Appraisal Manual

For Centrally Valued

Natural Resource Property

Preface

The Department of Revenue's Local Jurisdictions District is responsible for ensuring fair, accurate, and uniform property valuations as prescribed by Arizona statutes. The Local Jurisdictions District contains the Centrally Valued Property Unit which is responsible for producing this manual.

The Centrally Valued Property Unit is responsible for determining the full cash value of certain utilities, railroads, airlines, private rail cars, mines, and other complex or geographically diverse property. With the exception of airline and private rail car valuations, the values are then transmitted for entry on the individual county tax rolls for levy and collection of property taxes.

The manual is produced each year to serve as a guide in the appraisal of mines and other natural resource property. The techniques, procedures, and factors described in the manual are reviewed annually and revised in accordance with standard appraisal methods and techniques along with changes in statutes, rules, and regulations. Revisions are also made based on case law decisions. The procedures described in the manual are designed to assist the appraiser in the application of the income, cost, and market approach methods of valuation to these properties for the current tax year.

This manual is intended for use in ad valorem appraisal of specific centrally valued property including producing mines, certain non-producing mines, qualifying environmental technology property and oil, gas, and geothermal interests in Arizona. The guidelines in this manual are used to establish full cash values for these properties as of January 1 of the valuation year. The valuation year by statutory definition means "the calendar year…preceding the year in which the taxes are levied." Thus, the full cash values determined for property as of a valuation date of January 1, 2024 will serve as the basis for the tax year 2025 property tax billings.

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Natural Resource Property Valuation Overview

Introduction

The Centrally Valued Property Unit is responsible for the annual determination of ad valorem full cash values for certain types of natural resource property including producing mines, certain non-producing mines, qualifying environmental technology property, as well as oil, gas, and geothermal interests. In general, the valuations for mining property are based on standard appraisal methods and techniques, which are consistent with statutory provisions, department rules and judicial decisions. These appraisal methods include variations of the income, cost, and market approaches to valuation. Oil, gas, and geothermal properties are valued on the basis of a statutory procedure.

A wide variety of natural resource products including base and precious metals, non-metallic minerals, coal, oil, and gas are extracted from numerous locales within the state of Arizona. Based on the total dollar value of metal production, copper ranks the highest followed by molybdenum, silver, and gold. The latter three metals are produced as by-products during the copper extraction process. Lesser production value is realized from non-fuel, non-metallic minerals such as perlite, salt, mica, zeolites, and silica flux. Oil and gas properties are minor in terms of both value and volume of production. At present, there are no producing geothermal interests in Arizona that are centrally valued. Based on statutory provisions, sand and gravel pits, building stone quarries, and other facilities which produce materials normally processed into building stone are not considered producing mines for ad valorem tax purposes. These properties are valued at the local level by the county assessor.

The full cash value for a mining property located in Arizona is based on the unit valuation business concept. This concept derives a single unitary value for all taxable property associated with the mine as a unit. The components of value include such items as real estate, mineral-in-place (ore reserve), supplies inventory, construction work-in-progress, as well as the plant and equipment operated in conjunction with the business. An operating mine unit may include an underground mine, an open pit mine,

an in-situ leach, dump leach or heap leach facility, an ore concentrator (mill), a solvent extraction-electrowinning circuit, a smelter, a refinery plant, a by-product commodity recovery plant, or any combination of the aforementioned facilities used for the production of ores, metals, minerals, or mineral substances.

The full cash value of the property is determined by correlating data from all applicable approaches to value. These include the income approach, the cost approach, and the market approach. The income approach valuation for a mining property with a mineable ore reserve is based on the going-concern, unit valuation concept. The income approach valuation method for a property with an established operating record begins with the estimation of a future income stream based on a five-year average profit margin. This income projection is then discounted to a present value by using a single discount rate formula. The cost approach valuation is based on a summation of components approach within the unit valuation concept. Depending on the expected status of the property, the cost approach valuation may or may not be developed under the going concern concept. The cost approach method determines a property's value by combining separate valuations on a replacement cost new less depreciation method. The market approach method is based on the use of an actual or comparable property sale. Because of the limited number of actual or comparable sales of these types of properties, the market approach to value is rarely used. However, if an actual sale does occur, the market approach method may become the most reliable indicator of value. In general, most valuations of mining property are based on a correlation between values developed through the income and cost approach methods.

Based on current statutes describing the classified property assessment system in Arizona, centrally valued mining property is separated for assessment purposes into producing, non-producing, and environmental technology categories. Producing mines, which are assessed as Class 1 property, include properties which are intended for use in, or are actively engaged in the extraction and/or production of metal(s), mineral(s), or mineral substance(s) for commercial purposes. Non-producing mines represent

properties, which were once assessed as producing properties, but are no longer in operation. The Department values these properties for a period of three valuation years subsequent to the last valuation year in which the property was valued as a producing mine. Full cash values for non-producing mines may be assigned to either Class 1 (as other commercial or industrial property) or Class 2 property (as other property not included in classes 1, 3, 4, 6, 7, or 8) depending on current use. [Note: changes in classification were made during the 1999 Legislative Session.] Environmental technology property is valued under the same regulations and procedures as producing and non-producing mining property. The full cash value for this type of property is assessed as Class 6 property (formerly Class 8 property).

Under the classified property assessment system used in Arizona, the assessed value to be entered on the tax rolls for a property depends on the classification for that property. The full cash value for a producing mine is assigned to Class 1.1 property and assessed at a 16.0% ratio. Non-producing mines are assigned to property Class 2.1 or 2.2 and are assessed at 15.0%. Environmental technology property is assigned to Class 6.4 property and assessed at a 5.0% ratio for taxation purposes.

Oil, gas, and geothermal producing interests are also valued by the Department under a special production based method. The valuation is limited to the gross yield of the production from the oil, gas and/or geothermal well. The value excludes any amounts either used in the production process or exempted by law. These property interests are included with Class 1.5 and assessed at 16.0% of the full cash value for tax year 2025. The real and personal property utilized by oil, gas, and geothermal resource interests are valued separately by the local county assessor.

The actual tax bill for the property is the product of the full cash value multiplied by the assessment ratio multiplied by the tax rate established for the specific location of the property. The property tax rate is determined for each tax jurisdiction by combining individual tax rates for state, county, city, school district, and all other taxing authorities into the overall tax rate. For example, a tax bill for tax year 2025 for a class 1.1

producing mine with a full cash value of $10 million and a tax rate of $12.00 per $100.00 of assessed value would be $192,000 ($10,000,000 x 0.16 x $0.12 = $192,000).

Chronology of the Valuation and Assessment Process

Property tax values for natural resource properties are established as of January 1st of the year preceding the year in which the taxes are levied. For example, for tax year 2025 the date of valuation for the property is January 1, 2024. Tax rates related to this valuation will be determined by taxing authorities in the third quarter of 2025. Tax bills for the first half of the taxes payable for these valuations normally are mailed to taxpayers by September of the tax year. The first half of the bill related to the tax year 2025 valuations is due on October 1 and will become delinquent after November 1, 2025. The second half of the bill is due on March 1, 2026 and will be delinquent after May 1, 2026.

Prior to establishing these full cash values, the Department is required to inform affected taxpayers concerning the contents and proposed changes, if any, to this manual. The information is to be distributed prior to February 1st of the valuation year and the manual is to be made available to the public by March 15th or, if that date falls on a weekend, the next business day. The actual property valuation is based, in part, on data provided by the taxpayer on a report form such as Form 82061-A for copper mines, Form 82061-B for mines other than copper, Form 82061-C for small scale mines, or Form 82063 for oil, gas, and geothermal interests. The Department may also use other information from both public and private (confidential) sources in order to establish the value of the property. The Department established rules that require the mailing of the report forms by February 1st. These annual property tax report forms for all mining property, including oil, gas, and geothermal interests, must be filed with the Department by the taxpayer no later than April 1st, unless an extension is requested. Failure to file the report by the requisite due date may result in the assessment of a penalty. An extension of the filing date may be obtained upon written application of the taxpayer.

The granting of an extended filing date is at the discretion of the Department and depends on the actual conditions causing the delay in filing.

By law, the Department is required to provide taxpayers with a notice of preliminary full cash value on or before June 15th. Written applications to appear before the Department to review these values must be filed with the Department on or before July 15th. The final determinations of value after review of all pertinent information will be completed by the Department on or before August 31st.

Chapter 2

Mine Valuation Procedures

Income Approach

Application of the Income Approach

The use of the income approach method to value mining property is a commonly accepted standard appraisal technique for natural resource property. The application of the income approach to mine valuation requires the determination of a future projected income stream and an appropriate discount rate to derive the present value of that income stream. Bonbright described the essence of the income approach more than 80 years ago as, "The 'capitalized income method' of valuation refers to any procedure whereby the appraiser measures the value of the property by a calculation or estimate of the income or services derived or derivable from the property by its present or potential owner."[1]

Some form of an income approach has been used to value mining property since Arizona was organized as a territory in 1863. The methods have varied from a system of ⅛th of the gross value of the mineral product plus 4 times the net profit for the previous year and the value of improvements[2] to a system capitalizing a three-year average of net earnings at a 15.0% rate[3]. For a time up until the mid-1970s, income approach valuations were based on the difference between an estimated future commodity price (using weighted historical prices in nominal dollar terms) and future anticipated costs. The income was then discounted to a present value using the Hoskold dual rate equation, which provided for a return on capital in the form of interest and a return of capital in the form of a sinking fund.

Valuation Methodology

The income approach method of valuation for mining property as currently used by the Centrally Valued Property Unit consists of discounting a series of future modified cash-flow projections to obtain a present value. The value of the property should include

[1] J.C. Bonbright, 1937, The Valuation of Property, Vol. I and II, The Michie Company, Charlottesville, VA, p.230.
[2] P.J. Miller, 1913, The Assessment of Mines, Engineering and Mining Journal, Vol. 96, No. 21, p. 969.
[3] W.A. Roberts, 1944, State Taxation of Metallic Deposits, University Press, Cambridge, MA, p. 259.

all property components necessary for operation whether held through equity, leasehold or debt interests. The income projection is based on annual, production-based cash flows projected over a specified mine life determined by the ore reserve and may include certain applicable annual post-production costs following the termination of active production. The method the Department uses projects a cash flow income on an after-income tax basis derived from a five-year average profit margin adjusted for economic and operating conditions. The projected cash flow is not escalated for general price level inflation over future mine life and as a result, is similar to a constant dollar income stream. The income projections derived from the adjusted five-year average margin are then discounted to a present value by using a single discount rate to account for the time value of money. The Department has used the five-year average margin method since the mid-1970s. This method was designed for relatively stable operations with an established record in which future production is expected to be similar to levels recorded within the past operating history.

In the Arizona method, the five year average profit margin is commonly modified for future anticipated economic and operating conditions including commodity price cycles and changes (in real $ terms) in cash operating costs. Modifications to the five year average commodity prices are based on reviews of current commodity price projections from security analysts, investment banks, corporate information releases, and other applicable sources. In addition the Department prepares analyses of long term (10 to 20 year) constant dollar commodity price information. Modifications to operating costs are based on factors related to future production and, for example, may be related to higher or lower waste material stripping requirements for mining, harder or softer ores for ore concentrating operations, or changes in anticipated commodity treatment and refining (TCRC) costs.

Operating cash expenses include all applicable cash mining, concentrating, leaching, solvent-extraction, electrowinning, precipitating, treatment, refining, and overhead (administrative) costs for all primary and byproduct commodities produced from the

property. Applicable cash property tax, severance tax, permit fees, and other non-income taxes are included in the operating cash expenses. These expenses exclude (but are not limited to) non-cash charges such as depreciation, depletion, amortization, and certain accrued expenses. Reclamation and restoration costs, which may be incurred on a cash basis after production terminates, are included in the total cash flow projection from the property in the post production period.

Operating expenses also do not include financing or interest charges per Department regulations in R15-4-203. Non-allowable financing costs include leasing costs which may be composed of an interest expense component, a return on investment component (lessor profit), and a return of capital component to the lessor. However, if the leasing charge is based on equipment that is a necessary capital replacement to maintain the income stream, a capital charge may be allowed in the capital replacement cost section of operating expense to account for this equipment.

Income taxes under the Arizona valuation method are calculated by use of an effective combined federal and state income tax rate applied to operating cash flow. Operating cash flow is defined as operating cash revenues from the property less operating cash expenses. Operating cash revenues include all production and by-product based commodity revenue in addition to revenue from miscellaneous related sources including toll treatment and refining operations. The effective income tax rate is based on a simplification of statutory rates that take into account the impact of the allowable non-cash based income tax deductions for income tax calculations. For all mine properties the effective income tax rate is 21%. The effective income tax rate is adjusted in the cash flow projection for variations (for example, different depletion rate provisions) related to allowable income tax provisions.

Discount Rate Analysis

A discount rate is a factor that is used to convert a projected income stream into a value known as a net present value. Expressed in another way, a discount rate is "(t)hat rate used to discount the value of future benefits and costs to its present value (i.e., to account for the fact that an amount of money to be received in the future is worth less than the same amount if received today)."[4] Mining properties are commonly valued on their ability to earn profits over a period of time based on production from an ore reserve. The determination of an appropriate discount rate for valuation purposes is as important as the estimation of future benefits, expressed as cash flows, to be derived from the property. For Arizona valuation purposes, projected income is discounted on an annual end-of-period basis.

An important characteristic of a discount rate is that it should be matched to the type of future projected income stream. A discount rate will vary depending on the type of risk and parameters used for valuation. The discount rate may vary with assumptions concerning metal prices, mine lives, production rates, development status, country risk, foreign currency translations, and many other factors. Different discount rates may be used depending on the stage of development of the property. The rate applicable to developing a new foreign property would be higher (for example 25%, see Gentry and O'Neil, 1984, p. 324) than rates applicable to expansion or replacement at an operating domestic property (12-14%, Gentry and O'Neil, 1984)[5].

In general, an income stream may be projected in real or constant dollars (uninflated) or, it may be projected in current or nominal dollars (inflated). As stated in Mine Investment Analysis, "A very serious problem exists with many firms today that evaluate capital investments in constant-dollar terms and then use a market-determined cost of capital as the minimum acceptable rate of return. It is vitally important that consistency be maintained here. If a market-determined discount rate (e.g., the cost of capital) is

[4] T.F. Torries, 1999, Evaluating Mineral Projects: Applications and Misconceptions, p. 141.
[5] D.W. Gentry and T.J. O'Neil, 1984, Mine Investment Analysis, A.I.M.E., New York, pp. 309-310.

used, the rate will contain a component for inflation and should, therefore, only be used when revenues and costs are also adjusted for inflation. Similarly, if the analysis is performed in constant dollar revenues and costs, the discount rate should not contain a component for inflation."[6]

The adjustment process for converting a market-derived, nominal dollar discount rate to a real or constant dollar discount rate is described in Mine Investment Analysis. In effect, a market-derived, nominal dollar discount rate should apply to a nominal dollar income stream that is inflated for future changes in costs and revenues. In contrast, a constant dollar (real) discount rate should be applied to an income stream that does not contain future inflation. An example of the calculation of the net present value for real and nominal dollar cash flows is shown in Appendix 1.

An example of the distinction between nominal and real discount rates in the valuation of mines is provided by valuations related to the creation of Royal Oak Mines Ltd. through the combination of five previously existing mining companies in 1991.[7] In this particular case, a real discount rate of 8.5% was used for discounting a constant dollar income stream in comparison to a nominal discount rate of 13.0% applied to an income stream with a future inflation component of about 4.0%. Since cash flows derived under the Arizona system (using the adjusted five-year average margin method) are not escalated for future inflation, the appropriate discount rate should be a constant or real dollar discount rate.

Apart from reflecting the time value of money, discount rates should also take into account the risks, if any, involved in investing those monies. In its simplest form, a discount rate should include a component equivalent to a safe investment rate for using and managing the capital, and a component equal to the risks associated with a particular property or industry. As stated by Whitney, "The required rate of return that an

[6] D.W. Gentry and T.J. O'Neil, 1984, Mine Investment Analysis, A.I.M.E., New York, pp. 309-310.
[7] Royal Oak Mines Ltd., 1991, Joint Management Proxy Circular for Royal Oak Resources Ltd., Pamour, Inc., Giant Yellowknife Mines Limited, Pamorex Minerals, Inc., Akaitcho Yellowknife Mines Ltd., May 17th, p. G-9.

investor or project manager needs has three components. They include a fee for the use of the money, a fee for managing the project in which the money is invested, and a fee for taking the risk."[8] With regard to risk, Stermole states, "In most cases, the interest rate that should be used in economic evaluation calculations is not the cost of borrowed money, but instead, is the minimum rate of return that the investor feels he has opportunities in which to invest available capital with a reasonable level of risk."[9]

The discount rate should also be conformable with the inclusion or exclusion of income taxes in the cash flow projection. A discount rate may be derived on a pre-income tax or after-income tax basis from market data. As stated by Ibbotson Associates, "One important aspect of an income approach model is that the discount rate and the cash flows are projected in the model, they must be discounted to present value using a pre-tax cost of capital (as opposed to an after-tax cost of capital)."[10] If the projected cash flows are effectively infinite and the income tax rate is constant, the after-income tax rate is equal to the pre-income tax rate multiplied by one minus the tax rate as shown in Appendix 2. However, if the cash flows are limited in life and variable this relationship is no longer comparable.

The income stream from a property is normally capitalized by use of a weighted average cost of capital. This cost of capital is composed of equity and debt rate components weighted by the market value of the respective equity/debt segments in the business capital structure. However, the administrative rules the Department adopted dictate that, "Cash flow shall be based on an all-equity investment on a production basis, not a sales basis, assuming all production is sold in the year produced. Financing and interest charges shall not be considered".[11] Therefore, the discount rate used for valuation purposes for Arizona mining property is derived on a 100% equity basis.

[8] J.W. Whitney and R.E. Whitney, 1982, Investment and Risk Analysis in the Minerals Industry, Short Course Notes, Revision No. 4, p. 2.32.
[9] F.J. Stermole, 1977, Economic Evaluation and Investment Decision Methods, p. 7.
[10] Ibbotson Associates, 2002, Stocks, Bonds, Bills and Inflation, Valuation Edition, 2002 Yearbook.
[11] Arizona Administrative Code, R15-4-203(A).

Mine Investor Market

The Arizona system of mine valuation is based on the concept of treating the mining property as a geographically separate, stand-alone unit. The information utilized to estimate future income starts with the historical individual mine unit production and profitability as submitted by the mining taxpayer in a property tax report form filed with the Department. The investment perspective the Department uses is based on rates at which mining property investments are made or at which mines are bought, sold, or valued for fair market purposes.

Diversified international corporations typically operate mining properties. Because Arizona mining properties are treated as separate operating units, the discount rate should reflect operating parameters and risks associated with that operating unit. Although a discount rate may be derived from the accounting data for a diversified parent, the direct application of this rate to value Arizona mine property may be inappropriate. For example, a diversified international mining company may have properties in both relatively low-risk countries (such as the United States) and in other higher risk regions of the world. In a security valuation report for First Quantum Minerals Ltd. issued by RBC Capital Markets, discount rates of 12-15% were used for African copper properties in contrast to a normal 8% rate used for North American copper equities.[12] A discount rate derived from a corporation may reflect an aggregate average for the numerous risks associated with each division or geographical location. For example, a presentation by the former president and CEO of Barrick, a large international gold mining company, stated the cost of capital for Barrick was 8%.[13] However, this average rate may be too high for valuing gold properties in the United States and Canada and too low for valuing gold properties elsewhere.

Similarly, the average risk for a diversified parent company with interests in manufacturing and mining may not be representative of either division. An example of

[12] Hale-Sanders, C., 2002, First Quantum Minerals Ltd., RBC Capital Markets, September 12.
[13] Business Wire, 2002, Barrick CEO addresses Scotia Conference Business Editors Toronto, November 26.

the differences in discount rates applicable to individual business segments of a diversified international parent is provided by the 1999 merger prospectus valuations for ASARCO, Incorporated and Cyprus Amax Minerals Company. In this proposed merger, separate opinions were prepared for the different business segments by investment banking firms. The discount rates derived by the firm of Credit Suisse First Boston and quoted in this prospectus for ASARCO differed depending on the type of business with separate rates applicable to metal mining ventures (10.0-11.0%), aggregates businesses (9.5 to 10.5%), and specialty chemical businesses (10.5 to 11.0%).

Determination of the Discount Rate

The determination of the base discount rate for mines and mining property in Arizona is based on data derived from information sources summarized in Table 1. The data source sample for discount rates include merger and acquisition reports, new mine development evaluations, feasibility studies (both public and confidential), a form of the risk premium capitalization rate method, the capital asset pricing model (CAPM) method, equity and capitalization rates from other states and government agencies, and mineral valuation information published in professional journals, security analysts reports, and miscellaneous books and texts.

Table 1

Summary of Data for Determination of Equity Discount Rate
For Natural Resource Property

Tax Year 2024

Source of Data	Range of Equity Discount Rates	Representative Rate Estimate
Corporate Economic Evaluation Reports Discount Rates	4.50% to 10.00%	8.00% to 10.00%
Risk Premium Rate Indicator Method (Est. AA Rated Utility Bond Rate Plus 6%)		
Year End 2023 (Current $)	11.27%	
Five Year Average (Constant $)	6.92%	
Year End 2023 (Constant $)	8.29%	11.00%
Capital Asset Pricing Model		
Base/Specialty Metal Mines-Current $	11.40%	
Base/Specialty Metal Mines-Constant $	8.42%	10.00%
Precious Metal Mines-Current $	9.03%	
Precious Metal Mines-Constant $	6.12%	8.00%
Government Agencies		
Federal & State Agency Rates	12.89%	13.00%

The information provided in this database covers a wide range of conditions and assumptions. For example, economic analyses and feasibility studies may be based on current (nominal or inflated) dollars, or constant (real or uninflated) dollars. They may be based on either pre-tax or after-income tax cash flow. These valuations may also include other accounting variables that may affect future cash flows such as using a depletion allowance or using either straight-line depreciation versus accelerated depreciation on plant and equipment in calculation of the income tax liability.

Because of the inherent disparity in the assumptions used to develop this data, the selection of a base discount rate the Department uses in its valuation of mines and mining property is a matter of judgment. Based on the information summarized in Table 1 and the Department's appraisal experience, the base discount rate for natural resource property for the 2025 tax year is 12% for base metal, industrial mineral, and other mining property. These rates are conformable with income projections and commodity prices the Department developed. The graph in Figure 1 illustrates the relationship between the base discount rates the Department used since Tax Year 2015 with the interest rates on long term Treasury Bonds (through Tax Year 2025).

Figure 1

Graph of Department of Revenue Base Discount Rates Versus Interest Rates on Long Term Maturity U.S. Treasury Bonds

(Tax years 2015 through 2025)

COMPARISON OF THE DISCOUNT RATE VS THE US TREASURY RATE

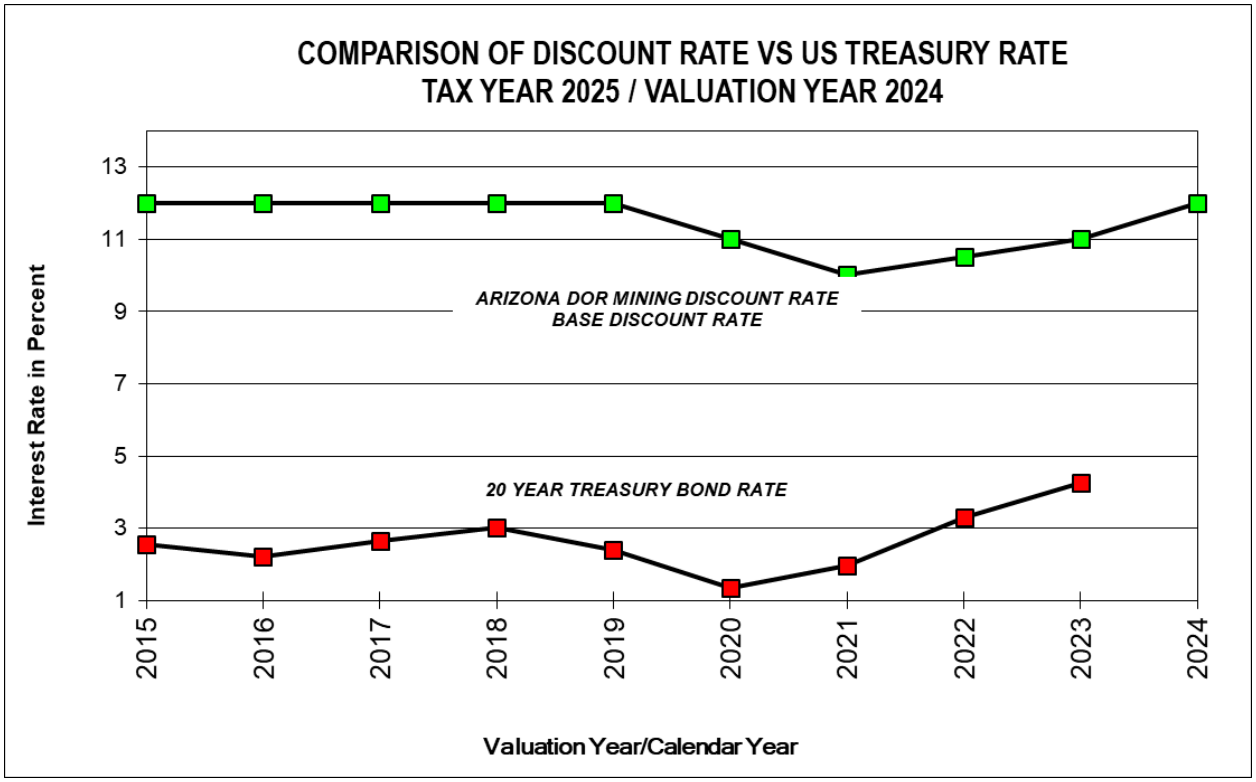

Table 2 presents discount rate information derived from industry publications. Sources for the data include merger, acquisition, and other mine development projects, annual financial reports, press releases, professional journals, periodicals, and other publications. The discount rate information on this table applies to base metal, precious metal, and industrial mineral properties. For copper properties the range of rates from this table is from 5% to 15%. However, the majority of the rates applicable to copper properties in this sample fall within a range of 5% to 8%. For gold properties rates have varied from 5% to 10%, with the majority of the rates falling within a range of 5% to 8%.

Table 2

Discount Rate Data from Mine Technical Evaluation Reports, Press Releases, Trade Publications, Corporate Officers and Other Sources

Tax Year 2025

Source/Property	Date	Analyst/Source	Commodity	Disc. Rate	Inc. Taxes
Santo Tomas	2023	Oroco	Copper	8%	Aft-Tax
Bandeira Lithium	2023	Lithium Ionic Corp	Lithium	8%	Aft-Tax
Lemhi Gold	2023	Freeman Gold	Gold	5%	Aft-Tax
Crawford Nickel	2023	Canada Nickel Company	Nickel	8%	Aft-Tax
Bombore Expansion	2023	Orezone	Gold	5%	Aft-Tax
DeLamar and FL Mt.	2023	Integra Resources	Gold	5%	Aft-Tax
Kindersley Lithium	2023	Grounded Lithium	Lithium	8%	Aft-Tax
ADF 34 Property	2023	ADF Unity Trust	Gold	8%	Aft-Tax
Los Ricos	2023	GoGold	Gold	5%	Aft-Tax
Goldfields Project	2022	Fortune Bay	Gold	5%	Aft-Tax
Mercedes Mine	2022	Bear Creek	Gold, Silver	5%	Aft-Tax
Bilboes Gold Project	2022	Bilboes	Gold	10%	Aft-Tax
Mount Milligan Mine	2022	Centerra Gold	Gold, Copper	5%	Aft-Tax
Los Gatos	2022	Gatos Silver	Silver, Gold	5%	Aft-Tax
Cactus Mine	2022	Arizona Sonoran Copper	Copper	8%	Aft-Tax
Madaouela	2022	GoviEx Uranium	Uranium	8%	Aft-Tax
Crater Lake	2022	Imperial Mining	Scandium	10%	Aft-Tax
Minera Salar Blanco	2022	Worley	Lithium	10%	Aft-Tax
Songwe Hill	2022	Mkango	Rare Earth Metal	10%	Aft-Tax
Lofdal	2022	Namibia Critical Metals	Rare Earth Metal	5%	Aft-Tax
Pebble Project	2022	Northern Dynasty Mineral	Copper	7%	Aft-Tax
Matawinie Mine	2022	Nouveau Monde	Graphite	8%	Aft-Tax
Cactus Mine	2021	Arizona Sonoran Copper	Copper	8%	Aft-Tax
CK Gold	2021	US Gold	Copper, Gold	5%	Aft-Tax
Ermitano	2021	First Majestic Silver Corp	Gold, Silver	5%	Aft-Tax
Eva	2021	Copper Mountain	Copper, Gold, Silver	8%	Aft-Tax
Granite Creek	2021	i-80 Gold	Gold	5%	Aft-Tax

Source/Property	Date	Analyst/Source	Commodity	Disc. Rate	Inc. Taxes
Kone	2021	Montage Gold	Gold	5%	Aft-Tax
Kutcho	2021	Kutcho Copper	Copper	7%	Aft-Tax
Laiva	2021	Otso Grold Corp.	Gold	5%	Pre-Tax
Loma Larga	2021	Dundee Precious Metals	Copper, Gold, Silver	5%	Aft-Tax
Mantos Blanco	2021	Capstone Mining Corp	Copper, Silver	8%	Aft-Tax
Mantoverde	2021	Capstone Mining Corp	Copper, Gold	8%	Aft-Tax
Marquez-Juan Tafoya	2021	enCoreEnergy	Uranium	7%	Aft-Tax
Pebble	2021	Northern Dynasty	Copper, Gold, Silver, Moly	7%	Aft-Tax
Red Chris	2021	Newcrest Mining Ltd	Copper, Gold	4.5%	Aft-Tax
Santa Elena	2021	First Majestic	Gold, Silver	5%	Aft-Tax
Terronera	2021	Endeavour Silver Corp.	Gold, Silver	5%	Aft-Tax
Twin Hills	2021	Osino Resources Corp.	Gold	5%	Aft-Tax
Zamora-Chinchipe	2021	Luminex Resources	Gold, Silver	5%	Aft-Tax
Mount Milligan	2020	Centerra Gold Inc.	Copper, Gold	5%	Aft-Tax
Salobo	2020	Wheaton Precious Metals	Copper, Gold	6.3%	
Yellowhead	2020	Taseko Mines Limited	Copper, Gold, Silver	8%	Pre-Tax
Hilarion	2020	Nexa Resources S.A.	Silver	10%	Aft-Tax
Santo Domingo	2020	Capstone Mining Corp	Copper, Gold	8%	Aft-Tax
Trident	2020	First Quantum Minerals	Copper	8.5%, 10%	
Kamoa-Kakula	2020	Kamoa Copper SA	Copper	8%	Aft-Tax
Brucejack	2020	Pretium Resources Inc	Gold, Silver	5%, 8%	Aft-Tax
McIlvenna Bay	2020	Foran Mining Corp.	Copper, Gold, Silver	7.5%	Aft-Tax
Chelopech	2020	Dundee Precious Metals	Copper, Gold	5%	Aft-Tax
Hope Bay	2020	Tmac Resources	Gold	5%	Aft-Tax
Vares	2020	Adriatic Metals	Gold, Silver	8%	Aft-Tax
Haib	2020	Deep-South Resources	Copper	7.5%	Aft-Tax
Homestake Ridge	2020	Auryn Resources	Copper, Gold, Silver	5%	
Cangrejos	2020	Lumina Gold Corp.	Copper, Gold, Silver, Moly	5%	
Rosh Pinah	2020	Trevali Mining Corp.	Silver	8%	Aft-Tax
Oyu Tolgoi	2020	Turquoise Hill Resources	Copper, Gold, Silver, Moly	8%	Aft-Tax
Quebrada Honda I&II	2020	Barrow Mining SpA	Copper, Moly	8%	Aft-Tax
Los Gatos	2020	Minera Plata Real, S. de R.L. de CV	Gold, Silver	5%	Aft-Tax
Terronera	2020	Endeavour Silver Corp.	Silver, Gold	5%	Aft-Tax
Ying	2020	Silvercorp Metals Inc.	Gold, Silver	5%	Pre-Tax
Kansanshi	2020	First Quantum Minerals	Copper, Gold	8%, 10%	
Grassy Mountain	2020	Paramount Gold Nevada	Gold, Silver	5%	Aft-Tax
Kamoa-Kakula	2020	Kamoa Copper SA	Copper	8%	Aft-Tax

Source/Property	Date	Analyst/Source	Commodity	Disc. Rate	Inc. Taxes
North Bullfrog	2020	Corvus Gold Inc.	Silver, Gold	5%	Aft-Tax
Rozino	2020	Velocity Minerals Ltd.	Gold	5%	Aft-Tax
Black Butte	2020	Sandfire Resources	Copper	5%	Aft-Tax
Tthe Heldeth Tue	2020	Denison Mines Corp.	Uranium	8%	Aft-Tax
Taca Taca	2020	First Quantum Minerals	Copper, Gold, Moly	8%, 10%	
Josemaria	2020	Josemaria Resources	Copper, Gold, Silver	8%	Aft-Tax
Aripuana	2020	Nexa Resources S.A.	Copper, Gold, Silver	9%	Aft-Tax
Ada Tepe	2020	Dundee Precious Metals	Gold	5%	Aft-Tax
Platreef	2020	Ivanhoe Mines Ltd	Copper, Gold	8%	Aft-Tax
Thierry	2020	Braveheart	Copper, Silver, Gold	6%	
Rochester	2020	Coeur Mining, Inc.	Silver, Gold	5%	Aft-Tax
Madsen	2019	Pure Gold Mining Inc.	Gold	5%	Aft-Tax
Abcourt-Barvue	2019	Abcourt Mines Inc.	Silver	5%	Aft-Tax
Copper Mountain	2019	Copper Mountain Mining	Gold	8%	Aft-Tax
Pegmont	2019	Vendetta Mining Corp.	Silver	8%	Aft-Tax
Rovina Valley	2019	Euro Sun Mining Inc.	Copper, Gold	5%	Aft-Tax
Timok	2019	Dundee Precious Metals	Gold	5%, 7.5%	Aft-Tax
Las Chispas	2019	SilverCrest Metals, Inc	Gold, Silver	5%	Aft-Tax
Gaocheng	2019	Silvercorp Metals Inc.	Silver	8%	Aft-Tax
Ayawilca	2019	Tinka Resources	Zinc, Silver	8%	Aft-Tax
Bushveld	2019	Waterberg JV Resources	Copper, Gold	8%	Aft-Tax
DeLamar	2019	Integra Resources	Gold, Silver	5%	Pre-Tax
White Pine North	2019	Highland Copper Co.	Copper, Silver	8%	Aft-Tax
Springpole	2019	First Mining Gold Corp.	Gold, Silver	5%	Aft-Tax
Alpala	2019	SolGold PLC	Copper, Gold, Silver	8%	Aft-Tax
CuMo	2019	American CuMo Mining	Copper, Moly, Silver	8%	Aft-Tax
Gibraltar	2019	Taseko Mines Limited	Copper, Moly, Silver	8%	Aft-Tax
Eskay Creek	2019	Skeena Resources	Gold, Silver	5%	Aft-Tax
Eagle	2019	Victoria Gold Corp	Gold	5%	Aft-Tax
Corani	2019	Bear Creek Mining Corp.	Silver	5%	Aft-Tax

Table 3 summarizes the results for the derivation of a discount rate by a form of the risk premium method. The risk premium method is a commonly used approach to estimate a capitalization rate. The method is based on the combination of a “safe” investment rate

with a “risk premium” rate to account for the higher risk of the investment. “In the absence of an internally established rate, a rate may be constructed by using risk-free market rates, plus a management fee and risk adjustment.”[14] The risk premium method that the Department uses is based on a 1980 study the Department commissioned.[15]

[14] J.W. Whitney and R.E. Whitney, 1982, Investment and Risk Analysis in the Minerals Industry, Short Course Notes, Revision No. 4, p. 2.33.
[15] G.A. Christy, 1980, An Evaluation of Capitalization Rate Development and Use in the Centrally Valued Properties Section Arizona Department of Revenue.

Table 3

Discount Rate Data Based on Risk Premium Method

Tax Year 2024
(Rates in Percent)

Year	AA Utility Bonds (Monthly Average)	Risk Premium	Adjusted Discount Rate
2019	3.61	6.00	9.61
2020	2.79	6.00	8.79
2021	2.97	6.00	8.97
2022	4.53	6.00	10.53
2023 Average	5.39	6.00	11.39
2023 Year End	5.27	6.00	11.27

Five Year Average Current $ Risk Premium Rate 9.86
2023 Year End Current $ Risk Premium Rate 11.27

Five Year Average Constant $ Risk Premium Rate 6.92
2023 Year End Constant $ Risk Premium Rate 8.29

For 2019 through 2023 AA utility rate used
Year end rate based on December average
Bond rate averaged over 12 months of year
Risk premium based on estimate per Christy (1980)

Current $ risk premium rate based on market determined cost of capital including component for general price level inflation (estimated to be 2.75%)

For conversion of current $ (inflated) market rate to real $ (constant) rate, the following relationship is used;

$$(1 + \text{Constant \$ Rate}) = (1 + \text{Current \$ Rate}) / (1 + \text{Inflation Rate})$$

See Gentry and O'Neil (1984), p. 308-310; Stermole (1987), P. 209.

Prior to tax year 2004, the method the Department adopted used the AAA utility bond rate as the safe rate (risk-free and management fee portion of the rate) and a premium

over that to account for risks associated with mining properties. The AAA utility bond rate is no longer available and the method now uses the AA utility bond rate. Because the risk premium method is a market-derived rate, it includes a component for general price level inflation. Therefore, the Table 4 rate was adjusted to remove the effects of general price level inflation to develop a constant dollar discount rate.

The Capital Asset Pricing Model as illustrated on Table 4, or CAPM, is another method for estimating the equity cost of capital. As expressed by Ibbotson Associates, this is a "model in which the cost of capital for any security or portfolio of securities equals the riskless rate plus a risk premium that is proportionate to the amount of systematic risk of the security or portfolio."[16] Systematic risk is "…The risk that is unavoidable according to CAPM. It is the risk that is common to all risky securities and cannot be eliminated through diversification. The amount of an asset's systematic risk is measured by its beta."[17]

The CAPM method involves the selection of a risk-free interest rate, a coefficient known as the beta factor, and a rate of return to the market. This return to the market (also termed the equity risk premium) is based on a long term perspective of the differences between the average return on stocks versus the average safe interest rate derived from long term government bonds.[18] The factor for estimation of the return to market with CAPM should be based on a period that is long enough to eliminate the influence of unrepresentative short-term results. For purposes of this study, a rate of 6.0% is used as the equity risk premium. Based on this equity risk premium from the US market and an assumed inflation rate of 2.75%, the constant dollar base metal equity discount rate from the CAPM would be 5.50%, while the rate for precious metal properties would be 2.38%.

[16] Ibbotson Associates, 1998 Stocks, Bonds, Bills and Inflation, 1998 Yearbook, p. 305.
[17] Ibbotson Associates, 1998, Stocks Bonds, Bills and Inflation, 1998 Yearbook, p. 310.
[18] D.W. Gentry and T.J. O'Neil, 1984, Mine Investment Analysis, A.I.M.E., New York, p. 331.

The CAPM analysis also supports the previously observed risk rate difference between base and precious metal mining companies. This difference in risk is demonstrated by the “beta” factor. This “beta” factor is derived from security market analyses and is a measure of the relative risk of a security compared with a market standard sample such as the Standard and Poor’s 500. The lower beta factor for a precious metal company sample versus a base/specialty metal company sample demonstrates a lower level of risk for a portfolio of precious metal companies. This observation indicates that lower discount rates apply to precious metal mining projects in the CAPM approach.

A variation of the CAPM method was used in a recent feasibility for the Casa Berardi Project of Aurizon. In this analysis an equity rate of 8.75% (in nominal terms, pre-income tax) was derived based on a long term interest rate of 5%, an expected return (TSX basis) of 7.5%, and a beta of 0.50.[19] This discount rate was associated with metals prices of $400 for gold and $6.50 for silver.

[19] Met-Chem Canada Inc, 2005, Casa Berardi Project Feasibility Study, Aurizon Mines Inc., January, p. 56,59.

Table 4

Discount Rate Data Based on
The Capital Asset Pricing Model

Tax Year 2024

Rate = Risk Free Rate + Beta (Return to Market - Risk Free Rate)
(Current Conditions) (Long Term Conditions)

Risk Free Rate = 4.30% (Estimate - long-term treasury rate)
Beta = 1.18 (Mean of 6 Base/Specialty Metal Companies)
Beta = 0.79 (Mean of 9 Gold/Silver Mining Companies)
Beta factors derived from Value Line

Equity Risk Premium = 6.0% (Median Rounded, US market basis)
www.damodaran.com US (2023) 4.60%

Inflation rate for long term conditions estimated @ 2.75%

Base/Specialty Metal CAPM Rate
Market Derived (Current $) Discount Rate

Rate = 4.30% + 1.18*(6.0%) = 11.40%

Constant Dollar (Real) Discount Rate
(1 + Real Rate) = (1 + Current $ Rate) / (1 + Inflation Rate)
Real Rate = 8.42%

Beta derived from Value Line for BHP Group, Ltd., Freeport McMoRan, Lundin Mining, Rio Tinto, PLC, Southern Copper Corp., Teck Resources Ltd.

Gold/Silver Mining CAPM Rate
Market Derived (Current $) Discount Rate

Rate = 4.30% + 0.79*(6.0%) = 9.03%

Constant Dollar (Real) Discount Rate
(1 + Real Rate) = (1 + Current $ Rate) / (1 + Inflation Rate)
Real Rate = 6.12%

Beta derived from Value Line for Agnico-Eagle Mines Ltd., AngloGold Ashanti Ltd., Barrick Gold Corp., Coeur Mining, Inc., Hecla Mining Co., Kinross Gold Corp., Newmont Corp., Pan American Silver Corp., Pretium Resources, SSR Mining, Inc., Yamana Gold Inc.

Capitalization rate data from state and other governmental organizations is summarized in Table 5. Most of these rates were derived from tax commissions and are used to determine values for mining property. A variety of methods are used by government agencies to derive capitalization rates. Some tax commissions, such as Utah, derive different equity rates for discounting income from precious metal, copper, and coal mines. Other commissions derive rates that apply to pre-income tax cash flow and include property tax components in the capitalization rates.

Table 5

Discount Rate Data from Selected Governmental Sources

Tax Year 2024

Source	Tax Year	Rate	Comment
State of Utah	2023	12.89%	Tax Commission, Non-Precious Metals, Overall Equity Rate, Tax Adjusted; Nominal $ Rate

Cost Approach

Application of the Cost Approach

The cost approach method of valuation is a widely used, generally accepted technique recognized by appraisal authorities for the valuation of property. The theoretical basis for the cost approach rests on the principle of substitution. This principle holds that, “A property’s market value tends to be set by the cost of acquiring an equally desirable and (equally) valuable substitute property, assuming that no costly delay is encountered in making the substitution.”[20] Because the sales price of equally desirable property is commonly not available for certain types of specialty properties, including mines, an alternative for this cost method is derived by a summation of the estimates of value for the individual assets comprising the property. As a general valuation technique, the cost approach as used in Arizona for natural resource property involves a summation of land

[20] International Association of Assessing Officers, 2010, Property Assessment Valuation, p. 20.

value and the reproduction cost new less depreciation value for plant and equipment. This cost approach includes the impact on the property of depreciation related to normal wear of assets. In addition, forms of functional and/or economic obsolescence may also be applied to the property if specific conditions warrant. The cost approach has been used to establish fair market values for mining properties associated with Arizona mine property sales in asset allocation analyses by consulting firms. The methodology was based on establishing a replacement cost new less depreciation, including obsolescence where applicable, for each operating unit of the property.

The terms “cost” and “market value” are not necessarily synonymous or equal.[21] The term “cost” may refer to an original acquisition (plus installment costs in construction) or a restated cost due to a subsequent acquisition or an accounting write-down of asset value.

The term “market value” as expressed as a concept of value means, “… the most probable price, expressed in terms of money, that a property would bring if exposed for sale in the open market in an arm’s length transaction between a willing seller and a willing buyer, both of whom are knowledgeable concerning all uses to which it is adapted and for which it is capable of being used.”[22]

In Arizona, the cost approach method may be used to develop an ad valorem value for property tax purposes and correlated with applicable valuations derived by the income and market approaches. For some properties, the cost approach may be the only method available when certain conditions exist as outlined in the Arizona Administrative Code, Title 14, Chapter 4, R15-4-206(B) and (C). These conditions include mines whose ore reserves are wholly or predominantly located on nontaxable lands, mines which have recently commenced production, or have recently been added to the tax rolls, mines near the end of their economic life, or where operations have resulted in an overall loss as determined by the historic margin, and mines where no reasonable

[21] International Association of Assessing Officers, 2010, Property Assessment Valuation, p. 14.
[22] International Association of Assessing Officers, 2010, Property Assessment Valuation, p. 26.

projection of future income or cash flows can be made. Since the income approach value is based on an adjusted five-year historical profit margin, a new mine with no operating history may normally be valued using the cost approach method as the primary value indicator. The cost approach may also be used exclusively to value certain property under circumstances related to contractual income limitations.

Valuation Methodology

The cost approach procedure used in Arizona involves a valuation using reproduction cost new less depreciation (RCNLD) for all taxable assets included within the definition of the producing mine unit. For personal property and improvements, a reproduction cost new less depreciation value is determined by applying percent good factors to the original cost of the assets. Reproduction cost for an asset is computed by multiplying the original cost of the asset by an applicable index or factor. Currently, the Department uses cost indices published by the Marshall Valuation Service. The Marshall Valuation Service reproduction cost indices have been used for preliminary capital cost estimates for mining equipment investment in mineral projects.[23] The Department annually determines asset depreciation lives based on Internal Revenue Service guidelines and internal studies for the average age at disposal of different types of equipment. The information in this study is based on data collected from several sources including operating mines, equipment dealers, mining associations, and other agencies in other states. Table 6 presents a summary of asset lives, residual, and salvage factors for equipment and improvements and the types of equipment included in each category.

For the current tax year, seven different types of personal property categories are used for valuation purposes. These categories include: small-scale mining equipment, large-scale mining equipment, shovels and draglines, office equipment, equipment at mills, refineries and solvent extraction-electrowinning facilities, equipment at smelters, and environmental equipment. The percent good factors applied to the original cost for

[23] A.L. Mular, 1980, The Estimation of Preliminary Capital Costs, in Mineral Processing Plant Design, A.L. Mular and R.B. Bhappu, editors, 2nd Edition, A.I.M.E., New York, p. 53.

this equipment are listed in Table 7. Residual and salvage values are also listed for each equipment category. The residual value factor is applied to operating equipment that has reached the end of its normal service life. Salvage value factors are applied to equipment that has been taken out of service, or that has been shut down. The “shut down” classification may apply to the operation as a whole when activity ceases because of depletion of the ore reserve, deterioration through severe operating conditions, technological changes or for some other economic reason.

Buildings and improvements are valued using a 35-year depreciation life and a reproduction cost based on the Marshall Valuation Service Index for Western District Metal Frame and Wall Structures. A listing of the percent good factors to be applied to the original cost of buildings and improvements is given in Table 8.

Land valuations include all patented and unpatented mining claims, leased lands, fee simple lands, severed mineral rights, and any other taxable lands connected to the natural resource property. Surface land valuations are generally based on values of comparable land adjacent to, or surrounding the area subject to valuation. In the case of natural resource property, a portion of the total property land value is attributed to the value of the sub-surface deposit, or mineral-in-place. Since this component of value is commonly not reflected in the value of surrounding surface land parcels, a separate value must be made for this element of property value. The mineral-in-place value represents an acquisition cost that the investor would make for the mineral deposit itself, separate from the rest of the property. Published data from selected sources relating to acquisition costs for copper and gold deposits are shown on Tables 9 and 10, respectively.

Table 6

Summary of Cost Approach Factors for Plant and Equipment Lives, Residual and Salvage Percent Good

Tax Year 2025

	Mining Small Scale	Equipment Large Scale	Shovels & Draglines	Mill, Refinery & SX-EW Plant	Smelter Plant & Equipment	Environ. Equipment	Office Equipment	Buildings & Improvements
Life Years	10	10	14	14	14	14	10	30
Residual Value	16	14	12	5	3	3	7	7
Salvage Value	12	11	10	3	2	2	1	0 to 5% of RCN Value

Itemized Listing of Types of Equipment in Each Category:

- Dozers
- Loaders
- Graders
- Scrapers
- Tractors
- Pumps
- Compressors
- Front End Loaders
- Substations
- Radios
- Light Plant Trucks (<35-and >1-ton)
- Underground Mine Equipment
- Tools
- Forklifts
- Haul Trucks (>35-ton)
- Cranes
- Blast Hole Drills
- Shovels
- Draglines
- Cables
- Buckets
- Crushers
  - Primary
  - Secondary
  - Tertiary
  - Jaw
- Mills
  - Rod & Ball
  - SAG mills
  - Autogenous
  - Pug & Pebble
  - Regrind
- Cyclones
- Classifiers
- Conveyors
- Screen Decks
- Refineries
- Column Cells
- Disk & Drum Filters
- Filter Presses
- Tailings Disposal Line
- Flotation Cell
- By-Product Plant
- Leaching & Precipitating Equipment
- SXEW Circuits
- C-I-P/C-I-L Circuits
- Merrill-Crowe Plant
- Bridge Crane
- Furnaces
  - Flash
  - Reverb
  - Electric
  - Doré
- Converters
- Reactors
- Fluid Bed Roasters
- Anode Hold. Furnaces
- Anode Cast. Wheels
- Slag Cars
- Slag Pots
- Oxy. Plant
- Ferro-Moly Plant
- Acid Plant
- Electrostatic Precipitator
- Cooling Towers
- Humidifiers
- Mist Precipitator
- Air monitor
- Noise Reduction Equipment
- Air/water Sampling Equipment
- Dust Collector
- Acid Storage Tanks
- Acid Plant Catalysts
- Desks
- Calculators
- Computers
- Misc. Office Equipment
- Power lines
- Roads
- Utility Lines
- Buildings
- Foundations
- Improvements

Table 7

Percent Good Factors for Natural Resource Personal Property
Mining Equipment Schedule

Tax Year 2025

Equipment Life			10	10	14	14	14	14			10
	Marshall Factor	Mining Trend Factor	Mining Small Scale	Equipment Large Scale	Mill & Refining Equipment	Smelter Plant	Environ-mental Equipment	Shovels & Draglines	Marshall Factor	Office Trend Factor	Office Equipment
2023	2576.5	1.000	90	90	93	93	93	93	1729.9	1.000	90
2022	2513.1	1.025	82	82	88	88	88	88	1710.0	1.012	82
2021	2203.4	1.169	82	82	92	92	92	92	1510.7	1.145	82
2020	1973.5	1.306	78	78	93	93	93	93	1374.0	1.259	78
2019	1940.5	1.328	66	66	85	85	85	85	1355.3	1.276	66
2018	1859.9	1.385	55	55	79	79	79	79	1321.2	1.309	55
2017	1799.2	1.432	43	43	72	72	72	72	1279.8	1.352	43
2016	1759.1	1.465	29	29	63	63	63	63	1253.0	1.381	29
2015	1761.1	1.463	16	14	52	52	52	52	1252.4	1.381	15
2014	1749.5	1.473	16	14	42	42	42	42	1242.6	1.392	7
2013	1724.6	1.494	16	14	32	32	32	32	1223.2	1.414	7
2012	1693.4	1.521	16	14	22	22	22	22	1221.5	1.416	7
2011	1632.9	1.578	16	14	11	11	11	12	1200.9	1.441	7
2010	1569.3	1.642	16	14	5	3	3	12	1166.1	1.483	7
2009	1557.9	1.654	16	14	5	3	3	12	1159.8	1.492	7
2008	1521.5	1.693	16	14	5	3	3	12	1146.8	1.508	7
2007	1446.1	1.782	16	14	5	3	3	12	1103.7	1.567	7
2006	1391.9	1.851	16	14	5	3	3	12	1065.1	1.624	7
2005	1325.9	1.943	16	14	5	3	3	12	1023.0	1.691	7
2004	1208.0	2.133	16	14	5	3	3	12	957.7	1.806	7
2003	1164.2	2.213			5	3	3	12			
2002	1142.1	2.256			5	3	3	12			
2001	1128.7	2.283			5	3	3	12			
2000	1120.7	2.299			5	3	3	12			
1999	1102.2	2.338			5	3	3	12			
SALVAGE VALUE			**12**	**11**	**3**	**2**	**2**	**10**			**1**

Source for trend factors: Marshall Valuation Service Mining & Milling Factor, Section 98
Equipment percent good, residual and salvage factors developed by Centrally Valued Property Unit
Minimum percent good factor for operating property equivalent to residual value factor
Office equipment percent good factors developed by Personal Property Unit, except for residual and salvage factors

Table 8

Mine Buildings and Improvements Valuation Schedule
Percent Good Factors
Building Life Years: 30

Tax Year 2025

Year Acquired	Marshall Factor	Valuation Trend	Depreciation Straight-Line Basis	RCNLD Factor
2023	4121.2	1.000	97	97
2022	4126.6	0.999	93	93
2021	3517.3	1.172	90	105
2020	3083.8	1.336	87	116
2019	2990.5	1.378	83	115
2018	2931.9	1.406	80	112
2017	2794.2	1.475	77	113
2016	2714.5	1.518	73	111
2015	2721.1	1.515	70	106
2014	2700.8	1.526	67	102
2013	2656.9	1.551	63	98
2012	2607.7	1.580	60	95
2011	2539.6	1.623	57	92
2010	2470.5	1.668	53	89
2009	2503.5	1.646	50	82
2008	2521.1	1.635	47	76
2007	2375.2	1.735	43	75
2006	2274.4	1.812	40	72
2005	2125.8	1.939	37	71
2004	1934.4	2.130	33	71
2003	1809.2	2.278	30	68
2002	1775.9	2.321	27	62
2001	1749.0	2.356	23	55
2000	1726.8	2.387	20	48
1999	1658.3	2.485	17	41
1998	1622.5	2.540	13	34
1997	1598.7	2.578	10	26
1996	1569.1	2.626	7	18
1995	1540.1	2.676	3	9
1994	1489.6	2.767		8
1993	1443.8	2.854		8
1992	1406.5	2.930		8
1991	1399.3	2.945		8
1990	1380.7	2.985		8
1989	1360.4	3.029		8

Salvage value for improvements range from 0 to 5 percent of replacement cost depending on condition, location, and reclamation
Marshall Valuation factor based on buildings-Western District metal frame and walls, Class S, Section 98, January supplement.

The mineral-in-place value for any particular commodity will depend on several factors including the stage of development for the deposit. In a recent study by Hodos[24], gold deposits were separated into four different categories as shown in Table 11. In this study deposits were segregated into exploration, advanced/pre-feasibility, feasibility, and production phases. Depending on the stage of development, the estimated market value in price per ounce ranges from less than $10 for exploration stage properties to an average of $60 for operating mines. A valuation of the Freeport McMoran Copper and Gold operations in Indonesia estimated a market value per ounce for gold reserves in place of $95. Another factor that could influence the price paid per unit is the sale price of the commodity. In an acquisition of a portion of the El Pavon gold resources in Chile, Meridian Gold Inc. agreed to pay $40 per ounce at a gold price less than $400, $50 per ounce at a gold price between $400 and $500 per ounce, and $60 per ounce at gold prices in excess of $500 per ounce.[25]

For copper properties a range of $.005 to $0.10 per pound for copper in the ground was quoted in a brokerage report evaluating Corriente Resources Latin American mining projects.[26] As stated in the report, "…This value per pound increases with an increasing certainty that the deposit will be mined." Another evaluation of the Freeport McMoran Copper and Gold operations in Indonesia estimated a market value of $0.15 per pound of copper in the ground associated with "…the world's lowest cost copper producer…"[27]

The analysis of a sale of a mineral deposit may involve a number of complex variables. The variables include both the value paid per unit of commodity (and equivalents based on byproducts) and the underlying quantity of the commodity itself. A mineral property sale may have a cash down payment or securities payment component, a deferred cash payment or securities component, a contingent payment component dependent on

[24] Hodos, E., 2004, Market Segmentation: An Important Facet of Market Analysis for Mineral Appraisals, The Appraisal Journal, Winter 2004.
[25] Meridian Gold Inc., 2004, Meridian Gold & Radius Gold Sign an Agreement on the El Pavon Property, September 23.
[26] Van Doorn, R., 2001, Corriente Resources-Speculative Buy, Loewen, Ondaatje, McCutchen, Ltd., December 18.
[27] Hill, J., 2004, Freeport McMoran Copper & Gold (FCX), Smith Barney 2005 Top Picks, January 6.

additional mineral discoveries or changes in commodity prices, and a royalty component. Deferred payments involve several complications including timing and the discount rate selected to convert the future payment to a net present value. Payments expressed in foreign currencies will require conversion into domestic equivalents. The in-place commodity amount may be expressed as a measured, indicated or inferred resource, or if economically viable as proven, probable or possible mineable ore reserves. The quantity of the commodity may be expressed in gross content or net recoverable or saleable content. The determination of an in-place commodity amount depends on many additional variables including, but not limited to, projected commodity prices, anticipated economics factors such as operating costs, capital costs and economic returns on investment, and technical factors such as on-site and off-site plant recoveries for each commodity produced.

An example of a sale agreement is that of the Rosemont Ranch property in Pima County, Arizona. In 2005 Augusta Resources, a Canadian company, agreed to acquire the property for a total of $20,800,000 in United States dollars in scheduled payments over three years. The sale included a 3.0% net smelter return retained by the prior owners. The Rosemont Ranch property consisted of several mineral property deposits with the Rosemont Deposit the largest in size. The quantity of gross commodity content, in this case copper, and equivalents for molybdenum and silver, was based on measured and indicated resources for the Rosemont Deposit only. The revised (2006) value of this transaction based on an accelerated payment by Augusta Resources is estimated at $0.0045 per pound of copper content and equivalents in resources as calculated by the Department of Revenue.

Although the above example is expressed for gross commodity content in resources, the best measure of a mineral-in-place value for an operating mine is based on value per recoverable commodity content in mineable ore reserves. In general resources represent a larger quantity of mineral content that may or may not contain a smaller quantity of economically viable, mineable ore reserves.

The 2005 sale of the Carlota property for an amount of US $37 million as announced by Quadra Mining Ltd. in Arizona represents another sale of an undeveloped copper mining property with declared ore reserves and several of the complications previously described. The sale involved a cash down-payment, an additional payment in ounces of gold deliverable in increments over the next two years, a contingent payment dependent on additional mineral discovery and advance, and production royalty payments. The property sale also included amounts for used mining equipment. Based on the available technical reports for the property, a mine plan was developed assuming $1.00 copper prices over future mine life. The net value per pound of copper for this sale ranged from $0.05 to $0.06 per pound of copper depending on the certain project assumptions and purchase terms as of the acquisition date.

The mineral-in-place value portion of the cost approach is determined by multiplying the recoverable mineral or metal content in the deposit by a representative factor for the commodity in question. Mineral valuation factors are derived from sales of United States and Canadian mineral properties, analysis of royalty data, and analyst valuations. The data supporting the commodity factors is obtained from actual sales transactions and acquisitions of both developed and undeveloped deposits. The Department analyzes the data set to produce a correlation between sales price per unit of metal and estimated cash operating costs. The sample is adjusted for changes in commodity prices and operating costs related to differences in timing between the sale date and the ad valorem valuation date. Commodity valuation factors the Department uses for copper deposits are listed in Table 12. The Department reviews commodity valuation factors annually to account for changes in market conditions.

Construction work in progress (CWIP) is generally valued at the cost of the investment as of the valuation date. The investment cost is the amount entered for financial purposes on the books and records of the taxpayer. If completion of the project is expected to be in excess of one year, the value attributed to this construction work will be discounted at the natural resource property discount rate.

Another taxable component of the cost approach is the supplies inventory used in the operation of the property. This property includes fuels, lubricants, reagents, spare parts, and other items that are maintained at or in the vicinity of the property for use in the producing unit. These assets are normally valued at acquisition with no allowance for depreciation. However, in-process or finished metal or mineral inventories are not taxable under this asset category.

Before arriving at a final cost approach to value, functional and/or economic obsolescence may be applied. Obsolescence may occur when equipment does not operate at design rates, or if unexpected events damage operating equipment at the property. Functional obsolescence generally arises from factors specific to the property and may be quantified by measuring the loss in utility of the property from the condition. Economic obsolescence generally arises from conditions outside of the property and may apply to the industry as a whole. Obsolescence may be applied for conditions such as the permanent shut down of a portion of a plant while the remaining facilities continue to operate. For new operating properties that have not achieved expected results, a cost approach valuation with an allowance for obsolescence may be applicable.

Residual value represents the minimum percent good value for operating property under normal circumstances. Residual percent good factors apply to both operating and temporarily idle property that has reached the maximum depreciable life for equipment in its class as established by the Department. A cost approach valuation set at residual value levels may also apply to property that has operated at continuing losses during the five years preceding the valuation date. The residual value factors are based on comparisons of the resale value of equipment to the original acquisition cost. If the equipment cost of the subject property has been restated and the original cost is no longer available (purchased by a new owner or written down), the residual value factors listed in Tables 7 and 8 may be modified to account for this restatement of value.

Salvage value, as utilized in the cost approach, applies to equipment that is permanently shut down, or no longer operating because of economic conditions. If the entire property is shut down with no remaining potential as a going-concern mineral property, then the cost approach valuation will be the summation of the salvage value of individual remaining components at the site. Salvage value is the controlling lower limit of value and includes the maximum amount of depreciation that may be applied to a property. Salvage value factors are based on comparisons of the resale value of equipment at the end of expected operating life to the original acquisition cost. If the equipment cost of the subject property has been restated and the original cost is no longer available (purchased by a new owner or written down), the salvage value factors listed in Tables 7 and 8 may be modified to account for this restatement of value.

Table 9

Selected Published Mineral-in-Place Valuations for Copper Deposits

Tax Year 2025
Copper Deposit Valuations

Source	Value per Pound
Doublestar Resource (2006)	Royalty C$2.00 per ton copper ore
Northern Dynasty (2006)	Market is paying $0.05/lb resource (ref Canaccord/Adams)
PolyMet Mining (2005)	$0.015 per pound copper-widely accepted rule of thumb-resource
Canaccord-Zerb (2005)	$0.05 per recoverable pound $0.03-0.07 @ $0.90 Copper
Freeport (Smith Barney 2005)	$0.15 per pound copper in reserve
First Assoc (2004)	$.02 per pound of resource in Prosperity Project
First Associates (2004) Meyer	$0.02 per lb resource (Latin America)
LOM (2001) Van Doorn	$.03 per pound of resource (Latin America)
Leader Mining (2000)	$0.0025 (Similco purchase) (in Skillings Review)
Christie et al (1998)	$0.05 reserves-feasibility
Christie et al (1998)	$0.01 resources-development
Echo Bay Mines (1995) (Brazilian Deposit)	$0.02 per lb reserves (Proven/Probable Ore)
Cyprus Amax (1994) (in Eng Mining Journal)	$0.08 (El Abra, Chile)
Gibraltar Mines (1994)	$0.015/lb recoverable (Chile)
Spickelmier (1993) (Doppler ref)	premium $0.015 (in Chile)
Glasser (1993)	$0.062 (Sanchez sale)
Producing stage	$0.12/lb recoverable
Feasibility/finance stage	$0.04/lb recoverable
Prefeasibility stage	$0.02/lb recoverable
Moon (1992)	$0.025 to 0.03 per reserve
Doppler (1992)	less than $0.02
Cambior (1991)	$0.037/lb recoverable
Estra (1990)	$0.05/lb insitu reserve

Table 10

Selected Published Mineral-in-Place Valuations for Gold Deposits

Tax Year 2025
Gold Deposit Valuations

Source	Value per Ounce
Northern Dynasty (2006)	Market is paying $65/oz for in-situ gold (ref Canaccord/Adams)
Celtic Resources Holdings (2006)	Ore reserve value @ $75 to $150/oz (SRK report) Inferred mineral resource @ $15 to $30/oz
Dutton (2006)	Value @ $62/oz for in ground reserves
Northgate-Young Davidson (2005)	$11 per resource ounce
Cambior-Sleeping Giant Mine (2005)	$45 per ounce-reserve
RBC Capital Markets (Africa Propects 2005)	$25 per ounce indicated & measured; $15 other
Freeport (Smith Barney 2005)	$95 per ounce gold in reserve
Meridian (2004)	$40 @$<400;$60 @>$500; El Pavon
Agnico-Eagle (2003)	$11 Purchase & Explor
Willis-Richards (2002)	$10 / Undiscoverd Oz
McEwan (2002)	$11 (Goldcorp)
Aurizon (2002)	$6 (exploration $/oz)
Van Doorn (2001)	$12 as equivalent
Golden Phoenix (2000)	$1.03 (bankrupt mine)
Wheaton River (1999)	$11 (Costa Rica mine)

Table 11

Commodity Valuation Standards for Gold Deposits

Tax Year 2025
Mineral-in-Place Value per Stage of Development

Property Stage of Development	Value of Deposit in $/Ounce
Production Phase	Average about $60/oz but with wide range in value
Feasibility Phase	Projects sell in $30/oz range
Advanced Exploration to Pre-feasibility	Average less than $15/oz
Exploration Phase	Average less than $10/oz

Adapted from Hodos, E., 2004, Market Segmentation: An Important Facet of Market Analysis for Mineral Appraisals, The Appraisal Journal, Winter.

Table 12

Commodity Valuation Factors for Copper Deposits

Tax Year 2025
Mineral-in-Place Value

Operating Cost in $/Pound	Value of Deposit in $/Pound
0.60	0.0750
0.70	0.0600
.080	0.0450
.090	0.0300
1.00	0.0150
Greater than 1.00	0.0100

Operating cost means cash operating costs before Income Tax and Capital Cost charges less by-product credits.

Market Approach

Application of the Market Approach

The market approach to value is a recognized standard appraisal method and technique used to establish property value. The technique is most useful when an open market, “arm’s length” actual sale of the property has occurred, or if a sufficient number of sales have occurred which are comparable to the subject property. An important characteristic of the market approach is that the sale must take place between a willing buyer and willing seller assuming that neither of the parties are under duress to buy or sell. In some cases, a form of the market approach to value known as “Stock and debt” method may be used to estimate property value. This method may be used to determine the market value of businesses with securities that trade on public exchanges or in open markets.

The application and usefulness of the comparable sales technique of the market approach to value for natural resource properties in Arizona is limited because of the infrequency of individual mine property sales and the varying characteristics of the individual natural resource properties. Similarly, the application of the stock and debt form of the market approach is also limited because of the difficulties in establishing the valuation of all the securities of the parent corporation and the complications involved in allocating a portion of the value to the individual natural resource property. The sale of a mine may be only part of a complex transaction including a heterogeneous group of other operations not all of which may be involved in mining and mineral processing activities. However, if the parent company is essentially a natural resources conglomerate with only a few operating properties, the stock and debt method may be an appropriate method to use to develop a value for ad-valorem purposes.

Valuation Methodology

In accordance with the Arizona Administrative Code Rule 15-4-205, the market approach to value for natural resource property is considered if a sale of a controlling

interest in the voting securities of the parent corporation has occurred or, if a direct sale of assets of a producing mine located within the State of Arizona has occurred. When the controlling interest in the voting securities of a parent corporation is sold, the usefulness of this transaction for valuation purposes depends on the value of the corporation's assets in Arizona compared with its out-of-state assets.

The market value technique in Arizona has generally involved an analysis of the terms of a sale and an evaluation of an asset allocation schedule based on the sale. The analysis of the transaction separates value into those parts that are taxable as centrally valued natural resource property and those that are locally valued as non-operating property, or non-taxable property such as metal inventories.

Based on Rule 15-4-206, the market approach may be considered the primary method of valuation if the sale of the mine unit has occurred within the twelve months preceding the valuation date that occurs on January 1st.

Chapter 3

Correlation of Value Indicators

The process of determining the final property value based on the applicable indicators is termed the reconciliation of value estimates.[28] The full cash value reconciliation for a mine or other natural resource property is based on consideration of appropriate valuation methods which may include the income, market, and cost approaches. The relative weight to be assigned to these indicators, or estimates, depends on the conditions affecting the property in question. Procedures for the determination of value and the relative weighting of indicators are contained in the rules the Department adopted. Normally, for a mine with an established operating history and reserves sufficient for continued production, the income approach to value represents the most reliable indicator. If a sale of a mine property has occurred within the preceding twelve months, a value developed through the market approach may be the prime indicator or estimate of value. And, if a natural resource property has recently commenced production, has operated at a loss, or is near the end of its economic life, the cost approach may be the primary method for the derivation of value. The cost approach may also be used exclusively to value taxable lands, personal property, and improvements for those properties in which the mineral deposit is held under a non-taxable leasehold interest.

[28] The Appraisal Institute, 2013, The Appraisal of Real Estate, Fourteenth Edition, Chicago, IL, pp. 641-42.

Chapter 4

Non-Producing Mine Valuation Procedures

The Department values non-producing mines by the same standard appraisal methods and techniques used for other property. When appropriate, the valuation methods utilizing the income, cost and market approaches would also be used to determine values for non-producing mine property. The Department values non-producing mine property for a period of three valuation years after the last valuation year in which it was valued as a producing mine.

Most non-producing mine property is valued by use of the cost approach. Because these properties are not operating and not generating income, use of the income approach to valuation would be inappropriate. Although occasional sales of non-producing property do occur, the applicability of the market sales approach is very limited.

Application of the cost approach to value for non-producing property depends on the specific conditions at the property. For permanently shut down, non-producing mines that are no longer going-concerns and have exhausted the existing mineable reserve, an evaluation based on salvage value would be appropriate. The overall valuation would include amounts for surface lands, supplies, personal property, and improvements, including construction-work-in-progress. For a property that is temporarily closed and has not exhausted the mineable reserve, a cost approach with an appropriate amount of obsolescence may be utilized to develop a value for the property. However, if the duration of the temporary shut down is quantifiable, then an income approach may be used to value the property. Finally, if an actual sale of a shut down property occurs, then the market value based on its sale price could be used in addition to other applicable methods to establish the full cash value in accordance with Rule 15-4-206.

Chapter 5

Valuation of Producing Oil, Gas, and Geothermal Interests

The Department values producing oil, gas, and geothermal interests in Arizona on the basis of production and field, posted or representative price for the commodity per A.R.S. §§ 42-14101 through 42-14106. The associated tax imposed for this particular type of property is a leasehold interest tax. The local county assessor separately values and assesses real and personal property used at the well site.

The valuation for this type of property is established by determining the gross yield and field price of the commodity being produced. Amounts are deducted for tax exempt production related to constitutional exemptions, such as an Indian interest in the production, and for amounts that are used at the well site for production purposes. The full cash value is derived by multiplying the taxable gross production of the commodity by the representative price for that commodity.

Chapter 6

Appendices

Appendix 1

Example of Constant $ and Nominal $ Cash Flow Calculations

Example Calculations

Comparison of Constant $ and Nominal $ Discounted Net Present Values

Constant $ Discounted Cash Flow Net Present Value

Real $ Discount Rate: 9.00%
Long Term Copper Price: $2.000 (Uninflated)
Assumes End of Period Discounting of Cash Flow Amounts

	2024	2025	2026	2027	2028	2029	2030
Production	100,000,000	100,000,000	100,000,000	100,000,000	100,000,000	100,000,000	100,000,000
Revenue-Copper $/lb	2.000	2.000	2.000	2.000	2.000	2.000	2.000
Operating Cost-$/lb	-1.500	-1.500	-1.500	-1.500	-1.500	-1.500	-1.500
Gross Margin-$/lb	0.500	0.500	0.500	0.500	0.500	0.500	0.500
Inc Tax @ 20%	-0.100	-0.100	-0.100	-0.100	-0.100	-0.100	-0.100
Capital Cost-$/lb	-0.050	-0.050	-0.050	-0.050	-0.050	-0.050	-0.050
Net Cash Flow-$/lb	0.350	0.350	0.350	0.350	0.350	0.350	0.350
Cash Flow in $	$35,000,000	$35,000,000	$35,000,000	$35,000,000	$35,000,000	$35,000,000	$35,000,000
Net Present Value	$176,138,969						
Discount Rate	9.00% (1 + 0.090) = (1 + 0.120) / (1 +0 .0275)						

Nominal $ Discounted Cash Flow Net Present Values

Nominal $ Discount Rate: 12.00%
Long Term Copper Price: $2.000 (Uninflated)
Annual Inflation (Escalation): 2.75%

	2024	2025	2026	2027	2028	2029	2030
Production	100,000,000	100,000,000	100,000,000	100,000,000	100,000,000	100,000,000	100,000,000
Revenue-Copper $/lb	2.055	2.112	2.170	2.229	2.291	2.354	2.418
Operating Cost-$/lb	-1.541	-1.584	-1.627	-1.672	-1.718	-1.765	-1.814
Gross Margin-$/lb	0.514	0.528	0.542	0.557	0.573	0.588	0.605
Inc Tax @ 20%	-0.103	-0.106	-0.108	-0.111	-0.115	-0.118	-0.121
Capital Cost-$/lb	-0.051	-0.053	-0.054	-0.056	-0.057	-0.059	-0.060
Net Cash Flow-$/lb	0.360	0.370	0.380	0.390	0.401	0.412	0.423
Cash Flow in $	$35,962,500	$36,951,469	$37,967,634	$39,011,744	$40,084,567	$41,186,893	$42,319,532
Net Present Value	$176,138,969						
Discount Rate	12.00%						

Appendix 2

Pre-Income Tax versus After-Income Tax Discount Rate Calculations

Perpetual Annuity

Pre-Income Tax Valuation

Pre-Tax Income	$1,000,000
Income Tax @ 0%	0
Income	$1,000,000
Pre-Income Tax Discount Rate	11.00%
Net Present Value	$9,090,909

Perpetual Annuity

After-Income Tax Valuation

Pre-Tax Income	$1,000,000
Income Tax @ 21%	-210,000
After-Tax Income	$790,000
After Income Tax Discount Rate (11% * (1 - 21%))	8.69%
Net Present Value	$9,090,909