

STRATEGIC REVIEW OF THE BANDED IRON FORMATION RANGES OF THE MIDWEST AND GOLDFIELDS

This review consists of:

- Executive Summary and Actions Arising. Endorsed by Government.
- DEC report 'Banded Ironstone Formation Ranges of the Midwest and Goldfields - Interim Status Report - Biodiversity Values and Conservation Requirements'
- DoIR report 'Strategic Review of an Iron Ore Industry in the Yilgarn Region (With Focus on the Midwest)'



Department of
Environment and Conservation

Our environment, our future



Department of
Industry and Resources

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EXECUTIVE SUMMARY & ACTIONS ARISING

World demand for iron ore is forecast to increase significantly in the next decade, prompting the Pilbara based BHP Billiton and Rio Tinto to announce, separately, plans to raise capacity to over 300 million tonnes per annum (Mtpa) each and FMG to 60 Mtpa. Chinese demand in particular has encouraged smaller companies to explore for new sources of iron ore, such as the Banded Iron Formation (BIF) ranges in the Midwest Region.

Since 2002 the Environmental Protection Authority (EPA) has completed formal assessments on three BIF mining proposals in the region and is currently assessing another three. There are, in addition, a further three at the feasibility stage of evaluation and some 25 prospects under exploration.

With the large number of mining proposals in the region, the EPA and government face an increasing and difficult challenge in addressing cumulative impacts and in balancing the economic, social and regional development benefits, against high conservation values.

The significant biodiversity values identified on the BIF ranges require measures to protect representative areas and species and ecosystems that are restricted to the ranges, consistent with State, national and international commitments on biodiversity conservation. However, the high biodiversity values and conservation requirements and the possible uniqueness of each of the ranges in the Midwest, if assessed individually, have the potential to preclude, or severely curtail as to render unviable, mining of millions of tonnes of iron ore. Alternatively, the broadscale mining of BIF ranges would have a significant detrimental effect on biodiversity values, particularly in respect of species and ecosystems restricted to those ranges.

Under the Environmental Protection Act 1986, the EPA is limited to assessing only the environmental aspects of proposals placed before it and, traditionally, such proposals are assessed on a project by project basis. Any assessment, strategic or otherwise, based on wider principles of sustainability or the "triple bottom line" of environmental, economic and social costs and benefits, is the role of government. Similarly,

environmental matters beyond the impact of the project are outside of the Part IV project environmental assessment process.

This Strategic Review of the biodiversity values and iron ore prospectivity in the Midwest and Goldfields (within the Yilgarn Craton) was undertaken to provide an additional level of information to government to allow for a more strategic approach to resource utilisation and biodiversity conservation decision making. The region covered in the review is shown in Figures 1 and 2.

Integrated Results

The BIF ranges are of very significant biodiversity value as a consequence of their unique geology, soils and relative isolation. The value of the ranges relate to the presence of endemic plant species, rare and restricted plant species and highly restricted and distinct plant communities and ecological communities. The ranges are also very distinct features in the regional landscape and in many cases possess outstanding landscape values. They also have fauna conservation values although these are less well documented than for flora.

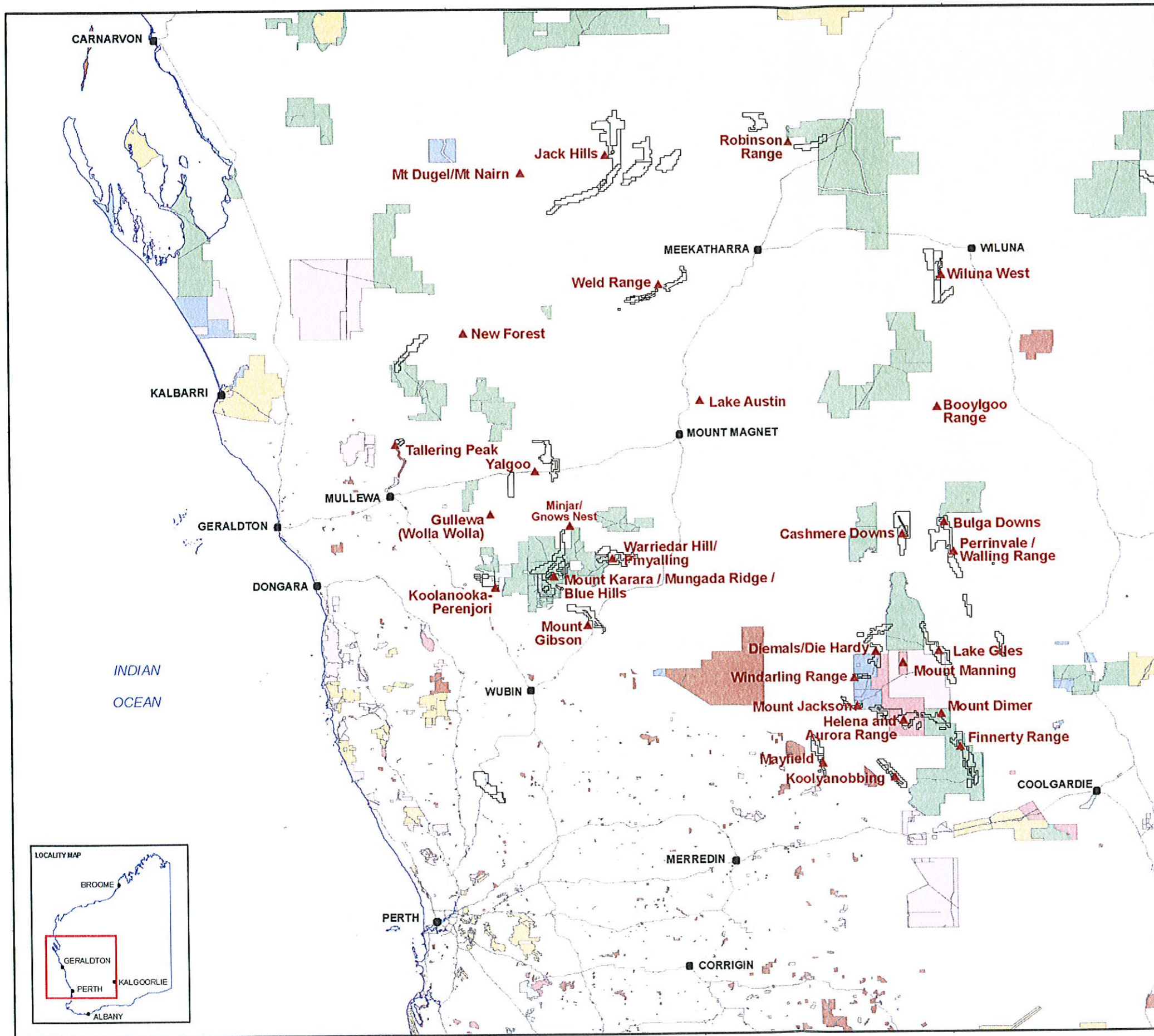
Indigenous heritage values of BIF ranges are not addressed in this review.

Implications for Economic, Social and Regional Development

Iron ore production in the region is at an early stage in its development, but is being shown to have very significant potential for the economic development and growth of the region and State overall. In addition to Portman's Koolyanobbing operation in the central Yilgarn, five significant projects have thus far been identified in the Midwest region that could amount to a combined investment of around \$7 billion. A further three 'starter' projects have come into production in the last few years.

In-ground resource value thus far defined is between \$45 billion and \$75 billion dependent on price forecasts. If these major projects were developed to their planned first phase of capacity, they could result in export revenues of \$3.6 billion to \$5.3 billion per annum with direct revenues to the State Government in the order of \$225 million to \$330 million per annum in royalties alone, plus payroll tax and other indirect returns through taxation income.

Figure 1. Banded Iron Formation occurrence in relation to Iron Ore mining tenements and Conservation estate in the Midwest and Goldfields



TOPOGRAPHIC FEATURES

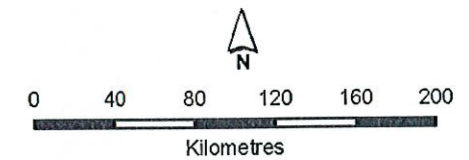
- Locality
- Principal road

CONSERVATION ESTATE

- National Park
- Nature reserve - A class
- Nature reserve - other class
- Conservation park
- Timber reserve
- Former pastoral leases purchased for conservation
- Pastoral leases to be DEC estate in 2015

MINING TENEMENTS

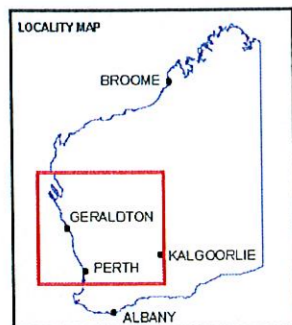
- Iron ore mining tenement



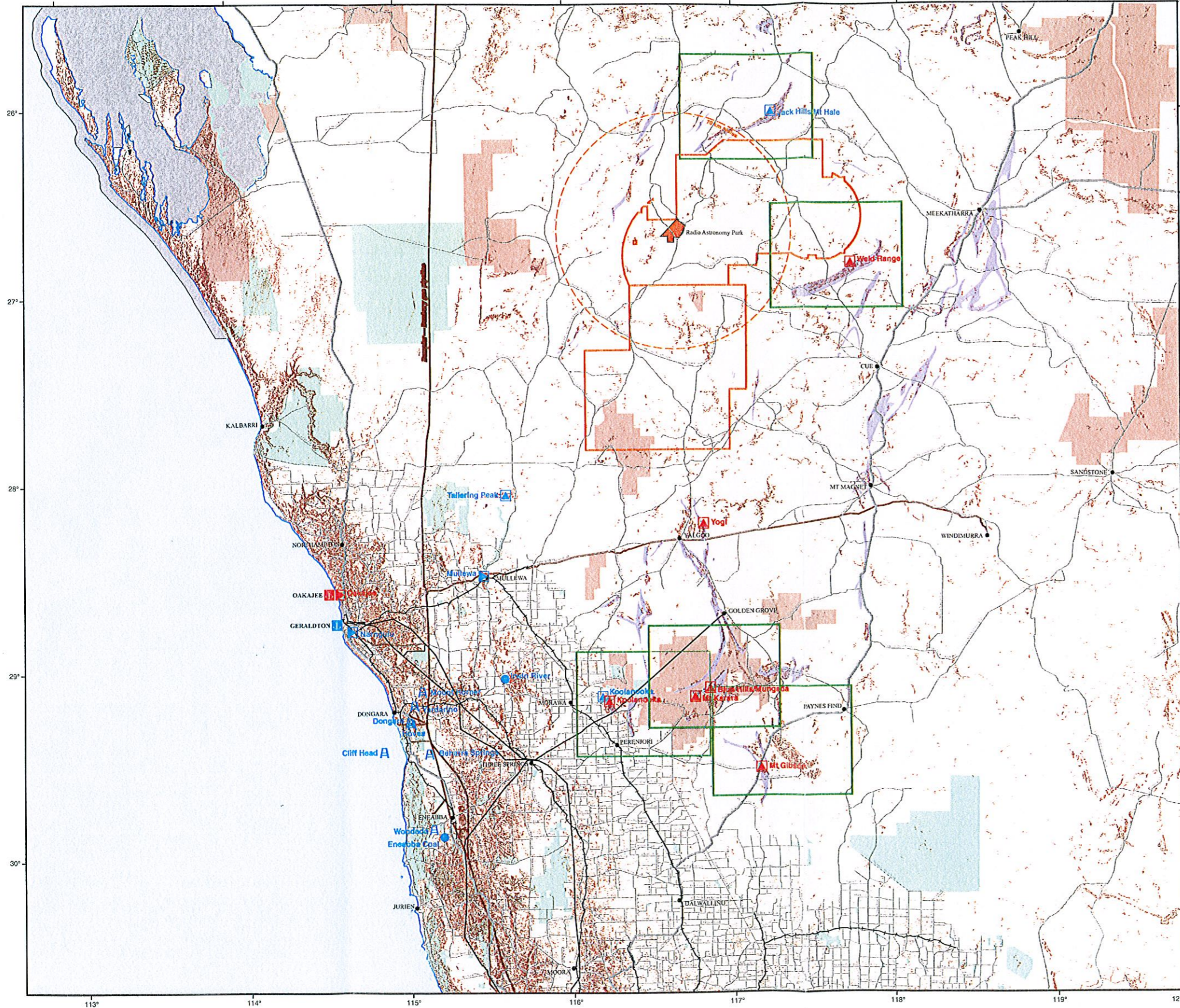
Produced by the GIS Section
under the direction of Keiran McNamara
Director General, Department of
Environment and Conservation.

| DATA DICTIONARY | | |
|----------------------|-----------|--------|
| Dataset | Custodian | Date |
| Localities | GA | 2004 |
| Tenements | DoR | Sep-06 |
| Conservation Estates | DEC | 2007 |
| Coastline | DEC | |

**IRON ORE MINING TENEMENTS
AND EXISTING AND PROPOSED
CONSERVATION RESERVES**



The Department of Environment and Conservation does not guarantee that this map is without flaw of any kind and disclaims all liability for any errors, loss or other consequence which may arise from relying on any information depicted.
Job Ref: Map4-tenements-conservation-A3, produced 3 September, 2007.

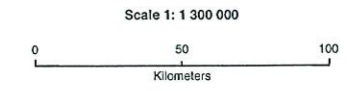


| Major Resources | Existing | Proposed |
|------------------|----------|----------|
| Ports | | |
| Industrial areas | | |
| Iron ore project | | |
| Coalfields | | |
| Gasfields | | |

- Conservation areas**
- CALM conservation reserves
 - CALM managed ex-pastoral leases
 - Shark Bay World Heritage Area

- Radio Astronomy Park**
- SKA radio telescope (Section 19)
 - 70 km radio quiet zone

- Localities and infrastructure**
- Localities
 - Railway
 - Major road
 - Minor road
 - Unsealed road or track
 - Gas pipeline
 - Powerline
 - Topographic ridges
 - Iron formations



UNIVERSAL TRANSVERSE MERCATOR PROJECTION
Map Grid of Australia Zone 50



**MID WEST REGION
POTENTIAL IRON ORE
INDUSTRY DEVELOPMENT**
(For discussion purposes only)

Iron ore trade already makes up 34% of cargo volume through Geraldton port. As a result of committed iron ore development plans, port capacity is being significantly expanded and there are plans for this to expand even further. However it is the triggering of the Oakajee port which is likely to have most impact for industrial development in the Midwest. The port development would provide the catalyst for the establishment of the Oakajee Industrial Estate. Not only is there the potential for iron ore based added value projects, but other heavy industrial projects.

Some "starter" or short lived stage 1 developments are proceeding, in many cases to provide the cash flow to fund a full scale, stage 2 development. It is the stage 2 projects which could bring the longer term benefits over a 20-30 year period. In addition to Mt Gibson, the other four major projects thus far identified in the Midwest region (Mt Karara Magnetite, Jack Hills Stage 2, Weld Range and Koolanooka Magnetite) as well as the Mungada Hematite are expected to be formally progressed through the environmental approvals process over the next 12 to 18 months. Triggering of the assessments of the major infrastructure development of the railway and Oakajee port should also be forthcoming in this period.

Major overseas companies are actively participating in and largely underwriting each of the significant developments and they are expressing frustration with time delays in accessing land, the slow speed of project development and the overall lack of certainty now emerging. A project-by-project assessment does not allow effective policies or strategies to be pursued. Given that major international owned enterprises are involved in the region's iron ore projects, an adverse "unanticipated" outcome for the more significant projects could impact on WA's – international business relationships. A number of major international companies could review their future investment in WA if the "rules of engagement" are not clarified upfront.

A clear statement of Government's policy position in respect to access to the BIF ranges for development is required to give confidence, on the one hand, that the significant sums being expended in exploration and feasibility studies are worthwhile and the major financing arrangements currently being put in place

can be brought to fruition through major project developments, and on the other hand, that the significant conservation values of BIF ranges will be adequately protected.

Decisions on the most advanced projects at Mt Karara/Mungada need to be made in the overall context of policies for all of the BIF ranges as they will create precedents and impact on the level of confidence for companies in being able to develop a significant sustainable iron ore industry in the Midwest. It needs to be noted, based on information that is currently available, that there are differences between the various BIF ranges in terms of their biodiversity conservation and mineral prospectivity/resource values.

Implications for Conservation

There is a strong case for conserving the unique and irreplaceable biodiversity values of the BIF ranges in situ within intact ecosystems. It is clear that the current approach to mining the BIF ranges has the potential to result in loss of unique communities and reduction in the populations of restricted plant species to the point where they will be under significantly increased threat of extinction in the wild. There is no clear understanding of the level of loss that can be sustained on the identified range communities without compromising the sustainability of the local ecosystems and their component species. The ranges are also very distinct features in the regional landscape and in many cases possess outstanding landscape values. Examples of the BIF landscapes need to be retained, both partially and in their entirety, for protection of their unique landscape and geodiversity values and for their tourism potential.

Unless appropriate guidance is in place there is a very high probability that, over time, none of the most outstanding range systems and very few of the remainder will be preserved intact. At present, of the 28 BIF ranges discussed in the review, two are in conservation parks and three are in former pastoral leases purchased for conservation but not yet reserved. None are in national parks or Class A nature reserves which offer the highest level of conservation security and protection from mining (i.e. Parliamentary approval required)

Expansion of the conservation reserve system in relation to BIF ranges will be required where high biodiversity values are designated for protection as a consequence of the formal project assessment process, or following further consideration of the Environmental Protection Act 1986 Section 16 (e) advice on the Mt Manning area or through reservation of pastoral lands already purchased for conservation or as an outcome of Government's consideration of this review. In this regard, if consideration was given to reservation as class A nature reserve or national park of BIF ranges identified as having the most significant biodiversity conservation values (eg the Helena-Aurora Range and the Mt Karara/Mungada/Blue Hills system) would provide a strong indication of recognition of the ranges' values.

Reservation of some of these most outstanding ranges would have potential implications for some sections of the iron ore industry.

Conservation and Industry Development

On current floristic information, Jack Hills and Weld Range have fewer environmental obstacles and should be able to proceed to development with minimal constraint and support the development of Oakajee Port. Both these ranges are quite extensive, and portions of them should be conserved in line with biodiversity conservation principles when the values are more precisely defined.

The south-west cluster of ranges (ie Karara/Mungada/Blue Hills, Mt Gibson, Koolanooka) present significant environmental impact assessment challenges because of their biodiversity richness. The Karara/Mungada/Blue Hills range system represents the most outstanding of these ranges and is worthy of full protection, however, development planning and environmental assessment of Karara/Mungada/Blue Hills is well advanced. Creation of a reserve category such as national park or Class A nature reserve over the entirety of this area at this stage would be inappropriate (notwithstanding that existing tenements would be honoured).

It will be important that mining approvals in these areas are coupled with conservation outcomes for appropriate parts of these ranges, as an outcome

of the environmental process. In regard to the partly mined Koolanooka Range, the remainder of this range is also worthy of full protection and may face significant environmental impact assessment challenges. The Koolanooka Ranges have two very significant magnetite deposits within their boundary.

In the south-east cluster (Mt Manning area), the Helena-Aurora Range is of the highest biodiversity significance and is at the exploration stage. Given the less advanced development planning and high biodiversity value, reservation as national park or Class A nature reserve could be considered (as recommended in EPA Bulletin No. 1256 'Advice on Areas of the Highest Conservation Value in the Proposed Extensions to Mount Manning Nature Reserve' (May 2007). The Bungalbin East area, is the focus of one exploration company's interest and any decision on this area in regard to Class A nature reserve should be deferred until further prospectivity information is available.

Based on current levels of knowledge **Table 1** outlines the intersection between biodiversity and prospectivity values. Further biodiversity information will be gathered as a consequence of proponent surveys and DEC funded surveys and accordingly information may come forward that will have further implications for projects and for the outcomes of EPA assessments. Similarly, exploration is an ongoing process which may result in other ranges being identified as having high prospectivity and a clearer definition within ranges of areas of resource significance.



Table 1

Intersection between biodiversity and prospectivity values

Lowest * Highest ***

Note: These ratings are purely relative and the lowest rating does not imply that biodiversity or prospectivity values in any individual range are of no significance.

| Range System | Stage | Biodiversity | Prospectivity |
|---|--|--------------|---------------|
| Jack Hills | Stage 1 mining. Part conservation | * | *** |
| Weld Range | Exploration. Part conservation | * | *** |
| Koolanooka | Partly mined. Scope for conservation | *** | *** |
| Mt Karara | Advanced mine planning | *** | *** |
| Mungada/Blue Hills | Advanced mine planning | *** | *** |
| Mt Gibson | Extension Hill approved | *** | *** |
| Helena & Aurora (including Bungalbin East) | Early exploration | *** | ** |
| Diemals / Die Hardy Range | Early exploration | ** | ? |
| Mt Manning | Exploration | ** | ? |
| Mt Jackson Range | Partly mined | *** | *** |
| Koolyanobbing Range | Extensive mining. Most conservation potential lost | *** | *** |
| Windarling Range | Partly mined. Significant impacts | *** | *** |
| Mayfield | Exploration | * | ? |
| Minjar/Gnows Nest | Exploration | * | ? |
| Mt Dimer | Exploration | * | ? |
| Tallering Peak | Partly mined | * | ** |
| Warriedar/Pinyalling | Exploration | * | * |
| Booylgoo Range | Exploration | ? | * |
| Bulga Downs | ? | ? | ? |
| Cashmere Downs | Exploration | ? | ? |
| Gullewa/Wolla Wolla | ? | ? | ? |
| Lake Giles | ? | ? | ? |
| Lake Austin | ? | ? | ? |
| New Forest (inc Twin Peaks) | Exploration | ? | ? |
| Perrinvale/Walling Range | Exploration | ? | ? |
| Robinson Range | Exploration | ? | ? |
| Wiluna West | Exploration/preFS | ? | *** |
| Yalgoo | Exploration/preFS | ? | ** |

?- Further investigation/exploration required. Limited information to date

MAJOR FINDINGS

There are significant biodiversity and mineral resource values in the banded ironstone ranges of the Midwest and Goldfields but that for many individual ranges, the mineral prospectivity is little or only partly defined and the knowledge of conservation values is not complete in both a detailed and regional context.

Under present known conditions, the current mining operations largely underpinning the economic and employment base of the Midwest, appear to have a limited foreseeable life.

The establishment of a significant iron ore industry in the Midwest would deliver substantial economic and social benefits to the Midwest Region and the State.

Without an appropriate framework for decision making, State commitments to biodiversity conservation will become increasingly difficult to meet in regard to banded iron ranges and the environmental approval process for developers will become increasingly problematic.

The development of substantial iron ore mines in the Jack Hills and Weld Range would be needed for the establishment of the Oakajee Port and associated infrastructure and this should be achievable in the light of current knowledge of biodiversity values (these ranges are quite extensive and that an adequate level of conservation of values can also be achieved taking into account the key principles. The Mt Karara, Mungada/Blue Hills and Koolanooka projects are likely to sustain the economic viability of Oakajee.

The BIF ranges located within the 'south west' cluster (i.e. Mt Karara/Blue Hills/Mungada, Mt Gibson and Koolanooka) have very high biodiversity conservation values, as well as advanced highly prospective project development proposals and strategic interests in regional development terms. Proposals relating to the Mt Karara, Mungada and Blue Hills range system are currently in the *Environmental Protection Act 1986* assessment process and Government will need to consider the economic and social benefits in the final decision-making process. The Mt Gibson Ranges have been the subject of a recent Ministerial decision with respect to development and conservation.

The BIF ranges located within the 'south east' cluster (Mt Manning Area) (i.e. Helena-Aurora, Mt Manning, Mt Jackson, Mt Windarling, Diemals/Die Hardy Ranges and Koolyanobbing Range) are still insufficiently explored to adequately assess prospectivity but have been the subject of EPA Bulletin No. 1256 'Advice on Areas of the Highest Conservation Value in the Proposed Extensions to Mount Manning Nature Reserve' (May 2007) which identifies very high conservation values.

ACTIONS ARISING

As a result of this Strategic Review, Government will provide the confidence for mining, investment, community and conservation interests by demonstrating its support for the establishment of an environmentally acceptable long term iron ore industry base in the region by endorsing a framework that:

- commits to sustainable economic, social and environmental outcomes in respect to development proposals and conservation needs in the banded iron ranges;
- provides for reservation as Class A conservation reserves (i.e. national parks, nature reserves or conservation parks) over appropriate areas of banded iron ranges;
- provides clear indications that the Government is pre-disposed to the development of key strategic iron ore resources needed to underwrite and sustain the proposed Oakajee Port and related infrastructure;
- provides guidance to the EPA and decision-making authorities for the remaining ranges, including the objective of achieving appropriate conservation outcomes in high conservation value Midwest Ranges currently undergoing assessment.
- provides adequate opportunity for further evaluation of prospectivity and conservation values to allow for informed decisions on land use.

Consistent with this framework the Government:

- (i) commits to the creation of Class A nature reserves or national parks over the Helena-Aurora Range, Die Hardy Range and Mt Manning Range (as generally recommended in Bulletin No 1256), with an indicated pre-disposition against development of these ranges,

- (ii) indicates its predisposition towards development over areas of
 - Jack Hills
 - Weld Range
 - Tallering Peak
 - Yalgoo
 - Wiluna West

where substantial iron ore resources are identified and are required to sustain a long term mining industry while also providing for an adequate level of conservation of their biodiversity values.

- (iii) indicates a predisposition that in the interests of sustainable economic development in the highly biodiverse Karara/Mungada Blue Hills area, to allow the development of the identified magnetite resource in the south west section of the range but the Government is not predisposed to the extraction of the hematite deposits of the area.

- (iv) further considers both the economic and biodiversity values present in the Koolanooka Hills when projects in this area come forward for assessment

- (v) indicates its intention to place the
 - Booylgoo
 - Bulga Downs
 - Cashmere Downs
 - Perrinvale
 - Wailing
 - Warriedar/Pinyalling
 - Wolla Wolla
 - Lake Austin
 - Bungalbin East

ranges into an appropriate reserve status (e.g. conservation park or nature reserve not of Class A) that will facilitate ongoing assessment of both biodiversity and prospectivity with a view to reviewing that status in 3 years in light of increased knowledge at the appropriate time.

- (vi) agrees that an updated strategic review of available information on biodiversity and mineral resource values in three years will make more specific recommendations for conservation reserves across the remaining

BIF ranges in the Midwest and Goldfields regions. with development proposal in these areas put forward in the interim to be considered on a case by case basis as required and with reference to the key principles.

Further, the Government will draw to the EPA's attention the Government's predisposition, as set out above, that exploitation of appropriate iron ore resources should be carried out sustainably by ensuring that critical thresholds for conservation of biodiversity are recognised in the consideration of development proposals and that best practise environmental management and mitigation programmes are committed to by developers.

The following conservation principles and guidance should be taken into account in environmental assessments and the provision of advice to Government:

Key Principles

- (i) No development activity to proceed in the Yilgarn Craton BIFs that would result in the IUCN Threat Category of any given plant or animal taxon increasing ie. initially not being listed as threatened under any category to being listed (the three IUCN categories for threatened species being Vulnerable, Endangered and Critically Endangered), or increasing from Vulnerable to Endangered, or from Endangered to Critically Endangered.
- (ii) No development activity to proceed in the Yilgarn Craton BIFs that would result in the IUCN Threat Category of any ecological community increasing from not being listed as threatened under any category to being listed, or where already listed (or qualifying for listing) as a TEC, having its actual or recommended Threat Category increased (i.e. from Vulnerable to Endangered or from Endangered to Critically Endangered).
- (iii) 15% - 30% of the total number of ranges should be reserved in their entirety, protecting complete examples of the landform and ecosystem. Examples of the most outstanding BIF ranges should be protected in their entirety where development has not significantly progressed, e.g. the Helena-Aurora Range (consistent with recommendations in EPA Bulletin 1256). The initial objective should be

to conserve 15% of ranges in their entirety. The DEC has completed 2 years of a 3 year flora survey program, and, when completed, a review should be undertaken to further define the list of ranges requiring reservation in their entirety, with the objective of achieving at least the 30% target.

Guidance

- (iv) Conservation reserves should include at least 60% of largely contiguous ecosystem/habitat for each of the key banded ironstone species and ecological communities which are restricted to the BIF ranges.
- (v) Subject to key conservation principles i and ii, identified above, an objective of detailed mine-site planning and assessment should be to maximize the protected area of any floristic community identified by detailed flora survey to be restricted to the BIF, or dependent on the BIF for its conservation. This would indicate that no development should occur in those floristic communities that are likely to be significant for the maintenance of long term viability of threatened species and threatened ecological communities
- (vi) Landscape, geodiversity, Aboriginal Heritage values and potential for nature based tourism should be taken into account in developing a reserve system. State, National and International assessment methodologies and criteria should be used for identifying areas of significant landscape, geodiversity, Aboriginal Heritage values and tourism potential for protection.

To support this work the Government will fund, in collaboration with industry, the completion of a major programme to fully define the overall regional conservation values and notes that industry is and will continue research into the mitigation of impacts and rehabilitation.

NOTE: Nothing in these undertakings derogates from the operation of the *Environmental Protection Act 1986* and consideration of proposals by the EPA.