



TECHNICAL STUDY SHOWS VIABILITY OF SAUDI PLANT

Magnum Mining & Exploration (ASX: **MGU**, “**Magnum**” or “**the Company**”) is delighted to announce the successful completion of an engineering study into the technical and economic viability of developing a green, high purity pig iron (GHPPI) project in the Kingdom of Saudi Arabia.

CAUTIONARY STATEMENT

The Engineering Study (“ES or Study”) referred to in this announcement has been undertaken to assess the technical merit and economic viability of a green, high purity pig iron project in the Kingdom of Saudi Arabia (KSA). It is based on high level technical and economic assessments that may change with further evaluation work. This may or may not result in a Feasibility Study in the future.

The Study is of a preliminary nature and is based on a proposed partnership with Midmetal of Saudi Arabia as announced on 1 November, 2023. The agreement entered into with Midmetal explores the technical and economic viability of building and operating a Hismelt plant in the KSA. It is proposed that the plant uses renewable biochar to supply the carbon needed for iron reduction. The aim is to produce a green, high quality pig iron with zero or near zero carbon emissions once the biomass growth and use cycle is established.

High grade magnetite concentrate feedstock for the project is planned to be sourced from the Company’s proposed Buena Vista Iron Project for which the Scoping Study was announced on 14 August, 2023 (“Positive Scoping Study Validates Buena Vista Iron Project”).

MinRizon Projects, an independent, industry respected, and experienced study team, was contracted to undertake the ES. The Study is based on the material assumptions outlined in this release. These include assumptions about the availability of funding. While the Company considers all of the material assumptions to be based on reasonable grounds, there is no certainty that they will prove to be correct or that the range of outcomes indicated by the Study will be achieved.

To achieve the range of outcomes indicated in the Study, funding by the Company in the order of US\$206 million may be required. Investors should note that there is no certainty that the Company will be able to raise that, or any amount of funding when needed, or that the desired zero or near zero levels of carbon emission can be achieved. It is also possible that such funding may only be available on terms that may be dilutive to, or otherwise affect the value of, the Company’s existing shares. In addition, there are no guarantees that Midmetal will commit to the 50% funding that the MOU with them proposes, or any level of funding or that Midmetal will proceed with the project.

Given the uncertainties involved, investors should not make any investment decisions based solely on the results of this Study.

STUDY HIGHLIGHTS

- Magnum and Midmetal is pursuing the development of GHPPI production facility in the Kingdom of Saudi Arabia
 - The facility will use high grade magnetite concentrate from Magnum's 100% owned proposed mine and beneficiation plant in Nevada, USA, and locally sourced steel mill waste
 - Waste palm oil biomass will be converted to biochar in Malaysia and used in the iron reduction process
 - The use of renewable biochar will potentially attract a "green" pricing premium for the GHPPI
 - A full financial model has not been completed at this stage due to the early phase the project is in and regulatory constraints. The Board of Magnum is satisfied that the project represents a compelling business case for development
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SUMMARY – ENGINEERING STUDY

The Engineering Study assessed a HIs melt based 1.1 million tonne per annum (Mtpa) pig iron production facility in the Kingdom of Saudi Arabia (KSA) to capitalise on the KSA's drive for low emissions steel production.

The purpose of the Study is to provide a reasonable estimate of CAPEX and OPEX for a HIs melt facility in the KSA using the proposed Buena Vista Iron Mine magnetite concentrate, augmented by local steel mill waste.

Magnum has entered into a Memorandum of Understanding (MOU)¹ with KSA-based Middle East for Metallic Industrial (Midmetal). Under the MOU, Midmetal will seek to become a 50/50 partner in the project and facilitate access to existing steel mills in the KSA, potentially manage the establishment of the facility at the King Fahad Industrial Port, and Port and procure customers for the HIs melt product.

The Project will need to undergo a thorough Prefeasibility Study, Feasibility Study, with permitting, and approvals, and engineering design required before construction and commissioning can proceed. It is estimated by the Company that this can be done in 24 to 48 months.

The study estimates a capital requirement of approximately US\$410M (base case) or \$205.3 to \$615.8M at the ±50% study accuracy. An additional US\$82.4M (\$41.2-\$123.6M) is estimated for the BioChar facility in Malaysia.

Operating costs estimated at US\$381.57/t (base case, \$193.76 to \$581.27 at the accuracy of the study) per tonne of GHPPI indicates that the project is economically viable at the assumed premium GHPPI market price of US\$700/t.

PROJECT LOCATION

The ownership structure of the project is planned to be 50% by Magnum, and 50% by Midmetal¹.

The facility for the production of GHPPI is proposed to be located in, or close to, the industrial areas adjacent to the King Fahad Industrial Port at the city of Jubail, KSA (Figure 1). The port was established in 1974 to serve Jubail Industrial City. Spanning approximately 44 square kilometres on reclaimed land, the port encompasses 16 berths, making it one of the largest man-made ports and one of the largest industrial ports in the world. The Saudi Iron and Steel Company (Hadeed) have their base there along with a number of major Saudi petrochemical companies. The industrial area is adjacent to the port

It is anticipated that the project will utilise the port to facilitate the delivery of incoming materials and equipment.

The port has access to land, power, water, and labour accommodation facilities. No land has yet been appropriated for the construction of this Project; there is considerable land available for the purpose. The Study assumes that the application for land and access to facilities will be granted to allow the project's build and operation, and all required approvals, permits and licences will be secured. The basis for this assumption is the existence of multiple similar undertakings in the port and the involvement of the project's KSA based partner, Midmetal. There is no guarantee that the Company or its partners will be able to obtain all required approvals, permits and licences.

¹ ASX:MGU Midmetal Pursues MOU with Magnum, 1 September, 2023



Figure 1 Project facilities location: King Fahad Industrial Port.

HISMELT TECHNOLOGY FOR GHPII PRODUCTION

The project will be based on the application of the Hismelt technology for the production of GHPII. Magnum has agreements in place to access, build, and operate the Hismelt technology².

The feed material for the Project is planned to be provided from two sources:

- Imported magnetite concentrate from Magnum's mining operations at its Buena Vista Iron Project, in Nevada, USA³
- Iron waste materials from existing iron ore processing facilities in the KSA and other potential locations.

In order to meet the requirement for green, net-zero (or close to net-zero) carbon emissions from the project, it is planned that the reductant for the operation of Hismelt will constitute BioChar sourced from

² ASX:MGU Magnum secures pathway to Hismelt licence, 18 May, 2023.

³ ASX:MGU Positive Scoping Study validates Buena Vista Iron Project, 14 August, 2023.

waste biomass produced largely by the palm-oil industry in Malaysia, possibly augmented by additional waste Biomass from other sources⁴.

The HIs melt technology was originally developed by Rio Tinto Limited, a major Australian mining company, over the period from 1982 until 2017 with a view to smelt high phosphorous haematite iron ore fines using non-coking coals as the reductant. A pilot plant was built at Kwinana, Western Australia and successfully operated, producing approximately 400,000 tonnes of pig iron that was delivered to electric arc furnaces in the USA and Asia.

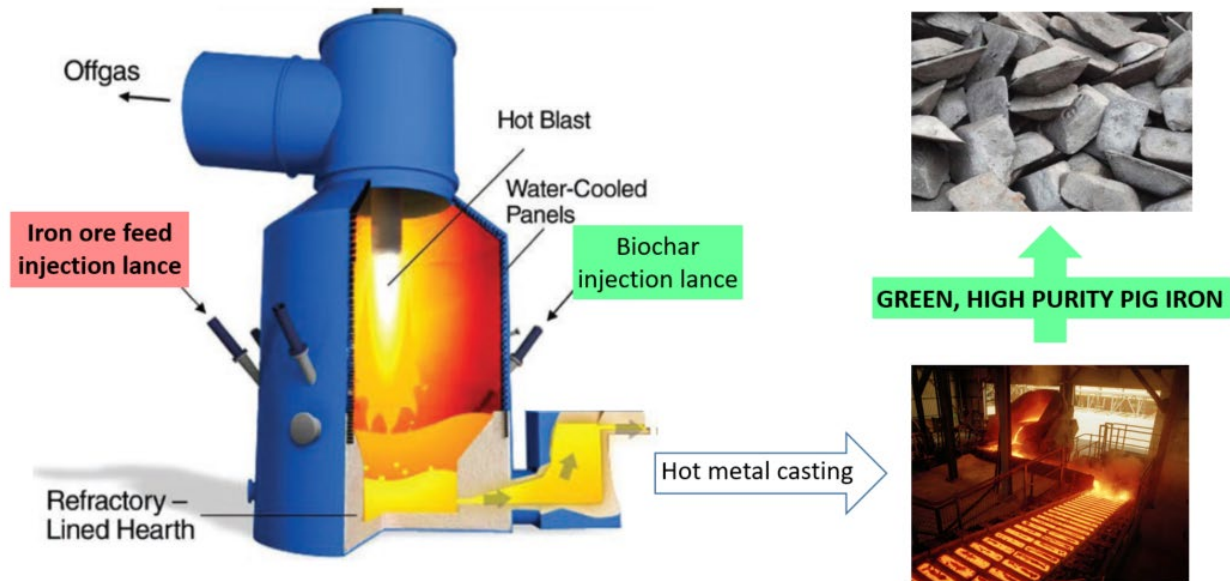


Figure 2 The Smelt Reduction Vessel (SRV) of a HIs melt plant.

The intellectual property rights for HIs melt were sold to Molong Petroleum Machinery Company Limited (“Molong”) in China, which remains the owner of the technology. Molong has operated a HIs melt plant in China since 2016. Magnum has a licensing agreement with Molong to build and operate a HIs melt plant⁵. There are now several more HIs melt facilities in various stages of design and construction in China, including three plants for Xingtai Iron and Steel Co Ltd.

FEED FOR GHPII PRODUCTION

The proposed feed for the HIs melt plant will be obtained from two sources:

1. Magnum’s proposed Buena Vista Iron mine from which a premium concentrate will produced. The mining operation has been shown to be viable through a recently completed Scoping Study⁶
2. Existing steel mill waste: mill scale, EAF slag oxide mix (pellet chips) and DRI mixed fines. Steel mill waste sources have not yet been secured under contract.

⁴ ASX:MGU, Appointment of Advisor for Malaysian Biochar, 29 November, 2023.

⁵ .ASX:MGU Magnum Secures Pathway to HIs melt License, 18May, 2023.

⁶ ASX:MGU, Positive Scoping Study Validates Buena Vista Iron Project, 14 August, 2023



Figure 3 Molong's operating Hismelt plant in China. A similar plant is being considered for the Project.

The carbon reductant planned consists of biochar produced in Malaysia from by-product of palm oil production in the country⁷. Magnum is pursuing permits and processes to obtain green accreditation for the project⁸.



Figure 4 The Hadeed steel plant in KSA. A typical steel plant generates approximately 2% of its total steel rolled as mill scale (<https://www.ispatguru.com/generation-transport-and-uses-of-mill-scale>).

⁷ ASX:MGU Appointment of Advisor for Malaysian Biochar", 29 November, 2023.

⁸ ASX:MGU Magnum Secures ESG Certification for Net Zero Green Pig iron Production, 27 July, 2022.

PIG IRON MARKET

The average price blast furnace pig iron price landed at NOLA (New Orleans, Louisiana) from 2010 to 2020 was US\$400/t (Figure 5)⁹. In Q4 2021, the price increased to US\$600/t due to the extremely high demand from the US and China, and in 2022 it again increased to US\$900/t due to the Russia/Ukraine war. Since 2021, the pig iron price has averaged US\$570/t.

It is expected that, as USA and European (EU) steel companies replace aging blast furnaces with Electric Arc Furnaces that cannot run on raw ores, the pig iron price is expected to rise. In addition, the imposition of carbon taxes such as the EU’s proposed Carbon Border Adjustment Mechanism (“CBAM”) is expected to increase the price of green pig iron (i.e. pig iron that is produced without additional emissions of CO₂). In the EU, the proposed CBAM tariff is expected to be in the order of US\$130/t. This study assumes a more conservative US\$100/t premium.

The GHPPI produced from the Project is planned to be used in-country to feed KSA’s burgeoning EAF steel making industry^{10,11}.

The pig iron pricing adopted in the Study is outline in Table 1.

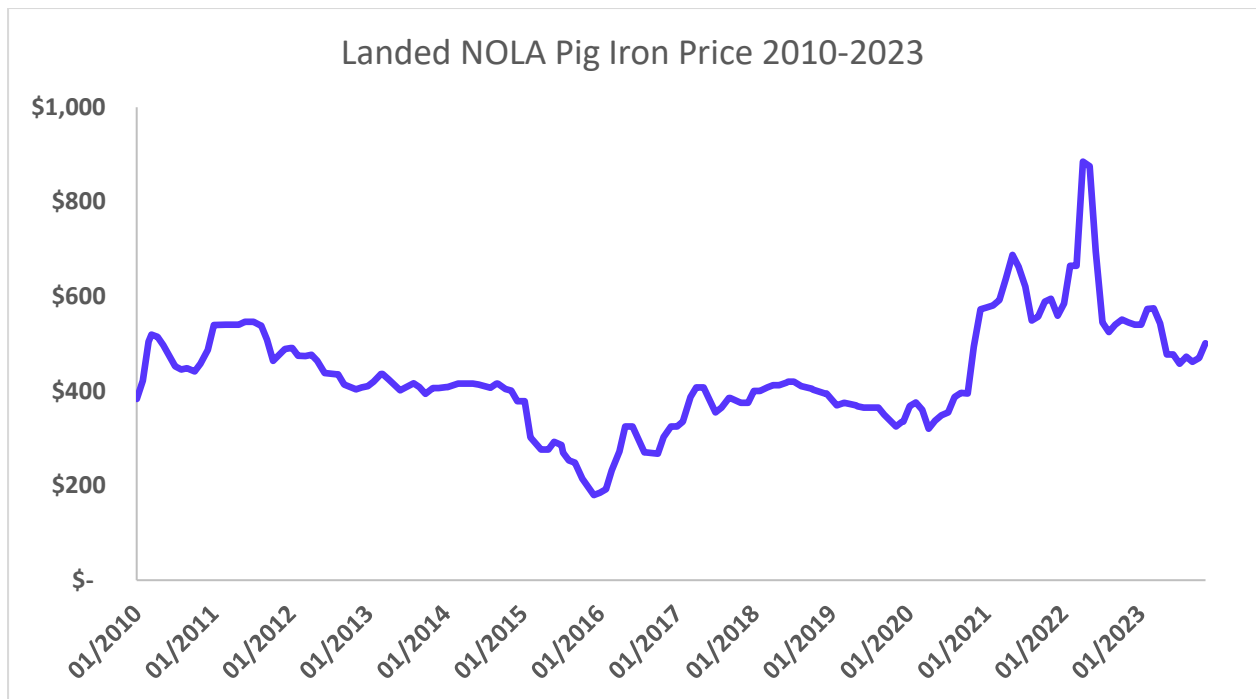


Figure 5 Blast furnace pig iron price landed at NOLA (New Orleans, Louisiana) from 2010 to 2023.

⁹ Metal Bulletin, Fastmarkets, Argus

¹⁰ “Saudi Arabia’s iron and steel industry is well-positioned for green transition – Minister of Investment”, <https://www.zawya.com/en/projects/industry/saudi-arabias-iron-and-steel-industry-is-well-positioned-for-green-transition-minister-of-investment-b8jng1ze>, 13 September, 2022.

¹¹ “Steel electric arc furnace in Saudi Arabia”, <https://knoema.com/data/steel+electric-arc-furnace+saudi-arabia>, accessed 23 December, 2023.

Table 1 Revenue base.

Feed In	Rate
GHPPI production	1.088Mtpa
Pig Iron sales price	US\$550/t
HPPI premium	US\$50/t
Green premium	US\$100/t
Assumed GHPPI sell price	US\$700/t

As a point of reference, the current spot price for 61.5% iron fines is US\$137.22/t¹²

CAPITAL COST ESTIMATE

The capital estimate for the project is estimated at US\$410M (base case) or \$205.3 to \$615.8M at the ±50% study accuracy. An additional US\$82.4M (\$41.2-\$123.6M) is estimated for the BioChar facility in Malaysia (Table 2).

Table 2 Capital cost estimate for the KSA-based Hismelt plant.

Capital Cost Estimates			
Item	Base case US\$ Million	-50% case US\$ Million	+50% case US\$ Million
Biochar plant all in costs	82.4	41.2	123.6
Hismelt plant all in costs	410.5	205.3	615.8

The capital cost estimate for the Buena Vista Iron Mine is outlined in a previous release¹³.

OPERATING COST ESTIMATE

The Operating costs or expenditure (OPEX) for the mining and beneficiation have been set out in a previous release¹³. These costs, together with biochar and Hismelt costs are outlined in Table 3.

Table 3 Estimated operating costs for the project.

Operating Cost Estimate			
Total Operating Cost per tonne of GHPPI	Base case US\$ /t PI	-50% case US\$ /t PI	+50% case US\$ /t PI
		\$381.57	\$193.76

FINANCIAL ASSESSMENT

The study did not undertake financial modelling and none is presented.

The life of the project is expected to exceed 20 years in line with the proposed Life of Mine of the proposed Buena Vista Iron Mine in Nevada, USA¹³.

The Board of Magnum are of the view that the proposed KSA—based project is achievable and that it represents a sound business proposition.

¹² <https://www.marketindex.com.au/iron-ore>

¹³ ASX:MGU Positive Scoping Study Validates Buena Vista Iron Project, 14 August, 2023.

PERMITTING, ENVIRONMENTAL AND SOCIAL

No site permitting, environmental studies, or social engagement has yet been done in Malaysia or the KSA.

GREEN PREMIUM PIG IRON FOR A LOW EMISSIONS FUTURE

The reductant used in the HIs melt plant is planned to consist of biochar sourced from renewable biomass. The operation will aim to achieve a zero, or near zero net emissions as the biomass growth cycle is established. There can be no assurances a zero or near zero net emission will be achieved.

HIs melt produces a high quality pig iron with a natural partitioning of silica and phosphorous to slag.



POTENTIAL PROJECT FUNDING

Magnum is working closely with Midmetal to establish funding for the project. Midmetal is exploring the utilisation of the latest technologies to produce pig iron in Saudi Arabia as part of the Nusaned Initiative. The Nusaned Initiative prioritises technologies to achieve the “Saudi Vision 2030” of increased localisation of downstream industries and reduce carbon emissions. Midmetal has met the requirements of the Nusaned Initiative and has been granted a certificate of acceptance supporting their proposal to build a pig iron production plant in Saudi Arabia. Funding for this pioneer initiative will be made by the Saudi Investment Development Fund “SIDF”, a sovereign fund of the KSA government.

In addition, Magnum is seeking to expand that funding into both the mining and beneficiation of magnetite at the Buena Vista Iron Project and the development of biochar capacity in Malaysia.

The Directors of Magnum consider that it may be necessary for the Company to engage with a major investor to fund the Buena Vista Iron Project, the Malaysian based biochar facility, and the KSA-based HIs melt operations. Any engagement may include, but is not limited to:

- a prepayment off-take agreement
- a farm-in joint venture, or
- an outright sale of the Project

In relation to the above, Magnum also confirms that it has commenced initial discussions with major international commodities trading houses for financing, and prepayment off-take funding options, as well as with steel manufacturers in Asia and the Persian Gulf region. However, there is no certainty that Magnum will be able to find suitable investment partners to fund the project.

Magnum currently holds a favourable A\$20 million convertible note facility which provides flexibility to allow it to undertake feasibility studies¹⁴.

¹⁴ ASX:MGU Magnum secures funding facility, 2 May, 2022.

TIME FRAME FOR DEVELOPMENT

The proposed project engineering, procurement, and construction is expected to take approximately 24 months after the final investment decision is made.

IDENTIFIED RISKS AND OPPORTUNITES

Risks identified for the Project include:

- The sites for the Project have not yet been secured in Malaysia or the KSA
- Detailed logistics studies have yet to be completed
- Industry inflation rates may impact CAPEX and OPEX estimates
- Pig Iron pricing, and its premia associated with grade and emissions amelioration may be volatile and differ to that assumed in this study
- Final steel mill waste suppliers and GHPPI customers have not yet been contracted

Opportunities identified for the Project include:

- The demand for green high purity pig iron is high and is expected to increase as the steel industry transitions from blast furnaces to electric steel making¹⁵. This offers the opportunity for increased pricing of pig iron.
- The imposition of proposed carbon border adjustment mechanisms in the EU and US will possibly increase the premium for green pig iron

NEXT STEPS

Magnum and Midmetal will work together to:

- Formalise agreements with biochar suppliers in Malaysia and SE Asia
- Formalise agreements for iron ore and steel plant waste materials supplies
- Continue due diligence with potential investors



Figure 6 A continuous pyrolysis plant of the type being considered to produce biochar from renewable biomass in Malaysia (<https://www.bestongroup.com/continuous-pyrolysis-plant/>)

¹⁵Steel Industry Pivoting to Electric Furnaces, Analysis Shows, <https://e360.yale.edu/digest/steel-industry-carbon-coal-electric-arc-furnaces>

THE BUENA VISTA IRON DEPOSIT

Buena Vista Iron Deposit is located approximately 160km east-north-east of Reno in the mining friendly state of Nevada, United States. It was discovered in the late 1890’s and in the late 1950’s to early 1960’s around 900,000 tonnes of direct shipping magnetite ore with an estimated grade of 58% Fe was mined.

In the 1960’s, US Steel Corporation acquired the Buena Vista Project and carried out an extensive exploration program including 230 diamond drill holes and considerable metallurgical test work. Richmond Mining Limited, an ASX listed company, acquired Buena Vista in 2009 and commenced a detailed exploration program culminating in a definitive feasibility study in 2012. A key component of these studies was extensive investigation of the optimal logistics plan for the deposit’s development. This included the negotiation of in-principle agreements with existing rail and port operators and the securing of all major mining permits. Detailed costings were completed on the trucking or slurry pipeline options to deliver the concentrate to the rail head located some 50 kilometres from mine site. A significant decline in iron ore prices to less than US\$50/tonne caused the then proposed development of Buena Vista to be deferred.

Geology

The Buena Vista Project magnetite deposits are the product of late-stage alteration of a localised intrusive local gabbro that resulted in intensely scapolitised lithologies and the deposition of magnetite. The most well-known example of this type of magnetite mineralisation is the Kiruna magnetite deposit in Sweden, which has been in production since the early 1900’s.

The distribution and nature of the magnetite mineralisation at Buena Vista is a function of ground preparation by faulting and fracturing, forming a series of open fractures and breccia zones. These ground conditions produce variations in mineralisation types from massive pods grading +60% magnetite to lighter disseminations grading 10-20% magnetite.

Metasomatic magnetite deposits such as those at Buena Vista have important positive beneficiation characteristics over the other main type of magnetite deposit, which is a banded iron hosted magnetite, also known as a taconite.

The Buena Vista ore is of magmatic origin and as a consequence is coarser grained and softer than banded iron hosted ores. Industry standard crushing, grinding and magnetic separation produces a concentrate grade of +67.5% Fe with very low levels of impurities.

Resource

The Mineral Resource Estimate (JORC (2012)) at Buena Vista is¹⁶:

Category	Million Tonnes	Fe %	DTR %
Indicated Resource	151	19	23.2
Inferred Resource	81	18	22
Total Resource	232	18.6	22.6

The Company confirms that all material assumptions and technical parameters underpinning the estimates continue to apply and have not materially changed.

Additionally, an Exploration Target has been identified¹⁷:

The potential quantity and grade of the Exploration Target is conceptual in nature, there has been insufficient exploration to estimate a Mineral Resource and it is uncertain if further exploration will result in the estimation of a Mineral Resource.

Development

Mining permits are in place to develop the Buena Vista Iron Mine. The Company has re-aligned the project from a simple mining, concentration and exporting model to a proposed green pig iron producer. Using cutting edge technology in tandem with biochar sources, the Company aims to capitalise on a first-mover advantage to supply green pig iron to the USA steel industry.

¹⁶ ASX:MGU – ‘Maiden JORC 2012 Resource for Buena Vista Magnetite Project’, 23 March 2021.

¹⁷ ASX:MGU – ‘Significant Exploration Target Defined’, 13 January 2023.

CAUTIONARY STATEMENTS**COMPETENT PERSON'S STATEMENT – RESOURCE ESTIMATION**

The information in this announcement that relates to Mineral Resources is based on information compiled by Mr Jonathon Abbott, a Competent Person who is a Member of the Australian Institute of Geoscientists and a full time employee of MPR Geological Consultants Pty Ltd. Mr Abbott has sufficient experience which is relevant to the style of mineralisation and type of deposit under consideration and to the activity which he is undertaking to qualify as a Competent Person as defined in the 2012 edition of the "Australasian Code for Reporting Exploration Results, Mineral Resources and Ore Reserves". Mr Abbott consents to the inclusion of the matters outlined in this announcement in the form and context in which they appear.

COMPETENT PERSON'S STATEMENT – EXPLORATION TARGET ESTIMATION

The information in this announcement that relates to an Exploration Target is based on information compiled by Mr Marcus Flis, a Competent Person who is a Fellow of the Australasian Institute of Mining and Metallurgy and a full time employee of Rountree Pty Ltd. Mr Flis has sufficient experience which is relevant to the style of mineralisation and type of deposit under consideration and to the activity which he is undertaking to qualify as a Competent Person as defined in the 2012 edition of the "Australasian Code for Reporting Exploration Results, Mineral Resources and Ore Reserves." Mr Flis consents to the inclusion of the matters outlined in this announcement the form and context in which they appear.

The Company confirms that the form and context in which the Competent Persons' findings are presented have not been materially modified.

NO NEW INFORMATION

The Company confirms that it is not aware of any new information or data that materially affects the information included in this announcement and that all material assumptions and technical parameters underpinning the estimates in the announcement of the 'Maiden JORC Resources for the Buena Vista Magnetite Project' dated 23 March, 2021 continue to apply and have not materially changed.

PRODUCT PRICING

Pricing assumptions are based on current and forecast economic conditions and may change as the proposed Project moves to production.

FORWARD LOOKING STATEMENTS

This release contains "forward-looking information" that is based on the Company's expectations, estimates and projections as of the date on which the statements were made. This forward-looking information includes, among other things, statements with respect to studies, the Company's business strategy, project plan, development, objectives, performance, outlook, growth, cash flow, projections, targets and expectations. Generally, this forward-looking information can be identified by the use of forward-looking terminology such as 'outlook', 'anticipate', 'project', 'target', 'likely', 'believe', 'estimate', 'expect', 'intend', 'may', 'would', 'could', 'should', 'scheduled', 'will', 'plan', 'forecast', 'evolve' and similar expressions. Persons reading this news release are cautioned that such statements are only predictions, and that the Company's actual future results or performance may be materially different. Forward-looking information is subject to known and unknown risks, uncertainties and other factors that may cause the Company's actual results, level of activity, performance or achievements to be materially different from those expressed or implied by such forward-looking information.

Forward-looking information is developed based on assumptions about such risks, uncertainties and other factors set out herein, including but not limited to general business, economic, competitive, political and social uncertainties; the actual results of current development activities; conclusions of economic evaluations; changes in project parameters as plans continue to be refined; future prices of metals; failure of plant, equipment or processes to operate as anticipated; accident, labour disputes and other risks of the mining industry; and delays in obtaining governmental approvals or financing or in the completion of development or construction activities. This list is not

exhaustive of the factors that may affect our forward-looking information. These and other factors should be considered carefully, and readers should not place undue reliance on such forward-looking information.

Neither the Company, nor any other person, gives any representation, warranty, assurance or guarantee that the occurrence of the events expressed or implied in any forward-looking statement will actually occur. Except as required by law, and only to the extent so required, none of the Company, its subsidiaries or its or their directors, officers, employees, advisors or agents or any other person shall in any way be liable to any person or body for any loss, claim, demand, damages, costs or expenses of whatever nature arising in any way out of, or in connection with, the information contained in this document. The Company disclaims any intent or obligations to or revise any forward-looking statements whether as a result of new information, estimates, or options, future events or results or otherwise, unless required to do so by law.

BY ORDER OF THE BOARD

Luke Martino

Company Secretary

Email: info@mmel.com.au

Phone: +61 438 014 304

Evan Smith

Investor Relations

evan.smith@advisir.com.au

Phone: +61 431 176 607