

# The 13th Annual Americas School of Mines Basics of Mining Accounting\*

Lenard Boggio, FCA, CPA (Illinois)

Incorporated Partner

Mark Patterson, CA, CPA (Illinois)

Partner

\*connectedthinking

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# Agenda

Enumerate the stages of a mining operation

Explain the phases of operations concerning the mining industry

Identify the key accounting principles for a typical mining company

Have a basic knowledge of the accounting issues in the mining industry

# Contents

The phases of operations of mining are:

Exploration and Evaluation

Development Phase

- Joint Ventures (JV)
- Ore Reserves
- Development Costs
- Start Up Costs

# Contents

## Production Phase

- Inventory
- Materials and Supplies
- Deferred Stripping
- Maintenance
- Depreciation and Amortization
- Revenue Recognition
- Derivatives and Hedging
- Impairment
- Foreign Currency Translation

# Contents

## Closure Phase

- Asset Retirement Obligations (ARO)

The basic accounting treatment of these phases will be discussed throughout the course.

# Exploration and Evaluation

## Stages of Operation

### Exploration and Evaluation

Exploration (search for) and evaluation of mineral resources suitable for commercial exploitation include the following activities:

- Research and analysis of historical data
- **Geological:** studies related to the science which deals with the history of the earth and its life, especially as recorded in rocks
- **Geochemical:** studies related to the science dealing with the chemical composition of and chemical changes in the crust of the earth

## Stages of Operation

### Exploration and Evaluation

- Exploratory drilling, trenching and sampling
- Determining ore grade and volume of deposit
- Feasibility study preparation
- Determine commercial viability of project
- Accounting treatment: Expense as incurred or capitalize and test impairment when required

## Stages of Operation

# Exploration and Evaluation

## Expensed or Capitalized (AcG 11 and EIC 126)

- Different from US GAAP, which prohibits capitalization of exploration or development costs until feasibility study completed and all permits in place
- Under Canadian GAAP, an enterprise applies the method of accounting for exploration costs that it considers to be appropriate to its operations and applies the method consistently to all its properties

## Stages of Operation

# Exploration and Evaluation

## Exploration Project Impairment (EIC 174)

- Apply recoverability test, if cash flow information available
- Apply fair value test, if project is early stage and no cash flows are available

## Stages of Operation

### Exploration and Evaluation

#### Flow Through Share Financing (EIC 146)

- Shares issued with proceeds required to be spent on grass roots exploration of Canadian properties
- Allows tax deduction for exploration expenditures (including incentive deductions) to flow through to share purchaser
- Account for the temporary tax differences which arise at the time renunciation form filed as FIT liability with charge to equity, then assess the liability at period end – may give rise to income
- Different treatment under US GAAP, which looks at whether any premium was received on the issue of the shares – any liability is recorded as charge to income

# The Development Phase

Joint Ventures (JV)

Ore Reserves

Development Costs

Start Up Costs

## Joint Ventures

Joint Ventures are common in the mining industry due to the following:

- The high capital requirements associated with new projects
- Increasing number of projects in high-risk developing countries
- Companies looking for a strategic investment

## Joint Ventures

### Joint Ventures Defined:

- “**Contractual** arrangements whereby two or more parties undertake an economic activity which is subject to joint control”
- “Joint Control”- **contractually** agreed sharing of the continuing power to determine the entities strategic operating, financing and investing activities (regardless of ownership interest)

Stages of Operation - Development

## Joint Ventures

Joint Ventures usually fall into one of two groups:

1. Jointly control entities
2. Jointly controlled assets and liabilities

## Joint Ventures

- Jointly controlled entities involve the establishment of a legal entity which can enter contractual arrangements in its own right
- Canadian GAAP – proportionate consolidation
- IFRS – equity accounting (ED 9) by each party
- US GAAP – equity accounting by each party

## Joint Ventures

- Jointly controlled assets and liabilities provide for an undivided interest in a percentage of each of the assets and an equivalent proportionate sharing of each of the liabilities required for the economic activity
- Canadian GAAP – proportionate consolidation
- IFRS – proportionate accounting may apply
- US GAAP – proportionate accounting accounting by each party (allowed for extractive industries under EITF 00-01)

Stages of Operation - Development

## Joint Ventures

However, there is a twist:

- Since the issuance of AcG 15 (FIN 46 in US), such joint venture relationships must be evaluated under the Variable Interest Entity rules first to determine if the joint venture is a variable interest entity and whether one investor, or another enterprise with variable interest in the entity, is the primary beneficiary and may be required to consolidate the joint venture.

Stages of Operation - Development

## Joint Ventures

### General Considerations

- Accounting policies
  - Where necessary, JV financial information should be adjusted to conform to the policies of the venturer which is incorporating the information in their own accounts

## Joint Ventures

### General Considerations

- JV financial statements should be adjusted to eliminate any material unrealized profits and losses existing between JV and investor
- JV agreement may require an audit of the entity
- Internal controls certification may exclude the operations of the JV

## Joint Ventures

Basic terms relating to the development phase:

- **Commencement** - Phase commences when it is determined that commercially recoverable reserves exist (usually through completion of a feasibility study) and a decision is taken by the directors to develop the mine
- **Construction** – Occurs during the development phase
- **Conclusion** - Phase concludes upon the commencement of production from the resource

## Ore Reserves

- **Resources** are identified mineral occurrences with reasonable prospects for eventual economic extraction.
- **Reserves** are the part of a resource that, based upon appropriate assessments, demonstrate that economic extraction could reasonably be justified.

## Ore Reserves

**Mineral Resources** are usually categorized based upon the degree of certainty with which quantities can be estimated and the extent to which properties containing reserves have been developed:

- 1. Proven (developed or undeveloped)**
- 2. Probable**
- 3. Measured and Indicated**
- 4. Inferred**

## Stages of Operation - Development

### Ore Reserves - The fisherman's view

<b>Proven Developed</b>	<b>The fish is in the boat – you have weighed it and will keep it for dinner</b>
<b>Proven undeveloped</b>	<b>The fish is on the hook and you can see it but it is still in the water, where they always look bigger</b>
<b>Probable</b>	<b>There are fish in the lake – you have had some bites, have seen them jumping and heard of others catching them, but have not caught any yet</b>
<b>Measured and Indicated</b>	<b>You saw something disturb the surface of the lake – it looked like a fish</b>
<b>Inferred</b>	<b>There is lake in the distance....</b>

## Ore Reserves

- Reserves form the basis for depletion and amortization calculations
  - Based on most current information – change in estimate when updated
- Resource estimates require updating for material changes (and usually done annually for producing companies) and are disclosed in Canadian continuous disclosure documents in accordance with NI 43-101 (different than US – SEC determination and disclosure requirements).

## Ore Reserves

### Reserve Disclosure

- SEC Industry Guide 7, *Description of Property by Issuers Engaged or to be Engaged in Significant Mining Operations*, states that estimates other than proved or probable reserves shall **not** be disclosed in any document in any document filed with the SEC unless:
  - Required by foreign or state law (such as set out in Canadian NI 43 -101), or
  - Where such estimates have been provided to a person offering to acquire, merge or consolidate with the registrant

## Stages of Operation - Development

### Development Costs

- Costs related to gaining access to the identified resources after the decision has been taken to develop (usually supported by feasibility study)
- Costs can include such items as:
  - Advance removal of overburden and waste rock
  - Infrastructure development (road building)
  - Shaft sinking

Note - Stripping costs incurred in the development stage should be capitalized if the stripping activity can be shown to represent a betterment to the mineral property. A betterment occurs when the stripping activity provides access to sources of reserves that will be produced in future periods that would not have otherwise been accessible in the absence of this activity.

## Development Costs

- Development costs are usually carried forward until the mine is commissioned (production begins) because the expenditure is for future benefit from the mineral extraction.
- Capitalized development costs are then amortized using the units-of-production (UOP) method as the resources are mined (UOP generally uses proven and probable reserves – some flexibility in Canada).

## Stages of Operation - Development

### Development Costs

- Establishing and commissioning facilities to extract, treat and transport production from the mineral reserve to markets
- Phase commences when tangible assets are built including:
  - Buildings
  - Machinery
  - Plant and Equipment
- Phase concludes upon the commencement of sustainable production from the reserve
- Lots of activity – controls should be strong

## Stages of Operation - Development

### Start Up Costs

- Canadian GAAP changed starting in 2009 to mirror US GAAP (through elimination of EIC 27). Under US GAAP (SOP 98-5) all costs of start-up activities and organization costs are **expensed as incurred.**

## Stages of Operation - Production

### Start Up Costs

- Cut-off point between development (including construction) and production is determined by whether the asset is available for use. Generally this is when commissioning and testing of a facility is complete and finished product is produced.

# The Production Phase

Inventory

Materials and Supplies

Deferred Stripping

Maintenance

Depreciation and Amortization

Revenue Recognition

Derivatives and Hedging

Impairment

Foreign Currency Translation

Stages of Operation - Production

## Inventory

Components of production inventory:

- Stockpiles
- Leach pad material
- Concentrate and in-process
- Processed metals

## Stages of Operation - Production

### Inventory

### Inventory Cost

The following should be included in inventory costs:

- Cost of purchase concentrates (smelting / refining facilities)
- Labor (standard and contract)
- Consumable material (fuel, reagents, and chemicals)
- Overhead elements directly and indirectly attributable to production based on “normal” capacity
- Stripping costs incurred during production

## Stages of Operation - Production

### Inventory

### Valuation

GAAP requires that inventory be valued at the lower of cost and net realizable value (CICA 3031)

- In the event that the inventory costs plus costs to complete will not be recovered by sales proceeds, inventories should be written down to net realizable value.
- Fair value write downs must be reversed if NRV recovers in future periods.

Stages of Operation - Production

## Inventory

Cost to complete includes **conversion costs**:

- Concentrating
- Refining
- Treatment charges
- Marketing charges (if applicable)

Stages of Operation - Production

## Inventory

## Joint Product vs By-Product Cost

Definitions:

Five key terms affecting Joint vs. By-product Costing

- 1. Joint Products:** metals or minerals within an ore body which each have significant relative sales values
- 2. By-products:** metals or minerals within an ore body which have minor sales values

## Stages of Operation - Production

### Inventory

### Joint Product vs By-Product Cost

- 3. Split-off Point:** point in production process before which minerals are not identifiable as individual products – significant issues in cost allocation to products can result
- 4. Separate Costs:** all inventoriable costs specifically attributable to a metal or mineral from the split-off point of sale
- 5. Joint Costs:** all inventoriable costs not specifically identified with a particular metal or mineral – allocation must be consistently applied

## Inventory

### Joint Product vs By-Product Impact on Costs of Sales

- **Joint-products** record their own costs and revenues separately – can affect NRV testing for inventories
- **By-products** revenue included in revenue section of P&L (unless not material)
- Revenue and Cost of Sales adjusted in MD&A (non-GAAP measure) to move by-products out of revenue and apply to Cost of Sales – industry practice to adjust per unit costs to reduce by by-product revenues

## Stages of Operation - Production

### Materials and Supplies

- Include materials utilized in the production of inventory
  - Reagents and chemicals, grinding balls, safety supplies, other consumables
- Exclude capital spares and insurance spares (CICA 3031)
- Perpetual method of inventory with cycle counts performed on a regular basis (most common method utilized)
- Usually accounted for using the average cost method – easiest to apply
- Perform obsolescence testing periodically (at least annual)

## Deferred Stripping

- Stripping is the removal of overburden or waste to access mineralized material. Capitalize prior to commercial production.
- Once production has commenced, production related stripping costs are accounted for as a cost of current production and, therefore, as a component of the cost of any inventory extracted from the mine and held at period end.
  - Applies to all types of inventory including stockpiles and in-process materials
  - Standard applies only to stripping costs (waste or overburden) incurred in surface (ie: open pit or strip) mining during the production phase of a mine

## Deferred Stripping

- Production phase of a mine begins when saleable minerals are extracted (produced), regardless of the level of production. However, the production phase does not commence with the removal of de minimis saleable mineral material that occurs in conjunction with the removal of overburden.

## Deferred Stripping

### Capitalize or expense:

- Generally, stripping costs should be accounted for as variable production costs that should be included in the costs of the inventory produced (that is, extracted) during the period that the stripping costs are incurred.
- Stripping costs should be capitalized if the stripping activity can be shown to represent a betterment to the mineral property. A betterment occurs when the stripping activity provides access to sources of reserves that will be produced in future periods that would not have otherwise been accessible in the absence of this activity (EIC 160).

## Deferred Stripping

Facts and circumstances must be considered when determining if stripping costs represent a betterment and may be capitalized at an existing operation which is in production.

- Workings of separate geological structures/mineral deposits
- Separate and distinct areas of mining operations contemplated by the mine development plans
- Enlargement of existing operations vs separate and distinct new operations
- Expenditures for tangible property and infrastructure development
- Are previously inaccessible resources now accessible?

Stages of Operation - Production

## Deferred Stripping

### How to amortize stripping costs

- Rational and systematic basis over the reserves that directly benefit from the stripping activity
- Generally apply Units of Production
- May differ from life of mine amortization, as the costs may relate to only a portion of the resource

## Stages of Operation - Production

### Maintenance

- Expense costs of routine maintenance and repairs as incurred
- Major cyclical maintenance projects (smelter rebuild)
  - Capitalize costs that replace a major part
  - Depreciate over the period benefited
  - Disclosure of accounting policy regarding maintenance activities is required

Stages of Operation - Production

## Depreciation and Amortization

Useful life of an asset is determined by either:

- Reference to the period over which it is expected to be used,  
  
or
- The number of units of production expected to be obtained from or processed by the asset

Stages of Operation - Production

## Depreciation and Amortization

Most common methods of depreciation are as follows:

- Units-of-production method - Each asset is depreciated by the proportion of the reserve extracted during the period to the total mineral reserves (typically proven and probable reserves)
- Straight-line method - Each asset is depreciated over the asset's useful life by equal annual charges

## Revenue Recognition

Revenue generally is (1) realized or realizable and (2) earned when all of the four criteria noted below are satisfied:

1. Persuasive evidence of an arrangement exists
2. Delivery has occurred
3. Seller's price to buyer is fixed or determinable
4. Collectability is reasonably assured

## Revenue Recognition

### Extractive industry – Provisionally priced sales contracts:

- Risks pass upon shipment/delivery at a preliminary price subject to finalization in a future quotation period (e.g., sales with final price setting three months out and initial provisional payment)
- Upon meeting all of the requirements for revenue recognition, that revenue should be recognized using the spot price on the date the sale is recognized
- Mark to market through settlement date – the accounts receivable contains an embedded derivative which should be disclosed

Stages of Operation - Production

## Revenue Recognition

### Other Issues

#### FOB Destination

- If title has not transferred, revenue recognition is not appropriate
- In some contracts, title does not transfer until payment

## Derivatives and Hedging

- CICA 3855 (Financial Instruments recognition and measurement) and CICA 3865 (Hedges) is required to be adopted by all companies – very similar to US GAAP and IFRS
- Requires recognition of all derivatives as either assets or liabilities on the balance sheet and measurement of those instruments at fair value
- Disclosure requirements of IFRS adopted for 2008 with new CICA 3862 and 3863

## Derivatives and Hedging

- Changes in the fair value of derivatives are recorded each period in current earnings or comprehensive income
- The accounting for changes in the fair value of a derivative depends on the intended use of the derivative and whether it has been designated as a hedge for accounting purposes

## Derivatives and Hedging

If certain conditions are met, a derivative may be specifically designated as one of the following:

- A hedge of the exposure to changes in the fair value of a recognized asset or liability or an unrecognized firm commitment (fair value hedge)
- Gain or loss is recognized in earnings in the period of change together with the offsetting gain or loss on the hedged item attributable to the risk being hedged

## Derivatives and Hedging

- A hedge of the exposure to variable cash flows of a forecasted transaction (cash flow hedge)
- The effective portion of the derivative's gain or loss is initially reported as a comprehensive income and subsequently reclassified into earnings when the forecasted transaction affected earnings. The ineffective portion of the gain or loss is reported in earnings immediately.

## Derivatives and Hedging

- A hedge of the foreign currency exposure of a net investment in a foreign operation or a foreign-currency-denominated unrecognized firm commitment, recognized asset or liability or forecasted transaction.
  - Gain or loss reported in comprehensive income as part of the cumulative translation adjustment

## Derivatives and Hedging

- For a derivative not designated as a hedging instrument, the gain or loss from changes in market value is recognized in earnings in the period of change.
  - Common in mining sector – difficult to achieve the requirements for hedge accounting

## Stages of Operation - Production

# Impairment

- CICA 3063
- Provides guidance on:
  - Recognition and measurement of the impairment of long-lived assets to be held and used
  - Measurement of long-lived assets to be disposed of by sale

## Impairment

**Impairment:** The condition that exists when the carrying amount of a long-lived asset or asset group exceeds its fair value.

- An impairment loss should be recognized if the carrying amount of a long-lived **asset** is not recoverable and exceeds its fair value
- The carrying amount of a long-lived asset is not recoverable if it exceeds the sum of the undiscounted cash flows expected to result from the use and eventual disposition of the asset

## Impairment

- The assessment is based on the carrying amount of the **asset** at the date it is tested for recoverability, whether in use or under development
- An impairment loss shall be measured as the amount by which the carrying amount of a long-lived asset exceeds its fair value
- If an impairment loss is recognized, the adjusted carrying amount of a long-lived asset is its new cost basis

## Impairment

### Fair value

- Amount at which that asset/liability could be bought (incurred) or sold (settled) in a current transaction between willing parties
- Quoted market prices in an active market are the best evidence
- If quoted market price is not available, fair value estimate should be based on the best information available, including prices for similar assets and the results of other valuation techniques

Stages of Operation - Production

## Impairment

### Examples of Mining Impairment Indicators:

- Significant changes in utility or physical properties of an asset
- Significant change in legal factors, regulations or business climate
- Substantial overruns of project costs
- Current period or trend of operating or cash flow losses supported by a forecast that demonstrates continued losses

Stages of Operation - Production

## Impairment

### Examples of Mining Impairment Indicators:

- Sustained decline in commodity prices
- Renegotiation or cancellation of major supply contract
- Operating problems in mining, milling, smelting, refining, etc.

## Impairment

Estimated cash flow approach to test recoverability of a long-lived asset

- Based on the remaining useful life of the asset to the entity
- Based on the asset's cash flow generating capacity
- Probability weighted approach may be used
- Incorporate the entity's own assumptions about its use of the asset
- For an asset under development, cash flows should be based on the expected service potential when development is substantially complete

Stages of Operation - Production

## Impairment

### Impairment Disclosures

- Description of the facts and circumstances leading to impairment or the expected disposal, the expected manner and timing of the disposal
- Business segment(s) (cash generating units) affected for reporting
- Reported in income from operations
- Amount of impairment loss
- Method used to determine fair value

## Foreign Currency Translation

- The measurement currency will have an impact on whether foreign currency gains and losses are recorded in a component of equity or in the income statement and also whether foreign currency derivatives exist in contracts
- An entity may elect to present its financial statements in a currency which differs from its measurement currency

The Closure Phase

Asset Retirement Obligations (ARO)

## Asset Retirement Obligations

### CICA 3110

- Requires recognition for a closure obligation when an obligation is incurred
- Measured at fair value
  - Price entity would have to pay a willing third party to assume the liability other than in a forced or liquidation sale
  - In absence of market for assuming liabilities required to use expected present value technique to estimate fair value
  - Discounted at credit-adjusted-risk-free-rate

## Asset Retirement Obligations

- Initial carrying value of PP&E is increased by the corresponding obligation and amortized over the life of the asset
- Allocate the asset retirement cost to expense using a systematic and rational method over its useful life

## Asset Retirement Obligations

In periods subsequent to the initial measurement, recognize period-to-period changes in the liability for an ARO as a result of the following:

- Passage of time
  - Apply an interest method of allocation to the amount of the liability at the beginning of the period
  - Amount recognized as an increase in the carrying amount of the liability and as accretion expense

## Asset Retirement Obligations

- Revisions to either the timing or the amount of the original estimate of undiscounted cash flows
  - Recognize as an increase or decrease in (a) carrying amount of the ARO and (b) the related asset retirement cost capitalized as part of the carrying amount of the related long-lived asset

Stages of Operation - Closure

## Asset Retirement Obligations

### Disclosure

- General description of the ARO and the associated long-lived assets
- Fair value of assets that are legally restricted for purposes of settling ARO

## Asset Retirement Obligations

### Disclosure

- Reconciliation of the beginning and ending aggregate carrying amount of ARO, showing separately the changes attributed to the following:
  - Liabilities incurred in the current period
  - Liabilities settled in the current period
  - Accretion expense
  - Revisions in estimated cash flows, whenever there is a significant change during the reporting period

## Asset Retirement Obligations

### Disclosure

- If the fair value of an ARO cannot be reasonably estimated, that fact and the reasons therefore should be disclosed.
- Must determine an ARO even when uncertainty exists as to the timing of the obligation or method of settlement
  - Can not assume indefinite life
  - Must account for asbestos and other environmental obligations even if remediation is not required until removal or exposure.

# IFRS is coming...

- Applicable for years beginning on or after January 1, 2011.

## Summary

More interest? Dig for more information at the [PwC Publication website](#). (Type mining in the 'Search' box to advance to the **mining** information.)

## Contacts:

Lenard Boggio, FCA, CPA (Illinois)

Vancouver, BC, Canada

+1 604 806 7016

[lenard.f.boggio@ca.pwc.com](mailto:lenard.f.boggio@ca.pwc.com)

Mark Patterson, CA, CPA (Illinois)

Vancouver, BC, Canada

+1 604 806 7160

[mark.patterson@ca.pwc.com](mailto:mark.patterson@ca.pwc.com)

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## Summary



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