Air Impact Assessment Planning Summary Memo
NorthMet Supplemental EIS
May 6, 2011

Introduction

The Minnesota Department of Natural Resources (MDNR), US Army Corps of Engineers (USACE), and US Forest Service (USFS), collectively known as the Co-Lead Agencies, have prepared this guidance memo as the concluding step in the impact assessment planning (IAP) process for this subject area. This memo provides (1) a summary of workgroup issues considered; and (2) specific guidance to PolyMet Mining and its consultants that is to be incorporated into a work plan for Co-Lead Agency review and approval prior to conducting impact analysis (i.e. modeling and other predictive work) on the Draft Alternative Summary as amended March 4, 2011.

The purpose of the Air Impact Assessment Planning (IAP) group was to determine what evaluations are needed to determine the air quality impacts of the Draft Alternative for the proposed NorthMet project. The evaluations will be used for the preparation of a Supplemental Draft Environmental Impact Statement. In an effort to efficiently determine what evaluations are needed, the IAP broke into five workgroups. The air quality core team was facilitated by Suzanne Baumann (MPCA) and Deb McGovern (ERM) and included Stuart Arkley (MDNR ECO), Dan Kringel (ERM), Ann Foss (MPCA), Kevin Pylka (PolyMet), Pat Sheehy (Barr), and Joy Wiecks (Fond du Lac). The core team attended all workgroup meetings. Technical staff with expertise in each relevant topic area also participated in each workgroup meeting. Each workgroup met at least once. A list of workgroup meeting participants is attached.

Impact Assessment Requirements of the DA

Workgroups were formed to discuss the following topics: Class I pollutants, Class II pollutants, mercury, greenhouse gases, and control equipment evaluation. In advance of each meeting, workgroup members were asked to review the evaluations completed for the preparation of the October 2009 DEIS, the project changes proposed by PolyMet, and current versions of the Air Data Package, Air Management Plan – Plant, and Air Management Plan – Mine. Each workgroup determined the scope of needed evaluations for the Draft Alternative and advised PolyMet and Barr on any new assumptions, standards, and guidance. Generally, the evaluations required to draft a Supplemental Draft EIS will mirror those needed for development of the 2009 Draft EIS, except that they will need to be updated to reflect the changes to the proposed project and alternatives and to reflect any new standards or other requirements.

See the attached table, titled PolyMet Air Impact Assessment Task List, for a description of each of the needed evaluations and required precursor reports (emissions inventory, work plans, protocols, etc). A recurring PolyMet air group has been formed to track PolyMet air-related environmental review development and permitting data submittals.

Key Issues and Decisions

There were very few topics of controversy or debate in the air IAP group. Notes were generated by each of the workgroups that details the discussions and outcomes. The following are items raised for decision by the co-lead agencies:

1) Tailpipe Emissions from Third Party Traffic.

Issue Statement: The Air IAP discussed whether tailpipe emissions from third party traffic should be evaluated as part of the risk evaluation or air permitting. The group concluded that as a result of the low number of third party vehicles on-site and because most of the final product will be shipped via rail, the potential impacts are low enough that they don't exceed risk evaluation thresholds and therefore would not be included in MPCA risk analyses. In addition, these on-road tailpipe emissions aren't regulated by air permitting requirements. Therefore, the group raised the issue for co-lead consideration about whether tailpipe emissions from third party traffic should be evaluated for EIS purposes.

Co-lead Resolution: Any impacts are considered minimal such that further consideration in the EIS is not warranted under MEPA and NEPA. This is consistent with the treatment of the issue in other joint MEPA/NEPA Mining EISs in Minnesota. Therefore, tailpipe emissions from third party traffic will not be evaluated in the SDEIS.

2) Short-Term Construction Emissions.

Issue Statement: The Air IAP discussed whether short-term construction emissions (such as the construction of the autoclaves concurrent with operation of crushing and flotation emissions sources) should be evaluated as part of the risk evaluation. The group concluded that potential impacts are low enough and temporary so that they wouldn't exceed risk evaluation thresholds. These emissions aren't regulated by air permitting requirements and would not typically be evaluated in a MPCA risk analysis. Additionally, because PolyMet is required to model its "worst case" emissions, including all emissions sources operating simultaneously (including emissions from scenarios 1 and 2), it is unlikely that emissions from construction would have impacts above the worst case emissions modeled. Therefore, the group raised the issue for co-lead consideration about whether short-term phased construction emissions should be evaluated for EIS purposes.

Co-lead Resolution: Given the low levels of pollutant generation and their temporary nature, further evaluation in the EIS is not warranted under MEPA or NEPA. This is consistent with the treatment of the issue in other joint MEPA/NEPA Mining EISs in Minnesota. Therefore, short-term construction emissions will not be evaluated in the SDEIS.

3) Railcar Dust and Spillage.

Issue Statement: The air IAP group concluded that there would be minimal air impacts from any dust generated from ore hauled in the railcars due to the coarse nature of the ore. Any impacts from dust generated from ore hauled in the railcars would be more appropriately evaluated in one of the water IAP groups. The air IAP group identified a need to coordinate, as needed, with other media regarding railcar handing dust emissions.

Co-lead Resolution: Any depositional effects, if measurable, would be realized in water resources, therefore that is the appropriate place to focus any discussion of the issue in the SDEIS. The Water Resources – Surface Water IAP workgroup did indeed consider this issue under the topic of "Baseline water quality data for outlying streams along the RR corridor" section of the Summary Memo. The Surface Water IAP workgroup recommends the collection of surface water quality data along the rail transport corridor to address the issue.

The co-leads confirmed that the Water Resources IAP did consider the issue of potential impacts from railcar dust and spillage, therefore there is no additional action needed.

4) NEPA Requirements for GHG Evaluations.

Issue Statement: When the air IAP group reaches consensus on the existing state and federal GHG guidance there is a need to engage the co-lead agencies to ensure that NEPA needs for greenhouse gas evaluation are fulfilled.

Co-lead Resolution: The Co-leads will need to monitor changes in GHG-related policy and guidance over the remaining course of the EIS, especially for NEPA-related implications. Because GHG-type evaluations rely on the modeling-generated air emissions inventory, it is possible that new directives might require Co-lead decisions on the appropriateness of new or modified modeling, with subsequent analysis, which in turn could impact the ongoing development of the SDEIS. Whether new analysis is required or not, the Co-leads need to ensure the SDEIS appropriately considers GHGs against the standard(s) in place at the time of SDEIS publication.

Therefore, the co-leads will monitor and evaluate state and federal GHG policy development over the remaining course of the EIS. PolyMet will be required to provide the underlying data and analysis as required to comform to existing guidance. ERM will be required to develop the SDEIS material consistent with available GHG-related guidance as interpreted and approved by the Co-leads.

5) Potential Impacts from Climate Change.

Issue Statement: The air IAP group identified a need to consider effects of climate change in conducting other impact assessments. For instance should any water modeling consider the potential of temperature changes, more extreme weather events, etc? Should the EIS describe how climate change was considered in the impact assessments?

Co-lead Resolution: In addition to the considerations by the air quality IAP, the co-leads confirmed that the Water Resources IAP will evaluate the need to consider global climate change in modeling scenarios for the SDEIS.

NorthMet EIS Impact Assessment Planning (IAP)
Air Resources Group Member List

Air Quality Core Team
Suzanne Baumann (MPCA) - Facilitator
Deb McGovern (ERM) - Facilitator
Stuart Arkley (MDNR ECO)
Ann Foss (MPCA)
Dan Kringel (ERM)
Kevin Pylka (PolyMet)
Pat Sheehy (Barr)
Joy Wiecks (Fond du Lac)

Class I Workgroup
Catherine Neuschler (MPCA)
Ruth Roberson (MPCA)
Sarah Seelen (MPCA)
Andrew Skoglund (Barr)
Trent Wickman (USFS)

Class II Workgroup
Nick Axtell (1854 Treaty Authority)
Jennifer Darrow (EPA)
Kristie Ellickson (MPCA)
Alex Jackson (Fond du Lac)
Simon Manoyan (EPA)
Eric Edwalds (Barr)
Jenny Koenen (Barr)
Ruth Roberson (MPCA)
Jim Scott (PolyMet)
Sarah Seelen (MPCA)
Cliff Twaroski (Barr)

Mercury Workgroup
Mike Berndt (DNR)
Ned Brooks (MPCA)
Esteban Chiriboga (GLIFWC)
Keith Hanson (Barr)
Anne Jackson (MPCA)
Nancy Schuldt (Fond du Lac)
Ed Swain (MPCA)
Cliff Twaroski (Barr)

Climate Change Workgroup
Yvette Chenaux (Grand Portage)
Peter Ciborowski (MPCA)
Alexander Jackson (Fond du Lac)
Sarah Seelen (MPCA)
Louise Segroves (Barr)

Control Equipment Evaluation Workgroup
Jack Kennedy (Barr)
Sarah Seelen (MPCA)
Cliff Twaroski (Barr)

Geotechnical Stability Impact Assessment Planning Summary Memo
NorthMet Project EIS
May 18, 2011

Introduction

The Minnesota Department of Natural Resources (MDNR), US Army Corps of Engineers (USACE), and US Forest Service (USFS), collectively known as the Co-lead Agencies, have prepared this guidance memo as the concluding step in the impact assessment planning (IAP) process for this subject area. This memo provides: (1) a summary of workgroup issues considered; and (2) specific guidance to PolyMet Mining and its consultants that is to be incorporated into a work plan for Co-lead Agency review and approval prior to conducting impact analysis (i.e. modeling and other predictive work) on the Draft Alternative Summary as amended March 4, 2011.

Workgroup Facilitators
Bill Johnson and Stuart Arkley, MDNR ECO
Al Trippel, ERM

Workgroup participants included those persons listed in Attachment A.

Impact Assessment Requirements of the Draft Alternative

The facilitators worked closely with MDNR Dam Safety and Lands and Minerals, along with USEPA Region 5, to review the stability analysis methods used in 2009 DEIS, and modify upcoming analysis of the Tailings Basin and Hydrometallurgical Residue Facility designs to be included in the Supplemental DEIS.

Tailings Basin and Hydrometallurgical Residue Cells

- The Draft Alternative for the Tailings Basin should be modeled as was done previously for the DEIS, with additions that are described below. Baseline investigation and analysis information used in the DEIS are adequate to support the new modeling.

  The existing GeoStudio modeling needs to be modified to include the proposed bentonite amended layer (exterior face of new dams and NorthMet tailings beaches) and bentonite enhanced permanent pond bottom. Some additional analysis of the modeling parameters is also requested. In addition, Dam Safety has requested that an additional cross section be created and analyzed for the southwest corner of cell 1E, at the site of a piping failure in the mid-1980s. This additional analysis does not need to be completed for the IAP, but should be completed within two years of construction start up.

- Factor of Safety (FS) - Proposed methodology for further analysis:

  FS should meet or exceed: 1.50 ESSA[1] (drained); 1.30 USSA[2] (undrained) for non-statically liquefiable materials; and 1.20 for seismic and static liquefaction. If material properties and distributions are well defined, the factor of safety for static liquefaction can be reduced to 1.10 (Poulos, S.J., Castro, G. and France, J. W., 1985. Liquefaction Evaluation Procedure). If FS meets

[1] ESSA - Effective Stress Stability Analysis
[2] USSA – Undrained Strength Stability Analysis

or exceeds these values, that cross section is complete and further analysis of that cross section will probably be unnecessary, pending results of the analysis.

- Drained and Undrained conditions – If a FS for the drained or undrained conditions does not meet or exceed minimums, a redesign or modification of that cross section will be required.
- Seismic liquefaction – Perform a Probabilistic Seismic Hazard Assessment for the site to estimate potential seismic events. Using these estimated events, evaluate seismic liquefaction potential using industry accepted commercial computer software. These results can then be used to assess material properties (post liquefaction shear strength of materials shown to liquefy) and pore pressure conditions to be used in post event stability analyses with a minimum FS of 1.2.

  If liquefaction, and therefore large material shear strength reductions, does not occur, perform a deformation analysis using pseudo static techniques which are industry accepted.
- Static Liquefaction – If the FS for static liquefaction is below 1.20 and the material properties are not well defined, further analysis is needed. This analysis includes determining if static liquefaction can be triggered. If the factor of safety for triggering liquefaction meets or exceeds 1.50, no further analysis is needed. If neither of these conditions can be met, the embankment will need to be modified or redesigned. Further analysis of the liquefied shear strength parameter ($USSR_{liq}$)[3] is needed as that value appears to be higher than typically observed.

- A geotechnical analysis of the new Hydrometallurgical Residue Facility design needs to be undertaken. This analysis will be different than the analysis of the Tailings Basin because of the different embankment configurations. The Hydrometallurgical Residue Facility design should include typical methodologies used to analyze a lined storage facility, such as an effective stress stability analysis, analysis of foundation conditions (including baseline hydrological conditions), and an analysis of the liner integrity. MPCA will also have permit authority of the Hydrometallurgical Residue Facility under their solid waste and water discharge rules, and the DNR's Permit to Mine will need to include information on the hydrometallurgical residue facility design.

- The work plan for the Hydrometallurgical Facility will state that the analysis of stability include a detailed accounting of existing baseline water sources at the site, including surface discharges from the surrounding highlands, subsurface movement of water through the buried stream channel, and/or springs that may still discharging water at the site.

<u>Waste Rock Stockpiles</u>

The approach to Waste Rock Stockpile stability analysis for the designs in the Draft Alternative will be the same as used for the 2009 DEIS. Design and construction of the Waste Rock Stockpiles will be required to conform to the criteria established in Minnesota Rules for the Permit to Mine.

[3] $USSR_{liq}$ – Liquefied Undrained Shear Strength Ratio

Report(s) Preparation

Separate reports are requested for the geotechnical analysis of the Tailings Basin, Hydrometallurgical Residue Facility, and the Waste Rock Stockpiles.

In each report, describe what will be built, where, and how with sufficient detail and clarity. Show baseline conditions of the existing LTVSMC Tailing Basin. Show that the embankments will be stable during construction and post-closure, and that conservative assumptions, parameters, and inputs were used. Provide a table showing all model input parameters, along with the range of values of the parameter and the sources/test/number of samples used to determine the value. Include a discussion of the long term post-closure period regarding stability of these facilities over time.

Key Issues and Decisions

For the Tailings Basin, MDNR Dam Safety revisited its requirements and the site specific conditions at the NorthMet Project and concluded that the design should meet or exceed a factor of safety of 1.20 for seismic and static liquefaction, unless supported by additional information/analysis as specified above.

ATTACHMENT A

NorthMet EIS Geotechnical IAP Participant List

Workgroup Participants

Stuart Arkley (MDNR ECO)
Bill Johnson (MDNR ECO)
Dana Dostert (MDNR Waters – Dam Safety)
Jason Boyle (MDNR Waters – Dam Safety)
Memos Katsoulis (MDNR LAM)
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Jon Ahlness (USACE)
Neil Schwanz (USACE)
Tom Hingsberger (USACE)

Tom Hale (USFS)

Stephen Hoffman (USEPA HQ)
Anna Miller (USEPA R5)

Richard Clark (MPCA)

Rose Berens (Boise Forte Band)

Margaret Watkins (Grand Portage Band)

Nick Axtell (1854 Treaty Authority)

John Coleman (GLIFWC)
Esteban Chiriboga (GLIFWC)

Al Gipson (KP / ERM)
Jeff Coffin (KP/ERM)

Tom Radue (Barr)
John Borovsky (Barr)

Jim Scott (PolyMet)

Water Resources/Groundwater Impact Assessment Planning Summary Memo
NorthMet Project EIS
June 30, 2011

Introduction

The Minnesota Department of Natural Resources (MDNR), US Army Corps of Engineers (USACE), and US Forest Service (USFS), collectively known as the Co-Lead Agencies, have prepared this guidance memo as the concluding step in the impact assessment planning (IAP) process for this subject area. This memo provides: (1) a summary of workgroup issues considered; and (2) specific guidance to PolyMet Mining and its consultants that is to be incorporated into a work plan for Co-Lead Agency review and approval prior to conducting impact analysis, (i.e., modeling and other predictive work), on the Agency Draft Alternative Summary, as amended March 4, 2011.

Co-Facilitators
Neil Schwanz, USACE
Dave Blaha, Environmental Resource Management (ERM)

Workgroup Interaction
The Groundwater IAP Workgroup was formed to make determinations on groundwater resources impact factors for modeling, assessments of data gaps, and modeling decision-making relative to the Agency Draft Alternative. The workgroup established the Wetland Hydrology Subgroup to explore options for predicting the both vertical and horizontal extent of drawdown from project-related pit dewatering.

The Groundwater IAP group is composed of representatives from PolyMet Mining, Barr Engineering, MDNR, Minnesota Pollution Control Agency (MPCA), ERM, Cooperating Tribal Agencies (Fond du Lac, Grand Portage, and Bois Forte Bands), Great Lakes Indian Fish & Wildlife Commission (GLIFWC), USFS, USACE, and the US Environmental Protection Agency (USEPA). The participant list for the Groundwater IAP Workgroup and the Wetland Hydrology Subgroup is provided in Attachment A.

The Groundwater IAP group held seven conference call meetings: December 17, 2010; January 11, 21, 26, and 31, 2011; February 16, 2011; and April 22, 2011. The Wetland Hydrology Subgroup held two conference call meetings, which occurred respectively on January 21 and February 16, 2011. In addition, a joint call with the Surface Water IAP Workgroup was held on February 24, 2011.

Impact Assessment Requirements of Draft Alternative

This memo provides direction to PolyMet regarding groundwater modeling for the NorthMet Project. Requirements for baseline groundwater data, groundwater flow paths, and evaluation locations are described in the following sections.

It is understood that PolyMet will continue to use MODFLOW for predicting: (1) groundwater inflow rates to the mine pits during operations; (2) seepage rates out of the pits during closure; and (3) seepage rates from the tailings basin. GoldSim will be the modeling platform used for evaluating the water quality effects of the Project; it can include input assumptions as either deterministic values or probabilistic distributions. The following groundwater-related input assumptions will be included as probabilistic distributions:

- Baseline bedrock and surficial aquifer water quality at the Mine Site
- Geomembrane liner slope
- Number of defects per acre in the geomembrane liner
- Hydraulic conductivity of the surficial aquifer at the Mine Site
- Baseline surficial aquifer water quality at the tailings basin
- Hydraulic conductivity of the surficial aquifer at the tailings basin
- Sorption coefficients for arsenic, antimony, copper, and nickel.

Key Issue and Decision – General

1. Groundwater Parameters to be Modeled. The same list of solutes that was used in water quality modeling conducted in support of the DEIS should be used for the SDEIS.

2. Non-Captured Processes. The SDEIS should disclose that aluminum, iron, and manganese concentrations are heavily influenced by processes not captured in the proposed models (e.g., site-specific redox reactions).

Key Issues and Decisions at the Mine Site

1. Surficial Groundwater Flow Paths and Evaluation Locations at Mine Site. There are five proposed flow paths at the mine site: the West Pit; Overburden Storage and Laydown Area; WWTP; OSP; and East Pit/Cat 2-3 flow paths. These flow paths were identified based on groundwater elevations and most direct paths to evaluation locations (e.g., property boundaries, surface waters of the state). The surficial aquifer evaluation locations at the Mine Site are shown on the attached Figure 1, *Mine Site Groundwater Flow Paths – Surficial Aquifer*. For each flow path, two evaluation locations will be analyzed, one at Dunka Road and one either at the property boundary or the Partridge River, whichever is closer. There is also a bedrock location of evaluation at the property boundary for the West Pit and East Pit flow paths respectively.

2. Groundwater Seepage from Mine Pits. During operations, groundwater will flow into the pits with little or no seepage out of the pits. After the pits flood, the model will predict groundwater seepage from the pits. The same methodology that was used in the DEIS for predicting groundwater outflow from the pits will be used for the SDEIS.

3. Wetlands Indirect Hydrologic Effects. An analogue-type approach will be used as a reasonable method to develop a credible estimate of the potential extent of groundwater drawdown in the surficial aquifer, which would assist in determining potential indirect impacts to wetlands. See attached memo regarding recommended zones and extent of potential hydrologic effects. The Cooperating Tribal Agencies raised concerns regarding the recommended zones, specifically indicating that hydrologic effects could extend farther than the analogue approach recommends, (i.e., no impacts beyond 3,200 feet from the pit). The Co-lead Agencies believe that the recommended zones are reasonable in that only 1 or 2 of 6 wells beyond 1700 feet from the pit edge showed any detectable response. Further, the analogue site is located in an area with greater hydraulic conductivities, which would be expected to show drawdown effects at greater distances than at the NorthMet site.

Further, the Cooperating Tribal Agencies raised concerns about relying completely on the analogue approach. They generally recommend collecting additional hydrogeologic data in order to support using MODFLOW, or a similar groundwater hydrology model, to predict the effects of pit dewatering on surficial groundwater levels, which in turn could be used to more quantitatively evaluate potential indirect effects on wetlands. The Co-lead Agencies believe that the glacial till represents a very complex hydrogeologic setting with widely varying hydraulic conductivities, therefore use of a groundwater model as proposed would involve significant costs and project delays with little improvement in the accuracy of impact predictions. Given these circumstances, the alternative method is appropriate for the situation.

4. Baseline Surficial Groundwater Quality at Mine Site. The Co-lead Agencies have determined that existing data from the three on-site wells, supplemented with either USGS or MPCA monitoring well data from the same hydrogeologic area, provide sufficient data to characterize the baseline surficial groundwater quality at the mine site. Because there is not enough data to perform a bootstrap analysis, the methods described in the "Characterizing Uncertainty in the Mine Site Background Groundwater Data" Technical Memorandum (Barr, May 4, 2011) will be used. There has been disagreement within the Groundwater IAP Workgroup regarding the adequacy of the data to characterize groundwater quality at the Mine Site. USEPA and the Cooperating Tribal Agencies contend that there are not enough independent samples to accurately characterize baseline surficial groundwater quality at the Mine Site within acceptable statistical standards. They raise concerns that there are only 3 surficial aquifer wells at the Mine Site, each of which has only been sampled 6 times.

   Rationale: The Co-lead Agencies believe the limited data available are adequate to characterize the surficial groundwater quality at the Mine Site for the following reasons:

   - The proposed Mine Site is an undeveloped site that has only been used for logging. The data collected is well below groundwater quality standards as would be expected for an undeveloped site. The only exceptions to this are aluminum, iron, and manganese, which are highly variable in the region and for which the concentrations are controlled by other known processes (e.g., redox);
   - The three monitoring wells represent locations that are respectively upgradient, over, and downgradient of the ore body, which is the only feature on the site that is expected to have any significant influence on groundwater quality;
   - The monitoring data is consistent with water quality data collected by USGS and MPCA from other areas within region with similar geologic and soil characteristics;
   - The monitoring data is consistent with the water quality of Partridge River baseflow that predominantly represents groundwater; it is acknowledged that the Peter Mitchell Pit discharges pit water to the Partridge River, although not expected during very low flow conditions; and
   - The purpose of these data is not to describe the detailed distribution of the groundwater across the site, but rather to quantify the spatio-temporal average, (i.e., mean), groundwater quality of the site.

   The Co-lead Agencies acknowledge that collecting additional data would increase confidence that average baseline groundwater concentrations are adequately presented and propose to initiate additional monitoring at the site to address the concern. This will involve identification and installation of wells at priority sites and initiation of water quality sampling and data collection;

reporting will be monthly. In the meantime, the SDEIS will rely on the available datasets (e.g., PolyMet; USGS; MPCA), including modeling high values to see how outputs are affected. New water quality data will be checked against those used for the SDEIS, and if determined necessary, the greater dataset will be remodeled and reported in the SDEIS or FEIS.

5. Baseline Bedrock Groundwater Quality at Mine Site. The Co-lead Agencies believe that the data from the 5 wells provides sufficient data to characterize the baseline groundwater quality of the bedrock groundwater at the Mine Site. Because there is not enough data to perform the bootstrap analysis, a similar statistical approach as proposed for the surficial aquifer data is required.

6. Liner Leakage Assumptions. The liner leakage parameter assumptions used in the Hydrologic Evaluation of Landfill Performance (HELP) model will be applied, including quantifying uncertainty in terms of average leakage rate from whole stockpile instead of for each unit of a stockpile (e.g., each acre) and the assumptions to be used on the slope of the liner (using absolute slope error from local field tests), subgrade permeability (this will be a deterministic value), and number of defects/acre in the geomembrane (using a probabilistic distribution).

Key Issues and Decisions at the Tailings Basin Site

1. Recharge Groundwater Quality at Tailings Basin. Data from GW-002, GW-011, GW-013, and GW-015 will be used to characterize recharge water quality at the tailings basin. Although it was also suggested that well GW-009 could be included to characterize recharge water quality, the Co-lead Agencies will not require this because GW-009 is located within the proposed tailings basin flow path and does have elevated values for some solutes.

   As discussed previously, aluminum, iron, and manganese concentrations are heavily influenced by processes not captured in the proposed model. A qualitative characterization is required identifying whether the concentrations/loadings for these solutes is expected to increase or decrease relative to existing LTV groundwater seepage.

2. Baseline Bedrock Groundwater Quality at Tailings Basin. It is expected that there will be negligible downward migration into the bedrock. This is because: (1) there are no pits or excavation into the bedrock at the tailings basin, and (2) the surficial aquifer is nearly saturated, so most tailings seepage is predicted to upwell and become surface water. No contaminant load from the tailings basin is assumed to reach bedrock.

3. Groundwater Flow Paths and Evaluation Locations at Tailings Basin. There are four surficial groundwater flow paths from the tailings basin: the West, Northwest, North, and South flow paths. These flow paths were determined based on groundwater elevations, depth to bedrock (e.g., there are bedrock outcrops east of the tailings basin so there is no East flow path), and surface water drainage patterns. Barr will calculate seepage flows for each flow path. Groundwater flow along the South flow path will not be modeled because under the Agency Draft Alternative essentially all seepage, including surface and groundwater, from this flow path discharges via SD026 and will be captured and pumped back into the Tailings Pond; bedrock outcrops in this location are expected to enable capture of nearly all seepage at this location. For each of the other three surficial flow paths, two evaluation locations will be modeled, one at the toe of the tailings basin and a second at the property boundary; see Figure 2. As discussed above, there are no bedrock flow paths or evaluation locations at the tailings basin.

4. Residential Well Sampling. The residential wells north of the tailings basin are no longer proposed as a Point of Evaluation because the seepage will need to meet groundwater standards at the property boundary, which is closer to the tailings basin. The Co-lead Agencies do not believe that sampling of the residential wells will provide additional data useful for inclusion in the SDEIS.

5. Hydraulic Conductivity at Toe of Tailings Basin. A probabilistic range of hydraulic conductivity values for the surficial aquifer should be used at the toe of the tailings basin within the GoldSim model; this is because this value is variable and uncertain. The range of hydraulic conductivity used will be defined in a manner similar to what was proposed for the Mine Site in the NorthMet Project Water Modeling Package Version 5.

6. Capture Well Efficiency. The location and extent of proposed capture wells will be determined by modeling in order to meet applicable groundwater and surface water standards. The Co-lead Agencies will require PolyMet to provide documentation of their ability to achieve the necessary capture efficiency.

7. Recalibration of Tailings Basin Model. The recalibration of the tailings basin MODFLOW model, to be accomplished by: (1) incorporating new data since the LTV operation ceased until the present, and (2) re-optimizing the hydraulic conductivity values, should be done as PolyMet proposes because it gives a higher confidence in the model. This should include consideration of wells outside the tailings basin footprint.

8. Groundwater Quality Data Near Hydromet Facility. There does not appear to be a compelling need for any additional groundwater data beyond the ambient groundwater data currently available around this location. Because the proposed Hydromet Facility will have a double liner with leak detection, it is expected that essentially no leakage will occur, or it will be detected and corrected. Therefore for modeling purposes, it will be assumed that the Hydromet Facility will have no leakage. Additional groundwater monitoring data immediately downgradient of the proposed Hydromet Facility should be collected prior to facility operation; it should continue on a schedule approved by MPCA thereafter to monitor if any leakage is occurring.

ATTACHMENT A

NorthMet EIS Groundwater IAP Participant List

GROUNDWATER IAP GROUP

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Tina Pint (Barr)
Jeré Mohr (Barr)
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Mike Olson (MDNR LAM)
Bill Johnson (MDNR ECO)
Steve Colvin (MDNR ECO)
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Kim Lapakka (MDNR)
Stuart Arkley (MDNR)
Richard Clark (MPCA)
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WETLAND HYDROLOGY SUBGROUP*

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Mike Liljegren (MDNR Waters)
Margaret Watkins (Grand Portage Band)
Nancy Schuldt (Fond du Lac)
Rick Gitar (Fond du Lac)
John Coleman (GLIFWC)
Esteban Chiriboga (GLIFWC)

* All Groundwater IAP members invited. This list represensents actual participants.

Water Resources/Surface Water Impact Assessment Planning Summary Memo
NorthMet Project EIS
June 30, 2011

Introduction

The Minnesota Department of Natural Resources (MDNR), US Army Corps of Engineers (USACE), and US Forest Service (USFS), collectively known as the Co-lead Agencies, have prepared this guidance memo as the concluding step in the impact assessment planning (IAP) process for this subject area. This memo provides: (1) a summary of workgroup issues considered; and (2) specific guidance to PolyMet Mining and its consultants that is to be incorporated into a work plan for Co-lead Agency review and approval prior to conducting impact analysis, (i.e., modeling and other predictive work), on the Draft Alternative Summary, as amended March 4, 2011.

Facilitators

John L. Adams, ERM
Michael Liljegren, MDNR

Workgroup Interaction

The Surface Water (SW) IAP Group held four meetings; minutes were prepared for each session. Most members participated by conference call and/or WebEx. Meetings were held:

- November 23, 2010: reviewed meeting protocol, future agenda items, meeting locations, and meeting procedures.
- December 21, 2010: all-day meeting based at Barr's office. Barr made two technical presentations. Follow-up tasks were assigned.
- February 14, 2011: Barr made technical presentation; reviewed conclusions/positions for all previously-discussed issues.
- March 31, 2011: final Surface Water IAP meeting. Greg Kruse (MDNR hydrologist) presented baseflow gagings on the Partridge River and Embarrass River; Barr presented West Pit outflow hydrology estimates and concept for modeling Embarrass River tributary streams near tailing basin. No further Surface Water IAP meetings are planned.

See Attachment A for a listing of the Surface Water IAP team membership.

Impact Assessment Requirements of Agency Draft Alternative

Baseline Data

Baseline streamflow data available for assessment of the Agency Draft Alternative (DA) includes all of the streamflow records used for the October-2009 Draft EIS, plus additional winter baseflow gagings taken by the MDNR during the winters of 2008, 2010, and 2011. Data was collected at: (1) several locations along the Partridge River; (2) South Branch of the Partridge River; (3) two locations along the Embarrass River (2010 and 2011 only); and (4) Longnose and Wyman Creeks. Final gagings were completed March 15-16, 2011; (see G. Kruse spreadsheet; final report attached).

Cooperating Tribal Agency representatives note that the data used in the 2009 DEIS was found to be inadequate for the purposes of the DEIS. They also believe that there has been no credible justification for reusing this data in the SDEIS, that although winter baseflow 2010-2011 data collected by the MDNR is helpful, it does not address all of the longstanding data adequacy concerns for this project. The Co-lead Agencies believe that use of the USGS data and the XP-SWMM model is appropriate. Results of the winter baseflow study completed by MDNR (see references #14 and #15) help support that conclusion.

Baseline water quality data for the Partridge and Embarrass Rivers used in the DEIS has been supplemented with additional data collected by Barr in 2010. Additional data has been collected for monitoring locations PM-11 and PM-19 for sulfate and chloride, and a suite of analysis has been collected for Colby Lake. Limited water quality data exists for monitoring location PM-6 on Wyman Creek, approximately one mile upstream of the railroad crossing. This data is not reflective of water quality at the railroad crossing. Data from monitoring location PM-5 is ideally located to characterize existing water quality below the railroad crossing.

In terms of analysis for both dissolved and total metals, the only parameter for which MPCA staff recommended analyzing both total and dissolved fractions is aluminum. The purpose of this recommendation is to obtain sufficient data to be able to calculate, as appropriate, a dissolved:total "translator" for aluminum that could be applied during permitting as allowed under MPCA rules. Monitoring for aluminum in NE Minnesota has often identified a significant difference between dissolved and total aluminum in many waters. MPCA staff did not recommend analyzing for total and dissolved fractions for any of the other metals; this is volunteered by PolyMet exclusively.

Baseline water quality data collection has been initiated downstream of the railroad crossings on the West Pit outflow stream (WP-1), Wetlegs Creek (WL-1), and Longnose Creek (LN-1). The Co-lead Agencies believe that sampling downstream of the railroad crossing is sufficient for generally characterizing the existing water quality condition of these streams. The Co-lead Agencies also note that upstream and downstream sampling would be an appropriate strategy for permit monitoring in order to adequately document all potential sources of contaminants in addition to rail car spillage. Upstream/downstream sampling should commence as soon as permits are issued and continue for at least one year prior to use of the railroad track by PolyMet.

Water quality data collection has also been initiated on Mud Lake Creek (MLC-1). Streamflow is also being gaged at WP-1 and MLC-1 at the time of water quality sampling. In addition, stream geomorphic data (e.g., stream cross sections and gradients) is being collected starting spring, 2011, for the West Pit outflow stream and Spring Mine Creek; see Barr's 2011 Surface Water Monitoring Plan for Tributaries near PolyMet NorthMet Site, REVISED 04/22/2011, and Dave Blaha email dated 05/03/11.

<u>Modeling Method – Partridge River and Tributaries</u>

The modeling method used in the 2009 Draft EIS for the main branch of the Partridge River is similar to what will be required for the Agency DA. For the Agency DA, the XP-SWMM model was calibrated to 23 flow parameters using the 1986-1987 water years flow records, then scaled to better match actual 1986-1987 water years when there was no dewatering from the Peter Mitchell Pit (PMP). This method reduces the impact of future PMP dewatering on project impact analysis when using the XP-SWMM model to predict future hydrologic changes at various locations along the Partridge River near the mine site. No adjustment for potential climate change during PolyMet's 20 year life expectancy is planned; see Barr's Water Modeling Package Version 5 [WMPv5]. The proposed method for estimating Partridge

River baseflow, which is necessary for modeling water quality impacts during extreme low flow conditions, is outlined in WMPv5, Sectioni 3.4.1.1.3. The specifics of the XP-SWMM calibration procedure are discussed in Section 5.1 of RS73A. The 23 flow parameters are referred to as "Richter Statistics," and are described in Section 3.2 of RS73B.

Streamflow modeling has been done for the West Pit outflow (under closure condition) for both the Continuous and Seasonal outflow concepts, and for the West Pit outflow stream, in order to help assess potential stream geomorphic impacts.

Modeling Input Assumptions/Outputs – Partridge River and Tributaries

The proposed modeling method assumes that use of the XP-SWMM model, calibrated to the two years when the PMP was not being dewatered, produces reasonably accurate estimates of Partridge River flow parameters near the mine site for hydrologic and water quality modeling. Baseflow in the Partridge River near the mine site, which is needed for water quality modeling, is assumed to be reasonably equivalent to the XP-SWMM-modeled average 30-day minimum flow during the winters of 1985, 1986, and 1987 when there was no PMP dewatering; see Water Modeling Package v5, Section 3.4.1.1.3. Preliminary evaluation of the MDNR 2011 winter gaging data suggests that the modeled baseflows near the mine site are conservatively low.

Modeling outputs for the Partridge River near the Mine Site would be similar to those produced for the Draft EIS; see Chapter 4.1, 2009 PolyMet Draft EIS.

The XP-SWMM model was also used to estimate selected flow parameters for the West Pit outflow stream, in turn for use in water quality and stream geomorphic analyses. Limited field measurements of stream geometry are anticipated for spring 2011 to confirm modeling estimates.

Modeling Method-Embarrass River and Tributaries

Given the anticipated small volume of un-captured seepage leaving the tailings basin (see reference #13), modeling of hydrologic impacts to the main branch of the Embarrass River is not proposed. Barr will quantify the seepage capture efficiency as part of modeling seepage outflow from the tailings basin. Uncaptured seepage volumes will be added to calculated low, average, and high flows from historic Embarrass River data (USGS gage 04017000), to quantify the impacts. The hydrology of Embarrass River tributary streams receiving seepage from the tailing basin will be modeled (input to water quality modeling) by unit-area extrapolation of data from the main branch. The quantity of seepage reaching the streams will be validated by Barr using existing water quality data; see WMPv5, Section 4.2.4.

Embarrass River tributary streams below the tailing basin will be modeled by unit-area extrapolation from the USGS Embarrass River data; see WMPv5, Section 4.2.4.

Modeling Input Assumptions / Outputs – Embarrass River and Tributaries

No streamflow modeling is proposed for the main branch of the Embarrass River. It is assumed that the unit-area runoff of the tributary streams below the tailing basin is similar to the Embarrass River watershed.

Key Issues and Decisions at the Mine Site

1. Adjustment of USGS data for climate change and Peter Mitchell Pit dewatering. Barr recommended an adjustment procedure to account for PMP dewatering, but concluded no adjustment warranted for climate change based on comparison with South Kawishiwi River long-term USGS gage record. The Co-lead Agencies concur with this recommendation; see Mine Site Points of Disagreement #1; also see WMPv5, Sections 3.4.1.1.1 and 3.4.1.1.2.

2. West Pit outflow evaluation point and outflow channel baseline data. Barr presented West Pit outflow estimates and XP-SWMM model estimates for present hydrology of outflow stream (WMPv5, Section 4.1.6). Baseline water quality and stream geomorphic data are to be collected spring, 2011. West Pit outflow evaluation location established at pit outlet. The Co-lead Agencies concur with the recommendations.

3. Modeling water quality of high flow events. GLIFWC suggested water quality modeling for outflow from the Mine Site be done for high flows as well as base flows. The Co-lead Agencies believe the concern is addressed because Barr will use probabilistic approach, one that models a broad range of flow conditions.

4. Partridge River baseflow gagings/interpretation. MDNR gagings were completed 03/16/2011. Greg Kruse presented gaging conclusions and interpretations to the workgroup. Data interpretations and conclusions were discussed. MDNR's final report was submitted in June, 2011, along with Barr's comparison of the gaging results of the XP-SWMM model projections; see references #14 and #15.

5. Groundwater contribution to Partridge River baseflow. This parameter is necessary for water quality modeling. Greg Kruse concluded from the MDNR winter gagings that the primary source of baseflow is surficial groundwater and wetland drainage. Final MDNR report pending; also see WMPv5, Section 3.4.1.1.3. The Co-lead agencies support the findings.

6. Stockpile hydrology modeling method. Barr presented conceptual model for estimating all components of stockpile hydrology, including runoff and deep seepage; see WMPv5, Section 4.1.2. The Co-lead Agencies support the conceptual model for use in the SDEIS.

7. Impacts to Colby Lake and Whitewater Reservoir. Available information is considered adequate to evaluate effects. The Co-lead Agencies note that hydrologic impacts to Colby Lake / Whitewater Reservoir for the SDEIS draft alternative will be less than those documented in the DEIS since PolyMet will be pumping much less water from Colby Lake.

8. Cumulative Partridge River impacts below Colby Lake. The Co-lead Agencies support the USEPA recommendation for a qualitative evaluation of this issue. This is because downstream, cumulative impacts to the St. Louis River are not expected to be modeled since the PolyMet EIS will precede the Mesabi Nugget EIS, and procedures for Nugget will be largely unknown. However, modeling results for the Upper Partridge River and Colby Lake can be used to "semi-quantitatively" document impacts to the St. Louis River.

9. Use of USGS data and the XP-SWMM model for streamflow estimation near the mine site. Cooperating Tribal Agencies believe this approach is inadequate, that at least one year of near-site flow record is necessary for model verification and impact analysis. Co-lead Agencies have considered the issue and believe the proposed approach to be adequate, given the anticipated magnitude of hydrologic alteration (maximum Partridge River watershed area disturbed by PolyMet is less than 7% at any location along the river). Actual watershed alteration will be more accurately determined during modeling of hydrologic impacts for the Agency DA.

   Barr has proposed a method of estimating baseflow in the Partridge River, a critical input for water quality modeling; the Co-lead Agencies support the proposed methodology. Meeting notes from USEPA Chicago meeting state that Barr is to re-evaluate the baseflow estimate for the Partridge River following the collection of new baseflow measurements by the MDNR. Cursory evaluation of MDNR gagings suggests that the XP-SWMM estimates are conservatively low. Barr will be required to technically evaluate the data with assistance from MDNR. The Chicago notes also state that USEPA concluded that the Partridge River low flow estimates were determined to be conservatively low and acceptable for water quality modeling purposes.

10. Baseline water quality for railroad corridor streams. USEPA and Cooperating Tribal Agencies expressed concern that baseline water quality data be collected for all streams along the railroad corridor. The Co-lead Agencies recommended an approach where PolyMet begins data collection this spring to provide some data to characterize existing condition for the SDEIS, and then continue data collection into permitting period; see reference #3. USEPA agreed to this approach, pending documentation that railroad car spillage was the only potential impact. Supporting information includes: watershed maps; Barr's NorthMet Data Package/Water v5; and rationale showing that the only impact to the railroad streams was potential ore spillage (see reference #4).

    The Co-lead Agencies agree that quantification of streamflow for contaminant load determination is warranted as part of the permit monitoring, but is unnecessary for characterizing stream water quality for the SDEIS. Barr will be producing a total project monitoring plan that will be available for review and comment.

    The Co-lead Agencies also note:

    - Discharges SD-008, SD-009, SD-010, SD-011, and SD-012 from Northshore Mining's Peter Mitchell Mining Area (NPDES/SDS Permit No. MN0046981) all potentially discharge to the headwaters of the Partridge River (e.g., Yelp Creek), and not to any of the tributaries that are part of the 2011 Tributary Monitoring Plan. Currently only SD-099 is significantly discharging, at a flow rate of approximately 7 MGD. There is no discharge from SD-008, SD-011, and SD-012, and there is a <0.01 MGD discharge from SD-010. As such none of the Northshore outfalls would be affecting the tributary creeks.
    - Discharges SD-010, SD-011, SD-012, and SD-030 from Cliff's Erie's Hoyt Lakes Mining Area all potentially discharge (directly or indirectly) to Wyman Creek upstream of the railroad corridor. Currently there are discharges from only SD-030 (to the headwater of Wyman Creek approximately 1.5 mi upstream of the railroad corridor) and SD-012 (to Wyman Creek approximately 0.5 mi upstream of the railroad) – outfalls SD-010 and SD-011 are not currently discharging and have not discharged in more than 15 years.

Discharges/runoff from the Cliff's Erie property outside of the proposed PolyMet project area could be impacting area surface waters such as Wyman Creek. However, any ongoing contribution from these "legacy" discharges would be part of the current baseline conditions at the railroad corridor and would be reflected in the baseline monitoring that is already being established at PM-5.

A Surface Water Monitoring Plan (04/11/2011; Revised 04/22/11) has been developed for the proposed collection of new data; see reference #1. Submittal of this plan initiated a series of comment letters and memos between the USEPA and the lead agencies (see references #8, #9, #10, #11, and #12). USEPA expressed concern about two issues: (1) monitoring locations for the railroad crossing streams; and (2) what they believe is a general lack of substantiation in the agencies responses.

In considering the full set of documentation, the Co-lead Agencies note that the IAP process is intended to principally address baseline data needs for impact modeling. The Co-lead Agencies believe that limited downstream water quality data, collected prior to the SDEIS, will be useful for describing existing baseline conditions. The Co-lead Agencies also believe that an upstream / downstream monitoring approach, including streamflow, should be implemented as part of MPCA's permitting process at least one full year prior to use of the railroad by PolyMet.

Data needs for permit monitoring assessment are best addressed during review of upcoming monitoring plans being developed by PolyMet/Barr. Remaining concerns will be addressed in that review process. Relevant information generated to this point includes, but is not limited to, the following:

- USEPA's 05/05/11 letter (see Reference #10) which notes, "the proposed sampling sites seem appropriate and should provide the needed data to establish baseline conditions in these small, largely unimpacted headwater streams."
- The Wetlegs Creek watershed area within the PolyMet project area was calculated at 78.8 acres, which is less than 4% of the Wetlegs Creek watershed. Very little, if any, of the 78.8 acres within the PolyMet project area will be impacted by PolyMet. The exact amount will be quantified and evaluated as part of the SDEIS process.
- This small hydrologic alteration does not result in significant environmental impacts, and could not be detected with streamflow monitoring. This further supports the conclusion that railroad car spillage is the only source of any potentially significant impact.
- Wetlegs Creek is the only railroad crossing stream, other than the West Pit outflow stream, that has any watershed area consumed by the PolyMet project.

REFERENCES

1. NorthMet Project, Water Modeling Package, Version 5, March 24, 2011(future issues to be updated), Barr Engineering.
2. USEPA Chicago meeting minutes, 12/08/2010.
3. J. Adams 03/02/11 email to USEPA (Simon Manoyan), and USEPA 03/08/11 response memo.
4. J. Adams 03/29/11 email to USEPA (Simon Manoyan), USEPA response pending.
5. Greg Kruse/Mike Liljegren 03/29/11 and 03/30/11 emails and spreadsheet of Partridge and Embarrass River baseflow measurement summary.
6. J. Adams 03/07/11 email to John Coleman and J. Coleman's 04/12/11 response.

7. Meeting minutes from four SW IAP meetings, 11/23/10, 12/21/10, 02/14/11, and 03/31/11.
8. 2011 Surface Water Monitoring Plan for Tributaries near PolyMet NorthMet Site – REVISED, Barr Engineering, 04/22/2011.
9. D. Blaha email to Simon Manoyan, with spreadsheet attachements, 05/03/11.
10. USEPA letter commenting on Barr's 2011 REVISED monitoring plan, 05/05/11.
11. Agency response to USEPA's 05/05/11 letter, 05/10/11.
12. USEPA letter responding to Agency's 05/10/11 memo, 05/16/11.
13. Wyman, Longnose, and Wetlegs Watershed Areas Map 5-18-11.
14. MPCA NorthMet – Impact Criteria – Permittability Memo 06/20/11.
15. Partridge River Watershed Winter 2010-2011 Base Flow Analysis, MDNR, June, 2011.
16. Comparison of MDNR Winter Flow Gaging to Partridge River XP-SWMM Model, Barr Engineering, June 09, 2011.

ATTACHMENT A
Surface Water IAP Participants

Adams, John (ERM)
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Williams, Greg (Barr)
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PolyMet NorthMet EIS - Wetland Resources IAP Final Summary Memo
July 1, 2011

Introduction

The Minnesota Department of Natural Resources (MnDNR), U.S. Army Corps of Engineers (USACE), and U.S.D.A. Forest Service (USFS), collectively known as the Co-lead Agencies, have prepared this guidance memo as the concluding step in the impact assessment planning (IAP) process for this subject area. This memo provides (1) a summary of workgroup issues considered; and (2) specific guidance to PolyMet Mining and its consultants that is to be incorporated into a work plan for Co-Lead Agency review and approval prior to conducting impact analysis (i.e., modeling and other predictive work) on the Draft Alternative Summary, as amended March 4, 2011.

Estimates of the direct, potential indirect and cumulative wetland impacts that would or could result from the proposed PolyMet NorthMet project need to be disclosed in the environmental impact statement (EIS) that is being prepared. Wetland hydrology monitoring, wetland vegetation monitoring, and wetland water quality monitoring will be important in order to determine the actual indirect wetland impacts that may occur if the project is permitted. Compensatory wetland mitigation would be required for unavoidable direct and indirect wetland impacts. The EIS will include information regarding the indirect wetland impact monitoring plan and the compensatory wetland mitigation plan.

Workgroup Facilitators:
Jon Ahlness (USACE) and Deb McGovern (ERM)

Workgroup Participants:
Jon Ahlness, Steve Eggers, Ralph Augustin, Tim Peterson (USACE)
Kate Gunderson, Doug Norris (MnDNR)
Marty Rye (USFS)
Margaret Watkins (Grand Portage Band)
Nancy Schuldt, Rick Gitar (Fond du Lac Band)
John Coleman, Esteban Chiriboga (GLIFWC)
Nick Axtell (1854 Treaty Authority)
Simon Manoyen, Mike Sedlacek, Melanie Haveman, James Grimes (USEPA)
Kevin Molloy, Tom Estabrooks (MnPCA)
Nick Rowse (USFWS)
Steve Koster, Heather Heater, John Adams, Doug Mensing (ERM)
Cheryl Feigum, Mark Jacobson (Barr Engineering)

Workgroup Interaction:
The Wetland IAP Workgroup is composed of the same people that have been participating in the NorthMet Project Wetland Workgroup that has been meeting, and will continue to meet, to address wetland delineation issues, wetland hydrology monitoring issues, wetland impact issues, and compensatory wetland mitigation issues for the proposed NorthMet project.

The Wetland Workgroup increased its activity after receiving the "NorthMet Project Baseline Wetland Type Evaluation – Mine Site and Tailings Basin Areas" report in March of 2010. A meeting/teleconference was conducted on July 27, 2010 to discuss that report. As a follow-up to that meeting/teleconference, a site visit was conducted on September 8 and 9, 2010, to field verify wetland types identified in the March 2010 report. Based upon the site visit and additional field work including a helicopter survey, PolyMet submitted a wetland type evaluation report supplement to the Wetland Workgroup on December 21, 2010. Barr Engineering has consolidated the March 2010 wetland type report and the December 2010 wetland type report supplement into a single document titled "NorthMet Project Baseline Wetland Type Evaluation" dated April 2011. In the consolidated report, the mine site area is referred to as Area One, and the tailings basin area is referred to as Area Two.

The first Wetland IAP Workgroup meeting/teleconference was conducted on October 26, 2010. At that meeting/teleconference, updates to the wetland type evaluation work were discussed along with development of impact assessment guidance to be provided to PolyMet regarding evaluation of wetland impacts (direct, potential indirect, and cumulative). In order to provide guidance regarding potential indirect wetland impacts, the Wetland IAP Workgroup believed that information was needed regarding: groundwater drawdown near the proposed open pit mine; and groundwater mounding (groundwater upwelling) near the proposed tailings basin.

The Wetland IAP Workgroup developed a list of questions regarding those two topics, and the questions were forwarded to the Water Resources IAP Workgroup on November 10, 2010. The Wetland IAP Workgroup received responses to those questions and analogue information guidelines regarding glacial aquifer drawdown near open pit iron mines on March 18, 2011, and a Wetland IAP Workgroup meeting/teleconference was conducted on March 30, 2011.

The Co-lead Agencies prepared and provided a Wetland Resources IAP Draft Summary Memo, along with three attachments, to the Wetland Resources IAP Workgroup on May 9, 2011 for review and comment. The following three attachments were provided with the draft memo:

- PolyMet NorthMet Project Co-lead Agency Workplan Preparation Guidance for Wetland Assessment
- Wetland IAP Workgroup questions for the Water Resources IAP Workgroup and that Workgroup's responses
- Summary of Indirect Wetland Impact Analogue Information by John L. Adams of ERM dated Feburary 26, 2011

A meeting/teleconference of the Wetland Resources IAP Workgroup was conducted on May 13, 2011 to discuss the draft memo and attachments.

The remainder of this document summarizes the key issues, decisions, and points of disagreement discussed during the Wetland Resources IAP Workgroup activities to date. The points of disagreement identified below need to be communicated to the Managing Sponsors of the Co-lead Agencies.

Key Issues and Decisions and Points of Disagreement

- **Wetland type evaluation for wetlands outside of the formal wetland delineations at the mine site and the tailings basin site** – The Wetland IAP Workgroup reached agreement during the March 30, 2011 meeting/teleconference regarding the acceptance of the Barr Engineering wetland typing work as accurately typing the wetlands in the Eggers and Reed wetland system for both the mine site area wetlands and the tailings basin site area wetlands. The Workgroup also agreed to use available vegetation data for subcategorizing bogs into precipitation only hydrology (ombrotrophic) vs. some groundwater hydrology (minerotrophic) bogs, and the team members will coordinate to make the subcategorizations. However, in comments on the Wetland Resources IAP Draft Summary Memo, the Grand Portage Band expressed concern that approximately 25 percent of the wetlands identified from aerial over-flights or air photos should be considered potentially misidentified as bogs.

- **Water Resources IAP Workgroup responses to the Wetland IAP Workgroup questions** – Some Wetland IAP Workgroup members expressed concern that a subgroup of the Groundwater subgroup of the Water Resources IAP Workgroup prepared and submitted the responses and the associated general guidelines regarding groundwater drawdown analogue information without the input and discussion of the entire Groundwater subgroup. To respond to this concern, a Water Resources IAP Workgroup Groundwater subgroup meeting/teleconference was conducted on April 22, 2011 to discuss responses to the Wetland IAP Workgroup questions and the associated general guidelines regarding groundwater drawdown analogue information. An updated report titled "Analogue Information Relating to Mine Pit Cone of Depression Impacts on the Surficial Aquifer" by John L. Adams, ERM, and Michael Liljegren, DNR dated May 23, 2011 was prepared. That report contained revised interpretations and guidelines regarding glacial aquifer drawdown at increasing distances from open pit taconite mines. The report was provided to the Wetland IAP Workgroup members on June 7, 2011 for review and comment. John Coleman provided comments on June 14, 2011.

- **Wetland impact assessment planning guidance**

  Direct Wetland Impacts: The Wetland IAP Workgroup reached agreement regarding how to conduct the direct wetland impact assessment. The Co-lead Agency position is that the direct wetland impact assessment will be conducted using the same method that was used for the Draft EIS. Co-lead Agency guidance for conducting the direct wetland impact assessment is provided in the attachment to this summary memo. The Minnesota Pollution Control Agency identified that it will be important for the EIS to address how organic material excavated from directly impact wetlands will be handled and stored in order to assess any impact to surface water quality. This issue will need to be addressed in the surface water quality analysis.

  Potential Indirect Wetland Impacts at the Mine Site: The Co-lead Agency position is that the assessment of potential indirect wetland impacts at the mine site should be conducted based upon an interpretation of the general analogue guidelines regarding groundwater drawdown analogue information provided by the Water Resources IAP Workgroup in accordance with the guidance provided in the attachment to this summary memo. The Co-lead Agencies believe that even with additional groundwater

data collection and additional groundwater modeling, there would still be a high level of uncertainty regarding groundwater model outputs. Therefore, the Co-lead Agencies believe that the analogue guideline method of estimating glacial aquifer groundwater drawdown near the proposed mine is reasonable and appropriate for this site and do not recommend that additional field data collection and groundwater modeling be conducted for the purpose of estimating glacial aquifer groundwater drawdown.

Some Wetland IAP Workgroup members disagree with the Co-lead Agency position. They believe that additional field data collection and additional groundwater modeling are necessary to provide groundwater drawdown cone of depression information near the open pit mine. That position was an earlier recommendation of the Wetland IAP Workgroup and was supported by Workgroup members from the Fond du Lac Band, Grand Portage Band, Great Lakes Indian Fish and Wildlife Service, U.S. Fish and Wildlife Service, 1854 Treaty Authority, Minnesota Pollution Control Agency and the U.S. Environmental Protection Agency. However; it was not supported by Workgroup members from the Co-lead Agencies, Environmental Resources Management, or Barr Engineering. In addition, some Workgroup members believe that the Co-lead Agency position is contrary to standard analysis that mining companies have to conduct as part of sulfide mine EIS processes across the country. In addition, the Grand Portage Band believes that the geology of the analogue sites appear to be non-analogous with the geology of the proposed mine site

The Co-lead Agencies have concluded that the use of lateral effect equations for ditches is not suitable for use in determining glacial aquifer drawdown near open pit mines, and that method should not be used to estimate groundwater drawdown near the NorthMet project open pits. There was no disagreement among any of the Workgroup members.

Potential Indirect Wetland Impacts at the Tailings Basin site: The Co-lead Agency position is that the assessment of potential indirect wetland impacts at the tailings basin site be conducted based upon tailings basin groundwater flow modeling (MODFLOW) and tailings basin groundwater quality modeling (GoldSim) results, which will provide information regarding: changes in groundwater seepage rates leaving the tailings basin, including the estimated portion that discharges to wetlands; changes in stream flow in the unnamed creek northwest of the tailings basin, Trimble Creek and the unnamed Creek north of tailings basin cell 2E; and water quality of the water entering those wetlands and streams. The Co-lead Agency guidance for conducting the assessment of potential indirect wetland impacts at the tailings basin is provided in the attachment to this summary memo. There was no disagreement in the in the Wetland IAP Workgroup regarding this recommendation.

Cumulative Wetland Impacts: The Co-lead Agency position is that the cumulative wetland impact assessment will be conducted using primarily the same methodology that that was used for the Draft EIS, which was based on the evaluation of direct and potential indirect wetland impacts from past, present, and reasonably foreseeable future actions within the Partridge River watershed, the Embarrass River watershed. For the SDEIS, the Section 106 area of potential effect (APE) portion of the St. Louis River (below the ordinary high water mark) from the confluence of the Embarrass River

to Lake Superior will also be included in the cumulative wetland impacts analysis. The Co-lead Agencies will also request that a qualitative analysis of estimated climate change impacts (to be coordinated with the climate change evaluation being conducted for the air impacts chapter of the SDEIS) on cumulative wetland impacts be conducted. Co-lead Agency guidance for conducting the cumulative wetland impact assessment is provided in the attachment to this summary memo. Co-lead

The Fond du Lac Band disagrees with the Co-lead Agencies regarding the definition of a reasonably foreseeable project. The Fond du Lac Band believes that several mine projects to the east and northeast of PolyMet are likely to be proposed in the near future. The Co-lead Agencies believe that a project that might be proposed is too speculative to include in a cumulative effects analysis.

The Minnesota Pollution Control Agency has requested that the EIS include an evaluation of how cumulative wetland impacts would impact water quality in the Partridge River watershed and the Embarrass River watershed. The Co-lead Agencies believe that the appropriate place in the EIS for that discussion would be in the water quality cumulative impacts section.

The Fond du Lac Band has requested that the EIS include an evaluation of cumulative impacts of Iron Range mine projects on water quality of wetlands. The Co-lead Agencies believe that the appropriate place in the EIS for a discussion of cumulative wetland water quality impacts would be in the water quality cumulative impacts section.

Water Quality Potential Indirect Wetland Impacts: The Wetland IAP Workgroup reached agreement regarding the need to evaluate potential indirect wetland impacts that may occur as a result of adverse changes to water quality in the wetlands near the mine site, tailings basin site, and the transportation corridor between the mine site and the plant site. Co-lead Agency guidance for conducting the water quality potential indirect wetland impact assessment is provided in the attachment to this summary memo.