

EARTH

Resources

INFORMATION SHEET

EMERGING NEW RESOURCES FOR WORLD CLASS IRON ORE AND STEEL PRODUCTION IN SOUTH AUSTRALIA

INTRODUCTION

South Australia is arguably the birthplace of the Australian iron ore and steel industry, and continues to play an important role as an iron ore and steel producer. Its iron-rich rocks are classified into six deposit types - residual, chemical sedimentary iron formations, Fe-skarn and, of lesser significance, hydrothermal, clastic and magmatic.

Production has been overwhelmingly from the high-grade residual deposits in the Middleback Range of northern Eyre Peninsula. These deposits were the main source of ore for Australia's iron and steel industry from 1915 to the early 1960s, until the Federal Government lifted the export embargo on iron ore which subsequently led to production from the Pilbara, commencing 1966, and iron ore exploration in South Australia declining. It was not until ~1985 that the search for iron ore in this State recommenced. During 1995-96, the Office of Minerals and Energy Resources and BHP outlined large low-grade and limited high-grade iron resources. The success of this exploration highlighted the potential for further major discoveries in very extensive banded iron formation (BIF) horizons throughout the Gawler Craton.

GAWLER CRATON

This stable region of Archaean to Mesoproterozoic crystalline basement extends over almost half the State. Regional aeromagnetic and geological surveys have shown that the Craton hosts two very extensive BIF sequences, which are sparsely exposed and generally overlain by thin soil and flat-lying younger sediments. The older BIF sequence occurs in the southern, central and western parts of the Craton. These Archaean rocks contain BIF generally <50 m thick with

discontinuous strike lengths of up to 500 m.

The younger (~1900 million years old) Palaeoproterozoic BIF units are most extensive in the eastern and northern parts of the Craton. These are up to 700 m thick, persist along strike for up to 25 km, and include Peculiar Knob, Hawks Nest, Giffen Well, Wilgena Hill and the Middleback Range. In terms of high-grade iron ore potential, the contiguous strike extent of aeromagnetic features associated with Hawks Nest and Giffen Well is similar to that of the Middleback Range, e.g. Iron Duke has a strike length of 2220 m and a maximum width of 180 m (Figure 1).

IRON KNOB AND MIDDLEBACK RANGE

The residual deposits in the Middleback Range are of Palaeoproterozoic age, with the larger deposits at Iron Monarch, the Iron Baron Mining area and Iron Duke having collectively yielded more than 200 million tonnes (Mt) in 85 years of mining. They occur in a discontinuous series of north-south-orientated hills and ridges on northeastern Eyre Peninsula, 40 km west of Whyalla (Figure 2). These extend for 40 km from Iron Knob in the north to Iron Duke in the south, and rise to a maximum height of 250 m above the surrounding plains. The current production of 2.7 Mt/year is from Iron Duke and neighbouring deposits at Iron Duchess and Iron Knight. The total remaining proven reserves are 26 Mt.

High-grade iron ore has been mined from three areas:

- Northern Iron Knob area that includes the Iron Knob, Iron Monarch and Iron Princess deposits
- Central Iron Baron area comprising the Iron Baron, Iron Prince, Iron Queen and Iron Cavalier deposits

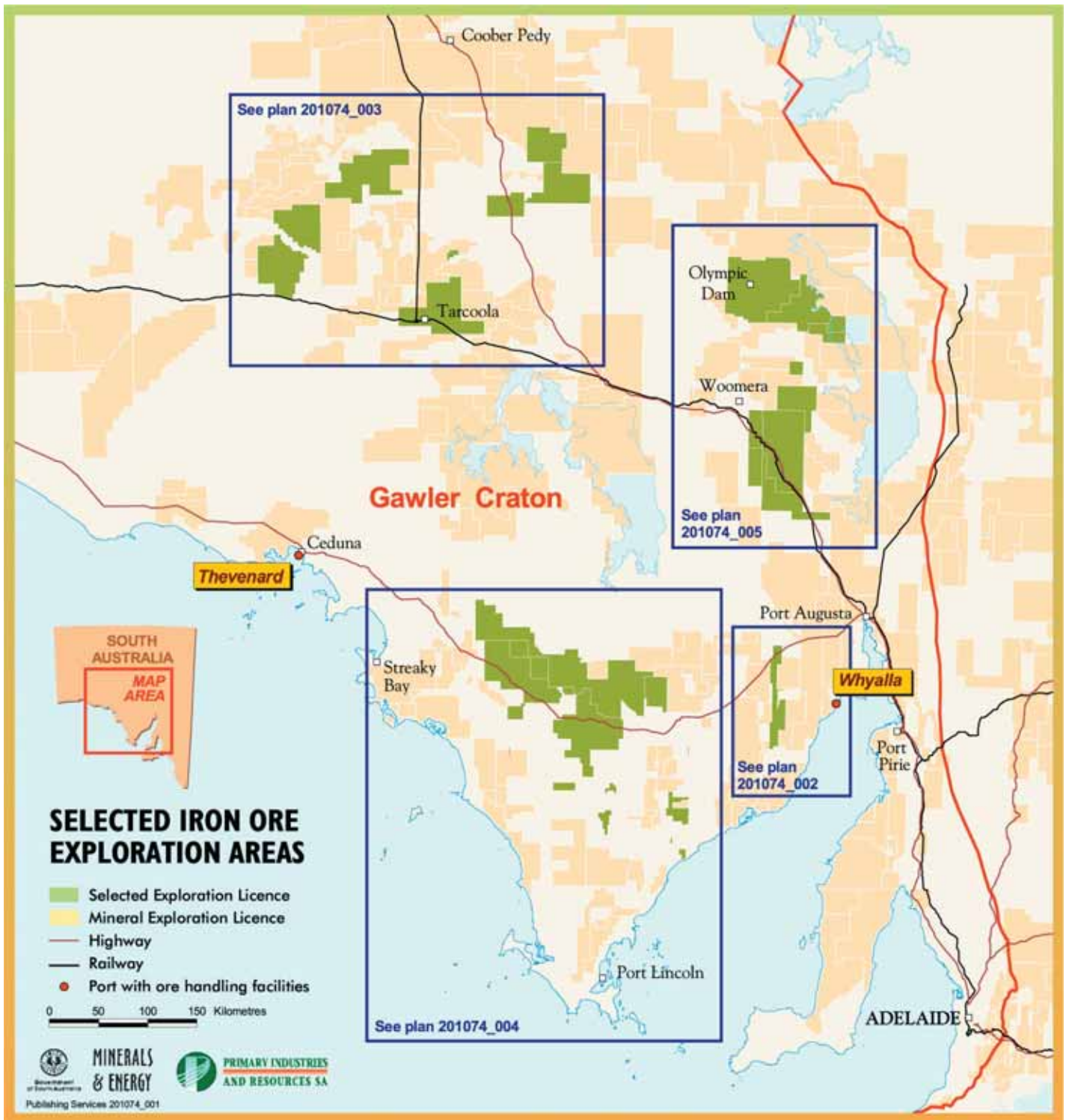


Figure I Selected Iron Ore Exploration areas on the Gawler Craton.

- South Middleback Range which includes the Iron Duke, Iron Duchess, Iron Knight and Iron Chieftain deposits.

In general, total iron within the Lower Middleback Jaspilite exceeds 20%, averaging 32–37% in the South Middleback Range but increasing to 61–68% in haematite orebodies. High-grade haematite resulted mainly from supergene enrichment of carbonate ore, carbonate-facies BIF and silicate-facies BIF. Most high-grade deposits are contained in shallowly north and south-plunging synclinal keels.

The vast resources of lower grade ore which extend over the 40 km long Iron Knob – Middleback Range zone have not been exploited but are on a scale that rivals North American taconite resources which continue to provide quality iron ore to the world steel industry.

ONESTEEL

Exploration and Mining licences held by OneSteel Ltd
Website: www.onesteel.com.au.

OneSteel operates open-cut mines in the Middleback Range, e.g. Iron Duke and Iron Duchess, to produce ore for the Whyalla pellet plant and blast furnace. Some is also shipped to Port Kembla and Newcastle New South Wales, in the form of blended fines and pellets.

Iron Duchess Magnetite Project — the magnetite reserve is located in the South Middleback Range, ~50 km from Whyalla. OneSteel is currently mining high-grade haematite from its South Middleback Range mines and processing to steel in the Whyalla Steelworks. The magnetite ores are located under the existing mines and generally occur within existing mining licences.



Figure 2 Onesteel's mineral leases over the Middleback Ranges

Current infrastructure includes a water supply pipeline and rail line to Whyalla. Shipping facilities at Whyalla are currently restricted to ~50 000 t.

Feasibility studies undertaken between 1990 and 1993 to assess the potential of producing a high-grade iron ore concentrate from low-grade magnetite-bearing rock types located at depth between the Iron Duchess and Iron Duke high-grade haematite ore deposits concluded that Iron Duchess contains a large resource of magnetite-bearing rocks which can be beneficiated to produce high-grade concentrate suitable for either pellet or sinter production.

The company is currently undertaking a \$6 million feasibility

study into expanding its mining operations at the South Middleback Range by utilising the magnetite orebody for the Whyalla steelworks and selling the remainder of the haematite ore overseas. A positive outcome to the study will enable OneSteel to expand and start exporting iron ore, i.e. marketing bulk iron ore and iron ore pellets to the Asian Iron and Steel industry.

Resource status as at the end June 2002

Total Iron Ore Resources	71.3Mt
Total Magnetite Mineral Resource	300 Mt

The resource estimate includes all rock types with a mass recovery of >30% (concentrate) but includes no consideration of whether the ore is minable or whether a sufficiently high-grade concentrate can be produced.

MAJOR GAWLER CRATON IRON PROSPECTS

Hawks Nest

Farm-In Exploration licence held by Felix Resources. In agreement with Minotaur Resources.

This prospect, ~115 km south-southeast of Coober Pedy, is an extensive Palaeoproterozoic BIF comprising scattered low outcrops with up to 20 m of cover; an aeromagnetic anomaly associated with the BIF horizons extends for ~20 km.

Three types of iron ore are indicated from drilling:

- Low-grade magnetite-BIF bodies 150–500 m wide occur as unoxidised sections of the BIF horizons; modeling of ground magnetic and gravity data indicates a depth extent of 500–1000 m. An inferred resource of ~600 Mt at 35–40% Fe occurs to 100 m below the level of oxidation in six deposits. The average composition of the largest magnetite-BIF body (Kestrel) is 36% Fe, 38% SiO₂, ~1% alumina and 0.06% phosphorus.
- High-grade magnetite zones such as the 30 Mt Kite body with drill intersections of 34–69.3% iron, with an average 50.5% over a 150 m width. A high-grade, 24 m thick magnetite body intersected in the 220 Mt Kestrel body averages 67.2% Fe, 3.22% SiO₂, 0.40% Al₂O₃ and 0.05% P, and represents direct-feed magnetite ore.
- High-grade haematite, such as the Buzzard body, is a tectonically brecciated BIF. Drill intersections range from 48.6 to 67.2% Fe with an average composition of 60.2% Fe, 1.4% Al₂O₃ and 0.03% P. This body represents direct-feed haematite ore, with an inferred resource of 6.7 Mt to 100 m below the oxidation level.

Preliminary beneficiation and comminution testing carried out on several magnetite-BIF (35–40% Fe) deposits from the Hawks Nest prospect indicates that a high-grade product (+60% Fe) can be produced, thus rendering the low-grade deposits economic. The concentrates will be suitable for the Ausmelt process and may be readily saleable on the world market as a premium iron ore feed.

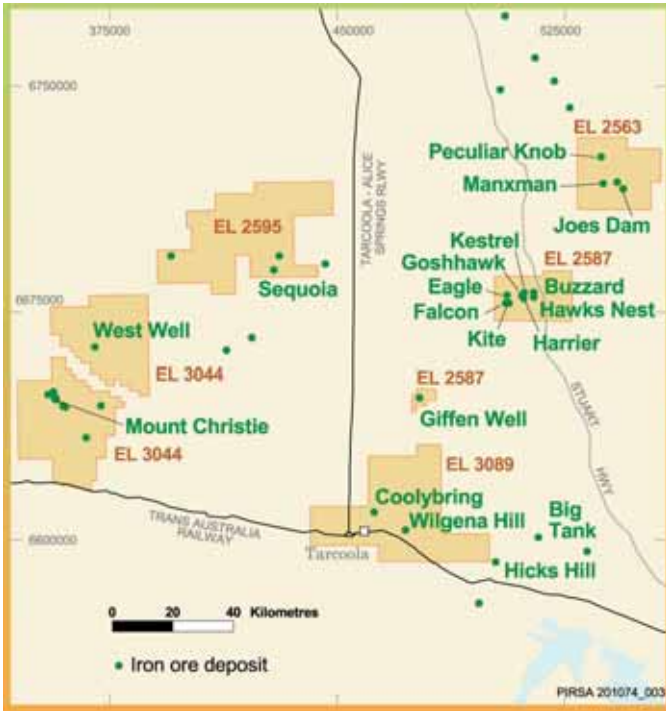


Figure 3. Shows the Mineral Leases held by Felix Resources and other Gawler Craton iron ore prospects.

Giffen Well

Farm – In Exploration licence held by Felix Resources in agreement with Minotaur Resources.

Website: www.aironenergy.com.au

This is another Palaeoproterozoic BIF which occurs as scattered outcrops along a gentle topographic rise ~140 km south of Coober Pedy. The associated aeromagnetic anomaly is 6 km long. Gravity and drilling results indicate that near-surface BIF, with a depth extent of 500–1000 m and 150–240 m width, is confined to a strike length of ~3 km. An inferred resource of 240 Mt to 100 m below the level of oxidation has been defined, averaging 36.55% Fe, 43% SiO₂, 0.11% Al₂O₃ and 0.08% P.

Peculiar Knob

Retention licence held by Felix Resources.

Website: www.aironenergy.com.au

A further Palaeoproterozoic BIF, completely concealed by 10–30 m of recent sediments, occurs 85 km southeast of Coober Pedy. Ore comprises specular haematite with minor remnant banding and some residual magnetite. The ore is 15–36 m thick, dips steeply to the northwest, and is well defined by associated magnetic and gravity anomalies. The inferred resource of 14 Mt at 63.2% Fe with low alumina (0.09–0.18%) and phosphorus (0.01–0.02%) occurs over a length of 1000 m and to a depth of 100 m below cover. The deposit is open along strike and at depth.

Sequoia

Retention licence held by Felix Resources.

Website: www.aironenergy.com.au

An Archaean BIF, ~105 km south-southwest of Coober Pedy, lies beneath a gentle topographic high ~1000 m long, 200 m wide and rising 15 m above the surrounding plain, with up to 10 m of recent cover. The magnetite-BIF zone has a well-defined magnetic and gravity expression. There are typically two magnetite-rich zones up to 45 m wide, which vary laterally in width and grade. The deposit contains an inferred resource of 20 Mt to 100 m below the level of oxidation at an average 28% Fe.

Warramboe Iron Project

Exploration licence held by Adelaide Resources NL.

Website: www.adelaideresources.com.au

The project area on northern Eyre Peninsula, which covers extensive Archaean iron formations occurs as coarse-grained magnetite-bearing gneiss. The cumulative strike length, estimated from aeromagnetic data, is at least 50 km (Figure 4).

Following a limited exploration and metallurgical test-work program completed in 2000, the Warramboe Iron Project shows potential for development into a substantial mining operation producing magnetite concentrates which, when pelletised, would have chemical specifications suitable for sale into both the blast furnace and DRI markets.

Three magnetic targets (Murphy, Dolphin and Collins) have been drilled, and substantial intervals of magnetite-bearing gneiss were intersected in all holes. Iron grades at Murphy and Dolphin are demonstrative of a magnetite content in the order of 25%.

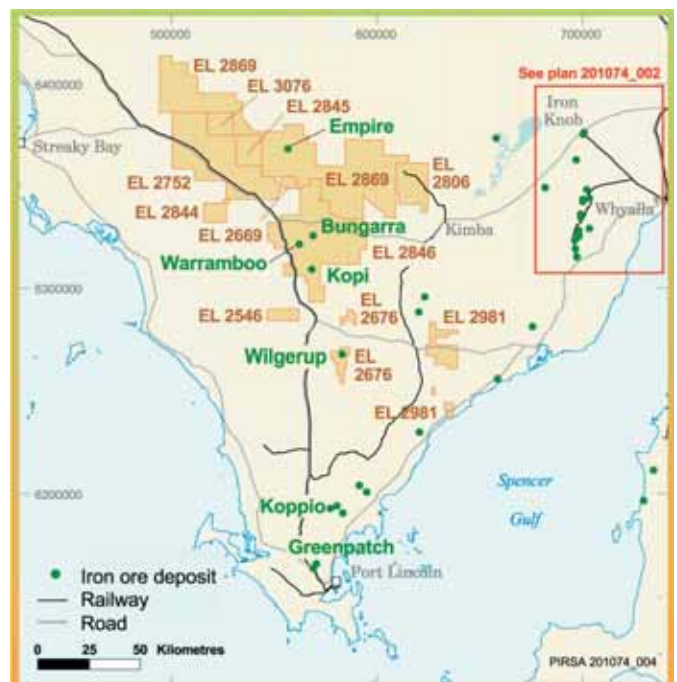


Figure 4 The Warramboe Iron ore leases and other iron ore mineral leases in the Central Gawler Craton.

Petrographic examination indicates physical characteristics that are likely to aid in the production of magnetite concentrates by enhancing the ease of mineral liberation and reducing grinding costs during beneficiation.

Metallurgical analyses demonstrated concentrate iron grades ranging from 69.7 to 71.4%, averaging 70.3%, which is excellent.

The overall concentrate chemistry result shows that the content of elements that could prove deleterious in the DRI process fall well within the limits of acceptability.

OTHER GAWLER CRATON PROSPECTS

Joe's Dam and Manxman

Exploration licence held by Minotaur Resources Ltd.

Website: www.minotaurresources.com.au

These prospects, which lie close to the Peculiar Knob deposits, are hosted by Palaeoproterozoic units in the Mount Woods Inlier, and have associated base-metal mineralisation. Limited drilling and associated extensive magnetic anomalies indicate potential for large-scale, medium to high-grade iron ore development, but 70–100 m of cover has precluded further drilling to date (see Figure 3). Significant drill intersections include:

- Joe's Dam — 64 m at 63.2% Fe from 72 m
- Manxman — 280 m at >45% Fe from 180 m.

Wilgena Hill

Exploration licence held by Grenfell Resources Ltd.

Website: www.grenfellres.com.au

A number of poorly delineated outcrops of Palaeoproterozoic Wilgena Hill Jaspilite are recorded in the Tarcoola region. Wilgena Hill, the most prominent outcrop, was visually estimated to contain 60 Mt at 40% Fe above plain level. No drilling has been undertaken and the depth extent is unknown. Other smaller outcrops include Coolybring, Big Tank and Hicks Hill, and the jaspilite has been intersected by drillholes elsewhere in the Tarcoola region (see Figure 3).

Olympic Dam

Exploration and mining licences held by WMC Resources Ltd.

Website: www.wmc.com.au

The Olympic Dam Cu–U–Au–Ag ore deposit, hosted by Mesoproterozoic granite, represents a total resource of 2200 Mt. It is a major iron ore occurrence with affinities to the Swedish Kiruna deposit (Figure 5).

Ooldea

Exploration licence held by Cosmo Developments Pty Ltd.

Email: mineralogy@mineralogy.com.au

An intense magnetic anomaly near Ooldea, 250 km

west of Tarcoola, is considered to represent an extensive Palaeoproterozoic magnetite-BIF at relatively shallow depth. One diamond-drillhole at the margin of the magnetic feature intersected magnetite-BIF which was magnetically concentrated to a product grading 69% Fe and 2.4% SiO₂.

Wilgerup

Exploration licence held by Centrex Resources Ltd.



Figure 5 Olympic Dam mineral leases and other iron ore prospects on the north eastern Gawler Craton.

Address: 3 Keys Court, Hove 5048, South Australia.

This prospect, ~100 km north of Port Lincoln, was discovered in 1992 with a best drill intersection of 38 m at 62% Fe from 22 m depth. The prospective BIF horizon, which may be Palaeoproterozoic Upper Middleback Jaspilite equivalent, has an associated magnetic anomaly extending over 10 km (see Figure 4).

Southern-central Eyre Peninsula

Several exploration licences held by Centrex Resources Ltd.

Email: Centrex@bigpond.com

Several exploration licences held by South Australian Iron Ore Group Pty Ltd.

Contact via parent company Portman Mining Ltd.

Website: www.portman.com.au

Apart from the Wilgerup prospect, very extensive BIF of the Palaeoproterozoic Hutchison Group was disclosed by aeromagnetic surveys conducted more than 30 years ago. Modern aeromagnetic surveys have enhanced the definition of these features. Exploration in the Greenpatch and Koppio areas has defined a number of narrow, low-grade BIF

horizons, and limited exploration of the Warrambo and Kopi anomalies ~160 km north of Port Lincoln has indicated subsurface BIF over 50–65 km (Figure 4).

Little attention has been given to evaluation of these very extensive BIF horizons on Eyre Peninsula. Given the recent significant high-grade iron intersections at Wilgerup, these vast zones warrant detailed evaluation.

Stuart Shelf

Exploration licence held by WMC Resources.

Website: www.wmc.com.au

Exploration licence held by Gunson Resources Ltd.

Website: www.gunson.com.au

Several other potentially very large iron deposits in Gawler Craton units 300–1000 m below the surface are indicated from drilling; these include the Acropolis, Oak Dam (WMC) and Emmie Bluff (Gunson Resources) prospects which all have polymetallic associations.

Mount Christie

Exploration licence held by Dominion Gold Operations.

At least four aeromagnetic anomalies representing Archaean BIF have been defined in this area, 120 km west-northwest of Tarcoola. At Mount Christie, the most prominent outcrop, resources of 5–20 Mt at 40% Fe are inferred from limited drilling (Figure 3).

INFRASTRUCTURE ON THE GAWLER CRATON

Road transport

Several freight companies service the craton using major sealed routes supported by numerous unsealed roads and tracks. The primary sealed roads include:

- Stuart Highway
- Eyre Highway
- Lincoln Highway
- Flinders Highway

Air transport

There are numerous airstrips in the area, including airports at:

- Port Lincoln
- Port Augusta
- Streaky Bay
- Ceduna
- Woomera
- Olympic Dam
- Coober Pedy

Rail transport

An Adelaide to Darwin rail line is currently under construction. Already in existence are two major lines (the

east–west Trans Australian Railway and north–south Central Australian Railway) and several smaller lines connecting:

- Thevenard
- Whyalla
- Port Bonython
- Port Pirie
- Port Augusta
- Woomera
- Tarcoola
- Andamooka

Sea transport

Four ports service the area, all of which are capable of accommodating and loading bulk carriers. They are owned and operated by different entities, as listed below:

- Port Bonython, Department of Transport
- Whyalla, BHP
- Thevenard, Ports Corp SA
- Port Pirie, Ports Corp SA

Energy

Northern Power Station, Port Augusta.

There is currently very little excess electricity supplied to the area that could be used for industrial and/or mining operations. Natural gas is piped from the Moomba area via Port Pirie and Whyalla by Epic Energy. Agreements are being finalised to build a gas pipeline from Victoria to South Australia which will improve energy supplies by summer 2004.

Water

There is little surface water available, and most water for both towns and mining operations comes from groundwater obtained through boreholes. There are reasonably abundant supplies of non-potable groundwater available for use as process water located in palaeochannels throughout the Gawler Craton.

SOUTH AUSTRALIA — MORE TO EXPLORE!

- The South Australian Government is committed to the long-term sustainable economic growth of the State
- The State has a long history of iron ore mining and production
- South Australia has readily accessible high-quality geoscientific mapping and information
- The State is centrally located, with easy access to growing Asian markets
- The Australian dollar is low relative to US, European and other currencies, making investment attractive
- A workable land access agreement is in place
- Low business costs compared to our near neighbours
- Low sovereign risk
- A supportive legislative framework