3

PUBLIC**ENVIRONMENTAL**REVIEW

project rationale and alternatives

3 Project Rationale and Alternatives

3.1 Rationale

Karara Mining Limited's (KML's) Karara Iron Ore Project (KIOP) proposes to supply 12 Mtpa of magnetite concentrate as feedstock to Anshan Iron and Steel Group Corporation's (AnSteel's) steel-making facilities in China which will incorporate a jointly owned pellet plant. AnSteel is developing a new, fully integrated steelworks at Bayuquan near the Port of Yingkou, located on the northeast coast of China. AnSteel is also significantly enhancing the operational performance of its current steelworks at Anshan City, 100 km inland from Yingkou.

The main factors driving the KIOP are summarised below, all of which reflect those mentioned in the Government of Western Australia's "*Strategic Review of the Conservation and Resources Values of the Banded Iron Formation of the Yilgarn Craton"* (Government of Western Australia 2007):

- the Karara iron ore deposit is substantial and of high quality - thus maximising long-term production and economic benefits relative to the investment and environmental impacts incurred;
- the demand for iron ore is rapidly expanding in the Chinese steel industry. This demand arises from sustained, strong economic growth within China as well as a robust export market for steel. In 2007 alone, a large proportion of the Western Australian iron ore industry was predominantly driven by the strong demand from China's rapidly growing steel industry. Western Australia produced over 250 Mt of iron ore, accounting for 98% of Australia's production (DoIR 2007). It is predicted that demand will continue to increase and will drive the Western Australian iron ore industry to continue to expand capacity (The Economist 2008);
- AnSteel's desire to diversify the supply of iron ore to its steel-making facilities; and
- AnSteel's desire to develop a long-term, reliable customer/supplier relationship with a well-positioned, strategic partner. Although Australia is currently the third largest producer of iron ore, behind China and Brazil, it still maintains a major advantage over its main competitors through its large, high quality, accessible deposits, a stable legal and political environment and proximity to major markets in Northeast Asia (Commonwealth of Australia 2006; DITR 2006).

3.2 Benefits of the Proposal

The KIOP will involve a number of impacts (both positive and negative) to the biological, physical and socio-economic environment of the project area, the region and the nation. The project has been designed to minimise or avoid potential adverse impacts, and to optimise benefits, as discussed in this PER.

The predicted benefits of the project are summarised below.

Increase in employment

The construction phase will require a workforce of approximately 1,500 people. The operation phase employment is estimated to be approximately 500 people plus up to an additional 80 people during periods of maintenance shutdown. These will result in a flow-on effect and boost employment in the businesses that provide goods and services to the different phases of the project in the Mid-West Region.

Increase in Gross State and Regional Product

Economic modelling predicts an increase in Gross Regional Product (GRP) for the Mid-West Region. In the 2008-09 financial year, GRP is estimated at $113 million rising to $636 million by 2019-20. At the State level for the same intervals, the forecast rise in Gross State Product (GSP) for Western Australia is $181 million rising to $736 million by 2019-20.

Economic Diversity

At the local level, the development will broaden the economic base of the Shires of Perenjori and Morawa, which currently rely predominantly on agriculture. The proposed development will also broaden business and employment opportunities within the Mid-West Region, and will diversify the State's industrial and economic base away from the Perth Metropolitan, Goldfields, South West and Pilbara regions.

Government Revenue

Revenue to local shires will increase through direct and indirect effects, such as an increase in local population leading to increases in rate revenue, over and above the direct payment of rates associated with the project infrastructure. The key revenue benefits are at the state level, with the Western Australian Government likely to receive in the order of $43 million per annum in royalties and approximately $4 million per annum in payroll tax, as well as other state taxes and charges. The Commonwealth Government will also receive a boost to revenue primarily in the form of company taxes, income taxes and goods and services tax (GST).

3.3 Project Alternatives

A number of alternatives were initially investigated to identify the most sustainable minesite design. The minesite design and alternative operational establishment options considered are presented below.

3.3.1 Minesite Location

The minesite is located within a tenement area that KML has secured. The mine pit is located at the economic concentration of iron ore on the Karara Ridge. This and other regional ridges exist due to the fact that they are a hard Banded Iron Formation (BIF) surrounded by softer shale rock. The BIF units contain varying amounts of iron ore, some being of sufficiently high concentrations of contained iron to be economically viable to mine.

3.3.2 Open Cut Mining or Deep Mining

Open-cut mining is the preferred method of extracting the Karara iron ore deposit, as the iron ore occurs relatively close to surface. Underground Mining is not an economically viable alternative at this time.

3.3.3 Water Supply Options

The KIOP requires a reliable supply of fresh water, which cannot be sourced in the immediate project area. Consideration was given to the possibility of an alliance with an adjacent iron ore developer in the region, Asia Iron, to obtain water from a borefield in the Tathra sub-area of the Arrowsmith Groundwater Area. However, there was insufficient water to be allocated to both projects. Following advice from the Department of Water (DoW), KML investigated locations in the Twin Hills and Mingenew sub-areas of the Arrowsmith Groundwater Area. Rockwater (a hydrogeological consultancy) planned and supervised the drilling and pump testing of one bore in each sub-area and modelled the results. Subsequently, DoW has advised that in line with potential changes to its water allocation policies, the department will only consider allocation of water from the Twin Hills sub-area to support KIOP's full water requirements. Consequently, KML is now focussing efforts on securing water from the Twin Hills sub-area and is progressing licenses to conduct more drilling.

3.3.4 Product Transportation by Road or Slurry Pipeline or Rail

While capital outlay for rail and slurry are similar and the operating cost of slurry transportation is significantly less than rail and road transport, rail transport has been selected for transport of product to the export Port for several reasons, including the:

- potential for rail to carry a variety of mineral products, whereas a slurry pipeline can only transport highly processed, finely ground product;

- ability of rail to provide incremental expansion in transportation capacity, where a slurry line is at or near its operational capacity upon construction; and
- potential for rail to provide regional benefits and possible use by others, where a slurry pipeline is an exclusive use option only.

Transportation of iron ore by road is the most expensive form of transport and creates a significant impact for other road users (from dust, noise, accident risk and visual amenity) if used on a long term basis, and is therefore not considered as a viable long term option in this instance.

3.3.5 Dry-stacked Tailings or Wet Tailings Disposal

In an endeavour to advance water consumption efficiency beyond prior industry achievements, KML intends to implement the best practice technique of dry-stacked tailings in lieu of conventional wet tailings disposal. Dry-stacked tailings involve the dewatering of tailings via filtering equipment; followed by mechanical transportation of tailings in solid form by conveyor or truck to a tailings storage facility (TSF). The material within the facility is in a dewatered state, and has the integrity to be stacked in similar fashion to a conventional rock waste dump albeit with a smaller average particle size.

Traditional wet tailings disposal involves the transportation of a tailings-water slurry by pipeline to a tailings dam, where tailings settle out and some of the transporting water is clarified and returned to the processing plant for reuse.

The advantages of the dry-stacked tailings (technique) over wet disposal are:

- recognition that dry-stacked tailings is considerably more water efficient;
- dry-stacked tailings requires significantly less land area per tonne of tailings solids;
- dry-stacked tailings minimises or removes the infiltration issues of wet tailings; and
- dry-stacked tailings provide a stable land-form upon deposition.

Dry-stacked tailings disposal for iron ore tailings is new technology now in some use in the Americas. The practice is yet to be undertaken on a commercial basis in Australia and yet to fully demonstrate water efficiencies and overall economic benefits when applied in the local geographical and climatic conditions. KML is confident in the ability of this technology to effectively apply to the KIOP conditions. However, KML maintains that the option of wet tailings disposal is the fall back position for tailings disposal for the project should dry-stacked tailings fail to be effective.

At the time of this PER preparation, KML is investigating the applicability of a mechanised system for transporting and stacking dewatered tailings in lieu of conventional truck transportation. The system entails the use of a combination of fixed, moveable and mobile conveyors. The ultimate mobile conveyor unit has a self-unloading device called a 'tripper' which travels up and down the conveyor removing material from the belt and stacking it uniformly to the TSF. The advantages of mechanised transportation and deposition are a significant reduction in diesel fuel use, total energy consumption, tyre consumption and greenhouse gas emissions through replacement of trucks with electrically-driven energy efficient conveyors.

Mechanised materials transport and stacking systems are yet to be employed on a commercial basis in Australia. Mechanised stacking is a preferable option, however KML maintains that conventional truck transport is the fall back position for tailings transport, should the investigation of mechanised transport and stacking prove inappropriate.

3.3.6 Accommodation Village and Airstrip Location within DEC Station

Due to the relative isolation and scale of the KIOP, an accommodation village and airstrip are planned to be established in close proximity to the mine and processing plant. Consideration has been given to locating these facilities further from the mine, outside the area of former pastoral leases purchased by DEC. Such siting was considered inferior from a worker safety and logistical perspective. After mining and processing ceases the accommodation village and airstrip will be removed and rehabilitated unless an alternative arrangement for their retention is reached with the State Government and or local Shire.

3.3.7 Power Supply Options

KML has considered the use of gas fired generators in the pre-selection process. It was found that the price of gas was prohibitively expensive and that long term supply arrangements were not able to be secured, potentially compromising the future of operations. Additionally, the associated infrastructure needed for a gas fired generation solution would require significant connection pipeline/transmission to connect to the Dampier/Bunbury Natural Gas Pipeline where the closest connection point is located approximately 180 km from the project.

3.3.8 In-pit Crushing vs Haul Out of Pit

At the time of this PER preparation, KML is investigating the applicability of moveable primary crushers for the KIOP. In-pit crushing has the potential to improve both the economic and environmental performance of the operation, as it has the potential to be more energy-efficient than trucking. This method is being considered as an alternative to 'haul to surface' truck haulage required for fixed installations.

Moveable crushers employ the same technology for crushing as fixed installations, however, the structure of the crusher is free standing and relocatable. This ability allows the crusher to be relocated periodically so as to maintain proximity to the active mining face as it moves. Through this, a significant reduction in the number of trucks required is achievable, compared to the number that would otherwise be needed as the pit deepens and mining faces become more distant from a conventional fixed crusher location. Crushed material is still delivered to the crusher by truck, but then transported from the crusher to surface and onto the processing facility via conveyor belt instead of being trucked all the way to the surface.

The advantages of moveable crushers are a significant reduction in diesel fuel use, total energy consumption, tyre consumption and greenhouse gas emissions through the replacement of trucks with electrically-driven energy efficient conveyors.

The base case for the project involves truck haulage to a fixed crusher adjacent to the processing plant. KML will investigate the applicability of this technology as more detailed engineering design is undertaken.