

# **CIM DEFINITION STANDARDS**

On Mineral Resources and Mineral Reserves

*Prepared by the CIM Standing Committee on Reserve Definitions*

*Adopted by CIM Council, November 14, 2004*

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## **FOREWORD**

CIM Council, on August 20, 2000, approved the “CIM Standards on Mineral Resources and Reserves – Definitions and Guidelines,” developed by the CIM Standing Committee on Reserve Definitions. The CIM Definition Standards on Mineral Resources and Reserves (CIM Definition Standards) establish definitions and guidelines for the reporting of exploration information, mineral resources and mineral reserves in Canada. The Mineral Resource and Mineral Reserve definitions are incorporated, by reference, in National Instrument 43-101 – Standards of Disclosure for Mineral Projects, which became effective February 1, 2001. The CIM Definition Standards can be viewed on the CIM web site at [www.cim.org](http://www.cim.org).

A new CIM Standing Committee on Reserve Definitions was established consisting of the following: John Postle, Bernie Haystead, Larry Cochrane, Normand Champigny, Mike Hoffman, Colin McKenny, Jack Mullins, Phil Olson, Fred Payne, Jody Todd and Joe Ringwald.

Subsequent to the publishing of the August 20, 2000 CIM Standards on Mineral Resources and Reserves, various CIM committees have compiled and published more extensive documentation on mining industry standard practices for compiling Exploration Information and estimating Mineral Resources and Mineral Reserves. These standard practices provide more detailed guidance than that contained in the August 20, 2000 CIM Standards on Mineral Resources and Reserves. This document updates the CIM Definition Standards to reflect the more detailed guidance available and provides certain editorial changes that are required to maintain consistency with current regulations. It is important to note that there has been no change to the Mineral Resource and Mineral Reserve definitions contained in the original August 20, 2000 document developed by the CIM Standing Committee on Mineral Resources and Reserves.

Readers should be aware that National Instrument 43-101 governs and establishes standards for all public disclosure that an issuer makes of scientific and technical information concerning mineral projects.

## **CIM DEFINITION STANDARDS**

The CIM Definition Standards presented herein provide standards for the classification of Mineral Resource and Mineral Reserve estimates into various categories. The category to which a resource or reserve estimate is assigned depends on the level of confidence in the geological information available on the mineral deposit; the quality and quantity of data available on the deposit; the level of detail of the technical and economic information which has been generated about the deposit, and the interpretation of the data and information. In the document the definitions are in bold type and the guidance is in italics.

## DEFINITIONS

Throughout the CIM Definition Standards, where appropriate, ‘quality’ may be substituted for ‘grade’ and ‘volume’ may be substituted for ‘tonnage’. Reports (including Technical Reports, as defined in National Instrument 43-101, for public disclosure) dealing with estimates of Mineral Resources and Mineral Reserves must use only the terms and definitions contained herein.

### Qualified Person

Technical Reports on Mineral Resources and Mineral Reserves must be prepared by or under the supervision of, and dated and signed by, a Qualified Person.

**A “Qualified Person” means an individual who is an engineer or geoscientist with at least five years of experience in mineral exploration, mine development or operation or mineral project assessment, or any combination of these; has experience relevant to the subject matter of the mineral project and the Technical Report; and is a member or licensee in good standing of a professional association.**

*The Qualified Person(s) should be clearly satisfied that they could face their peers and demonstrate competence and relevant experience in the commodity, type of deposit and situation under consideration. If doubt exists, the person must either seek or obtain opinions from other colleagues or demonstrate that he or she has obtained assistance from experts in areas where he or she lacked the necessary expertise.*

*Determination of what constitutes relevant experience can be a difficult area and common sense has to be exercised. For example, in estimating Mineral Resources for vein gold mineralization, experience in a high-nugget, vein-type mineralization such as tin, uranium etc. may be relevant whereas experience in massive base metal deposits may not be. As a second example, for a person to qualify as a Qualified Person in the estimation of Mineral Reserves for alluvial gold deposits, he or she would need to have relevant experience in the evaluation and extraction of such deposits. Experience with placer deposits containing minerals other than gold, may not necessarily provide appropriate relevant experience for gold.*

*In addition to experience in the style of mineralization, a Qualified Person preparing or taking responsibility for Mineral Resource estimates must have sufficient experience in the sampling, assaying, or other property testing techniques that are relevant to the deposit under consideration in order to be aware of problems that could affect the reliability of the data. Some appreciation of extraction and processing techniques applicable to that deposit type might also be important.*

*Estimation of Mineral Resources is often a team effort, for example, involving one person or team collecting the data and another person or team preparing the Mineral Resource estimate. Within this team, geologists usually occupy the pivotal role. Estimation of Mineral Reserves is almost always a team effort involving a number of technical disciplines, and within this team*

*mining engineers have an important role. Documentation for a Mineral Resource and Mineral Reserve estimate that will be publicly disclosed must be compiled by, or under the supervision of, a Qualified Person(s), whether a geologist, mining engineer or member of another discipline. It is recommended that, where there is a clear division of responsibilities within a team, each Qualified Person should accept responsibility for his or her particular contribution. For example, one Qualified Person could accept responsibility for the collection of Mineral Resource data, another for the Mineral Reserve estimation process, another for the mining study, and the project leader could accept responsibility for the overall document. It is important that the Qualified Person accepting overall responsibility for a Mineral Resource and/or Mineral Reserve estimate and supporting documentation, which has been prepared in whole or in part by others, is satisfied that the other contributors are Qualified Persons with respect to the work for which they are taking responsibility.*

### **Preliminary Feasibility Study**

The CIM Definition Standards requires the completion of a Preliminary Feasibility Study as the minimum prerequisite for the conversion of Mineral Resources to Mineral Reserves.

**A Preliminary Feasibility Study is a comprehensive study of the viability of a mineral project that has advanced to a stage where the mining method, in the case of underground mining, or the pit configuration, in the case of an open pit, has been established, where an effective method of mineral processing has been determined, and includes a financial analysis based on reasonable assumptions of technical, engineering, legal, operating, and economic factors and evaluation of other relevant factors which are sufficient for a Qualified Person, acting reasonably, to determine if all or part of the Mineral Resource may be classified as a Mineral Reserve.**

### **Exploration Information**

**Exploration information means geological, geophysical, geochemical, sampling, drilling, trenching, analytical testing, assaying, mineralogical, metallurgical and other similar information concerning a particular property that is derived from activities undertaken to locate, investigate, define or delineate a mineral prospect or mineral deposit.**

*It is recognised that in the review and compilation of data on a project or property, previous or historical estimates of tonnage and grade, not meeting the minimum requirement for classification as Mineral Resource, may be encountered. If a Qualified Person reports Exploration Information in the form of tonnage and grade, it must be clearly stated that these estimates are conceptual or order of magnitude and that they do not meet the criteria of a Mineral Resource.*

### **Mineral Resource**

*Mineral Resources are sub-divided, in order of increasing geological confidence, into Inferred, Indicated and Measured categories. An Inferred Mineral Resource has a lower level of confidence than that applied to an Indicated Mineral Resource. An Indicated Mineral Resource*

*has a higher level of confidence than an Inferred Mineral Resource but has a lower level of confidence than a Measured Mineral Resource.*

**A Mineral Resource is a concentration or occurrence of natural, solid, inorganic or fossilized organic material in or on the Earth's crust in such form and quantity and of such a grade or quality that it has reasonable prospects for economic extraction. The location, quantity, grade, geological characteristics and continuity of a Mineral Resource are known, estimated or interpreted from specific geological evidence and knowledge.**

*The term Mineral Resource covers mineralization and natural material of intrinsic economic interest which has been identified and estimated through exploration and sampling and within which Mineral Reserves may subsequently be defined by the consideration and application of technical, economic, legal, environmental, socio-economic and governmental factors. The phrase 'reasonable prospects for economic extraction' implies a judgement by the Qualified Person in respect of the technical and economic factors likely to influence the prospect of economic extraction. A Mineral Resource is an inventory of mineralization that under realistically assumed and justifiable technical and economic conditions, might become economically extractable. These assumptions must be presented explicitly in Reports.*

### **Inferred Mineral Resource**

**An 'Inferred Mineral Resource' is that part of a Mineral Resource for which quantity and grade or quality can be estimated on the basis of geological evidence and limited sampling and reasonably assumed, but not verified, geological and grade continuity. The estimate is based on limited information and sampling gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes.**

*Due to the uncertainty which may attach to Inferred Mineral Resources, it cannot be assumed that all or any part of an Inferred Mineral Resource will be upgraded to an Indicated or Measured Mineral Resource as a result of continued exploration. Confidence in the estimate is insufficient to allow the meaningful application of technical and economic parameters or to enable an evaluation of economic viability worthy of public disclosure. Inferred Mineral Resources must be excluded from estimates forming the basis of feasibility or other economic studies.*

### **Indicated Mineral Resource**

**An 'Indicated Mineral Resource' is that part of a Mineral Resource for which quantity, grade or quality, densities, shape and physical characteristics, can be estimated with a level of confidence sufficient to allow the appropriate application of technical and economic parameters, to support mine planning and evaluation of the economic viability of the deposit. The estimate is based on detailed and reliable exploration and testing information gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes that are spaced closely enough for geological and grade continuity to be reasonably assumed.**

*Mineralization may be classified as an Indicated Mineral Resource by the Qualified Person when the nature, quality, quantity and distribution of data are such as to allow confident interpretation of the geological framework and to reasonably assume the continuity of mineralization. The Qualified Person must recognize the importance of the Indicated Mineral Resource category to the advancement of the feasibility of the project. An Indicated Mineral Resource estimate is of sufficient quality to support a Preliminary Feasibility Study which can serve as the basis for major development decisions.*

### **Measured Mineral Resource**

**A ‘Measured Mineral Resource’ is that part of a Mineral Resource for which quantity, grade or quality, densities, shape, and physical characteristics are so well established that they can be estimated with confidence sufficient to allow the appropriate application of technical and economic parameters, to support production planning and evaluation of the economic viability of the deposit. The estimate 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 that are spaced closely enough to confirm both geological and grade continuity.**

*Mineralization or other natural material of economic interest may be classified as a Measured Mineral Resource by the Qualified Person when the nature, quality, quantity and distribution of data are such that the tonnage and grade of the mineralization can be estimated to within close limits and that variation from the estimate would not significantly affect potential economic viability. This category requires a high level of confidence in, and understanding of, the geology and controls of the mineral deposit.*

### **Mineral Reserve**

*Mineral Reserves are sub-divided in order of increasing confidence into Probable Mineral Reserves and Proven Mineral Reserves. A Probable Mineral Reserve has a lower level of confidence than a Proven Mineral Reserve.*

**A Mineral Reserve is the economically mineable part of a Measured or Indicated Mineral Resource demonstrated by at least a Preliminary Feasibility Study. This Study must include adequate information on mining, processing, metallurgical, economic and other relevant factors that demonstrate, at the time of reporting, that economic extraction can be justified. A Mineral Reserve includes diluting materials and allowances for losses that may occur when the material is mined.**

*Mineral Reserves are those parts of Mineral Resources which, after the application of all mining factors, result in an estimated tonnage and grade which, in the opinion of the Qualified Person(s) making the estimates, is the basis of an economically viable project after taking account of all relevant processing, metallurgical, economic, marketing, legal, environment, socio-economic and government factors. Mineral Reserves are inclusive of diluting material that will be mined in conjunction with the Mineral Reserves and delivered to the treatment plant or equivalent facility. The term ‘Mineral Reserve’ need not necessarily signify that extraction*

*facilities are in place or operative or that all governmental approvals have been received. It does signify that there are reasonable expectations of such approvals.*

### **Probable Mineral Reserve**

**A ‘Probable Mineral Reserve’ is the economically mineable part of an Indicated, and in some circumstances a Measured Mineral Resource demonstrated by at least a Preliminary Feasibility Study. This Study must include adequate information on mining, processing, metallurgical, economic, and other relevant factors that demonstrate, at the time of reporting, that economic extraction can be justified.**

### **Proven Mineral Reserve**

**A ‘Proven Mineral Reserve’ is the economically mineable part of a Measured Mineral Resource demonstrated by at least a Preliminary Feasibility Study. This Study must include adequate information on mining, processing, metallurgical, economic, and other relevant factors that demonstrate, at the time of reporting, that economic extraction is justified.**

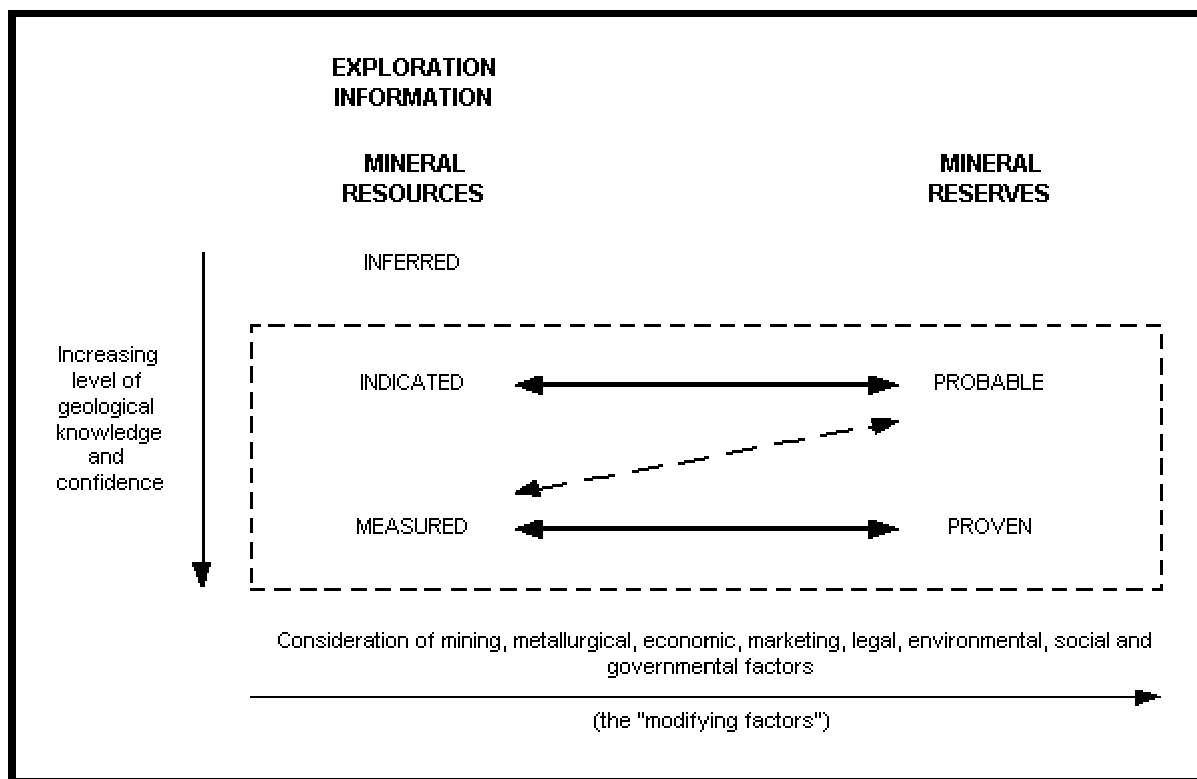
*Application of the Proven Mineral Reserve category implies that the Qualified Person has the highest degree of confidence in the estimate with the consequent expectation in the minds of the readers of the report. The term should be restricted to that part of the deposit where production planning is taking place and for which any variation in the estimate would not significantly affect potential economic viability.*

## **RESOURCE AND RESERVE CLASSIFICATION**

Reports dealing with estimates of Mineral Resources and Mineral Reserves must use only the terms and the definitions contained herein. Figure 1, displays the relationship between the Mineral Resource and Mineral Reserve categories.

The CIM Definition Standards provide for a direct relationship between Indicated Mineral Resources and Probable Mineral Reserves and between Measured Mineral Resources and Proven Mineral Reserves. In other words, the level of geoscientific confidence for Probable Mineral Reserves is the same as that required for the in situ determination of Indicated Mineral Resources and for Proven Mineral Reserves is the same as that required for the in situ determination of Measured Mineral Resources.

Figure 1  
Relationship between Mineral Resources and Mineral Reserves



*Figure 1 sets out the framework for classifying tonnage and grade estimates so as to reflect different levels of geological confidence and different degrees of technical and economic evaluation. Mineral Resources can be estimated by a Qualified Person, with input from persons in other disciplines, as necessary, on the basis of geoscientific information and reasonable assumptions of technical and economic factors likely to influence the prospect of economic extraction. Mineral Reserves, which are a modified sub-set of the Indicated and Measured Mineral Resources (shown within the dashed outline in Figure 1), require consideration of factors affecting profitable extraction, including mining, processing, metallurgical, economic, marketing, legal, environmental, socio-economic and governmental factors, and should be estimated with input from a range of disciplines. Additional test work, e.g. metallurgy, mining, environmental is required to reclassify a resource as a reserve.*

*In certain situations, Measured Mineral Resources could convert to Probable Mineral Reserves because of uncertainties associated with the modifying factors that are taken into account in the conversion from Mineral Resources to Mineral Reserves. This relationship is shown by the dashed arrow in Figure 1 (although the trend of the dashed arrow includes a vertical component, it does not, in this instance, imply a reduction in the level of geological knowledge or confidence). In such a situation these modifying factors should be fully explained. Under no circumstances can Indicated Resources convert directly to Proven Reserves.*

*In certain situations previously reported Mineral Reserves could revert to Mineral Resources. It is not intended that re-classification from Mineral Reserves to Mineral Resources should be applied as a result of changes expected to be of a short term or temporary nature, or where company management has made a deliberate decision to operate in the short term on a non-economic basis. Examples of such situations might be a commodity price drop expected to be of short duration, mine emergency of a non-permanent nature, transport strike etc.*

## **GUIDANCE FOR REPORTING MINERAL RESOURCE AND MINERAL RESERVE INFORMATION**

Qualified Persons preparing public disclosure of Mineral Resources and Mineral Reserves in Canada must follow the requirements of National Instrument 43-101, which is available on the following websites: [www.osc.gov.ca](http://www.osc.gov.ca); [www.bcsc.bc.ca](http://www.bcsc.bc.ca); [www.albertasecurities.com](http://www.albertasecurities.com) and [www.cvmq.com](http://www.cvmq.com).

The following discussion is included for additional guidance when reporting Mineral Resource and Mineral Reserve estimates.

*Mineral Resource Reports must specify one or more of the categories of 'Inferred', 'Indicated' and 'Measured' and Mineral Reserve Reports must specify one or both of the categories of 'Proven' and 'Probable'. Categories must not be reported in a combined form unless details for the individual categories are also provided. Inferred Mineral Resources cannot be combined with other categories and must always be reported separately. Mineral Resources must never be added to Mineral Reserves and reported as total Resources and Reserves. Mineral Resources and Mineral Reserves must not be reported in terms of contained metal or mineral content unless corresponding tonnages, grades and mining, mineral processing and metallurgical recoveries are also presented.*

*Qualified Persons are encouraged to provide information that is as comprehensive as possible in their Reports of Exploration Information, Mineral Resources and Mineral Reserves. The Mineral Exploration Best Practices Guidelines, the Estimation of Mineral Resource and Mineral Reserve Best Practice Guidelines and the Guidelines for the Reporting of Diamond Exploration Results provide, in a summary form, a list of the main criteria which should be considered when reporting Exploration Information, Mineral Resources and Mineral Reserve estimates. These guidelines are available on the CIM website, [www.cim.org](http://www.cim.org).*

*These Guidelines are not prescriptive and it may not be necessary to comment on each item in the guidelines, the need for comment on each item should be considered. It is essential to discuss any matters that might materially affect the reader's understanding of the estimates being reported. Problems encountered in the collection of data or with the sufficiency of data must be clearly disclosed at all times, particularly when they affect directly the reliability of, or confidence in, a statement of Exploration Information or an estimate of Mineral Resources and*

*Mineral Reserves; for example, poor sample recovery, poor reproducibility of assay or laboratory results, limited information on tonnage factors etc.*

*Mineral Resources and Mineral Reserves must be reported on a site by site basis.*

*Where estimates for both Mineral Resources and Mineral Reserves are reported, for consistency, it is recommended that Mineral Resources be reported exclusive of Mineral Reserves. Notwithstanding, it is recognized that there are legitimate reasons, in some situations, for reporting Mineral Resources inclusive of Mineral Reserves (the Australian approach) and, in other situations, for reporting Mineral Resources additional to Mineral Reserves (the South African and United States approach). When reporting both Mineral Resources and Mineral Reserves, a clarifying statement must be included that clearly indicates whether Mineral Reserves are part of the Mineral Resource or that they have been removed from the Mineral Resource. A single form of reporting should be used in a report. Appropriate forms of clarifying statements may be:*

- *‘The Measured and Indicated Mineral Resources are inclusive of those Mineral Resources modified to produce the Mineral Reserves,’ or*
- *‘The Measured and Indicated Mineral Resources are additional to the Mineral Reserves.’*

*Inferred Mineral Resources are, by definition, always additional to Mineral Reserves.*

## **REPORTING OF COAL RESERVES**

*For consistency in public reporting of coal resources and reserves, it is recommended that all issuers use the Mineral Resource and Mineral Reserve categories set out in the CIM Definition Standards. Qualified Person(s) should be guided by the Estimation of Mineral Resources and Mineral Reserve Best Practices Guidelines for Coal and by GSC Paper 88-21: A Standardized coal Resource/Reserve Reporting System for Canada. It is acceptable to use the GSC Paper 88-21 as a framework for the development and categorization of coal estimates, but the GSC 88-21 categories should be converted to the equivalent CIM Definition categories for public reporting. When using GSC 88-21 as a framework, in the classification of coal by A.S.T.M. ranking, the “Group” designation is preferred over the less descriptive “Class” designation.*

## **REPORTING OF INDUSTRIAL MINERALS**

*When reporting Mineral Resource and Mineral Reserve estimates relating to an industrial mineral site, the Qualified Person(s) should be guided by the Estimation of Mineral Resources and Mineral Reserves Best Practice Guidelines for Industrial Minerals.*

## **REPORTING OF DIAMONDS AND GEMSTONES**

*When reporting diamond Exploration Information and Mineral Resources and Mineral Reserves the Qualified Person is expected to comply with the CIM Guidelines for the Reporting of Diamond Exploration Results and the Estimation of Mineral Resources and Mineral Reserves Best Practice Guidelines.*