# October 25, 2005
# NorthMet Mine and Ore Processing Facilities Project
# Final Scoping Decision

## 1.0 INTRODUCTION AND PURPOSE

### 1.1 BACKGROUND

The Minnesota Department of Natural Resources (DNR) in co-operation with the United States Army Corps of Engineer (USACE) and the United States Forest Service (USFS) will prepare a joint state and federal Environmental Impact Statement (EIS) for the NorthMet Mine and Ore Processing Facilities Project (NorthMet) proposed by PolyMet Mining Inc. (PolyMet) to extract copper, nickel, cobalt, and precious metals. The joint EIS will allow evaluation of the NorthMet project in accordance with the National Environmental Policy Act (NEPA; 42 U.S.C. §§ 4321-4347), and Minnesota Environmental Policy Act (MEPA; Minn. Stat. Ch. 116D). The NorthMet mine is proposed approximately 6 miles south of the town of Babbitt while the ore processing facility is proposed at a currently inactive taconite processing facility, formerly owned and operated by LTV Steel Mining Company (LTVSMC) and now owned by Cliffs Erie, located 5 miles north of the town of Hoyt Lakes, all of which are located in St. Louis County, Minnesota.

The proposed project includes open pit mining operations with ore hauled to the processing facility on a largely existing rail line owned by Cliffs Erie. Waste rock, lean ore, and deferred ore stockpiles from the mining operations are proposed near the mine pit. Stockpiles would be segregated into reactive and non-reactive stockpiles. Non-reactive stockpiles would be constructed and managed in a manner similar to those associated with taconite mining. These stockpiles would be designed and built to prevent sedimentation and erosion from stormwater runoff and provide beneficial use of these areas. Reactive stockpiles are proposed to be placed on engineered liner systems that capture any runoff and direct the runoff to a wastewater treatment system. Ore would be processed at a refurbished and modified taconite processing facility. The hydrometallurgical process of flotation and autoclave leach facilities would be used with refurbished crushing and grinding facilities to produce copper metal and precipitates of nickel, cobalt, palladium, platinum, and gold. Precipitates are proposed for shipment off-site to third party treatment. The flotation process will generate flotation tailings that are proposed for disposal on top of a portion of an existing taconite tailings disposal facility. The hydrometallurgical process would generate some waste residue that is proposed for disposal in lined cells on top of the existing taconite tailings adjacent to the area proposed for disposal of flotation tailings.

### 1.2 SELECTION OF APPROPRIATE ENVIRONMENTAL REVIEW DOCUMENT

The EIS is mandatory for this project pursuant to Minnesota Rules part 4410.2000, subpart 2; the rule directs that an EIS shall be prepared if the project meets or exceeds the thresholds of any of the EIS categories listed in part 4410.4400. Part 4410.4400 identifies metallic mineral mining and processing under subpart 8 as requiring preparation of an EIS. The EIS will meet applicable requirements of Minnesota Rules part 4410.0200 to 4410.7800 (MEQB Rules) that govern the

Minnesota Environmental Review Program. The DNR is the responsible governmental unit (RGU) under MEPA. The DNR will engage the services of a consultant to assist in EIS preparation, however the DNR will retain responsibility for EIS content.

The USACE received an application from PolyMet to discharge fill material in waters of the United States, including wetlands, to develop the NorthMet project. The USACE has determined that its action on the permit would be a major federal action that could significantly affect the quality of the human environment, requiring the preparation of a Federal EIS pursuant to the National Environmental Policy Act (NEPA) (42 U.S.C. §§ 4321-4347) and its implementing regulations (40 C.F.R. parts 1500-1508).

The USACE is serving as co-lead agency in preparation of the EIS with the DNR. Although the mine site for the NorthMet project is located on USFS land, there is an existing mineral lease for the deposit. The USFS has determined that they do not have a federal action if the NorthMet project is developed in compliance with the existing conditions of the lease. The USFS is serving as cooperating agency in the EIS preparation with the USACE and DNR.

## 1.3 PURPOSE AND NEED OF THE PROJECT

The purpose of the NorthMet mining and ore processing project is to produce copper metal, precious metal concentrates, and nickel-cobalt concentrates for sale to the world market by uninterrupted operation of the facility for the life of the mine.

## 1.4 THE SCOPING PROCESS

The Scoping Decision Document is a companion to the Scoping Environmental Assessment Worksheet (EAW) prepared for the project. The Scoping EAW and Draft Scoping Decision Document were noticed in the Environmental Quality Board Monitor on June 6, 2005. The USACE issued a Notice of Intent (NOI) to prepare an EIS on July 1, 2005. The DNR and the USACE issued press releases about the availability of the Scoping EAW, Draft Scoping Decision Document, and the public meeting to local area newspapers. A public meeting was held on June 29, 2005 at the Hoyt Lakes Arena in Hoyt Lakes, Minnesota. The public comment period ended July 6, 2005. A total of 29 comment letters/emails and two verbal comments were received. The DNR and the USACE considered all comments that were received. A Response to Public Comments document was developed to address the comments. The Draft Scoping Decision Document was revised based on the public and agency comments.

Public review and comment on the Draft Scoping Decision Document was conducted as prescribed in MEQB rules part 4410.2100. This Minnesota state process has included all procedural and substantive requirements to satisfy scoping for preparation of a federal EIS under NEPA.

# 2.0 PROJECT ALTERNATIVES

The MEQB rules require that an EIS include at least one alternative of each of the following types, or provide an explanation of why no alternative is included in the EIS (*Guide to*

*Minnesota Environmental Review Rules*, page 12): alternative sites, alternative technologies, modified designs or layouts, modified scale or magnitude, and alternatives incorporating reasonable mitigation measures identified through comments received during the EIS scoping and draft EIS comment periods. The alternative of no action shall be addressed

Minnesota Rules part 4410.2300, subpart G directs that an alternative may be excluded from the analysis in the EIS if "it would not meet the underlying need for or purpose of the project, it would likely not have any significant environmental benefit compared to the project as proposed, or another alternative, of any type, that will be analyzed in the EIS would likely have similar environmental benefits but substantially less adverse economic, employment, or sociological impacts." Selection or dismissal of alternatives will be documented in the EIS.

## 2.1 PROPOSED ALTERNATIVE

The EIS will describe the proposed project and the potential environmental and socioeconomic effects outlined in Section 3.0.

## 2.2 NO ACTION ALTERNATIVE

The EIS will describe the expected condition if the proposed project is not developed, with respect to the potential environmental and socioeconomic effects outlined in Section 3.0.

## 2.3 SITE ALTERNATIVES

The MEQB rules allow the RGU to exclude alternative sites if other sites do not have any significant environmental benefit compared to the project as proposed, or if other sites do not meet the underlying need and purpose of the project. The MEQB's Guide to Minnesota Environmental Review Rules lists a number of factors for the RGU to consider when deciding whether alternative sites would meet the underlying need for or purpose of the project.

The DNR and USACE will not evaluate alternative mine pit or processing plant sites for this project. An alternative mine site would not meet the underlying need or purpose of the project. The mineralization of the desired elements within a geologic deposit dictates the location of the mine. An alternative processing plant site would not likely have significant environmental benefits over using existing mining industry infrastructure.

The EIS will evaluate the suitability and benefits of alternative waste rock stockpile and tailings basin locations.

### 2.3.1 Waste Rock Disposal

In-pit Reactive Waste Rock Disposal – Sub-aqueous placement of reactive waste rock in an existing taconite mine pit. The LTVSMC Area 3 Pit shown in Figure 1 has been identified for evaluation of in-pit disposal of reactive waste rock based on hauling distance and information on hydrologic characteristics. This evaluation will make use of both available information and additional information that can be developed during the time period for EIS preparation. Detailed

site specific hydrological and chemical data and modeling may need to be developed that cannot be collected within the time period for preparation of this EIS. In that case the EIS would identify the data gaps and the impacts of these gaps for evaluation of this alternative. This alternative would evaluate placement of reactive waste rock in an aqueous environment that would retard oxidation of sulfide minerals and could reduce the degree of associated water quality concerns. This alternative could also reduce the magnitude of long-term treatment of water contacting reactive rock. As part of this option, the use of various sub-aqueous cover materials to further restrict oxygen transport to the rock will be evaluated. In addition to environmental impacts, the effect of land and mineral ownership of remaining reserves would be addressed, as well as other pertinent issues. Because land and mineral ownership issues could impact feasibility, they will be investigated first.

Off-site Non-reactive Waste Rock Disposal – If there is an excess of non-reactive rock, it might be possible to reduce the total amount of land disturbance by stockpiling in existing areas already disturbed by mining activity. LTVSMC Area 3 Pit will be evaluated for placement of non-reactive waste rock. Other disturbed areas around the Area 3 Pit and an existing railroad stockpile shown in Figure 1 will be evaluated for land disposal of non-reactive waste rock. In addition to environmental impacts, the effect of land and mineral ownership of remaining reserves would be addressed. Because land and mineral ownership issues could impact feasibility, they will be investigated first.

### 2.3.2 Tailing Disposal

In-pit Tailings Disposal – Sub-aqueous placement of tailings in existing taconite mine pits including LTVSMC's Area 2, Area 2W, Area 2WX, Area 3, Area 5S, and Area 5N identified in Figure 1. This evaluation will make use of available information and limited additional information that can be developed during the time period for EIS preparation. Detailed site specific hydrological and chemical data and modeling may need to be developed that cannot be collected within the time period for preparation of this EIS. In that case the EIS would identify the data gaps and the impacts of these gaps for evaluation of this alternative. This alternative would evaluate placement of tailings in an aqueous environment that would retard oxidation of sulfide minerals and could reduce the degree of associated water quality concerns. This alternative could also reduce the magnitude of long-term treatment of water contacting reactive tailings. As part of this option, the use of various sub-aqueous cover materials to further restrict oxygen transport to the tailings will be evaluated. The benefits of this alternative would be greatly diminished if waste characterization determines that the tailings are non-reactive. In addition to environmental impacts, the effect of land and mineral ownership of remaining reserves would need to be addressed. Because land and mineral ownership issues could impact feasibility, they will be investigated first.

## 2.4 TECHNOLOGY ALTERNATIVES

The DNR and USACE will not evaluate alternative hydrometallurgical technologies. The proposed project uses a technology that does not include cyanide leach or other technologies that may have significant environmental effects. Although there are impacts that will need to be

analyzed for the proposed hydrometallurgical process, other processing technologies would likely have no significant environmental benefit over the proposed technology.

### 2.4.1 Mining Technologies

Underground Mining – This alternative will evaluate the feasibility and environmental impacts associated with using underground mining techniques to mine the NorthMet ore deposit. Although there may be environmental benefits associated with a smaller footprint from an underground mine, the cost of using underground mining techniques on the diffuse ore body may impact the feasibility of the project. If the cost of developing an underground mine were so high that the proposer could not develop the project, this alternative would not meet the purpose of the project. Due to this situation the economic feasibility will be evaluated by a third party contractor prior to any further assessment of this alternative. If the cost of underground mining is feasible at a lower economic return, the environmental impacts will be assessed to determine if there would be significant environmental benefits.

## 2.5 MODIFIED DESIGNS OR LAYOUTS

The DNR and USACE will not evaluate alternative designs and layouts for ore transportation from the mine to the processing plant. The proposed project includes using existing railroads with construction of a railroad spur at the mine site and approximately one mile of new railroad to connect the railroad that serves the mine site to the railroad that serves the ore processing plant. Alternative designs and layouts would not likely provide significant environmental benefit over the proposed project.

The DNR and USACE will not evaluate alternative designs and layouts for the ore processing plant. Alternative designs and layouts would not likely provide significant environmental benefit over the proposed project that makes use of an existing processing plant that would be refurbished and modified.

### 2.5.1 Technical Design Evaluation Reports

There are several design components of the project that the DNR and USACE will evaluate by generation and consideration of technical design evaluation reports. The intent of using these reports is to evaluate various project design components. These reports will be used to evaluate effectiveness, implementability, and cost of various project design components. Many of these reports will provide detail on the proposed action that will be used for evaluation of environmental impacts. A scope of work for each of these reports is included in Attachment A. The following technical design evaluation reports will be included in the EIS:

- Reactive residue facility and initial tailings facility
- Tailings basin geotechnical
- Wastewater treatment
- Air emission control (cross media effects)
- Wetland mitigation
- Reactive waste segregation

- Tailings basin modification

The evaluation criteria for these reports would include effectiveness, implementability, and cost during and after operation. The results of the reports will be summarized in the EIS. The permitting process would determine the ultimate design of project components.

### 2.5.2 Mine Pit

Two Mine Pits – This alternative would evaluate the feasibility and environmental impacts of mining the NorthMet deposit as two mine pits, with one pit being completely mined out before beginning the second pit. Waste rock from the second pit would be placed into the first pit so that the final mine pit lake and waste rock stockpiles would be considerably smaller. Evaluation will include the issue of encumbering resources and feasibility of backfilling with both reactive and non-reactive waste rock.

### 2.5.3 Reactive Waste Rock Stockpiles

Chemical Modification of Reactive Waste Rock Stockpiles – This alternative will evaluate geochemical modification by incorporation of material into reactive waste rock stockpiles to reduce reactivity or treat reactive water within the stockpile. Full assessment of this alternative may require development of information that cannot be collected within the time period for preparation of this EIS. In that case the EIS would identify the data gaps and the impacts of these gaps for evaluation of this alternative.

Co-disposal of Reactive Waste Rock and Tailings on a Lined Tailings Basin – This alternative will evaluate the feasibility and environmental impacts of disposing reactive waste rock with tailings in a lined basin. The feasibility of this alternative is dependent on the project being developed with a lined tailings basin.

### 2.5.4 Wastewater

The EIS will consider the suitability and benefits of alternative designs and layouts for wastewater treatment. In addition to the Technical Design Evaluation Report described in section 2.5, there are several options for management of wastewater that will be considered. Results from the waste characterization and wastewater treatability studies will be needed to determine the suitability of these alternatives. The following options have been identified:

- Pretreatment of mine site reactive runoff and discharge to Publicly Owned Treatment Works (POTW). The cities of Babbitt and Hoyt Lakes each have a POTW that could be considered.
- Pretreatment of tailings basin process water and discharge to the City of Hoyt Lakes POTW.
- Use of mine site reactive runoff as make-up water for processing plant with single wastewater treatment at the Processing Plant. This option could also include pretreatment and discharge to a POTW.

## 2.6 SCALE OR MAGNITUDE ALTERNATIVES

The DNR and USACE will not evaluate an alternative scale or magnitude for the project. Although there may be environmental benefits from smaller amounts of mine waste associated with a smaller scale project, the cost of operating a smaller mine and ore processing facility for the diffuse ore body will adversely impact the feasibility of the project. As part of project development, the proposer evaluated various mill feed rates to estimate the economic feasibility of the project. The 32,000 tons per day (tpd) scale currently proposed was ultimately selected, however an 18,000 tpd scale was evaluated as part of the optimization process. During this analysis it was determined that the return on investment for an 18,000 tpd operation was not feasible. There is some smaller variability associated with the 32,000 tpd scale that would still be economically feasible, but the environmental benefits associated with this smaller degree of variability would not produce significant environmental benefits. The DNR and the USACE have determined that an alternative scale or magnitude would not feasibly meet the purpose of the project.

## 2.7 INCORPORATION OF MITITGATION MEASURES IDENTIFIED THROUGH PUBLIC COMMENTS

Several mitigation measures were identified through public and agency scoping comments. The following mitigation measures are being carried forward as the other mitigation measures identified during public scoping were excluded by one of the three exclusionary criteria identified in Minnesota Rules Chapter 4410.2300 Subpart G.

### 2.7.1 Monitoring

Monitoring of waste rock stockpiles and tailings basin –
The EIS will consider various monitoring programs associated with waste rock stockpiles and the tailings basin. These monitoring programs will address the material being placed in the stockpile/basin, performance of design/construction (i.e. liners, trenches, collection systems), and water quality and quantity associated with the stockpile/basin (i.e. drainage, groundwater, and surface water). Additional detail on the scope or how monitoring will be addressed in the EIS is provided in Section 7.0 Mitigation and Monitoring.

### 2.7.2 Tailings Basin

The project description in the Scoping EAW includes deposition of tailings on the existing LTVSMC tailings basin. Due to limited available data on these tailings, there is uncertainty about whether or not the tailings would be reactive. Humidity cell testing is currently developing information about the potential reactivity of tailings. These tests are long-term tests that may not provide definitive answers within the time period for preparation of this EIS. As a result, the project proposer has developed the following strategy to mitigate for any potential environmental impacts if the tailings are ultimately found to be reactive:

- Develop a lined tailings storage facility on top of Cell 2W of the existing LTVSMC tailing basin to provide storage for five years of tailings.

- Continue waste characterization during this period and collect field data during operations to determine if the tailings are reactive.
- If during the initial 5-year operation period, the tailings are determined to be non-reactive, the original proposal to use an unlined tailings basin could be implemented. Potential environmental impacts and mitigation measures of placing non-reactive PolyMet tailings in the unlined Cells 1E and 2E will be included in the EIS.
- If the tailings are ultimately determined to be reactive, the company has proposed to line Cells 1E and 2E for the entire life of the operation to prevent reactive runoff from seeping into the ground and surrounding environment. Any discharge from the tailings basin would be monitored and if necessary, directed to a water treatment plant for appropriate treatment prior to discharge. Potential impacts and mitigation measures of this alternative will be included in the EIS.

## 3.0 EIS ISSUES

Issues have been identified and described in the Scoping EAW and are categorized below by significance and amount of additional analysis required in the EIS. Mitigation measures that could reasonably be applied to eliminate or minimize adverse environmental effects will be identified in the EIS.

3.1 *Topic has been adequately analyzed in the Scoping EAW. Topic is not relevant or so minor that it will not be addressed in the EIS. The Scoping EAW will be appended to the EIS for reference; the relevant EAW number is provided in parentheses () after each topic.*

Land Use (Item 9)
Water-related Land Use Management District (Item 14)
Water Surface Use (Item 15)
Geologic Hazards and Soil Conditions (Item 19a)
Traffic (Item 21)

3.2 *Significant impacts are not expected but information beyond that in the Scoping EAW will be included in the EIS.*

### 3.2.1 Cover Types (Item 10)

The EIS will discuss potential impacts from changes in cover types as a function of time both during and after operation using available information.

The EIS will evaluate the potential for increased proliferation of non-native invasive plant species.

### 3.2.2 Vehicle Related Air Emissions (Item 22)

The EIS will include a qualitative discussion of the effects of mine haul truck emissions on air quality at receptor sites near the mining operation, including carbon monoxide, nitrogen oxides and particulate emissions. The EIS will discuss the effects of mitigation measures on projected

air quality impacts. If the qualitative analysis shows anything other than insignificant impacts, further evaluation will be required.

### 3.2.3 Air Emissions (Item 23)

The EIS will include descriptions of air emissions sources from the mine and processing plant including crushing, grinding, flotation, all hydrometallurgical steps and copper electro-winning. Potential control technologies for emission sources will also be investigated. This information will be used in a model to complete a Class I and Class II analysis for air emissions from the project.

A Best Available Control Technology (BACT) analysis will be completed for $PM_{10}$, sulfuric acid mist and other pollutants as required by federal law. Maximum Available Control Technology (MACT) analysis may be required for some sources after case-by-case determinations have been made.

The EIS will verify the results of the previously completed Air Emission Risk Analysis (AERA). This verification will include the following analysis:

Conduct source-specific air dispersion modeling of those units that could influence the final risk estimates, specifically focusing on the risk drivers from the AERA (crusher/grinding operations and Hydromet plant; nickel and nickel compounds, hydrogen chloride, NO2, manganese) and/or conduct a quantitative sensitivity analysis of the critical sources using the new design parameters (location, height, exit velocity, emission database) to determine if the overall risks calculated in this AERA are still conservative estimates.

### 3.2.4 Odor and Noise (Item 24)

The EIS will verify potential sources and receptors of noise impacts previously conducted by PolyMet. Operational and structural mitigation to prevent potential impacts will also be discussed.

### 3.2.5 Archeology (Item 25)

The EIS will verify that Knot Camp will not be impacted by mining operations. The historical significance of the Cliff's Erie plant site will be evaluated and mitigation proposed, if warranted. The EIS will also provide additional information on areas of "unknown" potential for containing archeological resources. These unknown areas are undisturbed portions of the project area:

- Within 500 ft. (150 m) of an existing or former water source of 40 acres (19 hectares) or greater in extent, or within 500 ft. (150 m) of a former or existing perennial stream;
- Located on topographically prominent landscape features;
- Located within 300 ft. (100 m) of a previously reported site; or
- Located within 300 ft. (100 m) of a former or existing historic structure or feature (such as a building foundation or cellar depression).

Any resources identified will be discussed and mitigation to prevent impacts will be proposed.

### 3.2.6 Visibility (Item 26)

The EIS will evaluate potential visibility impacts from nighttime glow of mine site lighting and obstruction of daytime visibility from stockpiles.

### 3.2.7 Compatibility with Plans and Land Use Regulations (Item 27)

The EIS will include an evaluation of project compatibility with the USFS Management Plan, Forest Resource Council Plan, and the Water Conservation Plan. The EIS will also evaluate mineland reclamation strategies to develop those designs that are most compatible with surrounding land uses and local community goals.

### 3.2.8 Infrastructure (Item 28)

The EIS will include an evaluation of wastewater treatment alternatives that propose to use the existing Hoyt Lakes or Babbitt POTWs. If any of these alternatives are deemed suitable for further evaluation, the EIS will include details about existing plant capacity and discuss options for increasing capacity and meeting pretreatment and NPDES permit conditions.

The EIS will also include additional detail on the electrical powerline and substation associated with the mine site. Potential impacts will be identified as well as mitigation to prevent or minimize impacts.

### 3.2.9 Other – Asbestiform Fibers (Item 30)

The EIS will provide information about the presence of fibers in the NorthMet deposit. Material from the flotation pilot plant process will be collected and analyzed for the presence of fibers. Samples of crushed and ground ore material (head feed), tailings, and process water will be collected. The crushing and grinding operation is expected to be the most significant source of fiber release to the air, so the head feed material will be used as an indicator of potential fiber emissions from the PolyMet facility. Tailings and process water samples will be used to provide information on fibers potentially associated with the tailings basin.

Samples will be analyzed for presence/absence of asbestos minerals and a fiber count by an initial scan using Polarized Light Microscopy (PLM). Head feed and tailings will be analyzed by a detailed scan using Transmission Electron Microscopy (TEM). This analysis will identify fibers according to the following criteria:

- "Minnesota Department of Health (MDH) Fiber" – particles with an aspect ratio of 3:1 or greater (MDH Method 852)
- "Occupational Fiber" – particles that are five micrometers in length or longer, and have a length to diameter ratio of at least 3:1 (NIOSH 7400 Method)
- "Asbestos Fiber" – particles that are five micrometers in length or longer, and have a length to diameter ratio of at least 20:1 (EPA/600/R-93-116)

TEM will also be used for fiber speciation into the following groups:

- Amphibole

- Chrysotile
- Non-amphibole
- Ambiguous

Process water samples will be analyzed using MDH Method 851, which also uses TEM technology. This method identifies fibers as particles with an aspect ratio of 3:1 or greater. Once fiber counts are obtained, fibers will be classified as amphibole, chrysotile, non-amphibole, and ambiguous. Water samples will also be analyzed using EPA method 100.2 for identification of asbestos structures in drinking water, measured as asbestos structures over ten micrometers in length and reported as fibers per liter of water.

The results of these analyses will be used to identify potential impacts and propose mitigation to minimize impacts.

In addition, a literature review will be performed on asbestos related diseases and risks from environmental exposure to short fibers, long fibers, and cleavage fragments. The results of this literature review will be summarized in the EIS.

3.2.10 Other –1854 Ceded Territory

The EIS will include a description of tribal rights reserved as part of the 1854 Ceded Territory. Impacts to these tribal rights as result of the project will be evaluated and mitigation proposed as needed.

3.3 *Potentially significant impacts may result; information beyond what was in the EAW will be included in the EIS.*

3.3.1 Fish and Wildlife Resources (Item 11a)

The EIS will discuss potential impacts to fish and wildlife habitats. In addition to threatened and endangered species identified below, this evaluation will include potential impact to USFS Management Indicator Species. This discussion will make use of existing studies that are appropriate for identification of the potential impact. Examples of studies that may be used include the Copper-Nickel Study Plots and previous work in the area completed by the proposer. The EIS will use existing information to determine whether the overall abundance in the Northern Superior Uplands Section of each growth stage that will be affected is within the Range of Natural Variation. The EIS will assess habitat types (i.e., growth stages of ecosystems types) identified at the mine site and compare them to existing information on the Range of Natural Variation for Northern Superior Uplands. Habitat types (forest growth stages) that are below the Range of Natural Variation in abundance in the Section, but present in the project area will be identified. The EIS will discuss potential mitigation for impacts to fish and wildlife habitat.

The EIS will verify the Biological Monitoring that was conducted by the proposer on fish and macroinvertebrates in Trimble Creek, Partridge River, and area wetlands. This information will be evaluated for use in developing an Index of Biotic Integrity (IBI) for potential impact areas, which can be compared to Minnesota Pollution Control Agency (MPCA) reference sites. This information will be used to establish a baseline for potentially impacted aquatic ecosystems. The EIS will assess the suitability of biological monitoring of aquatic ecosystems, including IBI, during project operation.

### 3.3.2 Threatened and Endangered Species (Item 11b)

The EIS will evaluate potential impacts to state and federal threatened and endangered species. This information will be used to support state and federal regulatory requirements for threatened and endangered species. Potential mitigation strategies and alternatives will be evaluated to prevent and minimize any identified impacts. The following species will be included in the analysis:

Fauna-

- Gray Wolf – Existing information will be used.
- Canadian Lynx- A winter time track survey will be conducted to supplement existing information on the number of Canadian Lynx in the area. The survey area will consist of a six-mile perimeter around the entire project impact area. Survey transects will make use of existing forest service roads, mining haul roads, railroad tracks, and trails. The survey will include collection of Lynx scat for DNA testing to identify individual cats.
- Bald Eagle – Existing information will be used.
- Wood Turtle – Existing information will be used. Emphasis will be placed on potential impacts to wood turtle habitat downstream of the project on the Partridge and Embarrass Rivers.

Flora- Evaluations of impacts to threatened and endangered state listed plants will use existing information including recent surveys conducted by the proposer. The following plants will be included in this assessment:

Pale moonwort
Temate grape-fern
Least grape-fern
Floating marsh marigold
Neat spike-rush
Northern commandra
Lapland buttercup
Clustered bur-reed
Torrey's manna-grass

### 3.3.3 Physical Impacts on Water Resources (Item 12)

Wetland impacts associated with the entire project will be identified and discussed in the EIS. A wetland delineation has been completed for the entire project that will be used to assess wetland impacts. Avoidance, minimization and mitigation of the entire direct wetland impact (~1,257 acres) will be evaluated as part of the EIS. Indirect impacts to wetland function from changes in hydrology and water chemistry will also be evaluated. The EIS will also describe and discuss the suitability and feasibility of various wetland mitigation strategies.

The EIS will include a watershed assessment of the upper Partridge River to assess the net hydrologic effects of PolyMet's proposal. This watershed assessment will evaluate the changes in watershed

discharge due to land surface changes (loss of wetlands, vegetation, and mine pit construction), as well as the direct hydrologic changes from mine pit dewatering and other mine site discharges. Section 3.3.4 below describes a hydrogeologic study that will be used to quantify the mine site discharges. A Level 1 Rosgen geomorphic survey will be conducted for the Partridge River, down to Colby Lake to identify any potentially geomorphologically sensitive stream reaches. If the watershed assessment combined with the Level 1 Rosgen geomorphic survey indicates a potential for fluvial geomorphic impacts resulting from PolyMet's proposal, there will be additional evaluation of the impact. If this additional evaluation determines that the changes in stream flow will cause significant adverse impacts, additional mitigation and monitoring will be developed.

### 3.3.4 Water Appropriations (Item 13)

Mine Site - The amount of water that must be discharged to dewater the mine pit is a significant issue that will be included in the EIS. The following information will be used to better estimate this amount of water:

- A report on the design and effectiveness of diking and trenching to prevent surface run-off into the pit.
- A wetland hydrology study
- Hydrogeology studies of the NorthMet Deposit including the potential for water to enter the pit from the Virginia Formation.
- A water balance model to estimate the quantity of water entering the pit from various sources (including direct precipitation into the pit) with consideration of seasonal changes and pit size.

Phase I and Phase II Hydrogeology Studies – The purpose of the hydrogeology studies is to provide information to estimate the quantity and quality of water that will be entering the mine pit. Phase I made use of an ongoing drilling program to gain information about water yield and to collect water samples for analysis and was completed in spring of 2005. Information from the Phase I study was used to evaluate potential water yield into the mine pit from the unconsolidated surficial aquifer and the Duluth Complex. The Phase II study will evaluate potential water yield from the Virginia Formation that would make up the northern boundary of the mine pit. This study will use a series of pumping wells combined with observation wells to collect data on the transmissivity of the Virginia Formation. Water quality samples will also be collected to assist in the evaluation and estimation of mine pit dewatering water quality.

This information will be used to help design water treatment facilities and estimate changes in Partridge River streamflow as part of the watershed assessment described above in Section 3.3.3. Hydrologic modeling will also be done to estimate the quantity and timing of outflow from the pit and runoff from stockpiles after mining. This information will be necessary to determine potential water treatment needs for reclamation. Because this water is likely to have come into contact with exposed ore or could be saline, it could be reactive and need appropriate treatment. The amount of water potentially needing treatment will be an important consideration in the EIS.

The affect of mine pit dewatering on groundwater levels in the unconsolidated aquifer will also be evaluated in the EIS. Information from the hydrogeology studies combined with estimates of mine pit pumping rates will be used to evaluate changes in groundwater levels.

Processing Plant and Tailings Basin – A water balance for the processing plant and tailings basin will be included in the EIS that will use the results of the pilot plant and the results of an existing hydrology study of the LTVSMC tailings basin. The following information will be used in the water balance model:

- Water generated from the flotation tailings and from the hydrometallurgical processing
- Water collected at the base of the existing tailings basin
- Makeup water needed for the processing plant
- Existing water inputs and outputs to the system from the environment (such as precipitation, evaporation, seepage, etc.)

Similar to the mine site this information will be used to discuss water quantity effects as well as to develop a better understanding of water treatment needs. Additional information will be presented on the proposed appropriation from Colby Lake.

### 3.3.5 Surface Water Runoff (Item 17) and Erosion/Sedimentation (Item 16)

The EIS will evaluate surface water runoff quantity and quality impacts associated with the mine site, processing plant, and tailings basin. For the purposes of this evaluation, water quality impacts from surface water runoff will be treated separately from water quality impacts associated with potentially reactive waste rock, lean ore, deferred ore, and tailings. Water quality runoff from these sources will be addressed as wastewater in Section 3.3.6 below. Water quality impacts from other sources will address potential erosion and sedimentation from areas of the project with ground disturbance.

A report with additional detail on surface water runoff systems that handle non-contact and non-reactive runoff as well as the quality and quantity of this water will be used for this evaluation. Characterization of non-reactive runoff will also be estimated to ensure the suitability of treating this runoff source as non-contact runoff. As identified in Section 3.3.4 a watershed assessment will be conducted to identify net changes in watershed runoff during project operations and post closure of the mine site and tailing basin.

The EIS will include existing information on the quality and quantity of existing water bodies and any potential for changes to these parameters from all aspects of the mining project. Estimation of hydrologic and chemical balances at the mine site during normal operations and after closure and the potential effect of discharges on receiving water biota will be evaluated in the EIS (the hydrologic and chemical balances for the tailings basin and reactive runoff from reactive waste rock stockpiles are addressed in Section 3.3.6).

As part of the EIS, conservative estimates as well as ranges of flow will be used to ensure that any environmental impacts are identified. (For example, the lowest reasonable estimate of 7Q10 will be used to insure that in stream water quality standards are met and variable storm events including but not limited to the typical design standard of a 25-year, 2-hour event will be used to ensure suitable design of water management systems.)

### 3.3.6 Wastewater (Item 18)

Estimates of the quantity and quality of industrial wastewater generated from the mine site, processing plant and tailings basin will be included in the EIS. Predictions of water quality will be made as a function of time, during both the operating life of the project and after operations cease.

The following studies and information will be developed as part of the EIS to better understand potential wastewater impacts, and methods of prevention and mitigation as appropriate.

Mine Site

The EIS will evaluate potential impacts to surface and groundwater from wastewater generated from contact with reactive waste rock, lean ore, and deferred ore at the mine site. The following data will be used to evaluate water quality from wastewater sources:

- Waste characterization study results
- Phase I and II Hydrogeological Evaluations
- A wetland hydrology study
- Effectiveness of mine site water management systems (including lining and capping systems for reactive waste rock stockpiles)
- Background water quality data from the Partridge River.
- Existing water quality data from other sources such as the AMAX test shaft, Copper-Nickel Study, and other mining operations.

Predictions of water quality from these sources will be used to model potential impacts to groundwater from leakage of waste rock, lean ore, and deferred containment systems.

Treatability studies for this wastewater will be conducted and modeled from information gained as part of the waste characterization study. The use of water quality data from existing Duluth Complex stockpiles will be considered and used as part of the treatability studies, as appropriate. Conceptual treatment designs will be evaluated on the ability to meet water quality effluent discharge limits. Water quality results from the treatability studies will be used to model potential water quality impacts to downstream resources.

Mine Site Open Pit

Water quality from mine pit dewatering will be predicted from a model that makes use of the same data used to estimate water quality from reactive waste rock, lean ore, and deferred ore. The use of water quality data from existing Duluth Complex stockpiles will be considered and used as part of the treatability studies, as appropriate. This will include water quality data from ore that could be exposed in the mine pit. The predicted water quality will also be used in water treatability studies, as it is envisioned that the mine pit dewatering and reactive waste rock/lean ore stockpile runoff will be treated with the same treatment system.

This modeling effort will include water quality estimates generated as a function of time during mine operation and after closure as the mine pit fills as part of mineland reclamation.

Plant-Tailings Basin

The EIS will evaluate water quality impacts from the ore processing plant and tailings basin. A water balance and chemical budget as identified below in Sections 6.2 and 6.12 will be included in the EIS. Data from Pilot Plant Process Testing will be as used as part of the waste characterization study to predict water quality in the tailings basin. As identified above in Section 2.7.2, any uncertainty about whether or not the tailings are reactive will be addressed by developing five years of lined tailings storage capacity on Cell 2W of the existing tailings basin. Continued waste characterization, including additional laboratory and field data, will determine if all tailings will need to be managed in a completely lined basin, or if they can be placed on top of Cells 1E and 2E of the existing LTVSMC tailings basin without a liner. The EIS will evaluate the potential environmental impacts for both of these possibilities. Available waste characterization data will be used to estimate a preliminary conservative range of water quality from the tailings basin. This range will be used to assess the potential environmental impacts of both lined and unlined disposal systems. Design and management of tailings basin water will include the following information:

- Technical design evaluation reports on tailings basin modification and tailings basin geotechnical
- Models of predicted water quality in the tailings pond to determine when treatment and discharge are needed.
- Wastewater treatability studies
- Models of water quality after interaction with underlying taconite tailings, surrounding groundwater, and surface water.
- Details on design and effectiveness of the tailings basin seepage collection system
- Existing water quality data from tailings basin seepage

Water quality information from the hydrometallugical processing facility will be generated from the Pilot Plant Process Testing data. This information will be used to provide the water balance and chemical budget of the facility to predict water quality in the reactive residue facility. Using modeling techniques, the EIS will evaluate potential leakage from the lined reactive residue facility and any subsequent interaction with the underlying taconite tailings, buried hornfels, groundwater, and surface water. Water quality data collected from the existing buried hornfels monitoring well will be used to assist in this evaluation.

A treatability study for wastewater from seeps and from the tailings basin ponds will be included in the EIS. The study will include:

- Conceptual treatment design and ability of the design to meet expected water quality permit effluent limitations. Synthetic laboratory water, which has the expected chemical composition of seep and pond wastewater, will be created for the test.
- A variety of treatment options will be evaluated. This may include both active and passive (low maintenance) treatment systems as well as combinations of treatment.

Water Quality of Receiving Waters

The EIS will provide information about existing water quality of the Partridge River, Trimble Creek, St. Louis River, Embarrass River and Lake Superior based on existing data and, where needed, additional monitoring. Potential water quality impacts to these water bodies as a result of the project will be evaluated in the EIS. The water quality of wastewater discharges will be estimated for purposes of identifying potential wastewater discharge limits or the need for the project to apply for variances from water quality standards. If it appears that a variance would be needed, the EIS will describe the process for evaluation of the variance and identify issues and/or the possibility of receiving a variance, as well as any impacts to downstream resources as a result of the variance.

Mercury

The EIS will include a mercury balance for wastewater from the mine site and the ore processing/tailings basin. An assessment of the ability for these wastewater sources to meet the 1.3 ng/L water quality standard for the Lake Superior Basin will also be included. If it appears that the project is unable to meet the mercury standard, additional wastewater disposal options will be evaluated. The use of existing publicly owned wastewater treatment plants combined with a variance to the mercury standard is an option that will be explored. Impacts and/or needed facility upgrades will be identified as well as potential impacts to downstream resources as a result of a mercury variance.

The EIS will evaluate the potential and any impacts from methylation of mercury due to increased sulfate concentrations in receiving waters.

Sanitary Wastewater Disposal

Sanitary wastewater disposal for the project will make use of traditional treatment technology and is not expected to cause significant environmental impacts. The EIS will however provide information on treatment options and receiving waters.

### 3.3.7 Solid Waste (Item 20)

The characterization, handling, and facility design associated with waste materials will be a significant issue addressed in the EIS. Waste characterization is a long-term activity that would continue after environmental review and permitting is complete and even into project operations. All available waste characterization data will be used to estimate a conservative range of water quality from all waste materials. If the conservative estimates demonstrate that some of the waste will not produce drainage that would adversely impact natural resources, then that waste can be handled in a manner similar to non-reactive waste from existing taconite operations. If the data is not definitive and the estimates indicate that the drainage could adversely impact natural resources, then the waste will be placed in lined systems and all drainage collected, monitored and treated if necessary. The waste will be handled in this manner until sufficient field and laboratory data has been generated to demonstrate that the waste is non-reactive. The three components of the project that will be the major focus of this discussion will be waste rock from the mine site, tailings from ore beneficiation process, and reactive residue from the hydrometallurgical processes. The behavior of existing LTVSMC tailings will also be investigated.

Below is a brief description of materials and issues that will be included in the EIS on each of these components:

Mine site waste rock:

- Estimation of amounts and composition of potentially non-reactive waste rock, potentially reactive waste rock, lean ore, and deferred ore using a block model.
- Evaluation of details and alternatives for reactive waste rock stockpile design and siting.
- Evaluation of the mine waste management plan including effectiveness of the Grade Control Program including details on blast hole sampling for waste rock management.
- Estimation of the quantity and quality of drainage to be generated over time.

Ore beneficiation process tailings:

- Characterization of tailings.
- A lined tailings cell on top of Cell 2W of LTVSMC existing tailings basin to dispose of five years of PolyMet tailings.
- Evaluation on the use of the existing unlined tailings basin if tailings are non-reactive.
- Evaluation of alternatives for design, construction, and siting of tailings basin, including the use of a liner if tailings are reactive.
- Evaluation of physical and chemical suitability of existing and new tailings for construction of tailings basin.
- Estimation of the quantity and quality of drainage to be generated over time including the post-operational phase.

Hydrometallurgical processes reactive residue:

- Characterization and quantities of residue.
- Design of reactive residue facility.
- Suitability of reactive residue facility siting on existing tailings basin Cell 2W.
- Evaluation of alternatives for design, construction and siting.
- Estimate the water quantity and quality to be generated over time.

Results from the Pilot Plant Processing Testing study and the waste characterization study will be used in conjunction with existing data to characterize the above-described material. The Pilot Plant Process Testing study will generate tailings and reactive residue from a sample of the NorthMet deposit that was subjected to the proposed ore beneficiation and hydrometallurgical processes. As stated above, the waste characterization study is a long-term study that would continue after the completion of the EIS. This study makes use of humidity cell tests on wastes from the NorthMet deposit, including tailings to determine the reactive nature of the materials. All available data will be used to develop conservative estimates for assessment of environmental impacts in the EIS. As part of the characterization study, PolyMet will conduct a complete chemical and mineralogical study of its waste. This information will be used to compare the predicted behavior of the PolyMet material with other samples of Duluth Complex material for which long-term data exists. Comparisons with existing data may be used to determine the applicability of the available results.

Identification, handling and facility design of other solid wastes and hazardous materials such as wastewater treatment sludge and explosives will be included in the EIS.

### 3.3.8 Cumulative Effects (Item 29)

The EIS will evaluate cumulative effects using guidance from the Council on Environmental Quality handbook for considering cumulative effects under the National Environmental Policy Act (CEQ, 1997). The affected resources that are related to the cumulative effect issues will be used to determine the appropriate geographic and temporal scope to the analysis. The geographic and temporal scope will in turn be used to identify the specific past, present, and reasonably foreseeable future actions to be considered. The following list of cumulative effect issues are proposed for evaluation in the EIS:

- Hoyt Lakes Area Projects and Air Concentrations in Class II Areas
- Class I Areas $PM_{10}$ Increment
- Ecosystem Acidification Resulting From Deposition of Air Pollutants
- Mercury Deposition and Bioaccumulation in Fish
- Visibility Impairment
- Loss of Threatened And Endangered Plant Species
- Loss of Wetlands
- Loss or Fragmentation of Wildlife Habitat
- Streamflow and Lake Level Changes
- Water Quality Changes
- Economic Impacts
- Social Impacts

Additional detail about the specific analysis of each of these issues was included in response to the Scoping EAW Question 29. For clarity in the Scoping Decision Document and to address changes to the proposed evaluation of cumulative effect issues, the approach to evaluation of each issue is identified below.

#### 3.3.8.1 Hoyt Lakes Area Projects and Air Concentrations in Class II Areas:

An air dispersion modeling study will be performed. Background information on the study will be provided:

- Description of the air dispersion modeling protocol (including relevant assumptions). If the number of stacks becomes cumbersome from a modeling standing point, professional judgment will be used to consolidate stacks or emissions as appropriate given available modeling guidance from regulatory agencies.
    - Summary of estimated emissions of $SO_2$, $NO_x$, and $PM_{10}$ by emission unit (if available) for each of the three projects (Cliffs Erie Railroad Transfer Facility, Mesabi Nugget Plant, and PolyMet) proposed for the Cliffs Erie site (including relevant assumptions). Emission estimates will be provided by project proposers. If necessary, an emission scenario will be developed for projects lacking the necessary modeling details.

    - Description of the air dispersion model; a regulatory approved model will be used for the analysis (either ISCST3 or ISC PRIME).
    - Description of the receptor grid; the receptor grid will be established outside of the Cliffs Erie site boundary, from the site boundary out to 10 kilometers. Receptors will be placed on the Cliffs Erie site boundary with a 100 meter spacing. Receptors will have a 100 meter grid spacing from the site boundary out to 2 kilometers. Receptors will have a grid spacing of 1 kilometer starting at 2 kilometers from the Cliffs Erie site boundary out to 10 kilometers.
    - Description of meteorological input data; 1972-1976 Hibbing data will be used for the analysis.
- Modeling results will be tabulated, summarized and compared to the national and state ambient air quality standards (NAAQS/MAAQS)
    - Background air concentrations will be added to the modeled air concentrations. By including background air concentrations in the analysis it is assumed that past and present actions will be reflected in these background air concentrations. Depending on the availability of data, this assumption may need to be revisited upon actually conducting the study.
- Timeframe: the proposed facilities are assumed to be constructed and at full operations by 2008
- Report preparation and submittal to the MPCA and EIS contractor so that results can be evaluated and included in the EIS.
    - Model input/output files made available to the MPCA.

The impact analysis will be completed based on the results of the modeling study. Background information (see above) and final modeling results will be summarized in a report to be submitted to the MPCA and the EIS contractor. Description of air emissions control technologies is expected to be a significant section of the report. Uncertainties in the modeling study will be identified and discussed. Results of the cumulative analysis will be incorporated into the EIS with guidance from the MPCA.

3.3.8.2 Class I Areas $PM_{10}$ Increment:

A semi-quantitative assessment of Class I Areas $PM_{10}$ Increment will be performed. Background information on Class I Areas $PM_{10}$ Increment in Minnesota will be summarized:

- Summary of long-range regional transport issues for $PM_{2.5}$ (fine aerosol), sulfate, and nitrate
- Summary of the IMPROVE monitoring network data for particulates (including ammonium nitrate, ammonium sulfate, coarse particulate, and elemental carbon and organic carbon for the period of record for the Voyageurs National Park site and the Boundary Waters Canoe Area Wilderness (BWCAW) site
- Summary of the $PM_{10}$ air concentrations available from any nearby state monitoring sites
- Summary of air modeling studies conducted to date and the available results, with particular emphasis on major source contributions of fine particulate from in-state sources and out-of-state sources (national studies, CENSARA, other state efforts)
- Summary of current and foreseeable future federal regulatory controls to $PM_{2.5}$, $PM_{10}$, sulfates, nitrates: implementation of the Taconite MACT standard ($PM_{10}$ as a surrogate for metals);

Regional Haze Rule; $NO_x$ SIP call (40 CFR parts 51, 72, 75, 96; Clean Air Interstate Rule; EPA proposed rule (Federal Register, Vol. 70, No. 35) for $NO_x$ in Class I Areas); EPA "to-be" proposed rule for Best Available Retrofit Technology, BART (April 2005)

- Summary of current and foreseeable future state regulatory controls and/or actions (State acid rain rule and statewide $SO_2$ emissions cap; Title IV of the 1990 Clean Air Act Amendments, affected MN sources
- Timeframe: Emissions projections (increases, decreases) from the proposed facilities, as well as from existing facilities subject to the various regulatory requirements, will be through the year 2020.

Estimates of current $PM_{10}$, $SO_2$, and $NO_x$ emissions from sources in Minnesota will be summarized based on the most current emission inventory available. Emissions will be reported for major geographic areas in the state (Twin Cities, Iron Range, etc.). The trend of statewide emissions will be assessed using existing historical emission inventory data. This analysis will cover the period of record for such data. Background monitoring data ($PM_{2.5}$) for Voyageurs National Park and Ely (Fernberg Road) will also be summarized as will $PM_{10}$ monitoring data from nearby sites.

Cumulative impacts will be based on projections of the potential increases or reductions in $SO_2$, $NO_x$, $PM_{10}$ emissions from current Minnesota sources. Emission estimates from the following list of projects will be considered and included in the evaluation if appropriate:

- Existing Taconite Plants with Proposed Modifications
- Proposed Mesabi Nugget Plant
- Proposed Cliffs Erie Railroad Pellet Transfer Facility
- Proposed Minnesota Steel DRI/Steel Plant
- Implementation of Taconite MACT Standards
- Shutdown of LTVSMC Taconite Furnaces
- Mesaba Energy Coal Gasification Plant located near Taconite MN
- Implementation of the Regional Haze Rule and BART Rule (to be proposed)

The assessment will summarize the potential implications for $PM_{10}$ increment in the BWCAW. Description of air emissions control technologies is expected to be a significant section of the report. Results of the cumulative analysis will be incorporated into the EIS with guidance from the MPCA.

3.3.8.3 Ecosystem Acidification Resulting From Deposition of Air Pollutants:

A semi-quantitative assessment of cumulative acid deposition in Minnesota will be performed. Background information on acid deposition in Minnesota will be summarized:

- Summary of the long range pollutant transport issue (National Acid Precipitation Assessment Program; NAPAP)
- Summary of Minnesota's assessments of ecosystem buffering capacity (1980 – 2000)
- Summary of Minnesota's air modeling studies of source contributions (1986)
- Summary of Minnesota regulatory controls to protect sensitive ecosystems
- Summary of current and foreseeable future federal regulatory controls

- Timeframe: Emissions projections (increases, decreases) from the proposed facilities, as well as from existing facilities subject to the various regulatory requirements, will be through the year 2020.

Trend analysis will be conducted for $SO_2$ and $NO_x$ statewide emissions (using existing state wide emission inventory data) and for deposition monitoring data at three sites in northern Minnesota. These analyses will cover the period of record for such data and will include comparisons to the statewide emission cap and the deposition standard (11 kilograms/hectare/year) which were established to protect Minnesota's aquatic terrestrial ecosystems.

The potential cumulative impacts will be based on projections of the potential increases or decreases in sulfate and nitrate deposition to Minnesota ecosystems from reasonably foreseeable actions. The following list of projects will be considered and included in the evaluation if appropriate:

- Existing Taconite Plants with Proposed Modifications
- Existing Power Plants
- Proposed Mesabi Nugget Plant
- Proposed Minnesota Steel DRI/Steel Plant
- Mesaba Energy Coal Gasification Plant located near Taconite MN
- Implementation of the Clean Air Interstate Rule.
- Implementation of the Regional Haze Rule and BART Rule (to be proposed)
- Shutdown of LTVSMC Taconite Furnaces

The results of the cumulative impacts assessment will be compared to the Minnesota annual acid deposition standard, which was promulgated to protect sensitive ecosystems. The assessment will summarize the potential implications for Minnesota ecosystems.

Description of air emissions control technologies is expected to be a significant section of the report. Results of the cumulative analysis will be incorporated into the EIS with guidance from the MPCA.

3.3.8.4 Mercury Deposition and Bioaccumulation in Fish:

A semi-quantitative assessment of cumulative mercury deposition will be performed. Background information on mercury deposition in Minnesota will be summarized:

- Summary of the long range transport issue
- Summary of studies assessing mercury deposition and bioaccumulation in fish tissue in Minnesota's aquatic ecosystems
- Summary of air modeling results for source contributions (national, state efforts).
- Summary of state actions and the state's proposed statewide Total Maximum Daily Load (TMDL) (93% reduction in MN emissions)
- Summary of current and foreseeable future federal regulatory controls
- Timeframe: Emissions projections (increases, decreases) from the proposed facilities, as well as from existing facilities subject to the various regulatory requirements, will be through the year 2020.

The assessment of potential impacts will be completed through mercury emission trend analyses using existing statewide emission inventory data and trend analyses of annual wet mercury deposition monitoring data at two sites in northern Minnesota. These analyses will cover the period of record for such data and will include comparisons to natural background.

Cumulative impacts will be based on projections of the potential increases or reductions in mercury emissions from general source categories (e.g., electric utilities, mining, products, etc). Emission estimates from reasonably foreseeable actions will be included in the analysis. The following list of projects will be considered and included in the evaluation if appropriate:

- Existing Taconite Plants with Proposed Modifications
- Existing Power Plants with Proposed Modifications
- Proposed Mesabi Nugget Plant
- Proposed Minnesota Steel DRI/Steel Plant
- Mesaba Energy Coal Gasification Plant located near Taconite MN
- Implementation of Taconite MACT Standards
- Shutdown of LTVSMC Taconite Furnaces
- Implementation of the Electric Utility MACT Standards
- Implementation of Minnesota's Regional Mercury TMDL

Potential emissions of mercury from current and reasonably foreseeable future projects will be subject to the statewide TMDL. The implementation plan for the TMDL will specify the actions necessary to control mercury emissions so as to meet water quality standards.

Description of air emissions control technologies is expected to be a significant section of the report. Results of the cumulative analysis will be incorporated into the EIS with guidance from the MPCA.

3.3.8.5 Visibility Impairment:

A semi-quantitative assessment of cumulative visibility impacts will be performed. The assessment will focus on Minnesota's Class I areas. Background information on visibility pollution in Minnesota will be summarized:

- Summary of long range transport issue
- Summary of IMPROVE monitoring network in Voyageurs National Park and Boundary Waters Canoe Area Wilderness
- Summary of air modeling results for source contributions (national, CENSARA, other state efforts).
- Summary of current and foreseeable future federal regulatory controls
- Timeframe: Emissions projections (increases, decreases) from the proposed facilities, as well as from existing facilities subject to the various regulatory requirements, will be through the year 2020.

The assessment of potential impacts will be completed through statewide $SO_2$, $NO_x$, and $PM_{10}$ emission trend analyses using existing statewide emission inventory data (listing of sources and ton/yr emissions). Trend analyses will provide breakout of emissions by geographic area of the

state (Twin Cities, Iron Range, etc.) In addition, a trend analysis of background monitoring data from Voyageurs National Park and Ely (Fernberg Road) will be provided, including plots of light extinction and other pertinent parameters, depending on data availability.

Cumulative impacts will be based on projections on the potential increases in $SO_2$ and $NO_x$ emissions in Minnesota from current and reasonably foreseeable actions. Emission estimates (or decreases) from the following past, current and reasonably foreseeable actions will be included in the analysis. The following list of projects will be considered and included in the evaluation if appropriate:

- Existing Taconite Plants with Proposed Modifications
- Proposed Mesabi Nugget Plant
- Proposed Cliffs Erie Railroad Pellet Transfer Facility
- Proposed Minnesota Steel DRI/Steel Plant
- Mesaba Energy Coal Gasification Plant located near Taconite
- Implementation of Taconite MACT Standards
- Shutdown of LTVSMC Taconite Furnaces
- Implementation of the Electric Utility MACT Standards
- Emission reductions in other parts of Minnesota (Metropolitan Emission Reduction Project)
- Implementation of the Regional Haze Rule and BART Rule (to be proposed)

Description of air emissions control technologies is expected to be a significant section of the report. Results of the cumulative analysis will be incorporated into the EIS with guidance from the MPCA.

3.3.8.6 Loss Of Threatened And Endangered Plant Species:

A semi-quantitative analysis of cumulative impacts will be performed using available information. Because the Minnesota Department of Natural Resources is charged with administering the program to protect state-listed threatened and endangered species and managing species with the potential to become threatened or endangered within the state of Minnesota, the entire state will be defined as the geographic boundary for analysis. While the range of most of the potentially affected species extends beyond the state boundary, the regulatory program does not, and it would be difficult to determine "truly meaningful effects" within the species natural ranges that extend into other states and Canada. The species that will be addressed in the analysis are listed in Table 29-1.

**Table 29-1**: Rare species present within or near the PolyMet Mine Site

| Common Name | Scientific Name | State Status[1] | PolyMet Mine Site Observations (populations) | Approx. # of Individuals | Habitat |
|---|---|---|---|---|---|
| Pale moonwort | *Botrychium pallidum* | E | 4 pops . | 58 | Full to shady exposure, edge of alder thicket, along Dunka Road, and railroad and powerline right-of-way. |

| | | | | | |
|---|---|---|---|---|---|
| Ternate grape-fern | *Botrychium rugulosum (=ternatum)* | T | None identified | | Disturbed habitats, fields, open woods, forests |
| Least grape-fern | *Botrychium simplex* | SC | 20 pops . | 1,337 | Full to shady exposure, edge of alder thicket, forest roads, along Dunka Road, and railroad and power line rights-of-way. |
| Floating marsh marigold | *Caltha natans* | E | 13 pops . | ~150 | Shallow water in ditches and streams, alder swamps, shallow marshes, beaver ponds, and Partridge River mudflat. |
| Neat spike-rush | *Eleocharis nitida* | T | 11 pops . | ~1,450 sq.ft. | Full exposure, moist ditches along Dunka Road, wet area between railroad grades, and railroad ditch. |
| Northern commandra | *Geocaulon lividum* | SC | 11 pops . | | On *Pleurozium* and *Sphagnum* moss mats under black spruce, open to partly shaded. |
| Lapland buttercup | *Ranunculus lapponicus* | SC | 7 pops . | ~825 sq.ft. | On and adjacent to *Sphagnum* hummocks in black spruce stands, up to 60 percent shaded with alder also dominant. |
| Clustered bur-reed (floating marsh marigold) | *Sparganium glomeratum* | SC | 13 pops . | >100 | Shallow pools and channels up to 1.5 feet deep in *Sphagnum* at edge of black spruce swamps, beaver ponds, wet ditches, shallow marshes |
| Torrey's manna- grass | *Torreyochloa pallida* | SC | 8 pops . | ~800 sq.ft. | In muddy soil along shore and in water within shallow channels, beaver ponds, shallow marshes, along Partridge River. |

1- E - Endangered, T - Threatened, SC - Species of Concern

The life history of each species will be described including what is known about their preferred habitats, the role of disturbance in their life history, range, sensitivity to stresses, and the current level of understanding of the species. This characterization will differentiate between pioneering species and those that are part of mature communities.

Species losses from the following reasonably foreseeable actions will be included in the analysis as forecasted for 27-years consistent with the PolyMet projection of 2-years of construction, 20-years of operation and 5-years of closure:

- Proposed Minnesota Steel DRI/Steel Plant
- Proposed Ispat Inland Mine Pits
- Proposed Cliffs Erie pellet railroad loading project
- Proposed Mesabi Nugget Project

Losses from other projects with the potential to affect the species of interest will also be included in the analysis if the necessary species population information is available at the time of the analysis and can be provided by DNR (e.g. Mesaba Energy Coal Gasification Plant).

The past projects will include projects for which the DNR has issued takings permits for the species of interest.

Through compilation of known records of each species within the state from the Natural Heritage Information System, a distribution map for each species will be prepared. The data will be compiled to summarize the number of known populations, approximate numbers of plants, and locations. Takings permit information will be analyzed to determine the extent of past losses. The baseline condition will also include a description of how land use conditions affecting the various species have changed over time and how they are likely to change in the future; both with and without the proposed projects.

Impacts related to past, present, and reasonably foreseeable future impacts will be evaluated through a semi-quantitative summary of the number of populations and individuals of each species that may be affected and the magnitude of those effects based on the knowledge of the species within the state. This evaluation will include determining whether the various species are particularly vulnerable to decline. The "magnitude" of the effects will be evaluated within the context of the state, the affected region, and the DNR regulatory program.

Alternative configurations of the project will be evaluated to determine if the projected impacts can be minimized.

If it is determined that unavoidable impacts will result to threatened species; plans will be made to mitigate for those impacts. The mitigation for the loss of state-listed threatened, endangered, or special concern species will be developed in consultation with the DNR Natural Heritage and Non-game Research Programs and through administration of state threatened and endangered species permit requirements (Minnesota Rules Chapters 6134 and 6212) pursuant to statutory authority Minnesota Statutes, section 84.0895.

3.3.8.7 Loss of Wetlands

A semi-quantitative analysis of cumulative impacts to wetlands will be performed. Because several of the primary functions performed by wetlands are directly related to watershed processes, the analysis will be performed on a watershed basis. The geographic area of analysis will be the Partridge River watershed. Historical activities within the Partridge River watershed that have affected wetland resources are primarily mining activities and urban development that started on a large scale in the early 1950's. The remainder and majority of the watershed have seen limited disturbance and loss of wetlands. The baseline condition for wetland resources will be established using the following approach.

The National Wetland Inventory data will be used to help establish the baseline wetland condition in the undisturbed areas of the watershed since it is the best data representing the extent of wetland resources in the Partridge River watershed. In the areas of the watershed that have been significantly altered, wetlands will be mapped and classified to the extent feasible using a number of historic data resources layered in a geographic information system including:

- 1930's aerial photographs
- Original U.S. Geological Survey 7.5 minute quadrangle topography maps from the early 1950's, prior to the onset of significant mining activities

- DNR GIS data that incorporates notes from the original survey of the area and includes detailed wetland vegetation information

The baseline condition will also include a description of how conditions affecting wetlands have changed over time and how they are likely to change in the future both with and without the proposed projects.

A similar wetland mapping effort may be conducted to establish wetland conditions at an interim point in time, (e.g., 1970) to help track trends in wetland loss.

The next step will be to prepare a mapping of wetland resources, as they exist at the present time, before the start of any further projects in the Partridge River watershed. This wetland mapping will be prepared using information from the National Wetland Inventory mapping and from site-specific wetland surveys that have been conducted within the areas of the Partridge River watershed. This wetland mapping will be compared to the historic wetland (baseline) mapping to quantify the effects of past activities on wetland resources within the analysis area.

Wetland losses from the following reasonably foreseeable actions in the Partridge River watershed will be included in the analysis as forecasted for 27-years, consistent with the PolyMet projection of 2-years of construction, 20-years of operation and 5-years of closure:

- Proposed PolyMet Mine
- Portions of the proposed Cliffs Erie Railroad Pellet Transfer Facility in the Partridge River Watershed
- Future expansion of Northshore Mining Company's Peter Mitchell Mine Pits

Losses from other proposed projects with the potential to affect wetland resources in the Partridge River watershed will also be included in the analysis if wetland impact information is available at the time of the analysis.

Impacts related to past, present, and reasonably foreseeable future actions will be evaluated through a quantitative summary of the number of acres of various wetland types that may be have been affected in the past and may be affected in the future and the magnitude of those effects within the watershed. Trends that may be discernible from evaluating the data will be evaluated. This evaluation will include determining whether various wetland types are particularly vulnerable to rapid degradation. The "magnitude" of the effects will be evaluated within the context of the overall wetland resources within the watershed.

Alternative configurations of the project will be evaluated to determine if the projected impacts can be minimized. Unavoidable wetland impacts will be mitigated in accordance with the state and federal wetland permitting programs.

3.3.8.8 Wildlife Habitat:

Background

Since the state was established (1858), Minnesota's ecosystems have all been affected by both

human and natural disturbances. The drastic reduction in native prairie, which has been converted to row-crop agriculture, is a well-known example of human disturbances. Much of the forested areas of the state are still forested and appear to have been less impacted by disturbance in that they remain forested with native species, although forest types changed and the diversity of forests have been reduced. Human activities (e.g. mining, urbanization and logging) and natural disturbances (e.g. fire, windstorms, and insect infestation) have altered the character of the original ecosystems in the Arrowhead Region.

Mining activity on the Iron Range has created a unique, but unnatural, impact on the landscape in the Arrowhead Region. The locations and orientation of mineralized deposits, and thus the mining activities, are in a relatively narrow, linear band from Ely to Grand Rapids. The length and extent of 125 years of mining activity and associated infrastructure (shear-walled mine pits, tailings piles, haul roads, railroads, tailings basins, and associated structural development) in its' entirety have contributed to habitat loss/fragmentation and could potentially cause a "landscape barrier" which obstructs wildlife travel corridors.

This EIS will evaluate the cumulative impacts additional industry (mining) and human activity may have on both habitat loss/fragmentation and creating barriers to wildlife travel corridors along the iron range. The evaluations are described below.

Wildlife Habitat Loss/Fragmentation

Wildlife habitat has been lost along the Iron Range due to increasing human activities (e.g. mining). Habitat loss can be described as the outright destruction of habitat, such as filling a wetland or channelizing a section of stream. Depending on the scale and temporal aspects of habitat loss the impacts upon a biological community may be delayed or immediate and catastrophic. Habitat fragmentation on the other hand is the gradually disassembly of terrestrial habitats in discontinuous, often isolated patches as a consequence of development. The adverse effects are usually cumulative and not immediately noticeable and stem from habitat loss.

The two largest industries in the area that have had the greatest affect on wildlife habitat are logging and mining. The DNR prepared a Generic Environmental Impact Statement (GEIS) to address environmental impacts from state timber harvests. This GEIS made the conclusion that loss of forest in the northern part of the state is a significant unavoidable adverse impact. This loss of forest can cause increased fragmentation and changes in types of habitat that could result in a loss of habitat to some specialist wildlife species, and a gain of habitat to other generalist wildlife species.

Both logging and mining have habitat loss impacts that can be tempered by managing timber harvests for re-growth and reclamation of mining areas. However, the habitat that develops after logging and mining is not equal to the original habitat and the time for mineland reclamation to provide habitat is significant. Urbanization and infrastructure impacts to wildlife habitat create a permanent loss and fragmentation.

Approach to Evaluation

The geographic boundary for impact analysis of habitat loss/fragmentation will be necessarily large: the Arrowhead Region including the Border Lakes, Laurentian Uplands, Nashwauk Uplands, Northshore Highlands, and Tamarack Lowlands Ecological Subsections.

Marschner's map of the original vegetation of Minnesota (see Heinselman, 1975) will be used to define the baseline vegetation condition. This map was compiled from the U.S. General Land Office (GLO) Survey Notes. This map is based on field notes of the GLO surveyors, who conducted the original land surveys of Minnesota during the period 1850 to 1905. It was drafted at a 1:500,000 scale. Marschner mapped 16 vegetative/ecosystem categories, ranging from marshes to pine groves. The map therefore is the best representation of the original ecosystems of Minnesota before the impact of European man

The actual acres of the various ecosystems that have been disturbed by past and current mining and infrastructure development will be tabulated as will the relative loss by ecosystem category. These tabulations will also be summarized by ecological subsection. Marschner's vegetation types will be classified into habitat types that relate to U.S. Forest Service Management Indicator Habitats or Minnesota's Comprehensive Wildlife Conservation Strategy.

The area disturbed will be derived from the U.S. Geological Service (USGS) Level 2 Gap Analysis Program (GAP) and 2003 Mine Features GIS mapping layer available from the DNR. A similar assessment will be carried out overlaying a GIS layer of the projected cumulative disturbance 30 years in the future (total time of construction, operation and closure of current mining proposals) as related to the following proposed future actions:

- Proposed PolyMet Mine
- Proposed Mesabi Nugget Plant
- Proposed Cliffs Erie Railroad Pellet Transfer Facility
- Proposed Minnesota Steel DRI/Steel Plant
- Future mining plans for existing taconite operations
- Proposed Mesaba Energy Coal Gasification Plant
- Community and infrastructure growth/expansion

The extent of habitat loss and fragmentation will be evaluated semi-quantitatively with respect to permanent or temporary loss/fragmentation. It is recognized that this assessment will not account for changes in the quality of various habitat types. However, an assessment will be made with respect to the losses and fragmentation of habitat types and what affect that may have on wildlife species. The assessment will consider existing literature on habitat loss/fragmentation as well as the U.S. Forest Service Management Indicator Species and Minnesota's Comprehensive Wildlife Conservation Strategy. Impacts to area sensitive and cover-type sensitive species will be evaluated and described.

Wildlife Travel Corridor Obstruction/Landscape Barriers

Wildlife travel corridors are areas that connect habitats and increase the effective amount and diversity of habitat available for a species and possibly mitigate for habitat fragmentation. Landscape barriers may have impacts on dispersal, migration, and/or seasonal movements of

wildlife. Different species of wildlife have specific habitat needs at various times of the day, season, year, and lifetime in order to survive and reproduce. To meet those needs they must move from one type of habitat to another. Daily movements include travel from resting areas to foraging areas and to sources of water.

Seasonal and yearly movements may consist of travel from winter range to calving areas to summer range. Lifetime movements include dispersal of young animals from their areas of birth to establish new territories or home ranges. Human activities (i.e. mine pits) along travel corridors can block, deflect, or delay such movements**.**

The loss of any additional travel corridor through the Iron Range could potentially push this cumulative impact over a threshold. Once beyond that threshold, these species' normal/ historic movement and dispersal patterns could be altered forever. Negative consequences would be both short and long term, including effects on genetic distribution, food procurement, summer/winter range accessibility, annual dispersal and other yet unknown or unforeseen parameters.

Approach to Evaluation

The approach to evaluation of travel corridor obstruction will be to choose an appropriate analysis area, a baseline time and condition and then: 1) assess the cumulative disturbance of past and current mining and associated infrastructure development on that baseline condition; and 2) assess the presence of landscape barriers of past, current and proposed future actions and the effect on dispersal, migration, and/or seasonal movements of large mammals. It is assumed that large mammals will be the most sensitive to landscape barriers due to the size of potential barriers (mining operations) and the magnitude of large mammal movement. Smaller species with small travel distances may also be affected due to genetic isolation. However addressing the impact to large mammals is also likely to also prevent genetic isolation of smaller animals. Using other available information, a qualitative and quantitative description of the landscape barriers in areas disturbed by mining and non-mining activities will also be provided.

The cumulative impacts of landscape barriers on wildlife travel corridors will focus on habitats within a proximity of the iron formation that are likely to impact wildlife that use those habitats. A buffer of 15 miles around the Iron Range will be used to focus this evaluation. Travel corridors that exist as part of the current condition will be identified and evaluated for the reasonable foreseeable opportunity of preserving and maintaining those existing travel corridors.

It is reasonable to assume that prior to human disturbance habitat barriers were minimal with respect to the current condition and no additional effort will be given to characterization of baseline conditions for evaluation of habitat barriers.

DATA NEEDS FOR ANALYSIS OF CUMULATIVE IMPACTS

General Background Data

Previous assessments will be used to provide perspective on those changes in ecosystems that are associated with the cumulative effects of mining in contrast to those associated with other human

and natural disturbances (e.g., logging, fire, windstorms, and insect infestations). These assessments were not specifically targeted on the mining areas of the state, but instead considered either the entire forested area of the state or some sub-area in northern Minnesota. The following assessments will be reviewed to provide a brief qualitative perspective on ecosystem changes not related to mining:

- Friedman, S.K. Landscape Scale Forest Composition and Spatial Structure: A Comparison of the Pre-settlement General Land Office Survey and the 1990 Forest Inventory in Northeastern Minnesota. University of Minnesota, St. Paul: Ph.D. Thesis, 2001.

  *Friedman reconstructed the presettlement forest vegetation in northeastern Minnesota using General Land Office Survey Records and assessed change in this forest following the introduction of logging and the suppression of fire.*

- Minnesota Generic Environmental Impact Statement (GEIS) Study on Timber Harvesting and Forest Management in Minnesota.

  *The GEIS analyzed impacts resulting from timber harvesting and associated management activities in Minnesota, such as logging, reforestation, and forest road construction. Four sections of the GEIS may be useful in describing forest change not related to mining, including: Section 5.2.1 Forest Area and Cover Type Abundance, Section 5.2.4 Forest Fragmentation, Section 5.6.1 Forest Resources - Extent, Composition, and Condition, and Section 5.7.4 Cumulative Unmitigated Significant Impacts.*

- Minnesota Forest Resource Council (MFRC) Landscape Project.

  *The MFRC Landscape Project is a landscape level program and coordination effort. As part of the project, a number of reports have been generated that may be used in this evaluation of cumulative impacts. All reports are available from the MFRC website www.frc.state.mn.us/Info/MFRCdocs.html and include*:

  - Changes in disturbance frequency, age and patch structure from pre-European settlement to the present in north central and northeastern Minnesota. LT-1203a
  - Contemporary forest composition and spatial patterns of north central and northeastern Minnesota: An Assessment using 1990s LANDSAT data (accompanying maps/plates). LT-1203b
  - Changes in forest spatial patterns from the 1930s to the present in north central and northeastern Minnesota: An analysis of historic and recent air photos (accompanying maps/plates). LT-1203c
  - Potential future landscape change on the Nashwauk Uplands in northeastern Minnesota: an examination of alternative management scenarios using LANDIS. LT-1203d
  - Background paper: relationships between forest spatial patterns and plant and animal species in northern Minnesota (Report) (Appendices). LT-1203f

- Forest Plan Revision Final Environmental Impact Statement for Chippewa and Superior National Forests.

  *As part of their comprehensive planning process, the U.S. Forest Service developed an Environmental Impact Statement that discussed changes in forest conditions with time. This document can be found at www.superiornationalforest.org/analyses/2004Plan/feis/index.shtml.*

- Minnesota's Comprehensive Wildlife Conservation Strategy

  *Minnesota's Comprehensive Wildlife Conservation Strategy (CWCS) is designed to be a strategic plan for a partnership of conservation organizations within Minnesota. Species of greatest conservation need (SGCN) and priority habitat types within each Ecological Subsection are identified. The plan outlines priority conservation action that partners and interested individuals can use as a menu for action.*

Wildlife Habitat Loss/Fragmentation Data Needs

- Marschner's Original Presettlement Vegetation Map of Minnesota. Minnesota Department of Natural Resources.
- Land Use – Minnesota, Forested Area. Manitoba Remote Sensing Centre
- 1969 Land Use. Minnesota Land Management Information Center
- Minnesota Land Use and Cover 1990s Census of the Land. Minnesota Land Management Information Center
- Ecological Provinces, Sections, and Subsections of Minnesota. Minnesota Department of Natural Resources
- 2003 Mine Features GIS mapping layer. Minnesota Department of Natural Resources
- Minnesota Land Cover, 1991-1992. Minnesota Land Management Information Center
- GAP Analysis (level 2). United States Geological Survey

Wildlife Travel Corridor Obstruction/Landscape Barriers Data Needs

- 2003 Mine Features GIS mapping layer. Minnesota Department of Natural Resources
- Recent (2005) aerial photographs

3.3.8.9 Streamflow and Lake Level Changes:

Background

Cumulative impacts to the physical character of streams and lakes can occur from increases or decreases in flow or changes in the pattern of flow. The causes can include both point discharges (e.g., mine dewatering discharges) and changes in watershed runoff caused by land uses such as mining, timber harvest, residential development, road construction, etc. The impacts of flow changes can include erosion, sedimentation, and stream ecology.

Changes in frequency of bankfull flow can cause stream degradation. Changes to streams may accumulate over time, even for non-contemporaneous impacts if, for example, a stream is eroded and degraded by one event and then further eroded by a second event.

Flow impacts to streams and lakes are regulated under the DNR's program for appropriations of water and for work in public waters. Physical impacts to wetlands are also regulated by the Corps of Engineers, the DNR and the MPCA.

PolyMet will have point discharges of industrial wastewater to the Partridge River (from the mine site) and to a tributary to the Embarrass River (from the processing facility and tailings basin). The discharges to the Embarrass River are expected to be relatively small in volume. (Other changes to the Embarrass River that might be cumulative are limited to the small and intermittent discharge from the Babbitt Wastewater Treatment Plant, forest harvesting and the impacts of rural residential development in Embarrass Township. Again, these are relatively small impacts. Most mining-related discharges for Northshore Mining Company and Cliffs Erie are not to the Embarrass but to the Partridge. Therefore, the possibility of significant impacts to the Embarrass River via either direct discharge or cumulative impacts of discharge (including PolyMet) is believed to be small, and will not be addressed in the EIS.

PolyMet's net effect on the hydrology of the upper Partridge River is expected to be larger than its effect on the Embarrass River. Northshore Mining Company also operates the Peter Mitchell Mine in the headwaters of the Partridge River, upstream of PolyMet, resulting in potential combined impacts. In addition, PolyMet will appropriate water for the processing plant from Colby Lake (which is part of Partridge River drainage), raising the possibility of decreases in lake discharge and lake levels from present conditions. Short-term peak discharges from the mine site can be mitigated by control of outflow from sedimentation and treatment basins, if necessary, to limit potential impacts on stream geomorphology. During reclamation, there will be a period of time when the PolyMet mine pit will be filling with water and the flow to the Partridge River will be reduced as water accumulates in the mine pit. The cumulative impact of greatest concern is the potential for combined peak dewatering from PolyMet and Northshore Mining, or combined reduction in base flow caused by abandoned pits filling with water.

Approach to Evaluation

A quantitative assessment of cumulative impacts due to changes in flow will be performed for the upper Partridge River. This assessment will focus on flow changes in the immediate vicinity of the proposed project. Following this quantitative assessment, a qualitative assessment will be made of resources further downstream to evaluate whether cumulative impacts may occur at greater distances.

An evaluation of the geomorphology of the Partridge River in the vicinity of the project was conducted in 2004. It found that the upper Partridge River was in good condition in the reaches evaluated, suggesting that historic mining upstream of PolyMet has not resulted in channel stability problems. Therefore it is proposed to take the present condition as the baseline condition.

Probable streamflow changes will be estimated using a calibrated hydrologic model. The model will be calibrated to available flow data. The predicted change in flow characteristics will be estimated at appropriate stream reaches near the PolyMet mine site.

There are limited streamflow data for the Partridge River. There are two United States Geological Survey stream gauging stations on the Partridge River with long term flow records: one above Colby Lake at Hoyt Lakes (#04015475) and one near Aurora downstream of Colby Lake (#04016000). From 1978 to 1988 the U.S.G.S. operated gaging station #04015475 on the Partridge River just upstream from the confluence with Colby Lake. During this period Reserve Mining Company (the predecessor to Northshore Mining Company) was not pumping to the Partridge River so these data will probably be usable for calibration. This assumption needs to be verified, especially with respect to the impacts of any overflows that may have occurred from Reserve Mining Co. pits.

There is also limited flow data (13 months) from DNR's 2004 East Range Hydrology Study. NorthShore discharge data are available for this time on at least a monthly basis. Streamflow data can be augmented by available geologic, soils and ecological data and summarized to describe the condition and sensitivity of the Partridge River in the study area. The river will be classified in terms of sensitivity to streamflow change, using the Rosgen classification approach.

The streamflow record will be adjusted to remove the effect of known pumping or pit overflow discharges. If a model can be calibrated to this record with reasonable accuracy, the flow record will be extended using meteorological data. This extended record will be long enough to include both wet and dry climatic conditions. The error of estimate associated with use of the model will be displayed and discussed in light of its intended use in the EIS.

Hydrologic modeling will include the effects of past and present actions (through the date of monitoring) including:

- Existing Cliffs Erie discharges from pits (as of date of monitoring)
- Modification of land use (including wetland loss) by past mining practices within the upper Partridge River watershed
- Existing discharge from Northshore Mining Company Mine
- Existing Syl Laskin Energy Center discharges
- Existing discharge from City of Hoyt Lakes POTW
- Operation of Whitewater Reservoir
- Typical timber harvest activities on Superior National Forest (SNF), state and county lands and private lands.
- Existing runoff from the development of City of Hoyt Lakes

The extended flow record will be used to create a synthetic, local streamflow record for points of interest near the PolyMet site. The relationship of the sub-model to the overall model calibration will be checked to a limited extent using individual streamflow measurements done by PolyMet in 2004. The synthetic local streamflow record will be summarized in relevant flow statistics, including 7Q10, 1.5-year, and, if reasonable, 10- and 100-year flow estimates. The latter may be estimated by single-event simulation using standard estimates of extreme rainfall events.

The hydrologic models will be modified to include actions since the date of the monitoring and potential future actions including:

- Net hydrologic effects of PolyMet mine site discharges to Partridge River and appropriations for PolyMet
- Long-term flow management of PolyMet mine pit during and after filling of pit
- Any potential changes in water discharge from Northshore Mining Company discharges in Partridge River watershed
- Any reasonably foreseeable changes to timber harvest activities on SNF, state and county lands and private lands.

The threshold of significance for this cumulative impact assessment for the upper Partridge River will be the likelihood of major change in stream morphology as defined by the Rosgen classification method (Rosgen, 1994) or other applicable method. This analysis will be based on stream reconnaissance completed in 2004 by PolyMet as a base condition and augmented by available geologic, soils and ecological data to describe the sensitivity of the stream in the study area. The predicted change in flow characteristics will be estimated at the different stream reaches. The possibility of significant changes in stream morphology and ecology due to flow changes will be evaluated, based on the Rosgen methodology, existing information, and applicable research.

Where significant impacts are predicted, the EIS will suggest and evaluate mitigative measures such as controls on rate or volume of discharge or modifications to the water management plan to redirect water to less-sensitive stream locations. It will also evaluate the need for additional data collection to be addressed in the permitting processes.

After completion of the quantitative analysis of the upper Partridge River, the EIS will semi-quantitatively evaluate the probable cumulative impacts on Colby Lake/Whitewater Reservoir. This assessment will not be as rigorous as the Partridge River assessment since cumulative impacts on water levels and lake outflow are expected to be well within the range of historic conditions. Colby Lake/White Water Reservoir served as a water source for the former Erie Mining Company and LTVSMC operations, from 1950 through May, 2000. PolyMet is expected to appropriate less water from Colby Lake, with less impact on water levels and lake outflow than occurred under the previous mining operations. A minimum Colby Lake water level of 1439 ft msl was set by provision in the company's water appropriation permit, 49-0135. Minnesota Power presently holds this permit, with the same provision. Proposed PolyMet water withdrawal from Colby Lake and impacts on water levels will be evaluated and compared with historic effects from Erie and LTVSMC. The recent record of lake levels and outflow for Colby Lake will also be summarized for comparison to existing conditions. The effect of the project on the lake in view of the operating plan and recent experience will be evaluated. Potential changes in either the proposed project or the operating plan for the Colby Lake/Whitewater Lake outlet will be suggested as appropriate. The need for additional hydrologic data to monitor accumulative effects on Colby Lake/Whitewater Reservoir will be discussed.

Data Needs for Analysis of Cumulative Impacts

- Flow data for Partridge River
- Lake level data for Colby Lake and Whitewater Reservoir
- Operating plan for Colby Lake outlet and Whitewater Reservoir
- Historic air photos or GIS coverages showing modification of land use (including wetland loss) by past mining practices within the upper Partridge River watershed
- Discharge data from Northshore Mining Company mine and crusher areas and evaluation of possibility of changes to Northshore Mining Company discharges in future
- Operation plans and historic lake levels for Whitewater Reservoir
- Data on typical timber harvest activities on SNF, state and county lands and private lands.
- Estimates of future PolyMet Mine Site discharges for mine development, operation and closure, including long-term flow management of the PolyMet mine pit during and after filling of pit

3.3.8.10 Water Quality Changes:

A quantitative assessment of cumulative water quality impacts will be performed for the upper Partridge River (including Colby Lake) and the Upper Embarrass River (including Wynn and Sabin Lakes). PolyMet's discharges will be treated to meet chronic aquatic toxicity-based standards but levels of metals such as nickel may be elevated above natural background levels. At the plant site and tailings basin, discharges from the wastewater treatment plant may contain dissolved solids, hardness, chlorides and possibly sulfate at levels above background. Other common pollutants such as Biological Oxygen Demand (BOD), bacteria and suspended solids are not expected to be present in significant quantities in the discharges. The actual construction of the PolyMet facility can be expected to generate sediment but this impact is readily mitigated by use of stormwater best management practices such as sedimentation basins and will be of short duration. Therefore, this impact is not proposed as a suitable subject for cumulative impact analysis.

A number of models are available to analyze the generation, fate and transport of pollutants in streams. Models recently used in Minnesota EIS's and National Pollutant Discharge Elimination System (NPDES) permitting procedures include HSPF and QUAL2E and dilution models. Toxic metals will be modeled using a conservative dilution model of the stream water quality. If this indicates that potential cumulative impacts may be experienced, a more comprehensive model could then be applied. It appears likely that the initial modeling phase will be required for the NPDES permit and will be available to the EIS contractor. In this phase, both streams will be modeled using the hydrologic loading of water from tributary sub-watersheds for dry, normal and wet conditions. The background loading of pollutants from the watershed will be estimated based on historic and recent monitoring results. For each hydrologic scenario, loading from the PolyMet facility will be included and the resultant concentrations will be calculated as a simple dilution model. Upstream and downstream additions of pollutants from other discharges will be evaluated for past, present and future actions by other parties

The models will first be calibrated to existing conditions monitoring data from 2004. This will inherently include the effects of past and present actions (through the date of monitoring) including:

- Embarrass River
    - Existing discharges from Babbitt POTW
    - Existing Cliffs Erie tailings basin seepage
    - Other existing sources within the former LTVSMC site (e.g. waste rock piles tributary to Spring Mine Creek)
    - Modification of land use (including wetland loss) by past mining practices within the Embarrass River watershed above Sabin and Wynne Lakes
    - Typical timber harvest activities on SNF, state and county lands and private lands
    - Existing rural and residential development in Embarrass township
    - Construction of Embarrass Wetland Bank by LTVSMC
    - Closure of LTVSMC

- Partridge River and Colby Lake
    - Existing Cliffs Erie discharges (overflow) from pits
    - Other existing sources within the former LTVSMC (e.g. waste rock piles adjacent to Wyman Creek)
    - Modification of land use (including wetland loss) by past mining practices within the upper Partridge River watershed
    - Existing discharge from Northshore Mining Company Mine and Crusher area
    - Existing Syl Laskin Energy Center discharges
    - Existing discharge from City of Hoyt Lakes POTW
    - Operation of Whitewater Reservoir
    - Typical timber harvest activities of SNF, state and county lands and private lands
    - Existing runoff from the development of the City of Hoyt Lakes

The hydrologic models will than be modified to include actions since the date of the monitoring and potential future actions including:

- Embarrass River
    - PolyMet tailings basin wastewater treatment plant discharge
    - Changes to existing discharges from Cliffs Erie tailings basin due to PolyMet's proposed collection and treatment of seeps
    - Implementation of Regional Mercury TMDL
    - Any reasonably foreseeable changes to discharges from Babbitt POTW due to development and/or treatment system changes
    - Any reasonably foreseeable changes to timber harvest activities on SNF, state and county lands and private lands

- Partridge River and Colby Lake
    - PolyMet discharges from mine site and long-term discharges from closed pit and stockpiles
    - Potential future discharge from Mesabi Nugget facility
    - Proposed Cliffs Erie Railroad Pellet Transfer Facility construction and operation

- Any reasonably foreseeable changes to timber harvest activities on SNF, state and county lands and private lands
- Changes in runoff quality due to future development of City of Hoyt Lakes
- Implementation of Regional Mercury TMDL
- Any reasonably foreseeable changes to discharges from Hoyt Lakes POTW due to development and/or treatment system changes

Minnesota water quality standards were promulgated to protect the designated uses of waters of the state, which include protection for domestic consumption (human health), aquatic life, and recreation, industrial consumption, and agriculture and wildlife. The threshold for this cumulative impacts assessment will be the most restrictive water quality standards that apply to the respective waters being evaluated which, at a minimum, would be the chronic aquatic toxicity-based standards applicable to the respective waters being evaluated and the Class I drinking water standards that are applicable to Colby Lake as a drinking water source for the City of Hoyt Lakes. The future conditions scenarios will be completed for both operation and post-closure conditions, assuming that all other reasonably foreseeable actions have been completed.

3.3.8.11 Economic Impacts:

A quantitative assessment of cumulative employment and economic effects will be performed. Background information on employment and the economy of St. Louis County and the East Range will be summarized:

- Historical population trends by county and major population centers since 1980*
- Historical employment trends by county since 1980*
- Historical tax revenue trends by county since 1980*
- Summary of historical economic activity (major industries, major sources of employment) by county since 1980*
- Summary of population, employment, tax revenue and economic activity in 2002 (the baseline year)

** Approximate date. Actual historical data will be collected based on availability of primary sources and the economic/fiscal impact model used for the assessment.*

Impact analyses will be completed through input-output mathematical modeling to estimate employment impact, output impact and value added measures in terms of total (direct, indirect and induced) impacts for the construction period, operations period and closure period. Analyses will also assess impacts to State, Local and Federal taxes and royalties. All prices will correspond with the most recent data available.

Baseline conditions will be based on the economic activity reported in the most recent tax year available in the County/East Range. Cumulative impacts will be assessed by combining the baseline economic activity and projections of average annual employment (year by year) and estimated construction cost (year by year) for each of the following future (if they meet the criterion for "reasonably foreseeable") and past actions:

- Proposed NorthMet Project (PolyMet)
- Proposed Mesabi Nugget Plant (Mesabi Nugget, LLC)

- Proposed Cliffs-Erie Railroad Pellet Transfer project (Cliffs-Erie, LLC)
- Proposed NOνA Off-Axis Detector (University of Minnesota)
- Proposed expansions of existing taconite plants
- Shutdown of LTVSMC

The analysis will report findings for a typical year in four discrete periods: baseline year, construction period, operating period and closure period. Findings will be reported as employment, output impact (dollars), value added impact (dollars) and tax impact (dollars).

3.3.8.12 Social Impacts:

A qualitative assessment of cumulative social structure effects will be performed. Background information on social structure of the East Range [specifically the municipalities of Aurora, Babbitt, Biwabik, Ely, Hoyt Lakes, Soudan and Tower and surrounding areas] will be summarized:

- Summary of 2002 (or latest available data year) population characteristics including: structure by age, sex, family size, ethnicity, income, type of employment (including unemployed)
- Summary of 2002 (or latest available data year) community structure for project area cities and towns, including: size of government organizations (cities, townships and counties); participation in voluntary associations (description of groups and linkage to national organizations, if any); and inequities (economic, social or cultural) among community groups.
- Summary of 2002 (or latest available data year) housing availability and community services in major communities, including: police protection, health care, elderly care, schools, libraries, retail centers, recreational facilities, gathering places, computer access facilities.

Impact analysis will be completed through trend analyses:

- Trend analysis of population characteristics (structure by age, sex, family size, ethnicity, income, type of employment - including unemployed).
- Trend analysis of change in community structure: size of government organization (cities, townships and counties); participation in voluntary associations (description of groups and linkage to national organizations, if any); and inequities (economic, social or cultural) among community groups.
- Trend analysis of projected changes in availability of housing and community services including: police protection, health care, elderly care, schools, libraries, retail centers, recreational facilities, gathering places, computer access facilities
- Assessment of stakeholder perception toward proposed projects as related to perceived changes in quality-of-life issues such as: health, safety, security (personal and economic), political power, family stability, use of the natural environment, environmental quality, displacement or relocation, and trust in political and social institutions (intended to gauge community and stakeholder consensus on the cumulative effects of proposed projects on their shared vision for the future of the East Range).

Baseline conditions will be based on the social structure of the East Range in 2002. Cumulative impacts will be assessed by combining the baseline social structure and projections of change related to the following future (if they meet the criterion for "reasonable foreseeable") and past actions:

- Proposed NorthMet Project (PolyMet)
- Proposed Mesabi Nugget Plant (Mesabi Nugget, LLC)
- Proposed Cliffs-Erie Railroad Pellet Transfer project (Cliffs-Erie, LLC)
- Proposed NOνA Off-Axis Detector (University of Minnesota)
- Proposed expansions of existing taconite plants
- Shutdown of LTVSMC

The analysis will report findings for a typical year in four discrete periods: baseline year, construction period, operating period and closure period. Findings will be reported as projected changes in population characteristics, community structure, public attitudes, and availability of housing and community services.

### 3.3.9 Other – Reclamation (Item 30)

The EIS will evaluate the proposal with consideration for compliance with DNR rules for mineland reclamation. Minnesota Rules for nonferrous metallic metal mining (Chapter 6132) describe the DNR's policy for nonferrous mines, "…that mining be conducted in a manner that will reduce impacts to the extent practicable, mitigate unavoidable impacts, and ensure that the mining area is left in a condition that protects natural resources and minimizes to the extent practicable the need for maintenance." Alternative designs, layouts, and siting will also be evaluated to determine the most feasible reclamation strategy. Reclamation requirements and strategies for reactive waste rock will be included as part of this assessment. The three criteria that will be used in this evaluation will be protection of natural resources, minimization of long-term maintenance, and eventual land use objectives.

The Mining, Minerals and Sustainable Development Project Final Report will be reviewed and opportunities to incorporate recommendations from the report will be considered as part of PolyMet's reclamation plan. The EIS will suggest additions to the plan, to the extent that additions would provide mitigation for identified environmental impacts. Mineland reclamation planning will take into consideration local community land use goals.

As part of the permit to mine, financial assurance estimates will be developed on an annual basis for reclamation of mining activities that have occurred and are anticipated to occur during the upcoming year. This will include costs for reclamation in case of a premature shut down of mining operations. An evaluation of reclamation costs and its effect on facility design, construction and closure will be discussed in the EIS. This evaluation will include an assessment of reasonable closure maintenance costs to prevent release of reactive runoff into the environment. Although mineland reclamation rules allow for financial assurance for corrective action, the amount of financial assurance cannot be developed until the needed corrective action is known. For this reason financial assurance estimates associated with corrective action will not be included in the EIS. However, the EIS will describe the corrective action procedure and how financial assurance will be addressed in case a corrective action is needed.

## 4.0 IDENTIFICATION OF PHASED OR CONNECTED ACTIONS

There are no phased or connected actions associated with this project.

## 5.0 EIS SCHEDULE (TENTATIVE)

| | |
|---|---|
| June 2005 | Scoping EAW comment period (included public meeting) |
| October 2005 | Final Scoping Decision Document |
| January 2006 | EIS Preparation Notice Published |
| August 2006 | Draft EIS issued for public review (includes public meeting) |
| February 2007 | Final EIS Issued |
| May 2007 | EIS Adequacy Determined |

## 6.0 SPECIAL STUDIES OR RESEARCH

Many reports and studies will be developed to support the assessment of environmental impacts from the project. The project proposer will provide the following reports to the DNR and USACE for review and incorporation into the EIS. The content of these will be independently reviewed and confirmed by state/federal agencies or the EIS contractor prior being incorporated into the EIS.

### 6.1 Process Design - Tailings Basin Water Balance

This report will provide an estimate of the water balance for the tailings basin, quantifying both discharge and makeup water demand. The discharge will consist of two parts: 1) the unrecovered seepage through the dams and 2) a permitted discharge from the basin (this could either be on site or pumped to a POTW). The water balance will include precipitation, evaporation, runoff from upland areas, water from the concentrator used to transport tailings, water to the concentrator for reuse, seepage between cells, seepage from the basin and water retained in the tailings. A discussion of the HydroMet plant water balance demonstrating that the plant will be a net water user will be included. Assumptions made and modeling methods will be explained. The water balance will include operation, closure, and post-closure and will include an evaluation of average conditions as well as wet and dry cycles.

### 6.2 Hydrology - Mine Water Model & Balance

This report will provide an estimate of the overall quantity of water to be discharged from the mine site. The discharge will consist of three parts: 1) non-contact runoff including seepage from wetlands (based on Mine Diking/Trenching Effectiveness Study) and runoff from undisturbed portions of the site (based on Surface Water Runoff Systems); 2) non-reactive runoff including runoff from capped stockpiles and general runoff from non-reactive stockpiles (both based on Mine Wastewater Management Systems Study) and 3) reactive runoff including stockpile seepage and pit inflow. The water balance will include precipitation, evaporation soil/stockpile storage and groundwater inflow to the mine pit. Assumptions made and modeling methods will be explained. A groundwater flow model will be developed to predict the amount of groundwater inflow into the mine pit/pits at various stages in pit development (i.e., year 1, year 5, year 10, year 20). The model will take into account groundwater inflow from the Duluth

Complex, the Virginia Formation, and the surficial sediments. The water balance will include operation, closure, and post-closure and will include an evaluation of average conditions as well as wet and dry cycles. As part of the closure evaluation, the time required for the pit to fill will be evaluated for a variety of filling scenarios, including flooding the pit by using water from the Partridge River.

### 6.3 Mine Wastewater Management Systems

This report will review and discuss plans to segregate reactive and non-reactive mine wastewater with a focus on reactive mine wastewater. At least 2 scenarios will be evaluated, separate collection systems for segregated waste stockpiles and segregated collection systems for a combined stockpile. The following aspects of stockpile design investigated in the Reactive Waste Segregation report will be incorporated: capping systems to minimize the amount of precipitation passing through the stockpile and liner systems to capture the water flowing through the stockpile and keep groundwater from entering the stockpile. Liner systems for ditches and ponds transporting or storing reactive wastewater will be studied. Plans will minimize the use of ditches by using pipelines wherever practical. Transfer from operating mode to closure mode will also be discussed. The report will include operation, closure, and post-closure and will include an evaluation of average conditions as well as wet and dry cycles. Long-term maintenance will also be addressed. The report will also address the possibility of overflow due to uncommon storm events and the impact of uncollected runoff. Transfer of all of part of this water to the plant as makeup water will also be included.

### 6.4 Mine Surface Water Runoff Systems

This report will review and discuss plans to segregate non-contact and non-reactive mine surface runoff from reactive runoff with a focus on non-contact and non-reactive runoff. Aspects to be included are the design of conveyance systems from stockpiles to minimize erosion, sediment pond design and transition from systems for use during mining operations to systems for use after mine closure. The report will also provide an estimate of the quality of non-reactive runoff. Note that this report is closely related to the Mine Diking/Trenching Effectiveness Study in that both studies address aspects of non-contact runoff water management. The design of sediment ponds for non-contact water emanating from the interceptor dikes/trenches will be addressed in this report.

### 6.5 Mine Diking/Trenching Effectiveness Study

This report will review and discuss plans to intercept and handle non-contact runoff water from wetland areas adjacent to the mine. Aspects to be investigated include the design of conveyance systems around the mine, permeability of dikes, corrective actions to be implemented if a sand/gravel zone is encountered in the construction of the interceptor system and transition from systems for use during mining operations to systems for use after mine closure.

### 6.6 Wastewater Treatment Options

This report will review and discuss the options for the location of wastewater treatment plants. Because it may become necessary to discharge mine site reactive wastewater via the tailings basin to comply with Great Lakes Initiative (GLI) mercury constraints, mine site treatment options (no treatment, pretreatment, full treatment) and tailings basin treatment options (pretreatment, full treatment) will be discussed. Discussion on mine site/tailings basin locations will include the ability of the receiving waters to accept the quantity and quality of water expected. Because it may become necessary to discharge via a POTW to comply with GLI mercury constraints, pretreatment at site with discharge via the Hoyt Lakes or Babbitt POTW will be discussed. Discussion on POTWs will include their ability to accept the quantity and quality of water expected. On-site treatment plant location options are one at the mine site and one at the tailings basin or a single treatment plant at the tailings basin. The report on Wastewater Treatment Technologies will provide input to this report.

### 6.7 Reactive Waste Rock Stockpile Chemical Modification

This report will present a waste management plan implementing the concept of adding materials to reactive mine waste stockpiles to modify the chemical reactions that take place within the stockpile to prevent release of acid or dissolved metals. The plan will include stockpile design and impacts of this approach on reactive mine wastewater management systems and wastewater treatment systems.

### 6.8 Mine Pit Water Quality Model

This study will use available waste rock/lean ore characterization data, other laboratory and field data, literature results, and scientific principles to estimate mine pit water quality as a function of time. Estimates will be made for the operating, closure and post-closure periods and will model water quality under various closure scenarios. The study will explain the assumptions made to develop the model and the rationale for modeling tool selection and provide a range of water quality estimates (sensitivity analyses).

### 6.9 Mine Waste Management Plan

A draft Mine Waste Management Plan will be developed. The plan will include sections on waste categorization criteria, mine block model (including update methods - in-fill core/RC drilling and blast hole drilling), a blast hole monitoring program to field verify waste grade and volume, waste disposal control/monitoring via automated mine dispatch system, and stockpile design. The final operating plan will be finalized as part of the permit to mine and updated annually to reflect changes in knowledge of waste behavior and management technology.

### 6.10 Wastewater Modeling - Waste Rock and Lean Ore

This study will use available waste rock/lean ore characterization data, other laboratory and field data, literature results, and scientific principles to estimate reactive mine waste rock stockpile water quality as a function of time. Estimates will be made for the operating, closure and post-closure periods and will model water quality under various closure scenarios. The study will

explain the assumptions made to develop the model, the rationale for modeling tool selection and provide a range of water quality estimates (sensitivity analyses).

### 6.11 Water Treatability Study - Waste Rock and Lean Ore

One to three technologies identified in the Water Treatment Technology report using data from various sources including but not limited to Hydrology - Mine Water Model & Balance, Mine Pit Water Quality Model and Waste Water Modeling - Waste Rock and Lean Ore will be evaluated in bench-scale testing to determine operating parameters needed to achieve the required discharge standards for waste rock and lean ore wastewaters.

### 6.12 Wastewater Modeling – Tailings

This study will use available tailings waste characterization data, other laboratory and field data, literature results, predictions of process water chemistry and scientific principles to estimate water quality in the tailings basin and in seepage from the tailings as a function of time. Estimates will be made for the operating, closure and post-closure periods and will model water quality under various closure scenarios. The study will explain the assumptions made to develop the model, the rationale for modeling tool selection, and provide a range of water quality estimates (sensitivity analyses).

### 6.13 Water Treatability Study – Tailings

One to three technologies identified in the Wastewater Treatment Technology report using data from various sources including but not limited to Process Design - Tailings Basin Water Balance, and Wastewater Modeling - Tailings will be evaluated in bench scale testing (using water from the flotation pilot testing activities) to determine operating parameters needed to achieve the required discharge standards for tailings basin water.

### 6.14 Closure Plan

A draft Mine Closure Plan will be developed. The plan will include sections on watercourse restoration, mine and plant site reclamation, structure demolition, site remediation and ongoing maintenance/water treatment. An estimate for all closure costs will be included. The final closure and reclamation plan will be finalized as part of the permit to mine and updated annually to reflect changes in closure costs and integration with area mine reclamation/reuse strategies.

## 7.0 Mitigation and Monitoring

Minnesota Rules Chapter 4410.2300 identifies that the EIS shall include mitigation measures that could reasonably eliminate or minimize any adverse environmental, economic, employment, or sociological effects of the project. To meet this requirement the EIS will evaluate and discuss mitigation measures to address adverse effects identified as a result of analyses proposed in Section 3.2 and 3.3 of the Scoping Decision Document.

The EIS will also provide information about the types of monitoring needed to verify predictions made in the EIS and ensure compliance with permit conditions. Specific monitoring plans will be developed and included in the permitting process, which may or may not occur simultaneously with preparation of the EIS. To the extent that specific monitoring plans are available, they will be included as part of the EIS. If a specific monitoring plan is not available, and has been recognized in the EIS process as needed, a conceptual monitoring plan will be developed as part of the EIS. Monitoring programs will provide a means to identify non-compliance with permit requirements, so that corrective action can be developed to minimize unforeseen impacts from the project.

## 8.0 Government Permits and Approvals

The EIS will identify all permits and approvals required for this project. While some permit application review may occur concurrently with EIS preparation, the EIS will not necessarily contain all information required for a decision on those permits. No permits have been designated to have all information developed concurrently with the preparation of the EIS nor will any require a record of decision pursuant to Minnesota Rules part 4410.2100, subpart 6.D. However, the USACE will use the Final EIS to develop a Record of Decision on PolyMet's the Clean Water Act Section 404 permit.