

**PolyMet Mining, Inc.  
NorthMet Project**

**Addendum 01**

**Supplemental Information to the November 2006 Air Quality  
Cumulative Impact Assessment Report on Mercury Deposition and  
Evaluation of Bioaccumulation in Fish in Northeast Minnesota**

**EIS Report/Study RS70**

**Submitted in Support of the PolyMet Mining Company's  
NorthMet Mine and Ore Processing Facilities Project  
Environmental Impact Statement**

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## **1.0 Introduction**

The October 2005 Scoping Decision Document for the NorthMet project Environmental Impact Statement (EIS) identified that four air quality cumulative impact assessments were to be conducted.

- Ecosystem Acidification (RS69)
- Mercury Deposition and Evaluation of Bioaccumulation in Fish in Northeast Minnesota (RS70)
- Assessment of Potential Visibility Impacts in Federal Class I Areas in Minnesota (RS71)
- Evaluating Particulate Matter (PM10) Air Concentrations in Federal Class I Areas in Minnesota (RS37)

These four air quality cumulative impact assessments were also required to be conducted for the Minnesota Steel Industries, LLC, (Minnesota Steel) EIS. Because the Minnesota Steel and NorthMet projects were proceeding through Minnesota's environmental review process at the same time, the approved scopes of the respective analyses and the information to be used in assessing potential cumulative impacts in each respective reports is essentially identical for the two projects.

Minnesota Steel submitted their final cumulative impact report on Mercury Deposition and Bioaccumulation in October 2006. The two air quality cumulative impact reports prepared by Minnesota Steel addressing visibility and PM10 in Class I Areas in Minnesota were finalized in early November 2006 and at that time MPCA staff identified that no additional changes were needed to the August 2006 Ecosystem Acidification report. Report RS70 (Cumulative Impacts Assessment, Mercury Deposition and Bioaccumulation in Fish) for the NorthMet project was then submitted to the Minnesota Pollution Control Agency (MPCA) and the Minnesota Department of Natural Resources (MDNR) for review in late November 2006. The information in Report RS70 was intended to be identical to the information submitted in Minnesota Steel's October 2006 Mercury Deposition and Bioaccumulation in Fish Report, with only minor changes in text to accommodate the report submittal on behalf of PolyMet Mining Inc. (PolyMet). Subsequent to the delivery of RS70 and the other air quality cumulative impact reports to the agencies, PolyMet made changes to the project.

[Note: Both the Minnesota Steel project and the NorthMet project required similar cumulative air quality impact analyses to be conducted at approximately the same time and the two companies agreed to co-fund Barr Engineering's work. Because Minnesota Steel's project moved more

quickly to completion, the cumulative impact reports were finalized for that project first. Therefore, PolyMet's cumulative impact reports should reflect the final reports submitted for the Minnesota Steel project]

This Addendum provides a summary of the project changes submitted to the Minnesota State Agencies in July 2007 and the need to revise Report RS70 due to those changes.

## **2.0 NorthMet Project Information Assessed in Report RS70**

The data and information from the NorthMet project that were included in the cumulative impact assessment for Mercury Deposition and Evaluation of Bioaccumulation in Fish in Northeast Minnesota (RS70) included the following:

- Mine (ore) production rate of 32,000 tons/day.
- Crushing Plant production rate of 100,000 tons/day.
- Hydrometallurgical Plant production based on ore processing rate of 32,000 tons/day.
- Total facility potential to emit estimate of 8 pounds/year for mercury, including potential air emissions from the Plant Site, Tailings Basin and Mine Site. Most of the estimated emissions are associated with the Hydrometallurgical Plant.

The emphasis in the analysis is to assess whether the cumulative emissions from all proposed projects and reasonably foreseeable regulatory and voluntary actions have the potential for significant impact to the environment. A total of 9 proposed projects were included in the cumulative impacts analysis with potential emissions from all projects estimated to be approximately 221 pounds/year (Table 1). The NorthMet project potential mercury air emissions are approximately 3.6% of the estimated total proposed project emissions.

The Overview to Report RS70 identifies that there is a net reduction of approximately 1,300 pounds/year in statewide mercury emissions when the proposed projects and reasonably foreseeable regulatory actions and voluntary reductions are considered as a whole (Table 2).

The potential mercury emissions from the NorthMet project are not significant when compared to the potential mercury emissions from other proposed projects and to the potential future reductions due to reasonably foreseeable regulatory and voluntary actions.

**Table 1. Maximum potential mercury emissions from proposed projects and comparison to selected voluntary proposed actions that reduce emissions.**

(Adapted from: Table 1, Cumulative Impact Analysis, Mercury Deposition and Evaluation of Bioaccumulation in Fish in Northeast Minnesota, RS70; November 2006 draft)

Project	Location	Potential Emissions (pounds/year)	Mass Balance Completed/ Controls Evaluated?	Estimated Speciation Of Air Emissions [13]
Excelsior Energy [1]	Subject to State Site Process	42	Pending	Hg(0): 100%
Mesabi Nugget DRI Plant [2]	Hoyt Lakes	75	Yes	Hg(0): 99.3% Hg(II): 0.5% Hg(p): 0.2%
Minnesota Steel Industries[3]	Nashwauk	81	Yes	Hg(0): 99.8% Hg(II): 0% Hg(p): 0.2%
Northshore Mining Company: Furnace 5 Reactivation Project [4]	Silver Bay	1	Yes	Hg(0): 100%
PolyMet Mining, NorthMet Project [5]	Hoyt Lakes	8	Yes	Hg(0): 100%
United Taconite: Emissions and Energy Reduction Project [6]	Forbes	0	No	--
US-Steel Keewatin Taconite Fuel Diversification and Pollution Control Equipment Upgrade [7]	Keewatin	0	Yes	--
UPM/Blandin Paper Mill Expansion [8]	Grand Rapids	2	Yes	Hg(0): 100%
Laurentian Wood-Fired Energy Project [9]	Virginia/Hibbing	12	Yes	Hg(0): 100%
Total		221		
LTV Steel Mining Company (LTVSMC): Facility Closure (2001) [10]	Hoyt Lakes	-83		
Minnesota Power AREA proposal [11] (implemented by 2009)	Taconite Harbor	-64		
“Net” Emissions: Net Emissions = Proposed Projects – LTVSMC – AREA		74		
Other Emissions: Butler Taconite [12]	Nashwauk	-55		

Prepared April 2006; updated for November 2006 draft report:

- [1] Preliminary emission estimates, total for Phase I and Phase II, based on emission factors and heat inputs provide on Excelsior Energy Web site, [www.excelsiorenergy.com](http://www.excelsiorenergy.com), accessed on October 28, 2005.
- [2] Mesabi Nugget's Proposed Facility: Receive concentrate from off-site, Rotary Hearth Furnace: Air Permit Application, May 2005. Mercury mass balance completed; HG-2003 form completed.
- [3] Minnesota Steel Industries, Draft Permit Application and HG-2003 Form submittal to the MPCA, September 2006. Based on data from Minnesota Steel’s drill core analysis, the 95% confidence level high-end estimated emissions of mercury to air = 81 pounds. The “average” potential estimated emissions of mercury to air = 61 pounds. For this cumulative analysis, the high-end estimate of 81 pounds per year is used. If the average of 61 pounds per year is used in this analysis, the “net” increase in potential Hg emissions is 49 pounds/year, not taking into account the emissions reduction from Butler Taconite.
- [4] Northshore Mining’s Furnace 5 Project: reactivating 2 crushing lines, 9 concentrating lines, one pellet furnace (Furnace 5); new sources emissions only; EAW Table 6 (May 20, 2005). A “Total Facility Mercury Evaluation” was completed in 1999 for a direct reduced iron project. This total facility evaluation included an assessment of potential control technologies for reducing mercury releases to air, water, and land. The evaluation included Furnace 5. This 1999 evaluation was considered relevant and valid for the Furnace 5 Reactivation Project and was used as a reference in lieu of completing the HG-2003 form.
- [5] PolyMet Mining’s Proposed Facility: crushing/grinding of ore, reagent and materials handling, flotation, hydrometallurgical processing. Emission estimate is an update to EAW based on preliminary analysis of 2005 and 2006 pilot-plant stack test data using standard EPA Method 29; conservatively assumes non-detects are one-half the detection limit.
- [6] United Taconite Emissions and Energy Reduction Project; this project did not involve a change in potential mercury emissions. MPCA, Permit Change/Modification Application Forms, Line 1 Emissions and Energy Reduction Project (EERP), September 2004.
- [7] U.S. Steel Keewatin; Technical Support Document Permit Action #13700063-003, Dated 2/28/05. A total facility mercury mass balance was completed for the project. MPCA determined that there would be no change in the total facility mercury emissions.

Table 1 footnotes (continued)

- [8] Draft EIS, UPM/Blandin Paper Mill Project Thunderhawk, January 2006, Table 6-29; (PTE Increase due to expansion).
- [9] Laurentian Energy Project, Technical Support Documents for Virginia Public Utilities (MPCA Permit # 13700028-005) and Hibbing Public Utilities (MPCA Permit #13700027-003); Combined PTE for two new wood fired boilers (one at each site). The permit technical support documents estimate that actual Hg emissions are likely to be reduced by about one pound per year due to wood use in new boilers displacing coal in existing boilers.
- [10] LTVSMC: Permitted emissions (potential to emit) information from Technical Support Document for Air Emissions Permit No. 13700009-001, Table 1. From <http://www.pca.state.mn.us/data/edaAir/index.cfm>; downloaded on December 14, 2005. Emission reductions due to the shutdown of Butler Taconite in 1985 were not included because statewide mercury inventory comparison data starts in 1990. Mercury emissions from Butler Taconite peaked at 59 pounds per year in 1971 (Berndt, 2003, Appendix 3).
- [11] MPCA, January 17, 2006, Review of Minnesota Power's Arrowhead Regional Emission Abatement (AREA) Project. Table 12 (MPCA 2006a). Just prior to the MDNR's Final Decision Document being made available to the public on October 25, 2005, Minnesota Power announced a major initiative to reduce pollutant emissions, including mercury, at several of its power plants in northern Minnesota. Due to the significance of the AREA project, it was included in the analysis.
- [12] Butler Taconite. Maximum estimated emissions of 55 pounds/year for Butler Taconite using an emission factor similar to National Steel Pellet Company (Berndt 2003, Appendix 3). (Note: National Steel Pellet Company is now known as US Steel - Keewatin Taconite).
- [13] Speciated mercury air emissions for the proposed projects are from available information. As a point of comparison, speciation of taconite processing emissions has been characterized by the MPCA and MDNR for 2001 emissions (unpublished data):
- |  |  |
|--|--|
| Hibbing Taconite*:                             | 93.3% elemental; 6.6% oxidized; 0.1% particle-bound  |
| United Taconite*:                              | 93.3% elemental; 6.6% oxidized; 0.1% particle-bound. |
| U.S. Steel Minnesota Ore Operations (MinnTac)* | 93.3% elemental; 6.6% oxidized; 0.1% particle-bound  |
| U.S. Steel - Keewatin Taconite                 | 80% elemental; 10% oxidized; 10% particle-bound      |

\*note: speciation for Hibbing Taconite, United Taconite, and MinnTac is based on Ontario Hydro test data from Hibbing Taconite (2000).

Recognizing uncertainty in the estimated speciation for the proposed projects, deposition calculations in Section 6.0 of this report are also conducted with the following mercury speciation for all of the proposed projects: 93% elemental, 5% oxidized, 2% particle-bound.

**Table 2. Mercury emissions summary related to proposed projects and expected future reductions due to Minnesota voluntary actions and the 2006 Mercury Reduction Act.**

(Adapted from: Table OV-1, Cumulative Impact Analysis, Mercury Deposition and Evaluation of Bioaccumulation in Fish in Northeast Minnesota, RS70; November 2006 draft)

Description	Mercury Emissions (lbs/year)
Total Statewide Emissions in 2000 *	3,638
Emission Reductions from Point Sources 2000-2003**	(188)
Potential Emission Increases from Proposed Projects***	221
Reasonably Foreseeable Future Emission Reductions (2003-2015)****	(1,334)
Total	2,337
Net Change in Mercury Emissions Due to Reasonably Foreseeable Actions*****	(1,301)

\* Statewide emissions of 3,638 pounds/year from the MPCA’s “2005 Mercury Reduction Progress Report to the Legislature”. (MPCA 2005a).

\*\*Emission reductions include: 70 pounds/year due to Minnesota Power’s switch to Western coal; 83 pounds/year due to LTV Steel Mining Company plant closure in 2001; 35 pounds/year Xcel Energy switch from coal to natural gas at the Black Dog facility.

\*\*\*Proposed Projects: In addition to the Minnesota Steel project and PolyMet Mining’s NorthMet project, seven other proposed projects are included in this analysis, including the Mesabi Nugget DRI project. Table 1 in Section 1.1 of this report lists the proposed projects included in this analysis and their estimated potential mercury emissions.

For Minnesota Steel which is reactivating the former Butler mine that closed in 1985, the estimated proposed project emissions include a high-end estimate of 81 pounds per year. The estimated emissions from Butler Taconite were approximately 55 pounds per year (Berndt 2003). Therefore the potential net site emission increase, based on these emission estimates for Minnesota Steel and Butler Taconite, is approximately 26 pounds per year. The actual emissions increase for the site may be approximately 6 pounds per year when the average Minnesota Steel mercury emissions of 61 pounds per year is taken into consideration.

\*\*\*\*Future emission reductions include: 64 pounds/year, Minnesota Power AREA project; 170 pounds/year, Xcel Energy MERP; 1,100 pounds/year 2006 Mercury Reduction Act. The relationship between the emission reductions anticipated under the 2006 Mercury Reduction Act and the Clean Air Mercury Rule is uncertain at this time. To avoid double counting reductions, the estimated reductions due to the Clean Air Mercury Rule are not included in this table.

\*\*\*\*\*Additional reductions due to the implementation of the Statewide Mercury Total Maximum Daily Load (TMDL) are not included here. The TMDL goal is to reduce Minnesota mercury emissions to approximately 789 pounds per year. Based on the estimated “Total” emissions of 2,332 pounds per year, an additional reduction of 1,543 pounds per year (a 66% reduction) will be needed to meet the TMDL goal.

### **3.0 NorthMet Project Changes Not Reflected in Report RS70**

A summary of NorthMet project changes and a supplemental Detailed Project Description (DPD) were provided to the Minnesota Department of Natural Resources (MDNR) in July 2007. Appendix A includes the July 2007 summary of project changes.

The major changes to the NorthMet project were identified as follows:

1. **Concentrate Mode.** This mode of operations provides for the production and shipping of mostly copper concentrate ('copper' concentrate) and mostly nickel concentrate ('nickel' concentrate) as products in addition to the copper metal, nickel cobalt hydroxide and Platinum Group Metals/silver (PGM/Au) concentrate products currently defined. The Concentrate Mode provides operating flexibility for PolyMet. When operating in Concentrate Mode, the Hydrometallurgical Plant will not be operating or not operating at full capacity, thereby reducing power demands and other production activities downstream of the concentrator. Additional equipment for concentrate drying and handling and shipping dried concentrate will be installed.
2. **Limestone.** In the original NorthMet Project Description, lump limestone would initially be delivered by truck to the existing conveyor feeding the bins above the 3S Mill Line. Truck delivery was assumed to occur for up to two years. Ultimately, lump limestone would be rail delivered to an enclosed car dumper and stockpiled in the existing Coal Yard for reclaim into a new grinding system. Now, a local supplier of ground limestone is available and the option of delivering ground limestone is being considered. PolyMet is negotiating with suppliers and developing plans to use lump or ground limestone.
3. **Rail Car Maintenance.** Rail Car Maintenance was to be at the Area 2 Shop because the existing rail car maintenance facilities at the General Shop were not available for PolyMet's use. Because those facilities are now available, Rail Car Maintenance will be relocated to the General Shop.
4. **Course Tailings Mitigation.** Conservative water chemistry modeling for the tailings basin identified potential impacts to groundwater and surface water. To mitigate potential groundwater quality impacts from sulfate and surface water discharge impacts from sulfate, nickel, copper and cobalt associated with coarse tailings used in dam construction, a revision to the tailings deposition plan has been developed to minimize the mass of dams. Additional mitigation measures are described in Appendix A to this Addendum.

5. Category 3 Lean Ore Stockpile Mitigation. The Category 3 liner system under the Category 3 Lean Ore Stockpile will be replaced with a Category 4 liner system to provide better environmental protection against impacts from potential acids and metals leaching.
6. Overburden Stockpile Mitigation. The Overburden Stockpile will be eliminated by combining it with the Category 1 / 2 Waste Rock Stockpile.
7. Relocation of Mine Site 138 Kv Substation. Minnesota Power has revised the location of their proposed substation to serve the Mine Site so that the substation is on land owned by Minnesota Power.
8. Permitting Mine Site and Plant Site as a Single Synthetic Minor Source. PolyMet has proposed to permit the Mine Site and Plant Site as a single stationary source. This has resulted in refinement of estimates of potential actual emissions. PolyMet will propose emissions and operating limitations for some plant equipment to maintain potential actual emissions below the PSD Major Source Threshold of 250 tons/year for PM<sub>10</sub>, SO<sub>2</sub> and NO<sub>x</sub>, respectively.

## **4.0 Project Changes and the Need to Revise Report RS70**

The project changes identified in Section 3.0 are assessed below in regard to their effect on mercury emissions from the NorthMet project and the need for revising Report RS70.

1. **Concentrate Mode.** When operating in Concentrate Mode, the Hydrometallurgical Plant will not be operating or not operating at full capacity, thereby reducing power demands and other production activities downstream of the concentrator. Operating in Concentrate Mode is expected to result in lower mercury emissions from the Hydrometallurgical Plant. Concentrate will be dried by hot oil heated screws and that the oil will be electrically heated. Overall, the Concentrate Mode will likely result in lower Plant Site mercury emissions; operating in Concentrate Mode is not expected to significantly increase potential mercury emissions from the Plant Site. Handling and shipping dried concentrate are not expected to produce mercury air emissions.
2. **Limestone.** Changes to the limestone (lump or ground) delivered to the site is not expected to have an effect on potential mercury emissions from the Plant Site.
3. **Rail Car Maintenance.** The shift in Rail Car Maintenance from the Area 2 Shop to the General Shop is not expected to have an effect on potential mercury emissions from the Plant Site.
4. **Course Tailings Mitigation.** The revised tailings deposition plan and other mitigation measures to be undertaken at the Tailings Basin are not expected to have an effect on mercury emissions.
5. **Category 3 Lean Ore Stockpile Mitigation.** The change from a Category 3 liner system under the Category 3 Lean Ore Stockpile to a Category 4 liner system is not expected to have an effect on potential mercury emissions.
6. **Overburden Stockpile Mitigation.** Eliminating the Overburden Stockpile is not expected to have an effect on potential mercury emissions.
7. **Relocation of Mine Site 138 Kv Substation.** Relocating the substation to land owned by Minnesota Power is not expected to have effect on potential mercury emissions.
8. **Permitting Mine Site and Plant Site as a Single Synthetic Minor Source.** PolyMet has proposed to permit the Mine Site and Plant Site as a single stationary source. This has resulted in refinement of estimates of potential actual emissions. PolyMet will propose emissions and

operating limitations for some plant equipment to maintain potential actual emissions below the PSD Major Source Threshold of 250 tons/year for PM<sub>10</sub>, SO<sub>2</sub> and NO<sub>x</sub>, respectively. This change in air permitting is not expected to affect estimated potential mercury emissions from the project.

Only one of the 8 changes identified for the NorthMet project are expected to affect potential mercury air emissions: Concentrate Mode. Operating in Concentrate Mode is expected to reduce the potential mercury emissions from the Hydrometallurgical Plant and other downstream sources. It is unlikely that the potential mercury emissions from the Concentrate Mode would result in significantly higher emissions (8 pounds/year) than already estimated for the NorthMet project.

In light of the changes to the NorthMet project that likely reduce the estimates of potential mercury emissions, Report RS70 can be considered a conservative analysis because it uses the higher estimate of potential mercury emissions (~ 8 pounds/year) from the NorthMet project. With the higher potential mercury emissions from the NorthMet project included in the analysis, the overall conclusion from the cumulative impacts assessment is that the proposed projects are not likely to have any measurable effect on mercury deposition or fish tissue concentrations in northeastern Minnesota.

Incorporating a lower estimate of potential mercury emissions from the NorthMet project into the analysis would improve an already favorable conclusion. Therefore, it is concluded that the comparisons and assessments of potential cumulative emissions from the proposed projects in Report RS70 do not need to be revised or updated.

## 5.0 Summary and Conclusions

The previous discussions identify that even though changes were made to the project after submittal of Report RS70 (November 2006 draft), the overall effect of the project changes are likely to reduce the estimate of potential mercury emissions from the project. Therefore, the current version of Report RS70 provides a conservative estimate of potential air emissions for the proposed project.

The overall conclusions and findings from Report RS70 (November 2006 draft) are as follows:

*The proposed new and expansion projects are located in northern Minnesota where there are numerous lakes that are important for sport fishing, subsistence fishing, and other recreational opportunities. A primary concern is the potential for adverse impacts to the lake resource in this area from the proposed projects. However, the following findings indicate that emissions from the proposed projects are not expected to have a measurable effect on current mercury deposition and bioaccumulation in fish in northeast Minnesota or adjoining states.*

- *Proposed Cumulative Emissions:*
  - *Potential mercury air emissions from reasonably foreseeable projects are estimated to be approximately 221 pounds per year, primarily as elemental mercury (93-99% elemental). Statewide 2005 mercury emissions are estimated at 3,341 pounds, with emissions from taconite mining and coal-fired power plants estimated to be approximately 2,329 pounds (MPCA 2005a).*
  - *While the new projects may emit up to 221 pounds of mercury per year by 2015, emission reductions from Iron Range sources offset this potential increase:*
    - *Mining-related emissions have decreased by approximately 138 pounds per year since 1985 (shutdown of the Butler Taconite facility at 55 pounds per year and shutdown of the LTVSMC facility at 83 pounds per year).*
    - *When 2000 is used as a baseline, the following reductions have occurred: the shutdown of LTVSMC in 2001 reduced emissions by about 83 pounds per year; Minnesota Power's use of lower mercury coal reduced emissions by about 70 pounds per year (MPCA 2005a); the planned reductions at Minnesota Power's Taconite Harbor electric generating plant should further reduce nearby emissions by about 64 pounds per year (MPCA 2006a); Clay Boswell Unit #3. When these reductions are taken into account, there is a net decrease of approximately 1 pound per year in mercury emissions in the four-county project area of Itasca, St. Louis, Lake, and Cook Counties by 2015.*
    - *Implementation of the Minnesota Mercury Reduction Act of 2006 could reduce emissions from Minnesota Power's Clay Boswell Plant an additional 400 pounds per year by 2014.*

- *The potential mercury emissions from the proposed projects are further offset by Xcel Energy's MERP which reduces emissions by 170 pounds per year.*
- *Potential Cumulative Deposition*
  - *The proposed projects are not expected to measurably increase mercury deposition to northern Minnesota; therefore, the proposed new projects are not expected to cause an increase in bioaccumulation of mercury in fish in northeast Minnesota lakes or streams.*
  - *The proposed projects will primarily emit elemental mercury, which does not tend to be deposited locally near an emission source (MPCA 2005b; EPA 2006). As a result, the proposed projects are expected to have little effect on the current or future level of mercury deposited in northeast Minnesota.*
  - *Mercury deposition and fish bioaccumulation rates in northeastern Minnesota are primarily driven by national and global emission rates, not by in-state or local emissions. Approximately 10% of the mercury deposition to Minnesota is due to in-state sources; approximately 90% comes from outside the state (MPCA 2005b).*
  - *Sediment core data indicate that mercury deposition in the Great Lakes region (EPA 2006) and in parts of Minnesota, including Itasca County and Voyageurs National Park, has declined since the 1970s (Engstrom et al. 1999). Recent data indicate that mercury concentrations in fish in Minnesota and in the Great Lakes as a whole are declining in response to emission reductions (MPCA 2005b; EPA 2006).*
  - *Mercury deposition to northeast Minnesota lakes in St. Louis, Lake, and Cook Counties does not show a decline (Engstrom et al. 1999). However, sediment core studies conducted in northern Minnesota indicate that lakes located near the Iron Range and taconite processing facilities that primarily emit elemental mercury have mercury deposition rates similar to other Minnesota lakes that are distant from emission sources (Engstrom et al. 1999). Mercury fish concentrations in lakes immediately adjacent to the Iron Range are similar to fish concentrations in other lakes that are more distant from the Iron Range (Berndt 2003; MPCA 2006b). The available data indicate that Iron Range emission sources do not appear to affect mercury deposition to northeast Minnesota lakes.*
  - *Two estimates of potential deposition from the proposed projects were calculated. Both estimates are conservative in that they likely over-estimate the potential deposition associated with the proposed projects. Both estimates assume that all of the proposed projects move forward to full operation (~ 221 pounds/year of potential emissions) and there are no mercury reductions to offset the potential emissions from the proposed projects. Section 6.0 of this report provides additional details on the calculations.*

- *Within the four-county project area, it is estimated that the proposed projects could potentially increase mercury deposition by 0.16% to 1.6%; from  $12.5 \mu\text{g m}^{-2} \text{yr}^{-1}$  to  $12.52$  to  $12.7 \mu\text{g m}^{-2} \text{yr}^{-1}$ , respectively.*
  - *Based on the proportionality concept used by MPCA in developing the statewide mercury TMDL (MPCA 2006b), it is estimated that emissions of 221 pounds per year from the proposed projects could potentially increase mercury deposition by 0.6%, from  $12.5 \mu\text{g m}^{-2} \text{yr}^{-1}$  to  $12.58 \mu\text{g m}^{-2} \text{yr}^{-1}$ .*
  - *In both cases, this potential increase in mercury deposition is not expected to be measurable given the inherent variability in measuring and calculating mercury deposition.*
- *Future Actions to Reduce Emissions*
    - *Additional reductions in Minnesota's mercury air emissions are expected to occur due to foreseeable regulatory actions (Minnesota Mercury Reduction Act of 2006 and possibly from implementation of the Taconite MACT and BART/Regional Haze requirement, CAIR, CAMR, and the statewide mercury TMDL).*
    - *Because of the importance of out-of-state emissions to mercury deposition in Minnesota, the overall impact of the in-state emission increases or reductions on the deposition of mercury in northeast Minnesota and subsequent bioaccumulation in fish is likely to be small.*
    - *Implementation of the TMDL and the measured response, or lack of a response, in mercury deposition and fish concentrations will determine the extent of national and global emission reductions needed in order for Minnesota to comply with the mandates of the TMDL program.*

*Based on the findings presented above, the cumulative potential emissions from the proposed projects do not have the potential to cause or significantly contribute to mercury deposition and bioaccumulation in fish in northeast Minnesota lakes or streams.*

The changes to the NorthMet project as of July 2007 are expected to reduce potential mercury emissions. The associated reduction in potential emissions from the project do not change the overall conclusions in Report RS70; the higher NorthMet project emissions evaluated in Report RS70 provide for a more conservative analysis (i.e., overestimates potential contributions from the NorthMet project); a reduction in potential emissions for the NorthMet project improves an already favorable outcome for the environment. Therefore, it is concluded that this addendum is sufficient for updating Report RS70 and the changes to the NorthMet project do not require that Report RS70 be revised and resubmitted to the Minnesota state agencies.

## **Appendix A**

### **Changes to the NorthMet Project Identified as of July 13, 2007**

## Supplemental NorthMet Project Description - Summary July 13, 2007

Subsequent to the delivery of the NorthMet Project Description in January 2007, PolyMet has made changes to the project. This document summarizes those changes. A supplemental NorthMet Project Description is attached. The supplemental NorthMet Project Description contains all numbered section headings but only section paragraphs where the text has changed. Yellow highlight is used to focus attention on changes. Sections with changes have highlighted headings. The following paragraphs summarize the changes:

### **Concentrate Mode**

#### **Concept:**

PolyMet has recognized that a minor change in the project will provide significant operating flexibility without, in PolyMet's assessment, significant environmental impact. That change is to provide for the shipping of a mostly copper concentrate ('copper' concentrate) and mostly nickel concentrate ('nickel' concentrate) as products in addition to the copper metal, nickel cobalt hydroxide and PGM/Au concentrate products currently defined. There would be no change in the Mine Site, rail hauling of ore, Beneficiation Plant or flotation tailings portions of the project when operating in concentrate mode. The 'copper' and 'nickel' concentrates would be produced by separating the bulk concentrate into a 'nickel' concentrate and a 'copper' concentrate. This process step will be located within existing buildings and will not result in an additional waste stream. The 'copper' and 'nickel' concentrates produced would be filtered, dried and shipped instead of being processed by the Hydrometallurgical Plant.

The additional facilities to accomplish this are:

1. A series of concentrate separation flotation cells to separate the bulk concentrate into 'nickel' and 'copper' concentrates.
2. A pump/piping system to transport the two concentrate slurries to a Dewatering Plant located at the Heating and Additive Plant.
3. A pump/piping system to transport thickener overflow, filtrate and filter overflow from a Dewatering Plant to the Mill Process Water Tank in the Beneficiation Plant.
4. A Dewatering Plant consisting of two identical parallel process lines consisting of a thickener, filters and dryer located in new or existing buildings on disturbed ground at Heating and Additive Plant at the Pellet Plant level of the Plant Site.

5. A loading bin to load each of the filtered and dried concentrates into covered rail cars suitable for shipping of the high sulfur concentrate.

The benefits of this concept are:

- Flexibility will be provided during the construction/commissioning stage of the project. It is likely that the longest delivery equipment and most complex commissioning will be associated with the Hydrometallurgical Plant. The ‘copper’ and ‘nickel’ concentrate could be sold if construction/commissioning delays are encountered during startup of the Hydrometallurgical Plant thereby generating revenue for the project.
- The option of producing and selling ‘copper’ and ‘nickel’ concentrate will be available during required maintenance periods for the autoclaves or oxygen plant. Hydrometallurgical Plant capacity would be cut in half during autoclave maintenance and could be cut completely during oxygen plant maintenance.
- More options will be available to deal with changing market conditions. At metal prices in the expected range, producing the higher value Hydrometallurgical Plant products is more desirable. But unexpected combinations of metal prices, shipping costs or customer situations could result in a circumstance wherein producing a ‘copper’ and ‘nickel’ concentrate may be more desirable.
- The option to reduce total electrical power load and still produce the ‘copper’ and ‘nickel’ concentrate product will provide the flexibility in managing product mix and power consumption during extended peak power situations and periods of mandated power usage reductions.

### **Anticipated Environmental Impact Changes:**

Air emissions impacts associated with the Hydrometallurgical Plant will be reduced by about half when one autoclave is out of service or eliminated when both autoclaves are out of service. There will be products of combustion emissions from the natural gas fired steam generators for the dryers and particulate emissions from dryers and material handling steps downstream of the dryers. Rail loading will be indoors and no fugitive emissions are anticipated. It is anticipated that air emissions will not trip PSD or HAP limits in either operating mode.

The water drawn from Colby Lake by the Beneficiation Plant will decrease by 77 gpm (the difference between the 100 gpm water lost to the Hydrometallurgical Plant and the 23 gpm water loss to the Dewatering Plant). In addition water drawn from Colby Lake water by the Hydrometallurgical Plant will decrease by 70 to 520 gpm resulting in a net decrease of 147 to 597 gpm in water drawn from Colby Lake and a larger gap between water produced at the Mine Site and water consumed at the Plant Site - a better situation with regard to the total project water recycle/reuse plan.

Electric power consumption will be significantly reduced because the oxygen plant and electro-winning facility do not operate.

If the Hydrometallurgical Residue Facility is not operational, Mine Site Waste Water Treatment Facility sludge will need to be disposed at an alternate location. The St Louis County Landfill

approximately 30 miles away is permitted for disposal of this type of solid waste following adequate dewatering of the waste.

The impact on Beneficiation Plant/Flotation Tailings Basin water chemistry is insignificant because the reduction of the 100 gpm blowdown to a 23 gpm blowdown (net 77 gpm change) is less than a 1% change in the total volume of water that is being sent to the tailings basin.

There will be potential for spillage of the high sulfur concentrates. Shipping concentrate in a contained shipping system will mitigate this. The exact shipping method will depend on customer unloading capabilities. The key requirement is that the shipping method is contained and the potential for spillage during transport eliminated.

### **Limestone**

As presented in the original NorthMet Project Description, lump limestone would initially (up to two years) be delivered by truck to the existing conveyor feeding the bins above 3S Mill Line. Ultimately, lump limestone would be rail delivered to an enclosed car dumper and stockpiled in the existing Coal Yard for reclaim into a new grinding system.

At the time of the original NorthMet Project Description, PolyMet investigated the possibility of receiving ground limestone but was unable to secure a local supplier. A local supplier is now available and the option of delivering ground limestone is being considered. There is a substantial price premium for ground limestone, which is offset by reduced capital costs. PolyMet is negotiating with suppliers and developing plans to use lump or ground limestone.

Because PolyMet believes that the delivery of lump limestone as presented in the original NorthMet Project Description results in a greater environmental impact and PolyMet is not certain whether lump or ground limestone will be delivered, the Supplemental NorthMet Project Description has not been changed.

### **Rail Car Maintenance**

#### **Concept:**

Rail Car Maintenance was to be at the Area 2 Shop because the existing rail car maintenance facilities at the General Shop were not available. Because those facilities are now available, Rail Car Maintenance will be relocated to the General Shop.

#### **Anticipated Environmental Impact Changes:**

None

## **Coarse Tailings Mitigation**

### **Concept:**

Conservative and defensible tailings basin water chemistry modeling using recent kinetic testwork data predicts that sulfate generation and metal leaching in coarse tailings planned for use in dam construction could result in seepage water that exceeds the groundwater protection standard for sulfate and the most conservative surface water discharge limits for sulfate, nickel, copper and cobalt.

Sulfate and metals in tailings basin drainage water are primarily generated in the coarse tailings in the dams and upper beaches. Because of this, a revision to the tailings deposition plan was developed to minimize the mass of dams. The plan to minimize the mass of the dams is to deposit tailings in Cell 2E until the level reaches the elevation of the south dam of Cell 2E. During this period, dam construction will be limited to the north edge and the northern quarter of the east edge of Cell 2E. This is because the west edge is the dam along the eastern edge of Cell 2W, the south edge is the dam along the northern edge of Cell 1E, and the southern three quarters of the east edge is natural terrain. It will take approximately 8 years to fill Cell 2E to elevation 1675, which is approximately the same elevation as Cell 1E. Once tailings in Cell 2E reach the level of the dam that separates Cell 2E and Cell 1E, Cells 1E and 2E will be combined to form a single cell. Dam construction will then be extended to the east and south edges of Cell 1E. This is because the west edge is the dam along the eastern edge of Cell 2W and the north edge will be eliminated. This concept eliminates the dam between Cell 2E and Cell 1E and defers the construction of dams in Cell 1E for approximately 8 years. With this approach the dam and beach area would be minimized.

As a mitigation measure, a geomembrane barrier (cover) will be installed on the surface of the exterior face of each completed dam lift. This barrier will be covered with two to three feet of tailings and revegetated. At closure, the barrier over the final lift would be extended from the top of the dam to a point along the beach where the beach will remain saturated. The combination of the barrier and saturated tailings will keep surface water away from the coarse tailings, which will mitigate sulfate and metal release to the drainage.

The combination of the modified tailings deposition plan and the mitigation has been predicted to reduce the generation of sulfate and leaching of copper, nickel and cobalt to the point where all water that escapes the facility is in compliance with the most conservative surface discharge limits and the groundwater standards.

### **Anticipated Environmental Impact Changes:**

PolyMet will be implementing a seepage management system to collect all surface seepage. The seepage management system includes the installation of horizontal drains in the face of the tailings dams that will collect water from the coarse tailings and return it

to the tailings basin. That water is predicted to exceed the most conservative surface discharge limits the groundwater standard and will have to be managed to avoid a build up of pollutants in the tailings basin.

### **Category 3 Lean Ore Stockpile Mitigation**

#### **Concept:**

The Category 3 liner system under the Category 3 Lean Ore Stockpile will be replaced with a Category 4 liner system.

#### **Anticipated Environmental Impact Changes:**

The leakage through the stockpile liner system will be reduced and the impact on water quality in the Upper Partridge River reduced.

More water will be collected by the stockpile liners system and that water will have to be treated. To be conservative, determination of water quantity to be treated assumed that there would be no liner leakage. Therefore there is no change in the volume of water to be treated.

### **Overburden Stockpile Mitigation**

#### **Concept:**

The Overburden Stockpile will be eliminated by combining with the Category 1 / 2 Waste Rock Stockpile.

#### **Anticipated Environmental Impact Changes:**

The Overburden Stockpile will be eliminated and the overburden Category 1 / 2 waste rock will be placed in the same footprint as the Category 1 / 2 Stockpile. This will result in less wetlands impact. The Category 1 / 2 Stockpile will be higher so air emission, noise and light impacts due to operations (truck dumping and moving of overburden/waste rock by dozer) at the top of the stockpile may be greater at distance from the stockpile.

### **Relocation of Mine Site 138Kv to 13.8Kv Substation**

#### **Concept:**

Minnesota Power has revised the location of their proposed substation to serve the Mine Site so that the substation is on land owned by Minnesota Power.

**Anticipated Environmental Impact Changes:**

Any additional wetlands impacts are expected to be minor and if greater than the original impacts will be mitigated from Minnesota Power's wetland bank. Sensitive species and cultural resources surveys will be conducted on the new proposed site, results of the surveys will be provided for consideration in the EIS.

**Permitting Mine Site and Plant Site as a Single Synthetic Minor Source**

**Concept:**

PolyMet is now proposing permitting the Mine Site and Plant Site as a single stationary source. This has resulted in refinement of estimates of actual emissions. PolyMet will propose emission and operating limitations for some plant equipment to maintain actual emissions below the PSD Major Source threshold.

**Anticipated Environmental Impact Changes:**

Proposed total allowable actual emissions for most pollutants at the Mine Site and Plant Site will be reduced.