Resource/Reserve Reporting in the Minerals Sector

UN-ECE WORKSHOP
ALMATY
December 10th 2009

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PRESENTATION OUTLINE

• Background

• Players – Who’s Who

• CRIRSCO – JORC, PERC, SAMREC, CIM (NI 43-101)

• CRIRSCO TEMPLATE
  • Reporting of Mineral Exploration Targets and Results
  • Mineral Resources and Mineral Reserves
  • Current Reporting Practice

• The Competent Person – Role and Responsibility

• International Reporting Practice

• Common Problems – Examples from the ASX
BACKGROUND
WHY WE NEED STANDARDS

Resource + Feasibility = $
PLAYERS
CRIRSCo FAMILY OF CODES

FIRST EDITIONS


INTERNATIONAL DEVELOPMENTS


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CRIRSCO’s AIMS

• International consensus on Mineral Resource and Mineral Reserve definitions
• Consistent and **high quality reporting** of Mineral Resources and Mineral Reserves
• International convergence of systems through peer review and mapping
• Users of CRIRSCO style standards include
  – Governments
  – Stock Exchange Regulators
  – Financial Institutions
  – Mining Companies
  – Shareholders
JORC

Responsibility Organizations

Professional & Industry Organizations

Statutory/Semi-Government Organizations

Regulatory Organizations

Responsible
Entities

Aus IMM
AIG
MCA
ROPO
JORC

Compliance &
Guidance
Standards

JORC Code
Competent Person

Incorporated as
Appendix

Listing Rules

Professionals

Publicly listed
companies

Relationship
Key
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CRIRSCO STYLE CODES

- Transparency: Clear unambiguous presentation
- Materiality: All reasonable information expected
- Impartiality
- Competence
- Classification
- Definitions and Guidelines
WHAT CRIRSCO DOES

- Sets **minimum standards for public reporting** of Exploration Results, Mineral Resources and Mineral Reserves
- Provides a **mandatory system for classification** of tonnage/grade estimates according to geological confidence and technical/economic considerations
- Provides **definitions** for mineral resource and ore reserve classes that are compatible with international agreements
- Requires Public Reports to be based on work undertaken by a **Competent Person**; describes the qualifications and type of experience required to be a Competent Person
- Provides extensive **guidelines** on the criteria to be considered when preparing reports on Exploration Results, Mineral Resources and Mineral Reserves
WHAT CRIRSCO DOES NOT DO

- Regulate the procedures used by Competent Persons to estimate and classify Mineral Resources and Ore Reserves (methodology)
- Regulate companies’ internal classification or reporting systems
- Deal with breaches of the Code by companies (This is a function for the Stock Exchanges)
- Deal with breaches by individuals, these are dealt with under code of ethics of the relevant professional association
THE EXPLORATION PROCESS

Concept

DATA ACQUISITION, VALIDATION, COMPILATION AND INTERPRETATION

Budget

RESOURCE ESTIMATOR  ORDER OF MAGNITUDE  PRE-FEASIBILITY  FEASIBILITY
RELATIONSHIP BETWEEN EXPLORATION RESULTS, MINERAL RESOURCES & MINERAL RESERVES

Exploration Results

MINERAL RESOURCES MINERAL RESERVES

Inferred

Indicated → Probable

Measured ← Proved

Increasing level of geological knowledge and confidence

Consideration of mining, metallurgical, economic, marketing, legal, environmental, social and governmental factors (the “Modifying Factors”).

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REPORTING EXPLORATION RESULTS
• Exploration Results include data and information generated by exploration programmes that may be of use to investors but which may not be part of a formal declaration of Mineral Resources or Mineral Reserves.

CAUTIONARY STATEMENT

• “It is inappropriate to use such information for deriving estimates of tonnage and grade".
Report of Exploration Results must include information on sampling of the mineralisation such as drilling and sampling density, drilling and sampling methodology, sample and assay quality, true width etc. etc.
REPORTING MINERAL RESOURCES
REPORTING CONTAINED METAL

- Reporting of contained metal is not allowed without also reporting Mineral Resource or Ore Reserve tonnages and grades.
- It is relevant to the potential investor to know whether a quoted quantity of contained metal is the product of a large tonnage of low grade material or of a small tonnage of high grade material.
- Quoting contained metal without also quoting grades can, particularly for Mineral Resources, result in a potential investor inferring a value for the deposit which is totally at variance with its true realisable value.
 RESOURCE-RESERVE CATEGORISATION

- The Code does not allow statements in public reports which provide only total figures for Mineral Resources or Mineral Reserves.

- Mineral Resource estimates must be allocated to the defined categories of Measured, Indicated and Inferred.

- Mineral Reserve estimates must be allocated to the defined categories of Proved and Probable.
MINERAL RESOURCE

• A ‘Mineral Resource’ is a concentration or occurrence of material of economic interest in or on the Earth’s crust in such form, quality and quantity that there are reasonable prospects for eventual economic extraction. The location, quantity, grade, continuity and other geological characteristics of a Mineral Resource are known, estimated or interpreted from specific geological evidence, sampling and knowledge.
GUIDANCE

• Portions of a mineral deposit that do not have reasonable prospects for eventual economic extraction must not be included in a Mineral Resource;

• The term ‘reasonable prospects for eventual economic extraction’ implies a judgement by the Competent Person in respect of the technical and economic factors likely to influence the prospect of economic extraction, including the approximate mining parameters.

• Any material assumptions made in determining the ‘reasonable prospects for eventual economic extraction’ should be clearly stated in the Public Report.
INFERRED RESOURCE

• An ‘Inferred Mineral Resource’ is that part of a Mineral Resource for which tonnage, grade and mineral content can be estimated with a low level of confidence. It is inferred from geological evidence, sampling and assumed but not verified geological and/or grade continuity. It is based on information gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes which is limited or of uncertain quality and reliability.
INFERRED MINERAL RESOURCE

- Reasons for low confidence may include:
  - Inadequate **geological knowledge**
  - Limited **sampling data**
  - Data of uncertain or poor **quality**
  - Uncertain geological and/or grade **continuity**
- "Low" in this context means usually **not sufficient to allow the application of technical and economic parameters to be used for detailed planning**
- No direct link between Inferred Resources and Mineral Reserves
INDICATED MINERAL RESOURCE

• An ‘Indicated Mineral Resource’ is that part of a Mineral Resource for which tonnage, densities, shape, physical characteristics, grade and mineral content can be estimated with a reasonable level of confidence. It is based on exploration, sampling and testing information gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes. The locations are too widely or inappropriately spaced to confirm geological and/or grade continuity but are spaced closely enough for continuity to be assumed.
GUIDANCE

• An Indicated Mineral Resource has a lower level of confidence than that applying to a Measured Mineral Resource, but has a higher level of confidence than that applying to an Inferred Mineral Resource.

• Mineralisation may be classified as an Indicated Mineral Resource when the nature, quality, amount and distribution of data are such as to allow confident interpretation of the geological framework and to assume continuity of mineralisation.

• Confidence in the estimate is sufficient to allow the application of technical and economic parameters, and to enable an evaluation of economic viability.
MEASURED MINERAL RESOURCE

• A ‘Measured Mineral Resource’ is that part of a Mineral Resource for which tonnage, densities, shape, physical characteristics, grade and mineral content can be estimated with a high level of confidence. It is based on detailed and reliable exploration, sampling and testing information gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes. The locations are spaced closely enough to confirm geological and grade continuity.
GUIDANCE

- Mineralisation may be classified as a Measured Mineral Resource when the nature, quality, amount and distribution of data are such as to leave no reasonable doubt, in the opinion of the Competent Person determining the Mineral Resource, that the tonnage and grade of the mineralisation can be estimated to within close limits, and that any variation from the estimate would be unlikely to significantly affect potential economic viability.

- This category requires a high level of confidence in, and understanding of, the geology and the controls of the mineral deposit.

- Confidence in the estimate is sufficient to allow the application of technical and economic parameters and to enable an evaluation of economic viability with a high level of confidence.
FACTORS AFFECTING ESTIMATES

- Reliability of geological interpretation
- Amount, distribution and quality of resource data
- In “nuggety” deposits, treatment of very high grades
- **Assumptions** regarding mining and treatment methods
- Assumptions regarding commodity **prices** and exchange rates
- Experience and judgment of Competent Person
Reports of Mineral Resources and/or Mineral Reserves must make mention of any assessment criteria for which inadequate or poor quality data materially affects estimation or classification of the resource or reserve.
REPORTING MINERAL RESERVES
Where Mineral Resources and Mineral Reserves are both being reported, it must be made clear whether the Mineral Resources are inclusive of, or additional to the Mineral Reserves.

Mineral Resources and Mineral Reserves should not be added together.

Large differences between tonnages of Mineral Resources and Mineral Reserves may be an indication that not all of the Resources meet the requirement of “reasonable prospects for eventual economic extraction”.

MINERAL RESERVES

• A ‘Mineral Reserve’ is the economically mineable part of a Measured and/or Indicated Mineral Resource. It includes diluting materials and allowances for losses, which may occur when the material is mined. Appropriate assessments and studies have been carried out, and include consideration of and modification by realistically assumed mining, metallurgical, economic, marketing, legal, environmental, social and governmental factors. These assessments demonstrate at the time of reporting that extraction could reasonably be justified.
CONVERSION CRITERIA

- Level of technical/economic study expected to have been carried out to convert Mineral Resources to Ore Reserves – achievable mine plan;

- The term ‘economically mineable’ implies that extraction of the Mineral Reserve has been demonstrated to be viable under reasonable financial assumptions.

- It is expected that studies to at least a Pre-Feasibility level will have been carried out prior to determination of the Mineral Reserves
CONVERSION

Exploration Results

MINERAL RESOURCES | MINERAL RESERVES

Inferred

Indicated ↔ Probable

Measured ↔ Proved

Increasing level of geological knowledge and confidence

Consideration of mining, metallurgical, economic, marketing, legal, environmental, social and governmental factors (the “Modifying Factors”).
A ‘Probable Mineral Reserve’ is the economically mineable part of an Indicated, and in some circumstances, a Measured Mineral Resource. It includes diluting materials and allowances for losses which may occur when the material is mined. Studies to at least Pre-Feasibility level will have been carried out, including consideration of and modification by realistically assumed mining, metallurgical, economic, marketing, legal, environmental, social and governmental factors. The results of the studies demonstrate at the time of reporting that extraction could reasonably be justified.
PROVED MINERAL RESERVE

- A ‘Proved Mineral Reserve’ is the economically mineable part of a Measured Mineral Resource. It includes diluting materials and allowances for losses, which may occur when the material is mined. Studies to at least Pre-Feasibility level will have been carried out, including consideration of, and modification by, realistically assumed mining, metallurgical, economic, marketing, legal, environmental, social and governmental factors. These studies demonstrate at the time of reporting that extraction is justified.
RESOURCE ESTIMATION

• Geological Contacts
  • Lithological: Formation, Textural, Alteration, Metamorphic
  • Structural: Post- or Pre-mineral
• Geometallurgical Contacts: Density, Mineralogy, Metallurgy
• Grade Cut-off Contacts: Grade Continuity and Distribution

Geological Model: Continuity, Mineralogy, Grade

Mining Method

Processing Method
MODIFYING FACTORS

- Geology
- Mining
- Processing
- Environmental Impact
- Skills Required
- Etc

Geological Model: Continuity, Mineralogy, Grade
MODIFYING FACTORS

Geological Model: Continuity, Mineralogy, Grade

Mining
Method, Dilution, Output

Geology

Processing
Method, Recovery

Waste Disposal

EXTERNAL ISSUES
ECONOMIC ASSUMPTIONS

- Commodity prices
  - Commonly forward-looking estimates reflecting management’s reasonable and supportable short and long term expectations
  - For commodities sold under existing contracts, prices may be based on contract terms
  - In the USA, SEC currently requires that commodity prices for Ore Reserves be based on the average prices prevailing in the last three years; the mining industry is currently in debate with SEC

- Exchange rates
NON-TECHNICAL AND ECONOMIC MODIFYING FACTORS

- Marketing, e.g. restricted market, need to develop a market
- Legal, e.g. tenement status, critical agreements
- Environmental, e.g. environmental impact statements, national parks
- Social, e.g. impact on local community
- Governmental, e.g. national ownership requirements, royalties
HISTORICAL OR OVERSEAS RESOURCES

- Different attitude in different jurisdictions
- ASX – Special permission required
- Canada, South Africa – Publish, explain differences with National Code, and outline work program to render compliant with National Code.
THE COMPETENT PERSON
PERC CODE
THE COMPETENT PERSON

Rules of Conduct and Guidelines

• Duty To:

  – The Public and Society;
  – The Profession, Employers and Clients;
  – Professional Bodies, Colleagues and Associates;
  – The Environment, Health and Safety
THE COMPETENT PERSON

- CRIRSCO-style standards require publicly reported reserve and resource information to be based on work undertaken by a Competent Person
- The Competent Person is named in the public report
- It is the Competent Person’s responsibility to ensure that the estimates have been performed properly
- The Competent Person may be either an employee or a consultant
WHO IS A COMPETENT PERSON

- A Competent Person must have at least five years relevant experience.
- A Competent Person must be a member of a professional society that:
  - requires compliance with professional and ethical standards.
  - has disciplinary powers, including the power to discipline or expel a member.
- Because the Competent Person’s experience is in relation to the deposit style and situation under consideration, most countries do not attempt to maintain registers of Competent Persons.
WHAT MUST A COMPETENT PERSON DO

• Take responsibility for Disclosure;
• Familiar with property;
• No disclaimer;
• Certificate of consent in prescribed format;
• Report must be signed and dated.
LIABILITY

• Action by the securities regulators
• Action in civil court - Civil Liability
• Action by the professional association
ROPO’S

- Established to facilitate *international reciprocity* of Competent Persons and thereby promote high quality reporting across national boundaries

- ROPO like-systems also implemented by:
  - Australian Stock Exchange
  - Canadian Securities Administrators
  - Johannesburg Stock Exchange
  - LSE and AIM

- ROPO’s must require compliance with professional and ethical standards and have disciplinary powers, including the power to discipline or expel a member
## CODE CONVERGENCE

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<thead>
<tr>
<th>Adoption of CRIRSCO-type Standard</th>
<th>Australia</th>
<th>Canada</th>
<th>South Africa</th>
<th>UK/W Europe</th>
<th>Chile</th>
<th>USA - SME</th>
<th>USA - SEC</th>
<th>UNFC</th>
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<th>Level of study required for Mineral Reserves</th>
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1. Appropriate assessments and studies determined by the Competent Person
2. Pre-feasibility study - Expected (UK/W Europe); Required (Canada/Chile)
3. Feasibility Study for new projects

3** Feasibility Study for Proved Reserves; Pre-feasibility Study for Probable Reserves

| ROPO | Recognised Overseas Professional Organisation | Allowed under certain restricted circumstances |
COMMON PROBLEMS
ASX COMPLIANCE
October 2008 – March 2009

• 5,200 announcements checked.

• 333 instances of non-compliance (246 companies):
  – 176: Deficient or Missing Competent Person Statement;
  – 80: Combined or unspecified categories of Resources;
  – 41: Exploration target statement reported incorrectly;
  – 12: Insufficient information on Results;
  – 11: Combined or unspecified categories of Reserves;
  – 5: Use of in-ground values or sufficient information to explain equivalent calculations;
  – 5: Reporting of Historic/Foreign estimates;
  – 3: Miscellaneous
FOR FURTHER INFORMATION

- CRIRSCO  
  www.crirsco.com

- JORC (Australasia)  
  www.jorc.org

- PERC (UK)  
  www.percreserves.com

- CIM (Canada)  
  www.cim.org

- SAMREC (South Africa)  
  www.samcode.co.za

- SME (USA)  
  www.smenet.org

- SEC (USA)  
  www.sec.gov

- Chile  
  www.minmineria.cl