However, as new producers have debt coverage demands and production fluctuations resulting from low volume and 'young' operations, they will be susceptible to price.

4.2. *Capital Investment (Excluding Finance)*

Investment in capacity by existing producers since 2001 through to completion of planned expansion in 2007 is:

	Expenditure	*Total Capacity (mtpa)*	
	US$ Billion	*From*	*To*
BHPBIO	*2.0*	*87*	*145*
Rio Tinto	*2.0*	*80*	*180*

These Producers are not capital constrained. Their capital sources are not dependent on guaranteed long-term sales contracts.

The above compares to estimated capital development costs announced by Hope Downs and FMG :

	Total	*Rail Cost*	*Capacity*
	AUD$ Bn	*AUD$ Bn*	*mtpa*
Hope Downs	*1.5*	*0.75*	*25*
FMG	*1.85*	*0.80*	*40*

Capital strength is required to respond to market growth and the existing Pilbara producers are responding to the market.

Paraburdoo

The existing producers have been criticised for not having the capacity to meet rapidly expanding demand from China. Paraburdoo was a lesson which still resides in the corporate memories of the iron ore producers.

Paraburdoo, the township, the railway and the mine was constructed by Hamersley Iron in the late 1960's and commissioned in 1970. Immediately upon commissioning the operation was shut down due to lack of demand. Production finally commenced in January 1973.

The cost of that project in current dollars would be in the order of A$500 million. The cost of mothballing the project would have been crippling had Paraburdoo been a stand-alone operation

Market Share

The existing Pilbara producers' expansion plans will ensure they retain and even expand their market share in the seaborne iron ore trade, and specifically their share of the Chinese market

New Producers

- *Existing producers control the resource base,*
- *New producers will not have a significant impact on price other than a short-term downside risk.*

5. DESCRIPTION OF CURRENT AND LIKELY FUTURE RAIL SYSTEM/S

5.1. OVERVIEW

The Pilbara rail systems are regarded as some of the most efficient heavy haulage systems in the world. In 2003 the Pilbara railways transported approximately 190 Million tonnes of iron ore from mines to ports. Pilbara iron ore producers regard efficient, reliable and cost effective rail transport as essential for their ongoing competitiveness in the world market.

Two separate rail networks currently operate in the Pilbara. The western most system is the Pilbara Rail Company that services the iron ore mines operated by Rio Tinto Ltd (Hamersley Iron and Robe River). The eastern system is operated by BHPBIO and hauls iron ore from the mines they manage and operate. Existing rail networks are shown in figure 5.1.

Existing Rail Capacity

Capacity of the existing rail system has been progressively increased over the last 30 years as sales have grown, usually on a 5-year outlook.

Expansion of the trunk lines has been by installing passing sidings. Logically, this will continue until the trunk sections become dual tracked.

At current planning the BHPBIO Newman trunk line should be double tracked from Pt Hedland to Yandi Junction within 10 years giving a capacity of 400 mtpa.

The Rio Tom Price to Dampier line will be double tracked within 5 years with similar capacity.

Constraints to rail capacity and to third party access come more from perception of market competitiveness and operational complexity than from physical rail or rolling stock capacity. Unloading and stockyards at Port Hedland and Dampier will encounter environmental constraints, but not physical constraints.

The long-term forecast Pilbara supply rate of 400 to 500mtpa (double 2004 production) is within the capacity of dual tracking the existing system.

Ownership and Rail Access

Existing Pilbara producers have rail access from mines to ports.

Under their State Agreements, these two producers have an obligation to carry third party freight. To date, 40 years on, existing producers are strongly opposed to third party access and none has been achieved.

Without third party access new producers will be forced to build their own rail. This represents a barrier to entry of approximately $500 million

Existing Producers

Existing producers oppose open access arguing that it will reduce efficiencies on the existing rail systems because of:

- Capacity loss,
- Complexity of operation,
- Regulatory interference,
- Increased legal liabilities and
- Loss of control of rail that is seen as a key part of their production chain.

Further, existing producers claim that increasing competition will drive prices down thereby negatively impacting State royalties and threatening business viability.

Proponents of open rail access see it as a mechanism of facilitating start-up of new producers in the Pilbara:

- Potential new producers control iron ore resources but face significant barriers to entry including the economic and environmental cost of building and operating a separate rail system.
- Effective open access could remove such a barrier, and promote greater competition reducing the oligopolistic market power of existing producers.
- Greater competition should result in improved efficiencies of production, marketing and delivery thereby assisting the Pilbara iron ore industry to remain at the forefront of the world seaborne iron ore trade.

Third Rail

The so-called third rail is required by a new producer if access to either of the two existing rail systems is denied.

It follows that if the existing trunk lines are dual tracked, there is no need for a third rail.

There are significant drawbacks to a third rail compared to dual tracking:

- Adverse environmental impact of a 430km by 500m wide scar across the Pilbara;
- Inefficient allocation of capital to build the new line, as it would carry only a small proportion (10%) of Pilbara resources;
- Short life of the line, as the new mines are limited in resources (20 years); and

The needs of new producers to transport ore to the ports within a definite timeframe will probably result in construction of a third rail. It could be seen as a quicker solution than the commercial/legal/legislative route of third party access to the existing rail system.

An alternative outcome is that the threat of a third rail and/or forced third party access to existing rail will trigger acquisition of new producers' reserves by existing producers.

This has occurred in the past; BHPIO's acquisition of McCamey's Monster, (Jimblebar) from Hancock and RIO Tinto's acquisition of Robe. In each case, there was a third party attempt to gain access to the existing rail system. The positive result of such take-overs is that the 'stranded' resource gets access to the existing rail system. Such an outcome also means the existing Pilbara oligopoly is strengthened.

5.2. Existing Railways

Pilbara Rail Company

The Pilbara Rail Company (PRC) was formed in 2002, as an independent rail operation, under the joint ownership of Robe River Iron Associates and Hamersley Iron Pty Ltd, both groups controlled by Rio Tinto Limited.

The Robe railroad was the 180 km Cape Lambert to Mesa J railroad. The Hamersley railroad assets consisted of 868 km of track, connecting mines at Paraburdoo and Tom Price, Marandoo and Yandi and Brockman, to the port of Dampier.

The Robe Mesa J railroad crosses over the Hamersley railroad, some 70km south of Dampier and Cape Lambert, at the foot of the Chichester Range. At the time of the formation of the Pilbara Railroad Company, construction of a rail spur from the Hamersley Yandi railroad at about 264 km was completed to the Robe deposits at West Angelas.

Both systems are heavy haul railroads running on concrete sleepers and 68 kg/m steel rail, with axle load capacity of 36 tonnes. Both systems have been designed with bridges and drainage structures capable of withstanding the heavy wet season rains of the area and are long life railroads.

Robe trains from Mesa J use GE Dash 9 locomotives and 202 gondola style ore cars that are unloaded at Cape Lambert in a single cell car dumper. Hamersley trains and Robe trains from West Angelas use Dash 9 locomotives and 230 gondola style ore cars grouped into pairs for unloading by twin cell car dumpers at Dampier and Cape Lambert. The design of the Mesa J ore cars is not the same as the Hamersley designed ore car and are therefore not interchangeable.

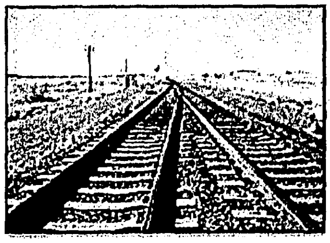
At the 70km grade crossing, there is a facility for trains from both railroad systems to cross from one rail system to the other.

Since the formation of the Pilbara Railroad Company, there has been a continuation of the Hamersley duplicated railroad, which was already from bottom to top of the Chichester Range, for a further 50km East to the Tunkawanna Creek. Currently this duplication is planned to be extended a further 100km to the Rosella Siding in 2004/05, which will bring the total duplicated track on this system to around 175 km.

Rosella Siding is at the junction of the Brockman, Tom Price and Yandi/ West Angelas spur lines. Completion of the railroad duplication to this point is expected to provide a railroad capacity of at least 150 MTPA from the various mines.

Hamersley current development plans, involve the opening up of deposits in the Brockman area, additional deposits in the Paraburdoo area and expansion at Yandi. Any new deposits in these areas are expected to be connected by conveyor or short railroad back to the main mine.

Robe is expected to further expand its deposits at West Angelas in the same time period.



The additional volume of ore to be railed on the spur lines connecting to Rosella siding is not expected to result in the further construction of rail duplication. However there may be the need to construct more passing sidings as the number of trains using a particular spur line increase.

Future long-term growth will be supplied from the Hamersley deposits around Paraburdoo and Yandi and from the Robe deposits around West Angelas, Angelo River, Bakers South and Rhodes Ridge. The expansion of Robe to the new deposits to the east of West Angelas will require extensions to the West Angelas rail spur for a total length of around 90 km. Further development of the railroad network to meet these requirements, is expected to be in the form of additional passing sidings on the Yandi and West Angelas spur lines and possible extension of the rail duplication from Rosella Siding to Marandoo, a distance of 50 km.

Duplication is unlikely until railings from West Angelas and Yandi exceed 150MTPA, but pressure from the West Angelas minority owners, seeking a high level of security for their product, may bring forward duplication as far as the West Angelas junction, which is around 120 km from Rosella Siding.

It would seem that effective duplication will be achieved by 2009 giving a trunkline capacity in excess of 400 Mtpa.

BHPBIO Railroad

The BHPBIO railroad connects the port of Nelson Point to Newman, a distance of 421km. The railroad has a branch line to the Yandi mine, which has recently been extended some 39 km to the south to connect with the new mine at Area C. Ore bodies near to Newman, for example Jimblebar and Ore Body 25, have been connected to the main rail line at Jimblebar Junction, some 20 km north of Newman.

A second railroad, the Finucane Island to Yarrie line, of some 208 km, is an extension of the old Goldsworthy railroad that was built to service Goldsworthy, Nimingarra and Shay Gap, prior to its take over by BHPBIO. This railroad operates independently of the BHPBIO railroad, as it uses bottom dump ore cars, which require a different unloading method, than the rotating car dumpers used by Robe, Hamersley and BHPBIO.

The BHPBIO heavy haul railroad has possibly the heaviest track standard in the world, using 68 kg/m steel rails on concrete sleepers of 50 tonne axle load capacity. Current axle loads in use are limited to 40 tonnes.

Trains operated on the BHPBIO railroad system, use a mixture of Dash 9 and AC 6000 locomotives. BHPBIO use a locotrol system, which enables the use of long trains, consisting of 4 locomotives and 224 ore cars and longer trains consisting of 6 locomotives and 336 ore cars. The trains carry loads of 30,464 tonnes and 45,696 tonnes respectively, which provides a more efficient use of the single-track rail system, over the relatively long distance of 420 km between Newman and Port Hedland.

The BHPBIO railroad is currently operating at around 100 mtpa capacity, with no duplication of its railroad track. Current plans for expansion of railing capacity to around 150 mtpa will involve considerations to duplicate at least portion of their railroad track between Nelson Point and Redmont a distance of 205 kms. Trains supplying ore to the busy Nelson Point facility are marshalled at Bing Siding, which is adjacent to South Hedland township. Noise issues related to this facility are an ongoing problem. Plans to construct a third unloading system at Nelson Point will involve more activity at the Bing marshalling yards and potentially bring more noise issues.

The predicted long-term growth of BHPBIO sales will be supplied from the Mining Area C deposits and from new areas further to the west, around Packsaddle, followed by the Alligator deposits, to the south west of Robes West Angelas area. This will require the extension of the Mining Area C spur line for a total distance of around 100 km. Increased capacity for the Mining Area C rail spur, up to 100 mtpa can be achieved by the construction of additional passing sidings.

It is expected that when BHPBIO reach 200 mtpa railing capacity estimated to be after 2010, there will be duplication from Nelson Point to Yandi Junction a distance of around 280 km.

5.3. OTHER PARTIES REQUESTING PILBARA RAILROAD ACCESS

Hope Downs

In the time that Hope Downs has been planning the development of their mine, it has:

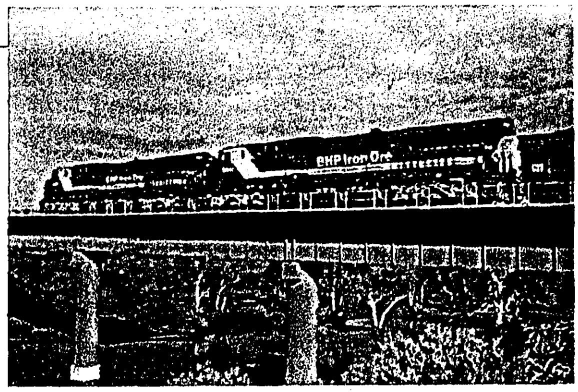
- Investigated gaining access to Hamersley's Dampier, Robe's Cape Lambert and BHPBIO's Port Hedland ports
- Pursued the right of access to the BHPBIO railroad, through the Courts and
- Has defined a rail corridor in which to build a new 324 km railroad between Hope Downs and Port Hedland, that for a majority of its length would run almost parallel to the BHPBIO railroad.

The Hope Downs Public Environmental Review (PER) states that a new rail line:

"Will conform to industry best practice design and construction standards and will be similar to and compatible with, the existing BHPBIO rail network. "

Alternatively, should Hope Downs gain access to the BHPBIO railroad, a spur line of around 50 km would be required to connect the mine to the BHPBIO railroad at a point south of Yandi Junction.

For the initial planned production of 25 mtpa to be absorbed into the BHPBIO rail operation, there would be the



Iowa Creek Crossing

requirement to purchase locomotives and ore cars, sufficient to transport the ore. Possible track improvements include the construction of additional passing sidings, or partial track duplication, depending on the volume of rail traffic already being operated by BHPBIO at the time.

Figure 5.2 shows the proposed link from Hope Downs to the BHPBIO railway.

Fortescue Metals Group

Fortescue Metals Group (FMG) has proposed the construction of an open access railroad, connecting their mines at Mt Nicholas and Mindy Mindy with Port Hedland. This railroad would be along an alignment close to the existing BHPBIO railroad. use.

Alternatively this project might gain access to the BHPBIO railroad, or the Hope Downs railroad, which would then require Fortescue Metals Group to construct a 160 km spur line from Mt Nicholas mine and a spur into Mindy Mindy mine of around 40 km in length. FMG has in June 2004 made application to the National Competition Council to have the BHBPB rail from Port Hedland 'declared' under the National Access Regime, for use by other third parties so that it would potentially be available for FMG use.

It is expected that if FMG construct a railroad it would have a similar standard to the BHPBIO railroad.

Figure 5.3 shows the proposed FMG Railway to Mt Nicholas and Christmas Creek and also demonstrates how the railway to Mindy Mindy could be extended to service Hope Downs.

5.4. CONSTRAINTS IMPOSED BY THE EXISTING RAIL SYSTEMS

Traditionally both BHPBIO and Rio Tinto have only increased railing capacity to match anticipated growth of sales over the short term, which is usually less than 5 years. This practice minimises outlay of capital for investment in rolling stock and new track until it is needed.

BHPBIO have a constraint on their existing railroad, imposed at Nelson Point, where unloading operations cause lengthy delays to train trip times. This constraint has been addressed in the past by the purchase of additional rolling stock. However traffic congestion at Nelson Point has necessitated the use of Bing Siding as a train marshalling facility. It is expected that the recent BHPBIO decision to conduct most crushing and screening operations at their mines, will remove most of the delay problems to trains using Nelson Point.

With sales commitments for both companies trending towards 150 mtpa over the next 5 years plans are progressing with new railroad construction and purchase of rolling stock to meet increased production.

Further demand for increased rail capacity, whether it be from the owner of the railroad, or a third party could be met in the same way. Prevention of third party access to the railroad would not be due to the inability of the railroad to carry the freight, but on the perception of the owner that a third party is a competitor for sales and the difficulty of establishing a suitable arrangement for transport and up front capital costs.

Once access is assured, the time for commencement of transport of the additional tonnes, would be dependent on the time taken for obtaining environmental, heritage and State approvals, time to construct the new track and purchase lead times for new rolling stock. Locomotives and some track items such as signalling equipment are on at least 12 months delivery. The total time to bring the track to accommodate the increased traffic could be around 2 years.

5.5. NEED FOR A THIRD RAILROAD

There are two potential proposals for a third railroad:

- Hope Downs to Port Hedland line constructed by Hope Downs Joint Venture.
- FMG's Port Hedland to Mindy Mindy and Mt Nicholas line.

Both these plans announced by third party iron ore producers attempting to launch projects in the Pilbara have directed the transport of their ore to Port Hedland, over a third railroad that would be in close proximity to the BHPBIO railroad. These plans raise the question about the ability of the BHPBIO railroad to transport the added freight.

Table 5.4 notes the capacity levels at which existing railways would need to be dual tracked. Once dual tracked each existing line would a capacity of approximately 400 mtpa.

The ability of a dual track rail system to transport volumes in excess of 400 mtpa raises practical issues such as time for track maintenance and safe spacing of trains. These operational factors have become less of an issue in recent years, as larger and faster track maintenance machines have become available and electronic train control systems are becoming more sophisticated.

It is more likely that the decision for a third railway in the Pilbara will depend on obtaining access to the BHPBIO railroad, in a suitable time and under suitable commercial terms to suit the development needs for the new project.

There is not expected to be a positive response from BHPBIO to make use of any third party railroad, on the basis of it being a replacement for their eventual duplication of the existing single track:

- BHPBIO has a significant investment in sidings, which will eventually be incorporated in to the track duplication.
- BHPBIO would not be receptive to the high risks in running their trains on a third party rail system, over which they would have little or no control.
- It is doubtful that BHPBIO would invest their capital for construction of a third railroad, as for a similar investment they could duplicate their own railroad.
- It is doubtful that BHPBIO would pay the freight cost and access cost per tonne that would be set by the operator of the new track.

Construction of a third railroad would require a new 500m wide construction corridor and a final rail lease 80 to 100m wide, over a distance of 430 km. Non construction of the railroad would remove any threat to flora and fauna and Heritage sites, that might be on or near the route.

A third railway route past South Hedland townsite area and into the Hedland port area, will restrict the direction of growth of South Hedland and have an impact on the visual and noise issues already evident. As the traffic on the new railroad grows, it is anticipated that, due to the restricted area of land available to Hope Downs and Fortescue Metals Group in the already congested port area, that they, like BHPB, will be forced to build rail yards and possibly railroad maintenance facilities in areas similarly situated to Bing Siding. South Hedland would then be surrounded by railroads, as if in the centre of a large marshalling yard.

Provided access to the BHPBIO railroad by third parties could be achieved *without protracted delays,* ***there is no technical reason why a third railroad is necessary,*** *however in the current climate of rapid growth in sales to the booming Chinese market, commercial decisions to bring on a new project, to supply this demand, may need to be made rapidly.*

Should a new railroad be constructed under these circumstances, it could have a limited life, compared with the other Pilbara railroads. At this time the proven saleable iron ore reserves held by both Hope Downs and Fortescue Metals Group amounts to around 10% of the total reserves in the Pilbara. On this basis ***a third railroad would be expected to have a useful life of around only 20 years.***

A short-term railroad will leave a legacy of earth cuttings and embankments, bridges and drainage structures, as a visual scar when all operations have ceased.

Alternatively, ***access to existing railroads would extend the life of those systems and contain any environmental impacts within existing boundaries.***

5.6. ESTIMATED CAPITAL COSTS FOR RAIL EXPANSION AND/OR DUPLICATION

5.6.1. Rolling Stock

Table 5.1 provides an estimate of rolling stock requirements for new producers(locomotives and ore cars will be similar under either shared or independent rail operation).

Table 5.1: Rolling Stock Requirements for New Producers (indicative tonnages)

	Sales MTPA	Rail Km	Trains required	$M per train	Cost $m *
HOPE DOWNS:					
Hope 1, 2	25	350	3	63	211
FORTESCUE METALS:					
Mindy Mindy	20	340	3	63	211
** Includes spares allowance 1 loco / 65 ore cars*					

5.6.2. Spur Lines to Existing Track

A greater degree of variability arises when determining appropriate levels of expenditure required for the provision of rail track

The estimates in table 5.2 are provided as a guide to the distances and costs that will be incurred, not only for spur lines proposed by Hope Downs and FMG but also as development continues and new mining areas are opened up by the existing producers.

Table 5.2: Pilbara Railway Expansion Spur Lines to Existing Lines

Location	Est. Km	Est. Cost A$M
Hope Downs Spur		
BHPBIO CH 310 TO HOPE DOWNS	60	132
FORTESCUE LINES		
A) BHPBIO CH 310 TO MINDY MINDY	45	131
B) BHPBIO CH 230 TO MT NICHOLAS	190	295
RIO TINTO		
WEST ANGELAS TO BAKERS SOUTH*	67	96
BAKERS SOUTH TO RHODES RIDGE	52	75
* INCL. GILES MINI	119	171
BHPBIO		
MAC PACKSADDLE	55	80
PACKSADDLE TO ALLIGATOR	66	94

5.6.3. Construction of Independent New Railways

Table 5.3 below provides:

- Estimates of the cost to construct Independent rail systems along with the associated sidings, marshalling yards and workshops necessary to operate a separate rail network.
- The estimated cost for alternative spur line extensions from existing networks with the associated extra sidings; mine loops, marshalling yard extensions, workshop expansions and additional track maintenance equipment.

Table 5.3: New Rail Networks Compared

	Independent Rail			Spur Lines if added to BHPBIO Line			
	Hope Downs	FMG			Hope Downs	FMG	
From	Hedland	Hedland	FMG "230"		BHP ch310	BHP ch310	BHP ch230
To	Hope Downs	Mindy Mindy	Mt Nicholas		Hope Downs	Mindy Mindy	Mt Nicholas
Mainline km	324	355	190		60	45	190
Mine Loop km	15	15	15		15	15	15
Sidings km	35	35	35		35	35	35
Hedland Yard km	40	40			10	10	10
Track Cost $M	**650**	**578**	**312**		**264**	**190**	**365**
Workshop $M	6	6		25%	1.5	1.5	1.5
Track Maintenance equipment $M	18	18		25%	4.5	4.5	
Total by Mine Site $M		602	312			196	366.5
Total Fixed Assets $M	**674**		**914**		**270**		**563**

5.6.4. 0Dual Tracking Existing Railway Systems

Table 5.4 provides dual tracking estimates for both existing systems.

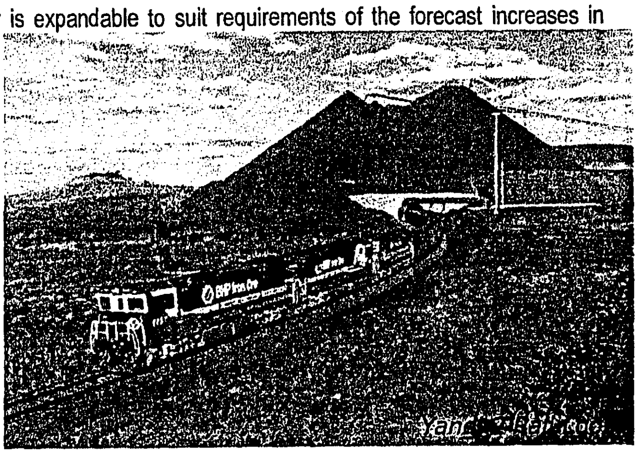
Table 5.4: Dual Tracking

	Pilbara Rail Co.	BHPBIO
From	Rosella	Bing Siding
To	Marandoo	Yandi Junction
For Ore Haulage From	West Angelas / HIYandi	South of Chichesters
When Capacity Exceeds (Mtpa)	100	250*
Km	50	240
Estimated Track Extension Cost $m	80	342
Timing (growth rate dependent)	< 2010	2015

** BHPBIO's 250 Mtpa could include ore from Hope Downs and/ or FMG*

5.7. CONCLUSION

- The **existing** Pilbara iron ore rail system capacity is expandable to suit requirements of the forecast increases in demand.



- The existing rail could be expanded to accommodate ore transport needs of new producers.
- There is no technical need for a third rail.
- The third rail represents inefficient allocation of capital and unnecessary environmental cost.

Historically, potential new producers have been taken over by the existing producers. If this does not happen then ironically the third rail will most probably be built as it represents the quickest most assured access to market for new producers.

Figure 5.1: Existing Pilbara Rail Networks

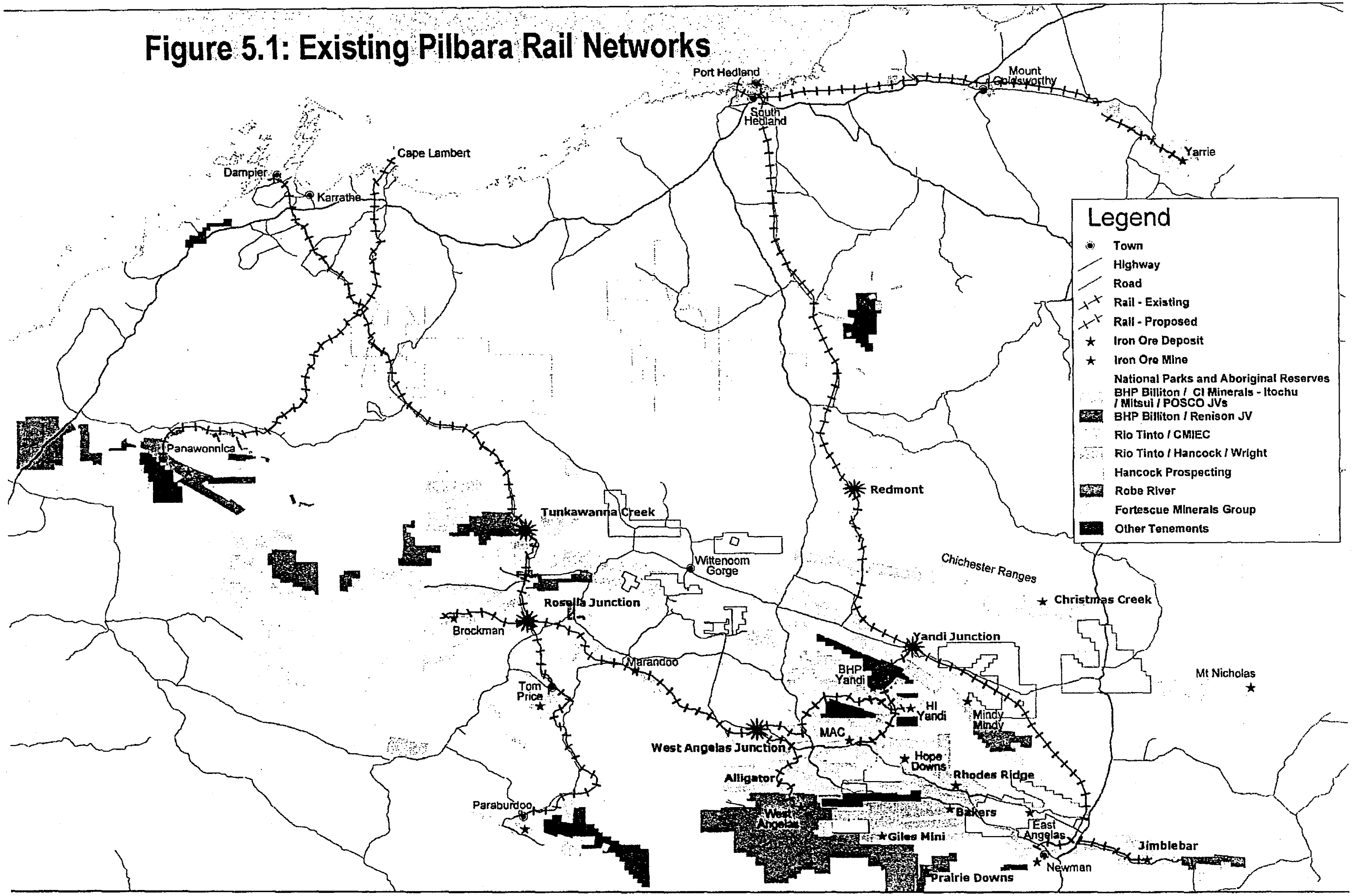


Figure 5.2: Existing Pilbara Rail Networks & Hope Downs Linked to BHPIO

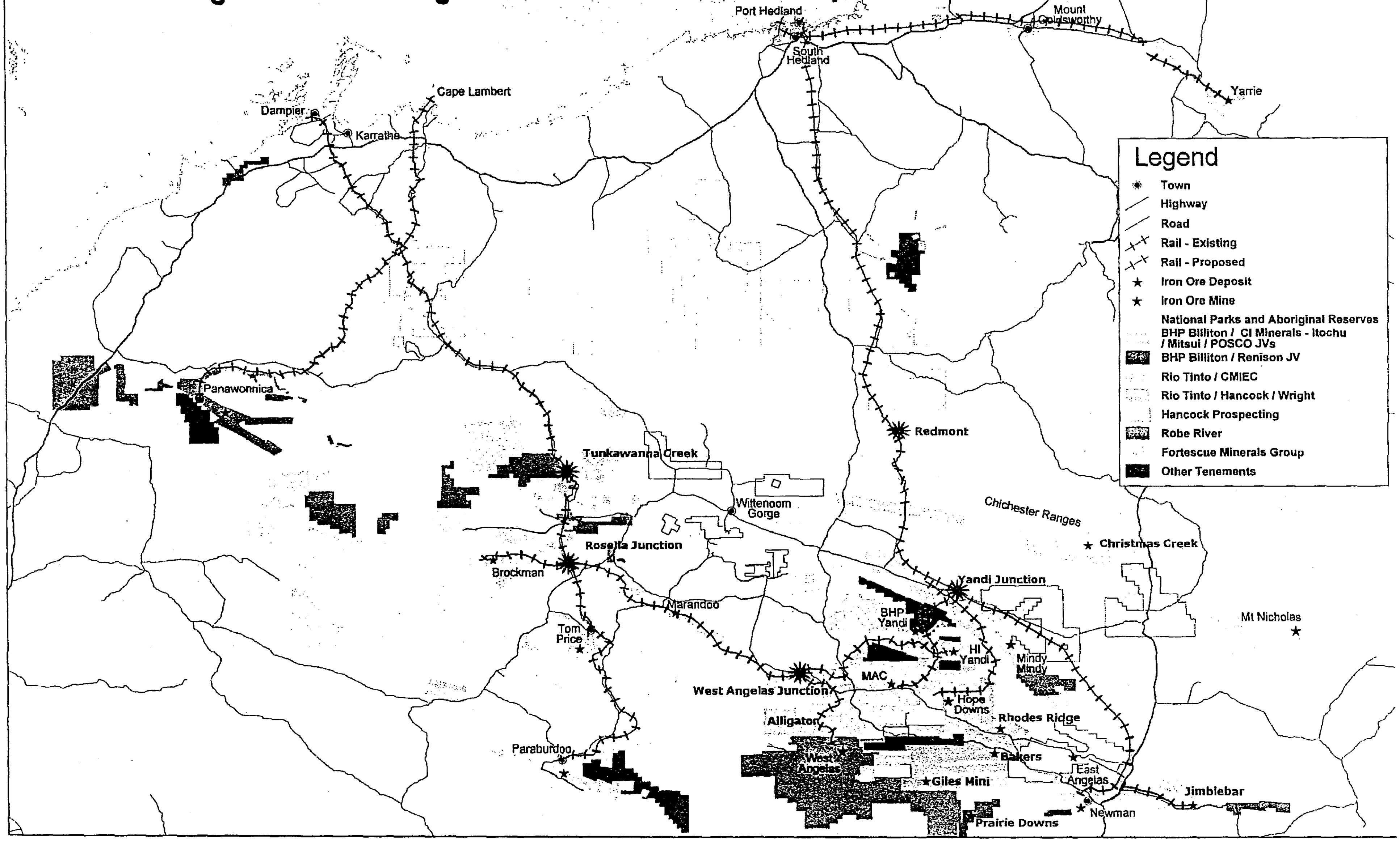
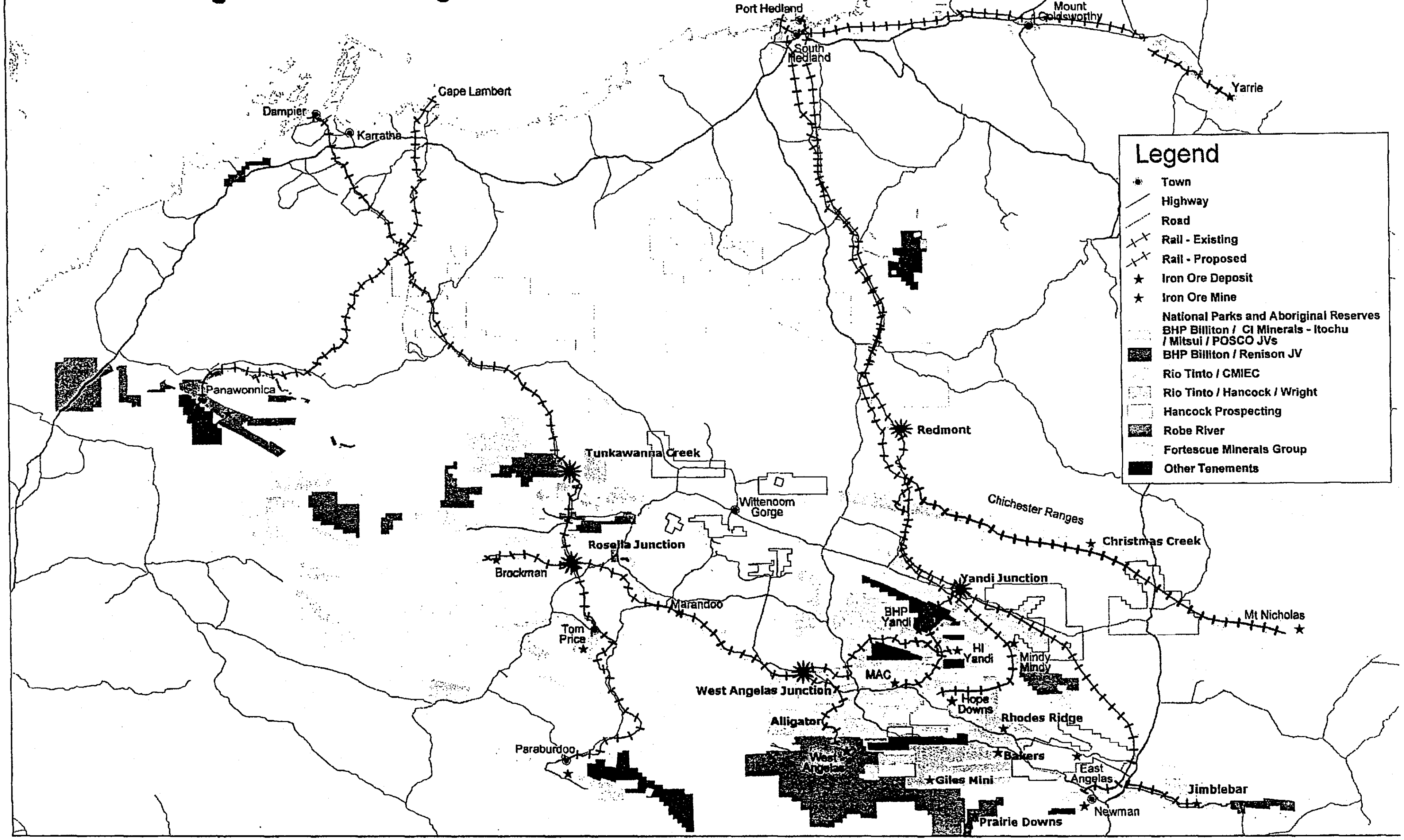


Figure 5.3: Existing Pilbara Rail Networks & Hope Downs Linked to FMG



6. POLICY

6.1. RAIL ACCESS REGIME IMPLICATIONS FOR POLICY

The State iron ore Agreements place clear obligations on the Pilbara iron ore companies to carry the iron ore of third parties, as long as their own operations are not unduly prejudiced or interfered with. More recently, in the context of National Competition Policy, a National Access Regime has been established to deliver the economic benefits associated with third party access to nationally significant infrastructure.

BHPBIO acknowledged its State Agreement obligations in 1987 when it entered into the Rail Transport Agreement, (RTA) but subsequently resisted efforts to give commercial effect to that Agreement. This resistance extended as far as Supreme Court action over the definition of "iron ore producer" contained within the RTA.

Rio Tinto, for its part, strenuously resisted the efforts by Robe River Iron Associates (RRIA) to gain access to its rail system under the National Access Regime, arguing in the Federal Court that the system was part of a "production system" and therefore exempt from the Regime. Rio Tinto took control of RRIA in 2001 and subsequently acknowledged the economic benefits and operational acceptability of rail sharing by establishing a joint entity to operate and maintain both Hamersley Iron and RRIA rail systems. In October 2003 Rio Tinto shipped ore from the Hamersley Yandi mine through Robe's Cape Lambert Port, demonstrating the rail integration that the group now has.

The findings of the qualitative economic modelling summarised in Section 7.1. are that an Open Rail access regime would be beneficial compared with the existing closed access regime, and that the major beneficiaries would be the existing large iron ore producers themselves.

Implications for State Government policy

On the one hand the existing large iron ore producers have demonstrated that they are prepared to take aggressive action in the courts to deny rail access to prospective producers. This demonstrates the value they place on defending market share, as well as the benefits of ultimately acquiring the iron ore deposits of third parties at minimum cost. On the other hand, the State has, through the State iron ore Agreements, and more recently in conjunction with National Competition Policy, demonstrated a consistent and continuing commitment to third party access.

To the extent that the State Government decides to affirm the importance it attaches to third party access in general – and iron ore rail access in particular – there is clearly the potential for significant conflict with the existing large iron ore producers

The State Government would obviously prefer to avoid such a scenario, but at the same time should not allow the prospect of disputation to defer it from the implementation of good and consistent policy. The challenge is, therefore, to find a path, which provides the opportunity to avoid drawn-out conflict with the existing large producers, while at the same time achieving the benefits of third party access to their railways.

The National Access Regime and National competition Policy was an agreement between the Commonwealth Government and the respective states to implement access regime state policies and enact state laws that mirror Commonwealth access regimes under the Trade Practices Act (part IIIA) Legislation.

Watch the Ball

This $8Bn industry will double in size in the next 10 to 15 years potentially increasing annual State royalties from $400m to $1 billion. The industry has been built by the existing producers and facilitated by the State Agreements.

Open access is unlikely without cooperation of the existing producers – they and the existing industry is the 'ball' that the state needs to firmly keep their eye upon.

Open access is beneficial but not to the extent that it is worth disrupting the growing iron ore industry, risking damages claims against the State from existing producers arising out of the State Agreement obligations, and signalling sovereign risk issues to investors.

Access Options

- *Certified" Regime*
The State could proceed to develop its own "certified" access regime for the iron ore railways consistent with the 1995 Competition Principles and impose Agreement, between the States and Commonwealth. The first problem with this approach is that the Federal Court has already ruled that the Hamersley Iron rail system is part of a "production process" and it would, therefore, not meet the definition of a "service" under the Trade Practices Act. It would, therefore, be necessary for the State to first sponsor a successful third party challenge to this ruling, for this approach to have any chance of

  The now pending FMG declaration application will decide this question.

  The second problem is how to impose a "certified" regime on companies, which are determined to resist. Essentially the establishment of an access regime simply creates a framework within which negotiations over operational and commercial issues take place.

  A third problem with a "certified" regime is the potential for the iron ore companies to challenge any differences between such a regime which would logically provide for access by third party trains – and what they might regard as their obligation under the State Iron Ore Agreements "... *to carry the freight... of third parties...*"

- ***"Declaration" of one or more rail systems.***
An alternative approach is for the State to actively support or sponsor an application by a prospective third party such as Hope Downs for the declaration of one of the iron ore rail systems – in this case BHPBIO's. As indicated, a declaration application by RRIA for the Hamersley Iron rail system has already failed, and as with the "certification" route the Federal Court ruling would first have to be set aside. To the extent that the declaration application was ultimately successful, the other difficulties with the "certified" regime approach would still remain.

  A key issue with the declaration process is that it only applies to assets specifically included in the declaration application; additional assets can only be added by repeating the declaration process. To have any chance of delivering the industry-wide benefits predicted by the qualitative model, the declaration approach would have to be extended to all of the iron ore rail systems.

  The pending FMG declaration application will decide the possibilities of this approach.

- .*State Agreement Regime.*
Given that the State Supreme Court has upheld the rights of Hope Downs to pursue access negotiations under the Rail Transport Agreement, the State could pro-actively support Hope Downs' efforts to reach commercial and operational agreement over access to the BHPBIO rail system. This regime is already in place and further legal challenges by BHPBIO are probably unlikely. The Agreement provides for disputes over commercial arrangements to be determined by an independent expert, which could probably be achieved in a relatively short time frame.

  The difficulties with this approach are, firstly that it does not extend to the two other rail systems and separate arrangements would need to be negotiated with Hamersley Iron and RRIA if the foreshadowed industry-wide benefits were to be achieved. Secondly the Rail Transport Agreement is limited to carriage by BHPBIO of third party ore, and does not permit access by third party trains.

- ***Specific State Legislation.***
The State could introduce specific legislation to establish an access regime covering the iron ore rail systems. This could be structured around the existing BHPBIO Rail Transport Agreement and would not necessarily need to meet the requirements for a "certified" regime. Such legislation would take precedence over the State iron ore Agreement Acts, and could as a result raise concerns about sovereign risk. The risk of this approach is that the existing producers could claim undue prejudice to their operations under their respective State Agreements, and take action against the State for the recovery of damages. However, in defending such an action, the State would be in a position to cite the BHPBIO Rail Transport Agreement, the Hamersley/RRIA arrangement, and the success of rail transport arrangements elsewhere.

Conclusions

There are clearly difficulties, shortcomings and uncertainties associated with pursuing access under any of the approaches outlined above. The qualitative analysis demonstrates that the benefits of open access to all Pilbara rail systems is likely to be significant, and of greatest benefit to the existing large operators rather than to prospective producers. At the same time, failure to achieve access across the board is **NOT** likely to substantially reduce the economic benefits in the short term because of risk of iron ore industry disruption. In the longer term benefits arising from open access will flow through to the current producers. For these benefits to be realised the existing producers need to recognise the benefits and provide their cooperation.

Government, therefore, needs to develop a strategy that has a high probability of delivering access to all rail systems **WITHOUT** disrupting the existing industry. Any such strategy has far more likelihood of success with the support of the existing large iron ore producers. Sustained opposition by any or all of the existing producers would diminish the prospect of achieving the full benefits of open access. The strategy must offer a win-win-win situation for existing and prospective producers, and for the State.

To the extent that a successful strategy requires the ultimate support of the large existing producers there appears to be little merit in pursuing a solution that attempts to comply with all the criteria of a "certified regime". Unlike most other access regimes, any Pilbara rail access regime is only likely to have to deal with one or possibly two third party users on a particular rail system. The focus should therefore, be on a practical commercial outcome which suits the needs of those particular parties, rather than trying to devise a generic regime which is capable of handling a multiplicity of applicants/users. Section 6.2 provides a discussion of the ingredients that might be considered in the development of a suitable implementation strategy.

6.2. POLICY OPTIONS

The attendees were briefed prior to the workshop on the outcomes of:

1. The qualitative model; which indicates that the main beneficiaries of a totally open access regime would be existing producers and
2. The quantitative model which found that the low production volume potential of new producers (10%) as a proportion of Pilbara total gives rise to a materiality issue:
    - Long term future of the Pilbara iron ore industry already in the hands of the existing producers
    - New producers will have little impact on prices – they will be price takers
    - Existing producers have capability of expanding and maintaining market share for the next 20- 30 years

The workshop accepted the desirability and benefits arising from open access and considered policy options, and attendant benefits and risks. Refer table Policy Options in Appendix 7.

Policy options were considered in category groups of:

Interventionist action	"Stick" Options
Incentives	"Carrot" Options
Facilitated Private Agreements	"Commercial" Options

Potential Commercial Resolutions

1. Facilitate and encourage direct third party commercial agreements or agreements under the respective State Agreements. This is the win-win-win outcome for all parties, the State, existing producers and new producers.

The risk is this will not happen without significant effort from the State including application of interventions and incentives.

2. Establish a joint Industry Group to study, model and demonstrate the benefits and costs to the existing producers of open rail access.

We recommend strong effort in this regard as demonstrating the commercial gain to the existing producers is the most compelling strategy of opening rail access.

Collaboration

Concentrate on demonstrating the potential commercial gains from open access to the existing producers. *This is the most compelling method of opening rail access*

The State convenes a joint industry working group to explore by technical and economic analysis the benefits and costs of an open access regime to all rail users. The aim, of this collaboration is to show a win result to the existing producers, with added benefit to new producers and the public.

7. IMPACT OF EFFECTIVE OPEN RAIL ACCESS ON INVESTMENT, ROYALTIES, EXPORTS, INCOME AND EMPLOYMENT

The Study brief states:

"As part of the examination of public interest issues the following work may be necessary:
- *Model impact of effective open rail access on investment, royalties, exports, income and employment."*

The study team undertook this as two tasks:

1. qualitative analysis to identify major issues and to determine how best to examine those issues and,
2. qualitative analysis, which was utilised to review the factors that were readily measurable within the scope of the study brief.

7.1. QUALITATIVE MODELLING

The **qualitative modelling** technique used is described in Appendix 6 and the outputs results are attached.

A major benefit of conducting the qualitative analysis is that the exercise forced the study team to examine the practical difference between third party access and genuine open access.

Third party access, similar to the Hope Downs application for access to the BHPBIO rail system, is not free open access as no parties other than Hope Downs would have access to the BHPBIO rail system.

True open access would enable all iron ore producers to access all other iron ore rail systems.

This distinction led the study team to examine the implications of existing producers operating under an open access regime. In the analysis we refer to this as Open-Open access as distinct from Closed access.

A hybrid model of a new 3rd rail with open access and existing rail systems remaining closed – the Closed-Open model was used as a sensitivity comparison of genuine open access (Open-Open) with partial open access (Open-Closed).

The modelling showed a strong public benefit from the provision of totally open access to the Pilbara rail system in terms of impact when measuring aggregate outputs of Gross State Product, Royalties and Environmental Impact, as compared with the existing closed access regime:

- The majority of benefit would arise from existing producers sharing each others' rail systems with benefits of economies of scale, efficiency, flexibility and blending improvements.
- Benefit to new producers is also undeniable, but those producers are marginal to the Pilbara iron ore industry.
- The public interest benefit from an Australian viewpoint as exporters of iron ore is enhanced by the producers' oligopoly and therefore the Closed Access regime has some advantages.
- There is an environmental and heritage impact linked advantage arising from a closed access regime.
- *The sensitivity model showed no difference in Public Interest benefit between the current regime (effectively Closed-Closed) including a closed 3rd rail and an Open-Closed regime which offers open access to a new third rail but retains existing rail networks as a closed system. Production volume marginability of new producers using the third rail causes this lack of differentiation.*

Benefits of a genuinely open access regime include:
1. *Reduced environmental and heritage impact as less rail construction would be required,*
2. *Reduced rail transport costs,*
3. *Multi mine ore blending optimisation; and*
4. ***Open access becomes an essential precursor to effective husbandry of the iron ore resources in the Pilbara. The authors are of the opinion that with effective husbandry the existing producers could produce at least an additional 10% iron ore from existing iron ore deposits. This would dramatically improve profitability as well as reducing environmental and heritage impact from their operations.***

QUANTITATIVE MODELLING
The results of the qualitative analysis and our assessment of quantity and viability of iron ore deposits not held by parties controlled by existing producers defined the scope of the quantitative analysis. The analysis attempted to determine what the Pilbara iron ore industry will look like in 25 years.

The analysis period was from 2005 through to 2030.

The forecast outputs were:
- Iron ore demand
- Sales volumes
- Pricing
- State royalty, employment and Gross State Product implications
- Future ore quality
- Sequence of new deposit development

7.2. QUANTITATIVE ANALYSIS

To quantitatively analyse the impact of increasing competition in the Pilbara iron ore market it is necessary to understand the market into which the Pilbara iron ores will be sold. The iron ore market has been discussed extensively in section 2 of this report.

The quantitative analysis has been performed over a series of stages:

7.2.1. Determination of appropriate time frame for the analysis

The time frame of the analysis has been set to equal the payback period of investment in railway track and earthworks, which is assumed to be 25 years. If Construction commences in 2005 and is completed in 2006 then the rail will have and operating life through to 2030.
Note: The existing Pilbara Rail Lines have been operating for more than 25 years.

7.2.2. Estimates of world demand

Potential world demand scenarios are discussed in section 2 of this report. It is important to note that, due to the high degree of uncertainty for the Chinese economy, industry analysts are reluctant to forecast demand beyond 2010.

Table 7.6: Chinese steel consumption growth Source: Rio Tinto

From	1990	2000	1990	2004
To	1999	2003	2003	2010
GDP growth/%	10	8	9.5	7 -8
Steel consumption growth%	10	23	13	9 - 11

As a result the following assumptions were adopted:

- The Pilbara producers will supply 45% of the Chinese market and 42% of the rest of the world seaborne iron ore market
- Chinese steel production levels are seen as the main driver of demand in the world seaborne iron ore market
- Growth rates for the rest of the world are significantly lower and are assumed to be 20% of Chinese rates
- The three scenarios modelled have common growth projections for the period 2004 through to the end of 2006 with varying rates from 2007 to 2030.
- The "low" case assumes constant growth in Chinese steel production of 2.5%.
- The "medium" case assumes constant growth of 5.0%.
- The "high" case assumes constant growth of 7.5%.
- The following demand projections were derived:

Table 7.7: Demand for Pilbara Iron Ore Under Three Scenarios

Year	Low Growth: 2.5% pa	Medium Growth: 5.0% pa	High Growth: 7.5% pa
2005	232	232	232
2006	248	248	249
2007	254	254	255
2008	261	262	264
2009	268	270	272
Through to			
2029	404	634	1,052
2030	412	663	1,127

- *The quantitative analysis found that the publicly announced expansion plans of existing iron ore producers and Hope Downs can* ***maintain the world market share*** *for iron ore produced from the Pilbara* ***until at least 2020*** *in all projected iron ore demand scenarios.*
- *Existing producers have historically demonstrated willingness to quickly but continuously* ***increase production capacity*** *when they are confident that demand exists*
- *In our opinion, it is* ***unlikely that the presence of additional iron ore producers would increase iron ore sales*** *from the Pilbara.*
- *Conversely, as discussed in section 2, it is felt that new producers, including Hope Downs would* ***not be able to adversely impact iron ore prices.***
- *Furthermore there is no significant medium or long-term impact on the amount of* ***royalties*** *generated by the introduction of an open access regime for existing or proposed rail networks.*
- *Marginal and short-term benefits would be produced by the construction of a new rail system in that the capital expenditure would be greater, and arguably earlier, than the expenditure incurred by existing iron ore producers.*

7.2.3. Determination of size, location and quality of iron ore deposits

Derived from section 3 of this report, the following deposits, or groupings of deposits, were identified and incorporated into the analysis.

Table 7.8: Pilbara Iron Ore Deposits in Quantitative Analysis; Tonnes, Fe Grade & Ore Type Production Rates and Capacity

Deposit /Area	Reserves & Resources Mt	Weighted Avg Fe%	P%	Ore Type				Production Mtpa	
				Brockman	Detritals	Marra Mamba	Pisolite	2004 Actual	Max. Theoretical
Newman JV	3,204	62.10	0.072	73%		27%		29	60
Mt Goldsworthy	93	61.00	0.061	100%				7	10
BHP Yandi JV	1,421	57.74	0.040	100%			100%	41	50
MAC	1,090	61.65	0.064	10%		90%		11	50
Prairie Downs	376	60.99	0.100	44%		56%			40
Jimblebar JV	1,134	61.52	0.111	100%				6	50
Marandoo	447	62.56	n/a				100%	19	40
Tom Price Region	462	62.77	n/a	77%	14%	9%		19	19
Namuldi	335	62.46	n/a		22%	78%		8	40
P'doo/Channar/E Ranges	489	63.01	n/a	100%		0%		15	40
Hi Yandi	1,211	58.09	n/a				100%	25	50
Pannawonica Area	2,260	58.95	n/a				100%	32	50
West Angelas	1,010	61.84	n/a			100%		20	50
Rhodes Ridge JV	6,840	62.16	n/a	62%	4%	28%	6%		80
Hope Downs	904	61.61	0.042			100%			50
Total Tonnes/Grade	**21,276**	**61.2%**		**10,358**	**420**	**6,175**	**5,744**		

7.2.4. Forecasting the development strategies of existing producers Determination of size, location and quality of iron ore deposits

Section 2.6 of this report discusses the study group's expectation of the types of product that the Pilbara producers will be able to mine and sell. The overall requirement is for producers to be able to reliably provide customers with a range of products that are of consistent quality and small variance.

The quality and type of ores sold from the Pilbara has changed markedly since production commenced in 1965. This change has been gradual and has been based on increasing the range of products available to the customers whilst maximising the life of existing deposits and keeping contaminant levels within acceptable ranges.

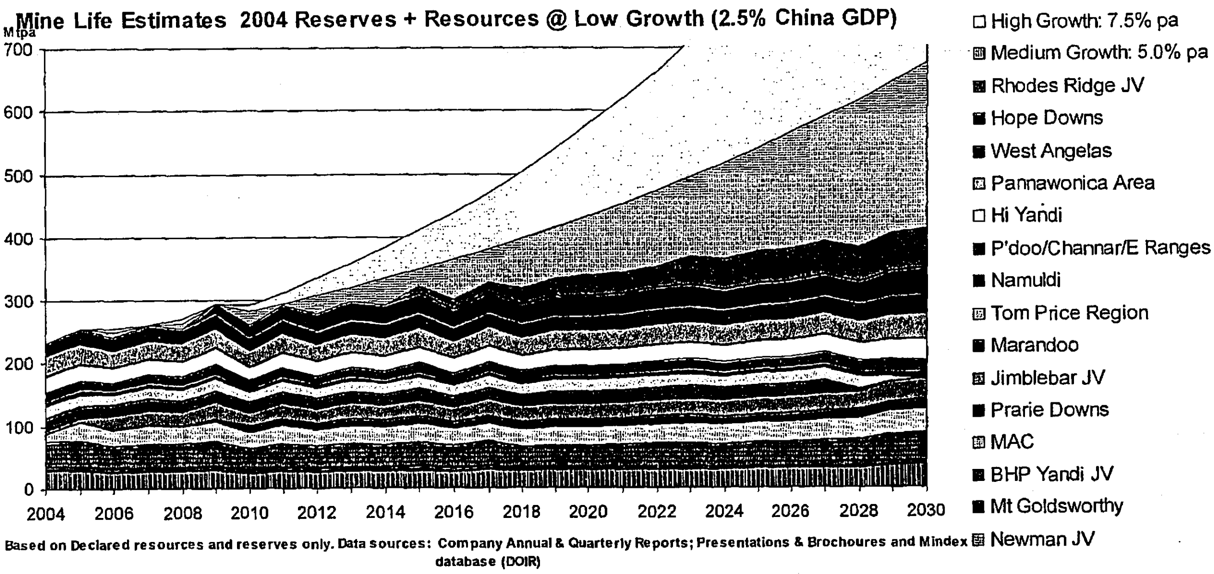
7.2.5. Developing an overview of Pilbara production through to 2030.

A set of detailed production schedules was developed for all of the deposits identified in table 7.9 above. The objectives of these schedules are to ensure that the life of low phosphorus Brockman deposits is maximised and that overall phosphorus levels of ore produced increase gradually while Fe levels are maintained at an average of more than 60%.

New deposits have been incorporated and capacity expansions assumed for existing deposits to satisfy increasing demand levels or falling production from other deposits. The timing and production rates are estimates only and are definitely not intended to provide an absolute guide to future development in the Pilbara.

Graphs 7.1 through to 7.3 demonstrate rates of production and timing for introduction and exhaustion of identified deposits under the low, medium and high growth scenarios.

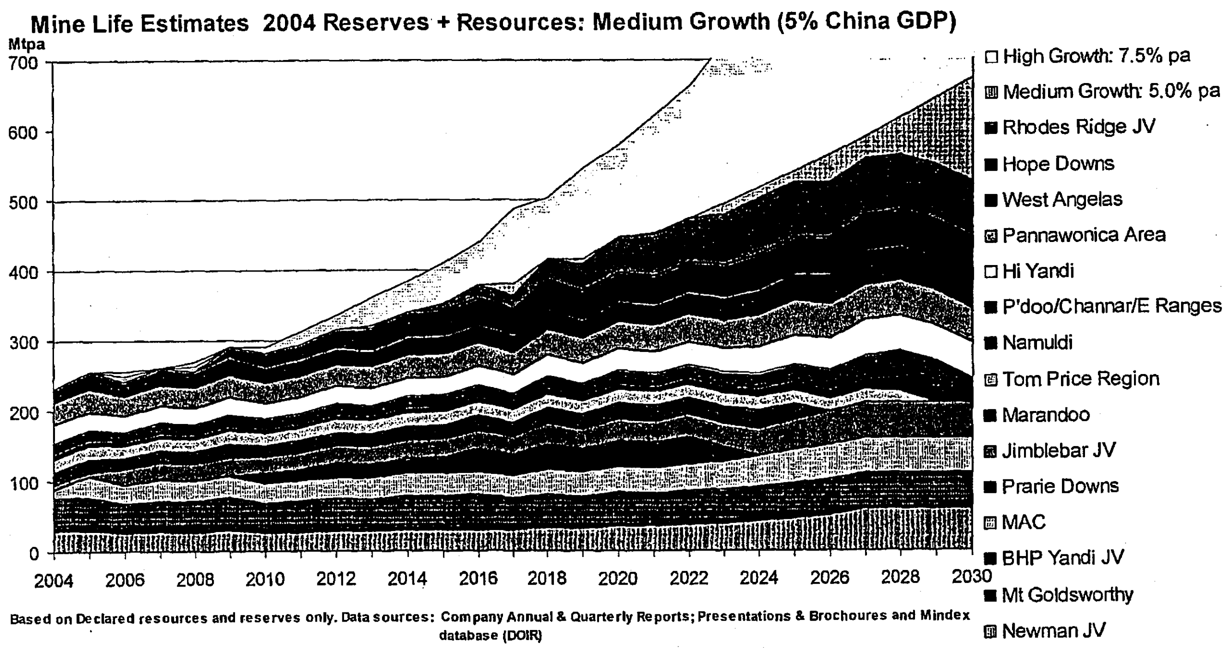
Low Growth Scenario demand is met beyond the duration of the study. Total sales from 2004 to 2030 are 8.7 Billion tonnes (Bt) and remaining resources are 12.6 Bt.



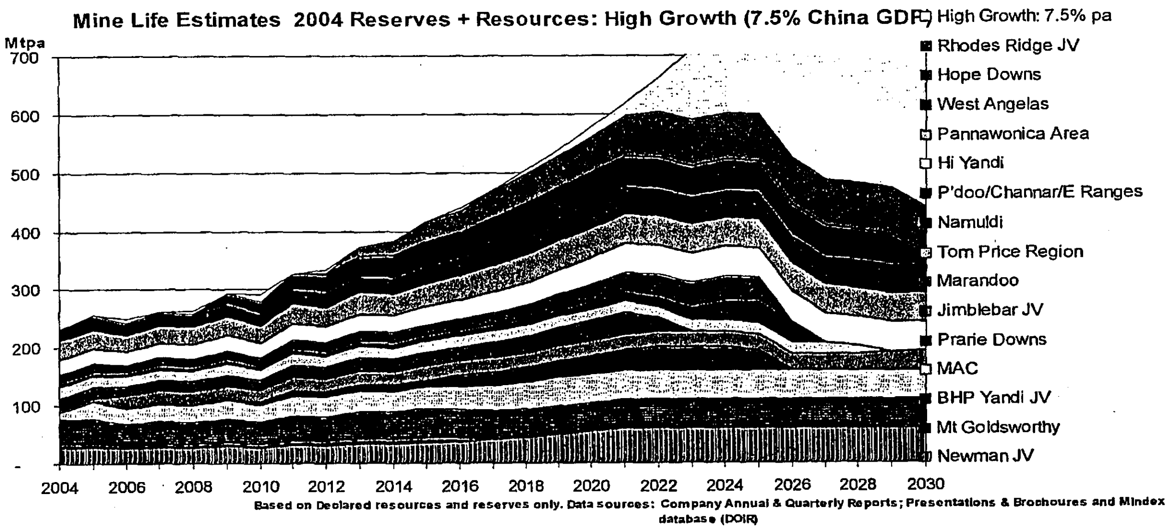
Graph 7.1 Pilbara Mine Life Estimates – Low Growth Scenario

Medium Growth Scenario demand is substantially satisfied for the next 20 years, after which defined blending and capacity constraints restrict ability to meet market share. Total sales from 2004 to 2030 are 10.7 Bt, remaining resources are 10.6 Bt.

Graph 7.2 Pilbara Mine Life Estimates – Medium Growth Scenario



High Growth Scenario demand is met for the next 16 years, after which the defined blending and capacity constraints severely restrict ability to meet market share. Total sales from 2004 to 2030 are 11.5 Bt, remaining resources are 9.8 Bt.



Graph 7.3 Pilbara Mine Life Estimates - High Growth Scenario

It is important to note the proposed capacity of new iron ore producers is unlikely to materially impact medium to long term pricing.

Hope Downs has a total reserve base of approximately 900 Mt and is proposing to exploit that at a 25 mtpa rate. If Hope Downs commences production in 2007 it is probable that the 25Mtpa capacity will not be achieved before 2010, by which time the lowest growth scenarios predict a world trade of 638 Mtpa. Hope Downs would represent a maximum of 4% of world trade. Hope Downs' 50% equity link with Kumba, which has never been a price setter, further indicates that Hope Downs is unlikely to have a disproportionate impact on pricing negotiations.

For the purposes of quantitative analysis it has been assumed that, over the 25-year period examined in the study, prices will continue to decrease at a rate on 1.8% per year. Pricing variations will however occur if calculated Pilbara production capacity differs from calculated demand for Pilbara ore as per table 7.6

Table 7.6: Calculation of Iron Ore Price Movements

	Change	Maximum Movement
For demand $yr^{(n+1)}$ = Supply $Y^{(n)}$ + growth trend	-1.76%	
Per 1 Mt when Supply $Y^{(n)}$ + Growth> demand $yr^{(n+1)}$	-1.15%	-10%
Per 1 Mt when Supply $Y^{(n)}$ + Growth< demand $yr^{(n+1)}$	0.05%	10%

7.2.6. Calculation of Impact on the Western Australian Economy

Project Costs: Our estimates in section 6 indicate that rail track construction costs will be $400 to $500 million greater if a third rail network is constructed rather than expanding current rail systems.

Timing: Preliminary analysis of the impact of third party access to existing Pilbara rail networks shows that the major impact on investment would relate to timing variances. Existing and potential producers, both argue that they are able to react more quickly and therefore be able to increase Pilbara production more rapidly. Performance-to-date indicates that the existing producers are more likely to meet expenditure and investment forecasts.

Employment: The other source of variance would be for ongoing operations where more people would be employed if a third railway network was operated. Employee numbers for operations personnel will be similar under either access regime. The number of extra employees is limited to additional administrative and supervisory staff.

Ongoing operations: Other than a small increase in employment there would be no measurable difference between owner-operate and third party access regimes.

Table 7.7: Financial and Economic Impacts of Hope Downs Operations

Hope Downs		Own Rail	BHPIO Line	Variance
Operation At Design Capacity				
Capacity	Mt	25	25	
Operations Cash Costs	$M	257	353	- 97
Admin/Marketing	$M	30	30	-
Total Cash Costs		287	383	- 97
Workforce (Average)	People	320	280	40
Revenue	$M	784	784	-
Hope Downs Financials *(Indicative Only)*				
EBITDA		497	401	97
Average Depreciation	10%	164	123	40
EBIT		334	278	56
Taxable Income		334	278	56
Taxation	30%	100	83	17
Interest	8%	131	98	32
Cash Surplus		266	218	48
Impact on W A Economy				
Royalties (2004 Prices)	$M	49	49	-
Multipliers				
Labour	4.1			
Permanent employment	people	1312	1148	164
Output	2.1			
Ongoing Operations	$M	602	805	- 203

Table 7.7 is included to demonstrate a one-year snapshot overview of the financial and economic outcomes of Hope Downs operations for both rail access options. The main estimated differences are:

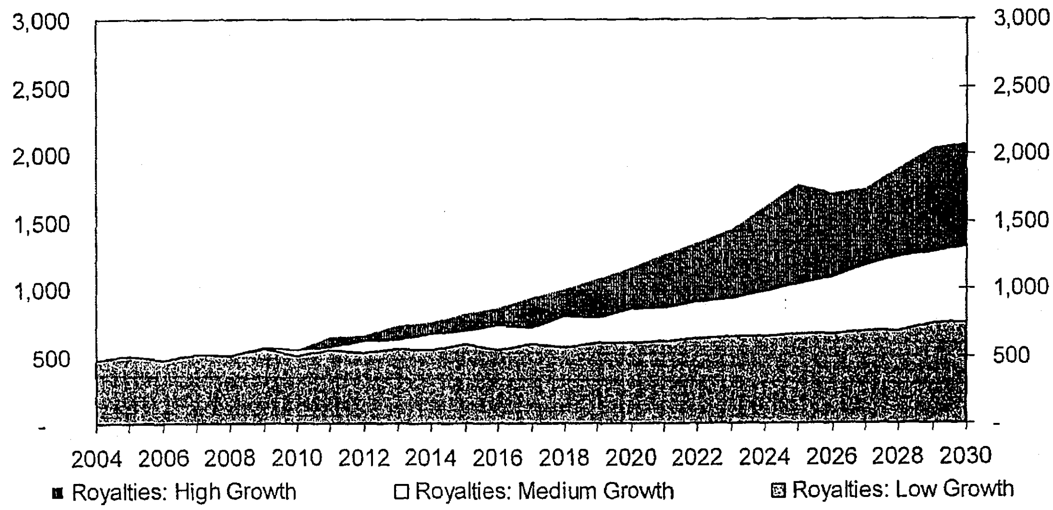
- *Cash operating costs would increase by $4/tonne railed due to fees paid to the rail owner under a third party access regime.*
- *An estimated additional 40 people would be directly employed under an owner operator regime, resulting in a total state wide employment increase of approximately 160 people.*
- *Capital and interest savings.*

7.2.7. Calculation of Western Australian Government Royalty Streams

The initial intention of this study was to calculate the differential WA Government royalty streams for the different rail regimes.

However given the conclusion that iron ore sales would not be significantly changed, in terms on both volume and price, such a comparison is not relevant.

Iron ore royalties will be an increasingly important component of State revenue. In today's dollars the royalty stream will increase by at least a factor of 2 if the Pilbara producers are able to maintain global market share and remain competitive in the world market.



Graph 7.4: Forecast Annual State Royalties from Pilbara Iron Ore Production in 2004 A$ Million