



# BLACK CANYON

## ASX Announcement



18 August 2022

ASX:BCA

## Robust Economics, Long Life Mine with Low Development CAPEX confirmed from the Flanagan Bore Scoping Study

### Cautionary Statement

The Scoping Study referred to in this ASX release has been undertaken for the purpose evaluating the potential development of the Flanagan Bore Manganese Project, Pilbara region, Western Australia. It is a preliminary technical and economic study of the potential viability of the Flanagan Bore Manganese Project. The Scoping Study outcomes, Production Targets and forecast financial information referred to in the release are based on low level technical and economic assessments that are insufficient to support estimation of Ore Reserves. The Scoping Study is presented to an accuracy level of +/- 35%. While each of the modifying factors was considered and applied, there is no certainty of eventual conversion to Ore Reserves or that the Production Target itself will be realised. Further exploration and evaluation and appropriate studies are required before Black Canyon will be in a position to estimate Ore Reserves or to provide any assurance of any economic development case. Given the uncertainties involved, investors should not make any investment decisions based solely on the results of the Scoping Study. All (100%) of the Mineral Resources scheduled for extraction over the 20 year mine life in Scoping Study production targets are classified as Indicated. Only 40% of the Global Mineral Resource has been scheduled for mining in this Scoping Study. No Inferred Mineral Resources have been used in the Scoping Study.

The Mineral Resources underpinning the production target in the Scoping Study have been prepared by a competent person in accordance with the requirements of the JORC Code (2012). For full details on the Mineral Resource estimate, please refer to the ASX announcement of 13 April 2022. Black Canyon confirms that it is not aware of any new information or data that materially affects the information included in that release and that all material assumptions and technical parameters underpinning the estimate continue to apply and have not been changed. This Scoping Study is based on the material assumptions outlined in the announcement. These include assumptions about the availability of funding. While Black Canyon considers that all the material assumptions are based on reasonable grounds, there is no certainty that they will prove to be correct or that the range of outcomes indicated by the Scoping Study will be achieved.

To achieve the range of outcomes indicated in the Scoping Study, funding in the order of \$44 million will likely be required. Investors should note that there is no certainty that Black Canyon will be able to raise that amount of funding when needed. It is also possible that such funding may only be available on terms that may be dilutive to or otherwise affect the value of Black Canyon's existing shares. It is also possible that Black Canyon could pursue other strategies such as project finance, strategic partners, a sale or partial sale of its interest in the Flanagan Bore Project. The Flanagan Bore Project is part of the Carawine Joint Venture ("Carawine JV"), with Carawine Resources Ltd ("CWX" ASX:CWX). The respective interests of each party currently being Black Canyon 51% and CWX 49%. Black Canyon is the manager of the joint venture and is earning up to a further 24% interest in the Carawine JV projects to 75%. Under the terms of the Carawine JV, following Black Canyon earning a 75% interest, CWX will have the right to contribute to further expenditure, or dilute its interest.

This announcement contains forward-looking statements. Black Canyon has concluded that it has a reasonable basis for providing these forward-looking statements and believes it has a "reasonable basis" to expect it will be able to fund development of the Flanagan Bore Manganese Project. However, a number of factors could cause actual results or expectations to differ materially from the results expressed or implied in the forward-looking statements. Given the uncertainties involved, investors should not make any investment decisions based solely of the results of this study.

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## HIGHLIGHTS

- Scoping Study confirms the Flanagan Bore Project will generate strong financial returns over a 20 year mine life at an average production rate of 1.8Mtpa
- Project pre-tax NPV of A\$134m (8% discount rate) and pre-tax IRR of 67%
- Life of mine (LOM) revenue of A\$2,282m and EBITDA of A\$420m with an average annual free operating cashflow of A\$32.1m for the first 4 years of mining operations
- Low development CAPEX of A\$44m with a payback period of less than 2 years
- LOM estimated Production Target of 36.1Mt @ 11.7% Mn mined from 104Mt @ 10.5% Mn Mineral Resource (Indicated)
- Conventional free dig mining with a very low strip ratio for the first 3 years and a LOM average strip ratio of 0.7:1 waste to ore
- The Scoping Study examines conventional beneficiation processing using Dense Media Separation (DMS) circuits, targeting a 33% manganese concentrate
- Further metallurgical studies and associated engineering design activities are underway, in preparation for detailed feasibility evaluation along with baseline studies to support permitting and the environmental approval pathway
- Testwork commencing on the generation of value-add high purity manganese sulphate (HPMSM), which will form part of a dedicated scoping study examining the production of battery grade manganese
- Strong cash position at the end of the June quarter of \$4.8m, to continue exploration and development studies on the Carawine JV and 100% BCA owned manganese assets

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Australian manganese explorer and developer, Black Canyon Limited (**Black Canyon** or the **Company**) (ASX:BCA), is pleased to announce positive Scoping Study results completed in conjunction with BatteryLimits Pty Ltd and selected independent consultants into the potential development of the Flanagan Bore Manganese Project. Flanagan Bore is part of the Carawine JV between Black Canyon (51% interest, earning to 75%) and Carawine Resources Ltd and is, located in the eastern Pilbara region of Western Australia.

The Scoping Study is based on developing a mine approximately 115km north east of Newman at Flanagan Bore, producing a manganese concentrate suitable for use as an essential manganese alloy used widely in the steel industry or as feedstock into the downstream manufacture of high purity manganese sulphate (HPMSM), a critical precursor component of cathodes for batteries used in electric vehicles.

The Scoping Study level economic evaluation shows a 20 year mine life, strong cash flow and solid returns, with a low capital start up requirement to produce manganese concentrate mined from a large Indicated Mineral Resource of **104Mt @ 10.5% Mn** containing **11Mt of manganese** (Table 1). This includes a higher-grade subset, comprising an Indicated Mineral Resource of **33Mt @ 12.8% Mn** (Table 2) across the FB3 and LR1 deposits.



# BLACK CANYON

## Black Canyon Executive Director, Brendan Cummins, commented:

*“The Scoping Study results clearly demonstrate significant value from a future mine development at Flanagan Bore.*

*“The key financial metrics are robust and in line with the Company’s strategy of discovery and delivery through de-risking the Project as we progress the development schedule. This is reflected with the infill drilling recently completed to upgrade the Mineral Resources classification across LR1 and FB3 (assays pending).*

*“The utilisation of lower risk conventional dense media separation as a primary separation technique will be further evaluated with the processing of life-of-mine composite metallurgical samples and several variability composites.*

*“Ancillary mining requirement studies are also commencing, with the search for processing water identified as a high priority in addition to understanding the infrastructure requirements. The Company is also planning and scheduling environmental studies and will further engage with stakeholders as we escalate ESG related activities in the project area.*

*“In parallel, the Company is well positioned to evaluate the longer-term ambition of downstream processing manganese ores from the potential long-life operation at Flanagan Bore to produce manganese sulphate for electric vehicle batteries.*

*“The initial leaching test work is almost complete and a comprehensive scope examining leaching, purification and crystallisation of HPMSM has been finalised and will be commencing soon.*

*“The Company recognises the tremendous global growth in electric vehicle demand within traditional NCM cathode based batteries and in evolving battery chemistries such as the recently released M3P (CATL) battery that includes manganese within Lithium Iron Phosphate (LFP) batteries.*

*“Significantly, the addition of manganese into M3P batteries increases energy density but at a similar manufacturing cost to the widely used cheaper/volume LFP batteries that are used more commonly in mass produced electric vehicles. This should translate into even higher demand for HPMSM going forward as the manganese is increasingly sourced for both NCM and M3P battery chemistries.”*

## KEY METRICS



## **SCOPING STUDY PROJECT DESCRIPTION**

The Flanagan Bore Project is located approximately 400 km southeast of Port Hedland and 115 km north-east of Newman, in the east Pilbara region of Western Australia. The Mineral Resources are hosted within a single granted exploration licence (E46/1301), which is part of the Company's Carawine JV and is subject to a farm-in and joint venture agreement with Carawine Resources Ltd (ASX:CWX). Having earned a 51% interest, Black Canyon is now earning up to 75% in the Carawine Project tenements by sole-funding an additional \$2.5m of exploration expenditure. Once Black Canyon has earned 75% of the Carawine JV, CWX can elect to dilute their interest, or contribute to further expenditure to maintain a 25% ownership interest. All Scoping Study metrics are presented on a 100% project interest basis.

This Scoping Study is based on mining optimisations of 100% of the JORC-2012 Indicated Mineral Resource, comprising 107Mt @ 10.4% Mn (Refer to ASX Announcement on 13 April for further details) The operating costs have been estimated using at market mining, transport and processing costs based on similar scales and styles of mining operations and mineral separation processes. The capital costs have been estimated based on quotes received from suppliers, which includes installation and a number of critical spares.

Conventional free dig excavator and trucking is proposed for the open pits with a number of staged mine pits developed on the LR1 and FB3 deposits. The initial starter pits will focus on low strip ratio, higher-grade (>12% Mn) mineralisation with a stockpiling strategy for material with grades between 10 and 12% Mn. The project is currently based on a 20-year life of mine, with mining only in the first 11 years followed by 9 years of processing stored stockpiles. Approximately 60% of the ores will be mined from FB3 and the remainder from LR1. There is significant opportunity to extend the mine life through the delineation of additional shallow mineralisation along the recently drilled L1 to TF1 and FB5 to FB6 trends in addition to delineating Mineral Resources at LR1 and LR2.

A 1.8 Mtpa processing plant is proposed with the front-end comprising scalping, primary and secondary crushers, log washer scrubbing and screening followed by fine and coarse DMS circuits treating +1mm to 6mm and +6mm to 30mm feeds respectively. Coarse (lump) and fine manganese concentrates will be produced, with the ability to integrate some of the fines into the lump manganese concentrate. The propose sales strategy is to sell a lump and fines products, with some of the fines product reserved for potential downstream processing into manganese sulphate. The Company plans to produce a 33% Mn product, generating approximately 500,000t of manganese concentrate per year over the LOM.

A predominantly lump and fines product will be transported using contract haulage service providers using road trains to Port Hedland and trucked to the Utah Point multi-user berth for ship loading. A number of haulage routes will be evaluated in future detailed studies with the potential to deliver concentrate initially to a site close to Port and then campaign truck the concentrate to the port for loading. Truck haulage costs include a component for road maintenance and upgrades. At Port Hedland, the Company intends to utilise large vessels with a minimum freight size of 50,000t to reduce CIF costs.

The Scoping Study has an accuracy of +/- 35%.

### ***Environment, Social and Governance***

The Company is in the process of evaluating the environmental and social impacts from the development of the Flanagan Bore Project. A set of policies and guidelines will be developed over time and tailored to those impacts with a specific focus on risks and benefits associated with the Project in relation to energy utilisation, waste and pollution management and conservation of natural resources including flora and fauna.

The Company intends to minimise water usage through water recovery with the inclusion of a tails thickener prior to deposition into the Tails Storage Facility. The utilisation of solar and potentially wind power generation will also be examined in future studies. The overall impact to climate will be measured



across all aspects of the operations, reviewed and published as part of the annual operations and sustainability report.

Several key stakeholders have been identified that are likely to be impacted by the operation. These include Pastoral Lease Companies who own and operate the Balfour Downs and Ethel Creek cattle stations and the Nyiyaparli People (Karlka Nyiyaparli Aboriginal Corporation (KNAC)) who are the traditional owners of the land, live in the region and also at Jigalong Community and Newman.

It will be an important component of the Project that suppliers and service providers can be locally sourced, competitive and can demonstrate ethical supply chains.

Black Canyon intends to pursue a high level of integrity across the business by being transparent, collecting and publishing accurate ESG related records, The Project Leadership team will encourage environmental sustainability and diversity while seeking opportunities to minimise emissions across mining and potential downstream operations.

## ***Geology and Mineral Resources***

The local geology of Flanagan Bore is dominated by shallow cover overlying shales from the Balfour Formation that overlies carbonate sequences ranging from calcareous shales and dolomite of the underlying Enacheddong Dolomite. The sequence is also intruded by cross-cutting dolerite dykes and sills. Large scale folds and associated faults have been mapped across the Project area, which appear to increase the grade and volume of mineralisation. The Enacheddong Dolomite will form a high priority target for water extraction, with the nearest occurrence located 4 to 5 kms from the proposed process plant location. The numerous dolerite dykes and sills may be a useful source for crushed hard rock for laydown, construction pads and road construction material

The geology at LR1 and FB3 can be separated into a number of primary units

- a. The surface enriched manganese shales, which are typically higher grade and maybe ferruginised to some extent and occurs from surface to 15m depth.
- b. A rare thin interval of upper unmineralised Balfour Shale. The upper unmineralised shale is brown grey in colour and occurs intermittently across the project area from surface up to 10m in depth.
- c. A thick and widely distributed manganiferous shale unit that contains a supergene (manganese) enriched shale located between surface and 40m depth and gently dipping. The manganese enriched layers are confined to distinct bands within the Balfour shale and alternate with barren red/brown or pale coloured shales intermixed within saprolitic clay bands.
- d. At depth, the fresh manganiferous olive to green shales of the Balfour Shale persist but have a lower manganese grade.
- e. Below the fresh manganiferous shales green or brown barren shale are encountered

At LR1, the northern extent of the current drilling demonstrates that the manganiferous deposit is structurally controlled, terminating at surface. This geological structure is visible by satellite imagery showing what has been interpreted as a large, folded structure with a nose closure possibly located to the west and then striking to the northeast towards FB2 and FB1. The mineralised zone generally strikes east-west forming a semi-basin like structure that outcrops and gently dips to the south-southeast. The southern boundary of the LR1 deposit is truncated by a northeast trending structure infilled with dolerite terminating the strike continuity to the east.

The FB3 deposit is located within an open asymmetric folded synformal structure with an axial plane striking to the northeast. The northern limb of the fold appears to be dipping slightly steeper to the

southwest while the southern limb appears to be dipping very shallowly to the northwest. The mineralisation terminates on the fold limbs but extends to the TF1 and FB5 prospects.

The LR1 and FB3 Mineral Resources have been zoned into three domains including basement. Target mineralisation is in the mineralised Balfour shale unit (Zone 2). The upper domain, Zone 1, is defined from surface up to 10m depth. Zone 1 comprises brownish unmineralised Balfour Shale lithology.

Zone 2 is the high grade, brown-grey Balfour Shale unit that is enriched with manganese. The mineralised zone generally strikes east-west forming a semi-basin like structure that outcrops and gently dips to the south.

Occasional low-grade Mn intercepts in Zone 2 are associated with Balfour Shale lithology consisting of unmineralised interbedded shale or ferruginous material. An oxidation and transition/fresh rock boundary has also been applied to the block model.

The basement (Zone 200) has been used to control the interpolation of high-grade Mn values into the un-sampled and low-grade area of the deposit.

Historic reverse circulation (RC) drill results from the LR1 Prospect and RC drill assay information completed by the Company from the LR1 and FB3 deposits have been reviewed and validated for the Mineral Resource estimate. The work was supervised and conducted by Greg Jones, a specialist consultant in Mineral Resources, metallurgy and processing technology and is employed by IHC Mining (refer to Competent Person statement).

Table 1 displays the Global Mineral Resource estimates for the FB3 and LR1 deposits. Oblique and cross-section views of the FB3 deposit are presented in Figures 1 to 2 (Refer to ASX Announcement on 13 April for further details) .

The Mineral Resources at LR1 and FB3 are outcropping, and form pronounced topographic features. The Mineral Resource estimate used as the basis for the Scoping Study were finalised in April 2022 and based on 200m spaced lines at 100m drill hole centres. At FB3, a total of 76 holes for 2,016m metres were drilled averaging 27m depth, whilst at LR1, a total of 47 holes for 2,296m averaging 48m depth were completed.

The drill data shows manganese grades are strongly continuous downhole and across strike, which has significantly improved the confidence in the estimate and supports the Indicated Mineral Resource classification. High-grade manganese mineralisation is encountered from surface at FB3 and LR1 with zones of continuous mineralisation typically between 20 to 40m thick.

Further infill and extensional RC drilling was completed in May and June 2022. As a result of the RC drill program (181 holes for 7,534m, assays pending), the overall drill spacing at FB3 and LR1 has been reduced from 200m spaced lines and 100m centred holes to 100m spaced lines and 100m centred holes. Significantly, the doubling of the drill density should enable the current Indicated classified Mineral Resources to be upgraded to Measured, which is suitable for detailed feasibility and associated mining and processing studies.

**Table 1. Global Mineral Resource estimate for the FB3 and LR1 deposits at Flanagan Bore April 2022\***

Summary of Mineral Resources <sup>(1)</sup>								
Deposit	Mineral Resource Category	Material (Mt)	In Situ Mn (Mt)	BD (gcm <sup>3</sup> )	Mn (%)	Fe (%)	Si (%)	Al (%)
FB3	Indicated	67	7	2.4	10.4	10.3	17.6	4.5
LR1	Indicated	37	4	2.4	10.8	8.9	18.3	5.0
<b>Grand Total</b>		<b>104</b>	<b>11</b>	<b>2.4</b>	<b>10.5</b>	<b>9.8</b>	<b>17.9</b>	<b>4.7</b>
<b>Notes:</b>								
(1) Mineral resources reported at a cut-off grade of 7% Mn								

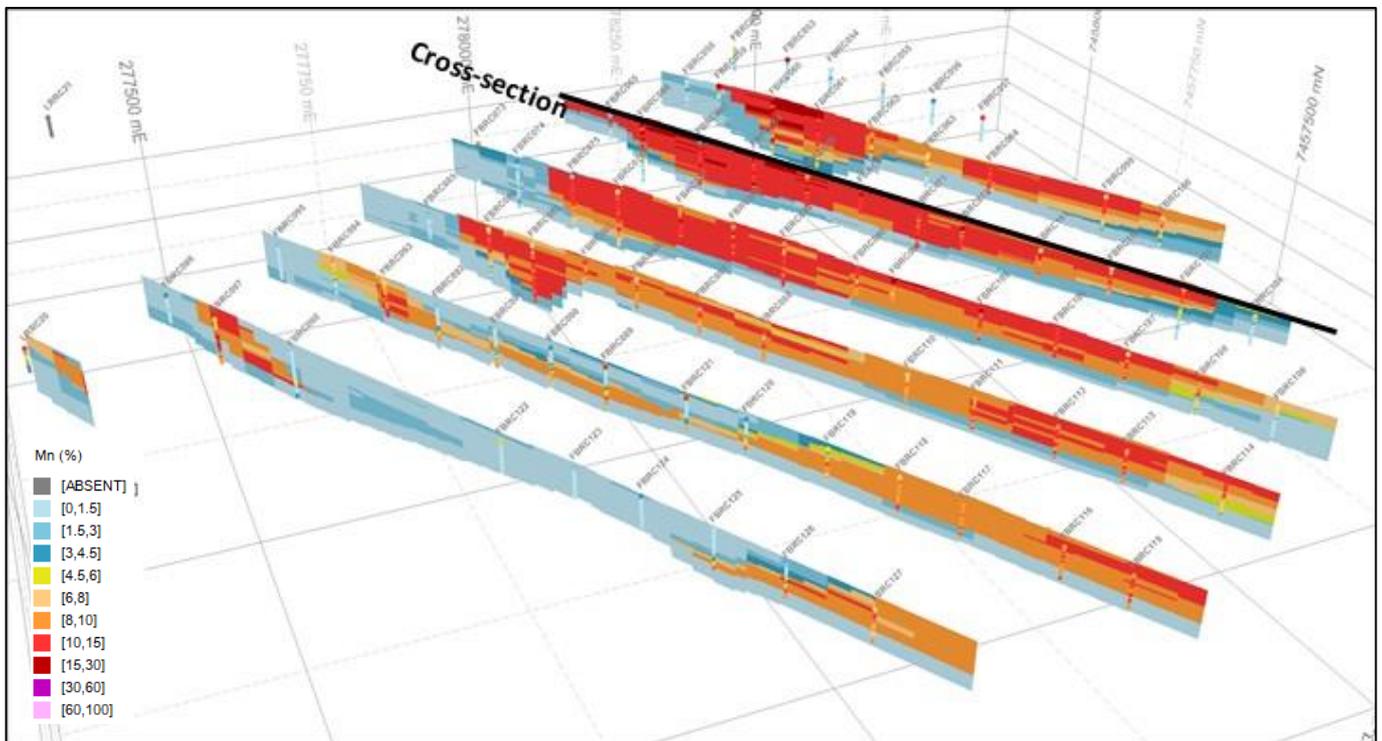
\* refer to ASX Announcement 13 April 2022 for further details

**Table 2. Higher-grade Zone Mineral Resource estimate from the FB3 and LR1 deposits at Flanagan Bore April 2022\***

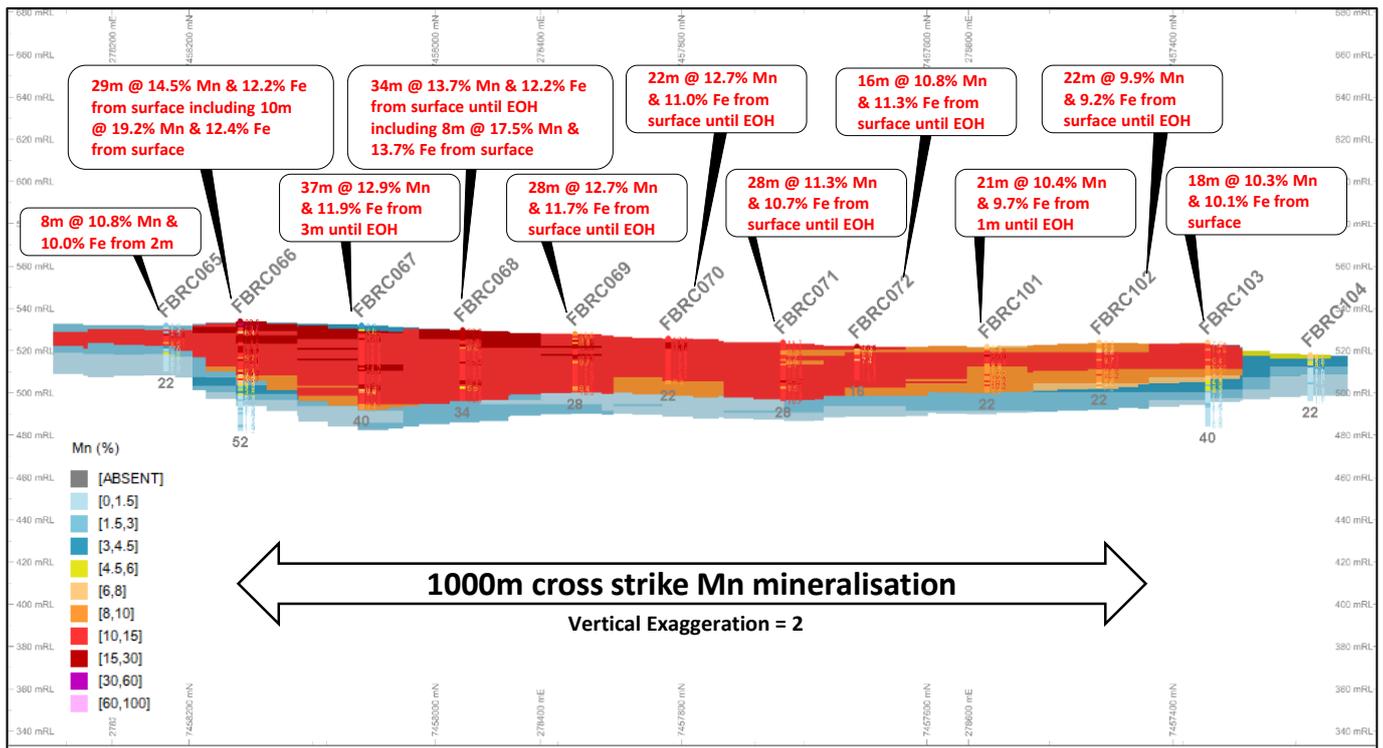
Summary of Mineral Resources <sup>(1)</sup>								
Deposit	Mineral Resource Category	Material (Mt)	In Situ Mn (Mt)	BD (gcm3)	Mn (%)	Fe (%)	Si (%)	Al (%)
FB3	Indicated	19	2	2.4	12.7	11.5	18.5	4.6
LR1	Indicated	15	2	2.4	12.9	9.9	18.4	4.9
<b>Grand Total</b>		<b>33</b>	<b>4</b>	<b>2.4</b>	<b>12.8</b>	<b>10.8</b>	<b>18.5</b>	<b>4.8</b>

**Notes:**  
 (1) Mineral resources reported at a cut-off grade of 11% Mn

\* refer to ASX Announcement 13 April 2022 for further details



**Figure 1. Oblique view of the Maiden FB3 Mineral Resource model looking northeast and coloured by Mn grade (%) (2x vertical exaggeration). (Labels represent drill holes used in the estimate)**



**Figure 2. Type section 278,450 mE mid-point (looking north-east) showing FB3 Mineral Resource model cells and drill holes coloured by Mn**

## Mining and Geotechnical

Whittle™ optimisation software was used for the optimisation runs and Surpac™ software for mine design. The objective was to investigate the potential for mining open cut mineralisation utilising the Mineral Resource models for LR1 and FB3 and economic inputs and associated parameters based around a 1.8 million tonnes per annum (Mtpa) processing plant. This scope of the study was to produce optimisation inputs and results, life of mine schedule (LOMS), Production Targets and scoping-level financial model outputs. Mr Paul O’Callaghan, Principal Mining Engineer with OTC Mine Planning, directed the mining study process on behalf of the Company.

Geotechnical parameters were provided by 4DG, which provided a desktop review of the site surface geology, analysis of drill logs from both the Mineral Resource RC drilling and 10 PQ vertical diamond drill core holes and associated geotechnical logs (RQD, hardness, oxidation, recovery and fracture counts). 4DG concluded the dominate host rock of manganese enriched shale can be excavated by ripping and typical load out methods. From the depth of oxidation and closely spaced bedding planes and low observed thickness of higher strength manganese bands, 4DG determined it was very likely that dozer ripper tines would successfully free this material for excavation using a suitable size excavator.

The mining study assumed a free dig truck and shovel open pit operation and a 5% mining dilution and loss was applied to the model.

Over the 20-year mine life at a processing rate of 1.8 Mtpa, the Flanagan Bore deposits will mine Production Targets totalling 19.8 Mt of ore at 12.9% Mn with the majority of the mining completed in the first 11 years. The remaining 9 years of mine life will process stockpiled ore, generating another 16.3 Mt @ 10.4% Mn of Production Targets significantly reducing operating costs in the latter half of the mine life. Over the LOM, a total of 9.9 Mt of 33% Mn manganese concentrate will be generated from Production Targets of 36.1Mt @ 11.7% Mn. During the first 3 years the strip ratio is very low at 0.1:1 waste to ore with a LOM strip ratio of 0.7:1 waste to ore.



The Scoping Study has only evaluated JORC-2012 Indicated Mineral Resources and has utilised approximately 40% of the Global Flanagan Bore Indicated Mineral Resource.

## ***Beneficiation Testwork***

The key objectives of the scoping level sighter testwork completed by the Company was to establish early-stage material characteristics, scrubbing and sizing analysis, variability, recoveries (where possible), potential flowsheet design options and product marketability. The initial metallurgical testwork has delivered highly promising results, achieving concentrate grades of more than 30% Mn and up to 35% Mn. (Refer ASX announcement 9 June 2022)

### *Scrubbing and washing*

As an important first stage of the beneficiation process, selected intervals from the drill core samples were composited and thoroughly combined. A total of three samples were generated based on deposit location and observed textural differences in manganese band thickness and shale content as logged from drill core. At LR1, upper (thinly banded manganese) and lower (thickly banded manganese) composites were generated, whilst at FB3, one composite was created from moderately banded manganese.

The three 50kg samples were crushed to 50mm, then scrubbed and washed for 7.5 minutes. The results show a distinct upgrade in manganese content through straightforward first stage crushing, scrubbing and washing to remove a high portion of the clay and shale mass. The manganese is also shown to be relatively coarse in size with higher percentages of recovered manganese reporting to the coarser fractions.

### *Heavy Liquid Separation (HLS)*

Heavy liquid separation analysis was used to approximate DMS. At the commencement of the HLS phase, a number of sighter tests were undertaken to evaluate achieved manganese grades using various liquid densities and fraction sizing applied to raw scrubbed/washed material in addition to crushing and sizing raw scrubbed and washed feeds to increase liberation. The testwork was also designed to confirm proof of concept in delivering a potentially marketable manganese product.

The overall manganese upgrades and consistency achieved across all three composites across a number of crushed size fractions indicated that dense media separation as a beneficiation technique has considerable merit and consistent with the Company's approach of using conventional beneficiating techniques. Further detailed testwork is warranted to further validate this separation technique.

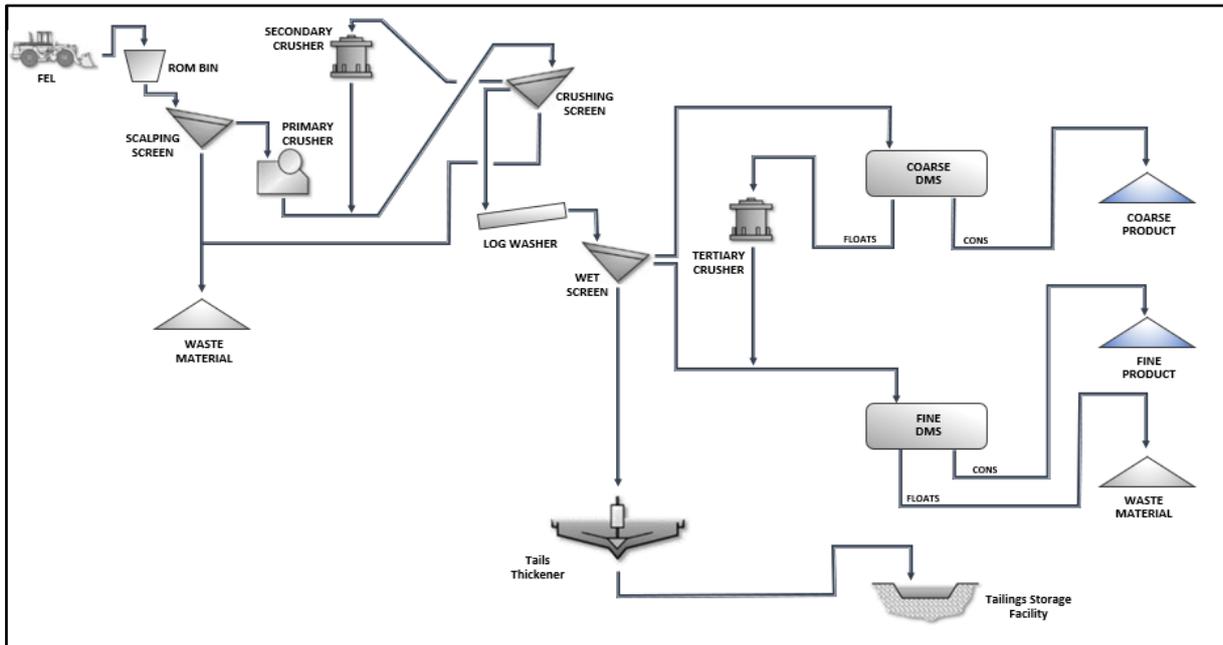
## ***Process Flowsheet Design***

The proposed flowsheet design is based on sighter level metallurgical test work completed on the three triple tube PQ sized diameter drill core composites from LR1 and FB3 (described above), experience of the principal process engineer and utilising standard "off the shelf" equipment. The design process was to review the application of existing technologies widely used in the beneficiation of manganese and other dense minerals and design sighter level tests to evaluate the potential of each technology to deliver a saleable product. This approach has formed the basis of the flowsheet design shown in Figure 3.

In summary, the flowsheet used as the basis of the Scoping Study is as follows:

- Fines scalping followed by primary crushing
- Scrubbing using a log washer
- Screening and secondary crushing and screening
- Two stage Dense Media Separation (DMS) circuits, including screening and tertiary crushing recycle stage circuit
- Production of +1-6.3mm and +6.3-32 mm Manganese concentrate products
- Waste disposal including:

- Dry coarse and fines material from primary crushing and screening and DMS waste streams will be either be utilised in TSF wall construction and capping or stored within the mine waste dumps
- Wet tailings to be thickened and discharged in a tailings storage facility (TSF).



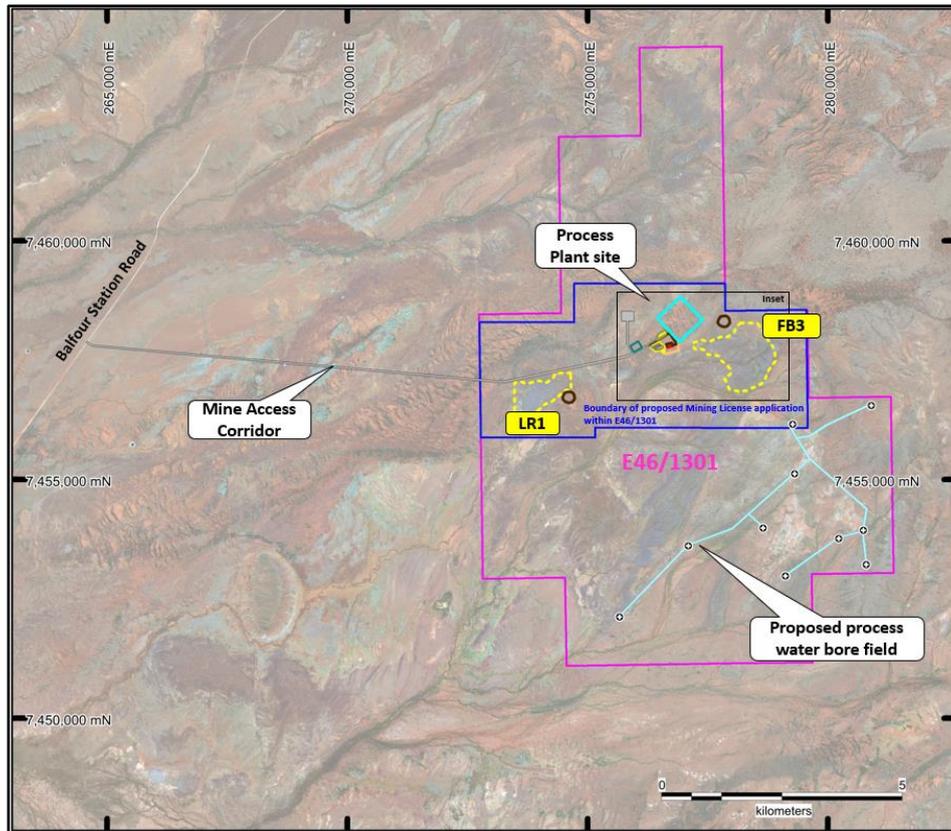
*Figure 3 Flanagan Bore process flowsheet schematic (1.8Mtpa throughput)*

**Site Infrastructure**

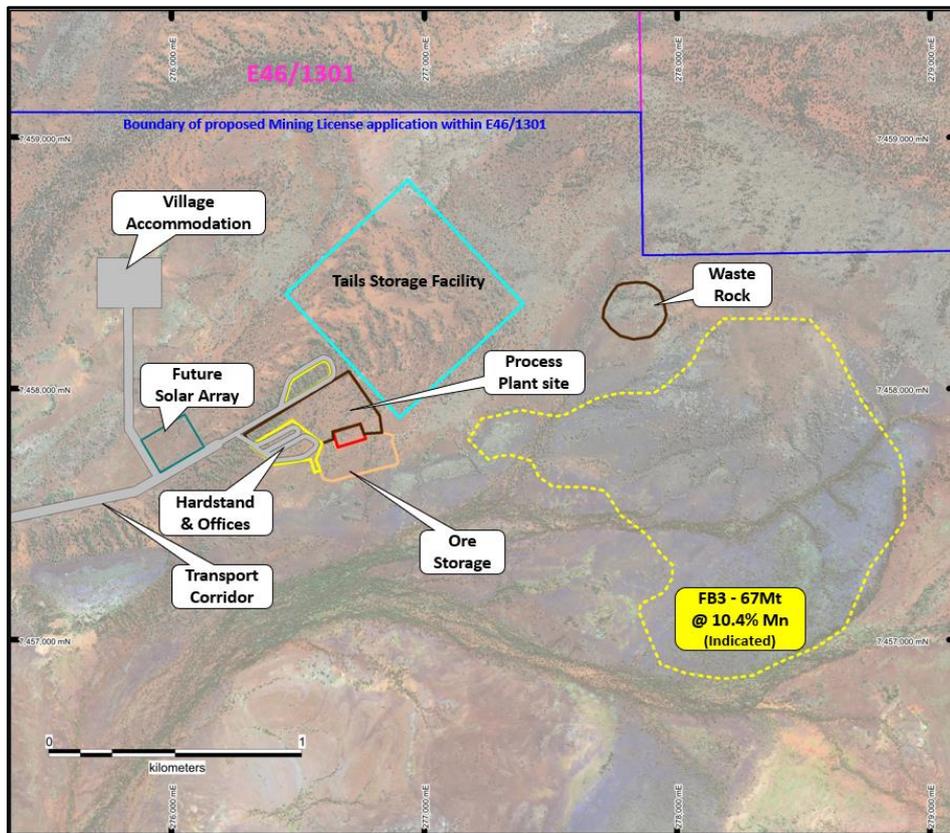
The plant and infrastructure associated with the Scoping Study comprises the following:

- Process plant and ancillary equipment such as the power station, office, laboratory and workshop facilities
- Tails Storage Facility (TSF)
- Mine, stockpiles and waste dumps
- Water supply bore field and pipe routes
- Access roads to and within the plant, mine and the Project site
- Accommodation facilities, complete with dedicated services (generators, water treatment etc).

The general project site plan and process plant site layout is shown in Figure 4 and 5 respectively.



*Figure 4. Overall Flanagan Bore project plan*



*Figure 5. Process plant and ancillary facilities in relation to the FB3 starter pit mineral resource*



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The power requirements for the process plant have been calculated with a total connected load of 2.3 MW including all duty and standby equipment with an estimated average operating load of 1.3 MW. The power station proposed in the study is based on diesel generator sets (gensets) and operated by an independent power provider. A solar /battery/ diesel hybrid power station option is to be further investigated as a means to reduce operating costs and reduce the carbon footprint of the mine.

The gravel roads maintained by the local East Pilbara Shire to the site from the Newman – Nullagine – Port Hedland road (managed by Main Roads WA) will require some upgrades for both the construction and operational phases of the Project. An allowance for this work has been included in the capital estimate and is based on costs of other road upgrade projects in the area. The road from Newman to Port Hedland is partly sealed servicing mining operations and the townships of Nullagine and Marble Bar. The roads in the area can be closed up to a week during the wet season due to heavy inundation associated with tropical lows, which will need to be factored in during construction and operations.

Water requirements for the process plant are estimated at 0.5 m<sup>3</sup>/t of mill feed resulting in a total make-up water required for the operation of 0.7-1.0 GL/y. For the study, it has been assumed that adequate groundwater will be available within a 5 km radius of the process plant to operate an effective bore field based upon an initial hydrological assessment completed by Knight Piesold Pty Ltd. The Company will undertake a monitoring and production bore investigation to establish aquifer potential, drawdown and recharge targeting structurally dislocated carbonate units of the Enacheddong Dolomite, which can be karstic and host high quality water.

The plant will include, raw, process and potable water systems including a tailings thickener to maximise water recycle.

Process plant tailings will comprise multiple streams including

- Dry scalped and screened material
- Wet fines
- DMS wet tailings

Dry materials will be stockpiled and re-used in Tails Storage Facility (TSF) construction where appropriate.

Wet tailings will be dewatered using a cyclone and with coarse recovered material stockpiled and rehandled. The dewatering cyclone overflow fine tailings are to be thickened and pumped to the TSF for discharge using sub-aerial deposition from multiple spigots. Thickener overflow water gravitates to the process water pond for recycle. Additional water is recovered from the TSF via tailings return water system.

Buildings within the plant, administration, and infrastructure areas will be of the demountable/portable office type. Large plant buildings will be provided as dome structures and shipping containers including:

- Processing maintenance workshop
- Maintenance and consumables warehouse

The accommodation village will consist of modular prefabricated buildings typically used in the Pilbara area for mine site accommodation and will be constructed to accommodate up to 52 personnel. The facilities will be complete with generators and water treatment plants.

### ***Transport and Concentrate Logistics***

The manganese concentrate products from the process plant will be stacked and blended as required and road hauled approximately 617km in quad semi-trailers to Utah Point Port Facility in Port Hedland for shipment to market. The transport of product to port, stockpiling and stevedoring will be done through a contract arrangement with a specialist logistics company.



The Utah Bulk Handling Facility is owned and operated by the Pilbara Ports Authority. The berth has a 24Mtpa capacity catering predominantly for iron ore juniors and other smaller bulk mineral export companies currently shipping manganese, chromite and spodumene ores. The bulk handling facility comprises, product receival hoppers and stackers, stockpiles, product reclaim and ship loader.

### ***Licensing, Environment and Permitting***

The project is situated within granted Exploration Licence E46/1301. A portion of the exploration licence will be converted to a production licence with the application of a Mining and relevant Miscellaneous licences administered by the Department of Mines and Petroleum (DMP). A proposed mining licence outline has been drafted and will be lodged with a Mineralisation Report as required by the DMP. The Company will also commence negotiations with the KNAC for a Mining Access Agreement to facilitate the mining licence grant process.

With the completion of the Scoping Study, the Company is now initiating seasonal baseline environmental studies to inform an assessment against the EPA's Key Environmental Factors that include impacts to Land (flora/vegetation, subterranean and terrestrial fauna, landforms) Water (groundwater ecosystems and surface water) Air (emissions and greenhouse gases) and People (human health and social surroundings).

The scale of the Project and level of assessment required under the Environmental Protection Act 1986 (amended 2020) has not been formally determined as it is dependent on the findings of the initial studies. Once relevant studies have been completed, the Company will be able to plan an appropriate approval pathway to receive approvals through the Part IV and/or V approval processes under the EP Act, as well as Mining Act 1978, Rights in Water and Irrigation Act 1914 and other minor approvals and permits.

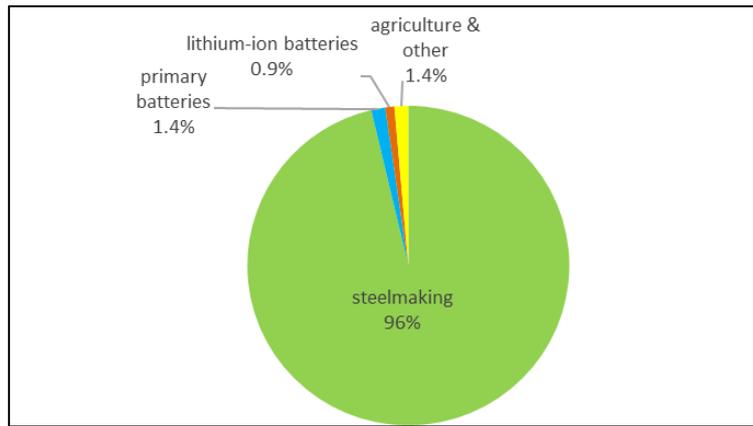
### ***Manganese Market and Scoping Study Ore Pricing\****

As an essential and non-substitutable component in steelmaking, manganese is most commonly used as a powerful de-oxidant and to improve either the strength or ductility of steel and increase the hardenability rate. The commodity is listed as a critical mineral by the governments of the United States of America and Australia with the majority of the ores produced from Australia, South Africa, Brazil, China, and Gabon.

Manganese is typically alloyed with silicon or iron to make silicomanganese and ferromanganese products that are added during the steel making process. Preliminary discussions with marketing specialists indicate manganese concentrates with key characteristics similar to ore from Flanagan Bore would be suitable for silico- or ferromanganese alloys.

Steel making on average represents 96% of total Mn ore demand with the remaining 4% used in the production of primary batteries, Li-ion batteries, agriculture and other uses (Figure 6, sourced with permission from IMnI). In 2022, steel demand is expected by Worldsteel to increase by 0.4% to reach 1.84Bt, after increasing by 2.7% in 2021. In 2023 steel demand is expected to see further growth of 2.2% to reach 1.88Bt. Going forward steel demand is expected to remain neutral as the Chinese Government looks to increase infrastructure investment and stabilise the real estate market. Demand for manganese alloys is contracting slightly in response to the slow-down in steel production demand and higher energy costs. However, whilst China will likely remain neutral, production in India, which is the second largest producer of steel to China has been steadily increasing year on year since 2015 driven by cheaper energy costs and rising internal demand. Demand for steel in India is likely to continue to rise with current steel consumption per capita of only 74kg/yr, versus a global average of 261kg/yr of steel consumed per person each year.

The largest potential sector for growth opportunities lies within high purity manganese sulphate monohydrate (HPMSM) used as a pre-cursor material combined with other cathode active materials utilised in lithium-ion batteries in electric vehicles.

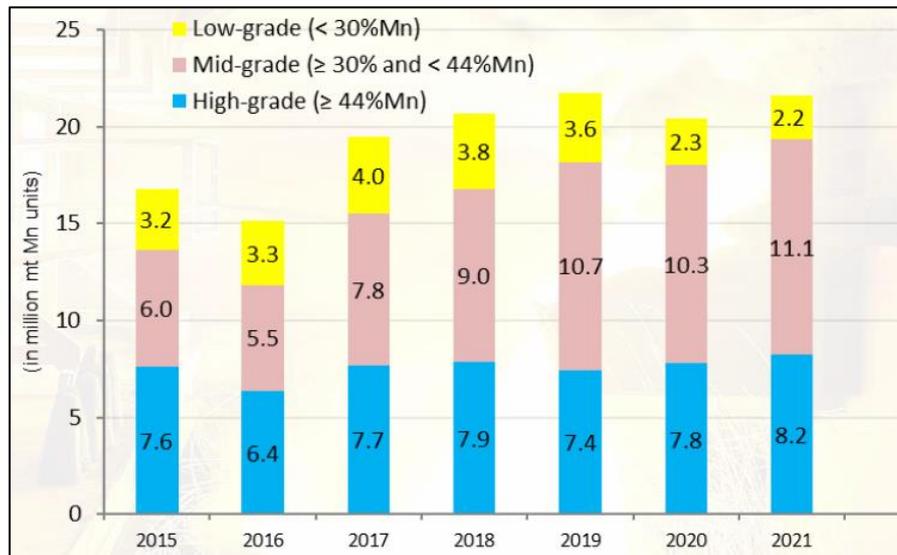


**Figure 6. Manganese Ore Consumption by application (source IMnI 2021)**

Ore grade manganese is typically sold and classified according to the following grade categories:

- High grade > 44% Mn
- Medium grade 30% to 44% Mn and
- Low grade < 30% Mn

Ores to be produced by Black Canyon at Flanagan Bore will target the largest segment of the graded manganese ores - Medium grade which account for approximately half of all manganese ores produced in 2021 (Figure 7 sourced with permission from IMnI).



**Figure 7. Global Mn ore production 2015 to 2022 by grade classification (source IMnI, 2022)**

Medium grade ores are typically sold on a contractual basis at a discount to High grade ores based on the manganese content with a potential premium payable for silica content when sold into the silicomanganese market. The manganese price index presented in Figure 8 (sourced with permission from IMnI) shows that in 2022 both Medium and High grade manganese ores have traded on average at a premium to prices received in 2021. This is particularly pronounced in the High grade or > 44% Mn ores in March 2022 due to the commencement of the conflict in the Ukraine.



**Figure 8. Manganese Ore Index 2021 to 2022 (sourced with permission from IMnI)**

Over the past 7 years > 44% Mn ore has traded at an average price of US\$5.33 CIF dmtu and over the past 12 months has averaged US\$6.32 CIF dmtu. For this Scoping Study Black Canyon management have applied a conservative pricing assumption of US\$4.90 CIF dmtu taking into account flattening demand for steel, discounting of Medium grade 33% Mn concentrate ore to the High grade 44% Mn CIF pricing per dmtu, long term pricing trends and potential credits for delivering a higher silica content product.

*Note \* Information provided in this section has been sourced with permission from the International Manganese Institute (IMnI). Other marketing information was reviewed but is unable to be published due to the confidentiality of that information.*

### **Economic Analysis and Financial Summary**

The capital and operating cost estimates and financial evaluation are presented in AUD\$ with base date of Q2 2022 and no allowance for escalation. Capital costs and operating costs have been prepared to an accuracy of  $\pm 35\%$ , which is appropriate for scoping level studies. The costs have been estimated by BatteryLimits based on its database, vendor pricing and benchmark data.

The Flanagan Bore Scoping Study financial performance summary is presented in Table 3, the capital and operating costs are shown in Table 4 to Table 6 respectively.

*Table 3 Financial Performance Summary*

Financial Performance Summary	Unit	LOM
Initial LOM	(years)	20
Annual concentrate production	(t)	500 kt
<b>NPV @ 8% - before tax</b>	<b>(\$ M, real)</b>	<b>134</b>
<b>IRR - before tax</b>	<b>(%)</b>	<b>67%</b>
Total LOM Revenue	(\$ M)	2282.4
Total LOM EBITDA	(\$ M)	420
Project Capital Expenditure	(\$ M)	44
Payback Period - before tax	(years)	<2
Average Sales Price (LOM)	(\$/t Mn conc)	231
Exchange rate AUD:USD	\$	0.7
CI Cash Costs (CIF)	(\$/t Mn conc)	175
AISC (CIF)	(\$/t Mn conc)	192

*Table 4. Capital Cost Estimate*

ITEM	DESCRIPTION	Cost (\$M)
<b>Process Plant</b>		
	Crushing	4.0
	Scrubbing	2.7
	DMS	13.8
	Tailing systems	2.0
	Services	0.4
	Plant bulk earthworks	0.9
	Process infrastructure	0.5
	<b>Total Process Plant</b>	<b>24.3</b>
<b>Infrastructure</b>		
	TSF	1.7
	Water supply	0.8
	Roads	0.9
	Accommodation Camp	4.7
	Light vehicles & mobile equipment	1.1
	Other	0.4
	<b>Total Infrastructure</b>	<b>9.6</b>
<b>Indirect costs</b>		
	Owners and other costs	1.9
	EPCM	4.6
	Contingency	4.1
	<b>Total Indirect cost</b>	<b>10.5</b>
	<b>TOTAL CAPEX</b>	<b>44.4</b>

*Table 5. LOM C1 Operating Cost /t (CIF)*

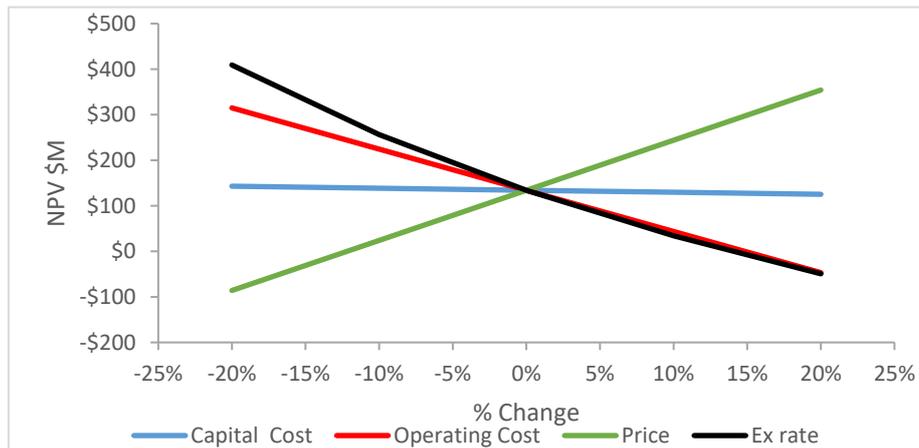
CA Operating Cost C1	\$/t LOM	\$/t Mn CONC
Mine to ROM Haulage	10.0	36.7
Milling Costs	5.5	20.1
Crusher Feed	0.7	2.6
Grade Control and rehandle	1.5	5.5
G & A	2.2	7.9
Product haulage	20.0	73.0
Port and shipping charges (CIF)	7.9	29.0
<b>Total C1 Operating cost</b>	<b>47.8</b>	<b>174.7</b>

*Table 6. LOM AISC Operating Cost /t (CIF)*

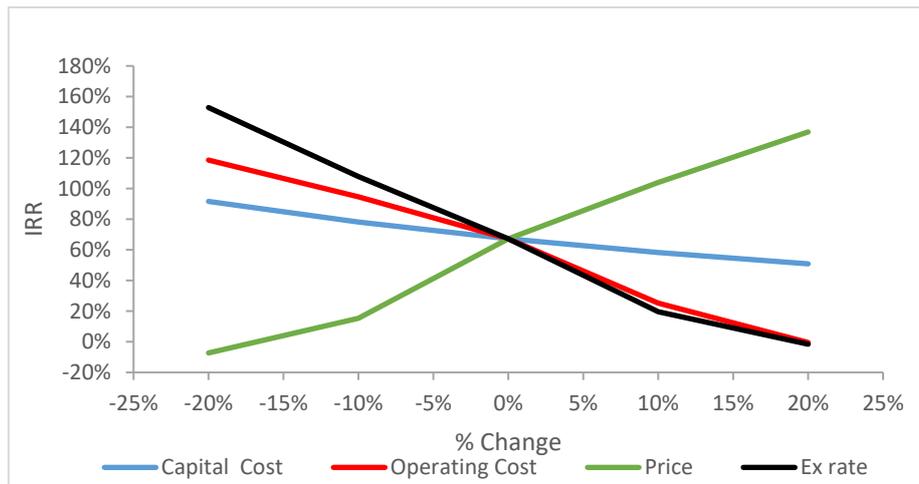
AISC	\$/t LOM	\$/t Mn CONC
C1 Operating cost	47.8	174.7
Sustaining Cost	1.0	3.7
Royalty (State and Traditional Owners)	3.8	13.9
<b>Total AISC</b>	<b>52.6</b>	<b>192.2</b>

**Project Sensitivities**

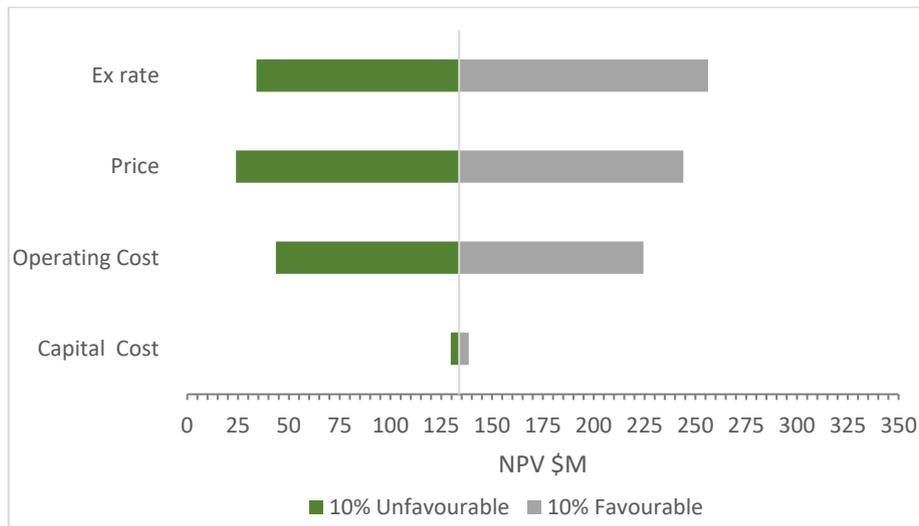
The sensitivity analysis indicates that the Project is most sensitive to exchange rate and price assumptions, followed by operating expenditure and capital expenditure assumptions and is summarised in Figures 10 to 12.



*Figure 9. Sensitivity analysis (NPV,8% before tax)*



**Figure 10 Sensitivity analysis (IRR, before tax)**



**Figure 11. Sensitivity analysis using a 10% threshold (NPV, before tax, real)**

**Project Funding**

Based on the outcomes of this Scoping Study, approximately \$44m of pre-production funding is estimated to be required. Based on the size of the capital requirement, it is anticipated that the funding will be sourced through a combination of traditional equity and debt instruments from existing shareholders, new equity investment and debt providers from Australia and overseas. Black Canyon is earning up to 75% of the Carawine JV projects that include Flanagan Bore with JV partners Carawine Resources. Once the 75% threshold has been reached CWX may either dilute under standard JV terms or elect to contribute to maintain their 25% holding.

Funding may come from strategic offtake partners that require the manganese concentrate for alloying or other pre-cursor cathode battery chemical producers seeking long term sources of raw materials. There is also significant interest in project funding for infrastructure and mining projects that can add value to local economies and bring an overall benefit to regions and their stakeholders. The North Australian

Infrastructure Fund (NAIF) is well known as a project enabler in northern regional Western Australia with a preference for long mine life assets such as Flanagan Bore.

Black Canyon has formed the view that there is a reasonable basis to believe that requisite funding for development of the Flanagan Bore Project will be available when required, having considered factors including the following:

- The Company's Board and management team has extensive experience in the development, financing and production in the resources industry.
- The relatively modest Capital requirement and the quality of the mineral resources used as the basis of the Scoping Study which will be updated and reclassified as the Company progress to more detailed feasibility studies to further de-risk the project.
- The simplicity of the flowsheet to produce a saleable product with strong fundamental and continued demand for manganese utilised in the steel industry but also as a critical mineral in the development of low-cost higher energy batteries.
- Strong financial flows in the early years with rapid payback of debt should support a reasonable level of debt financing if required. The ability to secure binding offtake agreements with loans secured against future production typically are well viewed by project financiers.

Based on the project financials, government funding initiatives and raisings completed for similar scale projects focussed on producing manganese concentrate provides further evidence that Flanagan Bore has a reasonable basis to assume funding will be available as and when required.

### ***Project Enhancements***

The following opportunities have been identified for further investigation:

- Optimisation of mine plan to stage development and reducing cutbacks with further evaluation of the cut-off grade reducing it from approximately 10% to potentially 8% Mn, which would reduce the strip ratio.
- Include additional Mineral Resources as part of the recent Mineral Resource infill and expansion drill program to potentially extend life or expand annual production rates
- Consider hybrid solar/battery/diesel- power option based on a long-term PPA to reduce power operating costs
- Review logistics path opportunities
- Geotechnical investigation to optimise plant and TSF sites and to identify suitable materials for construction to reduce costs
- Hydrology investigation to confirm water supply options and site water balance
- Geo-metallurgical investigation of the whole resource, both low and high grade, to determine the optimum grade/product size for mining and processing
- Further metallurgical optimisation

- Downstream evaluation of an integrated high purity manganese sulphate plant on site or the generation of manganese solutions for additional purification and crystallisation off site.

**Development timeline**

A conservative 30-month high-level Project schedule has been developed as shown in Figure 10. This shows the Project timeline of 18 months from funding approval to completion of commissioning and assumes all funding is in place and all permitting, and approvals are completed.

Task	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15	M16	M17	M18	M19	M20	M21	M22	M23	M24	M25	M26	M27	M28	M29	M30	
1 Permitting	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16															
2 Metallurgical testwork	1	2	3	4	5	6	7	8	9	10																					
1 Feasibility Studies Completion		1	2	3	4	5	6	7	8	9	10	11	12																		
2 FEED														1	2	3															
3 FID																1															
4 Roads, water, accommodation																	1	2	3	4	5										
5 Mine Est. and Pre-strip																			1	2	3	4	5	6							
7 Long Lead Orders																			1	2	3										
8 Process Plant Fabrication																	1	2	3	4	5	6									
9 Plant Construction																		1	2	3	4	5	6	7	8	9	10	11	12		
10 FIRST ORE																														1	
11 Commissioning																													1	2	3

Figure 12. Project implementation schedule

**Key Consultants and Contributors**

Content	Contributor
Study Management	BatteryLimits Pty Ltd
Geology and Resources	Black Canyon Ltd
Mining and Geotechnical	OTC Mine Planning / 4DGeotchnics Pty Ltd
Geo-metallurgical sample selection	Black Canyon Ltd
Processing	BatteryLimits Pty Ltd
Engineering	BatteryLimits Pty Ltd
Power, Water, Infrastructure	BatteryLimits Pty Ltd/Black Canyon Ltd/ Knight Piesold Pty Ltd
Logistics	Re:Group Pty Ltd / BatteryLimits Pty Ltd / Black Canyon Ltd
Project Implementation Schedule and Plan	BatteryLimits Pty Ltd
Capital Cost Estimates	BatteryLimits Pty Ltd
Operating Cost Estimates	BatteryLimits Pty Ltd / OTC Mine Planning / Black Canyon Ltd
Marketing	Black Canyon Ltd
Financial Assessment	BatteryLimits Pty Ltd/ OTC Mine Planning
Permitting and Environment	Black Canyon Ltd / Preston Consulting Pty Ltd

This announcement has been approved by the Board of Black Canyon Limited.

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**About Black Canyon**

Black Canyon has entered into a farm-in and joint venture with ASX listed Carawine Resources Limited (ASX:CWX) to acquire a majority interest in the Carawine Project in Western Australia. The Carawine Project covers approximately 800 km<sup>2</sup> of tenure located south of the operating Woodie-Woodie manganese mine, providing a large footprint in a proven and producing manganese belt. Black Canyon has also applied for and acquired other exploration licenses adjacent to the Carawine Project that would increase the total land holdings to over 2600 km<sup>2</sup> upon grant. In addition to manganese, the Carawine Project also hosts multiple copper occurrences including the Western Star prospect which comprises a large zone of surface copper enrichment.

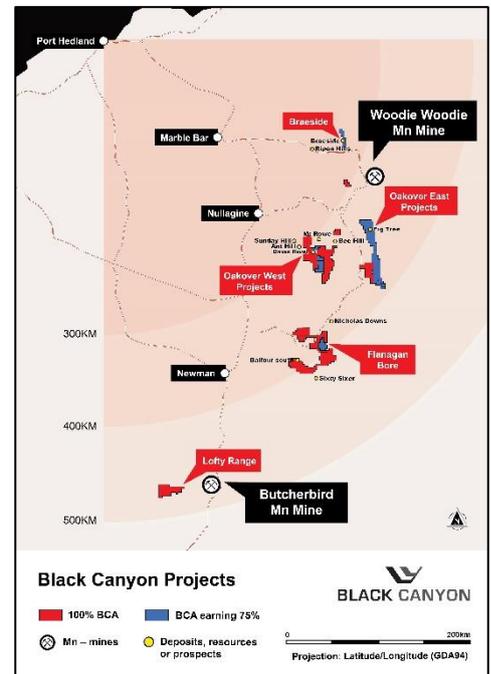
Manganese and copper continue to have attractive fundamentals with growing utilisation in the battery mineral sector and challenging supply conditions.

**Compliance Statements**

**Reporting of Exploration Results and Previously Reported Information**

The information in this report that relates to Exploration Results is based on, and fairly represents, information and supporting documentation reviewed by Mr Brendan Cummins, Executive Director of Black Canyon Limited. Mr Cummins is a member of the Australian Institute of Geoscientists, and he has sufficient experience which is relevant to the style of mineralisation and type of deposits under consideration and to the activity which has been undertaken to qualify as a Competent Person as defined in the 2012 Edition of the “Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves”. Mr Cummins consents to the inclusion in this release of the matters based on the information in the form and context in which they appear. Mr Cummins is a shareholder of Black Canyon Limited.

The information in this report that relates to Mineral Resources is based on, and fairly represents, information and supporting documentation prepared by Mr Greg Jones, (Consultant to Black Canyon and Geological Services Manager for IHC Mining). Mr Jones is a Fellow of the Australian Institute of Mining and Metallurgy and has sufficient experience of relevance to the style of mineralisation and type of deposit under consideration, and to the activities undertaken to qualify as a Competent Persons as defined in the 2012 Edition of the Joint Ore Reserves Committee (JORC) Australasian Code for Reporting of Exploration





## BLACK CANYON

Results, Mineral Resources and Ore Reserves. Mr Jones consents to the inclusion in this report of the matters based on the information in the form and context in which they appear.

The information in this report that relates to metallurgical test work results is based on information reviewed by Mr David Pass, who is a Member of the Australasian Institute of Mining and Metallurgy. Mr Pass is an employee of BatteryLimits Pty Ltd and consultant to Black Canyon Limited. Mr Pass has sufficient experience relevant to the mineralogy and type of deposit under consideration and the typical beneficiation thereof to qualify as a Competent Person as defined by the 2012 Edition of the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (the JORC Code, 2012 Edition). Mr Pass consents to the inclusion in the report of the matters based on the reviewed information in the form and context in which it appears.

For further information, please refer to ASX announcements dated 17 May 2021, 10 June 2021, 7 July 2021, 5 October 2021, 4 January 2022, 8 February 2022, 21 February 2022, 2 March 2022, 23 March 2022, 13 April 2022 and 9 June 2022 which are available from the ASX Announcement web page on the Company's website. The Company confirms that there is no new information or data that materially affects the information presented in this release that relate to Exploration Results and Mineral Resources in the original market announcements.