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NI43-101 Technical Report

MACARTHUR MINERALS LIMITED

Preliminary Economic Assessment

Lake Giles Iron Project

Western Australia

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Glossary of Terms

Al_2O_3	Alumina
AMD	Acid Mine Drainage
AUD M	Australian Dollars (Millions)
BIF	banded iron Formation
Ca Fe	Calcined iron (with water of crystallisation removed)
Cat	Caterpillar - equipment manufacturer.
CAWS	Country Areas Water Supply Act 1947 (WA)
CRM	Certified reference materials
DEC	Department of Conservation
DEE	Department of the Environment and Energy
DFS	Definitive Feasibility Study
DIA	Department of Indigenous Affairs
DMIRS	Department of Mines, Industry Regulation and Safety
DoW	Department of Water
DRF	Declared Threatened Flora
DSO	Potential Direct Shipping Ore
DTM	Digital Terrain Model
dtph	dry tonnes per hour
DTR	Davis Tube Recovery
ELH	Excavate Load and Haul, referring to mining using excavators and dump trucks
EMP	Environmental Management Plan
EP	Environmental Protection Act 1986 (WA)
EPA	Environment Protection Authority
EPBC	Environmental Protection and Biodiversity Conservation(1999)Act
Fe	Iron
FEL	Front End Loader
FOB	Free On Board
GDA94	National co-ordinate system used in this area.
GIS	Geographical Information System
GPS	Global Positioning System
GSWA	Geological Survey of Western Australia
H/G	Hematite/ Goethite
IDS	Inverse Distance Squared
IRR	Internal Rate of Return
km	kilometre
LIDAR	Light Detecting and Ranging (survey method)
LIMS	Low Intensity Magnetic Separation
LOI-1000	Loss on Ignition at 1000^0C
mg/L	milligrams per litre
MIO	Macarthur Iron Ore Pty Ltd
MOC	Mining Operations Centre

MOU	Memorandum of Understanding
MMS	Macarthur Minerals Limited
Mt	Millions of tonnes
Mtpa	Millions of tonnes per annum
NES	National Environmental Significance
NPV	Net Present Value
OK	Ordinary Kriging
P	Phosphorus
P80	80% passing size (of a Particle Size Distribution)
PEA	Preliminary Economic Assessment
PEC	Priority Ecological Communities
PFS	Preliminary Feasibility Study
PoW	Programme of Works
QAQC	Quality Assurance Quality Checked
QP	Qualified Person
RAB	Rotary Air Blast (refer to drilling method)
RC	Reverse Circulation (refer to drilling method)
RIWI	Rights in Water and Irrigation Act 1914 (WA)
ROM	Run of Mine, generally referring to stockpiles ahead of crusher.
RTKGPS	Real Time Keeping Global Positioning System
S	Sulphur
SAG	Semi Autogenous Grinding
SG	Specific gravity
SiO_2	Silica
SPA	Southern Ports Authority (operator of the Port of Esperance)
SRE	Short Range Endemics
TDS	Total Dissolved Solids
TEC	Threatened Ecological Communities
UCS	Unconfined Compressive Strength
UHP	Ularring Hematite Project
US$m	Millions of United States of America Dollars
USD	United states Dollars
WA	Western Australia
WC	Wildlife Conservation (1950) Act
XRF	X-ray Refraction (analytical method)

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1 Summary

1.1 Project

The Lake Giles Project ("Project") is located approximately 150 kilometres north-west of the town of Kalgoorlie in the state of Western Australia (Figure 1). The Project is owned by Macarthur Iron Ore Pty Ltd (MIO), a 100% owned subsidiary of Macarthur Minerals (Macarthur or MMS).

The Project consists of a series of Banded Iron Formation (BIF) hematite and magnetite prospects. This report covers the mineral resource and preliminary economic assessment (PEA) of the magnetite mineralisation of the Moonshine and Moonshine North prospects, completed by Snowden and the hematite resources of the Ularring project completed by CSA Global.

The resources of the Ularring Hematite Project and Moonshine Magnetite project were previously reported as stand-alone projects. A Pre-Feasibility Study was completed for the Ularring Hematite Project (CSA, 2012) and a preliminary economic assessment was completed for the Moonshine Magnetite Project (Snowden, 2011). The mineral resources remain current but Macarthur considers the operational philosophy to be outdated due to changes in the iron ore market. The Lake Giles Project presented herein is a combined magnetite and hematite operation of smaller scale.

The preliminary economic assessment is preliminary in nature and includes Inferred Resources which cannot have the modifying factors applied to them to convert them to reserves, and there is no certainty that the preliminary assessment will be realised.

1.2 Company Strategy

MMS is an Australian public company listed on the Toronto Stock Exchange that began exploration in 2006 for magnetite iron resources on its Lake Giles tenements in Western Australia. In 2009 a 1.316 million tonne magnetite resource (at a 15%Fe cut off) was delineated and a Preliminary Economic Assessment (PEA) was released to the market on 25th March 2010. At the time of the study, significant Global Economic uncertainty made the funding of major capital intensive mining projects (e.g. magnetite projects) difficult. In order to achieve commercial operations as early as possible, Macarthur sought to delineate a smaller tonnage of low capital intensity hematite resource for commercial exploitation prior to development of its major Moonshine Magnetite Project.

On 27 September 2012 MMS released a Pre-Feasibility Study (PFS) on the Ularring Hematite Project. This PFS identified encouraging results from metallurgical test work for beneficiation of the hematite material to produce a high grade, low impurity sinter fine product.

On completion of the PFS, MMS' corporate strategy was to advance the development of the 2 Mtpa hematite resource for export, through the Port of Esperance followed by the development of a 10 Mtpa magnetite operation.

Global changes in the export iron ore market and access to capital markets since the release of the PEA and PFS has impacted the ability to develop the projects. The projects were also constrained by a lack of export capacity through the Port of Esperance.

Recent changes in the global iron ore market favouring high-grade, low impurity iron ore has opened up opportunities for Macarthur to develop a combined Project primarily generating magnetite fines with some direct shipping ore (DSO) or a blending scenario. Closer to home, access to regional infrastructure that was previously unavailable has allowed Macarthur to re-evaluate the operating philosophy of its projects.

1.3 Conclusions and Recommendations

The technical and financial evaluation in the Preliminary Economic Assessment ("PEA") has concluded that, based on the information currently available, the project is potentially economically viable and that further project development is justified. However, it is important to note that the outcomes of the economic assessment is preliminary in nature and includes inferred mineral resources that are considered too speculative geologically to have the economic considerations applied to them that would enable them to be categorized as mineral reserves, and there is no certainty that the preliminary economic assessment will be realised.

- Project after-tax real Net Present Value ("NPV") of A$535 million at an 8% discount rate, based on a discounted cash flow model with:
  - a project life of 31 years with saleable product of 2.5 to 3.4 million tonnes per annum ("Mtpa")
  - total sales of 82.8 million tonnes; and
  - no terminal value added to the NPV, which assumes no extension to the plant and/or mine life.
- Total LOM free cash flow of A$2,093m.
- The project is potentially highly profitable with a discounted payback (based on NPV) in 3 years.
- Average operating costs of A$53.74 including A$44.71/t FOB for hematite and A$53.47/t FOB for magnetite.
- Total revenue estimated at A$9.8 billion (rounded)
- Total capital cost estimated at A$466 million including contingency of A$63 million.
- Rehabilitation costs of A$54 million and sustaining capital expense over life-of-mine ("LoM") of A$77 million.
- Total direct operating costs (including overheads but excluding royalties) are estimated at A$4.4 billion (rounded)
- Total project costs (direct and indirect operating costs, capital spend including contingency, rehabilitation and sustaining capital) are estimated at $6.4 billion (rounded).

1.4 Property Description and Location

The Lake Giles Project (the Project) is located about 450 km east-northeast of the coastal city of Perth, Western Australia. MMS manages 15 contiguous tenements covering a total area of 62 km^2. The Project comprises hematite/goethite and magnetite mineralisation located within these tenements. The Lake Giles Project area comprises 15 Mining Leases which are all held by MIO, a 100% owned subsidiary of Macarthur Minerals Limited (MMS).

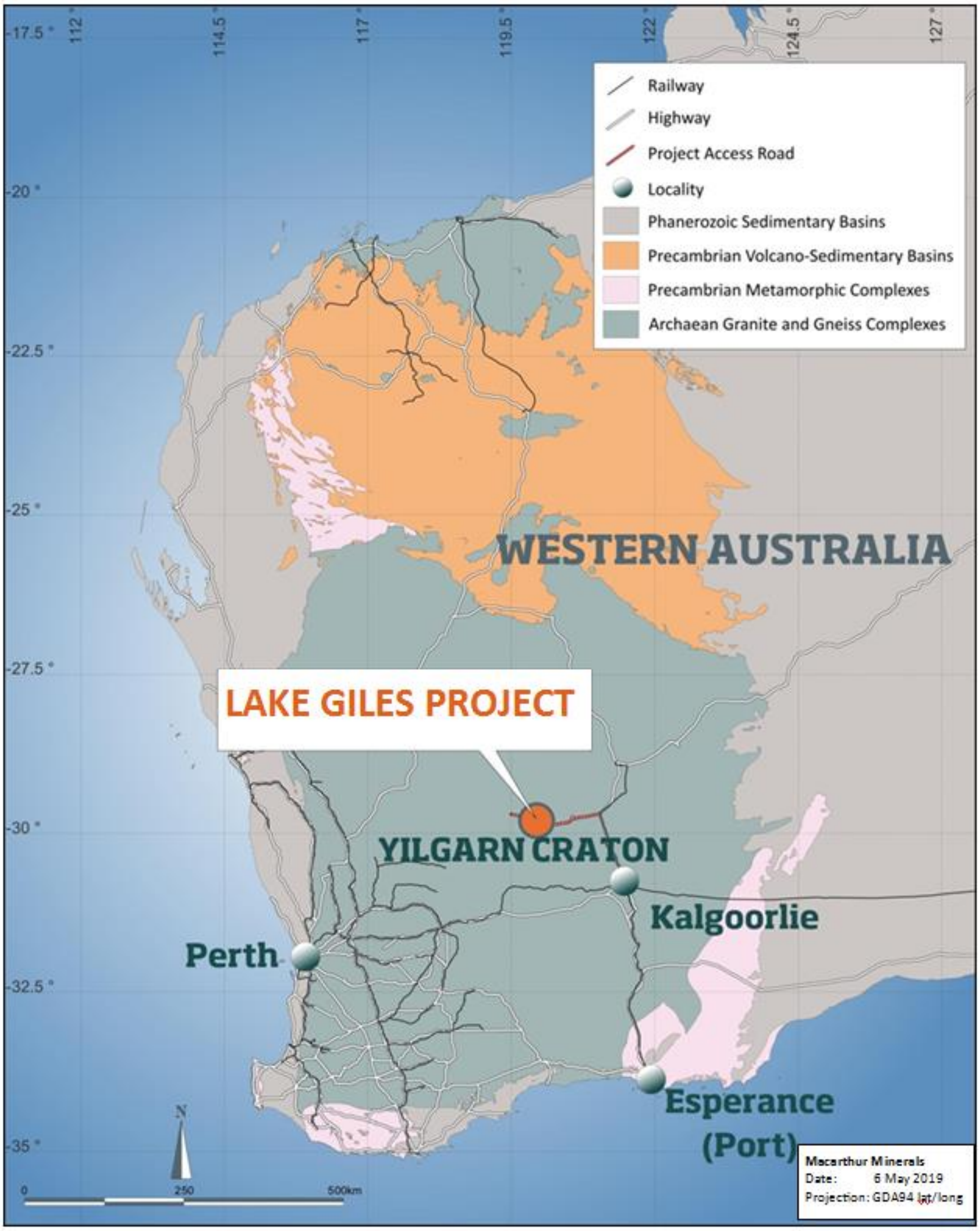

Figure 1. Location Plan

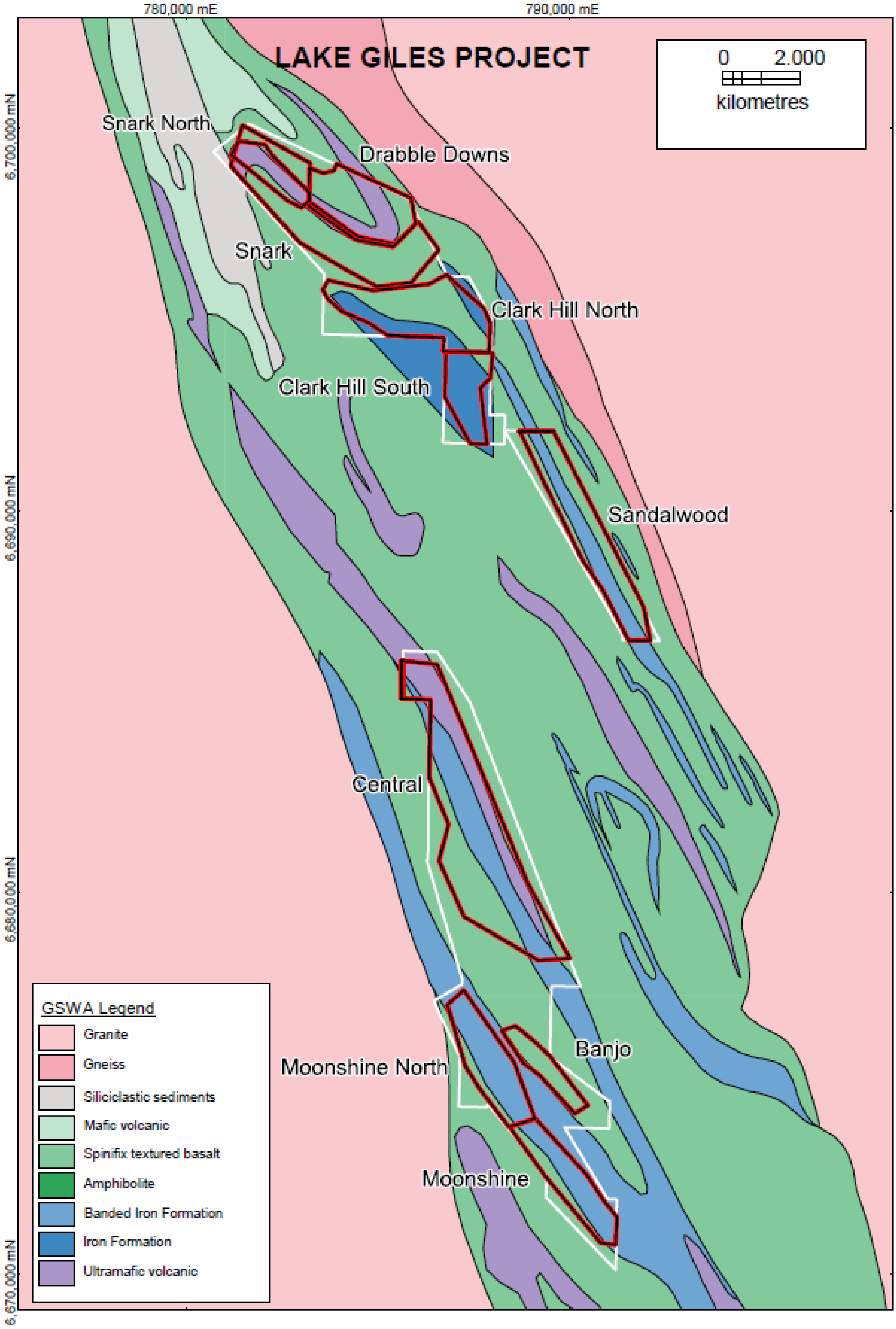

Figure 2. Access to Property – Lake Giles Project

1.5 History

1.5.1 Property Ownership

Since the late 1960's several exploration companies have held the exploration rights to the project tenements. There have been three main phases of exploration; nickel exploration from 1968 to 1972, gold exploration from 1993 to 2004 and more recently iron exploration.

1.5.2 Macarthur Minerals Ltd 2005-2006

MMS took over the tenements then known as the Lake Giles Project in late 2005 with the purchase of Internickel Pty Ltd. MMS immediately continued with the ongoing exploration program for nickel and gold. In particular anomalies generated by a 2004 helicopter electromagnetic survey (HoistEM) were visited and many were mapped and sampled, with emphasis on the search for nickel bearing gossans.

1.5.3 Historical Mineral Resource Estimates & Previous Mining

No known historical mineral resource or reserve estimates prior to 2007 exist for any commodity within the area now covered by MMS's tenements.

No mining is known to have been undertaken in the project area or anywhere on MMS's tenements to date.

1.6 Mineral Resource Definition

1.6.1 Moonshine Magnetite Resource

The magnetite Mineral Resource estimate completed by Mr Shane Fieldgate for the Moonshine and Moonshine North deposits is presented in Table 1. The Mineral Resource is not believed to be materially affected by any known environmental, permitting, legal, title, taxation, socio-economic, marketing, political or other relevant factors.

Mineral Resources have been reported in accordance with CIM Definitions for Standards of Mineral Resources and Reserves (CIM 2014). The QP has undertaken a review of sample assays, drilling data, data validation, QA/QC, estimation parameters, material density, block model parameters and classification procedures. The following information summarises the steps and procedures taken and data reviewed by the QP to ensure Mineral Resource estimates are reported in accordance with CIM 2014.

Mineralised envelopes for the Moonshine and Moonshine North deposits were based on ≥30% Fe conjunction with the lithological code 'BIF' (Banded Iron Formation) as contained in the geological database. Sample assays were compared against lithological logs and were consistent with the geological intervals. The database supporting the Moonshine Magnetite Mineral Resource estimate included in this study includes all information to 31 December 2011. Macarthur's drilling at the Moonshine and Moonshine North prospects totals 171 reverse circulation drill holes and 3 diamond drill holes.

QA/QC procedures relating to the Moonshine and Moonshine North deposits were reviewed although QA/QC data was not available for sampling. The QP considers that the sample preparation, security and analytical procedures adopted provide an adequate basis for the Inferred Mineral Resource estimates.

Resource classification has been based upon a number of criteria, including the geological confidence, the integrity of the data, the spatial continuity of the mineralisation as demonstrated by variography, and the quality of the estimation.

Block model validation was carried out graphically and statistically to ensure that the block model grade accurately represented the drill hole data. Cross sections were examined to ensure that the model grades honour the local composite drill hole grades.

Review of the above data was made with regard to the CIM 2014 Definition Standards for reporting Mineral Resources and Reserves. The QP is satisfied the resource estimates have been prepared in accordance with CIM 2014.

Table 1. Inferred Moonshine and Moonshine North Mineral Resource Estimate summary, at a 30% Fe cut-off

Prospect	Tonnes (Mt)	Fe %	SiO_2 %	P %	Al_2O_3 %	S %	DTR %	LOI %
Moonshine	427.1	29.3	42.1	0.05	1.1	0.5	31.3	0.02
Moonshine North	283.4	31.4	22.7	0.04	0.7	0.2	31.6	0.89
Total	710.5	30.2	34.4	0.05	0.9	0.4	31.4	0.36

*Mineral Resources that are not Mineral reserves do not have demonstrated economic viability

1.6.2 Ularring Hematite Resource

The hematite/goethite Mineral Resource Estimate completed by CSA Global for Banjo-Lost World, Snark, Drabble Downs and Central is presented in Table 2 and Table 3. The Mineral Resource is not believed to be materially affected by any known environmental, permitting, legal, title, taxation, socio-economic, marketing, political or other relevant factors.

Mineral Resources have been reported in accordance with CIM Definitions for Standards of Mineral Resources and Reserves (CIM 2014). The QP has undertaken a review of sample assays, drilling data, data validation, QA/QC, estimation parameters, material density, block model parameters and classification procedures. The following information summarises the steps and procedures taken and data reviewed by the QP to ensure Mineral Resource estimates are reported in accordance with CIM 2014.

Geological outlines representing the BIF strata for Snark, Drabble Downs, Central and Banjo were modelled using drill hole geological logging. Surface mapping was used to guide the interpretation for strike, dip and local structural complexities such as fold hinges. For Moonshine, mineralised domains were interpreted to follow the strike of surface mapping.

Mineralisation sometimes demonstrated continuity by drill results, where surface mapping indicated no outcrop.

Sample assays were compared against lithological logs and were consistent with the geological intervals. For example, Fe grades of >50% are associated with hematite / goethite mineralisation and sometimes BIF; but never with ultramafics.

The database supporting the hematite Mineral Resource estimate included in this study includes all information collected up until 31st August 2011 (Moonshine), and 9th May 2012 (Snark, Drabble Downs, Central, Banjo and Lost World). As of this date there were 1,626 drill holes (1,588 RC, 38 DDH) loaded in the database for 92,259m. Of this total, 85,557 samples from 1,588 holes were assayed, and verified for use in the Mineral Resource estimate.

The drill holes were loaded into Datamine and drill hole traces were visually checked to ensure they did not exhibit kinking (resultant from erroneous down hole surveys), were dipping downwards, and the collars were in the expected locations and not offset from the targeted mineralisation without good reason.

Sampling methodology and QA/QC procedures are discussed in detail in Section 11.3. The QP is satisfied that the adequacy of sample preparation, sample security and analytical procedures support the Mineral Resource classification, and are of industry standard.

Classification of the Mineral Resource was done by digitising a perimeter in long section, for each BIF domain, where the intended Indicated resource is inside the perimeter. The geometry of the perimeter was defined by drill hole density, where the holes pierced the domain. Blocks located outside the perimeter string, either along strike within the domain or down dip, were classified as Inferred. The parent block sizes are based upon approximately half the typical drill spacing. Sub blocks were used to ensure the block model honoured the mineralisation zone geometries and the geological contacts.

Review of the above data was made with regard to the CIM 2014 Definition Standards for reporting Mineral Resources and Reserves. The QP is satisfied the resource estimates have been prepared in accordance with CIM 2014.

Table 2. Mineral Resources, Ularring Hematite Project. Fe>40%

Category	Tonnes	Fe %	P %	SiO_2 %	Al_2O_3 %	LOI %	S %
Indicated	54,460,000	47.2	0.06	16.9	6.5	7.9	0.16
Inferred	25,990,000	45.4	0.06	20.6	6.0	7.2	0.09

Note: *The CSA Global Mineral Resource was estimated within constraining wireframe solids encapsulating BIF strata. The resource is quoted from blocks above 40 % Fe cut-off grade, except Moonshine where resource is quoted from blocks above 50 % Fe. Differences may occur due to rounding. Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability.*

Table 3. Mineral Resources, by deposit, Ularring Hematite Project. Fe>40%

Deposit	Reporting cut-off grade (Fe%)	Category	Tonnes	Fe %	P %	SiO_2 %	Al_2O_3 %	LOI %	S %
Snark	40	Indicated	21,830,000	47.2	0.07	17.5	6.1	7.7	0.15
	40	Inferred	10,960,000	45.2	0.07	21.8	5.1	6.8	0.09
Drabble Downs	40	Indicated	11,070,000	47.2	0.06	16.6	6.4	8.3	0.26
	40	Inferred	360,000	43.6	0.05	24.0	4.8	7.8	0.09
Central	40	Indicated	15,090,000	47.0	0.05	16.2	7.2	8.1	0.12
	40	Inferred	10,190,000	45.3	0.05	20.3	6.3	7.5	0.08
Banjo – Lost World	40	Indicated	6,470,000	47.8	0.06	16.7	6.6	7.4	0.14
	40	Inferred	3,880,000	45.4	0.06	18.7	7.6	7.9	0.09
Moonshine	50	Inferred	600,000	53.0	0.06	13.4	6.7	6.1	0.15

***Note**: The CSA Global Mineral Resource was estimated within constraining wireframe solids encapsulating BIF strata. The resource is quoted from blocks above 40Fe % cut-off grade, except Moonshine where resource is quoted from blocks above 50 Fe %. Differences may occur due to rounding. Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability.*

1.7 Project Geology, Exploration and Mineral Resource Estimate

1.7.1 Geology

The Lake Giles Project area is characterised by north-west (Moonshine) or north, north west (Moonshine North) trending inter flow BIF units outcropping at surface (within a sequence of high magnesium basalts and intruded gabbroic sills and overlain by a komatiitic ultramafic. All the rocks have been metamorphosed from lower to mid greenschist facies and have been subject to multiple phases of deformation.

The outcropping geology of the project area is comprised of a combination of un-altered silica rich banded iron formations (BIFs) and altered, enriched hematite / goethite BIFs. Weathering has resulted in the leaching of the majority of the silica from the BIFs, thus producing a rock rich in iron and low in silica, near surface. These enriched bands vary from 1m to 30m in true thickness and are largely steeply dipping at 70°-90°.

1.7.2 Magnetite Resource

The mineralisation at Moonshine and Moonshine North deposits is associated with primary magnetite mineralization hosted by banded iron formation (BIF). The multiple BIF units steeply dip 75° to 85° to the west and strikes approximately 320° and 335° respectively with outcrops and the units have an average thickness of 15 m, over a strike length of 17 km.

Exploration was undertaken by way of reverse circulation (RC) and diamond drill core (DDH) drilling. A total of 166 RC holes for 29,516m and 3 DDH holes were included in the Moonshine and Moonshine North magnetite Mineral Resource estimate.

Three dimensional (3D) modelling methods and parameters were used in accordance with best Canadian practices. Surpac mining software was used for establishing the 3D block model and subsequent grade estimates. A geological interpretation of the iron mineralisation was derived from the drill hole logs and assays. Statistical and grade continuity analyses were completed in order to characterise the mineralisation, and were subsequently used to develop grade interpolation parameters.

The drilling at the Moonshine and Moonshine North deposits is described in more detail in Section 10.

1.7.2.1 Magnetite Mineral Resource Recommendations

It is recommended that future drill programs should have an industry standard QA/QC data collection added to the normal procedures. This should be analysed immediately once the assays have been received and documentation should be completed after a drilling phase has been completed. It is essential for lifting the mineral resource category to Indicated or Inferred and it will require at a minimum:

- Collection of field duplicates at a regular intervals. One every twenty samples should be sufficient
- Insertion of suitable Certified Reference Material (CRM) and blanks at regular intervals.
- Undertake a routine program of umpire assays. Send randomly 5% of the samples to another laboratory for checking
- Twinning of some drill holes to determine the validity of drill holes without QA/QC data

1.7.3 Hematite Resource

The mineralisation extends along a strike extent of 6,800 m (Snark and Drabble Downs), 3,300 m (Banjo and Lost World), 7,100 m (Central) and 2,200 m (Moonshine). BIF strata, containing the Mineral Resources presented in this report, have been modelled to a depth of 120m below surface except where closed by drilling.

Exploration by way of reverse circulation (RC) and diamond drill core (DDH) drilling has occurred through 2011 and complements drill results from previous years to support the current Mineral Resource estimate. The database supporting the Mineral Resource estimate on which this study includes all information collected up until 31st August 2011 (Moonshine), and 9th May 2012 (Snark, Drabble Downs, Central, Banjo and Lost World). As of this date there were 1,626 drill holes (1,588 RC, 38 DDH) loaded in the database for 92,259m. Of this total, 85,557 samples from 1,588 holes were assayed and verified for use in the Mineral Resource estimate.

The Mineral Resource estimate is based upon a set of 3D wireframe solids, encapsulating the host Banded Iron Formation ("BIF") strata. The new Mineral Resource estimate has been constrained by the BIF envelope and is reported from all blocks above a 40% Fe cut-off grade and incorporates all of the drill results to date. The exception to this is the Moonshine deposit's Mineral Resource, which was modelled using a 50% Fe envelope and is reported for blocks > 50% Fe.

The wire framed envelopes represent the constraining geology and the dip and strike of each envelope attempt to mirror the data from field fact mapping as far as possible. Block models were constructed for Snark and Drabble Downs, Central, Banjo and Lost World, and Moonshine. Parent cell sizes were set for each individual Mineral Resource model, dependent upon the local drill spacing. The sample assayed grades were estimated into the block model using ordinary kriging. Density values were calculated by an algorithm according to the interpolated iron grade.

The Mineral Resource is classified as Indicated and Inferred, as required by NI 43-101 and described in the CIM 2014 Definition Standards on Mineral Resources and Mineral Reserves. The classification level is based upon an assessment of geological and mineralisation continuity, quality control results from drilling and assaying, and an analysis of available density information.

1.7.3.1 Hematite Mineral Resource Recommendations

It is recommended the following actions are implemented to increase or maintain the confidence of future Mineral Resource estimates:

- Interpret localised geology to model expected depth of weathering, to differentiate between soft and hard BIF.
- Continue to develop a deposit scale geological model incorporating lithology, mineralisation, weathering and structural features that locally control the occurrence and location of BIF host rock.
- Maintain field geological procedures with respect to drill rig inspections and sampling procedures, vetting the maintenance and cleanliness of sample splitters and sample recovery.
- Monitor the performance of certified reference materials (CRM) and field duplicates immediately upon receipt of assays.
- MMS geologists to compile a QAQC report prior to future Mineral resource estimates.
- Complete additional drilling in Inferred and un-classified Mineral Resource areas to increase geological confidence of individual mineralised units.

1.8 Metallurgical Test Work

1.8.1 Magnetite Test Work

Metallurgical test work was performed on chips taken from two RC drill holes (RC203 & RC199), one from Moonshine North and the other from Moonshine. An Industry benchmark for Blast Furnace (BF) grade magnetite concentrate is for the silica grade to be < 5%. The results show that the RC203 samples could produce a suitable magnetite concentrate, recovering about 88% of the iron, at a size passing a 45 microns screen. RC199 did not perform as well so a conservative grind size was used for this work.

As the P80 size of a pulverised sample closed with a 45 micron screen is about 25 microns this size screen was used for the DTR analysis as it would generate suitable concentrate

A short LIMS program showed performance slightly poorer than the DTR results, a conventional result. Further test work is recommended to study this beneficiation process

The DTR mass pull was seen to be above 40% for these two drill holes. A conservative value of 38% was used for preliminary assessment of plant and project design. Future representative test work will confirm a more robust figure for inclusion in future studies.

1.8.2 Hematite Test Work

The PFS reported the results of beneficiation of low grade ore. Beneficiation of hematite ore is not considered in this PEA. The current operating philosophy is to crush and grind hematite ore to be blended with the magnetite concentrate. This material will be mined at the required blending grade, from areas indicated in the resource model. As such test work was not required on the direct-shipping hematite section of the blend. The material would be mined from the higher grade areas of the resource and crushed locally for transfer to the processing facility.

1.9 Mining and Processing

1.9.1 Mining Operation

For the purpose of this scoping study the assumption has been made for a mass recovery of 38% from the magnetite ore. Hence, in order to achieve 2.5 Mtpa of magnetite concentrate, the amount of ore feed to the magnetite process plant (concentrator) is 6.5 Mtpa.

Additionally, a waste/low grade to ore strip ratio of 3:1 for magnetite has been assumed based on cross sections through the Moonshine deposit and 3.7:1 for hematite has been calculated based on preliminary pit designs for the Snark deposit. Total annual material movement is approximately 27 Mtpa.

The general options considered to mine the ore body are:

- Mining shall be conducted by conventional drill, blast, load and haul mining methods.
- Ore shall be hauled to the Run of Mine ("ROM") pad for crushing and then ore product conveyed to a concentrate plant. Concentrate product shall then be transported to port, by rail, for export sale.

1.9.2 Processing Operation

The development of the concentration process for the Lake Giles Project would be influenced by several key elements. These include conservation of water, minimum power consumption, the competent and abrasive nature of the ore, and the presence or otherwise of asbestiform minerals within sections of the mineralisation. The concentration process may include:

- primary crushing
- secondary/tertiary crushing (if required)
- primary milling by Semi-Autogenous Grinding
- first stage of wet low intensity magnetic separators (LIMS)
- secondary milling by ball mill
- second stage, double drum wet LIMS
- tertiary milling by Vertimills
- finishing stage of magnetic separation by triple drum wet LIMS
- Dewatering of the various final streams

A preliminary flowsheet for the combined operation is shown below

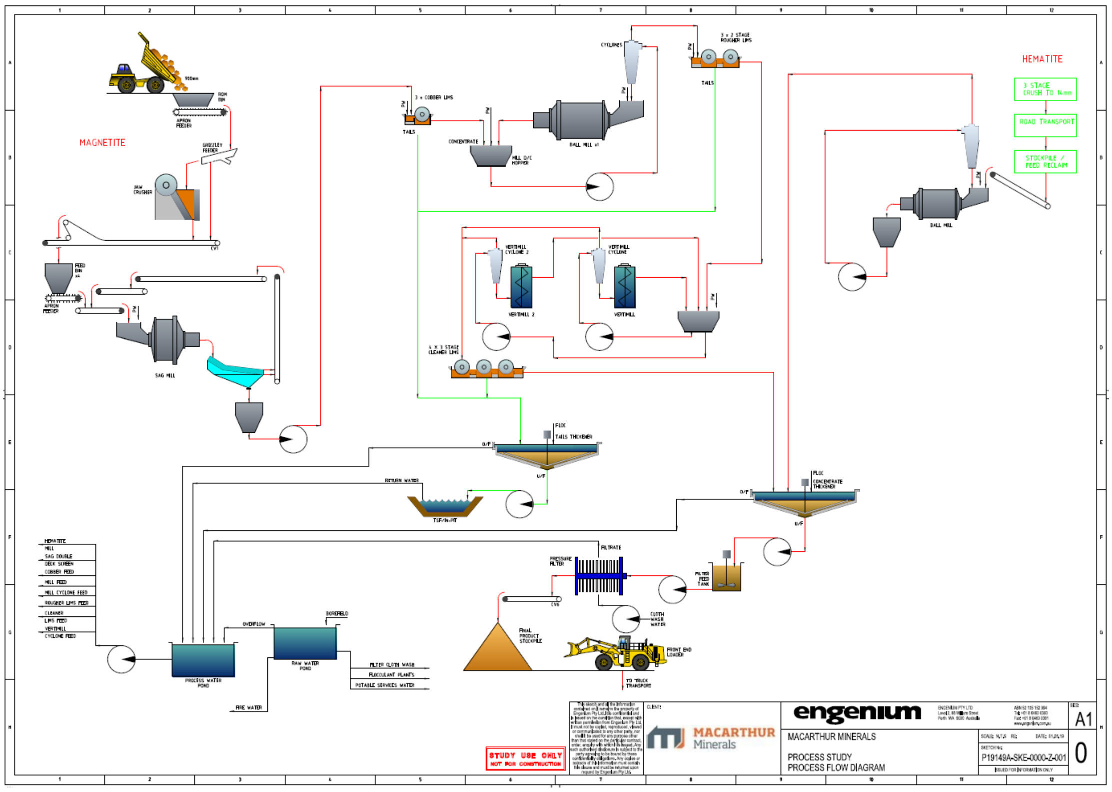

Figure 3. Conceptual Project Flowsheet

Approximately 58% of the feed to the crushing and concentration operations reports to the tailings circuit; being the non-magnetic streams from the concentrator.

Water sourcing is a major consideration and dewatering the coarser fractions of the tailings from the first two stages of magnetic separation may offer significant advantages in water savings. This will be a study to be included in future stages of assessment.

Concentrate dewatering will reduce the moisture content to a value below Transportable Moisture Limit. Tailings dewatering will recover as much process fluid as possible, while allowing for safe deposition of the tailings.

It is recommended that over the next stage of project development more metallurgical samples be obtained to conduct further process testwork. The testwork would be focused on confirming the response of the different ore zones within the magnetite and hematite deposits to develop a more robust process flow design for the project.

Further variability test work be conducted based on a range of samples from within, and marginal to, the orebody to reduce the longer term risk of ore body performance.

1.10 Logistics

Hematite product would be hauled from the hematite MOC to the wet processing plant for grinding to enable blending of the hematite fines and magnetite concentrate.

The iron concentrate from the processing plant will be transported from the mine by road to a rail siding located approximately 90 km south of the Project.

Road haulage will utilise quad road trains, with side tippers, along a private haul road. The concentrate will be stockpiled adjacent to the rail siding in 2 x 30 kt stockpiles before being rail transported with standard ore wagons to the Port of Esperance.

1.11 Port

The Lake Giles Project is located approximately 500 km by rail from the Port of Esperance and accessible via an open access rail line located 90 km south of the Project.

Esperance Port is capable of handling Cape Class vessels up to 200,000 dead weight tonnes, plus fully loaded Panamax class vessels up to 75,000 dead weight tonne. The port is presently licensed for 11.5 Mtpa of bulk iron ore loading.

A rotary car dumper (RCD) dedicated to unloading iron ore is available at the Port with capacity for up to 12 Mtpa. The RCD is owned by another iron ore producer currently exporting 5-6 Mtpa with plans to expand to 8 Mtpa by 2020. The terms of ownership require any spare capacity to be open access to other producers. Macarthur will commence access discussions as the project advances.

Iron ore is required to be stored in sheds at the Port and costed plans for a storage shed have been included in this study. Macarthur is currently in advanced discussions with the Port of Esperance to enter into a development agreement to build a storage shed.

The capacity of the existing shiploader at the iron ore berth (Berth 3) is approximately 16 Mtpa with 5-6 Mtpa currently allocated to another iron ore producer.

1.12 Infrastructure

The Project will comprise a fully serviced remote area mining and processing hub that will be supported by a fly in fly out (FIFO) work force supplemented by Kalgoorlie located personnel.

Power requirements include:

- 20 MW combined diesel and renewable power supply for the main (magnetite) process plant and main MOC
- 4 MW mobile diesel generator for the hematite process plant and hematite MOC
- 1-2 MW diesel generator for the camp

The total water requirement for the Project is estimated to be 2 Glpa. Water supplies for the accommodation camp should be available from aquifers in the Lake Giles Project area. Ore processing would require water quality of less than 5,000 ppm total dissolved solids (TDS). A review of the existing water supply environment highlighted the need for a detailed hydrological study to support the water requirements. Options for process water to be considered in the next study phase include:

- Access to water from closed and abandoned open cut mine pits within a 75 km radius of the Project. Several mine pits no longer in use have been identified within 45 to 75 km of the Project with potential to supply 2 Glpa.
- Access to local water supply pipelines including potential access to the Kalgoorlie pipeline. The Kalgoorlie pipeline sits approx. 120 km to the south. Discussions with WaterCorp indicate fresh water could be purchased subject to an infrastructure contribution.
- Bore field development. The region is likely to host sufficient water from a local palaeochannel although quality is likely hypersaline.

1.13 Approvals

The main legislation that governs environmental protection at the Federal level is the EPBC Act. It provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places – defined in the EPBC Act as Matters of National Environmental Significance (NES). Matters of NES have been identified within the Project area. The Ularring Hematite project of the PFS was formally referred to the Department of Environment and Energy (DEE) to determine whether it requires assessment under the EPBC Act. MMS received formal notification from DEE on 13 July 2012 that the Ularring project is not considered a controlled action and therefore does not require assessment under the EPBC Act. The Lake Giles Project covers additional area outside the Ularring Project. An updated project scope will be submitted to DEE that covers the full extent of the Project.

The primary legislation for environmental protection in Western Australia (WA) is the Environmental Protection Act 1986 (EP Act). In regards to mining approvals, Projects may require assessment under two separate parts; Part IV and Part V, administered by the Environmental Protection Authority (EPA) and the Department of Water and Environment Regulation, respectively. Under Part IV of the Act, Proposals are referred to the EPA for a decision on whether the project has the potential to cause significant impacts on the environment. The Ularring Project was granted approval by the EPA on 24 October 2013. The Lake Giles Project covers additional area beyond the area of disturbance approved by the EPA and an updated approval will be required.

Under Part V of the EP, secondary approvals such as Works Approvals and Operating Licences will be required for Prescribed Activities and facilities that result in discharges to the environment. These applications will be submitted upon receiving more detailed information on Project design and infrastructure requirements. Works approvals and licences will be required to operate the beneficiation process plant, tailings storage facility, sewage pond and site landfill.

Approval under the Mining Act 1978 is also required for mining projects and is administered by the Department of Mines, Industry Regulation and Safety (DMIRS). Approval under this Act involves the assessment of a Mining Proposal and Mine Closure Plan. In addition, if the Project is not assessed by the EPA under Part IV of the EP Act, then DMIRS are also required to assess Native Vegetation Clearing Permit applications.

Approval to disturb Aboriginal heritage sites may be required under the Aboriginal Heritage Act 1972. At this stage, there are no registered sites and consultation with the Traditional Owners is ongoing to determine the significance of potential sites.

1.14 Native Title

The Project sits within the Marlinyu Ghoorlie native title claim. The claim was registered on 28 March 2019 but is currently not determined. Native title rights in registration or grant give claimants the right to negotiate during the grant of mineral tenure. Macarthur's Mining Leases were all granted prior to registration of the Native Title claim and the current claim does not confer rights to negotiate or affect the tenure. There were no Native Title claims over the area at the time of grant and therefore no access agreements were required to be negotiated with Claimants.

A search of the Department of Indigenous Affairs (DIA), Aboriginal Heritage Inquiry System confirms that there are no registered heritage sites on any of the tenements within the Project area (DIA 2011).

Heritage surveys have been conducted in accordance with EPA Guidance Statement No. 41 (EPA 2004a) across all Project areas, including both archaeological and ethnographical surveys. To date, four potential archaeological sites have been identified within the Project area. Traditional Owner Group representatives have been consulted as to the significance of these archaeological sites. Should these sites meet the criteria as a heritage site under the Aboriginal Heritage Act 1972, a Section 18 application will be required to disturb the site.

MMS will work towards mutually beneficial outcomes through a commitment to community consultation and ongoing liaison. MMS facilitates local direct employment and indirect employment, endeavours to support training and development initiatives related to exploration, future mining and ancillary services. MMS respects cultural diversity, connection to country and encourages sustainable business relationships.

1.15 Capital Costs

Capital costs for the Lake Giles Project over the life of the project totalling A$466 million were estimated by Engenium. Additional sustaining capital of A$77million has been included in the financial analysis for replacement capital and ongoing mine road construction and tailings storage. Sustaining capital is incurred annually at a rate of 2% of capital expenditure. Mine closure and rehabilitation costs of A$54m have been included and incurred in the last two years of the project.

The estimates are summarised below in Table 4 and should be considered to be 30% order of accuracy current at the second quarter of 2019.

Table 4. Capital Cost Summary

	Capex (A$M)
Mine	8.7
Crushing	29.0
Process	120.6
Tailings	14.7
Infrastructure	99.0
Logistics	22.0
Port	21.0
Total direct costs	**315.1**
Construction indirects	47.3
Owners costs	9.5
EPCM	31.5
Contingency	63.0
Total indirect costs	**151.3**
Total project	**466.4**

Opportunities to reduce MMS's capital outlay through contracting with third parties to provide key elements of the project including potentially the beneficiation plant, project water supply infrastructure and site accommodation infrastructure will be evaluated in due course.

The following key assumptions have been made in regards to the capital cost.

- contracted mining operations
- owner processing
- contracted power generation
- contracted loading and haulage operations
- contracted rail logistics
- contracted Port handling and ship loading.

No capital allowance has been made for rail facilities as these are assumed to be covered by the respective controlling entities providing these services to the project as an operating cost.

1.16 Operating Costs

Operating costs have been estimated on the basis that mining operations will be carried out by a contractor under MMS's supervision for geology, grade control and survey. Concentrate transport to rail head and rail haulage to the port will be by contract, and port operations will be by SPA. Average mine operating cost (excluding royalties) is estimated to be A$42.89 for hematite mining and A$53.47 per tonne to product grading 65% - 68% Fe delivered FOB to Port. A summary of operating costs elements are shown below in Table 5.

Table 5. Operating Costs

	Opex A$/t	
	Magnetite	**Hematite**
Mine	12.03	13.85
Crushing	1.20	3.00
Process	13.41	0.32
Tailings	0.47	
Road transport	7.20	8.73
Filtration	0.35	0.35
Rail	11.31	11.31
Port	3.89	3.89
Indirects	3.61	3.61
Total operating costs ($/t concentrate)	**53.47**	**44.71**

1.17 Financial Analysis

The evaluation of the Lake Giles Project was completed using discounted cash flow analysis with a real after-tax discount rate of 8%, with a range of sensitivities applied. The key economic outcomes were:

- Life-of-Mine revenue over 31 years of greater than A$9.8 billion;
- A NPV estimate of A$535 million
- Operating costs of A$42.89/tonne of hematite and A$53.47/ tonne of magnetite product delivered free on board (“FOB”) to the Port and
- Capital discounted payback of approximately 3 years.

The financial outcomes from the studies of the Project are shown below in Table 6.

Table 6. Financial Outcomes

Financial Valuation	
NPV at 8% discount rate*	A$535 million
Internal Rate of Return*	21%
Project life	31 years
Fe grade of saleable product	65 – 68% Fe
Total sales tonnes	82.8 Mt
Capital payback period	3 years
Total revenue generated (real)	A$9.83 billion
Long Term Fe price	US$86 /t (FOB)
Long term A$/US$ exchange rate	0.70

** Real, after-tax*

*** Benchmark 65% Platts Fe Index adjusted to final product grade*

The outcomes of economic assessment is preliminary in nature and includes inferred mineral resources that are considered too speculative geologically to have the economic considerations applied to them that would enable them to be categorized as mineral reserves, and there is no certainty that the preliminary economic assessment will be realised.

1.18 Forward Work Programme

There are several areas that will require additional focus prior to MIO fully committing to the execution of the Lake Giles Project. These works are summarised below.

1.18.1 Permits and Approvals

Approval from the DEE under the EPBC Act and the EPA under the EP Act has already been granted for the Ularring Project. Further permits and approvals are required for the disturbance relating to the magnetite deposit and additional infrastructure requirements.

1.18.2 Resource Development and Metallurgical Assessment

Further drilling will be required to finalise the ore body size, configuration and quality to allow a long term mine plant to be developed.

In parallel with such development a Metallurgical Testwork Programme would be performed to determine the design parameters for the plant.

1.18.3 Water Source

MIO will need to undertake further validation of water sources for the Project. In order to validate the potential water supply sources, in field drilling and water testing will be required. All holes are to be geologically and hydro-geologically logged with water strike and flow rate data recorded during drilling. Sustainability tests will need to be undertaken along with water quality analysis to determine each of the selected areas ability to supply water at the volumes and quality required for continuous mining operations for the Project.

1.18.4 Geotechnical Investigations

MMS recognise the importance of quality and timely Geotechnical investigations and analysis to support the engineering design outputs of the Project. Geotechnical investigations will be required at the proposed MOC and processing plant areas

1.18.5 Front End Engineering Design (FEED)

The FEED component of the project provides for Process Design Criteria and Mass/Water balances, detailed P&IDs, preliminary design validations and 3D plant models be developed in order for MMS to make effective and timely informed decisions that impact cost implications, final designs, major maintenance or constructability issues, early procurement of critical path and long lead time items, final capital estimates and ultimately leading to final project approvals and procurements.

2 Introduction

2.1 Issuer

This Technical Report has been prepared for MMS by independent consultants Engenium Pty Ltd (Engenium).

Macarthur Minerals Limited is an Australian public company listed on the TSX Venture Exchange (TSX-V: MMS) and OTC Markets (OTCQB: MMSDF). The Company is incorporated in Australia and registered in Queensland. Macarthur Minerals owns the Lake Giles Project through its 100% owned subsidiary, Macarthur Iron Ore Pty Ltd.

2.2 Terms of Reference

The content of this report describes the Preliminary Economic Assessment ("PEA") level studies undertaken, for mining, processing and marketing for the combined hematite and magnetite Lake Giles Project.

The Project utilises Inferred Mineral Resources for the Moonshine Magnetite Project previously and Inferred and Indicated resources of the Ularring Hematite Project.

The Preliminary Assessment was undertaken by Neville Dowson, B App Sci (Ext Met), MBA, the Principal Process Engineer for Engenium Ltd who is a full-time employee of Engenium and who is a Qualified Person in terms of NI43-101 standards and a Fellow of the AusIMM.

2.3 Sources of Information

Capital and operating costs were derived from quoted rates to MMS and Engenium.

Product marketing and forecast pricing was supplied by Credit Suisse.

Information of current and forward product demand, product marketing and pricing were supplied by Glencore as well as published research reports by Credit Suisse, TD Securities Inc, Macquarie Bank research, Steel Orbis Bulletins, Global Mining Research and major global iron ore producers and marketers (BHP published price and market) forecasts..

The QPs have prepared or supervised the preparation of each section as follows:

- Neville Dowson: 1 to 6, 13, 14.1, 15-25, 26.2 and 27
- David Williams: 7, 8, 9, 10, 11, 12, 14.3 and 26.1
- Shane Fieldgate: 10, 11, 12, 14.2 and 26.1

2.4 Qualified Person Property Inspection

Mr Neville Dowson, Engenium Principal Process Engineer, visited the property on June 12, 2019. While on site, Mr Dowson inspected the overall geology of the project including outcropping hematite mineralisation of the Moonshine and Moonshine North deposits. Representative drill core and RC chips of mineralised intervals from the Moonshine and Moonshine North deposits were inspected. Multiple drill hole locations were visited and collar coordinates for five drill holes were surveyed with a handheld Garmin GPS device, with an accuracy of ± 3 metres on the GDA94 grid system. In all cases the surveyed collar coordinates were confirmed. Mr Dowson is satisfied no material activity has occurred or restrictions are in place that would restrict development as proposed herein.

Mr David Williams, CSA Global Principal Resource Geologist, did not complete a current site inspection.

Mr Shane Fieldgate, Resource Geologist, did not complete a current site inspection.

The QPs are satisfied there has been no new material scientific or technical information about the property since the last site visits by the qualified persons.

3 Reliance on Other Experts

No reliance on other experts who are not qualified persons was made in the preparation of this report other than outlined below.

Mr Dowson has relied upon and disclaims responsibility for information provided by the Issuer concerning legal and environmental matters relevant to the Technical Report in a document titled PEA Lake Giles Report 2019, dated April 24, 2019 authored by Dr Dean Carter, General Manager, Macarthur Minerals.

Mr Dowson has not independently verified the legal status, ownership of the properties and relies upon the above cited document. This information is used in Sections 4.2 and 4.3.

Mr Dowson has relied on information regarding environmental impacts, approval status and native title rights in the above cited document. This information is used in Chapter 20.

4 Property Description and Location

4.1 Location of Property

The Lake Giles Project is located approximately 450 km east-northeast from the coastal city of Perth and 175 km northwest from the historic gold mining town of Kalgoorlie-Boulder, in the state of Western Australia (Figure 4). The project can be accessed by heading 130 km north from Kalgoorlie via the sealed Goldfields Highway to the township of Menzies and then 115 km from Menzies via the graded Evanston-Menzies road (Figure 5).

Unless otherwise stated, all coordinates referenced in this report are in Geocentric Datum of Australia (GDA94, Zone 50). The project tenements are centred at approximately 788,000 mE and 6,687,000 mN.

4.2 Details of Tenure

At present MMS manages 15 granted mining leases covering a total area of approximately 6,256 Ha (Figure 6). All tenements are all controlled by Macarthur Iron Ore Pty Ltd (MIO), a 100% owned subsidiary of MMS as itemised in Table 7 and Figure 6.

Mining Lease boundaries are defined by the location of corner claim pegs with approximate coordinates based on GPS readings recorded in claim documentation. They must be accurately surveyed by an Approved Surveyor after the lease is granted.

Table 7. MIO Tenure Details and Expenditure Commitments as at 12 April 2019

Tenement ID	Holder	Area (Ha)	Grant Date	Expiry Date	Expenditure Commitment
M30/0206	MIO	189	2/07/2007	1/07/2028	$18,900.00
M30/0207	MIO	171	2/07/2007	1/07/2028	$17,100.00
M30/0213	MIO	258	13/06/2011	12/06/2032	$25,800.00
M30/0214	MIO	260	13/06/2011	12/06/2032	$26,000.00
M30/0215	MIO	521	13/06/2011	12/06/2032	$52,100.00
M30/0216	MIO	55	13/06/2011	12/06/2032	$10,000.00
M30/0217	MIO	114	13/06/2011	12/06/2032	$11,400.00
M30/0227	MIO	504	13/06/2011	12/06/2032	$50,400.00
M30/0228	MIO	362	2/07/2007	1/07/2028	$36,200.00
M30/0229	MIO	205	2/07/2007	1/07/2028	$20,500.00
M30/0248	MIO	585	22/02/2012	21/02/2033	$58,500.00
M30/0249	MIO	1206	22/02/2012	21/02/2033	$120,600.00
M30/0250	MIO	102	5/03/2013	4/03/2034	$10,200.00
M30/0251	MIO	1246	27/11/2012	26/11/2033	$124,600.00
M30/0252	MIO	478	27/05/2013	26/05/2034	$47,800.00

4.3 Tenure Conditions and Liabilities

All of the tenements occur on vacant Crown Land which is defined as Crown Land not currently being used or reserved for any future purpose. As the registered tenement manager MMS has the right to access the land for the purpose of mineral exploration, subject to the conditions of tenure described below (Table 8).

There are no heritage agreements in place as there are no registered native title claimants within the Project tenements. There are no other known significant risks that could affect access, title or the right to perform work on the tenements. All exploration activity is conducted according to the tenure conditions as listed below, including the requirement to obtain Programme of Works (PoW) approvals before any drilling is undertaken.

Approval from the Department of Sustainability, Environment, Populations and Communities (DEE) under the EPBC Act has already been granted for the Ularring Project. Further permits and approvals are required in order to move forward.

The project does not have any environmental liabilities from previous mining or exploration activities such as the rehabilitation of waste dumps or decommissioning of tailings storage facilities. No area of the site is registered as a contaminated site that requires remediation. MMS has not been fined or prosecuted under any environmental legislation or received any improvement notices for current or past exploration activities from the Department of Mines and Petroleum (DMIRS).

Current exploration is governed by the tenure conditions presented in Table 8.

Table 8. Tenure Conditions

Applicable Tenement	Condition
The follow conditions apply to all Mining Leases M30/206 M30/207 M30/208 M30/213 M30/214 M30/215 M30/216 M30/217 M30/218 M30/219 M30/227 M30/228 M30/229 M30/248 M30/249	• All surface holes drilled for the purpose of exploration are to be capped, filled or otherwise made safe after completion. • All costeans and other disturbances to the surface of the land made as a result of exploration, including drill pads, grid lines and access tracks, being backfilled and rehabilitated to the satisfaction of the Environmental Officer, Department of Mines and Petroleum (DMIRS). Backfilling and rehabilitation being required no later than 6 months after excavation unless otherwise approved in writing by the Environmental Officer, DMIRS. • All waste materials, rubbish, plastic sample bags, abandoned equipment and temporary buildings being removed from the mining tenement prior to or at the termination of exploration program. • Unless the written approval of the Environmental Officer, DMIRS is first obtained, the use of scrapers, graders, bulldozers, backhoes or other mechanised equipment for surface disturbance or the excavation of costeans is prohibited. Following approval, all topsoil being removed ahead of mining operations and separately stockpiled for replacement after backfilling and/or completion of operations. • The construction and operation of the project and measures to protect the environment being carried out generally in accordance with the Programmes of Works approvals (where present). Where a

Applicable Tenement	Condition
	difference exists between the Programmes of Works approvals and the following (tenement) conditions, then the following (tenement) conditions shall prevail.
M30/249	• No interference with Geodetic Survey Station NMF 395 and mining within 15 metres thereof being confined to below a depth of 15 metres from the natural surface.
M30/229	• The development and operation of the project being carried out in such a manner so as to create the minimum practicable disturbance to the existing vegetation and natural landform. • All topsoil being removed ahead of all mining operations from sites such as pit areas, waste disposal areas, mineralisation stockpile areas, pipeline, haul roads and new access roads and being stockpiled for later re-spreading or immediately re-spread as rehabilitation progresses.
M30/213 M30/214 M30/215 M30/216 M30/217 M30/218 M30/227	• Portions of these licences are overlain by the Mt. Manning Nature Reserve. This reserve was granted in April 2000, and is identified by Western Australian Government reference number 36208. The iron mineralisation of the Ularring Hematite Project does not encroach on the nature reserve. • Consent to explore on DEC - Managed Lands Conservation of Flora and Fauna Reserve 36208 granted subject to the following conditions: - Prior to lodgement of a Programme of Work (PoW), the lessee preparing a Conservation Management Plan (CMP) to address the conservation impacts of the proposed activities and submitting the CMP to the relevant Regional Manager of the Department of Environment and Conservation (DEC). This CMP shall be prepared pursuant to DEC-prepared "Guidelines for Conservation Management Plans Relating to Mineral Exploration on Lands Managed by the Department of Environment and Conservation" to meet the requirements of the Minister for Environment for acceptable impacts to conservation estate. A copy of the CMP and of DEC's decision on its acceptability under the guidelines is to accompany the lodgement of the PoW application with the Department of Mines and Petroleum. - At least five working days prior to accessing the reserve or proposed reserve area, unless otherwise agreed with the relevant Regional Manager of the Department of the Environment and Conservation (DEC-R), the holder providing the DEC-R with an itinerary and programme of the locations of operations on the lease area and informed at least five days in advance of any changes to that itinerary. All activities and movements shall comply with reasonable access and travel requirements of the DEC-R regarding seasonal/ground conditions - The licensee submitting to the Director of Environment, Department of Mines and Petroleum (DMIRS), and to the relevant Regional Manager, Department of the Environment and Conservation (DEC-R) a project completion report outlining the project operations and rehabilitation work undertaken in the

Applicable Tenement	Condition
	programme. This report is to be submitted within six months of completion of the exploration activities.
M30/213 M30/214 M30/215 M30/216 M30/217 M30/218 M30/227	• All Mining Proposals submitted for the commencement, alteration or expansion of operations within the tenement boundary are to contain information that demonstrates the proponent has genuinely engaged with the Department of Environment and Conservation on the Mining Proposal. The level of engagement will be to the satisfaction of the Director Environment, Department of Mines and Petroleum.
M30/213 M30/218	• Rights being reserved to persons authorised by the Chief Executive Officer of the Department of Environment and Conservation to enter the Lease and carry out land management operations and other duties and exercise such powers as may be necessary or expedient for the administration of the Conservation and Land Management Act 1984 and Regulations, the Wildlife Conservation Act 1950 and Regulations, the Bush Fires Act 1954 and Regulations and the Emergency Management Act 2005 and Regulations.
M30/207	• No interference with Geodetic Survey Station SSM - Kalgoorlie 93 and mining within 15 metres thereof being confined to below a depth of 15 metres from the natural surface.
M30/227	• No interference with Geodetic Survey Station SSM-KALGOORLIE 138 and mining within 15 metres thereof being confined to below a depth of 15 metres from the natural surface.
all the Mining Licences: M30/206 M30/218 M30/207 M30/219 M30/208 M30/227 M30/213 M30/228 M30/214 M30/229 M30/215 M30/248 M30/216 M30/249 M30/217	• Mining Leases must be surveyed by an Approved Surveyor upon grant of the tenement or approval of a Mining Proposal. • The lessee submitting a plan of proposed operations and measures to safeguard the environment to the Director, Environment, DMIRS for his assessment and written approval prior to commencing any developmental or productive mining or construction activity. • Mining on any road, road verge or road reserve being confined to below a depth of 15 metres from the natural surface.

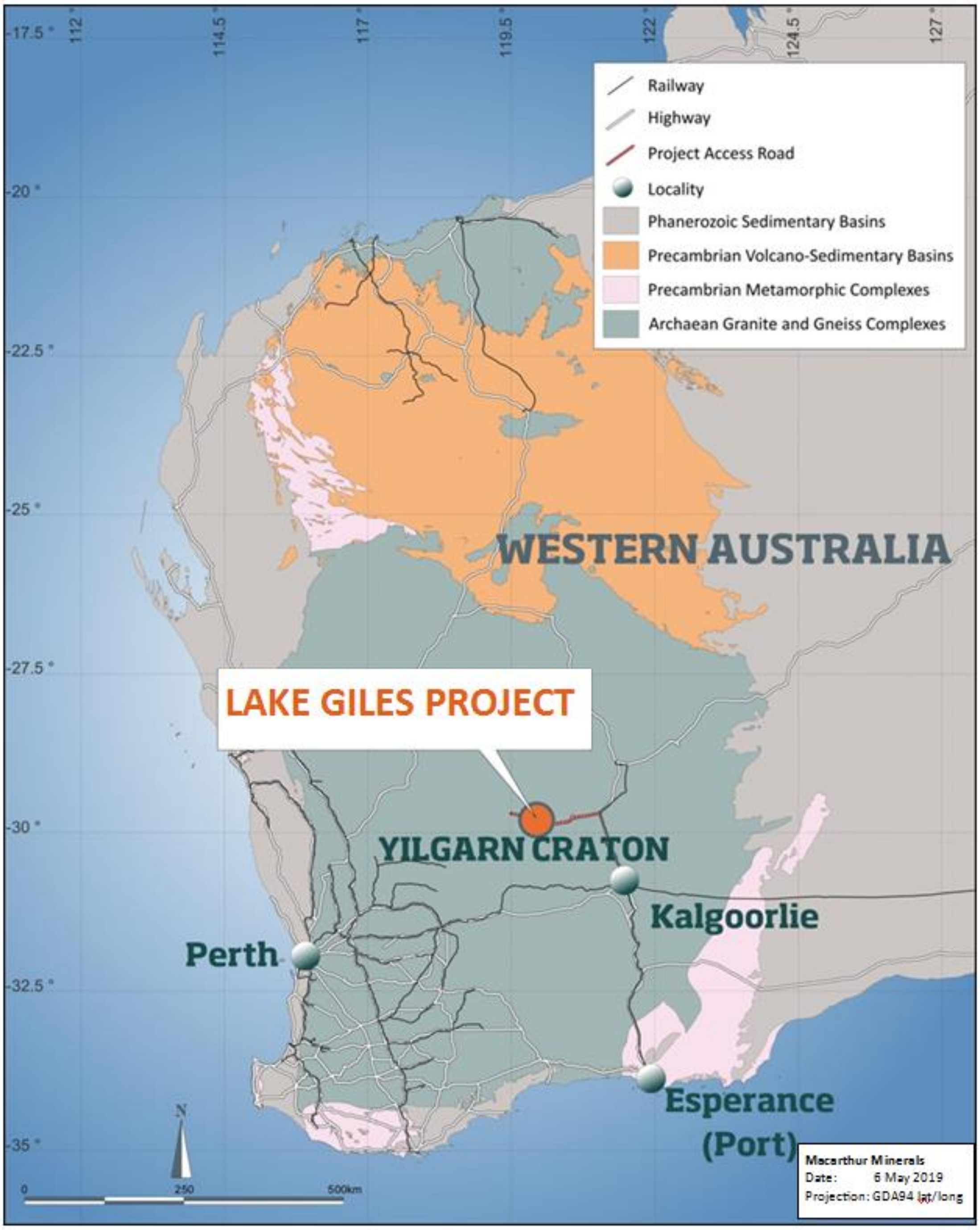

Figure 4. Location of Lake Giles Project in Western Australia

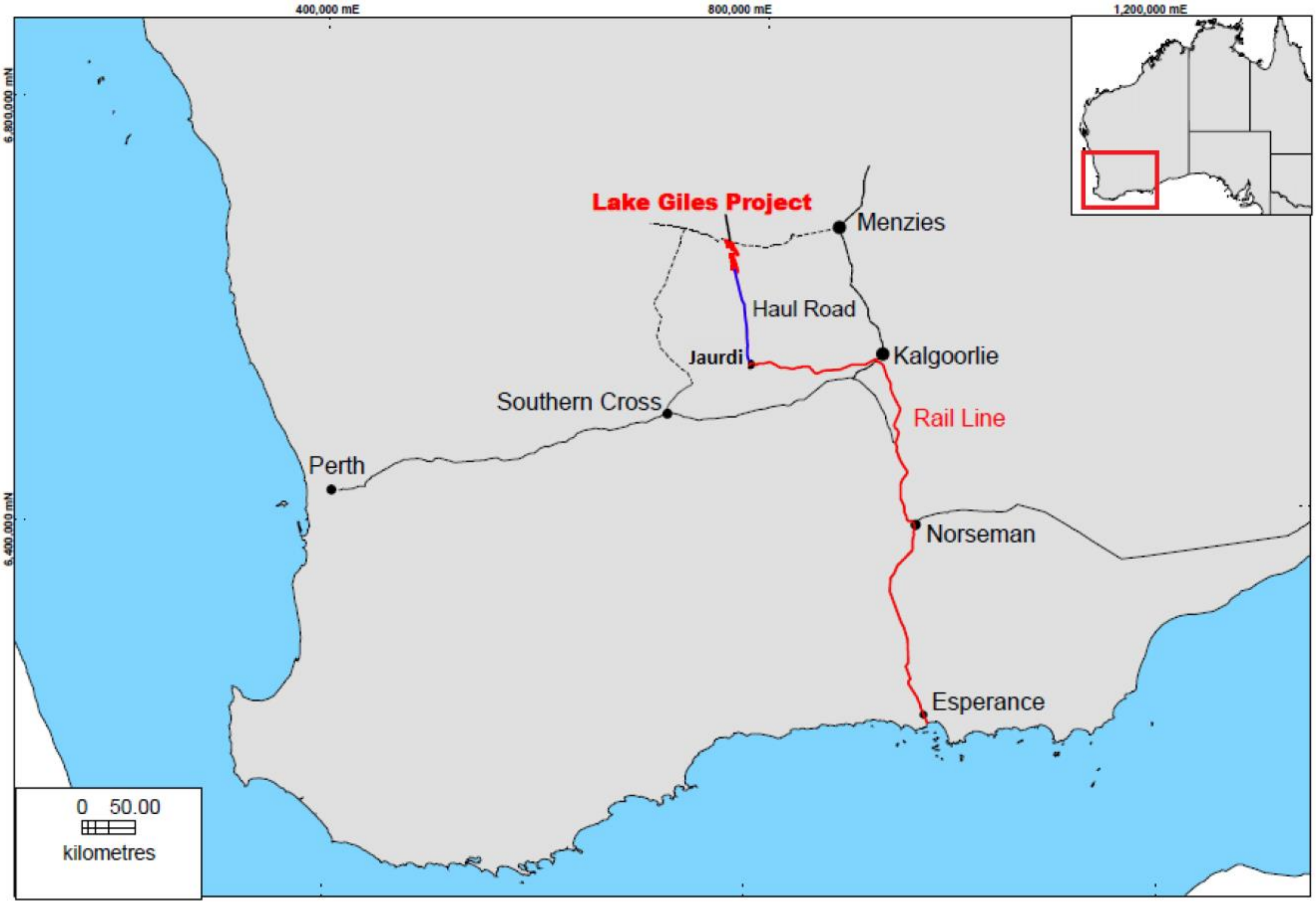

Figure 5. Location of the project area with local infrastructure and localities.

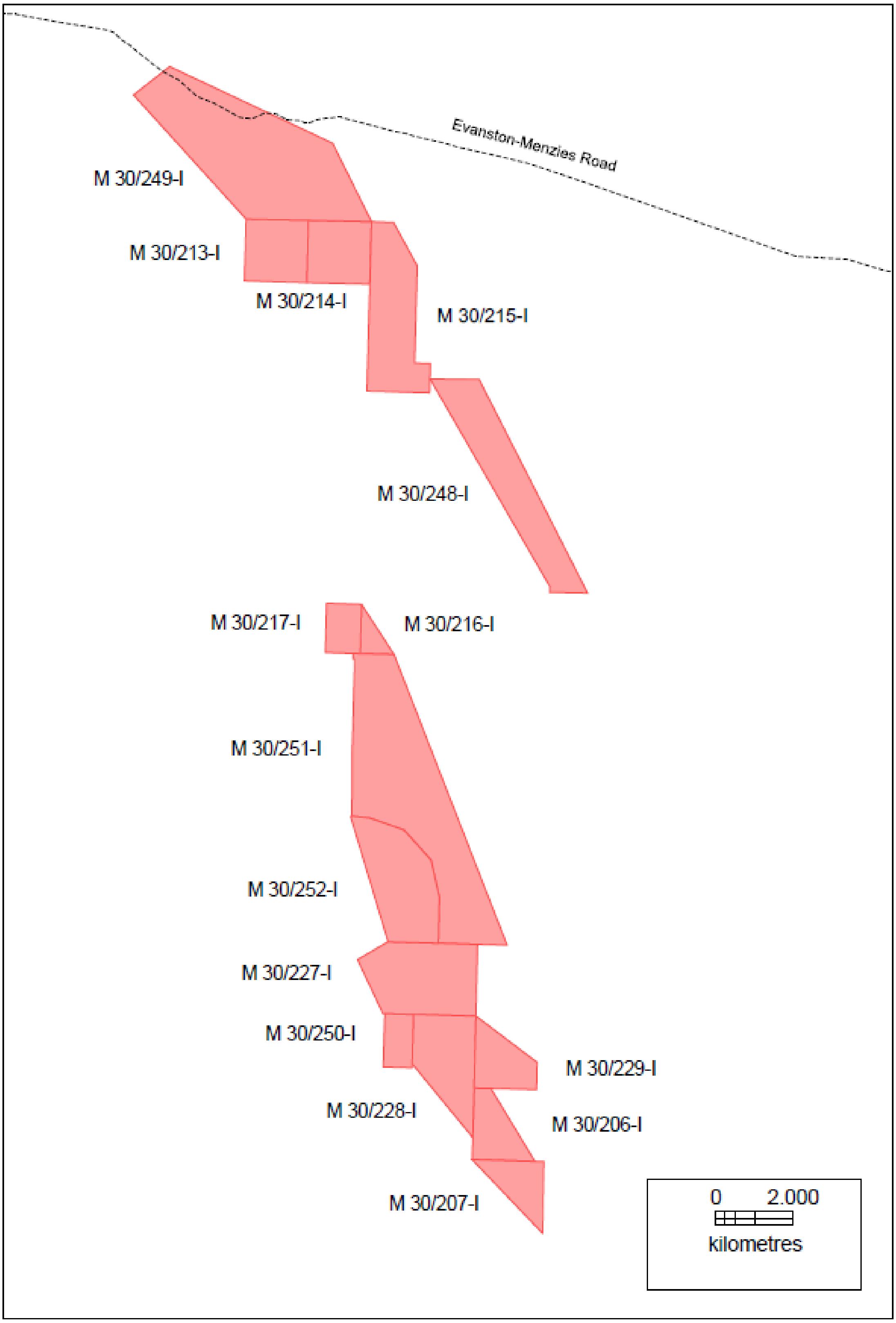

Figure 6. Macarthur Minerals Limited Tenement Holdings at April 2019

5 Accessibility, Climate, Local Resources, Infrastructure and Physiography

5.1 Topography, Elevation and Vegetation

The topography of the Project area is comprised of low ridges associated with the BIF units, striking in a general northwest - southeast direction, that rise up from the surrounding sandy plains. The range in elevation is approximately 120m with the highest point at approximately 520 mRL.

The vegetation of the project area is dominated by mulga scrub with local patches of low to medium eucalypt woodland and areas of salt tolerant shrub and spinifex.

5.2 Access to Property

The Project can be accessed from Kalgoorlie via the sealed Menzies Highway north for 130 kilometres, then west from the town of Menzies for 115 kilometres along the unsealed graded Evanston-Menzies road (refer Figure 5). Alternatively the project can be accessed from Perth, via sealed roads to Southern Cross and Bullfinch, then north and east for 200 kilometres along the Diemals road. Kalgoorlie is serviced by daily commercial flights from Perth. Access within the project area is by a number of tracks cleared by previous explorers, and more recently by MMS. These tracks may become impassable after heavy rain.

5.3 Climate

The climate at the Project is characterised as a semi-arid climate. The Diemals weather station, located to the west of the project at Latitude 29.67°S, Longitude 119.30°E, was operated by the Australian Bureau of Meteorology between 1970 and 1994 (Australian Bureau of Meteorology, 2011). Diemals recorded a mean annual rainfall of 275.7mm with rain fall mostly in the winter months. The temperature averages over 40°C for 15 days in the summer months, from November to March, while in the winter months, from June to August, the temperature averages a minimum range from 3.9°C to 5.0°C. See Figure 7 for more details.

The climate at the project area allows an operating season covering the full length of the year. In the Kalgoorlie region, mining and exploration activities are conducted throughout the year, with infrequent generally short disruptions during and after periods of heavy rain.

5.4 Infrastructure

The Project is serviced from the city of Kalgoorlie-Boulder, with a population of 31,000 people (Australian Bureau of Statistics, 2011), which provides services to a large number of operating mines and exploration properties in the region.

Some limited facilities are available in Menzies including fuel, accommodation and meals. A railway line passes through Menzies, and road freight lines deliver to the town.

The Project site itself is remote with no existing infrastructure other than unsealed roads and an exploration camp. This study has addressed the requirements for the provision of power, water, personnel, tailings storage areas, waste disposal areas and processing plant sites and these are detailed in Sections 17 and 18 of this report. Subsequent studies will further develop the provision of these services.

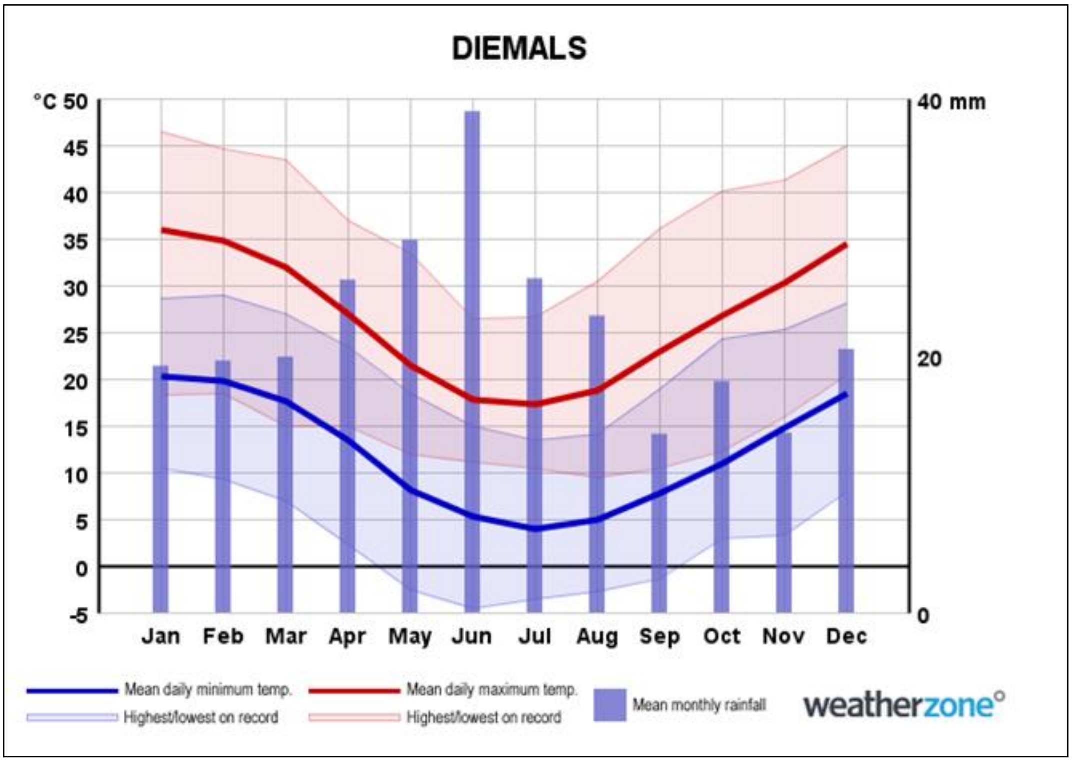

Figure 7. Average temperature ranges and rainfall on a monthly basis for Diemals weather station (Weatherzone, 2011).

6 History

6.1 Property Ownership

Since the late 1960's several exploration companies have held the exploration rights to the project tenements. There have been three main phases of exploration; nickel exploration from 1968 to 1972, gold exploration from 1993 to 2004 and more recently iron exploration. The following summary has been derived from Revell (2006), Farmer (1997a, 1998a, 1998c) and Busbridge (1998a, 1998b).

Between 1968 and 1972 the area was explored primarily for nickel sulphide mineralisation by Amax Exploration (Australia) Inc, Consolidated Goldfields Australia Limited, Geotechnics Pty. Ltd., on behalf of Welcome Stranger Mining Company Limited, Kia Ora Gold Corp. NL and Delta Minerals NL and Le Nickel (Australia) Exploration Pty Ltd.

Between 1972 and 1993 there are no records of any significant exploration activity. From 1993 to 1998, the region was explored primarily for gold by several companies, generally operating in joint ventures.

In May 1993, Battle Mountain Australia Incorporated (Battle Mountain) was granted Exploration License E30/93 which partially overlaps with the southern portion of the area now covered by MMS's currently granted Exploration License E30/240. In August 1993, Aztec Mining Company Limited (Aztec), a subsidiary of Normandy Exploration Limited (Normandy) was granted Exploration License E30/100 covering western parts of the current tenements, and in December 1993 Aztec were granted E30/99 which encompasses the area now covered by E30/240. In 1995-1996, Noble Resources NL (Noble) formed a Joint Venture with Battle Mountain to explore E30/93, with Noble managing exploration activities. Noble's interest in the joint venture was subsequently transferred to Barclay Holdings Ltd, a wholly owned subsidiary of Titan Resources NL. Titan withdrew from the joint venture in 1998, and Battle Mountain surrendered the tenement in 1998. In September 1994, Evanston Mines NL formed the Dodanea joint venture with Aztec to explore E30/99 and E30/100. Following Evanston's unsuccessful float, Evanston's share of the joint venture passed to Noble Resources, and subsequently after an asset swap, on to sister company Titan Resources in February 1997. In June 1998 Titan withdrew from the joint venture, and in December 1998 Normandy surrendered the tenements.

From late 1998 to 2003 the area was consolidated into the "Lake Giles Project" by Mr. Troy Dalla-Costa who was granted a number of tenements covering the area. In 2003, the tenements were purchased from Mr. Troy Dalla-Costa by Internickel Australia Pty Ltd (Internickel).

In early 2004 Internickel was purchased by Adex Holdings Limited. MMS purchased the project from Adex Holdings Limited in late 2005.

6.2 Project Results – Previous Owners

6.2.1 Nickel Exploration 1968-1972

The 1968 to 1972 phase of nickel focused exploration is reported by Ward (1970a, 1970b, 1970c) and Ward & Pontifiex (1970). Exploration undertaken during this period included grid establishment, geological mapping, rock chip sampling, magnetic, electromagnetic and induced polarisation geophysical surveying, and petrographic analysis of rock samples.

Geotechnics was the only company to drill in the area during this period. Table 9 summarises the drilling completed by Geotechnics, however the grid that Geotechnics used has not been re-established and the exact location of the drill holes is unknown.

Table 9. Summary of drilling 1968 to 1972 (modified from Ward 1970a, 1970b, 1970c)

Type	Number of Drill Holes	Number of Metres	Max Depth (m)
Diamond	7	523	127
Open Hole Percussion	15	658	60
Total	22	1,181	

It is unclear where these drill holes lie in relation to the areas of current interest for iron ore mineralisation. Rock chip sampling conducted by Geotechnics during this phase of exploration returned assays from samples of outcropping BIF with iron assay results of 36.1% to 63.5% (Cooper, 2007). Although these results provided an indication of the project's exploration potential they were not followed up, and no exploration specifically targeting iron mineralisation was conducted until Internickel commenced exploring the tenements in 2000.

6.2.2 Gold Exploration 1993-1998

In May 1993 Battle Mountain Australia Incorporated (Battle Mountain) was granted the tenement E30/93 which partly overlies the tenement E30/0240, which is part of the Lake Giles area (Famer 1997a, 1998a, 1998c). Battle Mountain established a grid over E30/040 from which MMS collected 37 rock chip samples and completed a soil 50m x 500m sample program, which MMS subsequently in filled to a 50 x 100 metre spacing for a total of 1,175 samples. This soil sample program identified several gold anomalous zones with maximum grades of 3 to 12 ppb gold (Anon 1994).

In August 1993, Aztec Mining Company Limited (Aztec) was granted the E30/100 lease which is immediately west of the project tenements and in December 1993 Aztec was granted tenement E30/99 (covered by tenements M30/213-218). Aztec collected 715 soil samples, 31 stream sediment samples and 901 soli auger samples with identified several anonymous gold zones which peaked at 53ppb. Aztec drilled 80 RAB holes (Table 10) to test the anomalous gold zones, which returned weak mineralisation, with the best result being from drill hole DON06 for 25 metres at 0.4 g/t (Smith and Govey, 1995, Busbridge 1998b).

Battle Mountain drilled 41 RAB drill holes (Table 10) in 1994/5, targeting the anomalies identified in the soil sampling. These anomalies were named Soapbox and Enfield prospects in tenement E30/99. The best result from the RAB drill holes was from DOP8 for 4m @ 0.4 g/t at the Soapbox prospect (Anon 1995).

In 1995 Noble Resources NL (Noble) formed a joint venture with Battle Mountain to explore E30/93, however Noble interest was transferred to Barclay Holdings Limited, a wholly owned subsidiary of Titan Resources NL (Titan), in February 1997.

Titan commissioned Telsa Airborne Geophysics in 1997 to complete an airborne geophysics survey of the tenements E30/93, E30/93 and E30/100. The airborne survey included magnetics and radiometric surveys and was flown at a height of 50 metres on 100 metre line spacing. In the same year Titan completed a 537 soil auger program over the tenement E30/93 (Famer 1997a, 1997b 1998a).

In early 1998 Titan collected 311 metre soil sample on a 50 x 80 metre grid within tenement E30/99, but failed to define any anonymous gold zones (Busbridge 1998a). Mid 1998, Titan commissioned G&D Drilling to undertake a vacuum drilling program on tenement E30/100. The drill hole went down to a maximum depth of 1.5 metres and a total of 1,275 samples were collected on a drill spacing of 100m x 400m. In December 1998 Titan withdrew from the joint venture and Noble surrendered the tenement (Busbridge 1998a).

Table 10. Summary of the Gold Exploration drilling from 1993 to 1998 (modified from Smith and Govey 1995, Busbridge 1998b, Anon 1995)

Company	Type	Tenement	Number of Drill Holes	Number of Metres
Aztec	Rotary Air Blast	E30/99, E30/100	80	3,442
Battle Mountain	Rotary Air Blast	E30/99	41	1,897
Total			121	5,339

6.2.3 Iron - Internickel Australia Pty Ltd 2001-2005

From Late 1998 to 2003 Mr Troy Dalla-Costa was granted a number of tenements in the Lake Giles area which were to become the foundation for the Macarthur Iron Ore tenement holding. Mr Dalla-Costa consolidated his holdings in the name of Internickel Australia Pty Ltd.

Internickel undertook detailed evaluation of all the historical data. In early 2004 Adex Holdings Limited purchased Internickel from Mr Dalla-Costa and then Adex changed its name to Internickel Australia Pty Ltd. Macarthur Minerals purchased Internickel in late 2005.

The following is summarised from (Fox2001, 2002, 2003) and Cooper (2003, 2004, 2005, 2006). Internickel's initial exploration effort targeted gold and nickel. Mapping and sampling was undertaken by Keith Fox, resulting in the generation of a number of gold and nickel targets (Figure 8). Fox estimated that more than 100 km strike length of komatiitic ultramafic sequence prospective for nickel sulphides existed on the tenements.

In December 2003 following the observation of fine gold in panned soils a program of metal detecting was completed in the area of gold in soil anomaly G14 (Figure 8). Two costeans were excavated and metal detecting within and adjacent to them resulted in recovery of a single large 26 ounce (about 0.8 kg) nugget together with a number of small nuggets between one and 12 grams in weight. The anomalous gold geochemistry is associated with zones of quartz veining. The trend orientation and dip directions of these zones are unknown.

In April 2004 GPX Airborne Pty Ltd undertook a helicopter Hoistem electromagnetic survey over the central part of the Lake Giles Project (Figure 9). This area was known to be mainly covered by thin (<2 metres) soils. Data were collected along east-west flight lines space 200 metres apart and the total survey comprised 950 line kilometres.

Interpretation of these data indicated the presence of a large number of electromagnetic anomalies. All anomalies are included on Figure 8.

By 2004 iron ore was also recognised as a significant target in the Project area. In early 2005 a scout sampling program of 29 Banded Iron Formations was completed. All samples were analysed for iron, as well as for a large number of other elements. Seven samples were found to contain more than 50% Fe and two contained more than 60% Fe. Subsequently applications were submitted (and granted) for the inclusion of iron ore in the commodities listed for all the tenements.

6.2.4 Macarthur Minerals Limited 2005-2006

Macarthur Minerals Limited took over the tenements then known as the Lake Giles Project in late 2005 with the purchase of Internickel Pty Ltd, renamed to Macarthur Iron Ore Pty Ltd in 2010. MMS immediately continued with the ongoing exploration program for nickel and gold. In particular, anomalies generated by a 2004 helicopter electromagnetic survey (HoistEM, see Section 6.2.3) were visited and many were mapped and sampled, with emphasis on the search for nickel bearing gossans.

Nine specific EM anomalies were identified and modelled and five fixed loop TEM surveys were then planned and undertaken by Outer-Rim Exploration Services from June to August 2006. The results were interpreted and reported by Southern Geoscience Consultants in September 2006. A number of anomalies were generated despite poor positioning of loops. No follow-up work was undertaken.

MMS has explored the project tenements for iron mineralisation since 2005 and has completed geological mapping surveys, geophysical surveys, auger sampling of the pisolite targets and RC and diamond drilling of the magnetite targets (Revell 2006). This work is summarised in Table 11.

Table 11. Previous iron ore associated exploration

Period	Activity
1997	Aeromagnetic surveys commissioned by Titan resources NL, while exploring for gold.
2000-2004	Compilation and review of historic exploration data and limited field work including geological mapping and rock chip sampling. Primary focus of this work was exploration for nickel sulphide targets.
2004	Helicopter “HOISTEM” electromagnetic survey, at 200 metre line spacing, totalling 950 square kilometres.
2005-2006	Geological mapping and reconnaissance rock chip and auger sampling of exploration targets including pisolite and BIF iron targets
June 2006	Auger sampling of pisolite iron targets, with approximately 229 holes drilled to around 4 metre depth on a 100 metre east-west by 500 metre north – south pattern.
July 2006	Phase One RC drill program comprising 7 holes (LGRC01 to LGRC07) for a total of 937 metres.
Aug – Sept 2006	Phase Two RC drill program comprising 20 holes (LGRC08-LGRC026) for a total of 3,007 metres.
Jan – Feb 2007	Phase Three RC drill program comprising 16 holes (LGRC27 to LGRC42) for a total of 3,502 metres.
Sept 2007 –Jan 2008	Phase Four RC drill program comprising 21 holes (LGRC57 to LGRC78) for a total of 3,703 metres.
March – April 2008	Phase Five diamond drill program comprising 5 holes (LGDH63, LGDH65, LGDH68, LGDH69 and LGDH77) for a total of 1,003 metres.
Feb – June 2008	Phase Six RC drill program comprising 26 holes (LGRC79 to LGRC104) for a total of 5,608 metres.
June 2008 – Dec 2009	Phases Seven and Eight RC drilling to define Inferred magnetite Mineral Resources. LGRC105 to LGRC220, 116 holes for 23,834.5 metres.
Feb – Dec 2010	Phase Nine RC drilling on near-surface hematite mineralisation at 5 priority deposits and increase Moonshine Mineral Resource. LGRC221 to LGRC513 (293 RC holes for 21,745 metres) and LGDD001 to LGDD006 (six diamond holes for 796.6 metres). Included 27 hole (441m) for CID targets. Seventeen RC holes for 3,112.6 metres at Cody’s Ridge, E30/317 (CRRC001 to CRRC017) – magnetite exploration.
Feb – Dec 2011	RC drilling on near-surface hematite mineralisation at Snark, Drabble Downs and Central, and deep infill RC drilling at Moonshine to increase resource confidence. LGRC514 to LGRC1629 (1,117 holes for 61,206.4 metres) and MMRC001 to MMRC029 (30 holes for 7,627.9 metres). Short diamond drilling on near-surface hematite mineralisation for metallurgical and geotechnical tests, and one deep diamond hole at Moonshine for metallurgy (LGDD007 to LGDD035, 29 holes for 1,580.4 metres).
Feb – April 2012	Resource infill RC drilling on near-surface hematite mineralisation at Banjo, Drabble Downs and Central. LGRC1630 to LGRC1874, 245 holes for 13,812.5 metres. Short diamond drilling on near-surface hematite mineralisation at Banjo, Snark and Central for metallurgical tests (LGDD042 to LGDD051, 10 holes for 335.0 metres).

6.3 Historical Mineral Resource Estimates

The Mineral Resource estimates for the magnetite and hematite resources remain current and are reported in accordance with CIM 2014 Definition Standards for Mineral Resources and Mineral Reserves.

No historical Mineral Resources have been prepared for the Lake Giles Iron Project.

6.4 Previous Mining

No mining is known to have been undertaken in the project area or anywhere on MMS's tenements to date.

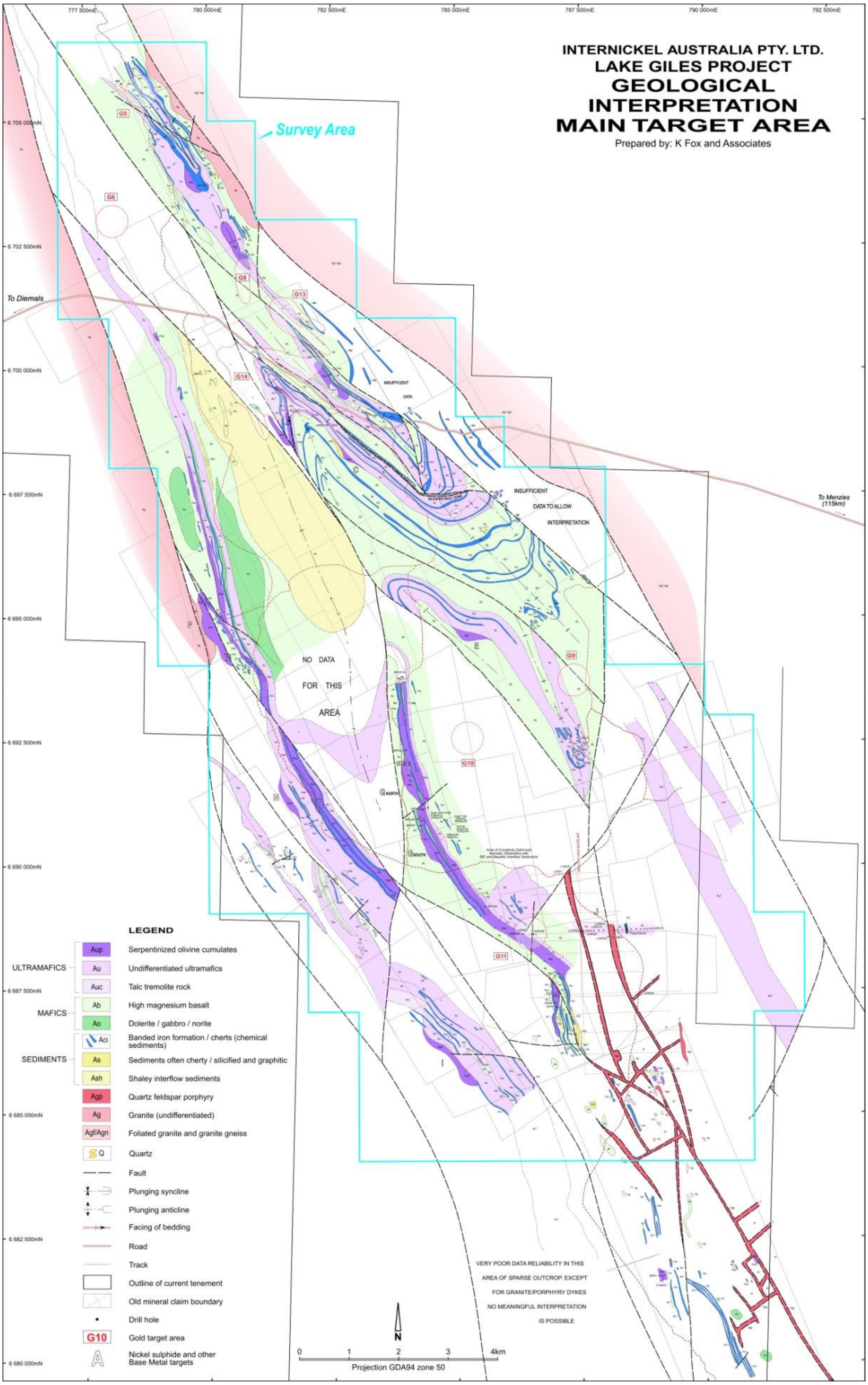

Figure 8. Historical Mapping and Target Generation

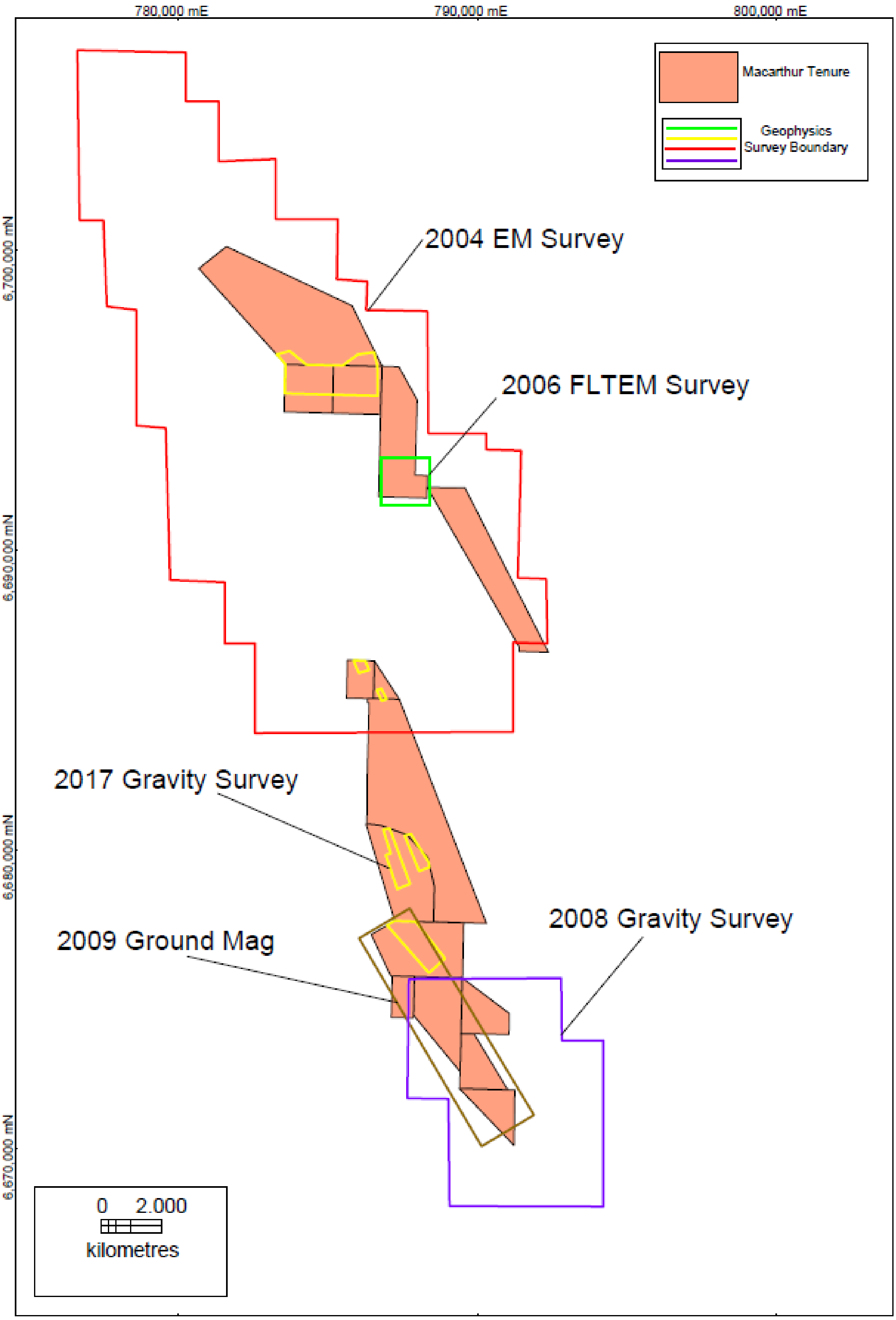

Figure 9. Location of Exploration Activity by Internickel Limited - Update

7 Geological Setting and Mineralisation

7.1 Regional Geology

MMS's tenements cover a portion of the Yerilgee Greenstone Belt which is over 80 kilometres in length and up to 10 kilometres wide, and lies within the Southern Cross Province of the Yilgarn Craton. The Yilgarn Craton consists of multiple lenticular greenstone belts surrounded by variably foliated gneissic granitoids.

The greenstone belts consist of metamorphosed ultramafic, mafic and sediments, including banded iron formation (BIF) which are Archaean in age and are commonly intruded by mafic, intermediate and granitic rocks.

The greenstone belts are generally metamorphosed to mid greenschist facies towards the central parts of the belt and lower amphibolite facies on the edges of the belt where they are in contact with the granitoids.

The greenstone belts are highly deformed, faulted and folded. Four deformation events are recognised regionally throughout the Yilgarn Craton:

- D1 - movement along the south-north direction
- D2 and D3 - shortening and shear movements in the ENE-WSW compression direction
- D4 - Lateral extension of the greenstone belt in a NNW-SSE direction.

Figure 10 shows the regional geology of the MMS area and its surrounding, derived from GSWA (2011).

7.2 Local Geology

The parts of the north-northwest trending Yerilgee greenstone belt covered by the project tenements are underlain by a layered succession of Archaean rocks (Figure 11). At the interpreted base of the succession is a sequence of high-magnesium basalt flows more than one kilometre thick overlain by komatiitic ultramafic volcanic rocks with narrow interflow BIFs and in some cases other sedimentary rocks. Further high-magnesium basalt lavas with occasional interflow BIFs overlain, possibly unconformably by sedimentary rocks (cherty, silicified, pyritic and graphitic) are thought to form the top of this sequence. In places gabbroic sills have been intruded into the lower mafic and ultramafic lavas. These are believed to be co-magmatic with the upper high-magnesium basalts. The elongated lens shaped Yerilgee belt is bounded by major north-northwest trending fault/shear zones.

The Archaean sequence has been intensely folded. At least five possibly sinistral fault zones of similar but slightly more north-westerly trend are interpreted within the widest part of the belt. These are believed to successively repeat the layered succession. Also two northerly trending sinistral faults obliquely crosscut the belt in this area.

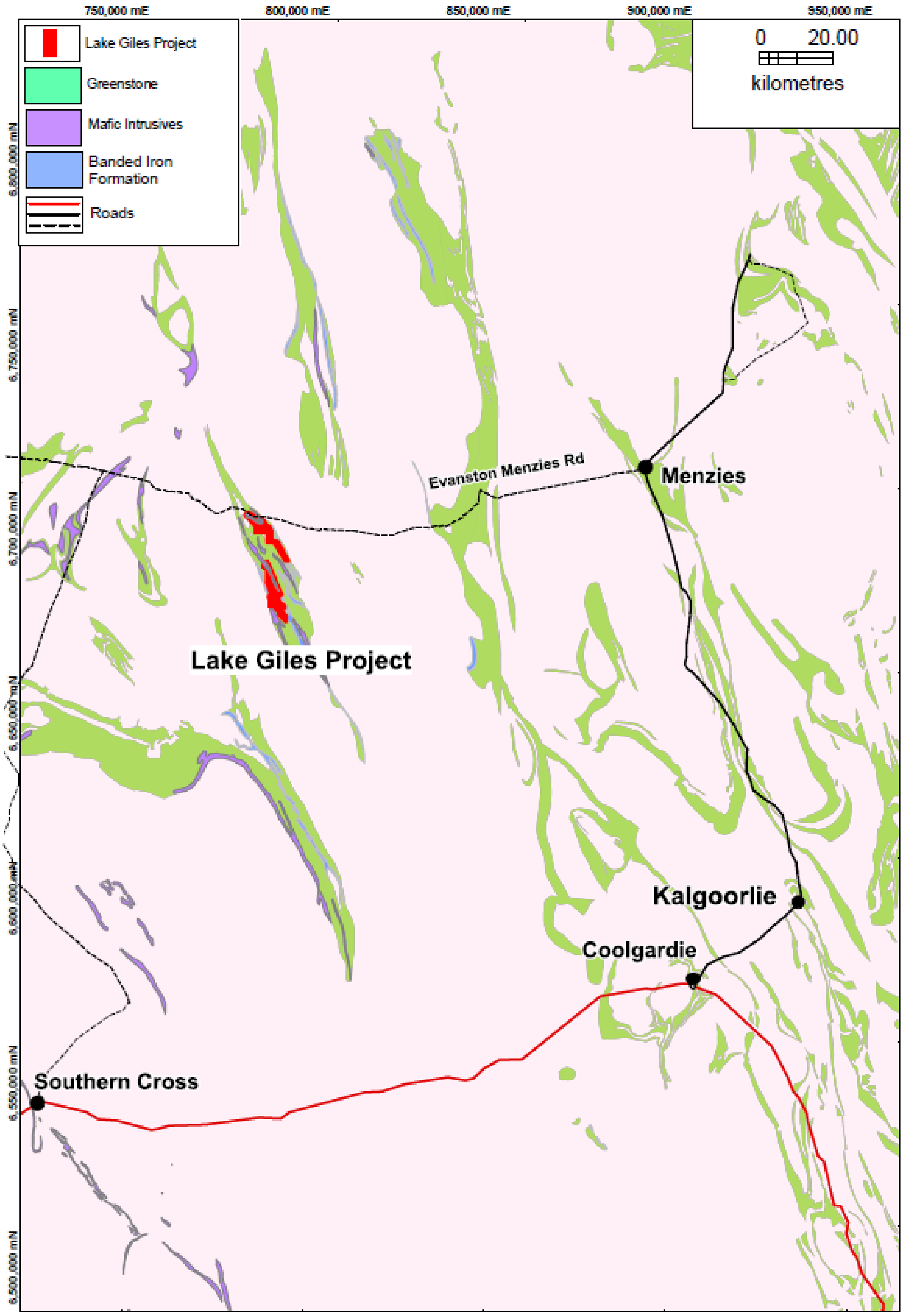

Figure 10. Project area with regional interpreted geology (GSWA) and infrastructure

A number of large synclinal fold structures have been identified. These appear to be located adjacent to the eastern margins of the fault blocks. These folds have north-westerly and north-north-westerly trending axes and where mapped in detail (Greenfield, 2001) show a plunge at 30° to 60° in the same direction. In general the fold axes are steeply dipping. The folding appears to have been contemporaneous with faulting. In plan, the movement on the fault planes was sinistral but in a true sense is believed also to have been reverse faulting with the direction of movement on the western down-throw sides of the fault planes being inclined at 30° to 60° towards the east northeast. The synclines and anticlines are considered to be drag fold structures.

The most recent notable tectonic event was approximately 2.6 billion years ago and appears to have dilated the north-northwest trending shear zones, generated north-northeast trending and conjugates northeast to easterly trending structures. These brittle fractures have in many places been intruded by granitic dykes or quartz veins. The project tenements cover about 60 kilometres of the greenstone belts strike length but because of fault repeats are estimated to cover more than 150 kilometres of BIF sequence strike length.

7.3 Property Geology and Mineralisation

Figure 10 shows the locations of the main prospect areas of the Project superimposed on the local geology. Figure 16 to Figure 18 present the detailed outcrop mapping within the individual prospect areas. The outcropping geology of the hematite areas are comprised of a combination of un-altered silica rich BIFs and altered, enriched hematite/goethite BIFs.

The iron ore mineralisation consists of secondary pisolite mineralization, primary magnetite mineralization associated with un-oxidized banded iron formation (BIF) and ultramafic rocks, and goethite-hematite mineralization associated with oxidized BIF.

The hematite/goethite units are the source of MMS's hematite Mineral Resources to date and exist largely as a supergene product. Weathering has resulted in the leaching of the majority of the silica from the BIFs, thus producing a rock rich in iron and low in silica. These enriched bands vary from 1 to 30 metres in true thickness and are largely steeply dipping by 70^{o} to 90^{o}.

The mineralisation at the Moonshine and Moonshine North magnetite deposits is associated with primary magnetite mineralization hosted by banded iron formation (BIF). The multiple BIF units steeply dip 75° to 85° to the west and strikes approximately 320° and 335° respectively with outcrops (and the units have an average thickness of 15 m, over a strike length of 17 km.

The project area is comprised of multiple parallel bands of BIF, many of which are enriched, with varying (1 to 30 metres) thicknesses. The strike of these bands is largely NW-SE. A number of folds with a NW plunge have been identified with further work into the structure of the deposit on-going. The strike extent of the main ridge line at Snark is 5.9 km and the package consisting of the multiple BIF bands along with the inter-bedded ultramafics has a thickness of approximately 500 m.

The mapped outcrops range from locally dark, rich and dense mineralized BIF (as shown in Figure 12 and Figure 13); to porous and lateritic weathered BIF with locally enriched layers (as shown in Figure 14 and Figure 15). In RC chips the mineralized material is dusty and brown and generally very fine grained.

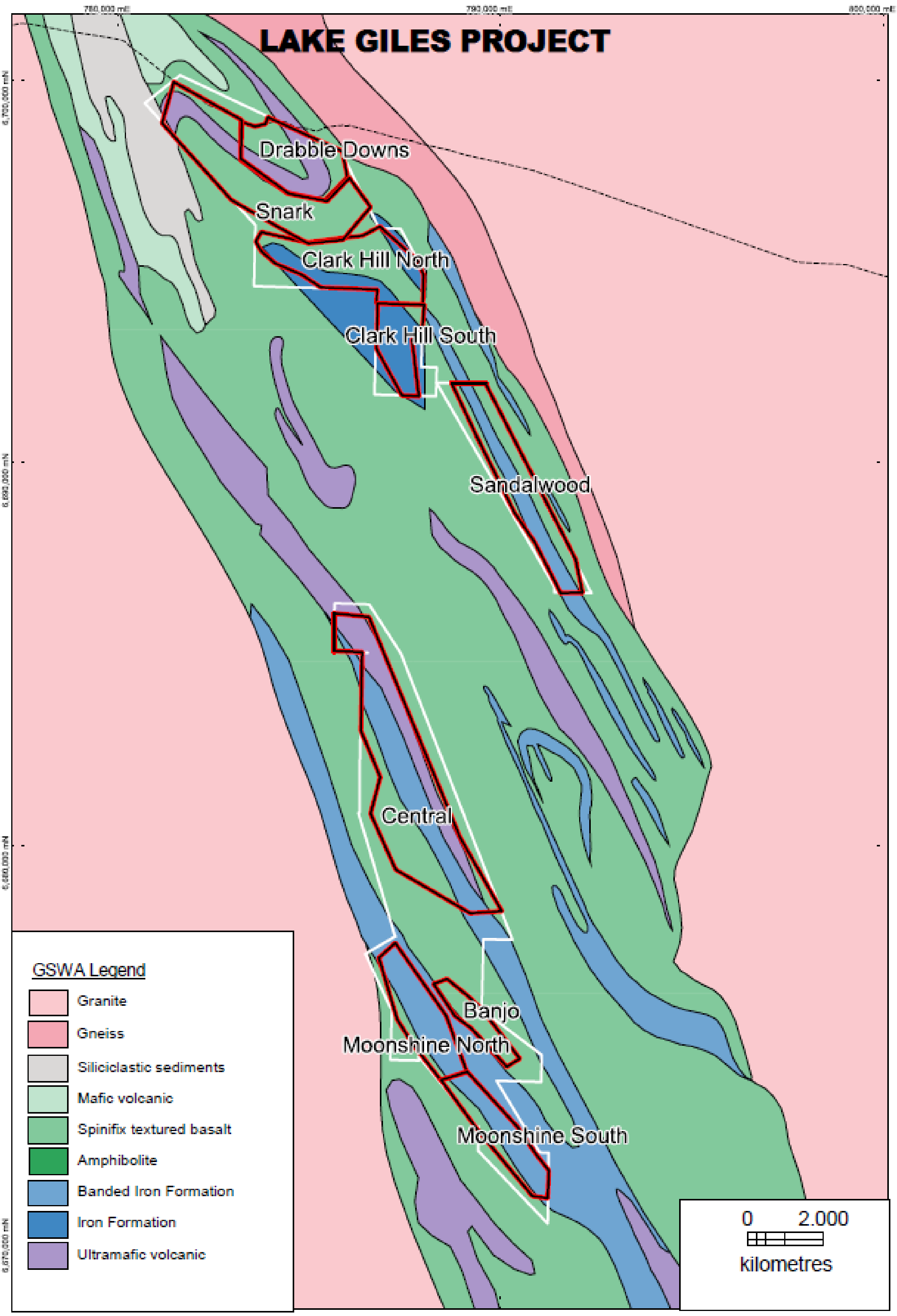

Figure 11. Interpreted geology of the Project

Figure 12. Float of exceptionally rich hematite/goethite mineralisation near LGRC_407, Snark

Figure 13. Outcrop of hematite/goethite mineralisation near LGRC-407, Snark

Figure 14. Outcrop of typical porous and lateritic hematite/goethite mineralisation, near LGRC_407, Snark

Figure 15. Outcrop of typical porous and lateritic hematite/goethite mineralisation, near LGRC_305, Banjo

7.4 Weathering Profile

The rocks of the Lake Giles Iron Ore Project have been logged into six different weathering classifications:

- Complete – All clay with no remnant rock texture
- Extreme – Largely clay with some remnant rock texture
- Strong – Rock texture moderately preserved, significant presence of fines, often weak
- Moderate – Rock texture fully preserved, all minerals show weathering
- Partial – Oxidation limited to the most unstable minerals only (e.g. sulphides)
- Fresh – No oxidation of any minerals

The majority of the hematite/goethite mineralisation grade (>50%Fe) material is located within the Strong and Moderate classifications. The boundary between partial oxidation and fresh rock has been determined to be variable within this area with down hole (-60^{o} dip) depths ranging from 30m to 100 m.

The magnetite is present in the fresh BIFs along with high quantities of silica. This is the primary unaltered form of BIFs at site and in general has not been subject to any significant later iron enrichment.

7.5 Water Table

The water table throughout the project area varies greatly in both level and salinity. The Snark area has been subject to a recent hydrogeological study (GRM, 2011) and the water table has been interpreted to between 50 to 65 metres below the surface, at an RL of 410 m to 425 m. With regards to salinity, the ground water in the area has a TDS value that typically ranges between 1,600 and 13,000 mg/L, which indicates a moderately brackish to saline classification (typical seawater is >35,000 mg/L).

8 Deposit Types

8.1 Mineralisation Styles

The tenements held by MMS are known to be prospective for nickel and gold as well as iron ore. The iron mineralisation is related to the extensive Banded Iron Formation (BIF) that occurs throughout the tenements. Aerial magnetic data shows that BIF units totalling at least 73 km of strike occur within the tenements, mostly under shallow cover. Iron mineralisation currently being explored comes in two forms:

- Magnetite – present in the fresh BIFs along with high quantities of silica. This is the primary unaltered form of BIFs at site and in general has not been subject to any significant later iron enrichment.
- Hematite/Goethite– present in the weathered BIFs with lower quantities of silica. It is the product of supergene enrichment of the BIFs, which results in the leaching of the silica from the primary fresh BIFs and in some cases addition of iron from mineralising solutions. This results in elevated iron content in comparison with the fresh BIF.

8.2 Conceptual Models

The hematite/goethite units are the source of MMS's hematite/goethite resources that comprise the Project and exist largely as a supergene product. Weathering has resulted in the leaching of the majority of the silica from the BIFs, thus producing a rock rich in iron and low in silica. These enriched bands vary from 1m to 30m in true thickness and are largely steeply dipping between 70^{o} and 90^{o} with variable dip directions dependent on the location within the deposit. The main units in Drabble Downs are generally shallower dipping (50^{o} to 80^{o}) to the south-west and appear to form the centre of the overall regional Snark fold sequence.

Hematite/goethite mineralisation crops out in abundance at Snark, Drabble Downs, Central and Banjo, and in lesser amounts elsewhere on the tenements. These outcrops have been the focus of most of the drilling to date. More recently detailed mapping of sub-crop and careful step out drilling have shown that the hematite/goethite mineralisation can continue in areas of limited of no existing outcrop.

The mineralisation at Moonshine and Moonshine North deposits is associated with primary magnetite mineralization hosted by banded iron formation (BIF). The multiple BIF units steeply dip 75° to 85° to the west and strikes approximately 320° and 335° respectively with outcrops and the units have an average thickness of 15 m, over a strike length of 17 km.

9 Exploration

Recent exploration activities associated with iron ore exploration undertaken by MMS since 2005 (other than drilling) are listed in Table 12. Iron mineralisation associated exploration of the Lake Giles Project commissioned by MMS since 2005 includes geological mapping, geophysical surveying, auger sampling of pisolite targets and RC drilling of magnetite targets.

Since 2009 exploration activity has focussed on geological mapping and drilling of hematite/goethite targets based upon that mapping. Detailed mapping from 2009 through to 2012 defined outcropping lenses of hematite-goethite mineralisation which were targeted in the subsequent drilling programmes. These mapping programmes assisted in defining the continuity and thickness of individual mineralised domain, supporting the Mineral Resources that are the subject of this report.

Table 12. Previous iron mineralisation associated exploration by Macarthur Minerals Limited.

Period	Activity
2005 - 2006	Geological mapping and reconnaissance rock chip and auger sampling of exploration targets including pisolite and BIF iron targets.
June 2006	Auger sampling of pisolite iron targets, with approximately 229 holes drilled to around 4 metres depth, on a 100m east-west by 500m north-south pattern.

During March 2006, Ian Cooper of Cooper Geological Services Pty Ltd (Cooper) inspected six sites where historic sampling showed elevated iron values associated with outcropping oxidized BIF. Three of these areas, initially designated as Northern Southern and Central areas, which were interpreted to have the greatest resource potential, were geologically mapped at 1:25,000 scale and rock chip sampled by Cooper. The Northern Area identified by Cooper was subsequently designated as the Snark Mineralized zone by MMS. Cooper's mapping and sampling is detailed in Cooper (2007), and summarized in this report.

The approximately five to six kilogram rock chip samples were collected in pre-numbered calico sample bags as representative chips collected by multiple hammer blows, and were analyzed for a suite of elements by Genalysis Laboratory Services Pty Ltd in Perth, Western Australia. Sample locations were recorded by GPS in GDA grid coordinates.

As shown in Table 13, assay results from Cooper's 2006 rock chip sampling showed iron grades ranging from 38.1% to 62.5%, with assays from 36 of the 45 sample locations returning values of above 50% iron. The sampling confirmed the presence of elevated iron grades associated with BIF units as indicated by historic sampling. Cooper's geological mapping for the Northern Area indicated areas of possible thickening of ironstone units, and Cooper recommended drilling these zones.

Table 13. 2006 Rock Chip sample results.

Sample	mE	mN	Fe (%)	Al (%)	Cr (ppm)	Ni (ppm)	P (%)	Si (%)
1001	782,378	6,698,414	56.41	1.84	<50	<20	0.06	3.4
1002	782,327	6,698,473	61.29	0.75	<50	<20	0.08	1.9
1003	782,277	6,698,533	60.54	0.94	<50	33	0.09	1.8
1004	782,221	6,698,584	61.16	0.85	<50	<20	0.18	1.8
1005	782,162	6,698,658	62.24	0.79	<50	27	0.08	2.1
1006	782,118	6,698,707	55.11	0.72	<50	28	0.12	4.9
1007	782,046	6,698,754	59.77	1.6	<50	<20	0.13	2.3
1008	781,990	6,698,756	62.11	0.94	<50	<20	0.12	1.6
1009	781,943	6,698,770	61.32	1.31	<50	24	0.05	3.4
1010	781,938	6,698,798	57.2	1.99	<50	37	0.08	4.6
1011			40.21	0.43	<50	<20	0.07	18.2
1012			55.75	1.46	<50	169	0.07	5.3
1013	781,874	6,698,640	54.48	1.89	<50	28	0.08	4.4
1014	781,849	6,698,659	60.49	1.35	<50	<20	0.09	1.6
1015	781,869	6,698,588	61.72	0.84	<50	25	0.1	2.5
1016			61.93	0.87	<50	33	0.11	1.6
1017	781,817	6,698,460	60.81	0.81	246	36	0.19	1.6
1018	781,607	6,698,823	42.17	1.24	1017	712	0.04	2.6
1019	781,603	6,698,774	45.56	1.29	584	264	0.05	2.4
1020	781,614	6,698,744	51.23	0.98	447	228	0.04	1.6
1021	784,204	6,696,872	60.41	1.22	<50	36	0.11	1.6
1022	784,242	6,696,845	58.94	1.34	<50	<20	0.09	1.4
1023	784,281	6,696,817	55.04	0.99	<50	<20	0.14	1.5
1024	784,144	6,696,877	60.01	1.36	<50	<20	0.08	1.5
1025	784,103	6,696,913	55.46	2.01	<50	<20	0.08	1.4
1026	784,063	6,696,935	59.06	1.96	<50	22	0.07	2.2
1027	784,040	6,696,961	60.25	0.92	<50	<20	0.14	1.4
1028	783,972	6,697,046	60.59	0.98	<50	23	0.14	2.2
1029	783,872	6,697,133	55.39	1.03	<50	65	0.16	4.4
1030	784,342	6,696,695	59.5	0.75	<50	21	0.1	2.8
1041	784,300	6,696,728	62.12	0.98	<50	42	0.08	1.2
1042	784,211	6,696,775	62.51	1.07	<50	26	0.07	1
1043	784,146	6,696,812	60.72	1.43	55	<20	0.07	1.7
1044	784,124	6,696,846	59.89	1.77	<50	<20	0.06	1.3
1045	784,324	6,696,759	46.75	1.04	<50	54	0.08	9.3

Rock chip sampling was used by MMS as a guide for targeting future exploration drilling. Rock chip samples were not collected systematically on a local grid, or at regular spacings. The rock chip samples indicate where in-situ mineralisation occurs, however the sampling methodology is considered to be biased and were not used in the Mineral Resource estimate documented in Section 14 of this report.

Between 2007 and 2012 MMS geologists have conducted ground traverses and geologically mapped the MMS prospects. The outcropping rock was classified as either BIF or hematite/goethite enriched BIF. The extent of outcrops was surveyed by handheld Garmin GPS devices, with an accuracy of ± 3 metres on the GDA94 grid system. These boundaries were subsequently digitised in the MapInfo GIS software package. The outcrop mapping has confirmed and improved the definition of the BIF and hematite mineralisation. The location of outcrops and mapped structural information was used in planning the location and orientation of drill holes for Mineral Resource modelling.

A summary of exploration drilling methodology and results, as used to support the Mineral Resource estimates discussed in this report, are presented in Section 10.

Outcrop maps with drill collars for the Project areas are presented in Figure 16 to Figure 18.

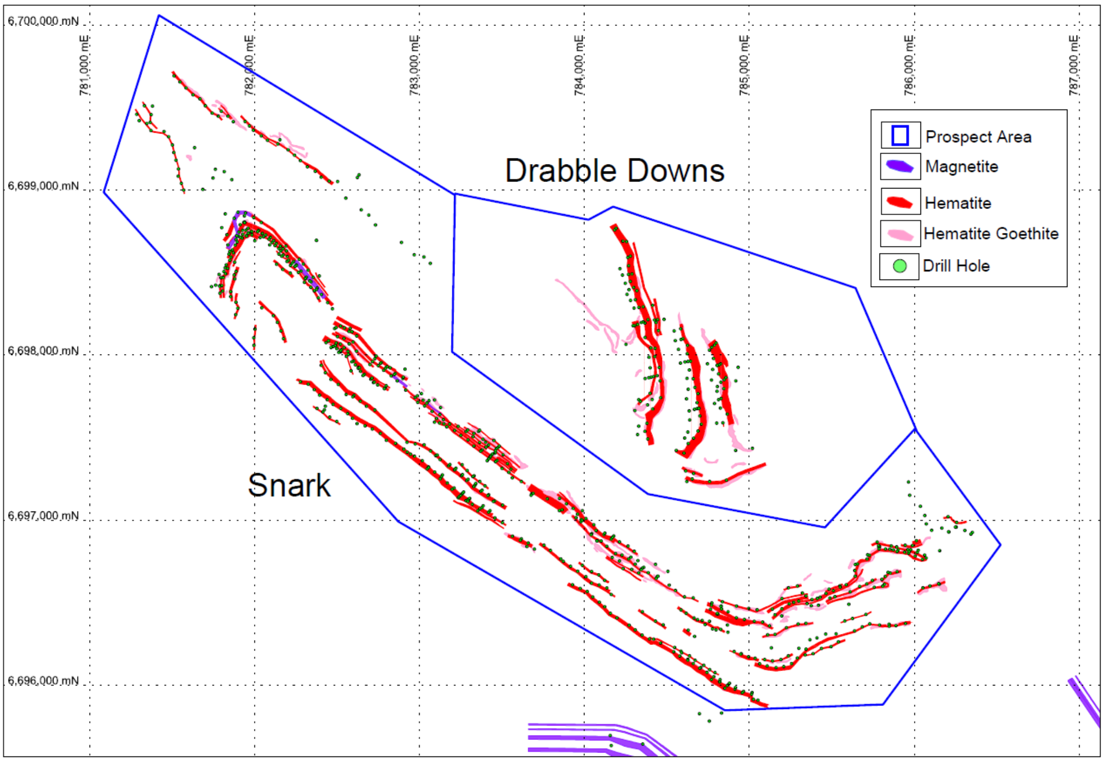

Figure 16. Outcrop map for Snark and Drabble Downs, showing drill hole collars

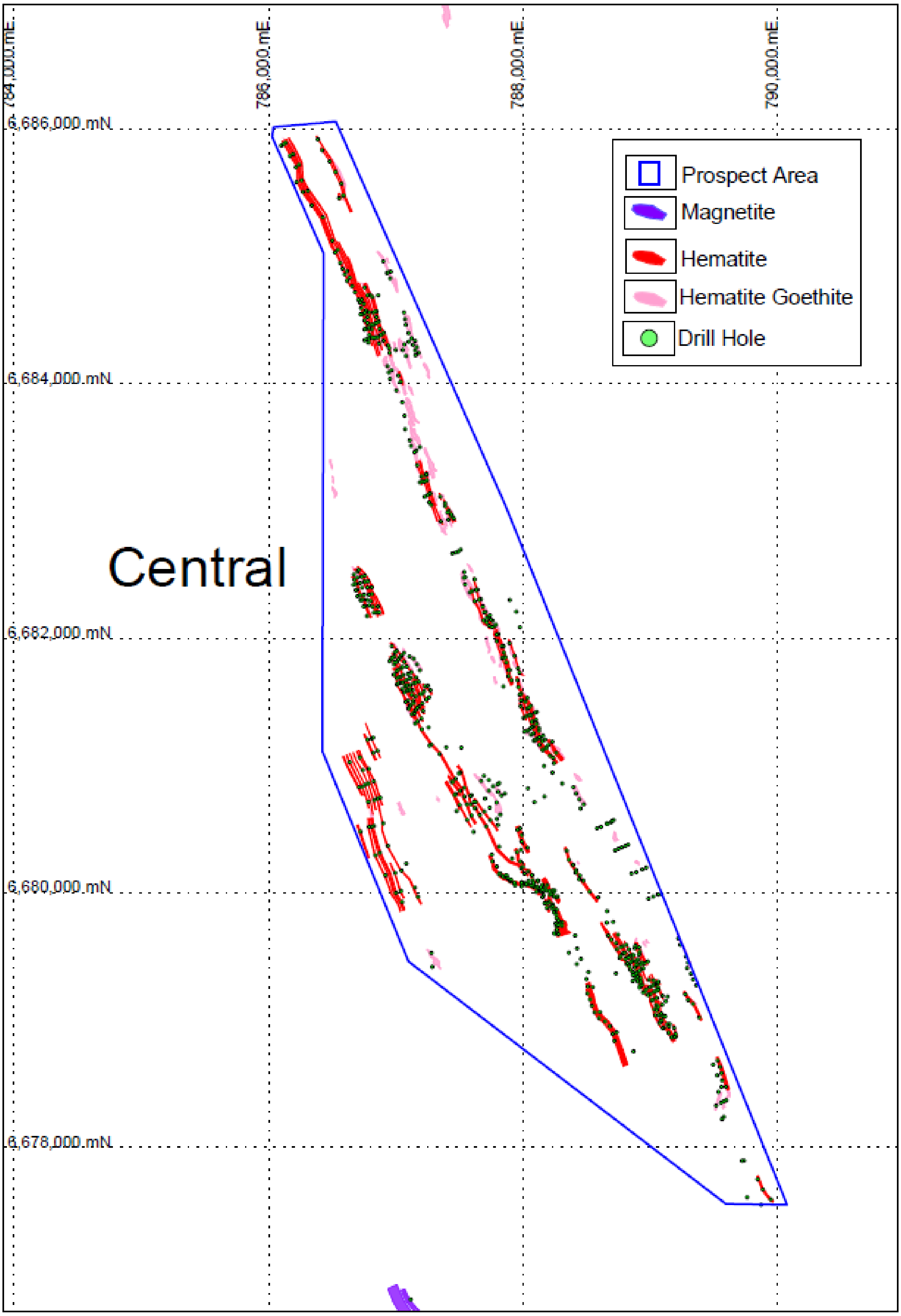

Figure 17. Outcrop map for Central, showing drill hole collars

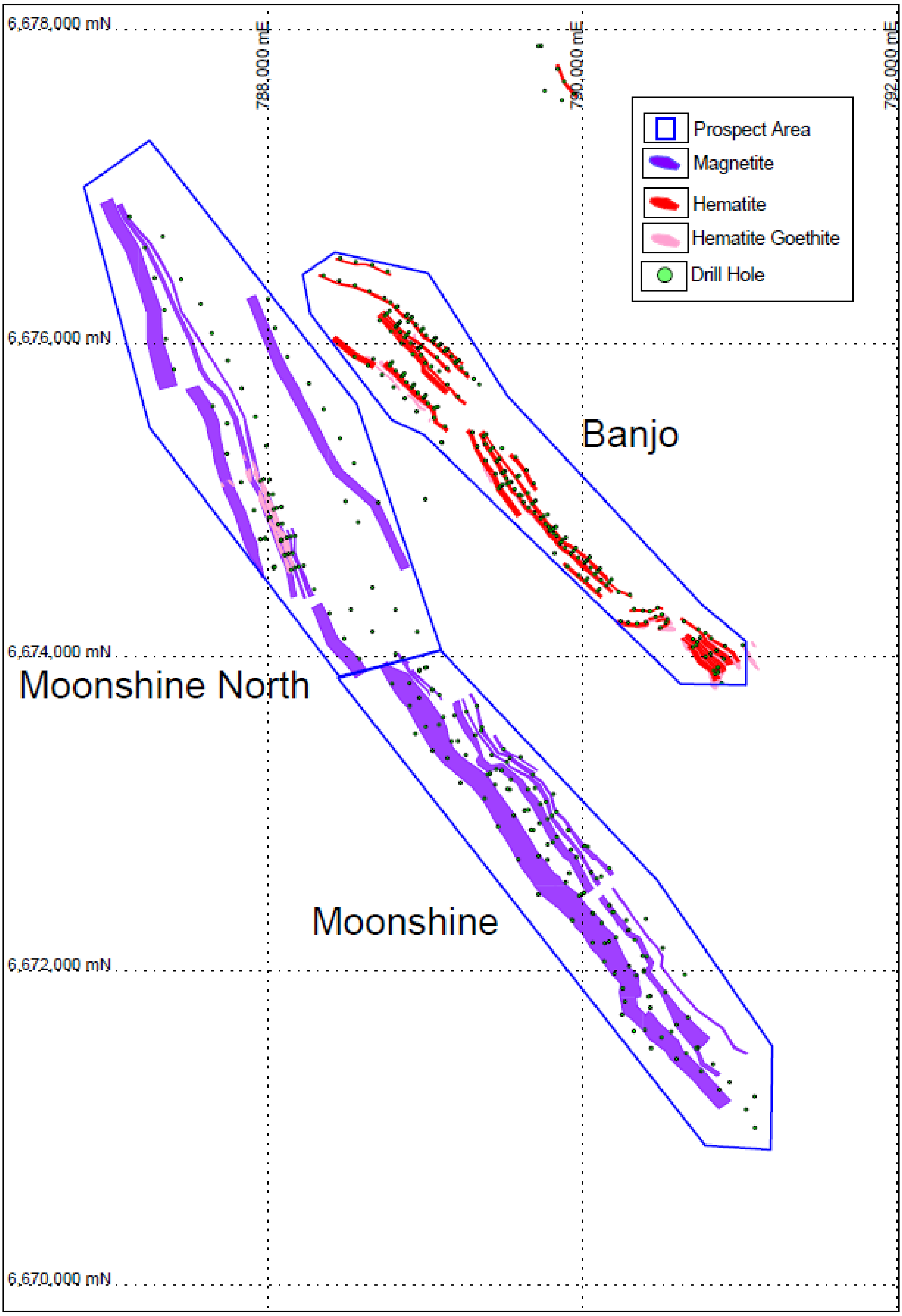

Figure 18. Outcrop map for Banjo and Moonshine, showing drill hole collars

10 Drilling

The hematite Mineral Resource estimate only includes results from drilling completed between 2009 and 2012 and therefore only includes drilling undertaken by MMS. The magnetite Mineral Resource estimate includes drilling to 31 December 2010.

Drill collar plans are presented in Figure 16 to Figure 18 and show the locations of drill hole collars superimposed on outcrop mapping. This demonstrates the number of ridges yet to be drill tested. It is important to note that some ridges have been assessed to be made up of non-mineralised BIF and are not intended to be drilled.

10.1 Hematite Drilling

The database supporting the hematite Mineral Resource estimate included in this study includes all information collected up until 31st August 2011 (Moonshine), and 9th May 2012 (Snark, Drabble Downs, Central, Banjo and Lost World). As of this date there were 1,626 drill holes (1,588 RC, 38 DDH) loaded in the database for 92,259m. Of this total, 85,557 samples from 1,588 holes were assayed, and verified for use in the Mineral Resource estimate.

Table 14 and Table 15 present the drilling statistics, supporting the Mineral Resource estimate.

Table 14. Drilling completed at Ularring Hematite Project to May 9th 2012

Deposit	RC Holes Drilled	Metres	Diamond Holes Drilled	Metres
Banjo	149	9,473	2	107
Central	627	36,093.8	7	289
Moonshine	20	1,570	-	-
Snark	662	36,987.1	29	1,333
Drabble Downs	130	6,710	-	-
Grand Total	**1,588**	**90,833.9**	**38**	**1,729**

Table 15. Analyses completed at Ularring Hematite Project to May 9th 2012

Deposit	RC Holes Drilled	Metres	Metres analysed for XRF Fe suite whole rock only
Banjo	149	9,473	7,514
Central	627	36,093.8	34,811
Moonshine	20	1,570	1,122
Snark	662	36,987.1	35,502
Drabble Downs	130	6,710	6,608
Grand Total	**1,588**	**90,833.9**	**85,557**

10.2 Magnetite Drilling

The database supporting the Moonshine Magnetite Mineral Resource estimate included in this study includes all information to 31 December 2011. Macarthur's drilling at the Moonshine and Moonshine North prospects totals 171 reverse circulation drill holes and 3 diamond drill holes. Further drilling by phase and locality are provided in Abbott et al (2009).

In the Moonshine and Moonshine North prospects, most of the drill holes are drilled perpendicular to strike of the BIF units, intersections approximate the true thickness of the BIF units. In Moonshine, most of the drill holes are -60° to 080 or -60° to 240, (Table 11.4) with a minor number of drill holes have a dip -90° or -60° to 030. Moonshine North, the azimuths ranges from 240 to 280 but all dip -60 towards the west (Table 11.5).

In both prospects the drill hole spacing varies from 50 meters to 300 meters and does not transect the mineralisation on some transverses.

The diamond drill hole targeted the central parts of the mineralisation in both Moonshine and Moonshine North and twinned a reverse circulation drill hole pulled up short.

No information on the diamond drill holes at Moonshine and Moonshine North was available at the time of the resource estimation.

Table 16 presents the drilling statistics, supporting the Moonshine and Moonshine North Mineral Resource estimate.

Table 16. Drilling completed at Moonshine and Moonshine North prospects to 31 December 2010.

Prospect	Year Drilled	Type	Number of holes	Meters
Moonshine	2008	RC	68	14,601.0
	2009	RC	25	4,562.5
	2010	RC	12	1,473.0
	2010	DDH	2	587.0
	Subtotal		*107*	*21,223.5*
Moonshine North	2009	RC	16	3,084.0
	2010	RC	49	5,795.5
	2010	DDH	1	22.2
	Subtotal		*66*	*8,901.7*
Total		RC	171	29,516.0
		DDH	3	609.2
	Grand total		**174**	**30,125.2**

10.3 Drilling Procedures

The drilling procedures are largely similar for the hematite and magnetite deposits and summarised below.

MMS contracted Orbit Drilling Pty Ltd (‘Orbit Drilling’) to carry out both the RC and diamond drilling. Orbit Drilling are an exploration drilling company based in Perth, Western Australia. Two RC drill rigs were utilised, a Schramm T660 (Volvo 8x4 wheel rig) and a track mounted Schramm T450WS.

MMS has a number of procedures in place, which have been designed to reduce the risk of errors from drilling, sampling and assaying processes. These processes along with the associated risk reduction procedures are summarised below.

Every hole drilled was planned and supervised by MMS geological staff. Holes were planned to intercept the resource body in the most representative way possible considering terrain, outcropping geology and results from previous drilling. During drilling, a company geologist would supervise the work and log the geology to each metre interval and end the hole at a certain depth based on the outcome of the drilling and the estimates provided by the planning.

Planned drill hole collar positions were marked by GPS, and if clearing was required to provide a suitable drill site, then planned collar positions were re-marked after clearing. To assist with drill rig alignment, two sighter pegs were placed at appropriate distances from the collar position using a sighter compass. After drilling all drill holes included in the Mineral Resource estimates were surveyed by high accuracy Real Time Kinematic GPS (RTKGPS). RTKGPS surveys, which were undertaken by surveyors from Minecomp Pty Ltd are accurate to within 50 millimetres in three dimensions.

After the drill rig set up on each hole, MMS staff checked hole inclinations with a clinometer. Holes drilled in 2009 and 2010 field seasons were down-hole surveyed with a single shot down-hole camera lowered down the rod string. Holes drilled in 2011 and 2012 (Snark, Drabble Downs, Banjo and Central) were surveyed with a GYRO tool.

At the magnetite deposits of Mooonshine and Moonshine North downhole surveys where taken at variable intervals from 24 to 184 meters. The azimuth was deemed unreliable because of the magnetic nature of the rocks (BIF unit) and therefore the planned azimuth was assumed.

Drilling practices are focused on maximizing sample recovery and minimizing sample contamination. At the end of each six metre drill rod, the drilling pauses and compressed air is blown through the rods to flush cuttings from the drill hole, the sample hoses and the cyclone to minimize sample contamination, and to ensure that there are no blockages in the sample stream. The cyclone is regularly inspected and cleaned as necessary. Samples are collected over one metre down-hole intervals and a sub-sample collected in a calico bag by splitting through an industry standard three tier riffle splitter. A total of 75% of the sample passes through the splitter to be captured in a residue bucket (Figure 37), whilst the remaining 25% of the sample is evenly distributed through the primary sample chute and the field duplicate chute. The calico bag sub-samples are labelled with the drill hole number and depth range and placed on top of the remnant bulk sample, which is placed in individual piles on the ground alongside the drill collar. All one metre samples were submitted to the assay laboratory. Sample recovery is judged from the appearance and volume of the primary sample, contained within its' calico bag, and the remnant bulk sample.

Assays for the hematite deposit were recorded for each one metre interval sampled whereas assays for the Moonshine and Moonshine North magnetite deposits were based on 5m composites created by the laboratory on an equal weighted basis.

The diamond drill holes were geologically logged and geotechnical logged, incorporating structural measurements, by contract geologists or MMS geologists. The structural measurements, the orientation of a planar feature is defined by the alpha angle, which is measured by the core axis and beta angle which requires a bottom or top of the core axis defined by the orientation line. Although, both the alpha and beta angles are required to define a features orientation, if the strike of the feature is known, some information about the dip can be inferred from the alpha angle.

Figure 19 demonstrates samples laid out on the ground adjacent to the drill rig.

Figure 19. Drill samples laid out prior to collection and dispatch to assay laboratory.

10.4 Density Measurements

Macarthur provided information from whole diamond core and rock samples by weight-in-water method.

This involves by drying the rock so all the contained water is remove from the rock. Then coating the rock in wax to cover the pore spaces and weight the rock in air and weight again suspended in water. The density can be calculated directly by the formula:

$$Apparent\ SG = \frac{M1}{(M2 - M3) - \frac{(M2 - M1)}{\rho\ wax}}$$

Where :

M1	=	Sample weight (g)
M2	=	Coated (sample + wax) weight (g)
M3	=	Immersed weight
ρwax	=	Wax SG

11 Sample Preparation, Analysis and Security

11.1 Sample Preparation and Security

Sample preparation for drill hole samples have followed consistent methodologies since drilling of the Project commenced in 2009. On completion of each hole the field assistants collect the samples and secure them in polyweave bags using a cable tie labelled with a unique ID, which the lab would check upon receipt as a way of being aware of tampering. The polyweave bags are securely stored in the Project exploration camp compound, where MMS personnel are located on a continual basis.

The samples are transported to the assay laboratory depot in Kalgoorlie in a large bulka bag to avoid loss of samples, prior to being dispatched to the assay laboratory in Perth using the Coastal Mid-West freight company.

Drill samples were sent to Amdel – Ultra Trace Assay Laboratories (Ultra Trace), Perth, and from 01 September 2011, were sent to ALS in Perth. ALS Laboratories offered faster sample turn-around times, and also provided analyses for LOI371 and LOI650, along with LOI1000 also provided by Ultra Trace.

Both Ultra Trace and ALS maintained sound security for all samples, from receipt of sample to storage of crush and pulp residue (limited storage time). Assay results were emailed to MMS and CSA Global Database Management (for the hematite project only).

11.2 Sampling and Analysis Procedures

The sampling and analysis procedures were largely similar for the hematite (Ularring Project) and magnetite (Moonshine Project) drilling programs. However, as the resource estimates for the hematite and magnetite deposits were generated from different drilling campaigns, datasets and do not overlap in space, the sampling and analysis procedures are presented separately for the sake of clarity.

11.3 Sampling, Analysis & QA/QC for the Hematite Deposits

A flow chart demonstrating sample preparation for all MMS samples is presented in Figure 20. The pulverised residues were analysed by XRF. Both Ultra Trace and ALS maintained sound security for all samples, from receipt of sample to storage of crush and pulp residue (limited storage time). Assay results were emailed to MMS and CSA Global Database Management.

Table 17 presents sample statistics by assay laboratory up to May 2012.

Table 17. Sample statistics by Assay Laboratory

Deposit	ALS_PTH	AMDEL_ADL	GENALYSIS	AMDEL_PTH	SGS_PTH	ULTRATRACE
Banjo	2988	20		144	4227	2195
Central	28076	78		35	1112	7939
Lost World	21				243	1072
Snark	3981		916			34034
Moonshine	1048	1093		3621	472	2902
Total	36,114	1,191	916	3,800	6,054	48,142

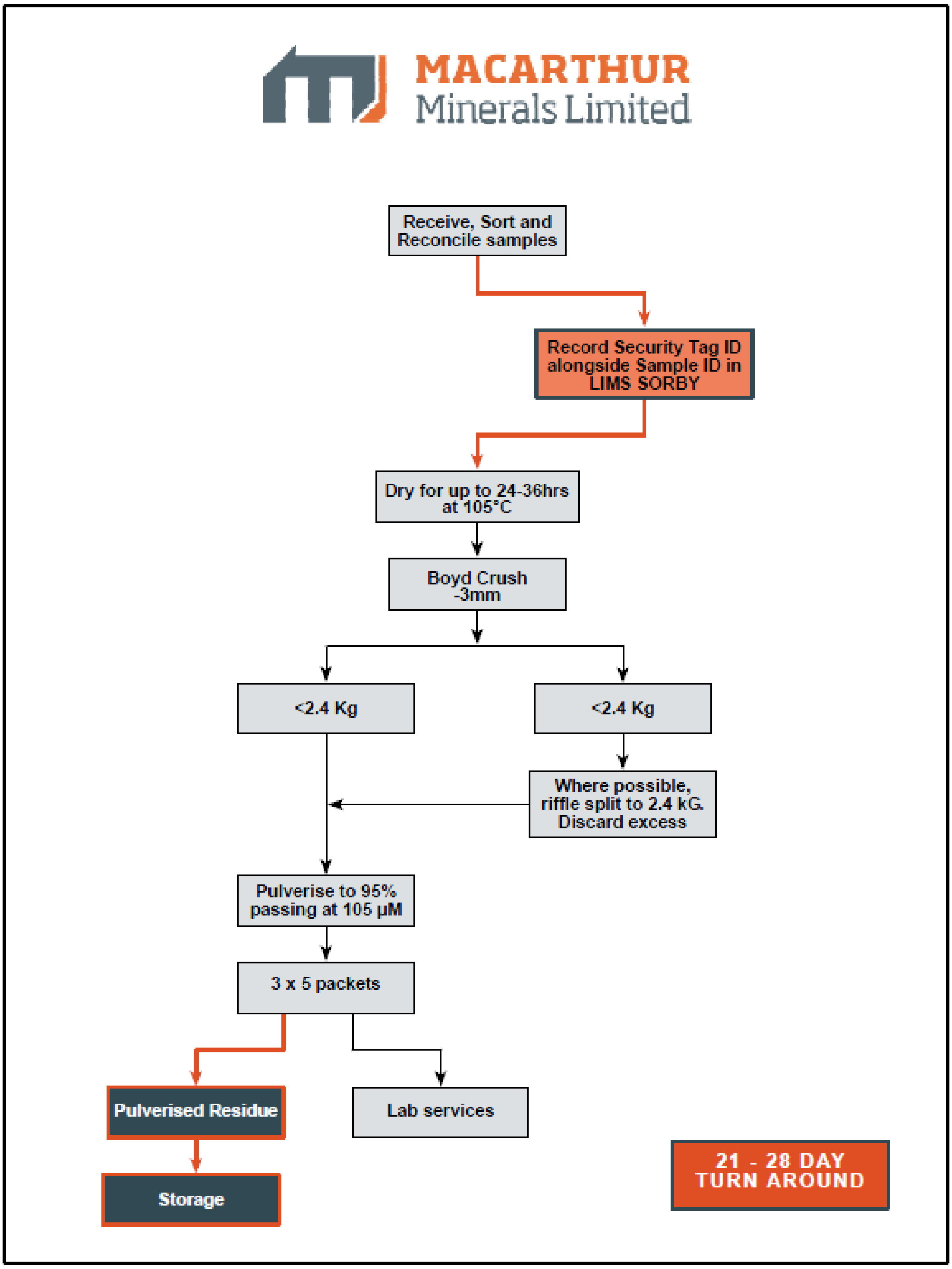

Figure 20. Flow Chart, Sample Preparation

11.3.1 Drill Hole Database

All data is loaded and processed by CSA Global through Datashed, which is a database management system developed by Maxwell Geoservices. The data is loaded via Datashed into Maxwells' latest data model housed on an SQL server in the CSA Global Perth office. The data model has various criteria, relationships and triggers to ensure the data entered into the database is valid. The database has been active since May 2011 and strict security and daily backups are managed by SQL server software.

Prior to May 2011, drill hole data was stored in a Microsoft Access database, maintained in MMS's Perth office. Data tables were exported as comma separated text files (csv format) and imported into Datamine. The Mineral Resource estimate for Moonshine is based upon data contained within this MS Access database. As of May 2011 all drill data was imported into the Datashed database.

11.3.2 Quality Assurance and Quality Control – 2011 and 2012 Drilling

11.3.2.1 Certified Reference Materials

Certified reference materials (CRMs) are packets of rock sample that have been ground to a size consistent with the grind size used in commercial assay laboratories, typically 105um. A variety of CRM types exist, and MMS chose the CRM type that most resembled the rock type that exists at the Ularring Hematite Project. They are certified because the manufacturer of the CRM has independently tested the accuracy of the expected mean grade of the sample through a series of round robin laboratory umpire testing, and therefore "certify" the assay grade.

MMS used CRMs sourced from Geostats Pty Ltd, a supplier of reference material based in Perth, Western Australia. Four CRMs were submitted with drill samples through the 2011 and 2012 drill campaigns, and are detailed in Table 18.

CRMs were inserted at the rate of one CRM every 50m of sampling, with at least one per hole. The results of the CRM assays are presented in a time sequenced scatter plot, and show the actual assayed grade against the expected grade of the sample (Table 18) within acceptable tolerances. MMS has nominated a tolerance limit of ± 2 standard deviations; if the assayed CRM falls within these limits then the results of assays from samples submitted for XRF testing with that CRM are deemed to have passed. If the assayed value for the CRM falls outside the tolerance limits, then the assayed CRM is deemed to have failed, which therefore casts doubt on the accuracy of the assays for samples that were submitted with the CRM. In this case MMS have the option of re-assaying a batch of samples, to ensure that the suite of assays received from the laboratory are as accurate as possible, when compared to available checks and balances. The graphs also allow the monitoring of any drift in assay trends over time and thus provide information on analytical accuracy.

QAQC results are discussed herein by assay laboratory for Snark, Drabble Downs, Central and Banjo, rather than by deposit. All the deposits with Mineral Resources reported are geologically similar and are part of the same project. Results analysed are for results received from the laboratories up to May 2012. QAQC results for Moonshine are discussed separately.

Table 18. Certified Reference Materials as used 2010 to 2012, Geostats Pty Ltd

CRM Code	Element	Expected Mean (%)	STDEV
GIOP-45	Fe	59.93	0.128
	Al_2O_3	2.0	0.031
	SiO_2	4.99	0.045
	P	0.050	0.001
	LOI	6.6	0.069
GIOP-54	Fe	48.05	0.214
	Al_2O_3	5.32	0.061
	SiO_2	15.78	0.137
	P	0.06	0.002
	LOI	7.96	0.086
GIOP-63	Fe	52.46	0.208
	Al_2O_3	5.14	0.071
	SiO_2	10.89	0.134
	P	0.05	0.001
	LOI	6.89	0.070
GIOP-64	Fe	56.32	0.217
	Al_2O_3	2.6	0.040
	SiO_2	8.07	0.099
	P	0.037	0.001
	LOI	5.5	0.058

11.3.2.2 Certified Reference Materials Ultratrace

The CRM plots for Fe (%) for CRM types submitted to Ultratrace are presented in Figure 21 and Figure 24.

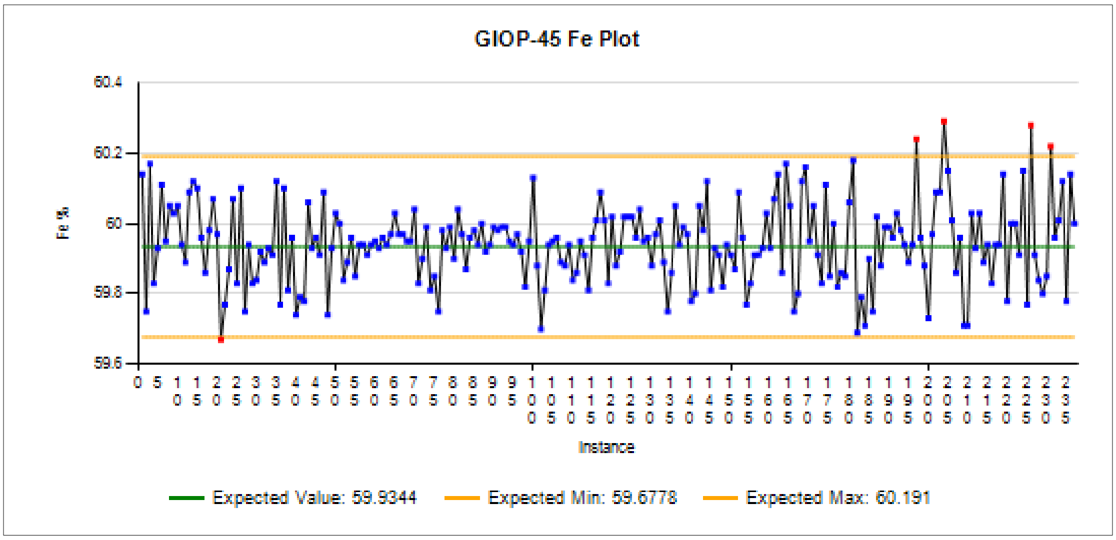

Figure 21. CRM GIOP-45 performance plot.

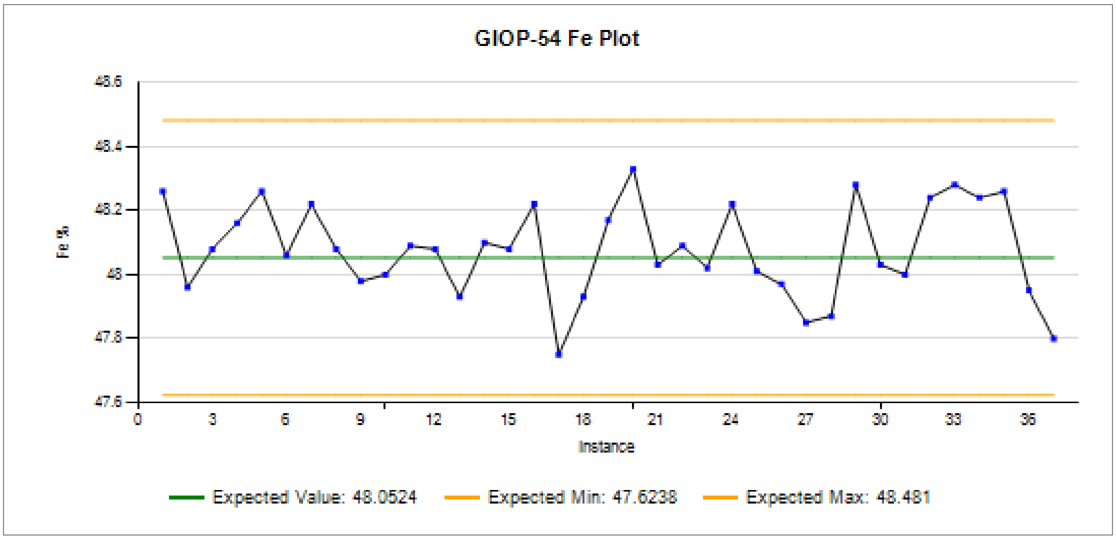

Figure 22. CRM GIOP-54 performance plot.

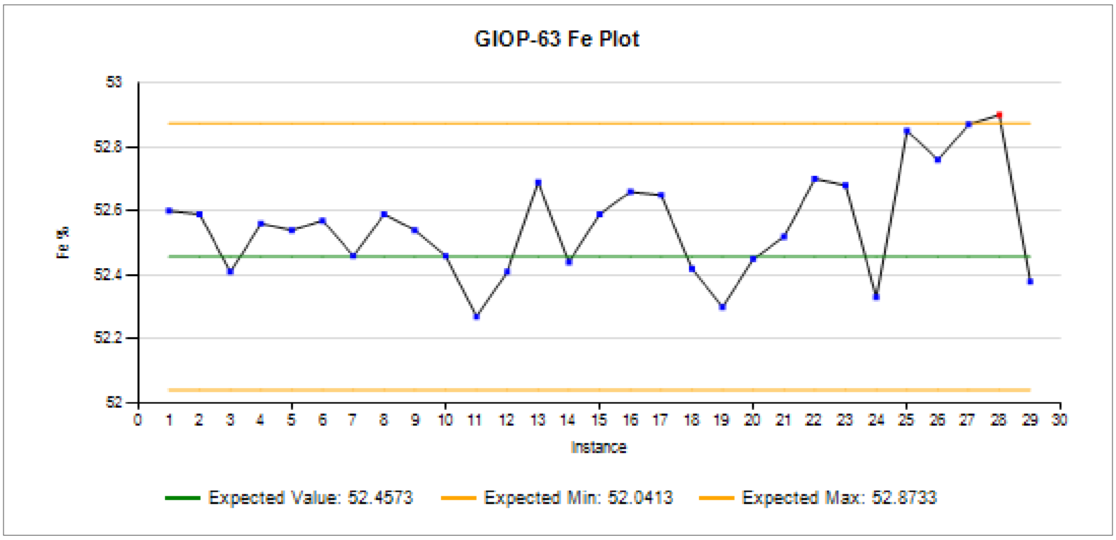

Figure 23. CRM GIOP-63 performance plot.

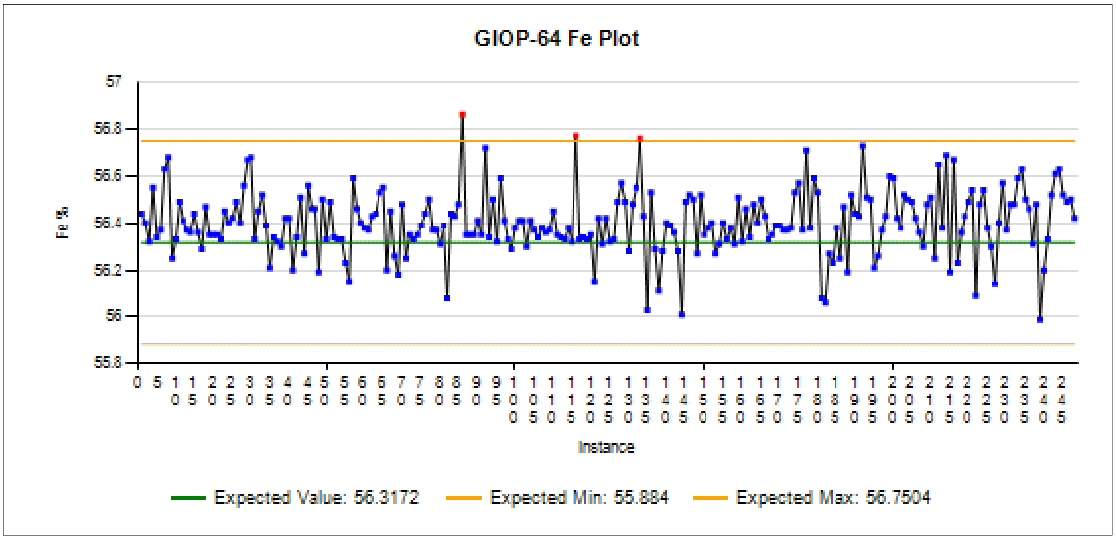

Figure 24. CRM GIOP-64 performance plot.

11.3.2.3 Certified Reference Materials ALS

The CRM plots for Fe (%) for CRM types submitted to ALS are presented in Figure 25 to Figure 28 .

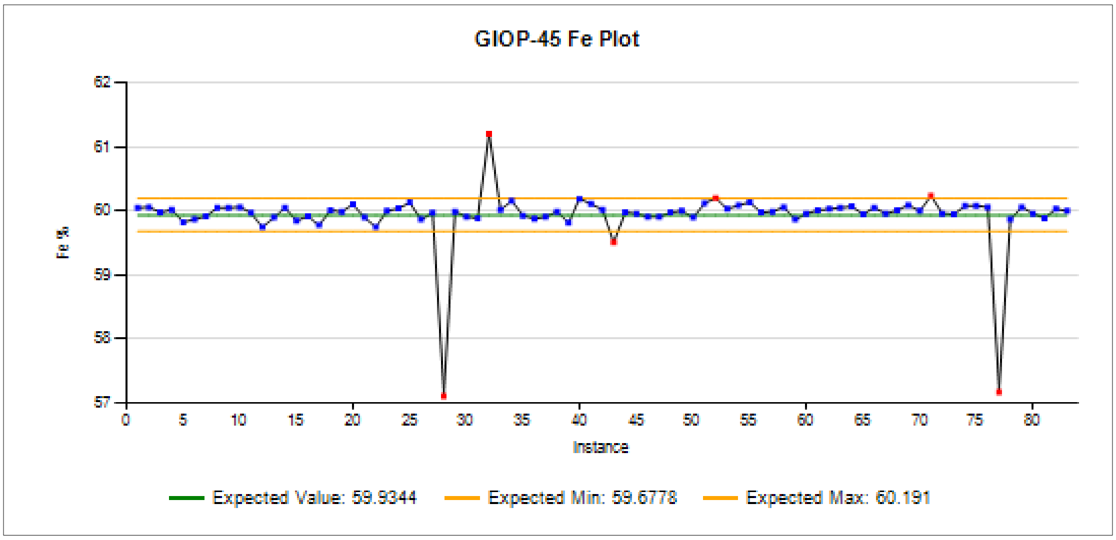

Figure 25. CRM GIOP-45 performance plot. ALS Laboratory

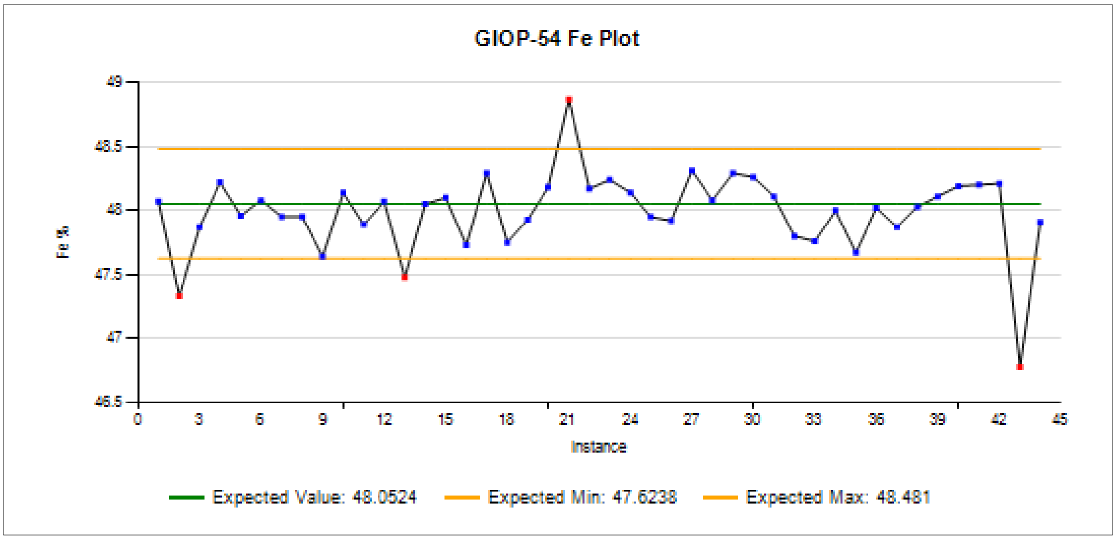

Figure 26. CRM GIOP-54 performance plot. ALS Laboratory

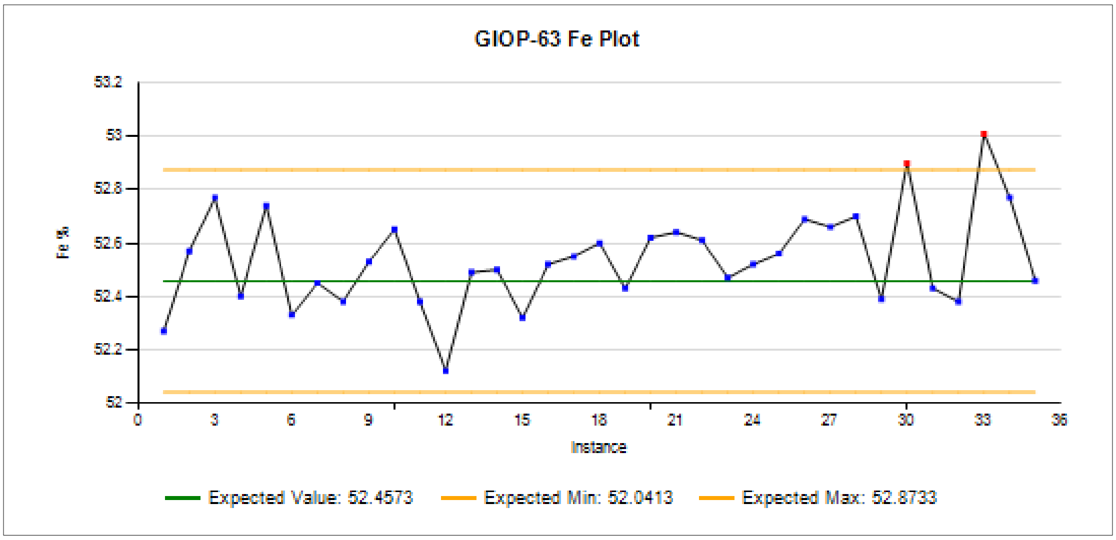

Figure 27. CRM GIOP-63 performance plot. ALS Laboratory

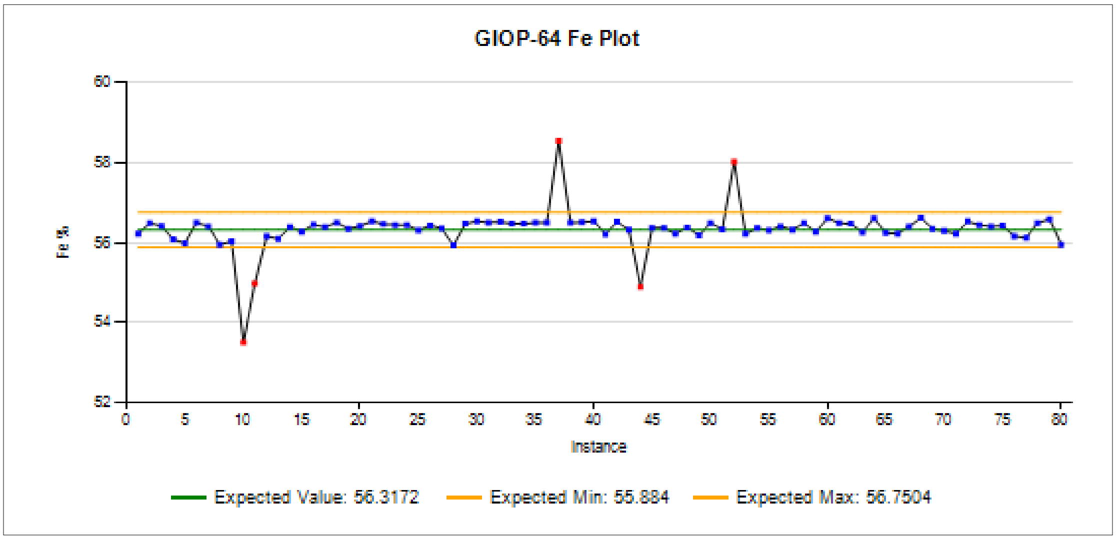

Figure 28. CRM GIOP-64 performance plot. ALS Laboratory

11.3.2.4 CRM Results September 2011 to May 2012

CRM results from samples submitted to ALS September 2011 to May 2012 for Fe% are presented in Figure 29 to Figure 32.

Results received from Ultratrace for Fe% up to February 2012 are presented in Figure 33 to Figure 36.

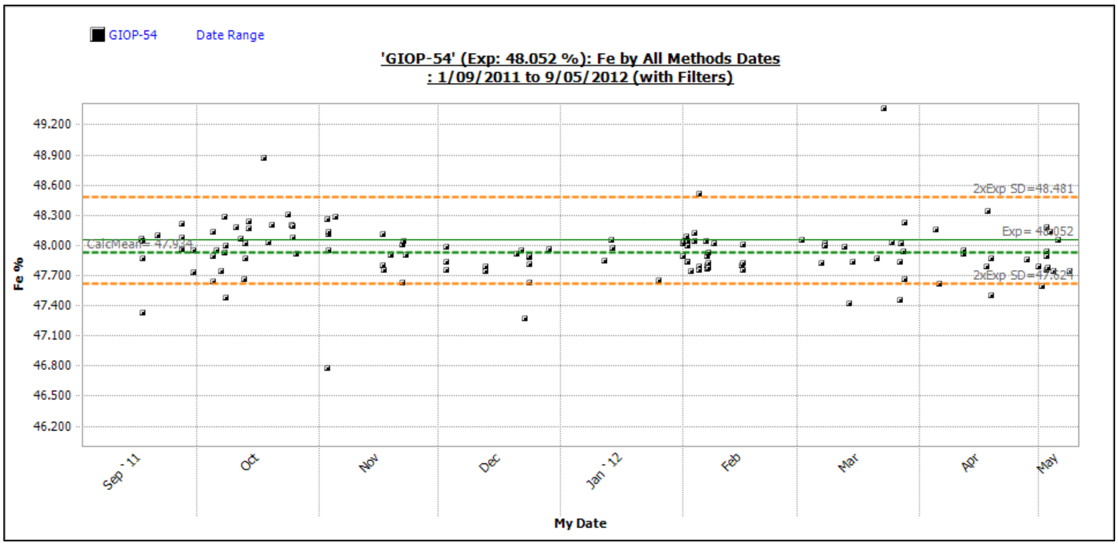

Figure 29. CRM GIOP-54 performance plot. Ultratrace Laboratory

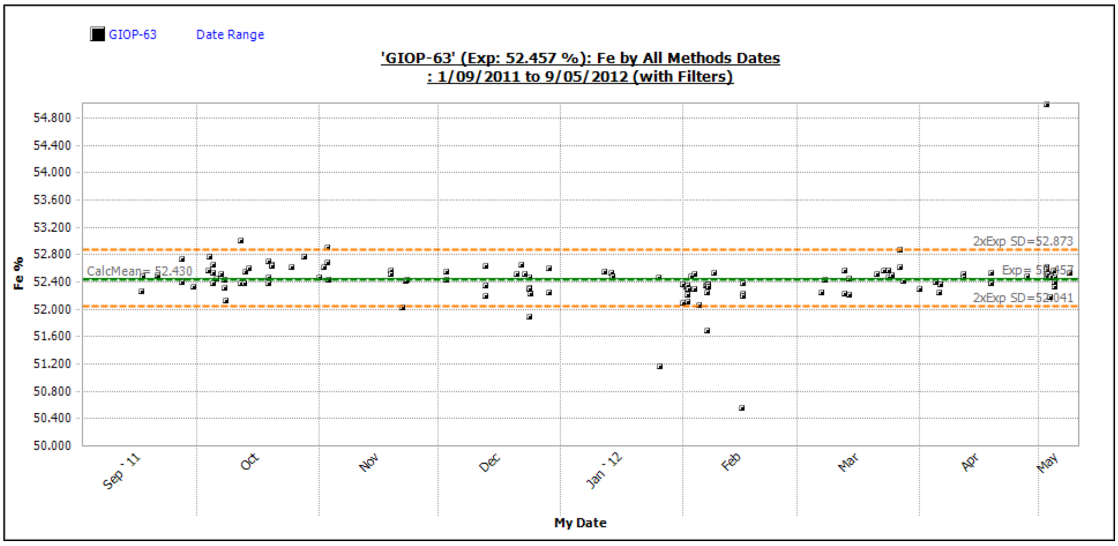

Figure 30. CRM GIOP-63 performance plot. Ultratrace Laboratory

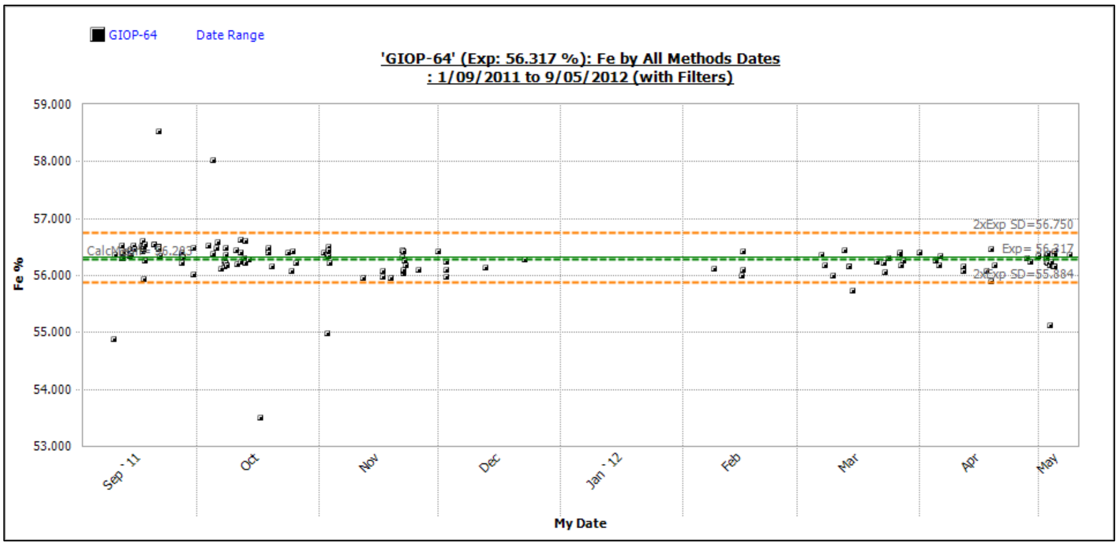

Figure 31. CRM GIOP-64 performance plot. Ultratrace Laboratory

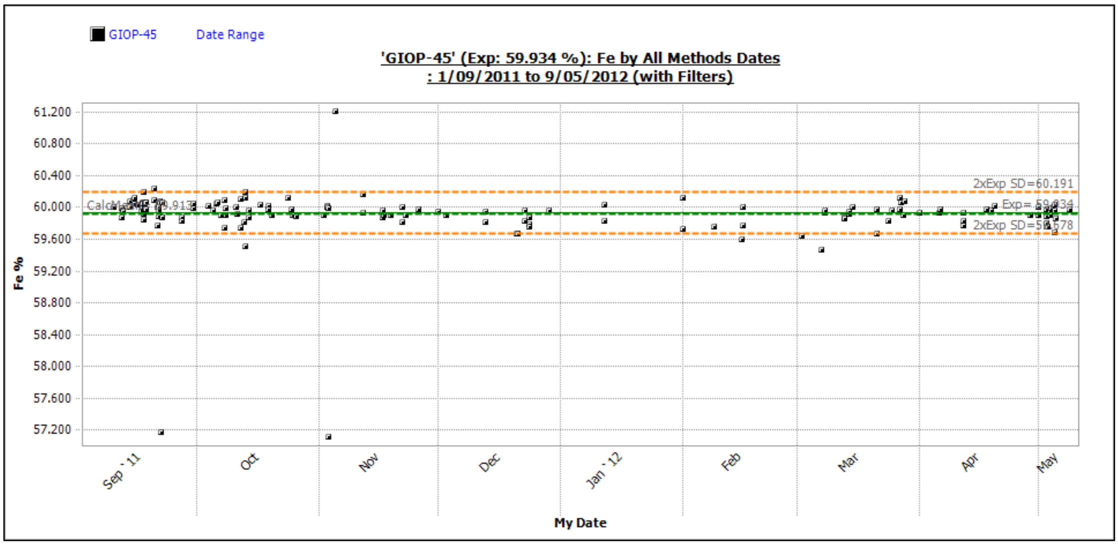

Figure 32. CRM GIOP-45 performance plot. Ultratrace Laboratory

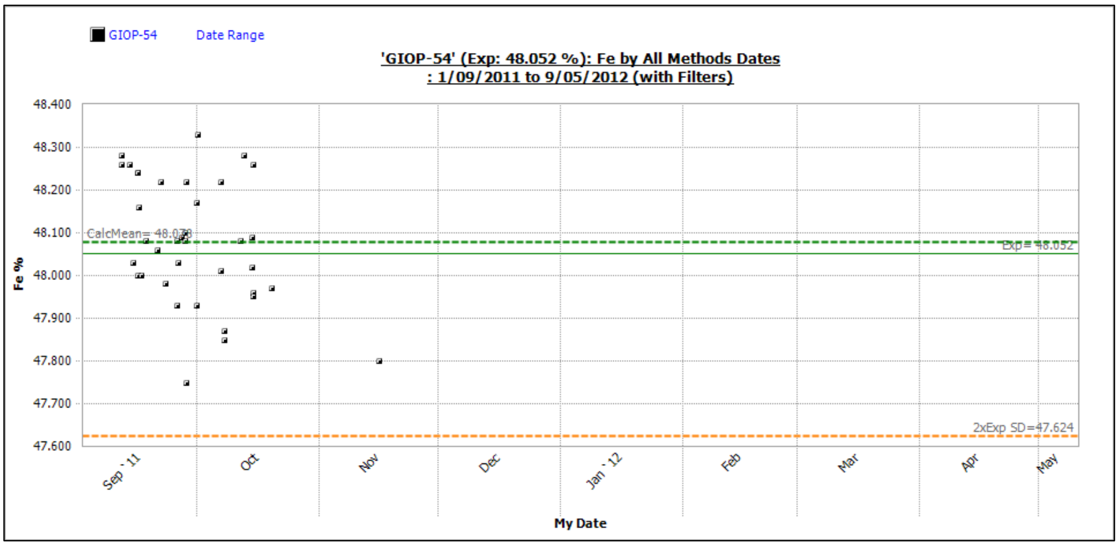

Figure 33. CRM GIOP-54 performance plot. ALS Laboratory

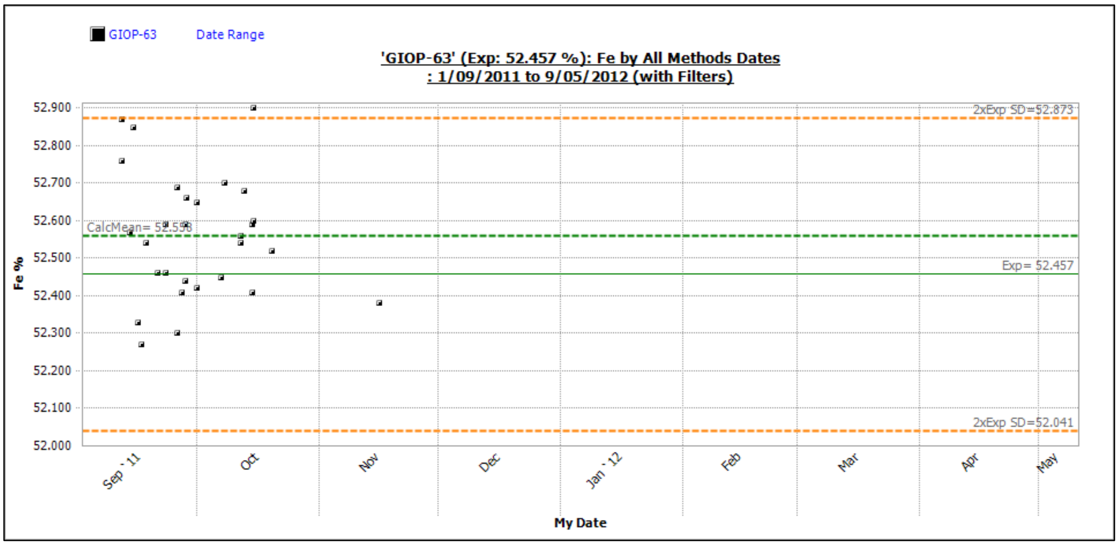

Figure 34. CRM GIOP-63 performance plot. ALS Laboratory

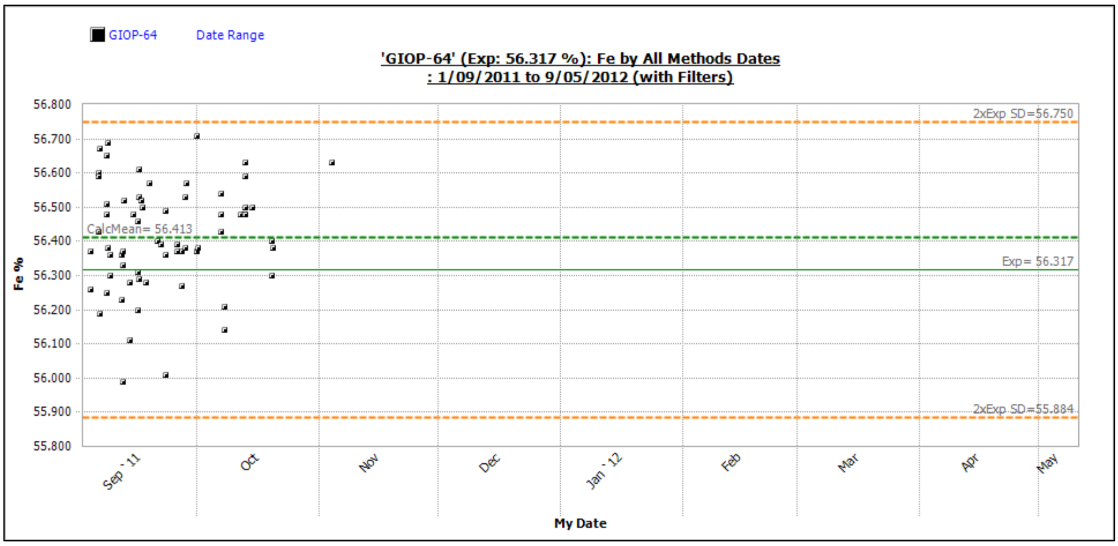

Figure 35. CRM GIOP-64 performance plot. ALS Laboratory

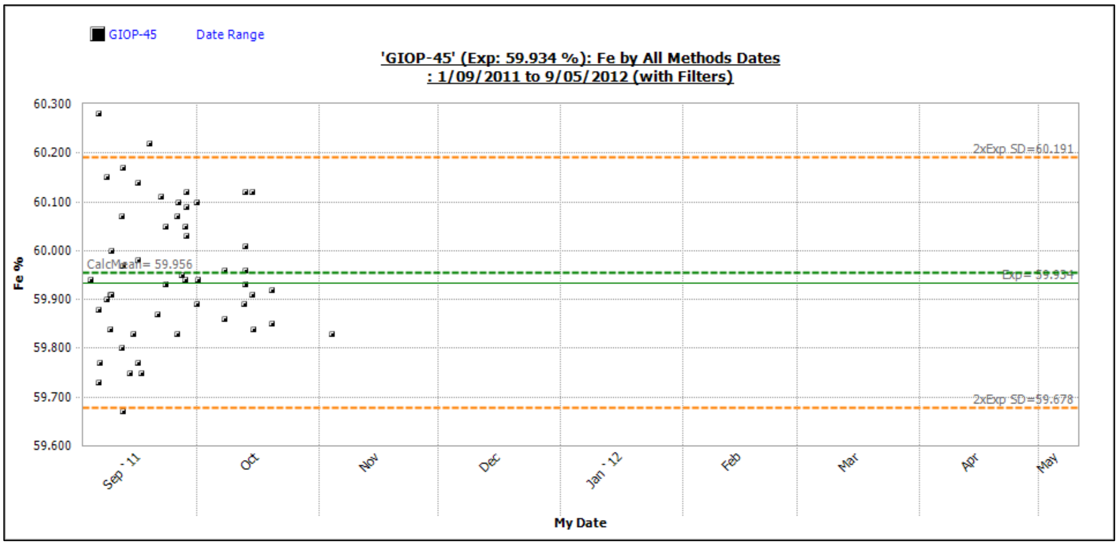

Figure 36. CRM GIOP-45 performance plot. ALS Laboratory

11.3.3 Duplicates

11.3.3.1 Field Duplicates

Field duplicates are duplicate samples taken at the drill rig, in parallel to the primary sample that is submitted for assay analysis. The purpose of a field duplicate is to test firstly the quality of the sample splitter on the drill rig; and secondly the quality of sample preparation at the assay laboratory. Figure 37 demonstrates the collection of a duplicate field sample, whereby the sample collected from the drill hole passes evenly through a three tiered riffle splitter, with equal portions of sample passing through to the primary sample and field duplicate sample. The field duplicate sample is submitted to the assay laboratory at the same time as the primary sample. MMS captures a field duplicate sample at the 8m depth of every hole, then every 25m beyond that depth, for each hole. When a field duplicate sample is not captured by calico bag, the sample stream from the duplicate chute is allowed to fall to the ground where it is discarded. The field duplicate calico bag is stored on the reject sample pile alongside the primary sample, as demonstrated in Figure 38.

Scatter plots for Fe (%) are presented in Figure 39 and Figure 40. These demonstrate a tight clustering around the 1:1 line, although there are outliers. These outliers may be due to mis-allocation of field duplicate samples (sample bags erroneously labelled) or sampling bias at the drill rig. A very high correlation coefficient (0.99) implies sampling at the drill rig was maintained at a high level of proficiency.

Figure 37. Three tiered splitter on RC drill rig, showing collection of primary sample and field duplicate. Sample residue collected in bucket.

Figure 38. Primary sample and field duplicate laid out on sample piles on ground.

11.3.3.2 Field Duplicate Analyses Ultratrace

A scatter plot for field duplicate samples dispatched to Ultratrace is presented in Figure 39. This demonstrates good repeatability.

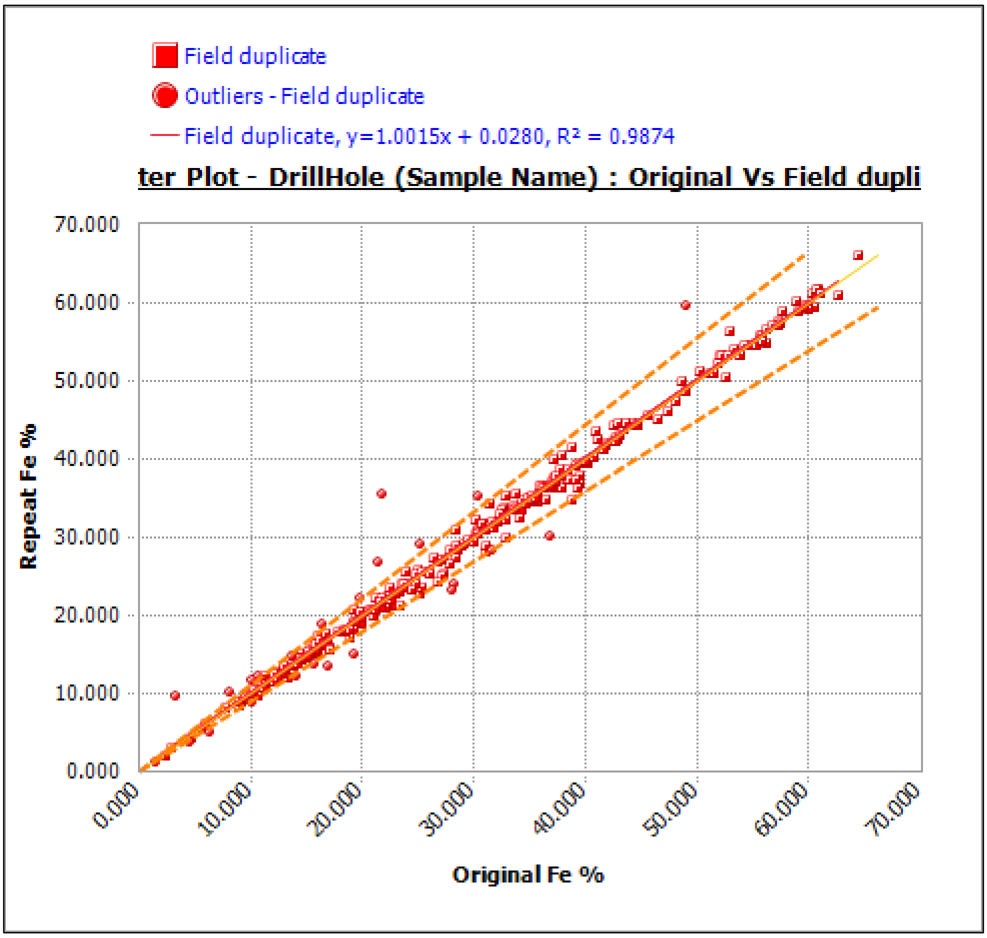

Figure 39. Correlation Analysis (Fe %), Field Duplicates, samples sent to Ultratrace Laboratory, to May 2012.

11.3.3.3 Field Duplicate Analyses ALS

A scatter plot for field duplicate samples dispatched to ALS is presented in Figure 40. This demonstrates good repeatability.

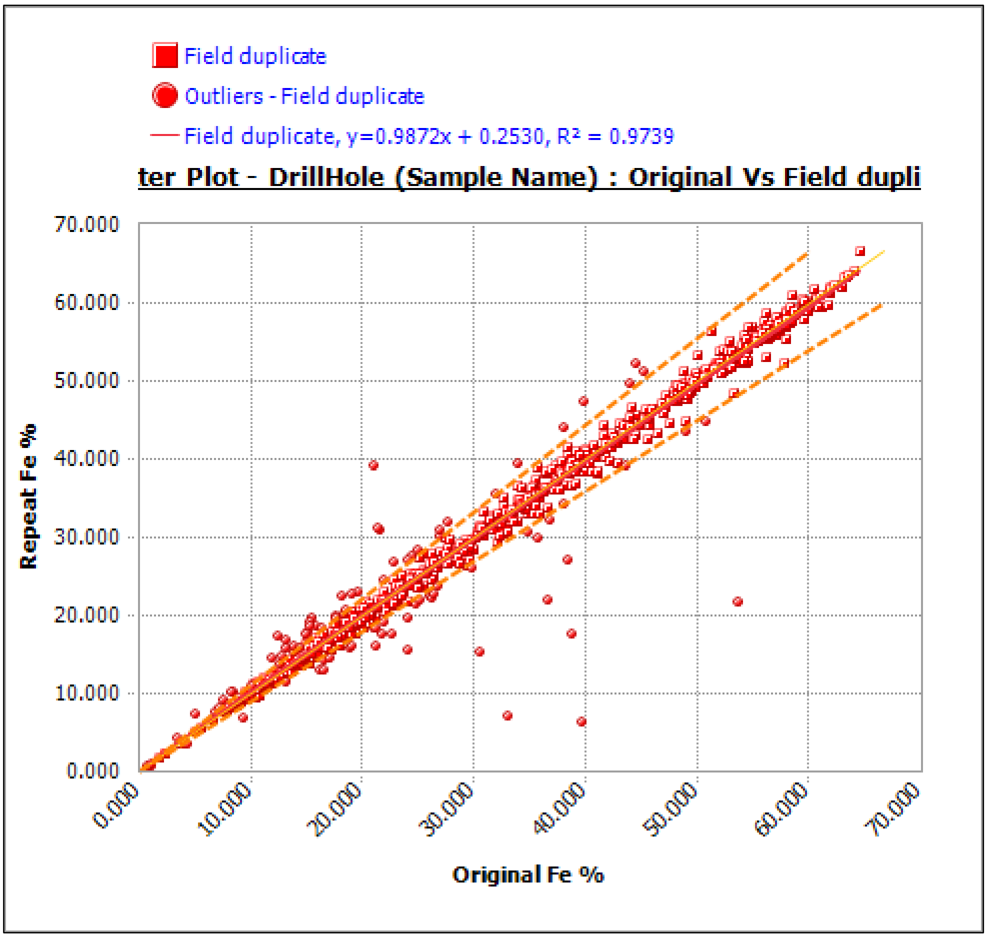

Figure 40. Correlation Analysis (Fe %), Field Duplicates, samples sent to ALS Laboratory.

11.3.3.4 Laboratory Duplicates

The assay laboratory independently tests its' own analytical quality using internal laboratory control procedures, one method of which is to submit a 'split' of the 105µm sample for XRF analyses, sometime after the original sample has been analyses. This is to test the accuracy of the XRF analyser. Assay results for iron mineralisation samples are anticipated to be very similar due to the low nugget effect of the mineralisation.

11.3.3.5 Lab Pulp Duplicates

Scatter plots of primary pulp samples versus laboratory pulp samples for Fe% from Ultratrace are presented in Figure 41. This demonstrates good correlation.

Scatter plots of primary pulp samples versus laboratory pulp samples for Fe% from ALS laboratories is presented in Figure 42. This demonstrates a high level of accuracy.

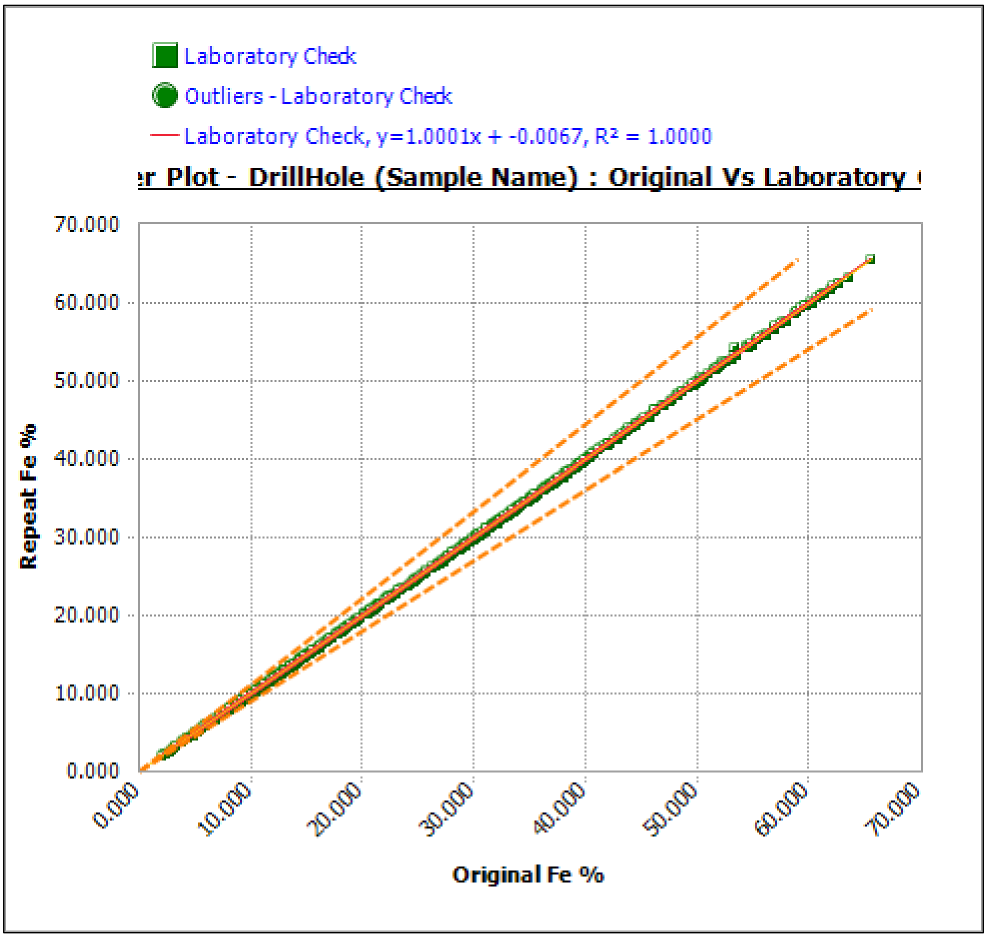

Figure 41. Scatter plot, pulp samples, primary versus duplicate. Fe %, Ultratrace laboratory.

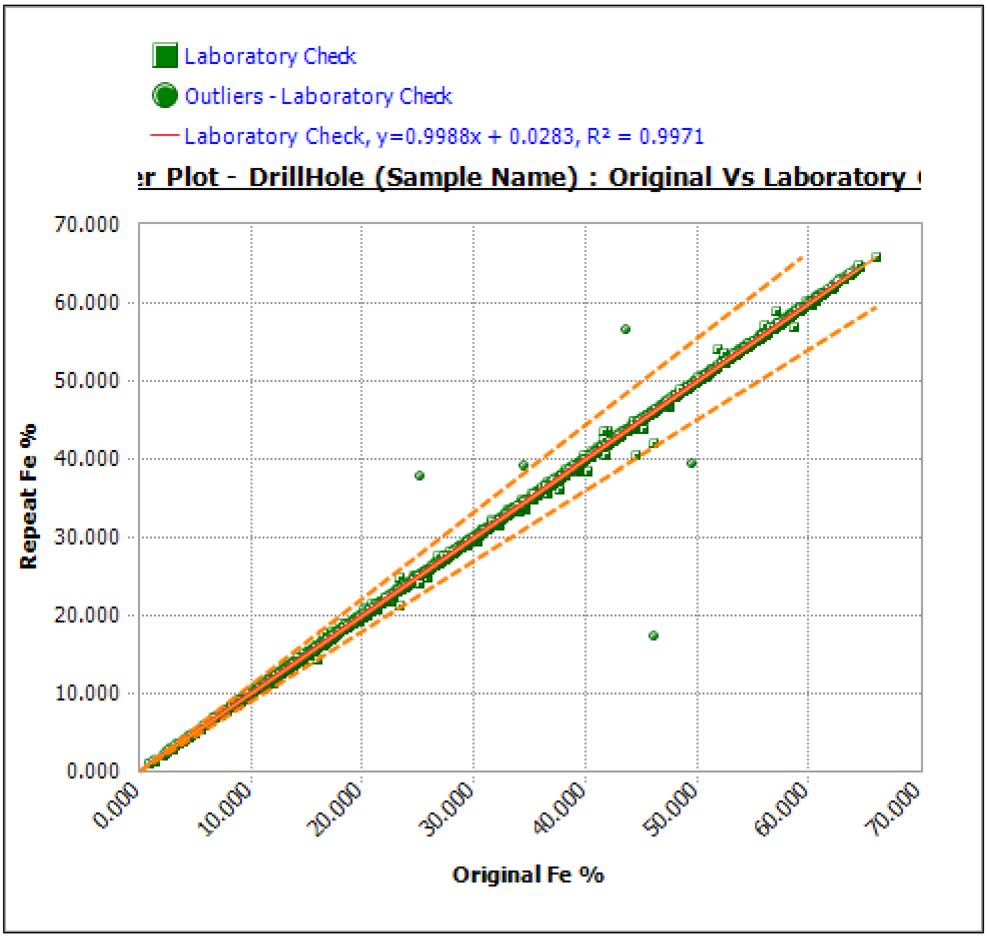

Figure 42. Scatter plot, pulp samples, primary versus duplicate. Fe %, ALS laboratory, 2011 to 2012.

11.3.4 Grind Size Passing 75 Micron

An analysis of the percentage of pulverised material per sample passing through a 75 micron mesh demonstrates an average pass rate of over 85% of the samples. The results were provided by ALS, who conducted their tests prior to submission of the pulverised sample for XRF analysis. The results are presented in Figure 43. This shows some pulverised samples did not achieve >85% of their total mass passing through the 75 mesh. This is not considered a significant issue for hematite / goethite mineralisation, however it is recommended MMS discuss these results with ALS, and to actively monitor future assay results when delivered by the laboratory.

ALS used their procedure PUL-23, where the entire sample is pulverised to better than 85% <75 micron screen (Tyler 200 mesh, US Std. No. 200). The total pulverised sample is used in the XRF analysis regardless of its' passing rate through the 75 mesh.

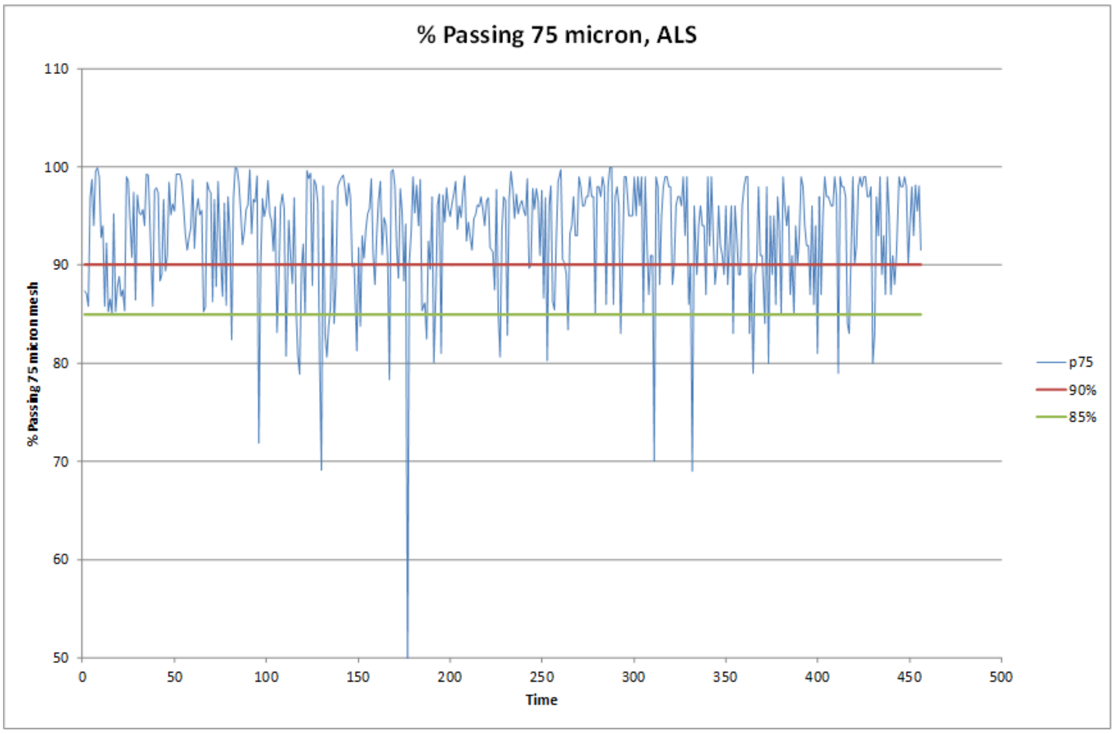

Figure 43. Percentage of pulverised sample passing 75 micron, by ALS. Primary samples only

11.3.5 Quality Assurance and Quality Control – 2009 to 2010 Drilling

The following QAQC analyses were conducted for Banjo, Lost World, Central and Moonshine, from the commencement of resource definition drilling for the Ularring Hematite Project. They also cover the Mineral Resource estimate published for Snark in 2010 (Macarthur Minerals Limited, 2010).

The QAQC data provided up to December 2010 included a separate database table of 176 field duplicate assays taken from the mineralized intercepts, and 623 laboratory repeat assays. The 176 field duplicates taken from hole LGRC_223 to LGRC_470 were resolved to 169 paired assays. All were of mineralized hematite-goethite intercepts, analysed for whole rock Fe suite XRF analysis.

Five 'duplicates' were excluded as the 1m samples correlated to a interval that was stored as a five metre sample in the assay table, so were not used (LGRC_270 102-107); it is possible these were somehow erroneously entered in the duplicates table and should be moved to the assay table.

The graphs of field duplicates versus original XRF assays as presented in Figure 44 show very good correlation. Only three samples appeared to be incorrectly paired, possibly due to mislabelled duplicate samples. These were LGRC_241 49-50, LGRC_249 12-13 and LGRC_253 37-38.

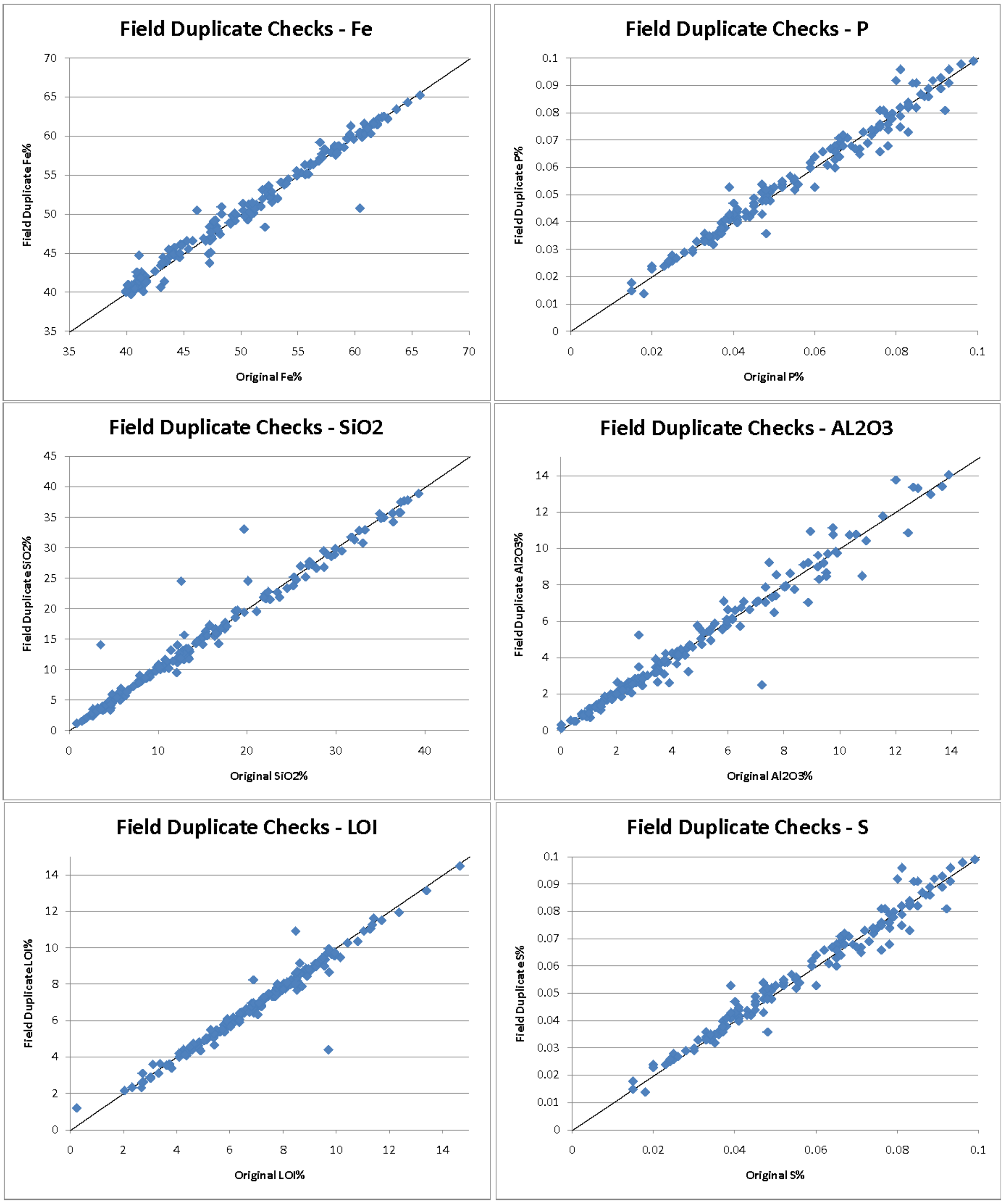

Figure 44. Field Duplicates: Scatter plots of initial versus duplicate assays, 2009 to 2010 drilling.

11.3.6 Author's Opinion on Sample Preparation, Security and Analytical Procedures

The author is satisfied that the adequacy of sample preparation, sample security and analytical procedures support the Mineral Resource classification discussed, and are of industry standard.

11.4 Sampling, Analysis & QA/QC for the Magnetite Deposits

11.4.1 Sampling Preparation and Analysis

For the RC drilling, one metre riffle split samples were submitted to Amdel Laboratories. Amdel produced an equal weight 5 metre composite for the Davis Tube Recovery and head assay. Both the Davis Tube Recovery and the head grade were analysed at Amdel. A flow chart of the process is illustrated in Figure 13.1.

All the one meter samples were collected by Macarthur field staff and transported to the Laboratory.

The National Association of Testing Authorities (NATA) has accredited both Genalysis and Amdel laboratories in accordance with ISO/IEC 17025, which includes the management requirements of ISO9001:2000 (Allen 2009).

11.4.2 Quality Control Measures

QA/QC practices and processes, which involve collecting QA/QC samples, have been implemented by Macarthur for the drilling programs.

According to Abbott el at (2009) certified reference material (CRM) were inserted by the laboratory for Phases three to seven and field duplicates have been taken during all drilling campaigns.

At the time of the resource estimation, no independent QA/QC data relating to the Moonshine or Moonshine North deposits was provided. The QP considers that the sample preparation, security and analytical procedures adopted by Macarthur provide an adequate basis for the Inferred Mineral Resource estimates.

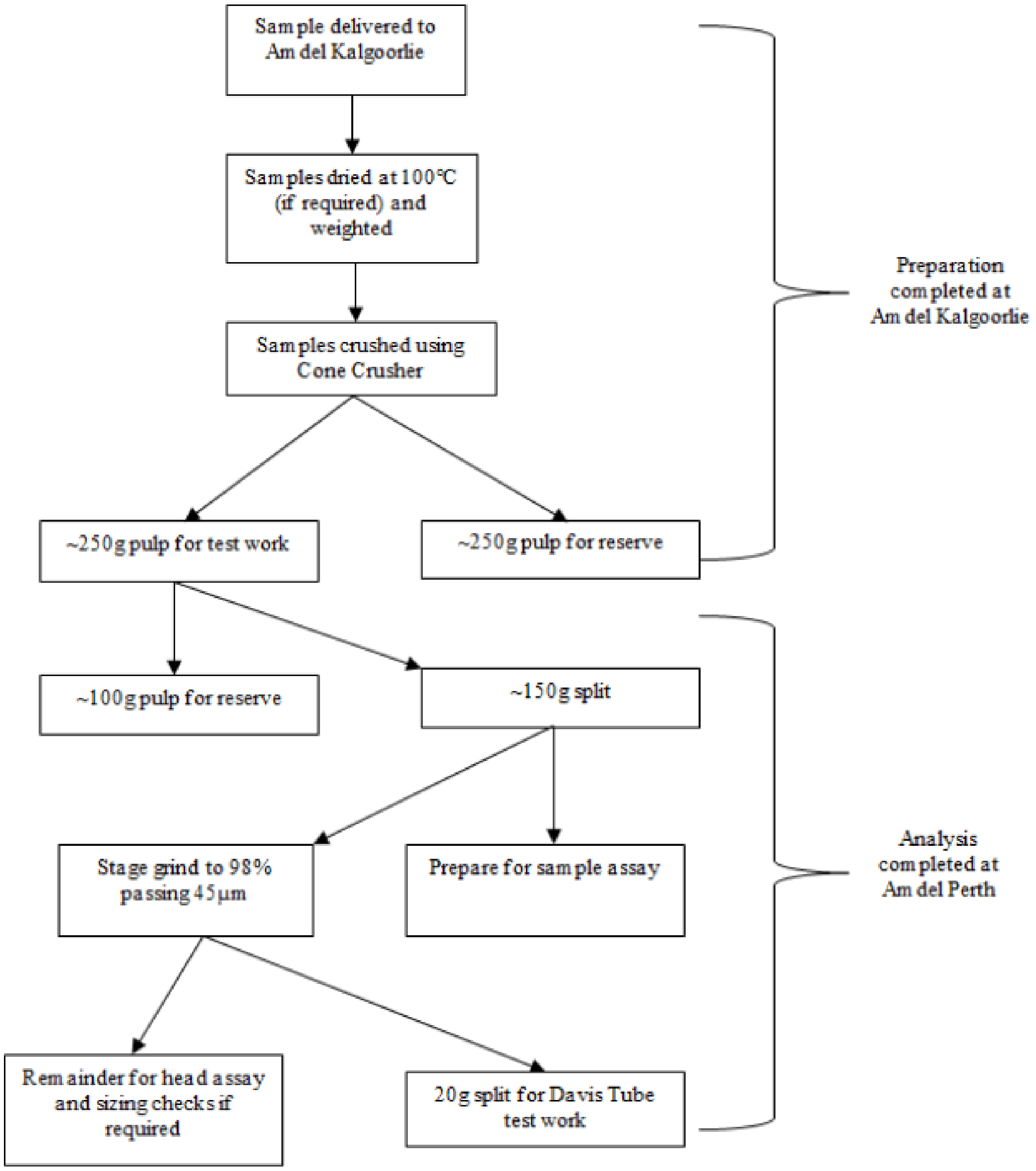

Figure 45. Flow chart of the analysis of the samples at the Amdel Laboratory

12 Data Verification

12.1 Data Validation – Hematite Data

The Qualified Person (QP) visited the Project site three times during 2011, and once in 2012. Many drill sites were inspected, both historical and active. Collar coordinates were measured using a hand held GPS and compared to the surveyed coordinates, and in all cases the surveyed collar coordinates were confirmed. The QP has also relied upon data validation carried out by site geologists who independently recorded the coordinates of holes and compared these against actual coordinates.

Sample assays were compared against lithological logs and were consistent with the geological intervals. For example, Fe grades of >50% were associated with hematite / goethite mineralisation and sometimes BIF; but never with ultramafics.

The drill hole database was validated initially by the database operator, and queries were sent to site for clarification. The author is satisfied that as many checks and balances as possible have occurred, and any errors or omissions that do exist will only possibly affect the Mineral Resource estimate in a marginal manner.

Finally, the drill holes were loaded into Datamine and drill hole traces were visually checked to ensure they did not exhibit kinking (resultant from erroneous down hole surveys), were dipping downwards, and the collars were in the expected locations and not offset from the targeted mineralisation without good reason.

The surface topography was validated by comparing it to drill hole collars (elevation records) to ensure there were no material gaps between the two items.

Geological wireframes of the BIF strata used to constrain the Mineral Resource estimates were validated by way of visual checks against drill hole traces, and statistical analyses during the resource estimation.

The QP is satisfied with the adequacy of the data used to compile the Technical Report, and that they are of acceptable quality.

12.2 Data Validation – Magnetite Data

No data verification of the Moonshine or Moonshine North sampling is possible as the samples were either not retained or have since been discarded. The author has not independently verified the assay results for the Lake Giles reverse circulation or diamond drilling.

The QP considers that the sample preparation, security and analytical procedures adopted by Macarthur provide an adequate basis for the Inferred Mineral Resource estimates.

13 Mineral Processing and Metallurgical Testing

13.1 Magnetite Metallurgical Test Work

Engenium (2010) carried out a preliminary study based on samples from two reverse circulation drill holes (LGRC199 and LGRC203) from the Moonshine and Moonshine North prospects, respectively. The samples were subjected to DTR analysis and LIMS treatment at various feed size distributions to compare the performances of the ore to the two magnetic treatments. These results are summarised below in Table 19.

Table 19. Metallurgical results summary (Engenium 2011)

Drill Hole	Test Work	P80 µm	Mass Recovery (%)	Fe (%)	SiO_2 (%)	Al_2O_3 (%)	P (%)	S (%)	LOI (%)
LGRC199	Stage Grind Full DTR	26	43.5	68.7	4.2	0.02	0.007	0.043	-3.0
	Single Stage LIMS	26	43.8	67.0	6.3	0.04	0.011	0.033	-2.9
	Two Stage LIMS	24	43.4	67.1	6.3	0.04	0.011	0.033	-2.9
LGRC203	Stage Grind Full DTR	25	55.5	69.3	3.2	0.05	0.010	0.038	-3.0
	Single Stage LIMS	27	60.3	67.3	5.0	0.04	0.015	0.036	-2.7
	Two Stage LIMS	25	57.8	68.4	4.2	0.04	0.015	0.036	-2.8

The main conclusions of the scoping study were:

- The Iron grade of the metallurgical test sample intervals and the Davis Tube mass recovery (DTR) of the metallurgical samples supplied to Engenium were higher than the bulk of the intervals used for the resource estimation of 27.5% Fe. This showed higher mass recoveries of the concentrate.
- The Low Intensity Magnetic Separators (LIMS) test results yielder a poorer quality concentrate than was determined from the DTR preliminary analysis. LGRC199 exhibited the largest discrepancy.
- The concentrate reached 5% silica for the DTR for both drill holes but the concentrate did not reach the target (5 % silica) for the LIMS test work in drill hole LGRC199. A minimum of 4.2 % DTR and 3.1 % DTR was achieved at a grind 25 micron for drill holes LGRC199 and LGRC203, respectively. The summary data is shown in Figure 13.1.

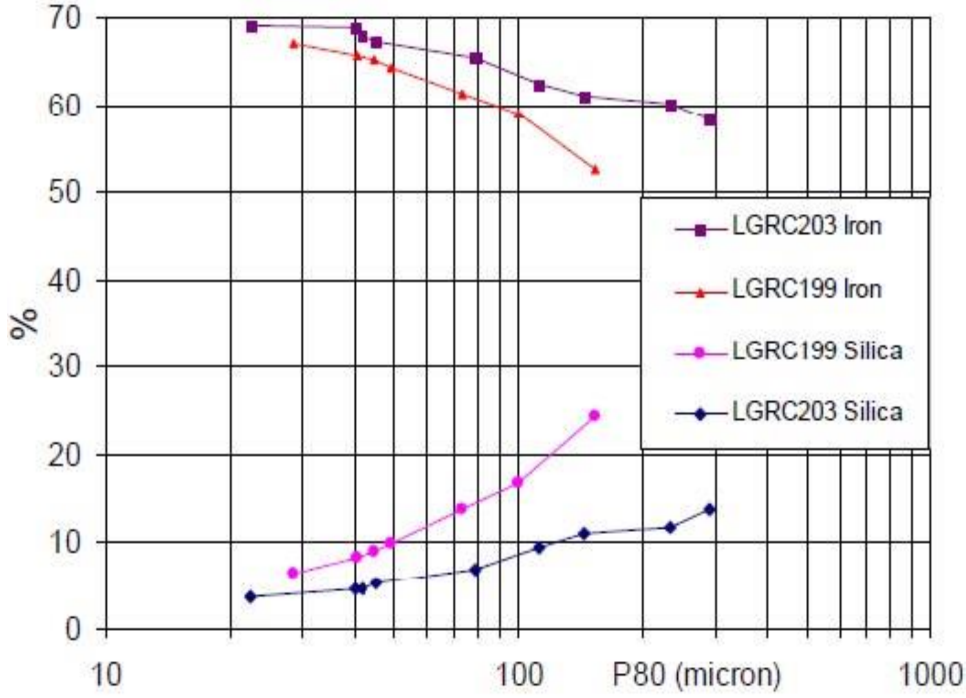

Figure 46. DTR Iron and Silica grades at various P80 sizes (Engenium 2011)

13.1.1 Conclusions and Recommendations

It is recommended that over the next stage of project development more metallurgical samples be obtained to conduct further process testwork. The testwork would be focused on confirming the response of the different ore zones within the deposits to develop a more robust process flow design for the project.

13.2 Hematite Metallurgical Test Work

The test work for the Ularring Hematite Project consisted of several programs of beneficiation studies upgrading low grade ore to a saleable concentrate. The current operating strategy for the Project is to mine, crush and grind hematite ore to be blended with the final magnetite concentrate. No beneficiation is contemplated and the test work presented below applies to a simplified crushing and screening operation. Although the data in the testwork programmes is shown below the only parameters relevant to the current PEA are the head grades and any differentiation in lump (6 x 30 mm) and fines (-6 mm) material.

13.2.1 Historical Test work

The test work conducted for Ularring Hematite Project consisted of the following and is described more fully in the Ularring Hematite Project Prefeasibility Study (2012):

- MMS commissioned an initial metallurgical test work program ('Phase 1 test Work') in the last quarter of 2011 based on 200 kilograms of sample composited from diamond drill core obtained from the Snark location in order to characterise the response of this material to both conventional gravity beneficiation processes and to magnetic separation process.
- A follow-up program was commissioned by MMS in February 2012 (Variability test Work'). The primary focus of this program was to confirm that beneficiation could be applied to the full range of material types found at Ularring over a range of material Fe grades and to provide indicative design information for a beneficiation process capable of handling a range of material types within the deposits. A secondary objective was to assess the response of the full range of material types to magnetic separation.
- MMS then commissioned a third phase of metallurgical test work to validate the conceptual flow sheet and to provide detailed engineering design and economic performance parameters. This test work program was based on two 500 kilogram samples derived from diamond drill core with the "A" sample composited to reflect a blend of high, intermediate and low grade zones at a bulk grade in the vicinity of 52% Fe which is presently expected to reflect the average plant feed grade and the "B" sample composited to reflect the very low end of the expected range of technically and economically viable feed grades with a view to establishing the metallurgical characteristics of low grade material and to assess the capability of proposed flow sheet to upgrade such material to a saleable product.

The operating philosophy for the current study does not consider beneficiation of low grade ore so presentation of the beneficiation test work is not considered relevant.

13.2.2 Crushing and Screening

MMS commissioned an initial metallurgical test work program in the last quarter of 2011 based on 200 kilograms of sample composited from diamond drill core obtained from the Snark location.

Core was segregated into 'ore' and 'waste' visually and composited to provide a broadly representative sample of iron ore material from this location. The material was visually logged as being predominantly goethite. The bulkhead grade of this sample was Fe 56.6%; $SiO_2$6.3%; Al_2O_3 3.8%; LOI 7.5%.

A sub-sample of the bulk sample was stage crushed to -32 mm to determine whether there was any evidence for preferential deportment of silica and alumina to the fine size fraction and whether the Fe minerals would preferentially deport to the coarse fraction. If this was demonstrated it may might provide an opportunity to produce a directly marketable 'lump' product. Size fractions from 25 mm to 0.045 mm were developed and assessed.

This initial crushing test work revealed that the material was friable, with stage crushing of the sample to -32 mm, resulting in 18.4% by mass reporting to the -45 micron size fraction and only 26.2% by mass reporting to the -+8 mm size fraction. Analysis of the +8 mm size fraction suggested that there was no significant preferential deportment of Fe to the coarse +8 mm fraction although both SiO_2 and Al_2O_3 value were reduced. Further analysis indicated that both SiO_2 and Al_2O_3 preferentially reported to the -45 micron fraction.

In view of these findings, there appeared to be no significant prospect of producing a significant proportion of enhanced grade 'lump' product from this type of material.

13.2.3 CWI and Abrasion Test work

Bond abrasion test work was conducted on core from the Snark deposit. The Bond Abrasion Index test for Snark was 0.02 and the CWI average was 1.9 kWh/t. The CWI ranged from 2.6 to 1.4 kWh/t and the average true SG of the specimens was 4.26.

13.2.4 UCS Values

The UCS results varied from weak to medium strong. The values are shown in Table 20.

Samples were selected visually, consisting of two friable core samples and one hard core sample. The hard core had a higher UCS.

Table 20. UCS Results

Sample No	U.C.S. (MPa)	Moisture %	Bulk SG
LGDD-0507 (18.0-18.2)	8.80	1.37	3.28
LGDD-047 (29.9-30.1)	11.54	1.09	3.11
LGDD-044 (40.6-40.8)	44.32	6.50	1.71

The ore would be classified as weak, ranging in the 6-20 MPa range.

Table 21. Definitions

U.C.S. (MPa)	Strength
< 6	Very Weak
6-20	Weak
20-60	Med' Strong
60-200	Strong
> 200	Very Strong

13.2.5 Conclusions and Recommendations

Previous hematite test work has shown that a coarse product richer than 59% Fe could be achieved and, depending on the final optimal Fe grade required, a coarse Fe product could be scalped off. Thus a stream to blend with the magnetite stream could be obtained.

Further variability test work be conducted based on a range of samples from within, and marginal to, the orebody to reduce the longer term risk of ore body performance.

14 Mineral Resource Estimates

14.1 Summary

This study utilises the Mineral Resources of the Moonshine Magnetite Project, prepared by Snowden (2011) and the Ularring Hematite Project, prepared by CSA Global (2012).

The Qualified Persons are satisfied that the Mineral Resources are prepared, estimated, classified and reported in accordance with the 2014 CIM definition standards. The procedures and methodology employed to confirm mineral resource estimates are reported in accordance with CIM 2014 are presented below in sections 14.2 and 14.3.

As the magnetite and hematite resource estimates are based on different data sets and are not overlapping, they are presented as separate sections in this chapter.

14.2 Magnetite Mineral Resource Estimate

The magnetite Mineral Resource estimate for the Moonshine and Moonshine North deposits is presented in Table 1. The Mineral Resource is not believed to be materially affected by any known environmental, permitting, legal, title, taxation, socio-economic, marketing, political or other relevant factors.

The estimation of the Moonshine resource was undertaken by Mr. Shane Fieldgate and Mineral Resources have been reported in accordance with CIM Definitions for Standards of Mineral Resources and Reserves (CIM 2014). The QP has undertaken a review of sample assays, drilling data, data validation, QA/QC, estimation parameters, material density, block model parameters and classification procedures. The following information summarises the steps and procedures taken and data reviewed by the QP to ensure Mineral Resource estimates are reported in accordance with CIM 2014.

Mineralised envelopes for the Moonshine and Moonshine North deposits were based on ≥30% Fe conjunction with the lithological code 'BIF' (Banded Iron Formation) as contained in the geological database. Sample assays were compared against lithological logs and were consistent with the geological intervals. The database supporting the Moonshine Magnetite Mineral Resource estimate included in this study includes all information to 31 December 2011. Macarthur's drilling at the Moonshine and Moonshine North prospects totals 171 reverse circulation drill holes and 3 diamond drill holes.

QA/QC procedures relating to the Moonshine and Moonshine North deposits were reviewed although QA/QC data was not available for sampling. The QP considers that the sample preparation, security and analytical procedures adopted provide an adequate basis for the Inferred Mineral Resource estimates.

Resource classification has been based upon a number of criteria, including the geological confidence, the integrity of the data, the spatial continuity of the mineralisation as demonstrated by variography, and the quality of the estimation.

Block model validation was carried out graphically and statistically to ensure that the block model grade accurately represented the drill hole data. Cross sections were examined to ensure that the model grades honour the local composite drill hole grades. Three dimensional (3D) modelling methods and parameters were used in accordance with best Canadian practices. Surpac mining software was used for establishing the 3D block model and subsequent grade estimates. A geological interpretation of the iron mineralisation was derived from the drill hole logs and assays. Statistical and grade continuity analyses were completed in order to characterise the mineralisation, and were subsequently used to develop grade interpolation parameters.

Review of the above data was made with regard to the CIM 2014 Definition Standards for reporting Mineral Resources and Reserves. The QP is satisfied the resource estimates have been prepared in accordance with CIM 2014.

14.2.1 Database

The drill hole data was provided by Macarthur in an MS Access format comprising collar, survey, assay, lithological and weathering data. The drill holes collars were rendered to the topographic surface provided by Macarthur Table 22

Downhole surveys where taken at variable intervals from 24 -184 meters. The azimuth was deemed unreliable because of the magnetic nature of the rocks (BIF units) and therefore the planned azimuth was used.

The use of a multi-shot north seeking gyro is recommended to accurately determine the azimuth and dip in magnetic rocks as the gyro will be unaffected by the magnetic properties of the rocks.

A plan view of the drill holes of Moonshine and Moonshine North is shown in Figure 47 and Figure 48, respectively.

Table 22. Type and number of meters in the Moonshine and Moonshine North Deposits

Prospect	Drilling Type	Number of Drill Holes	Number of Meters
Moonshine	Diamond	2	587.0
	Reverse Circulation	105	20,636.5
	Sub Total	103	21,223.5
Moonshine North	Diamond	1	22.2
	Reverse Circulation	65	8879.5
	Sub Total	66	8901.7
Total	**Diamond**	**3**	**609.2**
	Reverse Circulation	**166**	**29,516.0**
	Grand Total	**169**	**30,125.2**

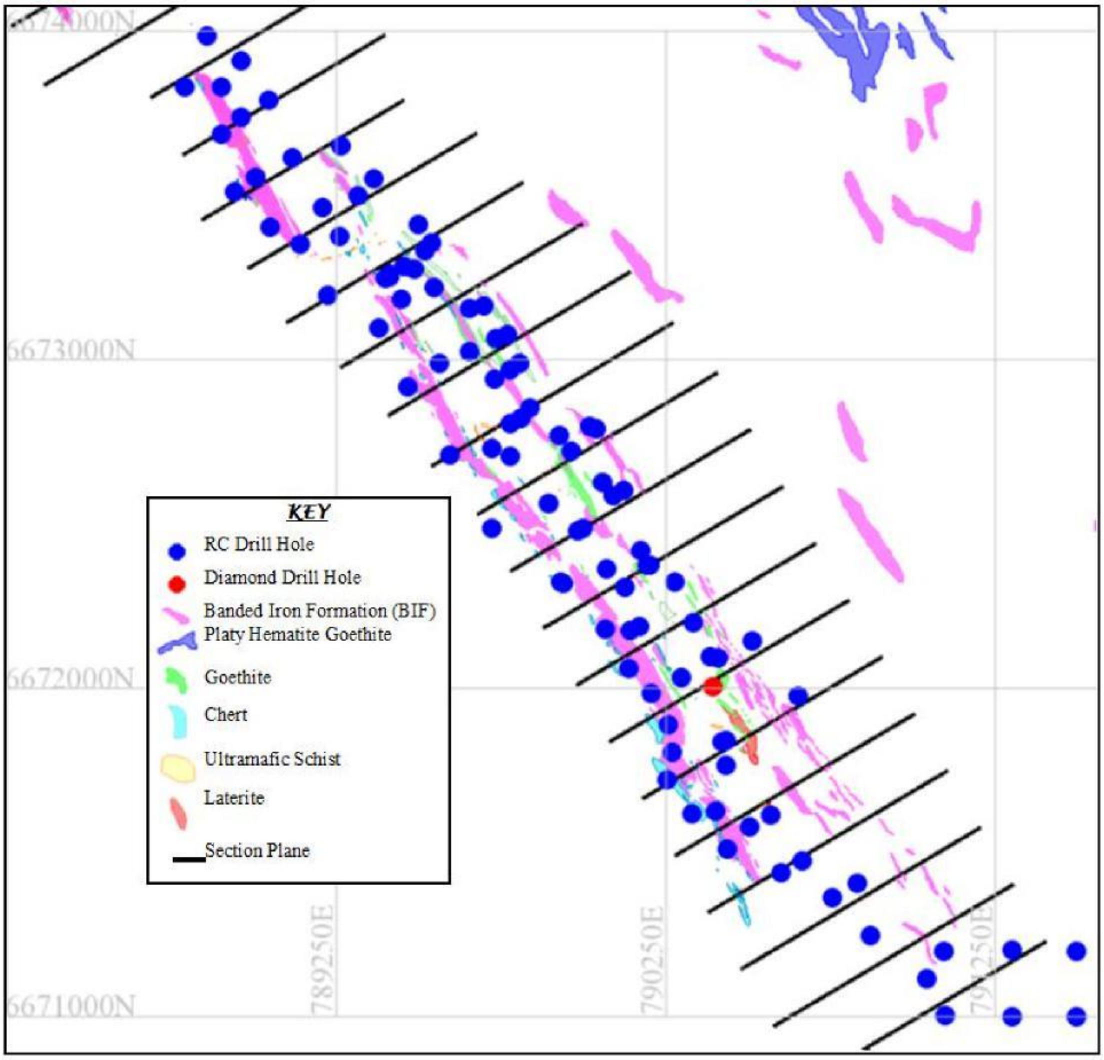

Figure 47. Plan view of the Moonshine deposit showing drill holes and oblique sections.

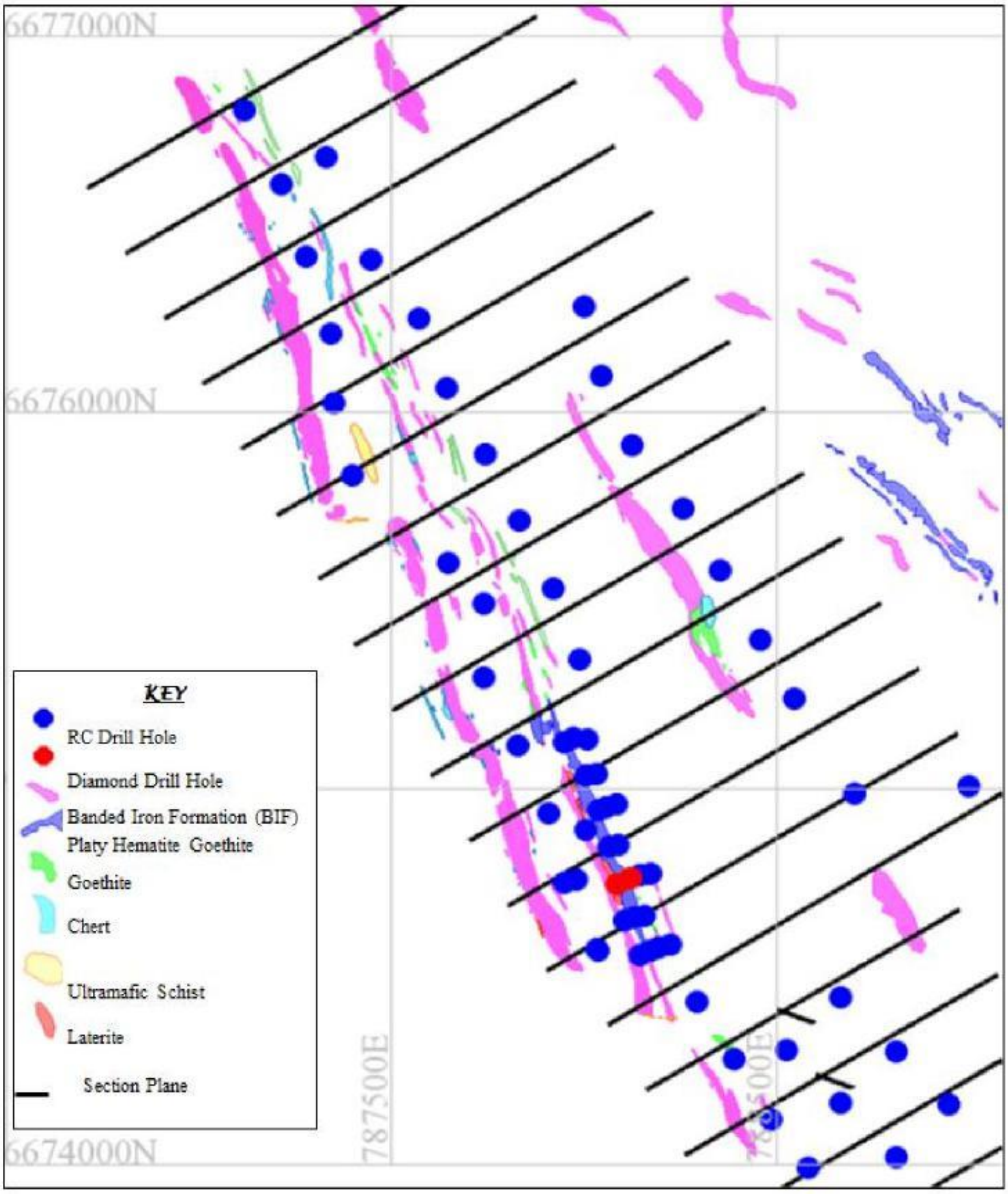

Figure 48. Plan view of the Moonshine North Deposit showing the drill holes and the oblique sections

The presence of non-numeric or negative assay values from the database was modified as shown in Table 23.

Phosphorous occurred in the database as, phosphorous (P) or as phosphorous pentoxide (P2O5). In order to use the maximum number of samples to estimate phosphorous, the P2O5 converted to phosphorous by dividing P2O5 by 2.291 (AusIMM 1995).

Table 23. Non-numeric and negative values in the database

Commodity	Value	Value Used	Comment
All	IS	"Blank"	Insufficient Sample
	I/S	"Blank"	Insufficient Sample
	I.S.	"Blank"	Insufficient Sample
	L.N.R.	"Blank"	Sample Listed not Received at Lab
	LNR	"Blank"	Sample Listed not Received at Lab
Al_2O_3	<0.01	0.005	Below Detection
	<0.010	0.005	Below Detection
	-0.01	0.005	Below Detection
Fe	<0.01	0.005	Below Detection
	<.001	0.005	Below Detection
P	<0.001	0.0005	Below Detection
P_20_5	<0.01	0.005	Below Detection
S	<.001	0.0005	Below Detection
	<0.001	0.0005	Below Detection
	0.002	0.0005	Below Detection
	<0.01	0.0005	Below Detection
	<0.1	0.0005	Below Detection
	<0.25	0.0005	Below Detection
	-0.001	0.0005	Below Detection

14.2.2 Geological Interpretation

All the mineralised envelopes for the Moonshine and Moonshine North deposits were based on ≥30% Fe conjunction with the lithological code 'BIF' (Banded Iron Formation). Each separate wireframe was given a separate object number for each prospect (Table 24).

The sectional interpretation was completed on 200 m ± 100 m oblique sections for the Moonshine deposits.

The mineralised envelopes for Moonshine and Moonshine North were projected down the 150 mRL.

Table 24. Mineralised wireframe

Prospect	Wireframe Name	Wireframe Ranges
Moonshine	moonshine_{wireframe number}.dtm	**2-15**
Moonshine North	moonshine_nth_{wireframe number}.dtm	**2-14**

14.2.3 Data Coding and Compositing

The Moonshine deposit was divided into two separate domains Moonshine and Moonshine North based on the orientation of the lenses (strike approximately 320° and 335° respectively).

The statistics on the two domains indicate that the 2 two domains are different and can be treated as independent populations. Each domain is broken into individual lodes or wireframes (lenses) which are apparently continuous at one point, either because they are one unit that is folded or as a result of fault thickening.

14.2.4 Statistical Analysis

The mean Fe grade within the BIF for Moonshine and Moonshine North domains, were 30.44% Fe and 32.64% Fe respectively. With the Davis Tube Recovery (DTR) the mean recovery was 28.44% and 31.98%.

Moonshine North has a slightly higher Al_2O_3 and LOI. This is probably due to of thinner BIF units with alternating ultramafics. Table 25 summarises the statistics for Moonshine and Moonshine North.

Statistical analysis was carried out on each element within the mineralised domain to determine the grade characteristics and ensure the domains were adequate for estimation. Individual mineralised pods were not separated for analysis as they appear to be all of a similar nature and there was insufficient data to separate them out for estimation.

Statistical analysis was carried out on each element within the mineralised domain to determine the grade characteristics and ensure the domains were adequate for estimation. Individual mineralised pods were not separated for analysis as they appear to be all of a similar nature and there was insufficient data to separate them out for estimation.

Table 25. Moonshine Deposits summary statistics

Prospect	Component	Samples	Minimum	Maximum	Mean	Standard deviation	CV
Moonshine	Fe	5694	5	53	30.44	5.902	0.194
Moonshine	SiO_2	5694	9.92	85	49.41	7.11	0.14
Moonshine	P	5660	0.0004	0.103	0.046	0.016	0.36
Moonshine	S	1349	0.01	14	2.09	1.94	0.93
Moonshine	Al_2O_3	2176	0.05	21	2.9	3.27	1.12
Moonshine	LOI	4872	-3	14	2.07	2.29	1.10
Moonshine	DTR	5101	0	58.52	28.44	16.24	0.57
Moonshine North	Fe	2806	2	64	32.64	8.08	0.25
Moonshine North	SiO_2	2806	1	91	44.43	12.05	0.27
Moonshine North	P	2113	0.005	0.34	0.050	0.023	0.454
Moonshine North	S	517	0.07	18	2.23	2.36	1.06
Moonshine North	Al_2O_3	1247	0.05	30	3.87	4.48	1.158
Moonshine North	LOI	2657	0	17	2.84	3.07	1.08
Moonshine North	DTR	2120	0	87	31.98	15.74	0.49

The histograms and log probability plots are illustrated in Figure 49 and Figure 50.

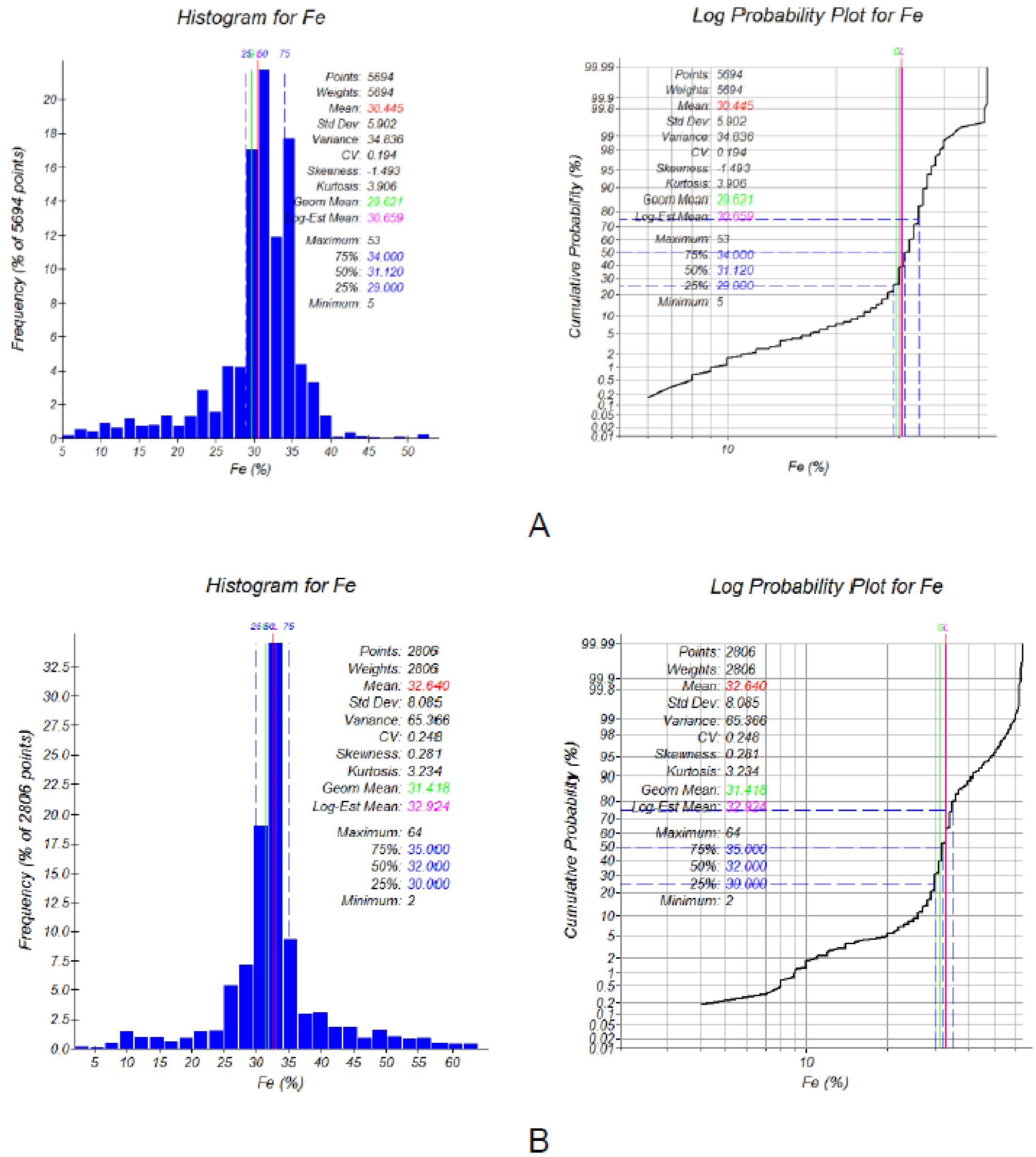

Figure 49. Iron histograms and log probability plots for A-Moonshine; B-Moonshine North

14.2.5 Continuity Analysis

14.2.5.1 Moonshine

The data within the individual mineralised wireframes wasn't enough to complete variography on therefore the variography was carried out on the combined mineralised lodes. Normal scores variograms were modelled for all the elements which was transformed back into normalised parameters. Downhole variograms were calculated and modelled to determine the nugget. Subsequently directional variograms were calculated and modelled using a nugget and two structures.

All variography for direction 3 was poor due to thin nature of the mineralised wireframes in this direction. Only the sulphur variograms were poor in all directions.

The normalised parameters are provided in Table 26. Variogram models are illustrated in Figure 50.

Table 26. Moonshine normalised variogram parameters

Attribute	Orientation	Nugget	Structure 1		Structure 1	
			Sill	Range	Sill	Range
Fe	10 → 323	0.02	0.81	115	0.17	415
	-76 → 010			13		140
	-10 → 235			9		120
P	00 → 130	0.17	0.73	100	-	-
	-60 → 220			256		-
	30 → 220			50		-
SiO_2	30 → 330	0.02	0.56	130	0.43	185
	-60 → 330			121		363
	00 → 240			133		363
Al_2O_3	-26 → 304	0.02	0.20	55	0.88	400
	14 → 027			95		260
	60 → 270			7		229
S	10 → 330	0.14	0.54	290	0.33	290
	-80 → 330			13		60
	00 → 240			206		234
LOI	00 → 325	0.02	0.35	55	0.63	970
	50 → 055			40		130
	40 → 235			50		95
DTR	00 → 320	0.01	0.24	55	0.75	430
	09 → 000			10		195
	00 → 230			120		305

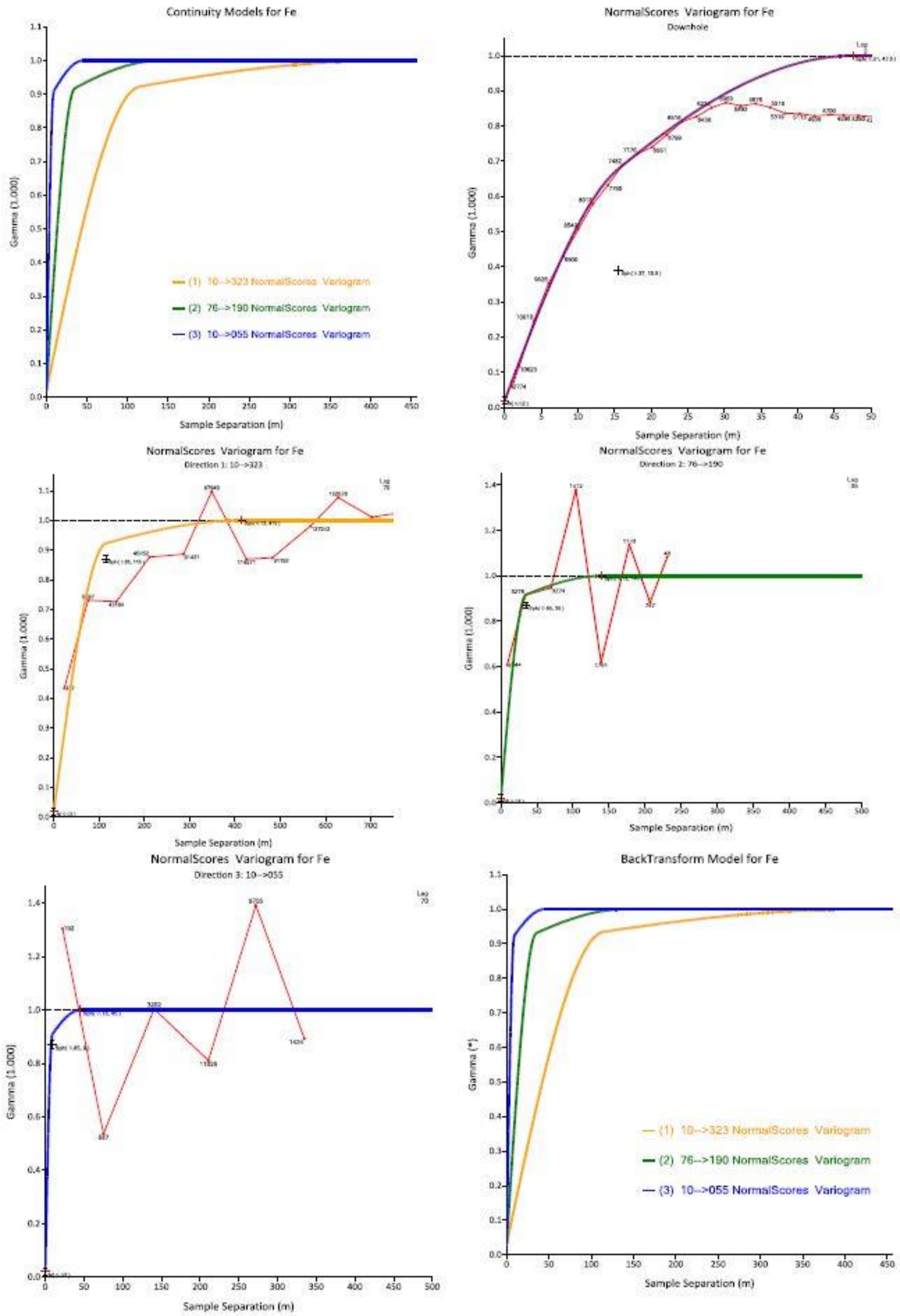

Figure 50. Moonshine variogram models

14.2.5.2 Moonshine North

The data within the individual mineralised wireframes wasn't enough to complete variography on therefore the variography was carried out on the combined mineralised lodes. Normal scores variograms were used for all the elements. Subsequently directional variograms were calculated and modelled using a nugget and one structure, except for iron, LOI and DTR which was modelled with two structures

All variography were poor for all attributes except for iron, aluminium and LOI. This is probably due to the lack of drilling data within the Moonshine North area.

All normal scores variogram models were back-transformed prior to estimation. The normalised parameters are provided in Table 27. Variogram models are illustrated in Figure 51.

Table 27. Moonshine North normalised parameters

Attribute	Orientation	Nugget	Structure 1		Structure 1	
			Sill	Range	Sill	Range
Fe	00 → 330	0.02	0.57	255	0.41	305
	80 → 240			40		290
	-10 → 240			30		175
P	70 → 050	0.01	0.39	125	0.60	385
	00 → 140			30		70
	-20 → 050			80		68
SiO_2	-68 → 277	0.03	0.97	350	-	-
	09 →343			206		-
	20 → 250			88		-
Al_2O_3	00 → 130	0.09	0.91	260	-	-
	80 → 220			20		-
	-10 → 220			448		-
S	00 → 330	0.09	0.91	210	-	-
	00 → 240			82		-
	90 → 000			19		-
LOI	00 → 310	0.09	0.91	280	-	-
	50 → 055			3		-
	40 → 235			67		-
DTR	00 → 320	0.03	0.36	225	0.61	360
	60 → 040			13		205
	30 → 220			8		45

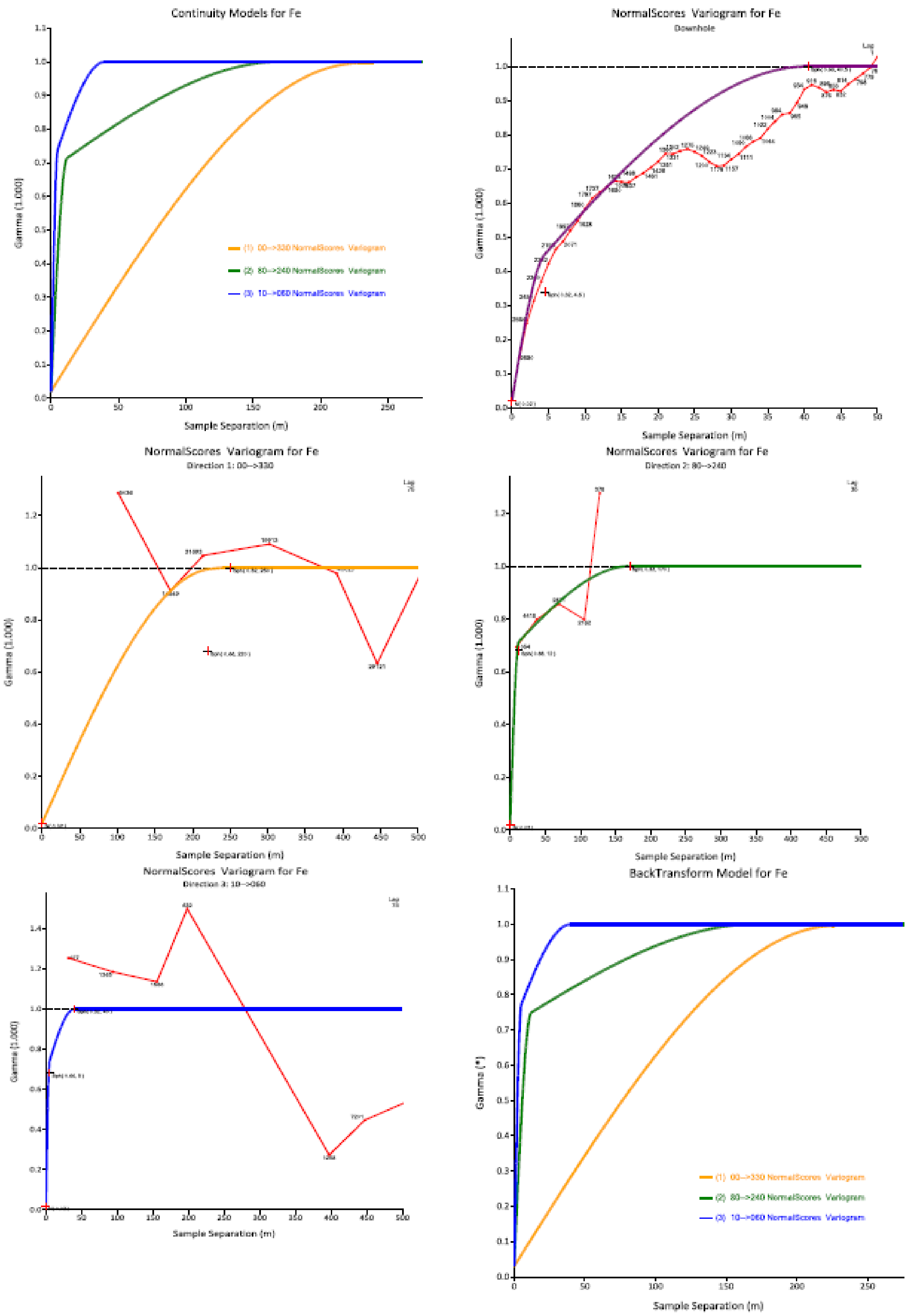

Figure 51. Moonshine North variogram models

14.2.6 Block Model

Grade interpolation was carried out using Ordinary Kriging (OK) with a cell discretisation of 3 x 3 x 3 was used for grade estimation. Table 17.7 summarizes the block model extents for the deposits.

Three passes were used to estimate within the mineralised wireframes which were used as hard boundaries. Sample selection for the OK grade estimate was completed using the search and sample parameters detailed in Table 17.8. The first search pass was set to the ranges of the first variogram structures and the KNA parameters. Subsequent runs were the search ellipsoid was modified and the minimum samples reduced to ensure that all the blocks with mineralised lodes were estimated. A run number was assigned to the run_fe attribute according to which run filled the block on the iron estimate.

After the third search pass, any un-estimated blocks, were assigned a default value of 0.01g/t for all attributes except for the DTR attribute where an average was calculated and applied to the un-estimated cells (Table 31).

Grades were calculated for each parent cell using the variogram parameters to apply appropriate weights to each sample assay according to the Ordinary Kriging algorithms.

Table 28. Block Model Parameters

Prospect	Type	Y	X	Z
Moonshine and Moonshine North	**Minimum Coordinates**	6,670,980	786,860	150
	Maximum Coordinates	6,677,055	791,160	560
	User Block Size (m)	25	25	10
	Min. Block Size (m)	3.125	3.125	1.25
	Rotation	0	0	0

Table 29. Ellipsoid search parameters

Prospect	Run Number	1	2	3
Moonshine and Moonshine North	Search Ellipsoid Multiplier	1x	1x	2x
	Minimum Samples	10	5	1
	Maximum Samples	40	40	40

Table 30. Moonshine and Moonshine North block model attributes

Attribute Name	Type	Decimals	Background	Description
fe_ok	Float	2	-99	Ordinary Kriging Fe %
p_ok	Float	3	-99	Ordinary Kriging P %
sio2_ok	Float	2	-99	Ordinary Kriging SiO_2 %
al2o3_ok	Float	2	-99	Ordinary Kriging Al_2O_3 %
s_ok	Float	2	-99	Ordinary Kriging S %
loi_ok	Float	2	-99	Ordinary Kriging LOI %
dtr_ok	Float	2	-99	Ordinary Kriging DTR%
density	Calculated	-	-	Density Value
class	Integer	-	0	Classification Code; 0= unclassified; 1= Measured; 2=Indicated; 3=Inferred
prospect	Character	-	waste	Prospect
weather	Integer	-	3	Weathering Code; 1=Oxide; Transitional; 3=Fresh
lode	Integer	-	0	Wireframe Number
run_fe	Integer	-	0	Iron Run Number

Table 31. DTR values applied to the un-estimated cells

Prospect	Weathering Domain	DTR%
Moonshine	Transitional	24.32
	Fresh	34.99
Moonshine North	Transitional	32.25
	Fresh	31.64

14.2.7 Bulk Density

Bulk density values assigned to the model were provided by Macarthur. These values were derived from samples collected from various outcropping mineralisation grab samples and diamond core (LGDD_004) samples by the coated wax method.

The Moonshine and Moonshine North Fe results was plotted against the density result and a regression line was plotted (Figure 52). The regression formula was then calculated to determine the density from the Fe grade.

The formula used for the density determination was:

$$Y = 0.0287X + 2.7008$$

Where:

Y = density

X = Fe grade

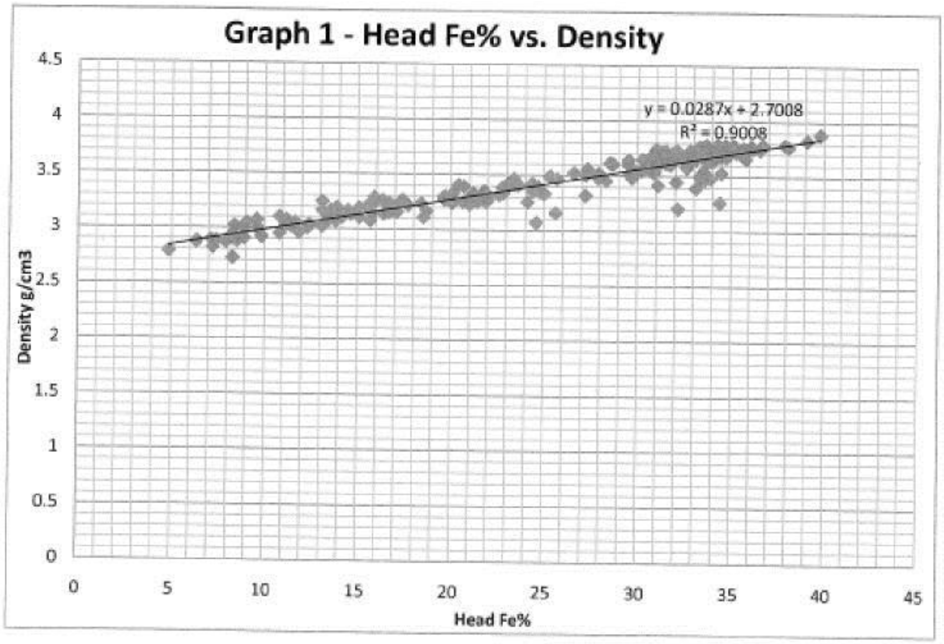

Figure 52. Relationship between Fe % and density (Drabble 2010)

14.2.8 Model Validation

Model validation was carried out graphically and statistically to ensure that the block model grade accurately represented the drill hole data. Cross sections were examined to ensure that the model grades honour the local composite drill hole grades. A comparison of OK model and drill hole composite grade was completed within the mineralised envelopes. A number of methods were employed to validate the block model these included:

- Visual comparison with drill hole
- Global mean comparison
- Comparison of IDS, kriged models and composite populations

14.2.8.1 Global comparisons

The final estimates were validated visually and statistically against the raw composites. Table 32 provides a global comparison of the estimate grade to the input grades.

This statistical comparison show that estimate validates well globally against the raw input data. The P and Al_2O_3 have a significant difference but are due to the low levels of the attribute. The application of an average value to any unestimated DTR cells has resulted in a difference between the global raw values and the global block model value. Table 32 summarises the comparison between the mean composite grades and the block model grades.

Table 32. Comparison of the mean composite grade with the block model grade

Prospect	Type	Fe (%)	SiO_2 (%)	P (%)	Al_2O_3 (%)	S (%)	DTR (%)	LOI (%)
Moonshine	Raw Data	31.45	46.42	0.05	1.22	0.62	28.44	0.02
	Block Model	30.47	46.46	0.04	1.12	0.58	32.50	0.02
	Difference	3.12	-0.09	20.00	8.20	6.45	-14.28	0.00
Moonshine North	Raw Data	31.64	34.44	0.05	0.87	0.22	31.08	1.15
	Block Model	30.74	34.22	0.04	0.69	0.21	28.15	1.10
	Difference	2.84	0.64	20.00	20.69	4.55	9.43	4.35

14.2.8.2 Visual Validation

Cross sections were used to validate on-screen drill intercepts. The block grade estimates were checked for similarity to their nearest drill sample intervals. This task was simplified by colour coding blocks and drill assay data with the same colour legend.

An example section for each prospect is illustrated in Figure 53 and Figure 54.

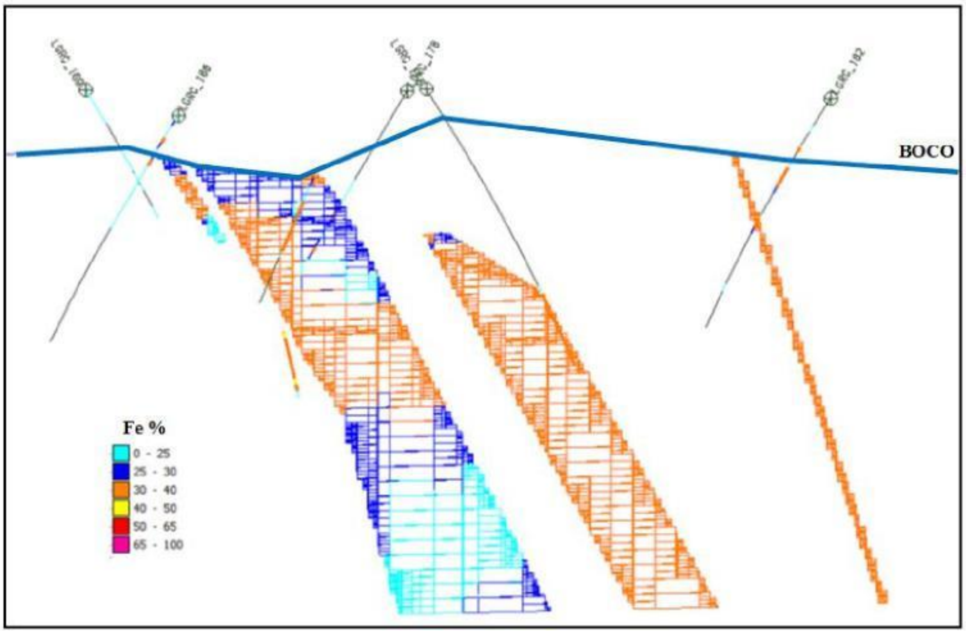

Figure 53. Moonshine North visual comparison - oblique section ± 100m

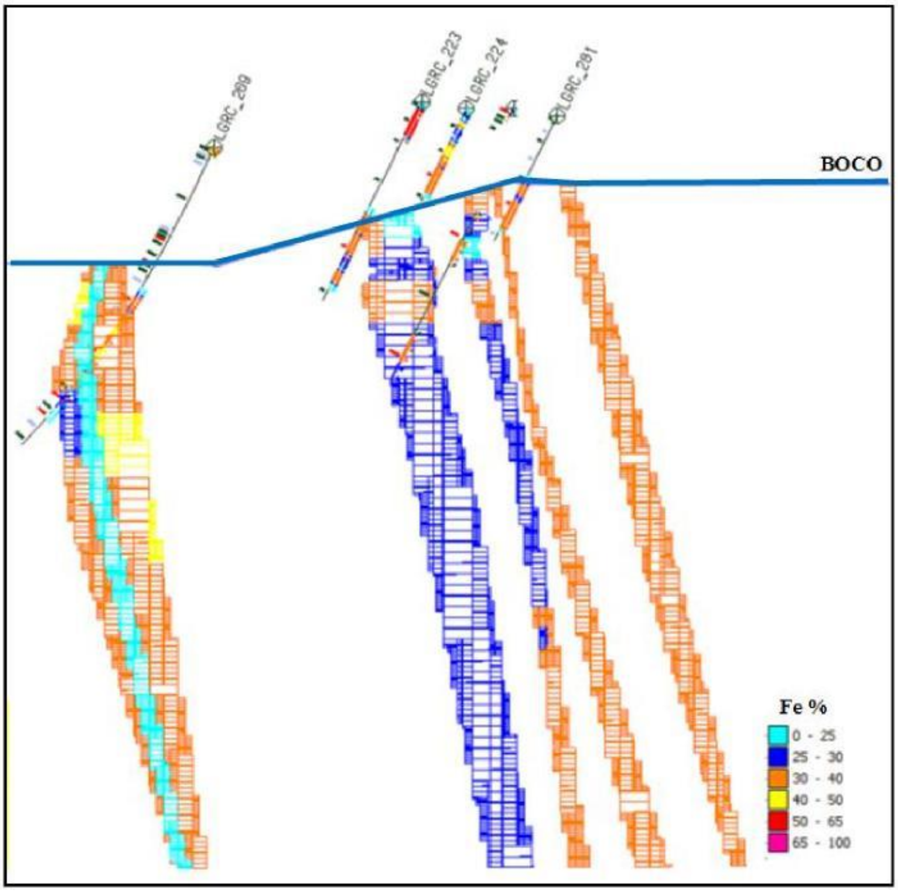

Figure 54. Moonshine North visual comparison - oblique section ± 100m

14.2.8.3 Grade Trend Plots

Sectional validation graphs were created to assess the reproduction of local means and to validate the grade trends in the model. These graphs compare the mean of the estimated grades to the mean of the input composite grades within model slices for the portion of the deposit estimated.

These graphs indicate that there is good local reproduction of the input grades in both the horizontal and vertical directions. The trend plots for Fe are illustrated in Figure 55 andFigure 56 for Moonshine, and Moonshine North respectively.

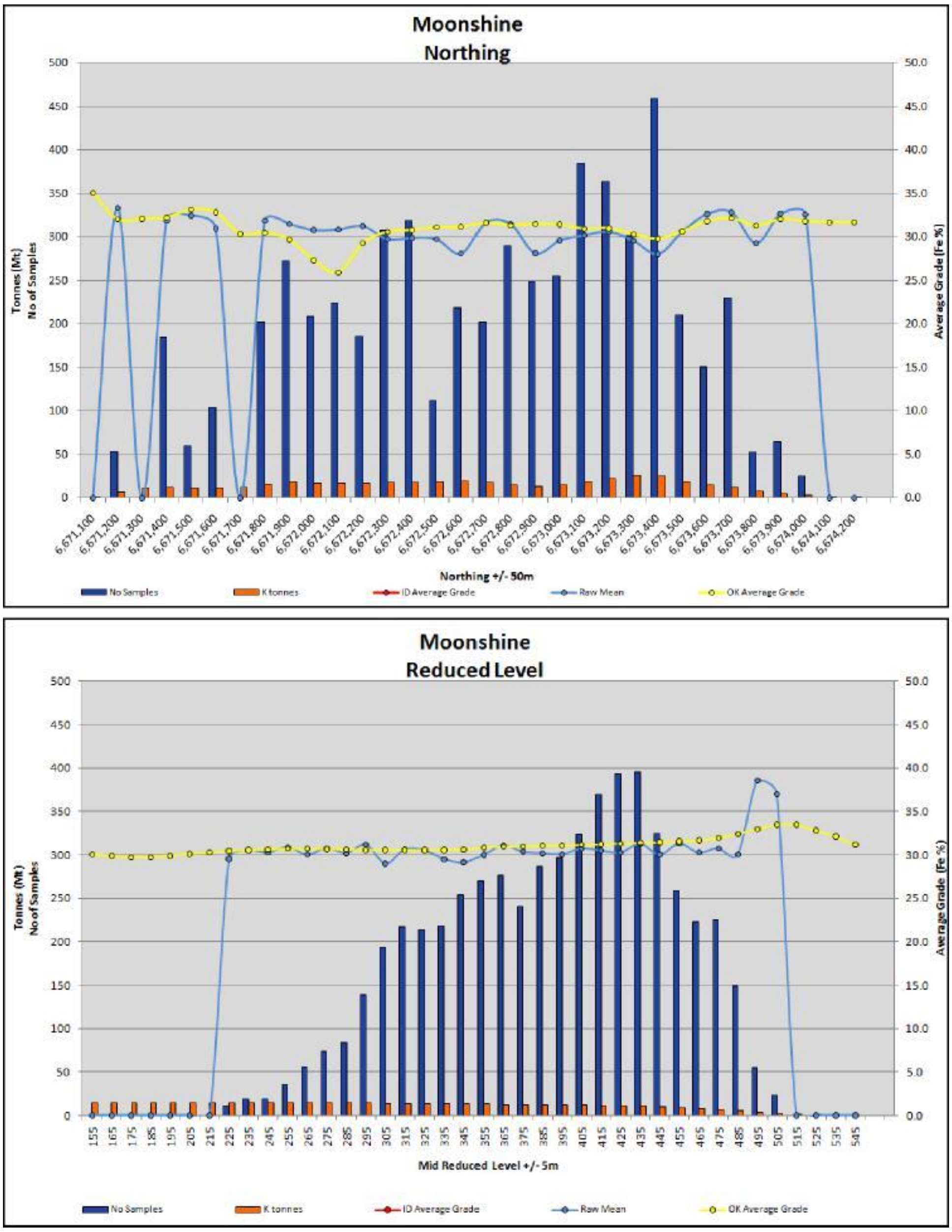

Figure 55. Moonshine trend plots for iron

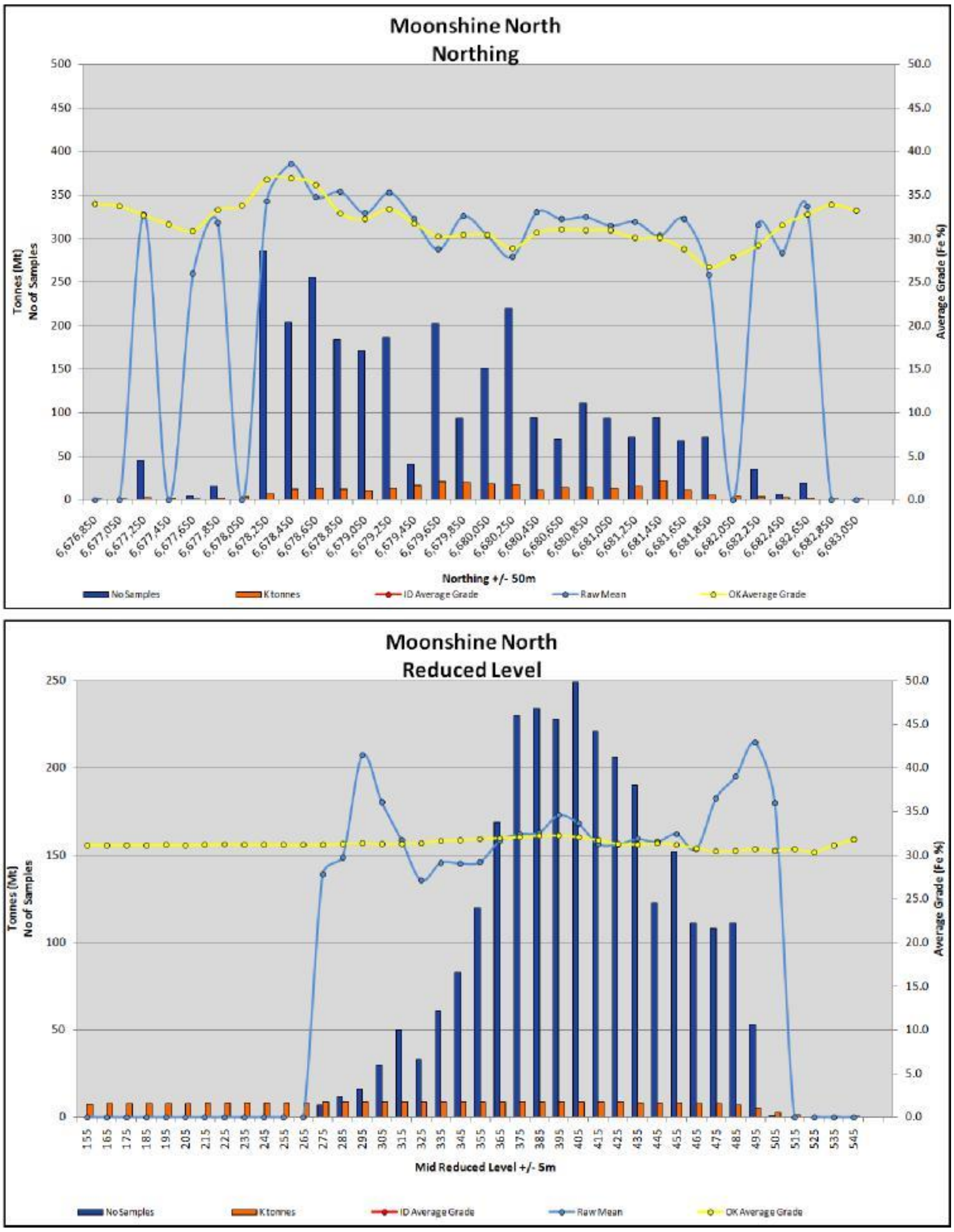

Figure 56. Moonshine North trend plots for iron

14.2.9 Resource classification

The Moonshine and Moonshine North resource estimate has been classified as an Inferred Resources in accordance with CIM 2014 guidelines.

Resource classification has been based upon a number of criteria, including the geological confidence, the integrity of the data, the spatial continuity of the mineralisation as demonstrated by variography, and the quality of the estimation.

14.2.10 Mineral resource report

The Moonshine and Moonshine North block model has been reported above a 30% Fe cut-off and shown in Table 33. Grade tonnage curves for Moonshine and Moonshine North are illustrated in Figure 57 and Figure 58, respectively.

The Moonshine Magnetite deposit has been drill tested using conventional drilling techniques, with appropriate QA/QC protocols implemented to monitor the precision and accuracy of the drill sample collections and sample analyses. Extensive geological surface mapping has been carried out to define the strike, dip and true width of the outcropping BIF units, which were used to control the geological interpretation supporting the Mineral Resource estimate. The collection of bulk density data has been carried out with results sufficient in quality and quantity to support the Mineral Resource estimate. The Qualified Person is satisfied that the Mineral Resource is prepared, estimated, classified and reported in accordance with the 2014 CIM definition standards.

The entire Mineral Resource estimate has reasonable prospects for eventual economic extraction, and is a realistic inventory of mineralisation which, under assumed and justifiable technical and economic conditions, might, in whole or in part, become economically extractable.

The Mineral Resource is reported for resource model blocks lying within granted tenure.

The Project is located within 240 km by road of the city of Kalgoorlie-Boulder which has a readily available workforce. An existing mining project is located 45 km to the south of the Lake Giles Project and has existing infrastructure which the Qualified Person assumes can be readily expanded to allow cost-effective mining, haulage and processing of the Project's iron mineralisation. The magnetite mineralisation can be processed by typical crushing, grinding and magnetite separation techniques as described in Section 17.3.

The reporting cut-off grade of 30% Fe realistically reflects the location of the Project, the scale of the deposit and its continuity. The mining methods employed are typical of similar iron ore operations within the region and magnetite operations in Western Australia. The metallurgical processes to be employed are well understood in the iron ore industry and involve crushing and grinding of ore to achieve a size specification to blend with higher grade magnetite concentrate. Iron recovery presented in Section 17.3 demonstrates reasonable prospects of upgrading the mineralisation to a product of saleable grade. The Qualified Person is satisfied the operating costs and reasonable long term metal prices are appropriate for the deposit and the Mineral Resource therefore has reasonable prospects for eventual economic extraction.

The Mineral Resource is not believed to be materially affected by any known environmental, permitting, legal, title, taxation, socio-economic, marketing, political or other relevant factors.

Table 33. Moonshine and Moonshine North block model grades

Prospect	Tonnes (MT)	Fe (%)	SiO_2 (%)	P (%)	Al_2O_3 (%)	S (%)	DTR (%)	LOI (%)
Moonshine	427.1	29.3	42.1	0.05	1.1	0.5	31.3	0.02
Moonshine North	283.4	31.4	22.7	0.04	0.7	0.2	31.6	0.89
Total	710.5	30.2	34.4	0.05	0.9	0.4	31.4	0.36

Note: Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability. The outcomes of the economic assessment presented herein is preliminary in nature and includes inferred mineral resources that are considered too speculative geologically to have the economic considerations applied to them that would enable them to be categorized as mineral reserves, and there is no certainty that the preliminary economic assessment will be realised.

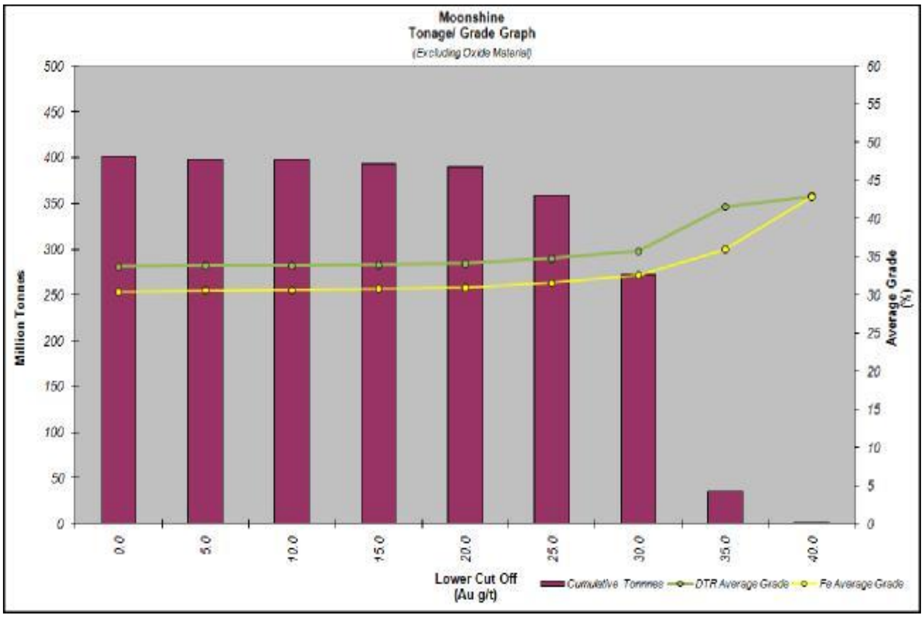

Figure 57. Moonshine grade tonnage curve

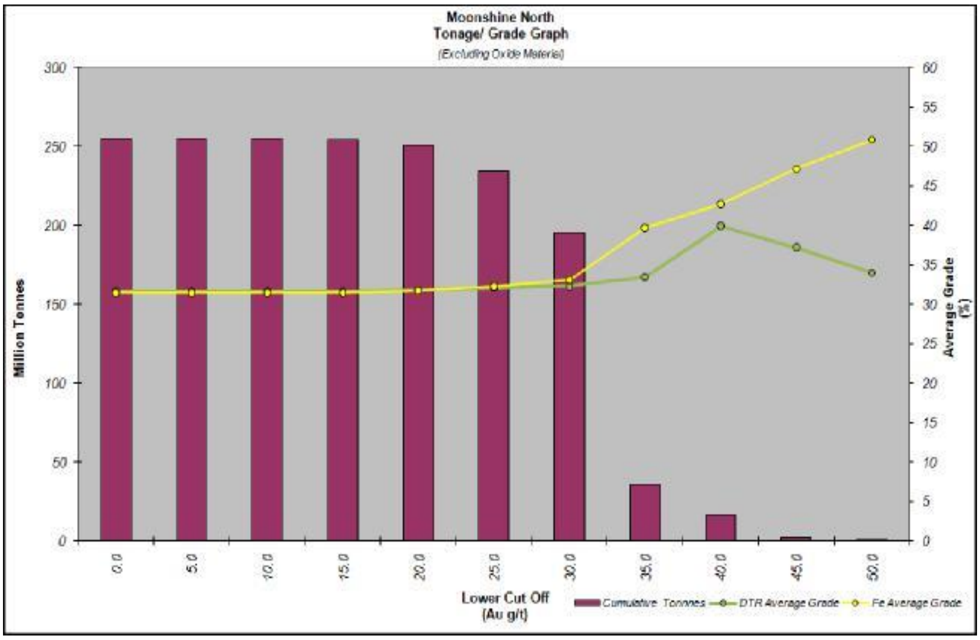

Figure 58. Moonshine North grade tonnage curve

14.2.11 Reasonable Prospects for Eventual Extraction

Reasonable prospects for eventual economic extraction are based on the reporting cut-off grade of 30% Fe that realistically reflects the scale of the deposit and its continuity. It was assumed the deposit will be mined utilising conventional open pit mining methods at a rate of 6.5 mtpa of ore. An assumed strip ratio of 3:1 was employed based on cross section sections giving total annual ore and waste movement of approximately 26 mt. Magnetite processing and iron recovery is based on the preliminary designs outlined in Section 17. Ore would be delivered to the processing plant with an average head grade of 30% Fe. The assumed mass recovery from the plant was 38% based on metallurgical test work presented in Section 17.

Mining and haulage costs are based on contractor rates for an average life of mine operational cost of $53.47/t of magnetite concentrate. The operating costs assume access to the existing open access rail network and Government owned Port of Esperance.

A long-term iron ore price of $86/t of magnetite concentrate has been used in the economic assessment which is considered conservative in comparison to current market prices.

The technical and economic assumptions used in the study are shown in Table 34.

The Qualified Person is satisfied the operating costs and reasonable long-term metal prices are appropriate for the deposit and the Mineral Resource therefore has reasonable prospects for eventual economic extraction.

The Mineral Resource is not believed to be materially affected by any known environmental, permitting, legal, title, taxation, socio-economic, marketing, political or other relevant factors.

Table 34. Economic and technical assumptions for magnetite ore extraction

Description	Units	Total
Ore head grade	%	30% Fe
Magnetite concentrate grade	%	68% Fe
Final blended concentrate iron grade[1]	%	65% Fe
Weight recovery	%	38.0%
Strip ratio	w:o	3:1
Ore mining tonnage	Mtpa	6.5
Waste mining tonnage	Mtpa	19.5
Total mining tonnage	Mtpa	26.0
Annual Concentrate Production	Mtpa	2.5
Operating costs per tonne concentrate	$/t	53.47
Long-term iron ore price	$/t	86.0

[1]The concentrate iron grade is the final grade of the blended magnetite and hematite concentrate blended at a ratio of 3:1 magnetite to hematite

[2]The long-term sales price is for a blended magnetite-hematite concentrate grading 65% Fe.

14.3 Hematite Mineral Resource Estimate

Four Mineral Resources were separately estimated for the Ularring Hematite Project, each representing different deposits. The four deposits are:

- Snark and Drabble Downs
- Central
- Banjo and Lost World (referred to herein as Banjo), and
- Moonshine

Snark, Drabble Downs, Central and Banjo have been re-modelled and estimated based upon the inclusion of additional drill hole data since the previously filed Technical Report (March 9, 2012). No additional drilling has occurred at Moonshine and therefore it's Mineral Resource has not been updated, but is re-reported and discussed here.

Estimation methodologies are similar for all except Moonshine, and are discussed in the following sections.

Mineral Resources have been reported in accordance with CIM Definitions for Standards of Mineral Resources and Reserves (CIM 2014). The QP has undertaken a review of sample assays, drilling data, data validation, QA/QC, estimation parameters, material density, block model parameters and classification procedures. The following information summarises the steps and procedures taken and data reviewed by the QP to ensure Mineral Resource estimates are reported in accordance with CIM 2014.

Geological outlines representing the BIF strata for Snark, Drabble Downs, Central and Banjo were modelled using drill hole geological logging. Surface mapping was used to guide the interpretation for strike, dip and local structural complexities such as fold hinges. For Moonshine, mineralised domains were interpreted to follow the strike of surface mapping. Mineralisation sometimes demonstrated continuity by drill results, where surface mapping indicated no outcrop.

Sample assays were compared against lithological logs and were consistent with the geological intervals. For example, Fe grades of >50% are associated with hematite / goethite mineralisation and sometimes BIF; but never with ultramafics.

The database supporting the hematite Mineral Resource estimate included in this study includes all information collected up until 31st August 2011 (Moonshine), and 9th May 2012 (Snark, Drabble Downs, Central, Banjo and Lost World). As of this date there were 1,626 drill holes (1,588 RC, 38 DDH) loaded in the database for 92,259m. Of this total, 85,557 samples from 1,588 holes were assayed, and verified for use in the Mineral Resource estimate.

The drill holes were loaded into Datamine and drill hole traces were visually checked to ensure they did not exhibit kinking (resultant from erroneous down hole surveys), were dipping downwards, and the collars were in the expected locations and not offset from the targeted mineralisation without good reason.

Sampling methodology and QA/QC procedures are discussed in detail in Section 11.3. The QP is satisfied that the adequacy of sample preparation, sample security and analytical procedures support the Mineral Resource classification, and are of industry standard.

Classification of the Mineral Resource was done by digitising a perimeter in long section, for each BIF domain, where the intended Indicated resource is inside the perimeter. The geometry of the perimeter was defined by drill hole density, where the holes pierced the domain. Blocks located outside the perimeter string, either along strike within the domain or down dip, were classified as Inferred. The parent block sizes are based upon approximately half the typical drill spacing. Sub blocks were used to ensure the block model honoured the mineralisation zone geometries and the geological contacts.

Review of the above data was made with regard to the CIM 2014 Definition Standards for reporting Mineral Resources and Reserves. The QP is satisfied the resource estimates have been prepared in accordance with CIM 2014.

14.3.1 Software

The Mineral Resource estimate for the Ularring Hematite Project was completed using Datamine Studio v3.20.6420 and Micromine. Geostatistical analyses were conducted using the 'Supervisor' (Snowden Industries) and 'GeoAccess Professional' (Widenbar and Associates) packages.

14.3.2 Drill Hole Database Loading

Nine tables were exported from the drill hole database in csv format. These tables included collars, assays, surveys, lithology and density. These tables were loaded into Datamine to generate a de-surveyed drill hole file named 'assay.d', using Datamine's 'HOLES3D' command.

The drill hole data were separated into individual files for each deposit, using a perimeter string to constrain the drill hole collars. The drill hole files by deposit are:

- Snark and Drabble Downs *sn_assay.d*
- Central *cen_assay.d*
- Banjo and Lost World *bj_assay.d*
- Moonshine *dsoass2.d*

The drill holes were validated to check for overlapping intervals and collars not located on the topographic DTM. The drill holes were visually checked for erroneous down hole surveys, such as kinks in the down hole traces, in Datamine.

14.3.3 Geological Interpretation

14.3.3.1 Snark, Drabble Downs, Central, Banjo

Geological outlines representing the BIF strata were modelled using drill hole geological logging. Surface fact mapping was used to guide the interpretation for strike, dip and local structural complexities such as fold hinges. Internal mineralisation envelopes were not modelled, in contrast to previous Mineral Resource estimates (Technical Report filed March 9, 2012). The current geological interpretations therefore provide a significantly increased volume within which the Mineral Resources can be reported.

The main changes to the Mineral Resources compared to the previously reported resources are:

- Mineral Resource outlines based upon BIF strata; previously based upon a 50% Fe envelope
- Previous models limited the Mineral Resource to a depth of 55m below surface. The current resource interprets the BIF to extend to over 120m below surface.

An example of the change in geological and mineralisation interpretation is provided in Figure 59. Note that drill holes LGRC1117 and LGRC1120 were not available for use in the March 2012 Mineral Resource.

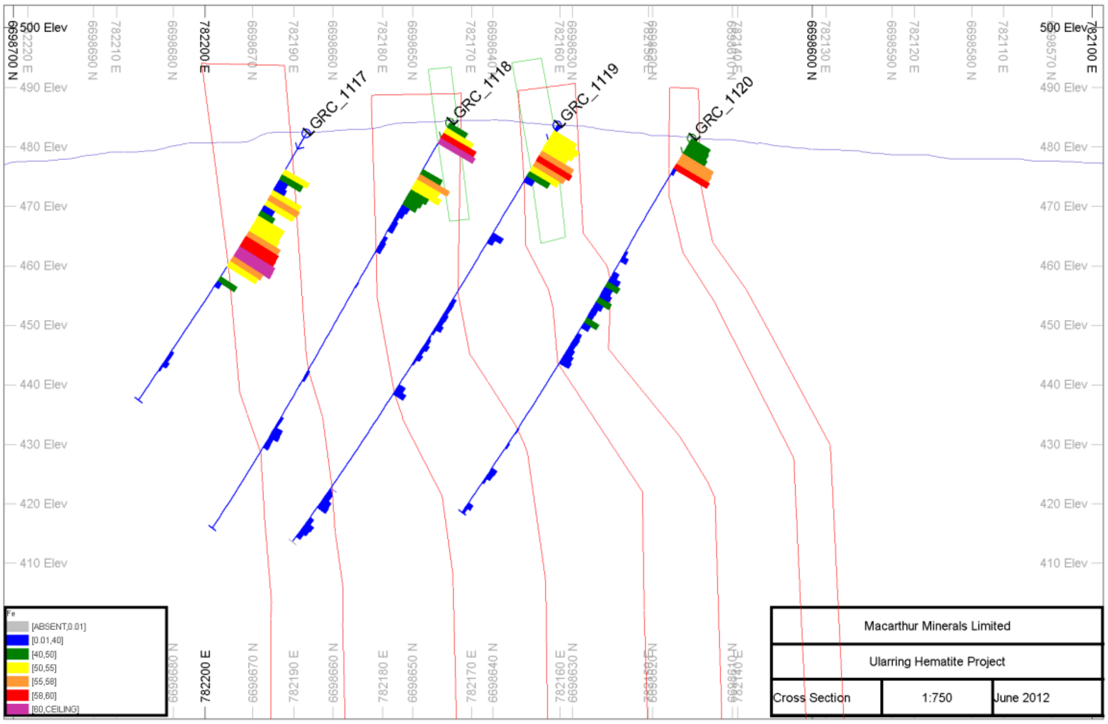

Figure 59. Comparison between previous and current geological interpretation, Snark. 50% Fe envelopes (green), BIF envelopes (red), drill holes coloured by Fe%, topography (blue).

14.3.3.2 Moonshine

Mineralised domains were interpreted to follow the strike of surface mapping. Mineralisation sometimes demonstrated continuity by drill results, where surface mapping indicated no outcrop.

Mineralisation envelopes were modelled based upon a higher Fe grade cut-off of 50%. This was the mineralisation cut-off grade used in previous Mineral Resource estimates for the Ularring Hematite Project. The Fe (%) assay grades were displayed against the drill hole trace with the primary lithological code, to ensure that only lithologies associated with iron mineralisation (BIF or hematite/goethite) were captured inside the envelopes. This eventuated to be always the case.

A general rule followed was to allow up to 2 consecutive metres of less than 50% Fe from any drill hole inside a mineralisation envelope. This rule was relaxed to allow for mineralisation marginally below the cut-off grade, especially if needed to maintain strike or depth continuity. An interpretation for any domain required strike continuity along at least two drill sections. Where a polygon was digitised around a drill hole exhibiting Fe mineralisation and no strike continuity was observed, either by closure by drilling, or open due to no drilling, then that hole and associated domain were not included in the final Mineral Resource estimate.

Dip and dip direction of the mineralisation envelopes were determined by surface structural readings near the drill hole collars.

14.3.3.3 Topography

14.3.3.4 Snark, Drabble Downs, Central, Banjo

A LIDAR topographic survey was flown in June 2011. The data was re-sampled from 1m to 2m and exported as a wireframe surface in dxf format. Banjo was re-sampled to 5m contours due to restrictions on file size for Datamine. The choice of a coarser contour interval has not resulted in any noticeable difference to resource volumes at the 'outcropping' surface of the BIF strata.

The dxf file was imported into Datamine and saved as a wireframe surface. The surface was validated against several drill collars, representing different geographical locations of the resource, to ensure matching elevation levels between drill hole survey and topographic survey. The topographic DTM covers an area significantly larger than the mineralisation footprint.

Separate surfaces were used to control the Mineral Resource estimates for each of the deposits.

14.3.3.5 Moonshine

A wireframe surfaces was created from the drill hole collars, in the absence of any measured survey data available at the time of modelling. The wireframe surfaces were expanded to cover the entire block model area. The LIDAR topographic survey was flown in June 2011, post-dating the reporting of the Moonshine Mineral Resource. The resource model was not updated with the new topography.

14.3.4 Wireframes

Wireframe solids encapsulating the BIF strata were constructed in Micromine for each of the deposits excluding Moonshine. The wireframes were imported into Datamine where they were given unique file names, and verified to check for crossing facets and open triangles. A total of 75 wireframes for Snark and Drabble Downs, 59 for Central and 21 for Banjo were imported.

One solid wireframe was created for Moonshine using Datamine.

14.3.5 Sample Domaining

Drill hole samples within the Datamine drill hole files were flagged with unique codes according to the geological or mineralisation wireframe solid within which they were located.

14.3.6 Sample Compositing

14.3.6.1 Sample Length Analyses

An analysis of all RC sample lengths, from samples contained within geological and mineralisation domains, indicates that all lengths are 1.0m. Diamond core lengths were not assessed because they were not assayed, and therefore not used for grade estimation.

14.3.6.2 Sample Compositing

Drill hole samples were composited to 1.0m lengths, based upon the sampling interval described in Section 14.3.6.1.

14.3.7 Statistical Analyses

14.3.7.1 Summary Statistics – Sample Assays

A statistical summary of key assay results for all mineralisation domains combined, by deposit, is presented in Table 35. Histograms for Fe, P, SiO_2, Al_2O_3, LOI and S (%) are presented in Figure 60 to Figure 64. The statistics and graphs demonstrate the polymodal nature of the mineralisation (particularly the Fe and SiO_2 graphs), representative of a rock type containing BIF and mineralised hematite and goethite.

Table 35. Summary Statistics, all mineralisation domains

	FE (%)	P (%)	SIO_2 (%)	AL_2O_3 (%)	LOI (%)	S (%)
Snark						
Samples	16672	16672	16672	16672	16670	16672
Minimum	1.4	0.001	0.8	0.1	-1.5	0.00
Maximum	66.4	1.000	82.0	35.8	25.5	6.73
Mean	42.3	0.062	25.9	5.5	6.8	0.12
Standard deviation	11.5	0.034	16.2	5.8	3.2	0.23
CV	0.3	0.551	0.6	1.1	0.5	1.88
Variance	131.9	0.001	263.4	33.9	10.0	0.05
Drabble Downs						
Samples	3051	3051	3051	3051	3051	3051
Minimum	2.2	0.004	0.9	0.2	1.0	0.00
Maximum	64.6	0.231	85.9	32.4	22.8	4.28
Mean	42.8	0.052	23.9	6.1	7.5	0.20
Standard deviation	12.0	0.028	16.6	5.6	3.1	0.33
CV	0.3	0.548	0.7	0.9	0.4	1.69
Variance	144.7	0.001	274.4	31.8	9.3	0.11
Central						
Samples	12613	12613	12613	12613	12612	12613

	FE (%)	P (%)	SIO_2 (%)	AL_2O_3 (%)	LOI (%)	S (%)
Minimum	1.1	0.001	0.7	0.0	-2.2	0.00
Maximum	66.4	0.688	85.5	36.2	23.4	6.35
Mean	43.8	0.048	22.8	6.0	7.2	0.10
Standard deviation	11.7	0.032	15.7	5.6	3.0	0.20
CV	0.3	0.660	0.7	0.9	0.4	1.93
Variance	136.8	0.001	247.3	31.2	8.9	0.04
Banjo						
Samples	4715	4715	4715	4715	4715	4715
Minimum	6.5	0.003	1.1	0.1	0.6	0.00
Maximum	64.2	0.245	83.4	33.9	26.8	6.65
Mean	41.3	0.057	28.4	5.4	6.1	0.11
Standard deviation	12.0	0.029	18.2	5.9	3.1	0.25
CV	0.3	0.507	0.6	1.1	0.5	2.30
Variance	144.0	0.001	331.2	35.4	9.9	0.06
Moonshine						
Samples	119	119	119	119	119	115
Minimum	39.4	0.021	1.5	0.11	0.44	0.01
Maximum	63	0.151	37.1	12.7	10.7	1.26
Mean	53.02	0.06	12.3	4.19	5.96	0.16
Standard deviation	5.29	0.02	6.9	2.7	2.29	0.27
CV	0.1	0.4	0.6	0.64	0.39	1.65
Variance	28.03	0	47.1	7.27	5.26	0.07

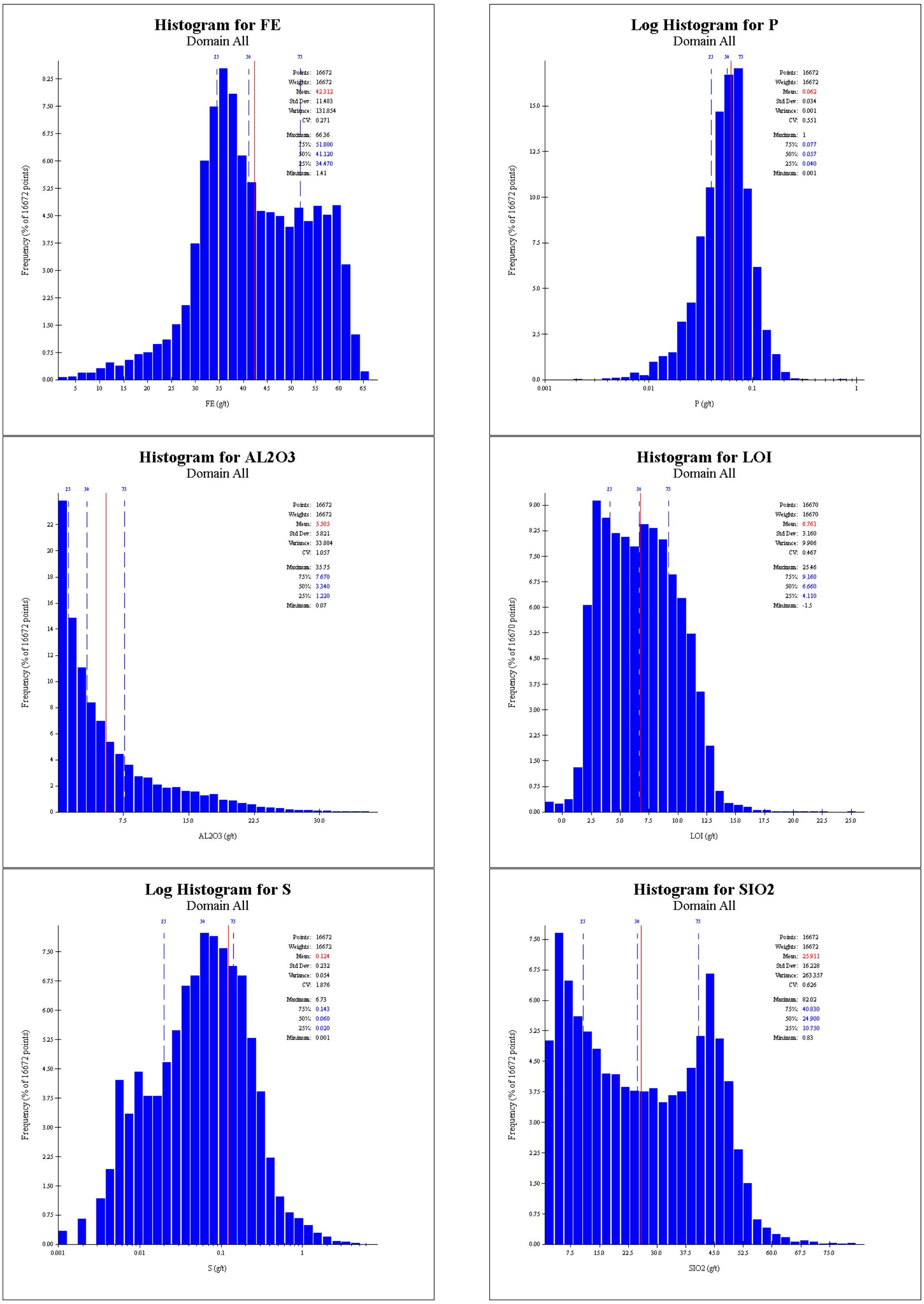

Figure 60. Population histograms, Snark, all domains.

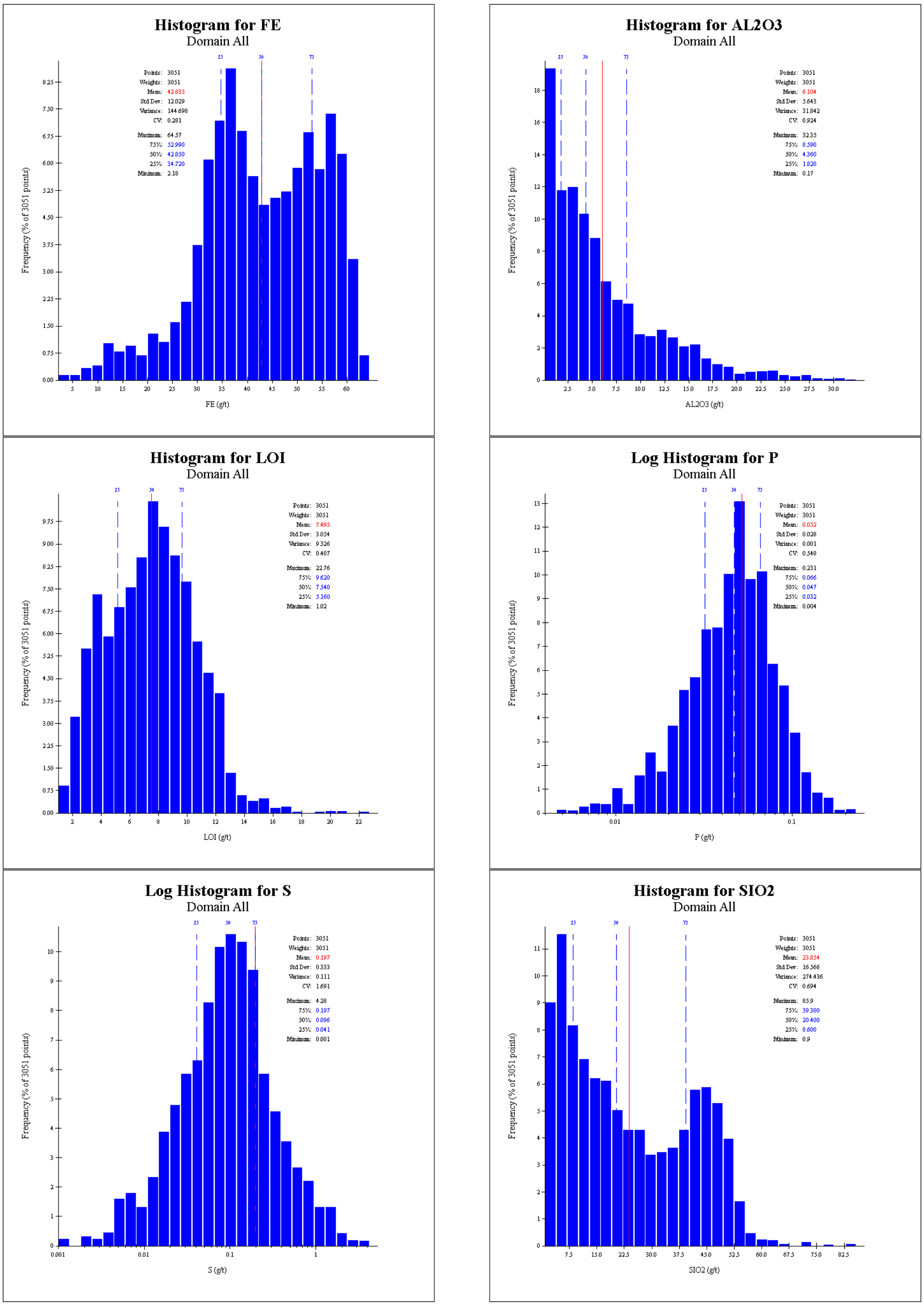

Figure 61. Population histograms, Drabble Downs, all domains

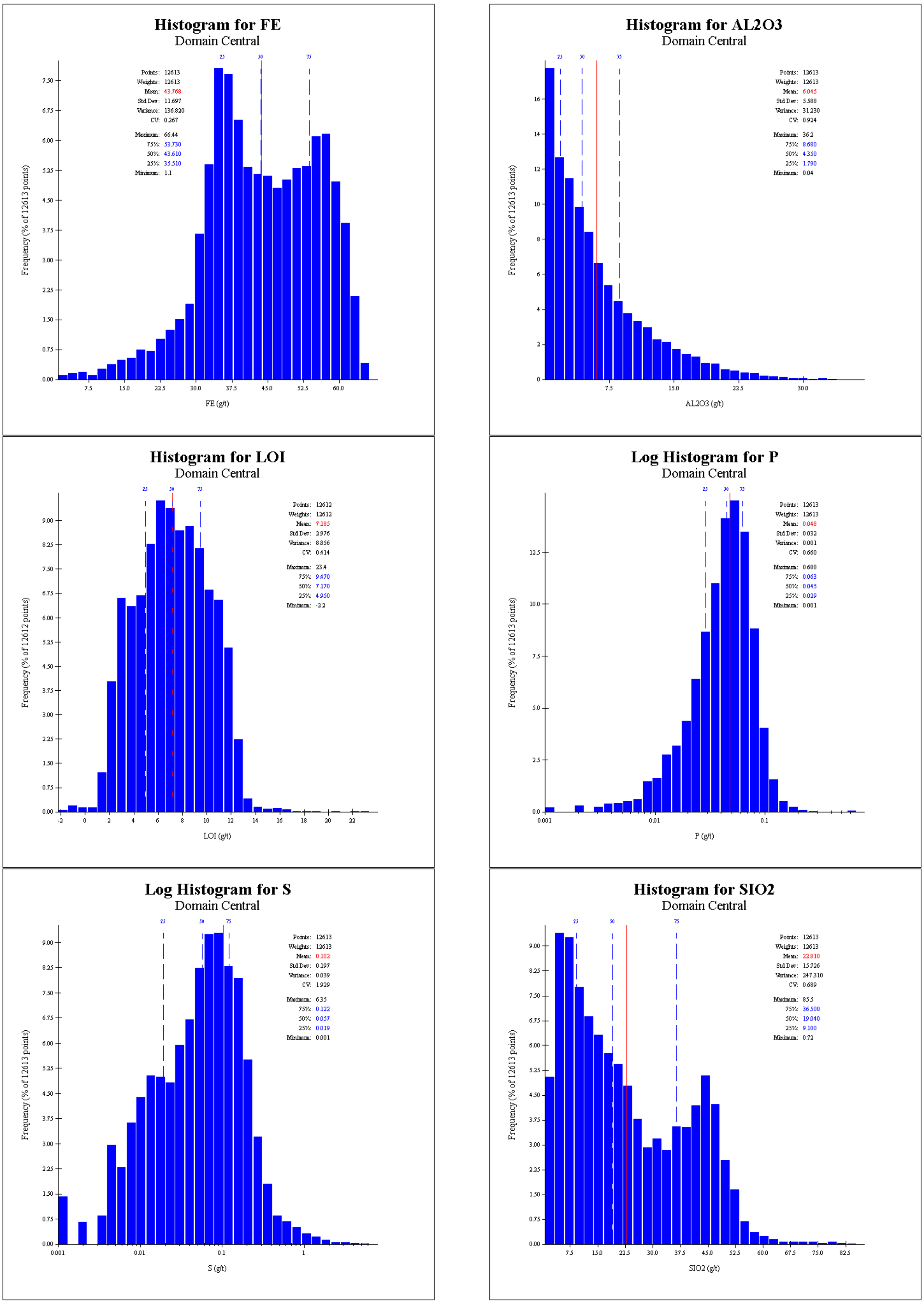

Figure 62. Population histograms, Central, all domains

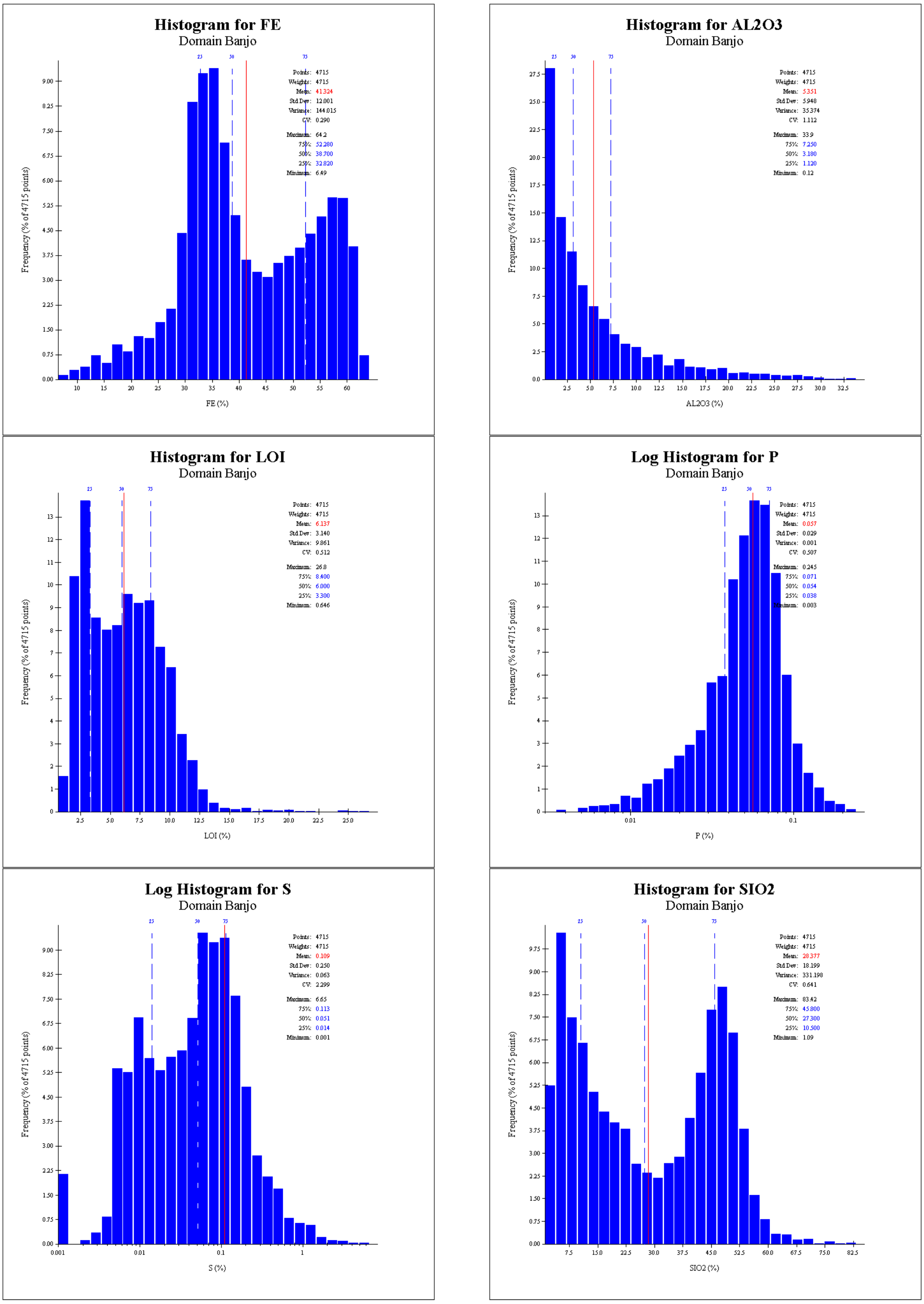

Figure 63. Population histograms, Banjo, all domains

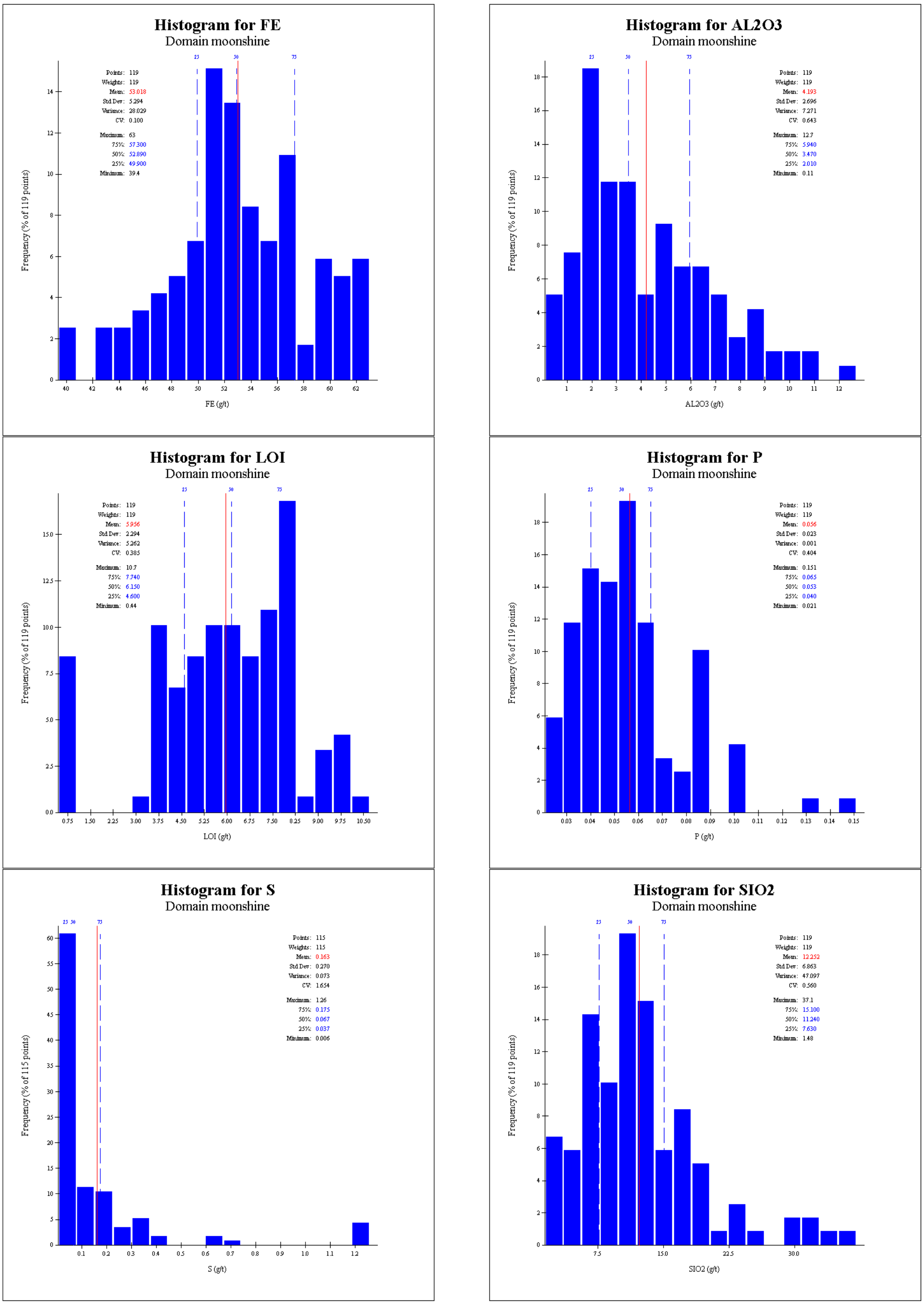

Figure 64. Population histograms, Moonshine, all domains

14.3.7.2 Mass Balance

An analysis of mass data is required to ensure the assayed grade values (%) sum 100%, within a tolerance of ±1.5%. This has been achieved with a few outliers noted. An example is provided in Figure 65, for Snark and Drabble Downs. The Qualified Person is satisfied that the assay data is of suitable quality, with regard to Mass Balance, to be included in the Mineral Resource estimate.

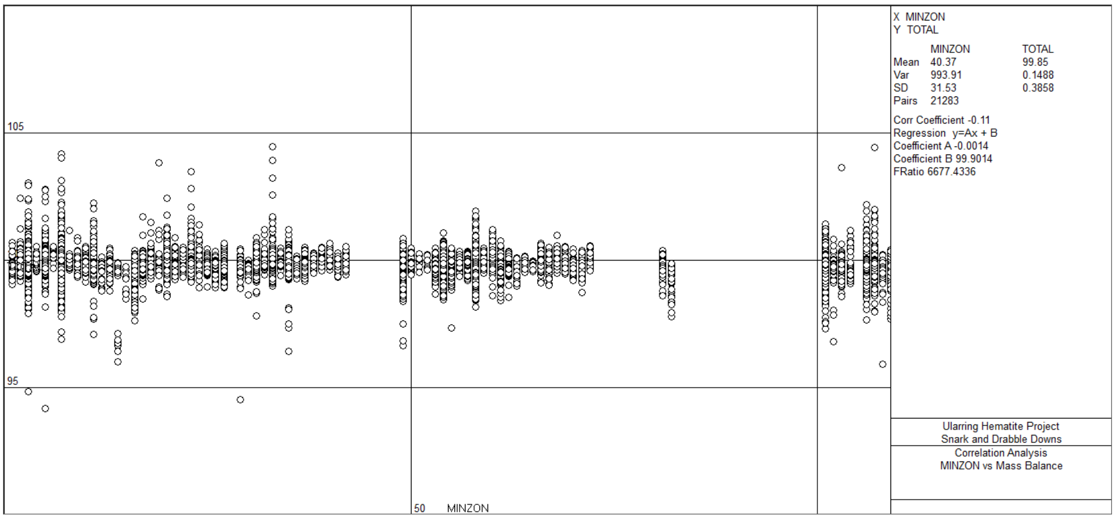

Figure 65. Mass Balance by domain (MINZON), Snark and Drabble Downs

14.3.7.3

Density measurements were conducted on billets of diamond core, and via geophysical down hole density probing. Physical measurement of core billets was restricted to a total of 19 samples from 11 diamond drill holes, for Snark only. These returned an average density value 3.05 t/m^3.

MMS tested 752 holes with a geophysical probe, using the independent survey company GeoVista, measuring sub-surface in situ rock density and hole diameter. A summary of the holes probed is presented in Table 36.

Table 36. Density Probe Drill Hole Statistics

Deposit	Hope Type	Number Probed	Number of Holes Assayed
Snark and Drabble Downs	Diamond	19	0
	RC	202	792
Central	Diamond	7	0
	RC	524	627
Banjo	Diamond	0	0
	RC	0	150

The down hole intervals were either 0.01m and 0.1m, dependent upon the operator at the time of the survey. The raw data was composited by CSA Global to 0.1m intervals prior to further assessment. The holes were flagged according to the mineralisation domain within which the samples were located and composited again to 1.0m intervals. The resultant drill hole data file, containing density, calliper and assay data was output to csv format and statistically analysed.

The geophysical density data were plotted against the calliper, or hole diameter readings. Two calliper populations are clear, representing HQ diamond drill holes and RC drill holes. An example from Snark is presented in Figure 66. A similar observation was made from Central data. Calliper readings above 160mm are due to naturally occurring cavities down the hole. The calliper data were filtered to less than or equal to 160mm for subsequent analyses.

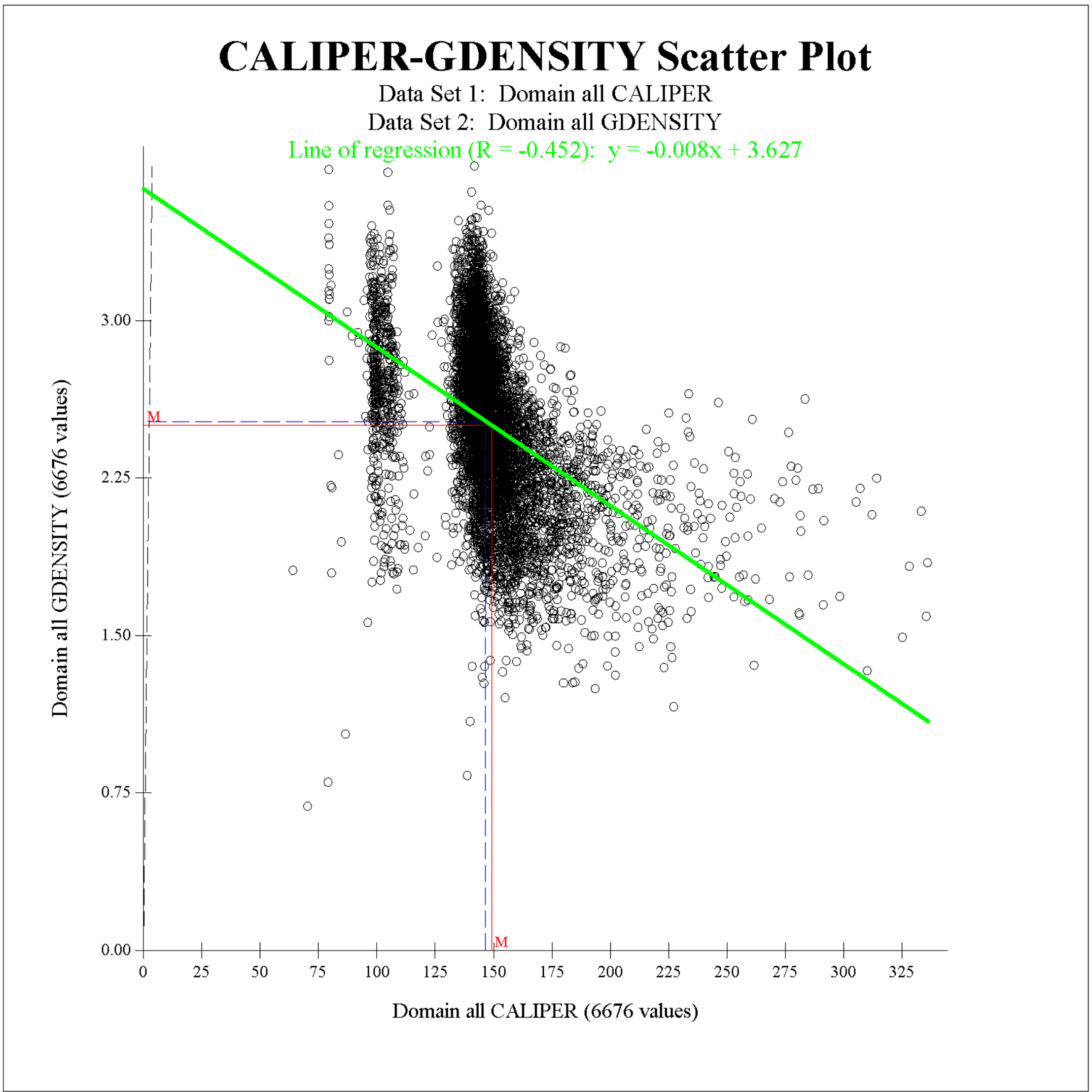

Figure 66. Scatter plot, calliper v density. All data inside BIF zones, Snark and Drabble Downs

14.3.7.4 Snark and Drabble Downs

Figure 67 presents a scatter plot of Fe v Density from Snark and Drabble Downs, for all mineralisation domains, with calliper readings of <160mm. It can be clearly seen that the majority of density values lie below 3.0, with a mean value of approximately 2.6 t/m^3. The 'slope' has been selected as an appropriate technique with which to calculate a density value for each block in the resource model estimated with Fe%.

The density formula for Snark and Drabble Downs is:

DENSITY = (0.009 * FE) + 2.167 (FE is estimated Fe block grade).

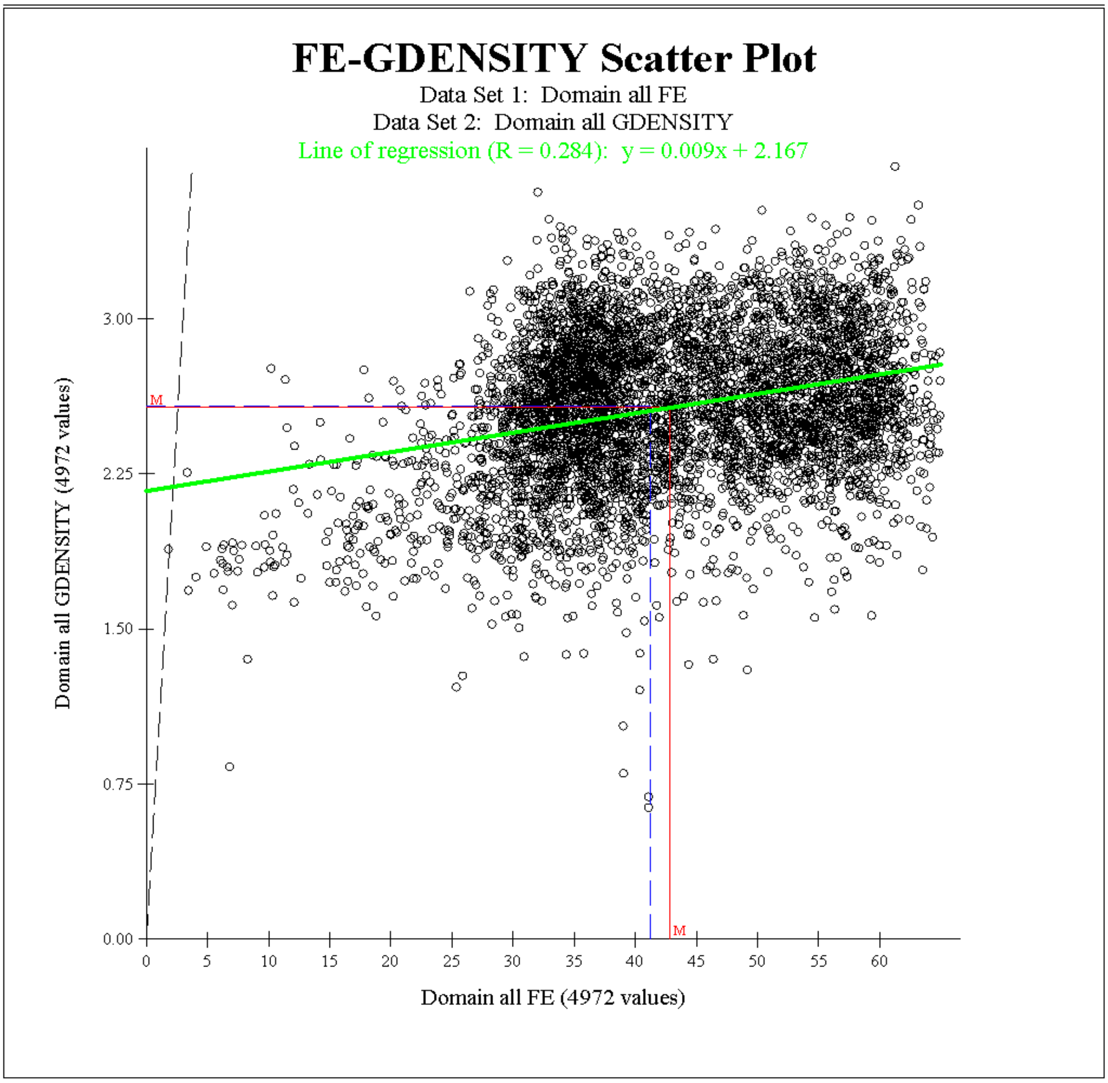

Figure 67. Scatter plot, calliper v density. All data inside BIF zones, calliper<=160mm. Snark and Drabble Downs

14.3.7.5 Central

Figure 68 presents a scatter plot of Fe v Density from Central, for all mineralisation domains, with calliper readings of <160mm. It can be clearly seen that the majority of density values lie below 3.0, with a mean value of approximately 2.6 t/m^3. The 'slope' has been selected as an appropriate technique with which to calculate a density value for each block in the resource model estimated with Fe%.

The density formula for Central is

DENSITY = (0.007 * FE) + 2.305 (FE is estimated Fe block grade).

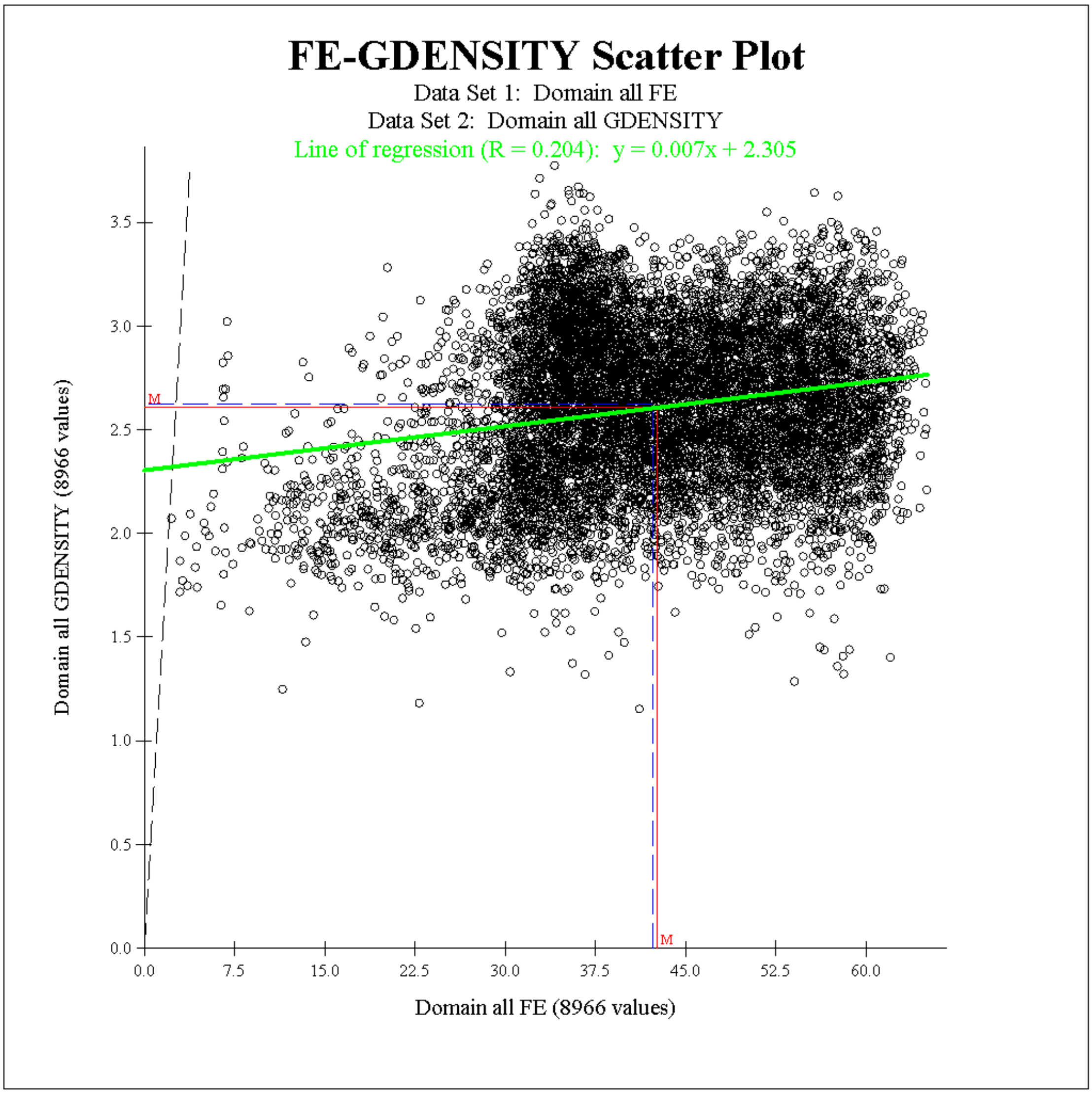

Figure 68. Scatter plot, calliper v density. All data inside BIF zones, calliper<=160mm. Central

14.3.7.6 Banjo

No density data were measured at Banjo, therefore the density algorithm for Central was also applied to Banjo. The Central algorithm was selected due to its geographical proximity to Banjo.

14.3.7.7 Discussion on Density Algorithm

The previous Mineral resource estimates for the Ularring Hematite Project (Technical Report filed 9th March, 2012) applied a density value of 2.9t/m^3 for all Mineral Resources, except Banjo which used an algorithm derived from surface samples. It is now recognised that the weathered rock profile at Ularring, especially through the BIF, has many cavities which have reduced the density of the rock. This can be seen in the diamond drill core, as demonstrated in Figure 69, which is geologically incompetent with respect to RQD.

Figure 69. Example of drill core (LGDD_027) showing poor competency and cavities. Hole depth 71m.

14.3.7.8 Density – Moonshine

MMS undertook the following density study in 2010:

- A downhole geophysical logging program, of 2000m over 11 drillholes at Moonshine
- Density measurements on diamond core taken for metallurgical testing – 40 measurements over 4 holes
- Surface sampling for density tests – 30 tests.

In mid April 2010 a program of surface sampling was undertaken within the Banjo and Moonshine prospects. The purpose of this program was to provide samples that could be analysed and their dry bulk density (DBD) determined, as well is the geochemistry. The reason for getting both the DBD and the chemistry was so that comparisons could be made with the hope of determining a reliable correlation between Fe% and density.

The sampling programme involved the collection of 15 rock samples from Moonshine (DS_1-15) and Banjo. The samples were collected in a way that was deemed to make the data suitably representative. Sampling locations were selected across the outcrops of the mineralised areas so that at least 1 sample was collected for each part of the resources.

The technique used was to select one in situ piece of outcrop which was representative of the specific location and break this off using a hammer, retaining it in one piece. Each sample was given a unique sample name (e.g. DS_1); this was recorded along with a description of the geology of each sample and the co-ordinates of its location. Each sample was bagged in separate, labelled calico bags and despatched immediately to the SGS metallurgical laboratory in Perth.

The surface sample locations, measured density and selected analyses are shown in Table 37. The densities were plotted and various regression lines tested on the graph in Figure 70. Note that the average density is 3.50, and average Fe of these samples is 60.6%, higher than the average grade of the deposits.

Table 37. Density measurements, locations and analyses for surface-collected enriched samples

Sample	GDA Easting	GDA Northing	Density g/cm^3	Fe %	SiO_2 %	Al_2O_3 %
DS_01	787893	6675135	3.91	63.7	1.49	0.49
DS_02	787987	6675032	3.64	60.6	4.96	1.73
DS_03	788017	6674943	3.53	62.0	4.33	1.22
DS_04	788051	6674834	3.58	62.6	1.77	1.47
DS_05	788102	6674763	3.70	60.1	3.54	1.90
DS_06	788117	6674720	3.33	60.2	2.05	1.93
DS_07	788123	6674654	3.73	63.2	1.60	1.25
DS_08	787984	6674923	3.83	64.1	2.63	0.92
DS_09	788049	6674809	2.66	57.6	4.52	1.41
DS_10	788072	6674734	2.89	57.3	4.30	2.55
DS_11	788135	6674555	2.92	51.3	17.00	1.45
DS_16	210883	6675035	3.37	58.1	7.14	2.47
DS_17	211025	6674903	3.69	61.3	6.25	0.49
DS_18	211100	6674827	4.05	61.9	4.40	2.60
DS_19	211175	6674746	3.16	59.6	6.39	1.61
DS_20	211247	6674679	3.37	59.2	4.60	2.53
DS_21	211347	6674619	3.58	58.5	4.88	2.76

Sample	GDA Easting	GDA Northing	Density g/cm^3	Fe %	SiO_2 %	Al_2O_3 %
DS_22	211395	6674563	3.21	61.0	5.51	1.27
DS_23	210693	6675314	3.62	57.1	7.01	5.28
DS_24	789172	6675885	3.78	61.8	3.06	2.49
DS_25	789040	6676006	3.89	64.2	1.97	0.99
DS_26	788805	6676098	3.96	63.0	2.89	1.75
DS_27	788933	6676040	3.39	59.9	4.96	3.06
DS_28	788945	6675950	3.55	62.2	2.16	1.08
DS_29	788890	6676007	3.36	62.9	2.11	1.71
DS_30	788832	6675755	3.29	62.5	1.92	0.87

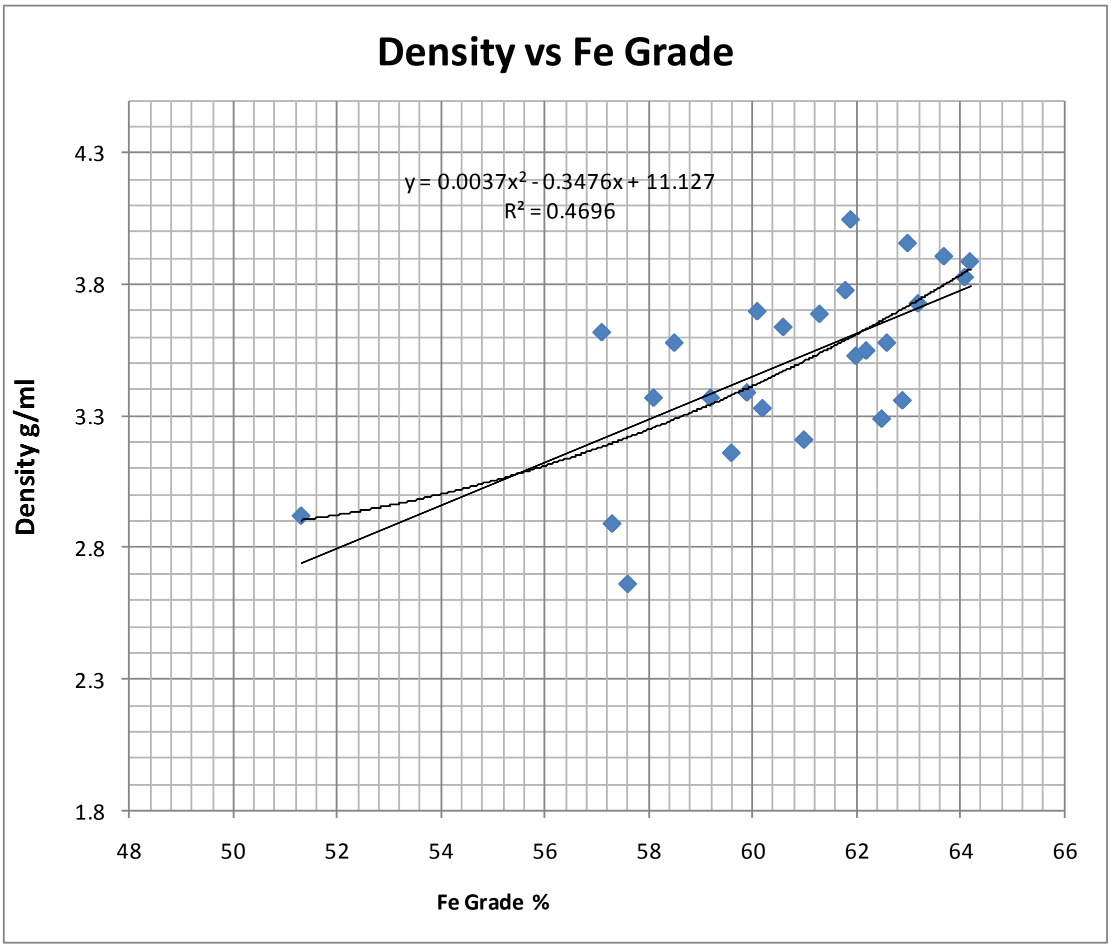

Figure 70. Regression of density values against Fe for hematite-goethite enriched samples.

MMS has not undertaken any geophysical density probe measurements in Moonshine (hematite / goethite), therefore the only physical density measurements available are from surface samples as discussed.

CSA Global has used the formula derived from Figure 70, which calculates a density for each block in the resource model based upon the interpolated Fe% block grade:

$$DENSITY = 0.0037*FE^2 - 0.3476*FE + 11.127$$

This density algorithm was only applied to the Moonshine resource model. The Banjo model used the algorithm as discussed in Section **Error! Reference source not found.** (Central).

It is recommended that MMS carry out a density measurement programme at Moonshine utilising diamond drill core and geophysical probing of the diamond holes. The lack of representative and quality assured density data has been a significant factor when classifying the Moonshine Mineral Resource according NI43-101 criteria.

14.3.7.9 Grade Cutting

The sample population were assessed with the need to apply top cuts, but it was determined that these would not be necessary for the Mineral Resource estimates. The previous Mineral Resource estimates applied top cuts to the hematite / goethite mineralisation models, but the current BIF geological models do not require them, in CSA's opinion. The estimation parameters, especially maximum number of samples used in a block estimate, allow for any extremely high grade assay value to be 'diluted' by the other samples selected for block estimation.

14.3.7.10 Moonshine

Composited sample data for Moonshine were cut according to Table 38. The 1 metre composited drill hole file was applied with either a bottom cut, for Fe, or top cuts prior to further data analyses and grade estimation.

Table 38 Grade Cutting Statistics Moonshine

Variable	Cut	Number Samples Cut	Raw Mean (%)	Cut Mean (%)
Fe [1]	40	1	53.0	53.1
P	-	-		
SiO_2	-			
Al_2O_3	-			
LOI	-			
S	1.1	5	0.163	0.156

1. *Bottom cut applied to Fe*

14.3.8 Variography

14.3.8.1 Definitions

A variogram is a graph of the variability between pairs of samples against the distance between them in a specific direction. A model is calculated for a particular variogram, which provides parameters known as the nugget, sills and ranges. An example is provided in Figure 71.

The nugget effect is the variability between the closest spaced samples available, which is usually two adjacent samples from the same drill hole. The nugget value is where the variogram model cuts the Y-axis, and is usually referred to as a percentage of the total sill. The type of variogram that produces such a variogram is termed a down hole variogram.

As another explanation, the nugget effect is the theoretical variance in grade that would be obtained if a duplicate sample was taken at exactly the same point in space. The nugget effect is an important measure of the reliability/variability of the assay value of samples and is one of the parameters used to determine the weight assigned to individual samples when estimating block grades. A sample population with a low nugget means that more reliability can be placed on nearby individual samples to estimate the grade of a block, such as may be achieved with an “inverse distance weighted” estimate with a high power. Conversely, a grade estimation from a sample population with a high nugget means that the average grade from a large number of samples will be required to give the best estimate of the grade for each block.

The sill is the population variance within a domain, and is often normalised to 1.0. The range is the distance at which samples are no longer spatially correlated, and can be considered as the point where the variogram model approaches or cuts the sill. This is a subjective decision for which the resource estimator or geostatistician will call on their experience from other projects for the same commodity. More than one sill is often modelled; the first sill (and short range) defines a range of influence up to which the variance between samples may rise very rapidly with increasing distance. Beyond this short range the variability may increase less rapidly with distance until the sill is reached. The short range is often a useful measurement for planning grade control drilling patterns during mining.

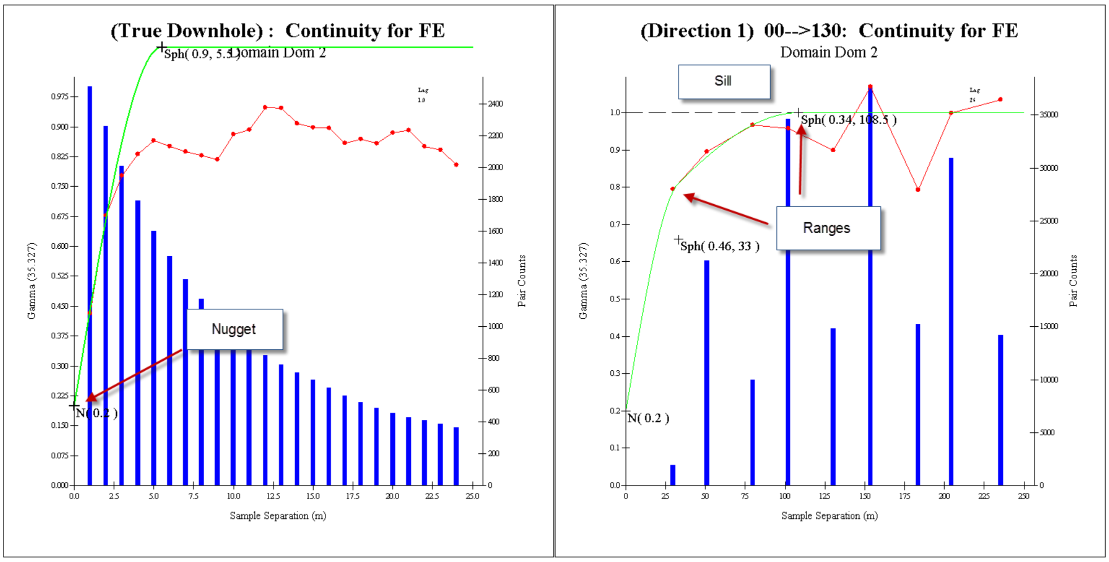

Figure 71. Example of Variogram Models. Green lines are variogram models, blue bars are number of pairs.

14.3.8.2 Methodology

Variograms for Fe and P were modelled from data within the most populated domains (MINZON) for Snark, Drabble Downs, Central and Banjo. The variogram parameters were used for the other domains during grade estimation, after adjustments made to the rotation of the variogram ellipse.

Down hole variograms were obtained from the 1m down the hole composites. These variograms were used to calculate the sample population nugget effect and sample variance related to the shortest distance between samples, for Fe and P.

Variograms for the Moonshine drill hole assay data were generated but had very poor structures except for the down hole variogram. A large radius variogram model was created as a nominal variogram for estimation, as the experimental variograms were too poor to model. Based on the univariate statistics for the lenses, a single domain was used along the strike of the lenses.

Variogram results are presented in Table 39 to Table 43.

Table 39. Variogram parameters, Fe% and P%, Snark (MINZON 23)

Grade Variable	Axes	Direction	Nugget	Sill 1	Range 1 (m)	Sill 2	Range 2 (m)
Fe	1	0 to 125	0.25	0.24	64	0.51	178
	2	-90 to 0			14		28
	3	0 to 035			15		26
P	1	0 to 125	0.13	0.87	65	-	-
	2	-90 to 0			25		-
	3	0 to 035			12		-

Table 40. Variogram parameters, Drabble Downs (MINZON 101)

Grade Variable	Axes	Direction	Nugget	Sill 1	Range 1 (m)	Sill 2	Range 2 (m)
Fe	1	0 to 170	0.29	0.44	60	0.27	280
	2	-70 to 260			16		28
	3	-20 to 080			27		36
P	1	-54 to 319	0.12	0.88	56	-	-
	2	28 to 001			46		-
	3	-20 to 080			12		-

Table 41. Variogram parameters, Central (MINZON 35)

Grade Variable	Axes	Direction	Nugget	Sill 1	Range 1 (m)	Sill 2	Range 2 (m)
Fe	1	-10 to 340	0.03	0.66	33	0.31	86
	2	80 to 340			9		15
	3	0 to 070			10		18
P	1	-20 to 160	0.21	0.31	34	0.48	99
	2	-70 to 340			17		28
	3	0 to 070			18		26

Table 42. Variogram parameters, Banjo (MINZON 17)

Grade Variable	Axes	Direction	Nugget	Sill 1	Range 1 (m)	Sill 2	Range 2 (m)
Fe	1	-20 to 140	0.26	0.33	59	0.41	160
	2	-70 to 320			20		27
	3	0 to 050			10		25
P	1	-80 to 140	0.11	0.23	23	0.66	39
	2	-10 to 320			30		58
	3	0 to 050			3		12

Table 43. Variogram Parameters, Moonshine

Grade Variable	Axes	Direction	Nugget	Sill 1	Range 1 (m)	Sill 2	Range 2 (m)
Fe	1	-90 to 000	0.5	0.2	99.5	0.3	256.5
	2	00 to 040			17		39
	3	00 to 130			116		200
P	1	00 to 330	0.2	0.4	148.8	0.4	254.5
	2	-90 to 000			26		51.5
	3	00 to 060			247		332

14.3.9 Block Model

Three block models were created, for Snark and Drabble Downs, Central, and Banjo. The block model dimensions and parameters are listed in Table 44. The parent block sizes were based upon approximately half the typical drill spacing. Sub blocks were used to ensure the block model honoured the mineralisation zone geometries and the geological contacts. Variable names are consistent with the drill hole sample variables. All blocks created above the surface topographic surface were deleted prior to the block model being used for Mineral Resource estimation.

Table 44. Block model parameters

Block Model Parameters			
Snark and Drabble Downs			
Block Model Parameters: Model **sn0512md**			
	X	**Y**	**Z**
Origin	781,200	6,695,800	280
Extent	5,300m	4,000m	270m
Block Size (sub block)	10 (1.0)	25 (2.5)	10 (1.0)
Attributes:			
MINZON	Mineralisation domain (1-100 are Snark, >100 are Drabble Downs)		
TOPO	In-situ (50), below mineralisation (99)		
FE	Ordinary Kriged (OK) Fe Grade		
FE_IDS	Inverse Distance Squared (IDS) Fe Grade		
SIO_2	Ordinary Kriged (OK)SiO2 Grade		
P	Ordinary Kriged (OK) Phosphorus Grade		
AL_2O_3	Ordinary Kriged (OK) Al2O3 Grade		
S	Ordinary Kriged (OK) Sulphur Grade		
LOI	Ordinary Kriged (OK) LOI Grade		
SLOPE	Theoretical slope of regression; derived from OK Fe block estimate		
KE	Kriging efficiency; derived from OK Fe block estimate		
SVOL	Estimation Pass (Fe)		
DENSITY	Calculated density		
CLASS	NI43-101 Classification (1 = Measured, 2 = Indicated, 3 = Inferred, 4=Un-classified). No measured was assigned to the models.		
Central			
Block Model Parameters: Model **cen512md**			
	X	**Y**	**Z**
Origin	786,200	6,678,700	290
Extent	3,200m	6,500m	260m
Block Size (sub block)	10 (1.0)	25 (2.5)	10 (1.0)
Attributes:	As per Snark, with following additions		
TENURE	Tenement value. TENURE>0 blocks are available for resource reporting.		
Banjo			
Block Model Parameters: Model **bj512md**			
	X	**Y**	**Z**
Origin	788,600	6,673,700	290
Extent	2,700m	2,700m	250m
Block Size (sub block)	10 (1.0)	25 (2.5)	10 (1.0)
Attributes:	As per snark		
Moonshine			
Block Model Parameters: Model ***krgmod2.dm***			
	X	**Y**	**Z**
Origin	787,500	674,000	180
Extent	3,500	2,500	340
Block Size (sub block)	10m (2m)	10m (2m)	5m (1m)
Attributes:	As per Snark		

14.3.10 Grade Interpolation

14.3.10.1 Data Used

All composited RC drill holes that intercepted BIF domains were available for grade interpolation. Only the portions of the holes intercepting the domains were used. Diamond holes were not assayed and therefore not used for grade estimation.

Grade variables estimated were Fe, P, SiO_2, Al_2O_3, LOI and S.

14.3.10.2 Methodology

The grade variables listed in Section 14.3.10.1 were estimated into the BIF domains using ordinary kriging (OK). Each BIF domain (MINZON) was estimated only by those composited drill samples located within them. This is achieved by using the same MINZON values for samples and blocks.

A typical primary search ellipse of 100m along strike by 15m down dip by 100m across strike, resembling a discoid, was used for the domains. The strike and width radii varied between the deposits reflecting typical drill spacing and variogram models (Snark 100m, Drabble Downs 250m, Central 100m, Banjo 125m), but the vertical (down dip) radius remained fixed at 15m. A major consideration during grade estimation was to limit the spreading of higher grade assays from the hematite / goethite zone into the deeper siliceous BIF zones, and conversely to prevent the lower grade assays from the BIF impacting upon the near surface hematite zones. With no 'hard boundary' used in the current Mineral Resource separating the hematite mineralisation from the siliceous BIF (such as a 50% Fe boundary as previously employed), it was decided to limit the vertical influence of assays by using a search ellipse with a limited vertical radius. Several grade estimation iterations were run, testing vertical search radii, with 15m chosen after validating the resultant estimated block model.

The minimum number of samples used within the search was 8, with the maximum being 24. The primary search was increased by 50% if the minimum number of samples were not encountered within the various searches. A maximum of 5 samples per drill hole per block estimate was set, with discretisation of 3 x 3 x 3 used. No octant based search was used.

Kriging estimation runs for SiO_2, Al_2O_3, S and LOI used the variogram parameters modelled for Fe to help ensure consistent major element support. Estimation runs for phosphorus used the P variogram parameters.

14.3.10.3 Moonshine

The grade variables were estimated into the mineralisation domains using ordinary kriging. The search parameters were based on the Fe variogram. The same ellipse was used for all assays, with radii of 150m x 500m x 75m. The alignment was altered for the different strike domains of each modelled area.

A minimum number of 10 composites was used to interpolate each cell (except 12 in the earlier Moonshine model), with a maximum of 12 per drill hole. Maximum number of composites was 30.

Gaps in drill hole assays were left as absent data for grade interpolation.

14.3.11 Model Validation

Model validation was carried out graphically and statistically to ensure that block model grades accurately represent the drill hole data. Drill hole cross sections were examined to ensure that model grades honour the local composite drill hole grades. Several statistical methods were employed to validate the block model, which included:

- Model tonnes vs drill hole metres
- Model grade vs drill hole grade

14.3.11.1 Trend Plots

Trend plots were generated for Fe and P, in easting, northing and elevation sections, from selected BIF domains for each deposit. These trend plots compare the trends of data in each direction and reveal whether the estimated block grades follow the trend of sample grades in each direction. This demonstrates the appropriate sample data were selected for estimating the block model domains. Figure 72 and Figure 73 show typical trend plots for Fe and P.

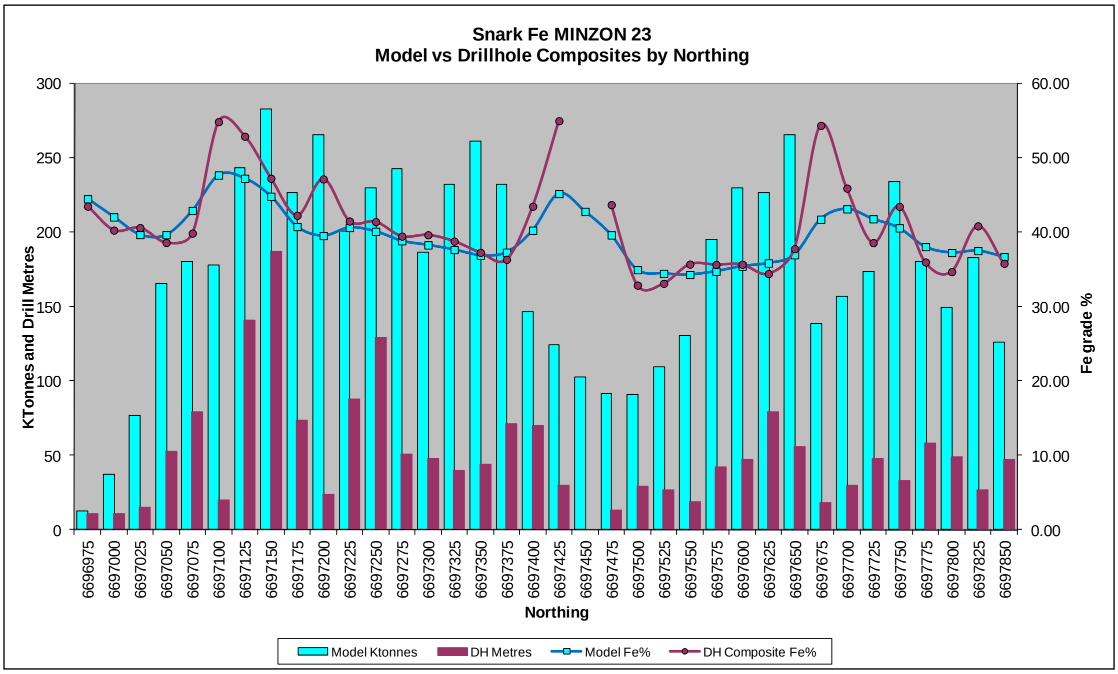

Figure 72. Trend plot, Snark domain 23, Fe %

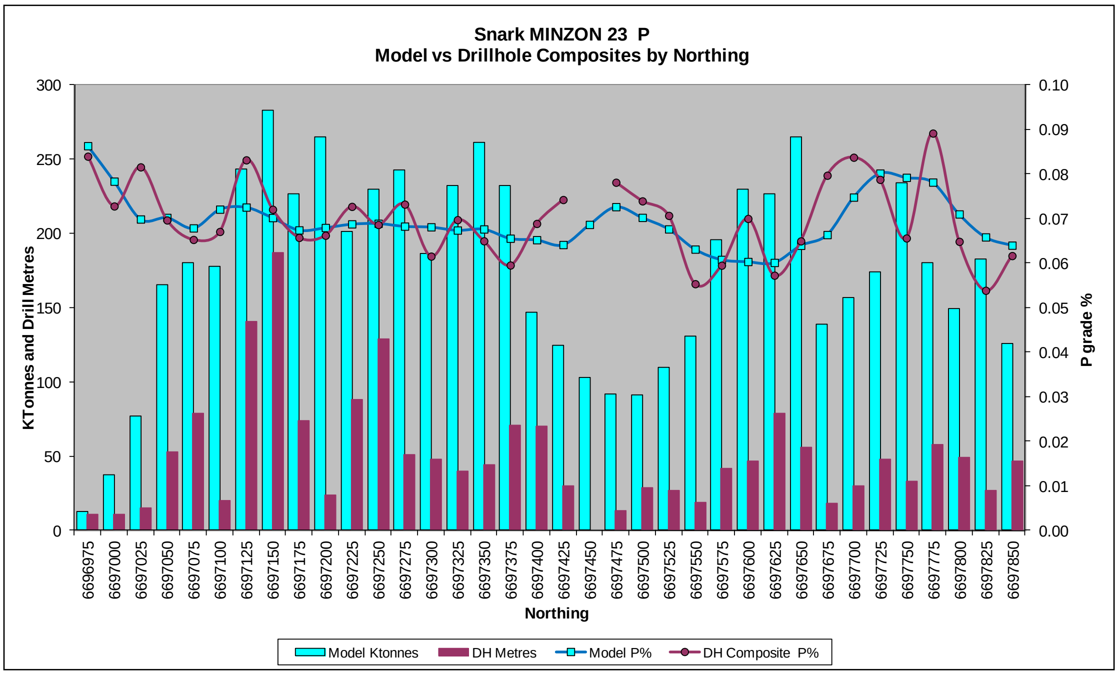

Figure 73. Trend plot, Snark domain 23, P %

14.3.12 Mineral Resource Classification

The Mineral Resource is classified as Indicated and Inferred, as required by NI 43-101 and described in the CIM 2014 Definition Standards on Mineral Resources and Mineral Reserves. The classification level is based upon an assessment of geological understanding of the deposit, geological and mineralisation continuity, quality control results and an analysis of available density information. Outcrop mapping also provides information as to occurrence and style of geology at surface, which can be reasonably projected down dip.

Classification of the Mineral Resource was done by digitising a perimeter in long section, for each BIF domain, where the intended Indicated resource is inside the perimeter. The geometry of the perimeter was defined by drill hole density, where the holes pierced the domain. An example is provided in Figure 74. Blocks located outside the perimeter string, either along strike within the domain or down dip, were classified as Inferred.

Blocks below a nominal depth of 400mRL were not classified for Mineral Resource reporting purposes. This depth, approximately 110m below natural surface, was determined by no drill intercepts supporting the geological interpretation at that depth. Block grades were estimated but the drill holes up dip were considered to be too far away for the block estimate to be considered for classification, even at the Inferred level. Depending on the drill hole coverage within the domain, the lower depth was sometimes set at 380mRL. This was determined on a domain by domain basis.

The Mineral Resource estimate for Moonshine was classified as Inferred. This is due to the wide spaced drilling, for which continuity of mineralisation is assumed but not verified. Many drill sections have only one drill hole, and depth of mineralisation has been assumed.

There are not enough QAQC results to support a higher level of classification. Density measurements are based upon a few rock chip samples, measured for density.

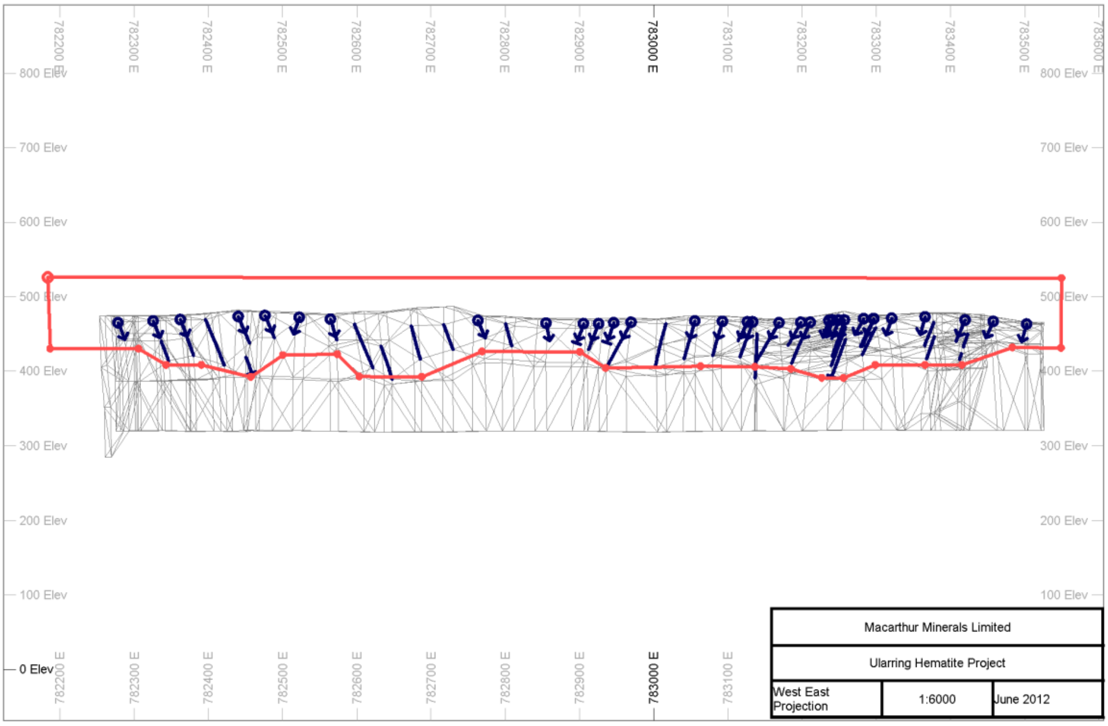

Figure 74. Indicated classification outline (red), Snark domain 23. BIF wireframe and drill holes shown. E-W section, view to north.

14.3.13 Mineral Resource Reporting

The Ularring Hematite deposit has been drill tested using conventional drilling techniques, with appropriate QA/QC protocols implemented to monitor the precision and accuracy of the drill sample collections and sample analyses. Extensive geological surface mapping has been carried out to define the strike, dip and true width of the outcropping BIF units, which were used to control the geological interpretation supporting the Mineral Resource estimate. The collection of bulk density data has been carried out with results sufficient in quality and quantity to support the Mineral Resource estimate. The Qualified Person is satisfied that the Mineral Resource was prepared, estimated, classified and reported in accordance with the 2014 CIM definition standards.

The Mineral Resource estimate has been reported above a nominal cut-off grade of 40% Fe, for all blocks in the resource models. No depletion has taken place from earlier mining activity.

The entire Mineral Resource estimate has reasonable prospects for eventual economic extraction, and is a realistic inventory of mineralisation which, under assumed and justifiable technical and economic conditions, might, in whole or in part, become economically extractable.

The Mineral Resource is reported for resource model blocks lying within granted tenure.

The Project is located within 240 km by road of the city of Kalgoorlie-Boulder which has a readily available workforce. An existing mining project is located 45 km to the south of the Lake Giles Project and has existing infrastructure which the Qualified Person assumes can be readily expanded to allow cost-effective mining, haulage and processing of the Project's iron mineralisation. The hematite mineralisation can be processed by simple crushing and grinding methods to be blended with higher quality magnetite concentrate making it economically extractable.

The reporting cut-off grade of 40% Fe realistically reflects the location of the Project, the scale of the deposit and its continuity. The mining methods employed are typical of similar iron ore operations within the region and Western Australia. Preliminary mining designs have examined iron ore tonnage and strip ratios based on cut-off grades to achieve a product of saleable iron grade. The metallurgical processes to be employed are well understood in the iron ore industry and involve crushing and grinding of ore to achieve a size specification to blend with higher grade magnetite concentrate. The Qualified Person is satisfied the operating costs and reasonable long term metal prices are appropriate for the deposit and the Mineral Resource therefore has reasonable prospects for eventual economic extraction.

The Mineral Resource is not believed to be materially affected by any known environmental, permitting, legal, title, taxation, socio-economic, marketing, political or other relevant factors.

The Mineral Resource is reported in Table 45 and Table 46.

Table 45. Hematite Mineral Resource

Category	Tonnes	Fe %	P %	SiO_2 %	Al_2O_3 %	LOI %	S %
Indicated	54,460,000	47.2	0.06	16.9	6.5	7.9	0.16
Inferred	25,990,000	45.4	0.06	20.6	6.0	7.2	0.09

Note: *The CSA Global Mineral Resource was estimated within constraining wireframe solids encapsulating BIF strata. The resource is quoted from blocks above 40 % Fe cut-off grade, except Moonshine where resource is quoted from blocks above 50 % Fe. Differences may occur due to rounding. Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability.*

Table 46. Hematite Mineral Resource by Deposit

Deposit	Reporting cut-off grade (Fe%)	Category	Tonnes Mt	Fe %	P %	SiO_2 %	Al_2O_3 %	LOI %	S %
Snark	40	Indicated	21.83	47.2	0.07	17.5	6.1	7.7	0.15
	40	Inferred	10.96	45.2	0.07	21.8	5.1	6.8	0.09
Drabble Downs	40	Indicated	11.07	47.2	0.06	16.6	6.4	8.3	0.26
	40	Inferred	0.36	43.6	0.05	24.0	4.8	7.8	0.09
Central	40	Indicated	15.09	47.0	0.05	16.2	7.2	8.1	0.12

	40	Inferred	10.19	45.3	0.05	20.3	6.3	7.5	0.08
Banjo – Lost World	40	Indicated	6.47	47.8	0.06	16.7	6.6	7.4	0.14
	40	Inferred	3.88	45.4	0.06	18.7	7.6	7.9	0.09
Moonshine	50	Inferred	0.60	53.0	0.06	13.4	6.7	6.1	0.15

***Note**: The CSA Global Mineral Resource was estimated within constraining wireframe solids encapsulating BIF strata. The resource is quoted from blocks above 40Fe % cut-off grade, except Moonshine where resource is quoted from blocks above 50 Fe %. Differences may occur due to rounding. Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability.*

14.3.14 Previous Mineral Resource Estimates

The Ularring Mineral Resource was previously reported for blocks where Fe% was greater than 50% (Technical Report filed March 9, 2012). This Mineral Resource was based upon mineralisation outlines encapsulating regions of >50% Fe. The March 2012 Mineral Resource is presented in Table 47.

Table 47. Mineral Resource published March 2012

Category	Tonnes	Fe %	P %	SiO_2 %	Al_2O_3 %	LOI %
Indicated	13,010,000	55.2	0.07	8.0	4.4	7.8
Inferred	16,950,000	55.6	0.07	8.1	4.4	7.4

***Note:** The CSA Global Mineral Resource (March 2012) was estimated within constraining wireframe solids based on a nominal lower cut-off grade of 50% Fe. The resource is quoted from blocks above 50Fe % cut-off grade. Differences may occur due to rounding. Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability.*

14.3.15 Grade Tonnage Tables

Grade – tonnage tables have been generated for each deposit by classification. Tables for Indicated Mineral Resources for each deposit are presented in Figure 75 to Figure 78.

Macarthur Minerals - Snark

Snark Indicated Mineral Resource

Fe% Cut	Volume	Tonnes	Fe%	S%	P%	LOI	SIO2%	AL2O3%	DENSITY
62	600	1,636	62.20	0.290	0.055	5.48	2.68	2.50	2.73
61	3,100	8,427	61.26	0.134	0.074	5.86	3.64	2.38	2.72
60	28,788	78,072	60.56	0.129	0.072	6.68	3.61	2.42	2.71
59	72,860	197,217	59.98	0.126	0.075	6.98	3.93	2.64	2.71
58	139,083	375,569	59.26	0.151	0.075	7.00	4.63	2.90	2.70
57.5	206,590	556,927	58.76	0.157	0.075	7.12	5.00	3.10	2.70
55	611,760	1,639,249	56.96	0.147	0.077	7.41	6.45	3.85	2.68
52.5	1,303,343	3,472,074	55.23	0.152	0.075	7.61	8.00	4.45	2.66
50	2,312,683	6,124,333	53.48	0.152	0.073	7.77	9.68	5.05	2.65
45	5,111,288	13,384,611	50.23	0.157	0.069	7.90	13.18	5.94	2.62
40	8,426,725	21,833,859	47.19	0.149	0.067	7.65	17.51	6.12	2.59
35	12,602,213	32,288,431	44.03	0.125	0.066	6.98	23.20	5.62	2.56
30	15,326,033	39,003,062	42.16	0.113	0.064	6.66	26.39	5.37	2.54
25	15,846,103	40,262,582	41.72	0.112	0.063	6.65	26.92	5.44	2.54
20	15,933,468	40,470,481	41.63	0.112	0.063	6.66	27.02	5.47	2.54
0	15,954,848	40,520,028	41.60	0.111	0.063	6.65	27.04	5.48	2.54

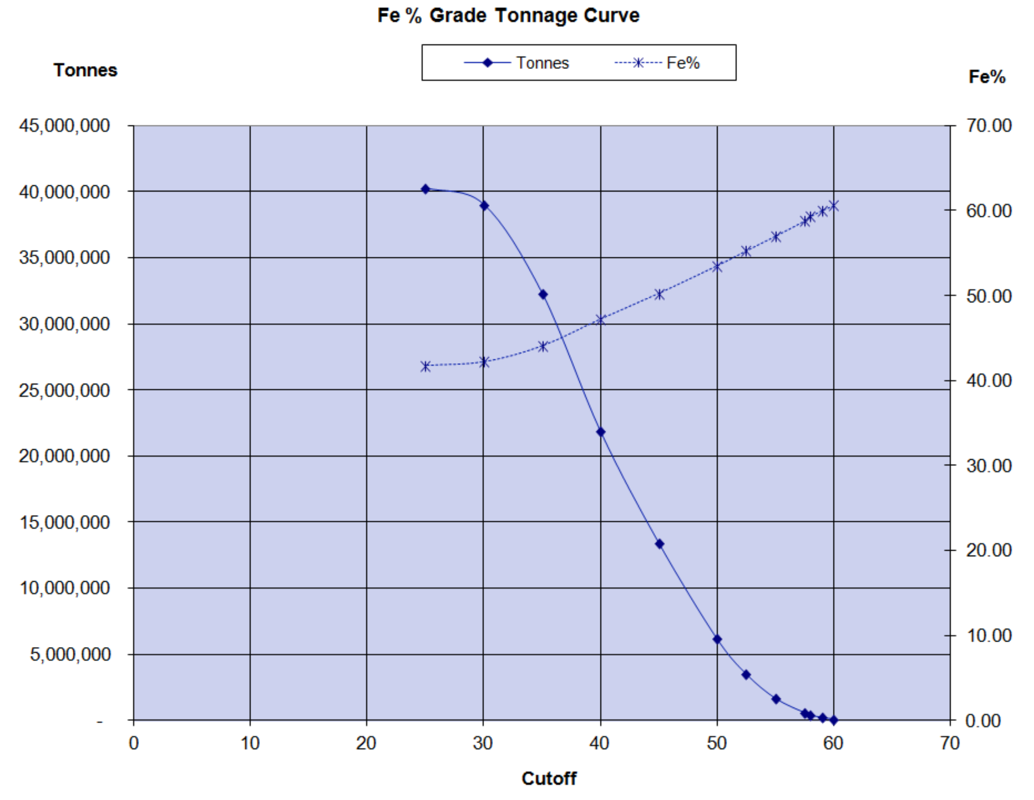

Figure 75. Snark (Indicated) Mineral Resource grade tonnage table. Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability.

Macarthur Minerals - Drabble Downs

Drabble Downs Indicated Mineral Resource

Fe% Cut	Volume	Tonnes	Fe%	S%	P%	LOI	SIO2%	AL2O3%	DENSITY
62									
61									
60									
59	2,500	6,757	59.52	0.393	0.077	6.43	4.25	2.93	2.70
58	9,260	24,975	58.90	0.355	0.066	6.55	5.17	2.94	2.70
57.5	26,473	71,217	58.14	0.341	0.056	6.61	5.83	3.32	2.69
55	170,950	457,261	56.43	0.283	0.060	7.38	6.94	4.04	2.67
52.5	566,813	1,505,398	54.33	0.286	0.060	7.90	8.63	4.77	2.66
50	1,178,935	3,113,884	52.71	0.272	0.061	8.17	10.15	5.27	2.64
45	2,731,545	7,141,437	49.75	0.270	0.058	8.50	13.06	6.17	2.61
40	4,271,715	11,069,315	47.21	0.256	0.056	8.30	16.63	6.36	2.59
35	5,532,353	14,223,908	45.01	0.223	0.055	7.79	20.59	6.10	2.57
30	6,783,568	17,304,390	42.83	0.197	0.053	7.36	24.15	5.99	2.55
25	7,529,050	19,107,064	41.42	0.185	0.053	7.17	26.00	6.10	2.54
20	7,832,825	19,826,815	40.74	0.180	0.052	7.11	26.86	6.16	2.53
0	7,908,870	20,004,116	40.54	0.179	0.052	7.09	27.10	6.19	2.53

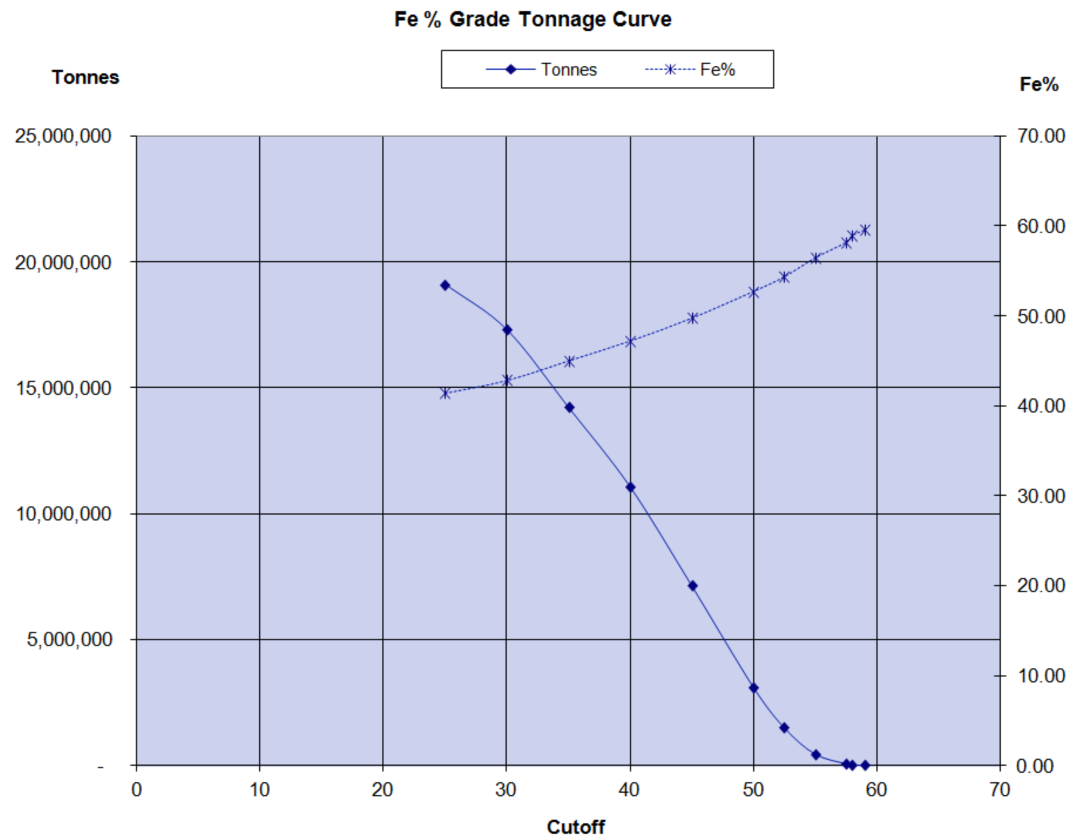

Figure 76. Drabble Downs (Indicated) Mineral Resource grade tonnage table. Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability.

Macarthur Minerals - Central

Indicated Mineral Resource

Fe% Cut	Volume	Tonnes	Fe%	S%	P%	LOI	SIO2%	AL2O3%	Density
62	11,438	31,382	62.68	0.028	0.045	5.02	3.18	1.87	2.74
61	15,948	43,719	62.35	0.037	0.048	5.17	3.28	2.04	2.74
60	24,880	68,093	61.70	0.056	0.047	5.47	3.67	2.24	2.74
59	49,370	134,732	60.58	0.098	0.047	5.98	4.13	2.72	2.73
58	75,655	206,070	59.84	0.106	0.049	6.36	4.44	3.01	2.72
57.5	93,200	253,606	59.45	0.117	0.051	6.62	4.54	3.12	2.72
55	294,588	796,861	57.15	0.120	0.054	7.09	6.40	3.95	2.71
52.5	666,123	1,792,656	55.18	0.142	0.054	7.47	7.93	4.75	2.69
50	1,421,750	3,804,714	53.03	0.149	0.053	7.84	9.70	5.56	2.68
45	3,491,308	9,261,962	49.73	0.140	0.051	8.14	12.88	6.68	2.65
40	5,730,335	15,089,766	46.96	0.124	0.048	8.14	16.23	7.21	2.63
35	8,158,415	21,322,359	44.17	0.103	0.046	7.61	21.18	6.74	2.61
30	9,579,940	24,927,854	42.56	0.093	0.046	7.31	23.92	6.48	2.60
25	9,846,588	25,594,668	42.18	0.092	0.046	7.27	24.44	6.49	2.60
20	9,945,060	25,837,140	42.00	0.091	0.046	7.27	24.66	6.52	2.60
0	9,984,158	25,931,908	41.90	0.091	0.046	7.27	24.78	6.54	2.60

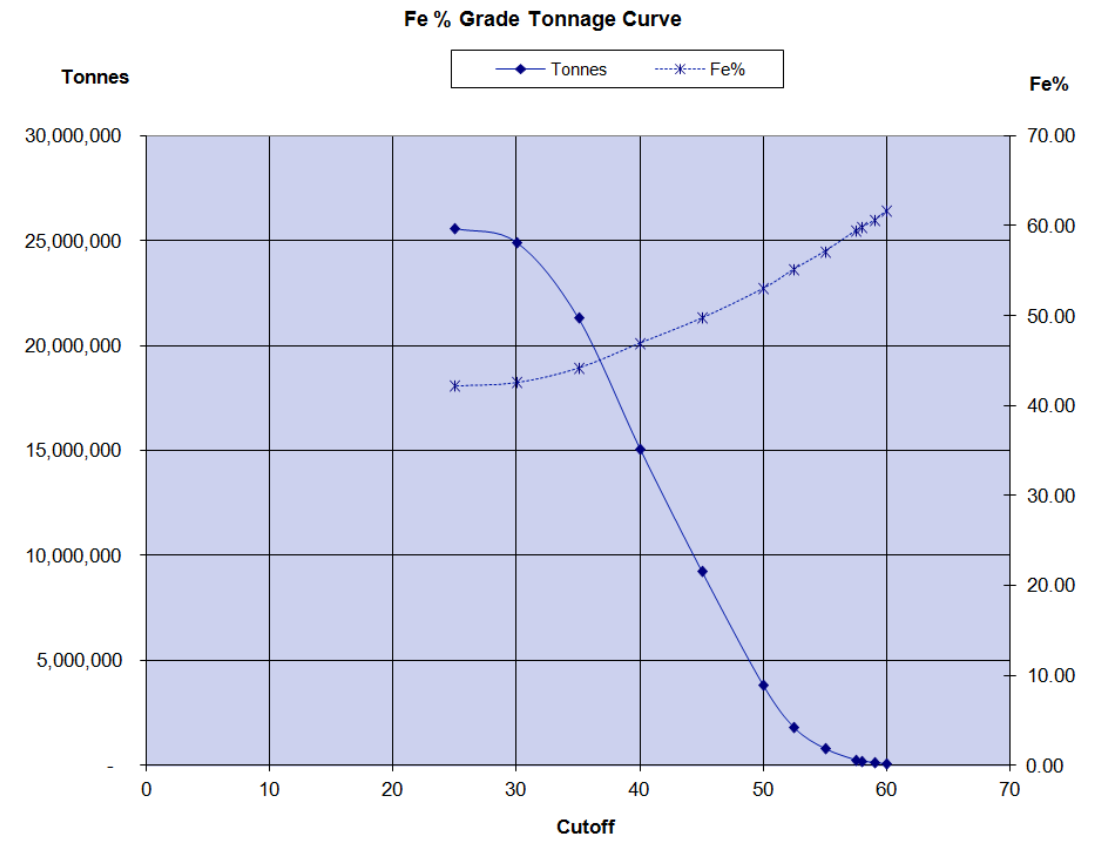

Figure 77. Central (Indicated) Mineral Resource grade tonnage table. Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability.

Macarthur Minerals - Banjo									
Indicated Mineral Resource June 2012									
Fe% Cut	Volume	Tonnes	Fe%	S%	P%	LOI	SIO2%	AL2O3%	DENSITY
61	2,500	6,831	61.05	0.040	0.062	5.09	4.30	2.75	2.73
60	5,038	13,747	60.56	0.038	0.064	5.28	4.57	2.99	2.73
59	14,495	39,473	59.74	0.039	0.067	5.50	5.02	3.43	2.72
58	22,288	60,617	59.26	0.067	0.066	6.12	5.32	3.19	2.72
57.5	26,585	72,257	59.00	0.078	0.065	6.18	5.56	3.25	2.72
55	172,408	465,533	56.46	0.160	0.066	6.82	7.20	4.40	2.70
52.5	482,598	1,297,038	54.67	0.158	0.067	7.07	8.89	4.97	2.69
50	844,765	2,261,798	53.22	0.159	0.065	7.24	10.16	5.56	2.68
45	1,611,603	4,284,230	50.51	0.156	0.061	7.39	13.28	6.13	2.66
40	2,450,233	6,466,540	47.80	0.142	0.059	7.35	16.73	6.60	2.64
35	3,619,695	9,464,998	44.38	0.123	0.056	6.80	22.50	6.32	2.61
30	5,381,618	13,929,209	40.63	0.097	0.056	6.05	29.36	5.53	2.59
25	5,625,435	14,539,841	40.12	0.095	0.056	6.03	30.02	5.57	2.58
20	5,660,623	14,626,722	40.02	0.095	0.056	6.03	30.15	5.58	2.58
0	5,663,328	14,633,312	40.01	0.095	0.056	6.03	30.16	5.58	2.58

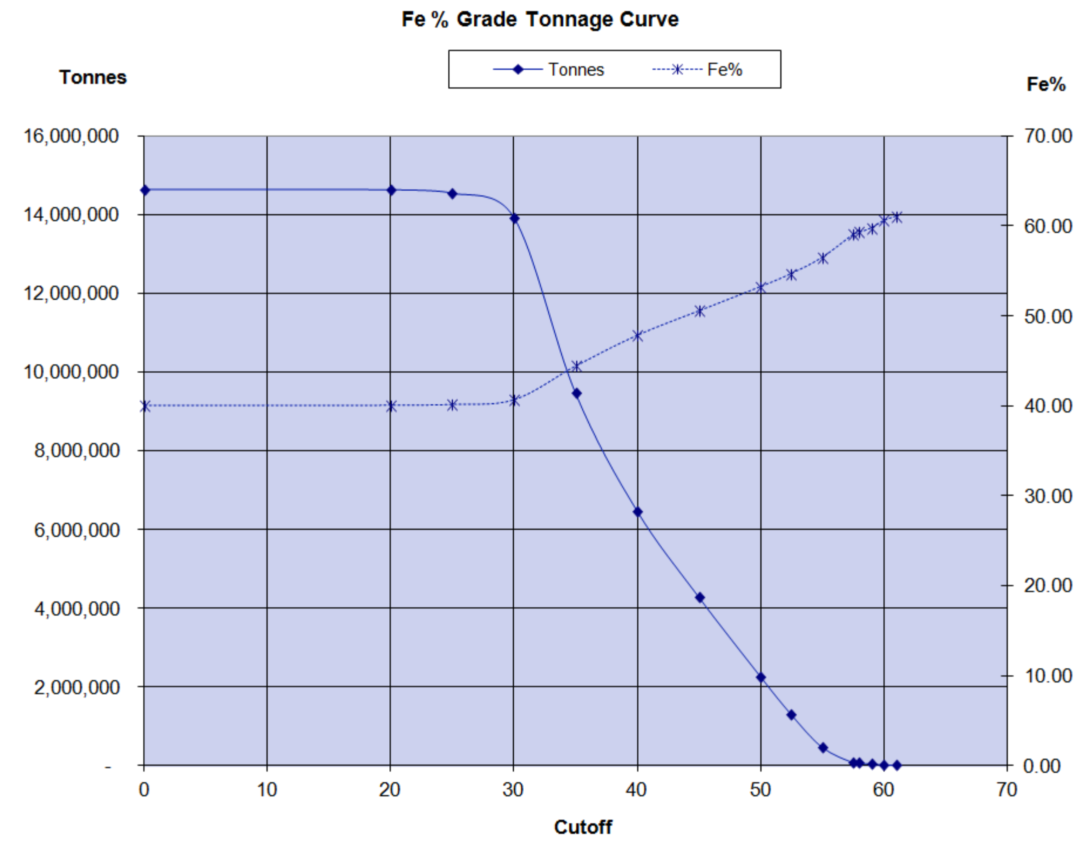

Figure 78. Banjo (Indicated) Mineral Resource grade tonnage table. Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability.

14.3.16 Reasonable Prospects for Eventual Extraction

Reasonable prospects for eventual economic extraction are based on the reporting cut-off grade of 40% Fe that realistically reflects the scale of the deposit and its continuity. It was assumed the deposit will be mined utilising conventional open pit mining methods at a rate of 0.9 mtpa. A pit optimisation was undertaken to understand the general scale and shape of the hematite pits. The Resource block model (sn_mz_0512md.dm) was regularised to a 10m x 10m x 5m cell size. The regularisation process is intended to model the ore loss and dilution expected from this style of deposit with the size and type of mining equipment proposed to be deployed. A cut-off grade of 54.0% Fe was employed to achieve a mined ore grade of 56.0% Fe. A strip ratio of 3.7:1 was calculated for the hematite pits at the Snark deposit. The strip ratio was extrapolated to the Central and Banjo deposits due to similarities in deposit style.

Mineral processing and iron recovery is based on the preliminary designs outlined in Section 17. Ore would be delivered to the processing plant with an average head grade of 56% Fe. Hematite ore would be crushed and then processed through a ball mill to achieve a size specification to be blended with the magnetite concentrate. The final concentrate grade of the blended product would achieve a grade of 65% Fe.

Mining and haulage costs are based on contractor rates for an average life of mine operational cost of $44.71/t. The operating costs assume access to the existing open access rail network and Government owned Port of Esperance.

A long-term iron ore price of $86/t of magnetite concentrate has been used in the economic assessment which is considered conservative in comparison to current market prices.

The technical and economic assumptions used in the study are shown in Table 48.

The Qualified Person is satisfied the operating costs and reasonable long-term metal prices are appropriate for the deposit and the Mineral Resource therefore has reasonable prospects for eventual economic extraction.

The Mineral Resource is not believed to be materially affected by any known environmental, permitting, legal, title, taxation, socio-economic, marketing, political or other relevant factors. The technical and economic assumptions used in the study are shown in Table 48.

Table 48. Economic and technical assumptions for hematite ore extraction

Description	Units	Total
Ore head grade	%	56% Fe
Concentrate iron grade[1]	%	65% Fe
Weight recovery	%	95.0%
Strip ratio	w:o	3.7:1
Ore mining tonnage	Mtpa	0.9
Waste mining tonnage	Mtpa	3.3
Total mining tonnage	Mtpa	4.2
Annual hematite concentrate production	Mtpa	0.86
Operating costs per tonne concentrate	$/t	44.71
Long-term iron ore price[2]	$/t	86.0

[1]The concentrate iron grade is the final grade of the blended magnetite and hematite concentrate blended at a ratio of 3:1 magnetite to hematite.

[2]The long-term sales price is for a blended magnetite-hematite concentrate grading 65% Fe.

15 Mineral Reserve Estimates

15.1 Mineral Reserves Estimate

No Mineral Reserves have been defined for the hematite or magnetite deposits for the Project.

The Moonshine Magnetite deposit is categorised as an Inferred Mineral Resource and therefore no Mineral Reserve can be defined for the Project.

16 Mining Methods

16.1 Scale of Operation

This Study utilises both the hematite and magnetite resources with a final concentrate consisting of a magnetite and hematite blend. The final blend dynamics will be primarily dictated by the recovery and grade of the magnetite concentrate.

For the purpose of this study, a blending ratio of 1:3 of hematite to magnetite ore has been chosen as the base case to achieve a desired blended concentrate of approximately 64.5% Fe.

For the purpose of this Preliminary Assessment, in the absence of comprehensive resource testing data, the assumption has been made for a weight recovery of 38% from the mined ore. Hence, in order to achieve 2.5 Mtpa of magnetite concentrate, the amount of ore feed to the magnetite process plant (concentrator) is 6.5 Mtpa. Additionally, a waste/low grade to ore strip ratio of 3:1 for magnetite has been assumed based on cross sections through the Moonshine deposit and 3.7:1 for hematite has been calculated based on preliminary pit designs for the Snark deposit. Total annual material movement is approximately 30 Mtpa. See Table 49 below.

Table 49. Annual mining requirement

Description	Units	Ore	Waste	Total
Weight Recovery - magnetite	%			38.00%
Concentrator Iron Recovery	%			95.00%
Stripping Ratio - magnetite				3:1
Stripping ratio - hematite				3.7:1
Mining Tonnage pa - magnetite	Mtpa	6.5	19.5	26.0
Mining Tonnage pa - hematite	Mtpa	0.9	3.3	4.2
Total mining tonnage	Mtpa	7.4	22.8	30.2
Annual Concentrate Production	Mtpa			3.35

16.2 Mining Operations Overview

At this level of the study, the general options considered to mine the ore body are:

- Mining shall be conducted by conventional drill, blast, load and haul mining methods
- Ore shall be hauled to the Run of Mine ("ROM") pad for crushing and then ore product conveyed to a concentrate plant. Concentrate product shall then be road hauled to a rail loadout and then by rail to the Port of Esperance for export sale.

The grade-tonnage characteristics for each the Snark, Drabble Downs, Central and Banjo (incorporating Lost World) hematite deposits were examined, and combined to estimate a

Mining Inventory over a range of product grades. The combined Resource Model inventory and Mining Inventory for the deposits is shown in Table 50.

Table 50. Mining Inventory for Combined Hematite Deposits

Fe% Target Grade	Resource Model (t)	Mining Inventory (t)	Delta
56.50	6,270,284	5,016,228	1,254,057
56.00*	**7,957,647**	6,366,118	1,591,529
55.50	9,927,315	7,941,852	1,985,463
55.00	12,062,978	9,650,382	2,412,596

*Base case scenario for economic valuation

A pit optimisation was undertaken to understand the general scale and shape of the hematite pits. The Resource block model (sn_mz_0512md.dm) was regularised to a 10m x 10m x 5m cell size. The regularisation process is intended to model the ore loss and dilution expected from this style of deposit with the size and type of mining equipment proposed to be deployed. A cut-off grade of 54.0% Fe will achieve a mined ore grade of 56.0% Fe.

In the absence of geotechnical data to definitively establish wall angles for the pit shells, an overall wall angle of 40 degrees has been used for this study. Similar overall wall angles are commonly seen in Pilbara iron ore operations mining hard, Banded Iron Deposits.

The optimisation indicated that the ore will be mined from a number of small, shallow discrete pits.

A mining fleet comprising 2 x 110 tonne-class excavators (Hitachi EX1200 or equivalent) loading 90 tonne haul trucks (Cat777 or equivalent) would capable of achieving the annual ex-pit ore and waste movement. It is expected that the excavators would move between ore and waste areas, and between individual pits in order to maintain continuity of ore supply. It is expected that waste rock would be hauled to either ex-pit waste dumps or mined-out pits (where possible).

Haulage options are discussed in Section 18.2 of this report.

For the purpose of this Study, the mining at Lake Giles would be by open pit and based on conceptual resource size and production rates of 3 Mtpa concentrate. A contractor would be engaged to undertake drill and blast, load and haul to the primary crusher and waste/low grade stockpile. Further “sterilisation” drilling would be required before waste dump and crusher locations can be established.

For the drilling and blasting, bench heights would be optimised to suit the drill rig and single pass drilling. Drilling and blasting, bench heights would be undertaken on 5 m benches. The ore and waste would be mined on 5 m benches, or 2.5 m flitches, depending on the selectivity required. ANFO would be used in the top benches above the natural water table.

Explosives would be delivered on a "down the hole" basis and only initiating materials would require storage in on-site magazines.

The natural water table in the area requires investigation for potential use as any water encountered could be reclaimed from pit dewatering for potential use in the process plant and dust suppression.

Planning for the deposition of the tailings from the plant and a water recovery system from this location would be required for approval processes.

16.2.1 Comparison of Mining Methods

Table 51 and Table 52 compare the various options considered for mining the Ularring hematite deposits.

Table 51. Comparison of Mining Methods

Parameter	Continuous Mining	Conventional Mining
Suitability for Ore Mining	Good	Good
Suitability for Waste Mining	Production rate may be low	Good
Adaptability to Pit Size	Smaller units required, which precludes direct loading of trucks. Use of mixed fleets difficult	Good
Mobility between Pits	Smaller units mounted on excavator undercarriages required	Good
Delivery of Waste to Dumps	If road trains used, waste dump maintenance more intensive	Good
Delivery of Ore to ROM	Use of smaller units needs FEL in pit to load either haul trucks or road trains	Haul trucks suitable for short hauls, rehandle required for longer distances
Estimated Operating Costs	$9.43/bcm	$4.99 to $9.75/bcm

The mining method adopted for this study is conventional ELH mining with drill and blast as required. Ore delivery to the ROM is by mine haul trucks for Moonshine and Banjo, and conventional road trains from Central and Snark. The reasons for this choice are:

- The close proximity of waste dumps are well suited to conventional surface mining trucks;
- Conventional ELH equipment fleets can be readily relocated from pit to pit;
- Conventional ELH for both ore and waste mining will minimise equipment interaction in small pits;

- The short haul distance from the Moonshine and Banjo deposits is suitable for conventional mining trucks; and
- The unit cost rates are lower.

All mining is assumed to be by contract, with mine technical services being provided by the owner.

16.2.2 Ore Haulage - Pit to ROM

The distance from the mine pits to the ROM pad vary from 1 to 3 km for the Moonshine and Moonshine North magnetite deposits. The distance from the ROM for the hematite pits range from 2 km for Banjo, 8 km for Central and 27 km for Snark.

Options considered for delivery of ore from pit to ROM include

- Conventional haul trucks for up to 4 km;
- Conventional road trains from pit rim to ROM pad; and
- Dual Powered road trains from pit loading to ROM pad.

Overhaul rates for conventional haul trucks were sourced from MACA, tonne km rates for conventional road trains were based on quotations sourced from Wagners for concentrate haulage, and a budget quotation was sourced from BIS Industries for the dual powered road trains.

Table 52. Ore Haulage Comparison

Method	Advantages	Disadvantages	Estimated Cost
Conventional Haul Trucks	No rehandling required Suitable for pit work	Not Applicable on longer hauls	Overhaul $0.07/bcm/100m, equiv $0.27/tkm
Conventional Road Trains	Able to haul long distances Readily available for contract work	Not suitable for in pit work Ore requires rehandling Greater ROM pad stockpile maintenance required	$0.12/tkm plus $1.00/t rehandle costs
Dual Powered Road Trains	No rehandling required Able to haul long distances	Less suited to small pit operations Greater ROM pad stockpile maintenance required Specialised equipment	$0.26/tkm, including loading but excluding road maintenance, workshop facilities

16.3 Hydrogeology

Hydrogeological studies for the Ularring Hematite Project area have been performed by Groundwater Resource Management Pty Ltd (GRM). As part of their brief during the November 2011 Scoping Study, GRM designed and conducted an exploration drilling programme to assess dewatering requirements for the Snark deposit. The results of the dewatering exploration drilling found that:

- Yields from all exploration and monitoring bores were very low, below 0.1 l/sec. Inflows did not increase noticeably with lithology or identified structural features; and
- Water levels along the deposit ranged from 410 to 427m RL, indicating a flow direction towards the west, consistent with the regional concept of groundwater flow.

Proposed mining at Snark is expected to be predominantly above the standing groundwater level and would require minimal pit dewatering.

Based on the above results, pit dewatering is unlikely to be a significant mining factor for the hematite deposits.

Additional investigations may be required prior to the development of the Central and Banjo hematite deposits and the Moonshine magnetite deposits which are deeper and more likely to intersect groundwater.

16.4 Waste Storage

16.4.1 Mine Waste

The potential to encounter Potentially Acid Forming (“PAF”) material during mining and the potential for AMD is being considered by MIO. A Waste Characterisation study was conducted by MBS Environmental Pty Ltd (“MBS”) for the November 2011 Scoping Study. This study involved geochemical testing of the main waste rock types associated with the proposed Snark deposit. Initial results suggested that some highly weathered material has the potential to produce a moderately acidic leachate (pH between 3.5 and 4). This waste material generally occurs between 10 to 40 m below ground level and is associated with aluminium rich minerals that have been produced by the oxidation of sulphidic materials over a long period of geological time. It is anticipated that these materials would be easily managed by engineering and design mechanisms.

The detail of the MBS report was reviewed by Graeme Campbell and Associates (July 2012), specialists on mine waste geochemistry to assist with interpretation of the results. Sampling was considered adequate for the mineralisation of the Snark deposit, and its location in the Yilgarn block. All samples were classified as Non-Acid Forming (“NAF”), with samples that are acidic labelled as NAF-[low pH]. These NAF [low-pH] lithologies are the pallid/saprolite zones that are naturally acidic and are devoid of sulphide minerals. These materials are not uncommon in the waste regolith profiles of the Yilgarn. They will be easily identified during detailed mine planning and this will allow planning of their burial within the waste dumps.

Planning for erosion control and physical stability of the final waste landforms will be of high priority.

Waste characterisation studies for the Central, Banjo and Moonshine deposits will also be considered after assessment of the similarity in geology and lithology to the Snark deposit.

Should PAF materials be identified, this waste will be placed in designated waste or tailings dumps. PAF material waste dumps would be designed and constructed in accordance with the EMP using common industry best practice to reduce the risk of AMD formation and to ensure dumps are effectively decommissioned and rehabilitated at closure.

17 Recovery Methods

17.1 Ore Processing

The development of the concentration process for the Project would be influenced by several key elements. These include conservation of water, minimum power consumption, the competent and abrasive nature of the ore, and the presence or otherwise of asbestiform minerals within sections of the mineralisation. (Though the probability of the presence of asbestiform minerals is low, mineralogical test work should be carried out at an early stage to resolve the question). Whilst addressing all of these issues the processing plant must also achieve efficient and economic recovery of the contained magnetite.

The Hematite resource is distinct from the magnetite zones and only requires appropriate selection of high grade ore to obtain the required grade. This material would be subjected to conventional 3 stage crushing and milling to allow mixing with the magnetite product.

A flowsheet to the operation is shown below in Figure 79

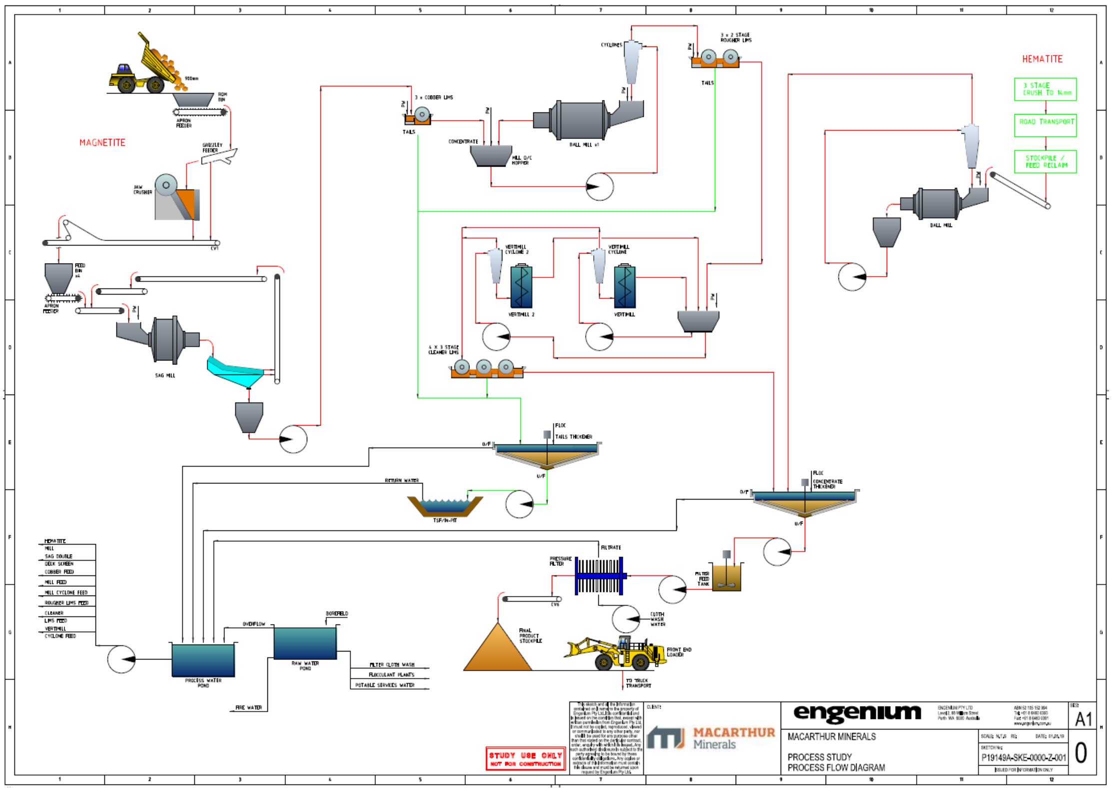

Figure 79. Conceptual Project Flowsheet

17.2 Magnetite Processing

For this order of magnitude estimate, a general concept plant is described. An accurate process flow representation cannot be developed until further metallurgical testing is undertaken. However most elements that may be required have been described below and shown in Figure 79.

In order to produce 2.5 Mtpa concentrate, assuming a weight recovery of 38%, an estimated 6.6 Mtpa of feed to the process plant would be required. The first stage is primary crushing to a size suitable for feed to a Semi Autogenous Mill.

It is likely that the primary crusher(s) would be located close to the plant operation. The coarse ore would be stored in a stockpile to supply surge capacity between the mine and the plant.

Primary milling would be by Semi-Autogenous grinding in closed circuit with screening to produce an appropriate size to feed the first stage of wet low intensity magnetic separators (LIMS), known as cobbers. The cobbing stage should reject the initial tailings while maintaining a high level of magnetite recovery. A coarse tails is produced at this stage and, as water is often of major consideration in tailings treatment, a water recovery system should be included.

Cobber concentrate would need to be reduced again in size. A ball mill would be used in closed circuit with cyclones for this purpose. The cyclone overflow would be the feed stream for the rougher LIMS stage.

Assuming the Lake Giles ore has similar characteristics to other Australian magnetite ore bodies, it is likely that a third stage of grinding to 80% passing 30 to 45 micron would be required. This duty is best suited to a pair of fine grinding mills such as the Vertimill. The product from these mills would feed the finishing stage of magnetic separation. This is a three stage drum which gives a progressively cleaner product grade and helps to eliminate any contamination due to entrapment.

17.3 Hematite Processing

The hematite material would be mined from the deposits at a grade that allows blending with the magnetite to make a saleable product.

The ROM material would be fed to a Grizzly feeder to allow fine material to bypass the Jaw Crusher. After this initial size reduction the material would be screened by double decked screens. These would remove the product material and divide the coarse material into secondary and tertiary crusher feed. These two streams would be crushed in cone crushers and then mixed with the Screen Feed material.

This material would be transported to a milling circuit to grind the mill to a size suitable for mixing with the Magnetite concentrate.

17.4 Tailings Storage

The tailings are the non-magnetic products from the concentrator. The size of the tailings disposal task cannot be underestimated. Approximately 57% of the feed to the crushing and concentration operations reports to the tailings circuit. For this study it has been assumed that the dewatering process will be a whole-of-stream process, but can be optimized in future designs.

Future studies are required to establish a suitable location for the tailings dam and its associated water recovery systems.

18 Project Infrastructure

18.1 Introduction

At this early stage of the Project several alternative options have been identified for the Project. Future studies would be required to determine the best option for the Project.

18.2 Logistics

Product will be transported from the mine by road to a rail siding, at or near the Jaurdi station, 90 km south of the Project (Figure 80) and then onto the Port of Esperance for export. Road haulage will be along a private haul road utilising quad road trains with side tip trailers, stockpiling at the rail siding, rail transport with standard ore wagons to the Port of Esperance, unloading by Rotary Car Dumper, stockpiling in a covered shed, reclaim and loading onto ships via the No3 berth ship loader. The following section describes this logistics path in more detail.

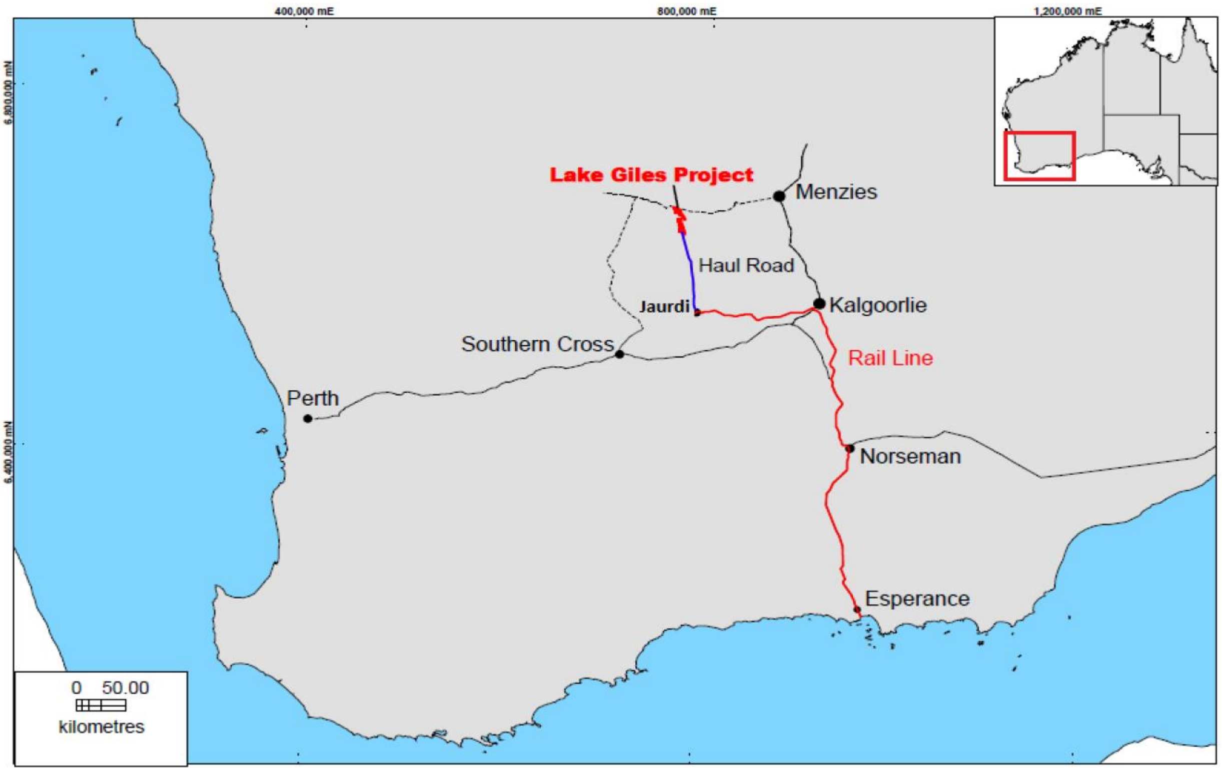

Figure 80. Ularring Hematite Project Logistics Route

18.2.1 Road Haulage

In order to reduce operating costs, road haulage needs to maximise payloads and minimise haulage cycle times. To achieve this outcome the largest possible truck configurations are required and the condition of the road needs to be at a high standard to maintain the higher speeds required for optimal cycle times.

The heaviest available haulage configuration for a public road is defined by the Western Australian Main Roads Department (MRWA) and is a Restricted Access Vehicles (RAV) network 10 (RAV10) standard. Based on this standard the largest configuration possible on a public road is a quad trailer side tipping road train with approximately 112t concessional payloads.

An option for the Ularring Hematite Project was previously explored using the existing Evanston-Menzies public road, owned and maintained by the Shire of Menzies. This option still requires a capital investment to bring the road to a standard suitable for the tonnages proposed and will incur higher operating costs due to reduced payload efficiency. In addition, the rail line from Menzies to Kalgoorlie will require substantial upgrades compared to the proposed route.

However, for haulage along a private haul road, the above criteria does not apply and configurations allowing greater payload can be utilised. Road haulage for the Project will be along a dedicated haul road to be constructed from the Moonshine deposit to a rail siding 90 km south and adjacent to the Perth-Kalgoorlie rail line near the Jaurdi station.

The quad trailer side tipping road trains of 180 tonne payload will be loaded at the Mine Operations Centre (MOC) product stockpiles via Caterpillar 988H size or equivalent wheel loaders. Loaders will require calibrated load cells to ensure consistent and accurate loading of all tucks to maximise payloads without exceeding allowable vehicle axle load limits. A typical road train contemplated is shown in Figure 81.

Figure 81. Typical Quad Side Tipper Road Train

There may be potential to access the sealed haul road owned by another iron ore producer at the Carina mine south of the project. Should this be achievable, only 45 km of haul road will need to be constructed.

Similarly, it may be possible to negotiate access to the Carina rail load-out which is currently not being used as the Carina mine is finished. These options should be considered in future studies.

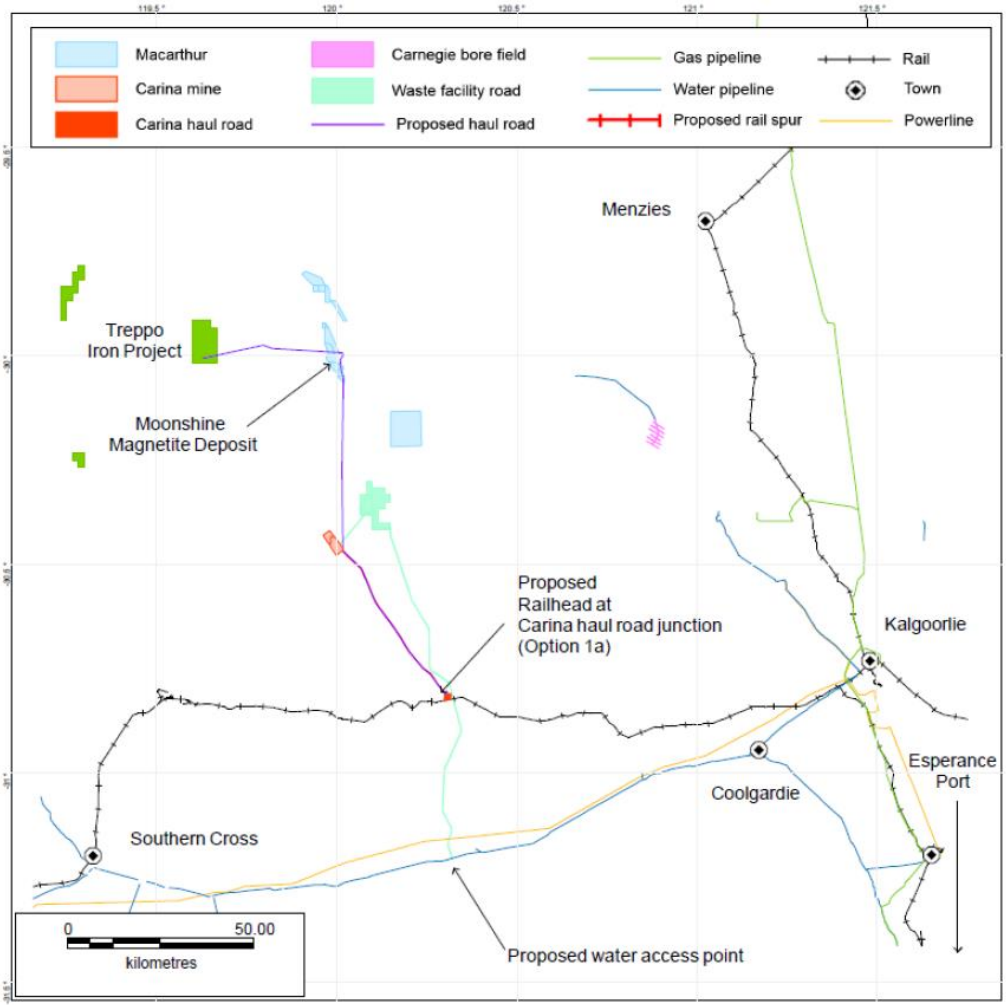

Figure 82. Carina Haul Road and Siding Option

18.2.1.1 Long Haul Services

The responsibility for transporting product from the MOC product stockpiles to the Jaurdi rail siding will be contracted out to a specialist long haul contractor with the benefits of offsetting capital expenditure, better haulage efficiencies and reduced operational costs. The services include all vehicles, plant, equipment and offices necessary for the provision of the services. The contractor will also have responsibility for stockpile management and train loading at the rail siding.

Typical Long Haul Contractor facilities would include:

- administration offices
- workshops
- refuelling

- services such as power, communications, IT, water, compact sewage treatment and waste water treatment
- turkeys nest or tanks for storage of water for dust suppression activities
- Wash down bay including oil-water separator
- Waste management facilities.

18.2.1.2 Rail Loading

A dedicated rail siding and product handling facilities is planned south of the Project to manage the transfer of product from road transport to rail transport.

There will be two permanent hardstands established of 2 x 30kt stockpiles (approximately 10 days product storage to allow for road closure events) to accommodate the unloading of the product from the quad side tipper trailer road trains, stockpiling and the loading of the rail car wagons by wheel loaders.

The stockpiles will be located 1/3 and 2/3 along the rail siding to provide two main load points areas to maximise load rates and also reduce the length of siding required, further reducing the required upfront capital.

18.2.2 Rail Logistics

18.2.2.1 Below Rail

The rail path from the Jaurdi rail siding to Esperance is approximately 500 km of standard gauge rail suitable for bulk ore wagon transport.

The rail line from the siding to the Port of Esperance is managed by Arc Infrastructure (Arc) under a lease agreement with the Western Australia Government. Arc Infrastructure is owned by global asset management company, Brookfield Infrastructure Partners and operates the rail under an open access regime.

Macarthur has made enquires with Arc and confirmed there is available capacity on the rail line to accommodate the Project. Additional capacity has recently become available given the downturn in production of the neighbouring Koolyanobbing operation and closure of the Carina operation which both utilised capacity on the rail.

Indicative pricing for rail access has been provided by Arc.

18.2.2.2 Above Rail

Macarthur has entered into an Exclusive Negotiation Agreement with Aurizon for rail haulage services. Aurizon is an ASX listed company and Australia's largest rail freight operator delivering over 40 Mt of commodities a year with its coal business transporting over 200 Mt annually. Aurizon transports magnetite concentrate and hematite ore in the mid-west of WA and previously transported up to 11.8 Mtpa from the adjacent Koolyanobbing mine to the Port of Esperance.

Aurizon has confirmed they have sufficient rolling stock capable of transporting magnetite concentrate and compatible with the Rotary Car Dumper at the Port of Esperance.

Budget pricing estimates have been obtained from Aurizon for the rail haulage cost between rail siding and the port at Esperance.

18.3 Port

The Project is centrally located between a number of ports in Western Australia's South-west. The preferred port is the Port of Esperance operated by Southern Ports Authority (SPA). Refer to Figure 83.

With the completion of a $54 million port upgrade project in February 2002, the Port of Esperance became the deepest port in southern Australia, capable of handling Cape class vessels up to 200,000 dwt, plus fully loaded Panamax class vessels up to 75,000 dwt.

Iron ore exports through the Port of Esperance are licenced to 11.5 Mtpa with current export around 6 Mtpa due to major reduction in production from the only iron ore operator. The Port of Esperance is also a major grain exporting hub and handles bulk imports such as fuel, sulphur and fertilisers. The port currently handles over 200 ships per annum and more than 11 million tonnes of trade.

The Port is located on the north eastern side of Dempster Head. It is sheltered from the south by a 1200 metre breakwater. The channel and turning basin for Berths 1 and 2 covers 27 ha and is dredged to 14.5 metres. Number 3 berth is currently utilised for all iron ore shipments.

Macarthur has held recent discussions with the SPA to identify an export solution.

18.3.1 Rail Unloading

There is an existing RCD at Esperance Port, owned by Mineral Resources Limited (MRL) and maintained by SPA. The RCD has capacity for 12 Mtpa and is currently underutilised with MRL nominating capacity of 5-6 Mtpa and expansion plans to 8 Mtpa by 2020. MRL is the only user of the facility and additional capacity is available. The terms of MRLs ownership requires unallocated capacity to be made available to other operators.

Macarthur intends to utilise the existing RCD at the Port.

Berths (Red Numbers)	Storage Facilities (Yellow Numbers)
1. Berth No. 1 – Grains 2. Berth No. 2 – Mineral Concentrate, Fertiliser, Fuel 3. Berth No. 3 – Iron Ore	1. Shed 1 - Iron Ore 2. Shed 2 - Iron Ore 3. Shed 6 - Mineral Concentrate 4. Shed 7 - Mineral Concentrate 5. Shed 5 - Mineral Concentrate 6. CBH Operations 7. Summit Fertilisers 8. Gas Fired Power Station 9. Shed 3 - Iron Ore 10. Shed 4 - Iron Ore 11. Shed 10 - Sulphur 12. Container Storage Area
General Infrastructure (Green Numbers)	
1. Rotary Car Dumper 2. Smith Street Level Crossing 3. Potential Shed Storage Area	

Figure 83. Port of Esperance Aerial View

18.3.2 Iron Ore Storage

The environmental conditions of the Port's operating licence require iron to be stored in a sealed shed to minimise the impacts of dust.

The Port has four sheds designated for iron ore storage but at present are owned or leased by another operator.

The Port has land available for the construction of up to two (2) new storage sheds inside the port yard which typically hold 300,000 tonnes of iron ore each (storage is equivalent to two cape size vessels). Macarthur has engaged with SPA and is currently negotiating a development agreement for construction of a new storage shed.

Preliminary designs and budget pricing for a shed and modifications to the existing conveyor network has been provided by Kerman Contracting. The preliminary design is shown in Figure 84.

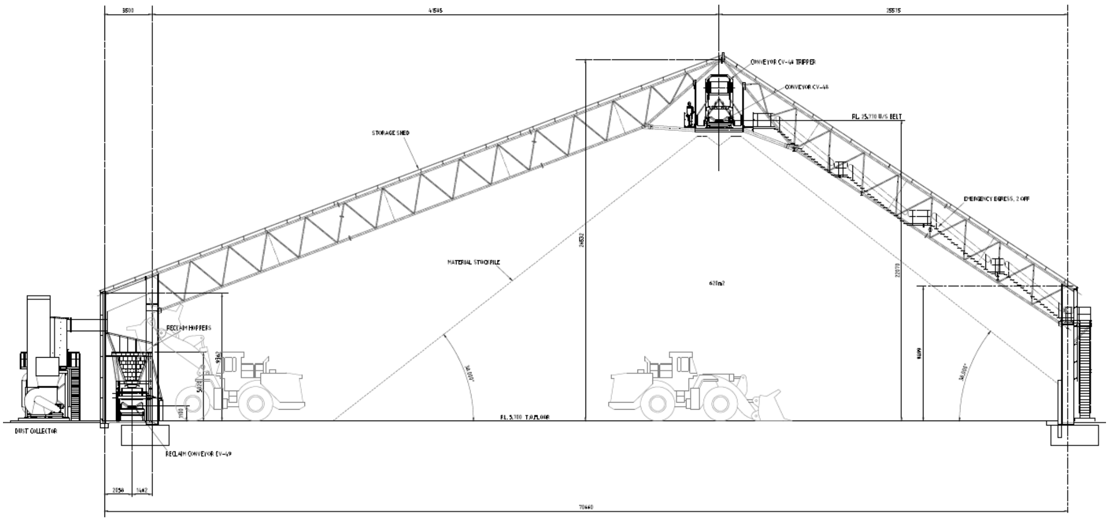

Figure 84. Cross section design for storage shed at Port of Esperance.

18.3.3 Ship Loading

Iron ore loading rates, at Berth 3, of up to 4,500 tonnes per hour are obtained by a travelling ship loader with an outreach suitable for vessel beams of up to 47 metres. The berth is 230 metres long with a depth alongside of 19.0 metres and it can accommodate ships with a maximum LOA of 290 metres and a draft of 17.8 m.

Figure 85 shows an iron ore vessel moored to the number 3 berth.

The capacity of the existing ship-loader is approximately 16 Mtpa with exports targeting 5-6 Mtpa allocated to MRL.

Figure 85. Iron ore loading at number 3 berth

18.4 Infrastructure

The Project will comprise a fully serviced remote area mining and processing hub that will be supported by a fly in fly out (FIFO) work force supplemented by Kalgoorlie located personnel.

18.4.1 Power

18.4.1.1 Power Generation and Reticulation

A 20 MW power supply would be required for the magnetite process plant including the hematite milling circuit. This power station would also supply the power to the main MOC. It has been assumed that this power supply would be provided by a combination of diesel and renewables constructed on site adjacent to the processing plant.

Additionally, a 4 MW power supply would be required for the hematite crushing and screening circuit and would also supply the mobile/satellite hematite MOC. This power supply would be provided by mobile generators.

The camp would have its own power generator of the order of 1-2 MW.

18.4.2 Process and Potable Water Supplies

The total water requirement for the Project is estimated to be 2 Gl per annum.

It is important to develop a comprehensive understanding of both the hydrogeology and water quality within the area. Rockwater completed an initial desktop assessment of groundwater availability for the Lake Giles Hematite Project.

18.4.2.1 Potable Water Supply

The Rockwater study concluded that water supplies for the Hematite Project and for the accommodation camp should be available from aquifers in the Project area. The camp water requirement is estimated at 250 litre per person per day.

A bore would be constructed to source water from the aquifers in the Project area. This water would be used for supply of potable water and for other non-process uses.

A small treatment plant, such as UV filtration or reverse osmosis, would be used to treat the water to provide a supply of potable water.

18.4.2.2 Process Water

The process water requirement is calculated at 214 kl/hr. Three options are currently being explored:

- Access to water from closed and abandoned open cut mine pits within a 75 km radius of the Project. Several mine pits no longer in use have been identified within 45 to 75 km of the Project with potential to supply 2 Glpa.
- Access to local water supply pipelines including potential access to the Kalgoorlie pipeline. The Kalgoorlie pipeline sits approx. 120 km to the south. Discussions with WaterCorp indicate fresh water could be purchased subject to an infrastructure contribution.
- Bore field development. The region is likely to host sufficient water from the palaeochannel although quality is likely hypersaline.

18.4.2.3 Hydrogeology

According to Rockwater (2010), a palaeochannel aquifer is inferred to exist beneath the Rebecca palaeodrainage west of the Project area. The aquifer is a potential source of large supplies of groundwater, although the groundwater is probably hypersaline. During the initial desktop assessment, Rockwater was unable to identify any large quantities of low salinity groundwater within the project area.

The closest confirmed sources of large supplies of low-salinity groundwater are palaeochannel and calcrete aquifers north of Leonora and Laverton (greater than 150 km); and sediments in the Perth Basin (greater than 400 km). These aquifers have already been extensively developed for water supplies.

18.4.3 Fuel Facilities

The main refuelling facility considered for this Project is a packaged facility supplied 'complete' from the fuel supplier. The facility would consist of a master self bunded tank which incorporates all the necessary pumps, hoses and appurtenances to enable the refuelling of heavy mining equipment, light vehicles and power station, and all of the necessary equipment to facilitate the refilling of the fuel facility via truck tankers.

The fuel supply would be adjacent to the power station would supply fuel to the power station via a direct feed between the fuel facility and the power station. The fuel supply would also be used to refuel mining vehicles, haulage trucks and light vehicles. A fuel truck would be used to refuel the camp power supply and other plant.

Self-bunded slave tanks of similar capacity may be added to the master tank as required, to obtain the necessary capacity for the mining operation.

Other than impervious concrete slabs located at the refuelling and refilling points, no other infrastructure associated with the fuel farm is envisaged.

The proposed fuel facility is supplied complete with fuel management equipment and systems that allow tracking and management of fuel consumption per consumer or groups of consumers. Automatic electronic re-ordering from the fuel supplier is possible, and the system facilitates contracts management during construction in the event that fuel is free-issued to construction contractors.

The fuel for the hematite MOC requirements would be the mining contractor’s responsibility.

18.4.4 Communications

During the operation of the mine and for the duration of the construction phase, it is anticipated that trailer mounted VSAT broadband units would be utilised to establish voice and data communications via a satellite network. This solution is inherently flexible and can be adapted to the changing requirements during initial site establishment, construction and subsequent mining operations.

A conventional VHF radio system would allow communications coverage for the minesite, plant area, first aid, camp and some of the highway and haul route. Four (4) channels are needed to allow for an emergency channel, general mine traffic, contractor's channel and a spare. VHF Radio base stations would be placed around the camp and mine site offices to ensure first aid and emergency communications are readily available. All vehicles shall have at least one (1) hard wired VHF radio.

It is expected that the mining contractor would provide radio base stations and mobile units as required for the mining operation. Any additional construction contractors would be expected to provide radio communications equipment as required for their works.

18.4.5 Access Roads and Plant Area Roads

The project can be accessed by heading 130 km north from Kalgoorlie via the sealed Goldfields Highway to the township of Menzies and then 115 km from Menzies via the graded Evanston-Menzies road.

A 30 km internal access/haul road would be established to link to each of the MOC locations (Snark/Drabble, Banjo/Central and Moonshine) and the camp with the Evanston-Menzies road.

The internal haul road between the hematite MOC locations and the magnetite MOC would be established to deliver hematite product to the ball mill circuit at the magnetite processing plant to enable blending of the hematite fines with the magnetite concentrate.

18.4.6 Mine Administration Facilities

The main (magnetite) Mine Operations Centre would include the following:

- Run of Mine (ROM) pad
- offices
- meeting rooms
- crib room
- ablutions
- storage rooms
- workshop
- access roads
- internal roads
- light vehicle car park
- heavy vehicle car park
- sewerage storage and treatment
- raw water supply and storage
- water treatment and potable water storage
- power
- communications
- fuel farm
- truck wash facility

- waste collection and storage,
- dangerous goods storage facility
- magazine
- ANFO facility.

The hematite Mine Operations Centre would largely comprise mobile demountable buildings and be limited to a satellite office, crib, ablutions and space for contractor's facilities.

18.4.7 Accommodation

It is estimated that a 350 man camp would be required to support both the magnetite operation and the hematite operation including the haulage contractor staff. Initially, the camp would accommodate mine construction contractors, with mine operations contractors accommodated in the longer term for the duration of the mine's life. Some downsizing of the camp may be possible once construction is complete.

The 350 man camp would include:

- offices
- meeting room
- accommodation for construction and mine operations
- sewerage storage and treatment
- raw water supply and storage
- water treatment and potable water storage
- laundry
- kitchen
- dry mess
- wet mess
- access roads
- internal roads
- light vehicle car park,
- heavy vehicle car park (for service delivery vehicles, semi-trailers, fuel tankers, water tankers, etc)
- sporting and recreational facilities, including:
    - pool
    - gym
    - library/TV room

19 Market Studies and Contracts

19.1 Marketing

Information of current and forward product demand characteristic, product marketing and pricing were supplied by Glencore as well as published research reports by Credit Suisse, TD Securities Inc, Macquarie Bank research, Steel Orbis Bulletins, Global Mining Research and major global iron ore producers and marketers (BHP published price and market) forecasts.

On the 21 March 2019, Macarthur Minerals Limited announced the entering into binding Offtake and Marketing agreement with Glencore. Transaction Highlights:

- Glencore secures life-of-mine of the project with commercial terms for approximately 4 million tonnes per annum average for the first 10 years, with the option to extend for a following 10 years for all tonnes of future Lake Giles iron ore production.
- Glencore agrees to release up to 70% of their off-take volume where Macarthur secures project financing from a Strategic Industry Investor, subject to their securing off-take of the product produced.
- Glencore will take possession of the iron ore once it is being loaded onto a vessel for export.
- Glencore is responsible for the marketing, shipping, delivery and associated freight insurances.
- This Agreement with Glencore positions Macarthur to go forward to complete their project financing.
- Terms and conditions have been competitively negotiated reflecting strong forward demand.

19.2 Iron Ore Market

This section outlines the supply and demand characteristics of the global iron ore market focusing on Australasia and China as the key producers and customers.

- Close to 75-100 Mt (Credit Suisse,16 April 2019) of iron ore has been taken from global supply during 2019. Key drivers have been:

    a. Vale tailings dam disasters; and
    b. Production forecast downgrades and value by Rio/BHP due to weather impacts (cyclone Veronica in Pilbara region, Western Australia)

- BHP reports global contestable iron ore demand was estimated to have increased by 2% in 2018 YOY (+34Mt) to total of 1,589Mtpa.

- BHP's Economic and Commodity Outlook (19 February 2019) reported:

a. In 2017/18 China iron ore imports grew by 4-5% to 1,075 million tonnes.
b. China's imports of iron declined – 0.9% to 1,095Mtpa
c. Seaborn major (iron ore producers) delivered a +50Mtpa expansion to supply during 2018 up 5-7% YOY.
d. Lower grade, high impurity ores continue to attract heavy discounts.
e. Chinese domestic iron ore production was estimated at 196 Mtpa during 2018, a + 2.6% YOY increase.

- All steel mills in the cities of Tangshan, Handan, Shijiazhuang and Xiangtan must meet ultra-low emission standards by the end of 2019. (Platt – Credit Suisse 16 April 2019, Page 10)

- Chinese trade data for April 2019 revealed iron ore imports declined to 80.8 million tonnes during the month, down 6.5% from March and 2.6% from 12 months ago. This pull back has been attributed to supply disruption in Brazil and Australia, rather than weak demand.

- Orbis Bulletin, 14 May 2019, reported "global iron ore prices have started this week with a downward moment due to the decline in Chinese steel futures market and a depreciation of Chinese yuan against the US dollar. Last week, the Chinese Ministry of Ecology and Environment stated that steel producers should target ultra-low emission levels in order to improve air quality. As a result, steel producers have started to increase their demand of higher quality iron ore in order to decrease emission levels and this situation has supported the upward movement of high quality iron ore prices due to concerns regarding tightness of supply.

  Figure 86 outlines the moving average monthly iron ore price over the past decade.

Figure 86. Historical iron ore price

19.3 Steel Outlook

Crude steel output had a strong start to the year:

- WBS official output +9% Year On Year(YOY) (+19Mt) 1Q19
- Contracts with a -4% YOY 1Q19 iron ore imports
- China import circa 86% of iron ore input requirements for its steel production.
- The short fall is currently being covered by:-
  a. Domestic iron ore production increases,
  b. Iron ore inventory shifts’
  c. Increase use of scrap metals and also
  d. the move to higher grade/low impurity iron ore may also assist this supply gap

19.4 Global Economic Growth

- World growth is forecast to be around 3% near term in line with 2018 & 2017
- BHP’s Economic and Commodity Outlook (19 February 2019) reported:-
  a. Global economic growth 3.75% during 2019 with strong outcomes in India and USA offsetting slower growth in China, Europe and Japan.
  b. Looking ahead, we (BHP) expect world GDP growth to fall in a range of 3 ¼ to 3 ¾ % in both calendar year 2019 and 2020. The IMF’s

January forecast now positions this expectation of world GDP growth in the middle of our (BHP's) GDP range.

c. The US dollar strengthened over the last 12 months on a real trade weighted basis and is now 7% higher YOY.

19.5 China

BHP's Economic and Commodity Outlook (19 February 2019) reported Economic growth to slow modestly with real DGP in a 6 to 6.7 per cent range for 2019/20.These forecasts reflect the likely impact of US trade protection on the export sector as well as an appropriate calibrated countervailing domestic policy response for China.

19.6 Forecast Pricing – 2021 to 2030

BHP reports their Iron ore pricing (62% Fe CFR) 2018 ranged from US$63Dmt to US$77Dmt and averaged US $69Dmt during 2018/19

- Price impacts have been measured given China's;
- Steel mill winter restrictions (CISA advising steel mills not to restock this year)
- De-stocking at Ports and by mills to meet production output. Credit Suisse (16 April 2019) report port stocks in China at 55Mt with 25Mt being held by Vale available for sale. Total stockpiles estimated at 142Mt.
- Global commodity traders are suggesting the spread between 62%Fe and 65% Fe will widen, supported by improved steel margins and environmental constraints.
- Commonwealth Bank of Australia Mining & Commodities Research Senior Analyst, Vivek Dhar quoted in Metal Bulletin (May 2019) "the spot price for benchmark 62% fines slipped 0.6% to US$95.57 per tonne, 58% fines fell by a smaller 0.3% decline to US $83.15 per tonne while 65% fines slid 0.5% to US$109.80 per tonne."

19.7 Project Iron Ore Pricing

Iron pricing for this study is based on a consensus view of several broker reports described above and a comparison of historical broker forecasts against actual pricing over time. Iron ore pricing and assumptions used in the economic analysis are shown in Table 54.

The pricing mechanism is based on the 65% Fe fines index as the product grade ranges from approximately 65% in the first five years before increasing to a nominal 68% Fe product as hematite blending stocks are exhausted. Realised pricing has been adjusted for iron grade on a dmtu basis. FOB pricing has been adjusted for sea freight from the Port of Esperance, Western Australia to Qingdao, China.

A long-term pricing scenario of US$86/t has been employed in the base case scenario, adjusted for grade as above. This is considered a conservative forecast in comparison to pricing throughout 2019 and in line with pricing throughout 2017/18.

Throughout 2019, the 65% Fe fines market has traded at low of US$95/t to a current high of $114/t. Historical pricing dating back to Q1 2017 has seen a low of $70/t and consistently traded above US$80/t from Q3 2017.

Sensitivity analysis has been performed for scenarios +/- 10% and +/- 20% against the base case price and detailed in Section 22.3.

Table 53. Iron ore and steel production supply demand balance

Chinese Crude Steel Production	**803**	**807**	**832**	**886**	**861**	**859**	**867**	**876**
YoY Growth	*-2%*	*0%*	*3%*	*7%*	*-3%*	*0%*	*1%*	*1%*
Rest-of-World Crude Steel Production	**817**	**820**	**859**	**885**	**928**	**948**	**968**	**989**
YoY Growth	*-4%*	*0%*	*5%*	*3%*	*5%*	*2%*	*2%*	*2%*
Global Crude Steel Production	**1,620**	**1,627**	**1,691**	**1,771**	**1,789**	**1,807**	**1,835**	**1,865**
YoY Growth	*-3%*	*0%*	*4%*	*5%*	*1%*	*1%*	*1%*	*1%*
Seaborne Iron Ore Supply (Mmt)								
Rio Tinto PLC	310	329	328	335	338	347	347	347
BHP Billiton	261	263	275	273	274	290	290	290
Vale SA	293	304	319	350	320	344	369	369
Other Exports	605	653	678	652	645	650	661	661
Total World Iron Ore Exports	**1,469**	**1,549**	**1,600**	**1,610**	**1,577**	**1,631**	**1,667**	**1,667**
YoY Growth	*8%*	*5%*	*3%*	*1%*	*-2%*	*3%*	*2%*	*0%*
Chinese Iron Ore Imports	953	1,025	1,075	1,079	1,083	1,085	1,085	1,087
YoY Growth	*2%*	*8%*	*5%*	*0%*	*0%*	*0%*	*0%*	*0%*
Rest-of-World Iron Ore Imports	463	449	463	474	482	488	494	501
YoY Growth	*12%*	*-3%*	*3%*	*2%*	*2%*	*1%*	*1%*	*1%*
Global Iron Ore Imports	**1,416**	**1,474**	**1,538**	**1,553**	**1,565**	**1,573**	**1,579**	**1,588**
	5%	*4%*	*4%*	*1%*	*1%*	*1%*	*0%*	*1%*
World Iron Ore Trade Balance	**53**	**75**	**62**	**57**	**12**	**58**	**88**	**79**
Source: Bloomberg, Australian Government - Dept. of Industry, Innovation and Science, World Steel Organization, Metalytics, TD Securities								

Table 54. Macarthur iron ore pricing assumptions

Iron Pricing Assumptions								
	2019	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**LT**
62% Fe Fines Benchmark Price, CFR, China (US$/t)	79	63	57	54	75	75	75	75
65% Fe Fines (US$/t), CFR, China	90	86	86	86	86	86	86	86
Exchange rate AUD/US	0.69	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Sea freight	8.40	10.0	11.0	12.0	12.0	12.0	12.0	12.0
AUD Inflation	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%
USD Inflation	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%

19.8 Marketing Risks

Given the forward looking nature of market analysis, there are several risks highlighted below (Table 55) that must be addressed under the broader project risk management protocols.

Table 55. Marketing Related Risks

Risk	Description
Market downturn	The GFC of 2008/2009 was largely unpredicted by the broader market until it was "almost upon us", it is not possible to predict a re-occurrence of this type of global event in the future.
Project delay	Speed to market is a key factor in the success of obtaining long term off take agreements for UHP iron ore fines tonnes production, should the project be delayed, these agreements will become more difficult for UHP marketing group to establish.
Pricing volatility	With price forecasts there is always a risk of incorrect prices (either high or low). Prices used by UHP in the evaluation of the project would be considered to be within the mid to upper range of the current range of estimates available. The forecast prices discussed in this analysis have been sourced from data compiled by Macquarie Research.
Ramp up delay	Project ramp up delays associated with both the mining capability and the port infrastructure to ship the 2Mtpa in a timely manner. The Port infrastructure has only a limited amount of storage and capacity to ship.
Inaccurate sampling and analysis	Key payment analytes are %Fe and dry tonnes. Poor sampling techniques may result in lower revenue than anticipated.

20 Environmental Studies, Permitting and Social or Community Impact

Environmental approval of the project will be required from various Decision Making Authorities (DMAs) of the Western Australian and Australian governments under various pieces of environmental legislation before the project can be implemented. To achieve these approvals, the Company is required to conduct an Environmental Impact Assessment (EIA) of the project area.

20.1 Current Approval Status

The Project includes resources from both the Ularring Hematite Project and the Moonshine Magnetite Project.

An impact assessment has been completed for the Ularring project and approval has been granted by the WA Environment Protection Authority (EPA) and Commonwealth Department of the Environment and Energy (DEE).

Further approval for the areas to be impacted by the magnetite operation is required.

20.2 Environmental Approval Process

The Department of Mines, Industry Regulation and Safety (DMIRS) is the WA Government body that administers the Mining Act 1978 and is the lead agency for the regulation of mining activities in WA. Approvals and advice provided by the DMP include:

- tenure for exploration and mining projects
- environmental approvals
- petroleum pipeline licences
- facilitation of native title agreements
- occupational safety and health
- dangerous goods

Other departmental roles include:

- Environmental Protection Authority (EPA) - assess and provide public advice on proposals likely to have a significant effect on the environment and develop statutory policy and advice to protect the environment.
- Department of Water and Environment Regulation (DWER) - regulate pollution and clearing of native vegetation; manage and regulate CALM Act lands and waters and provide advice on activities that affect these and manage and provide advice on biodiversity, wetlands, contamination, pollution and waste, and environmental harm; water licensing.

- Department of Aboriginal Affairs (DAA) - assessment and advice on proposals likely to have an effect on Aboriginal heritage; assessment and advice on access to and use of lands held by the Aboriginal Lands Trust and develop administrative policy and advice to protect Aboriginal heritage and manage lands held by the Aboriginal Lands Trust.
- Department of Health (DoH) - provide advice and guidelines on acceptable use and background levels of hazardous substances, provide permits to use some substances and regulation of Health Act, 1911.
- Local Government - Building Approvals.
- Commonwealth Department of the Environment and Energy (DEE) – Controlled actions under the EPBC Act.
- Department of Transport - integrated transport planning that arises from, and meets, the aims of land use planning; ensure all aspects of intermodal transport are taken into consideration; evaluating the transport economics of different transport solutions and there are no known projects where transport is not an important element in the delivery and ongoing operation of the project.

20.2.1 Primary approvals

As stated in section 20.1, the Ularring Project has approval to commence development under the WA EP Act and Commonwealth EPBC Act. An amendment to the current approval is required for elements of the Project where disturbance is planned outside of this area. The areas currently approved and where approval is yet to be granted is shown in Figure 87.

In accordance with Part IV, Section 38 of the EP Act, the Project will require referral to the Western Australian Environmental Protection Authority (EPA) for assessment. The EPA has a total of 28 days to provide one of the following levels of assessment:

- Assessment on Proponent Information (API)
- Public Environmental Review (PER)
- Not assessed – no public advice given
- Not assessed – public advice given
- Not assessed – recommended that the project be dealt with under Part V Division 2 of the EP Act (Clearing of Native Vegetation).

In the event that an API or PER level of assessment is determined, MIO will be required to submit an EIA document in accordance with EPA submission guidance notes as soon as practicable. The level of assessment expected for the project is considered to be set at an API. This assessment does not involve public review and can typically take 5-8 months to approve once the API document has been submitted to the EPA.

A Mining Proposal and Mine Closure Plan is required to be submitted to the Western Australian Department of Mines and Petroleum (DMIRS) and assessed under the Mining Act 1978 (WA) (Mining Act) prior to the commencement of any construction and/or mining activities. MIO anticipates submission of these documents to the DMIRS in late 2012 once further information is available on mine design and processing requirements.

A Mining Proposal is usually processed within a target timeframe of 30 working days from submission. More time may be taken if insufficient information is provided by the proponent.

Due to the presence of Matters of National Environmental Significance (NES) within the project area, the Project will be referred to DEE to determine whether it requires formal assessment under the EPBC Act.

20.2.2 Secondary approvals

The secondary approvals pathway requires the following:

- preparation of a Clearing Permit Application to be submitted to DMIRS and assessed under the Mining Act (only required if the Project is not assessed under Part IV of the EP Act).
- preparation of Works Approval and Operating Licensing applications to be submitted to DWER and assessed under Part V of the EP Act.
- preparation of Section 18 applications to be submitted to the Western Australian Department of Aboriginal Affairs (DAA) and assessed under the Aboriginal Heritage Act 1972 (WA) (AH Act).
- preparation of Section 5C and 26D licences to be submitted to the Western Australian Department of Water and Environment Regulation (DWER) and assessed under the Rights in Water and Irrigation Act 1914 (WA) (RIWI Act).

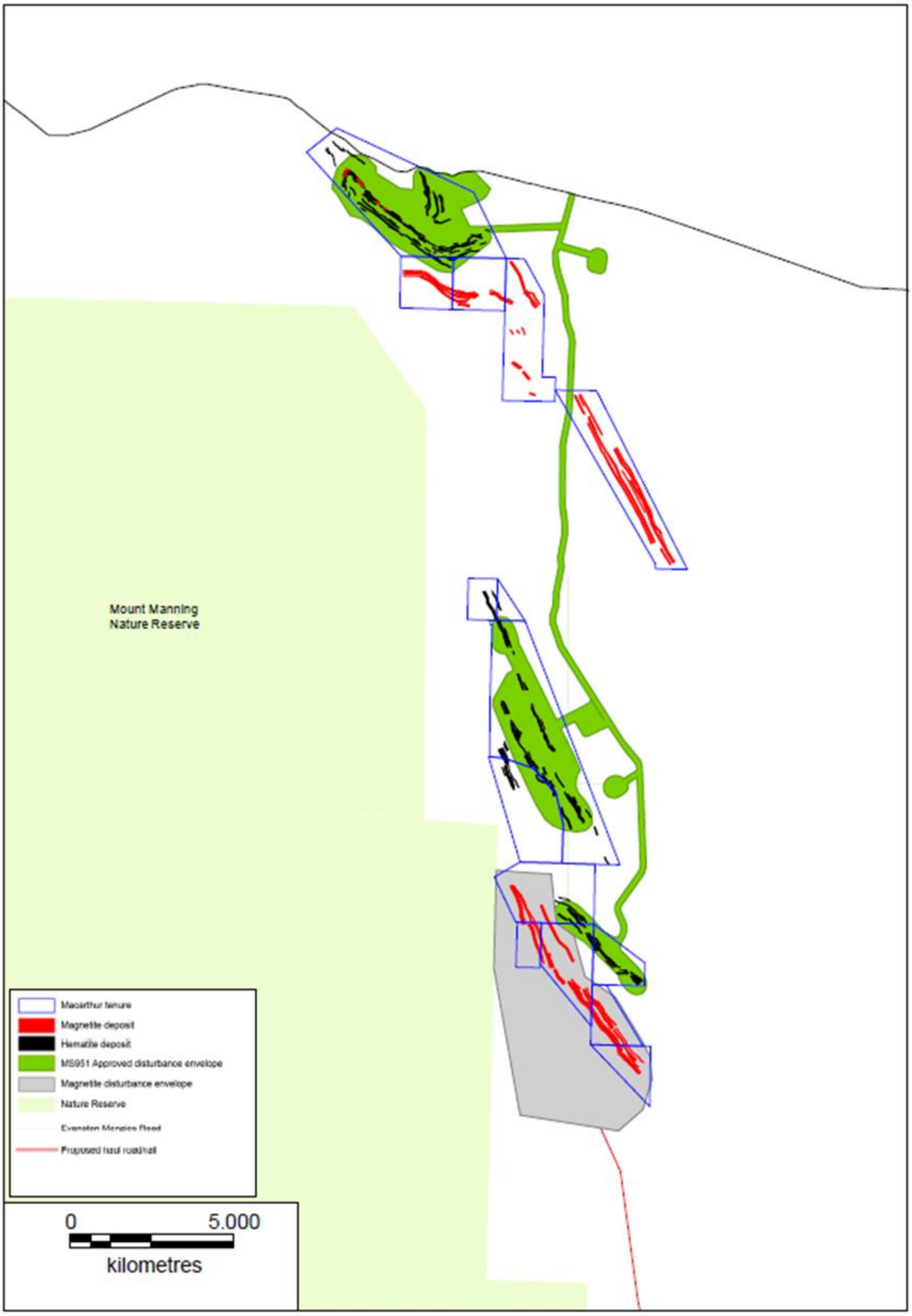

Figure 87. Environmental approval area and area to be approved for mining

20.3 Land Access and Native Title

20.3.1 Legislative Requirement

Aboriginal cultural heritage remains are a record of the past occupation of the landscape by Aboriginal people. There is the potential for isolated Aboriginal archaeological artefacts (e.g., stone tools or surface scatters such as shell middens) or sites to be present on land within the Project area. The Department of Aboriginal Affairs (DAA) regulates the disturbance of aboriginal sites by submission of a Section 18 Notice should a site need to be impacted. Survey reports are required identifying the location and significance of any Aboriginal Heritage Sites and to what extent such sites would impact upon the project proposal.

A MoU between DMIRS and DAA ensures that potential disturbance of registered heritage sites, acts as a trigger for DAA referral.

The Federal Native Title Act 1993 provides for the recognition and protection of native title. This Act recognises and protects native title. It provides that native title cannot be extinguished contrary to the Act. Essentially, this Act covers the following:

- acts affecting native title
- determining whether native title exists and compensation for acts affecting native title.

There are two kinds of acts affecting native title:

- Past Acts (mainly acts <u>done</u> before this Act's commencement on 1 January 1994 that were invalid because of native title); and
- Future Acts (mainly acts <u>done</u> after this Act's commencement that either validly affect native title or are invalid because of native title).

20.3.2 Native Title

For the purposes of claim management, the State is divided into six claim regions, Kimberley, Pilbara, Geraldton, Central Desert, Goldfields and South West. Each of these regions has a federally funded statutory body that is available to assist Aboriginal people in the preparation of their native title claim applications. The region applicable to this Project is the Goldfields region whose Native Title Representative Body is the Goldfields Land and Sea Council Aboriginal Corporation.

The relevant claim for the Project is the Marlinyu Ghoorlie (WC2017/007, WAD647/2017). This claim covers approximately 98,730 square kilometres of land in the Goldfields region. It lies in the City of Kalgoorlie-Boulder and the Shires of Coolgardie, Dundas, Menzies, Merredin, Mukinbudin, Narembeen, Nungarin, Westonia and Yilgarn.

The status of the claim is that it was accepted for registration on 28 March 2019. It is important to note that the Mining Leases were granted prior to registration of the claim and the claim therefore has no impact on the current Mining Leases or Mineral Resources.

As there was no native title claim at the time of grant of the Mining Leases, the Company is not subject to any access agreements affecting the current tenure.

20.3.3 Aboriginal Heritage

The Western Australian Department of Aboriginal Affairs (DAA) administers the Aboriginal Heritage Act 1972 (AH Act) which provides protection for all places and objects that are important to Aboriginal people through the connection to culture. The AH Act protects Aboriginal sites whether or not they have been previously reported.

There are no registered Aboriginal heritage sites located within the Project area of the current Mining Leases. There are a number of mythological sites located to the east of the greater MMS tenement area but these sites were identified by the DAA to have insufficient information and subsequently are not registered (DAA 2011). These sites will not be impacted by the Project.

A heritage survey has been conducted in accordance with EPA Guidance Statement No. 41 (EPA 2004a) across the tenement and Project areas involving both archaeological and ethnographical surveys. The ethnographic surveys were conducted with Traditional Owner Group representatives and consultation with the Traditional Owner Group(s) will continue throughout the planning stage of the Project. To date, four archaeological sites have been identified within the Project area (Glendenning W [Warranup Pty Ltd] 2011a; 2011b; 2011c, pers comm. 7 October). If disturbance of these sites is proposed for the Project, Traditional Owner Group representatives would be invited on site to assess the significance of these archaeological sites to assist with the consultation process going forward.

Under Section 17 of the AH Act it is an offence to excavate, destroy or damage, conceal or otherwise alter an Aboriginal site unless authorised to do so by the Minister. The Project would aim to avoid archaeological and ethnographic sites where possible. However, if disturbance of a site cannot be feasibly avoided, MMS must obtain permission from the Minister for Aboriginal Affairs under Section 18 of the AH Act prior to any disturbance commencing. If permission is granted by the Minister, MMS would liaise with the relevant local Aboriginal groups to determine appropriate site mitigation strategies, such as the potential relocation of archaeological sites.

21 Capital and Operating Costs

The capital cost estimate was compiled by the Engenium Project team utilising information provided by Macarthur Minerals and the Engenium Project team.

21.1 Estimate Scope

Capital and operating costs have been prepared based on the Study Scope, from this a Work Breakdown Structure (WBS) was developed and used as the framework for the estimates.

Estimated costs have been broken down into the main areas required to support the mining, processing, logistics and port operations. It encompasses development capital costs to be expended from the commencement of the Project execution phase through to completion of the facilities commissioning and commencement of operations.

21.2 Capital Cost Estimate Summary

The capital cost estimates for the options considered are presented at a summary level in Table 56 and Table 57. The costs shown are broken down by WBS area. Table 56 is a summary of direct capital only and excludes deferred/sustaining capital which is dealt with in the financial model.

Table 56. Summary of direct capital costs (A$M)

	Capex ($M)
Mine	8.7
Crushing	29.0
Process	120.6
Tailings	14.7
Infrastructure	99.0
Logistics	22.0
Filtration	0
Port	21.0
Total direct costs	**315.1**

Table 57. Summary of Project Capital Cost (A$M)

	Capex ($M)
Total direct costs	**315.1**
Construction indirects	47.3
Owners costs	9.5
EPCM	31.5
Contingency	63.0
Total indirect costs	**151.3**
Total project	**466.4**

The Capital Costs include:

- **Mine Capital -** Mine capital investment includes costs for:
  - site developing, clearing and grubbing
  - laydown areas and internal roads
  - initial grade control
- **Crushing Capital -** Crushing capital investment includes costs for:
  - site developing, clearing and grubbing
  - ROM pad construction
  - complete primary crushing and screening facility
  - stockpile and reclaim facility including conveyors
  - all associated earthworks
- **Process Capital -** Process capital investment includes costs for:
  - site developing, clearing and grubbing
  - complete concentrate process facility
  - concentrate storage facility
  - all associated earthworks
- **Tailings Capital -** Tailings capital investment includes costs for:
  - site developing, clearing and grubbing
  - waste removal conveyor system
  - return water pond
  - tailings mixing facility;
  - conveyor system for construction of tailings dam facility.
- **Infrastructure Capital -** Infrastructure capital investment includes costs for:

- increase existing 100 man camp to a 400 man permanent camp including amenities
- administration offices
- Mine Operation Centre
- laboratories
- workshops
- magazine
- ANFO storage facility
- dangerous goods storage facility
- refuelling facility
- mobile equipment
- 20MW power plant
- HV reticulation to entire site
- water supply from 150 km
- associated bores and pumping stations
- water treatment facility and potable water storage
- water reticulation
- complete data & voice communications system
- all associated earthworks

- **Logistics Capital -** Logistics capital investment includes costs for:
    - site developing, clearing and grubbing
    - access road
    - haulage roads to rail siding
    - rail siding
    - rail siding infrastructure
    - all associated earthworks
- **Filtration Capital -** Filtration capital investment includes costs for:
    - site developing, clearing and grubbing
    - complete concentrate filtration facility
    - product storage facility
    - all associated earthworks.
- **Port Capital -** Port capital investment includes costs for (where necessary):
    - site developing, clearing and grubbing

  - rail spur line
  - road crossings
  - allowance for power & utilities upgrade
  - allowance for general infrastructure
  - allowance for conveyor systems
  - allowance for storage shed
- **Capital Indirects -** Capital indirect costs include:
  - construction indirects at 15% of direct costs, cost to cover temporary construction facilities and utilities (assessed from similar projects)
  - owners costs at 3% of direct costs, cost to cover owners facilities and utilities (assessed from similar projects and discussion with the Client)
  - EPCM costs at 10% of direct costs, to cover engineering, procurement and contract management throughout construction (assessed from similar projects and discussion with the Client)
  - contingency of $63M, to bring the capital estimate into line with the accuracy required for a Scoping Study (discussion with the Client).

21.2.1 Capital Estimate Basis

The capital cost estimate has been prepared in line with Engenium's estimating guidelines for a Type 1 Scoping Study (SS) level estimate. This estimate is to target a predicted accuracy of between +/- 30% to 35%.

All costs are estimated on the basis of the pricing for labour and materials existing in Q1 2019. Escalation of costs beyond this date is not included in the capital cost estimate and has been considered within the financial model.

The estimate has principally been derived from Engenium in-house databases and/or cost factors derived from projects of similar size and scope, if considered accurate enough for this level of estimate. Where required, estimates have been derived from first principles or from contractor quotations with suitable sensitivity checks and benchmarking against recently completed projects in the region.

21.2.2 Currency Basis

All estimates are based in Australian dollars. No pricing has been requested or included in foreign currencies.

21.2.3 Quantity Development

Most equipment quantities and material take offs were derived from projects of similar size and scope. The quantities associated with the logistical routes and port options were supplied by the Engenium Project team.

Upon completion of the estimate, a complete scope and quantity review and validation process was performed. This review focused on completeness of scope, and allocation of allowances to ensure every known cost item was provided for in the estimate. The scope and quantity reviews also compared the approach to scope definition and quantity build up to the interpretation taken by the estimators to ensure consistency within the resulting estimate.

21.2.4 Unit Rate Development

The Study relies heavily on in-house experience and pricing information, utilising cost estimate factors from similar historical studies.

Engenium's standard commodity rate library and rates database were used where necessary as a basis and the estimating team further developed the unit rates specific to this Project.

21.2.5 Capital Cost Contingency

A contingency of $63m was applied to all options. This was recommended after discussion with the Client.

21.2.6 Escalation

The estimate base for capital cost estimate pricing is Q1 2019.

No allowance has been made for cost escalation beyond that date within the BEV. Cost escalation allowances are considered within the Project financial model.

21.2.7 Capital Cost Qualifications

The following items are specifically excluded from the capital cost estimate as they are included in the operations estimate:

- Contractor mobilisation costs have been included in the capital estimate. Demobilisation costs are included in the Financial Model.
- The following items are specifically **excluded** from the capital cost estimate and would require further definition and study:
    - purchase or lease of land, payment to land owners
    - capital contributions to local, state or federal governments for infrastructure
    - sales tax on permanent equipment and materials
    - goods and services tax (GST)

- development approvals (accommodation camp approvals are included)
- right of way costs (approval of lease boundaries)
- environmental approvals & permitting

- Costs that are **excluded** from the capital cost estimate and are typically considered within the financial modelling include:
  - mining contractor demobilisation (accounted for in operations costs)
  - demobilisation and rehabilitation of the site areas after the conclusion of mining operations
  - Australian Fringe Benefits Tax (FBT)
  - foreign currency exposure
  - financing costs
  - sunk costs
  - escalation costs (included in the financial model)
  - project funding establishment cost
  - project finance costs and associated bank charges
  - deferred, working / sustaining capital (sustaining capital for mining activities included in the financial model)
  - marketing costs
  - exploration/investigation/feasibility study costs
  - Government licences, royalties fees and taxes;
  - native title compensation

21.3 Operating Cost Estimate

The operating cost estimate was compiled by the Engenium estimating division utilising information provided by Macarthur Minerals and the Engenium Project team.

The operating cost estimate has been prepared in line with Engenium‟s corporate estimating guidelines for a Type 1 Scoping Study (SS) level estimate. This estimate is to target a predicted accuracy of between +/- 30% to 35%.

All costs are estimated on the basis of the pricing for labour and materials existing in Q1 2010. Escalation of costs beyond this date is not included.

The estimate has principally been derived from Engenium in-house databases and/or cost factors derived from projects of similar size and scope, if considered accurate enough for this level of estimate. Where required, estimates have been derived from first principles or from contractor quotations with suitable sensitivity checks and benchmarking against recently completed projects in the region.

21.3.1 Scope of Operations Estimate

The operating cost estimate includes all the costs associated with the operation of the Project facilities from extraction to ship loading.

The operating strategy used as a basis in this estimate is summarised as follows:

- Engage a mining contractor for ore extraction and stockpile at the mine site ROM pads.
- Operation of complete processing facility encompassing all crushing, grinding, separating and tailings removal operations allowing for labour, power, water, maintenance and operating spares.
- Misc indirects and services for the supply of operations infrastructure and support including camp accommodation and logistics support.

21.3.2 Operating Costs Estimate Organisation

The scope of the operating cost estimate covers the maintenance and operations of the following work areas over the life of mine and is organised into the following main areas.

- **A** Mining operations
- **B** Materials processing and handling
- **C** Product transport and handling,
- **D** Operations indirect costs & overheads

The Operating Cost Estimate (OPEX) has been built up on an Excel based spreadsheet model, which is intended to provide the basic inputs into the financial model.

21.3.3 Operating Cost Estimate Summary

The following Table 56 summarises the indicative operating costs for each of the options studied.

Table 58. Summary of operating cost (A$/t concentrate)

	Opex A$/t	
	Magnetite	**Hematite**
Mine	12.03	13.85
Crushing	1.20	3.00
Process	13.41	0.32
Tailings	0.47	
Road transport	7.20	8.73
Filtration	0.35	0.35
Rail	11.31	11.31
Port	3.89	3.89
Indirects	3.61	3.61
Total operating costs ($/t concentrate)	**53.47**	**44.71**

Note: These costs are annualised average cost. They do not include one off costs such as demobilisation or reflect production ramp-up/ramp-down.

21.3.4 Source of Estimate Quantities

An indication of how the quantities and rates were derived within the work areas is outlined as follows.

- **A – Mining Operation** - Mining quantities are sourced from the Engenium in-house database and from information supplied by Macarthur Minerals.
- **B – Materials Processing and Handling** - Mining quantities are sourced from the Engenium in-house database and from information supplied by Macarthur Minerals.
- **C – Production Transport and Shipping** - Mining quantities are sourced from the Engenium in-house database and from information supplied by Macarthur Minerals.
- **D – Operations Indirect Costs and Overheads** - Mining quantities are sourced from the Engenium in-house database and from information supplied by Macarthur Minerals.

21.3.5 Source of Cost Estimate Rates

The operating cost estimate rates were sourced from Engenium's in-house database, vendor information, and through discussion with the engineering team.

21.3.6 Operations Estimate Qualifications

The following items are specifically excluded from the operations cost estimate and are included within the financial model:

- demobilisation and rehabilitation of the sites at the conclusion of mining operations
- escalation
- marketing
- royalties/land compensation charges
- vessel demurrage at the port
- sea freight of final product
- corporate overheads
- shire rates
- mining lease costs
- regulatory and licence costs
- project finance charges
- exploration costs
- amortization, depreciation, financing and accounting effects
- legal costs
- insurances
- equipment replacement costs;
- public road usage charge.

22 Economic Analysis

22.1 Financial Model Assumptions

The following assumptions were used in the financial model:

Table 59. Financial Model Assumptions

	Magnetite	Hematite	Blended Conc.
ROM ore	6.4 Mtpa	0.9 Mtpa	
Concentrate	2.5 Mtpa	0.86 Mtpa	2.5 - 3.4 Mtpa
Recovery	38%	95%	
Conc. grade	68% Fe	56% Fe	65 – 68% Fe
Mine Life	31	8	31
Total conc.	76.2 Mt	6.4 Mt	82.6 Mt

- Base case used a long term iron ore price of USD 86/t (for 65% Fe)
- High price and low price scenarios explored at +/-15% against the base case iron ore price
- Iron ore price adjusted for iron and silica grade penalties and premiums
- Sales price adjusted for sea freight
- 5% WA State royalty rate
- 30% tax rate
- Sustaining capital of 2 %pa totalling $77m over the life of the project
- Average operating costs of A$53.74 including A$44.71/t FOB for hematite and A$53.47/t FOB for magnetite.
- Capital cost A$403m including direct costs of A$315m, constructions indirects of A$88m and contingency of A$63m.
- Mining rate of 6.4 Mt per annum of magnetite ore over 31 years, producing 2.5 Mt of magnetite iron ore concentrate per annum.
- Mining rate of 0.9 Mt per annum of hematite over 5.5 years
- Project life of 31 years and 81.5 Mt blended magnetite concentrate.
- Long term iron ore price of USD 86/t (for 65% Fe).
- Mass recovery of 38% for magnetite.
- Mass recovery of 95% for hematite.
- Final blended concentrate averaging 65.7% Fe in years 1-5 increasing to 68% Fe from year 6.
- Operating costs adjusted for inflation at 2.4%pa
- Mine closure and rehabilitation costs of $A54m included as deferred capital.

Operating costs are as outlined in Section 21.3 and Capital costs are as outlined in Section 21.2

22.2 Discounted Cash Flow Analysis

A discount cash flow model was used to derive a NPV for the Project. The assumptions used to derive this were:

- Discount rate of 10%.
- Model over project life of 31 years.

No terminal value has been added to the NPV, reflecting any extension to the plant and/or mine life

The outcomes of the base case financial valuation at 8% discount rate is shown in Table 60 and cash flow analysis shown in Table 62.

Following project developmental capital of approximately A$466 M in years 1 and 2, the project generates on average A$110 M of free cash flow per annum in the first 8 years of production. Once the hematite blending stock has been exhausted, the project generates on average A$77m per annum for the remaining 23 years. Total free cash flow totals A$2,093m or A$535m discounted at 8%.

The project generates on average A$14m in royalties or A$370m in total for the Western Australian Government.

Table 60. Project NPV for base case capex and variable iron ore pricing scenarios

Financial Valuation	
NPV at 8% discount rate*	A$535 million
Internal Rate of Return*	21%
Project life	31 years
Fe grade of saleable product	65.7 – 68% Fe
Total sales tonnes	82.8 Mt
Capital payback period	3 years
Total revenue generated (real)	A$9.83billion
Long Term Fe price (real, applied 2017 and beyond)**	US$86 /t (FOB)
Long term A$/US$ exchange rate (applied 2017 onwards)	0.70

** Real, after-tax*

*** Benchmark 65% Platts Fe Index adjusted to final product grade*

The outcomes of the economic assessment is preliminary in nature and includes inferred mineral resources that are considered too speculative geologically to have the economic considerations applied to them that would enable them to be categorized as mineral reserves, and there is no certainty that the preliminary economic assessment will be realised.

22.3 Sensitivity Analysis

Key economic risks were examined by running cash flow sensitivities (
Figure **88**). The Project NPV is most sensitive to iron ore pricing, followed by operating costs and capital costs. The NPV sensitivities are shown in Table 61 for scenarios +/- 10% and 20% variations in the above key factors. Furthermore, there is no certainty that the outcomes projected in the PEA will be realised and actual results may vary significantly.

Table 61. NPV sensitivity analysis of key economic factors

NPV @ 8%	Units	-20%	-10%	Base Case	+10%	+20%
Iron ore price FOB	A$ millions	42	289	535	781	1028
Capital cost	A$ millions	621	578	535	492	450
Operating cost	A$ millions	838	686	535	384	233

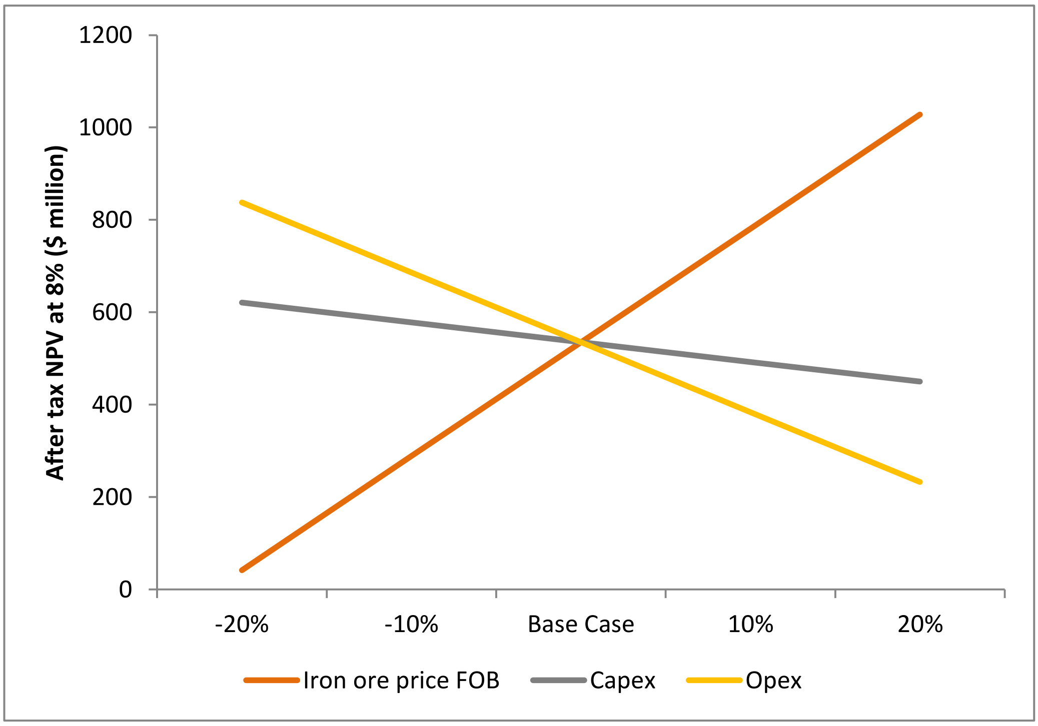

Figure 88. NPV sensitivity

Table 62. Lake Giles Project Financial Outcomes

Year			**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	→ **2051**
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	33
Physicals		***LOM Totals***																				
Magnetite ROM Ore	Mt (wet)	*197.5*			6.37	6.37	6.37	6.37	6.37	6.37	6.37	6.37	6.37	6.37	6.37	6.37	6.37	6.37	6.37	6.37	6.37	6.37
Hematite ROM Ore	Mt (wet)	*6.4*			0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total ROM Ore	Mt (wet)	*0.0*			7.27	7.27	7.27	7.27	7.27	7.27	7.27	6.44	6.37	6.37	6.37	6.37	6.37	6.37	6.37	6.37	6.37	6.37
Waste mined - Magnetite	Mt (wet)	*592.5*			19.11	19.11	19.11	19.11	19.11	19.11	19.11	19.11	19.11	19.11	19.11	19.11	19.11	19.11	19.11	19.11	19.11	19.11
Waste mined - Hematite	Mt (wet)	*19.1*			2.70	2.70	2.70	2.70	2.70	2.70	2.70	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Waste Mined	**Mt (wet)**	*611.6*			**21.81**	**21.81**	**21.81**	**21.81**	**21.81**	**21.81**	**21.81**	**19.31**	**19.11**	**19.11**	**19.11**	**19.11**	**19.11**	**19.11**	**19.11**	**19.11**	**19.11**	**19.11**
Primary Product Volumes																						
Magnetite Concentrate	Mt (wet)	*77.5*			2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
DSO Fines	Mt (wet)	*6.2*			0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL	**Mt (wet)**	*83.7*			**3.38**	**3.38**	**3.38**	**3.38**	**3.38**	**3.38**	**3.38**	**2.56**	**2.50**	**2.50**	**2.50**	**2.50**	**2.50**	**2.50**	**2.50**	**2.50**	**2.50**	**2.50**
Final Product Grades (dry basis)																						
Magnetite Concentrate	%	*68.0%*			65.6%	65.6%	65.6%	65.6%	65.6%	65.6%	65.6%	68.0%	68.0%	68.0%	68.0%	68.0%	68.0%	68.0%	68.0%	68.0%	68.0%	68.0%
Economic Assumptions		***Average***																				
Exch Rate USD/AUD	Real	*0.7*	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
AUD Inflation	% pa	*2.4%*	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%
Discount Factor - A$	Real	*8%*	1.00	1.08	1.17	1.26	1.36	1.47	1.59	1.71	1.85	2.00	2.16	2.33	2.52	2.72	2.94	3.17	3.43	3.70	4.00	11.74
Benchmark Iron Ore Price (CFR China)																						
65% Fe Index - Base Price	Real US$/dmt	*86*	90.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0
Cash Flow Statement																						
Revenue	Real A$M	*9832*	0	0	354	386	386	386	386	386	386	312	298	298	298	298	298	298	298	298	298	298
Costs	Real A$M	*-5841*	-1	-1	-225	-230	-230	-230	-230	-230	-230	-180	-176	-176	-176	-176	-176	-176	-176	-176	-176	-176
Royalties	Real A$M	*-370*	0	0	0	0	0	0	0	-18	-18	-15	-14	-14	-14	-14	-14	-14	-14	-14	-14	-14
Tax	Real A$M	*-918*	0	0	0	-12	-39	-39	-40	-40	-34	-35	-28	-26	-26	-26	-26	-26	-26	-26	-26	-32
Capex	Real A$M	*-556*	-116	-344	-10	-4	-4	-4	-4	-6	-4	-4	-4	-13	-4	-4	-6	-4	-4	-4	-4	0
Closure Cost*	Real A$M	*-54*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Free Cash Flow	**Real A$M**	***2093***	**-117**	**-345**	**103**	**137**	**113**	**113**	**113**	**93**	**100**	**82**	**78**	**69**	**78**	**78**	**76**	**78**	**78**	**78**	**78**	**76**
Discounted free cash flow	Real A$M	*535*	-117	-320	88	109	83	77	71	54	54	41	36	30	31	29	26	25	23	21	19	6
PV of future years cash flow	Real A$M		654	1051	1032	978	943	905	865	841	808	790	776	768	752	734	716	696	674	650	624	-41

Note: Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability. The outcomes of the economic assessment presented herein is preliminary in nature and includes inferred mineral resources that are considered too speculative geologically to have the economic considerations applied to them that would enable them to be categorized as mineral reserves, and there is no certainty that the preliminary economic assessment will be realised.

23 Other Relevant Data and Information

It is the authors' opinion that there is no other relevant data or information that should be listed here that has not been addressed in other parts of this report.

24 Interpretation and Conclusions

24.1 General Conclusions

The technical and financial evaluation in the Preliminary Economic Assessment ("PEA") has concluded that, based on the information currently available, the project is potentially economically viable and further project development is justified. The outcomes of the economic assessment is preliminary in nature and includes inferred mineral resources that are considered too speculative geologically to have the economic considerations applied to them that would enable them to be categorized as mineral reserves, and there is no certainty that the preliminary economic assessment will be realised.

- Project after-tax real Net Present Value ("NPV") of A$535 million at an 8% discount rate, based on a discounted cash flow model with:
    - a project life of 31 years with saleable product of 2.5 to 3.4 million tonnes per annum ("Mtpa")
    - total sales of 82.8 million tonnes; and
    - no terminal value added to the NPV, which assumes no extension to the plant and/or mine life.
- Total LOM free cash flow of A$2,093m.
- The project is potentially highly profitable with a discounted payback (based on NPV) in 3 years.
- Average operating costs of A$53.74 including A$44.71/t FOB for hematite and A$53.47/t FOB for magnetite.
- Total revenue estimated at A$9.8 billion (rounded)
- Total capital cost estimated at A$466 million including contingency of A$63 million.
- Rehabilitation costs of A$54 million and sustaining capital expense over life-of-mine ("LoM") of A$77 million.
- Total direct operating costs (including overheads but excluding royalties) are estimated at A$4.4 billion (rounded)
- Total project costs (direct and indirect operating costs, capital spend including contingency, rehabilitation and sustaining capital) are estimated at $6.4 billion (rounded).

The work performed prior to this Preliminary Assessment has shown that the Project is very dependent on:

- the liberation size of the magnetite mineralisation
- the water and power supplies to the Project
- port access and infrastructure

A number of key risks have been identified during the Preliminary Assessment, which include:

- current crushing and grinding test work is limited in its representation; but is being addressed in the upcoming drilling programme
- it is important to remove the siliceous gangue minerals at as coarse a grind size as possible so as to reduce the comminution energy required at each stage
- given there is increasing competition for water, the approvals and licensing process should commence as soon as feasible to ensure security in obtaining the resource for the Project
- given port capacity constraints and port development timelines, negotiation with SPA should commence as soon as possible to address issues and reduce options.

24.2 Mineral Resources

The estimate has been classified with respect to CIM 2014 guidelines with the resources classified at an Inferred status for the Moonshine magnetite deposits and Inferred and Indicated status for the Ularring hematite deposits, according to the geological confidence, sample spacing and the validity of the data that currently defines the deposit.

24.2.1 Magnetite Mineral Resource

The majority of the Moonshine deposit is defined by drill spacing of 200m X 200m and is of sufficient confidence for an Indicated Resource however, validity of the data remains poor and is therefore classified as an Inferred resource.

Moonshine North is classified as an Inferred Resource due to the sparse data spacing and validity of the data.

24.2.2 Hematite Mineral Resource

A Mineral Resource estimate has been compiled, and previously reported, as the Ularring Hematite Project, based upon a total of 1,588 RC drill holes. Results from these drill holes, and from geological field mapping and observations, provided the basis for the geological interpretations.

The Mineral Resource estimate was classified as Indicated and Inferred, required by NI 43-101 and described in the CIM 2014 Definition Standards on Mineral Resources and Mineral Reserves. The classification level is based upon an assessment of geological and mineralisation continuity, quality control results from drilling and assaying, and an analysis of available density information.

24.3 Mining

For the purpose of this study, a blending ratio of 1:3 of hematite to magnetite ore has been chosen as the base case to achieve a desired blended concentrate of approximately 64.5% Fe.

For the purpose of this Preliminary Assessment, in the absence of comprehensive resource testing data, the assumption has been made for a weight recovery of 38% from the mined ore. Hence, in order to achieve 2.5 Mtpa of magnetite concentrate, the amount of ore feed to the magnetite process plant (concentrator) is 6.5 Mtpa. Additionally, a waste/low grade to ore strip ratio of 3:1 for magnetite has been assumed based on cross sections through the Moonshine deposit and 3.7:1 for hematite has been calculated based on preliminary pit designs for the Snark deposit. Total annual material movement is approximately 27 Mtpa.

The general options considered to mine the ore body are:

- Mining shall be conducted by conventional drill, blast, load and haul mining methods
- Ore shall be hauled to the Run of Mine ("ROM") pad for crushing and then ore product conveyed to a concentrate plant.

The grade-tonnage characteristics for each the Snark, Drabble Downs, Central and Banjo hematite deposits were examined, and combined to estimate a Mining Inventory; see Table 50

24.4 Metallurgy and Processing

The development of the concentration process for the Project would be influenced by several key elements. These include conservation of water, minimum power consumption, the competent and abrasive nature of the ore, and the presence or otherwise of asbestiform minerals within sections of the mineralisation (though the probability of the presence of asbestiform minerals is low, mineralogical test work should be carried out at an early stage to resolve the question). Whilst addressing all of these issues the processing plant must also achieve efficient and economic recovery of the contained magnetite.

The Hematite resource is distinct from the magnetite zones and only requires appropriate selection of high grade ore to obtain the required grade. This material would be subjected to conventional 3 stage crushing and milling to allow mixing with the magnetite product.

For this order of magnitude estimate, a general concept plant is described and shown in Figure 79.

Primary milling would be by Semi-Autogenous grinding in closed circuit with screening to produce an appropriate size to feed the first stage of wet coarse LIMS . These units should reject the initial tailings while maintaining a high level of magnetite recovery.

The coarse LIMS concentrate would need to be reduced again in size. A ball mill would be used in closed circuit with cyclones for this purpose. The cyclone overflow would be the feed stream for the rougher LIMS stage.

It is likely that a third stage of even finer grinding would be required. This duty is best suited to a pair of fine grinding mills such as the Vertimill. The product from these mills would feed the finishing stage of magnetic separation. This is a three stage drum which gives a progressively cleaner product grade and helps to eliminate any contamination due to entrapment.

The hematite material would be mined from the deposits at a grade that allows blending with the magnetite to make a saleable product.

The ROM material would be crushed to a size suitable for feeding a Ball Mill and transported to a milling circuit to grind the mill to a size suitable for mixing with the Magnetite concentrate.

The concentrate would be dewatered to enable handling by front end loader and transport by trucks.

24.5 Infrastructure Logistics and Port

Product will be transported from the mine by road to a rail siding, at or near the Jaurdi station, 90 km south of the Project (Figure 80) and then onto the Port of Esperance for export. Road haulage will be along a private haul road utilising quad road trains with side tip trailers, stockpiling at the rail siding, rail transport with standard ore wagons to the Port of Esperance, unloading by Rotary Car Dumper, stockpiling in a covered shed, reclaim and loading onto ships via the No3 berth ship loader.

The Project will comprise a fully serviced remote area mining and processing hub that will be supported by a fly in fly out (FIFO) work force supplemented by Kalgoorlie located personnel.

There will be some Infrastructure facilities required such as:

- A 20 MW power supply would be required for the magnetite based process plant and facilities, as well as a MW power supply for the hematite crushing and screening circuit and facilities.
- The total water requirement for the Project is estimated to be 2 Gl per annum. A study has concluded that water supplies should be available from aquifers in the Project area. A small treatment plant, such as UV filtration or reverse osmosis, would be used to treat the water to provide a supply of potable water.
- The fuel supply would be adjacent to the power station would supply fuel to the power station via a direct feed between the fuel facility and the power station. The fuel supply would also be used to refuel mining vehicles, haulage trucks and light vehicles. A fuel truck would be used to refuel the camp power supply and other plant.
- During the operation of the mine and for the duration of the construction phase, it is anticipated that trailer mounted VSAT broadband units would be utilised to establish voice and data communications via a satellite network. A conventional VHF radio system would allow communications coverage for the minesite, plant area, first aid, camp and some of the highway and haul route. The mining contractor would provide radio base stations and mobile units as required for the mining operation.

- A 30 km internal access/haul road would be established to link to each of the MOC locations and the camp with the Evanston-Menzies road. The internal haul road between the hematite MOC and the magnetite would be established to deliver hematite product to the ball mill circuit at the magnetite processing plant to enable blending of the hematite fines with the magnetite concentrate.
- It is estimated that a 350 man camp would be required to support both the magnetite operation and the hematite operation including the haulage contractor staff.
- The Port of Esperance is the deepest port in southern Australia, capable of handling Cape and Panamax class vessels. Iron ore exports through the Port of Esperance are licenced to 11.5 Mtpa with current export around 6 Mtpa due to major reduction in production from the only iron ore operator. The Port of Esperance is also a major grain exporting hub and handles bulk imports such as fuel, sulphur and fertilisers. The port currently handles over 200 ships per annum and more than 11 million tonnes of trade.

24.6 Marketing

On the 21 March 2019, Macarthur Minerals Limited announced the entering into binding Offtake and Marketing agreement with Glencore. Transaction Highlights:

- Glencore secures offtake for the Project with commercial terms for approximately 4 million tonnes per annum average for the first 10 years, with the option to extend for a following 10 years for all tonnes of future Lake Giles iron ore production.
- Glencore agrees to release up to 70% of their off-take volume where Macarthur secures project financing from a Strategic Industry Investor, subject to their securing off-take of the product produced.
- Glencore will take possession of the iron ore once it is being loaded onto a vessel for export.
- Glencore is responsible for the marketing, shipping, delivery and associated freight insurances.
- This Agreement with Glencore positions Macarthur to go forward to complete their project financing.
- Terms and conditions have been competitively negotiated reflecting strong forward demand.

Iron pricing for this study is based on a consensus view of several broker reports described above and a comparison of historical broker forecasts against actual pricing over time. Iron ore pricing and assumptions used in the economic analysis are shown in Table 54.

A long-term pricing scenario of US$86/t has been employed in the base case scenario, adjusted for grade. This is considered a conservative forecast in comparison to pricing throughout 2019 and in line with pricing throughout 2017/18. Throughout 2019, the 65% Fe fines market has traded at low of US$95/t to a current high of $114/t. Historical pricing dating back to Q1 2017 has seen a low of $70/t and consistently traded above US$80/t from Q3 2017.

25 Adjacent Properties

A number of other companies hold almost all of the BIF containing greenstone belts within approximately 100 km of the UHP, and are actively exploring them. These include Polaris Metals Pty Ltd (Mineral Resources Ltd), Mindax Ltd, Jupiter Mines Ltd, Cashmere Iron Ltd and Radar Iron Ltd. Iron ore (DSO) mining operations are presently being undertaken by Polaris. Figure 89 shows the tenement holdings for the various projects adjacent to those held by MMS, and that the information discussed concerning adjacent properties can be clearly distinguished against the MMS property.

The qualified person has been unable to verify this information and that the information is not necessarily indicative of the mineralisation on the property that is the subject of this Technical Report.

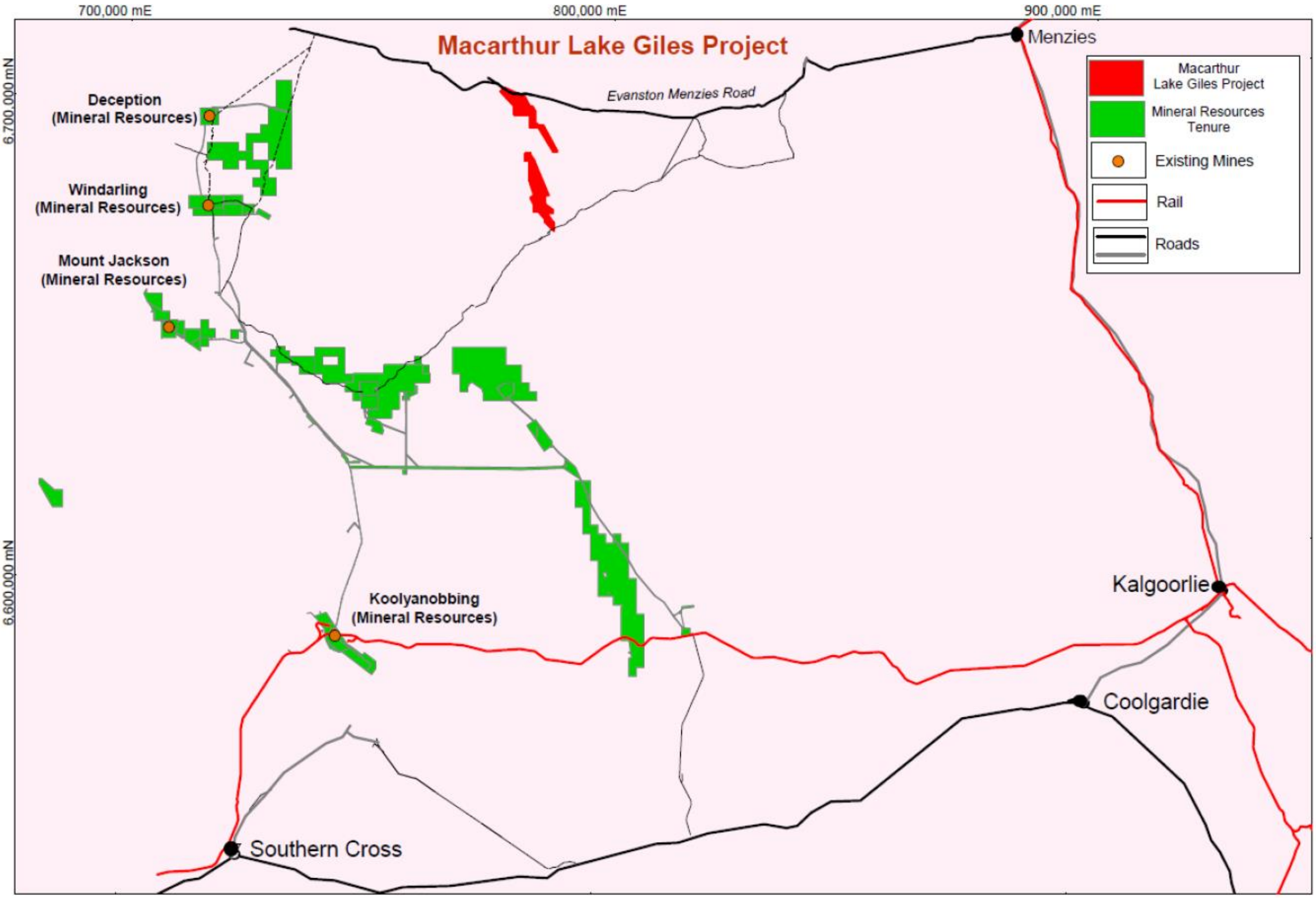

Figure 89. Iron Ore Exploration and Mining tenements adjacent to the Project

26 Recommendations

The following recommendations have been identified during compilation of this study. A detailed Scope of Work considering all recommendation to progress the Project is required to identify suitable work programmes and cost estimates for the work.

26.1 Mineral Resource Recommendations

26.1.1 Magnetite Mineral Resource

It is recommended that future drill programs implement an industry standard QA/QC data collection to the normal procedures. This should be analysed immediately once the assays have been received and documentation should be completed after a drilling phase has been completed. It is essential for lifting the mineral resource category to Indicated or Inferred and it will require at a minimum:

- Collection of field duplicates at a regular intervals. One every twenty samples should be sufficient.
- Insertion of suitable Certified Reference Material (CRM) and blanks at regular intervals.
- Undertake a routine program of umpire assays. Send randomly 5% of the samples to another laboratory for checking.
- Twinning of some drill holes to determine the validity of drill holes without QA/QC data.

The use of a multi-shot north seeking gyro will accurately determine the azimuth and dip as the gyro will be unaffected by the magnetic rocks. This can be used to accurately determine the trace of the drill holes in a 3D mining package.

Further drilling and test work is required to provide a basis for technical assumptions, currently only two samples have been submitted for metallurgical test work and this does not provide sufficient characterisation of the metallurgical properties of the Moonshine and Moonshine North. Drilling should be undertaken to increase the drill spacing to allow the estimation of an Indicate Resource which could then be used as the basis to generate Mineral Reserves. A proposed budget is provided in Table 63.

26.1.2 Hematite Mineral Resource

It is recommended the following actions are implemented to increase or maintain the confidence of future Mineral Resource estimates:

- Interpret localised geology to model expected depth of weathering, to differentiate between soft and hard BIF.

- Continue to develop a deposit scale geological model incorporating lithology, mineralisation, weathering and structural features that locally control the occurrence and location of BIF host rock.
- Maintain field geological procedures with respect to drill rig inspections and sampling procedures, vetting the maintenance and cleanliness of sample splitters and sample recovery.
- Monitor the performance of certified reference materials (CRM) and field duplicates immediately upon receipt of assays.
- MMS geologists to compile a QAQC report prior to future Mineral resource estimates.
- Complete additional drilling in Inferred Mineral Resource areas to increase geological confidence of individual mineralised units. This will require budgeting of money and resources, and will require a time frame of at least three months from initial drill hole planning and budgetary approval, to final receipt of sample assays. A proposed budget is provided in Table 63.

Table 63. Resource infill drilling budget

Activity	Budget A$
Diamond drilling - 2000 m	535,400
RC drilling - 3200 m	296,250
Analysis	179,550
Logistics	201,000
Management	121,220
Total	**1,333,420**

26.2 Forward Work Program

26.2.1 Introduction

The information contained in this section highlights key areas of proposed forward work subsequent to the submission of the scoping study report.

The scoping study presented herein is the first in a number of progressive studies that would typically be undertaken for projects of this size and complexity.

Further detailed investigation is required in a number of key areas, in order to challenge and refine concepts presented in the scoping study. Concepts presented can be developed and costs further optimized based on additional information presented from the undertaking of peripheral study work.

26.2.2 Process Test Work

It is recommended that over the next stage of project development more metallurgical samples be obtained to conduct further process testwork. The testwork would be focused on confirming the response of the different ore zones within the magnetite and hematite deposits to develop a more robust process flow design for the project.

Further variability test work be conducted based on a range of samples from within, and marginal to, the orebody to reduce the longer term risk of ore body performance.

The study testwork would include a final pilot plant stage to confirm the flowsheet and develop larger scale samples for customer assessment, TSF design, dewatering processing and concentrate flow properties.

26.2.3 Definitive Feasibility Study

The next phase of the Project's development would be to undertake a DFS. The underlying objectives of the study would be to achieve the following:

- challenge assumptions made to date
- undertake additional field and test work to prove the concepts suggested
- develop base concepts identified within the earlier works, based on the additional data received from field and test programs
- undertake further detail in design in order to refine the capital and operating estimates
- reduce areas of risk previously identified
- initiate consultation in relevant political and public areas
- improve investor and market confidence in the Project's viability

26.2.3.1 Scope

The scope of the DFS shall encompass all the necessary study management, design, engineering, procurement and other such services as necessary to a standard required of a feasibility study in accordance with CIM 2014 Definition Standards on Mineral Resources and Mineral Reserves.

The general structure and content of the report would be discussed and agreed with the Client during the initial stages of the DFS. A typical 'Table of Contents' for the DFS report would be as follows.

- Executive Summary
- Introduction
- Geology and Mineral Resources

- Reserves Estimate
- Metallurgical Testwork
- Mine Operations
- Processing Plant
- Tailings
- Filtration
- Logistics to Port
- Infrastructure and General Services
- Port Facilities
- Construction Facilities
- Environmental and Social Impact Assessment
- Project Approvals Process
- Land Access and Native Title
- Safety Management
- Human Resources
- Marketing, Products and Pricing
- Capital and Operating Costs
- Project Evaluation
- Project Status and Reviews
- Forward Work Program
- Attachments including:
    - Project Risk Assessment
    - Capital and Operating Cost Estimates and Contingency Analysis
    - Project Schedules
    - Mine Schedules
    - Mine Design, Pits etc
    - Basis of Design
    - Drawings
    - Meteorological Data

26.2.3.2 Deliverables

The deliverables for the DFS would include:

- Study Scope Statement, including:

  - Project Charter
  - Study Scope of Work
  - Organisation Chart
  - Study Execution Plan
  - Study Schedule
  - Work breakdown structure
  - Estimating Plans
- fully compiled DFS report inclusive of sub-consultant inputs
- mining resources and reserves
- preliminary mine design
- mining plan and schedules
- preferred ore processing operation and plant layout
- infrastructure analysis
- preferred transport and port analysis
- preferred Go-forward Option
- Capital Cost Estimate to +/- 25%
- Operating Cost Estimate to +/- 25%
- Basis of Estimate
- Basis of Design including design criteria
- general arrangement and layout drawings
- process flow diagrams
- risk assessment
- overall project development strategy
- market analysis
- preliminary schedule for the Design function

26.2.3.3 Schedule

The key milestones based on the high level schedule are:

Table 64. Key milestones

Phase	Completion
Scoping Study	Q2 2019
DFS	Q2 2020
Implementation – Design/Procurement	Q4 2020
Environmental Approvals	Q4 2020
Construction Works	Q1 2021
First Ore	Q3 2022

Several major factors contribute to the significant timeline described in the table shown above. These include:

- requirement to have the Project referred to the EPA for environmental assessment;
- requirement for pilot test work program;
- optimisation of flow sheet;
- long lead time for major equipment;
- interface issues with the port; and
- securing economic supply of power and water

The schedule presented above also assumes the following:

- favourable outcomes will be presented from investigative studies throughout the course of the feasibility phases thus increasing market and investor confidence for the project's viability;
- growth in the Project's mineral resource base is not likely prior to the commencement of site works (may lead to alternative development scenarios being realised, leading to potentially longer development timeframes or changes in the scope for development of the Project);
- funding available when required; and
- no adverse movements in world markets

The schedule includes a period between the scoping study and DFS of about 9 months. This is primarily to undertake additional metallurgical testing in order to better understand the ore properties.

27 References

Abbot, J. (2007b): Technical Report, Lake Giles Iron Ore Project Yilgarn Craton Western Australia, E30/230 And E30/240, Inferred Mineral Resource Estimate. Hellman & Schofield Pty Ltd

Allen, C. (2011): NI43-101 Technical Report On Lake Giles Iron Ore Project – Potential DSO Deposits, Western Australia, January 2011. CSA Global Pty Ltd.

Anon, (1994): Dodanea Project, Annual Report For Year Ending 27 May 1994, Exploration Licence 30/93. Battle Mountain (Australia) Ltd.

Anon, (1995): Dodanea Project, Annual Report For Year Ending 27 May 1994, Exploration Licence 30/93. Battle Mountain (Australia) Ltd.

Australian Bureau of Meteorology (2011): Climate Statistics For Australian Locations, Viewed 1st November 2011, Http://Www.Bom.Gov.Au .

Australian Bureau of Statistics (2007): 2006 Census: Quickstats: Kalgoorlie/Boulder (WA) (Statistical District), Viewed 4th October 2007, Http://Www.Censusdata.Abs.Gov.Au

Busbridge, M. (1998a): Final Report for the Period 10 December 1997 to 10 September 1998, Dodanea, E30/99, Normandy Exploration Limited

Busbridge, M. (1998b): Final Report for the Period 20 August 1997 to 18 August 1998, Yerilgee, E30/100, Normandy Exploration Limited

Cooper, I. (2005). Independent Technical Report, Lake Giles Project, Western Australia. Independent Technical Report prepared for Macarthur Mineral Limited, Cooper Geological Services Pty Ltd

Cooper, I. (2006a). Independent Technical Report, Lake Giles Project, Western Australia. Independent Technical Report prepared for Macarthur Mineral Limited, Cooper Geological Services Pty Ltd

Cooper, I. (2006b). Lake Giles Project, Western Australia. Summary Results of Auger Drilling Program over the Iron Pisolite Area. Letter to Macarthur Minerals dated 25th August 2006. Cooper Geological Services Pty Ltd

Cooper, I. (2007): Independent Technical Report, Lake Giles Project, Western Australia. Independent Technical Report Prepared for Macarthur Minerals Limited. Cooper Geological Services Pty Ltd.

CSA Global 2009, NI43-101 Technical Report on Lake Giles Iron Ore Project, Western Australia, Chris Allen 17th December 2009.

CSA Global 2011, NI43-101 Technical Report, Hematite Mineral Resource, Macarthur Hematite Project, David Williams November 2011.

CSA Global 2012, NI43-101 Technical Report, Hematite Mineral Resource, Ularring Hematite Project, David Williams, March 2012.

CSA Global 2012, NI43-101 Technical Report, Hematite Mineral Resource, Ularring Hematite Project, David Williams, June 2012.

Department of Indigenous Affairs (DIA) 2011, Aboriginal Heritage Enquiry System, [Online], Available From: Http://Www.Dia.Wa.Gov.Au/Ahis/Default.Aspx [4 September 2011].

Engenium 2011, Ularring Hematite Project Scoping Study Report, Internal Document December 2011.

Environmental Protection Authority (EPA) 2003, Consideration of Subterranean Fauna in Groundwater and Caves during Environmental Impact Assessment in Western Australia, Guidance Statement No. 54, December 2003.

Environmental Protection Authority (EPA) 2004a, Assessment of Aboriginal Heritage, Guidance Statement No. 41, April 2004.

Environmental Protection Authority (EPA) 2004b, Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia, Guidance Statement No. 51, June 2004.

Environmental Protection Authority (EPA) 2004c, Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia, Guidance Statement No. 56, June 2004.

Environmental Protection Authority (EPA) 2007, Sampling Methods and Survey Considerations for Subterranean Fauna in Western Australia, Draft Guidance Statement No 54a, August 2007.

Environmental Protection Authority (EPA) 2009, Sampling of Short Range Endemic Invertebrate Fauna for Environmental Impact Assessment in Western Australia, Guidance Statement No. 20, May 2009.

Farmer, K. (1997a): Barclay Holdings Ltd (Manager) and Battle Mountain (Australia) Inc E30/100, Annual Report, Reporting Period 20 August 1996 to 19 August 1997.

Farmer, K. (1998a): Barclay Holdings Ltd (Manager) And Battle Mountain (Australia) Inc E30/100 Annual Report, Reporting Period 10 December 1996 to 9 December 1997

Farmer, K. (1998c): Barclay Holdings Ltd (Manager) And Battle Mountain (Australia) Inc E30/93 Partial Surrender Report. Barclays Holdings Ltd.

Fieldgate, S. and Andrew, M. (2011): NI43-101 Technical Report – Preliminary Assessment, 25 March 2011. Moonshine and Moonshine North Prospects, Lake Giles Iron Project, Western Australia. Snowden Mining Industry Consultants.

Fox, K. (2001): The Lake Giles Project Comprising Exploration Licences E30/230, E30/240, E30/241, E30/242 And E30/260. Review Of Historical Exploration During The 1968 to 1972 and 1993 to 1998 periods and a report an exploration completed by Internickel Australia Pty Ltd Between 1st June 2000 and 31st July 2001. Unpublished K. Fox and Associates Report Prepared For Internickel Australia Pty Ltd

Fox, K. (2002): The Lake Giles Project Comprising Granted Exploration Licenses E30/230, E30/240 And E30/242. Combined Annual Technical Report No. C82/2001 for the Year to 18th April 2002. Unpublished K. Fox and Associates Report Prepared for Internickel Australia Pty Ltd

Fox, K. (2003): The Lake Giles Project Comprising Granted Exploration Licences E30/230, E30/240 And E30/242. Combined Annual Technical Report No. C82/2001 for the year to 18th April 2003. Unpublished K. Fox and Associates Report Prepared For Internickel Australia Pty Ltd

Greenfield, J. (2001): Geology of the Lake Giles 1:100,000 Sheet. Western Australia Geological Survey, 1:100,000 Geological Series Explanatory Notes

GSWA (2011): Data and Software Centre, Statewide Spatial Datasets. Http://Mapserver.Doir.Wa.Gov.Au/Datacentre/Datacentredb.Asp

Revell, N. (2006): Lake Giles Project, Combined Annual Technical Report No C82/2001, Period Covered 28/4/2005 to 27/4/2006. Consulting Geologists Report Prepared For Internickel Australia Pty Ltd Rockwater 2010, Lake Giles Magnetite and Hematite Projects: Initial Assessment of Groundwater Availability, Unpublished Report Prepared For Engenium on Behalf of Macarthur Minerals Ltd, July 2010.

Rockwater (2010). 376.0/10/01 Lake Giles Magnetite and Hematite Projects: Initial Assessment of Groundwater Availability Unpublished.

Rockwater 2011, Lake Giles Iron Ore Project: Results of Pilot Subterranean Fauna Investigation, Unpublished Report Prepared for Macarthur Minerals Ltd, March 2011.

Smith, B.H. & Govey, A.L. (1995): Dodanea Tenements, Exploration Licences, E30/199,E30/100 For The Period 20th August 1993 To 31 December 1994. Aztec Mining Company Limited.

Snowden Mining Industry Consultants (2011), Ni43-101 Technical Report Preliminary Assessment, Monshine And Moonshine North Prospects, Lake Giles Iron Project, Western Australia, S Fieldgate, M Andrew And N Dowson March 2011.

Ward, H.J. & Pontifex, I.R. (1970): Untitled Report Describing Mineralogy, Geochemistry, Magnetic and Electromagnetic Geophysical Surveying, Percussion and Diamond Drilling. Department of Industry and Resources Open File Report A12634.

Ward, H.J. (1970a): Report on Diamond Drill Holes 5, 6 And 7 M.C.88u - Area 1, Johnson Rocks. Geotechnics (Aust) Pty Ltd

Ward, H.J. (1970b): Geological Report on M.Cs 86u-89u and 96u-102u, Johnson Rocks North Coolgardie Goldfield Western Australia. Geotechnics (Aust) Pty Ltd

Ward, H.J. (1970c): Progress Report on Kia Ora/Delta Joint Venture Areas Group 2 Western Australia. Geotechnics (Australia) Pty Ltd.

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engenium
smart project delivery

CERTIFICATE OF QUALIFIED PERSON

NEVILLE DOWSON

B App Sci (Ext Met), MBA, FAusIMM

I, Neville Dowson, Perth, Western Australia do hereby certify that:

- I am a Principal Process Engineer of Engenium, Level 2, 88 William Street, Perth, WA 6000

This certificate applies to the Technical Report technical report entitled "NI 43-101 Technical Report, Macarthur Minerals Limited Preliminary Economic Assessment Lake Giles Iron Ore Project, Western Australia" dated June 13, 2019 prepared for Macarthur Minerals Limited (the "Technical Report").

- I hold the following academic qualifications:
    a. Bachelor of Applied Science degree in Extractive Metallurgy from Curtin University (Kalgoorlie School of Mines) having graduated in 1977.
    b. Master of Business Administration from Curtin University awarded in 2004.
    c. I am a Fellow of the Australasian Institute of Mining and Metallurgy.
- I have worked as metallurgist in the minerals industry for 42 years, graduating in 1977 and working as a Raw Materials Metallurgist and Process Development Engineer as well as various roles in Equipment Supply, Engineering and Consulting Firms. Over the last fifteen years I have managed testwork programmes and have performed many studies and design projects on hematite and magnetite based deposits. I have also performed some half dozen due-diligence reports on magnetite and hematite projects. I was an author of a paper on magnetite testwork requirements presented by others at the 2009 Iron ore Conference in Perth, WA.
- I am familiar with National Instrument 43-101 Standards of Disclosure for Mineral Projects ("43-101") and the definition of "qualified person" therein and confirm that, by reason of education, experience affiliation with a professional association (as defined in NI43-101); I fulfil the requirements of a qualified person as defined in NI 43-101.
- I have visited the Ularring Hematite Project on June 12, 2019;
- My prior involvement with the mineral property that is the subject of this Report has been as the author and Qualified Person for the NI43-101 Technical Report - Preliminary Assessment for the Moonshine and Moonshine North Prospects, Lake Giles Iron Project dated March 25, 2011. I was also the author and Qualified Person for the NI43-101 Technical Report - Ularring Hematite Project, dated January 3, 2012.
- I have read NI43-101 and the Report has been prepared in compliance with NI43-101.
- I am independent as described in section 1.5 of NI 43-101 and have provided consulting services to Macarthur Minerals Limited;
- I am responsible for sections 1 to 6, 13, 14.1, 16 to 25, 26.2 and 27;

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- As of the effective date of the Report to the best of my knowledge, information and belief, the Report contains all scientific and technical information that is required to be disclosed to make the report not misleading.

Dated this 13th June 2019

NJ Dowson.

Neville Dowson
B App Sci (Ext Met), MBA, FAusIMM
Principal Process Engineer
Engenium

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CERTIFICATE OF QUALIFIED PERSON
DAVID WILLIAMS

BSc (Hons Geology), MAIG

I, David Williams, Geologist, Spring Hill, Queensland do hereby certify that:

- I am a Principal Resource Geologist of CSA Global Pty Ltd, Level 2, 201 Leichhardt Street, Spring Hill, Queensland 4000, Australia.

This certificate applies to the Technical Report technical report entitled "NI 43-101 Technical Report, Macarthur Minerals Limited Preliminary Economic Assessment Lake Giles Iron Ore Project, Western Australia" dated June 13, 2019 prepared for Macarthur Minerals Limited (the "Technical Report").

- I hold the following academic qualifications:
    a. I hold a B.Sc. (Honours) in Geology from the University of Adelaide, graduated in 1990.
    b. I am a full member of the Australian Institute of Geoscientists.
- I have worked as a geologist for 29 years, 21 of those years being in Mineral Resource estimation.
- I am familiar with National Instrument 43-101 Standards of Disclosure for Mineral Projects ("43-101") and the definition of "qualified person" therein and confirm that, by reason of education, experience affiliation with a professional association (as defined in NI43-101); I fulfil the requirements of a qualified person as defined in NI 43-101.
- I have visited the Ularring Hematite Project on 21 and 22 June 2012;
- My prior involvement with the mineral property that is the subject of this Report has been as co-author and Qualified Person for the following NI43-101 Technical Reports:
    a. Pre-Feasibility Study, Ularring Hematite Project dated September 27, 2012
    b. Hematite Mineral Resource, Ularring Hematite Project, dated June 29, 2012.
    c. Ularring Hematite Project, dated January 3, 2012.
- I have read NI43-101 and the Report has been prepared in compliance with NI43-101;
- I am independent as described in section 1.5 of NI 43-101 and have provided consulting services to Macarthur Minerals Limited;
- I am responsible for sections 7, 8, 9 and 14.3 of the Report and jointly responsible for sections 10, 11, 12 and 26.1;
- As of the effective date of the Report to the best of my knowledge, information and belief, the Report contains all scientific and technical information that is required to be disclosed to make the report not misleading;

Dated this 13th June 2019

DWilliams

David Williams Principal Resource Geologist, CSA Global Pty Ltd

CERTIFICATE OF QUALIFIED PERSON
SHANE FIELDGATE

GEO BSc, PDip, MAusIMM, RPGeo (AIG)

I, Shane Fieldgate, Perth, Western Australia do hereby certify that:

- I am a Resource Geologist of PO Box 172, Maylands, Western Australia 6931

This certificate applies to the Technical Report technical report entitled "NI 43-101 Technical Report, Macarthur Minerals Limited Preliminary Economic Assessment Lake Giles Iron Ore Project, Western Australia" dated June 13, 2019 prepared for Macarthur Minerals Limited (the "Technical Report").

- I hold the following academic qualifications:
    a. Bachelor of Science (Mineral Exploration and Mining Geology) at the Western Australian School of Mines (Curtin University)
    b. Post Graduate Diploma – Honours (Mineral Exploration and Mining Geology) at the Western Australian School of Mines (Curtin University)
    c. I am a Registered Professional (CP) Geologist (RPGeo) of the Australian Institute of Geoscientist (AIG) (Membership # 3107)
- I have worked as a Resource Geologist;
- I am familiar with National Instrument 43-101 Standards of Disclosure for Mineral Projects ("43-101") and the definition of "qualified person" therein and confirm that, by reason of education, experience affiliation with a professional association (as defined in NI43-101); I fulfil the requirements of a qualified person as defined in NI 43-101.
- I have visited the Project on 21 and 22 June 2012;
- My prior involvement with the mineral property that is the subject of this Report has been as the author and Qualified Person for the NI43-101 Technical Report - Preliminary Assessment for the Moonshine and Moonshine North Prospects, Lake Giles Iron Project dated March 25, 2011. I was responsible for preparation of the Mineral Resource estimate for the Moonshine and Moonshine North deposits.
- I have read NI43-101 and the Report has been prepared in compliance with NI43-101.
- I am independent as described in section 1.5 of NI 43-101 and have provided consulting services to Macarthur Minerals Limited;
- I am responsible for section 14.2 of the Report and jointly responsible for sections 10, 11, 12 and 26.1.
- As of the effective date of the Report to the best of my knowledge, information and belief, the Report contains all scientific and technical information that is required to be disclosed to make the report not misleading;

Dated this 13th June 2019

Shane Fieldgate
GEO BSc, PDip, RPGeo (AIG)