Simple Efficient Alternative to NI 43-101 and Other Codes

Does the NI 43-101 or any other code really work?

In a small global mining community, we should have one set of codes or guidelines. The aim will be to eventually propose a new set of guidelines that will be much easier to aid investors/reviewers and the general non-mining public in assessing a mining project and reduce scams.

Mining investors are challenged by the various report ing standards worldwide, making it difficult to compare multiple international projects. Mining companies tend to prepare reports for investors based on the eventual stock exchange for which they want the listing.

There are many resource/reserve codes worldwide that are considered acceptable for economic investments and market related reporting. These codes differ on exact subject; thus, mining investors don't have an interna tional standard against which to benchmark projects.

With today's technology, the world is moving towards a single market and therefore the mining industry should have one set of guidelines similar to the international environmental and social standards for project financing (Equator Principles). Generating specific global guide lines will help investors make prudent investments.

Dissertation

"EVALUATION OF MINING PROJECTS BY GENERATING GUIDELINES (SPECIFICALLY IN THE AREA OF RESOURCES) FOR THE DOCUMENTATION OF THESE PROJECTS AS A GUIDE TO INVESTORS SEEKING PRUDENT OPPORTUNITIES"

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Declaration of authorship

„I declare in lieu of oath, that I wrote this thesis and performed the associated research myself, using only literature cited in this volume."

Preface, Dedication, Acknowledgement

A thesis submitted to the Faculty and the Board of Trustees of the University of Leoben in partial fulfillment of the requirements for the degree of Doctor of Philosophy (Mineral Resource Engineering).

I would like to express sincere 'thank you' to the very many people who made this research a possibility. My thesis advisors Prof. Peter Moser and Dr Tibor Rozgonyi have been very instrumental in leading me through my entire studies and completion of my thesis. Both gentlemen were always readily available to discuss and assist me during this process and I must say a very special thank you for the guidance and patience. Prof Peter Moser and Dr Tibor Rozgonyi are very familiar with my subject area and I was very lucky to obtain valuable information from them for the completion of my thesis.

Additionally, special mention to Dr Roger Newell and Barton G. Stone who have always been there for all levels of support. They both are very familiar with my subject area and have prepared numerous reports and I was lucky to benefit from these gentlemen. Dr Newell also played an important role in moral and emotional support as on many occasions they will email/call to ensure I am working on my thesis. Dr Newell – thank you very much for your continuous support and I really appreciated your push for the completion of my thesis.

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It was indeed a privilege working with everyone on my committee and I really appreciate all the assistance and patience of each member.

Abstract

This research gives a study outline that will eventually provide investors around the world with global guidelines to aid in investment opportunities. It should be noted that this research will be directed only towards the resource aspect of mining projects. Companies tend to follow guidelines deemed specific to the stock exchange for which they intend to list or in which they are currently listed.

This research program will establish global reporting standards on resources for the mining industry. This initiative can be the stepping stone for a new global reporting standard on the evaluation of projects.

Most companies are typically busy running their own operations and getting their projects to move forward, but would love to have global reporting standards but just don't have the time and resources. Many government regulatory bodies have pondered on the idea of having global standards, but with the increase in mining activities worldwide, these bodies don't have the time and personnel to be dedicated to generate global guidelines.

Theoretically this idea would be very helpful to the industry and investors. The limitations would be the geographic location of most major mining projects worldwide and how to implement these guidelines. The recommendation would be to actively lobby mining companies, government official and investors to set up a fund to pay for the implementation progress. This would include traveling to countries, conferences, seminar and universities to advocate these guidelines and how it can impact the industry worldwide.

Finally, this research will produce a new set of guidelines which could be accepted as the global standard. The long term aim is through critical and comparative analysis to generate a global set of guidelines (resources, reserves, environment, economics, etc) for investors and the mining industry.

Zusammenfassung

Die vorliegende Arbeit gibt einen Einblick in Forschungsergebnisse die Investoren weltweit eine allgemeine Hilfestellung für mögliche Investitionen in Rohstoffprojekte geben soll. Die Arbeit behandelt dabei nur die unmittelbaren Aspekte der Ressourcen von Bergbauprojekten. Viele Firmen folgen heutzutage bei der Zusammenstellung von Berichten nur börsenspezifischen Richtlinien, wenn sie planen an die Börse zu gehen oder schon an der Börse sind.

Diese Forschungsarbeit stellt Standards für ein global gültiges Berichtswesen für Ressourcen in der Bergbauindustrie auf. Diese Initiative kann als Beginn für ein weltweit gültiges Berichtswesen für Projektevaluierungen gewertet werden.

Die meisten Firmen sind typischerweise so damit beschäftigt ihre eigenen Betriebe am Laufen zu halten und ihr eigenen Projekte voranzutreiben, dass sie keine Zeit und Ressourcen haben um ein globalgültiges Berichtswesen zu erstellen. Ebenso wären viele Regierungsaufsichtsbehörden sehr interessiert daran globale Standards zu erstellen, jedoch bedeutet die zunehmende Anzahl von Bergbauprojekten weltweit, dass auch sie keine Zeit und Personalressourcen für die Erstellung solcher Standards zur Verfügung stellen können.

Die Idee selbst wäre theoretisch sehr hilfreich für Industrie und Investoren. Limitierend wirken die geographische Lage der meisten großen Bergbauprojekte und die Frage wie diese Richtlinien implementiert würden. Es wird daher empfohlen, dass Bergbaufirmen, Regierungen und Investoren sich dafür einsetzten, dass ein finanzieller Topf geschaffen wird, in den alle einzahlen um den Implementierungsprozess zu ermöglichen. Aus diesem sollten Kosten bezahlt werde, die das Reisen in verschiedene Länder, zu Konferenzen, Seminaren und Universitäten abdecken um die Richtlinien allgemein bekannt zu machen und zu zeigen wie sich diese auf die Industrie auswirken.

Schlussendlich stellt diese Dissertation neue Standards auf, die als globale Standards akzeptiert werden könnten. Das langfristige Ziel ist es durch kritische und vergleichende Analysen globale Standards (Ressourcen, Reserven, Umwelt, Wirtschaftlichkeit usw.) für Investoren und die Bergbauindustrie zu schaffen.

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1 Introduction

1.1 Problem Scope and Discussion

There are many articles that point to a reporting system for resources in the mining industry that is in need of updating to reduce misleading reports and have one (1) set of guidelines for the international community to follow.

> This research proposal gives a study outline that will eventually provide investors around the world with global guidelines to aid in investment opportunities. It should be noted that this research will be directed only towards the resource aspect of mining projects. Companies tend to follow guidelines deemed specific to the stock exchange for which they intend to list or in which they are currently listed. Finally, this research will produce a new set of guidelines which could be accepted as the global standard. The long term aim is through critical and comparative analysis to generate a global set of guidelines (resources, reserves, environment, economics, etc) for investors and the mining industry.

In the famous case of Bre-X Mineral Limited, once though to be sitting on a huge gold deposit at Busang, Indonesia, the company stock soared from a penny stock to approximately Cdn $286 on the Toronto Stock Exchange (TSX) in 1995. This sudden increase in stock price gave the company a market capitalization of over Cdn $5 billion. The first resource estimate was done by Filipino geologist Michael de Guzman who was the project manager at the said time. His initial estimate was 2 million ounces of gold. This estimate rose in 1995 to 30 million ounces; in 1996, 60 million ounces and finally in 1997 to 70 million ounces.

However, after initial due diligence evaluation of the assay results, Busang's crushed core samples from 2.9 m intervals, contained substantially more gold than corresponding 0.1m library core samples. Statistical analysis also verified that there were apparent fraudulent activities involved with the gold assay protocols.

By 1997, it was evident that something suspicious was happening with Bre-X and investors had lost billions of dollars. This project originally had support from prominent persons in the financial and mining sector, including the Toronto Stock Exchange.

As increasing population growth continues the demand for commodities increases worldwide and, more detailed evaluation should be done before making any investment decisions. Over the past 30 years mining has demonstrated that many of the future resources are of lower grade and deeper in the earth's crust. Finding new deposits with high grades is rare and companies have to rely more on developing lower grade deposits worldwide.

Mining investors face the challenge of deciding which company to invest in based on their multiple international projects because of the varying nature of reporting standards worldwide. During the most recent boom in the mining industry (2006 - 2008), companies tended to prepare reports for investors, based on the eventual stock exchange for which they want the listing.

There are a number of resource/reserve codes in use worldwide, primarily developed in countries with highly developed mining industries, including:

- **JORC CODE** – Joint Ore Reserve Committee (Australasia)
- **SAMREC CODE –** South African Mineral Committee (South Africa)
- **REPORTING CODE** - (UK / Western Europe)
- **CIM GUIDELINES (NI43-101)** – Canadian Institute of Mining, Metallurgy and Petroleum (Canada)
- **SME GUIDE** – Society for Mining, Metallurgy and Exploration (USA)
- **CERTIFICATION CODE** – (Chile)

These major codes are considered acceptable worldwide for economic investments and market related reporting. These codes differ on exact subject and therefore mining investors don't have an international standard against which to benchmark projects. With today's globalization of industries, the world is moving

towards a single international market and therefore the mining industry should have one (1) set of guidelines. By generating specific global guidelines, investors will be helped in the process of making prudent investments which should result in a reduction in the number of dishonest or fraudulent resource scams.

CRIRSCO (Committee for Mineral Reserves International Reporting Standards) is the only committee that is currently working towards establishing global guidelines for the mining industry. However, their work is somewhat slightly different from this research as CRIRSCO's focus is primarily on the bigger picture for mining projects and its' related aspects. The research outlined in this thesis will examine in more detail actual existing guidelines.

Taken from CRIRSCO: "*CRIRSCO, which was formed in 1994 under the auspices of the Council of Mining and Metallurgical Institutes (CMMI), is a grouping of representatives of organizations that are responsible for developing mineral reporting codes and guidelines in Australia (JORC), Chile (National Committee), Canada (CIM), South Africa (SAMREC), the USA (SME), UK (National Committee) and Western Europe (IGI and EFG). The combined value of mining companies listed on the stock exchanges of these countries accounts for more than 80% of the listed capital of the world's mining industry.*

The international initiative to standardize market-related reporting definitions for mineral resources and mineral reserves had its start at the 15th CMMI Congress at Sun City, South Africa in 1994. The mineral definitions working group (later called CRIRSCO) was formed after a meeting at that Congress, and was made up of representatives from the countries listed above (except for Chile, which joined later), with the primary objective of developing a set of international standard definitions for the reporting of mineral resources and mineral reserves.

In 1997, the five participants reached agreement (the Denver Accord) for the definitions of the two major categories, Mineral Resources and Mineral Reserves, and their respective sub-categories Measured, Indicated and Inferred Mineral Resources, and Proved and Probable Mineral Reserves.

In 1999, agreement was reached with the United Nations Economic Commission for Europe (UN-ECE), which had, since 1992, been developing an International Framework Classification for Mineral Reserves and Resources (UNFC), to incorporate into the UNFC the CMMI-CRIRSCO resource / reserve definitions for those categories that were common to both systems. This agreement gave true international status to the CMMI-CRIRSCO definitions.

Following these agreements, an updated version of the JORC Code was released in Australia in 1999 (and more recently, in 2005), followed by similar codes and guidelines in South Africa, USA, Canada, UK / Ireland / W Europe, Chile and Peru. The JORC Code (Joint Ore Reserves Committee of the Australasian Institute of Mining and Metallurgy, Australian Institute of Geoscientists, and Minerals Council of Australia) has played a crucial role in initiating the development of standards definitions for these codes and guidelines.

The similarity of the various national reporting codes and guidelines has enabled CRIRSCO to develop an International Minerals Reporting Code Template, which is available on their web site. This template may act as a "core code and guidelines" for any country wishing to adopt its own CRIRSCO-style reporting standard, after including provisions for country-specific requirements, such as those of a legal and investment regulatory nature."[1]

1.2 Dissertation Objective

The fundamental objective of the research is to generate new global resource guidelines that will replace all current guidelines (JORC, NI43-101 etc.) and will aid investors in making prudent decisions.

These new guidelines will accomplish the following:

- Reduce if not eliminate misleading reporting and consequently fraudulent scams
- Create global standards for resources
- Provide an excellent benchmarking tool for projects worldwide
- Reduce the number of third party reviews on resource validation

It should be noted that for this research, only the "resources" aspect of the evaluation process will be considered.

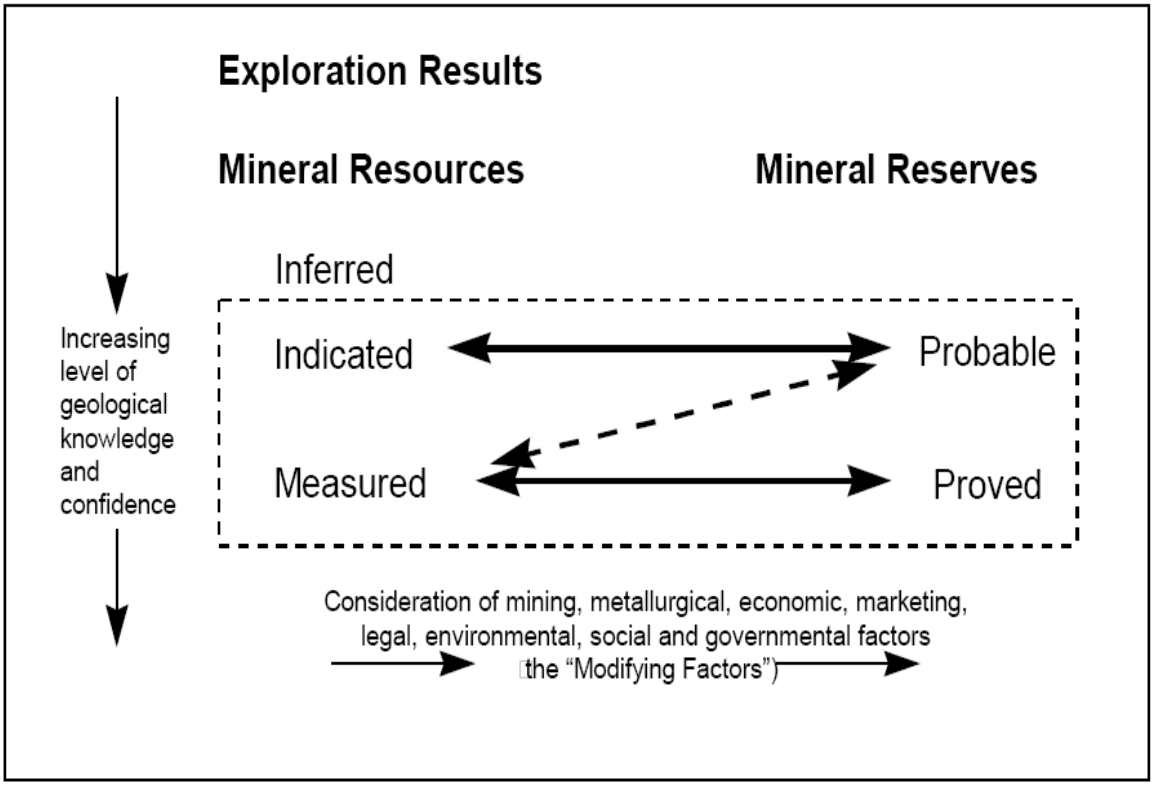


Figure 1 : CRIRSCO's general relationship between resources and reserves

The mining industry is currently (2007-2009) involved in huge mergers and acquisition activities. For example, the proposed BHP and Rio Tinto deal of USD $120 Billion and the Vale (CVRD) and Xstrata deal of USD $90 Billion. These proposed deals show indications that these major companies with properties all over the world would like to have universal standards to evaluate properties in a relatively fast and efficient manner. Resource reporting in Australia and Canada are different and hence it is very difficult to establish a "level playing field" to

analyze properties in these countries. Hence, by establishing global reporting standards, the evaluation process of properties worldwide will become easier.

A second benefit: global standards that are more defined than the current standards will reduce the number of fraudulent mining stock scams. Major companies attempting the acquisition or control of smaller companies with potential, will benefit from more rigid reporting guidelines.

Mineral Reserves are basically the economically viable portion of Measured and Indicated Resources which can be demonstrated by at least a pre-feasibility study. The conversion of resources to reserves must consider parameters on mining, processing, recoveries, geotechnical aspects, economics and all other appropriate factors that can demonstrate at the time of reporting that extraction can be done profitably. Figure 1 shows the relationship to convert resources into reserves and some factors for consideration. Additionally, reserves have to include and cater for mining dilution and mining recoveries.

According to the CIM Definition Standards – For Mineral resources and Mineral Reserves: *"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."[2]

For NI43-101 and JORC, resources are generally quoted with some high level economic parameters that are applied to the pure geological model. The general process is basically, the drillhole database is used to create a geological orebody (wireframe) and then a block model is created which is constraint by the hard boundary wireframe. The block model utilizes geostatistical tools to estimate the grades within each block within the orebody wireframe.

Once the block model is completed, a waste model is created and clipped by topography which will be used in Whittle Software. Whittle software is used to generate nested pits – base on economic, pit slope angles and financial inputs. Whittle would then consider all the parameters and the imported block model to generate economically viable pits. These parameters are high level estimates and normally reduce the block model total contained mineral contents. The reduced mineral content is then stated as mineral resources because it now has some reasonable expectation of viable extraction.

The parameters used to generate mineral resources and other in depth parameters are then estimated with a higher degree of accuracy to generate mineral reserves. Therefore the economic aspects play a higher role in mineral reserves estimation as these numbers will be used to determine the economic viability of the project.

I believe that economics should not be part of the resource estimation process as it should be based strictly off of geology and grades. The reason is that the high level economic parameters generally have no meaningful inputs as it's only a high level estimate. This maybe the reason why the SEC don't comment on mineral

resources. There are no consequences to work on the resources aspects at this time as all codes are based on the Resources/Reserves principle.

1.3 Original Idea and Contribution to the Field of Study

This research thesis will establish global reporting standards on resources for the mining industry. This initiative may act as the stepping stone for a new global reporting standard on the evaluation of projects.

Most mining companies are typically busy running their own operations and getting their own internal projects to move forward. They would love to have global reporting standards but just don't have the time and resources to develop them inhouse. Many government regulatory bodies have pondered on the idea of having global standards, but with the increase in mining activities worldwide and their cyclical nature, governmental bodies don't have the time and personnel to be dedicated to generate global guidelines.

Theoretically, the concept of a global standard would be very helpful to the industry and investors. The question facing industry is related to the limitations created by the geographic location of most major mining projects worldwide, and how to implement these guidelines. This thesis suggests that the approach should be to actively lobby mining companies, government official and investors to set up a fund to pay for the implementation progress. This would include traveling to countries, conferences, seminar and universities to advocate these guidelines and how they can positively impact the industry worldwide.

This research program will establish global reporting standards on resources for the mining industry. This initiative may act as the stepping stone for a new global reporting standard on the evaluation of projects.

To make this research complete, the following input parameters will be critical to the focus of the thesis:

- Cost of production, mining methods and processing
- Environmental liabilities
- Social Cost

The social cost will involve a major study and require extensive data collection. Some consideration will be given the first two (2) bullet points listed above as a starting point for further studies.

Finally, this research can standardize the reporting format worldwide for resources which will be very useful as a benchmarking tool. As the world moves towards a global village, the mining industry should reciprocate and follow.

2 Literature and codes review

RESOURCE DEFINITION

The major worldwide resource codes differ from country to country and by establishing one set of codes the mining community will benefit. The Canadians and Australians are very instrumental in taking their respective codes to a higher level by adding firmer and more rigid reporting standards. In this Chapter, each of the major codes will be explained to identify the similarities and differences in terms of resource definitions as the basis for discussions in the following chapters.

2.1 JORC Code

2.1.1 Background

The Australian Institute of Mining and Metallurgy (AusIMM) in collaboration with Minerals Council of Australia (MCA) in the late 1960s formed the Australian Joint Ore Reserves Committee (JORC). JORC was formed because of the numerous poor resource reporting practices which directly related to the Poseidon nickel boom, one that never really existed in 1960's Western Australia. In those days, the MCA was called the Australian Mining Industry Council and their mandate was to regulate the mining industry and ensure reporting standards were acceptable for public use.

In 1971, JORC was confirmed as a permanent committee and has been in existence since then. From its' inception to 1989, numerous documents were generated for reporting standards on ore reserve classification which eventually became an integral part of the current JORC Code. At that time, the documents were only guidelines. Over time most Australian mining and exploration companies accepted these guidelines. The basis on which the code is fundamentally built is the concept of the "Competent Person" and was noted in the first publication of JORC in 1972.

In 1992, the Australian Institute of Geoscientists (AIG) became JORC's third parent body. The two others are the Australian Stock Exchange (ASX) and the Securities Institute of Australia (SIA).

The first version of the JORC code was released in February 1989 and included mineral resources as a pre-cursor to ore reserves, something which was never included in previous documents. This release had two (2) fundamental applications; the ASX was immediately an integral part of the listing rules and secondly was adopted by AusIMM as an Institute Code.

With these two (2) additions; it became compulsory for publicly traded companies and individuals to comply with the Code. Compliance with these codes resulted in a reduction in reporting scandals for mineral projects in Australia. In 1992, the New Zealand Stock Exchange (NZX) listing rules and AIG (what is AIG?) accepted the code.

The final revised version of the JORC Code was released in December 2004 after publications in 1990, 1992, 1993, 1996 and 1999. Section one (1) of this thesis chapter will focus on the latest version published in December 2004. According to JORC, the code has been accepted worldwide and has been used as a template for other major mining countries like Canada, South Africa, Chile, Peru and USA to follow for their respective reporting formats.

The main purpose for establishing the JORC Code is to provide the public in Australasia with minimum standards for reporting mining resources and reserves. It also serves to guide investors with the primary information that should be included in the report prepared by the company, or individuals.

In addition, JORC noted that a compliant report should achieve the following:

a) Classification of resources and reserves into appropriate categories dependent on the level of confidence
b) An explanation of the competent person's experience and qualifications in the area of study
c) A complete list of the assumptions used in deriving resources and reserves

It is important to note that the JORC Code has no specific rules or guidelines for resource and reserve estimation and classification. The Code leaves that to the Competent Person's judgment in the estimation of resources and reserves, and their respective classification.

The JORC code has support from the stock exchange regulatory body in Australia and tries to avoid overly prescriptive definitions and operational requirements. JORC claims to be committed to communications and revisions of the code.

2.1.2 The JORC Code Summary

The Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves ~ The JORC Code~ 2004 Edition effective December 2004, was prepared by The Joint Ore Reserve Committee of the Australasian Institute of Mining and Metallurgy, Australian Institute of Geoscientists and Minerals Council of Australia (JORC) and called the JORC Code.

The JORC Code placed emphasis on the following principles:

- Transparency
- Materiality
- Competence

Transparency

All public reports must be very clear and precise for comprehension by any audience. Ambiguity is not encouraged and sufficient information must be available for the reader to clearly understand the report without any misleading information.

Materiality

Investors must be able to find all relevant data and information in all listed reports. This data and information must be documented in an accepted manner to allow decision making with respect to exploration and mineral resource reporting.

Competence

Preparation of all public reports for reporting mineral resources and ore reserves should be done by professional members of an organization that abides by an accepted code of ethics. These individuals must be well qualified and experienced in their subject area.

Although the JORC Code is generally used for the minimum standards for any public company, it is recommended that public companies should provide comprehensive information and data about their respective projects. The normal reports are expected to be included in any report, for example: quarterly/annual reports, shareholders documents, environmental statements and documents pertaining to resource and reserve estimates.

In many instances, the Competent Person will prepare reports for their company's internal uses which do not comply with the Code. In these instances, a clear statement should be made which mentions that the report does not comply with the JORC code. Sometimes the Code will not cover all aspects of the projects and therefore it is recommended that an appropriate detail of disclosure should be introduced. The Competent Person, based on his/her judgment will abide by the

Code by providing at least the minimum standard for public reporting and provide enough information for investors to completely understand the report on resource statements.

The JORC Code applies to all solid minerals for public reporting of mineral resources on the Australian and New Zealand stock exchanges. Included in the minerals are metals, coal, industrial minerals, gemstones and diamonds.

2.1.3 The "Competent Person"

All public companies are governed by a Board of Directors whose responsibility is to ensure that all public reports should truly reflect the project and enough information is posted to advise the public without any misleading data. In all public reports, the Competent Person or Persons must state their names and company with which they are employed. The JORC Code places emphasis on the Competent Person and these individuals are held liable for any public misleading reports. The Competent person will be responsible the preparation or oversee the final report. This person must clearly state and report his relevant experience in the field of work that he/she is conducting.

A competent person must have membership in a professional organization that is recognized by the Australian body that governs the reporting of mineral resources. Some of these organizations are:

- The Australian Institute of Mining and Metallurgy
- The Australian Institute of Geoscientists
- Recognized Overseas Professional Organization (ROPO)

In addition, the competent person must possess academic qualification in a relevant area of study, a minimum of five (5) years experience with the commodity and mineralization style, and his/her experience in such area must be applied to

the resource reporting. The risky aspect here is that “relevant” is not well defined and a lot of public reporting has the potential to be misleading.

Although, relevant experience is required – the Code then further states that you can apply your experience in one commodity/mineral to another when it comes to resource estimation. The judgment call of the competent person is totally within the discretion of the individual. The accepted principle is that when called upon, the competent person must be comfortable from a technical perspective and experienced in resource estimation for the particular commodity. If doubts exist, then the competent person must consult other colleagues with relevant experience or decline to accept the competent person designation for that mineral commodity.

2.1.4 Mineral Resource Reporting

According to “The JORC Code” 2004 Edition (Effective December 2004); *A Mineral Resource is a concentration or occurrence of material of intrinsic 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, geological characteristics and continuity of a Mineral Resource are known, estimated or interpreted from specific geological evidence and knowledge. Mineral Resources are sub-divided, in order of increasing confidence, into*

- *Inferred,*
- *Indicated, and*
- *Measured categories.*[1]

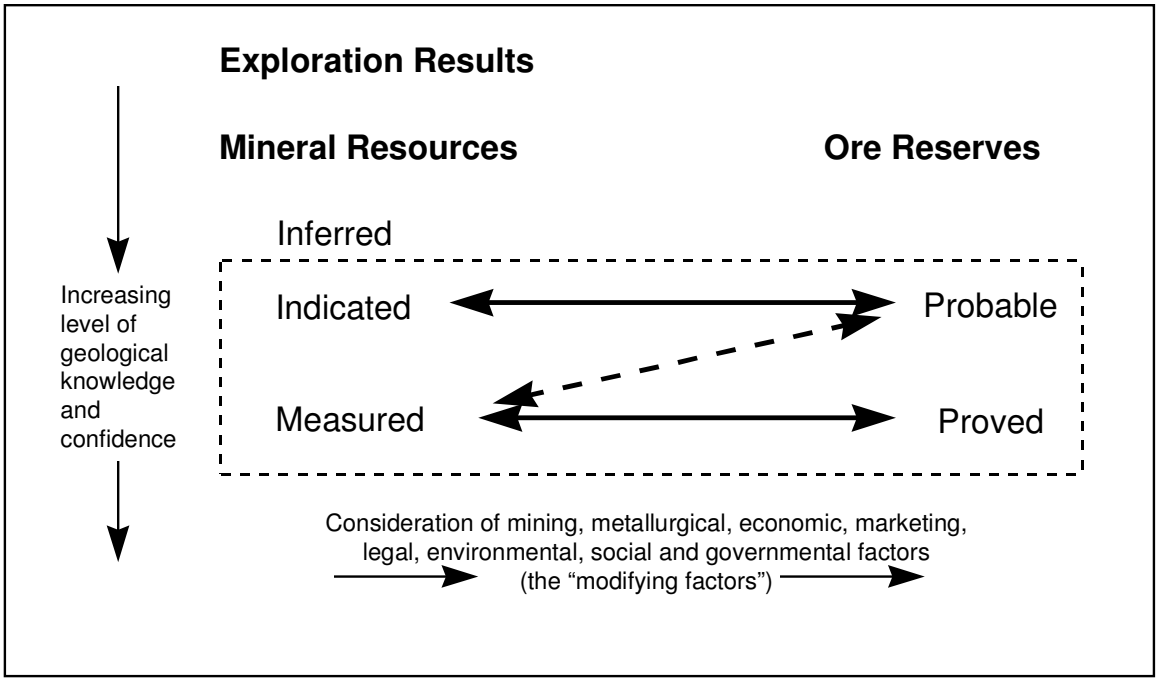


Figure 2 : JORC's general relationship between exploration results, mineral resources and ore reserves [2]

In any given deposit, only the extractable portions should be considered as mineral reserves. However; in some instance where the extractable portions are derived from non conventional techniques, this must be clearly stated in the public document.

The Competent Person dictates what is considered to be reasonable extractable portion based on technical parameters and experience. Therefore, a mineral resource is not a complete area drilled with positive assay results but a realistic volume of mineralized material which may be economically extracted under reasonable technical and economic conditions.

The Competent Person or Persons must determine which category to place the resources within and that should be a function of the confidence of the data as quoted in Figure 2. For example, in determining between Measured and Indicated Mineral Resource, the Competent Person must also consider the parameters used in Figure 2 to define the respective categories. Careful consideration must be

given by the Competent Person or Persons when placing resources into their respective categories.

In some mineral resource estimates, the Competent Person may include resources with values below the cut-off grade to ensure that the mineral resources contain bodies that are of adequate size and continuity to justify the proposed mining method. The public report must clearly identify any material below cut-off that is considered diluted material and of potential economic value.

Some companies will disclose all mineralized material in specific reports, and this material must not be considered as mineral resources under JORC Code.

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 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 may be limited or of uncertain quality and reliability.[3]

Low confidence in the estimation of inferred resources leads to an inability to convert to reserves, which means it cannot be used for mine planning purposes. It is commonly accepted that inferred resources can be upgraded to indicated resources with additional drilling to increase the confidence of the geology and eventual extraction of the material. However, in some cases this is not necessary true because of uncertainties within the deposit. Generally, inferred resources are material that has been identified as having some potential economic interest but inadequate data to interpret the deposit with reasonable confidence.

The JORC code – mentions that caution should be exercised if using inferred resources in economic studies because it implies that such resources could be considered.

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.[4]

Indicated resources have sufficient confidence to be used for economic evaluation after considering economic and technical parameters, because of an understanding of the quality, amount and distribution of data, geology and continuity. Indicated resources are derived from data with more confidence than inferred resources.

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.[5]

There is enough confidence in the measured category to safely apply economic and technical parameters to determine the viability of a project. Measured resources can be used for detailed mine planning because of a high level of confidence in geology and grade. Enough data is obtained in this category from close-spaced drilling that clearly enables the Competent Person to estimate the resources.

It should be very clear that mineral resources are estimated and not calculated. The estimates are derived from data on location, shape, geology and continuity of the deposit and on the sampling results. Accuracy is relatively more consistent with a measured resource as compared to an indicated resource. Inferred resources should always be qualified as an approximation to reflect their greater uncertainties.

The Competent Person or Persons should always document the degree of accuracy and confidence of the estimate. Whenever there is no quantitative mechanism to determine accuracy or confidence, the Competent Person or Persons should document some qualitative supporting facts.

The different categories of mineral resources must always be stated separately and never be aggregated with Ore Reserves. For Public Reporting, only the specific requirements according to the JORC code must be stated and no internal company reporting format is acceptable.

It is required by JORC that the Competent Person must clearly state within the Public Report any matters that will materially affect the public understanding; for example poor sample recovery, assay repeatability, etc.

Mineral Resources are normally converted to Ore Reserves after the application of economic, technical, social, environmental parameters, etc. However, if Ore Reserves are no longer economically viable because of a particular parameter or parameters, then they must be reclassified as Mineral Resources.

2.2 NI 43-101

2.2.1 Background

The National Instrument (NI) NI 43-101reporting format for disclosure of information was formed in Canada after the Bre-X scandal in 1997 to protect the public and investors from fraudulent activities.

The NI 43-101 is a technical report that must be submitted by stock issuers about their mineral projects. The Canadian Institute of Mining, Metallurgy and Petroleum (CIM) in August, 2000 established definitions and guidelines for reporting of exploration results, mineral resources and mineral reserves in Canada. The NI 43-101 – Standards of Disclosure for Mineral Projects became effective in February, 2001 after the Mineral Resource and Mineral Reserve definitions were incorporated.

Shortly after the August, 2000 council meeting, CIM worked on compiling and publishing more detailed procedures for estimating mineral resource and mineral reserve. Finally, in December 2005, the latest version of NI 43-101 became effective after even further modifications to the definitions of August, 2000.

CIM also prepared a guide to “Estimation of Mineral Resource and Mineral Reserve – Best Practices” which was adopted in November, 2003 and incorporated by reference in the NI 43-101. This guide plays a very integral part in resource reporting for the public and should be followed as closely as possible.

2.2.2 Qualified Person

A Qualified Person (QP) must prepare or supervise the estimation process of mineral resources and/or mineral reserves for NI 43-101 reports.

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.[6]

For the NI 43-101 reports, the QP plays a vital role and should always be very comfortable with the subject matter in terms of commodity, type of deposit and unique characteristics. Should there be any concerns; the QP should seek immediate advice from colleagues that have appropriate experience and knowledge in the specific type of deposit.

The tricky aspect for the QP is that relevant experience is not well defined and the QP is required to make the decision to partake in the public reporting of the mineral deposit. An example is found in the estimation of resources for a simple coal deposit; this estimation procedure cannot be fully applied in a complex roll front uranium deposit estimate. Hence, the term relevant experience is a judgment call by the QP and he/she must be professional when making decisions about the type of deposits which they are qualified to estimate or technically report.

The QP must be familiar with NI 43-101 guidelines as listed in Appendix A. For example, the QP must be aware of drilling protocols, assaying, database and all other aspects of resource estimation for the specific commodity that is of interest to the public.

The Qualified Person will base the mineral resource and mineral reserve estimation work on geological premises, interpretation and other technical information as the QP deems appropriate. In addition, the QP will select an estimation method, parameters and criteria appropriate for the deposit under consideration. In planning, implementing and supervising any estimation work, the

QP will ensure that the methods employed and the practices followed can be justified on technical merit and/or are generally accepted in the industry.[7]

2.2.3 Mineral Resource Reporting

According to CIM definitions standards; *A Mineral Resource is a concentration or occurrence of diamonds, natural solid inorganic material, or natural solid fossilized organic material including base and precious metals, and industrial minerals 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.*[8]

Based on the NI 43-101 standards, "mineral resource" encompasses mineralization and all natural material of intrinsic economic interest which is determined from drilling. Following resource determination, a mineral reserve can be defined by applying economic, geotechnical and environmental, etc., factors. The QP has the responsibility of deciding the reasonableness of the prospects for economic extraction, which is definitely a judgment call.

Under the NI 43-101 guidelines, a mineral resource is considered to be the inventory of mineralization that can be economically extracted based on firm technical and economic facts.

Mineral Resources are broken into the following categories;

- Measured
- Indicated
- Inferred

The different categories are a function of level of confidence in the geology, understanding of the deposit type, drilling and continuity; whereby "measured resource" has the greatest confidence while "inferred resource" has the least.

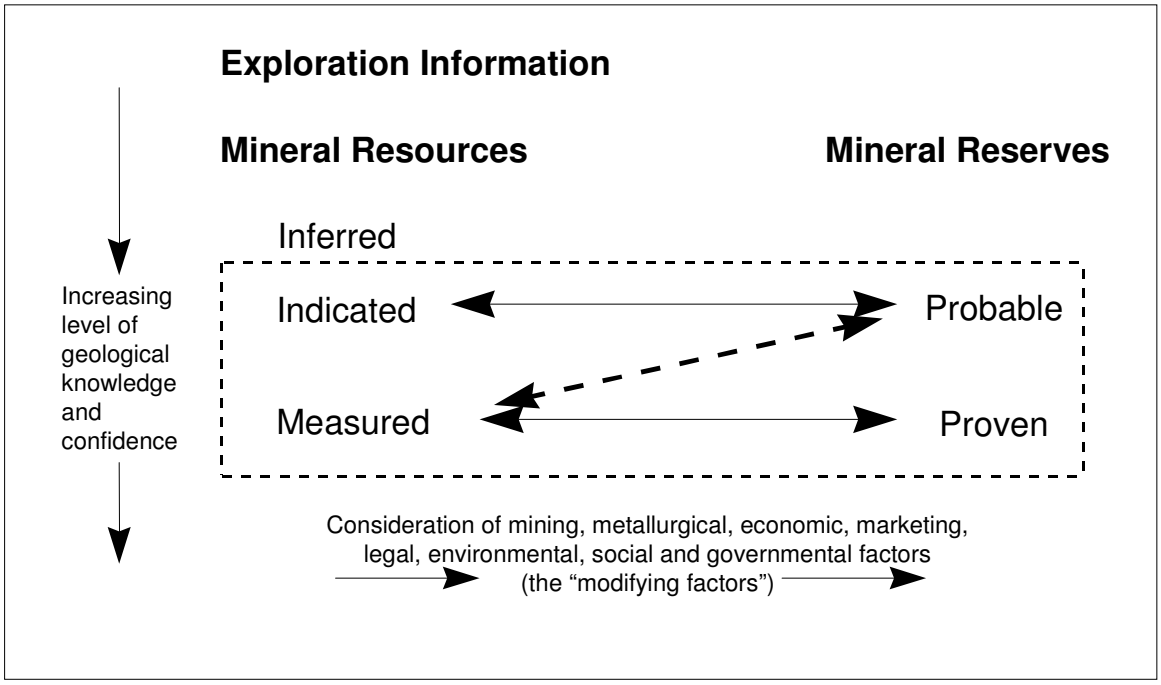


Figure 3 : Relationship between Mineral Resources and Mineral Reserves[9]

The direct relationship between mineral resources and mineral reserves are depicted in Figure 3 which clearly shows that measured mineral resource has the highest level of confidence and geological understanding.

Measured and Indicated Mineral Resources can be converted in Mineral Reserves with adequate information about the economics and other parameters. In some instances, because of uncertainties in conversion of resources into reserves, measured mineral resources could be converted to probable mineral reserves. Figure 3 shows this conversion as a broken arrow which implies a lower level of geological understanding and/or confidence.

Mineral Reserves can be reclassified into Mineral Resources if there are situation that warrants same. For example, if commodity price drops, then the complete economics of the project will be affected and mineral reserves can be reclassified into mineral resources.

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.[10]

Due to the lack of geological understanding and low confidence of inferred mineral resource, this category of resources should not be used to evaluate projects for the economic aspects. Additionally it cannot be assumed that all inferred mineral resource can be converted into indicated and/or measured resources with additionally drilling and sampling because of uncertainties in terms of geological understanding.

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.[11]

The QP must identify the significance of Indicated Mineral Resource because this category can be converted into mineral reserve which is the basis for pre feasibility study and feasibility study. The nature of the deposit, geological interpretation and continuity of mineralization has greater confidence than inferred mineral resource and can be used for major development decisions.

A "Measured Mineral Resource" is that part if 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 economic viability of the deposit. The estimate is based on the 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.[12]

This category has the highest level of confidence and understanding of geology and will be used for conversion to mineral reserves. Measured Mineral Resources are generated from closely spaced drill holes which indicate higher degree of certainty of the estimate.

Generally, reports must consist of one or more of the mineral resource categories and mineral reserves must specify one or both within this category. As a general rule of thumb, avoid combining categories and should there be a combined category then, detail explaining should be provided. Inferred mineral resource should always be reported separately from measured and indicated mineral resource.

The QP is encouraged to detail all aspects of the NI43-101 as per the guidelines. Additionally any material changing effect on the Ni 43-101 results should be clearly explained by the QP so that the public can comprehend. When reporting resources after the estimation procedures, then any unconventional instances should be addressed and documented. For example, if there were contamination in assaying or poor repeatability of densities.

On completion of Mineral Resource and Mineral Reserve estimates, it is recommended that resources be reported exclusive of reserves. The JORC approach is to report resources inclusive of reserves while the South African and USA report resources that are additional to reserves. However, for NI 43-101 purposes, the QP has the option to decide whether to state reserve as a part of

resource or have the reserve not included in the resource. The QP should be consistent in a single report when stating resources and reserves.

According to the NI 43-101 Rules and Policies; *Mineral Resource – In this Instrument, the terms "mineral resource", "inferred mineral resource", "indicated mineral resource" and "measured mineral resource" have the meanings ascribed to those terms by the Canadian Institute of Mining, Metallurgy and Petroleum, as the CIM Definition Standards on Mineral Resources and Mineral Reserves adopted by CIM Council, as those definitions may be amended.*[13]

2.3 The SAMREC Code

2.3.1 Background

The South African Code for reporting mineral resources and mineral reserves (SAMREC Code) is merely the minimum standards for reporting exploration results, mineral resources and mineral reserves to the public. The SAMREC Code was generated under the supervision of South African Institute of Mining and Metallurgy (SAIMM). SAMREC Code was derived and based off of the JORC Code and was accepted in 1998. The Committee that created the SAMREC Code consists of the following groups:

- SAIMM
- South African Council for Natural Scientific Professions (SACNASP)
- Geological Society of South Africa (GSSA)
- Geostatistical Association of South Africa (GASA)
- South African Council for Professional Land Surveyors and Technical Surveyors (PLATO)
- Association of Law Societies of South Africa
- General Council of the Bar of South Africa

- Department of Mineral and Energy
- Johannesburg Stock Exchange (JSE)
- Council for Geoscience
- South African Council of Banks
- Chamber of Mines of South Africa ('CoM')

The origin of the Code was in 1992 when the Council of Mining and Metallurgical Institutions (CMMI) requested a formal document to report Mineral Resources and Mineral Reserves to the public. *In 1994, the CMMI formed an ad-hoc International Definitions Group to create a set of international definitions for reporting Mineral Resources and Mineral Reserves with representatives from mining and metallurgical institutions from the United States (SME), Australia (AusIMM), Canada (CIM), the United Kingdom (IMM) and South Africa (SAIMM).*

Concurrently, and since 1992, the United Nations Economic Commission for Europe (UN-ECE) has been developing an international framework classification for Mineral Resources and Mineral Reserves[14] – according to South African Code for Reporting of Mineral Resources and Mineral Reserves (The SAMREC Code) March 2000.

Finally, the first official version of the Code was established in March 2000 and the JSE made it mandatory in the later part of the same year for all public listings. The latest version was in 2007 and adopted by most of the groups listed above.

2.3.2 The SAMREC Code Summary

Even though the Code is the minimum requirement for reporting to the public for the purpose of informing investors or potential investors, it is recommended any additional information that is worthy of noting should be included in the report. Basically the Code allows and encourages additionally information to be included so that the public can accurately comprehend what is happening with the project.

When preparing resource reports, the following principles must be considered:

Materiality: It is expected by investors and there independent advisors to have all relevant and reasonable assumptions in a public report which can be used to make economic decisions on a project.

Transparency: When presenting a public report to the market, all information should be very clear without any ambiguity so that the reader can understand the report. Additionally information is always better than limited information.

Competency: The Competent Person is responsible for the material published in a public report and should always ensure the information is accurate as possible. The Competent Person must be a part of a professional organization with Professional Code of Ethics and has experience in the subject matter.

2.3.3 The "Competent Person"

A 'Competent Person' is a person who is registered with SACNASP, ECSA or PLATO, or is a Member or Fellow of the SAIMM, the GSSA or a Recognized Overseas Professional Organization (ROPO). A complete list of recognized organizations will be promulgated by the SSC from time to time. The Competent Person must comply with the provisions of the relevant promulgated Acts.[15]

The Competent Person when undertaking a specific project must have at least five years experience with the said type and structure of deposit. Fundamentally the Competent Person must have reasonable judgment to determine or not he/she has sufficient relevant experience in the specific commodity.

For example, if the Competent Person is undertaking a resource estimate he/she must have relevant experience for the estimation procedures and should be very comfortable in defending what is being done for the evaluation process.

Similarly to the JORC Code, the main aspect of being a Competent Person for SAMREC is how to define what is relevant and reasonable. The Competent Person must take full responsibility for the resource estimate and should be used as a 'rubber stamp'.

The whole concept of reasonable and relevant is not well defined and the Competent Person should always use professional judgment to determine whether he/she is competent or not to do the job – especially when producing a public report.

2.3.4 Mineral Resource Reporting

According to SAMREC Code; 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 and realistic prospects for eventual economic extraction. The location, quantity, grade, continuity and other geological characteristics of a Mineral Resource are known, or estimated from specific geological evidence, sampling and knowledge interpreted from an appropriately constrained and portrayed geological model. Mineral Resources are subdivided, and must be so reported, in order of increasing confidence in respects of geoscientific into the following categories;

- *Inferred*
- *Indicated*
- *Measured*[15]

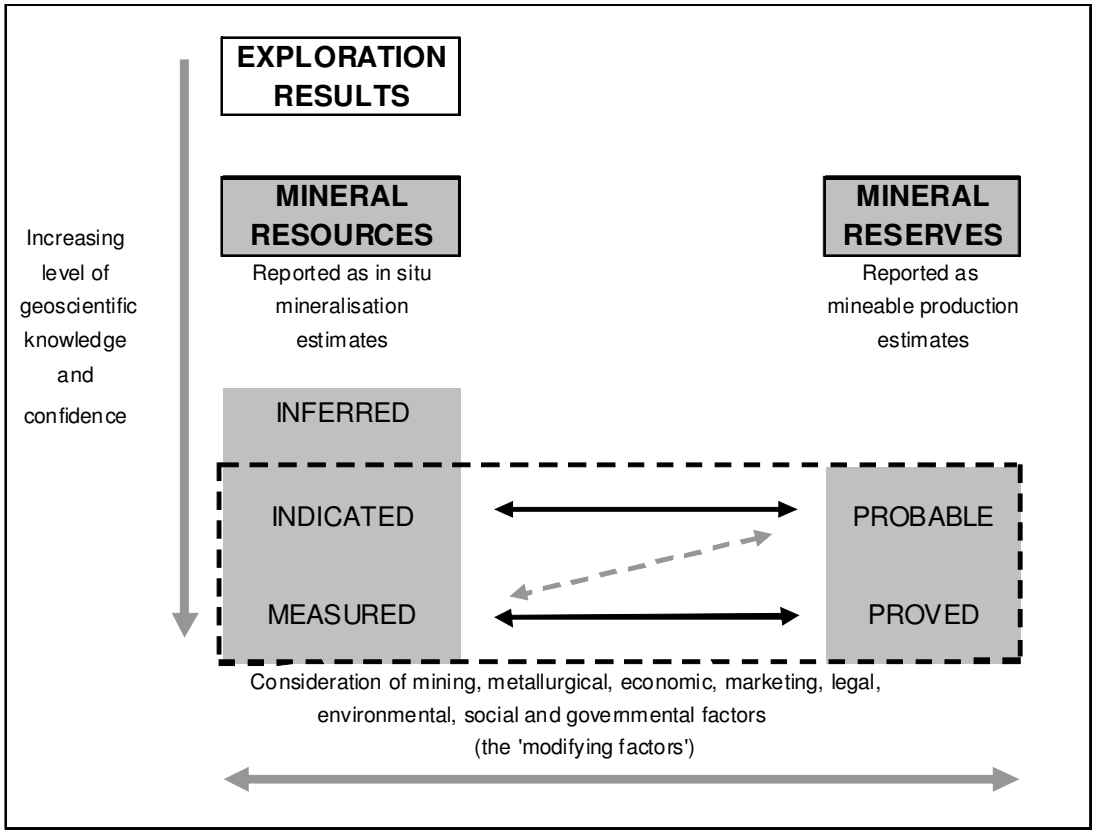


Figure 4 : Relationship between Exploration Results, Mineral Resources and Mineral Reserve[16]

Figure 4 shows how mineral resources are categorized base on increasing level of geoscientific knowledge and confidence. Mineral Resource includes in situ mineralization and tailings that were estimated and could be converted in Mineral Reserves by applying the abovementioned factors.

Therefore, a mineral resource is the extractable portion of a deposit that was derived from defendable technical and economic parameters that were used to determine whether the deposit might be extractable.

The Competent Person can include mineralized material below the cut-off grade to ensure that the Mineral Resource comprises bodies of mineralization of adequate size and continuity to properly consider the most appropriate approach to mining, including any dilution.

An 'Inferred Mineral Resource' is that part of a Mineral Resource for which volume and/or tonnage, grade and mineral content can be estimated with a low level of confidence. It is inferred from geological evidence and sampling and assumed but not verified geologically and/or through analysis of grade continuity. It is based on information gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes that may be limited in scope or of uncertain quality and reliability.[17]

From Figure 4, inferred mineral resource has the lowest geological understanding and confidence as compared to Indicated and Measured Mineral Resources. The limited data cannot suffice an estimate with great degree of accuracy.

SAMREC allows for portion on Inferred Mineral Resource to be included in mine planning and economic studies. If Inferred Mineral Resources are included in any report, then it must clearly be documented and be very specific so the public will be fully aware that inferred mineral resources are considered. Additionally the report should be done with Inferred Mineral Resources as an integral part and without – the results of these two options should be documented.

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.[18]

An 'Indicated Mineral Resource' has less geological understanding and confidence as compared to Measured Mineral Resource. This category can be used in reserve estimation with appropriate technical and economic parameters which would enable evaluations of economic studies.

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.[19]

Measured Mineral Resource has enough continuity and confidence to be converted in mineral reserves and for detailed mine planning purposes. This category has a very high level of geological understanding and confidence that leaves no doubt in the mind of the Competent Person that the results are acceptable for estimation and conversion to mineral reserves.

Mineral Resource estimates are based on sampling, geological interpretation and continuity, and should never be considered as a calculation. There are some uncertainties in resource estimation and these uncertainties should be clearly defined when preparing reports for the public.

2.4 SME Guide

2.4.1 Background

In 1998, the President of the Society for Mining, Metallurgy, and Exploration (SME), Inc, requested that some guidelines should be produce for public reporting of exploration results, resources and reserves. In 1992, the SME published “A Guide for Reporting Exploration Information, Resources and Reserves” (the first SME Guide) but continued working on this guide until 1996. The first guide was updated in 1999 to introduce the Competent Person as the responsible person for public reporting.

The SME and the US Securities and Exchange Commission (US SEC) differs on some points and hence the Guide is very limited in the US. In 2007, after some dialogue with the SEC to have one standard document with mutual agreements, the SME published its latest guide with the said recommendations. However, this September 2007 SME Guide was not accepted by the SEC and therefore the US and SEC has different views of public reporting.

2.4.2 SME Guide Summary

The fundamental principle that governs the SME guide is as follow;

- Transparency
- Materiality
- Competence
- Consistency between financial and technical reports
- Consistency between financial markets

Transparency: When presenting a public report to the market, all information should be very clear without any ambiguity so that the reader can understand the report. Additionally information is always better than limited information.

Materiality: It is expected by investors and there independent advisors to have all relevant and reasonable assumptions in a public report which can be used to make economic decisions on a project.

Competency: The Competent Person is responsible for the material published in a public report and should always ensure the information is accurate as possible. The Competent Person must be a part of a professional organization with Professional Code of Ethics and has experience in the subject matter.

Consistency between financial and technical reports: Financial and technical reports should be in synchrony taking into consideration all financial parameters like commodity price, exchange rate and other material changing factors. All technical and financial assumptions should be documented in details and be very clear and precise.

Consistency between financial markets: Companies that will be producing public reports internationally should establish consistent reporting formats for all financial markets to aid in transparency and accountability.

When producing public reports, the SME requires that a “Competent Person” who should apply reasonable and relevant experience and knowledge in the specific deposit to be reasonable for the report. The purpose of the Competent Person is geared towards achieving higher standard and quality of the public report which will be used as a guide to investors. This person must be independent and any relationship with the said company should be disclosed at the beginning of the work to prepare the report.

2.4.3 The “Competent Person”

A ‘Competent Person’ is a Registered Member of the SME or a Member or Fellow of an approved ‘Recognized Professional Organization’ (‘RPO’) included in a list promulgated by the SME from time to time. A RPO is a U.S. or foreign self-regulatory organization of engineers, geologists or geoscientists that admits individuals on the basis of their academic qualifications and experience, requires compliance with the professional standards of competence and ethics established by the organization, and has disciplinary powers, including the power to suspend or expel a member.

A Competent Person is an engineer, geoscientist or other mining professional who must have a minimum of five years experience which is relevant to the style of mineralization and type of deposit under consideration and to the activity which that person is undertaking.[19]

The Competent Person who is preparing a public report on Exploration Results or estimate on Mineral Resource must possess relevant experience in the respective areas. The whole concept of reasonable and relevant is not well defined and the Competent Person should always use professional judgment to determine whether he/she is competent or not to do the job – especially when producing a public report.

2.4.4 Mineral Resource Reporting

According to SME: *A '<u>Mineral Resource</u>' is a concentration or occurrence of material of economic interest in or on the Earth's crust in such form, quantity, and quality that there are reasonable prospects for eventual 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. Mineral Resources are sub-divided, in order of increasing geological confidence, into*

- *Inferred,*
- *Indicated and*
- *Measured categories.*

Portions of a deposit that do not have reasonable prospects for eventual economic extraction must not be included in a Mineral Resource.[20]

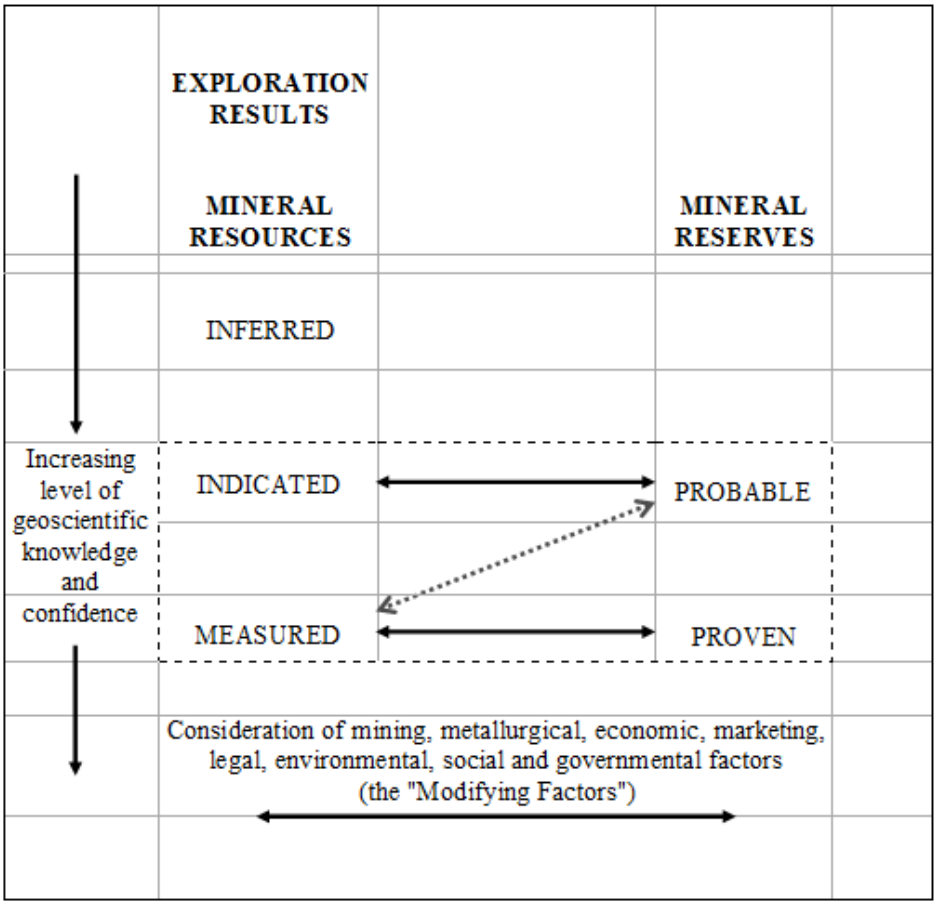


Figure 5 : General Relationship between Exploration Results, Mineral Resources and Mineral Reserves.[21]

Figure 5 shows how mineral resources are categorized base on increasing level of geoscientific knowledge and confidence.

An 'Inferred Mineral Resource' is that part of a Mineral Resource for which the overall tonnages, grades and mineral contents can be estimated with a reasonable level of confidence. It is based on geological evidence and apparent geological and grade continuity after applying economic parameters. It is derived from information gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes, and which in some way is limited or of uncertain quality and reliability. An Inferred Mineral Resource has a lower level of confidence than that applying to an Indicated Mineral Resource.[22]

It should be noted that Inferred Mineral resources must be estimated with "reasonable" level of confidence. This is where the judgment of the Competent Person will decide and define what is reasonable.

An 'Indicated Mineral Resource' is that part of a Mineral Resource for which overall tonnages, densities, shapes, physical characteristics, grades and mineral contents can be estimated with high levels of confidence, and local tonnages, densities, shapes, physical characteristics, grades and mineral contents can be estimated with reasonable levels of confidence. An Indicated Mineral Resource 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 continuity and grade continuity but are spaced closely enough for continuity to be assumed. 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.[23]

Indicated Mineral Resources can be used in technical and major development decisions for any project under the SME guidelines. The degree of knowledge and confidence are sufficient for economic studies.

A 'Measured Mineral Resource' is that part of a Mineral Resource for which both overall and local tonnages, densities, shapes, physical characteristics, grades and mineral contents 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.[24]

Mineral Resource estimates are based on sampling, geological interpretation and continuity, and should never be considered as a calculation. There are some uncertainties in resource estimation and these uncertainties should be clearly defined when preparing reports for the public.

The Competent Person is encouraged to be quantitative about relative accuracy and should give qualitative statements about uncertainties in any resource estimate. Inferred Mineral Resources must at all times be separated from Measured and Indicated Mineral Resources. It was not very clear whether Inferred Mineral resources can be used in technical studies but base on Figure 5, it clearly shows that this category cannot be converted into mineral reserves. However, the SME guide mentioned caution should be considered if this category is included in technical or economic studies.

2.5 SEC Guideline

It's amazing that nothing was really mentioned about resources in the SEC Guide 7. The only mentioned of something close to resources are as:

Proven (Measured) Reserves. Reserves for which

- *quantity is computed from dimensions revealed in outcrops, trenches, workings or drill holes; grade and/or quality are computed from the results of detailed sampling and*
- *the sites for inspection, sampling and measurement are spaced so closely and the geologic character is so well defined that size, shape, depth and mineral content of reserves are well-established.*

Probable (Indicated) Reserves. Reserves for which quantity and grade and/or quality are computed form information similar to that used for proven (measure) reserves, but the sites for inspection, sampling, and measurement are farther apart or are otherwise less adequately spaced. The degree of assurance, although lower than that for proven (measured) reserves, is high enough to assume continuity between points of observation.

Mining companies in the exploration stage should not refer to themselves as development stage companies in the financial statements, if applicable.

(b) Mining Operation Disclosure. Furnish the following information as to each of the mines, plants and other significant properties owned or operated, or presently intended to be owned or operated, by the registrant:

(1) The location and means of access to the property.

(2) A brief description of the tile, claim, lease or option under which the registrant and its subsidiaries have or will have the right to hold or operate the property, indicating any conditions which the registrant must meet in order to obtain or retain the property. If held by leases or options, the expiration dates of such leases or options should be stated. Appropriate maps may be used to portray the locations of significant properties;

(3) A brief history of previous operations, including the names of previous operators, insofar as known;

(4) (i) A brief description of the present condition of the property, the work completed by the registrant on the property, the registrant's proposed program of exploration and development, and the current state of exploration and/or development of the property. Mines should be identified as either open-pit or underground. If the property is without known reservesand the proposed program is exploratory in nature, a statement to that effect shall be made;

(ii) The age, details as to modernization and physical condition of the plant and equipment, including subsurface improvements and equipment. Further, the total cost for each property and its associated plant and equipment should be stated. The source of power utilized with respect to each property should also be disclosed.

(5) A brief description of the rock formations and mineralization of existing or potential economic significance on the property, including the identity of the principal metallic or other constituents insofar as known. If proven (measured) or probable (indicated) reserves have been established, state (i) the estimated tonnages and grades (or quality, where appropriate) of such classes of reserves, and (ii) the name of the person making the estimates and the nature of his relationship to the registrant.

Some important points to note:

1. *It should be stated whether the reserve estimate is of in-place material or of recoverable material. Any inplace estimate should be qualified to show the anticipated losses resulting from mining methods and beneficiation or preparation.*

2. *The summation of proven (measured) and probable (indicated) ore reserves is acceptable if the difference in degree of assurance between the two classes of reserves cannot be readily defined.*
3. *Estimates other than proved (measured) or probable (indicated) reserves, and any estimated values of such reserves shall not be disclosed unless such information is required to be disclosed by foreign or state law; provided, however, that where such estimates previously have been provided to a person (or any of its affiliates) that is offering to acquire, merge, or consolidate with, the registrant or otherwise to acquire the registrant's securities, such estimates may be included.*

(6) If technical terms relating to geology, mining or related matters whose definition cannot readily be found in conventional dictionaries (as opposed to technical dictionaries or glossaries) are used, an appropriate glossary should be included.

(7) Detailed geographic maps and reports, feasibility studies and other highly technical data should not be included in the report but should be, to the degree appropriate and necessary for the Commission's understanding of the registrant's presentation of business and property matters, furnished as supplemental information.[25]

The words Proven/Probable and Measured/Indicated are used together which is very different to JORC, NI43-101, SAMREC etc. The person who established the reserves is required to state his/her name and relationship to the registrant.

2.6 United Nations International Framework Classification for Reserves/Resources

2.6.1 Background

The United Nations International Framework Classification for Reserves/Resources – Solid Fuels and Mineral Commodities – (UN Framework Classification) has incorporated inputs from fifty countries and organizations during a six year periods from 1995 to 2001 to create the final document that was published 19th September 2001 (Energy/2001/11) by UN Framework Classification (Submitted by the UN-Task Force on Reserves/Resources for Solid Fuels and Mineral Commodities).

After the publication of the document, there was an agreement to create an international guideline for reporting and classifying reserve/resource data which will advance the conventional acceptable guidelines (JORC, NI43-101 etc) in the following ways:

- Combining all the different terms describing classes of reserve/resource of increasing geological assurance are replaced by activity-related terminology
- Having a sequential order to advance a project from exploration to Feasibility study
- Resource classification can be easily correlated with those of the new UN Framework Classification

According to the UN Framework Classification: most resource classification systems, except the former Russian system, do not have specific guidelines which introduces the judgment of the individual estimator. Therefore, it's difficult to establish an international accepted document for comparable reserve/resource estimates.

2.6.2 Mineral Resource Reporting

A mineral resource definition is based on those of the Council of Mining and Metallurgy Institutions (CMMI) and is as follow: *A 'Mineral Resource' is a concentration [or occurrence] of material of intrinsic 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, geological characteristics and continuity of a Mineral Resource are known, estimated or interpreted from specific geological evidence and knowledge. The resource figures are quoted as being of intrinsic economic interest, depending on the results of a Prefeasibility Study and Feasibility Study. Generally, only in-situ resource figures are reported at this stage of geological assessment.*

A Mineral Resource (Remaining or Additional Resource) is the balance of the total Mineral Resource that has not been identified as a Mineral Reserve. [26]

Mineral Resources are divided into the following base on increasing geological confidence:

- Inferred,
- Indicated and
- Measured classes.

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 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.

Estimated to be of intrinsic economic interest based on prospecting having the objective to identify a deposit. Estimates of quantities are inferred, based on

outcrop identification, geological mapping, indirect methods and limited sampling.[27]

This category is lower in confidence than Indicated Mineral Resources and should not be used in Prefeasibility Studies.

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.

Estimated to be of intrinsic economic interest based on General Exploration establishing the main geological features of a deposit providing an initial estimate of size, shape, structure and

grade.[28]

This category is lower in confidence than Measured Mineral Resources and can be used in Prefeasibility Studies.

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/or grade continuity.

Estimated to be of intrinsic economic interest based on Detailed Exploration establishing all relevant characteristics of a deposit with a high degree of accuracy.[29]

Measured Mineral Resources can used in detailed economic studies and at feasibility level because of the high level of geological understand and confidence.

Additionally, the UN Framework Classification mentions:

- Reconnaissance Mineral Resource – lower confidence than Inferred Resource
- Prefeasibility Mineral Resource – Part of Indicated and possibly Measured Resources
- Feasibility Mineral Resource – Measured Resources

2.7 The Reporting Code (United Kingdom/Western Europe)

2.7.1 Background

In 1991, the Council of Institute of Mining and Metallurgy (IMM), now the Institute of Materials, Minerals and Mining (IMMM), approved new definitions for resources and reserves which was quoted on the London Stock Exchange Listing Rules (Chapter 19 – Mineral Companies) in a slightly modified format.

The first publication of the Reporting Code replaced the 1991 definitions and was adopted by the IMMM, the European Federation of Geologists (EFG), the Geological Society of London (GSL) and the Institute of Geologists of Ireland (IGI).

The fundamental principles that govern the Reporting Code are as follow:

- Transparency
- Materiality and
- Competence

These principles are similar to the JORC Code.

2.7.2 The "Competent Person"

A 'Competent Person' is a person who is a corporate member of a recognized professional body relevant to the activity being undertaken, and with enforceable Rules of Conduct. A Competent Person must have a minimum of five years experience relevant to the style of mineralization and type of deposit under consideration and to the activity which that person is undertaking. If the Competent Person is estimating, or supervising the estimation of Mineral Resources, the relevant experience must be in the estimation, assessment and evaluation of Mineral Resources. If the Competent Person is estimating, or supervising the estimation of Mineral Reserves, the relevant experience must be in the estimation, assessment, evaluation and economic extraction of Mineral Reserves. [30]

Again – the words relevant and reasonable are important and the Competent Person must be professional about accepting the responsibility of the public report. He/she should make the judgment whether or not they have the relevant experience and knowledge for the said commodity.

2.7.3 Mineral Resource Reporting

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 and knowledge. Mineral Resources are subdivided, in order of increasing geological confidence into:

- *Inferred,*
- *Indicated and*
- *Measured categories.*[31]

Mineral Resources are categorized by the Competent Person and key skilled judgments are required. The degree of knowledge of the geology and confidence plays a major integral part in deciding the appropriate category.

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 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.

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.

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.[32]

Mineral Resources should not be combined with Mineral Reserves and Inferred Mineral Resources should not be combined with Indicated and Measured Mineral Resources. Generally, The Reporting Code is very similar to the JORC Code.

2.8 Code for Reporting of Mineral Resources and Ore Reserves – Peru

2.8.1 Background

The Peruvian Code was based off of the 1999 JORC Code and CIM 2001. The fundamental principles that govern the Code are:

- Transparency
- Materiality
- Competence

The Peruvian Code is similar to the JORC Code and hence not much will be documented.

2.8.2 "Qualified Person"

A 'Qualified Person' is a professional who is an active member of the Colegio de Ingenierosdel Perú: Capítulo de Ingeniería de Minas o Capítulo de Ingeniería Geológica, with aminimum of five relevant years of experience in the activity which that person is undertaking and who is registered in the "Qualified Person Register of the Lima Stock Exchange". If the Qualified Person is estimating, or supervising the estimation of Mineral Resources, the relevant experience must be in the estimation, assessment and evaluation of Mineral Resources. If the Qualified

Person is estimating Ore Reserves, the relevant experience must be in the estimation, assessment, evaluation and economic extraction of Ore Reserves.

2.8.3 Mineral Resource Reporting

A 'Mineral Resource' is a concentration or occurrence of material of intrinsic economic interest in or on the Earth's crust in such form and quantity that there are reasonable prospects for eventual 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. Mineral Resources are sub-divided, in order of increasing geological confidence, into:

- *Inferred,*
- *Indicated and*
- *Measured categories.*

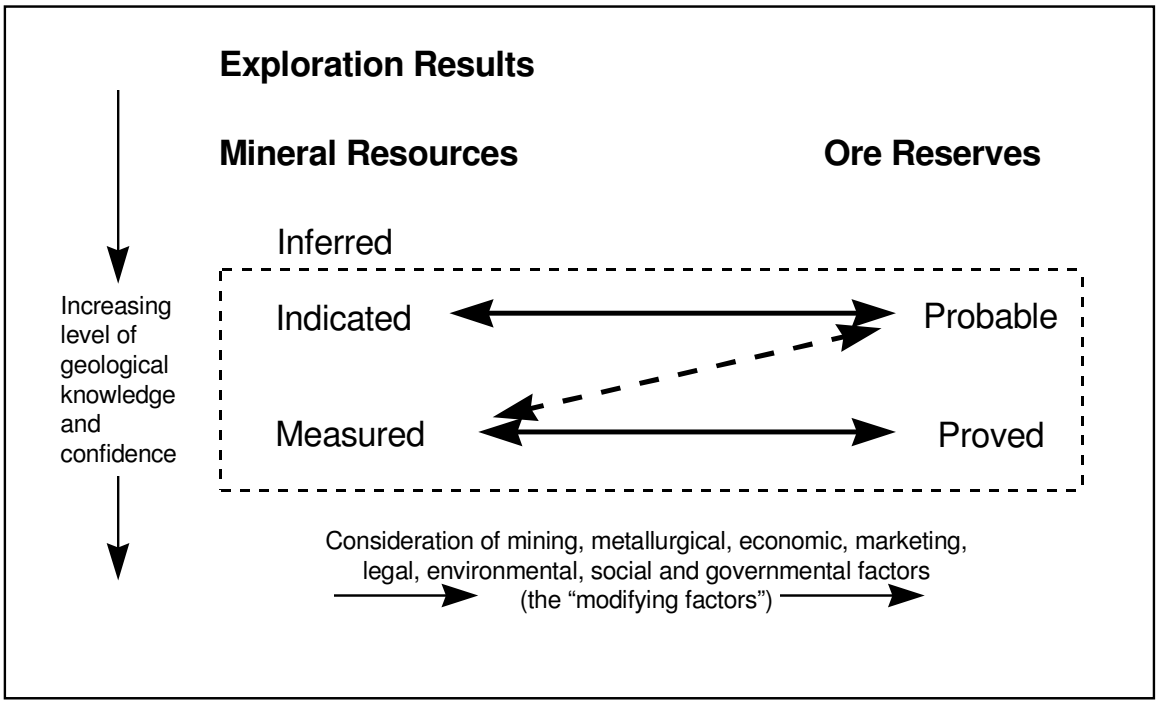


Figure 6 : General Relationship between Exploration Results, Mineral Resources and Ore Reserves

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 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 may be limited or of uncertain quality and reliability.

An Inferred Mineral Resource has a lower level of confidence than that applying to an Indicated Mineral Resource.[33]

It was mentioned that caution should be exercise if using inferred resources in economic studies which imply that it could be considered.

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.

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/or grade continuity.[34]

Mineral Resources must not be combined with Ore Reserves. The whole Peruvian Code is based off of JORC Code and most aspects are identical. After completing this section, it is very obvious that the Peruvian Code is an imprint of JORC.

2.9 Certification Code for Exploration Prospects, Mineral Resources and Ore Reserves - Chile

2.9.1 Background

It is indeed surprising that the Institute of Mining Engineers of Chile (IIMCh) in 1942, proposed definitions for technical terminologies for the estimation of mineral reserves. The IIMCh in consultation with the Chilean Mining Ministry in 2002 generated the Code for the Certification of Exploration prospects, Mineral Resources and Mineral Reserves which was used by Chilean capital and financial markets to regulate the mining industry. The latest version of the Code is dated December 2004.

The Certification Code is based off the norms that should be established and applied when preparing public reports:

- Transparency
- Materiality
- Competence

The norms as quoted in the Certification Codes are very similar to the JORC Code principle.

2.9.2 The "Competent Qualified Person"

According to the Certification Code for Exploration Prospects, Mineral Resources and Ore Reserves: *A Qualified Competent Person - whose task is to inform*

publicly about the Exploration Prospects, Mineral Resources and Ore Reserves - is a person registered as such by a state organization, that by law and with the support of a technical advising committee, will be assigned to this job.

A has obtained a university degree in one of the specialties associated with the mining business and have a minimum of 5 years of experience relevant to the area of analysis of geoscientific data, modeling, estimation and processing of Mineral Resources and Ore Reserves.

The Qualified Competent Person has a perfect knowledge of the mine business sustainability, the type and style of the mineralization being studied and the entire mining business chain of value.[35]

Even though the wording is slight different from the JORC Code or NI43-101, the fundamental principles are the same in terms of relevant experience in the area of work. The exception is that the Certification Code includes a statement whereby the Qualified Competent Person has a perfect knowledge of the mine business sustainability which can be very difficult.

2.9.3 Mineral Resource Reporting

Mineral Resource is a natural concentration or occurrence, solid, inorganic, or fossilized organic substance in such quantity and at such quality that there exist reasonable prospects about its technical and economic potential. Localization, tonnages, contents, geologic characteristics and degree of mineralization continuity are interpreted, known, or estimated from specific geological, metallurgical, and/or geoscientific evidences.

Inferred Mineral Resource is that part of the mineral resource for which tonnage and grade estimation is affected by accuracy and precision due to fragmentary and limited sampling, assumed perceptions regarding its geologic continuity and

subjective extrapolations regarding ore grade distribution. Data is sufficient to delineate mineralization but not to categorize the deposit as an Indicated Mineral Resource.[36]

The mentioned of Inferred Mineral Resources was not very clear whether they can be considered in economic studies. Vague terminologies were used and hence it appears Inferred Mineral Resources can be used in economic studies but must be used with caution.

Indicated Mineral Resource is that part of a Mineral Resource for which tonnages, densities, grades, geological, geometallurgical and geotechnical data have been captured with a reasonable level of confidence. Estimations and characterizations are based on exploration drilling, sampling and chemical analysis carried out in representative locations of the mineralization, source of these resources. These locations conform to a grid of nodes in such a way that the geological continuity and characterization, as well as the metal content associated with each node of the grid can be estimated with an acceptable degree of confidence. In addition, mineral resources can be codified and categorized as Indicated Mineral Resource when the nature, quality, quantity and distribution of data are such that they allow an adequate interpretation of the geological setting so that the continuity and characterization of the mineralization can be assumed in acceptable way.

Measured Mineral Resource is that part of a Mineral Resource for which tonnages, densities, grades, and geologic, geometallurgical and geotechnical data have been estimated and characterized by a significant level of confidence. Estimations and characterizations are based on detailed, reliable, and verifiable exploration data, representative sampling, and reliable chemical analysis in accordance with a grid of nodes to facilitate validation of grade continuity and geoscientific data.[37]

The Qualified Competent Person base on experience and judgment determines which category to classify each class of resources. The interesting aspect for the

Certification Code is the slight changes in phrase from JORC Code unlike most of the other codes.

2.10 Russian and Chinese Statement

The Russian codes on resources and reserves are generally different from NI43-101, JORC and SAMREC codes. The fundament difference is that the Russian codes were developed in the 1960s with the aim to achieve positive end results by prescribing the complete process from exploration to production reporting in a very logical and systematic way. The process was developed in the 1960s and hence can be completed manually and very easy to apply as there is not a lot of room for judgment calls.

Most of the other codes likes JORC, NI43-101 etc considers economic parameters and strongly depend on the judgment of a qualified person or competent person. As time progressed, there were gradual slight changes in the way which the Russian Codes were applied – especially in the role played by economic modeling. Lately, there are some equivalence between the Russian codes and Western Codes and the Russian Codes can be translated into Western Codes.

This section is adapted from a presentation given by Nikolai Vlasov, chief geologist, Peter Hambro Mining plc.

"The Soviet approach was centered on a document called the TEO (technico-economicheskiye obosnovaniye = technical-economic characterization) and the TER (technico-economicheskiye raschoti = technical-economic calculations). The TEO is broadly equivalent to the western pre-feasibility study, but it is much more formalized, and its preparation follows a defined set of procedures (Stanchenko et al, 1986). It takes into account factors such as technical options and commercial aspects, as well as the environmental implications of a planned project.

In a Russian mining project, one of the most important controlling factors, and the one which causes most misunderstandings in the west, is the procedure for reporting reserves and resources. Formerly, the Soviet TEO was a precisely defined document written according to a set of detailed specifications - a style manual. Now there is less central control over the structure and content, which will vary according to the mineral concerned, but each authorized reporting body (formerly one of the state-owned 'design institutes' but now drawn more broadly) follows its own internal guidelines for projects on which it is reporting, and requires consultants to follow such rules in their own reports on projects for which the institute is official adviser to the central GKZ.

The legislative framework within which the Russian system now works is all centered on GKZ, the State Commission on Mineral Reserves. This is a standing committee whose chairman is appointed by the Russian president. Clearly a single committee would be overwhelmed if it had to approve the reserves and resources for every mining project in such a large country.

Therefore GKZ has set up regional sub-committees, the TKZ (Territorial Committees on Mineral Reserves) who actually do most of the work. The TKZ chairmen are appointed by GKZ; membership of the TKZ committees consists typically of from 7 to 11 'chief specialists' employed directly by GKZ or the TKZ, and 5 to 7 'independent specialists' drawn from research institutes and other organizations within each region. Decisions on approval of resource/reserve estimates are reached by vote of the TKZ committee or, for larger scale deposits, by a vote at GKZ level.

Because all mineral rights are owned by the state, one of the concepts in Russia which continues to the present day is the idea of the 'national raw materials base' as a 'balance' of reserves of all kinds of minerals, which can be used in computing the national net worth. Any mining operation will necessarily reduce this 'balance' and there is a presumed burden on the mining company to take action to restore the 'raw materials balance'.

Mineral exploration in Russia follows a series of formal stages which represent progressively increasing detail of knowledge of a mineral deposit and are reflected directly in the resource classification system. Depending on the type of deposit (how complex it is, and its overall shape), drilling must be carried out on grids of prescribed density at each stage. Clearly most coal deposits require less dense drilling than most gold deposits. This is reflected in the rules. However, no account is taken of the detailed differences which make each mineral deposit unique.

Although this system is prescriptive, in practice it is little different from the western approach which establishes analogies with known deposits (e.g. "this is a Carlin-type deposit") and in which the exploration program is informed by the parameters which are expected thereby.

The ultimate quality of the numbers for reserves and resources – regardless of what system has been used – depends on the quantity and quality of the work that has been done, and the know-how and experience of the team that is carrying out the work, in Russia just as in the west.

Once a deposit is considered to be ready for mining, an official reserve is calculated that becomes part of the mining licence. Under the terms of the licence, the official reserve is classed as 'balance ore' and is reduced each year according to the annual production from the mine. The company will be charged royalties (generally 6% of production revenue) based on the official reserves. In principle these must be fully extracted, and the full royalties therefore paid, over the life of the mine. If this target is not met for some reason, penalties may be payable, though in practice there are generally mitigating circumstances which can be argued to waive the penalties.

There is also provision for the mining of 'out-of-balance' ore, which is generally low-grade ore that can be mined and boosts production. A lower rate of royalty is usually paid on 'out-of-balance' ore and if there is a shortfall on the 'balance ore' it

may be possible to offset some or all of that with 'out-of-balance' ore and so avoid the penalties for failing to meet the terms of the mining licence.

Due to the linking of the estimated ore reserves to actual payments of royalties over a mine's life, there is a natural tendency for Russian geologists to be conservative in their estimations. Not only would an over-estimate lead to paying higher than necessary royalties, in past times the geologist was likely to find himself in trouble."[38]

For the sake of fully understanding the statement the following classifications are being made:

1) Mineable Reserves
    - Explored
        - Category A – Highest Level of Accuracy as a function of drilling
        - Category B – Lower level than A
        - Category C_1 – Lower than B with loose grid drilling
    - Evaluated
        - Category C_2 – Lower level than C_1 with extrapolation of geology.
2) Potential Resources
    a. Prognostic
        i. Category P_1 – Highest level of confidence base on drilling
        ii. Category P_2 – Lower Confidence than P_1
        iii. Category P_3 – Lower Confidence than P_2

	Mineable Reserves				**Potential Resources**		
	Explored			**Evaluated**	**Prognostic**		
Economic	A	B	C_1	C_2	P_1	P_2	P_3
Sub-Economic	A	B	C_1	C_2	P_1	P_2	P_3

Figure 7 : Classification of Resources and Reserves in the CIS

"The former Soviet system for classification of reserves and resources, developed in 1960 and revised in 1981, is still used today in Russia and other CIS republics. Essentially, it divides mineral concentrations into seven categories, in three major groups, based on the level of exploration performed: fully explored reserves or resources (A, B, C_1), evaluated reserves or resources (C_2) and prognostic resources (P_1, P_2, P_3).

In principle, these follow a succession of approximations that are applied to various stages of exploration. This means that reserves or resources are assigned to classes based on the degree of reliability and indicate their comparative importance for the national economy (in other words, the classification is not defined purely by exploration confidence levels but also incorporate some economic criteria).

Computation of reserves and resources follows a prescribed set of manual procedures (though these days they may be implemented in computer programs). The precise procedure used depends on the type of deposit being evaluated, but for hard-rock gold or polymetallic deposits, they generally work from drillhole intersections on parallel section lines. The computation is effectively a simple linear interpolation – computing volumes of prisms and pyramids, and computing weighted averages of grades in the bounding drillholes. Although geostatistical methods have been available in Russia for some time (Kaputin et al, 1995), it requires special justification, and approval by the TKZ or GKZ, to use these for formal reporting, and they are not yet widely used.

Reserves and resources that can be matched to the usual international categories are classified into five main classes designated by the symbols A, B, C_1, C_2 and P_1. Capital letters are used to designate ores that are economic. Sometimes, the same group of letters are written in lower case when the mineralization is considered sub-economic. Alternatively, and more commonly, a simple classification into classified (A,B,C_1,C_2) "balansovye" (balance) = commercially

exploitable reserves and unclassified "zabalansovye" (out-of-balance) = uneconomic resources is used. Synonyms of "balansovye" and "zabalansovye" which are often met, and used descriptively, are "konditsionniye" (conditioned) and "nekonditsionniye" (unconditioned).

The resource/reserve categories are defined below (please note that the terms 'reserves' and 'resources' are to a large extent interchangeable here, and do not have the very distinct meanings that are placed on them by the international reporting codes):-

Category A *The reserves in place are known in detail. The boundaries of the deposit have been outlined by trenching, drilling, or underground workings. The quality and properties of the ore are known in sufficient detail to ensure the reliability of the projected exploitation.*

Category B *The reserves in place have been explored but are only known in fair detail. The boundaries of the deposit have been outlined by trenching, drilling, or underground workings. The quality and properties of the ore are known in sufficient detail to ensure the basic reliability of the projected exploitation.*

Category C_1 *The reserves in place have been estimated by a sparse grid of trenches, drillholes or underground workings. This category also includes reserves adjoining the boundaries of A and B reserves as well as reserves of very complex deposits in which the distribution cannot be determined even by a very dense grid. The quality and properties of the deposit are known tentatively by analyses and by analogy with known deposits of the same type. The general conditions for exploitation are known. The ore tonnage is derived from estimates of strike length, dip length and average thickness of the ore body. Allowance for barren blocks may be made statistically.*

Category C_2 *These reserves are based on an extremely loose exploration grid, with little data. The limits of the orebody are defined mainly by extrapolation within*

known geological structures, and from comparison with other similar deposits in the vicinity. The grade and mineral properties of the orebody are determined from core samples and comparison with similar mineral deposits in the area. The reserves have been extrapolated from limited data, sometimes only a single hole. This category includes reserves that are adjoining A, B, and C_1 reserves in the same deposit.

***Prognostic Resources** are estimated for mineralization outside the limits of areas that have been explored in detail and are often based on data from trenches and from geochemical and geophysical surveys.*

***Category P_1** Resources in the P_1 category may extend outside the actual limits of the ore reserves defined in the C_2 category. The outer limits of P_1-type resources are determined indirectly by extrapolating from similar known mineral deposits in the area. P_1 is the main source from which C_2 reserves can be increased.*

***Category P_2** These resources represent possible mineral structures in known mineral deposits or ore-bearing regions. They are estimated based on geophysical and geochemical data. Morphology, mineral composition and size of the orebody are estimated by analogy with similar mineralized geologic structures in the area.*

***Category P_3** Any potential ore-bearing deposits are classified as resources in the P_3 category. The presence of these resources relies on the theoretical definition of a "favourable geological environment". Resource figures are derived from figures of similar deposits in the region.*

Estimates of Prognostic Resources (P_1, P_2, and P_3) routinely depend on assumptions and projections regarding the probable dimensions (length, width and depth) and grade of the deposit that are subject to confirmation by more detailed investigations.

In decision-making on a new mining project, the categories that are normally taken into account are A, B, C_1, and C_2. There is, therefore, a broad equivalence between these and the western proved plus probable reserves." [39]

A relative comparison of the Western and Russian Codes is showed below:

Russian	International reporting Code, JORC, etc
A,B	Proved Reserve / Measured Resource
C_1	Proved or Probable Reserve / Indicated Resource
C_2	Probable reserve / Indicated Resource / Inferred Resource
P_1	Inferred Resource
P_2	Reconnaissance Mineral Resource (or UNFC code 334)
P_3	no equivalent

"Reserves (in western classifications such as JORC) will generally contain material of categories A, B, and C_1, but adjacent to existing or planned mining operations (where technical and economic studies have been carried out), C_2 will often also be considered as part of the reserves. In exploration areas (where no mine planning has been done), C_2 might more appropriately be thought of as indicated resource.

For material to be included in A, B, and C_1 categories there has generally been sufficient technical and economic study carried out to interpret them as ***reserves.*** *C_2, as noted above, depending on the circumstances, may correspond to inferred or indicated resources or to a probable reserve, though the Russian rules for acceptance of C_2 also require a substantial amount of additional work to have been done.*

The Russian classification allows for something known as a 'sub-economic reserve' (often material that is classified as "zabalansoviye" resources). This is material that has been intensely drilled and analysed (including economics, engineering, etc.) but which is not economic under current conditions.

This material would not be considered a 'reserve' according to the SEC standard, but could well fit within the Measured and Indicated category under the International Code. Moreover, the intent of the classification is the same. This is material that has been the subject of a full feasibility, but which does not fall into an economic reserve at present.

When expressing Russian classified reserves and resources in terms of one of the western codes, it is important that a ***competent person*** *(in the sense of the International Reporting Code definition) who understands both systems should carry out the 'conversion'. It is important to note that in the western codes, the methods of analysis are not defined. For example, the JORC definitions use words such as 'appropriate' and 'estimation'. Much reliance is placed on the experience of the competent person supervising the analysis. However, the exact methodology of the analysis is not defined – and is deliberately left open to allow for developments in exploration, mining and geostatistics."* [40]

3 Comparative Analyse of Codes

Codes Analysis

This Chapter will focus on the similarities and differences of the major reporting codes for mineral resources worldwide. It will aid in the presentation of the proposed new guidelines that will be generated in Chapter 5. By understanding the different approaches on how resources are defined, it will assist in producing guidelines which investors can use to further their due diligence in determining in which project to invest.

It was very evident in Chapter 2 that most of the reporting codes for resources were derived or extracted from the JORC code. In some instances, resources were exactly as quoted in the JORC Code. The reason for this trend was due to the fact that the JORC Code has been established earlier and has been relatively reliable as compared to the other codes. Due to the fact that most codes are based on the JORC Code, the comparative analysis will focus on the two instrumental codes (NI43-101, JORC Code) that varies in principle and whereby most mining companies are aligned to.

The exceptions were cases where the SEC basically had very limited requirements for public reporting for mining projects. However, it should be noted that based on the principles of the SEC for mineral reporting – SEC Guide 7 is acceptable. The SME is continually trying to incorporate its standards with the SEC but the two organizations objectives are fundamentally different. Although the SME code is somewhat similar to JORC and the other codes, the SEC requires only specific reserve statements, because its' primary concern as an oversight agency is the protection of the investor from abuse and misinterpretation. The SEC requires the use of a historical three-year average commodity price to generate reserves as compared with SME suggests a forward looking forecast.

The Certification Code (Chile) does take some portion of both the NI43-101 and JORC Codes, and incorporates them into a document to create their reporting standards for resources. For example, the person responsibility for the preparation of the report is called “Qualified Competent Person” which is derived from “Qualified Person” (NI43-101) and “Competent Person” (JORC Code). Chilean professional mining and geologic organizations have supplied some of the considerations incorporated into the Certification Code.

In principle, most codes are similar in terms of the person who is responsible for preparing the public report, except for the Russian and Chinese Codes. Additionally, most of the definitions of resources are similar in principle. However, there are fundamental differences in how the different classes of resources are used in economic studies. These differences create the unlevel playing field for investors. One of the aims of this thesis research is to combine these differences and specify the class of mineral resource to be used in economic studies to help investor decision-making.

3.1 Code Similarities (Resources)

The author of a public resource report (NI43-101- ‘Qualified Person’, JORC – ‘Competent Person’) must conform to certain experience levels and qualifications, which are very similar for all major reporting resource standards. A significant emphasis and trust is placed in the author and this person must belong to a professional organization and is required to make reasonable judgments.

The following points are similar for the author (‘Qualified Person/Competent Person’) of public reporting for most of the codes documented in Chapter 2:

- Require five (5) years ‘relevant’ experience
- Exposure to similar style and type mineralization under consideration
- Must be an engineer or geoscientist
- Experience in mineral exploration, mine development or exploration or mineral project evaluation, or any combination of these

- Member of a professional organization that complies with high ethical standards
    - Basis on academic qualification and experience
    - Professional standards of competence
    - Has disciplinary powers
    - Recognition of the professional organization by the host country
    - Reference from professional members of the said organization
    - Good professional standing within the industry
- The Author must be 'independent'
    - No direct interest in the company that could have an effect or influence on public reporting
- The author of public report must state the following on completion:
    - Employee of Company or relationship to employer
    - Full name, relevant experience, date, occupation
    - Professional Membership in which relevant recognized organization
    - Academic qualifications and years of relevant experience
    - Any prior involvement in the project

For actually resource definition and classification, most of the codes are very similar in principle. This thesis consideration will be based on the JORC and NI43-101formats as most other codes are based on that of the JORC except for the Russian and Chinese Codes.

According to "The JORC Code" 2004 Edition (Effective December 2004); *A Mineral Resource is a concentration or occurrence of material of intrinsic 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, geological characteristics and continuity of a Mineral Resource are known, estimated or interpreted from specific geological evidence and knowledge. Mineral Resources are sub-divided, in order of increasing confidence, into*

- *Inferred,*
- *Indicated, and*
- *Measured categories.*[1]

According to CIM definitions standards; *A Mineral Resource is a concentration or occurrence of diamonds, natural solid inorganic material, or natural solid fossilized organic material including base and precious metals, and industrial minerals 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. Mineral Resources are sub-divided, in order of increasing confidence, into*

- *Inferred,*
- *Indicated, and*
- *Measured categories.*[2]

The similarities of the definitions of resources are profoundly based on the definitions by CIM and AusIMM. Additionally, the resource classification into the different categories is very similar and is based mainly on drilling and understanding of the geology.

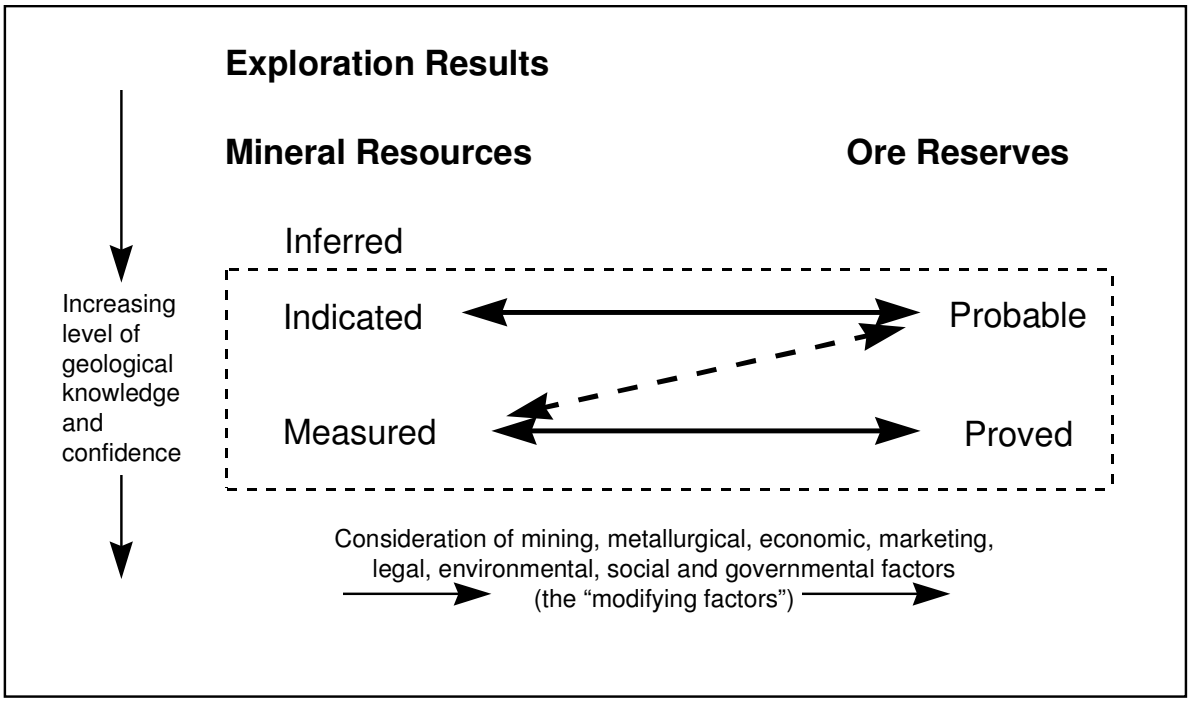


Figure 8 : JORC's general relationship between exploration results, mineral resources and ore reserves[3]

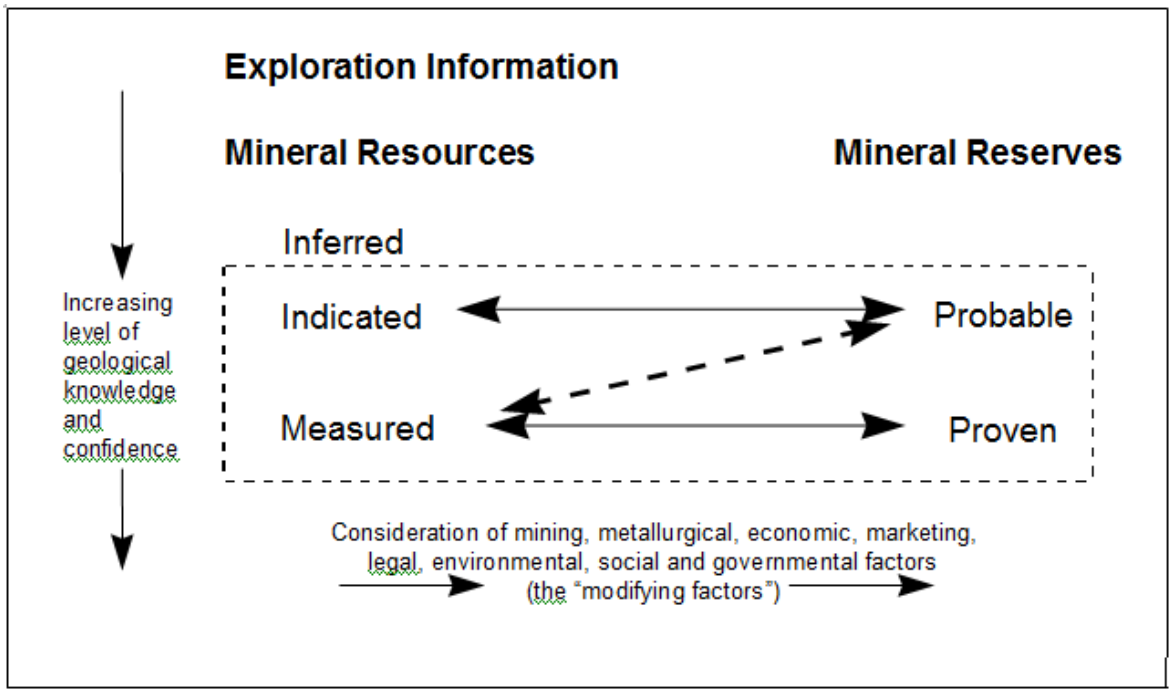


Figure 9 : NI43-101 *Relationship between Mineral Resources and Mineral Reserves*[4]

Based on the above Figures – it is very clear that resource classification is identical for most resource reporting codes worldwide except for the Russian and Chinese Codes. Additionally, as shown in Appendix A, the resource reporting

guidelines are very similar for producing the public report. Mineral Resources should always be broken into measured, indicated and inferred categories and should never be combined.

3.2 Code Differences (Resources)

The SEC is the only resource monitoring organization that does not allow "resource" reporting. The reason why the SEC doesn't allow "resources" reporting is mainly because they consider the publication of resource statements are subject to abuse and have the potential to mislead investors.

According to the SME article "Concept Release on Possible Revisions to the Disclosure Requirements Relating to Oil and Gas Reserves" regarding the SEC: *As in the case with oil and gas, technological advances since 1982 have significantly improved how companies may identify mineral reserves, model the deposit, estimate its economic value. Mining and processing methods have changed significantly. Three dimensional computer modeling is fundamental in the estimation of mineral resources, mine design and production scheduling. Industry Guide 7 (SEC) is obsolete to the extent that is describes in great details documentation required for 1982 technology (mostly based on two-dimensional maps and drawings) and ignores current technology. One should however note that in this respect the SEC staff interpretation has kept up with technology.*[5]

Based on the above statement by the SME to the SEC, it is more apparent why these two organizations within the same country don't seem to have their reporting standards aligned. It is my view that two dimensional maps and drawings are still very important and three dimensional computer modeling for estimation of mineral resources is commonly used. However, the Russian methodology still does a great job using polygonal sectioning for resource estimation, and it is vital to remember that these high tech three dimensional modeling software packages require input skills with which users may be uncertain. Additionally, the output from these three

dimensional software programs should be properly analyzed for their usage and understanding of what the software is doing on the back end of the computations.

The fundamental point to note is that the resource principles are the same worldwide and three dimensional software packages can aid the process for resource estimation, however, the old fashioned way of resource estimation is also very accurate when done correctly.

Although all resource reporting codes require an author for public reporting, and the author's responsibilities are identical, the name titles are different. For example, JORC – Competent Person, NI43-101 – Qualified Person and Certification Code – Qualified Competent Person.

According to the Standard Oxford English Dictionary:

a) 'Qualified' means:
    1) having passed the exams or completed the training that is necessary in order to do a particular job; having the experience to do a particular job
    2) having the practical knowledge or skills to do
b) 'Competent' means:
    1) having enough skill or knowledge to do well or to the necessary standard

There are some minor intricate differences in meaning between the two titles and based on the Oxford Dictionary's definition it is apparent neither title is entirely appropriate for the author. In Chapter 5 of this research, I will propose a new title which will be more representative of the title for the author.

Resources reporting for most codes are subdivided:

- Inferred (reasonably assumed, but not verified)
- Indicated (reasonable level of confidence)
- Measured (high level of confidence)

The exceptions for this classification are the Chinese and Russian codes that basically have additional subdivided groups, somewhat similar to the United Nation Framework Classification (UNFC). The Chinese for example have a 'Reconnaissance' class which is equivalent to the 'inferred' class in the JORC or NI43-101. The Russian code also has some additional class and can also be combined to an equivalent infer class in the JORC Code or NI43-101 Code.

Additionally, the Chinese definitions for the different classes of resources do not mention anything about the potential of being economically viable. According to the National Standard of The People's Republic of China: *A measured resource involves the fact that the geological features, shape, occurrence, scale, ore quality or grade, mining technology and the continuation of the ore body are detailed identified in the detailed exploration area on the basis of the accuracy of detailed exploration. It is of high creditability due to the sufficient data by which the quantity if the mineral resources is estimated.*[6]

This leads to the very interesting point which has completely been overlooked for decades, the fact that based on the figures that show how each class is subdivided, there is no mention of economic or technical parameters considered in the resource figures. The definition of resources clearly state that there must be potential for economic extraction, but the figures do not show any instances of economic factors allowing for such classification.

The Russian Code does not include anything about economics for resource reporting. The cut off grade used in their resource statement is generally generated from similar deposits and personal experience. However, the cut off grade is generated by considering commodity price, recoveries, geotechnical parameters etc. When applying a cut off grade to a resource estimate, it is advisable to be very conservative and use a reasonable lower cut off grade.

It is generally recommended, that mineral resources should be reported exclusive of mineral reserves. In some cases mineral resources are inclusive of mineral reserves (JORC) and, in other instances, mineral resources are reported additional to mineral reserves (SAMREC and SME). However, whatever way is finally determined, that should be documented in the public report. For example a clarifying statement may be as follows:

- Measured and indicated resources are inclusive of reserves or
- Measured and indicated resources are additional to reserves

In Chapter 5 of this research, a format will be proposed for reporting resources by the international mining community.

The fundamental difference in resource reporting is the determination of which class of resources may be used for economic studies. This is where the major codes vary, and may be misleading to investors. For example, the JORC Code recognizes that the confidence level for inferred resources is not normally sufficient to pursue economic viability studies and clearly states that inferred resources should only be used with caution if used in economic studies. There are some grey areas and definite ambiguity in the wording of how inferred resources can be used in economic studies to be in accordance with the JORC Code. Assuming that inferred resources can be used in economic studies based on JORC definitions, then according to the Reserve Resource Figure 2.1.1 there should be some connection of resources to reserves.

The SME states that inferred resources can be used in economic studies, and warns that caution should be integral to the study if this class of resource is being used. SAMREC states that caution must be exercised in any public disclosure if an inferred resource is used in economic studies. However; SAMREC further stated that inferred resources are not normally considered in economic studies.

CIM (NI43-101) clearly states that inferred mineral resources may not be used for economic studies that will be released to the public because of the low confidence and insufficient data. However, inferred mineral resources may be used for internal planning, but must be made clear in any reporting document by stating that inferred mineral resources were used.

An essential difference between the Australian and Canadian systems is that documentation on which public reports are based does not have to be provided on a routine basis to the ASX. This is primarily because neither ASIC, ASX nor JORC believe that more information is necessarily better information.

Because of these reporting differences, it is possible to use inferred resources in JORC format and not in NI43-101, the reporting of resources can be misleading to investors, especially in economic studies. For the most part, most codes are identical or similar in principle, but the point of including inferred resources in economic studies by JORC etc., is fundamental different from NI43-101. Figure 2.1.1 does not show any link from the inferred category to the reserves category.

According to the JORC Code: *Confidence in the estimate of inferred mineral resources is usually not sufficient to allow the results of the application of technical and economic parameters to be used for detailed planning. For this reason, there is no direct link from an inferred resource to any category of ore reserves (Figure 2.1.1). Caution should be exercised if this category is considered in technical and economic studies.*[7]

In this author's view, the reference above (7) contradicts itself with Figure 2.1.1 and can be difficult for an investor to understand. The line mentions words like 'is not usually sufficient' which is not very definitive, and may lead to ambiguity for the investor. The sentence then states this category of resources can be used with caution which raise more questions about the clarity of such statements.

4 Case studies on current resource reporting

4.1 Case Study 1 – NI43-101

Company - Southwestern Resources Corp.

4.1.1 Background on Company (October 2008)

Southwestern Resources Corp. (Southwestern) is a junior exploration company based in Vancouver, Canada. Southwestern is be involved in project evaluation and exploration for gold, silver and other base metals. The company had some issues in 2007 about assay samples being tampered with that created an over estimate of their mineral resources.

As would be expected the market capitalization of the company decreased because of this event. The Independent Engineering Consult Group that created the estimate, produced a NI43-101 compliant document of their project. This over estimation of mineral resources became public information and then their CEO resigned. The project was a gold property located in China.

In August 2007; Southwestern was a Vancouver, Canada based mineral exploration company conducting project evaluations for the identification and acquisition of gold, silver and base metal properties in China and Peru. The Company had projects that included the Liam Gold-Silver Project in Peru, a joint venture with Newmont Peru Limited, the Antay Porphyry Copper-Gold Project in Peru with Anglo American Exploration Peru S.A. and the Boka Gold Project in China. In 2007, the company had both a good financial image and large upside potential.

The project of interest for this research is the Boka Gold Project in China. The initial document stated mineral resources were in accordance with NI43-101 which

was based on incorrect assay data in March 2007. The Company then hired another Independent Engineering Consulting Group to conduct a due diligence/validation on the assay database and finally create a new mineral resource estimate, after there were some suspicions of tampering with the assay database.

In July, 2007 the company put out a press release stating that it withdrew its previously announced mineral resource estimate and started legal action in the Supreme Court against its former CEO.

4.1.2 Southwestern Public Information – Toronto Stock Exchange (TSX)

The following below gives an indication of the Company's value after the issue with resources estimation.

As of 29th October, 2008 - Southwestern is listed on the TSX under the symbol SWG-T.

The TSX market: (Canadian Currency)

Open:	$0.135
High:	$0.200
Low:	$0.135
Bid Price:	$0.180
Bid Size:	228
Ask Price:	$0.200
Ask Size:	24
Average Volume:	133,600
EPS:	- $1.190
52 Week High:	$0.980 (27th October, 2008)
Share Outstanding:	44.923 Million
Market Capitalization:	$8.985

4.1.3 Mineral Resource Reporting Review

A major consulting company was commissioned by Southwestern Resource to prepare a geological model and resource estimate for the Boka Gold Project, in Yunnan Province, P.R. China. The mineral bodies of interest are “B1N” and “B1S”, and the mineral resource estimate was going to be used for a NI43-101 and eventually for a pre-feasibility study. The NI43-101 was completed in January 2007.

For the mineral resource estimate, a total of one hundred and seventy one (171) diamond holes were incorporated in the model. The holes were drilled on 50m N-S x 50m E-W spacing, where possible, to ensure a high degree of confidence in the resource estimate.

After drilling, the core was placed in a plastic core tray with wooden markers at even meter intervals. Recovery rates varied because of the loose natural of the material. The core trays were transported to the storage facility via 4WD vehicle. The core was then logged on the ground by Southwestern’s geologist and the same was recorded on paper and then transferred to the drill hole database.

The plan was the*; creation of a coherent 3D model of either lithology or mineralization by linking sectional interpretations along strike for B1N makes little sense until major sub-vertical NNE striking discontinuity is introduced. The consultancy has based the location of this discontinuity on a number of features including:*

- *surface expression from geophysical surface mapping;*
- *southern termination of the major Gabbro unit;*
- *Au grade trends;*
- *Au grade discontinuities;*
- *sudden changes in the direction of some adits which may be an indication that they*

have hit a structure and driven along it;.

- *location of smaller intruded Gabbro unit; and*
- *topographic features.*

Interpretations for the B1N discontinuity zone, lithology and subsequent lodes proceeded in a series of phases, first modeling the discontinuity then the lithology then the grade using the following work plan:

- *sectional interpretation of individual features;*
- *examination of long section with sectional interpretation imposed to check continuity;*
- *adjustment of sectional interpretation where necessary;*
- *examination and interpretation in plan guided by imposed sectional interpretation;*
- *adjustment of sectional interpretation where necessary;*
- *build preliminary 3D model;*
- *repeat the entire procedure with preliminary 3D model imposed to check for irregular continuity in 3D;*
- *create final 3D model;*
- *repeat for lithology interpretation with discontinuity model imposed; and*
- *repeat for grade model with discontinuity and lithology model imposed.*

No lithology models were created for B1S due to the lower density of drilling and observed lack of lithological control of mineralization in B1N. A series of major offsetting faults were modeled for B1S based on surface expression and observed discontinuities in long section.

There is a large gap in the drilling of B1S where surface access has not been possible and the southern strike extension from section 5000 is unable to be determined. For the current model the southern strike extension has been terminated at a possible fault between 20m and 60m from section 5000. The

closest southern drilling is some 200m further south and does not contain any significant mineralisation.[1]

An amazing thing about this project was that a lot of effort was placed on the resource estimate but not the input data for the resource estimate. This has been the issue for many projects using the NI43-101 report format. For example, the company had a duplicate and standard ratio of 45:1 and 47:1 respectively which is generally lower than the accepted standards of approximately 25:1. The report also stated that there was a high nugget effect and some outliers which will imply extra precaution should have been given to the estimate.

The NI43-101 report did identify many issues with the resource estimate, and the preparation of the report was not aligned with the guidelines. For example, NI43-101 clearly states that contained resources should not be stated unless corresponding tonnages, grades and mining, mineral processing and metallurgical recoveries are also presented – according to CIM definition standards. Although there were major concerns by the independent consulting group, they still decided to publish the mineral resource numbers. Most importantly the report was successfully listed on the stock exchange and investors could have been misled.

4.1.4 Mineral Resource Report – Misled the Public

Later in July 2007 Southwestern commissioned another independent consulting group to conduct a complete drill hole database validation and to prepare another mineral resource estimate for the Boka property. This move by Southwestern was initiated because of indications that the mineral resource estimate was overstated due to tampering with the drill hole gold assays.

The new consulting group conducted numerous checks to ensure that the new drill hole database is accurately based on the assay certificates. The previous mineral resource statement in fact did mislead the public because of manual and

deliberate changes to gold assay data. The following steps proved that the earlier resource estimate was inaccurate and could not be used in future as a valid database:

- Compare assay certificates with electronic assay which will be used for estimate
- Rebuild new database with verified data
- Ensure no errors were in the database
- Verify all the electronic database (collar, survey, assay, lithology) with original records
- Independent sampling and analysis

Using the new drill hole database, the new consulting group estimated an inferred mineral resource estimate. There were no measured or indicated resources because of lack of understanding of the structures within the deposit. Additionally, the classification was only in the inferred category because of poor sample recoveries and data issues.

The previous estimate had measured, indicated and inferred resources and the new estimate had only inferred resources with the correct and validated data. The previous consulting group did identify issues with model structures and data integrity but proceeded with a classification and estimate that was inaccurate.

Although this project had issues from the beginning, it was able to successfully report the new inferred mineral resources in the public domain, even though the reporting format was not consistent with NI43-101 standards.. With the new resource statement of resources, contained metal was reported without corresponding mineral processing and metallurgical recoveries, as clearly stated in CIM Definition Standards for Mineral Resources and Mineral Reserves (2005). Frauds occur between the actual drilling and the creation of electronic drill hole database that will be used for resource estimation.

By reducing or eliminating fraud in the period between the drilling and the creation of the electronic drill hole database, practical help will be given the public in making wise decisions based on these public documents. In the case with Bre-X, the fraud occurred during this same interval. This thesis research will focus on the drilling to database entry interval, and rigid guidelines will be established in a quantitative manner so that most people would be able to determine whether there are high risks involved.

4.2 Case Study 2 – JORC Document

Company - Beaconsfield Gold NL (ASX Code BCD)

4.2.1 Background on Company (October 2008)

Beaconsfield Gold is a gold producing company with properties all over Australia and listed on the Australian Securities Exchange. The project of interest for this research will be the “Stavely Project – Thursdays Gossan Copper Prospect” taken from the multi projects that the company is currently working.

Beaconsfield acquired the Stavely project in mid 2005 from New Challenge Resources Pty Ltd and commenced exploration drilling to delineate and outline the presence of mineralization. At Thursday’s Gossan, the Stavely Project contains a very large area of copper mineralization associated with a copper-porphyry deposit. Many previous explorers drilled the area and recently Newcrest found some relatively high grade copper mineralization in a drill hole intersection.

The company’s focus is to delineate copper mineralization that is near surface so that it can be easily mined and heap leached. There were previous shallow mining ventures that produced copper-gold mineralization associated with a secondary supergene blanket. The preliminary drilling by the company did prove the existence of the proposed continuous supergene copper mineralization. The company then further conducted a follow up drill program in March 2008 to

increase confidence in their understanding of the geology and to prepare a JORC compliant resource estimate.

In June 2008, Beaconsfield retained an Australian company to prepare a JORC compliant resource estimate for the Thursday Gossan Copper Deposit of the Stavely Project which is located in Central Western, Victoria, Australia. The JORC compliant resource estimate was completed in July 2008 and then listed on the ASX in August 2008.

4.2.2 Beaconsfield Gold Public Information – Australian Securities Exchange (ASX)

As of 29th October, 2008 – Beaconsfield is listed on the ASX under the symbol BCD.

The ASX market: (Australian Currency)

Open:	$0.093
High:	$0.093
Low:	$0.092
Bid Price:	$0.093
Offer:	$0.097
Average Volume:	150,000
Share Outstanding:	430 Million
Market Capitalization:	$40 Million
Open:	$0.093
High:	$0.093
Low:	$0.092
Bid Price:	$0.093

It was quite interesting to note how the ASX reports stock prices as compared to the TSX. More information is listed on the TSX for publicly traded companies.

4.2.3 Mineral Resource Reporting Review

In addition to preparing a mineral resource report that is JORC compliant, the following were also required to be conducted by the Independent Engineer group:

- QA/QC of drill hole data
- Generate wireframes of deposit with consideration of the specific geology
- Statistical analysis of physical and chemical characteristics of reviewed drill hole data
- Generate optimum composite length
- Statistical analysis of the composite data
- Variogram analysis of drill hole composite data constrained by geology
- Grade estimation for block model based on appropriate method
- Cross validation of block model (visual and statistical)
- Resource classification based on JORC

Although numerous mentions of drill hole data review were quoted, the Independent Engineer group stated that there were no data for drill hole information for holes prior to 2006. No sampling methodologies for drill holes prior to 2006 were available. The Independent Engineer group went on further to state that they assumed the drill holes prior to 2006 were sampled and assayed to industry standards.

Base on the ASX document “Beaconsfield Gold N.L., A.C.N 057 793 834, 7 August 2008, Maiden Copper Resource in Western Victoria – Stavely Project, Thursday’s Gossan Resource Estimate- Table 4.1_1” clearly shows a total of 106 drill holes of which only 46 drill holes were accounted for in the JORC document. Hence, the JORC compliant mineral resource estimate was based on less than

50% of validated drill hole data. The fact that the estimate was derived from more than 50% assumed assay data should definitely be flagged as a concern and the ASX should seriously consider the accuracy of the assumptions in such public reporting, as the existing data could be very misleading to the investor.

It is evident again that a lot of focus is placed on variograms, estimation criteria and statistical analysis for resource reporting and not on the actual input data. It is this author's view that a lot of scam happens between actual drilling results and the electronic drill hole database input, which is quite similar to the NI 43-101 document in Case 1.

Resource Category	Cu Lower CoG	Tonnes	Avg. Grade above CoG	Contained (Cu)
	(Cu %)	(Millions)	(Cu %)	Tonnes
Inferred	0	12.4	0.42	51,700
	0.3	10.6	0.45	47,300
	0.4	5.6	0.53	30,000
	0.5	2.3	0.66	15,400

Table 1 : JORC Compliant Resource Estimate for Stavely Project

This is the JORC compliant final resource report that is listed on the ASX. This reporting format clearly did not follow the JORC Code (2004 Edition) and the following deviations noted from the Code:

1) Mineral resources should not be liste at zero cut off grade because they will not fit within the definition of a mineral resource.

2) The categorization of mineral resources for this project is fundamentally flawed because according to JORC Code, inferred resources should be generated when there is limited geological knowledge and understanding. The categorization of mineral resources for this project was based on

unavailable sampling and assay information, which according to the Independent Engineer decreases the confidence in the data. Because of the low confidence in the drill hole database validation, the mineral resources were classified as inferred mineral resources.

3) There should be very clear supporting documentation according to the JORC code when stating contained metal amounts.

4) Additional information should be documented if the mineral resource estimate is derived from data which was not properly validated, especially when more than 50% of the drill hole data cannot be validated.
5) Even though a number of times it was mentioned that the drill hole database was not validated prior to 2006 – the ASX allowed the publishing of this document and very clearly a number of the JORC code standards were not followed.

In this thesis research, these types of poor practices will be clearly identified in a graph format that will be easy to understand. This type of visual aid has the potential to aid both the stock exchange and any interested investor.

4.3 Case Study 3 – SEC Filing 10K

Company – Geovic Mining Corp.

4.3.1 Background on Company (November 2008)

Geovic Mining Corp (Geovic) is a publicly listed company with projects in Cameroon, Africa, the USA, and a few other countries. Its current primary focus is in Cameroon on a cobalt-nickel-manganese project. The project has recently passed the feasibility study level and is currently in the process of raising capital.

The company completed its feasibility study in January 2008 and an optimization study in September 2008. While the optimization study was being done, Geovic

was concurrently trying to raise capital for the start up of the project. The optimization study was to improve the mineral processing aspect of the project and reduce operating and capital costs. The optimization study did achieve some reductions in cost; however commodity prices started on the downward trend and hence the company is still trying to raise capital as of November 2008.

Based on the optimization study, the mine life will be 18 years with an initial capital investment of approximately $450 million US dollars. The total reserves according to NI43-101 standards are 55 million tonnes of ore with an average grade of 0.25% cobalt, 0.69 nickel and 1.33% manganese. The strip ratio (waste:ore) is 1.88 for the life of the mine, which means a total of approximately 103 million tonnes of waste will have to be mined. There is an additional 145 million tonnes of inferred resources (NI43-101 compliant) from a similar nearby deposit.

In addition to the cobalt-nickel-manganese project in Cameroon, Geovic has uranium properties in USA, chromite properties in New Caledonia, and a copper deposit in the Philippines. Most of the properties are at an exploration stage and the company is currently conducting drilling to delineate the deposit.

Geovic is based in Colorado and is listed on the Toronto Stock Exchange (GMC) and also traded in the US on Over The Counter Bulletin Board (OTC.BB) under the ticker GVCM. There are three series of warrants that are traded on the Toronto Stock Exchange (GMC.WT, GMC.WTA, GMC.WTB). Geovic reports resources and reserves which supposedly are aligned with NI43-101 Code and the reserves with the SEC Guide 7. For this case study, the SEC portion of the filing will be reviewed.

4.3.2 Geovic Public Information – (US OTC.BB)

The following below gives an indication of the Company's value based on its reserves.

As of 12th November, 2008 - Geovic is listed on the (US OTC.BB) under the symbol GVCM.

The market: (US Currency)

Open:	$0.71
Bid:	$0.71 x 2500
Ask:	$0.79 x 2500
Average Volume:	279,951
52 Week Range:	$0.51 - $5.89
Day Range	$0.69 - $0.79
Last Trade	$0.70
Previous Close	$0.74

It's truly interesting to see how each stock exchange list public companies' stock parameters. For Geovic, on their website (www.geovic.net), the comparison was evident as they are listed both in Canada and the USA. On the Canadian side – much more details were quoted relating to their stock indicators.

4.3.3 Mineral Resource Reporting Review

For the SEC, companies are not required to quote mineral resources, as mentioned in Chapter 2; however, Geovic actually listed mineral resources in its 10K SEC filing for year end 2007.

According to the United States Security and Exchange Commission, Washington D.C. 20549, Form 10-K, for fiscal year ended December 2007, Commission File Number 000-52646; *Under U.S. standards, mineralization may not be classified as a "reserve" unless the determination has been made that the mineralization could be economically and legally produced or extracted at the time the reserve*

determination is made. U.S. investors are cautioned not to assume that all or any part of measured or indicated resources will ever be converted into reserves.

The SEC permits issuers to report "resources" as in place tonnage and grade without reference to unit measured. Information concerning descriptions of mineralization and resources included in this Form 10-K may not be comparable to information made public by U.S. companies subject only to the reporting and disclosure requirements of the SEC.[2]

The SEC 10-K form reported resources and reserves which was an extract from the NI43-101 report that was used in Canada. The resource reporting was still very limited in terms of the classification procedures that the NI43-101 prescribed. Hence, it is amazing how most exchanges have their own codes/guidelines and they are very seldom followed.

After a thorough review of the resource reporting of this 10-K form, it can be concluded that investors are still at risk with these current codes/guidelines. The SEC states that you should not report resources and Geovic did; more over – the resource reporting did not follow the NI43-101 code either, and both reports are public information that investors may readily review and which may be misleading.

5 Guidelines for resource reporting

5.1 Background for Guidelines

Mining investors face the challenge of deciding which company to invest in based on their multiple international projects because of the varying nature of reporting standards worldwide. Mineral resources can be stated differently for the same project and hence the final economics can be misleading. With the recent boom in the mining industry, companies tend to prepare reports for investors, based on the eventual stock exchange for which they want the listing.

There are many resource/reserve codes worldwide namely:

- **JORC CODE** – Joint Ore Reserve Committee (Australasia)
- **SAMREC CODE –** South African Mineral Committee (South Africa)
- **REPORTING CODE** - (UK / Western Europe)
- **CIM GUIDELINES (NI43-101)** – Canadian Institute of Mining, Metallurgy and Petroleum
- **SME GUIDE** – Society for Mining, Metallurgy and Exploration (USA)
- **CERTIFICATION CODE** – (Chile)

These major codes are considered acceptable worldwide for economic investments and market related reporting. These codes differ on exact subject and therefore mining investors don't have an international standard against which to benchmark projects. It would definitely be helpful if there was one set of guidelines for all mining projects to follow.

With today's technology, the world is moving towards a single global marketplace, and therefore the mining industry should have one (1) set of guidelines similar to the international environmental and social standards for project financing (Equator

Principles). Hence, by generating specific global guidelines, investors will be helped in the process of making prudent investments and this should result in a reduction in the number of scams.

5.2 Assumptions and considerations for Guidelines

This research will include some fundamental assumptions and definitions that will vary from the current mineral resource reporting definitions. The reasons for these new definitions are to ensure that the guidelines are actually going to be enforced and most of all that they have practical application. For example, most major code/guideline state that mineral resources should only be reported at reasonable cut off grade implying that the deposit has potential to be economic. From the Case Studies in Chapter 4, mineral resources were even reported at zero cut off grade.

In the case where the qualified person or competent person will be responsible for mineral resource reporting, this research would recommend a “Responsible Person” which was derived from the fact that the word “Responsible” is more appropriate when compared with “qualified” or “competent”. Considerable persuasive weight is attributed to this individual and hence this individual should be very knowledgeable in the specific deposit subject matter.

5.2.1 Definitions

These definitions are being proposed for the purpose of mineral resource reporting for the mining industry.

a) **“Responsible Person”** – an individual who has at least an undergraduate degree (four years of academic training from a reputable college or university) in engineering, geology or geoscience with a minimum five years relevant experience

on the subject matter of interest, for mineral resource estimates and technical reporting.

The Responsible Person must be a member of a professional organization that supports and sanctions professional ethics and a code of conduct when dealing with the public. The professional organization must have penalties for misconduct and hold individual members accountable should there be malpractice or misconduct.

It is critical that the Responsible Person must be aware he/she will be held responsible for documentation of part or the complete report that the public will eventually use for project evaluation and should be assured that he/she can generate the mineral resource estimate and technical report with confidence. If the Responsible Person is uncertain whether he/she has the relevant experience and knowledge, then he/she should not proceed.

Should there be a team effort in creating the mineral resource estimate and technical report, the Responsible Person must be satisfied with all aspects and the work product of team members for which he/she will be held responsible for in public reporting. If there are multi Responsible Persons for a mineral resource estimate and technical report, then they should collectively agree whether they are comfortable to let the public use the material for project evaluation and be responsible for their chapters of the guidelines.

For example, if one Responsible Person is accountable for data validation another for mineral resource estimate, then the second Responsible Person must communicate with the first Responsible Person to ensure data was verified against assay certificates and that they both are comfortable with the validation process. It is strongly recommended that all input for a mineral resource estimate should be under a single Responsible Person.

The reason for this new definition of the person responsible for the technical report came from the fact that the current names are not truly representatively of the duties and function for technical public reporting. The Oxford Dictionary states the following for “Responsible”:

- *having an obligation to do something, or having control over or care for someone.*
- *being the cause of something and so able to be blamed or credited for it.*
- *morally accountable for one’s behaviour.*
- *capable of being trusted.*
- *(of a job or position) involving important duties or decisions or control over others.*
- *(responsible to) having to report to and be answerable to.*

The author’s view that the term “Responsible Person” is more in line of the duties and functions of the individual involved with mineral resource reporting and that individual can be held more accountable for public reporting. The “Responsible Person” would replace the “Qualified Person”, “Competent Person” and any other named designation.

b) **Mineral Resource** – is a natural occurrence or concentration of material of interest that could have a productive use and can be legally extracted. The material includes mineralization of intrinsic value and not limited to the following; natural solid inorganic material, natural solid fossilized organic material – base and precious metals, coal, industrial minerals. Mineral Resources must be established from some form of drilling, trenching and sampling that will identify the parameters of the three dimensional deposit – for example – grade, geological characteristics and structures, and the densities of specific lithologies which aids in the estimation of quantity.

Mineral Resources can be estimated in numerous ways, but must use the drill or trenching data to complete the mineral resource estimate. The Responsible Person will validate all drill or trench sample data thoroughly before conducting the estimation procedures, and determine whether the data is adequate for the mineral resource estimate.

Mineral Resource estimates must at least be generated from the following databases;

1) Collar or trench location
    a. Hole ID,
    b. X Coordinate,
    c. Y Coordinate, and
    d. Z Coordinate.

2) Survey
    a. Hole ID, or trench designation
    b. Bearing,
    c. Dip, and
    d. Distance.

3) Assay
    a. Hole ID, or trench sample
    b. From,
    c. To, and
    d. Grades. (If multi grades)
        i. Grade A
        ii. Grade B

4) Lithology (Optional)
    a. Hole ID, or trench geology
    b. From,
    c. To, and
    d. Lithologies. (If multi lithologies)
        i. Lithology A
        ii. Lithology B

It should be noted that more parameters may be included in these databases that will be used to generate mineral resources but these are the primary data requirements for any estimate. Densities can be included and will be used to generate volume and tonnage quantities. The critical aspect must be the actual

validation of these data in the database with the actual information on/in the ground.

Mineral Resources are divided into the following categories based on geological knowledge and confidence:

- Measured Mineral Resource
- Indicated Mineral Resource
- Inferred Mineral Resource

An inferred mineral resource has less geological knowledge and confidence when compared to an indicated mineral resource. An indicated mineral resource has less geological knowledge and confidence when compared to measured mineral resources. The geological knowledge and confidence are derived from exploration and drilling and trenching of the deposit.

Notes:

This definition of mineral resource varies from most of the generally accepted codes/guidelines in the following aspects;

- It does not include anything about the resource having the potential to become economic, because it is very difficult to determine whether a mineral resource can have such potential to become economically viable if no economics are being considered. Mineral/Ore Reserves normally are generated from economics and technical parameters applied to a mineral resource.
- It does not limit the material to be within the earth's crust or on the earth.

Inferred Mineral Resources – are a portion of the mineral resources that can be estimated with limited geological knowledge and confidence. The Responsible Person must apply reasonable judgment to determine what portion of the mineral resources may be categorized into the inferred class based on exploration and drilling. Although the Responsible Person can estimate grade and tonnage for this

category, the resource report must clearly state the estimation parameters used to generate the estimate.

Due to the limited geological knowledge and confidence in the estimation of inferred mineral resource, the category of mineral resource should not be considered in any economic study. The Responsible Person must ensure that the inferred category of mineral resource is separated from the indicated mineral resource and the measured mineral resource.

Inferred mineral resources should not be combined with measured mineral resources or indicated mineral resources. Part or all of the inferred mineral resources may be converted into indicated mineral resources or eventually measured mineral resources with additional exploration and sampling. The Responsible Person would determine whether the inferred mineral resource may be upgraded to indicated mineral resource and/or measured mineral resource.

Indicated Mineral Resources – are a portion of mineral resources that can be estimated with more geological knowledge and confidence. The Responsible Person must apply reasonable judgment to determine what portion of the mineral resources may be categorized into the indicated class based on advanced exploration and drilling. Although the Responsible Person can estimate grade and tonnage of this category, they must clearly state the estimation parameters used to generate the estimate.

Due to the better geological knowledge and confidence in the estimation of indicated mineral resource, the category of indicated mineral resource may be considered in economic studies. The Responsible Person must ensure the indicated category of mineral resource be separated from inferred mineral resource and measured mineral resource.

Indicated mineral resources should not be combined with measured mineral resources or inferred mineral resources. Part or all of the indicated mineral resources may be converted into measured mineral resource with additional exploration and sampling.

The Responsible Person would determine whether the indicated mineral resource can be upgraded to a measured mineral resource. Indicated mineral resources may be converted to probable mineral reserves by applying reasonable technical, economic and socio-economic parameters.

Measured Mineral Resources – are a portion of the mineral resources that may be estimated with extensive geological knowledge and confidence. The Responsible Person must apply reasonable judgment to determine what portion of the mineral resources may be categorized into the measured class based on advanced exploration and sampling. Although the Responsible Person may estimate grade and tonnage for the “measured” category, they must clearly state the estimation parameters used to generate the estimate.

The Responsible Person may classify mineral resources into the measured category when they are absolutely sure that the grade, tonnage, densities, geology and continuity are acceptable, within reasonable limits.

Due to the extensive geological knowledge and confidence in the estimation of the measured mineral resource, this category of mineral resource may be considered in economic studies. The Responsible Person must ensure that this “measured” category of mineral resource be separated from inferred mineral resource and indicated mineral resource.

Measured mineral resources should not be combined with indicated mineral resource or inferred mineral resources. Measured mineral resources may be

converted to probable mineral reserves and/or proven mineral reserves by applying reasonable technical, economic and socio-economical parameters.

Notes:

All Technical Reports that report on resources must clearly separate each resource class and state them as: Measured Mineral Resource, Indicated Mineral Resource and/or Inferred Mineral Resource. For public reporting of mineral resources, the Responsible Person must only state the tonnage and grade of each class separately and they should never be combined. After completion of the reporting of each class separately, “Measured” and “Indicated” mineral resources can then be summed up. However; inferred mineral resources must always be separate and never summed with measured or indicated classes.

Mineral Resources must never be stated at a zero cut off grade. When reporting mineral resources the Responsible Person must document all procedures and parameters used to generate the estimates. Only Measured Mineral Resources and Indicated Mineral Resources may be used for economic studies. If the Responsible Person is not satisfied with the data/information and inputs used for the mineral resource estimate, then he/she must clearly document same and not make the report public information.

5.3 List of Guidelines

This section will include the proposed new guidelines and special emphasis will be to determine it’s practicality and whether it is relatively easier to use when compared with current standards.. The format and overall base will be structured off of the current NI43-101 and JORC templates. However, the contained material will differ and be in a question format as compared to the current standard of descriptive writing.

5.3.1 Table of Contents of New Guidelines

- Cover Page
- Table of Contents

Chapter 1 – Responsible Person – Qualifications and Experience

Chapter 2 – Other Responsible Person/s – Data and Information

Chapter 3 – Executive Summary

Chapter 4 – Introduction

Chapter 5 – Property Location, neighboring property and Description

Chapter 6 – Property Legal Permits

Chapter 7 – Regional, Local and Property Geology

Chapter 8 – Deposit Nature and Mineralization

Chapter 9 – Property History – Previous Mining Records

Chapter 10 – Exploration Potential

Chapter 11 – Drilling

Chapter 12 – Sampling Procedures

Chapter 13 – Sample preparation, assay analysis and custody

Chapter 14 – Drillhole Database and Verification

Chapter 15 – Mineral Resource Estimate

Chapter 16 – Mining, Processing and G&A

Chapter 17 – Mineral Reserve Estimate

Chapter 18 – Economic Cash Flow Model

Chapter 19 – Other relevant information

Chapter 20 – Recommendations, Risks and Conclusions

Chapter 21 – References

- List of Figures
- List of Tables

This research will focus only on the resources side which will include all bullet points and Chapters 1-15. Additionally, the core of this research will be based on Chapter 6, and Chapters 11-15 inclusive.

Notes:

There will be a scoring matrix whereby 10 is rated as the highest and "Yes", while 1 is rated as the lowest and equivalent to a "No".

- Cover Page

The cover will include the title of the technical report and general information pertaining to the company and project. The following is recommended but is not limited to:

  - Title of Report
  - Name and address of Company
  - Name and address of Project
  - Name and address of authors
  - Date

- Table of Contents

The table of contents will show where in the report the respective sections and chapter are located. An example can be 5.3.1. Also the list of tables and figures will be included in the table of contents.

Chapter 1 – Responsible Persons (RP) – Qualifications and Experience

The responsible person is defined in 5.2.1.

1) Name, date and address of Responsible Person/s

2) Is your undergraduate degree in engineering, geology or geoscience?

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

3) Did your undergraduate degree (2) include four (4) years of academic training from a reputable university or college or equivalent?

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

4) Do you have five (5) years of relevant experience in the subject area of this report?

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

5) State all previous work history, previous involvement, other qualifications, professional membership and other relevant information?

6) Are you comfortable with this subject area or relevant portion of this report as define in

section 5.2.1?

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

7) List all Chapters/Sections that will be prepared and be held responsible by you?

8) Overall for Chapter 1 – Did you meet the requirements, and are you willing and comfortable being designated the Responsible Person?

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

Chapter 2 – Other Responsible Person/s – Data and Information

The Responsible Person/s must state all chapters and sections that were prepared by other (RPs) with their corresponding names. The author must include a disclaimer of responsibility where all data/information that was relied upon or accepted in the report and was not created or generated by them. Should the author not be an expert in a specific area and received data on the said subject area – then he/she must disclose that the data relied upon was generated by someone else. This may happen in the case with information concerning legal ownership, country risk, political, environmental and other relevant factors that are discussed in particular sections.

1) List all other (RPs) as define in 5.2.1 and corresponding sections/chapters that they prepared.

2) Are you comfortable that 1) did not have a material effect on the drillhole database and resource estimate?

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

3) Overall for Chapter 2 – How comfortable are you that the other RPs information will not have a material impact on the final resource estimate that the public will utilize and are you satisfied with the level of details?

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

Chapter 3 – Executive Summary

The executive summary would give a brief overview of the project and may include but is not limited to the following:

- Property, Location and Ownership
- Geology, mineralization and type of deposit
- Drilling, Resource Estimate, and parameters used to generate the estimate
- Recommendations and Conclusions by the RP

Chapter 4 – Introduction

The introduction should include a wider overview of the project. The following may be included but are not limited to the following:

- Terms of reference and purpose of the technical report
- Source of information
- Effective date of report
- Limitations and reliance on information
- Disclaimers and cautionary statement for investors
- Mineral Resource and Mineral Reserve Estimates
- Economic Analysis and Pricing
- Key project personnel and respective areas
- Date of site visits

Chapter 5 – Property Location, Neighboring Property and Description

The property location, neighboring property and description of each property that is included in the report must describe the following:

- The location of the project site on a reasonable scale with major points of interest
    - Roads
    - Infrastructure
    - Property boundary
    - Neighboring property
    - Mineralization
    - Historical mine workings
    - Waste disposal
    - Mineral resources
    - Reservation/Nature/Park/Burial Ground, etc.

Ideally a plan view map depicting the above and any other relevant points of interest.

- Area of each property
- Survey of property boundaries
- Description of how the boundaries were demarcated
- Neighboring Property
    - Mineralization
    - Historical mine workings
    - Waste disposal
    - Mineral resources
    - Reservation/Nature/Park/Burial Ground etc
    - If RP cannot confirm, he/she should include a cautionary statement

Chapter 6 – Property Legal Permits

The property legal permits are critical in this report and much emphasis must be placed to accurately determine the status of appropriate mineral tenure. Should the author not be clear on this subject matter, he/she must clearly seek professional advice and clearly disclose same. If there are absolutely any doubts, then the RP must seek professional advice immediately.

This Chapter should be reviewed by the legal, environmental and financial teams that are responsible for the preparation of this report. Based on the definition of mineral resources as stated earlier, the permits/tenure must be valid to justify and support the calculation of mineral resources.

The following should be clearly stated:

- Type of mineral tenure, name and number
    - Claim
    - Concession
    - Lease
    - License
    - Area
    - Registration date
    - Expiration date
- The nature and extent of the title that was issued, what rights are included, any other rights and all terms and conditions.
- The agreement for any royalties and payments or other agreements to which the property will be subjected. This must include future time estimates and constraints so that the resources/reserves will end at the same time as the permits expire.
- The nature and extent of all environmental permits for the safe extraction of mineral reserves.
- All other permits necessary for the mining and tailings disposal.
- A table with all names, number, area, registered date and expiration date of permits

- Any agreements with third parties such as JV, partnership and other impediments that may occur in obtaining licenses

1) Are there adequate valid permits to conduct drilling to generate a mineral resource estimate? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

2) Is the project area under legally valid permits to conduct mining activities? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

3) Are the environmental permits valid? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

4) Are there any other permits that are necessary to conduct mining operations and both waste and tailings disposal. If yes, list all with dates of registration and expiration.

5) Is the project economic within the valid dates of the permits? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

6) Overall for Chapter 6 – How comfortable are you that all the necessary permits are valid and will be so for the mine life plus reclamation? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

Chapter 7 – Regional, Local and Property Geology

The Regional and Local geology should clearly describe the geology of the property from a local to a regional scale. The description should be based on some form of scientific backup data, such as existing National and State geologic reports, University theses, etc.

This may include, but is not limited to exploration work and field data which have been interpreted to a reasonably acceptable level by a qualified person.

Should data be available, the following should be included in a very clear and precise manner:

- Regional Geology
- Local Geology
- Property Geology

Figures are highly recommended to be included in this Chapter.

Chapter 8 – Deposit Nature and Mineralization

The deposit nature and mineralization should describe the characteristics of the deposit being studied in a clear and precise manner.

The mineralization should include but is not limited to the following:

- Description of stratigraphy
- Possible sections showing the known mineralization
- Structures and structural control of deposit
- Alteration and rock strength features which may impact geotechnical and stability issues.
- All mineralized zones on the property
- Rock type and surrounding rock types
- Relevant geology controls
- Approximate length of mineralization
- Approximate width of mineralization
- Approximate depth of mineralization
- Direction of mineralization
- Approximate continuity of mineralization
- Mineralization type, character and distribution

Chapter 9 – Property History – Previous Mining Records

The property history should state all previous mineral resource estimates and mineral reserves of the property of interest if any estimate was done. The RP must clearly disclose any estimate and not attach himself/herself to the numbers in the estimate. These estimates should include the date when it was done and possibility by which company/person. The estimate should also be quoted under the system, if any, by which it was estimated (for example, JORC, SAMREC).

All production on the property should be reported with the corresponding tons and grades. A plan view with the production area will be helpful, and any material on the tailing disposal or other relevant information. All development work that is present on the property should be documented.

All known exploration work must be documented and corresponding grades for the particular commodity. The samples and grades can be tabulated for easy reference to give an indication that there was exploration work conducted in the area. All relevant data from the exploration work should be documented.

The history of ownership of the property should be stated with the corresponding dates of acquisition and expiration. All legal aspects of ownership should be documented and the property boundary of the ownerships.

Chapter 10 – Exploration Potential

All exploration work that was conducted on the property should be documented to the best available data. Historical exploration is also recommended, and the relevant approach used and type of previous exploration (soil sampling, trenching, drilling, etc).

Extension of known mineralization trends can be classified as exploration potential with the review of the RP. These extensions must be scientific and have some realistic points to maintain focus. The interpretation of the exploration potential should be conducted by the responsible person and the figures demonstrating this potential should be precisely documented.

All exploration work should be supervised by a RP and the same for the field work planned. The RP should be aware of the recording procedures of all data from exploration work. The location of samples must be accessible to any other party who may be required to verify or audit the location and assay grades. The quality and consistency of the exploration data should be of utmost importance. A plan view figure would be highly recommended for all planned exploration work.

The exploration process may include the following;

- Planning
- Mapping
- Sampling
- Sample preparation
- Sample security
- Testing
- Sampling Procedures
- Results in a readily useable format
- RP report on the process

Chapter 11 – Drilling

This Chapter is considered very important to this report and hence the material contained should be carefully reviewed by the RP. Should the RP fail to completely and thoroughly review the contents and inputs to this chapter, , then he/she may be held liable should any fraud be later detected.

The following should be included in this Chapter:

- Type, size and name of drill/s used
- Drill Company and address
- Drillers name and address
- Drill helper and all other persons related to the drilling
- Drill Plan View Map with, co-ordinate, dips and other relevant dates
- Pictures of drill in area with driller and actual drilling with extraction of sample
- Purpose of drill program and spacing
- All holes drilled, date, length and corresponding contractor company
- Proper data recording system – under supervision of RP
- Proper checking system to ensure reliable drill data
- Drill sample material that was retained

- Drill logs – under supervision of RP
- Core or sample recoveries should be noted on the logs
- Cross Section of drill holes with topography
- Pictures of core when possible
- A report from driller on a periodic basis on visits by other people and other relevant data.

1) Are there relevant permits to drill on the particular property? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

2) Is there any chance the drilling was meddled with which may materially affect the final results? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

3) Were there any company employees or individuals who may have tampered with the drilling that could materially affect the final results? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

4) As the RP, how comfortable are you that the drilling results are truly reflective of what actually took place at the time of drilling? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

5) Overall for Chapter 11 – How comfortable are you that all the necessary precautions were taken to ensure that drilling was done to a reasonable acceptable level and the results are dependable? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

Chapter 12 – Sampling Procedures

This Chapter is also considered very important to this report and hence the material contained should be carefully reviewed by the RP. Should the RP fail to completely and thoroughly review this Chapter, then he/she may be held liable should there be any fraud detected at a later date.

There is a connection with this Chapter and the previous chapter on the sampling method and all other relevant sampling procedures between the time of drilling/sampling and the preparation of the database. Sampling must be done under the supervision of a RP and he/she must ensure that all relevant aspects are done to a reasonable professionally accepted level. A fully detailed document from drilling stage to the sampling stage must be reported and include the following;

- Persons visited the drill site while sampling was being done and reason they were there.
- All relevant information that could affect the final estimate

The following also should be included but is not limited to:

- List of all sampling programs, date, company and samplers' name
- Practice and procedures used
- Sampling specifications

- Method, Year, Company, number, location,
- Nature, spacing and any other relevant information

- Sampling and sample recoveries that may materially affect the final results
- Sample quantity, description and representativeness of the deposit
- Description on the mineralization zones, trends, faults, structural changes and geology
- Sampling intervals and other relevant data
- Complete description on sample reduction prior to shipping if applicable

1) With what degree of certainty have you that there is a clear connection between drilling/trenching and samples taken and that the sample analyzed represents the same interval that was sampled. Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

2) How similar are the sampling methods with existing mining/exploration practices? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

3) Was there any chance that the sampling methods and procedures used were tampered with that could materially change the results? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

4) As the RP on this report, how comfortable are you that the sampling methods and procedures were done to a reasonable level of accuracy? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

5) Overall for Chapter 12 – How comfortable are you that all the necessary precautions were taken to ensure that sampling was done to a reasonably acceptable mining industry standard level and that the results are dependable? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

Chapter 13 – Sample preparation, assay analysis and custody

This Chapter is considered very important to this report and hence the material contained should be carefully reviewed by the RP. Should the RP fail to completely and thoroughly review this Chapter, then he/she may be held liable should there be any fraud detected later.

There must be a correlation between this Chapter and the previous chapter on the sampling preparation, analysis and custody, and all other relevant sampling information while and after the sample is being taken. Sampling preparation, analysis and custody, must be done under the supervision of a RP and he/she must ensure that all relevant aspects be done to a reasonable mining industry level of acceptance.

A fully detailed document from the drilling stage to the sampling preparation, analysis and custody must be reported and include the following;

- Persons who visited the sampling preparation, analysis and custody areas and corresponding reasons
- Description of the preparation of the sample, the analysis and full chain of custody of all samples

- Description of the laboratories that were used to analyze the samples and whether the laboratory is certified
- A flowchart of all the steps of the sample being taken, prepared, analyzed and the appropriate chain of custody records
- All relevant information that may affect the final estimate

Based on the previous chapters which depicted the areas where most mining fraud occurs, it is crucial to ensure that the samples are prepared, analyzed and custodian records are fully supervised by the RPs, and that special precaution and QA/QC protocols are implemented for the highest possible standards.

Additionally the following should be included but are not limited to;

- Full description of sampling method
- All QA/QC measures for the complete sample process
    - Blanks
    - Check Assay
    - Twinning
    - Any edits/changes to original data
    - Any person's name, date and their relationship to the company
- Full description of custody before and after the samples are sent for testing
- Full description of sample reduction and possible areas that could affect the results
- Full description of the security of the samples from when collected to the time it is delivered to the analytical testing facility.
- Sample integrity and documentation of its protection
- Full description of the persons involved in this Chapter and their relationship to the Company, date and all other relevant information
- Any other relevant information

1) What degree of certainty do you as the RP have that the sample procedures are appropriate for the sampling preparation, analyses and custody arrangements? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

2) The relevance and appropriateness of the assaying and laboratory procedures? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

3) The degree of quality controls implemented by the client/customer as well as the laboratories internally (blanks, duplicates, alternative laboratories, and representativeness? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

4) The degree of comparison and measure of precision of high grade intersections by independent parties? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

5) How comfortable are you that the sampling preparation, analysis and custody were not deliberately tampered with? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

6) How comfortable are you that the samples prepared, analyzed and secured were the samples taken from the corresponding drilling program? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

7) As RP, how comfortable were you with the sample preparation, and the sample used for analysis that the reduced analytical sample was representative of the larger sample taken? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

8) As RP, how comfortable were you with the laboratory and material used in the analytical process? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

9) As RP, how comfortable were you with the reliability of the results? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

10) As RP, how comfortable were you with duplicate analyses conducted and how variable was the comparison? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

11) As RP, how comfortable were you with the complete secure custody of the samples? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

12) Was there any part of this process (sample preparation, analysis and security), where there may be some level of suspicion about fraud? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

13) What percentage of the samples used for analyses is retained for independent review? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

14) Overall for Chapter 13 – What is your overall level of acceptance for the adequacy of the sample preparation, analysis and security? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

Chapter 14 – Drillhole Database and Verification

This Chapter is considered very important to this report and hence the material contained should be carefully reviewed by the RP. Should the RP fail to completely and thoroughly review this Chapter, then he/she may be held liable should there be any fraud detected.

There is a corresponding connection with this Chapter and the previous chapter, and all other relevant information should be in included in the details. Drillhole database preparation and verification must be done under the supervision of a RP and he/she must ensure that all relevant information meet with acceptable industry standards.

A fully detailed document from drilling stage to the sampling preparation, analyses and custody to the preparation of the drillhole database must be reported and include the following;

- Persons who prepared the format for the drillhole database and the persons who input the data
- Description of the formats used and whether it was supervised by a RP
- Complete description of where the data was obtained for at least the Drill Collar, Survey, Topography and Assay database.
    - Collar Database – explain whether X,Y,Z coordinates where derived from GPS, surveyed etc
    - Topography database
    - Survey Database – explain how the dip and bearing were derived
    - Assay Database – explain the chain of custody of the assay and precisely how the grades in the database were derived.
    - Lithology Database – specify appropriate field and how they were derived
    - All other relevant database information.
- State the number of drill holes in the database and explain any differences detected and the action taken to rectify the problems so that all databases have the same number of drill holes.
- All relevant information that may affect the final estimate

It is of utmost importance that the drillhole database truly reflects the actual data and that special precautions and QA/QC protocols are implemented to the best possible standards. Most fraud happens at this stage and hopefully this research can help reduce or eliminate fraud.

A precise documentation of all quality control protocols that were used in the verification process of the drillhole database. The following should be included in the documentation;

- Multiple laboratories for comparison of results (assay, densities)
- Standard reference material used and its source
- Blanks
- Independent Review of all QA/QC protocols
- Twinning of drill holes and the comparison of them
- Comparison of assay results and retained samples that were not sent to laboratory

The drillhole database chain of custody must be clearly defined and each person/company that had access to the sample must state their name, address and date. The final database that will be used for the resource estimate must clearly indicate all the changes and edits that were done. These changes/edits must be done under the supervision of a RP.

1) Approximately what level of certainty do you have that there is a clear connection between this Chapter and the previous Chapter, and that there is no allowable potential for fraud? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

2) How well do you believe that the drill hole database is reflective of the actual data in the ground? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

3) What level of certainty do you have that the collar database is reflective of the actual data on the ground? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

4) What degree of certainty do you have that the survey database is reflective of the actual data on the ground? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

5) What degree of certainty do you have that the assay database is reflective of the actual sampled intervals? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

6) Approximately how well does the assay database compare with another laboratory result for the exact same samples? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

7) What level of certainty do you have that the assay database was not tampered with? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

8) What degree of certainty do you have to believe that the assay database represents the commodity grades in the ground where the corresponding samples were taken? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

9) What degree of certainty do you have to believe that the QC procedures were adequate and reliable? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

10) With what degree of certainty do you think that the drillhole database was prepared to a reasonable acceptable level for mineral resource estimation? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

11) How comfortable are you with the percentage of total sample retained as a record for potential future use or audits? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

12) What is the likelihood that the retained samples can be easily identified and extracted for assaying to conduct a comparison of grades? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

13) What is the likelihood someone deliberately changed the assay values in the database? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

14) Overall for Chapter 14 – What is your overall level of acceptance for the drill hole database and verification of the final resource estimate? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

Chapter 15 – Mineral Resource Estimate

This Chapter is considered very important to this report and hence the material contained should be carefully reviewed by the RP. Should the RP fail to completely and thoroughly review this Chapter, then he/she may be held liable should there be any fraud detected.

There is a correspondence of this Chapter and the previous three (3) chapters, and all other relevant information should be in included in the details. Mineral resource estimate preparation and verification must be done under the supervision of a RP and he/she must ensure that all relevant aspects be done to a reasonably acceptable mining industry standard.

A fully detailed document from the preparation of the drillhole database that will be used for the mineral resource estimate must be reported and include the following;

- The integrity and validity of the drillhole database that will be used for the mineral resource estimate

- The RP/s name, date and relationship to the company and who will prepare the resource estimate
- State what method and software will be used for the mineral resource estimate
- Describe the importation of all drillhole databases and any modifications of the databases
- Produce basic statistics on the raw assay data
- Describe the compositing process and generate statistics on the composite data
- Describe how density was estimated and comment on the reliability of the result
- Describe any zoning and wireframes that will constrain the block model
- Describe any trends (dips, azimuth) that will influence the search ellipse
- If any kriging was done – describe the following;
    - Variograms on composite data for each zone
    - Downhole variograms
    - Kriging parameters that will be used for the estimate
    - Nugget effect
    - Diagrams of the variograms that will be used for mineral resource estimation
    - All other relevant parameters
    - All assumptions
- State the mineral resource estimate
    - Grade with units
    - Tonnage
    - Grade and tonnage at different cut off grades
    - Grade tonnage curve
    - Block size
- Describe the resource classification parameters and reasoning
- State mineral resource estimate for each category
- All drillhole database information must be validated before conducting any estimate

1) With what degree of certainty are you comfortable that there is a clear connection between this Chapter and the previous Chapter, and there is no potential scope for fraud? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

2) What degree of certainty do you have that the drillhole database is reflective of the actual drillhole sample data? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

3) As RP – how comfortable are you that the drillhole database is reliable for the final mineral resource estimate? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

4) Was the drillhole database reviewed by a third party? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

5) To what degree are you comfortable that the drillhole database has been validated? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

6) How does the mean assay grade compare to the mean composite grade? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

7) How comfortable are you that the block model is adequate and reliable? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

8) How comfortable are you that the mineral resource estimation process (kriging, IDs) are adequate and reliable? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

10) To what degree of certainty are the parameters and assumptions sufficient for the mineral resource estimate? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

11) To what degree to certainty are the search ellipses used in the modeling representative of the actual trend (dips, azimuth etc?) Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

12) To what degree of certainty is the final resource estimate representative of the actual tons and grade in the ground? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

13) To what degree to certainty is the mean grade of the final mineral resource estimate when compared to the composite and assay mean grades? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

14) To what degree to certainty is the classification process complete? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

15) How comfortable are you that the drillhole database that was used in the resource estimate was not tampered with to change the grades? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

16) Overall for Chapter 16 – What is your overall level of acceptance for the adequacy and reliability of the mineral resource estimate and classification? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

Chapter 19 – Other relevant information

The RP must state any other relevant information to ensure the report is done to a level that is reasonable acceptable in the mining industry, and reliable. This Chapter may include any technical or non technical aspect that was not covered previously and may have some effect on the final mineral resource estimate.

Chapter 20 – Recommendations, Risks and Conclusions

The Chapter should provide clear and precise recommendations to advance the project in an economically viable manner. For example, it may recommend further exploration be conducted to increase mineral resources and mineral reserves. These recommendations must state the steps that will be involved to advance the project. All other relevant recommendations should be included in this chapter and, most importantly, whether the recommendations involve any material risks for the project.

A complete list of all possible risks that could influence the results of the project should be stated and a corresponding level of certainty. An example is given below;

1) Approximately what degree of certainty,i.e., country risk, could affect the final results of this project? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

The following risks may be included but are not limited to;

- Country and political risks
- Environmental, safety and social risks
- Seismic activities
- Permitting

- Legal
- Title
- Taxation and royalties
- Marketing
- Currency conversion
- Geopolitical
- All other relevant risks

A complete example will be done in Chapter 7 when there is a case study that follows this new set of guidelines.

The conclusion should be a complete summary of all the results generated in the report and the reliability of the results. The RP/s conclusion must state the degree of confidence in the report and that the results will not mislead the public, and whether there exists any possibility of fraud. The Chapter must include a scoring scheme for each chapter and the RP must determine what degree of confidence he/she has in each Chapter. An example is given below;

1) In summary, what is the RP/s opinion on the reliability and validity for Chapter 1_Introduction? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

A complete example will be done in Chapter 7 when there is a case study that follows this new set of guidelines. This will be easy for the investor to determine whether or not he/she is comfortable with the project.

Chapter 21 – References

A complete list of all references that were used in the report should be stated in a consistent format.

A complete list of all figures and tables in a consistent format must be stated and can be stated after the Table of Content.

- List of Figures
- List of Tables

5.4 Proposed Consequences if the Guidelines suggested are not followed

The following should be considered if the RP fails to follow the guidelines as stated above:

- The report should not be considered adequate for publication in the public domain unless there is additional work
- The RP/s may be held liable and may be sanctioned for loss of professional license certification.
- Worst case scenario – if there is deliberate fraud by the RP/s – then legal action should be taken to charge the RP/s involved
- If there are doubts, then the report should not be published

5.5 Future areas of studies

There is considerable potential to expand this idea of using questions and a risk matrix to generate technical reports that could advise investors. The future areas for continuing studies should be in the following:

- Chapter 16 – Mining, Processing and G&A
- Chapter 17 – Mineral Reserve Estimate
- Chapter 18 – Economic Cash Flow Model

These Chapters must be fully detailed documents as the mineral reserve estimate will determine the economic and financial obligations of the project. Many questions should be included to cover all assumptions that were used to generate the mineral reserves and economic parameters. These are major components of any mining project and investors have a high level of interest in them.

Additionally, some other fine tuning on the proposed questions as stated above may be conducted to ensure the summary is precise and logical. The flagging system on reporting “possible resource” areas also may be improved.

6 Mining and Processing costs - Opex

6.1 Overview of Associated Costs – Give Investor a guide to some costs

This chapter was included to give the investor a basic knowledge to determine whether or not the operating costs are reasonable or not. There are detail studies on these costs that are available in many Handbooks. Additionally, the same principle of using the question of level of confidence as in Chapter 5 can apply.

Mining investors face the challenge of deciding which company to invest in based on their multiple international projects because of the varying nature of reporting standards worldwide. Mineral resource can be stated differently for the same project and hence the final economics can be misleading. With the boom in the mining industry, companies tend to prepare reports for investors, based on the eventual stock exchange for which they want the listing.

Project financing requirements have become increasingly stringent and more complex since the BRE-X scandal and late 2008 decline in the commodity sector. As a result, stock exchanges have instituted strict reporting requirements such as the TSE NI43-101, technical reporting guidelines. Financial institutions, tired of poorly executed feasibility studies resulting in capital cost overruns, construction delays, substandard resource estimation, and production shortfalls, have also stiffened their lending requirements. Ever-increasing environmental and socio-economic “sustainability” requirements have added a dimension to mining never before seen.

To raise capital in the equity or debt market, it is vital to have a comprehensive and thorough feasibility study or technical report completed to a high degree of confidence. Operating costs has been critical in the review process of financial institutions before money is being loaned. Financial institution will normally consult an independent engineering outfit to advice on all costs that are in the economic

cash flow model. Particular interest has been on processing and mining costs of the total operating costs.

The RP/s within his/her best judgment must make reasonable assumptions to define the operating costs. This Chapter will only consider pre-tax cash flow models as taxation can be very complicated and require significant legal advice. It is the current practice of independent engineering consulting group to identify some of the largest cost items in the economic cash flow model and then reviews these costs.

Two of the popular methods that are currently being used by Consulting Engineers to determine what costs to use in the economic cash flow model are;

- Spot price
- Forecasted price

For example, if the processing cost entails usage of chemicals or steel, then the RP/s will either use spot price or forecasted price. This is arguable and neither is correct, however, it's the best data at the time of the preparation of the due diligence for the financial institution. Therefore, at times the Company's Technical Study (Feasibility Study) of the economics of the project can differ when it reached the financial institutions' due diligence team.

Some of the main contents of the operating costs are labor and fuel; hence these items must clearly be documented in the report. It is recommend that the same questioning format that is currently being recommended to be implemented in the complete economic cash flow model. An example is shown below;

1) Advice on the degree of confidence of the processing operating costs? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

6.2 Mining Costs

Mining cost has been a main operating cost and normally second mostly costly item in the cash flow model. However, in some instances, mining operating costs can be the highest operating cost item in the economic cash flow model. Mineral processing operating costs are generally higher than mining operating costs and special caution should be taken when estimating these costs. The contingency factors most time are very helpful as it is very difficult to include all aspects of all operating costs.

The critical aspect of the mining operating cost is to realize when there is a large difference in units cost as compared to other mining operation worldwide. This is normally done through a comparative analysis of mining operations world. Additionally, there are many database and available resources with average unit costs of mining operating costs. The RP/s should ensure that each major cost item in the cash flow model should be reasonable estimated and reliable at the time of preparation of the report.

The mining aspect of any operating should clearly state how the mining will be conducted and the flow of equipment and machineries. The RP should then model out each segment and associate all cost to the respective segment. This can be done on a plan view map with sequential costing as the mine progresses. The major components of the mining operating costs should be clearly included and the RP/s should make a judgment call on the level of confidence on each major item and the overall mining operating cost. For example,

1) Advice on the degree of confidence of the labor component of the mining operating cost? Comments can be included after the scoring.

RP Score:	1	2	3	4	5	6	7	8	9	10
3rd Party Score:	1	2	3	4	5	6	7	8	9	10

XXX) Advice on the degree of confidence of the overall mining operating cost? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

6.3 Processing Costs

Processing operating costs have been the sensitive item for a lot of mining companies in recent years and determine whether a mine is economically viable or not. For example, in the case of Geovic Mining Corp, there mineral processing operating cost was by far the largest operating cost item in their economic cash flow model. The independent engineer for the financial institution that was assisting Geovic with funding then conducted a detail review of the mineral processing costs and used the spot price approach – which eventually increased the total operating costs. The point here is that the processing operating costs was the most important aspect of all costs and hence the independent engineer conducted detailed review.

The comparative analysis approach can also be considered in determining the level of acceptance of processing operating costs. Hence by benchmarking the processing operating costs against others worldwide can be a good indicator of whether or not the costs are reasonable. The RP/s should ensure he/she has reviewed these costs in details as it can jeopardize the complete project.

A lot of times because of the complex nature of the mineral processing aspect of any project, the processing flowsheet is very unique but similar in some aspects. Therefore, the financial institution independent engineer requires pilot testing which can be expensive. Most companies do not normally include pilot plant testing as they are comfortable that the slightly modified flowsheet with work. However, most times financial institution needs this level of confidence that the process will work and hence it will negatively affect the economic cash flow model.

The RP/s should always maintain a professional balance and ensure he/she can act as neutral as possible base on the available data. He/she should not incur cost to anyone base on only that the process was never done before but on some circumstantial facts and interpolation as most process will be unique. This is a tough decision for the RP and he/she must be comfortable to make a statement. Should the RP, not comfortable to make a statement, then he/she must refer for professional advice.

The major components of the procesing operating costs should be clearly included and the RP/s should make a judgment call on the level of confidence on each major item and the overall mining operating cost. For example,

1) Advice on the degree of confidence of the chemical cost component of the processing operating cost? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

XXX) Advice on the degree of confidence of the overall processing operating cost? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

6.4 Environmental Liability

Environmental liability is becoming more and more complicated and it is apparent that Mining Engineers and Geologists are depending more on environmentalist and legal persons to assist on this topic. RP/s must clearly state all persons who prepare this aspect of the report and he/she must state their level of confidence in the questioning format.

Environmental liability can be the cost associated with the damage to the environment and even the possibility of legal charges with the court system. The ultimate objective is to protect the environment as much as possible and try to restore the place after mining. Should there be any environmental disaster, then the company should have to pay large sums of cash and face possible legal court hearings. This aspect has never been able to be quantified and hence not fully included in the economic cash flow model. The RP/s should always ensure he/she thorough read this aspect of the report, and establish that the person/s who will be responsible for this section is qualified and knowledge in this area.

Standard should be applicable for all countries worldwide in determining environmental liability and all other liabilities. This will be the next goal of implementing goal rules and hence the investors will not have to bother about. Environmental liabilities and permits are becoming more related and tricky to understand. In Chapter 5, it clearly stated that this high sensitive information should be formatted in a question style with level of confidence response by the environmentalist. Should there be any major obstacle, then the RP/s must stated these facts and determine whether it would materially affect the project – before making it public.

If there are absolutely any reasons to believe that the environment will be compromise, then the RP and/or the environmentalist should clearly indicate this opinion as soon as it is discovered. The public well being must be of utmost importance to any company and project worldwide.

7 Resource report review with new guidelines

Public Domain Project – Bear Creek Mining Corporation – NI43-101

7.1 Background on Company

Bear Creek Mining Corp. (BCM) is a junior mining company that has been exploring in Peru for precious metals. Their main asset is the Corani Silver-Gold project which was discovered in 2005 is now at an advance exploration stage. BCM has conducted some metallurgical testings and some preliminary economics on the project in 2008. Some preliminary estimates are available on operating and capital costs that were quoted in the 2007 report. However, these numbers have changed and it had an impact on the final economics.

The report that will be used in this Chapter will be the one dated March 3, 2008 and is available on Sedar. It should be noted that there was a previous estimates that was done in March 2006. The updated report in 2008 was based off of the 2006 report and additionally drilling. This region has a long history for mineralization of silver, lead and zinc and the geology of the area do support this kind of mineralization.

It is apparent that the property would support a large tonnage bulk mining scenario with relatively lower grades. Some of the points of the project are;

- Large deposit with relatively lower grades (lead, silver, zinc)
- Robust economics based off preliminary assessment
- Large exploration potential
- Remote location
- Located close to an existing community

The deposits that are considered in the report are as follow;

- Corani main

- Corani Minas
- Corani Este

7.2 Company Public listing Information (Symbols, Market Capital)

The following below gives an indication of the Company's value base on its reserves.

As of 12th February, 2009 – Bear Creek Mining is Corp listed on the TSX under the symbol BCM-V.

The TSX market: (Canadian Currency)

Open:	$1.66
Bid:	$1.70 x 3
Ask:	$1.74 x 3
Average Volume:	145,200
52 Week Range:	$0.57 - $9.37
Day Range	$1.66 - $1.84
Last Trade	$1.70
Previous Close	$1.66
Market Capitalization	$94.28 Million
Shares Outstanding	55.46

7.3 Resource Review with new guidelines

This section will focus on the new proposed guidelines and see how it compares with current methods of reporting mineral projects worldwide. It should be noted that the project under consideration and that will be used with the new guidelines

will only focus on the main sections that could materially affect the results or even cause fraud.

Therefore, topics like regional geology and introduction will not be included. The purpose of section is to show the new “questioning format” is relatively easier and more practical for a busy investor to have a quick overview of a project in substantial less time. Additionally some quantitative analysis will be done on the risk matrix on the major chapters of the new proposed guidelines.

The other data and information will be in the public report dated March 3, 2008 and available on SEDAR. The complete name of the report is “Technical Report – Corani Resource Estimate and PEA, Prepared For Bear Creek Mining Corporation, Prepared By INDEPENDENT Mining Consultants, INC., March 3, 2008”. The approach will be to take this report and extract data for the new guidelines. This quantitative analysis will be done in MS Excel and the summary will be report in this section in MS Word format.

However, the fundamental aim will be to have a combination of writing which will precisely describe the geology etc and the quantitative analysis which will give a quick overview of the risk in a snapshot and the respective areas where the risk exist. Further investigation in the risk areas can then be further investigated in a relatively short time.

New Guidelines as it applies;

- Cover Page (Not included)
- Table of Contents (Not included)

Only Chapters that include the list of questions will be considered in this research. All other Chapters will be in regular text format as per the current standards. The aim will be to have both text and the Excel Spreadsheet in the final document.

Chapter 1 – Responsible Peron/s (RP) – Qualifications and Experience

The responsible person is defined in 5.2.1.

In Report	3rd	Risk	Indicator	
x				1) Name, date and address of Responsible Person/s
	9	10	1	2) Is your undergraduate degree in engineering, geology or geoscience? RP Score: 1 2 3 4 5 6 7 8 9 10 3rd Party Score: 1 2 3 4 5 6 7 8 9 10
	8	10	1	3) Did your undergraduate degree (2) include four (4) years of academic training from a reputable university or college or equivalent? RP Score: 1 2 3 4 5 6 7 8 9 10 3rd Party Score: 1 2 3 4 5 6 7 8 9 10
	8	7	1	4) Do you have five (5) years of relevant experience in the subject area of this report? RP Score: 1 2 3 4 5 6 7 8 9 10 3rd Party Score: 1 2 3 4 5 6 7 8 9 10
x	8	10		5) State all previous work history, previous involvement, other qualifications, professional membership and other relevant information?
	7	9	1	6) Are you comfortable with this subject area or relevant portion of this report as define in section 5.2.1? RP Score: 1 2 3 4 5 6 7 8 9 10 3rd Party Score: 1 2 3 4 5 6 7 8 9 10
x	10	10		7) List all Chapters/Sections that will be prepared and be held responsible by you?
	7	8	1	**8) Overall for Chapter 1** – Did you meet the requirements, willing and comfortable being the Responsible Person? RP Score: 1 2 3 4 5 6 7 8 9 10
				3rd Party Score: 1 2 3 4 5 6 7 8 9 10

Chapter 2 – Other Responsible Person/s – Data and Information

Chapter 2 – Other Responsible Person/s – Data and Information

In Report	3 rd	Risk	Indicator
x			
	7	8	1
	7	8	1

1) List all other (RPs) as define in 5.2.1 and corresponding sections/chapters that they prepared.

2) Are you comfortable that 1) did not have a material effect on the drillhole database and resource estimate?

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

3) Overall for Chapter 2 – How comfortable are you that the other RPs information will not have a material impact on the final resource estimate that the public will utilize and satisfy with the level of details?

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

Chapter 6 – Property Legal Permits

In Report	3rd	Risk	Indicator
	8	8	1
	5	6	1
	5	7	1
x	6	8	
	8	8	1
	6	7	1

1) Are there adequate valid permits to conduct drilling to generate a mineral resource estimate? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

2) Is the project area under legality valid permits to conduct mining or exploration activities? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

3) Are the environmental permits valid? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

4) Are there any other permits that are necessary to conduct mining and tailings disposal. If yes, list all with dates of registration and expiration.

5) Is the project economics within the valid dates of the permits? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

6) Overall for Chapter 6 – How comfortable are you that all the necessary permits are valid and will be so for the mine life plus reclamation? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

Chapter 11 – Drilling

In Report	3rd	Risk	Indicator
	7	8	1
	5	6	1
	5	5	1
	5	6	1
	6	6	1

1) Are there the relevant permits to drill on the said property? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

2) Is there any chance the drilling was meddled with and can materially affect the final results? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

3) Was there any company employees or individuals who may have tampered with the drilling that could materially affect the final results? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

4) As the RP, how comfortable are you that the drilling results are truly reflective of what actually took place at the time of drilling? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

5) Overall for Chapter 11 – How comfortable are you that all the necessary precautions were taken to ensure that drilling was done to a reasonable acceptable level and the results are dependable? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

Notes:

1) Before you start drilling on a property - you must ensure you have the legal requirements to do so.
2) To your knowledge, was there any tampering with the drilling that could materially affect the results.
3) Was there any company or related person/persons who may have done something on the drilling that could materially affect the results?
4) As RP, do you think the results from drilling is accurate.
5) An overall comment on the complete drillling process.

Chapter 12 – Sampling Procedures

In Report	3rd	Risk	Indicator
	9	7	1
	8	8	1
	8	7	1
	8	8	1
	8	8	1

1) Approximately what degree of certainty, that there is a clear connection between drilling/trenching and sampling, and there maybe no reason that there might be scope for the drill sample to be different sample? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

2) What degree of acceptance were the sampling methods and procedures taken? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

3) Was there any chance that the sampling methods and procedures where tampered with that could materially change the results? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

4) As the RP on this report, how comfortable are you that the sampling methods and procedures were done to a reasonable level? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

5) Overall for Chapter 12 – How comfortable are you that all the necessary precautions were taken to ensure that sampling was done to a reasonable acceptable level and the results are dependable? Comments can be included after the scoring.

RP Score: 1 2 3 4 5 6 7 8 9 10

3rd Party Score: 1 2 3 4 5 6 7 8 9 10

Notes;

1) This should tell you that the drilling/trenching etc is the direct and exact sample that was taken for analysis.

2) Is the sampling method and procedures appropriate to acquire results?

3) Was there any instance of doubt that the samples taken may have been modify or affected to deliberately alter the results?

4) As the RP, give a summary comment on the overall sampling method and procedures.

In Report	3rd	Risk	Indicator
	8	8	1
	8	8	1
	8	6	1
	5	6	1
	5	6	1
	6	8	1
	6	7	1
	6	7	1
	8	8	1
	6	5	1
	6	6	1
	6	7	1
	5	5	1
	7	6	1

Chapter 13 – Sample preparation, assay analysis and custody

1) Approximately what degree of certainty, that there is a clear connection between this Chapter and the previous Chapter, and there maybe no reason that there might be scope for that the s
RP Score: 1 2 3 4 5 6 7 8 9 10
3rd Party Score: 1 2 3 4 5 6 7 8 9 10

2) The relevance and appropriateness of the assaying and laboratory procedures? Comments can be included after the scoring.
RP Score: 1 2 3 4 5 6 7 8 9 10
3rd Party Score: 1 2 3 4 5 6 7 8 9 10

3) The degree of quality controls implemented (blanks, duplicates, alternative laboratories, and representativeness? Comments can be included after the scoring.
RP Score: 1 2 3 4 5 6 7 8 9 10
3rd Party Score: 1 2 3 4 5 6 7 8 9 10

4) The degree of comparison of high grade intersections by independent parties? Comments can be included after the scoring.
RP Score: 1 2 3 4 5 6 7 8 9 10
3rd Party Score: 1 2 3 4 5 6 7 8 9 10

5) How comfortable are you that the sampling preparation, analysis and custody were not deliberately tampered with? Comments can be included after the scoring.
RP Score: 1 2 3 4 5 6 7 8 9 10
3rd Party Score: 1 2 3 4 5 6 7 8 9 10

6) How comfortable are you that the samples prepared, analyzed and secured where the samples taken from the corresponding drilling program? Comments can be included after the scoring.
RP Score: 1 2 3 4 5 6 7 8 9 10
3rd Party Score: 1 2 3 4 5 6 7 8 9 10

7) As RP, how comfortable were you with the sample preparation, and the sample used for analyze which was reduced was representative of the larger sample taken? Comments can be inclu
RP Score: 1 2 3 4 5 6 7 8 9 10
3rd Party Score: 1 2 3 4 5 6 7 8 9 10

8) As RP, how comfortable were you with the laboratory and material used in the analyzing process? Comments can be included after the scoring.
RP Score: 1 2 3 4 5 6 7 8 9 10
3rd Party Score: 1 2 3 4 5 6 7 8 9 10

9) As RP, how comfortable were you with the reliability of the results? Comments can be included after the scoring.
RP Score: 1 2 3 4 5 6 7 8 9 10
3rd Party Score: 1 2 3 4 5 6 7 8 9 10

10) As RP, how comfortable were you with duplicate analyses and how was the comparison? Comments can be included after the scoring.
RP Score: 1 2 3 4 5 6 7 8 9 10
3rd Party Score: 1 2 3 4 5 6 7 8 9 10

11) As RP, how comfortable were you with the complete security custody of the samples? Comments can be included after the scoring.
RP Score: 1 2 3 4 5 6 7 8 9 10
3rd Party Score: 1 2 3 4 5 6 7 8 9 10

12) Was there any part of this process (sample preparation, analysis and security), there maybe some level of suspicion about fraud? Comments can be included after the scoring.
RP Score: 1 2 3 4 5 6 7 8 9 10
3rd Party Score: 1 2 3 4 5 6 7 8 9 10

13) What percentage of the samples used for analysis is retained for independent review? Comments can be included after the scoring.
RP Score: 1 2 3 4 5 6 7 8 9 10
3rd Party Score: 1 2 3 4 5 6 7 8 9 10

14) Overall for Chapter 13 – What is your overall level of acceptance for the adequacy for sample preparation, analysis and security? Comments can be included after the scoring.
RP Score: 1 2 3 4 5 6 7 8 9 10
3rd Party Score: 1 2 3 4 5 6 7 8 9 10

Chapter 13 – Sample preparation, assay analysis and custody – Con't

Notes:

1) Was the sample collected as stated in Chapter 12 is the exact sample for preparation and analysis.
2) The laboratory for analysis should be in a reasonable state and capable of doing the analysis.
3) The RP should confirm that there were enough QA/QC done.
4) The use of different assay labs to confirm high grades.
5) Comment on any tampering of the sample.
6) Ensuring that the samples taken are carried through the process for final assay results and that no other sample was used instead.
7) As extracts are taken for assaying, what is the representativeness of this small portion of the larger sample.
8) Comment on the laboratory condition and whether it can adequately and accurately report the results.

12) In your view, do you think there maybe any possibly of fraud during the complete process?
13) Were there remaining samples retained in a safe and secure place so that there could be checks?

In Report	3rd	Risk	Indicator	
	7	8	1	1) Approximately what degree of certainty, there is a clear connection between this Chapter and the previous Chapter, and there maybe no reason that there might be scope for fraud? Comments can b RP Score: 1 2 3 4 5 6 7 8 9 10 3rd Party Score: 1 2 3 4 5 6 7 8 9 10
	4	5	1	2) To what degree of certainty the drillhole database is reflective of the actual data in the ground? Comments can be included after the scoring. RP Score: 1 2 3 4 5 6 7 8 9 10 3rd Party Score: 1 2 3 4 5 6 7 8 9 10
	5	8	1	3) To what degree of certainty the collar database is reflective of the actual data on the ground? Comments can be included after the scoring. RP Score: 1 2 3 4 5 6 7 8 9 10 3rd Party Score: 1 2 3 4 5 6 7 8 9 10
	5	9	1	4) To what degree of certainty the survey database is reflective of the actual data on the ground? Comments can be included after the scoring. RP Score: 1 2 3 4 5 6 7 8 9 10 3rd Party Score: 1 2 3 4 5 6 7 8 9 10
	5	5	1	5) To what degree of certainty the assay database is reflective of the actual data on the ground? Comments can be included after the scoring. RP Score: 1 2 3 4 5 6 7 8 9 10 3rd Party Score: 1 2 3 4 5 6 7 8 9 10
	1	1	0	6) Approximately what percentage of the assay database was compared with another laboratory result of the exact same samples? Comments can be included after the scoring. RP Score: 1 2 3 4 5 6 7 8 9 10 3rd Party Score: 1 2 3 4 5 6 7 8 9 10
	5	7	1	7) What degree of certainty do you think that the assay database was not tampered with? Comments can be included after the scoring. RP Score: 1 2 3 4 5 6 7 8 9 10 3rd Party Score: 1 2 3 4 5 6 7 8 9 10
	4	5	1	8) What degree of certainty do you think that the assay database represent the grades in the ground where the corresponding samples were taken? Comments can be included after the scoring. RP Score: 1 2 3 4 5 6 7 8 9 10 3rd Party Score: 1 2 3 4 5 6 7 8 9 10
	6	8	1	9) What degree of certainty do you think that the QC procedures were adequate and reliable? Comments can be included after the scoring. RP Score: 1 2 3 4 5 6 7 8 9 10 3rd Party Score: 1 2 3 4 5 6 7 8 9 10
	6	8	1	10) What degree of certainty do you think that the drillhole database was prepared to a reasonable acceptable level for mineral resource estimation? Comments can be included after the scoring. RP Score: 1 2 3 4 5 6 7 8 9 10 3rd Party Score: 1 2 3 4 5 6 7 8 9 10
	2	2	1	11) Approximately what percentage of total sample was retained? Comments can be included after the scoring. RP Score: 1 2 3 4 5 6 7 8 9 10 3rd Party Score: 1 2 3 4 5 6 7 8 9 10
	4	5	1	12) What is the likelihood that the retained samples can be easily identified and extracted for assaying to conduct a comparison of grades? Comments can be included after the scoring. RP Score: 1 2 3 4 5 6 7 8 9 10 3rd Party Score: 1 2 3 4 5 6 7 8 9 10
	4	7	1	13) What is the likelihood someone deliberately changed the assay values in the database? Comments can be included after the scoring. RP Score: 1 2 3 4 5 6 7 8 9 10 3rd Party Score: 1 2 3 4 5 6 7 8 9 10
	5	5	1	**14) Overall for Chapter 14** – What is your overall level of acceptance for the drillhole database and verification for the final resource estimate? Comments can be included after the scoring. RP Score: 1 2 3 4 5 6 7 8 9 10 3rd Party Score: 1 2 3 4 5 6 7 8 9 10

Chapter 14 – Drillhole Database and Verification – Con't

Notes:

1) Was the sample collected, prepared and analysed as stated in Chapter 13 is the exact sample inputted in the drillhole database.
2) Comment on the data inputted in the drillhole database and whether is reasonable.
6) Comment on the percentage of assay in the drillhole database that was compared to assay certificate.
12) Comment on whether you can retrieve a specific sample that was saved.
13) How do you feel that there were manual changes in the drillhole database?

Chapter 15 – Resource Estimate

In Report	3rd	Risk	Indicator	
				1) Approximately what degree of certainty, there is a clear connection between this Chapter and the previous Chapter, and there maybe no reason that there might be sc
	7	8	1	RP Score: 1 2 3 4 5 6 7 8 9 10
				3rd Party Score: 1 2 3 4 5 6 7 8 9 10
				2) To what degree of certainty the drillhole database is reflective of the actual data in the ground? Comments can be included after the scoring.
	7	5	1	RP Score: 1 2 3 4 5 6 7 8 9 10
				3rd Party Score: 1 2 3 4 5 6 7 8 9 10
				3) As RP – how comfortable are you that the drillhole database is reliable for the final mineral resource estimate? Comments can be included after the scoring.
	7	8	1	RP Score: 1 2 3 4 5 6 7 8 9 10
				3rd Party Score: 1 2 3 4 5 6 7 8 9 10
				4) Was the drillhole database received by a third party? Comments can be included after the scoring.
	6	9	1	RP Score: 1 2 3 4 5 6 7 8 9 10
				3rd Party Score: 1 2 3 4 5 6 7 8 9 10
				5) To what degree are you comfortable that the drillhole database has been validated? Comments can be included after the scoring.
	8	7	1	RP Score: 1 2 3 4 5 6 7 8 9 10
				3rd Party Score: 1 2 3 4 5 6 7 8 9 10
				6) How does the mean assay grade compares to the mean composite grade? Comments can be included after the scoring.
	8	9	0	RP Score: 1 2 3 4 5 6 7 8 9 10
				3rd Party Score: 1 2 3 4 5 6 7 8 9 10
				7) How comfortable are you that the block model is adequate and reliable? Comments can be included after the scoring.
	8	8	1	RP Score: 1 2 3 4 5 6 7 8 9 10
				3rd Party Score: 1 2 3 4 5 6 7 8 9 10
				8) How comfortable are you that the mineral resource estimation process (kriging, IDs) are adequate and reliable? Comments can be included after the scoring.
	8	9	1	RP Score: 1 2 3 4 5 6 7 8 9 10
				3rd Party Score: 1 2 3 4 5 6 7 8 9 10
				9) How comfortable are you that the mineral resource estimation process parameters (kriging, IDs) are adequate and reliable? Comments can be included after the scorir
	8	9	1	RP Score: 1 2 3 4 5 6 7 8 9 10
				3rd Party Score: 1 2 3 4 5 6 7 8 9 10
				10) To what degree to certainty are the parameters and assumptions sufficient for the mineral resource estimate? Comments can be included after the scoring.
	8	9	1	RP Score: 1 2 3 4 5 6 7 8 9 10
				3rd Party Score: 1 2 3 4 5 6 7 8 9 10

	8	7	1	11) To what degree to certainty are the search ellipses representatives of the actual trend (dips, azimuth etc? Comments can be included after the scoring. RP Score: 1 2 3 4 5 6 7 8 9 10 3rd Party Score: 1 2 3 4 5 6 7 8 9 10
	8	8	1	12) To what degree to certainty is the final resource estimate representative of the actual tons and grade in the ground? Comments can be included after the scoring. RP Score: 1 2 3 4 5 6 7 8 9 10 3rd Party Score: 1 2 3 4 5 6 7 8 9 10
	8	8	1	13) To what degree to certainty is mean grade of the final mineral resource estimate compares to the composite and assay mean grades? Comments can be included after the scoring. RP Score: 1 2 3 4 5 6 7 8 9 10 3rd Party Score: 1 2 3 4 5 6 7 8 9 10
	8	8	1	14) To what degree to certainty is the classification process done? Comments can be included after the scoring. RP Score: 1 2 3 4 5 6 7 8 9 10 3rd Party Score: 1 2 3 4 5 6 7 8 9 10
	8	7	1	15) How comfortable are you that the drillhole database that was used in the resource estimate was not tampered with to change the grades? Comments can be included after the scoring. RP Score: 1 2 3 4 5 6 7 8 9 10 3rd Party Score: 1 2 3 4 5 6 7 8 9 10
	7	6	1	**16) Overall for Chapter 15** – What is your overall level of acceptance for the adequacy and reliability of the mineral resource estimate and classification? Comments can be included after the scoring. RP Score: 1 2 3 4 5 6 7 8 9 10 3rd Party Score: 1 2 3 4 5 6 7 8 9 10

Notes:

1) Was the sample collected, prepared, analysed and inputted in the drillhole database as stated in Chapter 14 is used for the resource estimate.

3) Comment on the accuracy of the drillhole database that will be used for the resource estimate.

5) What work was done to validate the drillhole database and confirm the numbers are correct?

7) What steps have to been taken to ensure the block model grades and tons are reasonable.

8) Taken into consideration the deposit (geology etc), how would you consider the estimate to be done?

13) The important data that the public will receive and of most interest are the grades and tons.

Comment on any biases that maybe included the complete process.

7.4 Comment on whether new guidelines were better in representing the facts

It is very evident that the new proposed system is much simpler to summarize a lot of details into one page. Chapter 8 includes the one page summary for the new format. This system with the graph and flagging system will now tell you quickly where they are areas of concern and you can dive down into the root cause.

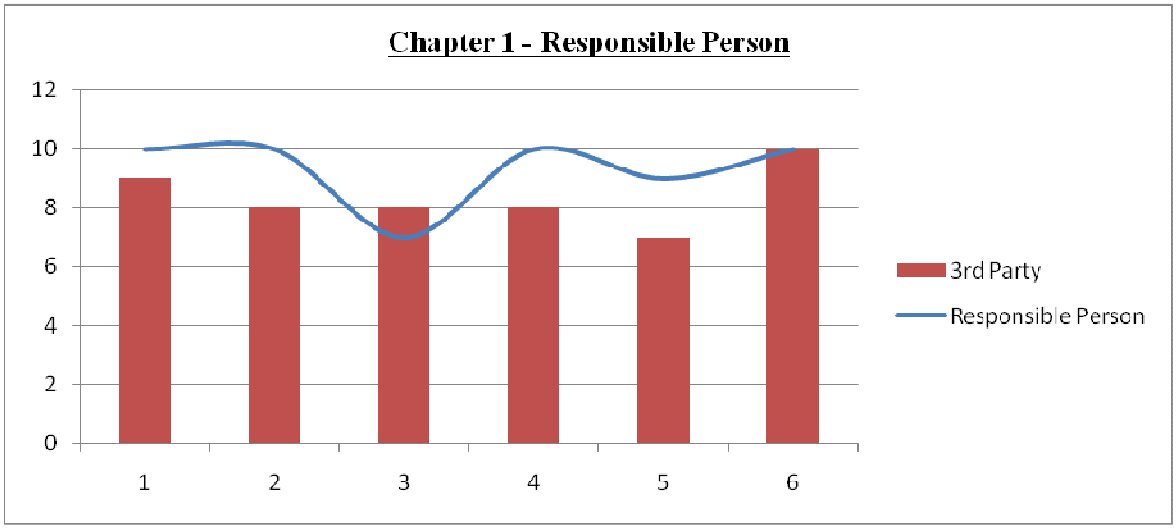
It should be noted that the new system will also include text for all Chapters and the Xcel workbook. Therefore you can always go back and read the complete report or just use the Xcel workbook to get a general overview of the project.

The following points should be noted;

- RP – Responsible Person
- 3rd – Anyone reviewing the report – Investors, shareholders, general public
- Indicator (Ind.) – Absolutely necessary
- Flag – Greater than zero means there are some issues and should be reviewed

The tables listed below correspond to the respective Chapters, and the 3rd party verses the responsible person scores. On the X-axis, the numbers represent the questions as stated in Chapter 7.3.

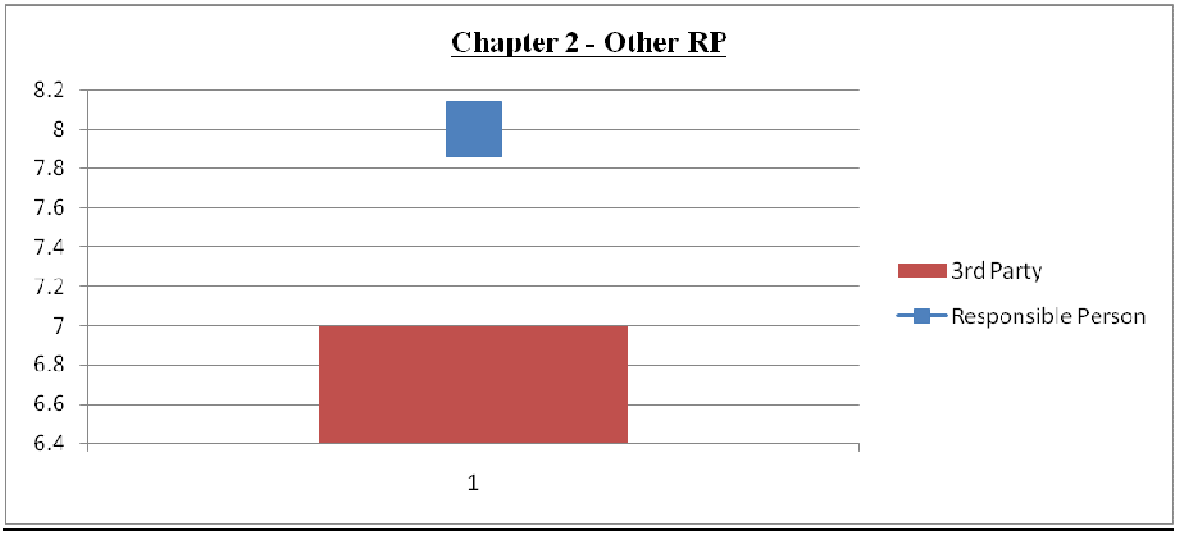
Chapter 1 - Responsible Peron/s – Qualifications and Experience



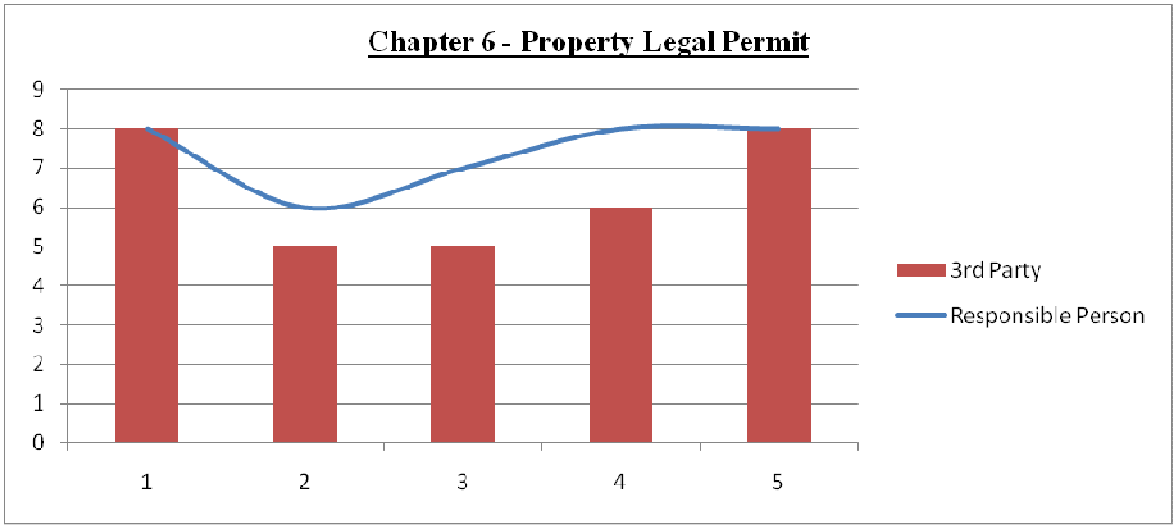
Where the red arrow is, implies that in Chapter 1 there was an issue because the "RP" score was lower than what was required by the 3rd party. So whenever the bar chart is greater than the line chart,it representes that there is an issue that needs to be addressed.

For example, in Chapter 1, the question to the RP was "Do you have five (5) years of relevant experience in the subject area of this report" and the response was a 7; however the 3rd party person required an 8 to be comfortable. Hence this new system flag this issue to the 3rd party person.

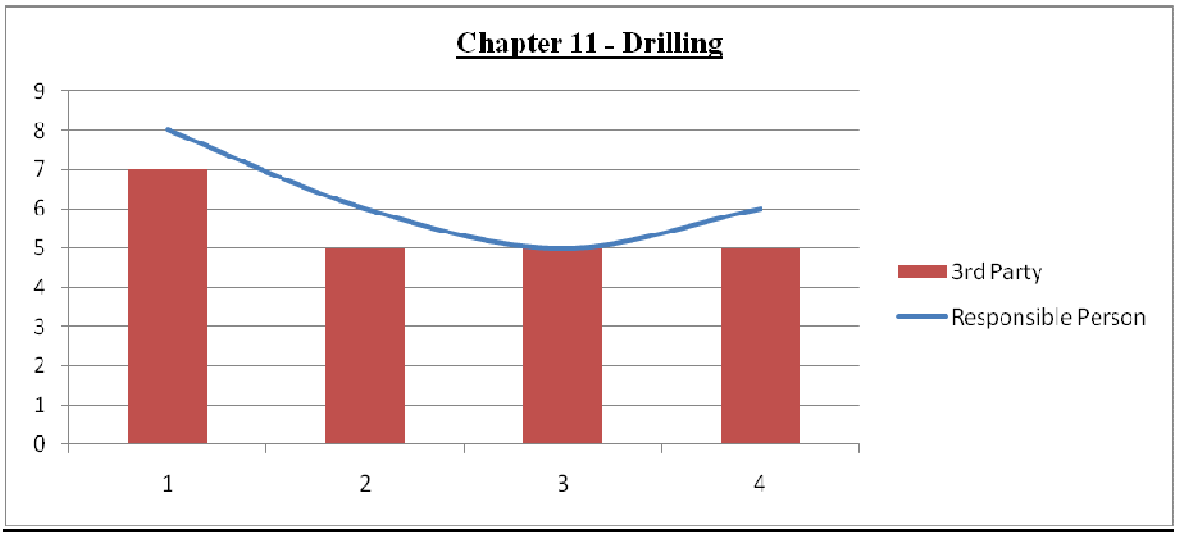
Chapter 2 – Other Responsible Person/s – Data and Information



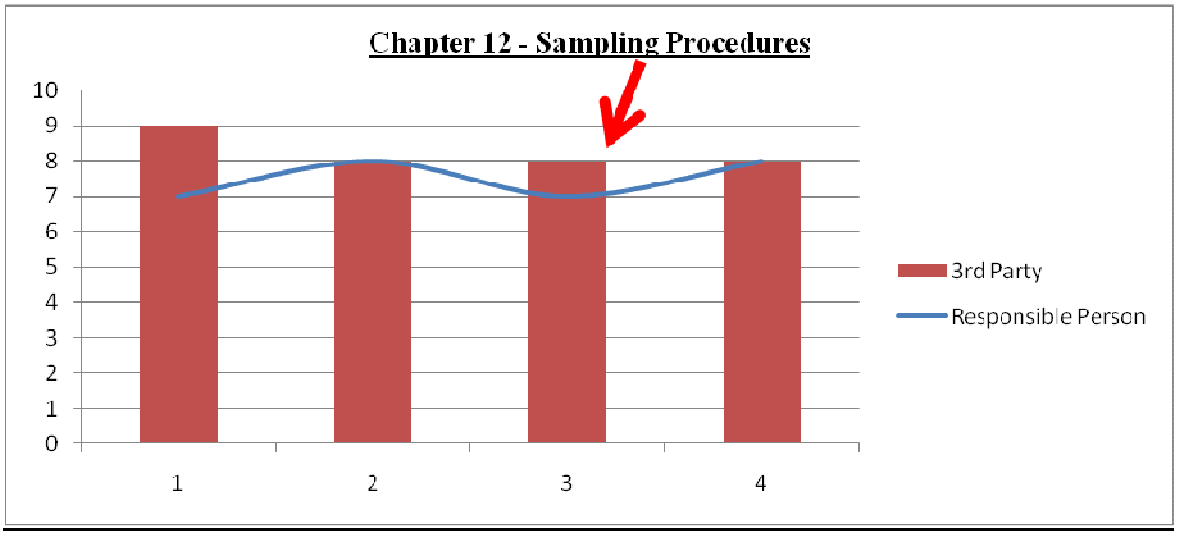
Chapter 6 – Property Legal Permits



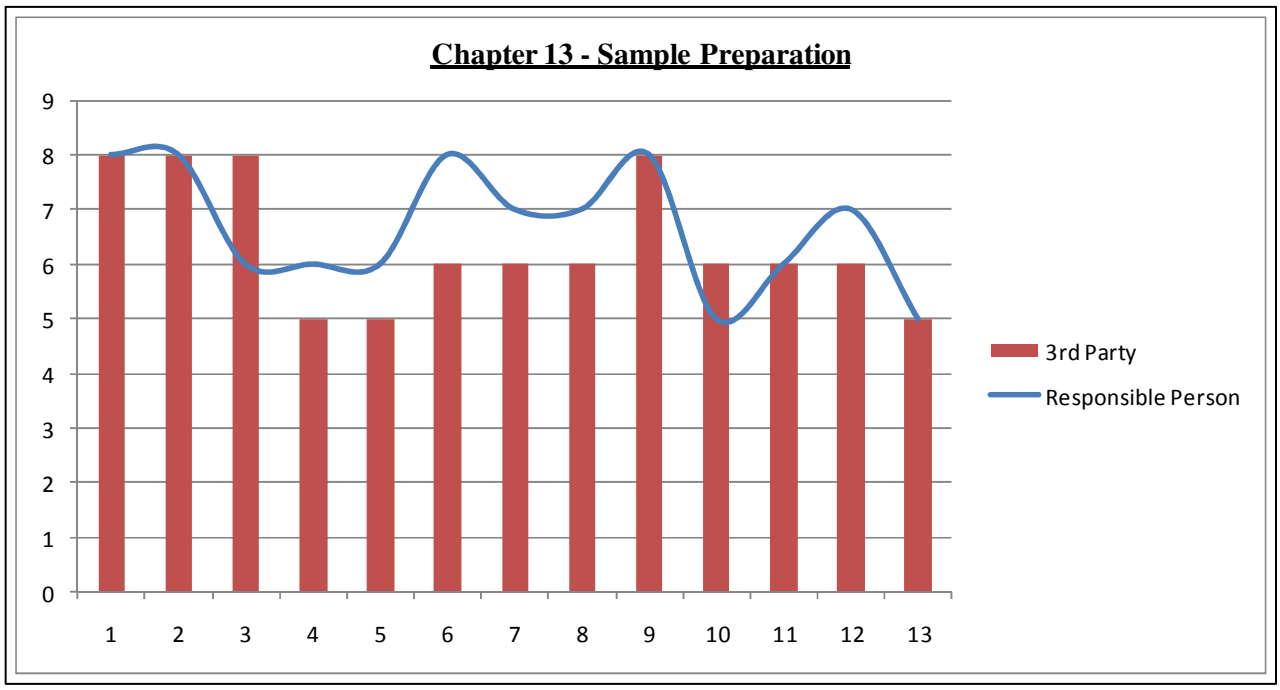
Chapter 11 – Drilling



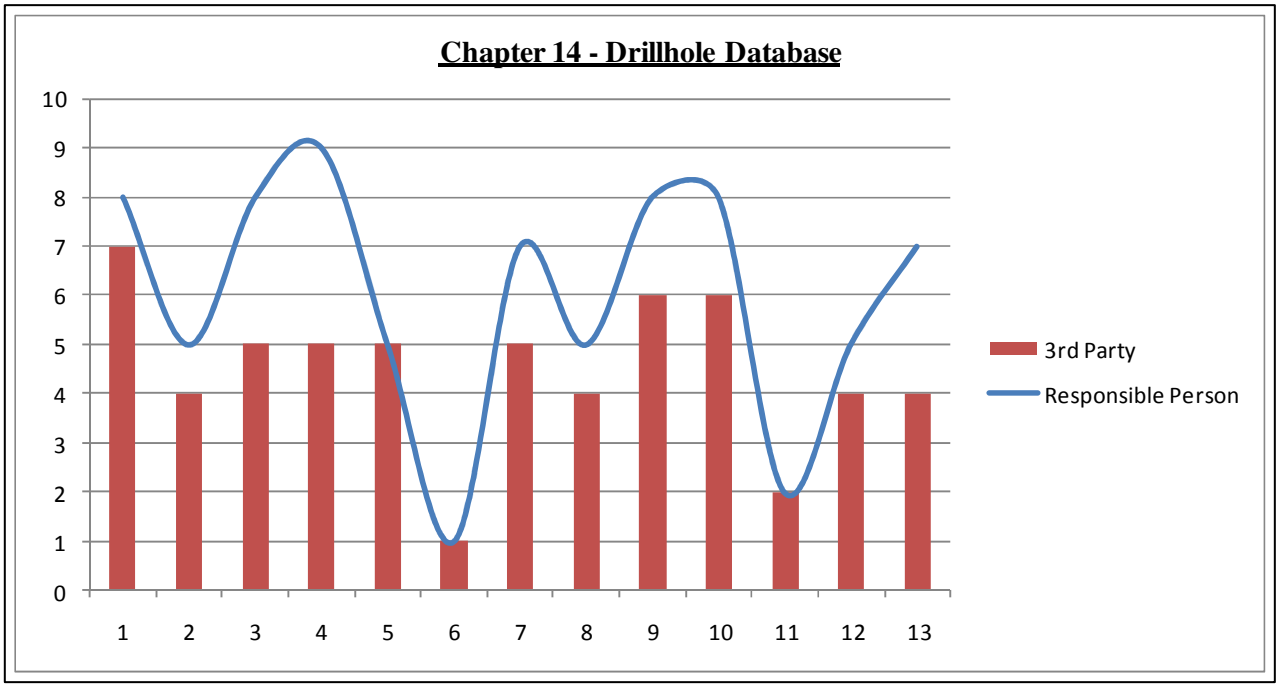
Chapter 12 – Sampling Procedures

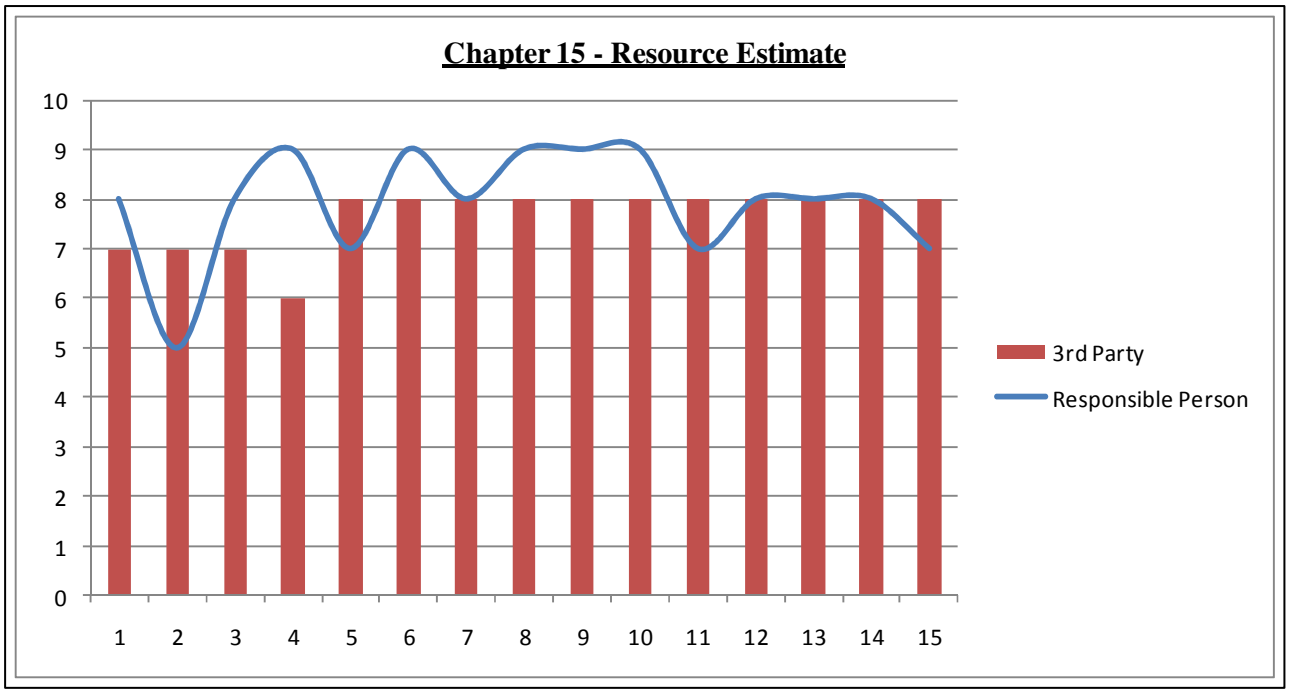


Chapter 13 – Sample preparation, assay analysis and custody



Chapter 14 – Drillhole Database and Verification




Chapter 15 - Resource Estimate
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3rd Party
Responsible Person

8 Conclusions and recommendations for future studies

8.1 Conclusions

This research now outlines to investors around the world with global guidelines to aid in investment opportunities. It is evident base on the findings of this research that the representation of the NI43-101, JORC etc can now be done on a single page which is much easier to read and understand.

This simplification of the reporting process can quickly guide the investor on risk versus opportunities. However; it should be noted that the single page is only a representation of the project and the complete report should be completed as outlined in Chapter 5.

The fundamental objective of the research was to generate new global resource guidelines that will replace all current guidelines (JORC, NI43-101 etc.) and will aid investors in making prudent decisions.

These new guidelines will accomplish the following:

- Reduce if not eliminate misleading reporting and consequently fraudulent scams
- Create global standards for resources
- Provide an excellent benchmarking tool for projects worldwide
- Reduce the number of third party reviews on resource validation

It should be noted that for this research, only the “resources” aspect of the evaluation process will be considered.

The new format on the risk matrix will be as follow:

Project Summary

	Overall Summary				
Items	3rd	RP	Ind.	Flag - Chapter	Questions
Chapter 1 – Responsible Person/s (RP) – Qualifications and Experienc	7	8	1	-1	
Chapter 2 – Other Responsible Person/s – Data and Information	7	8	1	-1	
Chapter 6 – Property Legal Permits	6	7	1	-1	
Chapter 11 – Drilling	6	6	1	0	
Chapter 12 – Sampling Procedures	8	8	1	0	
Chapter 13 – Sample preparation, assay analysis and custody	7	6	1	1	
Chapter 14 – Drillhole Database and Verification	5	5	1	0	
Chapter 15 – Resource Estimate	7	6	1	1	

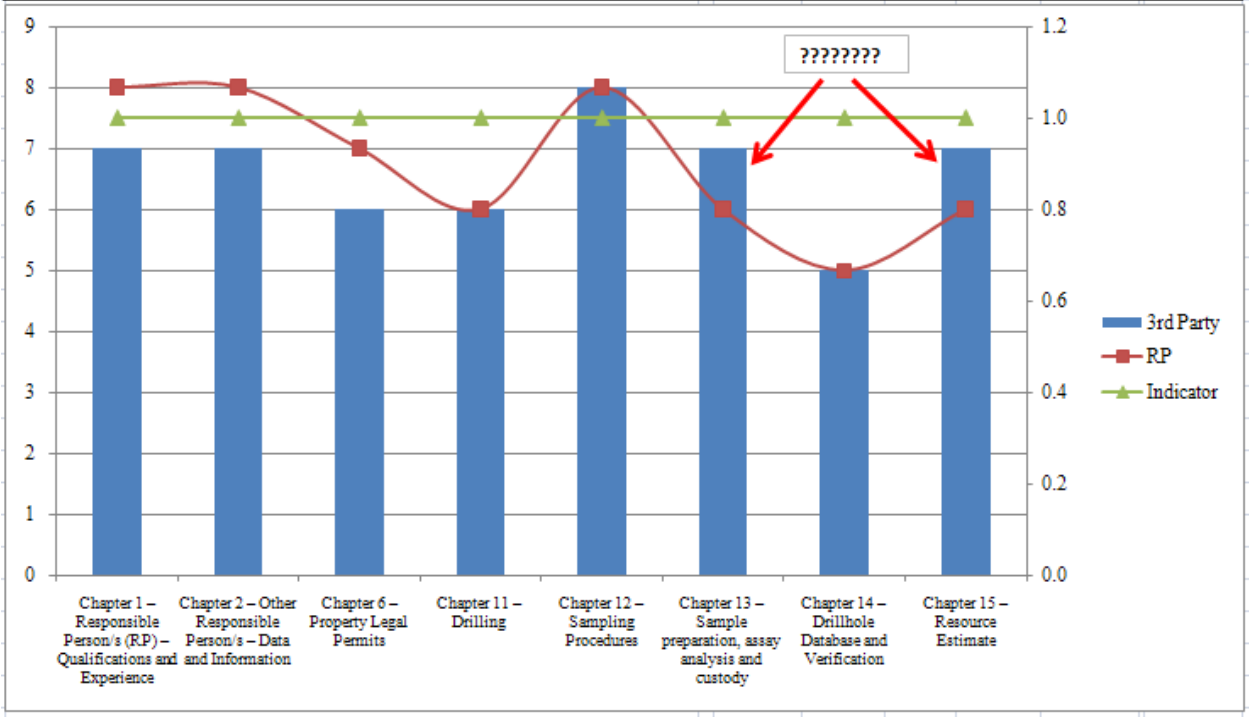

Table 2 : Project Summary represents that some issues on Chapters 13 and 15.

The following are abbreviated:

- 3rd – Independent party that reviews of the project (investor, analyst, public).
- RP – The Responsible Person for the preparation of the report (replacement of the Qualified Person).
- Ind. – An indicator whereby always require a score of 1 if the project is to be considered. A zero represents that the corresponding Chapter is not necessary.
- Flag – if the score is greater than zero; it will be flagged which will suggest there is an issue with that Chapter.
- Questions – scoring for each Chapter.

The following steps will be the format:

Step 1 – The RP completes with report and fill out the Excel workbook

Step 2 – The Excel workbook can then passed onto any independent reviewer (3rd party)

Step 3 – A comparison of Step 1 verses Step 2 will identify any issues between the 3rd party and the RP.

- A red flag means that the Chapter as a whole has some issues.
- The orange bars mean that within the Chapter there are some issues but will not materially affect the Chapter.
- For example; Chapter 1, the RP scored an 8 out of 10 and the 3rd party person required a 7; hence this Chapter as a whole was okay. However; the orange bar represented that within Chapter 1 – there was an issue. The issue was that the RP did not have enough experience in the area of the study. This was done by reviewing the Excel spreadsheet.
- The scoring system is rated from zero to ten where 10 is considered to be the best case scenario.

Step 4 – The RP and 3rd party discuss differences and work towards an agreeable solution should the party want to invest.

Step 5 – The final aspect will be to ensure there are no red flag or the line graph is always equal or greater than the bar chart.

CRIRSCO (Committee for Mineral Reserves International Reporting Standards) is the only committee that is currently working towards establishing global guidelines for the mining industry. However, their work is somewhat slightly different from this research as CRIRSCO's focus is primarily on the bigger picture for mining projects and its' related aspects. The research outlined in this thesis will examine in more detail actual existing guidelines.

This research thesis will establish global reporting standards on resources for the mining industry. This initiative may act as the stepping stone for a new global reporting standard on the evaluation of projects.

Most mining companies are typically busy running their own operations and getting their own internal projects to move forward. They would love to have global reporting standards but just don't have the time and resources to develop them inhouse. Many government regulatory bodies have pondered on the idea of having global standards, but with the increase in mining activities worldwide and their cyclical nature, governmental bodies don't have the time and personnel to be dedicated to generate global guidelines.

Theoretically, the concept of a global standard would be very helpful to the industry and investors. The question facing industry is related to the limitations created by the geographic location of most major mining projects worldwide, and how to implement these guidelines. This thesis suggests that the approach should be to actively lobby mining companies, government official and investors to set up a fund to pay for the implementation progress. This would include traveling to countries, conferences, seminar and universities to advocate these guidelines and how they can positively impact the industry worldwide.

This research program will establish global reporting standards on resources for the mining industry. This initiative may act as the stepping stone for a new global reporting standard on the evaluation of projects.

These guidelines and scoring matrix is only a guide to assist investors and be noted that there can be changes to any aspect to reflect the project under study.

The complete new set of guidelines as stated in Chapter 5 is a combination of all the current codes and the risk matrix. In summary the new proposed guidelines will incorporate all the aspects of the currents codes and additionally a risk matrix.

It is clear that this system will reduce scams; for example in the case with Bre-X scandal, the scoring system would have picked up the numbers of assay certificates that were compared to drill assay in Excel.

8.2 Recommendations for Future Studie

To make this research complete to cater for all aspects of mining, the following input parameters will be critical to the focus on and recommended for future studies:

- Cost of production, mining methods and processing
- All aspects of mining (operating and capital costs, Whittle parameters etc)
- Environmental liabilities
- Social Cost

The social cost will involve a major study and require extensive data collection. Some consideration will be given the first two (2) bullet points listed above as a starting point for further studies.

Finally, this research can standardize the reporting format worldwide for resources which will be very useful as a benchmarking tool. As the world moves towards a global village, the mining industry should reciprocate and follow.

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