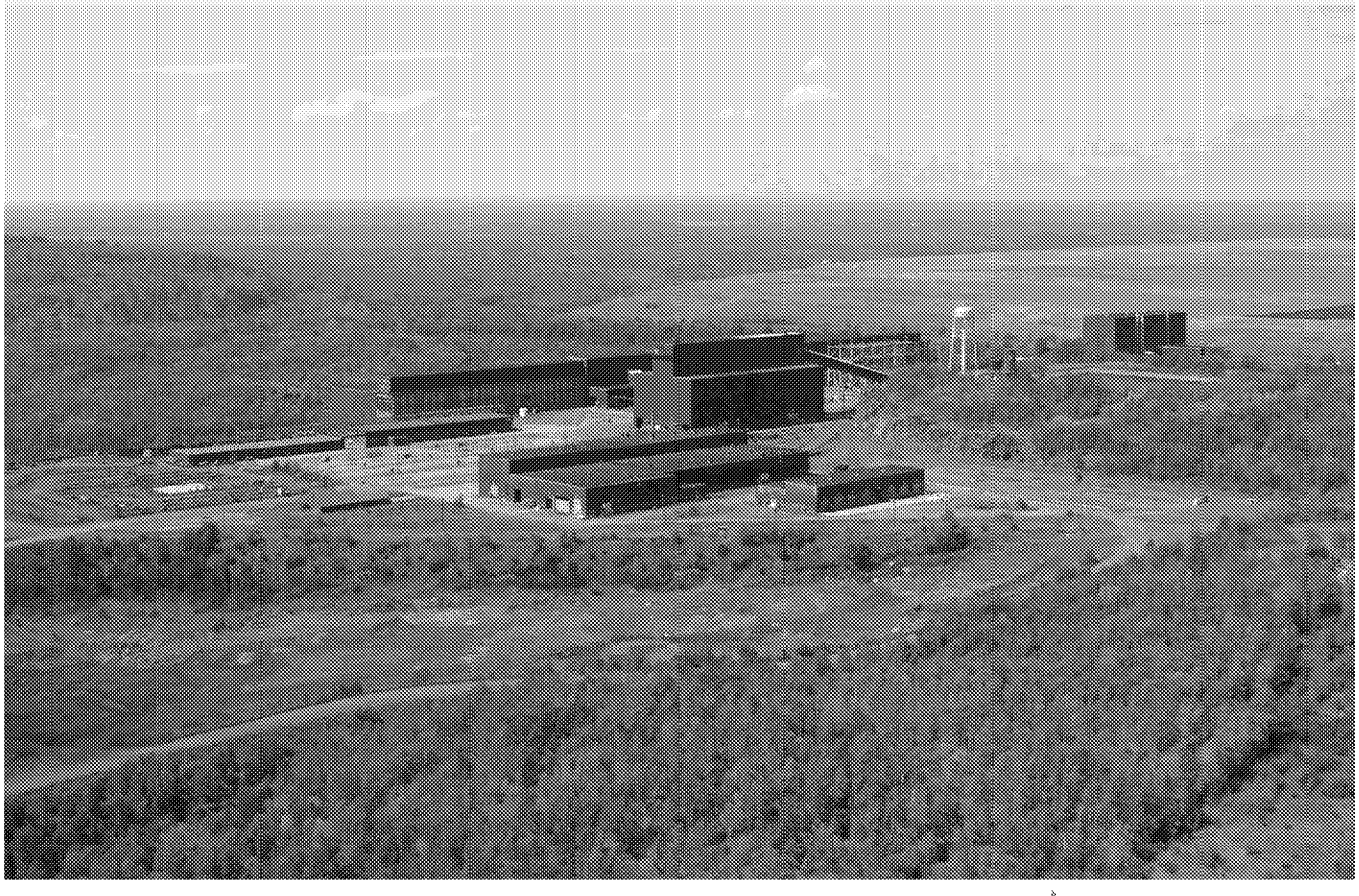
FINANCIAL ASSURANCE REVIEW AND EVALUATION FOR THE NORTHMET MINING PROJECT

PHASE I – TASK 1A REPORT

Financial and Technical Metrics



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EOR water ecology community

SPECTRUM ENGINEERING AND ENVIRONMENTAL LLC

JLT

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CAUTIONARY NOTE

The assumptions and analyses in this report were independently generated by Emmons and Olivier Resources Inc. (EOR), Spectrum Engineering and Environmental LLC (Spectrum) and Jardine Lloyd Thompson (JLT) for use by the State of Minnesota in its review of potential financial assurance mechanisms and requirements for the proposed NorthMet project. This report was created solely for government regulatory purposes related to the State of Minnesota's implementation of the financial-assurance requirements of the Minnesota Mineland Reclamation Act, Minn. Stat. § 93.44-93.51, and the Nonferrous Metallic Mineral Mining Rules, Minn. R. ch. 6132. None of the statements or analyses reported herein are made by or on behalf of PolyMet Mining Corp.

This report and the analyses contained herein were not generated by EOR, Spectrum, JLT, the State of Minnesota, or PolyMet Mining Corp. in order to generate mineral resource or mineral reserve estimates under any applicable securities laws.

This independent report is not a National Instrument 43-101 technical report. PolyMet Mining Corp.'s NI 43-101 technical report, last updated on January 14, 2013, is publicly available at: https://www.sec.gov/Archives/edgar/data/866028/000106299313001723/exhibit99-1.htm.

EXECUTIVE SUMMARY

Financial assurances are a source of funds to be used by the Minnesota Department of Natural Resources (DNR) Commissioner if the mining company permittee fails to perform:

A. Reclamation activities including closure and post-closure maintenance needed if operations cease; and
B. Corrective action as required by the Commissioner if noncompliance with design and operating criteria in the permit to mine occurs.

The objectives of this report are: to identify the liabilities requiring financial assurance, provide an assessment of those liabilities, determine the data needed to quantify them, and discuss potential financial vehicles for funding.

Potential liabilities associated with the proposed Poly Met Mining Inc. (PolyMet) NorthMet mining and processing operations have been organized into four major categories:

- **Reclamation** – Earthwork, backfilling, stockpile grading, capping, and structure demolition
- **Long-term water treatment and site maintenance** –Wastewater treatment plants and waste rock stockpiles, monitoring, pumping for stream augmentation, west pit pumping for water treatment, tailings basin seepage collection and water cover maintenance, etc.
- **Legacy issues** – Reclamation and water treatment associated with the LTV mining property
- **Contingencies** – To cover costs that were unanticipated or underestimated

The financial assurance for PolyMet's liabilities would be defined and calculated during the Permit to Mine review process, become effective if the Permit is issued, be reviewed annually as required by rule, and be modified, as needed, as outlined in the Permit. If permitted, PolyMet's reclamation liability will grow as the mine develops, and is expected to reach its maximum level just before the east and central pits' backfilling begins (year 11 of ore processing). As the pits and stockpiles are reclaimed, the liability will be reduced. After reclamation is completed, the liability will include the long-term water collection and treatment, and the long-term site maintenance activities as described in section 2.2.2. The duration of the water collection, water pumping, and treatment is unknown, so financing should assume perpetual operation.

The financial assurances for mine reclamation should be treated differently than the financial assurances for long-term water treatment and site maintenance. Reclamation costs can be estimated with reasonable accuracy because the work can be completed in a few years and will be checked and reviewed annually. In contrast, long-term costs are more difficult to estimate because the costs are incurred over decades or centuries. Long-term costs also require different financing considerations than reclamation costs.

The financial assurances for the NorthMet project should consider both trusts and sureties. Trusts are funds that include cash and cash equivalents available to pay for long-term activities such as reclamation and water treatment costs. Sureties include a variety of financial instruments that can be converted to cash, under certain conditions. To better manage cash flow, PolyMet may propose to fund only a portion of the trust up front using cash equivalents and guarantee the balance with a

surety. After that, PolyMet could propose to make annual contributions from cash flow generated from operations until the trusts are fully funded.

Obtaining reclamation surety for a small and new company like PolyMet would be very difficult (unless the NorthMet project is sold to a major mining company, a financial partnership is formed, or any other financial arrangement is made). Finding a surety willing to guarantee the long-term liabilities would also be very difficult, even for a major mining company.

As part of the Permit to Mine, the State determines the total financial assurance amount and the timing to fund the trust. It is also the State's prerogative to require PolyMet to utilize sureties that pass some financial health test. Therefore, the State should require a more aggressive financing of the financial assurance trust if less secured, stable surety companies are used to guarantee the bond. To minimize the risk to the State under these conditions, the assurances should be converted into a funded trust or escrow account within the first few years of operation.

The principal required to fund a perpetual trust is a function of the anticipated annual cost of long-term operations and maintenance (at present value as required by rule) and the effective interest received from the financial instruments in the trust. The effective interest rate is the difference between the annual average growth rate of the fund and the inflation rate. The shrinking spread between inflation and return on investments in the last 30 years suggests that traditional "safe" instruments such as T-bills, CDs and bonds may not be the appropriate financial mechanisms over long timeframes when inflation erodes the return on investment. Some other more aggressive investment portfolio strategy should be used to fund the long-term operations, maintenance and periodic capital replacements.

Given the risks associated with any long-term investment strategy, it is prudent to use conservative effective interest assumptions initially, and later adjust them over time as needed. If the trust is overfunded or underfunded, then a mechanism could be incorporated to periodically rectify the difference.

Traditionally, surety bonds have been used as financial assurance for mine reclamation, and continue to be the preferred vehicle for mining companies, because the premium for the bond is far less than the cash flow that would be needed if cash or some other type of collateral security were required. Due to numerous coal and hardrock mine bond forfeitures that caused considerable losses to the surety industry, it has become more difficult to obtain surety bonds. Today it is extremely difficult for a small or new mining company to obtain a bond if there is any risk of future bankruptcy. A large well established well capitalized company may be able to obtain these bonds more easily, whereas a small company may not. If a surety bond is not obtainable, the alternatives would require up front capital that could affect the project economics. Financial assurance should always be part of the mine financial analysis, no matter how it may harm the project's feasibility.

PolyMet could also present a non-expiring, Irrevocable Letter of Credit (ILOC) as security for their obligations to the State. The State should establish criteria regarding the financial strength of a financial institution that would be an acceptable issuer. The State would also need to clarify acceptable ILOC wordings and amounts needed to secure the reclamation exposure.

Given the potential for catastrophic accidents resulting from the day-to-day operations and the nature of the mining industry exposures, an Environmental Impairment Liability (EIL) would offer a viable risk transfer mechanism to prevent long-standing environmental damage (see Section 3.3).

If permitted, liabilities and financial assurance calculations will be updated annually as required by rule. They must reflect the cost to the State if the State were required to take over and manage the unfinished reclamation and the long-term water collection, treatment and site maintenance. To perform these annual financial assurance updates, as-built mine plans, new information or updates, and the future one year and long-term mine plans must be incorporated into the reclamation plan as required by rule. The reclamation plan must provide the quantity, distance, and sizing details data (see Section 4) needed to prepare the annual updates and ensure that all liabilities are accounted for. These data can be organized based on type, timing, or location. The cost calculations should also include the State's overhead, fees and administrative costs and an analysis of the risk associated with each cost element so that there is a logical basis to add-on an allowance for contingency.

INTRODUCTION

The Minnesota Department of Natural Resources (DNR) is responsible for reviewing the Permit to Mine application for the Poly Met Mining Inc. (PolyMet) NorthMet project, including assessing the project's ability to meet all Permit to Mine requirements. The purpose of the Permit to Mine is to mitigate the possible adverse environmental effects of mining by ensuring orderly construction and development of a mine, sound operational practices, progressive reclamation of mined areas, and long-term protection of the environment. Financial assurance is required to provide adequate funding that the DNR could access in the event that a company abandons a project, fails to properly maintain or reclaim the site, or fails to correct noncompliance.

The objectives of this report are: to identify the liabilities requiring financial assurance, provide an assessment of those liabilities, determine the data needed to quantify them, and discuss potential financial vehicles for funding.

The first section of this report describes what financial assurances are and why they are needed for Minnesota mining permits. The second section identifies the liabilities requiring financial assurances and the financial requirements for those liabilities if a permit were to be issued and the NorthMet project were to proceed as planned. The third section reviews the advantages and disadvantages of various financial strategies and products that can be used as financial assurances. The fourth section outlines the data and information needed to calculate financial assurances as the mining project progresses.

1. WHAT ARE FINANCIAL ASSURANCES?

Financial assurances are a source of funds to be used by the Minnesota Department of Natural Resources (DNR) Commissioner if the mining company permittee fails to perform:

C. Reclamation activities including closure and post-closure maintenance needed if operations cease; and
D. Corrective action as required by the Commissioner if noncompliance with design and operating criteria in the permit to mine occurs.

Before a mining permit can be granted, Minnesota Administrative Rule 6132.1200, financial assurance, requires the mining company to determine the cost to reclaim the mine and perform post-closure maintenance if operations cease for any reason during the first calendar year of operations. The cost estimate to reclaim the mine following a cease in operations must be updated annually (as required by rule) by the mining company and submitted to the State. Therefore, DNR must look many years ahead to anticipate the value of the financial assurance package needed to perform the required reclamation activities or corrective actions during the entire course of mining production. The mining company must provide satisfactory financial assurances to perform the necessary reclamation activities and corrective actions that must meet the following criteria listed in Minnesota Rule 6132.1200, subpart 5:

A. assurance of funds sufficient to cover the [reclamation and corrective action] costs estimated under [Minnesota Rule 6132.1200] subparts 2 and 3;
B. assurance that the funds will be available and made payable to the commissioner when needed;
C. assurance that the funds will be fully valid, binding, and enforceable under state and federal law;
D. assurance that the funds will not be dischargeable through bankruptcy; and
E. all terms and conditions of the financial assurance must be approved by the DNR Commissioner.

After mining begins, Minnesota Administrative Rules 6132.1200 and 6132.1300 require the mining company to provide an annual report, including a contingency reclamation plan. The contingency reclamation plan must include long-term operation and maintenance to be implemented if operations cease during the upcoming year, and it must provide financial assurance to ensure that there is a source of funds to perform the work if the State assumes the responsibility and must contract a third party to perform the work.

These rules require that the financial assurance plans and costs be revised annually to reflect the liability that will be incurred during the following year. However, the State recognizes that some reclamation activities will require long-term operation and maintenance, so the financial assurances plans and costs must recognize that the liabilities created in the following year will also have costs that extend far into the future.

It is important to note that EPA has indicated they intend to promulgate financial assurance rules for hard rock mining. This may affect financial assurance for this project in the future.

2. LIABILITIES REQUIRING FINANCIAL ASSURANCE

This section discusses considerations of the potential liabilities requiring financial assurance for the proposed PolyMet NorthMet mining and processing operations, and is organized into four major subsections:

- Reclamation
- Long-term water treatment and site maintenance
- Legacy issues
- Contingencies

2.1. Reclamation Liabilities

Reclamation liabilities include the relatively short-term activities that must be completed during and after the life of the mine. This includes earthwork to make the pit walls and stockpiles comply with grade and height limitations, slope stabilization and revegetation, and removal of buildings, roads, power lines, and equipment. The level of effort required for reclamation is well known based on years of experience reclaiming many former mining sites in Minnesota and other States. Standard methods and costs have been developed based on the types of overburden and waste rock at the site, the configuration of the mine pit and stockpiles, and the available equipment.

The cost to perform the reclamation (e.g. earthwork, backfilling, stockpile grading, capping, structure demolition, pumping for stream augmentation, pumping for water treatment, tailings basin seepage collection and water cover maintenance, etc.) can be reasonably and accurately estimated using conventional cost engineering estimating methods. For example, a standardized mine reclamation cost estimation (SRCE) model has been developed by SRK Consulting in conjunction with the State of Nevada, the Bureau of Land Management, and several large international mining companies operating in Nevada. This software is a Microsoft Excel spreadsheet that uses well established cost estimating principles to compute the labor hours and equipment hours to perform the reclamation, and then applies local Davis Bacon labor rates and current fuel and maintenance rates to compute the estimated costs. This program is rapidly gaining acceptance as a standardized tool for estimating mine closure costs and periodically revising the costs as needed, and could be considered for this project.

If the permit to mine is granted, the reclamation financial assurance estimate will be revised annually (as required by rule) to reflect the as-built geometry and any operational modifications that occur or are proposed. The cost components will be annually revised to reflect actual inflation of labor, materials and supplies, and to recognize a reduction in liability as the reclamation is completed. When the reclamation cost is updated annually to reflect the cost to close the mine during the next year, and the financial assurance is sufficient to cover the costs of the State overhead, administration, and inflation during construction, then there should be no major uncertainties. However, there is a risk associated with only assuring the current liability and not looking ahead and understanding possible future liabilities. If PolyMet encounters financial difficulties during operation, the State should ensure that the reclamation financial assurance estimate also looks into the future as generalized in Figure 1.

2.2. Long-Term Liabilities

Long-term liabilities include water collection and treatment, and site maintenance that must be completed to provide long-term protection of the environment. Considerations for estimating the financial assurance for water treatment and site maintenance are discussed separately.

2.2.1. Water Treatment

The long-term water treatment includes all of the water collection and water treatment components needed to mitigate environmental impacts for as long as it may take until water discharges could meet standards without treatment.

PolyMet plans to reuse many of the defunct LTV taconite mine facilities and assume the reclamation and water treatment liabilities for this legacy site from Cliffs Natural Resources (CNR), the owner of these facilities. PolyMet is proposing to place the nonferrous mill tailings on top of the existing taconite tailings and then collect and treat the water that leaves the basin, if the water does not meet discharge standards. PolyMet is also proposing to leave a low sulfide content waste rock stockpile (Category 1) on the edge of the mine pit and collect and treat any contaminated water that escapes the stockpile. All of the higher sulfide waste rock would be temporarily stored back in the mine (east and central pits) where it would be inundated by water. This will prevent the remaining sulfides from oxidizing, but will also temporarily contaminate the water with the metal salts that have already oxidized. Therefore, it would be necessary to collect and treat the mine water for an indeterminate period until the dissolved metals have been captured and the water achieves discharge standards.

The capital and operating costs to collect and treat the water for an indeterminate period are difficult to accurately predict due to the uncertainties regarding the chemistry and quantity of water that must be treated. It typically takes several years for mining impacted water chemistry to stabilize and for all the potentially non-compliant constituents to become evident. Unanticipated high cost and duration of long-term water collection and treatment is the reason that some previous mining financial assurances were under funded. For this reason, the annual cost estimate for long-term treatment and maintenance should be conservative, or at least contain a high contingency factor. Unproven future technologies should not be considered. For financial assurance, the duration of treatment should be assumed to be perpetuity.

In recognition of the lessons learned from previous underfunded financial assurances, the regulators and industry are now more thoroughly investigating the minerology and geochemistry of the ore and waste and using state-of-the-art science to more accurately predict the long-term water chemistry and the quantity of water that will be impacted by mine and closure plans. In this regard, there is less chance of major unanticipated water chemistry or water quantity problems for NorthMet compared to the mines that closed in the past.

The major uncertainty for NorthMet would be the duration of the water collection and treatment and how to create a financial assurance mechanism that addresses this uncertainty. The NorthMet EIS investigated the likely water chemistry and long-term risks. The EIS indicated that if the water quantity and/or chemistry are underestimated, the collection and treatment facilities can be easily expanded later. That is true, but the question of when and from where will the funding be secured

still remains. Case studies of underfunded financial assurances generally identify the water collection and treatment as the most underfunded component.

Moreover, current water quality standards may change in the future becoming more or less restrictive, or may not change at all. Therefore, long-term water treatment financial assurances should be grounded on current standards and treatment technologies and not based on speculative future technological or regulatory changes.

2.2.2. Site Maintenance

The proposed long-term site maintenance of the PolyMet NorthMet mine includes management of the tailings basin, management of the Category 1 stockpile and monitoring. Pumping for stream augmentation and pit filling, and west pit pumping for water treatment, would also be part of the long-term site maintenance.

The proposed tailings basin design includes a "wet closure" where water must cover the tailings forever, and the structure must remain stable forever. This means that dam safety and maintenance will be a perpetual requirement. Precipitation will accumulate in the basin, so surplus water that doesn't evaporate or seep out the bottom may need to be released. During low precipitation periods, water may need to be pumped in from Colby Lake to keep the tailings inundated. Monitoring and continuous management of the tailings basin water quality and quantity will be required. Climate change may make it difficult to accurately estimate the amount of future precipitation, and how that may affect the quantity of water that must be treated, added or released. Climate change may also make it more difficult to assess the potential for erosion.

Stockpiled waste rock that is not placed beneath the water table in the open pits will need to be monitored for erosion, water collection and cap integrity.

PolyMet intends to install seepage containment systems to prevent contaminated groundwater from escaping the tailings basin and the permanent waste rock stockpile. Based on previous experiences, there is a tangible risk that these systems may not be as effective as anticipated, requiring some additional mitigation.

Periodic monitoring of surface water and groundwater quality at and around the mine site will be necessary to determine that all pollution control systems are performing as designed.

2.3. Legacy Issues

If permitted, PolyMet will assume reclamation, long-term water quality permit compliance and operations and maintenance responsibilities from Cliffs Natural Resources (CNR) for parts of the former LTV mining site. These include the future location of the production facilities and the tailings basin. Permit issues associated with the previous use of these sites are known as "legacy issues". What legacy site liability issues remain with CNR under their corporate guarantee will be detailed in permitting? Currently, there are no financial assurances for the legacy liabilities other than CNR's corporate guarantee.

PolyMet should assume responsibility from CNR for the tailings basin when nonferrous tailings are placed in the basin (mine year 1) if not sooner. The tailings basin currently holds ferrous tailings. When PolyMet begins putting nonferrous tailings into the basin they will change the chemistry of the tailings basin seepage and create new water quality and dam construction/safety issues.

Within the production facilities' location, "areas of concern" (AOCs) have been identified where soil, surface water, or groundwater contamination remain, or where removal of old structures and equipment is still necessary. Some AOCs would be addressed during the construction process as the site is cleared and graded for new buildings, other AOCs would require specific, possibly long-term remediation.

PolyMet may propose to defer assuming the liabilities for the LTV site because it will be necessary to transfer the corporate guarantee to some type of financial instrument, which will involve a cash outlay or surety bond. For the reasons outlined above, this deferral is not recommended, unless keeping the current CNR corporate guarantee as an alternative to bonding or in conjunction with bonding is determined to be a stronger financial assurance option.

Any transition of liabilities from CNR to PolyMet should be legally vetted. The State's attorneys should confidentially review all agreements involving the transfer of the property and liabilities to PolyMet to ensure that there are no hidden issues that will complicate the transaction or cause the State problems later.

2.4. Contingencies

Engineering cost estimates typically include contingencies for costs that were unanticipated or underestimated. At a minimum, contingencies should cover underestimated costs, overlooked reclamation needs, underestimated water treatment needs, and State oversight of reclamation and long-term water treatment and site maintenance. Contingencies may be calculated for each item or calculated as a percentage of the whole cost. For example, the State of Michigan recently required a 20% contingency to be added to the total financial assurances requirement for the Eagle Mine Permit to Mine. Other potential costs associated, for instance, to catastrophic events or future changes in environmental regulations and standards, are difficult to assess and may be better addressed by environmental insurance coverage or other vehicles.

As required by rule, contingencies include the additional costs for a third party to perform the reclamation and water treatment compared to the company performing the work. Reclamation and water treatment costs should be calculated assuming that the State hires a third party to perform the work, which is costlier than PolyMet performing the work. Also, the State administrative costs are typically higher than the private industry. Additionally, a contractor would use smaller more expensive methods, and would require a profit. The USFS (Peter Werner, mining engineer, USFS Bozeman MT) suggests a 55-60% add-on for contingency and oversight, but recognizes that the percentage contingency depends on the size of the project, since smaller projects require a disproportionate overhead. Werner suggested that the contingency can be better managed by performing a risk assessment of the individual cost components and using a probability based approach to assigning the contingency. He pointed out that most large government construction projects significantly overrun the initial cost projections.

Contingencies should also consider "holding year" costs. If PolyMet goes bankrupt, the State typically cannot start reclamation activities right away. There may be no advance warning of the bankruptcy, so organizing a reclamation effort will require time. Contracts must be bid and negotiated with multiple contractors. During the "holding year" (or longer time period), the State agency will incur management costs and contractor cost increases due to inflation that should be covered by the financial assurances.

A significant contingency should be placed on water collection and treatment as this cost is difficult to estimate accurately before mine projects are installed and operating. Past experience shows that the amount of water, the cost to treat, and the duration of treatment have often been underestimated. Frequently, when sulfides are involved, new studies identify a water quality analyte that wasn't previously recognized. Initially, a conservative costing approach should be used and revised annually as experience is gained. Some of the water quality parameters may take years to stabilize or become apparent. The risk to the State is that water collection and treatment requirements may be underestimated initially and the State could later be forced to assume the liability for new water treatment systems before the full costs and risks are established. Also, the company may default after the mine has been reclaimed, and the State would have to assume the costs for the long-term liabilities, such as operation and maintenance of water treatment facilities.

Contingencies should also cover risk, including errors in cost estimating, items that might have been overlooked, changes in water chemistry or quantity, and the financial risk associated with estimating inflation and trust return on investments in perpetuity. Even though PolyMet is a copper-nickel project with potential to create acid mine drainage and water pollution, the company and the State appear to have taken the appropriate steps to evaluate and address the types of geochemistry and dam failure risks that were not properly addressed in the mine reclamation failures prior to the early 2000's. Given the thoroughness of the EIS and other studies, the risk of unforeseeable environmental surprises has been reduced, and the contingency associated to these risks could be also reduced.

Finally, EPA has indicated they intend to promulgate financial assurance rules for hard rock mining. This new regulations may affect financial assurance for the NorthMet project in the future.

2.5. Changes in Financial Assurance Requirements over Time

The purpose of this section is to illustrate how financial assurance requirements change over time to ensure that the financial assurance is sufficient to cover the maximum reclamation liability and long-term water treatment and site maintenance. It is important to note that the liability costs reported in this section are estimates only, provided to show the trend in liability with time, and are not meant to represent the actual total liability for NorthMet.

The financial assurances for mine reclamation should be treated differently than the financial assurances for long-term water treatment and site maintenance. Reclamation costs can be estimated with reasonable accuracy because the work can be completed in a few years and will be checked and reviewed annually. In contrast, long-term costs are more difficult to estimate because the costs are incurred over decades or centuries. Long-term costs also require different financing considerations than reclamation costs.

The financial assurance for PolyMet's liabilities will be defined and calculated during the Permit to Mine review process, become effective if the Permit is issued, be reviewed annually as required by rule, and be modified, as needed, as outlined in the Permit. If permitted, PolyMet's reclamation liability will grow as the mine develops, and is expected to reach its maximum level just before the East and Central pits' backfilling begins. As the pits and stockpiles are reclaimed, the liability would be reduced. After reclamation is completed, the liability would only include the long-term water collection and treatment, and the long-term site maintenance. The duration of the water collection, water pumping, and treatment is unknown, so financing should assume perpetual operation.

The NorthMet EIS reported preliminary cost estimates for closure, reclamation and long-term treatment of the NorthMet project for the first 20 years and a long-term annual estimate (Table 1). These preliminary cost estimates do not indicate whether these are the costs for PolyMet or a state contractor to perform the work, and are subject to change. If the reclamation work is performed by PolyMet, the cost will be much less than if it is performed by the State because the mine will use larger more productive equipment and does not need to include State management costs. However, as required by rule, the financial assurance must recognize the cost for the State to manage the work and hire third party contractors.

Table 1. Preliminary cost estimates for closure, reclamation, and long-term treatment of NorthMet

Preliminary cost estimate for:	Mine Year 1	Mine Year 11	Mine Year 20	Long term
Closure, reclamation and long-term treatment	$50M – $90M	$160M – $200M	$120M – $170M	$3.5M – $6M per year

Source: Table 3.2-15, FEIS, November 2015. "Year" is based on production year

2.5.1. Reclamation Liability

Figure 1 illustrates the trend (not absolute liability costs) in PolyMet reclamation liabilities for an assumed 25 years period (2 years of construction previous to ore processing, 20 years of ore processing/operations and 3 years to finalize reclamation after cease of operations). As previously noted, the actual liability each year may be different, but the general pattern would be similar. The assumption of 2 construction years before ore processing is based on Figure 16-5 of the PolyMet Mining Corp.'s NI 43-101 Technical Report. The 3 years of post-operation reclamation is just an assumption and does not reflect PolyMet's proposal at this time.

In addition to any legacy liabilities assumed if the Permit to Mine is issued, PolyMet will begin occurring reclamation liabilities when it begins pre-stripping in the mine area to expose the ore body, and when it begins constructing the facilities required to transport and process the ore during pre-production years. After pre-production development, reclamation liabilities will increase as PolyMet assumes control of the tailings basin and begins disposing of nonferrous tailings in Year 0. Liabilities will continue to increase as the NorthMet site is mined, waste rock piles are created, and the HydroMet facility is brought on line. PolyMet will then begin reducing reclamation liabilities as waste rock is returned to the open pits and other waste rock piles are reclaimed after year 11. Then liabilities should decrease faster than they increase, until the sites would be fully reclaimed in year 23.

After the permit conditions and the plans are finalized, the annual reclamation costs can be accurately estimated for the following year. The costs for State oversight, contract management, and third party operation can be reasonably estimated for reclamation activities, thus minimizing the overall financial assurance risk for this component. Since the work would presumably all be completed within a few years of the last computation, inflation and return on the money invested can be reasonably estimated and incorporated in the financial assurance.

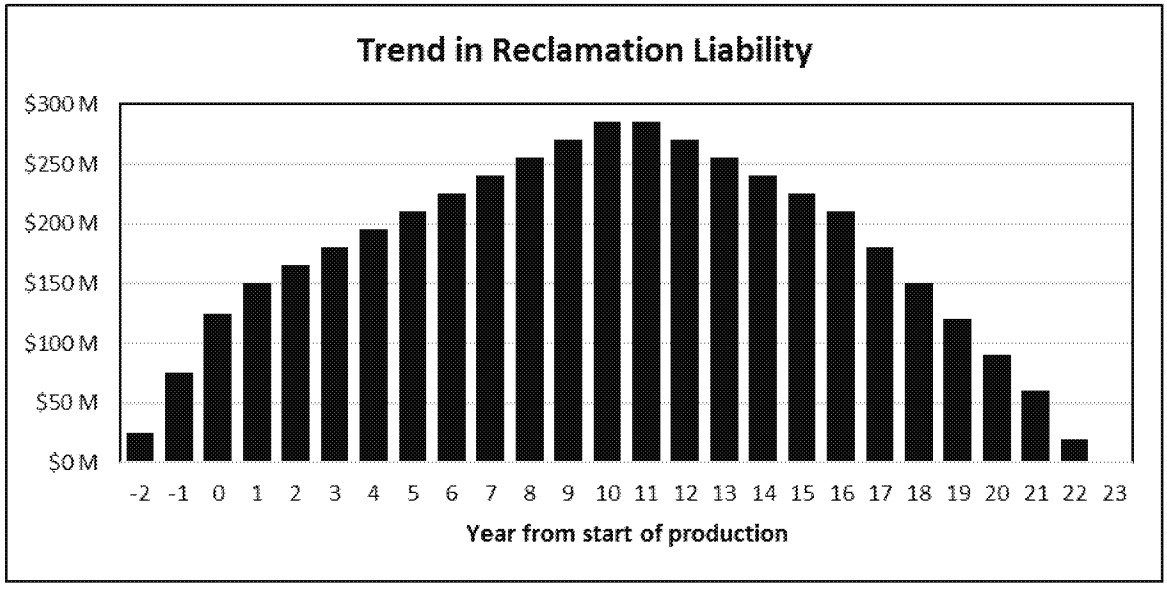

Figure 1. Trend (not absolute liability costs) in reclamation liability for financial assurance (excludes long-term operations and maintenance)

2.5.2. Long-Term Activities

Figure 2 illustrates the trend in estimated PolyMet long-term water treatment, collection facilities and operations and maintenance liabilities (assuming no inflation) for the first 100 years after mining activities are initiated. The $26 M spike in cost every 30 years includes the added cost to periodically replace the main capital facilities (treatment plant and main water collection network). The constant annual cost of $5 million is for long-term water treatment and long-term site maintenance activities as described in Section 2.2.2. Cost assumptions in Figure 2 are for illustration purposes only. Actual long-term annual costs may be different and would be recalculated annually.

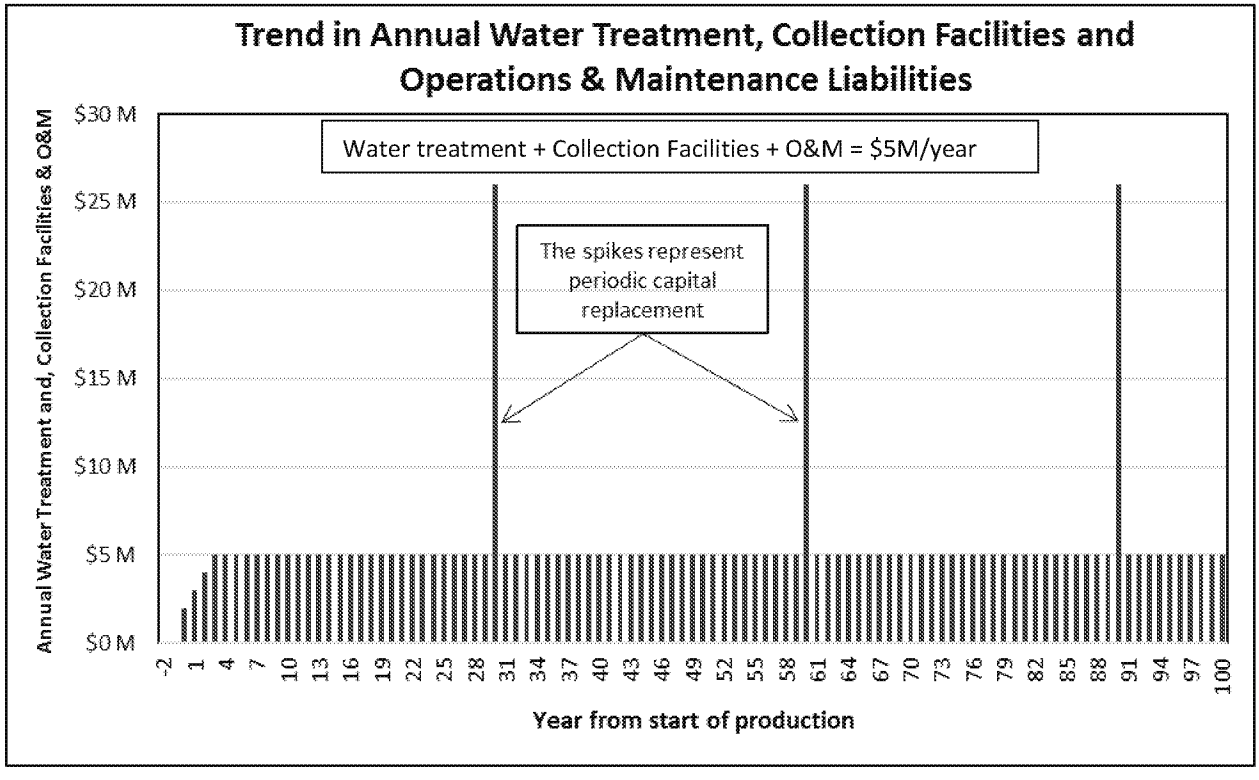

Figure 2. Trend in estimated annual long-term liabilities for financial assurance (water treatment, collection facilities and O&M)

2.6. Additional Considerations

The methodology for determining the financial assurance should address what happens if PolyMet is forced into bankruptcy at any time in the future, requiring the regulatory agency to manage the unfinished work and the long-term water collection, treatment and site operations and maintenance. Additional considerations for when a governmental entity takes over a mining company include:

- A new project management team must be put into place to manage the accounting, finances, engineering, earthwork and demolition, water collection and treatment, and long-term operations and maintenance. This can be done using State employees or a combination of State employees, consultants, and contractors.

- If PolyMet owns the equipment rather than leasing it, then a construction lien or other condition could be placed on the equipment so that it stays on site and can be used by the State contractor making the reclamation and long-term activities more economical. Nevertheless, the cost of equipment will be part of the cost of hiring a third party to perform the work, as required by rule and should not be considered an asset in calculating financial assurance.
- As required by rule, the residual value of facility structures, equipment, land, or other assets at the time of bankruptcy cannot be used to calculate financial assurances.
- If possible, the State should obtain title to all land and facilities if a bankruptcy occurs and the company is the title holder or, at a minimum, obtain land access agreements.
- If a performance bond is used and the trust is only partially funded when bankruptcy occurs, then the bond could immediately be applied to fully fund the trust. This is not something sureties usually do and will be challenging to obtain.
- The trust should be managed by the State and not by a third party. Any anticipated cost associated to the long-term management of the trust should also be reflected in the financial assurance.

3. FINANCIAL ASSURANCE VEHICLES

Financial assurance vehicles can be a surety bond, cash collateral, certificate of deposit, letter of credit, sinking fund, escrow account, lien on property, security interest, guarantee, or other instrument or method in favor of and acceptable to the Minnesota Department of Natural Resources Commissioner. As required by rule, the amount of the financial assurance must be sufficient for the State to retain and manage a third party to perform reclamation and long-term operations and maintenance work. This section discusses the advantages and disadvantages of various financial assurance vehicles that could be used for the PolyMet's NorthMet project.

3.1. Trusts and Sureties Bonds

A key challenge for the NorthMet financial assurance is how to set up and fund financial assurance vehicles that will provide the annual payment and periodic spikes for an indefinite time (as illustrated in Figure 2 in Section 2.5). In those cases, it is generally agreed that a trust fund should be established that would grow to account for inflation while simultaneously dispersing the money needed to fund the operation.

The creation of two different trusts should be considered before NorthMet mine development begins: one for the reclamation and one for long-term water treatment and site management. In addition, the rate at which the trust balances are funded from cash flow needs to be determined. To better manage cash flow, PolyMet may propose to fund only a portion of the trust up front using cash equivalents and guarantee the balance with a surety. Sureties include a variety of financial instruments that can be converted to cash, under certain conditions, to pay reclamation and long-term water treatment and site maintenance costs. Then, PolyMet would make annual contributions from cash flow generated from operations until the trusts are fully funded.

Obtaining reclamation surety for a small and new company like PolyMet would be very difficult (unless the NorthMet project is sold to a major mining company, a financial partnership is formed, or any other financial arrangement is made). Finding a surety willing to guarantee the long-term liabilities would also be very difficult, even for a major mining company.

As part of the Permit to Mine, the State determines the total financial assurance amount and the timing to fund the trust. It is also the State's prerogative to require PolyMet to utilize sureties that pass some financial health test. Therefore, the State should require a more aggressive financing of the financial assurance trust if less secured, stable surety companies are used to guarantee the bond. To minimize the risk to the State under these conditions, the assurances should be converted into a funded trust or escrow account within the first few years of operation.

On the other hand, if PolyMet is required to place cash or cash equivalents equal to 100% of the potential liabilities prior to beginning mine development, the risk to the State will be minimized, but the timing of the cash flow may render the project less financially attractive or even unfeasible.

The cash flow generated from operation depends on revenue, which is very sensitive to metal prices and cash outflows (as discussed in the Phase 1-Task 1B report). The cash outflows include the cash operating costs, debt repayment, taxes, funding to trusts, and returns to the investors. The State should ensure that funding the trusts is a priority. There is a solid argument for funding the

trusts first. This reduces the risk to the sureties and the State, but it makes the mine investment less attractive because the returns are delayed.

3.1.1. Inflation and Return Rates

One challenge in determining an appropriate mix of equities versus fixed income investments for the long-term trust is that future inflation and return rates on investments are difficult to predict. A slight error in the projected rates will be amplified over time. In the long-term, the return on investment for equities (e.g. 6–7% for the stock market, real-estate, etc.) outperforms fixed interest investments such as U.S. Treasury Bills (T-Bills), bonds or certificates of deposit. However, in the short-term (less than 10 years) the volatility of equities makes them riskier.

In the 1980's when both inflation and interest rates were high, T-bills and AAA bonds returned an interest rate that exceeded inflation by 4-7% (Figure 3). However, the spread between fixed interest rate returns and inflation has since decreased and now inflation exceeds the returns on bonds and T-Bills. The shrinking spread between inflation and "safe" return on investments suggests that traditional instruments such as T-bills, CDs and bonds may not be the appropriate financing mechanisms over long timeframes when inflation could erode the return on investment. A more aggressive investment portfolio strategy is recommended to fund the long-term operations, site maintenance and periodic capital replacements.

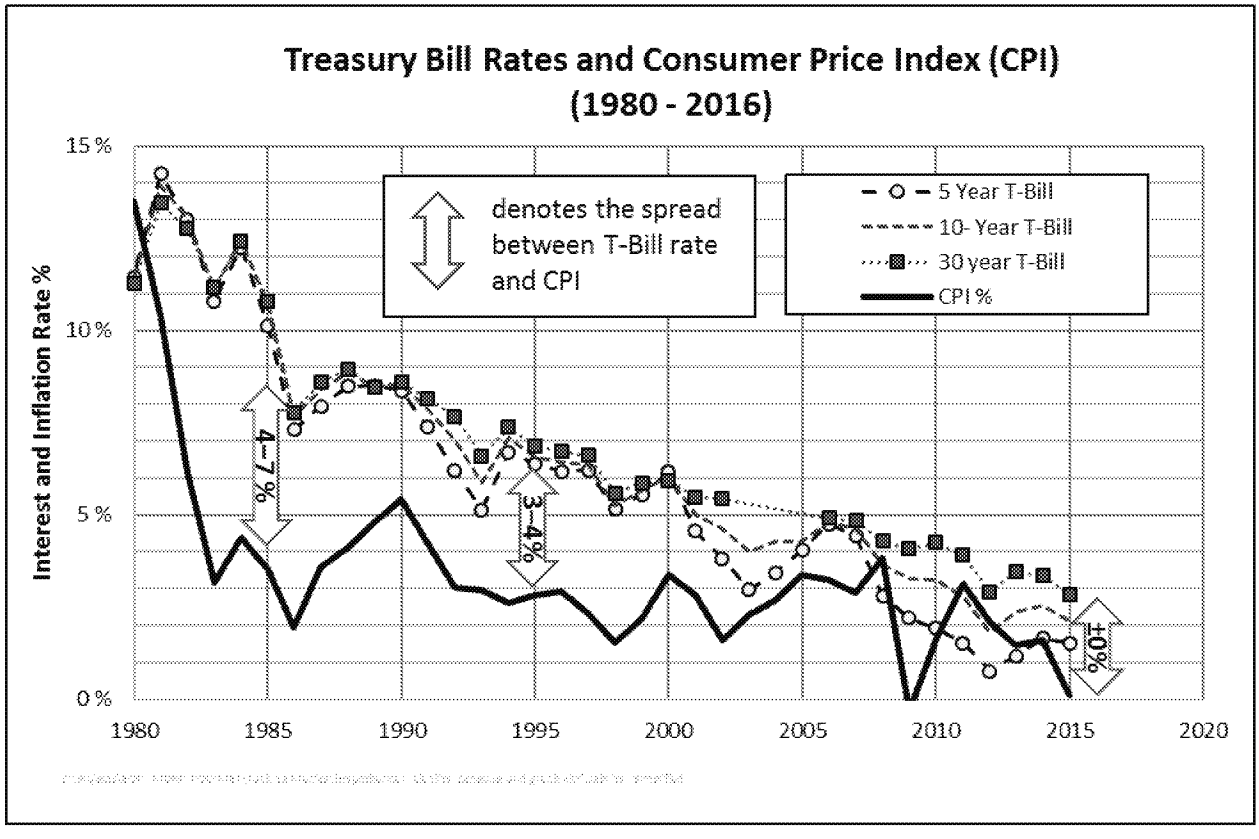

Figure 3. Convergence of T-Bill rate and inflation rate (CPI) from 1980 to 2016

The stock market indices (S&P 500, DJIA, etc.) generate greater returns over long-time spans than T-Bills, money market funds, or CD's. Figure 4 shows the growth rate of the Standard and Poor's 500 since 1950. The black dotted line represents an exponential trend best fit with an excellent Pearson correlation (95.6%). The trend in S&P 500 since 1950 is an increasing rate of growth. The average compounded growth rate is 6.9%, not including dividends. The same data is plotted on a logarithmic chart in Figure 5 and illustrates how constant the S&P growth has been over decades or longer timeframes. The charts also illustrate that the index can fluctuate up or down in any given year, but over the long-term it has always gone up. Volatility makes the index unreliable for short-term funding, but over the long-term it has a higher and more predictable rate of return than typical "low risk" investments.

Of course, there is no guarantee that future behavior will mirror the past, but given the potentially low returns and historical fluctuation (Figure 3 shows interests varying from about 14.5% to less than 1%) of government bonds, some other long-term investment strategy is strongly recommended. In summary, traditional low risk investments may not be low risk in the long run.

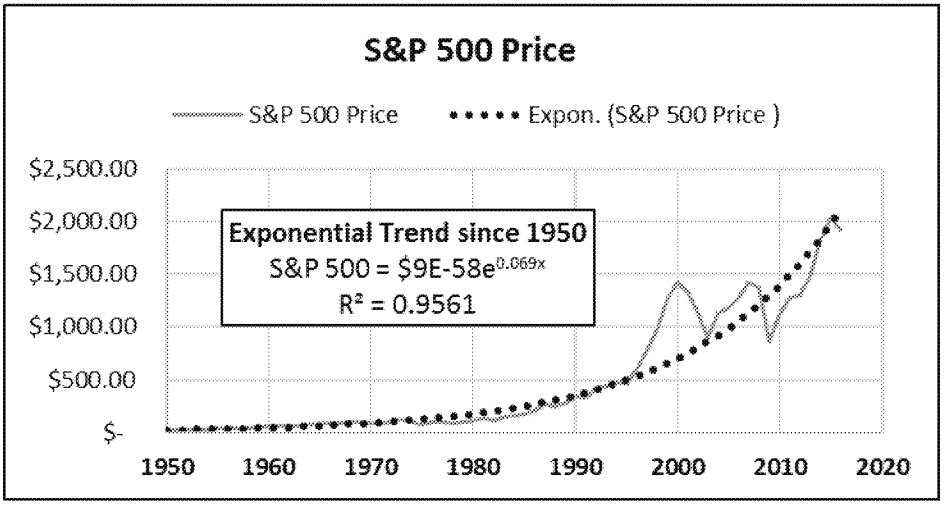

Figure 4. Exponential increase in Standard & Poor's (S&P) 500 price, 1950 – 2016

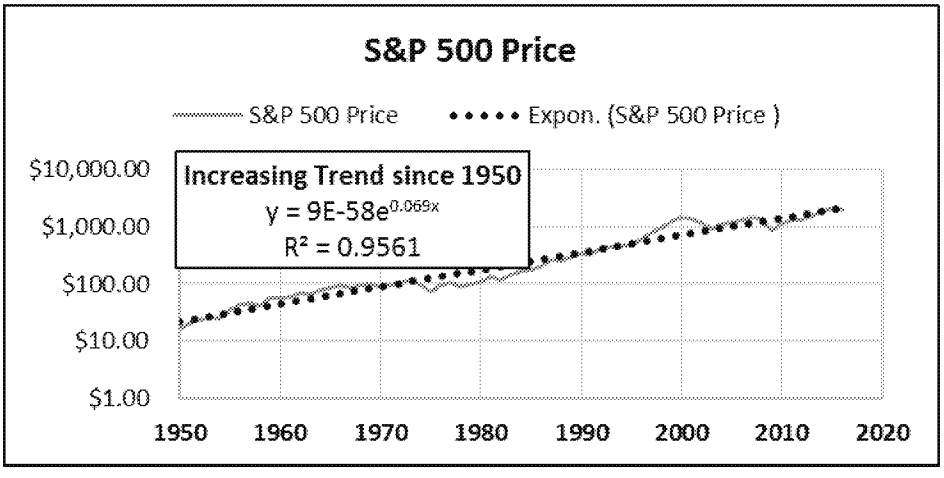

Figure 5. Increase in Standard & Poor's (S&P) 500 price plotted logarithmically, 1950 – 2016

If growth is needed for the long-term but certainty is needed for the short-term, an investment strategy could include a combination of index funds and laddered bonds that can be some combination of T-Bills and other bonds that generate a known interest rate. In the mid-term (less than 30 years), other predictable investment vehicles such as annuities could be used. The majority of the fund to finance long-term activities would be placed in the index funds to grow at ±6%, and the laddered bonds and annuities would be used to fund the short-term (5 to 20 years). Every few years, when the fund is performing well, a portion of the index fund could be converted to fixed income investments.

Given the risks associated with any long-term investment strategy, it is prudent to use conservative (low) effective interest assumptions.

3.1.2. Principal Required in Trust

The principal required to fund the trust is a function of the anticipated annual cost (at present value as required by rule) and the effective interest received from the financial instruments in the trust. The effective interest rate is the difference between the annual average growth rate of the fund and the inflation rate. For example, assume the constant dollar average annual cost to operate the water treatment plant and the long-time site maintenance, including an allowance for periodic small equipment capital replacement, is $5M. To determine the size of the trust fund to generate this amount at perpetuity, the dollars in the trust (principal) multiplied by the effective interest rate must equal $5M.

Figure 6 illustrates the trust principal needed to generate the required capital at different effective interest rates. The required trust principal is very sensitive to the assumed difference between the growth rate and the inflation rate. Management of the trust funds requires investments that will yield an adequate, long-term rate of return. If one assumes a very small spread between inflation and return on investments, then the initial amount in the trust will need to be high.

For example, many trust funds assume a 2% effective interest rate spread. To generate $5M per year, an initial investment of $250M would be required to keep the fund solvent in perpetuity. But, if the spread was less than 2%, then the $250M trust would eventually be depleted. If the spread was greater than 2%, then the money in the trust would continue to grow over time. The difference in fund solvency between the actual spread compared to the assumed spread can be significant. For this example of $250M, if the actual spread was 1% compared to the assumed 2% spread, then the trust would be depleted in 70 years. If the actual spread was 0% compared to the assumed 2% spread, then the trust would be depleted in just 51 years.

Therefore, selecting an appropriate effective rate of return is the key factor in determining the funding required to cover long-term liabilities. As mentioned before, given the risks associated with any long-term investment strategy, it is prudent to use a conservative effective interest rate.

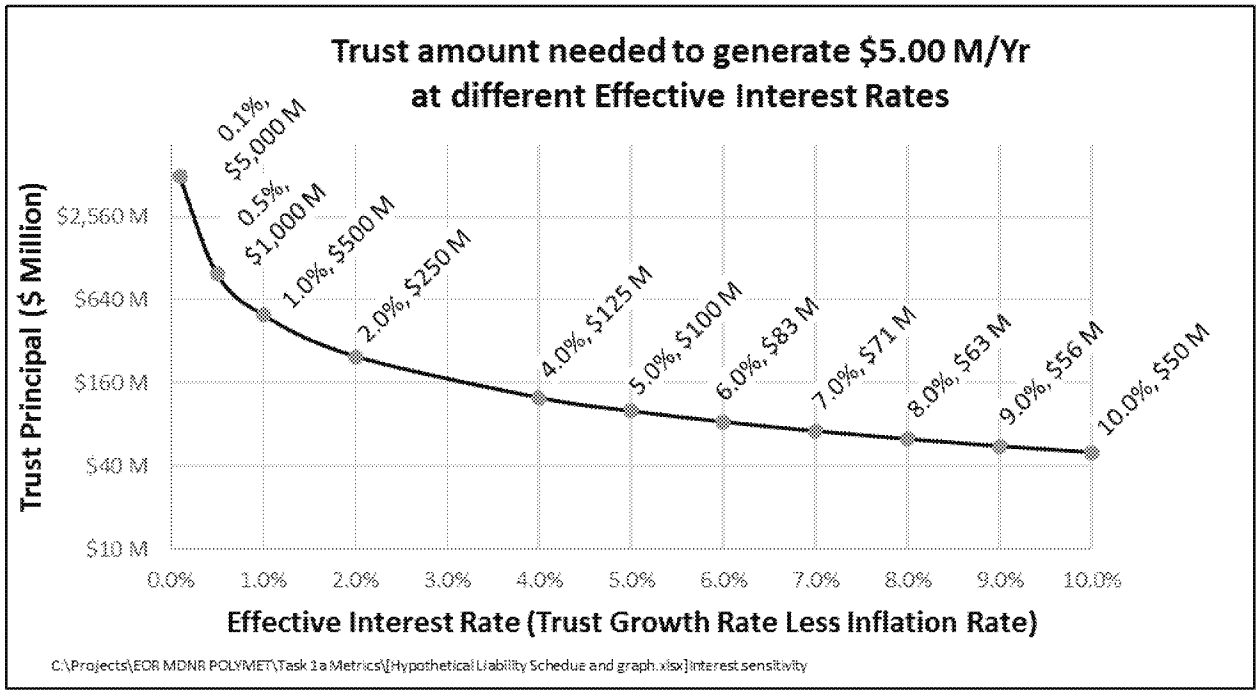

Figure 6. Trust principal needed to generate $5M/year perpetual interest

3.1.3. Financial Assurance Management and Release of Liability

The Financial Assurances include two discrete components that should be treated separately because the uncertainties, risks, mechanisms, and duration are materially different.

Short-term Reclamation Component

The reclamation component includes the physical restoration of the land and the removal of structures. This component can be well defined and the costs accurately determined. As required by rule, future liability will be annually revised during the life of the mine. A trust could be set up to fund this work, or a large portion of the remaining liability could be guaranteed by a letter of credit or a surety bond.

As the reclamation is being performed, the liability for the remaining reclamation work will decrease. If a trust were set up, then at the point when the trust fund could cover the remaining reclamation and long-term liability, the surety bond could be reduced to zero. After that, as reclamation has been completed and the long-term water treatment and site maintenance liability is fully covered by the trust, the remaining reclamation money in the trust could be refunded. If long-term water treatment and site maintenance liability is underfunded, then if a reclamation trust or letter of credit exists, the balance should be transferred to the long-term trust. A procedure should be developed to determine the timing and release amount for the bond and trust as PolyMet performs the work and all future liabilities are covered.

Long-term liability will also be updated annually. In anticipation of unexpected long-term liabilities above the original contingency estimate, the State may want to temporally keep some reclamation funds until these liabilities are better understood and could be more reliably estimated.

If PolyMet defaults, and if the financial assurance is a mix of assets in a trust and a surety bond, some arrangement should be negotiated with the surety regarding whether the surety gives cash to the State, or whether the surety performs their share of the work. This could become complicated if the surety does not cooperate in order to minimize their financial exposure. The surety needs to upfront articulate how work will be performed and how the surety will transfer cash to the State.

An item that does affect bond release is post reclamation repairs and maintenance. For example, financial assurance for coal mine reclamation requires that a portion of the bond be held for 10 years after the last site maintenance was performed (e.g. if rills or gullies form in year 9, and maintenance is required, then the 10-year clock restarts). This should be considered by the State when determining bond release conditions.

Long-Term Water Treatment and Site Maintenance Component

The long-term component includes the cost of water treatment and site maintenance. Site maintenance includes management of the tailings basin, management of the Category 1 stockpile, and monitoring. Pumping for stream augmentation and pit filling, and west pit pumping for water treatment, would also be part of the long-term site maintenance.

The long-term liability will be difficult to bond because of the uncertainties regarding the length of time and the future costs. Some type of fully funded trust is needed to continue to pay for this work indefinitely. To minimize risk, this trust needs to be fully funded as quickly as possible using either hard cash or some type of bond or insurance that will immediately fund the outstanding trust balance if PolyMet defaults. To determine the funding required to finance the long-term trust, a conservative (low) assumed effective interest rate should be established by the State for use in financial projections.

At any point in time, actuarially, the trust may be overfunded or underfunded. The trust would be overfunded if funds in the trust exceed the long-term water treatment and site maintenance liability. For example, the long-term component of the trust could become overfunded if non-mechanical, long-term water treatment becomes an option. Underfunded trusts are typically related to unexpected, long-term water treatment and site maintenance costs not covered under contingency, an effective interest rate below projections, or water quality regulations becoming more restrictive.

Unless the long-term trust is fully funded before mining operations begin, PolyMet will be contributing to the long-term trust from operating revenues throughout the period of mining operations. A standard should be developed to determine whether the long-term trust is being adequately funded to meet projected needs. If, during this period, the long-term trust is found to be overfunded or underfunded beyond certain thresholds, a mechanism should be in place to alter (up or down) the rate at which the trust must be funded.

After the trust is fully funded, the State may also periodically consider whether the trust is overfunded or underfunded. Only non-financial changes (e.g. availability of non-mechanical water treatment, unexpected water treatment and site maintenance additional costs, etc.) should be considered to determine if funding rates to the trust should be changed, if refunds should be issued, or if additional deposits should be required. Overfunded amounts due to short-term interest rate fluctuations should not be considered for funding rate changes or refunds to PolyMet. Refunds from the trust fund principal should be considered only if the State's potential financial liabilities remain

securely covered. Retaining an overfunded trust will reduce the State's financial exposure should unanticipated long-term liabilities (not contemplated in the contingency estimate) occur. After mining operations are complete, PolyMet would possibly not be able to add funds to the trust unless it receives income from some other source. In that case, the trust fund would be the only source of capital to address liabilities not covered by the contingency.

If PolyMet remains viable and fully funds the trust within the first few years of operation, and then continues to successfully operate the treatment plants and maintain the site as planned, a mechanism needs to be developed for the trust to reimburse PolyMet for the work they perform. This mechanism will continue so long as PolyMet or its successors exist. Accounting principles should be established so that direct costs, indirect costs, depreciation, mine and corporate overhead are correctly allocated to the reimbursement. This can be a complicated subject, especially if the initial costing assumptions are not correct. The trust managers should have the unfettered right to have a third party confidentially audit any and all of the mining company accounting records and time sheets to ensure that costs to be reimbursed are properly charged and allocated. A method to resolve billing disputes is also needed.

3.1.4. Surety Bonds

Traditionally, surety bonds have been used as financial assurance for mine reclamation, and continue to be the preferred vehicle for mining companies, because the premium for the bond is far less than the cash flow that would be needed if cash or some other type of collateral security were required. The following is an excerpt from the article titled, "Reclamation Bonds from the Surety Perspective" by William T Gorton III, Esq. [1].

> *"A surety bond is not insurance. It is typically a three party contract where the surety provides a financial guarantee only if the mining company fails to meet its obligation to the regulatory authority. The mining company is obligated to reimburse the surety, so in essence the bond is an extension of credit by the bonding company to the mining company. A surety can "step into the shoes" of the mining company or the government to perform the obligation.*
>
> *In insurance, there is a two-party contract where an insurance company spreads the risk of losses over a group of insureds and expects to take a loss during the policy period. If an insured event occurs, the insurance company pays with no recourse against the insured.*
>
> *Many principles of surety law apply along with the regulatory framework. For example, "subrogation" is an important concept that allows the surety to "step into the shoes" of either the permittee or the regulatory agency depending on the situation. A surety is entitled to assert all of the defenses of its principal. A surety who pays the debts of another is entitled to all the rights of the person he paid (obligee) to enforce his rights to be reimbursed. The doctrine of subrogation also allows a surety to step into the shoes of the government for whom the job was completed.*
>
> *In a bankruptcy context, there are often conflicts between secured creditors (lenders) who want money from the bankrupt estate and the regulatory agency, permittee and surety who all*

[1] "RECLAMATION BONDS FROM THE SURETY PERSPECTIVE", William T Gorton III. (*https://www.bestlawyers.com/Downloads/Articles/2267_1.pdf*)

want reclamation accomplished. The surety, for example, can argue the state's position regarding the need for compliance with state law under US § 959 of the bankruptcy code."

Due to numerous coal and hard rock mine bond forfeitures that caused considerable losses to the surety industry, it has become more difficult to obtain surety bonds. A bond is not an insurance policy. It is a banking instrument that temporarily frees up mining capital until the reclamation obligation can be performed later by the mining company. Therefore, today it is very difficult for a small or new mining company to obtain a bond if there is any risk of future bankruptcy. A large, well-established, well-capitalized company may obtain these bonds, whereas a small company may not.

It may not be easy for PolyMet, a small company, to obtain a surety bond for the reclamation financial assurance. It may be even more difficult to obtain a bond that covers the long-term operations and maintenance because of the uncertainties in predicting these costs into perpetuity. For the long-term, PolyMet probably would desire to use a third party performance bond that transitions to a funded trust over several years rather than fully funding the trust up front. The surety is unlikely to immediately fund the trust deficiency because it would cost PolyMet less to pay the annual cost over an extended period than to pay it all out at once. If it is possible to negotiate a lump sum payment, the premium would be more expensive. In this case, the surety is selling insurance rather than a surety bond.

If a surety bond is not obtainable, then the alternatives become expensive. Certificates of deposit, irrevocable letters of credit, or cash equal to the required dollar amount of the financial assurance require additional up front capital that may not be available and may adversely affect the project economics. The financial assurance should be considered by PolyMet in the mine cash flow and feasibility no matter how it harms the economics. The project economics are improved if the financial assurances can be funded over the life of the project from internal cash flow, but this places the economic risk on the State rather than on PolyMet. This is why using a surety bond is so important. It allows PolyMet to defer the upfront cash outlays, but this requires finding a reputable company to underwrite the bond. The onus is then on the State to ensure that the bonding company is financially strong. The State may even require the bond to be covered by several sureties to spread the risk.

If the State allows the third party bond to be converted to a fully funded trust over a period of time, then it should be consider what happens if PolyMet goes bankrupt when the trust is less than 100% funded. If a third party bond is obtained, then the State should have the option to obtain a lump sum payment to fully fund the balance of the trust on the day the bankruptcy is declared or whenever PolyMet stops operating the facility, whichever is first, with no latency. The bond should be inflation adjusted and the money immediately payable (as required by rule) in order to continue operating the facilities. The bond for the reclamation could be different because of the short time frame. For reclamation, the surety could be set such that the bonding company has the right to either perform the work itself, or provide the funds to the State.

3.2. Irrevocable Letter of Credit (ILOC)

PolyMet could present an non-expiring, irrevocable letter of credit (ILOC) as security for their obligations to the State. The State should establish criteria regarding the financial strength of a financial institution that would be an acceptable issuer. The State would also need to clarify

acceptable ILOC wordings and amounts needed to secure the reclamation exposure. For example, the State might wish to have "evergreen" language inserted in the ILOC to automatically extend the ILOC period and negate the need to annually renew the ILOC.

3.3. Insurance

Given the potential for catastrophic accidents resulting from the day-to-day operations and the nature of the mining industry exposures, an Environmental Impairment Liability (EIL) could offer a viable risk transfer mechanism. Insurance coverage may be tailored and policy language written to include the following terms:

- Cleanup costs for any onsite or offsite contamination discovered by the insured or required by a regulatory authority for new conditions or unknown pre-existing conditions. Terms may be restricted depending on known conditions at particular properties. This can include the tailings dam (whether on or off-site), waste water treatment systems, leachate processing, etc.
- Costs associated with third-party liability claims alleging damages from exposure to environmental conditions at or from the site. This would include:
  - Property damage, including diminution in value
  - Bodily injury, including associated medical monitoring
  - Business interruption due to pollution conditions
- Defense costs are covered but are included within the limit of liability
- Coverage for claims arising out of non-owned disposal sites where hazardous materials and wastes from operation are disposed of
- Coverage for claims arising out of spills during transportation (first- and third-party) of materials to and from the insured property
- Illicit abandonment of hazardous materials on an insured property
- Emergency response costs to respond to immediate threats to human health and safety and imminent environmental damage
- Crisis management or image restoration costs, such as public relations management costs in connection with negative media attention as a result of pollution conditions

The publicly available information (e.g. Environmental Impact Statement, pending Permit application, etc.) will be helpful in understanding the operational risks necessary to select the appropriate insurance policy. A copy of the proposed closure/post closure plan should also be required. It will be sufficient to obtain environmental liability insurance proposals from certain carriers but the coverage will be limited most likely to "New" conditions coverage only. New conditions coverage only responds to loss which occurs on or after the retro-active date on the policy, which includes both sudden and gradual releases.

Financial assurance calculations should also include the insurance costs to the State to carry long-term environmental insurance if PolyMet is no longer the carrier.

4. DATA REQUIREMENTS FOR FINANCIAL ASSURANCE ESTIMATION

This section describes the type of data needed to estimate the financial assurance for the NorthMet project and methods for managing the data to update the financial assurance in the future. To consistently establish and update the financial assurances for the PolyMet's NorthMet mine project, itemized cost components should be georeferenced with as-built drawings of the project plans as described below.

All drawings and reclamation standards showing before and after plans, and the narrative description of the plans, should be incorporated into a reclamation plan. The plan should provide, at least, all the quantity, distance, and sizing details needed to prepare the cost estimates. Annually (by law), this plan will be revised to reflect actual as-built mine plans, new information or updates, and the future one year and life of mine plan. The plans should be both paper and electronic (CAD or GIS), so that third parties can easily use CAD or GIS software to verify the quantities and distances.

The initial reclamation and long-term operations and maintenance costs are based on projected plans and geochemical estimates. During construction, PolyMet should be required to provide the DNR with as-built CAD drawings of the facilities, stockpiles, and pits in some form of 3D lines, TIN or cloud point (depending on the current technology). A detailed record of the pre-mining, active, and final design needs to be on file with the DNR using state-of-the-science CAD technology. Periodic orthorectified air photos (from drones or Google Earth) could be used to verify compliance and to update the as-built conditions.

In addition, a list of itemized cost components should be generated and organized based on type, timing, or location. It is important that all the cost component details be identified to ensure that all the liabilities are accounted for. An example of a list of cost items that could be associated with georeferenced locations in CAD or GIS is included at the end of this section. Note that this list was based on a cursory review of preliminary NorthMet plans and should be revised and expanded as the project plans are updated.

Each major defined cost item could be defined as a cost center which can contain items such as labor, supplies, equipment rental, etc. and allocated according to a set of rules, similar to a chart of accounts used in accounting. The estimated labor and equipment hours for each year would be based on the quantity, the geometry and the productivity using standard engineering estimating methods. A typical cost center could be a stockpile, a road, a building, a water treatment plant, tailings basin, etc. Each cost center can have sub-cost centers that can be rolled up into the total for each year.

Some cost items can be well defined and easily quantified, such as the volume of a stockpile, or the amount of cut/fill grading to slope a stockpile or backfill a pit. If the mine develops slightly differently from the initial plan, these quantities can be updated with confidence, and new costs developed using current labor and equipment operation and maintenance costs. SRK's SRCE Excel cost estimating spreadsheet (discussed in Section 2.1) is one tool that can be used to perform the estimating. If PolyMet presents the cost backup in this format, the DNR can decide if this is tool is adequate for all future annual costing updates.

The cost centers should then be associated with a georeferenced location on the as-built drawings to rapidly verify and update quantities and distances for the financial assurance estimate.

A water quality monitoring plan should also be developed and the data provided to the DNR in digital electronic form to be appended to a database. Standard monitoring reports and annual summaries filed with the DNR and MPCA should be required. This data would be used to check the efficacy of the water collection and treatment.

4.1. Periodic Data Revision

If the NorthMet permit is approved, the first version of the financial assurance cost estimate will be based on the approved permit including any conditions or representations in the permit. If changes are made to any of the plans, then the changes need to be updated in the master or current version of the reclamation plan and then rolled into the revised costing. This type of change may occur up until the time all the facilities are constructed and operating, or after. Data that will need to be revised include: local labor rates, cost of demolishing buildings and structures, and stockpile, pit and tailing quantities.

Assuming Davis-Bacon labor rates continue into the future, the local rates can be revised annually. A provision should be included to address the possibility of Davis-Bacon being repealed. The logic used in the Nevada SRCE spreadsheet model (described in Section 2.1) can continue to be used for the annual Capital and Operating cost for the equipment.

For items such as demolishing buildings and structures, the initial estimates for the labor and equipment hours shouldn't change unless the structures are modified. As required by rule, the salvage values of items such as steel and copper should not be included in the demolition costs.

If the mining economics change due to commodity price changes, then there may be changes in the quantities stockpiled, the pit geometries, and the quantity of tailings and hydrometallurgical wastes. If the mineralization extends beyond the permitted pit limits, then there is a possibility of a permit extending a pit or opening a new one in the future. The engineer's reports suggest that the pits may grow or shrink as a function of mining costs and commodity prices. If that happens, and according to rule, a new set of plans will need to be prepared, permits will need to be amended and new financial assurances will be required to be in place. Environmental Review may also be needed.

Tables 2-4 contain a summary of NorthMet reclamation, long-term, legacy, and contingency components that could be associated with georeferenced locations in CAD or GIS. This list was based on a cursory review of preliminary NorthMet plans (from FEIS) and should be revised and more detail added as the project plans are updated for permitting.

Table 2. Preliminary list of reclamation components

Reclamation Component	Comment
Mine Site Reclamation	• Pit-related management and O&M activities • Stockpile Cat 1, 2, 3, & 4 and ore blending and mixing • Ponds and surface water drainage ditches • Mine WWTF • Water collection, conveyance and monitoring • Non-mechanical long-term compliance • Miscellaneous demolition components
Transportation and Utility Corridor Reclamation	• Dunka Road • Water pipelines • Transmission line and railroad connections
Plant Site Reclamation	• Existing CNR facilities • New beneficiation facility and hydrometallurgical processing facility • CNR tailings basin and Residue Facility • Water collection and conveyance pipelines • R/O WWTP and pond
Reclamation Monitoring	• Long-term monitoring • Wetlands and Ground and surface water • Containment systems (Tailings basin, HydroMet and Cat 1 stockpile) • Tailings basin
Long-term Management	• Vehicle, equipment and consultants costs • Managers and operation labor
Adaptive Management and Mitigation	• Groundwater downgradient of lined infrastructure • West pit water quality and northward flow path strategies • Faults impacting groundwater flow • Tailings basin water quality and underground seepage

Table 3. Preliminary list of long-term treatment components

Treatment Component	Comment
Long-term Treatment Component	• Wetlands, groundwater and surface water • Cat 1 and HydroMet containment system • Tailings basin • Long-term management and maintenance • Transition to non-mechanical treatment • Adaptive management and mitigation contingency

Table 4. Preliminary list of legacy and contingency components

Component	Comment
Legacy and Contingency Components	• Plant site and tailings basin • Water quantity/chemistry and overlooked reclamation costs • Catastrophic events • Environmental regulations and technological changes • State oversight (e.g. trust, accounting, project management, etc.)