

# Capability Statement

August 2024



# The orelogy difference

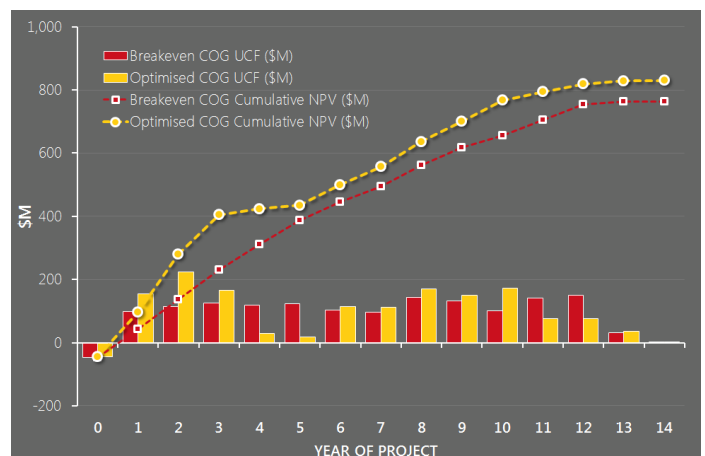
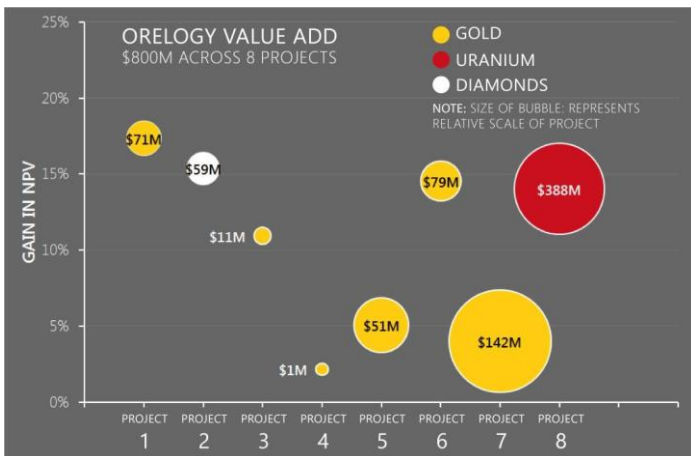
## Our number one goal is to unlock the true value of your project.

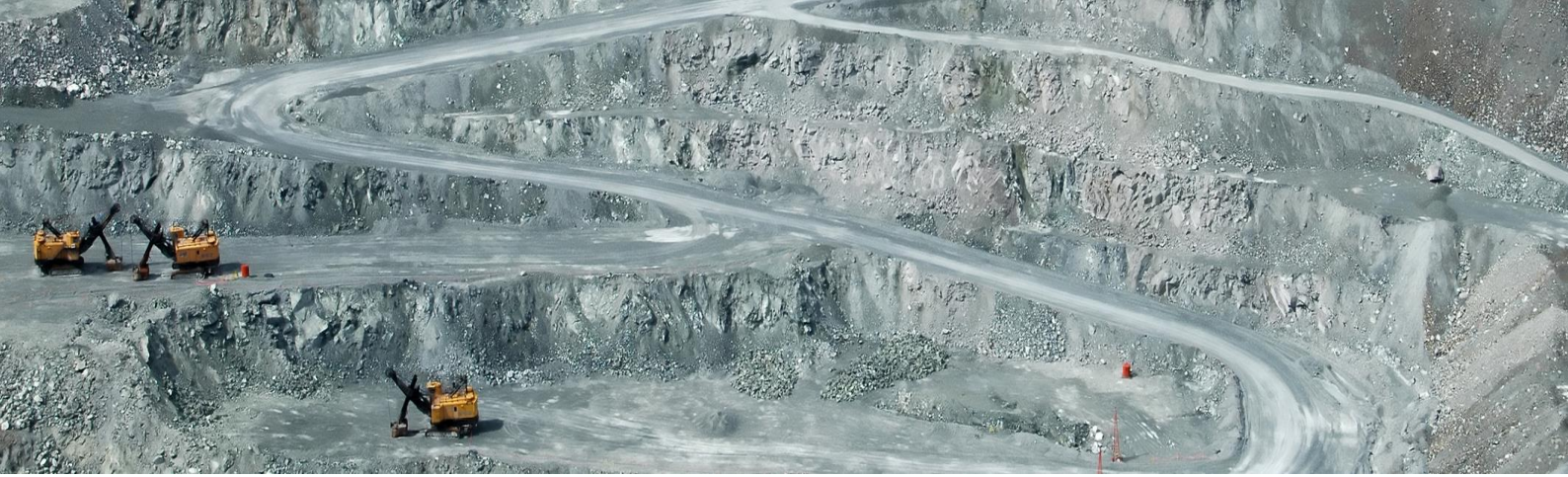
Cut-off Grade optimisation is the single biggest value adding task that can be applied to a mining operation. orelogy, utilising Maptek's innovative Evolution™ Strategy solution, have generated significant added value to client projects in just a few months.

Whether your project is precious metal, base metal or energy commodity based, you will be guaranteed to add value and improve the early cash flow of your operation. orelogy ensure that the value is gained within a practical and achievable framework.

**Talk to orelogy today to unleash YOUR projects full potential by optimising your life-of-mine cut-off grade strategy.**

## orelogy consulting added \$800M NPV across 8 projects.





# About orelogy

We are a rare combination of both operational experts and technologists that have demonstrably improved the profitability of mining projects for the past 20 years.

## Who we are

Established in March 2005, orelogy has organically grown to become a close-knit team of highly experienced professionals and specialist associates.

orelogy has a diverse range of clients from junior explorers, mid-tier developers to some of the world's largest miners in Australia, Africa, Canada and Asia; many being longstanding clients. orelogy's personnel have operational and consulting experience in a range of different commodities throughout the world. As a result, we bring a global understanding of the mining industry to develop practical solutions within a strategic framework.

orelogy offers a range of professional services that include Study & Project Management, Mineral Resource Estimation and Reporting, Open Pit & Underground Mine Design, Scheduling, Technical Reporting, Ore Reserve Estimates, Due Diligence, Cost Modelling, Equipment Assessment and ongoing site support to mining operations.

The continued success of the company can be directly attributed to the professionalism, diligence and innovation of our team of orelogists.

In February 2022 orelogy was acquired by idoba, part of the Perenti Group. idoba is a digital transformation service business, bringing together multiple technology and service offerings including management consulting, industrial mathematics, data science, artificial intelligence and product development.

## Experience and expertise

orelogy has a track record consulting in a large range of differing commodities, locations and mining methodologies. As a company and individually we have particular experience and knowledge in the following:

### Commodities

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Iron	Lithium	Lateritic Ni/Co/Sc
Gold	Graphite	Zinc & other base metals
Nickel	Uranium	Niobium / Vanadium
Copper	Polymet	Rare Earths

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### Mine planning specialists including:

- Exploration data analysis, geological modelling and Mineral Resource Estimation
- Strategic mine optioneering
- Cut-off grade optimisation
- Alternative materials handling such trolley-assist/IPPC/railveyor assessment and implementation
- Blend Vectored Modelling and Scheduling
- Underground mining method selection and access optimisation



## Company ethos

Since 2005 orelogy's primary focus has been on providing our clients with value. orelogy achieve this by not only utilising smarter technical approaches, but also providing cost effective outcomes in a timely fashion. We call our approach to consulting "AGILE THINKING".

We "think" for our client, utilising our experience, leading-edge technology and common sense to solve problems. Our objective is to always deliver practical, high value outcomes, not just apply cookie-cutter solutions. orelogy have a proven track record in applying world class technical solutions to mining projects at both the feasibility and operational phase. Our team of dedicated of mine strategists are fully invested in the projects we undertake and seek to consistently provide the highest value deliverable.

orelogy are constantly evaluating the opportunities and risks associated with your project. Our goal is to meet your key outcomes with the greatest likelihood of success and lowest risk.

As a small group we can react quickly and efficiently to our clients' needs and the markets unpredictability, changing approach and deliverables when the goal posts change.

## Client services

orelogy provides an extensive range of services to assist clients with the planning and management of their project, and the journey from resource to reserve to operation. These include:

1. Project management
2. Exploration data analysis and Mineral Resource Estimation (MRE).
3. Independent valuations, due diligence studies and technical verification.
4. Pre-feasibility & feasibility studies
5. Scoping studies
6. NI43-101 & JORC 2012 technical reporting
7. Site specific mine planning solutions
8. Equipment assessment, selection and costing
9. Operational implementation & benchmarking
10. Mine operations production, planning & support
11. Underground Mining Ventilation
12. Training
13. Scheduling



## 1. Project management

orelogy undertake management of studies on behalf of clients, ensuring all relevant elements are incorporated, assessed to an acceptable level and completed in a timely fashion.

The management of study programs, particularly feasibility type studies, requires a fundamental understanding of all facets of the proposed mine development.

The development of a project's mine plan must effectively encapsulate all relevant aspects of an entire project, including not just mining but also mineral resource estimation, geotechnical, hydrological, processing, environmental, marketing, tenure, closure, safety and more. This plan will determine the eventual economic viability and overall scale of the project. The requirement for mine planning to interface with all parties to determine project value gives orelogy an inherently comprehensive appreciation of all the key parameters of a project and their interaction with each other.

orelogy have a core group of highly experienced Principal Consultants and Project Managers who can bring a wealth of experience to any project, across a huge range of locations and commodities.



## 2. Mineral Resource evaluation studies

orelogy has expanded its inhouse capabilities from consulting services specialising in mine planning to include the following comprehensive mineral resource evaluation services :

- Advising on the appropriateness of the methods and procedures used to collect exploration data that informs geological modelling and mineral resource estimation.
- Statistical analysis of client and laboratory QAQC data to assess the precision and accuracy of the assay data that informs resource estimation.

- Exploratory data analysis to determine the statistical characteristics of the analytical attributes (e.g. grades and in-situ density) and their corresponding relationships with the project geology and mineralisation.
- 3-D modelling of geological surfaces and solids reflecting changes in lithology, weathering, host rock alteration and mineralisation styles with different physical, geophysical and geochemical characteristics.
- Geostatistical analysis (e.g. variography and kriging neighbourhood analysis) to guide the determination of appropriate sample search parameters for input to resource grade estimation and the definition of resource classification criteria.
- Analysis and advice on drill spacing requirements aligned with appropriate JORC resource classification criteria.
- 3-D grid modelling of narrow vein deposits or block modelling of broader mineralisation styles.
- Estimation of global insitu mineral resources using traditional linear estimation techniques (e.g. ordinary kriging) or estimation of recoverable resources using non-linear estimation techniques such as local uniform conditioning (LUC) or multiple indicator kriging (MIK).
- JORC 2012 CP signoff and reporting of gold-silver, nickel-cobalt, iron ore, lead-zinc, copper, lithium and graphite Mineral Resources for a wide variety of geological settings, deposit types and mineralisation styles.
- Technical report preparation at an appropriate level aligned with the study objectives whether a stand-alone resource estimation study or as part of a broader project due diligence assessment, scoping study, prefeasibility study or feasibility study.

The new resource geology arm of orelogy has a broad range of previous resource modelling experience on gold-silver, nickel-cobalt, iron ore, lead-zinc, copper, lithium and graphite projects in Australia, Africa, North America, South America, Europe and Indonesia.





### 3. Independent verification, evaluations and due diligence appraisals

orelogy is able to provide demonstrably independent analysis and assessments for mining companies, banks and lenders, investors, insurance companies and the like. This form of study includes:

- Due diligence type assessments of both current operations and planned projects for the purposes of investment, acquisition and divestment.
- Independent technical evaluations.
- Technical verification for internal company evaluation.
- Fatal flaw assessments of completed studies.

These appraisals cover a range of issues to varying levels of detail, dependent on time frame, budget and client requirements. They can include:

- Examination of exploration data quality, appropriateness of geological modelling constraints and resource estimation technique(s) used by our clients or their consultants, and whether an estimate is likely to reflect the ore tonnages and grades that will be recovered upon mining.
- Detailed assessment of the validity and robustness of the parameters used to develop a project (e.g. mining models, optimisation parameters, design parameters, optimise costs). This is particularly important in the case of verifying reported ore reserves conform to the required reporting codes.
- Examination of planning systems and assumptions to ensure they are practical while at the same time meeting corporate requirements and expectations.
- Rigorous performance assessment of proposed or actual operating systems and management strategies to determine their suitability, effectiveness and whether short or long-term targets are achievable.
- Assessment of the interface between mining and all other aspects of the project (e.g. geology, processing, environmental) to determine if any of the interacting systems or assumptions adopted are suitable or could be improved.
- Evaluate the basis for operating and economic projections to determine whether they can be considered valid and realistic.

orelogy can produce reports complying with all relevant disclosure requirements and reporting codes and brings a wealth of practical experience, both within Australia and internationally, to the formation of these reports.



### 4. Pre-feasibility, feasibility & implementation studies

orelogy undertake all mineral resource evaluation and mining engineering related aspects of pre-feasibility and feasibility assessments. Such studies are usually defined as providing engineering and cost estimates to an accuracy of  $\pm 25-30\%$  and  $\pm 10-15\%$  respectively and are always based on Mineral Resources classified as either Measured or Indicated. Implementation studies are generally undertaken to budget level accuracy. The projects can be comprised of proposed “green-field” projects, expansions to existing operations, resumption of abandoned developments or combinations of all three. Components covered can include, but not limited to:

- All aspects of exploration data analysis and resource estimation previously detailed in Section 2.
- Mining Method determination and production rate assessments.
- Optimisation of excavation geometry, be it open pit bench height or underground stope / panel, in conjunction with appropriate modifying factors (ore loss, dilution, equipment selection, productivity estimation etc.)
- Open pit optimisation and / or underground layout optimisation and assessment of any interaction / trade-off between the two.
- Strategic project development assessment including cut-off grade and / or blending strategies.
- Detailed, practical open pit and / or underground designs.
- Calculation of mineable Ore Reserves in compliance with the appropriate reporting standard (JORC, NI-43101, AIM, SAMREC).
- Life of Mine (LoM) mine scheduling including cut-off grade, stockpiling and blending strategies.
- Design of mine layouts including mine infrastructure, road networks, surface water management etc.
- Mine closure and rehabilitation plans.
- Generation of LoM cash-flows and analysis of key project parameters.
- Risk and opportunity assessment.

orelogy can also cater for the geotechnical appraisal and infrastructure requirements of these studies by utilising our network of recognised and trusted service providers.

orelogy have the background and expertise to take mining operations from study level through implementation and execution, with a history of involvement in projects from feasibility through execution to on-going support. We can provide the next level of practical detail to ensure feasibility studies translate into a viable and sustainable operation with the greatest likelihood of success.



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## 5. Scoping studies

orelogy can undertake all aspects of scoping studies or provide specific resource modelling and/or mining engineering contributions as part of a larger team.

This style of study involves an early evaluation of the project mineral resources and practical assessment and economic viability of a project, with a view to confirming whether further, more detailed assessment is warranted.

The resource modelling component aims to understand the nature, spatial coverage and quality of the early exploration data and identify any shortcomings to be considered in future exploration programmes. It also aims to broadly assess and characterise the styles of potential economic mineralisation present and provide a 'global' estimate of the insitu Mineral Resources available for input to the mining evaluation component of the study.

The mining study component involves high-level first pass evaluation using generic or historical parameters to determine potential scale, extent and whether there is a potential break point for applying an underground mining approach. orelogy then builds on this by quickly conducting high level strategic scheduling while concurrently assessing the benefits of a cut-off grade and / or blending strategy to fully understand and realise the projects true value.

The toolset orelogy uses also allows rapid assessment of different project development options, or "optioneering", which provides our clients with an improved forward view of what their project may realistically look like. In this way, an early indication of the scale of operations and the most appropriate development path can be determined, unlocking the project's true value while also identifying possible risks and opportunities.

The advantage orelogy has is our combination of experience and innovative toolsets enables us to turn around these initial assessments in a short time-frame. This agility saves our clients both time and money and allows rapid decision-making on a sound technical basis.



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## 6. NI43-101 & JORC 2012 technical reporting

Over almost 20 years of feasibility level study work and associated Ore/Mineral Reserve reporting, the orelogy Principal Consultants have amassed Competent Person / Qualified Person status over a range of commodities, styles of mineralisation, mining methods and locations. orelogy Principals are all Members or Fellows of the AusIMM and are therefore qualified to act as CP for Mineral Resource and Ore Reserve reporting under the Australian JORC Code and Qualified Persons for Mineral Reserve reporting under the Canadian National Instrument 43-101. We have developed multiple feasibility level reports for the mining components supporting Ore Reserves and Technical Reports supporting Mineral Reserves.

orelogy currently have QPs/CPs covering:

- Precious metals
- Lead/Zinc
- Lithium
- Iron
- Nickel
- Graphite
- Vanadium
- Mineral Sands
- Rare Earths
- Copper
- Uranium



## 7. Site specific mine planning solutions

The orelogy team has a vast amount of collective experience in developing robust and transparent solutions to challenging mine planning problems. This is a result of our orelogists utilising the mine planning software packages currently available not only in operations, but in constantly developing outcomes for complex mining projects as part of ongoing study work. As such we are uniquely placed to tailor a mine planning solution to your project.

Some examples are:

1. Developing a systematic methodology to complex pit or stope optimisation scenarios.
2. Modelling of complex dilution approaches and then automating via scripting.
3. Application of complicated geotechnical criteria to optimisation or design process.
4. Developing robust and achievable mining schedules while catering for multifaceted geometallurgical considerations.

orelogy also have considerable experience in assessing and modelling many of the alternative mine production technologies such as autonomous haulage, trolley-assist haulage, In-Pit Crushing Conveying (IPCC) etc.

We can include the site specific aspects of these approaches to the mine planning solution we develop.



## 8. Equipment assessment, selection & cost modelling

orelogy has undertaken many studies involving both optimisation of mining methods and assessment of mining equipment selection options.

This includes assessment of:

- Continuous Surface Miners
- In-Pit Crushing and Conveying (IPCC)
- Railveyor Material Handling
- Trolley-Assist Truck Haulage

It has the knowledge and experience to provide detailed cost estimation and provide recommendations for mining applications and purchases of associated capital items.



## 9. Operational implementation & benchmarking

orelogy are able to provide support and guidance to our clients not only through the study phases of a project, but right through implementation and execution. orelogy's Principal and Senior Consultants have managed mining projects, some of them as greenfields start-ups, some as brownfield re-starts, or existing operations. It is important to appreciate that the environment around which a feasibility study is developed can quickly change on the journey to execution. We are therefore well paced to provide the project execution support while also having the mine planning background to amend mine plans to fit with changing goal posts. Our orelogy team bring a wealth of experience across commodities and locations which can be tapped into to add value at any stage of the execution process.

orelogy can also verify and comment on mining related production targets or cost estimates, either via comparison to historical data available on the orelogy's internal database, or by building comparable first – principal estimates.





## 10. Tailored mine planning support and mentoring

orelogy personnel collectively have considerable mine planning experience and high-level competency in most recognised mine planning packages, including MineSight, Vulcan, Whittle 4X, Surpac, Deswik and Datamine. They are regarded as the pre-eminent experts in Maptek Evolution globally.

orelogy also has expert scripting and programming skills to help projects where a customised solution is necessary. As a result, orelogy can develop comprehensive mine planning systems and procedures tailor-made to the specific requirements of our client. This can vary from strategic life-of-mine planning for multiple working areas to short term planning for individual open pits.

orelogy can provide a bespoke planning support service to operations at either the implementation, pre-production or production phases of operation. This includes every level from Life of Mine (LoM) schedules, annual budgets to monthly production schedules, including development plans and blast layouts.

orelogy personnel have considerable practical site experience, and this background can be of considerable benefit to clients. orelogy personnel have often been embedded with our client's team to offer on-going mine planning expertise, training and mentoring to site based personnel. Their role can include evaluation and optimisation of all aspects of site mining operations, from the mine face right through the mine operations and planning chain to the end customer.

orelogy are also agile enough to quickly react to a client's requirements and provide support as and when needed.



## 11. Underground Mine Ventilation

Introducing a new capability to our services, orelogy offers expertise in the field of underground mine ventilation. This addition strengthens our expertise and dedication to excellence. We are devoted to providing outstanding value and enhanced safety to our clients with this new offering.

Ventilation capabilities include:

- Life of mine ventilation planning.
- Ventilation system and network analysis, design, and optimisation.
- Detailed cost-estimation and scheduling.
- Concept designs and trade-off studies.
- Heat Load analysis and thermodynamic network modelling.
- Ventilation equipment sizing and selection.
- Rock thermal properties and geothermal studies.
- Project support, site support, document assessments and technical appraisals.

Trusted by a growing list of mining operators, we collaborate with clients who prioritise safety and seek innovative ventilation solutions.





## 12. Training

The orelogy team has a vast amount of collective experience in the effective use of many of the mine planning software packages currently available. This includes, but is not limited to products from:

- Maptek
- Deswik
- Hexagon
- Geovia (Whittle™ and Surpac)

We can develop and present training courses tailored to your specific company, project or operation. However more importantly, we do not just teach the “how”, we also teach the “why”. In other words, our training is not just an exercise in showing which buttons to push. It will also cover the concepts and “tips and tricks” associated with all aspects of the mine planning process, be it pit or stope optimisation, open pit or underground design, and short/medium/long term scheduling or any other area of mine planning.



## 13. Scheduling experts

As mine planning engineers, our primary goal is to improve the value of a mining project. This goal is best served through development of robust and practical high value mine plans using smart scheduling techniques.

orelogy has always sought ways to deliver improved solutions to our clients, and as part of that process orelogy developed EVOLUTION, a best-of-breed open-pit mine scheduling solution that harnesses a variety of optimisation techniques.

In October 2014 Maptek™, providers of the Vulcan general mining software, acquired the EVOLUTION suite of products from orelogy. Its acquisition by Maptek is a validation of the unique and proven product orelogy developed.

orelogy remain the pre-eminent power users of the EVOLUTION product globally and bring an unrivalled capability in the application of this product to provide real world mining solutions.



# Projects by location & commodity



## All Projects

- Base metals
- Battery
- Energy
- Industrial
- Poly-Metallic
- Precious Metals
- Steel making



# The orelogists

orelogy provides an extensive range of expert mining services to assist clients with optimisation, planning and management of their project, and the journey from resource to reserve to operation

orelogy personnel have often been “embedded” with clients to offer ongoing mine planning expertise, training and mentoring to site based personnel. Their role can include verification and optimisation of all aspects of site mining operations, from the mine face right through the mine operations and planning chain to the “end client”.

orelogy pride ourselves on our ability to quickly respond to a client’s requirements and provide support as and when required.

To explore our employees' extensive expertise further, please visit orelogy’s website [here](#).





**Peta Barnes**  
**CEO**

*BSc Geology, Geophysics,  
Geochemistry*



**Ross Cheyne**  
**Head of Consulting /  
Principal Mining Consultant**

*BEng (Mining- Hons), FAusIMM*



**Steve Craig**  
**Executive Consultant**

*BEng (Mining- Hons), FAusIMM,  
GAICD*



**Ryan Locke**  
**Principal  
Mining Consultant OP & UG**

*DipEng, MAusIMM*



**Jake Fitzsimons**  
**Principal  
Mining Consultant - OP**

*BEng (Geological Eng), FAusIMM*



**Andrew Hollis**  
**Principal Mining Consultant /  
Open Pit (OP) Team Leader**

*BEng (Mining), MAusIMM*



**Julian Broomfield**  
**Principal Mining Consultant /  
Underground (UG) Team Leader**

*BEng (Mining), MAusIMM,  
First Class Mine Managers Ticket*



**Laurynne Joyce**  
**Principal  
Mining Consultant - OP**

*BAppSc. (Applied Geology),  
GDip (Mining), MAusIMM*





**Aleks Mihailovic**  
**Senior**

**Mining Consultant - OP**

*BSc (Mining-Hons), MAusIMM*



**Buffy Davies**  
**Senior**

**Mining Consultant - UG**

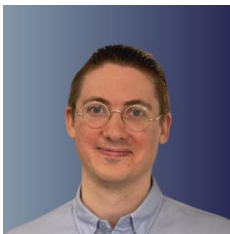
*BEng (Mining), MAusIMM,  
First Class Mine Managers Ticket*



**Hossein Parhoon**  
**Senior**

**Mining Consultant - OP**

*MEng (Mining), MAusIMM*



**Lawrence Vincent**  
**Senior**

**Mining Consultant - OP & UG**

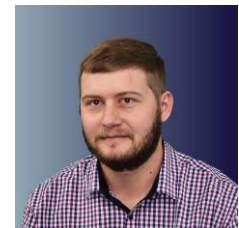
*BEng (Mining - Hons) / BCom, Dip.  
Mod. Lang. (French), MAusIMM*



**Sarah Collings**  
**Senior**

**Mining Consultant - OP & UG**

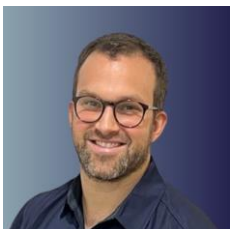
*BSc (Mining), MAusIMM*



**Ruan Roos**  
**Senior**

**Mining Consultant - UG**

*BSc (Physiology-Hons),  
MVSSA, MAIOH, MAusIMM*



**Bruno Frontini**  
**Senior**

**Mining Consultant - UG**

*BEng (Mining-Hons),  
First Class Mine Managers Ticket*



**Brendan Hart**  
**Mining Consultant - OP**

*BEng (Mining), MAusIMM*



**Damien Steinbacher**  
**Mining Consultant - OP & UG**

*Grad Dip (Mining), BSc (Mine &  
Engineering Surveying)*

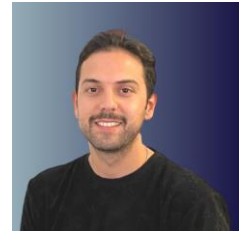




Aline Costa  
**Mining Consultant - UG**  
*BEng (Mining), MAusIMM*



Amir Khaki  
**Mining Consultant - OP**  
*MEng (Mining), BE(Mining)  
PRE IEAUST, MAusIMM*



Hamid Mergani  
**Mining Consultant - OP**  
*MEng (Mining), BE(Mining),  
MAusIMM*



Jafar Khademi  
**Mining Consultant - OP**  
*PhD, MEng (Mining), MAusIMM*



Julia Batkhuyag  
**Mining Consultant - UG**  
*BSc (Industrial Economics &  
Mining - Hons), MSc (Mining),  
MAusIMM*



Farnoush Eftekhari  
**Mining Consultant - OP**  
*MEng (Mining), MAusIMM*



# Snapshot of Relevant Projects

Company	Project	Country	Commodity – Scope
Arcadium Lithium	Mt Cattlin	Australia	Li - UG DFS
Australian Vanadium	Australian Vanadium Project	Australia	V <sub>2</sub> O <sub>5</sub> - PFS/DFS/Trade-off Study
Caravel Minerals	Caravel Copper Project	Australia	Cu - PFS
Fenix Resources	Ironbridge/Beebyn/W11	Australia	Fe - Mining Study/DFS
Lotus Resources	Kayelekera Uranium Mine	Malawi	U <sub>2</sub> O <sub>3</sub> – DFS/Project Implementation
Centamin	Doropo	Côte d'Ivoire	Au - PFS/DFS
Elevate Uranium	Marenica Uranium Project	Namibia	U <sub>2</sub> O <sub>3</sub> – Scoping Study
Rio Tinto	Rossing Uranium Mine	Namibia	U <sub>2</sub> O <sub>3</sub> – Operational planning support
Swakop Uranium	Husab Project	Namibia	U <sub>2</sub> O <sub>3</sub> – SS/PFS/DFS operational planning (+ 18 years)
Red Hawk Mining	Blacksmith Project	Australia	Fe - Scoping Study/PFS
Technology Metals Australia	Murchison Technology Metals Project	Australia	V <sub>2</sub> O <sub>5</sub> - DFS
Consolidated Copper Corp	Tschudi	Namibia	Cu – PFS
ANAX	Multiple	Australia	Cu, Zn – UG & OP PFS, FS & Reserves
AIC Mines	Jericho	Australia	Cu – UG PFS & Reserves
Barrick Gold	Hemlo	Canada	Au – PFS & NI43-101
Polyus Gold International	Sukhoi Log	Russia	Au – Owners Engineer
Eurochem	Kovdorsky Gok	Russia	Fe/PO <sub>4</sub> - Mine Planning Study
Zincx	Shaimerden	Kazakhstan	Zn - Mine planning and FS Studies
JSC Varvarinaskoye	Varvarinaskoye	Kazakhstan	Cu/Au - Mine planning and FS Studies
Goldfields	Gruyere Expansion	Australia	Au -Study Management & support
Liontown Resources	Kathleen Valley	Australia	Li – PFS open pit and underground mining study
Sarama Resources	Sanutura	Africa	Au – PEA
Whitehaven Coal	Winchester South	Australia	Coal - PFS
Red 5	King of the Hill	Australia	Au - Implementation Plan
Matador Mining	Cape Ray Gold	Canada	Au – Scoping Study
GMA Garnet	Port Gregory Project	Australia	Garnet Sands - On-going mine planning
Dacian Gold	Mt Morgans	Australia	Au – DFS/LOM Update/Ore Reserves
Primary Gold	Rustlers Roost	Australia	Au – PFS Update
Superior Lake Resources	Superior Lake	Canada	Zn – DFS
Hanking Australia	Toms Gully	Australia	Au – UG PFS
Superior Gold	Plutonic	Australia	Au – NI-43 101 underground development; Mine Planning support
Allied Gold	Various	North Africa	Au – Strategic Planning/DFS/PFS/Implementation Studies including mine re-start
Ibaera Capital	Gold	Ghana	Au – Wa Gold DFS, Tender package and implementation studies
Cheetah Resources	Rare Earths	Canada	REE - Nechalacho PFS
Alita/AMAL/Tawana	Bald Hill	Australia	Li – UG Mining Contract Tender & PFS
Sandfire Resources	T3/A4	Africa	Cu – DFS/LOMP
St George Mining Limited	Project Destiny	Australia	Ni – Mining Study/LOM Strategic Plan
RTG Mining	Mabilo	Philippines	Cu/Au/Fe – Scoping / PFS
Barrick	Lumwana Copper	Zambia	Cu - SS/PFS/FS continued mine planning support from inception to 2019
Mod Resources	Mahumo Cu project	Botswana	Cu – Mine planning study



# Projects by Method & Commodity

		Primary Commodity																										
		Coal	Bauxite	Iron Ore	Manganese	Garnet	Mineral Sands	Limestone	Kaolin	Poly Metallic	Copper	Zinc	Lead	Tin	Nickel Laterite	Sulphide Nickel	Graphite	Vanadium	Molybdenum	Niobium	Lithium	Tungsten	Uranium	REE	Gold	PGE	Diamond	Other
Surface Mining	Strip Mining	•					•																•					•
	Quarrying		•			•	•	•	•																			
	Open Pit (Large/Bulk)			•	•				•	•	•			•	•	•	•		•	•			•	•	•		•	
	Open Pit (Selective)			•	•		•		•	•	•			•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
	Mineral Sands					•	•																					
	IPCC			•																								
Underground Mining	Surface Miners		•	•																		•						
	Block Caving									•															•			
	Sub-level Caving														•													
	Stoping with fill								•	•	•				•										•			
	Open Stoping								•						•					•								
	Cut and Fill Stoping								•	•					•										•			
	Room & Pillar								•	•	•									•				•	•			
	Narrow Vein Stoping								•	•															•			•
	Airleg Stoping													•		•									•			•
Civil Tunnelling																											•	





**Contact orelogy,  
an idoba company  
for more information.**

Level 2,  
101 St. Georges Terrace,  
Perth WA 6000

+61 (0) 9318 5333

[info@orelogy.com](mailto:info@orelogy.com)

[www.orelogy.com](http://www.orelogy.com)

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