

6th March 2019

## Carrapateena Block Cave Expansion has potential to optimise value and further unlock the province

OZ Minerals Limited (ASX: OZL) is pleased to report it has completed a scoping study on the Carrapateena Block Cave Expansion. The scoping study shows that converting the lower portion of the Carrapateena Sub Level Cave to a block cave from 2026 may optimise value and further unlock the Carrapateena Life of Province Plan.

### Scoping Study Parameters – Cautionary Statements

The scoping study referred to in this announcement has been undertaken to determine the potential viability of converting the lower portion of the Carrapateena Sub Level Cave currently under construction to a block cave and expanding annual throughput from 2026. It is a preliminary technical and economic study of the potential viability of a block cave expansion to the Carrapateena mine. It is based on low-level technical and economic assessments that are not sufficient to support the estimation of ore reserves.

The production targets for the Carrapateena Sub Level Cave currently under construction initially appeared in the announcement entitled "OZ Minerals Carrapateena Feasibility Study Announcement and Update" which was released to the market on 24 August 2017 and is available to view at [www.ozminerals.com/media/asx](http://www.ozminerals.com/media/asx). OZ Minerals confirms that all the material assumptions underpinning the production target in the original market announcement continue to apply and have not materially changed.

The production targets for the Carrapateena Block Cave Expansion are based on the 6 March 2019 Carrapateena Resource Update and comprise 41% Measured Mineral Resource, 46% Indicated Mineral Resource and 13% Inferred Mineral Resource. Further evaluation work and appropriate studies are required before OZ Minerals will be in a position to estimate any ore reserves or to provide any assurance of an economic development case.

There is a low level of geological confidence associated with Inferred Mineral Resources. There is no certainty that further exploration work and studies will result in the determination of Inferred Mineral Resources or that the production targets will be realised. The Ore Reserve and Mineral Resource estimates underpinning the Carrapateena Sub Level Cave production targets were reported in compliance with the JORC Code 2012.

The scoping study is based on the material assumptions outlined below. These include assumptions about the availability of funding to support the capital required, which is expected to be sourced from a mix of operating cash flow and supported debt. While OZ Minerals considers all 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 scoping study will be achieved. It is also possible that funding may only be available on terms that may be dilutive to or otherwise affect the value of OZ Minerals' existing shares.

It is also possible that OZ Minerals could pursue other 'value realisation' strategies such as a sale, partial sale or joint venture of the project. If it does, this could materially reduce OZ Minerals' proportionate ownership of the project.

OZ Minerals has concluded that it has a reasonable basis for providing the forward-looking statements included in this announcement, however, given the uncertainties involved, investors should not make any investment decisions based solely on the results of the scoping study.

6th March 2019

## Carrapateena Block Cave Expansion has potential to optimise value and further unlock the province

- Carrapateena Block Cave Expansion study shows converting the lower portion of the Carrapateena Sub Level Cave to a block cave from 2026 optimises value by:
  - more than doubling mine throughput rate from 4.25 Mtpa to 10 – 12 Mtpa
  - increasing life of mine average copper production to ~105 – 125 ktpa from 2026
  - reducing life of mine all-in sustaining costs to ~US 90 – 95 c/lb
  - accessing higher grade bornite mineralisation, first via the top-down sub level cave followed by a bottom-up block cave
- Block Cave Expansion can occur without impeding existing sub level cave delivery, ramp-up or ongoing operation which is on track for first production in Q4 2019
- Block Cave Expansion pre-production capital of circa \$1.0 – \$1.3 billion
- Increase of the Carrapateena Resource to ~587 Mt at ~0.8% CuEq<sup>1</sup> enabled by block cave option in lower portion
- Block Cave Expansion unlocks possible future value accretive options for the Carrapateena Life of Province Plan
- Carrapateena Sub Level Cave capital payback achieved before Block Cave Expansion major development spend
- 2019 guidance for project studies and drilling commitments is now \$75 – \$80 million (up from \$45 – \$50 million)

OZ Minerals today announced it would progress its Carrapateena Block Cave Expansion to pre-feasibility and the Carrapateena Life of Province Plan to a scoping study.

On releasing a summary of the Carrapateena Block Cave Expansion scoping study, OZ Minerals Chief Executive Officer, Andrew Cole, said:

“The scoping study determined that replacing the lower half of the sub level cave with a block cave and expanding the annual throughput rate from 4.25 Mtpa to 10 – 12 Mtpa from 2026, has the potential to create significantly more value than the sub level cave alone. The block cave would be supported by expanded surface infrastructure.

<sup>1</sup> The copper equivalent percent was calculated using the following formula:  $CuEq \% = Cu \% + (0.5 * Au \text{ g/t})$ . Copper equivalent has been calculated using a copper price of \$US 2.96/lb, a gold price of \$US 1305/oz, a copper recovery of 91% and a gold recovery of 73%.

"The Carrapateena Block Cave Expansion work showed the conversion to a block cave to be the most value accretive next step for the Carrapateena resource and conceptually for the entire province, as it potentially enables a series of future add-on block caves, which themselves will now be the subject of a Carrapateena Life of Province Plan scoping study.

"A Block Cave Expansion of the lower portion of the current Carrapateena Sub Level Cave has the potential to increase average life of mine copper production from 65,000 tonnes per annum to ~105,000 – 125,000 tonnes per annum from 2026 and reduce life of mine all-in sustaining costs to ~US 90 – 95 c/lb.

"The Carrapateena Sub Level Cave construction remains on schedule for first production in Q4 of 2019, ramping up to full production of 4.25 Mtpa over the following 18 months.

"The Carrapateena Block Cave Expansion scoping study provides a high-level view of how a block cave could be constructed without impeding operation of the Carrapateena Sub Level Cave currently in construction, or without rework of current construction plans, as underground infrastructure being installed for the sub level cave contemplates a potential increase in the 4.25 Mtpa rate. The majority of Carrapateena Block Cave Expansion pre-feasibility study activity will be desktop studies and technical activity.

"Transitioning from a Carrapateena Sub Level Cave to the Block Cave Expansion would allow us to extract the higher-grade ore at the top of the orebody via the sub level cave (mining from the top down) and the higher-grade material from the bottom of the resource via the block cave (mining from the bottom up), and prioritise these over the lower-grade central section.

"The potential for the Carrapateena Block Cave Expansion to progressively unlock the Carrapateena Life of Province more broadly via a controlled, methodical and incremental approach is particularly attractive as it manages risk and capital expenditure whilst enhancing value for shareholders and other stakeholders.

"The Carrapateena Block Cave Expansion pre-feasibility study is expected to be completed by mid-2020," Mr. Cole said.

With work on the Carrapateena Block Cave Expansion moving to pre-feasibility study and the Carrapateena Life of Province Plan work to scoping study, OZ Minerals' 2019 market guidance on expected project studies and drilling commitments is now \$75 – \$80 million (up from \$45 – \$50 million).

### **Value Proposition**

- Carrapateena Block Cave Expansion increases life of mine tonnes from 84 Mt at 1.8% copper and 0.7g/t gold, to approximately 145 Mt at 1.2% copper and 0.5g/t gold over a 20-year period.
- Increase in average life of mine copper production from 65,000 tpa to ~105,000 – 125,000 tpa from 2026.
- Increase in ore milled from 4.25 Mtpa in existing sub level cave to 10 – 12 Mtpa.
- Lower operating costs compared to Carrapateena Sub Level Cave alone.
- No negative impact to current Carrapateena Sub Level Cave construction schedule and ramp up to full operation.
- Opportunity to unlock future value of the Carrapateena Life of Province Plan.

### **Key Next Steps**

- Complete the construction of the Carrapateena project as planned by Q4 2019 and ensure capital payback prior to any major Carrapateena Block Cave Expansion spend.
- Conducting a pre-feasibility study on transitioning the bottom of the sub level cave into a block cave with a production rate in the range of 10 to 12 Mtpa and expanding surface infrastructure to suit.
- Progress the Carrapateena Life of Province Plan to scoping study, including a review of Carrapateena, Fremantle Doctor and Khamsin mineralised zones and various methods of extraction.
- Progress approvals planning and stakeholder engagement.

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# CARRAPATEENA BLOCK CAVE EXPANSION

## Scoping Study

March 2019

EXECUTIVE SUMMARY

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## Carrapateena Block Cave Expansion

### Introduction

Carrapateena is in a highly prospective mineral province. The Carrapateena project currently in construction will mine an 84 Mt inventory by the sub level caving method. First sub level cave production is scheduled for Q4 2019, followed by ramp up over an 18-month period to 4.25 Mtpa production. The sub level cave will produce an average of 65,000 tonnes of copper and 67,000 ounces of gold<sup>1</sup> per annum over a 20-year mine life.

The Carrapateena Block Cave Expansion scoping study focused on realising further value from the Carrapateena copper-gold resource.

This executive summary focuses on the Carrapateena Block Cave Expansion scoping study. Conducted over six months, the study concluded that there is the potential to deliver superior value for OZ Minerals' stakeholders by replacing the bottom half of the current sub level cave with a larger block cave, operable from 2026. Value is derived from increasing production throughput from 4.25 Mtpa up to 10 – 12 Mtpa at a lower operational cost and cut-off grade than the sub level cave.

The block cave would also create the opportunity to unlock value by future expansion options into lower grade areas. The Carrapateena Life of Province Plan was considered at a conceptual level only, considering future potential of satellite deposits and exploration targets, including Fremantle Doctor, The Saddle, Khamsin and Punt Hill, known collectively as the Carrapateena province (as shown in Figure 1).

The Carrapateena Resource was updated to ~587 Mt at ~0.8% copper equivalent<sup>2</sup> as a result of the proposed conversion of the lower portion of the sub level cave to a block cave.

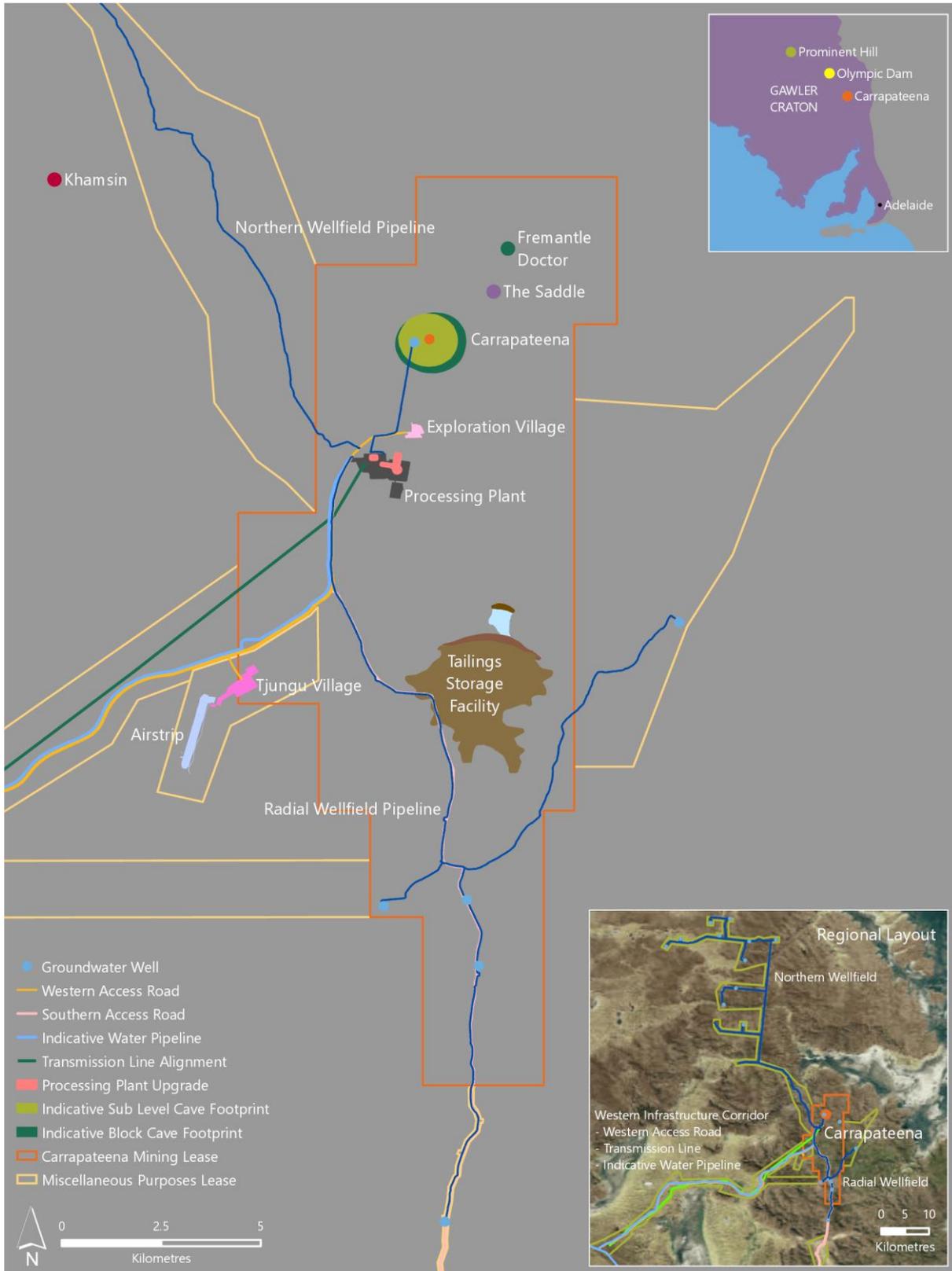
### Carrapateena Sub Level Cave Update

The Carrapateena Sub Level Cave project remains on track for first production in Q4 2019. Industry experience gained from other caving projects in Australia and abroad are being used to de-risk project delivery and operational ramp up. A focus on early geotechnical analysis and mine design updates, infrastructure timing and crusher station one installation, are expected to facilitate a rapid ramp up of the sub level cave production rates as a differentiator from some other cave operations.

<sup>1</sup> These production targets initially appeared in the announcement entitled "OZ Minerals Carrapateena Feasibility Study Announcement and Update" which was released to the market on 24 August 2017 and is available to view at [www.ozminerals.com/media/asx](http://www.ozminerals.com/media/asx). OZ Minerals confirms that all the material assumptions underpinning the production target in the original market announcement continue to apply and have not materially changed.

<sup>2</sup> The copper equivalent percent was calculated using the following formula:  $CuEq \% = Cu \% + (0.5 * Au \text{ g/t})$ . Copper equivalent has been calculated using a copper price of \$US 2.96/lb, a gold price of \$US 1305/oz, a copper recovery of 91% and a gold recovery of 73%.

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**Figure 1: Carrapateena Province Copper Resources and Exploration Targets**

## Next Steps

To meet optimal timeframes for a block cave transition, the Carrapateena Block Cave Expansion will progress to a higher level of evaluation which will include:

- Maintaining Carrapateena Sub Level Cave project delivery and operation to plan ensuring payback prior to major block cave spending.
- Conducting a pre-feasibility study on transitioning the bottom of the Carrapateena sub level cave into a block cave with a production rate in the range of 10 – 12 Mtpa and expanding surface infrastructure to suit.
- Progressing the Carrapateena Life of Province Planning to scoping study level, including review of Carrapateena, Fremantle Doctor and Khamsin mineralised zones and various methods of extraction.
- Progressing approvals planning and stakeholder engagement.
- Further geotechnical and resource drilling to inform the pre-feasibility study.

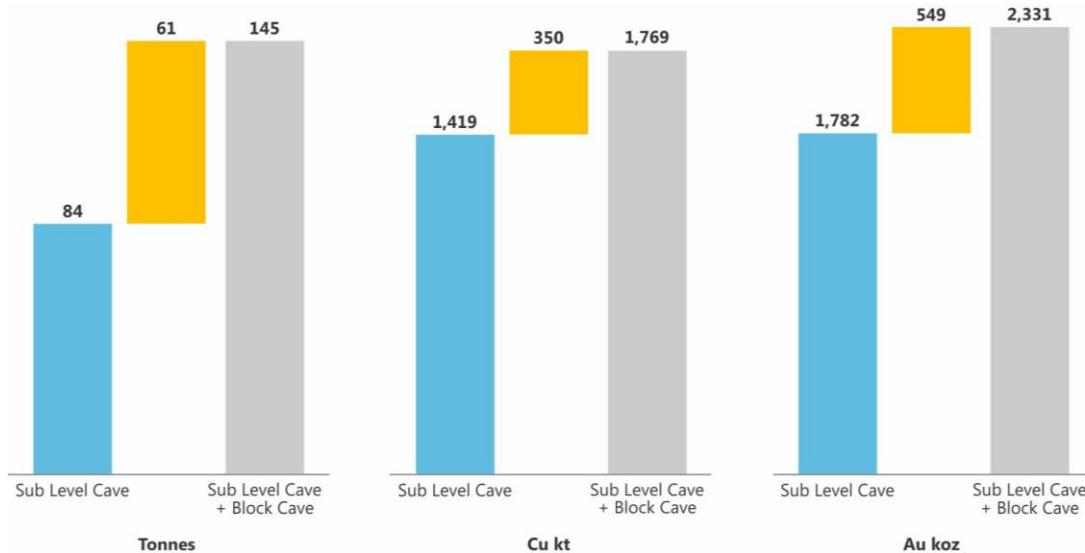
## Key Findings

A summary of the key findings for the Carrapateena Expansion Block Cave scoping study is shown in Table 1 and illustrated in Figure 2.

**Table 1: Summary of Key Carrapateena Block Cave Expansion Metrics v Carrapateena Sub Level Cave Base Case**

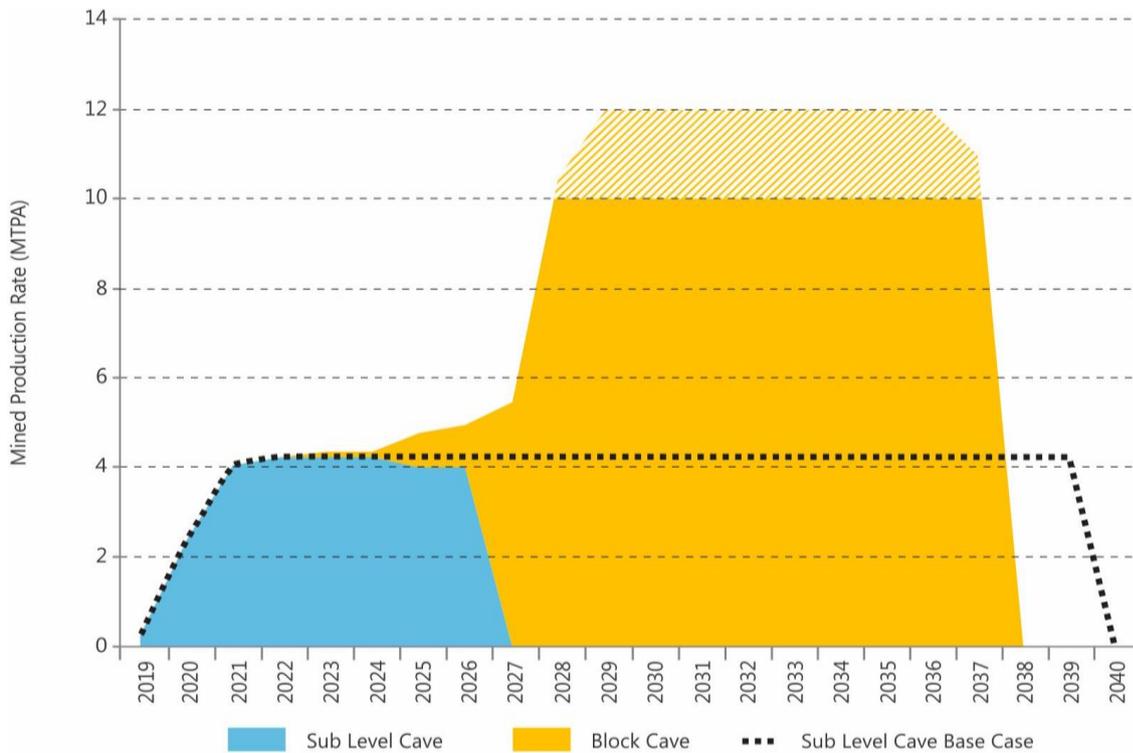
Area	Measure	Unit	Sub level cave	Sub level cave + Block cave (Estimated values)
Production	Ore milled	Mtpa	4.25	10 – 12
	Life of mine	Years	20	20
	Average annual Cu production	ktpa	65	105 – 125 (from 2026)
	Sub level cave first production		2019	2019
	Block cave first production		n/a	2026
	Life of mine tonnes	Mt	84	145
	Average copper grade	%	1.7	1.2
	Average gold grade	g/t	0.7	0.5
Capital	Pre-production capital	\$ (real)	916 million	916 million + 1.0 – 1.3 billion
Operating	Total operating cost	\$/t	50	30 – 40
Primary Financial Metrics	C1 costs (net of by-product credit)	US\$/lb	0.62	0.50 – 0.55
Supporting Financial Metrics	AISC	US\$/lb (real)	1.05	0.90 – 0.95

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**Figure 2: Indicative Waterfall Charts of Sub Level Cave to Sub Level Cave + Block Cave Physical Changes**

Figure 3 shows the indicative production profile of the sub level cave transition to block cave.



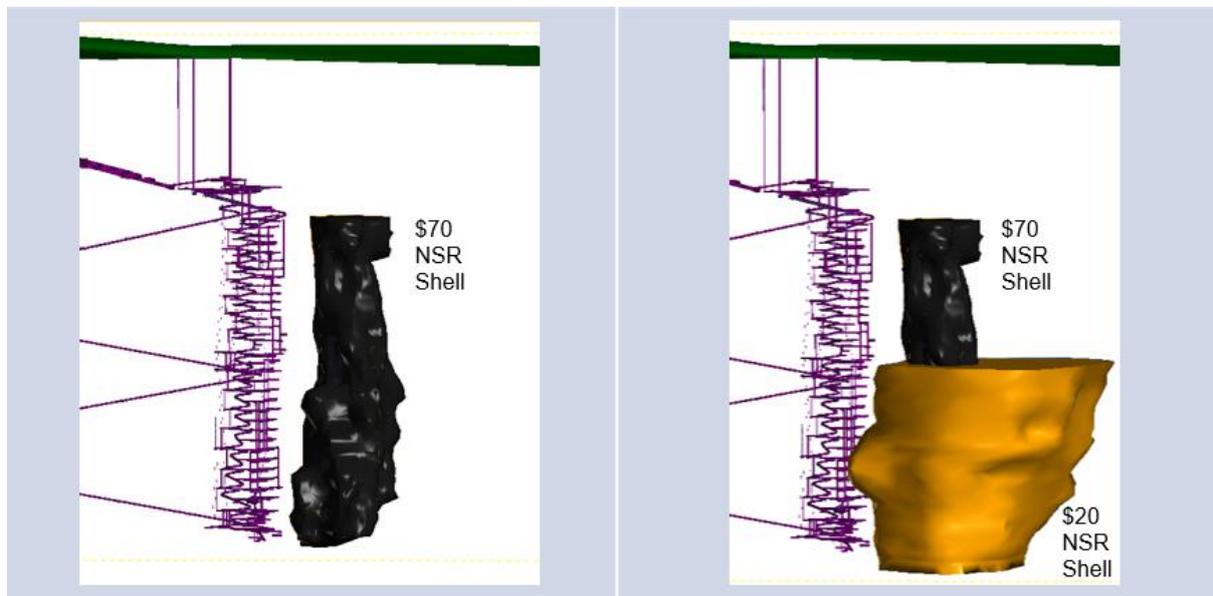
**Figure 3: Indicative Carrapateena Block Cave Expansion Scoping Study Production Profile<sup>3</sup>**

<sup>3</sup> The Carrapateena Block Cave Expansion production targets are based on the 6 March 2019 Carrapateena Resource Update and comprise 41% Measured Mineral Resource, 46% Indicated Mineral Resource and 13% Inferred Mineral Resource. Further evaluation work and appropriate studies are required before OZ Minerals will be in a position to estimate any ore reserves or to provide any assurance of an economic development case. There is a low level of geological confidence associated with Inferred Mineral Resources and there is no certainty that further exploration work will result in the determination of Indicated Mineral Resources or that the production target will be realised.

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## Carrapateena Mineral Resource Update 6<sup>th</sup> March 2019

The differences in resource tonnages and grades between the 6<sup>th</sup> March 2019 Mineral Resource and the 2016 Mineral Resource are solely due to a change in the assumed cut-off value between 3,600m RL and 4,200m RL, which was modified to allow assessment of exploitation by block cave between these levels. This change is shown graphically in Figure 4.

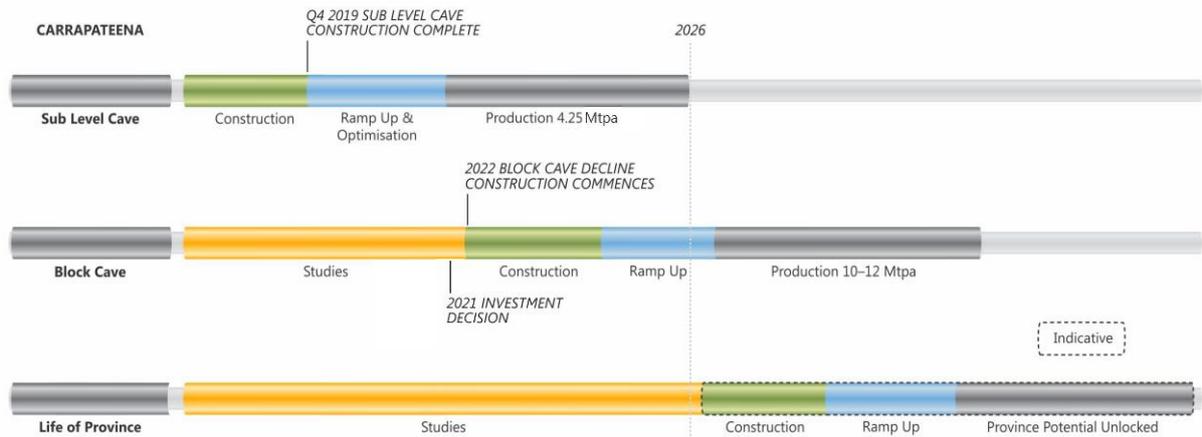


**Figure 4: Carrapateena Resource 2016 (on left) compared to Update 6<sup>th</sup> March 2019 (on right)**

## Proposed Mine Expansion

The study demonstrates that the block cave expansion can be constructed without impeding operation of the sub level cave currently in construction, or without requiring major rework of the sub level cave underground infrastructure, ensuring project delivery and return on investment base case. The Carrapateena underground infrastructure, such as access and conveyor declines, materials handling and primary ventilation, are common for either the sub level cave or proposed block cave. Mine expansion and transition to a block cave would require adjustment to the location of future underground infrastructure below crusher station two, including a change in orientation of the decline, conveyor and ventilation, however, this is not due for installation until after 2021. An indicative schedule and key milestones are illustrated in Figure 5.

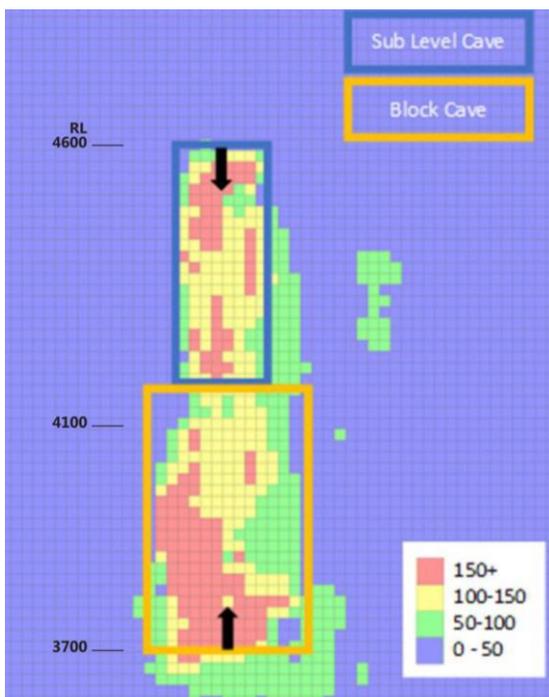
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**Figure 5: Indicative Sequencing of Potential Carrapateena Expansion Opportunities**

## Carrapateena Block Cave Expansion

The scoping study recommends a transition from the sub level cave to block cave for the lower half of the Carrapateena resource. This approach allows targeting of the high-grade material at the top then the bottom of the known Carrapateena resource before the lower grade material, as seen in Figure 6 and Figure 7, so value is maximised. Hill of Value analysis has identified 10 – 12 Mtpa as the current optimum rate, based on the mining footprint, infrastructure requirements, capital costs and operating costs.

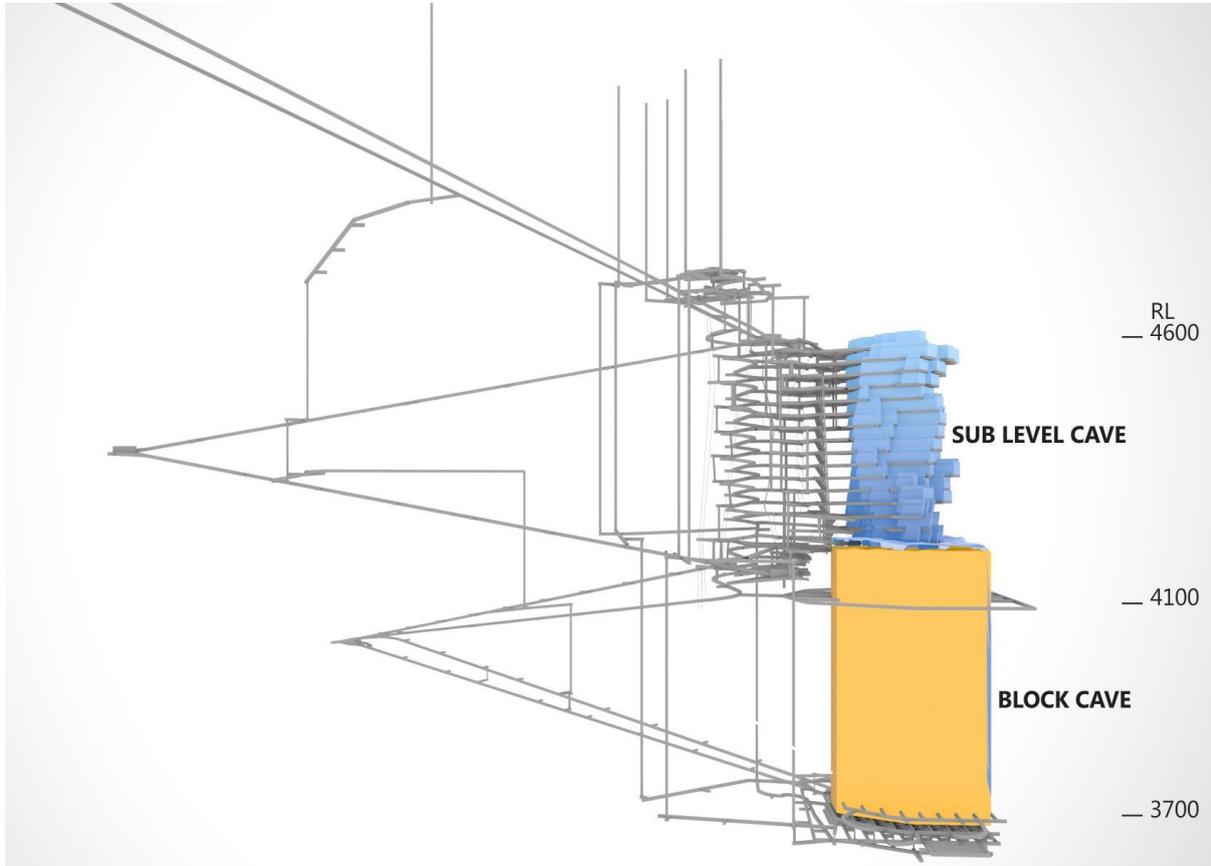


**Figure 6: Indicative Carrapateena Resource NSR (\$) Cross Section Showing Sub Level Cave to Block Cave Expansion Targeting High Value Material<sup>4</sup>**

<sup>4</sup> Resource model as per Carrapateena Mineral Resource Statement and Explanatory Notes as at 6 March 2019.

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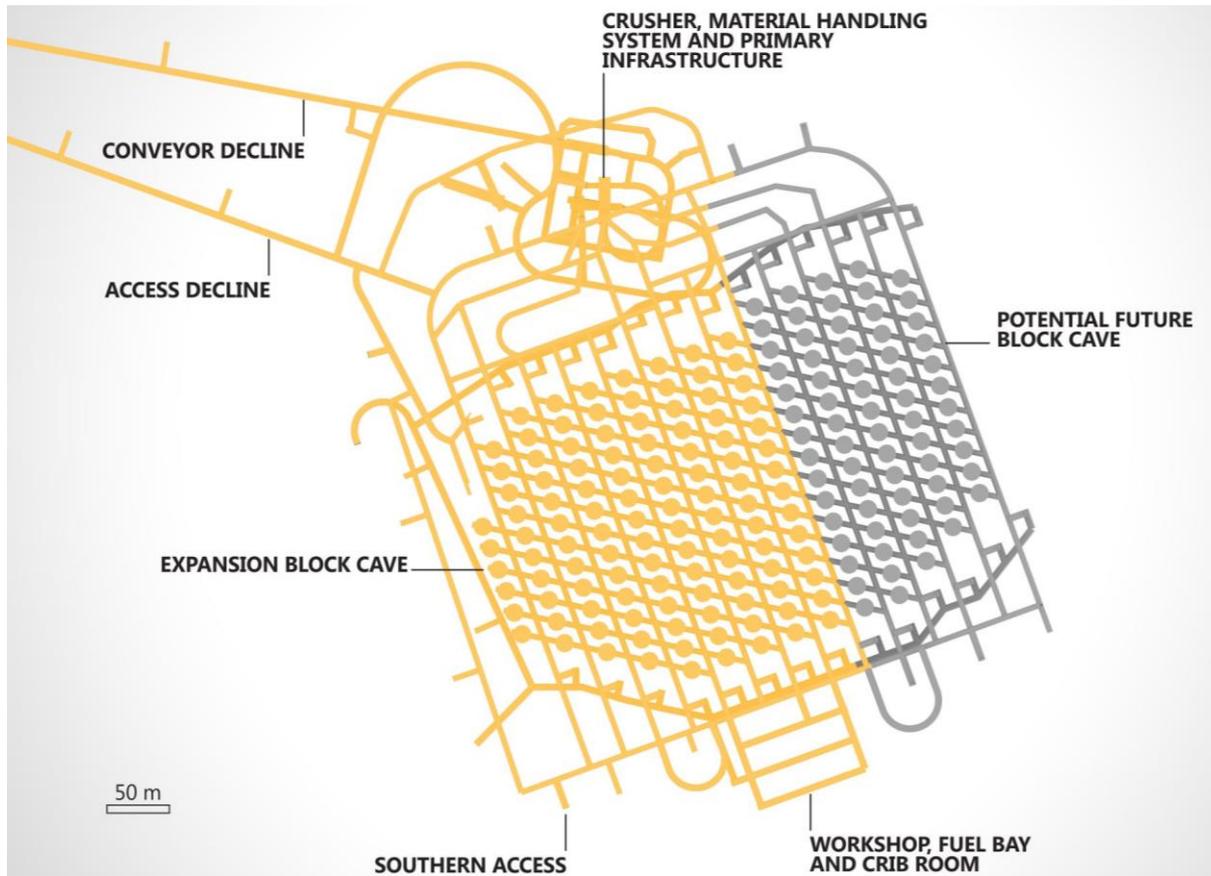
The proposed block cave is different from previous Carrapateena block cave studies as it targets a smaller, higher grade footprint whilst enabling future lower grade block cave development. The Carrapateena block cave builds on modern block caving experience and would aim to deliver an automated, data-driven mine with technology embedded in the design.



**Figure 7: Proposed Mine Layout of the Sub Level Cave and Proposed Block Cave Expansion**

Figure 8 shows the proposed extraction level layout for the block cave and how a future additional lower grade block cave might be achieved (this will be studied further in the Carrapateena Life of Province scoping study).

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**Figure 8: Indicative Extraction Level Layout for the Carrapateena Block Cave Expansion and Potential Future Block Cave**

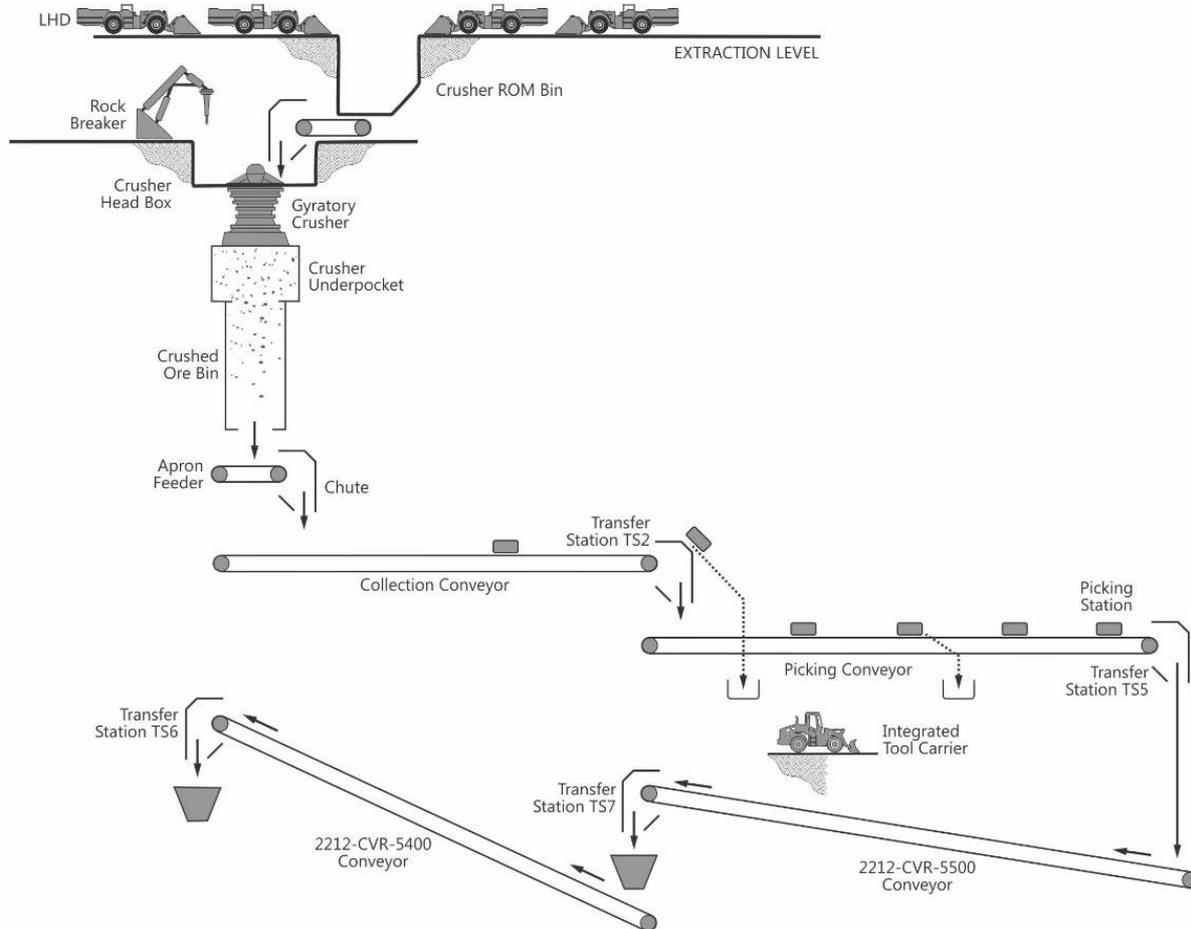
## Underground Infrastructure

A review and upgrade path for the underground infrastructure was carried out, focusing on the key infrastructure:

- Materials Handling System and Crushing – increase from 4.25 Mtpa up to 10 – 12 Mtpa through additional drive motors and a faster conveyor system
- Primary and secondary ventilation
- Electricity and communications
- Water supply and dewatering
- Underground facilities.

Key upgrades include faster conveying systems and a larger Crusher 3 for the block cave with increased capacity over that required for the sub level cave. The proposed underground Materials Handling System upgrade from Crusher 3 to surface is illustrated in Figure 9.

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**Figure 9: Proposed Underground Materials Handling System from Upgraded Crusher Station 3**

## Proposed Process Plant Expansion

### Processing Plant Upgrade

Two options have been identified for increasing the current sub level cave processing plant capacity to a rate of up to 10 – 12 Mtpa:

- a new parallel processing plant, or
- an upgrade of the current sub level cave processing plant.

Within the plant upgrade option, there are two sub-options; a parallel milling circuit or a tertiary crushing circuit.

The study has recommended the plant upgrade route with a tertiary crushing circuit as the most likely path for increasing processing plant capacity, however, both primary options (a parallel plant and a plant upgrade) can feasibly satisfy the requirements of the scoping study.

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### **Tailings Storage Facility**

The Tailings Storage Facility currently under construction for the sub level cave was designed with expansion capacity. The Tailings Storage Facility is approved for the deposition of up to 145 Mt of dry tailings over a period of approximately 36 years at a rate of 4.25 Mtpa. The sub level cave will only utilise the Tailings Storage Facility for a period of 20 years so the Expansion Project to extract approximately 145 Mt at 10 – 12 Mtpa brings forward the staging of the embankment raises. The Tailings Storage Facility design philosophy will be subject to further detailed design, including a review of paste and dry-stacking methods and regulatory approvals, which will be a key focus in the next study phase.

The expansion of the Tailings Storage Facility will be a key approval required for the project, with an opportunity to demonstrate strong construction and operation capabilities during the sub level cave project and operations.

### **Proposed Infrastructure Expansion**

#### **Power**

Available power from the ElectraNet Davenport to Woomera power line is limited to the estimated requirement for the Carrapateena Sub Level Cave project. OZ Minerals' new power line project will enable supply of the required power for the proposed Carrapateena Block Cave Expansion.

The current powerline from the Mount Gunson substation to the Carrapateena site is suitable for the proposed Carrapateena Block Cave Expansion without duplication. A new or upgraded substation at the Carrapateena end of the power line will be required.

#### **Western Access Road**

Upgrade to the previously designed Western Access Road would be required. The Western Access Road is scheduled to be constructed in 2020 with the opportunity to include the upgrade into an updated design. Lengthening of the road, including a Stuart Highway underpass, would be required to provide access to a future rail siding.

#### **Rail Siding**

To support efficient concentrate movement, a rail siding is proposed on the ARTC railway near the Western Access Road connection to the Stuart Highway. Concentrate would be trucked on the Western Access Road from the site to this siding.

#### **Water Supply and Use**

At steady state, the Carrapateena Block Cave Expansion scoping study showed incremental water demand could be up to 16 ML/day, with opportunities identified in the study, including paste thickening of tailings, reducing this incremental demand to approximately 5 ML/day.

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The Carrapateena Block Cave Expansion scoping study water requirements may then be satisfied by:

- Local groundwater resources, or
- Sea water via a regional pipeline.

Currently, the potential use of sea water is capital intensive. OZ Minerals is working collaboratively with SA Water and other stakeholders to investigate a regional water solution to reduce capital intensity for all parties.

The implementation of paste thickening to tailings contains some uncertainties and remains subject to further test work. The pre-feasibility study will continue to investigate the two water supply options including regional water infrastructure and groundwater resources, while opportunities to reduce water demand are further studied and understood.

## Approvals and Social Performance

The approvals strategy will facilitate OZ Minerals extending its approach to the agile adoption of new mining methods, technologies and innovative ways of thinking over an extended operational life. The existing approvals framework will be utilised with key approvals studies focused on demonstrating that the conditions and outcomes of the Mining Lease and supporting Tenement can be achieved. Consultation with the Department for Energy and Mining has been undertaken to discuss and seek alignment on the approvals strategy for the potential Carrapateena Life of Province Plan scenarios. Key focus areas for the approvals effort will relate to the risks associated with a change in design of the Tailings Storage Facility and any impact upon groundwater resources.

Working with key stakeholders, including the traditional owners, the Kokatha people, and local pastoralists, will remain a focus for the project to ensure we continue to create value for our stakeholders.

## Risk Management and Assurance

Material level risk assessment has been carried out for the Carrapateena Block Cave Expansion, including an independent peer review process undertaken by SRK Consulting. Key threats to be managed include approvals processes for the Tailings Storage Facility upgrade, caving risks associated with block cave mining and the interaction of the block cave project with the sub level cave operation. Key opportunities include favourable geology and geotechnical drilling results, innovation, technology and transformation projects and the block cave expansion further unlocking future province potential.

Risk management and assurance will underpin the pre-feasibility study with a focus on further understanding the risk profile of the project. All material opportunities and threats identified during the scoping study have been escalated as per the OZ Minerals Risk Management Process Standard and maintained by the Corporate Risk Function and will be monitored by the Board.

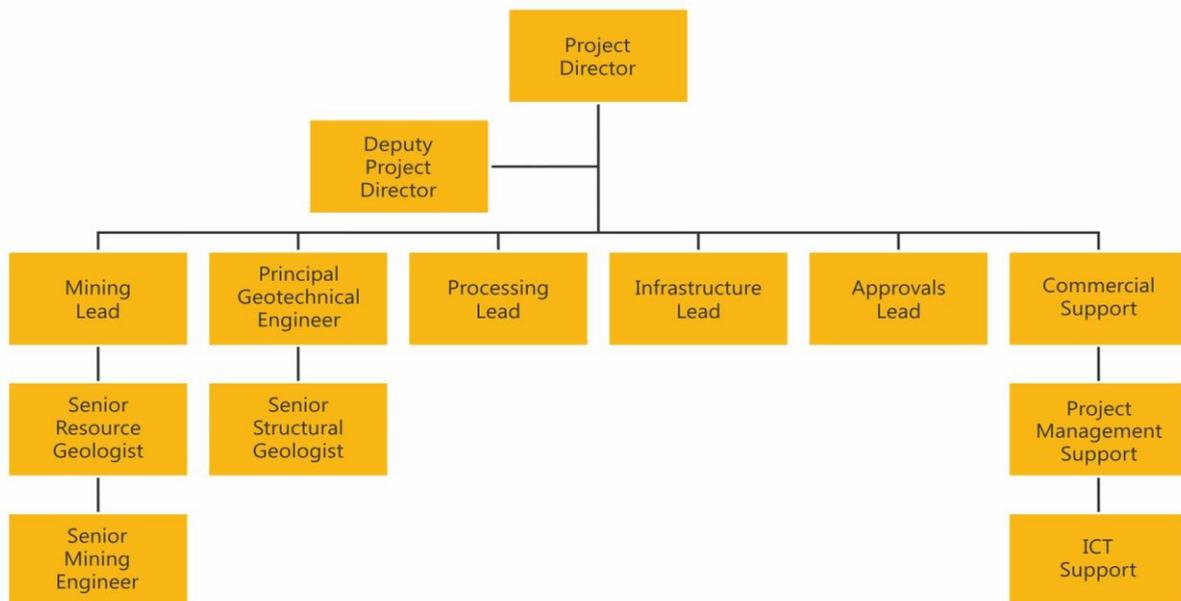
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## Carrapateena Block Cave Expansion Project Execution

The scoping study has demonstrated that a block cave expansion can be constructed without impeding operation of the sub level cave currently in construction, or without requiring major rework of the sub level cave underground infrastructure, ensuring project delivery and return on investment base case.

The Carrapateena Block Cave Expansion study team will add technical and operational skills, and experience which complements the Carrapateena Operations team, adding to depth of knowledge in the geological, geotechnical, cave mining, infrastructure and processing areas.

The proposed pre-feasibility study team structure and experience areas is shown in Figure 11.



**Figure 11: Proposed Carrapateena Block Cave Expansion Pre-Feasibility Study Team and Skills**

Brownfields expansion of the processing plant and underground and surface infrastructure is considered within upgrade paths of the current construction and will include detailed planning to ensure uninterrupted operations of the Carrapateena Sub Level Cave base case.

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## Key Contributors

OZ Minerals would like to thank the following organisations for their contribution in the development of the scoping study:

- AECOM Australia
- GR Engineering Services
- CS-2 Pty Ltd
- Golder Associates
- ITASCA Australia
- BBE Consulting Australasia
- CDM Smith Australia
- SA Water
- Minpraxis Solutions
- Consilium Technology
- Bear Rock Solutions
- Orway Mineral Consultants
- AMC Consultants
- SRK Consulting

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