

Guideline of Mineral Exploration

Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures

12.0 Mineral Resource Development Work Phases

1. Exploration Work Phase:

Ideally, the exploration phase ends when a newly discovered mineral deposit has first been delimited on a moderately wide drilling grid and a mineral inventory has been carried out to establish its potential economic interest for eventual development. Estimation of a mineral resource shall be justified by the dimensions and the metals and minerals contents and other pertinent characteristics of the deposit. The economic potential that justifies the estimation of a mineral resource should be formally presented in a preliminary technical and economic study.

2. Deposit Appraisal Work Phase:

This phase includes all activities directed essentially at converting mineral resources by definition drilling into measured reserves that can be extracted legally and at a profit. The deposit appraisal phase effectively starts when the operator has the required funds and engages in the detailed geological and technical appraisal stages that initiate deposit appraisal. Clearly, an exploration program does not jump to the deposit appraisal stage as soon as a mineral discovery occurs. The following two examples describe extreme situations.

Limits between Exploration and Deposit Appraisal

A discovery estimated, after a first round of delineation drilling, at 50 000 tonnes grading 2 grams per tonne gold, or 100 000 tonnes at 1.0% copper, may constitute a significant mineral occurrence, but does not normally constitute a mineral deposit of "potential economic interest" (unless it is situated near surface, close to an operating mine). In most cases, additional work done after the discovery of a small mineralized zone does not yet qualify as deposit appraisal and should still be reported as exploration.

At the other end of the scale, a discovery based on a few drill intersections of 60 to 100 metres in length, grading 3% nickel and 2% copper, does not yet constitute a delineated deposit, despite the apparently enormous economic potential. Accordingly, further drilling as part of the exploration phase is required to delimit this mineral discovery and to carry out a first semi-quantitative estimate of its size and mineral content, and a project review is required to plan further, more detailed work and obtain the required budgets.

Concurrent Deposit Appraisal and Exploration Activity

It is customary to continue to search for extensions to, or enlargements of, the deposit on which deposit appraisal has started. As a result, the drilling footage reported as deposit appraisal may include, in addition to the definition drilling, some drilling to extend the size of the known deposit(s). However, surveys and drilling carried out for the discovery or first delineation of new deposits on the same property should continue to be considered as exploration expenditures.

3. Mine Complex Development Work Phase:

This phase includes expenditures for mine development activities and investment in construction, and machinery and equipment. Mine development consists of two distinct groups of activities. The first group relates to short to mid term objectives: delimiting, detailing and gaining access to the ore and preparing it for production. The second group targets mid to long term objectives, i.e., extending the reserves of the mine in production or committed to production in the immediate vicinity of the deposit(s), within the limits defined below.

Limits between Mine Development and Mine-Site Exploration

The following geometric criteria are proposed to delimit the area where mine-site exploration activity starts:

- For a typical stratiform base metal deposit, mine-site exploration begins 75 metres from the boundary of the known deposit across the structure and 150 metres from each end or at depth along the plane of continuity of the structure.
- For gold mines based on planar vein structures, mine-site exploration begins 50 metres across the structure from the boundary of the known deposit and 100 metres along the plane of continuity from the boundary.
- For horizontal or sub-horizontal sedimentary deposits, such as coal or potash deposits, larger distances of up to 500 metres from the boundary of the delineated deposits should be used along the plane of the geological structure. Exploration would begin at 100 metres or more perpendicular to the reserves/deposits.

From this perspective, drill programs, geophysical surveys, and other rock work carried out between the boundary of the ore reserves and the area where mine-site exploration activity starts will qualify as mine complex development activity to extend the ore reserves.

Distinction between Mine Development and Mine-Site Deposit Appraisal

Whenever mine-site exploration activity is successful and a deposit is discovered and first delimited on a moderately wide drilling grid, a deposit appraisal program will be required up to the time at which the feasibility of mining this new zone is confirmed (tonnage, grades and limits) and a commitment to production can be made.

13.0 Site of a Producing Mine: Criteria to Define The Limits of A Mine Site

A mine site is the area that can be accessed and exploited from the current or committed installations. Based on criteria 4/ of the mine site definition, its area and limits are those of the environmental permits obtained. The limits and area(s) of the mining site will always be established based on the environmental permits obtained, as these permits are meant to meet the operation's needs and the requirements to protect and restore the environment. In practice, the area and limits are established based on the operational requirements established in the feasibility study. These requirements will vary depending on the type, surface extent, and position (horizontal, inclined, vertical) of the deposit(s), and on the mining methods used. Variations in these deposit/mining parameters contribute to the difficulties of deciding the actual extent of the mine site. Some plants and infrastructure that are essential parts of the mine complex may be located off the mine site, such as roads, docks, airports, or processing and pelletizing plants (Section 12.0 (3)). Needless to say, this infrastructure should also dispose of the required permits.

The area of the mine site is distinct from the area of the mining concessions or mining leases. These vary between jurisdictions, from a mining lease restricted to the deposit(s) that is the object of a production feasibility study with positive recommendations to much more extensive mining leases that may include a considerable portion of poorly explored areas.

Examples of Specific Situations

The following paragraphs establish criteria specific to each situation in order to divide expenditures between "off-mine-site" and "on-mine-site" activities.

a. For Multiple Deposits or Mining Sites

For example, Dominion Diamond Corporation's Ekati diamond mine (formerly owned by BHP Billiton Diamonds Inc.) is currently based on seven kimberlite pipes, but may eventually include other diamond pipes. By definition, a mine site is based on deposits in production or committed to production (Guide). Thus, only the seven pipes covered by the production feasibility study and by the required permits should be considered as part of the mine site at the beginning of production. Each of the other pipes will only become an "adjoining" mine site once the appraisal process has been completed, the environmental permits have been obtained, and a commitment to production has been made for that pipe (Guide). The same criteria will apply to multiple coal or potash deposits, or other metal deposits located in the same geological formation, as well as to mineral leases that will constitute either a complex, extended mine site or multiple independent mine sites.

b. Environmental Restoration After Production Ends

Restoration and care and maintenance expenditures on the site of a temporarily closed mine are considered as being "on mine site" in the mine complex development phase. This is required in order to avoid allocating these, very often substantial, costs to the exploration and deposit appraisal phases. Such costs should be allocated in 18.1.1 and 18.1.2 if they represent capital or in 18.2.1 and 18.2.2 if they represent repair and maintenance expenditures.

c. Exploration at an Exhausted Mine

Exploration carried out by the operator of a mine after the reserves have been mined out but before the site has been closed should be classified as **On-Mine-Site Exploration**.

d. Exploration at the Site of a Closed Mine

Often a mine that was in production will close because of depressed commodity prices. If underground exploration and deposit appraisal are carried out from the underground workings to delineate additional mineralized zones before a decision is made to resume production, these expenditures should be classified as **Off-Mine-Site Exploration** or **Off-Mine-Site Deposit Appraisal**.

e. Exploration on a Property Adjoining a Mine

Exploration (or deposit appraisal) work by Company A, the owner of Mine A, is carried out under an option agreement on the property of unrelated Company B, immediately adjacent to the workings of Mine A. Whether Company B or Company A carried out and reported on this work, it should be classified as **Off-Mine-Site Exploration**.

Special Categories of Expenditures

14.5-14.8, 14.9, 14.14, 14.23 Large to Very Large Bulk Sample

“Large to very large bulk sample” is a generic term involving several types and sizes of samples (ranging from hundreds to several tens of thousands of tonnes) and straddles several field work categories. These activities may have one or several legitimate objectives:

1. To process mineralized material in a sampling plant to confirm the content of the substance of interest detected and estimated by drilling and other sampling (14.5-14.8, 14.9, and 14.23);
2. To devise appropriate mineral processing/metal extraction technology through pilot and full scale testing, and to determine actual concentrator/extraction plant recovery and loss percentages, as well as total metal content (14.14);
3. To establish and evaluate the geotechnical parameters for the design of the mine and the fields, and plan test mining (14.14).

Large to very large bulk samples are normally part of the deposit appraisal phase and are rarely justified at the exploration phase. This may happen mainly for deposits whose mineral distribution is very nuggetty, such as diamond deposits or some gold deposits with very coarse and scattered gold particles, or in deposits of other types with concentration/extraction problems, to establish their potential economic value.

Obtaining a large to very large bulk sample may involve stripping and trenching on surface, drifting, crosscutting, slashing or stoping work (14.9 and 14.23) or large-diameter drilling (14.5 to 14.8). Sampling costs should therefore be allocated to these specific activities. The handling and transportation costs involved to bring the sample material to the sampling or processing sites should be charged to 14.5 to 14.8 (drilling), 14.9 and 14.23. Sampling plant, mining, and/or processing test work should be charged to 14.14 (engineering). Marketing-related expenditures, such as providing samples to prospective clients for tests or pilot work, should be charged to 14.24 (economic studies).

For statistical purposes, expenditures for bulk sampling and engineering tests should be reported, not taking into account any income received from the sale of the metal(s) or concentrates produced.

Engineering tests - Example (line 14.14)

A Saskatchewan uranium deposit occurs in a porous sandstone rock. The expenditures related to the following tests, which are required to determine the technical feasibility of mining this deposit, should be recorded in the engineering category.

1. Well pumping tests were done to determine whether the water table could be drawn down sufficiently to permit mining of the deposit and to determine pumping costs.
2. A subsequent test-mining program was designed and carried out to determine:
 - a. The problem that ground water constitutes and ways to solve it;
 - b. The rock mechanics characteristics of any poorly consolidated clay rock that surrounds the deposit; and
 - c. Whether a practical mining method can be developed to mine the deposit without exposing the miners to highly radioactive ore, taking into account the low mechanical strength of the rock.

14.24 Scoping, Pre-Feasibility or Final Feasibility Studies (including economic studies)

The exploration phase ends with the first quantitative deposit inventory that is accompanied by a preliminary technical and economic study (scoping study) that evaluates the potential economic interest of the deposit. Deposit appraisal starts when the funds required to do so are available and the operator decides to undertake a deposit appraisal program. Several pre-feasibility studies are carried out during deposit appraisal for review and planning purposes. A production feasibility study (full-scale and detailed) is required to establish the technical feasibility and economic profitability of a mining project and to conclude this phase.

This due diligence review is the first of the five essential criteria needed to establish that the project has entered the mine complex development phase.

14.17 Other Field Work Costs (accommodation, meals, transportation, only if unable to report with the activities mentioned above, and temporary construction, e.g., access roads)

The current set of definitions aims to collect complete and representative expenditures for the various field surveys and work categories carried out. Unless you are unable to prorate the costs, no expenditures that could be attributed to field surveys geology, geochemistry, geophysics (ground and airborne surveys), drilling, stripping/trenching, underground rock work, engineering studies and scoping, pre-feasibility or final feasibility studies, mineral leases, claims, staking, line cutting (14.18), the environment (15.5), socio-economic and impact and benefits agreements (including rights of way and damage costs) (16.1), capital expenditures (18.1), or repair and maintenance (18.2) should be included here. The costs of maintaining projects on hold can be reported on this line.

18.1 Capital Assets

Imported used assets should be reported with new assets because they constitute new acquisitions for the Canadian economy. The costs of refurbishing and upgrading construction, as well as machinery and equipment, must be reported with new assets on lines 18.1.1 or 18.1.2, as required, depending on the situation, to maintain or increase productivity. Used assets purchased in Canada are reported separately because, for National Accounts, they do not constitute new additions to the national asset inventory.

18.2 Repair and Maintenance

Repair and maintenance expenditures are current accounts, not capital assets. They are included in this survey to highlight their contribution to maintain productivity of the capital assets invested in mineral development and mining activity.