

Geological Risk:

Governance processes to provide assurance on Exploration Results, Resources and Reserves

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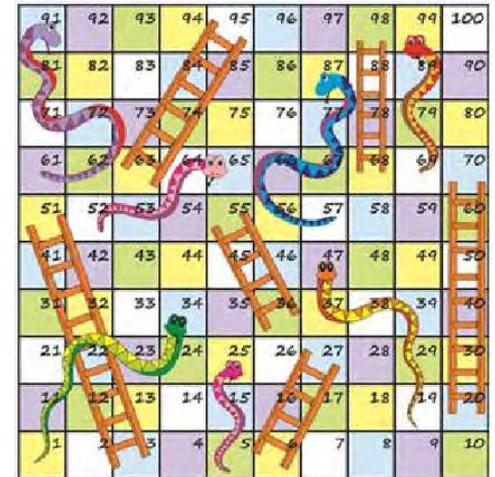
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Content

Assurance on technical data: Exploration Results, Resources and Reserves

- Introduction – Geological, Resource and Reserve risk
- Mitigation – Technical peer review and audit process
- Examples – Risk management / technical assurance
- Discussion
- Conclusion



Introduction

Mining is an inherently risky business

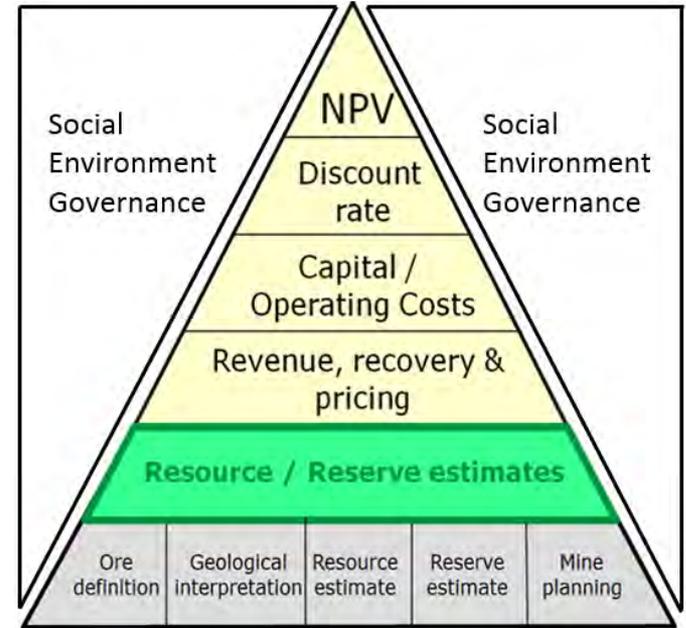
- The company and the market need **transparent, consistent and balanced** reporting of a project's technical data, confidence and development status
- Risks and opportunities exist when:
 - advancing an exploration prospect to a viable project, and
 - operating a mine
- Incorrect **data collection, interpretation, estimation and reporting** can impact on business decision making, reporting and corporate reputation



Introduction - Context

Importance of Exploration Results, Resources and Reserves to value

- Exploration potential, Mineral Resources and Ore Reserves underpin strategic and actual investment decisions and technical valuations

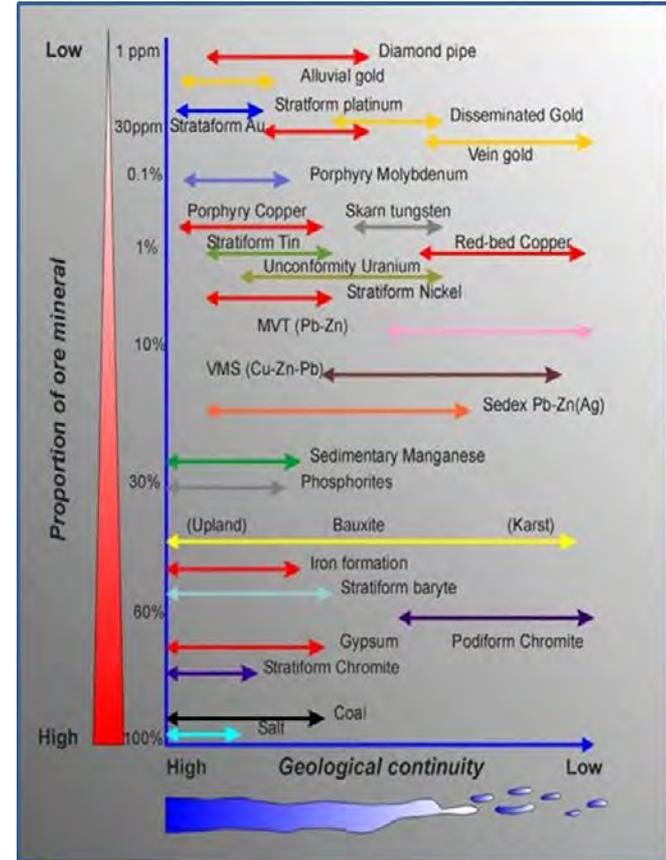


Valuation "buckets"

Introduction - Accuracy, confidence & quality

Accuracy and the nature of the deposit

- No two deposits are identical
- Essential the Competent Person's meaning of confidence in the Resource depends on:
 - Quality and quantity of geological data
 - Sampling and assaying
 - Geology and grade continuity
 - Geological interpretation and modelling
 - Grade / tonnage estimation
 - Reasonable prospects for eventual economic extraction
 - Resource confidence classification and reporting



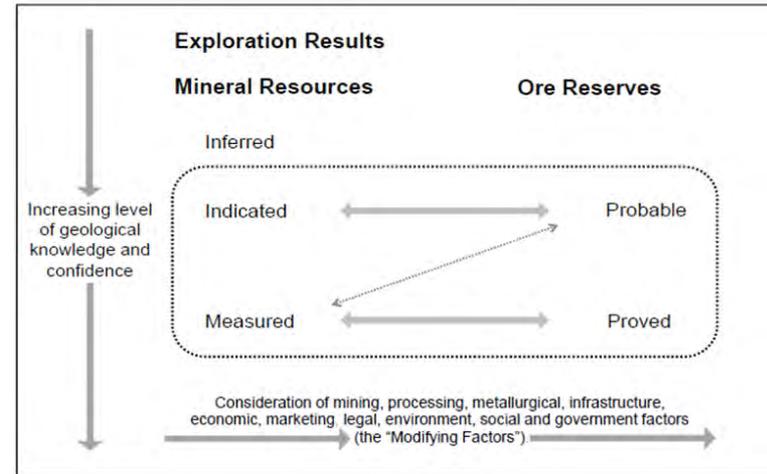
Introduction - Errors that should not occur

Age old subjects continue to be an issue

- Different types and quality of sample data
 - More data \neq better data
- Treatment of missing sample intervals
 - Biased estimates, incorrect estimates
- Incorrect rock density
 - Incorrect tonnage
 - Incorrect weighting when compositing
- Geological controls not recognised / applied
- Inappropriate estimation (methods / application)

Why?

- Fewer staff, inexperienced staff, lack of mentoring and peer review?



The role of Technical Reviews and Audits

Why do we need Technical Reviews / Audits?

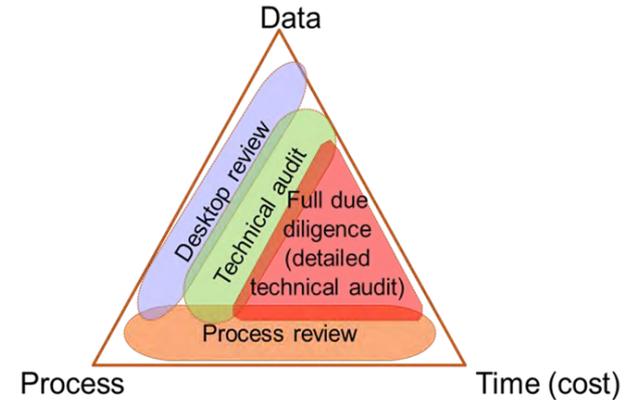
What is an Audit / a Review / a Peer Review?

Why Review and Audit?

- Compliance
- Assurance
- Annual reporting
- Independence
- Reputation
- Due diligence
- Value
- Market perception
- Fraud
- Understanding risk
- Identifying opportunities
- Process improvements
- Skills improvement

Types of Technical Review / Audit

1. Independent Technical Review (ITR)
2. Independent Technical Expert (ITE)
3. Competent Person Report (CPR)
4. Due Diligence (to support investment decision)
5. **Technical Peer Review** (improved technical assurance)
6. **Governance Audit** (Exploration Results, Resources and Reserves)



Risk mitigation – Technical assurance

- Exploration Results, Resources and Reserves
 - Key assets for mineral-focused companies
- Assurance
 - Needed over the processes applied in the data collection, estimation and reporting of Exploration Results, Resources and Reserves
- The assurance process
 - Must assess and manage the risk that the Exploration Results, Resources and Reserves are incorrectly defined and/or reported

Terminology - Audit vs Review

What is an audit?

- Oxford Dictionary:
An official inspection of an organisation's accounts, typically by an independent body
- A systematic review or assessment of something
- Accountant's perspective
 - Seeks to provide **only reasonable assurance** (statistical sampling is often adopted in audits)
 - a set of financial statements are said to be true and fair when they are **free of material misstatements / errors**

Terminology - Audit vs Review

What is a review?

- Oxford Dictionary:
Formal assessment of something with the intention of **instituting change** if necessary:

Synonyms:

appraisal, evaluation, examination, assessment

Definitions - Technical Peer Review / Audit

Peer Review

- Ideally **concurrent** with the preparation of data, selection of estimation procedures and validation of outputs from Resource and Reserve estimation processes
- Completed **before** the handover of results, or prior to the final reporting of results to allow for the **implementation of improvements**
- May involve a detailed investigation, or “drill down”, and even the recalculation or re-estimation of values for **verification of the numbers and processes**

Audit

- Generally **retrospective**, intended to review and rate the risks inherent with an already completed process, identifying opportunities for improvement **in the future**
- Generally focused on **people (competency)**, **processes** and **systems (adequacy and effectiveness)**
- Does not necessarily include a detailed investigation into all of the available data or a verification of the reported numbers



Governance Audit (Resource and Reserves)

Audit

- Used to ensure that internal / external reporting can be trusted

Methodology

- Review data and information processes that support Resource and Reserve generation
- Confirm no significant output / input data or process issues
- Ensure / recommend best practice for internal data / estimation / reporting controls





Governance Audit (Resource and Reserves)

- The “*primary purpose of the audit process is to **provide assurance** over internal controls.*
- *The process ensures the **adequacy** of the process design, that is, that the controls work as intended (**effectiveness**)” – de Lange (2016)*
- Other benefits
 - Where weaknesses are identified, **recommendations** can be made on how to improve the controls
 - More systematic issues can be identified over time, and **corrective actions** developed





Peer Review

Purpose

- Companies require
 - Internal confirmation that work has been done correctly by the study team
 - independent peer review of study work carried out by other teams (owner's team, consultants)
- Gap analysis / improvement opportunities

Methodology

- Generally conducted by “technical peers” who are knowledgeable / experienced in the process, but independent of the actual process or project
- Reviewers can be from within the Company or external
- Ideally carried out concurrently with the process, or at key stages of decision-making



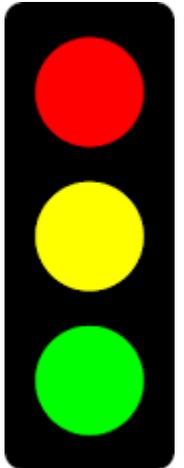
Audit vs Peer Review

An Audit

- Provides rated findings (e.g. High, Medium, Low), and has in particular an overall final rating (e.g. “satisfactory”, “poor”)
 - Technically assess the processes that underpin Resource and Reserve estimates
 - Not to verify the Resource and Reserve numbers in detail
 - Identify opportunities for future improvement

A Peer Review

- May rate the findings, but does not typically provide an overall outcome
 - Technically assess the processes that underpin Resource and Reserve estimates
 - Verify numbers where required
 - Identify gaps / improvement opportunities for concurrent improvement





The Peer Review and Audit Process



Why have a Peer Review and Audit process

*The overall objective of Peer Review and Audit is to provide effective risk management and control to provide the Board and Senior Management with a level of **assurance** that the reported Exploration Results, Resources and Reserves are accurate and reliable*

The process:

- Recognises the fundamental importance of Resources and Reserves
- Requires complete, accurate information to meet internal standards and public disclosure obligations
- Helps define competencies, accountabilities and responsibilities

A risk management process

The Institute of Internal Auditors (IIA) provides an outline of an effective risk management and control process known as “*The Three Lines of Defence*” model (IIA, 2013), where:

1. **Management control** is the first line of defence
2. The various risk controls and compliance **oversight functions** established by management are the second line of defence
3. **Independent assurance** is the third line of defence

A risk management process for R&R

First Line of Defence:

- **Peer review of technical work** at specific stages of the various estimate generation and reporting stages (i.e. concurrently)
- By suitable qualified / experienced peers (internal or external reviewers)

Second Line of Defence:

- **Oversight and selectively applied peer reviews** of the technical processes and **compliance** to procedures, standards and the operation of the **controls** in place at specific stages of the estimate generation and reporting
- By suitable qualified and experienced peers, typically technical peers or indirect supervisors **at least one reporting line removed** from those performing the original work
- The outcomes are reported through to **technical management**

A risk management process for R&R

Third Line of Defence:

- **Independent reviews / audits**
- Generally managed by and reported through the company's **internal audit** group rather than through the technical management group (whose work is the subject of the review or audit)
- The reviewers are typically **independent and external** to the company
- The outcomes are reported through to the technical management, the **senior management and the board** (often through a board-appointed technical or audit committee)

Example: Rio Tinto's three levels of R&R governance

1. The primary governance is through the Ore Reserve Steering Committee (ORSC)
 - Meets at least quarterly to discuss resource and reserve matters, provides sponsorship of Competent Person training and development, maintains and monitors Resource, Reserve and Reconciliation standards
2. The Rio Tinto Executive Committee (EXCO)
 - The ORSC reports to the EXCO independently of the various product group lines
3. The Board Audit Committee (BAC)
 - Annual reviews of R&R at a group level, review of findings from a group-wide R&R audit program, administered and managed independently of the ORSC by Rio Tinto's internal Audit and Assurance function

Who makes a good Reviewer / Auditor?

- Specialists conforming to applicable codes
- Knowledgeable about specific and broad technical aspects
- Knows when they are out of their depth and require further specialist knowledge
- Can fit in at all reporting levels, from site to boardroom
- Bring teams together – “lead auditor”

Who should be on a review team?

- Good communicator
- Interpersonal be able to get information
- Independent...discloses all liabilities
- Credibility
- Member of professional organisation (AIG, AusIMM)
- May be external



Discussion

- Why is peer review / technical audit not consistently applied across the industry?
 - Some people are nervous or suspicious about having their work reviewed / audited, or believe it is a sign of weakness to be subjected to peer review

*“Mineral Resource and Ore Reserve estimation processes are **surprisingly underrepresented** in resource companies’ assurance systems given that these are the material assets of the companies”*

*“Stakeholders are also increasingly **more interested in non-financial areas** of entities, as the future success of an entity is more than a set of financial metrics” (de Lange, 2016)*

Discussion

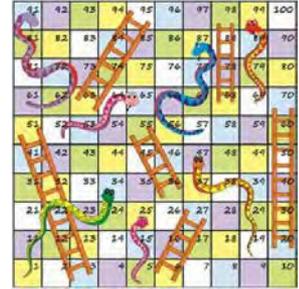
- Peer reviews and audits contribute to:
 - Governance
 - Technical improvement opportunities
 - Mentoring and professional development guidance to those whose work is being reviewed
- Technical review / audit is particularly crucial at this time in the industry when:
 - Companies are running lean teams, or perhaps inexperienced teams, with limited technical or management oversight
 - Mining companies are suffering investor “crisis of confidence” in their ability to achieve stated objectives
 - Investors are increasingly risk adverse
 - Regulators are taking a closer look at industries “self regulation” model



Conclusion

Reviews and Audits

- Provide increasing levels of independent and objective assurance
- Lead to systematic and disciplined processes of evaluating and improving the effectiveness of the Exploration Results (data), Resource and Reserve risk management and governance processes
- Provide management and the board with assurance that the Exploration Results, Resources and Reserves are accurate and reliable
- Responsible management of a resource project through its full lifecycle relies on
 - competent and dependable controls and direction
 - effectively provided by the senior management and board leadership of the organisation



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