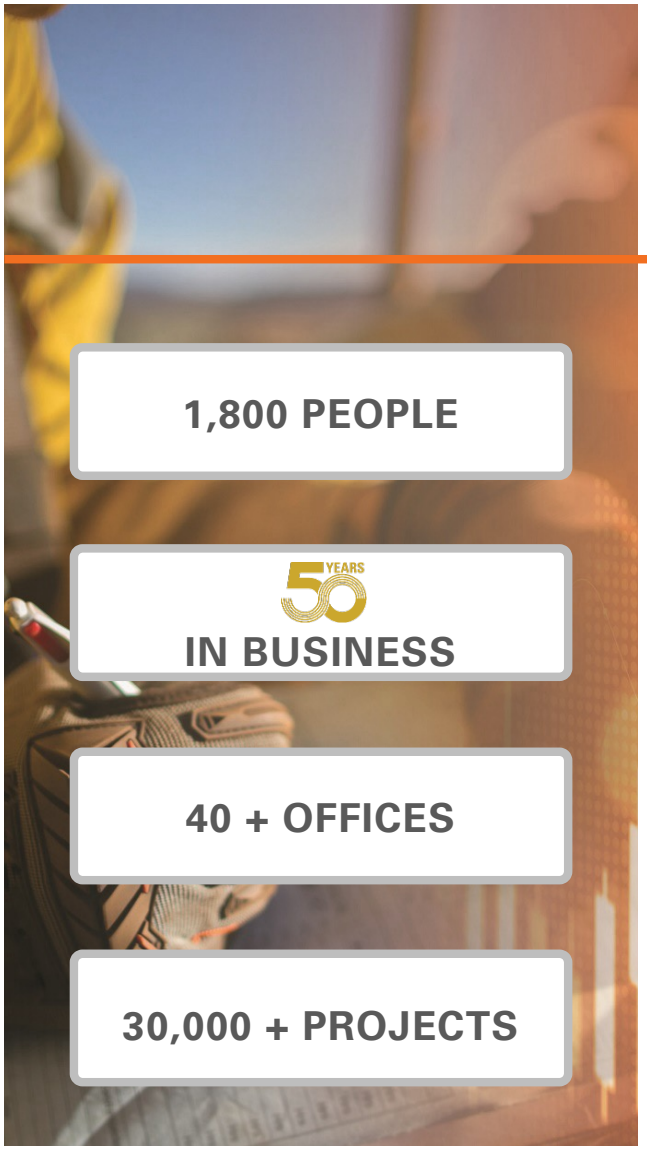

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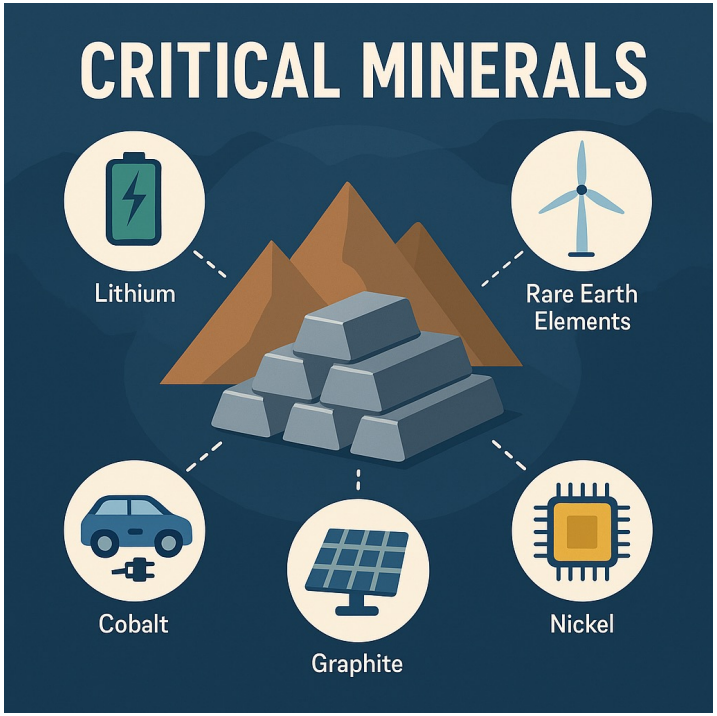
An independent, international group providing specialised consultancy services to the earth and water resource industries.

These services cross the mining project life cycle from early-stage exploration through development and operations to closure.

Mineral Resource Estimation of Critical Minerals

What needs to be considered?



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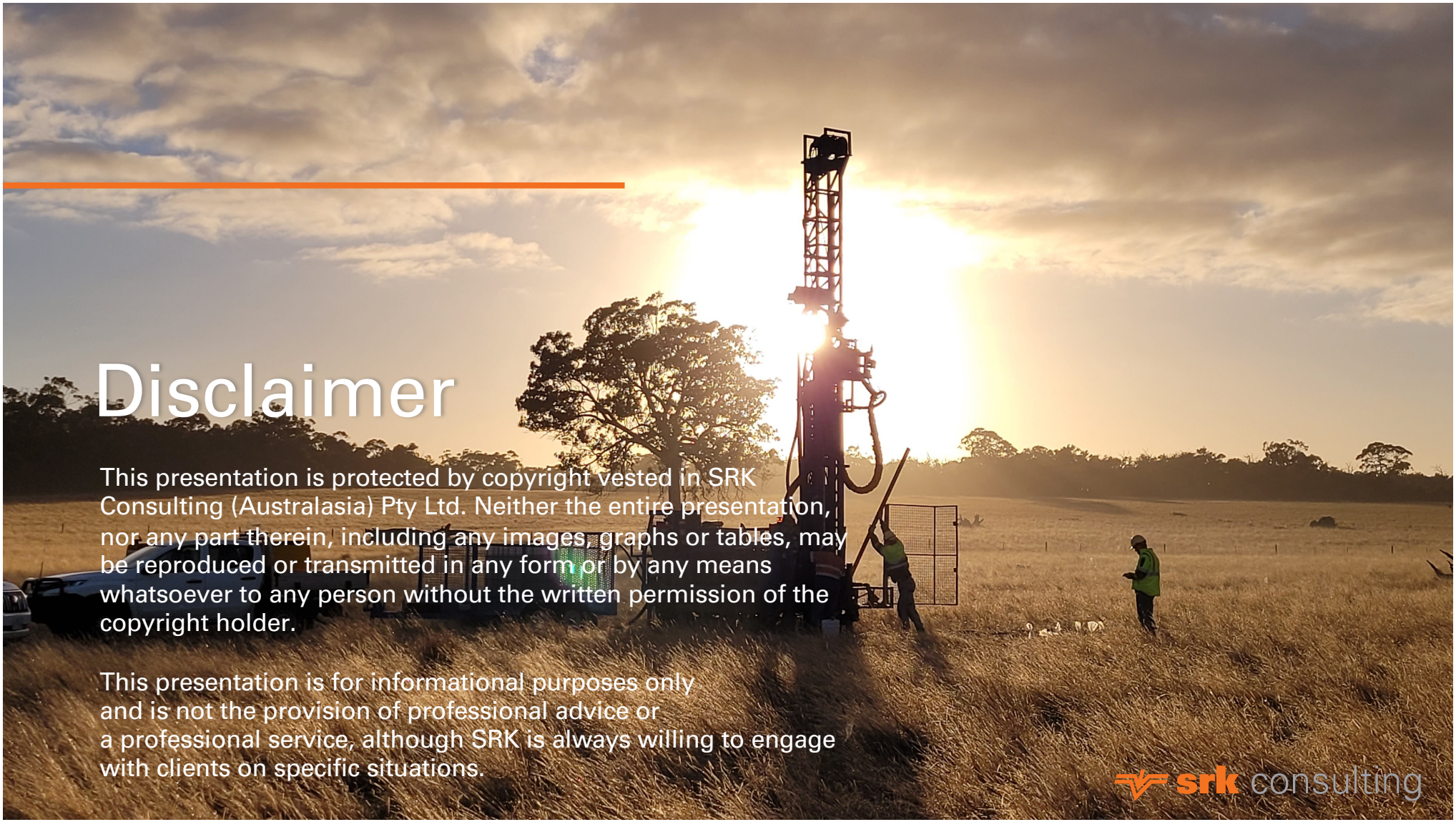
Presenter:

Mike Cunningham
Principal Consultant (Geology)



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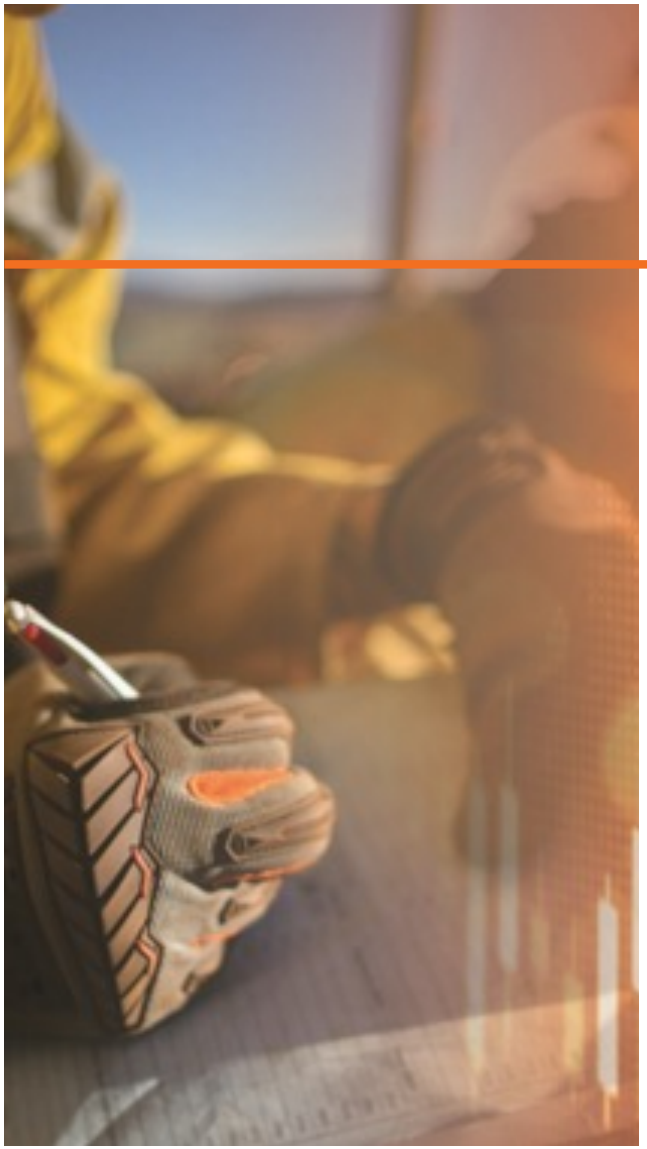
Reporting – Mineral Resource Estimates

- A ‘Mineral Resource’ is a concentration or occurrence of solid material of economic interest in or on the Earth’s crust in such form, grade (or quality), and quantity that there are reasonable prospects for eventual economic extraction. The location, quantity, grade (or quality), continuity and other geological characteristics of a Mineral Resource are known, estimated or interpreted from specific geological evidence and knowledge, including sampling. Mineral Resources are subdivided, in order of increasing geological confidence, into Inferred, Indicated and Measured categories

- All reports of Mineral Resources must satisfy the requirement that there are **reasonable prospects for eventual economic extraction** (i.e. more likely than not), regardless of the classification of the resource



Governing Principles

- **Transparency**: reporting of Mineral Resources (public report) must provide clear, sufficient, and unambiguous information so the reader is not misled by content or omissions known to the Competent Person
- **Materiality**: all information reasonably required for investors to form a balanced and informed view must be disclosed or the reasons for any omissions must be clearly justified
- **Competence**: estimation and its reporting being prepared by a suitably qualified and experienced professional (the Competent Person) who works under an enforceable code of ethics

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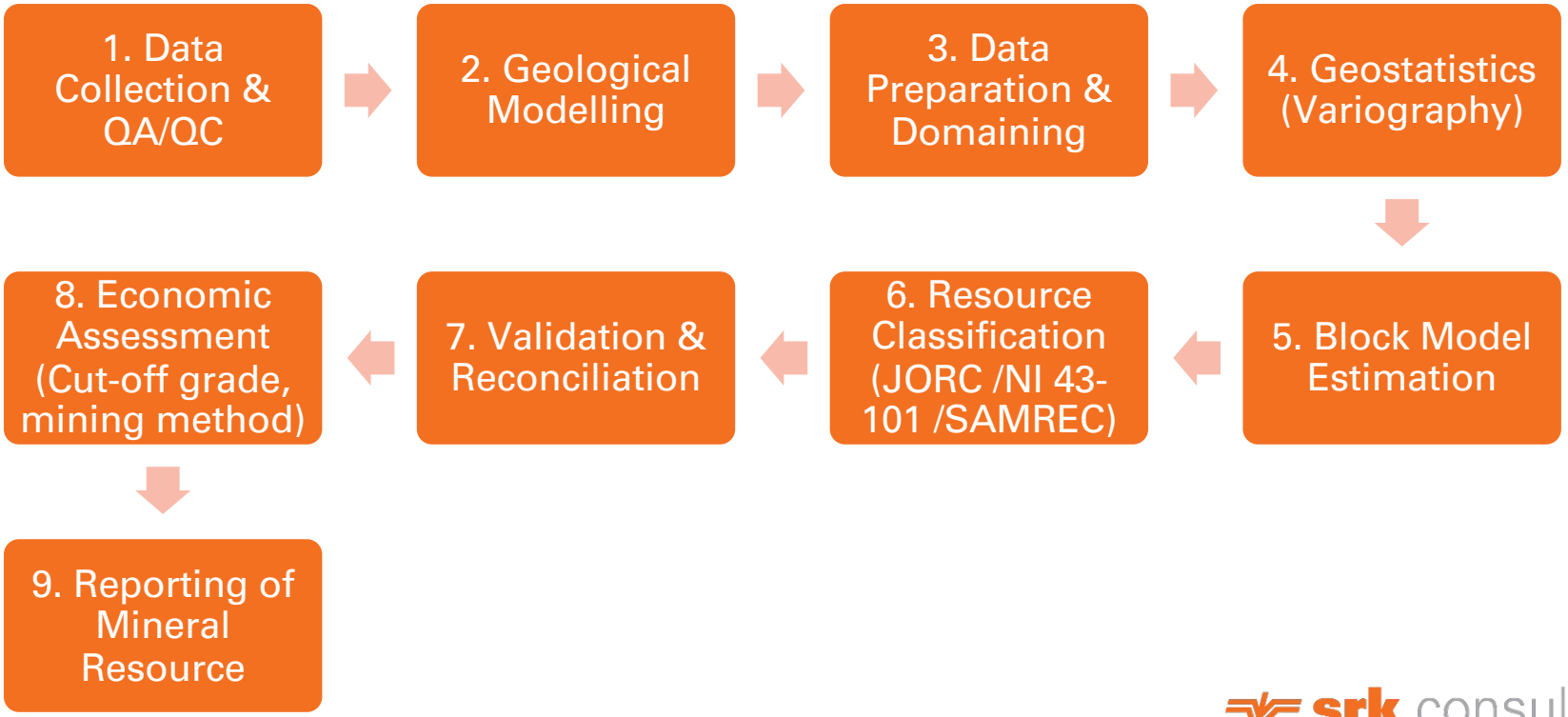
Workflow



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Reliable Estimates

- Drill hole data, geophysics, etc., for domain (stationarity) modelling
- Database integrity and representative results of high accuracy and precision
- Exploratory data analysis: variography, data transformation, support correction, block model parameters, etc.
- Confidence in the results, including data spacing, density data for conversion to tonnes and metal, metallurgical testwork of ore types, etc.

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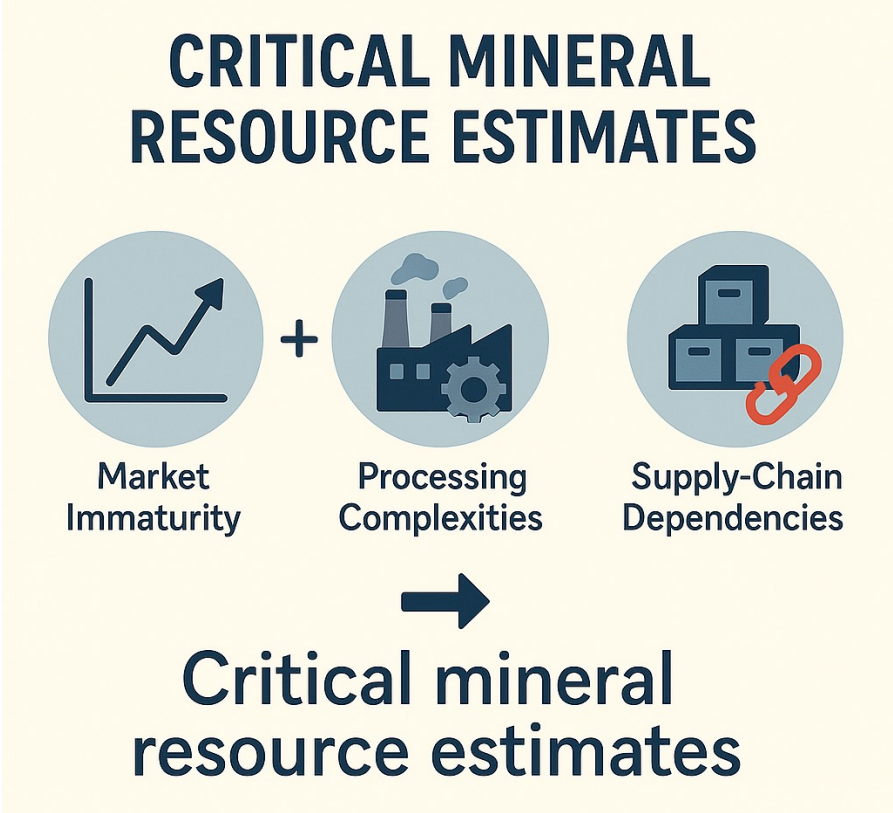
Critical Minerals – Challenges



- Essential for modern technologies (e.g. batteries, renewable energy, defense, etc.)
- Not just supply: geopolitical concentration, difficult substitution, limited recycling
- Specialised markets
- Prices can be volatile due to technology shifts or geopolitical events
- Supply chains are complex and often international

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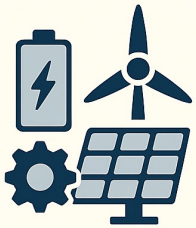
Critical Minerals – Characteristics

END USES

High-tech and strategic applicatlons: batteries (EVs, storage), wind turbines, solar panels, semiconductors, defense systems



POLICY AND REGULATION

Governments maintain critical mineral lists (e.g., US, EU, Australia) due to economic and national security concerns. Subject to strategic stockpiling, international agreements and funding for exploration

SUMMARY

Technology-driven, supply-risk focussed, strategic

- **End uses**
  - High-tech and strategic applications: batteries (EVs, storage), wind turbines, solar panels, semiconductors, defense systems
- **Policy and regulation**
  - Governments maintain critical mineral lists (e.g. US, EU, Australia) due to economic and national security concerns
  - Subject to strategic stockpiling, international agreements and funding for exploration
- **Summary**

Technology-driven, supply-risk focused, strategic

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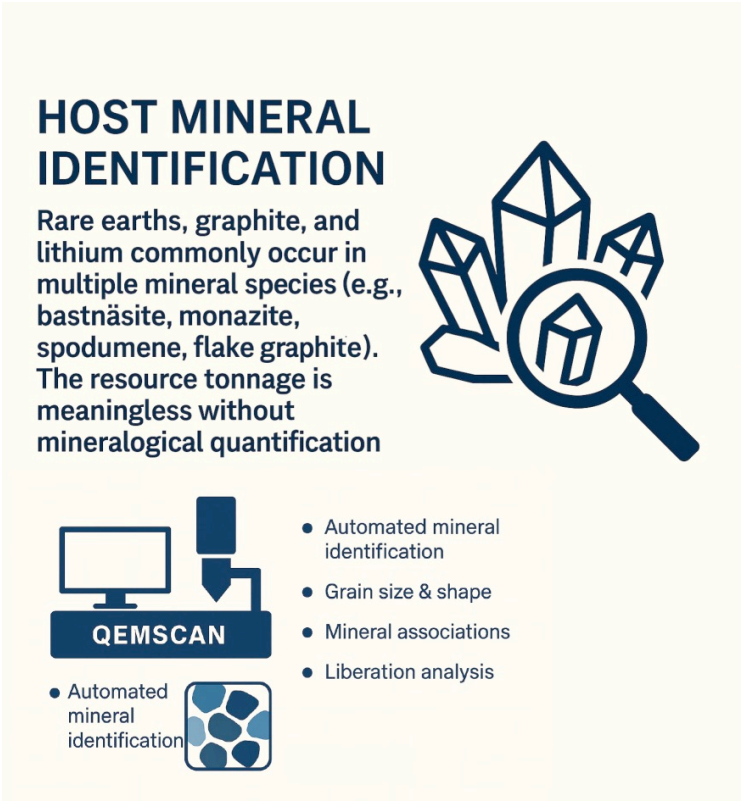
Mineralogical & Metallurgical Complexity



- **Host mineral identification**: Rare earths, graphite, and lithium commonly occur in multiple mineral species (e.g. bastnäsite, monazite, spodumene, flake graphite). The resource tonnage is meaningless without mineralogical quantification
- **Liberation and association**: Detailed mineralogy (e.g. QEMSCAN, MLA) to determine grain size, associations, and liberation
- **Processing uncertainty**: Metallurgical test work is often more critical than for bulk commodities, as recoveries can vary widely

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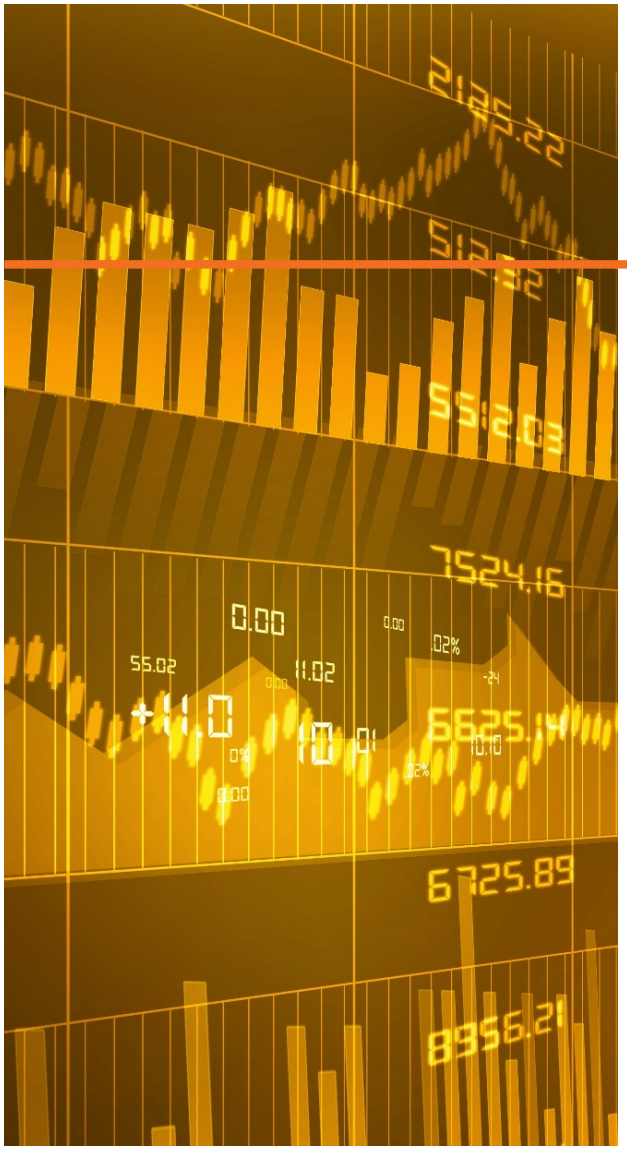

Specification-driven Resource Reporting

- For many critical minerals, **not all tonnes are equal** – end users require specific purity, particle size, or chemical composition (e.g. battery-grade graphite vs amorphous graphite)
- Resource estimates must consider **quality parameters**, not just grade × tonnes
- May require specialised **cut-off criteria** (e.g. reporting only graphite above a certain flake size or lithium oxide within spodumene)

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Non-traditional Market Risk

- **No transparent spot market**: Prices are often negotiated under long-term contracts
- **Geopolitical and supply-chain risk**: China dominates rare earths and graphite supply; this affects project viability
- Resource estimates should be contextualised with **market studies** and **offtake agreements** more explicitly than for gold or copper

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By-product & Co-product Accounting

- Many critical minerals are **by-products** of larger mining operations (e.g. rare earths from phosphate or iron deposits, cobalt from nickel/copper mines)

- Resource estimation may need **multi-commodity** balancing and careful allocation of costs/credits

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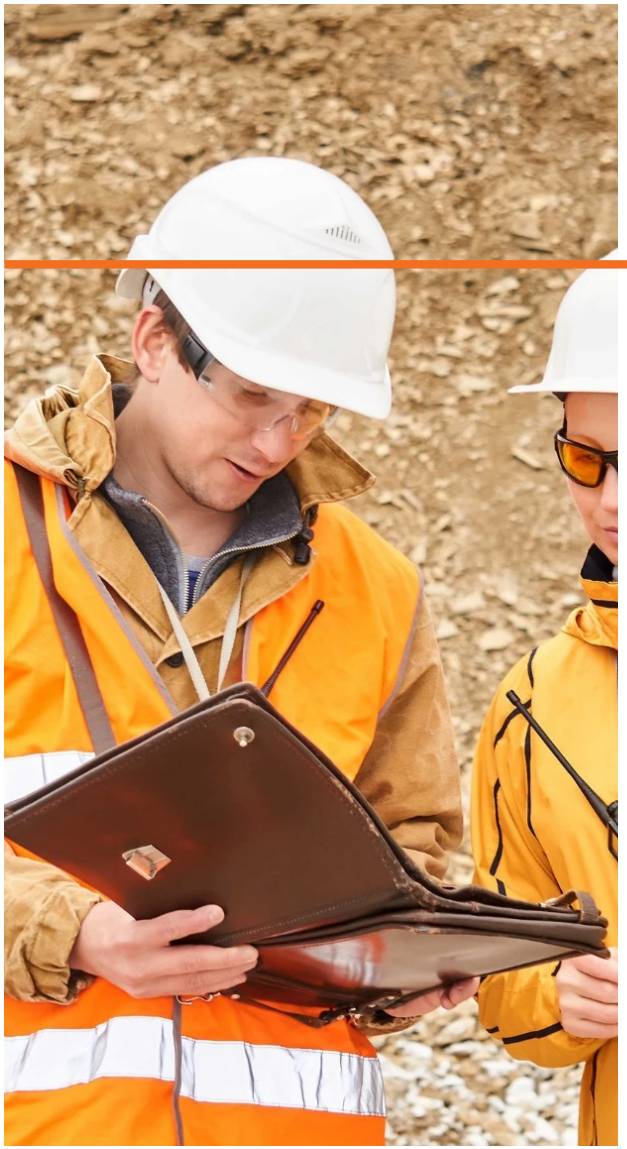
Environmental, Social and Governance Considerations

- Critical minerals often have **challenging processing** routes (e.g. radioactive thorium in rare earth projects)
- Estimation must be linked to **environmental feasibility** (can the waste streams be managed?)
- ESG reporting is increasingly tied to **financing and government support** for critical minerals. It also helps de-risk projects and gives more confidence to potential investors

Critical Minerals Conference – Jakarta

Mining permits (nickel laterite) were revoked for Raja Ampat, Sulawesi, after this protest

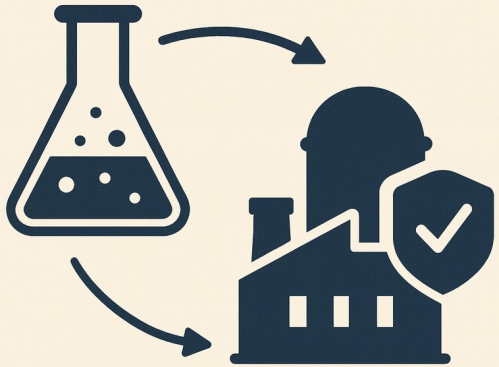


Regulatory & Strategic Frameworks

- Many governments classify critical minerals as **strategic resources**
- Estimation may need to align with **government definitions** (e.g. EU Critical Raw Materials Act, US Critical Minerals List)
- In practice, this means resource reporting may require extra detail on **supply security, processing routes, and potential substitution**

Pilot-scale Validation

PILOT-SCALE VALIDATION



Integrate recovery factors, not just lab tests

- For commodities like gold, resource → feasibility is relatively well-trodden
- For critical minerals, investors and regulators often expect a **pilot plant demonstration** before classification as ‘Measured’ or ‘Indicated’
- This means the Competent Person must integrate **pilot-scale recovery factors** into estimation, not just lab tests

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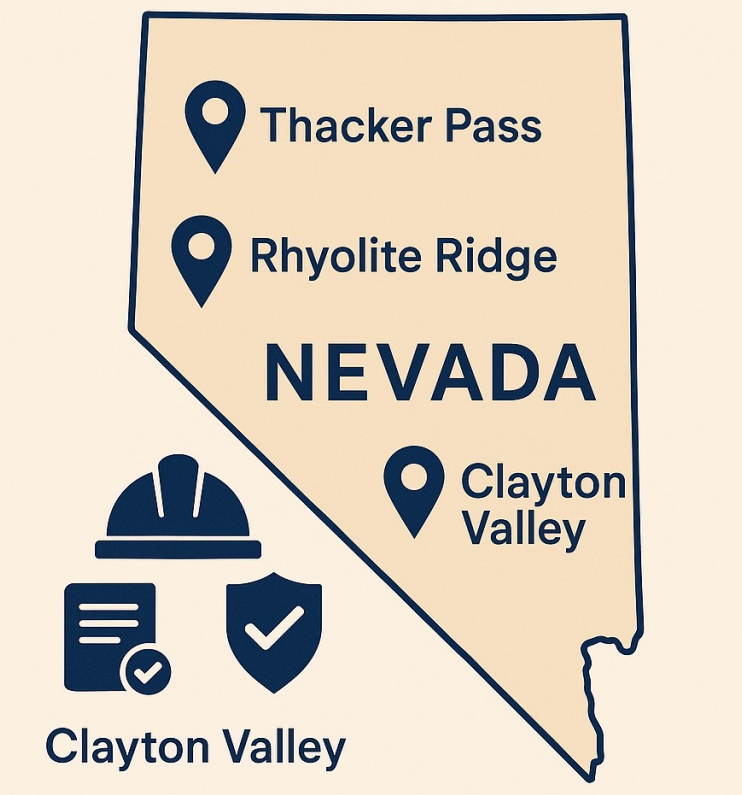
Lithium Clay – Examples from Nevada



- There are a number of lithium clay projects in the Western United States, with many located in Nevada, e.g.:
  - Thacker Pass
  - Rhyolite Ridge
  - Clayton Valley
- There is currently no actual commercial production from lithium clay

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JORC Table 1

- **Section 1: Sampling techniques and data**
  - Community and land access: All sampling and drilling on BLM-managed land conducted under approved Notices/Plans, with consultation of tribal and local communities
  - Environmental constraints: Drill pads and access roads sited to avoid mapped sage-grouse habitat, wetlands, and known cultural resources
- **Section 2: Reporting of Exploration Results**
  - Tenure and governance: Federal claims are in good standing; BLM Record of Decision (ROD) and Final Environmental Impact Statement (FEIS) issued for **Thacker Pass**. Litigation is ongoing but construction is permitted
  - Stakeholder engagement: Section 106 cultural consultations documented; ongoing engagement with tribal nations and rural communities regarding land use and cultural values

JORC Table 1

- **Section 3: Estimation and reporting of Mineral Resources**
  - Reasonable prospects for eventual economic extraction: Acid-leach process requires on-site sulfuric acid plant with cogeneration
  - Clay tailings filter stack permitted as lined, monitored, ‘zero-discharge’ facility per WPCP NEV2020104
  - Water rights must be appropriated under Nevada water law
  - Material constraints: Areas coincident with Tiehm’s buckwheat (endangered species, Rhyolite Ridge) and sage-grouse habitat are excluded from reportable Mineral Resources
  - Stakeholder engagement: Section 106 cultural consultations documented; ongoing engagement with tribal nations and rural communities regarding land use and cultural values

Summary

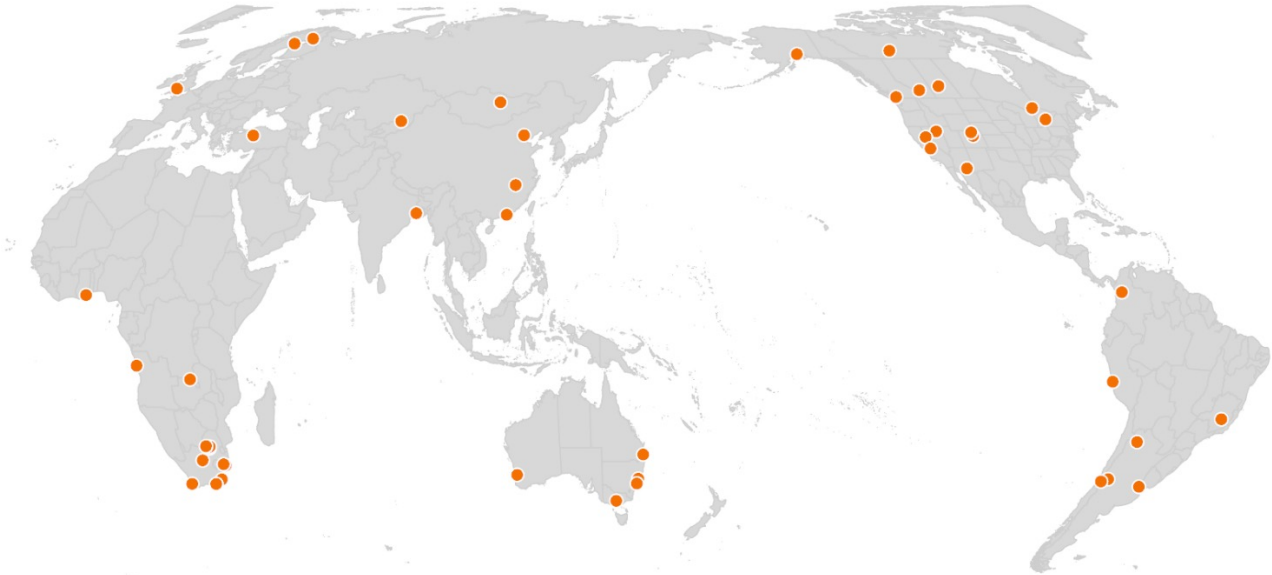
For critical minerals, resource estimation must go beyond **tonnes and grade** to incorporate

- ✓ mineralogy
- ✓ processing feasibility
- ✓ specification-driven quality
- ✓ ESG
- ✓ market context

Without these, the reported resource may look impressive on paper but may be **unusable in practice**.

Thank You

For enquiries email mcunningham@srk.com.au



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