



# MINING ACTIVITY IN WILUNA

Mid-West Development Commission

October 2011

urbis

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# 1 Introduction

## 1.1 CONTEXT AND PURPOSE OF THIS REPORT

To assist the Mid-West Development Commission (MWDC) and the Shire of Wiluna respond to growth in the resources sector in the Shire of Wiluna, Urbis has been engaged to compile a data on existing and future mining operations. This data will be useful in the assessment of impacts on existing infrastructure (including transport infrastructure) and land supply in the town of Wiluna. Completion of this work coincides with the preparation of a Local Planning Strategy for the Shire and a town planning scheme review. These documents establish a planning framework and spatial plan to guide the location of land uses and delivery of infrastructure.

The Shire of Wiluna has the potential to become a major contributor to the Mid-West and State Gross Domestic Product (GDP). There are a number of mining companies having operations or conducting exploration in the area, including three uranium prospects.

In order to effectively plan for infrastructure in the Mid-West, it is necessary to get an understanding of existing and future mining activity in the Shire and the consequential impacts on transport, utility and community infrastructure. The major mining operators include:

- Apex Wiluna Gold
- BHP Nickel West
- Magellan
- Newmont Jundee
- Golden West Resources (Wiluna West Hematite and Wiluna West Gold)
- BHP Billiton Yeelirrie
- Toro Energy
- Mega Uranium

The purpose of this report is to review and confirm the existing and future mining activity, in light of the current resource investment outlook for the Shire.

## 1.2 CRITICAL DRIVERS AND ISSUES

The Wiluna region hosts significant gold, nickel, lead, uranium, and iron ore mineralisation. The Shire is located within the Mid-West Iron Ore Northern Group - an intensive and rich mineral deposit area. Geraldton and the Mid-West is currently the second fastest growing iron ore producing area in Australia and, given supportive Government policies and the goodwill of local communities, the area could be transformed over the next decade into the second most significant iron ore producing region in Australia, exporting some 60 to 90 million tonnes per annum of iron ore products.

There is also significant uranium mineralisation projected to come online, in close proximity to the Wiluna town centre. This significant increase in surrounding mining activity within the Shire has the potential to provide positive effects on the town of Wiluna provided that the growth is managed appropriately. The flow on effects of this increased mining activity requires good long term planning to manage growth and minimise adverse impacts on the community. In particular the provision of adequate services and infrastructure to cater for growth in both permanent and temporary population associated with the development of mining operations will be important.

## 1.3 DATA SOURCES

In March 2011 the MWDC released a 'Major Projects Summary', which provides a broad scan of resource projects throughout the Mid West. This report supplements the MWDC report, and provides specific information on projects located within the Shire of Wiluna. This will in turn paint a more holistic picture of mining activity within

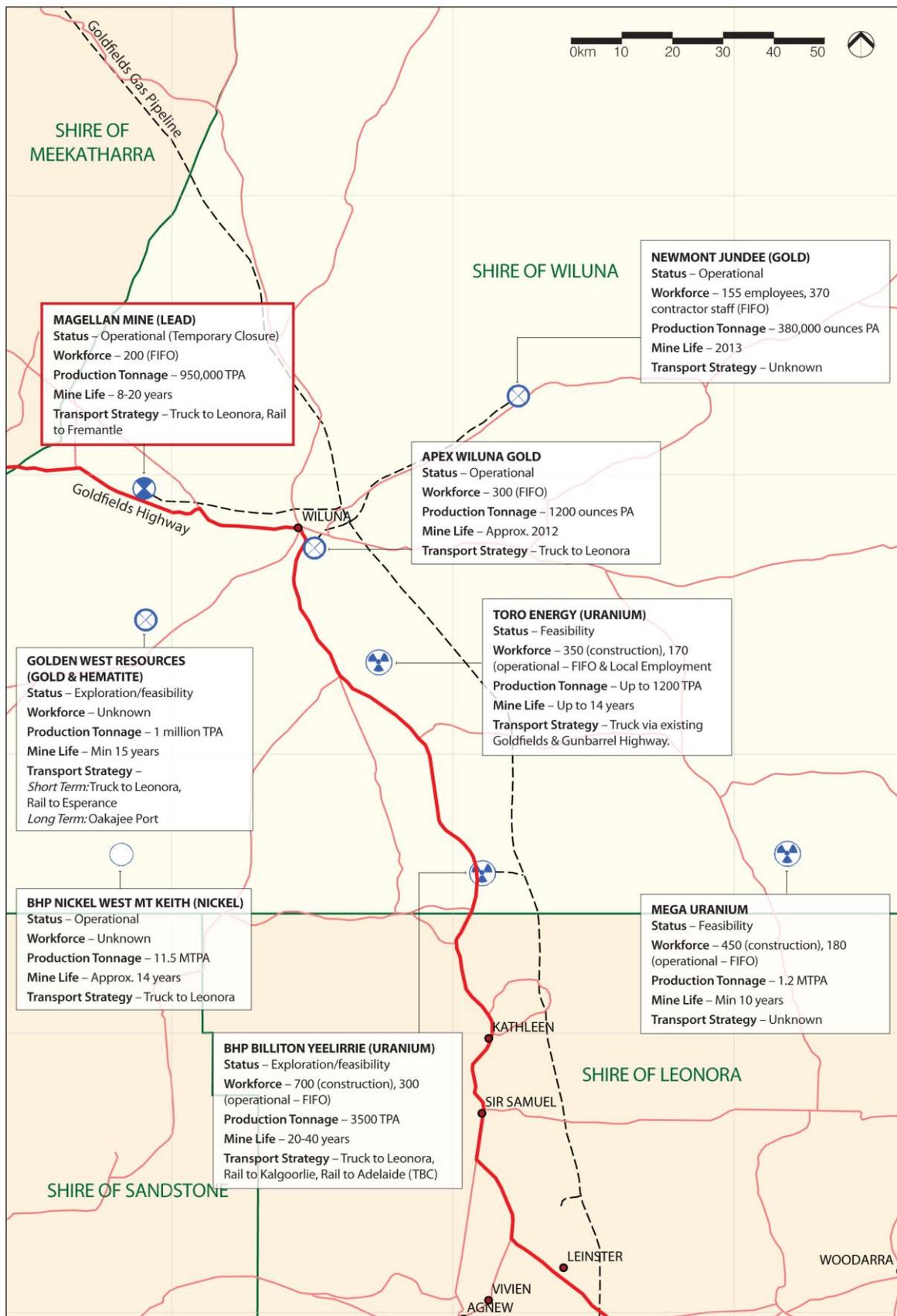
the Shire. This will assist in informing future strategies and managing growth as well as appropriately managing impacts of mining on the town of Wiluna.

Where possible, Urbis has utilised publicly available Environmental Scoping Report documents produced by mining operators in the feasibility phase to gather this data, in addition to general desktop research and consultation with individual mining operations.

#### 1.4 THE COMBINED PICTURE - SUMMARY OF MINING OPERATIONS

Figure 1, overleaf, draws together and presents a Shire-wide snapshot summary of the eight (8) mining operations:

FIGURE 1 – MINING OPERATIONS IN THE SHIRE OF WILUNA



## 2 Mining Operation Profiles

The following section of the report provides individual profiles of each mining operation in the Shire of Wiluna. Each profile provides information on the following:

- Location of mining operations.
- Diagrammatic or descriptive representation of the ore body (based on available data).
- Information on the proposed ore processing process.
- Workforce requirements both operational and construction, and number of FIFO and local based positions (scenarios based on available information).
- Infrastructure requirements (transport, power, water).
- Feasible production tonnages.
- Implementation timeframes and scenarios.

This investigation will result in a set of considerations for State and local government infrastructure planning.



SOURCE: MEGA URANIUM 2011

# TORO ENERGY

Feasibility

<b>LOCATION</b>	Wiluna, 17km SE	<b>SUMMARY/STATUS</b>  Toro Energy are currently seeking approval to develop a Uranium project that would involve mining up to approximately 2 million tonnes of mineralised ore per year over an anticipated mine life of up to 14 years, producing up to 1200 tonnes per annum (tpa) of uranium oxide concentrate.  The Wiluna Project is at an advanced stage in government assessment and approval, with Toro planning to commit to construction late next year for first production in 2013.
<b>COMPANY</b>	Toro Energy Limited	
<b>RESOURCE</b>	Uranium	
<b>CONSTRUCTION START</b>	2012/13	
<b>PROJECTED MINE LIFE</b>	10 years	
<b>PRODUCTION TONNAGE</b>	Up to 1200 tpa	

## LOCATION OF MINING OPERATION

The land on which the project would be established is Crown Land. The Centipede deposit (shown in Figure 4, overleaf) is predominantly within granted mining tenement M53/224, covering an area about 4 kilometres long and up to 1.5 kilometres wide. Toro Energy holds the uranium rights over the tenements included in this proposal.

Aboriginal interest in the project area is expressed through two Native Title claimant groups, the Wiluna and Tarlpa claims. Toro Energy has been working through Central Desert Native Title Services (CDNTS), as the representative body for the region pursuant to the Native Title Act, to build relationships with the native title claimants.

## DESCRIPTION OF ORE BODY

The mineralisation for the Centipede and Lake Way deposits is typically contained within zones lying at between 1 metre and 15 metres below the land surface. The ore body varies in thickness up to a maximum of approximately 6.5 metres. The mineralised zones are laterally extensive but vertically can be irregular, with some areas of very low grade or barren material occurring within the overall mineralised zones.

The shallow nature and relatively broad areal extent of the deposits mean that open cut would be the most appropriate mining method.

## PROPOSED ORE PROCESSING PROCESS

Toro has selected a more conventional alkaline leach process (crushing and screening followed by alkaline heap leach and direct uranium precipitation) as opposed to the preferred ore processing and uranium extraction methods. A diagrammatical summary of this process is provided within *Toro Energy's Environmental Review and Management Programme* document, an excerpt of which is

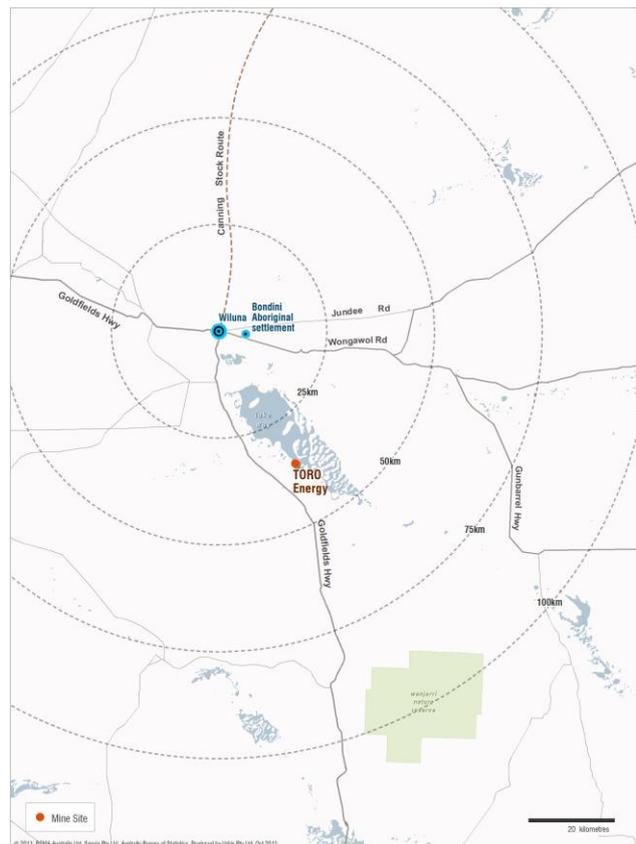


FIGURE 2 – TORO ENERGY LOCATION PLAN



IMAGE SOURCE: THE WEST AUSTRALIAN 2011

provided in Figure 3, below:

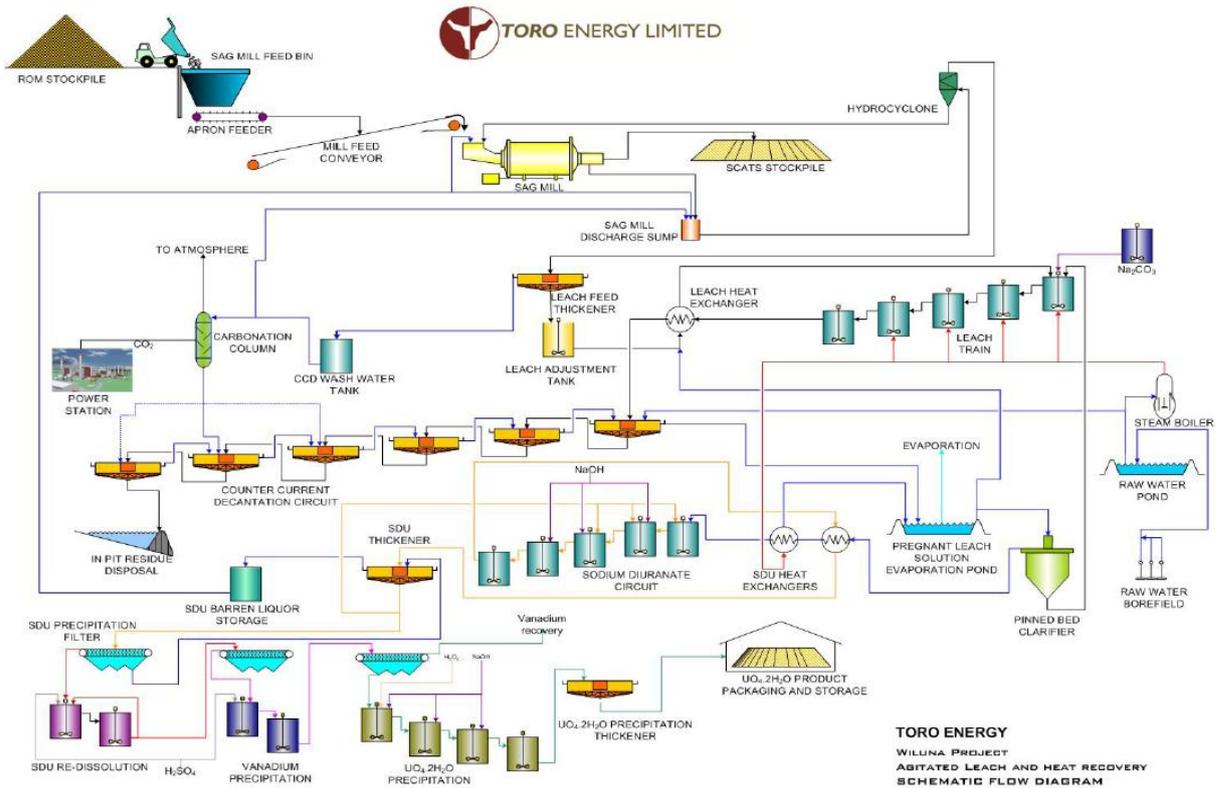


FIGURE 3 – BLUE PROCESSING PROCESS (SOURCE: TORO ENERGY ENVIRONMENTAL REVIEW AND MANAGEMENT PROGRAMME 2011)

### WORKFORCE REQUIREMENTS

The anticipated construction and operational workforce for the Toro Energy operation is described below:

WORKFORCE TYPE	WORKFORCE REQUIREMENTS
Construction Workforce	Up To 350 employees
Operational Workforce	Up to 170 employees

A temporary and permanent accommodation village will be required to house both workforces, however some permanent housing may be provided in the Wiluna township.

The location of the accommodation facility has yet to be determined. However options to be considered will include a stand-alone facility that is located on the site of the demobilised village that served the Wiluna South (Matilda) mine, a facility that is integrated with the Wiluna township and utilises some town services (e.g. power, water and sewerage) or an alternative location. Toro’s Environmental Review and Management Plan (released July 2011) also states that Toro are considering options for ‘fly-in, fly-out’ accommodation within the Wiluna township.

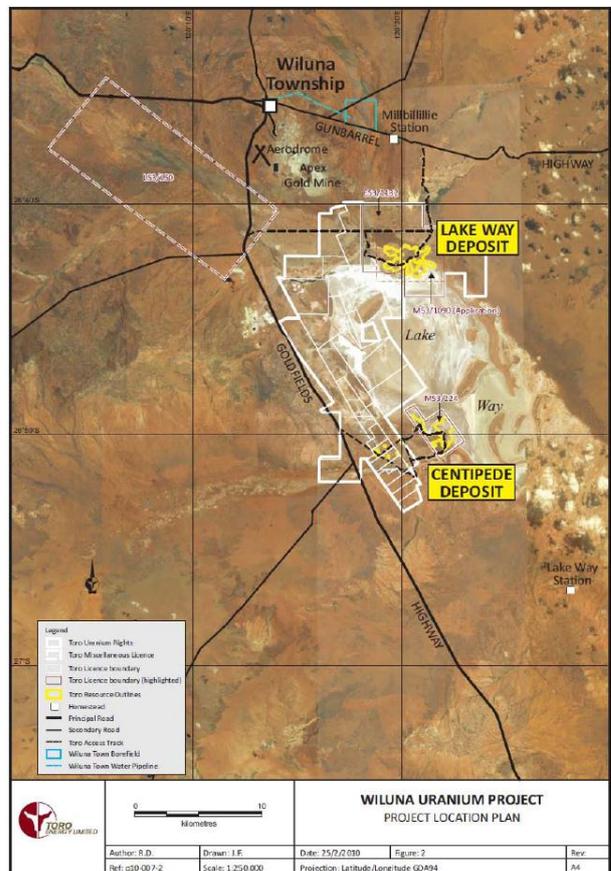


FIGURE 4 – TORO ENERGY DEPOSIT PLAN SOURCE: TORO ENERGY – Environmental Scoping Report 2011

## INFRASTRUCTURE REQUIREMENTS

In summary, the key infrastructure elements of the Toro proposal are as follows:

- Accommodation village and amenities areas;
- Communications infrastructure to support telephone and computer linkages;
- A power station of up to 12 MW capacity (depending on the processing method selected);
- A water supply borefield and associated pipeline (nominally 2.5 GLpa depending on process option selected);
- Septic waste treatment and disposal facilities;
- Transport Requirements - Access to mine operations areas will be by the existing Goldfields and Gunbarrel Highways. The existing Wiluna airport will be used for fly in-fly out workforce. Given current State policy prohibits the shipment of uranium out of WA ports, Toro will transport uranium oxide concentrate east, to Northern Territory and/or South Australia; and
- Laydown areas;
- Water storage ponds, evaporation ponds, water pipeline and a reverse osmosis plant; and an
- Airstrip - Toro propose to utilise the Shire of Wiluna airstrip for their FIFO workforce.

In relation to the overall water requirements of the operation, the total water demand for the project is estimated to be up to 2.5 GLpa depending on the process option selected. A water treatment plant is required to produce approximately 32 m<sup>3</sup>/h of demineralised water for steam generation. Approximately 5 m<sup>3</sup>/h of potable-quality water would be required for product washing and for camp and plant amenities. This high quality water would be generated by a small reverse osmosis plant.

It is proposed to refurbish and upgrade a disused borefield at West Creek, located on Miscellaneous Licence L53/150, approximately 10 km southwest of Wiluna, as the primary water supply for the project. Other areas of potential water supply are currently being investigated.

## FEASIBLE PRODUCTION TONNAGES

Toro envisage an annual production rate of up to 1200tpa uranium oxide concentrate, with up to 2 million tonnes of mineralised ore per year over an anticipated mine life of up to 14 years, producing up to 800 tonnes per annum of uranium oxide concentrate for sale to nuclear power utilities overseas.

## IMPLEMENTATION TIMEFRAMES AND SCENARIOS

Toro Energy released its *Environmental Review and Management Programme* document in July 2011. The project is at an advanced stage in government assessment and approval, with Toro planning to commit to construction late next year for first production in 2013.

# GOLDEN WEST RESOURCES

## WILUNA WEST HEMATITE PROJECT AND WILUNA GOLD PROJECT

Exploration/Feasibility

<b>LOCATION</b>	Wiluna, 34km W	<b>SUMMARY</b> Golden West Resources Hematite (Iron Ore) and Gold operations are located 35 kilometres south west of Wiluna in the north-eastern Goldfields of Western Australia. The Project covers 440km <sup>2</sup> of tenements.
<b>COMPANY</b>	Golden West Resources Limited	
<b>RESOURCE</b>	Hematite and Gold	
<b>CONSTRUCTION START</b>	Stage 1 commenced	
<b>PROJECTED MINE LIFE</b>	Minimum 15 years	
<b>PRODUCTION TONNAGE</b>	Hematite - 1 Mt increasing to 10 Mtpa Gold – unknown.	

### LOCATION OF MINING OPERATION

Golden West Resources ('Golden West') Hematite and Gold operations are located near the town of Wiluna in the north-eastern Goldfields of Western Australia. The nearest regional centres are to the south, the inland city of Kalgoorlie (535km) and to the southwest, the coastal city of Geraldton (630km). The Golden West Projects are located 35kms southwest of Wiluna and comprises 440km<sup>2</sup> of tenements. The project area is 45km long and covers almost the entire 'Joyners Find' greenstone Belt, a region known for significant mineralised deposits with potential for iron ore, gold and uranium.

### DESCRIPTION OF ORE BODY

The Wiluna West Projects (hematite and gold) contains 5 mineralised ridges with a cumulative strike of 125 kilometres.

### PROPOSED ORE PROCESSING PROCESS

#### *Hematite Project*

Hematite is a favoured variety of iron ore because as it does not require processing (Minerals Processing 2010).

#### *Gold Project*

Golden West plans to progress the development of a gold mining operation initially focussing on the Golden Monarch deposit. An infill RC drilling program is planned for this deposit, for metallurgical test work and aiming to upgrade some of the Inferred Resources to Indicated status.

### WORKFORCE REQUIREMENTS

Whilst the anticipated construction and operational workforce for the proposed Wiluna West Hematite and Gold Projects is currently unconfirmed, it is understood Golden West Resources had 11 Aboriginal employees, 10 of whom are local Martu or Yamatji people. In addition 50% of the field employees at the Wiluna West Project are Aboriginal. Golden West is committed to working with Martu people to identify and create opportunities to maximise employment and training opportunities.

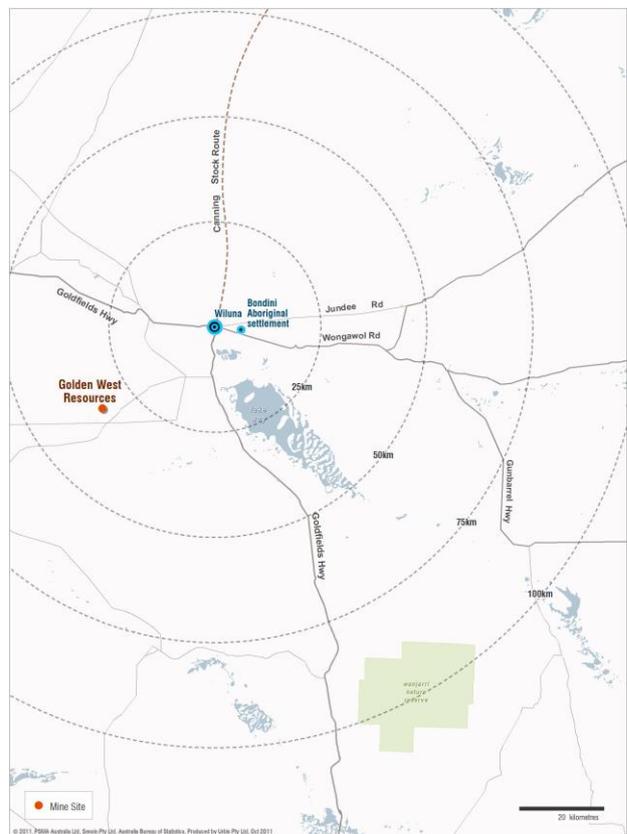


FIGURE 5 - GOLDEN WEST RESOURCES LOCATION PLAN

## INFRASTRUCTURE REQUIREMENTS

Golden West has signed a foundation customer agreement with Yilgarn Infrastructure Limited to use rail infrastructure, berth and storage facilities, industrial facilities, ship loading and unloading and other infrastructure proposed to be financed and built by Yilgarn Infrastructure at the Port of Oakajee.

Under the terms of the foundation customer agreement Yilgarn Infrastructure has undertaken to finance and build a railway connecting Golden West's project at Wiluna West, via Weld Range junction, to the proposed port at Oakajee providing that all the required government approvals are given to the parties. GWR has taken a 20% interest in Yilgarn Infrastructure Limited. Yilgarn is the reserve proponent for construction of the port at Oakajee and GWR believes it retains rights to construct a railway network in the Midwest to transport ore from various mines to the coast. Golden West believe the construction of the railway network will be open access and will encourage the development of additional mining operations in the Mid-West (*Golden West Quarterly Report 2008/09*).

Through consultation with Golden West, it is understood they will utilise the Shire of Wiluna airstrip for their FIFO workforce.

### Transport Infrastructure

Infrastructure requirements continue to be assessed and Golden West is in frequent discussions with other stakeholders in the Mid-West region to ensure nominated rail and port provider, Oakajee Port and Rail, prioritise advice on tariff charges to allow bankable feasibility studies to be progressed.

In view of its location, Golden West also has a short-term infrastructure option, pending the completion of the Oakajee development, to enter discussions for the export of ore through the port of Esperance which already exports significant iron ore volumes from Cliffs, one of GWR's major shareholders (*Golden West Resources Annual Report 2010*).

Golden West continues to make progress on its production strategy, aligned with the Port of Esperance expansion plans (*Golden West – March Quarterly Review 2011*). The port is linked by rail through Kalgoorlie to Leonora. Trucking operations would then use the fully sealed Goldfields Highway from Wiluna to Leonora.



FIGURE 6 – BROADER CONTEXT PLAN  
SOURCE: GOLDEN WEST RESOURCES –  
[www.goldenwestresources.com.au](http://www.goldenwestresources.com.au) - 2011

## FEASIBLE PRODUCTION TONNAGES

### *Hematite Project*

The project has the potential to host a major high grade iron ore (hematite) deposit of at least 200 to 250 million tonnes. The Golden West Hematite Project is the second largest direct shipping hematite iron ore project in the Mid-West. The projected annual output for the GWR Hematite project (directs shipping ore) is described as follows:

- Stage 1 – 1 Mt
- Stage 2 – 3 Mt
- Stage 3 – 10 Mt

### *Gold Project*

Golden West hosts a combined gold resource of 788,000 tonnes at 3.5 g/t gold for a contained 87,000 ounces with considerable further potential. In mid-2010, Golden West announced a 230% increase in Inferred and Indicated gold resource estimates to further advance the Company's plans to progress the development of a gold mining operation (*Golden West Resources Limited 2011*).

## IMPLEMENTATION TIMEFRAMES AND SCENARIOS

Golden West has prepared an environmental scoping study operations (hematite and gold) as well as fauna and flora studies. A detailed feasibility report for the Hematite Project is due for completion in December 2011 and production planned for Q4 2014. Stages 2 and 3 will be dependent on rail and port enhancements either at Esperance or Oakajee.

# BHP BILLITON YEELIRRIE

Pre-Feasibility

<b>LOCATION</b>	Wiluna, 75km SW	<b>SUMMARY</b> BHP Billiton Yeelirrie Development Company Pty Ltd, located 70km south of Wiluna, proposes to mine uranium mineralised ore over an anticipated mine life of 30+ years, producing up to 3500 tonnes per annum of uranium oxide concentrate.
<b>COMPANY</b>	BHP Billiton	
<b>RESOURCE</b>	Uranium	
<b>CONSTRUCTION START</b>	Est. 2014	
<b>PROJECTED MINE LIFE</b>	20-40 years	
<b>PRODUCTION TONNAGE</b>	Initially 2-2.5 ktpa, increasing to 5 ktpa.	

## LOCATION OF MINING OPERATION

The location of the proposed BHP Yeelirrie operation is shown in Figure 7. The elevation of the site is 480–595 metres above sea level, and the location is approximately 550 km due east of the Port of Geraldton, 500 km north of Kalgoorlie, 110 km north-west of Leinster, 70 km south of Wiluna and 60 km west of Mt Keith.

The footprint for the operation covers a maximum area of approximately 10,000 hectares which will be disturbed over the life of the mine.

## DESCRIPTION OF ORE BODY

Mining and processing of uranium mineralised ore to produce uranium oxide concentrate (UOC).

## PROPOSED ORE PROCESSING PROCESS

The proposed ore processing process for the BHP Yeelirrie site is direct precipitation with tank leaching. Run of mine (ROM) ore is crushed and then milled, as required, to obtain an optimal particle size for the leach process. Milled ore is subject to alkaline tank leaching, to extract the uranium, at an elevated temperature.

The ore then goes through a recovery and purification phase, where the slurry from the leach process is washed in a counter current decantation (CCD) thickener circuit, and the concentrated solution is clarified, and uranium is precipitated by use of caustic soda solution, to produce uranium diuranate. The barren solution (after uranium recovery) is recycled back as the washing solution; and the excess solution is recycled back to the grinding area to minimise water and reagent consumption.

Following purification the uranium is precipitated, in pH and temperature-controlled tanks using caustic soda and hydrogen peroxide, as UO<sub>4</sub> (which is the final product in the UOC). The precipitate is then thickened and centrifuged, followed by the automated drying, packaging and shipping of uranium (*BHP Yeelirrie Environmental Scoping Report 2010*).

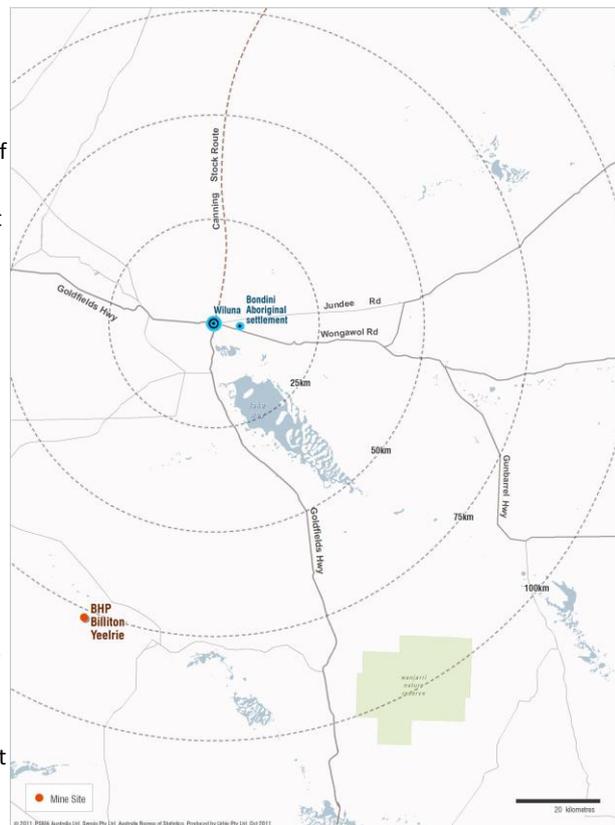


FIGURE 7 – BHP YEELIRRIE RESOURCES LOCATION PLAN

## WORKFORCE REQUIREMENTS

The anticipated construction and operational workforce for the BHP Yeelirrie proposal is described below:

WORKFORCE TYPE	WORKFORCE REQUIREMENTS
Construction Workforce	Approximately 650-700 employees
Operational Workforce	Approximately 300 employees

The operations workforce will be predominately 'fly-in, fly-out' (FIFO), however BHP have stated that they may potentially consider 'drive-in, drive-out' (DIDO) from the town of Wiluna if demand is there. BHP's strategy for sourcing their workforce will be to seek personnel locally, regionally, within Western Australia and then nationally and internationally, if required.

## INFRASTRUCTURE REQUIREMENTS

The anticipated infrastructure requirements for the operation are outlined within *BHP Yeelirrie Environmental Scoping Report (February 2010)*, and have been summarised below:

### *Power*

A diesel power station operating at a capacity of up to 20 megawatts (MW) would be used to meet power needs, which are estimated in the order of 15 MW.

### *Water*

The primary water supply infrastructure items on the process plant site will comprise a raw water dam, a stormwater pond, a RO plant and an evaporation pond. For potable use, RO water would be subjected to further treatment in a chlorination facility.

Water from mine dewatering would be transferred to the raw water pond by pipeline from the dewatering operations. Additional water supply sources may be borefield located in areas currently under investigation, which are located in close proximity to the operation. Borefields would comprise bores, pipelines, access roads and either power lines or remote generators. Remote borefields may also require intermediate pumping stations.

### *Transportation*

As the export of uranium from WA ports is currently prohibited, the movement of the uranium oxide concentrate will be incorporated as required within existing transportation frameworks in South Australia and the Northern Territory. This will be associated with the transport of uranium from the Company's Olympic Dam operations.

Uranium shipments will be transported using the established heavy vehicle routes through Leonora and around Kalgoorlie to connect to the Kalgoorlie Intermodal Terminal. BHP Billiton is currently investigating the following transportation options for road movement to Adelaide:

- Road to Leonora, rail to Kalgoorlie then Adelaide.
- Road to Kalgoorlie, rail to Adelaide.
- Road to Kalgoorlie Research Plant, road to Kalgoorlie, rail to Adelaide.

### *Access Roads*

- An access road to the project will be constructed from the Meekatharra-Yeelirrie Road. The existing road network used for access and transport of product from the project is proposed to follow the route from the access road along the Meekatharra-Yeelirrie Road to the Goldfields Highway.
- Alternative access routes from Perth are from the west and south-west via the Great Northern Highway near Meekatharra, or via Sandstone. Other access routes are from Geraldton via Mt Magnet and Sandstone, and from

Esperance via Norseman and Kalgoorlie.

The existing access road will be examined for suitability. Any proposed upgrading of the access road would be considered in consultation with road owners (local Shires).

#### *Quarry*

A quarry for the Project is proposed approximately 6 km north of the processing area. The quarry will be used to source materials for the construction of roads, laydown and sealed areas and other civil engineering works as well as ongoing operations. This area, as a key component of the project footprint, will be assessed for impacts on the environment and included as part of the ERMP.

#### *Accommodation and Personnel Transport*

BHP propose to construct an on-site accommodation camp for approximately 300 persons for their fly-in-fly-out workforce. Flights to and from the site will be via the existing Mt Keith airport. The indicative location of the accommodation camp is approximately 8 km east of the processing plant.

#### *Kalgoorlie Staging Area*

- BHP Billiton is examining options for a staging area facility in Kalgoorlie. The operations at the staging area could include:
  - o During construction, intermediate transit storage of construction materials, trucks and trailers, and some pre-fabrication work.
  - o During operation, intermediate transit storage of UOC, reagents, spare parts and trucks and trailers. Any reagents stored on site would be in accordance with Australian Standards and Western Australian legislative and regulatory requirements.

#### *Waste Management Facility*

- A Waste Management Facility will be set up on site to handle all material which has been associated or generated by site activities. The facility will collect and process all material that has come into contact with Yeelirrie-originated material. Items that are free of any material containing radioactivity will be recycled as far as possible or disposed of offsite. Radioactive material will be kept within the project area and ultimately disposed of as per the BHP's Code of Practice on Radiation Protection and Waste.

#### *Other Support Infrastructure*

- Other supporting infrastructure for the operation will include:
  - o Laydown area, workshop and stores;
  - o Fuel and reagent storage;
  - o Communication systems;
  - o Fire protection system;
  - o Waste disposal area;
  - o Change house and laundry; and
  - o Administration offices.

#### *Airport*

The possibility of providing an airstrip near the project area for FIFO of personnel has been considered. The Mt Keith airstrip (approximately 60 km to the east), however, has capacity for BHP Yeelirrie personnel.

The use of the Mt Keith airstrip would mean that personnel would need to be transported to and from the Yeelirrie camp, however the associated costs of this would be offset by using an existing facility and additional land clearance would be avoided. The Mt Keith airstrip is closer than the existing airport at Wiluna.

### FEASIBLE PRODUCTION TONNAGES

The BHP Yeelirrie operation is projected to produce up to 3,500 tonnes of uranium per annum.

### IMPLEMENTATION TIMEFRAMES AND SCENARIOS

Subject to government approvals, BHP Billiton Yeelirrie proposes to commence construction activities in 2012 (including any pre-mining activities) and commence uranium production in 2014. Based on the current mineralisation estimates, the anticipated life of the mine is in the order of 30+ years.

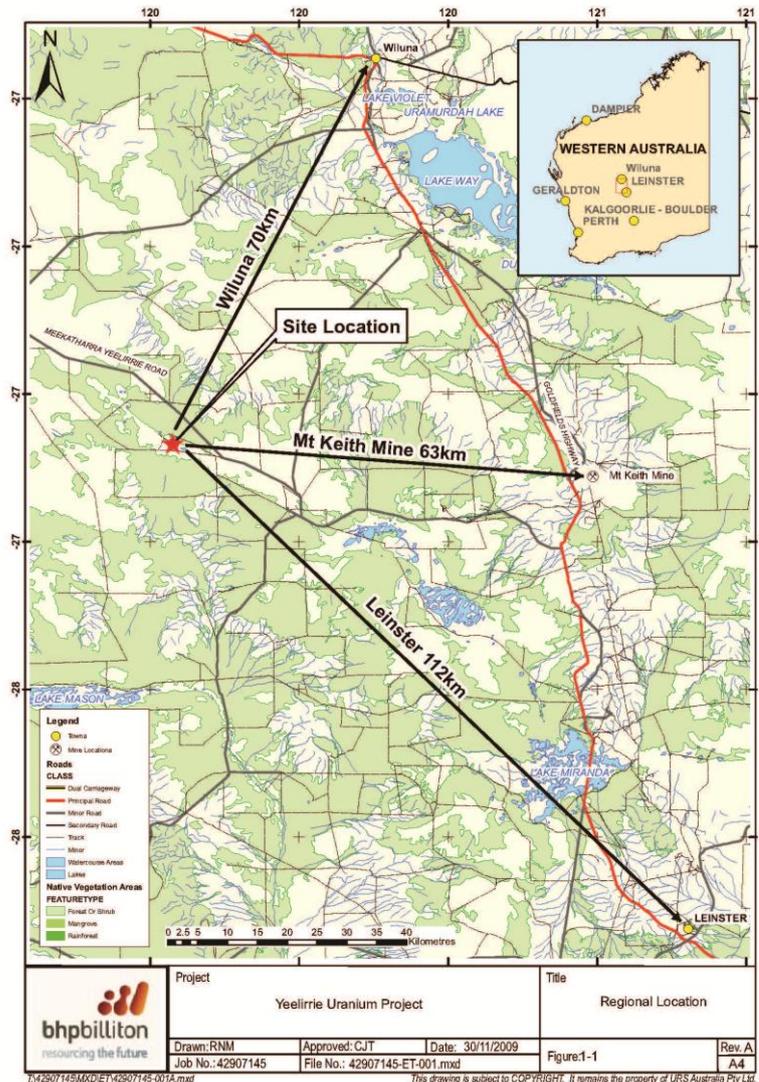


FIGURE 8 – REGIONAL LOCATION PLAN  
SOURCE: BHP YEELIRRIE – Environmental Scoping Report 2010

# MEGA URANIUM (LAKE MAITLAND)

Pre-Feasibility

<b>LOCATION</b>	Wiluna, 105KM SE	<b>SUMMARY</b>
<b>COMPANY</b>	Mega Uranium Limited	Mega Uranium’s Lake Maitland project is located in the Eastern Goldfields, approximately 105 kilometres south-east of Wiluna. The operation is within the vicinity of existing mining operations, and close proximity to existing infrastructure including roads, airstrips and a major gas pipeline.
<b>RESOURCE</b>	Uranium	
<b>CONSTRUCTION START</b>	2012	
<b>PROJECTED MINE LIFE</b>	10+ years	
<b>PRODUCTION TONNAGE</b>	0.8 ktpa (Yellowcake)	

## LOCATION OF MINING OPERATION

The Mega Uranium operation is located in the Eastern Goldfields, approximately 95 kilometres north-east of Leinster and 105 kilometres south-east of Wiluna. The operation is located on the Barwidgee Pastoral Station and predominately on Mining Lease M53/1089 (See Figure 9 and 10).

## DESCRIPTION OF ORE BODY

The operation covers a large area of approximately 6 kilometres long (N-S) and around 2 kilometres wide (E-W). The footprint of the operation is approximately 8,500 hectares, however the proposed disturbance area is approximately 1,500 hectares (see Figure 10, below).

## PROPOSED ORE PROCESSING PROCESS

Two options are being considered for the ore processing phase. Each option is described below:

- Option 1 – Crushing, scrubbing, grinding, counter current washing, alkali tank leaching, resin in pulp and adsorption, uranium precipitation and uranium drying and packaging.
- Option 2 – Crushing, scrubbing, alkali tank leaching, counter current decantation, direct uranium precipitation and uranium drying and packaging.

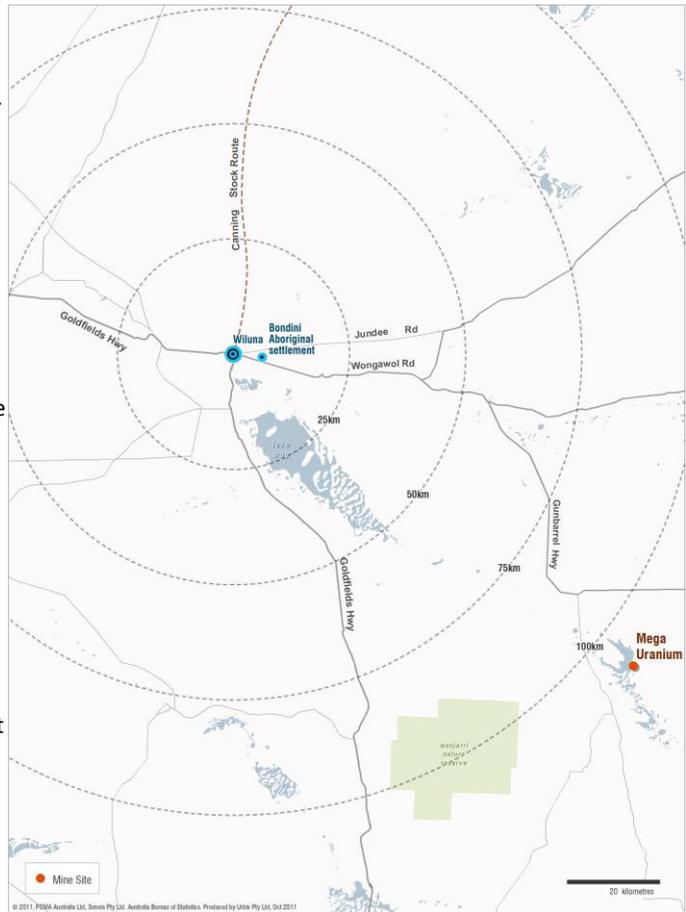


FIGURE 9 – MEGA URANIUM LOCATION PLAN

The predominant mining method will be by conventional excavator and track, with no blasting required. The options for tailing storage include in-pit long term tailings storage, out-of-pit long-term, tailings storage or a combination of both.

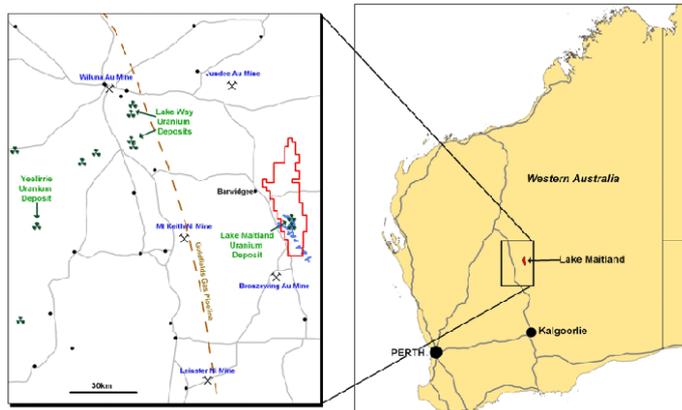


FIGURE 10 – MEGA URANIUM DEPOSIT  
PLAN SOURCE: MEGA URANIUM 2011

## WORKFORCE REQUIREMENTS

The anticipated construction and operational workforce for the Lake Maitland project is described below:

WORKFORCE TYPE	WORKFORCE REQUIREMENTS
Construction Workforce (approximately 12 months)	Approximately 450 employees
Operational Workforce	Approximately 180 employees

## INFRASTRUCTURE REQUIREMENTS

The anticipated infrastructure requirements for the project are outlined below:

### *Water*

- Water demand is approx. 2 gigalitres per annum. A water supply borefield will be established, which will include wells, pipelines and roads.
- Indicative location for an accommodation camp is 5 kilometres north-west of the processing plant, within an exploration tenement held by Mega Lake Maitland.
- Discussions with other regional mine operators have occurred to explore the option of sharing accommodation infrastructure.

### *Infrastructure Location*

There are two options being considered for alternative off-site locations for the plant and infrastructure:

- East of the Lake Maitland uranium deposit within the LMUP Mining Lease, above the estimated 1:100
- In the west-north-west part of the Mining Lease and the adjacent area within an exploration tenement held by Mega Lake Maitland and above the estimate 1:100 year flood line.

### *Transport/Access Road*

Access to the operation will be established from Barwidgee – Yandal Road, which will be accessed via the Goldfields Highway from Kalgoorlie, and the Great Eastern Highway from Perth. Fuel supplies will be delivered using road takers from Kalgoorlie depots via Goldfields Highway, approximately once per week.

### *Power*

The Mega operation is likely to require a 10 megawatt power station. The preferred power supply option is to generate power using on-site diesel generators. The potential to source power from a third-party supplier will be investigated.

## FEASIBLE PRODUCTION TONNAGES

The operation anticipates production of up to approximately 1.2 million tonnes per annum (Mtpa) of Run of Mine (ROM) ore, and up to 1000 tonnes per annum of uranium peroxide concentrate.

## IMPLEMENTATION TIMEFRAMES AND SCENARIOS

The Mega operation anticipates a construction period of approximately 12 months, with construction and pre-mining activities to commence 2012 and production to commence 2013. The operation anticipates to have a mine life of approximately 10 years.

# APEX WILUNA GOLD

Operational

<b>LOCATION</b>	WILUNA, 5KM SE	<b>SUMMARY/STATUS</b>
<b>COMPANY</b>	Apex Minerals NL	The Apex Wiluna Gold is located approximately 5 kilometres south east of Wiluna. According to the Mid-West Development Commission, the estimated mine life of the Apex Wiluna Gold operation was until 2012, however it is unknown whether this timeframe is still accurate.
<b>RESOURCE</b>	Gold	
<b>PROJECTED MINE LIFE</b>	2012	
<b>PRODUCTION TONNAGE</b>	Estimated 120,000 ounces of gold per annum	

## LOCATION OF MINING OPERATION

Situated approximately 600 kilometres north east of Geraldton and approximately 5 kilometres south east of Wiluna, Apex Gold comprises mining leases covering approximately 50km<sup>2</sup> as well as miscellaneous licences.

## ORE PROCESSING PROCESS

Previous production and known resources occur in two main fault structures, the East Lode and West Lode, to a depth of 1,000 metres below surface. It is estimated that only 50% of the known extent of these lodges has been tested by systematic exploration drilling, with much of this carried out at very broad drill spacing. Considerable potential therefore exists for the delineation of additional resources with a high probability of converting these to reserves (Refer Figure 12, overleaf).

Apex is pursuing a vigorous drilling program at Wiluna with the dual aim of infill drilling known resources to the indicated category and drilling around previous known intercepts to delineate additional resources (Apex Minerals 2011).

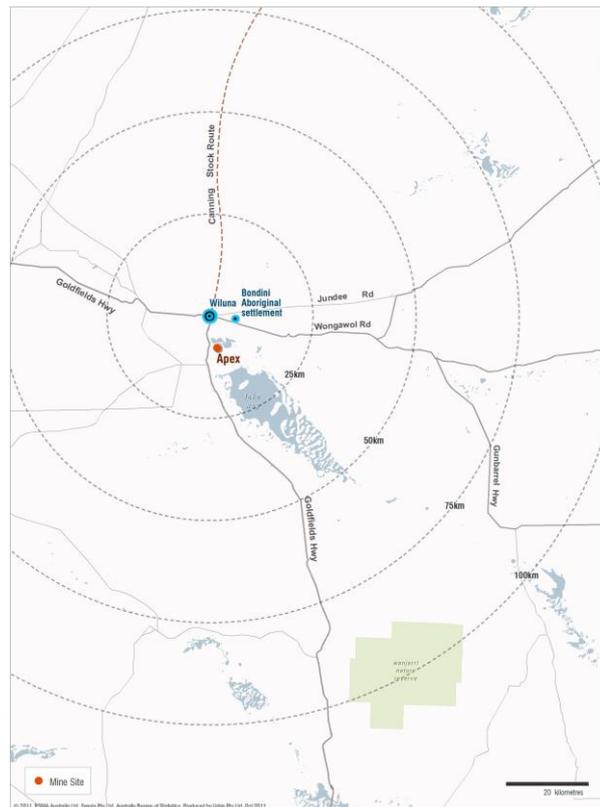


FIGURE 11 – APEX WILUNA GOLD LOCATION PLAN

## WORKFORCE REQUIREMENTS

The Apex Gold operation employs approximately 300 people.

## INFRASTRUCTURE REQUIREMENTS

The operation has access to the Goldfields Gas Pipeline and includes gold resources totalling over 1 million ounces and a 1Mtpa processing facility and a BIOX bacterial oxidation plant, along with other established infrastructure.

## FEASIBLE PRODUCTION TONNAGES

The Apex operation currently produces about 120,000 ounces of gold per annum. The production tonnage for the 2009/2010 period was 365,336 tonnes (Apex Minerals Annual Report 2010). One of the significant attractions of Wiluna is its potential to host significant gold deposits (500,000 – 1,000,000 million ounces). Three of the four million ounces produced at Wiluna to date has come from just three deposits.

## IMPLEMENTATION TIMEFRAMES AND SCENARIOS

According to the Mid-West Development Commission (MWDC) Major Projects Summary, prepared in 2009, the estimated mine life of the Apex Wiluna Gold operation was 3 years (2012). It is unknown whether this timeframe is still accurate.

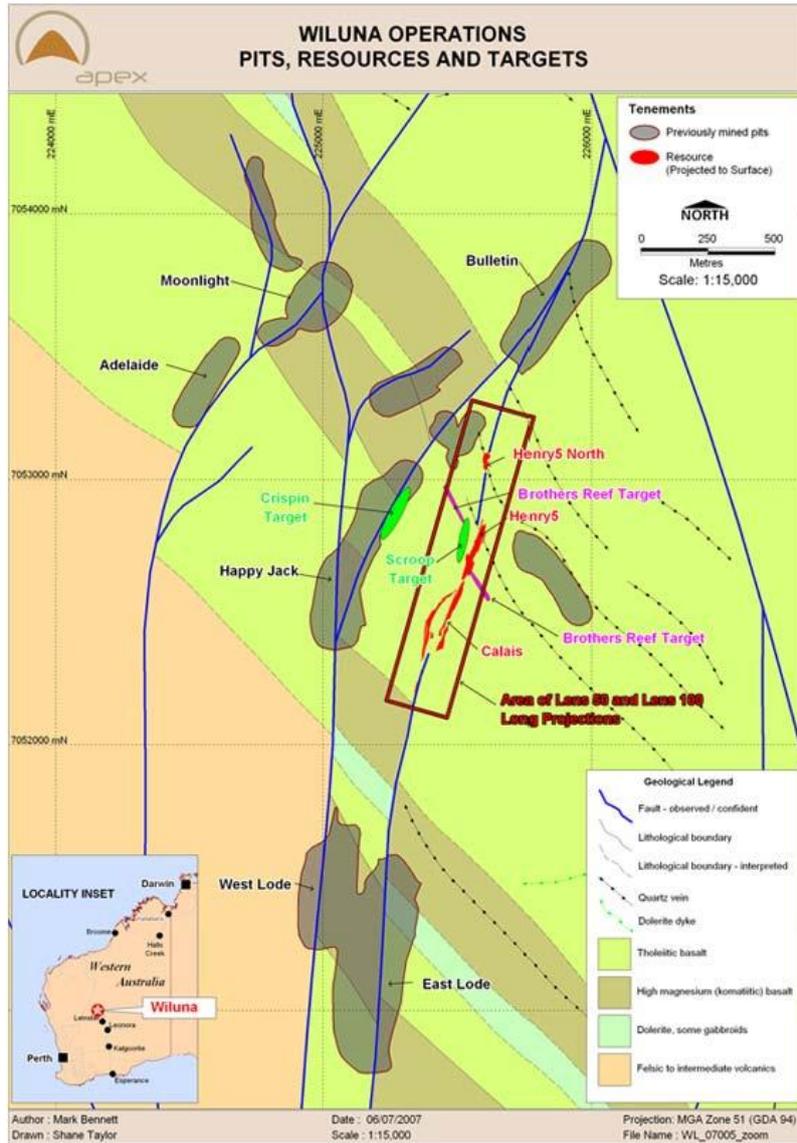


FIGURE 12 – APEX GOLD DEPOSIT PLAN  
 SOURCE: APEX MINERALS 2011

# MAGELLAN MINE

Operational

<b>LOCATION</b>	WILUNA, 30KM	<b>SUMMARY</b> Magellan's lead operation is located approximately 30 kilometres from Wiluna. It comprises of an open pit mine, treatment and concentrating plant, and bagging, containerising and truck washing facilities. The area of disturbance is approximately 320 hectares.  <b>However, due to recent environmental management breaches, Magellan has resolved to put the mine into care and maintenance for the foreseeable future while it assesses the viability of continuing to operate under the current circumstances.</b>
<b>COMPANY</b>	Magellan Metals	
<b>RESOURCE</b>	Lead	
<b>CONSTRUCTION START</b>	Operational	
<b>PROJECTED MINE LIFE</b>	8-20 years	
<b>PROJECTED TONNAGE</b>	950,000 tpa	

## LOCATION OF MINING OPERATION

The Magellan operation is located approximately 30 kilometres from Wiluna (see Figure 13).

## DESCRIPTION OF ORE BODY

The Magellan Mine produces a lead carbonate concentrate which typically contains about 63% lead. At the mine site, lead occurs in the form of the minerals Cerrusite (lead carbonate) and lesser amounts of Angelesite (lead sulphate). The concentrate also contains minor amounts of other naturally occurring lead minerals, plus quartz. The size of the ore body is approximately 8.2 million tonnes.

The major components of the operation include an open pit, waste dumps, infrastructure (eg. plant site water supply, roads, accommodation camp) and tailing storage facilities.

## ORE PROCESSING PROCESS

Mining operations consist of an open-cut mine with an average depth of 50 metres, and contractor processing facilities. There is a waste rock dump adjacent to the mining pit.

Ore is processed on-site through conventional crushing, milling and flotation concentration. There are none of the complications of a sulphide ore body. When operations at the site recommence the material will be packed direct into bags.

Each bag is sealed and its exterior vacuumed before being loaded into a steel shipping container. When the shipping container is full it is locked and loaded onto a truck. The truck and container are washed before leaving the site for delivery to the nearest rail terminal at Lenora. Recently issues with potential contamination during transport of the lead concentrate, has resulted in the temporary closure of the mine (*Magellan Metals* – [www.magellanmetals.com.au](http://www.magellanmetals.com.au)).

## WORKFORCE REQUIREMENTS

During operation the mine utilises approximately 90% 'fly-in, fly-out' (FIFO) workforce and 10% local workforce. There are 200 people on staff, of that, 80 people are employed per shift. All professional/management staff work on a FIFO roster, and 10 employees are Indigenous.

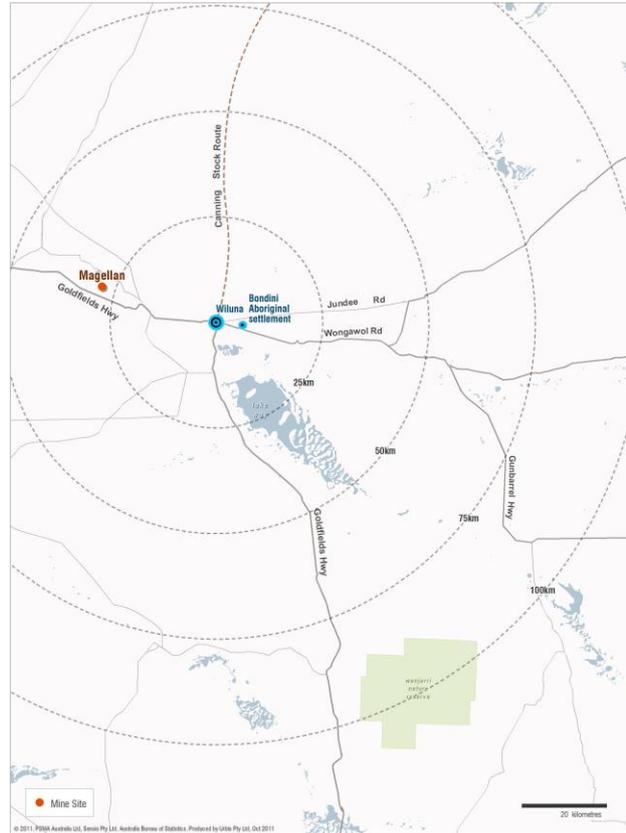


FIGURE 13 – MAGELLAN MINE LOCATION PLAN

The workforce is accommodated in an 80-person village constructed 3.5 km east of the minesite.

## INFRASTRUCTURE REQUIREMENTS

The following provides a summary of the infrastructure requirements of the Magellan Mine:

### *Water Supply*

The operation's water supply is sourced from calcrete and chert aquifers southeast of minesite. The maximum hourly water requirement is 170 kilolitres per hour, and the annual requirement is 1.5 million kilolitres per annum

### *Power Generation*

The operation generates 139 terra joules per annum of natural gas.

### *Fuel Usage and Storage*

The Magellan operation uses approximately 1.8 million litres of fuel per year, and has capacity for 50 kilolitres of fuel storage.

### *Transportation*

The shipping containers packed with bags containing lead carbonate concentrate are transported by road to Leonora for loading on to rail cars. They are then carried along the rail freight line to the container terminal at Fremantle Port. Fremantle is the only Western Australian port with the infrastructure to ensure safe, efficient and cost-effective regular loading of containerised shipments to global markets.

## FEASIBLE PRODUCTION TONNAGES

The Magellan mine produces approximately 950,000 tonnes of ore per year.

## IMPLEMENTATION TIMEFRAMES AND SCENARIOS

The anticipated lifespan of the Magellan Mine ranges from 8 to 20 years, depending on the price of lead.

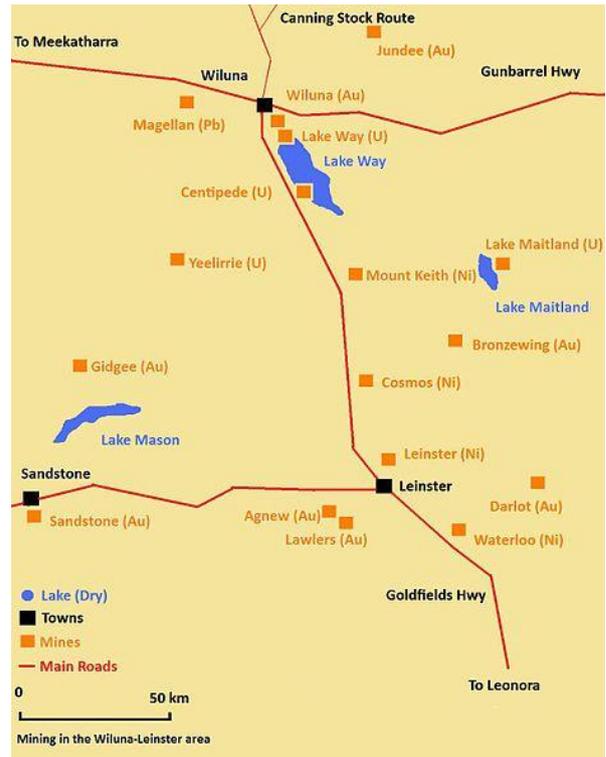


FIGURE 14 – BROADER CONTEXT PLAN  
SOURCE: MAGELLAN METALS 2011

# NEWMONT JUNDEE

Operational

<b>LOCATION</b>	Wiluna, 50km NE	<b>SUMMARY</b>
<b>COMPANY</b>	Newmont Limited	The Jundee Gold Mine is an active gold mine in Western Australia, approximately 55 km north east of the town of Wiluna, owned by Newmont Mining.
<b>RESOURCE</b>	Gold	
<b>CONSTRUCTION START</b>	Operational	Production began in 1995 from a complex of open pits and two underground mines at Newmont Jundee, in the heart of the remote Yandal goldfield. By 2007, the last remaining open pit closed, leaving just two underground mines producing.
<b>PROJECTED MINE LIFE</b>	Approximately 2013	
<b>PRODUCTION TONNAGE</b>	4.4 million ounces (to date)	

## LOCATION OF MINING OPERATION

The Newmont Jundee operation is located within the eastern Goldfields of Western Australia. The Newmont Jundee operation is located approximately 50 kilometres north east of Wiluna (Refer to Figure 15 and 16).

## DESCRIPTION OF ORE BODY

The Newmont operation consists of an underground operation (Barton and Invicta underground mines) producing gold from a number of very thin high grade ore veins. Open pit mining ceased in 2002, however could resume again if drill tests reveal sufficient yields away from the original mine.

The commencement of the Gateway Underground Mine occurred in late 2010. This increased the operation’s mining flexibility with the first stope ore planned to come into production in the second half of 2011 (*Newmont - Beyond The Mine 2010*).

## ORE PROCESSING PROCESS

The ore from the underground mine is fed by a front end loader into the ROM (run of mine) bin at a rate of around 13 tonnes per bucket. From the ROM bin, the ore is fed into the primary crusher, and then is carried by a series of conveyor belts to the crushed ore stockpile. The process works in a continuous loop called a closed circuit until the particles of ore are ground fine enough to pass to the next stage of the processing plant.

The ore then goes through a series of processes, before it is treated with a heated mixture containing cyanide and sodium hydroxide. This gold bearing solution is then pumped through electrowinning cells which use extremely high electrical current to plate the dissolved gold onto steel wool. Once the gold cake has been melted, it is poured into cascading moulds. When the molten metal has set, the moulds are tipped out and the gold bars are cooled in cold water before being cleaned and weighed. From site, the gold bars are shipped to the Perth Mint where they are refined into bars of pure gold and silver (*Newmont Jundee 2011*).

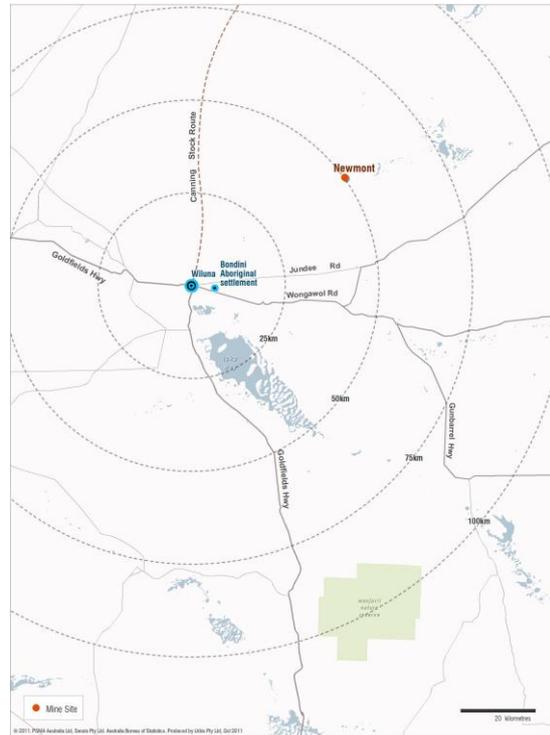


FIGURE 15 – NEWMONT JUNDEE LOCATION PLAN

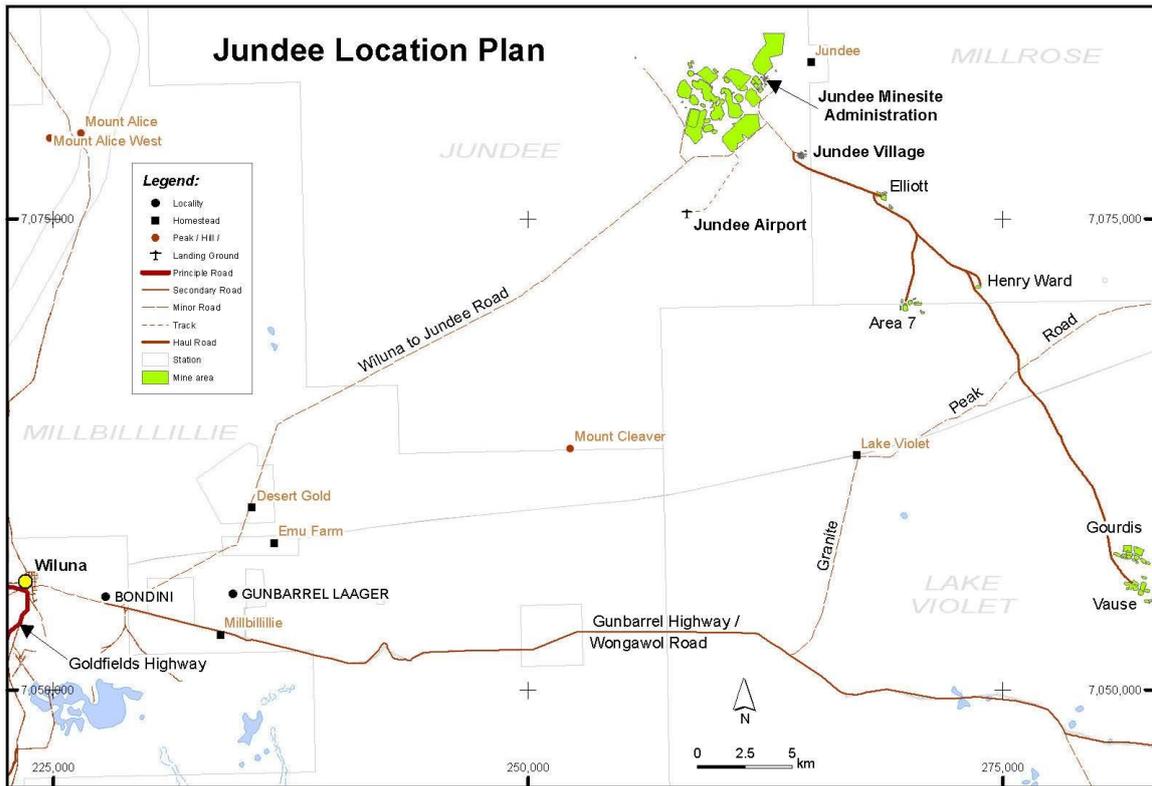


FIGURE 16 – BROADER CONTEXT PLAN  
SOURCE: NEWMONT MINING 2011

## WORKFORCE REQUIREMENTS

The operational workforce for the Newmont Jundee operation is described below:

WORKFORCE TYPE	WORKFORCE REQUIREMENTS
Employees	146 employees
Contractor Staff	423 employees

The operation consists of a FIFO workforce and currently operates a day 'labour pool' in Wiluna, which provides an opportunity for local residents to obtain work and stay in town whilst not being excluded from Government subsidies.

## INFRASTRUCTURE REQUIREMENTS

There is limited publicly-available information regarding Newmont Jundee's infrastructure requirements, however, it is understood a trial is planned at the Jundee power station to convert diesel power generators to a mixture of natural gas and diesel to reduce overheads and carbon emissions.

## FEASIBLE PRODUCTION TONNAGES

More than 4.4 million ounces of gold has been mined at Jundee since the operation began in late 1995. In 2010, Newmont Jundee produced 335,153 ounces of gold at year end, and had proven and possible reserves of 760,000 ounces (*Newmont Beyond The Mine 2010*).

## IMPLEMENTATION TIMEFRAMES AND SCENARIOS

The current economic mine life is estimated at 2013. In-mine exploration, however, added a net contribution of 288,000 ounces in 2010 which will add significant ounces to Newmont's portfolio and hence, extend the mine life beyond 2013

# BHP NICKEL WEST (MT KEITH)

Operational

<b>LOCATION</b>	WILUNA, 90KM N	<b>SUMMARY</b> BHP Nickel West Mt Keith is an operational open-pit nickel mine located approximately 90 kilometres south of Wiluna and 460 kilometres north of Kalgoorlie, in the Shire of Wiluna.
<b>COMPANY</b>	BHP Billiton	
<b>RESOURCE</b>	Nickel Concentrate	
<b>CONSTRUCTION START</b>	Operational	
<b>PROJECTED MINE LIFE</b>	14 years	
<b>PRODUCTION TONNAGE</b>	11.3 Mtpa	

## LOCATION OF MINING OPERATION

Nickel West Mt Keith is located in the Shire of Wiluna, 75km south of the town, along the Goldfields Highway (Refer to Figure 17).

## DESCRIPTION OF ORE BODY

No publicly available information on Nickel West’s ore body is available.

## ORE PROCESSING PROCESS

Nickel West Mt Keith comprises an open pit mine and concentrator plant. The size and shape of the nickel deposit makes it amendable to open-cut mining, using a conventional drill, blast, load and haul mining system.

Ore from the pit is delivered to the crusher to be crushed and then conveyed to the concentrator. The concentrator uses the latest technology in mineral processing equipment and currently has the capacity to process 11.5 million tonnes of ore per year.

The Mt Keith Talc Redesign Project aims to enhance the processing of ore at its Mount Keith nickel concentrator, and was expected to commence operation in 2011. It is unknown as to whether this project is currently in operation.

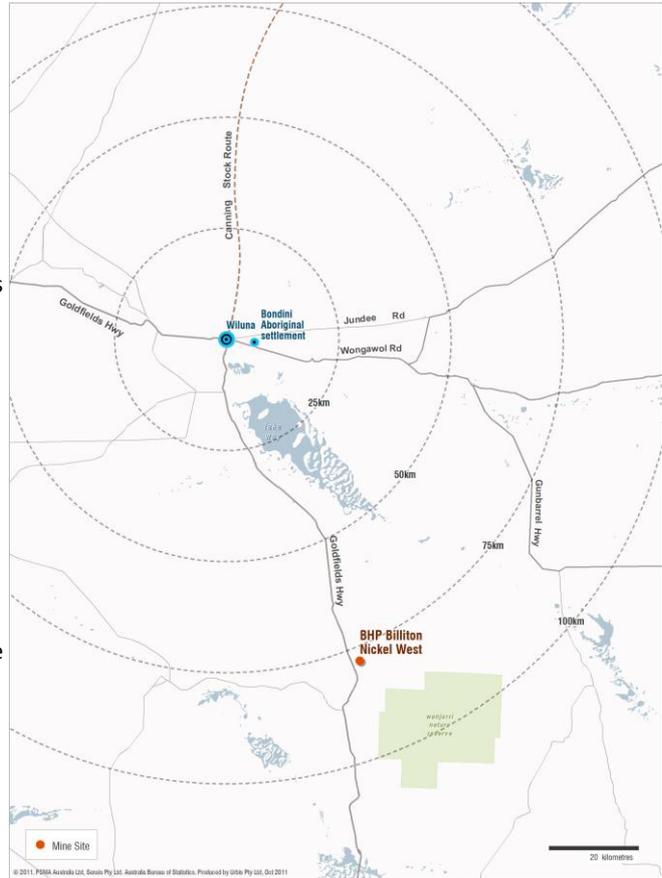


FIGURE 17 – BHP NICKEL WEST LOCATION PLAN

## WORKFORCE REQUIREMENTS

Nickel West is currently in operation. The estimated operational workforce is 150 – 200 staff, of which a majority (greater than 90%) is FIFO.



IMAGE SOURCE: BHP BILLITON 2011

## INFRASTRUCTURE REQUIREMENTS

Nickel concentrate from the Wiluna operation is transported to Nickel West Leinster for drying before being transported to Nickel West Kalgoorlie by rail for further processing. Nickel West exports bulk nickel sulphide concentrate from concentrators at Nickel West Mt Keith through the Port of Esperance (as shown in Figure 18).

BHP Billiton manage and operate their own individual airstrip for their FIFO workforce at Mt Keith, which is also used by other mining operations within the Shire.

## FEASIBLE PRODUCTION TONNAGES

The Nickel West operation produces approximately 11.3 Million Tonnes of nickel concentrate per annum.

The Mt Keith Talc Redesign Project, which will enhance the processing of ore at its Mount Keith nickel concentrator, was expected to commence operation in 2011. The project will assist in sustaining the production level at Kalgoorlie Nickel Smelter at approximately 100,000 tonnes per annum (*Minerals Processing 2009*).

## IMPLEMENTATION TIMEFRAMES AND SCENARIOS

The timeframe for closure of the BHP Mt Keith mine is unknown.

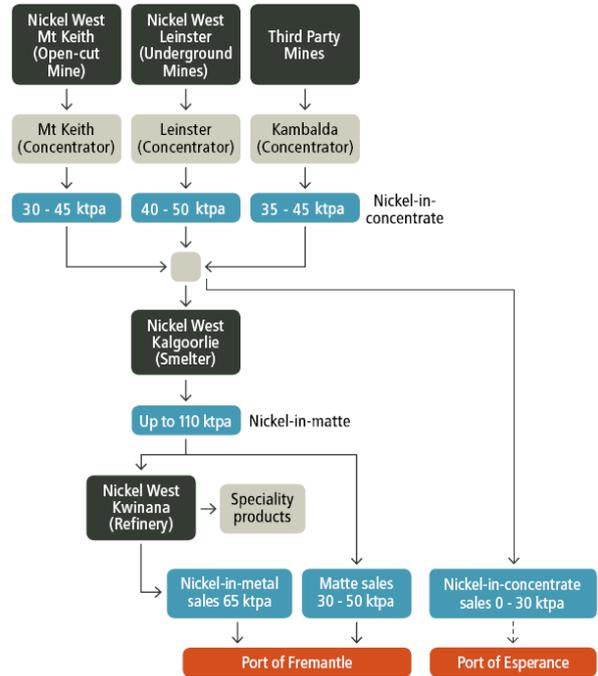


FIGURE 18 – TRANSPORT STRATEGY FLOW CHART  
SOURCE: NICKEL WEST 2011

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